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ABSTRACT BOOK

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Persistent Cranial Defects Following Endoscopic Sagittal Synostosis Surgery

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Robin Wu


Robert Menard

Abstract
Background: Incomplete cranial ossification following calvarial-vault remodeling for sagittal synostosis ranges in incidence from 0.5-18%, often requiring reoperation. The occurrence after endoscopic craniectomy is poorly reported and management is less clear.
Methods: Infants with sagittal synostosis who underwent endoscopic sagittal synostectomy and barrel-stave osteotomies with post-operative orthotic helmeting between 2003-2021 by a single surgeon were included with minimum follow up until completion of helmeting.
Results: Of eighty-six patients meeting inclusion criteria; three had persistent cranial defects (3.5%) requiring reoperation. Patients with and without cranial defects had no difference in age of surgery (mean 113 days vs 131 days), duration helmeting (mean 6.6 months vs 7.0 months), or peri/post-operative complications. Two patients underwent reoperation for synostosis recurrence. Patients with cranial defects manifested evidence of developmental concerns more often than patients without (100% vs 16.9%).
The average cranial defect size was 19.33cm2 and age at reoperation was 4.29 years. All were managed with cranial particulate bone grafting with addition of bone matrix and SonicWeld plate. The first patient had a 6x6 cm posterior defect requiring cranioplasty at 4.86 years with excellent healing. The second had a 3x6 cm posterior and 1x1 cm anterior defect, underwent cranioplasty at 4.14 years with continued 4x6 defect, requiring repeat cranioplasty at 5.3 years. The third had a 3x5 cm posterior defect and underwent cranioplasty at 3.88 years with continued defect, currently planning for repeat intervention.
Conclusions: This is the largest series focusing on reoperations for incomplete ossification after endoscopic sagittal synostectomy with post-operative helmet treatment. We report a 3.5% rate of cranial defects, managed with bone grafting, bone matrix, and absorbable plates. Patients with poor ossification may have a propensity towards multiple reoperations and possible developmental concerns.

Objectives
1. Participants will appreciate the incidence of persistent cranial defects following endoscopic sagittal synostosis surgery. 2. Participants will understand management strategies and difficulties for patients with persistent cranial defects. 3. Participants will be able to counsel families of patients with sagittal synostosis considering endoscopic synostectomies on the anticipated complications, risks, and treatment course.

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Facial Contour Refining after Surgery-First SSRO with Computer-Assisted Design in East Asians

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Chenzhi Lai


Xiaolei Jin

Abstract

Background

Surgery-first sagittal split ramus osteotomies (SF-SSRO) are an effective treatment for patients with dental malocclusion. However, some patients with mandibular prognathism usually have facial deficiencies which cannot be corrected completely after orthognathic surgery. These are not accepted because the remaining facial contours are in disharmony.

Methods

Twenty-five patients, who were unsatisfied with their appearances after SF-SSRO and orthodontics, were included. The preoperative CTs were used to investigate patients for facial deformity. To achieve a harmonious facial contour, mandible long-curve osteotomy/mandible U-shaped osteotomy, genioplasty or facial autologous fat grafting was selected depending on patients' contour deformities with the assistance of CAD.

Results

Among the patients who underwent osteotomy, the gonial angle was improved from 111.16° ± 9 to 111.58° ± 9.06 after SF-SSRO because of distal fragment setback and rotation. After facial refine surgery, the gonial angle was significantly increased to 121.69°±2.41 ($p < 0.05$). And the mandibular width was decreased from 11.29 cm ± 0.44 to 10.45 cm ± 0.39 ($p < 0.05$) after mandibular outer plate griding. All patients were shown no signs of infection, massive bleeding, and osteonecrosis in the early stage. After follow-up time, they were all satisfied with their results and most of them recovered from lip numbness.

Conclusions

This study indicated the clinical feasibility of two-stage orthognathic and facial bone contouring surgery for the treatment of dentofacial deformities. Two-stage facial contouring surgery can provide esthetic improvement for more accuracy in refining the facial contour.

Objectives

1. In this study, we aimed to investigate the feasibility and effectiveness of two-stage performance aimed at facial contour features. 2. In this presentation, participants will be able to know our surgical skills and paradigm of facial contour refining after surgery-first SSRO 3. Aesthetic orthognathic surgery, already massively popular in Korea and China, will steadily increase in popularity until it matches other procedures in aesthetic surgery. This will come to the United States and other Western nations in short order. It is important for the participants of Aesthetic Plastic Surgery to continue their education in this arena.

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A Novel Surgical Technique for Management of Frontonasal Encephalocoeles: The Mercy Ships Method

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Abstract

BACKGROUND Large Frontoencephalocoeles require complex reconstruction of cerebral herniation, elongated nose, telecanthus and frontal bone changes. Previous techniques require segmental osteotomies that often fail to address the brow rotation in particular. This presentation provides a single stage technique through simplified osteotomy techniques performed on the Mercy Ships through a dedicated craniofacial team. **METHODS** Retrospective review were performed on patients who underwent Frontoencephalocoele reconstruction on the Mercy Ships using the technique described. Patient data included country, age, gender, associated diagnoses and previous procedures. Intraoperative and postoperative complications were recorded. **RESULTS** Eight patients with frontoencephalocoeles (age 4 to 14 years) underwent surgery with the novel technique in 4 countries. Average surgical time was 6 +/- 0.9 hours. No intraoperative complications occurred. Postoperatively, one patient has a dislodged lumbar drain requiring replacement and one patient sustained a fall requiring reoperation for hardware replacement. Minimum follow up was two and a half months with no additional complications with phone follow up at 1 to 2 years post operatively. **CONCLUSIONS** Reconstruction of large frontoencephalocoeles requires resection and functional closure of the encephalocele defect, as well as craniofacial reconstruction to correct medial hypertelorism, long nose deformity, and cephalad rotation of the forehead. We present a novel and reliable method of addressing the function and aesthetic needs of frontoencephalocele reconstruction through incision design, modified osteotomies and simplified bandeau manipulation.

Objectives

1. Identify the management issues of Frontoencephalocoeles 2. Identify the underlying anatomical issues that present in these patients 3. Learn to perform the simplified surgical steps required to balance the face

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Early Bone Reformation after Cranial Vault Remodelling for Sagittal Craniosynostosis: 3D Measurement and Reformation Pattern

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Abstract

Background: Sagittal craniosynostosis is the most common isolated craniosynostosis. Surgical approaches range from a strip craniectomy to extensive craniectomy to facilitate cranial vault remodelling (CVR). There is little information on post-surgical cranial re-osteogenesis; intraoperative technique and postoperative care vary widely. This study aims to measure postoperative bone reformation percentage, rates and patterns after CVR in isolated non-syndromic sagittal craniosynostosis.

Methods: Patients (n= 43) who underwent cranial vault remodelling between January 2018 and July 2021 were selected. Early postoperative CT scans were collected. Volumetric bone measurements created after surgery were performed starting from the DICOM files. The 3D images were then resampled into the master box, and 'Skull 3D models' were derived. The percentage of bone reformation was investigated using automated 3D analysis software.

Results: Of the 43 patients, there were 37 males (86%) and 6 females (14%). The intra-rater reliability analysis revealed high reliability. The median bone reformation volume and rate were 11.2 ml and 1.98 ml/week, respectively. The median percentage of bone reformation was 56.7% (6.5–94.5), and the median postoperative CT timing was 6.1 weeks (range 1.0-55.0). As a statistic model, the linear plateau showed the highest Pseudo R^2 in both volume and percentage of bone reformation predicting patterns.

Conclusions: We concluded that using the bone reformation model at 9 weeks postoperatively, the re-osteogenesis reaches 80% of the total cranial defect. After CVR, the early bone reformation pattern was demonstrated as a linear plateau model rather than logarithmic, as previously believed.

Objectives

1. Provide the opportunity to explore and better understand the pattern and progress of bone reformation after CVR. 2. Investigation of the temporal and spatial response of bone reformation after CVR should aid understanding and improved prediction of short- and long-term outcomes. 3. Develop a mathematical model to predict bone reformation after CVR.

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Midface intermediate osteotomy with Rigid External Distraction in Crouzon syndrome

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Jacques Saboye

Abstract

Background: In Crouzon syndrome, there is a growth disorder that affects the midface. it is retrusive and needs a facial advancement. We describe an intermediate midface osteotomy between Lefort 2 and 3, that respects the nose, combined with distraction on a RED

Material and method: We use an endobuccal approach. Pterygo maxillary disjunction, cut of nasal septum, oblique section of the zygomatic arch, section of the horizontal external orbital apophysis and of the lower orbital rim outside the nasal tear canal. The Rigid External Distractor is placed on the skull with two horizontal support bars, this allows four points for traction. After 1 mm a day, the mark of the correct positioning is the dental bite.Six weeks later the removal is easy

Discussion:Distraction in Crouzon syndrome has been used for many years. It allows important advances. Maxillary advancement is necessary because obstructive sleep apnea syndrome is common in Crouzon. Preoperatively polysomnography justifies the surgery

Results:seven children with Crouzon disease benefited from this technique between 2015 and 2022, the average age was 12 years, they all had sleep apnea syndrome, of varying intensity. All were in need of surgery due to unsightly facial appearance, complaining of facial retrusion and exophtalmos.The advance obtained corrects exorbitism, with its aesthetic and corneal benefit. The dental bite has been stable over time for 5 of them, two are still in orthodontic treatment, none has been reoperated since the intermediate osteotomy .They all improved on a respiratory level and on aesthetic appearance

Conclusion: The intermediate osteotomy is like a Lefort 3 osteotomy respecting the nose. The distraction with cranial support allows a very important advance stable over time. It corrects dental bite, eliminate exophthalmos and treat sleep apnea syndrome. It changes the nose aspect without rhinoplasty pushing the tip of the nose upward

Objectives

explain Crouton syndrome consequences on vision, breath, aesthetics explain how to manage facial distraction with an external device explain midface osteotomies

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Lasting Structural Support with Cadaveric Cartilage for Wegener's Granulomatosis (Polyangitis) Nasal Reconstruction

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Abstract

Background: Granulomatosis with polyangitis (Wegener's) is known to cause progressive nasal collapse related to the dissolution of septal and other nasal cartilage resulting in nasal obstruction and severe central face deformity. It is not known whether structural reconstruction with cadaveric cartilage is comparable to traditional rib cartilage grafting. To investigate this we compared the 2 reconstructive groups for long term stability.
Methods: Patients suffering from Granulomatosis with polyangitis (Wegener's) were divided into 2 groups: 1) Costocartilaginous and 2) Cadaveric cartilage (MTF) based on reconstructive grafts used for structural reconstruction (n=21) performed consecutively by a single surgeon over a 15-year period. Outcome assessment was based on perioperative complications, long term stability (1-year), need for revisions, and patient-reported functional and aesthetic outcomes using the SCHNOS validated questionnaire (Student's T-test used).
Results: Perioperative complications (infection, exposed cartilage, need for take-back) was similar in the 2 groups (9% and 7%) and related to preoperative severity (increased SCHNOS score); all with scores more than 40)-likely related to soft tissue contraction. With patient reported outcomes, cadaveric cartilage was slightly superior (lower scores) to costocartilaginous with postoperative scores: (11.1+2 vs 19.2+4) and improvement (greater difference between preoperative to postoperative scores (36.3+9 vs 29.9+7). Detailed nasal cartilaginous reconstruction technique video will be shown.
Conclusions: Cadaveric cartilage structural reconstruction was comparable to traditional rib cartilage for Granulomatosis with polyangitis (Wegener's) nasal reconstruction and provided patients with major functional and cosmetic improvement.

Objectives

Readers will learn that cadaveric cartilage structural reconstruction is comparable to traditional rib cartilage for Granulomatosis with polyangitis (Wegener's) nasal reconstruction. This paper will create conversation around the outlined forms of nasal reconstruction which provides hope to patients for major functional and cosmetic improvement. With the detailed nasal cartilaginous reconstruction technique video will be shown, surgeons who read/watch can start to practice this technique and increase access.

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Morphometric Analysis and Outcomes following Posterior Cranial Vault Distraction in Syndromic and Multi-suture Craniosynostosis. The Hospital for Sick Children's Experience

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Sultan Al-Shaqsi


Christopher Forrest


Christine Novak

Abstract

Background: Turribrachycephaly, is a common feature in many syndromic and multi-suture craniosynostoses and is traditionally treated with total cranial vault reshaping and fronto-orbital advancement. A staged approach with posterior cranial vault distraction as a primary procedure followed by anterior cranial vault reshaping has the advantage of reducing the vertical dimension of the skull in a controlled and gradual manner while expanding the cranial volume. The purpose of this study was to evaluate outcomes following posterior cranial vault expansion using distraction osteogenesis at a single tertiary pediatric centre.

Methods: This retrospective review included all cases of posterior cranial vault distraction at a single institution from 2008-2022 performed by one surgeon. Morphometric outcomes were assessed from pre and post-operative CT scans for patients who underwent posterior cranial vault distraction as a primary first stage operation. Clinical outcomes and complications were collated.

Results: 41 patients (25 females, 16 males; mean age 11 months) with 32 cases of syndromic craniosynostosis and 7 cases of non-syndromic craniosynostosis were included. The main indication for posterior cranial vault distraction in this cohort was turricephaly (63%). The mean distraction distance was 25.9 mm and the mean decrease in the turricephaly index was 18%. The estimated increase in posterior cranial volume from distraction alone in this cohort was 19.7%. In this cohort of patients, 13 patients (32%) experienced complications but there were no mortalities.

Conclusion: Posterior cranial vault distraction osteogenesis is an effective surgical procedure to increase intracranial volumes in children with syndromic craniosynostosis. It reduces the vertical height and corrects turricephaly appropriately. It is an effective procedure to normalize craniofacial dysmorphism as a first stage approach in the appropriately selected cases.

Objectives

1) Participants will learn about staged approach for the management of turricephaly in syndromic craniosynostosis. 2) Participants will learn about the morphometric changes from posterior cranial vault distraction. 3) Participants will learn about potential risks from posterior cranial vault distraction.

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Magnetic Resonance Cranial Imaging In Pediatric Patients: Evaluation Of Both Motion Corrected and Automated Deep Learning Pseudo-CT Estimated MR Images

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Abstract

Background: Three-dimensional imaging of the skull is essential for diagnosis and surgical planning. Magnetic resonance imaging (MRI) is radiation-free but has been unable to produce clinically useful images of bone. We aim to deploy automated motion correction and deep learning to generate clinically acceptable pseudo-CT images from MRI.
Methods: Pediatric patients who underwent a clinical head CT scan for either trauma or cranial suture patency were recruited. Enrolled patients then underwent a 5-minute research unsedated MRI. Depending on indication for scan, either presence of skull fracture or suture patency was recorded while viewing the MRI-based pseudo-CT, then re-evaluated while viewing the clinical CT.
Results: 15 patients underwent scanning to evaluate suture patency. 27 patients underwent scanning for head trauma. For cranial suture patency, pseudo-CT had 96% specificity and 100% sensitivity for suture closure. For the patient with open sutures on CT but not pseudo-CT, the MRI was obtained 8 weeks later in the postoperative period from calvarial vault remodeling. For identification of skull fractures, pseudo-CT had 100% specificity and 83% sensitivity. For the fracture identified on CT but not pseudo-CT, the scans were obtained 9 weeks apart, and pseudo-CT showed radiographic healing.
Conclusions: Automated motion corrected and deep learning-generated pseudo-CT images generated from MRI of the pediatric skull were acceptable for clinical use and offer a high level of diagnostic accuracy when compared to standard CT scans.

Objectives

Participants will be able to evaluate the shortcomings in prior techniques for MRI of bone. Participants will be able to compare MRI-based pseudo-CT to traditional CT images of the skull and assess their clinical utility. Participants will be able to analyze areas for continued improvement in MRI of cranial bone.

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Evaluation of Treatment with Unilateral Mandibular Sagittal Split Ramus Osteotomy and Maxillary Osteotomy in Patients with Condylar Osteochondroma and Mandibular Asymmetry

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Liang Xia

Wenwen Yu

Abstract

Background: We evaluated the skeletal symmetry of patients with dentofacial deformities secondary to condylar osteochondroma after unilateral mandibular sagittal split and maxillary osteotomy by measuring mandibular deviation and rotation. Occlusion stability and facial symmetry were also evaluated during the follow-up.
Methods: Patients with a unilateral condylar osteochondroma combined with dentofacial deformity and facial asymmetry who underwent surgery at Ninth People's Hospital of Shanghai Jiao Tong University School of Medicine between January 2020 and December 2020 were enrolled in this retrospective study. The operation included condylar resection, Le Fort I osteotomy and contralateral mandibular sagittal split ramus osteotomy (SSRO). Simplant Pro 11.04 software was used to reconstruct and measure the preoperative and postoperative craniomaxillofacial CT images. The deviation and rotation of the mandible, change in the occlusal plane, position of the "new condyle" and facial symmetry were compared and evaluated during follow-up.
Results: Three patients were included in the present study. The patients were followed up for 9.6 months (range, 8-12). Immediate postoperative CT images showed that the mandible deviation and rotation and occlusion plane canting decreased significantly postoperatively; facial symmetry was improved but still compromised. During the follow-up, the mandible gradually rotated to the affected side, the position of the "new condyle" moved further inside toward the fossa, and both the mandible rotation and facial symmetry were more significantly improved.
Conclusions: Condyle resection surgery combined with orthognathic surgery was a reliable treatment for patients with a condylar osteochondroma and secondary dentofacial deformity. For some patients, a surgical combination of condylectomy with condylar neck preservation and bimaxillary surgeries without ipsilateral mandibular SSRO could be effective in achieving ideal facial symmetry. Concurrent ipsilateral mandibular SSRO and second-stage contouring surgeries might be avoided.

Objectives

1. Participants will learn about what condylar osteochondroma is. 2. Participants will learn about the jaw deformity secondary to condylar osteochondroma. 3. Participants will learn about the surgical treatment of condylar osteochondroma associated with malocclusion.

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Predictors of outcomes and complications after orbital wall fractures reconstruction with unsintered hydroxyapatite/poly L-lactide

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Sang Wha Kim

Abstract

Background

The unsintered hydroxyapatite/poly L-lactide (uHA/PLLA) is a novel bioresorbable material with osteoconductive and osteosynthetic properties. The purpose of this study is to report the outcomes in orbital wall fracture reconstruction with uHA/PLLA.

Methods

The authors retrospectively reviewed patients who underwent surgical repair for orbital fractures using the 0.5mm-thick porous mesh type of uHA/PLLA from 2015 to 2021. Patient characteristics, trauma mechanism, symptoms (diplopia, enophthalmos, limited ocular movement, infraorbital numbness), complications, and computed tomographic scans were collected.

Results

A total of 118 patients (90 males and 28 females, mean age 39.1 years) with orbital fracture repair at a mean 13.9 days postinjury were analyzed in this study. Mean follow up was 1 to 70 (mean 10.3) months. There were 70 patients with orbital floor fractures, 23 with medial orbital wall fractures and 24 with both medial and inferior orbital wall fractures. At their latest follow-up visits, 6 patients had persistent diplopia in the extreme gaze, one had mild enophthalmos, and one had infraorbital numbness. These sequelae were assumed to be associated with the severity of the fracture. There were 4 patients who presented eye discharge and tenderness between 1 and 3 months after isolated medial orbital fracture surgery. All of them resolved spontaneously without implant explantation.

Conclusions

uHA/PLLA is an effective bioactive and resorbable material for orbital reconstruction because of its suitable mechanical intensity, degradation time, thinness, and few complications. Mild inflammation probably related to the process of biodegradation and simultaneous regeneration of the new bone may occasionally occur, which can be managed conservatively.

Objectives

participants can evaluate outcomes of orbital wall fractures participants can explain the unsintered hydroxyapatite/poly L-lactide (uHA/PLLA) participants can manage the complications of orbital wall fractures

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Comparison of one-jaw and two-jaw design in virtual surgery planning for patients with class III dentofacial problem

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Yoshitsugu Hattori

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Abstract

Background: Orthognathic surgery is versatile in the treatment of maxillomandibular discrepancies for patients with class III malocclusion. It facilitates not only to attain an ideal occlusion, but also to improve overall facial aesthetics and harmonize facial profile; in recent times, patient's expectation is focused profoundly on facial appearance and the demand for aesthetic enhancement is increasing. However, there is still controversy regarding the selection of one-jaw (mandibular setback or maxillary advancement) or two-jaw surgery. The purpose of this study is to evaluate the quantitative differences between one-jaw and two-jaw surgical designs.
Methods: We retrospectively recruited consecutive patients with class III malocclusion who underwent orthognathic surgery between August 2016 and November 2021. One hundred patients were included, and all patients had received two-jaw surgery with preoperative three-dimensional surgical simulation. Based on the same final occlusion setup, two types of one-jaw surgery design were created. A total of 400 image sets, including preoperative images and three types of surgical simulations, were measured and compared.
Results: The one-jaw mandibular setback design showed improvements in most of the cephalometric measurements and facial symmetry. Although the one-jaw maxillary advancement design had improved ANB angle and facial convexity, it tended to induce maxillary protrusion and decreased facial symmetry. The two-jaw design facilitated to achieve significantly closer cephalometric measurements to the normative values, better symmetry, and lesser occlusal cant compared with the other surgical designs.
Conclusions: Overall, the two-jaw surgical simulation provided a quantitatively better facial appearance in terms of symmetry, proportion, and profile. Although the practical surgical design could be determined through detailed preoperative evaluation and a shared decision-making process with the patient, two-jaw surgery should be considered as a versatile alternative to improve the overall facial esthetics and harmonize the facial profile.

Objectives

Participants will be able to tell the three-dimensional facial bone characteristics of patients with class III malocclusion and specific considerations in the surgical planning. Participants will be able to tell the quantitative differences between one-jaw (mandibular setback or maxillary advancement) and two-jaw surgery. Participants will be able to select the ideal surgical design for each individual patient with class III malocclusion.

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Comparing Clinical Outcomes in Bone Particulate Autologous and Alloplastic Pediatric Cranioplasty

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Abstract

Purpose: Cranioplasty in the pediatric population represents an understudied cohort due to anatomic plasticity, growth considerations and an amalgam of presenting conditions. Pediatric cranial reconstruction techniques are established for adults, yet there is a paucity of data representing outcomes and complications of cranioplasties within the pediatric population. This study aims to provide insight into outcomes associated with bone particulate autologous and alloplastic cranioplasties in pediatric patients.

Methods: The meta-analysis herein follows PRISMA and GRADE Criteria. We screened 1,338 articles with 8 meeting criteria for synthesis, extracting 371 pediatric patients (age 9mo-18yr) for review with 119 (32%) undergoing alloplastic reconstruction and 252 undergoing reconstruction with other materials (follow-up 9mo-7yr). Inclusion criteria included age, material, and procedure performed. Studies published prior to 2000, of adult populations, utilizing other procedures, or with unratifiable data were excluded. Risk differences across studies were calculated in R to compare rates of reoperation in patients undergoing bone particulate autologous and alloplastic cranioplasty.

Results: Analysis showed that alloplastic pediatric cranioplasties were associated with a statistically significant decrease in reoperations compared to bone particulate autologous techniques, with a risk difference of 0.17% ($p < 0.01$). Alloplastic cranioplasties also provided a significant decrease in reoperations when compared to all other materials combined, with a risk difference of 0.12% ($p < 0.01$).

Conclusions: Our findings of a decreased risk of reoperation when using alloplastic materials for cranioplasties in the pediatric population is an important consideration when evaluating the rapidly growing skulls of pediatric patients and the potential risk that reoperations pose. The extremely limited literature on this population demands further exploration to better understand the ramifications of material type on the rate of reoperation for pediatric cranioplasties.

Objectives

Participants will be able to see the observed difference in outcomes between alloplastic and bone particulate autologus cranioplasties in pediatric patients over a large group of published literature. Participants will be able to discern which material is best for future pediatric cranioplasties thanks to lower rates of reoperation with specific techniques and materials. Participants will be able understand the different strengths and weaknesses between cranioplasty materials.

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Pediatric Maxilla-Mandible Oncoplastic Reconstruction: A 25 Patient Case Series.

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Ammar Hashemi

Nicholas Yim

Abstract

Background: We present a case series of 25 patients who underwent pediatric maxillary and mandibular oncoplastic reconstruction at a single institution. Further we discussed the present review of the literature and underscored the unique considerations for the pediatric population.

Methods: A retrospective chart review of 25 maxillary and mandibular pediatric oncoplastic reconstruction patients was done between March 2015 to January 2022.

Results: 13 patients underwent maxillary reconstruction, and 12 patients underwent mandibular reconstruction. The mean age of the maxillary cohort was 10.2 years, and the mean age of the mandibular cohort was 9.8 years. The age range of patients followed was from 6 months to 18.8 years.

Conclusion: Maxillary and mandibular reconstruction following oncologic resection requires special attention in the pediatric population because of the difficulty to predict bony growth of the mid and lower face, dentition, symmetry, and donor site morbidity. Our single institution case series demonstrates that advances in microsurgery and 3D virtual surgical planning, has allowed reconstruction in these patients safe and efficacious.

Objectives

Participants will be able to understand the unique challenges in the pediatric population. Participants will be able to understand the importance of the condyle for mandible reconstruction. Participants will be able to appreciate neurosensory functional reconstruction considerations.

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Posterior Cranial Vault Distraction in Transplant Patients

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John Sullivan


Alicia Snider


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Ian Hoppe

Abstract
Purpose:The incidence of craniosynostosis is 1/2500 in live births. While craniosynostosis is moderately prevalent, the incidence of patients with both craniosynostosis and organ transplant is rare. However, with increasing numbers of pediatric patients undergoing organ transplant, this pairing of diagnoses will increase. The immunosuppressive nature of transplant medications raises concern for both impaired healing and infection. Given the paucity of information regarding this unique patient population, we seek to share our institutional experience. The purpose of this study is to evaluate the perioperative course of two patients undergoing cranial vault distraction with previous organ transplantation on immunosuppressive medications.
Methods:Patient 1 is a 3 year-old female with a kidney transplant in 2018 at 2 years-old and with bicoronal and sagittal craniosynostosis. Patient 1's surgery for craniosynostosis was 08/28/2019 and distractors were removed on 10/04/2019 due to infection. Patient 2 is a 3 year-old male with a heart transplant in 2017 at 3 months-old who had bicoronal and sagittal craniosynostosis. Patient 2's surgery was on 08/29/2019 for placement of the distractors and they were removed on 10/28/2019 for infection. Both patients were on anti-rejection drugs.
Results:Both patients developed an infection requiring hardware removal. From this, we sought to evaluate the contributing factors associated to see if there are contributing factors that can be mitigated in future cases.
Conclusions:Immunosuppressive therapy inhibits wound healing and places patients at risk for wound infection. Further investigation is needed into preventative measures of mitigating distractor site infections in this population. Increased awareness of this potential outcome prompts vigilance in hygienic pin sites, consideration for an extended course of antibiotics while hardware is in place, and taking prompt action for signs of infection. To our knowledge, this is the first case series of transplant patients undergoing surgical management with posterior vault distraction.

Objectives
1. To present our experience with patients with cranial distractors that also are on long term immunosuppressive therapy 2. To recommend the use of extended antibiotic duration for patients that are immunosuppressed that also have implantable cranial distraction hardware 3. To recommend prompt removal of cranial distraction devices in the setting of an infection in patients with a cranial distraction hardware system

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The Carbon Footprint of the Craniomaxillofacial Surgeon: A Single Center Analysis of 3D-Printed Constructs

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Abstract

Background: Three-dimensional (3D) printing has an expanding role in craniomaxillofacial surgical planning and implementation. Nevertheless, the environmental impacts of this technology are not well understood. To better understand when the benefits of 3D printing outweigh its ecological costs, a focused exploration of 3D printing at a single institution was conducted.
Methods: All invoice data from commercial vendors used at Johns Hopkins Hospital for the two-year period from January 2020 to December 2021 were reviewed, and information regarding the material composition and surgical indication of each construct was recorded. Concurrently, a review of commercially available 3D printers was conducted, and the energy required to power each printer was calculated from manufacturer data. Using estimated print times for common surgical constructs and conversion factors from the U.S. Energy Information Administration, the carbon emissions generated in the production of all surgical constructs used by craniomaxillofacial surgeons were assessed.
Results: Invoice data revealed 406 patient-specific constructs (158 contour models, 104 guides, 84 implants, and 60 splints) composed of resin (51.0%), titanium (25.4%), polyamide (23.4%), and polyether-ether-ketone (0.2%). In total, 2,644.4 printer hours and 36.1 megawatts of power were needed to manufacture these constructs. To power these printers, an estimated 15.71 metric tons of carbon emissions were released. These emissions are equal to those released when burning 7,882.1 kg of coal or 36.4 barrels of oil. To offset these emissions, 5.4 tons of waste would need to be recycled instead of landfilled, or 595 incandescent bulbs would need to be exchanged for light-emitting diodes.
Conclusions: 3D printing is a resource-intensive practice; therefore, CMF surgeons must weigh its patient benefits against its environmental costs to determine when 3D printing is warranted. Restricting prints to critical anatomical features, minimizing support structures, and reusing printed constructs may help to lessen the environmental impact of this growing practice.

Objectives
Participants will be able to explain how the design of 3D-printed constructs influences their carbon footprint. Participants will be able to evaluate practices associated with sustainable printing. Participants will be able to review and critique the best indications for 3D printing in clinical practice.

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Posterior Vault Distraction in the Acute Setting

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Matthew Sink


Laura Galarza


Kristin Weaver


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Laura Humphries


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Abstract
***Background**:* Using posterior vault distraction osteogenesis (PVDO) in cases of slit ventricle syndrome (SVS) and idiopathic intracranial hypertension (IIH) has been shown to resolve acutely increased intracranial pressure (ICP) while carrying an acceptable complication and risk profile. PVDO in such cases has been associated with symptomatic improvement postoperatively and decreased need for additional shunt related surgeries in those patients requiring ventriculoperitoneal shunt placement. We present our experience with PVDO performed as an acute intervention as evidence for the safety and efficacy for management of acutely increased intracranial pressure (ICP).
***Methods**:* We report four cases of PVDO in patients with acutely increased ICP of varying etiologies.
***Results**:* Four children with craniosynostosis underwent PVDO to address acutely increased ICP, all at less than 5 years of age. The four patients all presented with papilledema and symptoms of increased ICP. One patient presented with SVS and multiple shunt revisions, now with a non-functioning shunt. There were no reported intraoperative complications during distractor placement or removal. Distraction protocol was similar in all patients with distraction beginning on post-operative day one and proceeding at 1-2 mm per day for an average total distraction of 28 mm. For the 3 cases not requiring shunt placement, the average length of stay was 7 days following distractor placement. The patient with SVS required externalization of the shunt during distraction followed by early distractor removal and replacement of shunt. Computed tomography in all patients indicated increased intracranial volume following distraction and improved symptoms. One case of surgical site infection (in an immunocompromised patient) required premature distractor removal during the consolidation period.
***Conclusions**:* Our experience with PVDO in the acute setting is reported, alongside a review of current literature, in order to provide supporting evidence for the efficacy of posterior vault distraction as a tool for resolving acutely increased ICP.

Objectives
Participants will be able to review four cases of posterior vault distraction in the acute setting. Participants will understand the efficacy of posterior vault distraction as a tool for resolving acutely increased ICP. Participants will be able to compare the benefits and complication profile of posterior vault distraction in the acute setting.

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Craniometric and Volumetric Analyses of Normocephalic and Scaphocephalic Patients with Nonsyndromic Single-Suture Sagittal Craniosynostosis

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Abstract

Methods: Head CT scans of 20 scaphocephalic and 20 normocephalic patients with sagittal craniosynostosis and their age- and sex-matched controls were analyzed, including cranial base angles, distances-from-midline, and intracranial volumes. Two-tailed t-tests compared groups.

Results: Cranial Index was lower for cases than controls in both the scaphocephalic and normocephalic groups (p = <0.001, respectively). Right external acoustic meatus angle (EAMA) was significantly larger in scaphocephalic (p = <0.001) and left EAMA was significantly smaller in normocephalic patients (p = 0.002) when compared with controls.

Midline angular analysis showed that interoccipital angle decreased in both scaphocephalic and normocephalic groups(p=<0.001). Bifrontal angle was significantly decreased amongst scaphocephalic patients (p=0.028) but not for normocephalic patients.

Cranial base distances-from-midline were longer to the right and left internal acoustic meatus and shorter to the euryon-to-zygomaticofrontal suture for both groups of cases than controls (p<0.05).

Scaphocephalics had a larger anterior cranial volume ratio than controls (18% vs 13%, p=<0.001). Normocephalics had larger posterior volume ratios than controls (42% vs 33%, p=<0.001). Scaphocephalics had larger anterior volume ratios than normocephalics (1.69 vs 1.16, p=0.016), but smaller posterior compartment volume ratios (0.9 vs 1.53, p=<0.001).

Conclusion: NSSS scaphocephalic and normocephalic patients have significant craniometric and cranial volumetric differences than their controls and each other. Specifically, both normocephalic and scaphocephalic patients had a longer-than-wide head ratio (cranial index) than their controls, and wider anterior cranial base angle (IOA) than controls. However, both scaphocephalic and normocephalic patients demonstrated rightward lateralization of cranial base angles and distances compared to controls but not to the same extent. These data show craniometric evidence that although normocephalic and scaphocephalic sagittal craniosynostosis patients have overlapping

cranial morphologic characteristics, they also differ in their cranial base lateralization and their intracranial volume distributions. This may have implications for underlying pathophysiology, diagnosis timing and treatment of NSSS.

Objectives

At the end of the presentation / poster, participants will be able to: -identify effective practices for improving interdisciplinary team coordination and apply new team management practices to their cleft/craniofacial team. -interpret trends in craniometric and volumetric similarities/ differences in patients with NSSS. -develop a comprehensive understanding for cranial manifestations of NSSS

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Mandibular Distraction in Patients with Pierre Robin Sequence: A Multi-Surgeon Experience

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Madyson Brown


Samuel Hopper


John Phillips


Matthew Sink


Katie Brown


Colton Fernstrum


Laura Humphries


Ian Hoppe

Abstract

Background:

Mandibular distraction osteogenesis (MDO) is rapidly becoming a standard of care for management of patients with severe Pierre Robin Sequence. The tongue is brought forward to alleviate the airway obstruction. This study will look at an institutional, multi-surgeon experience with MDO over ten years.

Methods:

This study was conducted as a retrospective chart review including all patients who underwent MDO at the authors' institution from 2012 to 2022. Demographics, preoperative and postoperative respiratory and feeding status, and distraction data were collected. Primary outcomes were achievement of full oral feeds, avoidance of a gastrostomy tube (GT), avoidance of a tracheostomy, discharge from hospital on room air and complications. A significance value of 0.05 was utilized.

Results:

Twenty-seven patients met inclusion criteria. A shorter duration of intubation following index procedure was associated with discharge on RA and a longer duration of intubation was associated with unilateral pan-facial nerve palsy. A longer activation phase was associated with discharge with a GT and a shorter activation phase was associated with discharge on full oral feeds. The ability to discharge on RA was associated with a shorter latency phase, shorter activation phase, and decreased distance of distraction.

Conclusions:

The goal of MDO is to achieve full oral feeds with no respiratory support. When assessing patients preoperatively, it is important to note the higher rate of failure to avoid a tracheostomy in patients with a syndrome and those with tracheomalacia and subglottic stenosis noted on airway evaluation. Syndromic patients were also noted to be more likely to be discharged with a GT. Several different latency periods were used in this study, and it appears that not only is a short latency period safe, but that it may be correlated with successful discharge on RA.

Objectives

Participants will be able to evaluate pertinent risk factors for feeding and respiratory complications preoperatively in patients with Pierre Robin Sequence. Participants will be able to manage expectations of outcomes based on patient presentation and distraction protocol. Participants will be able to plan more informed and individualized procedures based on a variety of objective measures.

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Propeller Buccal Myomucosal Flap: anatomical study and preliminary experience in 25 primary cleft palate reconstructions

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Nicholas Sinclair **Ying Ku** **Lianne Mulvihill** **Bahar Bassiri Garb** **Antonio Rampazzo**

Abstract

BACKGROUND: Buccal artery myomucosal (BAMM) flap has been well-described for cleft palate (CP) reconstruction. However, anatomic analysis and application of a completely islanded propeller flap have not been reported in the literature.

METHODS: Anatomical study was performed using Indocyanine green, red and blue latex injected directly into the buccal pedicle of 22 fresh hemifacial cadavers. Then, clinical analysis of the senior authors' (BBG, AR) experience with 25 consecutive primary cleft palate reconstructions utilizing a propeller islanded BAMM flap was conducted to assess palatal healing and flap outcomes.

RESULTS: Mean buccal artery diameter was 0.95±0.29mm. Neurovascular pedicle entered the flap 11.38±2.87mm anterior to the pterygomandibular raphe. Buccal artery advanced inside the flap as much as 66.8%±6.0% of the total flap length. All reconstructions were performed using Furlow palatoplasty. 36 flaps were utilized in 25 patients (mean age 478d). The mean maximum cleft width was 11.7 mm. Mean BAMM flap width was 1.2 cm and 11 cases utilized bilateral flaps. The flap always reached the contralateral pillar and the buccal nerve was always preserved. Mean follow-up was 400 days. There were 2/36 flap loss. In both flap losses, pedicles were aggressively dissected. 4/36 flaps underwent revision surgery for flap debulking.

CONCLUSIONS: This study shows that the buccal pedicle is the main blood supply to the flap and this modification allows preservation of the sensory innervation. The contralateral pillar could always be reached improving the traditional advancement and inset. Traditional extensive propeller flap dissection should be avoided in these neonates to avoid vascular compromise.

Objectives

Evaluate cleft palate repair adjuncts Expand on role of buccal myomucosal flaps Investigate anatomical considerations in buccal myomucosal flaps

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Arteriovenous malformation of the head and neck: Treatment Outcome and Factors related to recurrence: A Single-Center Retrospective Analysis

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Thi Ngoc Linh DO


Hong Ha NGUYEN


Thanh Dung LE

Abstract

Background: Arteriovenous malformations of the head and neck (HN-AVMs) are relatively uncommon but it may cause cosmetic and/or functional impairment with severe complications. Treatment of HN-AVMs is very challenging and high rate of recurrence after treatment affect the HN-AVM treatment outcome. This study evaluated the outcome after treatment and analyzed correlations between extracranial head and neck AVM presentations and the frequency of recurrence.

Methods: We retrospectively assessed AVM recurrence among 93 patients with head and neck AVMs treated with embolization and resection between January 2008 and December 2020. Outcome after follow-up were classified according to Wu's classification. Recurrence was defined as any evidence of AVM expansion following embolization and resection. Patient variables, including sex, age, history, AVM size, AVM location, stage, and treatment modalities, number of feeding arteries, angiographic features, occlusion after embolization were examined for correlations with the recurrence after treatment of head and neck AVMs. Statistical analysis was performed using SPSS 20.0.

Results: A total of 86 patients with at least 6 months of follow-up following AVM treatment with embolization and surgical resection were enrolled in this study. 67 of 93 treated patients (72%) were questioned and checked at hospital: The cure rate after treatment was 62,7% (n=42), the improved rate was 29,8% (n=20). During follow-up, 18 patients experienced recurrence (the long-term recurrence rate was 20.9%). Prior treatment, stage, AVM size, localization, number of feeding arteries and treatment modality were identified as independent predictors of recurrence. Recurrence was less likely following the treatment of lower-stage or smaller lesions and did not correlate with age, sex, location, angiographic features or embolization efficiency.

Conclusions: AVMs of the head and neck are among the most challenging conditions to manage due to a high risk of recurrence. Early and total AVM resection is the best method for preventing recurrence.

Objectives

Participants will be able to tell: The definition of head and neck arteriovenous malformations, the difficulties of treatment and factors related to recurrence after treatment.

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Scalp Free Flap in Elhers-Danlos Syndrome

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Braden Rolig


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Andrei Odobescu

Abstract
Background: A 70-year-old woman with a past medical history of Ehlers-Danlos Syndrome (EDS) presented to the hospital after sustaining a subdural hematoma from a fall. She underwent three neurosurgical operations complicated by scalp wound dehiscence and failure to thrive. The patient was taken to the operating room for soft tissue closure of the dura and scalp with a latissimus dorsi free flap utilizing the facial artery and vein as the recipient vessels. She ultimately went on to achieve excellent functional and cosmetic outcomes post-operatively.
Summary: EDS is caused by genetic mutations that cause either defective collagen or defective enzyme modulation of collagen fibers, resulting in qualitatively abnormal collage formation. EDS patients undergoing surgery are at increased risk of adverse complications. Here, we present a case in which surgical intervention for soft tissue coverage was clinically necessary to prevent devastating complications in a patient with vascular EDS. To date, there has been only one other case report in the literature describing microsurgery performed for free flap reconstruction in a patient with EDS.
Conclusion: We have shown that EDS is not a contraindication to microsurgical free flap surgery. While these patients are more complex and may require additional intra-operative time and resources, it is possible to safely perform microsurgery and obtain satisfactory outcomes.

Objectives
1. Participants should realize that EDS is not a contraindication to microsurgical free flap surgery 2. Participants should understand that EDS patients may have delicate vessels requiring multiple vascular anastomosis attempts 3. Participants may want to consider using heparin drips to prevent vessel thrombosis when performing free flaps in patients with EDS

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Posterior cranial retraction combined with bilateral parietal distraction for children with non-syndromic craniosynostosis

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Weimin Shen


Jie Cui


Yi Ji

Abstract

Background: The non-syndromic craniosynostosis are the most common of craniosynostosis in childhood. There are many treatments. We aim to treat 12 cases of non-syndromic craniosynostosis via posterior cranial vault distraction osteogenesis combined with bilateral parietal distraction .

Methods : Data of a total of 12 patients (7 boys and 5 girls) with non-syndromic sagittal synostosis who underwent distraction osteogenesis between January 2015 and August 2020 were retrospectively analyzed. Bilateral parietal bone flaps and posterior occipital flaps were designed and cut. Then, distraction device was placed, which was distracted at 5 days after surgery (twice/day, 0.4-0.6 mm/d, and lasting for 10-15 days). After 6 months of fixation, the secondary surgery was performed to remove the device.

Results : the scaphocephaly was corrected and the appearance was satisfactory. Postoperative follow-up time was 6-14 months, with an average of 10 months, and the mean CI was 63.2 and 78.25 before and after surgery, respectively; the mean anterior-posterior skull diameter was shortened (12.63±3.47) mm, the transverse diameter of both temporal regions was lengthened (15.4±4.18) mm, and the scaphocephalic deformity was significantly improved. There was no detachment or rupture of the extender postoperatively. No severe complications, such as radiation necrosis or intracranial infection, were observed.

Conclusion : Posterior cranial retraction combined with bilateral parietal distraction in for children with non-syndromic craniosynostosis, in which the proposed technique did not exhibit severe complications, and it is worthy of further promotion and application in clinical practice.

Objectives

We aim to treat 12 cases of non-syndromic craniosynostosis via posterior cranial vault distraction osteogenesis combined with bilateral parietal distraction .

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Ubiquitination of BMPR1A by SMURF1 Suppresses Osteogenic Differentiation of Cranial Suture Mesenchymal Stem Cells

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Liangliang Kong


Yi Ji


Jie Cui


Weiming Shen

Abstract

Background: Cranial suture mesenchymal stem cells (SMSCs) play a critical role in maintaining the function of cranial suture. Premature fusion of cranial sutures leads to craniosynostosis. The aim of the current study was to investigate the role of SMURF1 in the regulation of BMPR1A and the impact of this regulatory process on osteogenic differentiation of SMSCs.

Methods: Human cranial suture mesenchymal cells were isolated and cultured from the residual fused and contralateral cranial sutural tissues of patients with unilateral coronal craniosynostosis, and MSC characteristics were identified by flow cytometry and multilineage differentiation. Further, qPCR analysis was performed to explore the mRNA expression of SMURF1, BMPR1A, RUNX2 and osteocalcin. The effect of SMURF1 on osteogenic differentiation was detected by ALP assay and Alizarin red staining. Western blotting and Immunoprecipitation helped to observe the influence of SMURF1 in BMP2 signaling pathway. Immunohistochemistry and von Kossa staining were utilized to evaluate the role of SMURF1 in renal subcapsular transplantation experiment of SMSCs in vivo.

Results: Human cranial suture-derived mesenchymal cells were successfully cultured in vitro. Flow cytometry analysis showed these cells highly expressed typical MSC markers and could differentiate into three lineages. Compared with the cells from the normal side, osteogenic differentiation of the fused suture derived cells was stronger accompanied by down-expression of SMURF1 mRNA. Overexpression of SMURF1 significantly inhibited osteogenesis of the fused suture derived SMSCs through inactivated the BMP2 signaling pathway by ubiquitination and degradation of BMPR1A. Silencing Smurf1 in normal SMSCs reversed the impact of overexpression of SMURF1 on osteogenic differentiation. The renal subcapsular transplantation experiments demonstrated that overexpression of SMURF1 significantly inhibited the osteogenic differentiation in vivo.

Conclusions: Our studies reveal that SMURF1 suppressed the SMSCs osteogenic differentiation through ubiquitination of BMPR1A to inactivate BMP2 signaling pathway, suggesting a novel therapeutic strategy of Craniosynostosis.

Objectives

1.Participants will be able to know a new type of mesenchymal stem cell in cranial suture tissue. 2.Participants will be able to tell the difference between prematurely fused suture derived MSCs and normal suture derived MSCs. 3.Participants will be able to know the role of SMURF1 and ubiquitinated regulation in osteogenesis of cranial suture MSCs.

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Morphometric Outcomes of Non-Syndromic Sagittal Synostosis following Open Middle and Posterior Cranial Vault Expansion

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Abstract

BACKGROUND: This study aims to quantify the change in three-dimensional skull morphometrics for patients with sagittal synostosis between presentation, after surgery, and at two-year follow-up.
METHODS: Computed tomography scans from 91 patients with isolated sagittal synostosis were age, gender and race matched to 273 normal controls. We performed vector analysis with logarithmic regressions to model the impact of open middle and posterior cranial vault remodeling on cranial shape and growth.
RESULTS: Anterior cranial volume, bossing angle and frontal shape were not changed by surgery but normalized without surgical intervention by two years. Bi-parietal narrowing and middle cranial volume was corrected after surgery and maintained at two years. Occipital protuberance was improved after surgery and normalized at two years. Posterior cranial volume was decreased by the occipital remodeling and remained slightly lower than control volumes at two years whereas middle vault volume was larger than controls. Persistent residual deformities at two years were decreased supero-lateral width at the level of opisthion, and increased antero-superior height (vertex bulge). Logarithmic models suggested older age at surgery resulted in more scaphocephaly and enlarged posterior cranial vault volumes at two years but did not impact other volume outcomes. Initial preoperative severity score was most predictive of two year morphometrics.
CONCLUSION: Initial severity of sagittal synostosis deformity was the best predictor of two year morphometric outcomes. Upper posterior cranial width decreases with time after surgery and an anterior vertex bulge can persist after open surgery, but frontal dysmorphology self-corrects without surgical intervention.

Objectives: Participants will be able to visually appreciate the immediate and long-term bony morphometric outcomes for open middle and posterior vault cranial remodeling for patients with sagittal synostosis. - Participants will understand that the frontal dysmorphology in sagittal synostosis self-corrects following open middle and posterior vault cranial remodeling without any direct anterior intervention. - Participants will be able to identify predictors of long-term bony morphometric outcomes for patients with sagittal synostosis undergoing open middle and posterior vault cranial remodeling.

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Effect of Subcranial Le Fort Osteotomy on Maxillary Molar Development

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Hitesh Kapadia

Abstract
Background: The goal of this study was to evaluate the effect of subcranial osteotomy pattern on maxillary molar development.
Methods: Retrospective chart review was performed for patients with syndromic craniosynostosis with a history of subcranial surgery due to midface hypoplasia. Osteotomies compared were Le Fort III osteotomy (LF3) versus Le Fort II osteotomy with zygomatic repositioning (LF2 + ZR). Maxillary molar follicle development was evaluated using pre- and post-operative computed tomography scans. Secondary variables included age, sex, osteotomy trajectory, and proximity of hardware to developing tooth buds. Bivariate statistics were used to compare the two osteotomy groups. A p-value < 0.05 was considered significant.
Results: A sample of 38 patients yielded 76 osteotomy sites. The sample's mean age was 8.5 + 2.4 years; 17 patients were female. LF3 osteotomy occurred in 27 patients and 11 patients underwent LF2 + ZR. The sample included 22 patients with Crouzon syndrome and 16 patients with Apert syndrome. Following surgery, post-operative imaging showed two osteotomy sites having propagated through the developing molar tooth buds. One osteotomy site showed fixation hardware affecting a developing tooth bud. Rotation or displacement of molar tooth buds was observed at 6 sites prior to surgery. Post-operatively, 10 sites (13.2%) showed rotation or displacement of molar buds following subcranial separation. No significant differences were found in tooth displacement on the basis of osteotomy pattern (p = 0.50).
Conclusion: The rate of disruption in maxillary molar bud position following LF2 + ZR or LF3 osteotomies is 13%. Both osteotomy patterns appear to affect molar tooth bud displacement similarly. Additional investigation is needed to determine the long-term developmental impact of follicle displacement/rotation.

Objectives
1. Define the frequency of maxillary molar bud displacement following Le Fort II and Le Fort III osteotomies in mixed-dentition patients. 2. Understand potential risks to the developing dentition as a result of subcranial procedures. 3. Provide additional guidance when counseling families who are considering these procedures

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Title: Orthognathic Treatment in a Patient with SHORT syndrome: A Case Report

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Abstract

Background

SHORT syndrome (OMIM 269880) is an autosomal dominant condition caused by a mutation of the gene PIK3R1(Dyment et al., 2013). The prevalence is unknown, but it is less than 1: 1 000 000 with fewer than 50 cases reported in the literature (Dyment et al., 2013). It has historically been defined by its acronym: short stature, hyperextensibility of joints and/or inguinal hernia, ocular depression, Rieger abnormality and delayed tooth eruption.

The craniofacial abnormalities include a distinct progeroid facial appearance with a triangular face, frontal bossing, hypoplastic or thin alae nasi and large low set ears.

Delayed dental eruption and midface and mandibular hypoplasia are among the most consistent features, (Avila et al., 2016) but there are no reported cases of the long-term dental, orthodontic or orthognathic management of these patients.

We report on the orthodontic and orthognathic surgical treatment of an individual with SHORT syndrome.

Methods

The patient required combined orthodontic and oral and maxillofacial surgical treatment. Fixed orthodontic appliances on a non-extraction basis was undertaken to align the dentition and expand the maxillary arch to obtain arch co-ordination. An increased curve of Spee was maintained in the mandibular arch to facilitate tripoding of the occlusal relationship.

The orthognathic surgical plan was bimaxillary osteotomies with maxillary down fracture and bilateral sagittal split osteotomy to advance the mandible. A concomitant open-tip rhinoplasty was also undertaken.

Results

A favourable skeletal, facial and dental result was achieved. The antero-posterior and vertical facial dimensions both increased, resulting in an improvement in the patient's facial balance and profile. Occlusally, the overjet was reduced from 10mm to 2mm.

Conclusions

A significant improvement in facial form and occlusion were achieved, however, a triangular facial appearance persists due to the difficulty in correcting a truly three-dimensional facial hypoplasia.

Objectives

Participants will be able to: 1. Identify the features of SHORT syndrome. 2. Understand the challenges in providing orthodontic treatment for these patients. 3. Appreciate the limitations of treating a three-dimensional mandibular deformity.

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Combining Patient Specific Implant with Malar Reduction to Repair Mid-facial Asymmetry Caused by Craniofacial Fractures in Asians

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Abstract

Background: Mid-facial asymmetry caused by bone defect or deformation resulted from craniofacial fracture was a common secondary complication needed to repair. Patient-specific implant designed with the unaffected side as a template is a good choice to repair this kind of facial asymmetry. However, in Asians, the broad and prominent zygomatic bone in unaffected side is not an optimal template, because the oval facial shape was considered as a more attractive appearance in Asian aesthetic concept.
Methods: In order to repair the mid-facial asymmetry and to improve the facial contour, we combined PSI implantation with malar reduction in one-stage surgery. We referred the facial proportion index (the optimal ratio of mid and lower face was 1.27) as a basis for preoperative precise design. Since the deformation of affected side, we separated the skull into two parts with sagittal plane, unaffected side and affected side. Then the straight-line distance between the zygion in unaffected side and sagittal plane was measured as WM unaffected, the straight-line distance between bilateral gonions was measured as WL. According to the ratio, we calculated the expected WM unaffected, expected WM unaffected=WL*1.27/2, and the distance of malar reduction (MRD), MRD=WM unaffected-expected WM unaffected. After determining the ideal shape of zygoma in the unaffected side, we stimulated the post-operative ideal unaffected side and used it as a template to design the PSI by mirrored image overlay technique (MIO). The thickness of soft tissue in each side was measured additionally and the thickness of implant was adjusted if the soft tissue on the affected side was too thick or too thin. Therefore, the disparity between bone tissue and soft tissue on both sides could be balanced.
Results and Conclusions: With this surgical strategy, patients not only can repair facial asymmetry but also can get a more attractive appearance.

Objectives

1.Participants will learn about the proper ratio between the middle and lower parts of the Asian face. 2.Participants will learn how to design surgical plans and patient specific implants based on optimal facial proportions. 3.Participants will learn how to repair post-traumatic facial asymmetry while taking care of facial contours.

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Perioperative management of obstructive sleep apnea in patients with syndromic craniosynostosis undergoing LeFort III osteotomy with distraction: a case series.

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Kathryn Brown


Shelley Edwards


Ian Hoppe

Abstract

Purpose: The purpose of this publication is to address the absence of literature detailing respiratory management in patients with syndromic craniosynostosis and obstructive sleep apnea during the immediate postoperative interval following Le Fort III advancement with placement of distraction hardware but prior to sufficient midface advancement.

Methods: After IRB approval, the investigators retrospectively selected candidates for inclusion in this case series. The sample was composed of four patients ranging from 10 to 19 years of age undergoing Le Fort III midface advancement during a one-year span at a single tertiary care center. All operations were performed by a single surgeon. Three of the selected patients suffered significant obstructive sleep apnea necessitating the operation, as determined by polysomnography. One patient experienced persistent apnea postoperatively requiring prolonged ICU level care.

Results: Three of the four patients had severe OSA diagnosed by polysomnography with a median AHI of 28.3. Two of the three patients with preoperative OSA experienced no untoward respiratory compromise in the immediate postoperative period; one required nightly oxygen tent and the other required no supplemental oxygen. Patient 1 experienced significant postoperative respiratory distress with nightly apneic episodes and desaturations requiring supplemental oxygen and frequent stimulation.

Conclusion: The present study suggests that early involvement of sleep medicine and management of patient expectations is vital. Extremely close postoperative monitoring in the ICU is necessary. Future studies are needed to protocolize perioperative management of obstructive sleep apnea in patients undergoing Le Fort III osteotomy prior to initiation and completion of midface advancement.

Objectives

1) Participants will be able to recognize potential postoperative airway risks in patients with syndromic craniosynostosis undergoing Lefort III with distraction hardware placement 2) Participants will be able to create postoperative protocols for inpatient monitoring of patients undergoing Lefort III distraction in the setting of syndromic craniosynostosis and obstructive sleep apnea 3) Participants will be able to better manage patients with syndromic craniosynostosis and obstructive sleep apnea in the immediate postoperative period when presence of distraction hardware limits ability to wear positive pressure airway masks

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JAPANCranio 2021: national prospective survey of craniosynostosis in Japan

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Takuya Akai


Yuzo Komuro


Shigeo Kyutoku

Abstract
Background
It is well known that the incidence of craniosynostosis and the types of synostosis differ among races. While a discussion of the relationship between race and craniosynostosis requires as a minimum that a reliable database be constructed in each country, only a few, epidemiological studies of craniosynostosis in the form of retrospective questionnaire surveys have been conducted in Japan. Therefore, we planned to build a comprehensive, craniosynostosis database in Japan under the auspices of the Japan Society of Craniosynostosis (JSC).
Methods
After obtaining approval from the Board of Trustees, medical centers throughout Japan were invited to participate. A database was constructed using REDCap and went online for the first time at Tokyo Metropolitan Children's Medical Center. We began accumulating cases in September 2021 and plan to accumulate primary surgical cases over a five-year period.
Results
As of January 2023, 48 facilities in Japan are participating in this project. The number of cases registered in the database is 109, which is slightly lower than originally expected; nonetheless, the prospective design of this observational study has allowed us to accumulate high-quality data. Not only epidemiological studies but also evaluations of neurological prognoses and surgery are planned to begin after the case accumulation is complete.
Conclusions
Thanks to the JSC's assistance with organizing this project, we were able to build the first comprehensive database of craniosynostosis in Japan to serve as a source of new information about this condition for worldwide dissemination.

Objectives
Participants will be able to learn how to manage the national survey of craniosynostosis. Participants will be able to compare the epidemiological situation in Japan with that of their own countries. Participants will be able to compare the trend of craniosynostosis treatment in Japan with that of their own countries.

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Velopharyngeal function change after two-jaw orthognathic surgery in patients with cleft: A study on 162 consecutive cases

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Chun-Lin Su


Lun-Jou Lo

Abstract
Background
Orthognathic surgery (OGS) is common to correct midfacial hypoplasia in patients with cleft. Although the LeFort I maxillary advancement was reported to influence the velopharyngeal function, such impact by the two-jaw OGS has rarely been reported.
Methods
A total of 162 consecutive patients with cleft undergoing two-jaw orthognathic surgery from 2015 to 2020 were enrolled. Clinical data were collected. Pre- and post-operative skeletal forms were measured on cephalometric images. Velopharyngeal function was evaluated by perceptual and nasopharyngoscopic assessment. A logistic regression model was used for risk analysis of velopharyngeal function change.
Results
After two-jaw OGS, the velopharyngeal function remained unchanged in 82.1% of the patients, while 3.7% had an improved velopharyngeal function, but 14.2% worsened.
The velopharyngeal function changes were statistically significant comparing with the pre-OGS velopharyngeal status ($p = 0.008$). Multivariate logistic regression showed that the maxillary advancement amount was an independent risk factor for post-OGS velopharyngeal function worsening (OR = 1.74, 95% CI = 1.20-2.52, $p = 0.004$). The receiver operating characteristic curve based on maxillary advancement demonstrated good discrimination with an area under curve of 0.727 (95% CI = 0.62-0.83, $p = 0.001$). The Youden index was 4.27 mm.
Conclusions
While a small percentage of patients showed improvement, the velopharyngeal function was at risk of deterioration after two-jaw OGS in patients with cleft. The amount of maxillary advancement has a negative impact on velopharyngeal function.

Objectives
1. To know the velopharyngeal function changes after cleft orthognathic surgery 2. To design the amount of maxillary advancement in a safe range in cleft orthognathic surgery 3. To compare one and two-jaw orthognathic surgery in cleft patients

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Comparative Analysis of Surgical Morbidity of Secondary Frontal Orbital Advancement After Primary Frontal Orbital Advancement for Syndromic and/or Multisutural Craniosynostosis

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Davinder Singh


Austin Grove


Tom Sitzman


Nicole Kurnik

Abstract

Background: For patients diagnosed with craniosynostosis, frontal orbital advancement (FOA) is commonly performed to improve frontal orbital projection and increase orbital/intracranial volume. A small proportion of patients who undergo FOA in infancy have unfavorable growth and require a second FOA later in life. The perioperative risks associated with this second FOA have never been quantitively characterized in the literature. This novel study aims to evaluate the morbidity of secondary FOA.

Methods: A retrospective review was conducted analyzing a similar cohort of patients diagnosed with syndromic and/or multisutural craniosynostosis. The perioperative morbidity of an initial FOA (primary) and secondary FOA (surgical history of prior FOA) were compared utilizing non-parametric univariate tests. Key data points include operative time, estimated blood loss by weight, transfusion rate, blood transfusion by weight, the prevalence of intraoperative dural injury, and postoperative complication rate.

Results: 33 subjects were included: 20 primary FOAs and 13 secondary FOAs. The secondary FOA group was significantly older, with the median age being 7.07 years versus 1.23 years for primary FOA. Primary FOA had significantly lower unadjusted intraoperative blood loss, however, had significantly higher blood loss when adjusted for the weight of the patient (28 mL/kg for 1° versus 18 mL/kg for 2°, P=0.014). Primary FOA also had significantly higher likelihood of intraoperative blood transfusion (95% for 1° versus 62% for 2°, P=0.025). There were no significant differences between primary and secondary FOA operative time, blood transfusion by weight, the incidence of intraoperative dural injury, or postoperative complications ($P > 0.05$).

Conclusion: Secondary FOA imposes similar surgical risk relative to primary FOA in most measures of surgical morbidity. However, secondary FOA averaged significantly less weight-adjusted intraoperative blood loss with a smaller likelihood of requiring intraoperative transfusion, as expected with the more advanced age at the time of secondary FOA.

Objectives

Each learner will be able to compare the relative risks of secondary FOA relative to primary FOA operations. Each learner will also have an increased ability to convey these risks to families during pre-surgical consultations, thus increasing informed consent. Importantly, learners can integrate this knowledge into their surgical decision making for patients with syndromic and/or multisutural craniosynostosis.

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Application of Orthognathic Surgery Principles and Techniques in the Management of Deformity and Malocclusion after Craniomaxillofacial Trauma

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Han-Tsung Liao

Abstract

Background

Posttraumatic secondary deformities of facial skeleton may occur because of nonmanagement or ill management of primary injuries, whereas some unexpectedly occur even after dedicated management attempts. Orthognathic surgery (OGS) principles and techniques can be used as an efficient tool to correct posttraumatic craniomaxillofacial deformities or skeletal developmental deformities during trauma management.

Materials and Methods

Patients with orthognathic surgical osteotomies during primary or secondary management of facial trauma (referred to as trauma-OGS) during the period of 2010 to 2018 were retrospectively reviewed. Variables pertaining to patients and surgery were collected, including trauma diagnosis, etiology, duration between trauma/primary surgery and secondary presentation, suggested reason for secondary deformity, intervention undertaken to address, and the surgical outcome.

Results

Twenty-seven patients were eligible and extensively reviewed. Etiological categorization of trauma-OGS could be done into posttraumatic deformities (18) and developmental deformities (9). The former group was further categorized as OGS done as primary procedure (8) that included immobile Le Fort fractures and delayed initial treatment, and OGS done as secondary procedure (10) that included complex fractures and condylar fractures. The developmental deformity group was categorized into OGS done simultaneously during trauma management (5) or done as a secondary procedure after trauma management (4).

Conclusions

Application of principles and techniques of OGS in indicated primary or secondary management of facial trauma patients should always be considered. The categorization of scenarios presented in this article relating facial trauma and OGS may further help to understand the application.

Objectives

1. Learning the different etiologies that casuing post-traumatic maxillofacial deformity and maloccluison 2. Learning how to use the orthoganthic principles to treat the post-traumatic maxillofacial deformity and malocclusion according to the categories 3. Learning how to do the orthoganthic surgery simultaneously in craniofacial trauma patient with congenital class III malocclusion

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Implementation of Mandibular Distraction Osteogenesis for Patients with Pierre Robin Sequence in a Developing Country through International Collaboration: A Paradigm for Success

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Thom Dang Hoang


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Son Thiet Tran


Lam Ngoc Vu


Christopher Runyan

Abstract

Background: Vietnam National Children's Hospital (VNCH) provides tertiary care in a low-middle income country (LMIC). It is one of few centers equipped to treat Pierre Robin Sequence (PRS) patients. Before 2015, surgical options were tongue lip adhesion (TLA) or tracheostomy. 80% had a tracheostomy, mechanical ventilation or died. From 2015-2019, mandibular distraction (MDO) was introduced by visiting international surgeons on a short-term basis. Since 2020, surgeons at VNCH have widely used MDO independently.
Methods: A retrospective review was conducted of patients diagnosed with Pierre Robin Sequence at VNCH from 2015-2022. Paper records were digitized, translated, and reviewed for demographics, indications, hospital course, and postoperative outcomes.
Results: 53 patients with PRS underwent MDO from 2020-2022. From 2015-2019, there were 19 cases of MDO, with incomplete records. Median age at time of MDO was 50 ± 43 days. Forty patients (75.5%) had isolated PRS and 13 (24.5%) were syndromic. Forty-four patients (83%) had a cleft palate. Fifty-one (96.2%) of patients required pre-operative O2 or mechanical ventilation. Distraction and consolidation phase was 4.8 ± 1.3 months. Median days to discharge after surgery was 19.0 ± 8.3 days. Median weight at birth, surgery, and device removal were 6.8 ± 1.2, 7.7 ± 1.9, and 14.8 ± 2.8 pounds. Fifty-two patients (98.1%) had obstructive sleep apnea (OSA) preoperatively with mean Apnea Hypopnea Index (AHI) of 25.0 ± 10.6. Post-MDO, only 4 (7.5%) had OSA and mean AHI was 5.2 ± 0.6. No patients (0) required tracheostomy for a 100% success rate.
Conclusions: The success of MDO by local surgeons in Vietnam following introduction by visiting surgeons illustrates a paradigm for capacity enhancing global surgery. Surgical techniques can be transferred with basic infrastructure through collaboration and resource optimization (i.e. re-using distractors). Global surgery may be scalable with direct benefits for patients in LMICs.

Objectives
1. Participants will understand PRS and MDO treatment strategies 2. Participants will learn how to adapt surgical treatment for MDO in resource limited settings 3. Participants will learn examples of successful international collaboration in surgical teaching

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Orbital Fracture Management and Outcomes in Baltimore: A Multicenter Analysis

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Seray Er


Bashar Hassan


Joshua Yoon


Eric Resnick


Cynthia Yusuf


Tomer Lagziel


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Robin Yang


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Michael Grant

Abstract

Background: Orbital fractures constitute up to 25% of facial trauma injuries in adults. Baltimore, a city with one of the highest per-capita violent crime rates in the US, experiences a considerable volume of high-intensity trauma. Although surveillance data is collected by Baltimore, the characteristics of patients presenting with orbital fractures remain poorly understood. Our study is the first multicenter analysis of the etiologies, fracture patterns, and management of patients who underwent orbital fracture repair (OFR) at two Level I trauma centers in Baltimore.

Methods: We conducted a retrospective review of trauma patients who underwent OFR at the R. Adams Cowley Shock Trauma Center and the Johns Hopkins Hospital from 2015 to 2019. Primary outcomes were fracture etiology, severity, and location. Secondary outcomes were length of hospital stay, operating time, surgical service, and incidence of any postoperative ocular complication following repair. Descriptive statistics were calculated. Secondary outcomes were compared between the two institutions using bivariate analysis and multivariate regression.

Results: Of n=374 patients, n=179 (47.9%) had orbital fractures due to violent trauma, n=252 (67.4%) had moderate-to-severe orbital fractures, and n=338 (90.4%) had concomitant neurological symptoms/signs. Patients who presented to Shock Trauma (n=208), compared to those who presented to Hopkins (n=166), were more likely

to have had assault (n=97/208 [46.6%], n=72/166 [43.4%]; P <0.001), concomitant intracranial hemorrhage (n=23/208 [12.3%], n=5/166 [4.4%]; P=0.024), intracranial injury (n=28/208 [15.0%], n=7/166 [6.2%]; P=0.025), and loss of consciousness (n=80/208 [42.8%], n=24/166 [21.2%]; P <0.001). After controlling for factors pertaining to injury severity, there was no significant difference in patient throughput or incidence of postoperative ocular complications following OFR between the two centers.
Conclusion: Most patients who underwent OFR presented after violent trauma and had concomitant neurological symptoms/signs. Despite the different management systems of orbital fracture at our two centers, patient throughput and outcomes were similar.

Objectives

1. Audience will be able to better understand the etiologies, fracture patterns, and management of patients presenting with orbital fractures and having orbital fracture repair at R. Adams Cowley Shock Trauma Center and the Johns Hopkins Hospital in Baltimore 2. Audience will be able to compare management strategies of orbital fractures between the two trauma centers 3. Audience will be able to appreciate the severity of presentation of patients with traumatic facial fractures, specifically orbital fractures, in Baltimore

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The Impact of Cranial Vault Expansion on Brain and Cerebrospinal Fluid Volumes for Cephalocranial Disproportion in Slit Ventricle Syndrome

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Kate Carroll


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Abstract

Introduction: Excessive drainage of cerebrospinal fluid (CSF) in patients with chronically shunted hydrocephalus may collapse the lateral ventricles, resulting in loss of compliance and slit-ventricle syndrome (SVS). Cranial vault expansion has been described as an end-stage intervention for SVS. In this study we describe our institutional experience with cranial vault expansion for SVS, characterize the post-operative changes in intracranial compartment volumes, and present our management algorithm for children with severe hydrocephalus.

Methods: Patients with chronically shunted hydrocephalus who underwent cranial vault expansion due to SVS at a single pediatric hospital from 2004 to 2022 were included. Diagnostic and therapeutic interventions for CSF drainage in the year before and after cranial vault expansion were tallied. Three-dimensional CT scans were used to create volumetric models of the cranium, brain, and ventricular space, and the preoperative, immediate postoperative, and one-year postoperative volumes were compared.

Results: Eight patients were included in this study. Surgeries included fronto-orbital advancement (75%) or posterior vault expansion (25%). The number of therapeutic shunt interventions dropped from 7.1 pre-operatively to 5.0 post-operatively (p=0.52). The post-operative course of one patient was complicated by multiple washouts and shunt revisions for infection. When this patient is excluded from the analysis, the number of shunt interventions drops from 7.4 to 2.4 (p=0.016) following cranial vault expansion. Morphometric analysis revealed that intracranial volume increased by 4.3% (p=0.002) and the CSF volume increased by 37.4% (p=0.007) and these volume gains were both stable at one year postoperatively following cranial vault expansion (p=0.362, p=0.501, respectively).

Conclusion: For patients with SVS and increased intracranial pressure (ICP) in the setting of a working shunt or rapid increase in shunt failure rate, cranial vault expansion is a safe and effective procedure that can increase intracranial volume, increase the volume of cerebrospinal fluid, and possibly decrease the need for shunt interventions.

Objectives: 1. The audience will understand the role of craniocephalic disproportion in the pathophysiology and development of slit ventricle syndrome. 2. The audience will understand the morphometric impact of cranial vault expansion on intracranial volume for patients with slit ventricle syndrome. 3. The audience will understand the clinical impact of cranial vault expansion on both diagnostic and therapeutic shunt interventions.

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School-Age Anthropometric Outcomes After Open or Endoscopic Repair of Sagittal Craniosynostosis

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Abstract

Background

Several studies have compared perioperative parameters and early postoperative morphology of endoscope-assisted strip craniectomy with orthotic therapy (endoscopic) versus cranial vault remodeling (open). To extend these results, we evaluate school-age anthropometric outcomes following these techniques across three institutions.

Methods

School-age children (4-18 years) with previously corrected isolated sagittal craniosynostosis were enrolled. Upon

inclusion, three-dimensional photographs and patient-reported outcomes were obtained, and measures of cephalic index and head circumference Z-scores were calculated. Analyses of covariance models controlling for baseline differences and a priori covariates were performed.

Results

Eighty-one participants (median [range] age, 7 [4-15] years) were included. Mean [95% CI] school-age cephalic index was significantly higher in the endoscopic cohort, though within the normal range for both groups (endoscopic 78% [77 to 79%] versus open 76% [74 to 77%]; $p = 0.027$). Mean preoperative to school-age change in cephalic index was significantly greater within the endoscopic group (9% [7 to 11%] versus open 3% [1 to 5%]; $p < 0.001$). Compared to preoperative measurements, mean school-age head circumference Z-scores decreased significantly more in the open cohort (-1.6 [-2.2 to -1.0] versus endoscopic -0.3 [-0.8 to -0.2]; $p = 0.002$). Patient-reported levels of stigma were within normal limits for both groups.

Conclusions

Endoscopic and open repair techniques effectively normalize school-age anthropometric outcomes. However, endoscopic repair produces a clinically meaningful and significantly greater improvement in school-age cephalic index, with maintenance of head growth. These findings demonstrate the importance of early referral by pediatricians and inform treatment decisions.

Objectives

Through comparison of school-age anthropometric outcomes of patients who underwent either open or endoscopic repair across three institutions, this study defines the importance of multi-disciplinary collaboration and early referral by pediatricians to craniofacial centers. Participants will learn about the differences in school-age anthropometric outcomes between those patients undergoing open vs. endoscopic repair. Participants will be able to share vital information regarding school-age anthropometric outcomes with families seeking repair of sagittal craniosynostosis

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An Institutional Enhanced Recovery After Surgery (ERAS) Protocol for Orthognathic Surgery Reduces Rates of Post-Operative Nausea

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Abstract

Background: Enhanced recovery after surgery (ERAS) protocols have been implemented by many surgical specialties to improve patient outcome, particularly post-operative nausea and vomiting (PONV). The purpose of this study was to evaluate reduction in post-operative nausea after orthognathic surgery following implementation of an ERAS protocol.
Methods: The study was conducted retrospectively and included patients who underwent orthognathic surgery at Boston Children's Hospital between April 2018 and December 2022. Patients with syndromes and those who had a hospital stay greater than two days were excluded from the study. The primary predictor variable was enrollment in our institutional ERAS protocol pre-operatively. Our main outcome variable was post-operative nausea. A series of intra-operative and post-operative outcomes were measured and compared between groups using unpaired T-tests and chi-squared analysis. ERAS status alongside other intra-operative and post-operative outcomes were analyzed using univariate and multivariate logistic regression models. Significance was set as $p<0.05$.
Results: There were 119 patients (68 non-ERAS, 51 ERAS) included in this study (58 males, mean age 19.06 [± 3.29] years). No significant differences were found in demographics and comorbidities between the two groups. Patients that underwent the ERAS protocol had a shorter surgical time (187 ± 64 minutes vs. 248 ± 95 minutes, p=0.019), less intra-operative fluid volume given (953.3 ± 462.3 mL vs. 1583.6 ± 847.6 mL, p=0.003), less intra-operative blood loss (217.2 ± 203.2 vs. 273.5 ± 280.5, p=0.023) and experienced less post-operative nausea (39.2% vs. 57.0%, p=0.039). ERAS status was the only predictor for post-operative nausea on the multivariate model (p=0.019).
Conclusion: Implementation of an ERAS protocol for orthognathic surgery reduces post-operative nausea experienced by patients.

Objectives
1. Explain the details of our ERAS protocol for orthognathic surgery 2. Learn the benefits of an ERAS protocol for orthognathic surgery 3. Understand which aspects of our ERAS protocol may result in a reduction in post operative nausea

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MicroNAPS: A Novel Classification for Infants with Micrognathia and Robin Sequence

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Cory Resnick

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Abstract

Background: Robin sequence (RS) describes a heterogeneous population with micrognathia, glossoptosis and upper airway obstruction. Workup, treatment and outcomes assessment differ widely. Rarity of the diagnosis limits most studies to small samples with broad inclusion. Despite several proposed classifications, none is extensively used. The objective of this investigation was to develop and trial a novel classification system for adoption in clinical communication and research.

Methods: This is a retrospective cross-sectional study of infants with micrognathia, RS and/or tongue-based airway obstruction (TBAO) with at least 1 year follow-up. We developed a classification system with 5 elements: MicroNAPS(Micrognathia, Nutrition, Airway, Palate, Syndrome/comorbidities). Elemental scores are summarized into stage R0-R4 or TBAO. Modifiers are described for application in special circumstances (e.g., ongoing/incomplete workup, use of alternative classification criteria) to increase applicability. For the test sample, demographics, birth and clinical findings, polysomnograms, and comorbidities were recorded, and MicroNAPS scores were applied. Outcomes included length-of-stay (LOS), treatment, feeding characteristics, and palatoplasty timing. Descriptive statistics were calculated and $p<0.05$ was considered significant.

Results: The sample included 100 infants with mean follow-up of 5.0±3.6 years. Several significant associations were identified: R3 was associated with continuous hospitalization from birth until definitive treatment. R0 and TBAO displayed the most variable LOS. Stage >/= R2 corresponded to initial management with an operation. Palatoplasty was frequently delayed due to influence of comorbidities and/or unresolved airway obstruction for R0, R4 and TBAO stages.

Conclusion: MicroNAPS is easily applicable and associated with relevant outcomes. Since adoption, experience in our center has demonstrated enhanced communication, clarified documentation, and consistent assignment between providers. Use of modifiers has facilitated classification from the initial encounter, even when workup is incomplete. Future directions include defining treatment pathways by stage and utilizing staging for multi-center research inclusion.

Objectives

Participants will be able to describe the most important initial findings in infants with Robin sequence. Participants will be able to do stage infants by with micrognathia using the MicroNAPS classification system. Participants will understand the relevance of classification of infants with Robin sequence to clinical practice and research.

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Development and Validation of a Risk Calculator for the Prediction of Postoperative Diplopia Following Orbital Fracture Repair in Adults

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Abstract

Background: Postoperative diplopia is the most common complication following orbital fracture repair (OFR), occurring in up to 52% of cases. Existing evidence on risk factors for postoperative diplopia following OFR is based on single-institution studies and small sample sizes. Our study is the first multi-center study to develop and validate a risk calculator for the prediction of postoperative diplopia following OFR.

Methods: A retrospective review of trauma patients who underwent OFR was conducted at two centers from 2015 to 2019. Excluded were patients <18 years old and those with postoperative follow-up <2 weeks. Our primary outcome was incidence or persistence of postoperative diplopia at 2 weeks or more following OFR. A risk model for the prediction of postoperative diplopia was derived using a development dataset (70% of study sample) and validated using a validation dataset (30%). The C-statistic (area under the curve) and Hosmer-Lemeshow tests were used to assess the risk model accuracy.

Results: A total of 254 adults were analyzed to derive a risk model for the prediction of postoperative diplopia following OFR. The factors that predicted postoperative diplopia in the risk model were: age at injury, preoperative enophthalmos, periorbital swelling, fracture size/displacement (> or < than 2 cm^2; > or < than 3 mm displacement), planned surgical timing (> or < than 2 weeks), globe/soft tissue repair, and medial wall fracture location. Our

predictive model had excellent discrimination (C-statistic=80.4%), calibration (P=0.2), and validation (C-statistic=80%). The sensitivity and negative predictive value of our predictive model were 87.9% and 95.8%, respectively.
Conclusion: We designed the first validated risk calculator that can be used as a powerful screening tool to rule out postoperative diplopia following OFR in adults. This will assist in counseling patients presenting with orbital fractures and improve surgical decision making.

Objectives

1. Participants will learn the risk factors for and protective factors against postoperative diplopia after orbital fracture repair in trauma patients. 2. Participants will learn how to use a risk calculator that will aid them in the prediction of postoperative diplopia in patients undergoing orbital fracture repair after traumatic orbital fractures. 3. Participants will be able to appreciate the statistical analyses used to derive predictive risk models than can be applied clinically.

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Time is Muscle: The Impact of Surgical Timing in Orbital Fracture Repair

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Michael Grant

Abstract
Background: For decades, there has been an ongoing debate about the ideal timing of orbital fracture repair (OFR) in adults. Although there is strong consensus that extraocular muscle (EOM) entrapment is an indication for early repair, factors that should govern surgical timing in case of no EOM entrapment are unknown. Our study is the first and largest multi-center study to assess the association between surgical timing and postoperative ocular outcomes following OFR.
Methods: We retrospectively reviewed trauma patients who underwent OFR at two centers from 2015 to 2019. Excluded were patients <18 years old and those with follow-up <2 weeks. The primary outcome was incidence and/or persistence of any postoperative ocular complication at >2 weeks following OFR. Surgical timing was categorized into 0-7, 8-14, 15-28, and >29 days from injury to surgery. The association between surgical timing and postoperative ocular complications was assessed using Chi-square/Fisher's exact tests in patients with EOM entrapment, enophthalmos, diplopia, and different fracture sizes.
Results: Of n=253 patients, n=13 (5.1%) had preoperative EOM entrapment. Of these, patients who had OFR within 1 week of injury were less likely to develop postoperative diplopia compared to patients who had OFR within 8-14 days of injury (n=1/8 [12.5%], n=3/3 [100%]; P=.018). Patients with near-total defects were more likely to develop enophthalmos if OFR occurred 15-28 days (n=2/6 [33.3%]) or >28 days (n=8/24 [33.3%]) after injury compared to patients who had OFR within 1 week of injury (n=0/30 [0.0%]; P<.001). There was no significant association

between surgical timing and postoperative ocular complications in patients with no EOM entrapment and less severe fractures, preoperative diplopia, or enophthalmos.
Conclusion: We recommend OFR within 1 week of injury for orbital fractures with EOM entrapment or near-total defects. Surgical delay is possible for less severe fractures, preoperative diplopia, and/or enophthalmos.

Objectives

1. Participants will be able to differentiate postoperative outcomes following orbital fracture repair among different surgical timings. 2. Participants will be able to understand the importance of early surgical repair in certain orbital fractures in adults. 3. Participants will be provided with a management flowchart and guided through the thought process needed for the management of adults presenting with orbital fractures.

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Orbital Fracture Repair in the Traumatic Brain Injury Patient

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Abstract
Background: Facial fracture repair is often delayed in traumatic brain injury (TBI) patients who require stabilization and/or neurologic surgery. There are currently no recommendations regarding surgical timing of orbital fracture repair (OFR) in TBI patients. Our study is the first to investigate the association of surgical timing and postoperative ocular complications in TBI patients.
Methods: A retrospective review of trauma patients who underwent OFR was conducted at two centers from 2015 to 2019. Excluded were patients <18 years old, with <2 weeks follow-up, and with unreported GCS on presentation. TBI was defined as GCS<15 or any neurologic symptom/sign on presentation. TBI was categorized into mild (GCS=14-15) and moderate-to-severe TBI (GCS<13). Surgical timing was categorized into 0-14, 15-29, 30-59, and >60 days from injury. Our primary outcome was incidence/persistence of postoperative diplopia and/or enophthalmos >2 weeks following OFR. Bivariate analysis and multivariate logistic regression were performed.
Results: Of n=203 patients, n=145 (71.4%) had concomitant TBI. Compared to patients with mild TBI, those with moderate-to-severe TBI were less likely to have OFR within 2 weeks (n=91/120 [75.8%], n=11/25 [44.0%]; P=.043), more likely to have delayed OFR >60 days after injury (n=8/120 [6.7%], n=6/25 [24.0%]; P=.043), and more likely to develop postoperative enophthalmos (n=8/120 [6.7%], n=6/25 [24.0%]; P=.012). After controlling for fracture severity, location, and preoperative ocular symptoms/signs, patients with mild TBI who underwent OFR 15-29 days

after injury had 3.8 the odds [adjusted odds ratio (aOR) (95% confidence interval [CI]) 3.8 (1.1-13.1)] of diplopia and/or enophthalmos compared to patients who underwent OFR <2 weeks of injury.
Conclusion: A close working relationship with the neurotrauma/neurosurgery service is critical for the optimal timing of OFR in TBI patients. We recommend early OFR within 2 weeks of injury, when possible, to optimize postoperative ocular outcomes in TBI patients.

Objectives

1. Participants will be able to recognize the high incidence of concomitant traumatic brain injury in patients who underwent orbital fracture repair after trauma. 2. Participants will be able to appreciate the impact of traumatic brain injury on surgical timing of orbital fracture repair adults after trauma. 3. Participants will be able to understand the impact of orbital fracture delay on postoperative ocular outcomes in the traumatic brain injury patient.

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Is Outpatient Facial Feminization Surgery Safe?

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Mengyuan Tommy Liu

Natalie Hernandez

Abstract

Background:
Facial feminization surgery (FFS) is typically performed as a single surgery requiring post-operative admission. The hypothesis is that FFS can be safely performed in an outpatient setting by keeping the length under 6 hours and staging surgeries as needed.

Methods:
A retrospective review of consecutive patients undergoing FFS by a single surgeon over a 14-month period, with at least 3-month follow-up. Major complications included unplanned returns to the operating room within 30 days, unplanned admissions, presentation to urgent care, permanent motor nerve injury, and transfusions.

Results:
A total of 149 consecutive FFS were performed on 97 patients, including 88 frontal cranioplasties, 64 rhinoplasties, and 60 mandibular osteoplasties. Mean age was 34.7 + 10.6 years (19 to 70 years), and mean operative time was 206.0 + 69.3 minutes (46 to 510 minutes). Thirty patients underwent single-stage feminization, and 66 underwent at least the first of 2 stages. All but 2 were scheduled as outpatient surgeries, with the planned admissions due to inadequate post-operative transportation.
Five (3.4%) had a major complication: 3 unexpected post-operative admissions, 1 urgent care visit, and 1 post-operative infection requiring operative intervention. Of the 3 admissions, 2 had urinary retention after >6 hours of surgery with a urinary catheter, and 1 patient with BMI 43 had hypoxia requiring oxygen therapy. All 3 were discharged within 23 hours of admission. One patient presented to urgent care on night of surgery for nausea/vomiting requiring IV antiemetics. The takeback rate was 0.7%: 1 patient had surgical-site infection after V-line genioplasty requiring operative debridement and IV antibiotics. There were no hematomas, transfusions, or permanent motor nerve deficits.

Conclusions:
FFS is safe to perform in an outpatient setting, with 3.4% major complication rate, and 0.7% takeback rate. Predictive factors for admission are surgeries longer than 6 hours, and BMI greater than 40.

Objectives

1) Participants will learn the complication rates of outpatient facial feminization surgery. 2) Participants will be able to better predict which FFS patients may require post-operative admission. 3) Participant should be able to draw their own conclusion of whether outpatient FFS is safe, based on the data presented.

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Dysmorph: Development of A Normative Three-Dimensional Craniofacial Soft Tissue Database and Image Quantification Tool

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Abstract

Background: Objective appraisal of craniofacial dysmorphology and postoperative outcomes remains challenging and has proven recalcitrant to several modern techniques. Current mechanisms of appraisal are subjective and demonstrate poor inter-rater reliability (e.g. Whitaker classification system). Previous approaches have quantified or described normative bony craniofacial skeleton; however, techniques have not been described to represent normative craniofacial soft tissue anatomy. Here the authors describe their long-term experience developing a normative craniofacial database from patients with “normal” craniofacial anatomy receiving MRI.

Methods: Patients with normative craniofacial anatomy receiving T1w MRI scans were retrospectively included from an institutional imaging database. MRI scans of a given demographic were reconciled using diffeomorphic techniques and advanced normalization tools (ANTs) to create three-dimensional composites for each demographic of interest representing “normal” craniofacial anatomy. Soft tissue anatomic measurements were performed in Materialise Mimics. Geodesic shooting and Jacobian matrices were used to render three dimensional differences between two scans of interest.

Results: Two hundred and sixty-three patients (137 female and 126 male) aged three through nine years with normal craniofacial soft tissue anatomy were included in this study. Composites were created and rendered for three- through nine-year-old white and black males and females. Anatomic measurements including head circumference, intercanthal distance, and nasion to nasal tip in Materialise Mimics were within 10% of normative published anatomic values. Geodesic shooting and Jacobian matrices depicted three dimensional differences between two patient scans of sequential ages (e.g., three- and four-year-olds).

Conclusions: Application of diffeomorphic techniques and ANTs to pediatric patient MRIs is effective for creating composites representative of normal craniofacial soft tissue anatomy. Future steps include application of geodesic shooting and Jacobian matrix methods to further quantify differences in craniofacial soft tissue anatomy and development of anatomic indices to quantify craniofacial dysmorphology and postoperative outcomes.

Objectives

- Participants will learn challenges in objectively appraising craniofacial dysmorphology and postoperative outcomes - Participants will learn methods of reconciling two MRI scans of interest with advanced normalization tools (ANTs) - Participants will learn methods of comparing two craniofacial images of interest with Jacobian matrices and geodesic shooting

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Improving Access to Intracranial Volume Measurements for Clinical Use: Open-Source Method Using Computed Tomography

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Raymond Harshbarger


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Akhil Surapaneni

Abstract

Background: Three-dimensional measurements of intracranial volume (ICV) can guide clinical management of brain and skull disorders. However, widespread adoption is limited by the scarcity of software methods for analyzing CT scans, which are more available than MRI images, and the inaccessibility of proprietary and expensive commercial software. We present a method for calculating ICV from CT scans using an open-source software, 3D Slicer.
Methods: We took a data-driven approach to optimize the open-source workflow by using a multi-factor ANOVA to determine the optimal parameters for ICV accuracy. We demonstrate its validity by comparing ICV measurements of pediatric hydrocephalic macrocephaly patients (N = 15 scans) using this method against commercial and proprietary software.
Results: We found that an open-source workflow of combining an initial semi-automatic segmentation of ICV with a fully automatic segmentation, using a coronal CT scan reconstruction minimizes the ICV error. The open-source method shows excellent agreement, (r2 = 0.998 and 95% confidence interval of regression slope: [0.986; 1.047], [0.985;1.066] respectively) with both the commercial and proprietary software methods. The mean percent difference of ICV measurements of the open-source software from the commercial software was -0.56% [95% CI: -1.08%, -0.028%] and from the proprietary software was -0.07% [95% CI: -1.26%, 1.1%]. The mean percent difference of ICV measurements of the commercial software from the proprietary software was -0.36% [95% Confidence Interval: -0.61%, 1.32%].
Conclusions: This is the first study comparing an open-source method for measuring ICV with commercial and proprietary options. A high degree of fidelity was found, confirming this open source method as a viable option for clinicians who are looking to incorporate ICV measurements into their practice.

Objectives

1) Participants will be able to apply open-source software to estimate intracranial volume. 2) Participants will be able to apply intracranial volume measurements in clinical practice. 3) Participants will be able to understand intracranial volume changes due to total vault reconstruction in pediatric macrocephaly patients.

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Fronto-orbital Distraction in Unicoronal Craniosynostosis: A 3-year follow up study.

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Peter Tarnow


Robert Olsson


Tobias Hallén


Giovanni Maltese

Abstract

Background: The use of fronto-orbital distraction (FOD) in unicoronal craniosynostosis (UCS) was first introduced by Kobayashi et al. in 1999, and since 2018, this has been the preferred treatment at the craniofacial unit at Sahlgrenska University Hospital. A previous study by Mellgren et al. presented the first fourteen patients with UCS who underwent FOD, demonstrating notable improvements in both symmetry and surgery correlated morbidities. This is a follow up study on the patients who have reached three years of age.
Methods: Seven patients were included in this study. We measured and compared the orbital dystopia angle (ODA), anterior cranial fossa deviation (ACFD), and anterior cranial fossa cant (ACFC) on CT scans preoperatively, at distractor removal, and at three years of age.
Results: Significant improvements in both ODA and ACFD could be observed when comparing the preoperative results to those at three years of age. ODA went from [median (95% confidence interval)] 8.6° (5.6° to 11.6°) to 2.5° (−1.9° to 6.9°) (p=0.018), and ACFD from 14.3° (9.6 to 19.0°) to 5.4° (2.2 to 8.7°) (p=0.018). ACFC went from 2.3° (0.0° to 4.6°) to –0.7° (–3.6° to 2.2°) (p=0.051). When comparing the measurements at distractor removal to those at three years of age, a significant improvement of 1.7° (−1.0° to 4.4°) could be observed in ACFD (p=0.043). ODA improved with 0.3° (−2.9° to 3.5°) (p=0.398) and ACFC improved with 0.1° (−1.3° to 1.5°) (p=0.496).
Conclusions: These results suggest that the corrections from FOD seem to persist over time, further supporting the technique as a favorable treatment of UCS. Surprisingly, ACFD continued to improve after distractor removal, whereas ODA and ACFC remained the same as at distractor removal.

Objectives

Surgical treatment of unicoronal synostosis Distractor treatment of unicoronal synostosis Facial symmetry in unicoronal synostosis

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Comparative Study between Surgical Navigation and Screw-track Transfer Guide Plate in Treating Orbital Hypertelorism

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Jie Yuan

Min Wei

Abstract

Background：To explore the effect of surgical navigation and screw-track transfer guide plate in orbital Hypertelorism therapy.
Patients and Methods： In 6 Hypertelorism patients（IOD>35mm, with plagiocephaly）, traditional Box osteotomy and reposition were used with surgical navigation (n=3) or screw-track transfer guide plate (n=3).
Results：All patients recovered well (IOD <20mm) and without complications. Both methods could increase the osteotomy accuracy, especially in concealed osteotomy site (such as the line from zygomatic process to pyriform opening). Furthermore, screw-track transfer guide plate could improve the reposition efficiency (especially on cranial bone and periorbital margin), which was also in accordance with the pre-op surgical design.
Conclusion： Both methods could increase the osteotomy accuracy, screw-track transfer technique could improve the reposition efficiency further.

Objectives

Participants will be able to tell the difference between Surgical Navigation and Screw-track Transfer Guide Plate in Treating Orbital Hypertelorism

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Maternal Vitamin D Supplementation on PTCH1 and RAD54B Gene Polymorphisms in Children with Oral Cleft

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Reza Morvaridi Farimani


Asghar Ebadifar


Saba Tohidkhah

Abstract

Background: Oral clefts are frequent birth defects caused by inadequate lip and palate closure during fetal development. PTCH1 and RAD54B gene polymorphisms are identified as potential genetic risk factors for oral cleft, and maternal vitamin D deficiency during pregnancy is associated with an increased risk of birth defects, including oral cleft. However, the modifying effects of maternal vitamin D supplementation on genetic risk factors for oral cleft, particularly PTCH1 and RAD54B gene polymorphisms, remain unclear. This study aims to evaluate the role of maternal vitamin D supplementation on PTCH1 and RAD54B gene polymorphisms in children with oral clefts.
Methods: A cross-sectional study was conducted with 122 cases with oral clefts and 161 healthy subjects as a control group. Participants were drawn from a hospital in a city in northeast Iran where oral clefts are common. Genotyping of PTCH1 (rs10512248) and RAD54B (rs12681366) polymorphisms was determined using the Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) technique. Statistical analysis was performed using SPSS software version 18.0.
Results: PTCH1 and RAD54B gene polymorphisms did not differ between patients and controls ($p > 0.05$). A significant difference has been observed in the maternal utilization of vitamin D when comparing the case and control groups (p 0.05). The Fisher exact test p-value was less than 0.001, demonstrating a statistically significant connection between cleft type and maternal vitamin D consumption during pregnancy. Of the three forms of cleft lip and palate, patients with a maternal history of vitamin D had a lower frequency of cleft palate.
Conclusions: PTCH1 and RAD54B gene polymorphisms were not significantly different between cases and controls in our sample size whose mothers got vitamin D supplementation during pregnancy. Our data suggest that vitamin D consumption during pregnancy affects the type of oral cleft. Vitamin D deficiency increased cleft palate and lip concomitance.

Objectives

1. The study aims to evaluate the role of maternal vitamin D supplementation in modifying the effects of PTCH1 and RAD54B gene polymorphisms in children with oral clefts 2. The findings may provide valuable insights into the potential use of maternal vitamin D supplementation as a preventive strategy for oral clefts in high-risk populations. 3. To identify the modifying effect of maternal vitamin D supplementation on the type of oral cleft that can be caused.

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Efficacy and safety of expanded polytetrafluoroethylene implantation in the correction of long-term posttraumatic enophthalmos

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Sizheng Zhou


Liang Xu


Jie Yuan


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Abstract

Background: Long-term enophthalmos is a common orbital fracture sequela. Various autografts and alloplastic materials have been studied in post-traumatic enophthalmos repair. However, expanded polytetrafluoroethylene (ePTFE) implantation in late enophthalmos repair has scarcely been reported. This study aimed to evaluate the **efficacy** and safety of ePTFE implantation in late post-traumatic enophthalmos (PTE) repair.
Methods: This retrospective study included patients with post-traumatic long-term enophthalmos who underwent hand-carved ePTFE intraorbital implantation for enophthalmos correction. Computed tomography data were collected preoperatively and at follow-up. The volume of ePTFE, the degree of proptosis (DP), and enophthalmos were measured. Postoperative and preoperative DP and enophthalmos were compared using paired t-test. The correlation between ePTFE volume and DP increment was established using linear regression. Complications were identified via chart review.
Results: From 2014 to 2021, 32 patients were included, with a mean follow-up of 19.59 months. The mean volume of implanted ePTFE was 2.39 ± 0.89 ml. After surgery, the DP of the affected globe significantly improved from 12.75 ± 2.12 mm to 15.06 ± 2.50 mm ($p < 0.0001$). A significant linear correlation was found between ePTFE volume and DP increment ($p < 0.0001$). Enophthalmos were substantially ameliorated from 3.35 ± 1.89 mm to 1.09 ± 2.07 mm ($p < 0.0001$). Twenty-five (78.23%) patients had postoperative enophthalmos less than 2 mm. Infection and implant dislocation were not observed.
Conclusions: ePTFE intraorbital implantation exhibited long-term efficacy and safety for late PTE repair. Thus, the ePTFE method is an effective and predictable alternative in clinical practice.

Objectives

1. Participants will be shown the surgical technique of using expanded polytetrafluoroethylene (ePTFE) in correcting late posttraumatic enophthalmos (PTE). 2. The presentation will demonstrate the effectiveness of ePTFE on improving enophthalmos in late PTE patients. 3. Participants will be able to predict the approximate increment of globe proptosis after ePTFE implantation based on the ratio of proptosis/implant volume that we conclude in the study.

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Anomalous venous collaterals in Apert and Crouzon syndrome are related to ventricle size

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Abstract
Background Children with Apert and Crouzon syndrome are known to have anomalous venous collaterals that might be related to intracranial hypertension (ICH). Goal of this study is to assess the correlation between venous collaterals with ventricle size and ICH and to determine changes in the collaterals over time.
Methods All CT-A and MR scans of children with Apert and Crouzon syndrome were included. Ventricle size was determined with the frontal occipital horn ratio (FOHR). Venous collaterals were scored per anatomical structure as normal (0) or abnormal (1) (Florisson et al., 2015). ICH is defined as hydrocephalus, papilledema, abnormal total retinal thickness on OCT (>503 µm), or abnormal invasive ICP measurement.
Results 90 patients were included. Mean total collateral score (TCS) for Apert was 8.0 (+- 2.2 SD) and for Crouzon 7.3 (+- 2.7 SD). 30 patients (27 Crouzon) presented with ICH at the time of first CT-A (mean age 2.9 years). TCS for 8 patients with a VP shunt was 8.8 (IQR 7.9-9.6). A significant association between higher TCS and larger FOHR was found (exponentiated ß-coefficient 1.034 (95% CI 1.022-1.046, $p<0.01$).
A second CT-A (n=16 patients) 3 years later showed a constant TCS (Δ 0.3, IQR 0.0-0.6). Four patients had ICH at the time of the second CT-A. The TCS was hardly influenced by presence of ICH.
Conclusions Presence of 1 extra abnormal venous collateral increases the FOHR with 3.4%. The number of collaterals remains constant over time, irrespective of ICH or VP-shunt. Apert and Crouzon patients appear to remain dependent on their abnormal collateral drainage and the potential outflow capacity can be exhausted, resulting in ICH. We hypothesize that a high pressure in the venous system impairs CSF resorption and ultimately induces an increase in ventricle size.

Objectives
Abnormal venous drainage of the brain is very common in Apert and Crouzon syndrome. Abnormal venous drainage of the brain does not reflect ICH. Apert and Crouzon patients remain dependent on the venous collaterals and thus should be preserved during surgical treatment.

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Treatment of Rare Craniofacial Clefts: Experience from an Egyptian center

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Karam Allam

Abstract

Background: Wide spectrum of malformations affect the face and cranium. Low frequency of atypical craniofacial clefts made its study and management challenging. Because of the unlimited number of presentations with variable degrees of soft tissue and skeleton affection, no standardized techniques could be proposed for their correction. Restoring functionally and aesthetically acceptable face is the main objective of the different surgical techniques. Practicing in a limited-resources community may have its impact on treatment choices.
Methods: From January of 2012 to January of 2022, a series of 73 patients with rare craniofacial clefts were treated at the Plastic Surgery Department, Sohag University, Egypt. 46 were primarily treated for craniofacial clefts by the author while 27 had previous surgeries done elsewhere. Regarding the original facial cleft; 41 had multiple clefts and 32 had a single cleft. The treatment objectives aimed to get the best use of the available resources to treat these patients with primary or secondary craniofacial cleft deformities according to the main treatment principles especially restoration of like with like, minimizing scar burden and respecting the aesthetic subunits.
Results: Patients underwent a total of 186 operations. Follow-up ranged from 9 months to 8 years. Patients who underwent primary reconstruction by the author showed better surgical outcomes and higher satisfaction than those who were presented with suboptimal outcomes of previous unfavorable surgical designs. Treatment plans were individualized with respecting the principle of aesthetic subunits. Surgical decisions were tailored according to the available resources to reach the best possible outcomes.
Conclusion: Following general principles of reconstruction in a suitable timeline can achieve good aesthetic and functional outcomes with high patient's satisfaction in limited-resources communities. Patients with secondary deformities may experience less optimal outcomes if they had unfavorable primary designs. Corrective surgeries help these patients to live more normal lives.

Objectives

1. Participants will be able to see the different associations of craniofacial clefts. 2.Participants will be able to compare the treatment outcomes of primarily presented vs. previously operated craniofacial clefts. 3. Participants will be able to appreciate the ability of treating some of the most challenging craniofacial clefts in limited resources communities.

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Primary Cleft Repair in Adult Patients With Untreated Cleft Lip and Palate Deformity

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Karam Allam

Abstract

Background: Referring cleft patients to a specialized medical center at the earliest possible time after birth provides the best outcome and minimize possible complications. For diversity of economic and social factors, some patients may not receive the adequate care and surgical repair at the proper time and present late in adulthood with totally or partially unrepaired clefts.
Patients and Methods: Patients with untreated primary cleft deformity older than 16 years who were treated at the Department of Plastic Surgery, Sohag University, were retrospectively reviewed. The assessment included evaluation of demographic data (age at first consultation and sex distribution), type and laterality of cleft, patients' social and educational status, and previous cleft surgeries. Patients satisfaction following surgery was also assessed.
Results: All adult patients with untreated primary cleft deformity in this study were males, unilateral cleft lip and palate was the commonest deformity. Majority of patients had no education. Marriage was the main motive for having surgery done. All patients were moderately to highly satisfied with surgical outcomes.
Conclusions: Although uncommon nowadays, unrepaired primary cleft deformity in adults can still be seldom reported in some patients especially in lower socioeconomic classes. Surgical repair is more challenging and need more radical solutions, but it achieves good satisfaction in all patients.

Objectives

1. Participants will be able to identify the causes of late presentation of primary cleft lip and palate deformity 2. Participants will be able to see the results of surgical repair in adults with primary un-repaired cleft lip and palate deformity 3. Participants will be able to tell the satisfaction score in adults who had late repair of primary cleft lip and palate deformity

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SCP -- CR RIP

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Abstract
Background:
In maxillofacial surgery, centric relation (CR) has been deemed the important objective for defining a stable position of the mandible upon which surgical planning is based. Problems with CR arise from inconsistencies regarding its definition. Of much greater significance is the fact that a static radiographic image of the condyles in some location, discloses nothing of the overall orthopedic stability of the cranio-cervical-mandibular-dental complex. Therefore, a more appropriate term and pre-surgical objective in maxillofacial surgery is the concept of a stable condylar position (SCP).
Methods**:**
SCP can be defined as the harmonious, asymptomatic articulation of the cranio-cervical-mandibular-dental complex with the anterior skull base (maxilla), not just a static position of the condyles. SCP should be the objective prior to final surgical planning in all patients, and particularly in those patients with history of any temporomandibular disorder, headaches, neck pain, bruxism, radiographic joint changes, etc. SCP is obtained through a combination of therapies and, most importantly, through the introduction of a maxillary orthotic. Once a SCP is established, then predictable surgical planning can be initiated.
Results/Conclusions:
The concept of SCP and how it is achieved will be discussed, along with multiple case studies demonstrating its essential significance.

Objectives
1. Illustrate limitations for the concept of centric relation (CR). 2. Understand the concept of stable condylar position (SCP) and its significance for pre-surgical treatment planning in maxillofacial surgery. 3. Understand the importance of maxillary orthotics in obtaining SCP.

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Patient tailored surgery in Saethre-Chotzen Syndrome: Analysis of reoperation for intracranial hypertension

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Abstract

Background: Saethre-Chotzen syndrome (SCS) is a syndromic craniosynostosis with pathogenic variants in the TWIST1 gene showing a broad phenotypic spectrum. Controversies exist in the literature regarding the surgical management (single one-stage versus patient tailored surgery) and the related reoperation rate for intracranial hypertension with up to 42%. We assessed the reoperation rate for intracranial hypertension and other reasons of SCS patients treated in our unit.
Methods: We retrospectively assessed all case notes and scans of all confirmed SCS patients who attended the Alder Hey Craniofacial Unit from 1999-2022.
Results: Twenty-six of 35 patients (10 females and 16 males) were operated. Mean (median) age at first surgery was 1.70 years (1.24 years, range 0.3-6.01), mean (median) age at second surgery 3.86 years (3.1, range 1.31-7.21). Eleven (31.4%) of the 35 patients had invasive ICP monitoring, 4 of them before, 1 of them before and after, 1 during, and 5 after primary surgery. Three of the 35 patients had papilledema prior to first surgery. Three patients presented with papilledema after first surgery and underwent a second surgery. Twenty-two of the 26 operated patients were initially referred to our unit and had patient tailored surgery with single stage FOAR (fronto-orbital advancement and remodeling) or FOAR and posterior distraction in individually determined order. Of the 22 patients with primary surgery in our center, 9 (41%) had second surgery, 3 (14%) of them because of intracranial hypertension, 6 (27%) for aesthetic reasons. All 4 patients (100%) initially operated in another center, had second surgery, 2 (50%) of them for raised intracranial pressure, 2 (50%) for aesthetic reasons. Median follow-up was 13.98 years (range 1.85-18.08).
Conclusions: Patient tailored surgery in a specialized center with FOAR or FOAR and posterior distraction in individually determined order and long-term follow-up allow for a low reoperation rate for intracranial hypertension.

Objectives

Participants will be able to tell the broad phenotypic spectrum of Saethre-Chotzen syndrome (SCS) patients. Participants will be able to compare the different strategies of surgical management of Saethre-Chotzen syndrome (SCS) patients. Participants will be able to interpret the relevance of fundoscopy and of invasive intracranial pressure (ICP) monitoring in Saethre-Chotzen syndrome (SCS) patients.

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Impact of perioperative hypotension and blood loss on brain injury biomarkers in metopic craniosynostosis surgery

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Abstract

Background: Recent studies show that the brain injury biomarkers glial fibrillary acidic protein (GFAP) and neurofilament light (NfL), are elevated postoperatively in infants undergoing surgery for craniosynostosis. Our aim was to investigate the possible influence of perioperative hypotension or blood loss on the release of brain injury biomarkers.

Methods: In this retrospective study, all consecutive patients undergoing surgery for metopic synostosis at the Craniofacial Unit at Sahlgrenska University Hospital, Gothenburg, Sweden, from January 2019 to September 2020, were included. Records were reviewed for perioperative blood pressure, heart rate, blood loss and pre- and postoperative levels of GFAP and NfL. Hypotension was defined as the area under the curve (AUC) of mean arterial blood pressure (MAP) at three threshold levels: 35, 40 and 45 mmHg respectively. The AUC of the three threshold levels of hypotension as well as perioperative blood loss were analysed for correlation with the postoperative change from baseline of GFAP and NfL.

Results: A total of 20 patients, with an age of 190±65 days (mean±SD) and weight of 8.0±1.0 kg were included. Perioperative blood loss was 27±11 ml/kg. There was no association, neither for GFAP, nor for NfL, for any MAP threshold level or for blood loss.
Conclusion: The absence of correlation between MAP, as well as bleeding, with elevated markers of brain injury, suggests that other factors, e.g. mechanical manipulation could explain the elevated brain injury biomarkers after surgery for craniosynostosis.

Objectives

Participants will be introduced to the novel brain damage biomarkers that are elevated after surgery for craniosynostosis. Anaesthetic management and its impact on these biomarkers will be discussed.

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Success Rate and Predictors of Outcomes in 900 Alveolar Bone Grafts: A Single Surgeon Cohort Study

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Pauline Tio


Prakriti Garkhail


Laura Nuzzi

Abstract
Background: Significant discrepancies exist in the reported variables influencing alveolar bone graft outcomes. The purpose of this study was to evaluate graft success and identify outcome predictors in a large patient cohort using an objective Cone Beam Computed Tomographic (CBCT) assessment tool.

Methods: Consecutive patients with cleft lip/palate who underwent alveolar bone grafting by one surgeon were included. Predictor variables were age at graft, oronasal fistula, canine position, concurrent premaxillary osteotomy, size of cleft, presence of bony palatal bridge, history of failed graft, location of primary repair, and surgeon experience. The outcome variable was graft success determined using a CBCT assessment tool and defined as a score of > 3 out of 4 in each domain: vertical bone level, labiopalatal thickness, and nasal piriform symmetry.

Results: The sample included 900 alveolar cleft sites (median graft age 9.9 years). The success rate was 94.6%. Presence of an erupted canine, large cleft defect, and premaxillary osteotomy were independent predictors of graft failure, while presence of a bony palatal bridge was associated with graft success ($p < 0.05$).

Conclusions: Presence of an erupted canine, large bony defect, and premaxillary osteotomy increase failure, and a bony palatal bridge portends success. Variables of age > 12 years, visible oronasal fistula, history of failed graft, primary cleft repaired at outside institution, and surgeon experience were associated with higher graft failure but were not independent predictors when controlling for co-variates. Surgeons should be aware that these factors in combination increase the odds of graft failure.

Objectives
Participants will be able to explain the predictors of bone graft outcomes Participants will be able to evaluate methods for assessing bone graft outcomes Participants will be able to apply the techniques for assessing bone graft outcomes

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(Not) Talking the Talk: The Role of Primary Language in Velopharyngeal Insufficiency

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Kylie Swiekatowski


Phuong Nguyen

Abstract
Background: Velopharyngeal insufficiency (VPI) may occur following primary cleft palate repair and affect speech. Speech sounds may differ based on primary language. The contributory role of language to VPI is unknown. This study seeks to determine the incidence of VPI in Spanish- versus English-speaking patients as well as to evaluate the effect of primary language on patient-reported speech outcomes.
Methods: Patients who had a primary palate repair at a single institution from 2004-2019 were divided into two primary language groups: English (EN) or Spanish (SP). Retrospective analysis of VPI incidence and a survey of speech outcomes were conducted. VPI was defined as receiving VPI surgery, recommendation for VPI surgery, or hypernasality score of at least 2 on most recent follow-up. CLEFT-Q Speech Function and Speech Distress surveys were administered to patients ages 7-18 years. Surveys were scored 0-100 with higher scores indicating better function and less distress.
Results: Of the 228 patients included, 46 (20%) were SP and 182 (80%) were EN. There was no statistical difference in the Veau class or type of primary palatoplasty performed in SP and EN patients. There was a greater incidence of VPI in SP compared to EN (52% vs. 38%, p=0.04). For patient-reported speech outcomes, 40 patients were surveyed (n=12 SP, n=28 EN). The median age of surveyed patients was 13 (IQR 8,15.25) years for both groups. SP patients reported lower scores than EN in both Speech Function (58 ± 18.19 vs. 68 ± 20.61, p=0.17) and Speech Distress (64 ± 17.30 vs. 70 ± 18.16, p=0.43).
Conclusions: There was a statistically significant greater incidence of VPI in SP compared to EN patients. It is unclear if these findings are caused by primary language differences. Further research is needed to investigate contributing factors such as socio-demographics with the goal of achieving equitable outcomes in these groups.

Objectives
Compare speech outcomes in Spanish- versus English-speaking patients with cleft palate.

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What to do with Incidental Finding of a Fused Sagittal Suture?

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Synostosis Research Group

Abstract

Background

As many as 3% of children may have a prematurely fused sagittal suture with a normal cephalic index and grossly normal head shape, yet the clinical significance and best course of management of this finding remains unclear. Therefore, we surveyed providers in the Synostosis Research Group to create a multicenter consensus on an optimal treatment and monitoring algorithm.

Methods

A survey was distributed to 20 neurosurgeons and plastic surgeons with expertise in craniosynostosis across nine institutions, which presented three patients (aged 3 years, 2 years, and 2 months) with incidentally discovered fused sagittal sutures, normal cephalic indices, and no parietal dysmorphology. Surgeons were queried about their preferred term for this entity and preferred management of these patients.

Results

Survey response rate was 95%. Most surgeons preferred terms such as sagittal synostosis without scaphocephaly or premature fusion of the sagittal suture (95%). All surgeons opted not to operate on the three-year-old patient unless symptoms of intracranial hypertension or papilledema were present. Three surgeons (16%) would change their management for the two-year-old patient: two suggested closer follow-up and additional testing due to younger age and an open anterior fontanelle, while one opted to operate due to clinical judgment that the phenotype more closely resembled classic sagittal craniosynostosis. Finally, seven surgeons (37%) would recommend operative intervention in the case of the two-month-old patient, due to concerns about future head shape and neurodevelopment and given that a minimally invasive option would be available.

Conclusions

Most surveyed surgeons would not operate on an incidentally discovered fused sagittal suture in a patient with normocephaly. However, the respondents were more likely to operate on a young patient where a minimally invasive option is available. Further work is necessary to determine if this entity should be classified as craniosynostosis or if it represents a normal variant.

Objectives

1. Participants will be able to understand surgeons' recommendations for treatment and management of an incidentally discovered fused sagittal suture in a patient with normocephaly. 2. Participants will be able to recognize signs and symptoms that would prompt operative management of fusion of the sagittal suture. 3. Participants will be able to discuss the potential risks and benefits of operating on a normocephalic patient with a fused sagittal suture.

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Institution experience on the first case of using pre-epiglottic baton plate for a patient with Pierre Robin Sequence

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Abstract

Background

Pierre Robin Sequence (PRS) infants have been previously reported to be treated with a pre-epiglottic baton plate (PEBP) with good results. PEBP is a simple, removable, non-invasive, and effective tool for PRS patients with mild-moderate upper airway obstructive and respiratory problems. We will discuss our experience in using PEBP.

Methods

Sleep study and fibreoptic nasopharyngoscopy were performed to assess airway obstruction and suitability of PEBP. A hard acrylic plate was made from a digital maxillary scan. The plate consisted of a palatal part, covering the hard palate, alveolar ridges, cleft, and a velar extension.

The plate was inserted on the infant under general anesthesia and adjusted through assessment of airway endoscopically. Once position was satisfactory, extraoral strengthening wires were bent to allow plate taping to the forehead. No desaturations, respiratory noise, or snoring were noticeable with the plate in situ.

Results

Insertion and placement of PEBP were fairly straightforward, however, we had great difficulty in securing it in a stable position. The PEBP was constantly pulled backward by the tongue base and the plate was under constant traction posteriorly, as the anchoring tapes to the forehead were insufficient to counterforce. The method described for PEBP securement was inadequate in our patient due to repetitive plate malpositioning. Despite trying other measures, they were similarly unsuccessful. To secure optimal position, we could have applied adhesive cream to hold the plate by adhesion to improve retention and use adhesive glue on the extraoral bows to fix to the forehead.

Conclusion

Application of PEBP for PRS has not been widely accepted, potentially because it requires multi-disciplinary team training, nurse educators to train parents, parental acceptance, and the ability to troubleshoot. We are at the early stages of the learning curve and need further recommendations to help implement this highly effective non-surgical treatment option.

Objectives

1. Evaluate the use of PEBP on Pierre Robin Sequence patient 2. Evaluate the design of PEBP 3. Evaluate the tape anchoring of PEBP

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Reconstruction of Complex Facial Asymmetry: Problems and Refinements

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Oswaldo javir Gomez Diaz

Abstract

we describe 2 patients with complex facial asymmetry characterized by hemiarhinia, microorbitism, palpebral fissure shortening, ipsilateral canthal dystopia, maxillomandibular hypoplasia, and occlusal plane inclination. These unusual pheno- types are part of the oculoauriculo-vertebral spectrum. Their dev- astating functional, esthetic, and psychologic effects demand the use of different craniofacial surgery techniques, in order to alleviate the profound impact of these pathologies. Initial skeletal balance through bimaxillary distraction osteogenesis and orbital expansion sets the basis for further reconstruction of the nose and periorbital area with local tissue.

Objectives

Participants will be able to: 1. Learn about phenotypical expressions in relation to hemifacial microsomia 2.Understand the importance to keep always in mind that a balanced internal structure is the basis for a successful soft tissue reconstruction. 3.Evaluate the main problems that must be address with surgery and propose a surgical plan adopted for different types of facial malformations that include osseous and soft tissue anomalies.

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The efficacy and safety of milled PEEK(polyetheretherketone) implant for facial bone reconstruction

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Dong Yeon Kim

Abstract
Background
To assess the clinical efficacy and safety of custom made Polyetheretherketone (PEEK) patient-specific implants in treatment of facial bone reconstruction. By applying milling technique, the implant can be manufactured as thin as 0.7mm in thickness which may be beneficial to reconstruct exact 3-dimensional property of facial bones without causing unwanted volume change.
Methods
Total of 9 patients were enrolled in the study. Five patients with unilateral post-traumatic orbital wall defect, two patients with frontal bone fracture, one patient with zygomatic bone fracture and one patient with maxillo-zygomatic defect after tumor ablation. All patients received PEEK patient-specific implants (PSI) reconstruction and comparative analysis of the treatment outcomes were performed. The efficacy of the reconstruction was calculated as volumetric ratio between pre-operative CAD design which were mirror image of contra-lateral normal side with post-operative CT image.
Results
Mean follow up was 10 months. There were no postoperative complications such as infection, inflammation, implant exposure/migration. The calculated efficacy of reconstruction was 93.1% in average. Clinical course was similar to the patient group with porous polyethylene/titanium implant reconstruction. However, patient satisfaction was higher in PEEK implant group with visual comprehension of facial bone reconstruction was possible with PSI.
Conclusion
By incorporating milled PEEK PSI, clinical application was able to expand from orbit to zygoma and maxilla with higher clinical efficacy. With further accumulation of experiences of PEEK implant in facial bone reconstruction, PEEK may become a material of choice in facial bone reconstructive surgeries.

Objectives
Participants will be able to explain the difference and the advantages of PEEK PSI over titanium implants. Participants will be able to develop better understanding for design of facial implants used for facial bone reconstruction Participants will review and critique about early clinical results of PEEK implant used in facial bone reconstruction.

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Pediatric Cranial Intraosseous Lipoma: Literature Review and Craniofacial Treatment Approach

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Thomas Ridder


Allyson Alexander


Brooke French


David Mathes


David Khechoyan

Abstract
BACKGROUND: Craniofacial Intraosseous Lipomas (CIOLs) account for about 4% of all intraosseous lipoma diagnoses. Fewer than 50 cases of pediatric CIOLs (PCIOLs) have been reported in literature to date and thus, there is no effective diagnostic approach and standardized treatment for this patient population. This study aims to formulate a multidisciplinary approach to the diagnosis and treatment of PCIOL and review the potential reconstructive options.
METHODS: We conducted a literature review on diagnostics and current surgical techniques for PCIOL.
RESULTS: The proposed diagnostic procedure includes MRI, CT and CT venogram to delineate the sinus anatomy in relation to the mass, and an initial biopsy. The multidisciplinary treatment team should include a pediatric craniofacial surgeon, pediatric neurosurgeon, and medical oncology. Virtual surgical planning (VSP) is an indispensable to plan the resection of the mass and the reconstruction. Reconstructive options include autologous bone grafts or an alloplast (Medpor or PEEK implants). The unpredictable bone resorption as well as large cranial defects that may require reconstruction are critical limitations for autologous cranioplasties. Medpor provides adequate cerebral neuroprotection, allows for vascular tissue ingrowth and incorporation, and is easy to modify intraoperatively. These features render it to be a useful reconstructive option for patients with PCIOL.
CONCLUSIONS: This influences the diagnosis and surgical treatment of PCIOL to emphasize a multidisciplinary approach that takes advantage of VSP and tailored implant options.

Objectives
Participants will be able to: (1) Evaluate pediatric patients presenting with a painless, cranial mass (2) Investigate the optimal implant after craniofacial mass resection (3) Reinvent how surgeons may approach surgical treatment of pediatric craniofacial intraosseous lipomas by using pre-operative virtual surgical planning

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Preliminary reports of augmented-reality assisted craniofacial bone fracture reduction.

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Li Lin


Haisong Xu


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Le Xie

Abstract
Background: Zygomaticomaxillary complex fractures involve four fracture ends. It is difficult to fully expose the operative area through a main coronal incision, an intraoral incision, and an eyelid incision. To address the partial visual field loss in craniofacial fracture reduction, we attempted to use an augmented reality (AR) navigation system.
Methods: Patients with zygomaticomaxillary complex fractures underwent three-dimensional (3D) computed tomography (CT) modeling before surgery, and preoperative plans were de-signed. The control team used traditional optical navigation to perform the surgery. The ex-perimental team used an AR navigation system. From May 2019 to December 2019, 10 patients with zygomaticomaxillary complex fractures were included in this study. Data were collected after surgery and analyzed.
Results: There was a significant difference between the two groups in the fracture point error (1.35 vs. 1.61, P = 0.02) and fracture reduction time (15.40 vs. 20.40, P = 0.03). However, there was no difference in the operative **duration** (6.60 vs. 6.65, P = 0.92), blood loss volume (620.00 vs. 580.00, P = 0.83), or incidence of complications. Conclusions: The AR navigation system used by the research team has good auxiliary effects for reducing zygomaticomaxillary complex fractures. The new surgical method has better accuracy and a shorter reduction time than the traditional surgical method.

Objectives
Participants will be able to understand using AR navigation system for reducing zygomaticomaxillary complex fractures.

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Morphological Features of Skeletal Dentofacial Asymmetry and Efficacy of Surgery-First Approach in Treating Skeletal Dentofacial Asymmetry with Orthognathic Surgery.

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Zhewei Chen

Bin Yang

Abstract

Background: Skeletal dentofacial asymmetry decreases patient's attractiveness by deteriorating symmetry of facial appearance. Surgery-first orthognathic approach manifests its advantages of shortening treatment time and improving patient's quality of life. However, current literature on surgery-first approach mainly focuses on treating prognathism, overlooking its efficacy in improving facial symmetry of skeletal dentofacial asymmetry patients. This study aimed to assess SFA's efficacy in improving facial appearance by analyzing morphological features of asymmetric bone as well as facial soft tissue in a three-dimensional manner.

Methods: Thirty-four patients who received orthognathic surgery in a surgery-first fashion were included. Based on three-dimensional CT reconstruction, bilateral preoperative morphological features and postoperative symmetry of hard tissue were compared respectively. Efficacy of facial soft tissue symmetry restoration was evaluated using root mean square deviation (RMSD) value.

Results: Asymmetric features mainly located in menton, mandibular body length, angulation between ramus and midsagittal plane, distance between gonion and MSP and so on, which were significantly restored after the whole treatment. RMSD of facial soft tissue surface were significantly declined after the treatment and prognathism was corrected simultaneously if existed.

Conclusions: With the help of mirror-method and RMSD value, subgroup analysis suggested that surgery-first approach not only treats the asymmetric skeletal shape, but restores the deformed facial soft tissue as well. To summarize, surgery-first orthognathic approach is proved to be capable of treating skeletal dentofacial asymmetry effectively and efficiently.

Objectives

(1) Participants will be able to tell the morphological differences between three subgroups of dental facial aysmmetry. (2) Our experience of treating skeletal dentofacial asymmetry with surgery-first and virtual surgery planning will be shared with participants. (3) Efficacy of surgery-first approach in restoring facial soft tissue attractiveness of skeletal dentofacial asymmetry will be presented to participants in a three-dimensional manner.

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Traumatic Brain Injury in Patients with Frontal Sinus Fractures

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Abstract
Background: TBI associated with facial fractures is a significant public health concern worldwide. TBI has been reported to be as high as 86% in patients presenting with facial fractures. Our study is the first to evaluate the prevalence and risk factors of TBI in patients with frontal sinus fracture(s).
Methods: We retrospectively reviewed patients who presented with traumatic frontal sinus fractures in 2019. Excluded were patients with no documentation of neurologic symptoms/signs on presentation. Our primary outcomes were prevalence of concomitant TBI on presentation and at >2 weeks after trauma. TBI on presentation was defined as having GCS<15 or any neurologic symptom/sign and categorized into mild (GCS=14-15), moderate (GCS=9-13), and severe (GCS<8). Persistent/incident post-traumatic neurologic symptoms were assessed at >2 weeks after injury. Bivariate analysis and logistic regression were performed.
Results: Of n=62 patients, n=57 (91.9%) had concomitant TBI on presentation. Compared to patients with no concomitant TBI, patients with severe TBI were more likely to have had combined anterior and posterior table fractures (n=0 [0.0%], n=12 [85.7%]; P=.002), displaced fractures (n=1 [20.0%], n=12 [85.7%]; P=.036), and comminuted fractures of the frontal sinus (n=0 [0.0%], n=13 [92.9%]; P<.001). Of n=51 patients who were followed up for a median (interquartile range [IQR]) of 162 [23-970] days, n=41 (80.4%) had neurologic symptoms at >2 weeks following trauma. Combined anterior and posterior table fractures of the frontal sinus was associated with 7 times the odds [crude odds ratio (cOR) (95% confidence interval [CI]) 7.0 (1.3-38.6)] of having neurologic symptoms

at >2 weeks after trauma compared to isolated anterior table fracture. This was not significantly associated with mechanism of injury, fracture displacement, or surgical repair.
Conclusion: Emergency physicians should maintain a high degree of suspicion of TBI, even when their primary concern is facial trauma with frontal sinus fracture.

Objectives

Participants will be able to evaluate the prevalence and risk factors of TBI in patients with frontal sinus fracture(s). Participants will be able to compare the presenting and follow-up neurologic symptoms/signs among frontal sinus fracture patients with varying degrees of TBI. Participants will be able to explain the importance of head CT at presentation and close neurologic follow-up for frontal sinus fracture patients with combined anterior and posterior table fractures.

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Syringomyelia in Crouzon/Pfeiffer syndrome; watch the back long term.

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Abstract

Background: Syringomyelia can lead to significant (neurological) disabilities. In most cases, it is associated with Chiari-I malformation (CM-I) and altered cerebrospinal fluid dynamics. Children with Crouzon/Pfeiffer syndrome have the highest prevalence of CM-I compared to other craniosynostosis syndromes. However, which children are prone to develop syringomyelia is unknown. This ERN CRANIO international multicentre study, conducted at ten craniofacial centres, aims to identify risk factors for syringomyelia development and progression in Crouzon/Pfeiffer patients.

Methods: This longitudinal cohort study included all Crouzon/Pfeiffer patients with MRI imaging. Syringomyelia size, fronto-occipital horn ratio (FOHR), and tonsillar herniation (TH)/CM-I over time were determined for syringomyelia (Syr) and no syringomyelia (nSyr) patients. The presence of high intracranial pressure (ICP) during follow-up was determined by papilledema, hydrocephalus, or positive invasive ICP measurement. Data on clinical symptoms and surgical procedures were obtained from patient files.

Results: Currently, data collection was completed in 1/10 of the participating centres; in this centre, 6/77 patients developed syringomyelia during follow-up. The median age at discovery of syringomyelia was 11.3 (IQR 8.6 – 15.0) years. During follow-up, 3/6 Syr patients required foramen magnum decompression due to deterioration of neurological symptoms. Forty-three out of the 77 patients had long-term radiological follow-up (MRI scans at > 8 years old). In this subgroup, 4/20 with CM-I versus 2/23 without had developed syringomyelia. Other potential associated factors in syringomyelia development were ventriculomegaly (2/13 with versus 2/23 without), VPS (2/7), and ICH after age 6 (5/16 with versus 1/26 without).

Conclusions: These preliminary results of the data of one of the participating centres indicate that syringomyelia development in Crouzon/Pfeiffer syndrome seemed to be age-related and, in most cases, associated with CM-I. Other potential related factors were ventriculomegaly, VPS, and ICH at an older age. We recommend long-term clinical and radiological follow-up.

Objectives

1. Syringomyelia development in Crouzon/Pfeiffer syndrome seems to be age-related 2. Not all Crouzon/Pfeiffer patients with syringomyelia need surgery, but some still require it later in life 3. Keep Crouzon/Pfeiffer patients under long-term clinical and radiological follow-up

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A European multicentre outcome study on the different perioperative airway management policies following midface surgery in syndromic craniosynostosis: a proposal for a Standard Operating Procedure.

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Abstract

Background: Perioperative airway management following midface advancements in children with Apert and Crouzon/Pfeiffer syndrome can be challenging, and hospital protocols often differ. This international study, conducted at seven craniofacial centres, examined airway management following midface advancements and postoperative respiratory complications.

Methods: An ERN CRANIO multicentre, retrospective cohort study was performed to obtain information about the timing of extubation, perioperative airway management, and respiratory complications after monobloc (MB)/ le Fort III (LF3) procedures.

Results: Ultimately, 275 patients, 129 MB and 146 LF3, were included; 62 patients received immediate extubation (IEX), 162 delayed extubation (DEX), 42 had long term tracheostomies (LTT), and 9 had perioperative short term tracheostomies (STT). STTs were in most centres reserved for selected cases. DEX patients remained intubated for three days (IQR 2 – 5). The rate of no or only oxygen support after extubation was comparable between the IEX and DEX groups, 58/62 (94%) and 137/162 (85%) patients, respectively. Patients with DEX were however more likely to develop postoperative pneumonia compared to IEX, 24/161 (15%) versus 0/62 (0%) (P = 0.001), respectively. IEX also appeared safe in moderate/severe OSA since 19/20 (95%) required either no or only short-term oxygen support after extubation. Additionally, the odds of developing intubation-related complications increased by 21% with every extra day of intubation/mechanical ventilation.

Conclusions: IEX following midface advancements was found to be safe compared to DEX in most cases, as it was not associated with respiratory insufficiency but did lead to fewer complications. IEX should be considered routine management in patients with no/mild OSA and should be the aim in moderate/severe OSA after careful assessment.

Objectives

1. Immediate extubation following midface advancements was found to be safe compared to delayed extubation in most cases, as it is not associated with respiratory insufficiency but does lead to fewer complications 2. Immediate extubation should be considered routine management in patients with no/mild OSA and should be the aim in moderate/severe OSA after careful assessment 3. If the decision is made for delayed extubation, consider extubation within the first 24 hours.

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Experiences of parents in Mandibular Distraction Osteogenesis

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Abstract

Background:
Mandibular Distraction Osteogenesis (MDO) is a preferred method for treatment of respiratory distress or obstructive sleep apnea in patients (<18 years) with mandibular hypoplasia that are unresponsive to non-surgical treatment This study explores the experience of parents during this treatment, to determine the best conditions for optimal care.

Methods:
Data were collected by administering semi-structured interviews. The data were analyzed from a grounded theory framework. Eight parents participated. Two patients underwent this surgery for the second time, the other six patients had a first time treatment.

Results:
Parents are satisfied about the treatment, even if the goal was not (yet) reached. All parents think they were well informed about the medical part. Attention about the emotional impact was missed. They experienced stress when confronted with their child after surgery at ICU, wearing the distractors. Distraction procedure at home was emotional but became part of the daily routine and was in most cases not painful for the child. Sleep and behavior problems were reported, not only for the patient but also for other family members. Peer support was helpful.

Conclusion:
For optimal care we advise to involve psychological help in this care, to optimize all information and inform parents about peer support.

Objectives

Participants will be able to tell how they can inform parents about this treatment Participants will be informed about patient information animations from the ERN Participants have awareness about the role of psychologist in this treatment

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VELOPHARYNGEAL DYSFUNCTION IN CRANIOFACIAL MICROSOMIA: A RETROSPECTIVE COHORT STUDY AND SYSTEMATIC REVIEW OF THE LITERATURE

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Abstract

Background

Velopharyngeal dysfunction (VPD) constitutes the inability to achieve full closure of the velopharyngeal valve during speech and swallowing. It is a common problem in patients with a cleft palate but has also been described in patients with craniofacial microsomia (CFM). We investigated the prevalence and underlying pathophysiology of VPD in patients with CFM.

Methods

We initiated a retrospective cohort study, including patients from two craniofacial centres. All patients with CFM who were examined by a speech and language therapist were included. Patients were further analysed by an ENT-surgeon using fibroscopy or videofluoroscopy when velopharyngeal dysfunction was suspected. Additionally, we conducted a systematic review of the literature regarding the prevalence and pathophysiology of VPD in CFM.

Results

In total, 223 patients with CFM were analysed by a speech and language pathologist. Of these, 46 (20.6%) were further analysed because VPD was suspected. Twenty patients with confirmed VPD also had a cleft palate. VPD was

significantly more prevalent in patients with a cleft palate. No significant correlation was found between the degree of hypoplasia in CFM and the presence of VPD.
Our systematic review included 16 articles. The prevalence of VPD ranged between 0% and 55%. The literature shows varying results concerning the relationship between the degree of hypoplasia in CFM and the presence of VPD. There are, however, some indications that VPD is caused by hypoplasia of the soft palate and by a partial paralysis of the velopharyngeal musculature.
Conclusions
VPD is a common finding in CFM, even in the absence of a cleft palate. The literature suggests that VPD may be the result of hypoplasia of the soft palate and partial paralysis of the velopharyngeal musculature, but the exact pathophysiology remains unknown. We therefore recommend that all patients with CFM are screened by speech and language pathologist.

Objectives

1. Participants will be aware of the possible presence of velopharyngeal dysfunction in patients with craniofacial microsomia. 2. Participants will be able to understand the potential causes of velopharyngeal dysfunction in craniofacial microsomia. 3. Participants will recognize the need for early screening of patients with craniofacial microsomia by a speech and language pathologist.

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Taking the "M" shape out of "M"asculine Hairlines: A Prospective Evaluation of a Technique using Temporal Rotation Flaps To Improve Hairline Shape in Facial Gender Affirming Surgery

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Abstract

Background

Hairline advancement is an impactful part of facial feminization surgery. Published hairline techniques do not address the most masculine portion of the hairline: the lateral temporal recession and “M” shape. Here we present results from our ongoing database of hairline feminization cases to compare our temporal rotation flap technique with standard central hairline advancement.

Method

In our technique, bilateral rotation flaps of hair-bearing temporal scalp were rotated anteriorly and combined with central scalp advancement, allowing a wedge of alopecia in the area of temporal recession to be excised. Control patients underwent uniform hairline advancement only. We identified key anatomic landmarks and defined measurements that best represents differences between a feminine and masculine hairline. Statistical analysis compared pre and post operative measurements between patients who had this technique of temporal rotation flap hairline advancement vs uniform hairline advancement. Our hypothesis is that our temporal rotation flap technique decreases the distance from lateral temporal recession peak (TRP) to lateral brow (LB) and obliquely to the midline glabella (MG) compared to central hairline advancement alone, allowing for a more feminized hairline shape.

Results

A total of 90 cases were reviewed; 64 temporal rotation flaps and 26 controls. We showed statistically significant improvement in the height of temporal recession peak (TRP) demonstrated by two measurements. TRP vertically to lateral brow (LB) was 2.1 vs 1.2 cm in controls, $p < 0.0001$. Oblique measurement from TRP to midline glabella

(MG) was 3.0 vs 1.2 cm control group, p <0.0001. This did not sacrifice advancement at the midline (1.6 vs 1.4 cm, p>0.05). There were no major complications and minor complications of T junction delayed wound healing or scar widening was identified in 15%.

Conclusion

Our temporal rotation flap technique is a powerful tool to correct temporal recession and feminize the hairline shape and forehead.

Objectives

1. Understand key anatomic landmarks and measurements that are important when performing hairline shape and height reconstruction for facial gender affirming surgery. 2. Learn a new technique for hairline feminization that addresses the masculine shape of the hairline in addition to the height. 3. Appreciate the improved forehead feminization with this new technique of hairline reconstruction both statistically by measurements and clinically by appearance.

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Genetic diagnostic yield in an 11-year birth cohort of craniosynostosis patients

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Abstract

Background: The clinical focus of genetic diagnostics in craniosynostosis has shifted from confirming classical syndromic cases to offering genetic diagnostic testing to all craniosynostosis patients. We aimed to establish the diagnostic yield of genetic diagnostics by investigating the prevalence of chromosomal and monogenic (likely) pathogenic variants in an 11-year birth cohort of 1020 craniosynostosis patients.
Methods: We conducted a retrospective study at the Erasmus Medical Center, Rotterdam, The Netherlands. We included all children born between January 1st 2010- January 1st 2021 with radiologically confirmed craniosynostosis. We collected information on genetic diagnostics, diagnosis, affected suture(s), gestational factors, family history and consanguinity.
Results: Genetic diagnostics were performed in 502 children. A pathogenic variant was identified in 179 patients (36%). We found significantly higher diagnostic yield in syndromic craniosynostosis patients (63%) as compared to non-syndromic craniosynostosis patients (6%). Initially, targeted single-gene testing was performed on indication. Diagnostic yield was highest for FGFR2 (21%), FGFR3(13%), EFNB1(50%) and IL11RA(14%).Diagnostic yield for microarray and Next Generation Sequencing (NGS) craniosynostosis panel were 8% and 10%, respectively. On indication additional NGS analyses were performed. Diagnostic yield was highest for NGS open exome (29%), followed by Multiple Congenital Anomaly (15%) and Intellectual Disability panels(11%).
Conclusion: Array analysis and NGS craniosynostosis panels are key to identifying pathogenic variants in craniosynostosis patients. If no diagnosis is obtained through these analyses, open exome sequencing is recommended after genetic counseling regarding incidental findings. If parents are uncomfortable with open exome sequencing, multiple congenital anomaly or intellectual disability NGS panels may be considered. Although current genetic analyses have imperfect diagnostic yields, they are important as a genetic diagnosis can be a strong predictor for clinical outcome, may warrant screening for additional congenital anomalies, and is key for counseling (future) parents on recurrence risk and prognosis of affected children.

Objectives

1. Participants will be able to describe current genetic diagnostic testing strategies in craniosynostosis. 2. Participants will gain insight into the genetic diagnostic yield in craniosynostosis. 3. Participants will be able to discuss next steps for future clinical practice and future research regarding genetic diagnostics of craniosynostosis.

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Demographic Trends and Predictors of Postoperative Complications in Craniosynostosis Surgery

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Abstract

Background: Previous craniosynostosis studies reported Hispanic and non-White patients were diagnosed later in life with higher rates of open repair and complications. This study analyzed recent trends and identified postoperative predictors.

Methods: Retrospective review ACS NSQIP® Pediatric 2019-2021 identified all craniosynostosis patients (ICD-10 Q75.0) who underwent repair. Excluded: combination minimally invasive/open repair. Covariates: demographics, comorbidities. Outcomes: transfusions, postoperative complications, length of stay, reoperations, readmissions. Multivariable regression assessed predictors of postoperative complications.

Results: 4,711 patients were included. 469 (9.96%) underwent minimally invasive surgery, 4,242 (90.04%) open repair. Median age was significantly lower in minimally invasive surgery (3.4 months, IQR=2.8,4.2) vs. open repair (9.2 months, IQR=5.0,15.2, p<0.001). Race distribution was significantly different (p<0.001): White patients made up a greater proportion of minimally invasive surgery (72.9%) vs. open repair (62.1%), Black patients made up a greater proportion of open repair (9.5%) vs. minimally invasive surgery (3.0%). Minimally invasive surgery was associated with shorter operative (80 minutes, IQR=61,104) and anesthesia times (171 minutes, IQR=143,219) and length of stay (1 day, IQR=1,2) vs. open repair (179 minutes, IQR=104,254, p<0.001; 290 minutes, IQR=214,375, p<0.001; 3 days, IQR=2,4, p<0.001). In minimally invasive surgery, predictors of blood transfusions were American Indian/Native Alaskan race (OR=7.7, p=0.031), longer anesthesia time (OR=1.02, p<0.001); predictor of other postoperative complications was increasing age (OR=1.028, p=0.016). In open repair, predictors of blood transfusions were younger age (OR=1.014, p<0.001), Hispanic/Latino ethnicity (OR=1.226, p<0.029), longer anesthesia (OR=1.005, p<0.001) and operative times (OR=1.003, p<0.001); predictors of other postoperative complications were Asian race (OR=2.827, p=0.009) and preexisting comorbidities (OR=1.883, p=0.004).

Conclusions: Disparities continue to exist in craniosynostosis care. White and younger-aged children were more likely to undergo minimally invasive surgery with better postoperative outcomes. Early diagnosis in non-White patients is essential to improve craniosynostosis outcomes for all patients.

Objectives

1. Participants will be able to identify benefits of minimally invasive surgery vs. open repair in craniosynostosis. 2. Participants will be able to identify predictors of postoperative craniosynostosis outcomes for minimally invasive surgery vs. open repair. 3. Participants will be able to identify at least one way to improve demographic disparities in postoperative craniosynostisis outcomes.

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Sociodemographic disparities affecting access to and outcomes after cleft lip repair: A systematic review of the literature

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Abstract

BACKGROUND

Cleft lip repair (CLR) enhances functional, cosmetic, and quality of life (QOL) outcomes. However, there are sociodemographic differences in access to CLR, which can alter surgical outcomes. This study reviews current literature regarding disparities that impact access to CLR and surgical outcomes in the United States (US).

METHODS

A systematic review was conducted using Pubmed, Embase, and Medline databases. Studies discussing disparities regarding access to and outcomes after CLR were included. Studies performed outside the US and published before 2000 were excluded.

RESULTS

Of the 3782 articles identified on our initial search, 31 met our inclusion criteria. Disparities discussed included access to care (n=10), missed appointments (n=3), use of preoperative nasoalveolar molding [NAM] (n=3), surgical timing (n=9), and surgical outcomes (n=10).

Four studies demonstrated that remote geographical location was associated with poor access to care. In addition, financial limitations, poor healthcare literacy, and logistical constraints, such as taking time off from work, also limited patients' access to care.

Predictors for missed appointments included low socioeconomic status (SES), black race, and public insurance. Two studies found that decreased pursuit of NAM was associated with Asian race, long driving distance to care facilities, and multi-children households.

Factors associated with delayed CLR included non-white race, non-private insurance, non-English primary language, and non-urban setting. Surgical outcomes were assessed using various aesthetic, speech, and QOL measures. Factors linked to worse surgical outcomes included black, latino, or mixed race as well as non-private insurance.

CONCLUSION

Patients who are non-white, publicly insured, have lower SES, and those from geographically remote regions are impacted by disparities in access to and outcomes after CLR. State-affiliated care centers and statewide surgery mandates can help address these disparities. Future research should focus on developing strategies to promote equity in management of patients with cleft lip.

Objectives

1) To summarize the type of disparities present in cleft lip care (ie. delayed surgical timing, poor access to care) as reported in current literature. 2) To discuss sociodemographic barriers (ie. race, geographical location) affecting access to and outcomes in management of cleft lip. 3) To identify potential strategies discussed in current literature for addressing sociodemographic disparities in cleft lip care.

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Abbé flap as a treatment for sequelae in patients undergoing cleft lip surgery. A case report.

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MACARENA FERNÁNDEZ-MAYORALAS GÓMEZ

ALBERTO GARCÍA-PERLA GRCÍA

Abstract

Materals and Methods

The patient was a 9-year-old male patient. He was born in Russia, where he underwent surgery to correct a cleft lip. Once he was seen in our surgery it was observed that he had a short and narrow lip as a sequel, constituting a functional and aesthetic defect.
After trying to achieve an ideal result using conservative techniques, an Abbé flap was finally proposed. In this case, the patient is fully aware of the postoperative discomfort of this technique and is totally convinced to undergo this surgery, as is the family.

Results

The Abbé flap is performed. In a second stage, after 4 weeks, the pedicle is sectioned and the labial aesthetics are remodelled.
A greater length and projection of the lip is achieved, achieving better aesthetic and functional results. The patient improves his lip competence and shows his satisfaction with the aesthetic result.

Conclusion

This case is presented in which the Abbé flap is shown as a valid alternative in the treatment of patients with sequelae of cleft lip.

Objectives

Sometimes we find patients who have undergone surgery for cleft lip in whom, as they grow, the result is not ideal. Among the sequelae that can be found is the maintenance of a short and narrow lip, constituting an aesthetic defect and in the majority of cases a functional defect. This paper presents a case of secondary reconstruction of cleft lip using a classic Abbé flap.

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Non-Binary Rhinoplasty: A Case Series of Pre-Operative Considerations, Techniques and Clinical Outcomes

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Sumun Khetpal


Aura Elias


Justine Lee

Abstract

Background: While rhinoplasty has been well-described and studied within the transgender female population, there has been minimal research efforts dedicated to understanding the technical and clinical considerations when performing rhinoplasty in the non-binary population. The purpose of our investigation is: 1) to understand technical considerations among non-binary patients undergoing rhinoplasty; 2) to assess clinical outcomes, including complications and need for revision surgeries among patients; 3) to review specific case examples of non-binary patients receiving rhinoplasty by the senior author; 4) to provide surgeons with guidance during their pre-operative consultation with such patients.

Methods: A retrospective review was conducted among non-binary patients undergoing rhinoplasty for alleviation of gender dysphoria. Variables collected included demographics, operative details, complications, and revision surgeries were recorded.

Results: A total of seven non-binary patients were included in the analysis. The majority of patients identified as Caucasian and had private insurance. In terms of operative details, 4 (57%) patients underwent open approach. For the nasal tip, the majority of patients received tip-defining sutures (57%), while some received a columellar strut (29%) or cephalic trim (14%). Dorsal reduction and percutaneous osteotomies were performed in four patients (57%). Cadaveric rib was warranted for creation of spreader and columellar strut grafts in a single patient. One patient required a revision rhinoplasty, specifically left nasal bone osteotomy via a closed approach.

Conclusion: Rhinoplasty in the non-binary population presents a unique set of challenges and considerations. Moreover, an individualized approach is often warranted in order to determine the appropriate reconstructive plan to help align a given patient's gender identity with their physical appearance. Our study is the first to shed light on these important nuances, and provides important insights and takeaways for surgeons who perform rhinoplasty in the non-binary patient population.

Objectives

Readers will gain insight on managing pre-operative consultation with non-binary patients who seek rhinoplasty. Readers will understand the technical considerations of performing rhinoplasty in non-binary patients. An individualized approach is often warranted in order to determine the appropriate reconstructive plan to help align a given patient's gender identity with their physical appearance.

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STRUCTURAL FACIAL FEMINIZATION

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Rodrigo Penagos


Diego Caycedo


Marcela Cabal

Abstract
The face has secondary sexual characters that allow the differentiation of a male or female face. These characteristics, which are found in the upper, middle and lower third of the face, allow structural changes in soft tissues and bone tissues that can allow the treatment of gender dysphoria and can become more important than the change in genital characteristics. The objective of this work is to demonstrate that when we perform a structural surgical management of bone tissues and coverage with soft tissues we can achieve that anthropometric measurements and male characteristics obtain a result that defines a definitive facial, pleasant feminization without the need to perform female makeup on male faces.

Objectives
To plan a surgical order in facial feminization surgery To formulate a surgical option To innovate in the development of osseous and soft tissues management

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Multiple revolution osteotomies in trigonocephaly

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Ana Cabezas


Diego Caycedo


Marcela Cabal


Luis Santacruz

Abstract
Trigonocephaly is a craniosynostosis caused by the premature closure of the metopic suture. The synostosis of the metopic suture causes the restriction of the growth of both frontal bones and the compensatory growth of the parietal bones. This results in a wedge-shaped frontal region with biparietal flash and deficient lateral supraorbital edges (1). There is no universally accepted classification, but a study carried out by Beckett and collaborators in 2012 (2) where they make measurements from tomographic studies dividing into two groups essentially this type of craniosynostosis according to the bifrontal endocranial angle: moderate trigonocephaly (124º-148°) and severe trigonocephaly (100°-124º). The objective of the work is to carry out a review of the literature of the general aspects of trigonocephaly, it also presents the technique used by the authors and proposed variations according to the tomographic findings and classification.

Objectives
To formulate a surgical option To innovate in the resolution of trigonocephaly To decrease the surgical morbidity

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Posterior fossa distraction with cranial vault remodeling in cloverleaf skull deformity: case report

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Diego Caycedo


Juan Ayala


Marcela Cabal


Luis Santacruz

Abstract

Cloverleaf skull is a rare malformation associated with early closure of multiple sutures; it presents with alterations in neurological development and high mortality. Surgical treatment aims to restore the shape and function of the skull, if possible with the fewest number of procedures.This paper aims to present the case of an infant with a cloverleaf skull deformity, characterized with the use of diagnostic aids and operated on in a single surgical stage with distraction of the posterior fossa and remodeling of the cranial vault.

Objectives

To demostrate the early correction of cloverleaf deformity To plan a surgical option To decrease the mortality risks in the surgical procedure

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A Descriptive Analysis of Ophthalmologic Comorbidities in Craniosynostosis

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Darin Patmon


Brooke Geddie


Anna Carlson


John Girotto

Abstract
Background: Craniosynostosis often alters the upper third of the facial skeleton which may lead to orbital distortions or asymmetry. This can have ophthalmologic consequences thus highlighting the importance of a multidisciplinary approach including ophthalmologists in craniosynostosis care. We seek to better understand the ophthalmologic comorbidities associated with craniosynostosis by performing a descriptive analysis of our patients.
Methods: A retrospective analysis of consecutive patients who received cranioplasty secondary to craniosynostosis were included for analysis in our study. Notes from ophthalmologists in our multidisciplinary clinic were audited to verify diagnoses. Additional demographic and surgical data were collected and analyzed to provide summary statistics of the most common ophthalmologic comorbidities associated with craniosynostosis.
Results: A total of 177 patients met inclusion criteria for our study. The most common ophthalmologic comorbidity associated with craniosynostosis was strabismus which was diagnosed in 15.82% (n=28) of patients. Most commonly exotropia was recorded (60.71%, n=17) but also esotropia (35.71%, n=10) or hypertropia (3.57%, n=1). Pseudostrabismus was diagnosed in 5.08% (n=9) of patients. Strabismus was most commonly diagnosed in patients with unicoronal craniosynostosis (47.06%, n=8) followed by multisuture craniosynostosis (38.46%, n=5) and bicoronal craniosynostosis (35.71%, n=5). Trigonocephaly was associated with strabismus in 13.16% (n=5) of patients but had the highest rate of pseudo strabismus at 15.79% (n=6).
Additional ophthalmologic comorbidities present in our patient population include amblyopia (n=15, 8.47%), papilledema (n=8, 4.52%), optic neuropathy (n=4, 2.26%), and exposure keratopathy (n=1, 0.56%).
Conclusions: Strabismus affects approximately 1 in 6 patients diagnosed with craniosynostosis with a higher prevalence in patients with involvement of the coronal sutures. Early consultation of ophthalmologists in these patients may prove beneficial in decreasing the long-term consequences of strabismus.

Objectives
Main Objectives: After reading this abstract, individuals will be able to identify common ophthalmologic comorbidities in patients with craniosynostosis.

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Early Delays in Longitudinal Development in Single Suture Craniosynostosis

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Alexis Johns


Christopher Tien


J Gordon McComb


Mark Urata

Abstract
Background: Children with nonsyndromic single suture craniosynostosis may be at higher risk for developmental delays. This study describes early delays in development in a diverse prospective cohort by suture type.
Methods: The Bayley Scales of Infant and Toddler Development – Third Edition was completed preoperatively (T1), at 6 (T2) and 18 (T3) months postoperatively, and age 36 months (T4). Delays in development were defined as at least one score under the 10th percentile. Frequencies and correlations (P<.05) with delays were calculated.
Results: Patients (N=268) had isolated sagittal (50%), unicoronal (26%), or metopic (24%) craniosynostosis with surgery completed at a mean age of 8.3±4.4 months by the same surgeons with an average of 306±61 minutes anesthesia time. Patients were male (67%), had public insurance (57%), and were mostly Latinx (49%) or European American (27%). Familial socioeconomic status (SES) was evenly distributed. Although there was no variation in demographics for follow-up testing completion, results should be interpreted in context of attrition, including COVID-19 restrictions. Delays were identified at T1, T2, T3, and T4 for: sagittal (15%, 25%, 21%, 21%), unicoronal (22%, 23%, 9%, 5%), and metopic (26%, 21%, 36%, 27%), respectively. From T1 to T4, developmental status was fairly stable for sagittal (81%), unicoronal (85%), and metopic (73%) craniosynostosis. Delays were not related to surgical age or anesthesia time. Delays were not associated with sociodemographics for sagittal craniosynostosis. Delays at T3 and T4 were associated with larger households for unicoronal craniosynostosis and with public insurance and lower SES for metopic craniosynostosis.
Conclusions: Development was largely stable from preoperative baseline to age 36 months. About a fifth of patients with sagittal craniosynostosis and over a quarter of metopic craniosynostosis demonstrated a delay, while children with unicoronal craniosynostosis had lower rates of later delays. Developmental screening helps identify areas to target intervention services.

Objectives
Participants will be able to list the frequency of delays in early development for children with sagittal, unicoronal, and metopic craniosynostosis. Participants will describe the variation of delays in early development from baseline to age 3 years in children with single suture craniosynostosis. Participants will identify three variables associated with early delays in development for children with single suture nonsyndromic craniosynostosis.

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Counterclockwise Craniofacial Distraction Osteogenesis: Indications, Outcomes and Mid-term Follow-up

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Howard Wang


Ezgi Mercan


Annie Nguyen


Hitesh Kapadia


Richard Hopper

Abstract

Background: Early results of counterclockwise craniofacial distraction osteogenesis (C3DO) in tracheostomy-dependent patients with Treacher Collins Syndrome (TCS) have shown high success rate of achieving decannulation. The aim of this study is to review a larger cohort of patients that underwent C3DO for various indications and evaluate clinical outcomes including airway changes, complication profile and skeletal stability.

Methods: A retrospective review of all patients who underwent C3DO between 2008-2020 was performed. Clinical variables such as demographic information, diagnosis, previous surgical history, operative data, and surgical complications were recorded. Cephalometric data and polysomonography results at various time points were analyzed.

Results: 15 patients with diagnoses including TCS, craniofacial microsomia, Auriculo-condylar syndrome, Burn-Mckeown syndrome, Miller syndrome and radiation-induced maxillary hypoplasia underwent C3DO at a mean age of 10.2±4.9 years with an average follow-up of 47.1 months. 10 out of 13 tracheostomy-dependent patients (77%) were successfully decannulated. Two patients did not have a tracheostomy tube prior to surgery and has not required tracheostomy after surgery. After C3DO, the average palatal rotation was 14.7 degrees and mandibular lengthening was 14.7 mm. Apnea-hypopnea index decreased from a mean of 24.0±18.7 preoperatively to 4.8±3.8 postoperatively ($p<0.01$). 24% relapse in palatal rotation was noted at 12.9±8.2 months and 42.7% at 4.5±1.9 years of follow-up. However, none of the decannulated patients has required reinsertion of tracheostomy tube based on continued clinical evaluation. One or more complications occurred in 66.7% of cases, but most were minor and involved surgical site infections or distractor adjustments.

Conclusions: C3DO performed during the mixed dentition stage is an effective technique to alleviate severe airway obstruction and achieve decannulation in patients with maxillomandibular hypoplasia and clockwise rotational deformity.

Objectives

1. Participants will be able to review the various potential indications for counterclockwise craniofacial distraction osteogenesis (C3DO). 2. Participants will be able to evaluate decannulation rates after C3DO for severe upper airway obstruction. 3. Participants will be able to analyze the short and mid-term skeletal changes after C3DO

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An additional whole-exome sequencing study in 102 panel-undiagnosed patients:A retrospective study in a Chinese craniosynostosis cohort

Yingzhi Wu MD
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Yingzhi Wu

Abstract

Background:Craniosynostosis (CRS) is a disease with prematurely fused cranial sutures. In the last decade, the whole-exome sequencing (WES) was widely used in Caucasian populations.This study aims to explore the genetic diagnosis and mutation spectrum in a Chinese cohort.
Methods:In this study, we enrolled 264 CRS patients in China. After a 17-gene-panel sequencing designed in the previous study, 139 patients were identified with pathogenic/likely pathogenic (P/LP) variants according to the ACMG guideline as positive genetic diagnosis. WES was then performed on 102 patients with negative genetic diagnosis by panel. Then we designed a compatible research pipeline (RP) for further exploration.
Result:Ten P/LP variants were additionally identified in ten patients, increasing the genetic diagnostic yield by 3.8% (10/264). The novel variants in ANKH, H1-4, EIF5A,
SOX6, and ARID1B expanded the mutation spectra of CRS. The RP could detect
all seven P/LP SNVs and InDels identified above, in addition to 15 candidate
variants found in 13 patients with worthy of further study. In sum, the 17-gene
panel and WES identified positive genetic diagnosis for 56.4% patients (149/264)
in 16 genes.
Conclusions:In our estimation, the genetic testing strategy of “Panel-first”
saves 24.3% of the cost compared with “WES only”, suggesting the “Panel-first”
is an economical strategy.

Objectives

Participants will be infomed of newly found gene mutation in craniosynostosis. Participants will be able to tell the efficient and economic way of gene sequencing in craniosynostosis.

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Maxillofacial Fracture：an 11-year retrospective study of 2240 cases in Northwest China

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Di Yan


Zhongwei Zhou


Jingjing Mao


Kun Cao


Xiaojuan Sun

Abstract

Background: Maxillofacial trauma accounts for 11%–34% of systemic trauma and is a significant part of it. Clarifying maxillofacial fracture patterns can aid in establishing efficient preventative and therapeutic modalities in the public health system.

Methods: Information on gender, age, cause of injury, fracture site, concomitant injuries, timing of therapy, therapeutic approaches and complications of 2240 patients with maxillofacial fractures admitted to the General Hospital of Ningxia Medical University between January 2011 and December 2021 were retrospectively analyzed.

Results：The mean age was 35.88±15.69 years and male-to-female ratio was 3.9 to 1. Patients aged 20 to 49 years accounted for the most cases. Summer and autumn were the seasons with greatest percentage of maxillofacial fractures. The most frequent cause of maxillofacial fracture was road traffic accident (56.3%), of which motor vehicles were the most common (73.3%). The common sites of midface fracture were the anterior wall of the maxillary sinus and arcus zygomaticus, accounting for 15.9% and 15.2% of the total 6645 fractures. Mandibular body accounting for 13.0% of the total 6645 sites was the most common site of mandibular fracture, followed by condyle for 7.2%. Of all patients, 48.8% suffered from concomitant injuries and craniocerebral injury was the most common. Among the patients who received active intervention, 1386 cases (61.8%) underwent open reduction and internal fixation.

Conclusion：The COVID-19 pandemic may be linked to a decrease in the incidence of new instances of mandibular fractures in the region in 2020. The most common cause of fracture was road traffic accident, mainly in young and middle-aged males. The most frequently observed fracture sites was the anterior wall of maxillary sinus, followed by arcus zygomaticus, mandibular body and mandibular condyle. Open reduction and internal fixation is now an effective treatment option for maxillofacial fractures.1

Objectives

1.The purpose of this study was to analyse the demographics, morbidity profiles, and clinical epidemiology of patients with maxillofacial fractures in northwest China during an 11-year period in order to provide effective prevention and treatment recommendations. 2.Clarifying maxillofacial fracture patterns can aid in the development of efficient preventative and therapeutic approaches in the public health system. 3.Better understand the clinical epidemiological status of maxillofacial fractures in northwestern China.

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European Reference Network CRANIO

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Irene Mathijssen

Jana Steerneman

Ikram Ikhssim

Abstract
In 2017, the European Commission established 24 European Reference Networks (ERNs) of which one is dedicated to congenital craniofacial disorders, ERN CRANIO. Only centers that are accredited by their national government as center of expertise are allowed to be member of an ERN. Within ERN CRANIO 48 hospitals from 24 countries plus patient support groups are collaborating. The members develop guidelines, exchange programs for clinicians and researchers, patient information material including videos and animations, and a registry on outcome of care data that allows multicenter research.
The organization of ERN CRANIO will be outlined, including several examples of network activities that are relevant to the attendees of the meeting.

Objectives
Know about the presence of this European network of expert centers for craniofacial care. Find access to relevant documents, such as guidelines.

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Patients of syndromic craniosynostosis treated with LeFort III distraction osteogenesis during middle and late childhood: A long-term surgical outcome study

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Chi-Chin Lo


Pang-Yun Chou


Lun-Jou Lo


Wen-Ching Ko

Abstract

Background: Midface advancement surgery of LeFort III distraction osteogenesis (DO) during childhood is often indicated for the patients of syndromic craniosynostosis presenting with midface hypoplasia. This study aimed to investigate the long-term surgical outcome and cephalometric changes in these patients who underwent LeFort III DO during middle and late childhood.

Methods: 8 patients (5 males, 3 females) with syndromic craniosynostosis (5 Crouzon, 2 Apert, 1 Pfeiffer), who received LeFort III DO at an average age of 9.6 ± 1.9 years old, were enrolled in this study. Longitudinal lateral cephalograms were performed preoperatively (T0), early postoperatively (T1), and after reaching skeletal maturity (T2). Standardized cephalometric landmark, distance, angle, and relationship were assessed between T0, T1, and T2.

Results: LeFort III DO produced an anterior advancement of 18.3 ± 7.1 mm at anterior nasal spine (ANS) and 18.8 ± 9.1 mm at A-point immediately after the operation (T0 to T1). These advancements led to the significant increase of SNA, ANB, Wits appraisal, and overjet. Postoperative growth (T1 to T2) revealed no posterior surgical relapse nor anterior growth of ANS and A-point. However, vertical (inferior) growth of ANS, A-point, B-point, Pogonion, and Menton was observed. Phenotypic relapse of decreased ANB, Wits appraisal, and overjet was accordingly recorded. Despite the phenotypic relapse during the postoperative growth, comparing T0 and T2, LeFort III DO produced an improvement of 10.1 ± 6.6 ° in SNA, 6.8 ± 2.5 ° in ANB, and 5.2 ± 4.2 mm in overjet.

Conclusions: LeFort III DO produced overcorrection of midface hypoplasia with good surgical stability. LeFort III DO during middle and late childhood provided long-term improvement of midface profile and occlusal relationship, which could possibly avoid further skeletal management after skeletal maturity.

Objectives

1. Participants will be able to know the facial profile changes after LeFort III distraction osteogenesis in patients with syndromic craniosynostosis presenting with midface hypoplasia. 2. Participants will be able to know the characteristic subsequent facial growth after the LeFort III distraction osteogenesis. 3. Participants will be able to know the importance of overcorrection during LeFort III distraction osteogenesis.

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Soft Tissue Correction in Hemifacial Microsomia and Parry-Romberg Syndrome Patients: Systematic Review

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Marina Lentskevich


Alice Yau


Sophia Allison


Prottusha Sarkar


Arun Gosain

Abstract

Background: Both hemifacial microsomia (HM) and Parry-Romberg syndrome (PRS) patients suffer from facial asymmetry. The use of fat transfer for the correction of facial defects was first reported by Neuber. We conducted a systematic literature review on soft tissue correction in HM and PRS patients.
Methods: PubMed and Embase were used to identify articles on soft tissue correction in HM or PRS patients. Inclusion criteria were English-language prospective and retrospective studies that utilized either vascularized tissue transfer or autologous fat grafting to achieve satisfactory face symmetry and provided objective outcome evaluations. PRISMA guidelines were followed and articles quality was assessed. SPSS IBM was used for statistical analysis.
Results: Initial search delivered 579 abstracts. 74 articles were selected for full-text review. Of these, 28 met inclusion and bias tool criteria. 14 prospective studies evaluated a total of 239 patients with PRS and 104 HM patients. 14 retrospective studies evaluated a total of 196 PRS patients and 185 HM patients. 18 papers investigated autologous fat injection, 10 papers looked at vascularized adipofascial flaps, and 1 paper described bulk fat graft transfer. Two studies created stromal vascular fraction (SVF) gel to use as an adjunct. Injected fat volume ranged from 9.3mL to 48.0mL with a median of 27.8mL. While both fat grafting and flap studies overcorrected the deficit by 10-50%, flaps left a long-term overcorrection in most of the patients ($p<0.01$). Utilization of 3D analysis did not improve the prediction of necessary volume of fat. Rates of resorption ranged from 32% (SVF gel used as adjunct) to 58%. Tissue sagging was the most common subjective complaint.
Conclusions: Soft tissue correction in PRS and HM patients continues to be a highly individualized procedure, as rates of resorption are difficult to predict and disease severity varies. Utilization of SVF gel might decrease rate of resorption.

Objectives

1) Participants will learn about trends of soft tissue correction in hemifacial microsomia and Parry-Romberg syndrome patients 2) Participants will learn about updates on autologous fat grafting in this patient population 3) Participants will learn about objective outcomes measurements and its correlation with soft tissue correction method

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Risk Factors Associated with Hospital Admissions for Pediatric Craniofacial Trauma

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Vicky Yau


Dongdan Guo


Hunter Martin

Abstract
Background: The purpose of the current study was to identify risks factors associated with pediatric craniofacial trauma and hospital admissions.

Methods: Data from the National Electronic Injury Surveillance System (NEISS), a public database recording data from emergency department of 100 hospitals were reviewed retrospectively. The study included trauma cases dating from 1/1/2019 to 12/31/2021. Data were included if patients were under or equal to the age of 17, and if the injuries occurred at craniofacial region (head, face, eyeball, mouth, and ear). Predictor variables included age, gender, race, location of trauma and diagnosis, and primary study outcome was admissions. Data with unspecified demographic information and diagnoses were excluded. Descriptive, univariate, and multivariate analyses were conducted with SAS 9.4 software.

Results: The final study sample consisted of a total of 2617 patients. Most of them were Caucasian (79.14%), male (65.99%) and over the age of 12 (66.34%). Head (59.30%) was the most common location of injury while fracture (66.41%) was the leading diagnosis. Admissions were significantly associated with male gender ($p<0.05$), age group of under 12 ($p<0.01$), fracture ($p<0.01$), and coexistence of multiple diagnoses ($p<0.01$). Despite children who suffered from trauma at street or highway were more likely to be admitted relative to those injured at home ($p<0.05$), the latter still imposed significantly more risks for admissions relative to places of recreation or sports, and school ($p<0.05$). Head trauma was an independent risk factor for admissions relative to face ($p<0.01$).

Conclusions: Risk factors for admissions included gender, age group, diagnosis of fracture and multiple diagnoses. Relative to school and sports venues, home was associated with increased risk of admissions. It is essential for parents to be educated about home risks for pediatric craniofacial trauma and future studies should analyze mechanisms of injury for proper application of safety measures.

Objectives
1. Participants will review significant risk factors for pediatric craniofacial trauma 2. Participants will be informed of factors influencing chances of hospital admissions among pediatric craniofacial trauma patients 3. The presentation will improve awareness of home risks for pediatric craniofacial trauma and aid in public health education

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Free flaps for reconstruction of advanced oncological defects of the midface and anterior skull base: Prospective randomized study

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Bruno Albuquerque

Abstract

Introduction: Reconstructive microsurgery is the gold standard for the reconstruction of advanced oncological defects that affect the midface and anterior skull base. Despite the variety of options for these reconstructions, the choice of the most suitable free flap still uncertain. The aim of this study is to identify which free flap is the most appropriate for the reconstruction of advanced oncological defects of the midface and anterior skull base.
Methods: We performed a prospective randomized study (NCT05749120) in patients who underwent midface and anterior skull base oncological ablation and reconstruction with free flap from April 2018 to April 2022 in a tertiary oncologic center. Patients were randomly divided into two groups: Group A – free fasciocutaneous flap (anterolateral thigh flap) and Group B – free musculocutaneous flap (rectus abdominis flap or latissimus dorsi flap). The postoperative, aesthetic result, nutritional status, technical aspects and morbidity of the donor area were analyzed.
Results: Twenty three patients were selected: twelve were allocated to Group A and eleven to Group B. The vascular pedicle length of the free flap of Group A was greater than that of Group B, while the dissection of the musculocutaneous free flap was in a shorter time, $p < 0.001$ and $p = 0.008$, respectively. There was a prevalence of major complications in the donor site in the musculocutaneous flap group with statistical significance ($p = 0.037$). There was no difference in relation to nutritional and aesthetic status, $p = 0.241$ and $p = 0.731$ respectively.
Conclusions: Both fasciocutaneous and musculocutaneous flaps proved to be effective for the reconstruction of advanced oncological defects of the midface and anterior skull base. The fasciocutaneous flap proved to be a viable option with less morbidity in the donor site when compared to traditional musculocutaneous flaps.

Objectives

1) Participants will be able to analyze the differences between free flaps for reconstruction of midface and anterior skull base; 2) Participants will debate tips to improve results; 3) Participants will compare the different options of oncological reconstruction to improve results.

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Artificial Intelligence-Based Estimation of Craniofacial Soft and Hard Tissue defect for Virtual Surgical Planning

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Bimeng Jie


Boxuan Han


Chengyi Wang


Hongen Liao


Yi Zhang


Yang He

Abstract
Backgrounds: Without “mirror”technique, virtual planning of reconstruction on soft and hard tissue defect across the midline remains challenging and ambiguous. This study aimed to establish and validate an artificial intelligence based estimation algorithm for craniofacial defects.
Methods: 200 paired models (F:M=1:1, 35.4±10.5yrs) of hard and soft tissue were randomly selected from 3D craniomaxillofacial database of normal people. The algorithm was composed of two modules: 1) non-rigid registration-based estimation of hard tissue defect. 100 skull models were randomly selected from the database to create Statistical Shape Model(SSM) by ICP method. Virtual bony defects of the bilateral zygomatic and naso-orbital-ethmoid (NOE) region were created respectively. Non-rigid registration was applied between each skull defect model and SSM. CNN-based landmark detection and comparison network were conducted to select the most coordinate model. The model output from the algorithm was considered to be the final estimation of bone defect. 2) PF-Net -based estimation of soft tissue defect. 3D models were converted to point cloud image and down-sampled. Virtual soft tissue defects of mid-face, cheek and mandibular angle region were created respectively and input to PF-Net. The output cloud point image was considered to be the final estimation of soft tissue defect. The original intact 3D models of soft and hard tissue were served as groundtruth. The root mean squared error(RMSE) between models estimated from the algorithm and groundtruth was evaluated.
Results: 180 and 20 pairs of models were randomly distributed to training set and validation set. For hard tissue estimation part, RMSE between estimated model and ground truth was 1.96±0.39mm. For soft tissue estimation part, RMSE between estimated model and ground truth was 1.45±0.25mm.
Conclusions: Artificial intelligence-based estimation of craniofacial soft and hard tissue defect was initially established and clinically acceptable for virtual surgical planning.

Objectives
1. Participants will be able to manage the virtual surgical planning for craniofacial defects. 2. Participants will be able to learn relevant image registration methods for medical research. 3. Participants will be able to compare difference between soft and hard tissue defects.

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Gearing Effect in Clockwise Rotational Orthognathic Surgery

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Tae Hyung Kim


Soo Hyun Woo


Young Chul Kim


Jang Yeol Lee


Jong-Woo Choi

Abstract
Background: The standard procedure for the management of skeletal class III malocclusion is maxillary advancement with mandibular setback. Occlusal plane altering orthognathic surgery, such as jaw rotation, is useful as well. Although clockwise jaw rotation is a common procedure, its mechanism has not been well-investigated. Therefore, in this study, we aim to introduce the gearing effect to correct class III malocclusion in Asians by maxillary posterior impaction via clockwise rotation without advancing the maxilla.
Methods: Patients with class III correction with clockwise rotation of the maxillomandibular complex without maxillary advancement were included, while those with genioplasty were excluded. Various facial skeletal cephalometric landmarks were measured through artificial intelligence based cephalometric analysis software. The gearing effect was determined by dividing the lower anterior facial height (LAFH) in relatively short and long groups compared to those in the ANS–PNS length.
Results: In a total of 29 patients, the amount of Menton setback between group 1 (n=15, short LAFH) and group 2 (n=14, long LAFH) was 1.67±0.66 and 2.74±0.99 mm per 1 mm of PNS impaction, respectively (p=0.002), and 1.56±0.73 and 2.22±0.67 mm per 1° clockwise rotation of palatal angle, respectively (p=0.018). The convexity of the A point was improved without any significant change in the SNA angle before and after surgery.
Conclusions: This article addressed the scientific evidence in impact of clockwise rotational orthognathic surgery based on the gearing effect. Considering the gearing effect, the mandibular setback turned out to be more effective in patients with a long LAFH.

Objectives
Participants will learn about clockwise rotation of the jaw by posterior impaction.

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Total Cranial Vault Remodeling for Isolated Sagittal Synostosis: Long-term Outcomes for Cranial Growth

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David Chong

Abstract
BACKGROUND: The Melbourne technique of total vault remodeling for non-syndromic sagittal synostosis aims to expand intracranial volume and address all phenotypic aspects of the scaphocephalic head shape. We have previously published an appreciable degree of secondary craniosynostosis following the Melbourne technique. This study aimed to evaluate long-term outcomes for cranial growth, its relationship to sutural patency, and potential clinical implications.
METHODS: The authors retrospectively reviewed a cohort of patients who underwent total cranial vault remodeling for sagittal synostosis between 2004-2008 at the Royal Children's Hospital in Melbourne. Inclusion criteria consisted of patients with both pre- and post-operative CT scans and 3D photographs. Anthropometric measurements were compared with sex- and age-matched normative data.
RESULTS: 42 patients met inclusion criteria. Cranial growth was evaluated at a median age of 8.3 months preoperatively, 23.7 months in the short-term, and 73.8 months in the long-term postoperatively. Cephalic index and auricular head height increased postoperatively and were maintained at long term follow-up. Head circumference decreased from the 90th population centile pre-operatively and trended towards the 50th centile at long term follow-up. Cranial breadth Z-scores increased from preoperative to short-term assessments but regressed long-term. A positive correlation was observed between interval change in head circumference and total sutural patency score. Only one patient (2.4%) required cranial re-expansion in the setting of suspected intracranial hypertension to date (14 to 18 year follow up).
CONCLUSIONS: This study demonstrated that the Melbourne technique of total vault remodeling procedure is a safe and effective method for treating non-syndromic sagittal synostosis. The relative head circumference reduced towards the norm in the setting of secondary sutural fusion and reoperation rates remained low for aesthetic or functional concerns.

Objectives
Participants will be able to appreciate long term outcomes following the Melbourne technique of total vault remodelling Participants will be able to see the value of measuring long term surgical outcomes Participants will be encouraged to measure and present long term outcomes for comparison

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Delays in Early Development in Syndromic and Multiple Suture Craniosynostosis

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Alexis Johns


Eric Riklin


Dylan Choi


Sophia Garnica


J Gordon McComb


Mark Urata

Abstract
Background: Children with syndromic and multiple suture craniosynostosis are at higher risk for developmental delays. This study describes delays in early development and intervention services.
Methods: The Bayley Scales of Infant and Toddler Development – Third Edition was completed preoperatively (T1), 6 (T2) and 18 (T3) months postoperatively, and age 36 months (T4). Developmental delays were defined as one or more scale <10th percentile. Frequencies and correlations (P<.05) with delays were calculated. Families reported on services.
Results: Patients (N=59) had an identified syndrome (32%) or nonsyndromic bicoronal (36%) or multiple suture (32%) craniosynostosis. Surgery was at an average age of 7.9±3.1 months by the same surgeons with a mean anesthesia time of 366±64 minutes. Patients were male (54%), had public insurance (64%), and were mostly Latinx (64%) or European American (17%). Socioeconomic status (SES) was evenly distributed. Other than males with syndromic craniosynostosis being less likely to follow-up at T3 and T4, there were no sociodemographic variations in testing completed. Results should be understood in the context of attrition, including COVID-19 restrictions. Delays at T1, T2, T3, and T4 were: syndromic (82%, 85%, 75%, 50%), bicoronal (36%, 31%, 27%, 21%), and multiple suture (13%, 50%, 40%, 33%) craniosynostosis, respectively. Delays were unrelated to surgical age or anesthesia time. Sociodemographics weren't associated with delays for bicoronal or multiple suture craniosynostosis. For syndromic craniosynostosis, T3 delays were associated with immigrant parents, lower SES, and public insurance. Early intervention services were provided to children with syndromic (95%), bicoronal (29%), and multiple suture (42%) craniosynostosis.
Conclusions: Consistent with prior reports, a large proportion of children with syndromic craniosynostosis had early delays with nearly all receiving developmental services. There were lower rates of delay and interventions for children with nonsyndromic bicoronal and multiple suture craniosynostosis. Developmental screening assists in identifying intervention service needs.

Objectives

Participants will describe rates of delays in early development for children with syndromic and multiple suture craniosynostosis. Participants will identify sociodemographic factors related to delays for syndromic craniosynostosis. Participants will list the rates of early intervention services for children with syndromic and multiple suture craniosynostosis.

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Morbidity of Transcranial Midface Advancement in Patients with Syndromic Craniosynostosis is Associated with Prior Fronto-Orbital Advancement

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Abstract
Background: Our center adopted posterior vault distraction osteogenesis (PVDO) as a first-line intervention for cranial expansion in syndromic craniosynostosis in 2008, and we have a growing cohort of patients undergoing transcranial midface advancement who have not had prior fronto-orbital advancement (FOA). The purpose of this study was to evaluate whether a history of FOA influences the risk profile of transcranial midface advancement in patients with syndromic craniosynostosis.
Methods: Patients undergoing transcranial fronto-facial advancement from 2000-2022 were retrospectively divided into cohorts based on preceding history of fronto-orbital advancement (FOA- and FOA+). Perioperative outcomes including operative time, length of stay, intraoperative dural injury, and complications were compared between groups with appropriate statistics.
Results: Thirty-eight patients were included (15 in FOA- group and 23 in FOA+ group). The overall complication rate was 47% (10% minor, 37% major). Compared to the FOA- group, the FOA+ group had a higher incidence of dural tears (65% v 20%, p=0.006) and major complications (48% v 13%, p=0.028). Prior FOA was the only independent predictor of major complications in multivariable analysis. Length of hospital stay was greater in the FOA+ group (7 days, IQR 6-10) than the FOA- group (6 days, IQR 5-6, p=0.037). There were no cases of postoperative CSF leak in the FOA- group and four cases in the FOA+ group (p=0.139). Operative time was 295 minutes (IQR 258-264) in the FOA- group and 332 minutes (IQR 298-390) in the FOA+ group (p=0.128).
Conclusions: Prior FOA is associated with increased rates of major complications and dural tears in patients with syndromic craniosynostosis undergoing fronto-facial surgery. Options for cranial vault expansion that avoid the frontal region, such as PVDO, may favorably alter the risk profile of fronto-facial advancement.

Objectives: Participants will understand how patients with syndromic craniosynostosis undergoing transcranial midface advancement may benefit from treatment algorithms which spare the forehead, such as PVDO 2) Participants will appreciate the spectrum of complication severity, and in particular infectious complications, that result from transcranial midface advancement 3) Participants will understand the proposed mediators of the associated between prior FOA and increased morbidity, which include scarring and adhesions encountered while operating in a previously operated region, increased risk for dural tears, and longer operative times.

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3D Printed Surgical Positioning Rib Graft Jig in Combined Orthodontic Surgical Management of Pruzansky/Kaban Type IIB and Type III Hemifacial Microsomia

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Omri Emodi


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Jiriys Ginin


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Abstract
Costochondral grafts (CCG) are considered the best method for condylar reconstruction in young children with Pruzansky/Kaban type IIB and type III HFM. This orthodontic surgical intervention immediately corrects the facial asymmetry by eliminating the hypoplastic mandible and the negative influence on the normal maxillary growth simultaneously with ramus height restoration. However, CCG precise surgical positioning is a challenge in these patients due to mandibular hypoplasia when the glenoid fossa is difficult to identify, or it might be absent. The aim of the 3D printed jig is to manage the precise suitable placement position and fixation of the costochondral rib graft in relation to the contralateral unaffected temporomandibular joint and soft tissues. The jig may preserve the rib's cartilage cap, prevent fractures at the costochondral junction and result in a decrease in the risk of interference of cartilage growth.

Objectives
Develop Design Explain

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Utilizing Swap Disentangled Variational Autoencoders to Improve the Diagnosis of Craniofacial Syndromes and Assess Surgical Outcomes

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David Dunaway

Abstract
Background
The application of deep learning to surface meshes has the ability to provide more detailed insight into the intricacies of human head shape. In this work, we will discuss the use of the Swap Disentangled Variational Autoencoder (SD-VAE) with relevance to Crouzon, Apert and Muenke syndromes. In particular, we will outline how it can improve diagnosis and aid the planning and assessment of craniofacial surgery.
Methods
The model is trained on a dataset of 3D meshes of healthy and syndromic patients which was increased in size with a novel data augmentation technique based on spectral interpolation. Thanks to its semantically meaningful and

disentangled latent representation, SD-VAE is used to analyse head shape as a whole, while also considering the influence of different anatomical sub-units.

Results

When considering the entire latent space, classification of each represented craniofacial syndrome yields a high diagnostic accuracy with quadratic discriminant analysis. It is also possible, for the first time, to analyse the influence of each region of the head on the syndromic phenotype. By comparing the shape differences in post-operative patients, it is also possible to assess the outcomes of craniofacial procedures. This provides objective analysis of the strengths and shortcomings of commonly used midfacial osteotomies.

Conclusions

The ability of SD-VAE to disentangle facial features and determine how each region contributes to the overall craniofacial appearance has great translational potential. Avenues for future research and integration into clinical practice lie in the automation of virtual surgical planning and iterative evaluation of outcomes throughout the patient journey.

Objectives

To explain how disentangled variational autoencoders can be used to analyse the influence of regional anatomy on the prevailing phenotype in Crouzon, Apert and Muenke syndromes. To discuss how deep learning can improve diagnosis and influence treatment planning. To demonstrate how artificial intelligence can be applied to objectively evaluate the outcomes of craniofacial surgery.

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Tongue Reduction for Macroglossia in Beckwith-Wiedemann Syndrome: Considerations of Surgical Timing and Epigenetics

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Abstract

Background

Macroglossia is a cardinal feature of Beckwith-Wiedemann syndrome (BWS). Optimal timing of tongue reduction is debated due to the spectrum of phenotypic severity across and within epigenetic subtypes. This study leverages a cohort of molecularly characterized patients to correlate epigenetic diagnosis with phenotype and surgical outcome.

Methods

Patients with BWS seen in consultation for macroglossia from 2009-2022 were reviewed for phenotype, molecular diagnosis, tongue reduction status, timing of surgery (early = under 12 months, late = after 12 months), and perioperative complications.

Results

Two hundred thirty-seven patients were included, 95 (40%) of whom underwent tongue reduction (47 early, 48 late). Imprinting control region 2 loss of methylation (IC2 LOM) was the most common epigenotype (61%). Paternal uniparental isodisomy for chromosome 11 (pUPD11) comprised a larger proportion of patients undergoing tongue reduction (18%) than those not undergoing surgery (8%, p=0.024) and was associated with need for repeat surgery

(OR 4.49, 95% CI 1.06-18.98, p=0.041). Omphalocele (OR 4.20, 95% CI 2.11-8.35, p<0.001), hyperinsulinism (OR 4.39, 95% CI 2.14-9.03, p<0.001), and organomegaly (OR 3.68, 95% CI 1.98-6.86, p<0.001) were more frequently observed in patients undergoing tongue reduction. Complications including wound dehiscence, ventilator associated pneumonia, and unplanned extubation were more common in patients undergoing early surgery (20%) than late surgery (4%, OR 5.70, 95% CI 1.14-28.55, p=0.034).

Conclusions
The results support correlations between severity of features such as omphalocele, hyperinsulinism, and organomegaly and severe macroglossia necessitating tongue reduction. Certain genetic subtypes, namely pUPD11, are associated with more frequent tongue reduction and repeated surgery, perhaps due to tongue regrowth. While early operation is indicated for relief of obstructive sleep apnea, this must be weighed against risk of perioperative complications, most of which are non-surgical. This study highlights how molecular diagnosis advances clinical care in BWS by risk stratifying clinical outcomes in a multidisciplinary center.

Objectives

1) Participants will understand how certain phenotypic features of Beckwith-Wiedemann Syndrome predict the severity of macroglossia and necessity of tongue reduction 2) Participants will appreciate how molecular testing in these patients advances clinical care through risk stratification, with a specific example being the association between the pUPD11 subtype of BWS and a greater risk of needing tongue reduction and repeated tongue reduction. 3) Participants will understand the risks associated with tongue reduction in the first year of life compared to tongue reduction at a later age.

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Variation in Airway Morphology and Upper Airway Obstruction in FGFR2 Mutation Subtypes of Apert Syndrome

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Abstract

Background

Apert syndrome is predominantly caused by two paternally inherited gain-of-function mutations in the FGFR2 gene, Pro253Arg and Ser252Trp. Studies comparing phenotypic features between these two mutations have established differences in syndactyly severity and incidence of cleft palate. Obstructive sleep apnea can be debilitating in a subset of patients with Apert syndrome yet is not well understood. This study aimed to determine whether subtypes of FGFR2 mutation impart differential effects on airway physiology and morphology.

Methods

Patients with Apert syndrome and confirmatory molecular testing were reviewed for polysomnography, nasal endoscopy, and computed tomography (CT) imaging. Obstructive apnea hypopnea index (OAHI) and oxygen saturation (SpO2) nadir, nasal airway volumes, choanal cross-sectional area, and midfacial cephalometric dimensions were compared across mutation types.

Results

Twenty-four patients (13 Ser252Trp, 11 Pro253Srg) were included. Severe obstructive sleep apnea (OAHI > 10) occurred in 8 (62%) patients with Ser252Trp mutations compared to 1 (9%) patient with Pro253Arg mutations (p=0.009). CT imaging at one year of age demonstrated that nasopharyngeal airway volumes were 5302 ± 1076mm3 in the Ser252Trp group and 6832 ± 1414mm3 in the Pro253Arg group (p=0.041). Thirteen patients (9 Ser252Trp, 4 Pro253Arg) underwent nasal endoscopy between 1 month and 4.5 years of age. Nasal cavity stenosis

was noted in 5 patients (4 Ser252Trp and 1 Pro253Arg) and choanal stenosis was noted in 5 patients (4 Ser252Trp mutations and 1 Pro253Arg mutation). Maxillary length (ANS-PNS, p=0.026) and Basion-ANS (p=0.007) were shorter in patients with Ser252Trp mutations.

Conclusions

The findings suggest that the Ser252Trp mutation in Apert syndrome is associated with more severe obstructive sleep physiology in early life. Patients with Ser252Trp mutations demonstrated more severe OSA, decreased nasopharyngeal airway volume, and a trend towards a higher incidence of nasopharyngeal airway stenosis. Heightened clinical awareness of these associations may inform treatment planning and family counseling.

Objectives

1) Participants will be able to explain the observed association between FGFR2 mutation and early life OSA in patients with Apert syndrome 2) Participants will understand the multiple factors associated with airway obstruction in patients with Apert syndrome including midface hypoplasia, choanal stenosis/atresia, and laryngeal/tracheal anomalies 3) Participants will appreciate that the observed difference in airway severity is multifactorial and likely owing to both differences in craniofacial skeletal development as well as nasopharyngeal/choanal development

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Sociodemographic Disparities in Access to and Outcomes After Cleft Palate Repair in the United States: A Systematic Review of the Literature

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Matthew Greives


Thomas Imahiyerobo

Abstract

Background: Multiple studies confirm that timely cleft palate repair (CPR) can improve feeding, speech, and quality of life. However, not all patients have equivalent access to CPR, which may impact outcomes. This study reviews published data on sociodemographic disparities affecting primary CPR timing and outcomes in the US.
Methods: Systematic review was performed using Pubmed, Embase, and OVID databases. Studies on sociodemographic disparities in access and outcomes after CPR were included. Studies performed outside the US or published before 2000 were excluded.
Results: Twenty-six articles were included; these focused on disparities in access to care, financial cost, preoperative optimization, surgical timing, and surgical outcomes.
In 2 national studies, geographic distance was a barrier to care, particularly for American Indian/Alaska Native patients and rural populations. In North Carolina (NC), common barriers included logistical issues, financial cost, and difficulty navigating the hospital system. Four institutional studies found Black and publicly-insured patients had more missed appointments, delayed surgeries, or loss to follow-up. Initiation of a cleft navigator program eliminated those disparities.
All studies on preoperative optimization found better access to NAM in patients who were first-born, Caucasian, with parental English proficiency, and private insurance.
In 6 national studies, CPR was delayed for non-white, female, publicly-insured, and Midwestern patients. In NC, Hispanic and Asian patients had fewer or more often postponed surgeries. Government mandates, or institutional or state care coordinators helped mitigate disparities in surgical timing. In 3 national studies, non-white ethnicities had higher rates of readmission, prolonged hospital stay, and complications after CPR.
Conclusions: Disparities in CPR access and outcomes affect minority and geographically remote patients. Introducing a cleft coordinator at an institutional or state level may resolve these disparities. Future studies should investigate financial disparities and design initiatives that improve CPR timing and outcomes for at-risk populations.

Objectives

1. To summarize barriers (ie. financial cost, geographical location) in access to cleft palate repair. 2. To outline barriers affecting outcomes after cleft palate repair. 2. To identify sociodemographic factors associated with increased barriers to access and outcomes after cleft palate repair.

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Clinical and radiological observations following Posterior Vault Distraction (PVD) suggest a biological process different to that of distraction osteogenesis

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David Johnson

Abstract

Background: Posterior cranial vault distraction (PVD) is an established procedure to correct brachycephaly and raised intracranial pressure in infants with craniosynostosis. Traditionally, the distraction devices have been left *in situ* for a consolidation period (CP) once active distraction is complete - based on the assumption that the process involved is that of distraction osteogenesis (DO). This study assesses the effect of no latency period (LP) and a significantly reduced CP on acute or delayed relapse. In addition, novel post PVD CT radiological observations are made on neo-osteogenesis.

Methods: A retrospective study was undertaken to investigate the impact of an absent latency period and a reduced CP on morphological outcomes in patients undergoing PVD in Oxford. Cranial morphological data (head circumference (HC), cephalic index (CI)) were analysed preoperatively and one year after surgery. Radiological CT scans available on all patients who underwent post PVD imaging were reviewed.

Results: Morphological analysis was available on 38 PVD procedures with a mean distraction distance of 20.5mm. There was no significant correlation between the duration of the CP & changes in HC and CI (Pearson correlation coefficient $r < 0.3$; $P > 0.05$). Clinical and radiological findings showed no evidence of acute of long term relapse as a result of an absent LP and a significantly reduced CP. Novel radiological findings showed that following PVD most new bone formation is from the anterior edge of the inner table and that the distractor site inhibits bone growth, which leads to delayed ossification.

Conclusion: The clinical and radiological results of this study suggest that the biological process involved in PVD is distraction followed by osteogenesis rather than DO. This negates the need for a LP and a CP. The distractors may produce a physical block to the paracrine effect of the acute bone cut on the underlying dura.

Objectives

1. Participants will be able to tell the difference between distraction osteogenesis and distraction followed by osteogenesis 2. Participants will be able to understand the outcome measures for posterior vault distraction 3. Participants will be able to gain insight into biological mechanisms of osteogenesis

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Trametinib prevents formation of vascular lesions in a conditional Map2k1 mutant arteriovenous malformation mouse model.

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Patrick Smits

Abstract

Background: We have previously shown that a Map2k1-K57N mutation causes human extracranial arteriovenous malformation (AVM) and generated a mouse model that allows inducible tissue specific expression of Map2k1-K57N from the ROSA (R26) locus (R26GT-Map2k1-GFP/+). Postnatal activation of Map2k1-K57N expression in endothelial cells (ECs), using the Cdh5CreER transgene, leads to formation of vascular malformations. The lesions are most prominent in the brain and intestines and features tortuous vascular networks with enlarged blood vessels comprised of wild type and mutant cells. Hemorrhage in the brain lesions cause premature death of the animals. Trametinib is a FDA approved Map2k1 inhibitor, developed for treating melanoma, now being used off label to treat humans with AVM. The goal of this study was to test the efficacy of trametinib to prevent the formation of vascular malformations in our mouse model.
Methods: Twelve R26GT-Map2k1-GFP/+; Tg-Cdh5CreER+/- pups were treated topically on the dorsal skin of the left ear with 50 ug of 4-OH-tamoxifen at postnatal day 10 (P10). At P21 (weaning) six mice were placed on trametinib (continuous access to 3 ug/ml in their drinking water).
Results: All six mice without access to trametinib died between P30-P45 and contained multiple vascular malformations in their brain and intestines. Mice treated with trametinib (n=6) survived and were analyzed at P52. None of the treated mice displayed vascular lesions.
Conclusion: Trametinib prevents formation of vascular malformations in a conditional Map2k1-K57N murine arteriovenous malformation model. These findings support the use of trametinib to treat human AVMs. Trametinib may prevent human AVM formation, natural progression, or recurrence of after embolization or resection.

Objectives

Participants will get a better understanding of the biology of arteriovenous malformation Participants will learn about conditional and tissue specific animal models Participants will learn about potential pharmacotherapy for arteriovenous malformation

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M-shaped anterior maxillary osteotomy for correction of bimaxillary prognathic and class II profile

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Chunming LIU


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Quanwen Gao


Min Hou

Abstract
M-shaped anterior maxillary osteotomy for correction of bimaxillary protrusion and class II profile.
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Background: Bimaxillary protrusion and class II profile, usually an impression of monkey face, are quite common aesthetic problem in Asian populations. Traditional anterior maxillary osteotomy usually led to nasal base collapse due to damage of pyriform aperture framework.
Methods：M-shaped osteotomy lines were designed with two vertical lines run from the alveolar edge of extracted first premolar upwards to a point that leveled 5mm above the root apex of the canine. From this point, an oblique line was drawn to the midline of maxilla, at the level of 5mm above the root apex of the central incisor. The same treatment was performed on the other side. Different from the traditional anterior maxillary osteotomy, the new design leaves the framework of the pyriform aperture intact, and thus adverse postoperative nasal changes were avoided. The position and posture of the anterior maxillary segment can be adjusted three dimensionally by fine cutting at certain osteotomy lines. Anterior mandibular sub-apex osteotomy was performed for bimaxillary setback. In correction of class II profile, M-shaped osteotomy was performed together with anterior mandibular sub-apex osteotomy and rotation forwardly at the lower end of the segment, and chin advancement.
Results: Since 2009, M-shaped anterior maxillary osteotomy and related procedure has been applied in 130 patients, 12 received single maxilla operation, 90 patients underwent bimaxillary procedure, and 28 had bimaxillary anterior osteotomies and chin advancement. Majority of patients recovered uneventfully with high satisfaction. One patient had a temporary complained of overcorrection. Two incisors had color changes in two patients. No adverse nasal change was found in this group.
Conclusions: M-shaped osteotomy and related maneuver are safe and efficient for correction of bimaxillary protrusion and class II profile.

Objectives
1. Participants will be able to tell the difference between M-shaped anterior maxillary osteotomy and traditional anterior maxillary osteotomy. 2. Participants will be able to tell that the position and posture of the anterior maxillary segment can be adjusted three dimensionally in the new design. 3. Participants will be able to tell how the class II profile be corrected by M-shaped osteotomy and combined procedure.

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Use of 3-Dimensional Modeling in Interdisciplinary Planning of Cleidocranial Dysplasia

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Kathryn Preston


Jason Yu


Sanjay Mallya

Abstract
Background: Supernumerary teeth and delayed dental eruption are common features of cleidocranial dysplasia. Identification of these teeth can be challenging, even with 3-dimensional radiographs. Finding an effective mode of communicating between the orthodontist, oral radiologist, and oral surgeon is critical, as traditional methods can be insufficient in the surgical planning of these complex cases. The purpose of this case report is to describe the use of 3-dimensional (3D) modeling of the teeth as an effective communication tool in interdisciplinary case planning.
Methods: A 13-year-old patient with cleidocranial dysplasia presented with multiple supernumerary teeth, including 6 maxillary and 8 mandibular, and an unerupted permanent dentition with exception of teeth #3, #14, #19, #24, and #25. To simulate a typical eruption sequence while maintaining sufficient dentition to anchor orthodontic appliances, a staged approach was pursued, focusing on the anterior teeth in this first surgery. To locate and clearly communicate location of teeth to be removed and those to have forced eruption, a 3D modeling software (Anatomodel by Osteoid Inc.) was used to segment the teeth in surgical planning.
Results: Using color coding, the orthodontist marked the teeth in red to indicate removal and those marked green were exposed-and-bonded for forced eruption. Teeth marked in blue were not included in this surgery. The oral surgeon used the color mapped modeling, allowing for minimal surgical exposure during the surgery to correctly identify the necessary teeth. This also allowed preoperative planning to delay extraction of certain teeth due to proximity of vital structures.
Conclusions: In patients with cleidocranial dysplasia, using 3-dimensional modeling software to plan complex dental surgical procedures facilitates clear communication and can reduce errors in tooth identification and extractions.

Objectives
Participants will: 1. Learn interactive tooth identification techniques in complex orthodontic-oral surgical cases 2. Acquire knowledge of methods to optimize effective interdisciplinary communication 3. Apply principles of 3-dimensional tooth segmentation technologies in interdisciplinary surgical planning

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It's Hip to Go Home: An Evaluation of Safety and Efficacy of Outpatient Alveolar Bone Grafting

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Chioma Obinero


Jessica Nye


Jackson Green


Michael Talanker


Phuong Nguyen


Matthew Greives

Abstract

Background: The advent of techniques such as trephine drill harvest and local anesthesia has made outpatient alveolar bone grafting (ABG) an increasingly feasible and cost-effective procedure. The goal of this abstract is to evaluate our institution's outpatient ABG ERAS protocol for safety and efficacy.
Methods: A retrospective single-institution review was conducted on all patients who underwent ABG from 2017 to 2022. ABGs done concurrently with other procedures, including palatoplasty, revision rhinoplasty, cheiloplasty, and myringotomy were excluded. At our institution, autologous iliac crest bone grafts (ICBGs) are harvested using a trephine drill system with a minimal donor site incision. Ropivacaine pain pumps are secured transcutaneously to the ICBG harvest site with self-adhesive polyurethane film and removed at first postoperative visit. All patients are prescribed twenty doses of weight-based opioid at discharge.
Results: There were 117 total ABGs performed from August 2017 to July 2022. Forty-five of these ABGs were done concurrently with other procedures and therefore excluded. Of the 54 patients included, median age was 9 years (IQR 8, 11). Thirty-two patients (59.3%) had unilateral alveolar clefts compared to 22 (40.7%) with bilateral clefts. Fifty patients (92.6%) received a pain pump during the operation. The median duration of surgery and length of stay were 76.5 mins (IQR 63.3, 98.8) and 1.75 hours (IQR 1.50, 2.25), respectively. Fifty-two patients (96.3%) were discharged on the same day as their surgery. The median pain score at discharge and maximum recorded pain score during hospital stay were 0 (IQR 0, 0) and 6 (IQR 5, 6), respectively. There was 1 readmission (1.9%) after pain pump failure and no re-operations within 30 days of surgery.
Conclusion: Our current ERAS protocol for outpatient ABG surgery is safe & effective with low postoperative pain scores and low rates of readmission.

Objectives

Participants will be able to understand the main goals of safe and effective outpatient alveolar bone grafting.
Participants will be able to critically assess our institution's outpatient alveolar bone grafting ERAS protocol.
Participants will be able to examine obstacles faced by patients and caretakers undergoing alveolar bone grafting.

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Comparing the squamosal to coronal suture relationship between unicoronal and bicoronal synostosis

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Trent Schimmel


Swetha Prakash


Emilie Robertson


Vivek Mehta


Curtis Budden

Abstract
Background: The choice between endoscopic strip craniectomy and cranial vault remodeling for bicoronal (BCS) and unicoronal craniosynostosis (UCS) remains controversial. There appears to be anatomical variation in the location of the squamosal suture based on head shape. Without excising the entire suture, outcomes of strip craniectomy may be suboptimal. The aim of this study is to characterize the differences in anatomic relationship between the squamosal and coronal suture in BCS and UCS patients. Our hypothesis is that knowledge of differences will allow a more precise suturectomy if performed.
Methods: Cases were identified and age-matched to control patients without craniosynostosis. CT scans of these cases were exported and analyzed using 3D Slicer. ANOVA and paired student t-tests were performed for age-matched controls.
Results: Twenty four normal, 23 unicoronal, and 10 bicoronal craniosynostosis cases were included in this study. Cranial index was measured to support data validity. Comparing the position of the zygomaticofrontal suture to the coronal-squamosal junction resulted in a significant difference ($p < 0.0001$). In BCS the mean distance from ZF was 6.5 mm compared to 14.7 mm in UCS and 14.3 mm in normal skulls. In BCS the distance from pterion to zygomatic-temporal suture was shorter than UCS and normal skulls (19.7 mm vs 22.6 mm and 23.8 mm, $p <0.01$). There is approximately 10 mm difference in the mean peak height of the squamosal suture measured from the zygomatic arch when comparing BCS to UCS and normal skulls ($p < 0.001$).
Conclusions: This is the first study to describe the difference in coronal suture position when comparing normal, unicoronal and bicoronal craniosynostosis. In BCS, the suture is positioned inferior and anterior compared to UCS and normal skulls. Surgeons performing strip craniectomy may benefit from a change in exposure or technique modification in order to accurately complete this surgery.

Objectives
Participants will recognize differences in suture anatomy based on craniosynostosis type. Participants will be familiar with anatomical differences if performing strip craniectomy. Participants will consider using 3D model assessments when performing strip craniectomy.

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Application of Augmented Reality based on Automatic Markerless Registration for Facial Plastic and Reconstructive Surgery: A Validation Study

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Abstract

Background: This study aims to present a novel marker-less augmented reality (AR) system using an automatic registration based on machine-learning based algorithms, which visualizes facial region and provide intraoperative guide during facial plastic and reconstructive surgeries.
Methods: 20 patients scheduled for facial plastic and reconstructive surgeries were prospectively enrolled. The AR system aims to visualize computed tomographic data in the three-dimensional (3D) space, by aligning with the 3D point clouds captured by a 3D camera. The point cloud registration consists of two stages: The preliminary registration gives an initial estimate of the transformation based on landmark detection, followed by the precise registration based on Iterative Closest Point algorithms. The CT data can be visualized either as 2D slice images or 3D reconstructive images in the AR system. The AR registration error was defined as the cloud-to-cloud distance between the surface data obtained from the CT and 3D camera. The error was calculated in each facial territory including upper, middle, and lower face, when patients were in awake and oral-intubated status.
Results: The mean registration error was 1.490±0.384mm in awake status and was 1.948±0.638mm in oral intubated status. When stratified by the facial territories, there was significant difference of error in the lower face; 1.502±0.480mm in awake status, and 2.325±0.971 during oral-intubated status. (p=0.006)
Conclusion: The marker-less AR can accurately visualize the facial region with a mean overall registration error between 1 to 2mm, with slight increase in the lower face due to errors arising from the oral intubation.

Objectives

This study introduce a novel marker-less augmented reality (AR) system using an automatic registration based on machine-learning based algorithms, which visualizes facial region and provide intraoperative guide during facial plastic and reconstructive surgeries. We anticipate that this technology can be expanded to various clinical situations when combined with three-dimensional computer simulations for bony and soft tissue surgeries of the face.

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OUTCOMES AND COMPLICATIONS AFTER FRONTOFACIAL MONOBLOC DISTRACTION

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Eric ARNAUD

Abstract
Frontofacial Monobloc Advancement with distraction (FFMBA) allows simultaneous correction of exorbitism and obstructive sleep apnea syndrome (OSAS).

Methods
149 patients were prospectively analyzed (mean follow up 10 years, range 2-20 years) out of 176.
Mean age at surgery: 3.9 years (range 4 months - 17 years). Preoperative AHI=22,6/h (N<5/h). Four internal distractors were used, below 18 months (n=25) with a transfacial pin, and below 12months with an external traction provided during 7 days. Quantity of distraction was about 25mm at the orbital level. Consolidation time was 5-6 months.

Results
- Outcomes: Exorbitism was corrected in 95%. AHI, dropped at 8,5/h at 12months. It was normalized in 40% and partially improved in 55%. Class I (or II) were obtained only in 75% of the patients. In 19 patients an early Le Fort 3 osteotomy was performed to normalize the respiration. Tracheostomy was removed in half of the cases.
- Complications:
    1. 3 patients died in the immediate postoperatory period (1 acute tonsillar herniation, 2 cerebral venous thrombosis linked to vascular anomalies)
    2. In the distraction period, 3,3% of the patients experienced devices related problems, 27% a CSF leak, 6% a transient visual problem, all resolved in 3 months.
    3. In the consolidation period, 35% experiences local inflammation around distractors (tracheostomy as a risk factor). The frontal bone loss risk was significantly lower in primary patients (1/124), in comparison with secondary patients (3/25).
    4. Lack of ossification was present in 16% especially in Pfeiffer syndromes

Conclusions
FFMBA remains the most powerful tool to correct simultaneously exorbitim and OSAS in faciocraniosynostotic children. It should preferably be performed after a posterior skull expansion and prophylactic removal of tonsils/adenoids in primary patients . When adequately managed FFMBA can bring ten years of normal life in those children who will request lighter surgeries until adulthood.

Objectives
Provide objective results in a large series of patients after FFMBA

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Computer-aided, customized-assembled cutting guides for intraoral approach mandible reduction

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Po-Cheng Huang


Yu-hsun Kao

Abstract

Background: In mandible reduction surgery through the intra-oral approach, the operation field was usually limited and difficult to direct visualize the target area. Thus, a well-designed cutting guide may effectively facilitate precise mandible reduction procedure. However, currently there were no ideal products on the market, mainly because of the lacking of consideration on the limitation caused by the soft tissue environment.
Here we presented a case of mandible contour asymmetry in a neurofibromatosis patient. Computer-aided, customized-assembled cutting guides were designed for reduction of right-side mandibular deformity, which overcame the anatomic barrier of intraoral approach.
Methods: Before surgery, virtual surgical planning was done based on the CT scan images (Mimics Innovation Suite, medical 22.0 (Materialise N.V., Leuven, Belgium)). To achieve bilateral symmetric contour, the amount of mandible reduction was decided by the mirror image from the normal side. Then a set of cutting guides were developed from the result of simulation, which can be assembled after inserted intraorally. Finally, the cutting and shaving of the deformed mandible angle were performed under this guidance.
Results: The customized surgical guide had effectively overcome the space limitation caused by intra-oral approach, and facilitate the precise mandible reduction surgery. The inferior alveolar nerve had been identified through pre-op simulation, and was well-protected throughout the procedure. After the surgery, the mandible has attained satisfactory contour symmetry.
Conclusions: Even with their limitation of direct visualization and access, with the help of good virtual surgical planning and smart cutting guides design, we can still facilitate precise and safe mandible angle reduction through intra-oral approach. We think our “computer-aided, customized-assembled cutting guides” may not limited to the use of correcting pathological or asymmetrical conditions of the mandible, but further can be used on any mandible contouring surgery through intraoral approach.

Objectives

1. To identified the current difficulties encountered in intraoral approach mandible reduction 2. To better understand how computer image technique effectively helping the current cranio-maxillofacial surgery. 3. To understand the design concept of our customized cutting guides, and how they help the intraoral approach mandible reduction

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Secondary Alveolar Bone Grafting Following Gingivoperiosteoplasty in Children with Cleft Lip and Palate.

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Abstract

Background: The utility of a gingivoperiosteoplasty (GPP) in the management of alveolar cleft is debated. When successful, secondary alveolar bone graft (SABG) is avoided. GPP is not always successful leading to residual alveolar cleft and increased risk for maxillary growth restriction. We aim to establish the frequency of SABG among children who underwent GPP, and determine factors associated with its indication.
Method/Description: A retrospective chart review was performed on children who had GPP at our institution from 2000-2015. Children < 8years, those with incomplete documentation or lost to follow up were excluded.
Results: Of 1682 identified during the study period, 87 underwent GPP. 23 were excluded. 64 met the inclusion criteria. Of these, 18 had cleft lip and alveolus, 46 complete cleft lip and palate. 59 had unilateral clefts and 5 had bilateral clefts. GPP was undertaken at the time of primary lip repair (52%), at the time of primary palatoplasty (43%), (4.6%) had GPP during revision surgery: 2 patients at the time of cleft lip revision with a complete takedown and 1 during cleft palate revision.
The mean age at GPP was 9.6 months. Fifty children (78%) were indicated for SABG. Among these, 21 had undergone SABG at the time of the study. The mean age at SABG was 10.5 years.
27 completed NAM prior to GPP. There was no significant association between SABG indication and NAM status (p = 0.0674).
Age at GPP, concurrent surgical procedure (primary lip repair, palate repair, other), operating surgeon and type of cleft were significantly associated with indication for SABG.
Conclusions: Gingivoperiosteoplasty didn't preclude the need for SABG. Timing of GPP at primary lip or palate repair, operating surgeon, and age statistically significantly influenced the need for SABG. Further studies are needed to clearly define the ideal patient for GPP.

Objectives

1).participants will be able to understand the challenges of gingivoperiosteoplasty success. 3).Participants will be able to tell the factors associated with failure of GPP in our patient population. 3). participants will be able to decide between performing gingivoperiosteoplasty at the time of cleft lip repair vs cleft palatoplasty

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Modified Keystone Perforator Island Flap Techniques for Small- to Moderate-Sized Scalp and Forehead Defect Coverage

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Abstract

Background: We aimed to demonstrate the effective application of keystone perforator island flap (KPIF) in scalp and forehead reconstruction by demonstrating the authors' experience with modified KPIF reconstruction for small- to moderate-sized scalp and forehead defects.

Methods: Twelve patients who underwent modified KPIF reconstruction of the scalp and forehead from September 2020 to July 2022 were enrolled in this study. In addition, we retrospectively reviewed and evaluated the patient's medical records and clinical photographs.

Results: All defects (size range, 2 cm × 2 cm to 3 cm × 7 cm) were successfully covered using four modified KPIF techniques (hemi-KPIF, Sydney Melanoma Unit Modification KPIF, omega variation closure KPIF, and modified type II KPIF) with ancillary procedures (additional skin grafts and local flaps). All flaps (size range, 3.5 cm × 4 cm to 7 cm × 16 cm) fully survived, and only one patient developed marginal maceration that healed with conservative management. Furthermore, through the final scar evaluation with the patient satisfaction survey and Harris 4-stage scale, all patients were satisfied with their favorable outcomes at the average final follow-up period of 7.66 ± 2.14 months.

Conclusions: The study showed that the KPIF technique with appropriate modifications is an excellent reconstructive modality for covering scalp and forehead defects.

Objectives

1) Participants will be able to explain the four modifications of keystone perforator island flap (KPIF). 2) Participants will be able to explain the anatomic layers and regions of scalp and forehead. 3) Participants will be able to explain the application of the modified KPIF technique to small- to moderate-sized scalp and forehead defect coverage.

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Long-term Outcomes of Fronto-Orbital Distraction for Craniosynostosis with Brachycephaly and Oxycephaly

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Abstract

Background: Recently, post-operative results of Fronto-Orbital distraction have been reported, and we reported some complications due to cranial distraction for 120 patients with craniosynostosis (J.Craiofac.Surg.32, 2021). However, few evaluations have been made over the long term. In this study, the clinical outcomes have been evaluated every two years for patients underwent Fronto-Orbital distraction, with all involved in the study having been followed for more than ten years.

Methods: The study participants underwent Fronto-Orbital distraction for Brachycephaly and Oxycephaly between 2001 and 2012, and have been followed for more than 10 years. Surgery-related data (secondary surgery, intracranial volume, relapse, dysmorphology) were verified using medical records. The intracranial volume and the distance per 10 degrees between forehead and sellae were obtained from 3D-CT images at pre-operation, immediately after elongation and for over 10 years post-operation. Also, these results were compared with those of normal individuals.
Patients with incomplete medical records and involving lateral distraction, were excluded from this study.

Results: Fifty-eight patients with Brachycephaly or Oxycephaly underwent Fronto-Orbital distraction have been followed up for more than 10 years. There were 41 Patients with syndromic craniosynostosis and 17 Patients with non-syndromic craniosynostosis. Mean age at the time of surgery was 11.2months (range, 3–77months). Maximum amount of elongation per patient was 36.4mm (range, 8.5–50.5mm). The immediate post-elongation data reached those of normal individuals at the same age. Additional surgery, such as occipital distraction, was indicated in 4 cases. There were 10 patients with temporal hollowing deformies. There was no significant change between immediate post-elongation data and the data obtained over the 10-years follow-ups. No significant relapse occurred.

Conclusions: The rate of secondary surgery has been low, and Fronto-Orbital distraction gives a sufficient amount of elongation. We believe that long-term follow-up outcomes indicate that Fronto-Orbital distraction is useful and appropriate for craniosynostosis surgery.

Objectives

1) Participants will be able to understand the long-term results of Fronto-Orbital distraction. 2) Participants will be able to know the advantage and the disadvantage of Fronto-Orbital distraction. 3) Participants will be able to gain knowledge to perform Fronto-Orbital distraction more safely based on evidence.

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Computer-Aided Midface Distraction in Syndromic Craniosynostosis

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Thomas Mon-Hsian Hsieh


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Abstract
Background: Compare to the traditional one-time surgery, the midface distraction may provide more extent of advancement, and probably less chance of relapse. Long treatment time and more unpredictable outcome were the shortcomings. If the patient had undergone several times of craniofacial reconstruction, the treatment will be even more challenging.
Here we present a case of Crouzon Syndrome, who underwent several times of craniofacial reconstructions, including one traditional midface advancement, with recurrence. This time, midface distraction was planned, however, the presence of a titanium skull implant makes the installation of the head frame more challenging.
To solve these difficulties, computer technology were employed in pre- and intra-op stages, as to ensure more safe, precise and predictable outcome.
Methods: Before the surgery, computer simulated midface osteotomy was done, and the ideal position of the midface after advancement was determined. Then the main part of the distraction device was scanned by laser scanner and incorporate into the 3DCT module, the best position for head frame installation was decided, which ensure the cranial pin will contact with the solid bone but not the titanium implant or thin bone in temporal region of the skull.
During the surgery, the result of computer simulation was incorporated into the surgical navigation system, which was used to guide the safe and precise osteotomy of the midface, and also ensure the frame and cranial pin were installed according to the pre-op planning.
Results: Under the guidance of the navigation system, the surgery was completed successfully and as planning. Subsequent distraction was performed according to the protocol, and the final result was well predicted as the pre-op planning.
Conclusions: Computer technologies could effective helping the midface distracting procedure, either on device installation, osteotomy or distraction planning and result prediction, and enen more valuable in complicated conditions.

Objectives
1. To understand the challenging issues in midface surgery 2. To identified the problem encountered in applying distraction device in complicated cases. 3. Learn how to apply the up-to-date computer technology in the craniofacial reconstruction surgery.

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A novel workflow of concomitant fibula free flap and orthognathic surgery for the reconstruction of dentomaxillofacial deformity secondary to a long-term mandibular defect

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Xudong Wang

Abstract

Background: The reconstruction of mandibular defect may be delayed or compromised due to many reasons, especially in pediatric patients. With the growth of the remaining mandibular and the maxilla in the malocclusion status, the secondary dentomaxillofacial deformity is plausible. To deal with the co-existent mandibular defect and secondary dentomaxillofacial deformity, a hierarchical algorithm using orthodontics, orthognathic surgery, and fibula free flap was developed.

Methods: This was a retrospective case series study of patients with a long-term mandibular defect caused by tumor resection without repair or with compromised costochondral reconstruction. All patients were treated using the same staged protocol but with minor changes: 1) presurgical orthodontics, 2) virtual surgical planning, 3) fabrication of the guides and splints, 4) sequenced operations, and 5) postoperative care. The patients were followed up at 1, 6 and 12 months after surgery. The demographic information, surgical interventions, outcomes, and complications were collected from the medical records.

Results: The operations and wound healings were uneventful in all patients, and no flap failure or severe complications were detected. Also, the patients exhibited no signs of temporomandibular joint ankylosis after the follow-up. The subspinale-nasion-supramental angle (ANB) and lower incisor-mandiblar plane angle (LI-MP) were reduced significantly after the surgery ($P<0.05$). In addition, the chin deviation angle, intercommissural line deviation, and mandibular contour deviation angle were reduced significantly after the surgery ($P<0.05$).

Conclusions: This proposed workflow of concomitant orthognathic surgery and the fibula free flap is effective and reliable for the reconstruction of dentomaxillofacial deformity secondary to the long-term mandibular defect.

Objectives

1. Participants will be able to realize that the long-term defect of mandible would lead to the sencondary dentomaxillofacial deformity. 2. Participants will be able to tell the characteristics of the secondary dentomaxillofacial deformity. 3. Participants will be able to understand the workflowand virtual surgical planning of concomitant fibula free flap and orthognathic surgery.

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Incidence and factors of secondary craniosynostosis: a single-center retrospective research

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Songchunyuan Zhang

Abstract

Background: Postoperative follow-up imaging data show secondary fusion of the initial patent sutures. The incidence and influencing factors of the disorder have not been comprehensively verified. In this study, the clinical data of children with nonsyndromic craniosynostosis undertaking operation treatment were analyzed to explore the secondary synostosis (SCS) rate and risk factors.
Methods: From January 2015 to February 2022, children with craniosynostosis who underwent surgical treatment in a single center were analyzed retrospectively. The inclusion criteria are as follows: 1. complete head CT scan images, including three-dimensional reconstruction images, 2. Operated by the same experienced pediatric plastic surgeon. Excluding cases diagnosed with syndromic CS or followed <6 months(m) for imaging data or lack of CT images. The data collected included demographic data and 3D-CT images, which were processed with the univariate and multivariate logistic regression analysis by R 4.1.3. Ten articles were reviewed.
Results: 100 patients met the inclusion criteria. 33 (33.00%) children suffered from secondary synostosis, with an average month age of (15.70±13.00) m, an average operation time of (3.34±1.11) h and the initially involved sutures included sagittal [13 patients (39.39%)], unicoronal [9 patients (27.30%)], unilambdoid [2 patients (6.06%)], metopic [2 patients (6.06%)]and polycraniosynostosis[7 patients (21.21%)]. Multivariate logistic regression showed that the multiple sutures involvement was a risk factor for SCS (P=0.03, OR=4.54, CI: 1.21-18.97). The reported incidence rate of SCS ranged from 1.7% to 89%. Genetic susceptibility, intrinsic properties of the bone, suturectomy with barrel staving, as well as bilambdoid sutures involvement have been regarded as risk factors of SCS.
Conclusions: The secondary synostosis was common radiologically. Multivariate regression found that multiple sutures involvement was a risk factor for SCS (P=0.03, OR=4.54, CI: 1.21-18.97), suggesting that it may be due to congenital factors or intrinsic property of bones. And long-term follow-up is indispensable.

Objectives

1. To make secondary craniosynostosis attracts the attention of surgeons 2. To explore the incidence and factors of secondary craniosynostosis 3.To provide reference for the treatment of non-syndromic craniosynostosis

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Assessment of Robot-Assisted Mandibular Contouring Surgery in Comparison With Traditional Surgery: A Prospective, Single-Center, Randomized Controlled Trial

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Li Lin

Abstract

Background: Few clinical studies on robot-assisted surgery (RAS) for mandibular contouring have been reported.
Methods: This small-sample, early-phase, prospective, randomized controlled study included patients diagnosed with mandibular deformity requiring mandibular contouring surgery. Patients of both genders aged 18 to 30 years without complicated craniofacial repair defects were enrolled and randomly assigned in a 1:1 ratio by a permuted-block randomized assignments list generated by the study statistician. The primary outcomes were the positioning accuracy and accuracy of the osteotomy plane angle 1 week after surgery. Surgical auxiliary measurement index, patient satisfaction scale, surgical pain scale, perioperative period, and complications at 1 week, 1 month, and 6 months after surgery were also analyzed.
Results: One patient was lost to follow-up, resulting in a total of 14 patients in the traditional surgery group and 15 in the robot-assisted group (mean [standard deviation] age, 22.65 [3.60] years). Among the primary outcomes, there was a significant difference in the positioning accuracy (2.91 mm vs 1.65 mm; $P < 0.01$) and angle accuracy (13.26º vs 4.85º; $P < 0.01$) between the 2 groups. Secondary outcomes did not significantly differ.
Conclusions: Compared to traditional surgery, robot-assisted mandibular contouring surgery showed improved precision in bone shaving, as well as higher safety.

Objectives

Participants will be able to learn the advances in Robot-Assisted Surgery. Participants will be able to learn the Robot-Assisted Surgery for Facial Bone Contouring Surgery. Participants will be able to discuss the potential Robot-Assisted Surgery advantage for craniofacial surgery

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Long-term Skeletal Stability of Rotational Orthognathic Surgery based on Occlusal Plane Alteration

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Jong Woo Choi

Abstract

Background: Evolving from conventional orthognathic approach which has mainly focused on advancement or setback of the maxillomandibular complex (MMC), this study proposed the concept of rotational orthognathic surgery in Asian ethnicity. This study investigated the long-term skeletal stability of the rotational orthognathic surgery based on occlusal plane alteration.

Methods: This study included patients who underwent clockwise or counterclockwise rotation of MMC after maxillary Le Fort I osteotomy and bilateral sagittal split osteotomy of the mandible. Patients were classified into 4 group based on the direction of maxillary movement: Group A, Clockwise rotation based on posterior nasal spine (PNS) impaction; Group B, Clockwise rotation based on anterior nasal spine (ANS) lengthening; Group C, Counterclockwise rotation based on PNS lengthening; Group D, Counterclockwise rotation based on ANS impaction. Skeletal stability was assessed by measuring absolute change of cephalometric parameters during 3-year postoperatively.

Results: A total of 76 patients were included; Group A (n=29), Group B (n=22), Group C (n=14) and Group D (n=10). The group B and D showed the most favorable skeletal stability in terms of maxillary and mandibular relapse. The group C showed the least stability in terms of anterior maxillary relapse in both horizontal and vertical position. The group A presented the lease stability in horizontal maxillary relapse, while the group C showed the least stability in vertical mandibular relapse.

Conclusion: The rotational orthognathic surgery based on occlusal plane alteration can be an ideal surgical option in consideration of the hierarchy of skeletal stability for various dentofacial deformities.

Objectives

1. Participants will be able to compare several types of rotational orthognathic surgery 2. Participants will be able to understand how to maintain the long-term stability after rotational orthognathic surgery 3. Participants will be able to build their strategies for orthognathic surgery.

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The Simultaneous Use of Spring and Distraction Osteogenesis as a Safe and stable Method for Coronal-Suture CraniosynostosisJI Y., SHEN W.MChildren's Hospital of Nanjing Medical University

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Abstract

Abstract Craniosynostosis caused by premature fusion of the cranial suture.Premature closure of the coronal suture results in scaphocephaly deformity,resulting in a long anteroposterior diameter of the skull.The purpose of this study was to demonstrate the stability and safety of use of spring and distraction osteogenesis.Methods We reviewed 3cases of scaphocephaly deformity,which were treated using of spring and distraction osteogenesis.Results The children who underwent spring and distraction osteogenesis achieved the desired results. The left and right diameters of the skull become longer, and the anteroposterior diameters become relatively shorter according to the cranial index.Conclusion The clinical results showed that the result of this mehthod was satisfied stably. Although the spring does not accurately control the length of the distraction, the distraction osteogenesis of adjustment can be used to stabilize the shape of the skull and maintain normal cranial index.
Keywords:Craniosynostosis,scaphocephaly,spring,distraction osteogenesis

Objectives

Participants will be able to tell the stability and safety of using spring and distraction osteogenesis for scaphocephaly.

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Adjunctive Techniques in Primary Cleft Palate Reconstruction: A Systematic Review

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Abstract
Background: Adjunctive techniques are crucial in primary palatoplasty for managing tension at the defect site. This review aimed to compare outcomes across various adjuncts employed in primary palatoplasty.
Methods: A literature search was conducted of MEDLINE, EMBASE, and Cochrane Library using keywords cleft palate, palatoplasty, surgical flaps, allografts, autografts. Adjunctive techniques involve methods obtaining non-palatal tissue for additional coverage of the defect. Data extracted included demographics, cleft severity, primary and adjunctive techniques, outcomes, and follow-up periods. Logistic regression models and Chi-squared tests were performed to investigate associations among variables.
Results: Forty-seven articles were included, comprising a total of 2,234 patients aged 3 months to 32 years. Follow-up periods ranged from 1 month to 25 years. Submucous cleft was described in 1% of patients, whereas Veau I/II and Veau III/IV in 30.5% and 65% of patients, respectively. Furlow (56%) and intravelar veloplasty (9.5%) were the most reported techniques for soft palate repair, while Bardach (21.9%) and V-Y Pushback (11.2%) for the hard palate. Buccal myomucosal flap (BMMF) was utilized in 52% of cases, buccal fat pad flap/graft (BFP) in 32.1%, and acellular dermal matrix (ADM) in 10.3%. Greater cleft severity (Veau III/IV) was most frequently repaired with BMMF ($p<0.0001$). Postoperative complications were identified in 3.9% of patients and were associated with the use of ADM ($p=0.0003$). Oronasal fistula was present in 4.4% of patients and velopharyngeal insufficiency (VPI) in 6.5%. Fistula ($p=0.6$) and VPI ($p=0.2$) rates did not vary with cleft severity. Within the Veau III/IV subgroup, fistula was associated with ADM when compared to BFP ($p=0.01$).
Conclusion: Primary palatoplasty adjuncts mitigate the risks of unfavorable outcomes associated with high cleft severity, with BMMF being considered superior given its inherent tissue properties in contrast to BFP and ADM. BFP is effective in reducing fistula formation.

Objectives
(1) Participants will be able to explain different adjuncts in primary palatoplasty. (2) Participants will be able to analyze the indications and outcomes of different adjuncts in primary palatoplasty. (3) Participants will be able to develop a treatment plan that incorporates appropriate adjuncts based on patient-specific factors and the results of the literature.

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Analysis of Risk Factors for Traumatic Optic Neuropathy in Patients With Facial Trauma and Comparison of the Visual Outcomes of Management Strategies

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Pang-Yun Chou


Chih-Hao Chen


Han-Tsung Liao


Chien-Tzung Chen

Abstract

Background: Traumatic optic neuropathy (TON) is a rare complication of facial trauma that results in vision loss. Clinical diagnosis of TON is based on a history of head trauma and an ophthalmic examination; however, the risk factors for TON and the ideal treatment strategy remain undetermined. This study investigated the predictive risk factors for TON and analyzed the effectiveness of current treatments with respect to visual outcomes in patients with TON.

Methods: This study retrospectively enrolled patients with periorbital facial bone fracture between 2008 and 2019. Initial facial bone computed tomography, ophthalmic exam results, initial Glasgow Coma Scale, Injury Severity Score, and New Injury Severity Score (NISS) were recorded. This study classified patients into 4 intervention groups (ie, medication, surgery, combination therapy, and observation) to compare the degree of improvement in visual acuity.

Results: This study enrolled 1121 patients with facial bone fractures, 77 (7.38%) of whom were diagnosed as having TON. Independent risk factors for TON included an NISS ≥ 26, medial orbital wall fracture, retrobulbar hematoma, and head Abbreviated Injury Scale ≥ 4. Patients with TON who initially presented with no light perception tended to have poor final visual acuity (VA) outcomes. The results indicated no significant improvement in VA in patients receiving mega-dose corticosteroid therapy, surgical decompression, or combined steroid therapy and decompression.

Conclusion: Clinicians can achieve early prediction of TON in patients with an initial unconscious state and the determined risk factors. The results indicated that conservative observation yielded noninferior VA outcomes in patients with TON compared with those receiving medication or surgical treatment.

Objectives

1. Clinicians can achieve early prediction of TON in patients with an initial unconscious state and the determined risk factors 2. Clinicians can better understand that conservative observation yielded noninferior VA outcomes in patients with TON compared with those receiving medication or surgical treatment. 3. Families of patients with trauma who arrive at the ED with impaired consciousness may benefit from this knowledge and from awareness of the risk factors for TON

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Does age at the time of speech surgery for cleft velopharyngeal insufficiency influence functional outcomes and the need for revision surgery?

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Danielle Sobol


Stefanie Hush


Katherine Dillon


Kazlin Mason


Joseph Williams

Abstract

Background: Velopharyngeal insufficiency (VPI) in patients with cleft palate affects speech intelligibility and quality of life. A pharyngeal flap (PF) and sphincter pharyngoplasty (SP) are accepted interventions, though the exact size of the pharyngeal ports, sphincter size, and palatal movement cannot be guaranteed. In considering early intervention to avoid maladaptive speech, we investigated VPI surgical outcomes by age.
Methods: A retrospective review was completed for patients who underwent superiorly-based pharyngeal flap or sphincter pharyngoplasty between 2015-2021. Inclusion criteria included cleft palate diagnosis, age <18 years old, and 5-18 months post-operative speech evaluation. Pre-operative and post-operative speech outcomes were compared. The need for revision surgery within the 18 month study period was evaluated. Chi-square analysis was completed.
Results: 125 patients met inclusion criteria; 62 PF and 63 SP. The average age was 7.6 years for PF group and 6.7 years for SP group. In the < 3 year old age group, 2 patients (7.7%) required revision. In the 4-7 year old group, 7 patients (12.1%) underwent revision. 5 patients (12.2%) required revision in the >8 year old age group. Overall, the PF group had a lower revision rate, 4.8% vs. 17.5% SP which was significant, p=0.006. Obstruction requiring revision was more frequent in the SP group vs PF group, p < 0.001; 63.6% of SP revisions. No significant differences were seen in post-operative VP function and hypernasality between the PF and SP groups, p=0.395 and p=0.433 respectively.
Conclusions: The overall revision rate for pediatric patients undergoing cleft VPI surgery was 11.2%; 4.8% PF vs. 17.5% SP. Early intervention did not show a higher complication rate. Functional outcomes were comparable after pharyngeal flap and sphincter pharyngoplasty which may suggest appropriate surgical selection based on patient anatomy.

Objectives
Participants will be able to compare outcomes after pharyngeal flap and sphincter pharyngoplasty. Participants will be able to explain revision risks after VPI surgery. Participants will be able to evaluate the effect of age on VPI surgery outcomes.

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Midface Morphology and Growth in Syndromic Craniosynostosis Patients Following Frontofacial Monobloc Distraction.

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CRISTIANO TONELLO


Nivaldo Alonso

Abstract
Background: Facial advancement represents the essence of the surgical treatment of syndromic craniosynostosis. Frontofacial monobloc distraction is an effective surgical approach to correct midface retrusion although someone consider it very hazardous procedure. The authors evaluated a group of patients who underwent frontofacial monobloc distraction with the aim to identify the advancement results performed in immature skeletal regarding the midface morphologic characteristics and its effects on growth.
Methods: Sixteen patients who underwent frontofacial monobloc distraction with pre- and postsurgical computed tomography (CT) scans were evaluated and compared to a control group of 9 nonsyndromic children with CT scans at 1-year intervals during craniofacial growth. Three-dimensional measurements and superimposition of the CT scans were used to evaluate midface morphologic features and longitudinal changes during the craniofacial growth and following the advancement. Presurgical growth was evaluated in 4 patients and postsurgical growth was evaluated in 9 patients.
Results: Syndromic maxillary width and length were reduced and the most obtuse facial angles showed a lack in forward projection of the central portion in these patients. Three-dimensional distances and images superimposition demonstrated the age did not influence the course of abnormal midface growth.
Conclusion: The syndromic midface is hypoplastic and the sagittal deficiency is associated to axial facial concavity. The advancement performed in mixed dentition stages allowed the normalization of facial position comparable to nonsyndromic group. However, the procedure was not able to change the abnormal midface architecture and craniofacial growth.

Objectives
Participants will be able to analyze the midface morphologic changes after Monobloc Advancement, evaluate the effects on midface growth, and compare facial growth pre and post-operative.

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Reconstructive surgery of orbital dystopias and asymmetric hypertelorism secondary to non-syndromic craniosynostoses

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Bin Yang


Ye-hong Zhong


Qin-hua Huang

Abstract

Background: In non-syndromic craniosynostoses, especially plagiocephaly, secondary orbital dystopias often occur. Ipsilateral and contralateral orbits are affected differently, including anterior-posterior, vertical and horizontal dystopias, even asymmetrical hypertelorism.

Methods: Twenty-seven consecutive patients with orbits dystopias and asymmetric hypertelorism secondary to craniosynostoses were analyzed retrospectively and divided into three group who underwent different reconstructive procedures and assessed the surgical results by means of 3D-CT orbital measurements.

The age ranged from 6 months to 6 years old. They followed by 1~10 years.

Group1, mild type, 11 patients with unilateral coronal synostosis(UCS), ipsilateral orbit dystopia (vertical, anterior-posterior), who underwent unilateral fronto-orbital advancement.

Group2, moderate type, 9 patients with multiple premature fused sutures including UCS, with ipsilateral orbital dystopia(anterior-posterior , vertical , horizontal) and contralateral forehead buldging , who underwent bilateral floating forehead combined with unilateral inverted U-shaped orbital osteotomy.

Group3, Severe type , 7 patients with multiple premature fused sutures, severe forehead malformation and bilateral orbits dystopias(vertical,horizontal,anterior-posterior) , eventually resulting in asymmetrical orbital hypertelorism, who underwent calvarial vault remoulding combined with bilateral inverted U-shaped orbital osteotomies.

The 3D-CT measurements for the Supra-or_MP, Supra-or_FP , Supra-or_EAM, IOD were utilized to annlyze the position and change of the orbits preoperatively ,early and late postoperatively.

Results: All these patients got satisfactory surgical outcomes that the forehead and orbits obtained normal appearance with the IOD being corrected to the normal range . The statistic results showed that there were not differences in 3D-CT measuring parameters of Supra-or_MP and Supra-or_FP between the ipsilateral and contralateral orbits after reconstructive operation.

Conclusion: These mild and moderate types of orbital dystopias without hypertelorism were suitable for unilateral frontal advancement or bilateral floating forehead combined with unilateral inverted U-shaped orbital osteotomy. Those severe type of orbital dystopia even with asymmetrical hypertalorism were suitable for calvarial vault remoulding combined with bilateral inverted U-shaped orbital osteotomy .

Objectives

1. Participants will be able to tell the three types of orbital dystopias. 2. Participants will be able to know the reconstructive surgery of orbital dystopias. 3. Participants will be able to understand the reconstructive operation of asymmetric hypertelorism.

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Upper airway differences between Pierre Robin sequence and Treacher Collins syndrome.

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CRISTIANO TONELLO

Nivaldo Alonso

Abstract

Background: Pierre Robin Sequence (PRS) and Treacher Collins Syndrome (TCS) are congenital disorders in that respiratory distress is presented in both clinical conditions. The goal of this study was to compare the morphology pharynx taking account of volumes of segments (nasal cavity, nasopharynx, and oropharynx) and minimum sectional area of TCS and non-syndromic PRS subjects.
Methods: PRS group were composed of 14 subjects (5 male, 9 female), and TCS group was formed of 14 subjects (6 male, 8 female). Pre-orthodontic cone-beam computed tomography (CBCT) exams of all individuals were evaluated using Mimics Innovation Suite 21.0 (Materialize, Leuven, Belgium). The pharynx was divided into 3 sections: nasopharynx, oropharynx and hypopharynx. After delimiting the regions, the total volume, nasal cavity volume, nasopharyngeal volume, oropharynx volume, and minimum sectional area were determined. Statistical analyzes were performed using Wilcoxon test for independent, paired, non-parametric data for comparative analysis of variables. The mean values and standard deviation of the variables were also determined for the PRS and TCS groups.
Results: The age of PRS group range from 6 to 23 years old with a mean of 11.07±5.12 years, and at TCS group age were between 6 to 20 years with a mean of 12.00±4.50 years. Regarding the volumes of the segments of the upper airways, when comparing PRS and TCS, a significant difference was observed in total volume (p=0.0494), in nasal cavity volume (p=0.0085), in nasopharynx volume (p=0.0166) and in the minimum section area (p=0.0166). No difference was observed in the oropharynx volume (p = 0.8077). total volume, nasal cavity volume, nasopharynx volume and minimum sectional area were higher in PRS patients than in TCS patients.
Conclusion: Patients with TCS have greater involvement of the upper airways with significant loss of total, nasal cavity and nasopharynx volumes compared to patients with non-syndromic PRS.

Objectives

Participants will be able to compare the differences between Pierre Robin Sequence and Treacher Collins Syndrome airway and evaluate and analyze these differences to the best practice for the treatment.

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Harnessing the Power of Technology to Perform Accurate Osteotomies : A Novel Computer-Controlled Workflow

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Naji Bou Zeid


Devansh Saini


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Abstract

Background: Surgical manipulation of the shape of bone is an integral part of many craniomaxillofacial procedures. However, the techniques used for bony deformation have changed little in the past decades. Using advanced technologies now available, we sought to develop a new workflow which permits more accurate translation of the surgical plan. We used computer-aided design (CAD) generated digital models to drive a computer-controlled (CNC) milling cutter, creating osteotomies several orders of magnitude more precise than those achievable by hand.
Methods: 12-day old piglet calvarium was chosen as our animal model of choice, according to our previous work. Harvested calvaria specimens were imaged using a microCT, 3D models were exported as STL files. A CAD software was used to design complex patterns and generate G-codes for driving the CNC milling cutter. Bone specimens were secured inside the milling cutter and osteotomies were executed with varying parameters. An infrared thermographic camera recorded temperatures during the cuts. Machined specimens underwent histologic analysis of microarchitecture. Measurements of the osteotomy dimensions were compared with the virtual plan.
Results: Ten piglet calvaria were processed using the proposed workflow, all successfully. The dimensions of the osteotomies were accurate to the digital plan within 0.010”. The peak cutting temperatures observed were 97°C for dry machining, and 31°C for flood coolant. Less aggressive spindle speed, feed rate and depth of cut were associated with lower temperatures. Histologic analysis showed very little disruption of the surrounding microarchitecture, with clean osteotomy margins.
Conclusions: The proposed workflow demonstrated excellent ability to be used on bone graft specimens, permitting accurate reproduction of fine osteotomy patterns while also minimizing bony injury. This workflow allows for the significantly more accurate execution of presurgical plans than can be achieved by hand and opens the door to new technique modifications in craniomaxillofacial surgery and beyond.

Objectives

Participants will get to learn about currently available technologies that could be employed to execute precise osteotomies Participants will be able to recognize the different technological elements used in our workflow Participants will be able to develop their own techniques that could employ our designed workflow, thus translating our findings to the operating room

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Brain volume in metopic synostosis

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Linda Gaillard

Abstract
Background: Metopic synostosis patients are at risk for neurodevelopmental disorders despite a negligible risk of intracranial hypertension. To improve our understanding of the underlying pathophysiology of metopic synostosis and its association with neurodevelopmental disorders, this study aims to investigate preoperative global brain volumes of non-syndromic trigonocephaly patients using MRI brain scans.
Methods: We conducted a retrospective cohort study at the Erasmus University Medical Centre. Non-syndromic metopic synostosis patients, who underwent MRI brain scans preoperatively, and controls were included. MRI scans were processed with HyperDenseNet to calculate total intracranial volume (ICV), total brain volume (TBV), total grey matter (TGM), total white matter (TWM) and total cerebrospinal fluid (CSF). We compared global brain volumes of patients with controls using linear regression to correct for age and sex. Lobe-specific grey matter volumes were included in secondary analyses.
Results: Forty-five metopic synostosis patients and 14 controls (median age at MRI 0.56 years(IQR 0.36) and 1.1 years (IQR 0.47), respectively) were included. We found no significant differences in total ICV, TBV, TGM, or CSF volume in patients compared to controls. TWM volume was significantly smaller in patients (-62233mm3 [95% CI: -96968; -27498], Holm-corrected p = 0.004) and raw data suggests an accelerated growth pattern of white matter. Lobe-specific grey matter volume analyses revealed smaller frontal (-10438mm3 [95% CI: 3751; -17955], parietal (-5712mm3 [95% CI: 2833; -11389]) and occipital volume (-6649mm3 [95% CI: 2599; -11858]) compared to controls.
Conclusion: As compared to controls, we found smaller TWM in metopic synostosis patients with an accelerated white matter growth pattern, similar to white matter growth patterns seen in autism, despite similar total ICV, TBV, CSF and TGM volumes. Secondary analyses suggest smaller frontal, parietal and occipital grey matter volume. These findings are suggestive of a generalized intrinsic brain anomaly as part of the pathophysiology of metopic synostosis.

Objectives
1. Participants will be able to describe how MRI scans can be processed to obtain intracranial volume and brain volumes. 2. Participants will be able to describe how brain volume is affected in patients with metopic synostosis. 3. Participants will be able to discuss how our findings of reduced white matter volume potentially relate to the pathophysiology of metopic synostosis and its association with neurodevelopmental disorders.

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Fat Grafting for Temporal Hollowing Augmentation Following Craniectomy

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Sophia Arbuiso


Joshua Choe


Gillian Graifman


Edmond Ritter


Elizabeth Zellner

Abstract
Background: Temporal hollowing is a common sequela affecting patients who have undergone craniectomy. Free fat grafting has been proven beneficial as a secondary reconstructive modality with a low incidence of graft rejection or infection. However, this usually requires additional surgery. We have instituted fat grafting at the time of primary cranioplasty to address the cosmetic deformity of temporal hollowing while avoiding an additional procedure.
Methods: Temporal hollowing augmentation via free fat grafting encompasses the following steps: abdominal fat is harvested via manual liposuction through an umbilical incision into a 10mL syringe, processed via Telfa rolling, and loaded into 1cc syringes. The refined fat is injected as microdroplets via a 20-gauge needle on retropulsion into the elevated temporalis muscle and subcutaneous tissue of the scalp (not directly on the avascular implant). Three patients with an average of 1.1 year follow up underwent cranioplasty with adjunctive fat grafting under the neurosurgical and plastic surgery services. An average of 15.6cc (12 – 20cc) of fat was injected into and above the temporalis muscle, and into adjacent subcutaneous fat at the time of cranioplasty. Retropulsion was performed to avoid intra-arterial injection especially around the superficial temporal artery. Harvesting, processing and injecting the fat was performed at the end of the procedure, after incision closure, and added an average of 9 minutes to the surgery.
Results: The procedures were successful and the patients did not suffer from any complications associated with the fat grafting. Patient satisfaction with respect to overall cosmetic outcome was high in the experimental group even one year later despite mild absorption. This reconstruction is not associated with additional complications.
Conclusion: Adjunctive fat grafting at the time of cranioplasty in our hands has been an effective neuroplastic tool in improving patient outcomes and allows for cooperative workflow between neurosurgical and plastic surgery teams.

Objectives
1. Participants will be able to have improved cosmetic outcomes following cranioplasty. 2. Participants will be able to avoid the need for additional procedures for cosmetic purposes by initiating fat grafting at the time of primary cranioplasty. 3. Participants will be able to understand the process of temporal fat grafting.

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Optimal outcome reporting for single-suture craniosynostosis: a novel metric forbenchmarking quality

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Lauren Schmidtberg


Monica Maloney


Megan Anderson


David Hersh


Markus Bookland


Jonathan Martin


Charles Castiglione

Abstract
Background: Outcomes following surgery for craniosynostosis are not uniformly reported across institutions. The lack of a common language for postoperative success may make quality benchmarking and decision making difficult for families. Optimal outcome reporting (OOR) has been introduced previously as a way to benchmark quality for cleft palatoplasty. This paper introduces a novel application of the OOR for “success” following surgical correction for nonsyndromic craniosynostosis in order to improve transparency and empower informed decision-making.
Methods: We developed a sequential branching-tree algorithm to define the OOR for patients undergoing repair for nonsyndromic craniosynostosis. This was designed to reflect the percentage of patients who experienced the best postoperative outcome: 1. No elevated intracranial pressure; 2. One operation; 3. Good head shape at 1 year postoperatively. Patients who underwent surgical treatment at our institution between September 2014 and June 2021 were analyzed according to the algorithm.
Results: OOR was 91.3% (73/80). None of the patients failed the algorithm for elevated intracranial hypertension postoperatively. Three patients had a suboptimal outcome due to the need for additional procedures related to surgical complications within the first postoperative year. Four of the remaining patients had a suboptimal outcome due to dissatisfaction with headshape at 1 year postoperatively. Patients with optimal outcomes had significantly fewer inpatient days compared to patients who experienced suboptimal outcomes (4 [1-5] v 1 [1-2]; U=119.5, p=0.013). Sagittal suture involvement was more often associated with an optimal outcome than other sutures (p=0.01). Surgical approach (minimally invasive versus open) was not significantly associated with optimal outcome (p=0.35).
Conclusions: OOR for craniosynostosis represents a novel metric to benchmark quality for patients undergoing surgical correction. It can provide helpful information that matters directly to patients and families. By allowing for more accurate interinstitutional comparisons, OOR can help drive innovation and improvement in craniofacial care for children.

Objectives

1. This presentation will explain a novel quality metric for craniosynostosis. 2. Participants will be able to apply this outcome measure at other institutions to improve quality comparisons. 3. Participants will be able to formulate more refined and patient-relevant outcomes measures to drive innovation and improve care.

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Repeat Buccal Flaps Successfully Reduce Hypernasality in a Patient with Cleft Palate.

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David Mitchell


Jackson C. Green


Austin Lignieres


Matthew R. Greives

Abstract
Background
The buccal flap allows for retro-positioning of the levator veli palatini in velopharyngeal insufficiency (VPI). Buccal flaps are considered single-use, but we report the use of repeat buccal flaps for lengthening of the palate in a patient with persistent VPI. The purpose of this study is to demonstrate the efficacy of repeat buccal flaps in treating VPI.
Methods
This is a single patient retrospective review. At the time of presentation, the patient was a 3-week-old girl beginning nonsurgical intervention of cleft lip repair. Primary repair of the bilateral cleft palate was performed using the Furlow palatoplasty technique with bilateral buccal flaps at one year of age. At 4 years of age, the patient presented with a hypernasality score of 3 and a total parameter score of 14. The palatal motion study showed moderate VPI with a gap of 5mm of the velopharyngeal space and incomplete lateral pharyngeal wall adduction. **Revision** of the cleft palate with repeat bilateral buccal flaps was performed at 4 years of age.
Results
Operatively, the patient had posterior release of the soft palate with secondary double opposing buccal flaps incorporated into the created defect. Four months after surgery, the patient had evaluation by speech pathology and a repeat palatal motion study. The patient had significant improvements in speech with a hypernasality score of 1 and total parameter score of 8. The patient's palatal motion study demonstrated mild VPI with a velopharyngeal gap of 1.5mm and continued incomplete lateral pharyngeal wall adduction.
Conclusions
Buccal flaps are generally understood to be limited to a single use. In certain cases, repeat buccal flaps that incorporate the previous scar and buccinator muscle may provide an option for persistent VPI. Further studies are necessary to investigate the safety and efficacy of repeat buccal flaps in a larger patient population.

Objectives
Participants will be able to identify patients with persistent VPI. Participants will be able to evaluate patients needing repeat buccal flaps. Participants will be able to use repeat buccal flaps to treat persistent VPI.

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Outcome analysis of delayed primary and secondary complex orbital reconstruction under application of computer-assisted intraoperative navigation system

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Jia-Ruei Yang


Yu-Ying Chu


Han-Tsung Liao

Abstract

Background: Complex orbital reconstruction is challenging because it is difficult to achieve adequate visualization intraoperatively and reconstruct the unique anatomy. Post-traumatic enophthalmos is the most common and challenging complication of orbital fracture. Although the current studies mainly support early orbital reconstruction which led to superior clinical outcomes, delayed orbital reconstruction is sometimes inevitable due to an untreated orbital defect or insufficient primary reconstruction.

Methods: A retrospective study was conducted on consecutive 17 unoperated patients from 2015 to 2019 presenting with unilateral delayed primary or secondary complex orbital fractures at the Chang Gung Memorial Hospital. All patients underwent orbital reconstruction via intraoperative navigation more than 30 days after injury. The preoperative presentation and postoperative complications were described. CT-measurement outcomes were analyzed. Pearson Correlation analysis was performed to determine the relationship between enophthalmos and changes in orbital volume.

Results: All extensive orbital fractures were successfully reconstructed. Enophthalmos and hypoglobus were improved in all patients postoperatively. Average enophthalmos and hypoglobus among the 17 patients, evaluated by a 6-month postoperative follow-up CT scan, were significantly improved from 2.5mm to 0.2mm, 2.5mm to 1.5mm, respectively. There was a high correlation between the difference of the injured and uninjured orbital volume and the degree of enophthalmos ($r= 0.74$, $p= 0.001$), and for every 1 cm3 of orbital volume change, clinical enophthalmos was changed by 0.84 mm ($Y = 0.84X$, $R2 = 0.89$, $p= 0.001$). There were no major complications during the follow-up, and all patients were satisfied with their final appearance.

Conclusions: Our surgical approach under the assistance of an intraoperative navigation system can be a safe, accurate, and effective method for the management of delayed primary and secondary complex orbital fractures. The approach optimizes clinical outcomes and particularly improves post-traumatic enophthalmos significantly in delayed primary and secondary orbital reconstruction.

Objectives

1.Solve post-traumatic enophthalmos in delayed orbital reconstruction under application of intraoperative navigation 2.Apply computer-assisted intraoperative navigation approach to optimize clinical outcomes in delayed orbital reconstruction 3.Compare reconstructive outcomes of delayed primary and secondary complex orbital reconstruction under intraoperative navigation assistance

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Supplemental Reconstruction of the Apert Hand Following Syndactyly Release

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Jonah Donnenfield


Laura Nuzzi


Amir Taghinia


Brian Labow

Abstract
Background:
Apert syndrome is a rare autosomal dominant condition affecting up to 1:65,000 live births and is attributable to a mutation in the fibroblast growth factor 2 gene. Affected individuals feature craniosynostosis, midface hypoplasia, and complex bilateral syndactyly of the hands and feet. The literature on Apert hand treatment largely focuses on syndactyly release, usually in the first 2-3 years of life. The purpose of this investigation is to explore if an extended treatment model for the Apert hand—using specific, uncommonly performed interventions after syndactyly release—can benefit patients during periods of skeletal maturation and beyond.
Methods:
Following division of the Apert hand into five digits, we detail the techniques and benefits of metacarpal synostosis release, corrective phalangeal osteotomies, and thumb distraction lengthening.
Results:
In the years following syndactyly release, the Apert hand usually develops fusion between the fourth and fifth metacarpals, resulting in extreme deviation of the fifth digit and functional challenges for the patient. Metacarpal synostosis release involves osteotomy of the fused metacarpal and pin placement to correctively rotate the deviated digit. Also following syndactyly release, other forms of digit deviation (e.g., fingertip deviation) arise between the ages of 2 and 6. These can be functionally and cosmetically ameliorated with surgical straightening and wire placement. The Apert thumb may also be shortened and radially deviated, which presents functional challenges as the thumb is thought to comprise about 60% of hand function. Distraction lengthening has been therapeutically validated in moderate-sized patient cohorts and involves two stages: osteotomy and distractor placement followed by bone grafting and fixation.
Conclusions:
We present several validated treatment options for managing the Apert hand following syndactyly release, for which there is little literature documentation. These innovative techniques have been successfully performed by the senior author and provide improved function and appearance for Apert patients.

Objectives
• Participants will learn about the effects of bone maturation on the progressive deformity of the Apert hand in the years following syndactyly release. • Participants will understand that additional treatment options for the Apert hand exist beyond syndactyly release. • Procedural diagrams and patient outcomes will convey the reconstructive and cosmetic utility of performing these adjunct procedures.

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Three-Dimensional Controlled Non-surgical Treatment of Hemifacial Microsomia in the Growing Child

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Reiko Shibazaki-Yorozuya


Ryo Sasaki


Yorikatsu Watanabe

Abstract
Background: We had already reported that the asymmetry correction with orthodontic/orthopedic activator treatment had produced facial symmetry in vertical dimension in three-dimension (3D) of Hemifacial Microsomia (HFM) at the 16th Congress of ISCFS 2015. Our aim of this study is to present 3D results of orthodontic/orthopedic treatment not only in vertically but also in horizontally/anteroposteriorly acceleration of maxillofacial growth in affected side of HFM.
Methods: A 11-year-girl with HFM; Pruzansky/Kaban classification type IIA. She was treated with only orthodontic/orthopedic activator to guide and promote skeletal growth with stimulation of the affected areas in growing period. 3D changes were compared between pre and post treatment vertically/ horizontally/anteroposteriorly comparison in 3D by using computed tomography (CT) images.
Results: In vertically, maxillary and mandibular ramus height on affected side growth were accelerated, and it's height were same as contralateral control side. Moreover, mandibular body growth on affected side was much accelerated than that of anteroposterior maxillary growth on affected side. Thus, the effect of this activator treatment was an excessive changes not only in vertically but also in horizontally/anteroposteriorly acceleration of maxillofacial growth in affected side of HFM.
Conclusions: This is the first report that shows three-dimensional controlled non-surgical treatment of HFM in the growing child in vertically but also in horizontally/anteroposteriorly acceleration of maxillofacial growth in affected side of HFM. Before this treatment, this patient had a plan that she will need maxillofacial reconstructive surgery after growth. However, she does not need any skeletal surgery anymore.

Objectives
Participants will be able to tell the effect of orthodontic/orthopedic treatment on asymmetrical facial growth in Hemifacial Microsomia.

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Sand Dollar & Staves Technique for Treatment of Unilateral Lambdoid Craniosynostosis in Non-Syndromic Patients: A Comparative Analysis of Operative Metrics and Aesthetic Outcomes

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Abstract

Background: Unilateral lambdoid craniosynostosis (ULC) is a rare form of craniosynostosis that produces asymmetric morphological changes to the calvarium with growth. Switch cranioplasty (SC) is the gold standard surgical intervention in patients older than 6 months of age, however, it often produces suboptimal aesthetic results. The Sand-Dollar & Staves technique (SDS) is an alternative to SC that employs virtual surgical planning to correct parietal bossing following suturectomy. In this study, we seek to compare operative metrics and aesthetic outcomes in patients treated with SC and SDS.

Methods: Retrospective review was performed to identify patients with non-syndromic ULC who were treated with SC and SDS from 11/1/2011- 5/1/2022. Variables collected included patient age at surgery, operative length, instances of transfusion, complications, and length of stay. Pre- and post-operative photographs were distributed to a panel of 6 surgeons to grade aesthetic outcomes.

Results: Fourteen patients who underwent surgical correction of ULC (4 with SC, 10 with SDS) were included in our study with a median age of 10 months at surgery. When comparing SC to SDS, we observed no differences in median operative length (148 minutes versus 142 minutes, p=0.84), number of patients requiring transfusion (4 [100%] versus 3 [30%], p=0.07), and median length of stay (4 days versus 3 days, p=0.47). No complications were observed. Twelve patients (3 SC, 9 SDS) had both pre- and postoperative photographs. Of these patients, 5 (1 [33%] SC, 4 [44%] SDS) were deemed to have a "very abnormal" head shape at baseline. Sixty percent and 72% of

responses stated that patients treated with SC and SDS had moderate-to-significant improvement of their cranial morphology after surgery, respectively.
Conclusion: SDS is comparable to SC for operative metrics and aesthetic outcomes. Further comparative studies with larger sample sizes are needed to derive definitive conclusions regarding the efficacy of SDS.

Objectives

1) Participants will be able to describe the morphological sequelae of unilateral lambdoid craniosynostosis. 2) Participants will be able to understand the benefits and limitations of various surgical interventions for treating isolated, unilateral lambdoid craniosynostosis in the non-syndromic population. 3) Participants will be able to describe each step of the Sand Dollar & Staves technique for treatment of unilateral lambdoid craniosynostosis.

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Three-dimensional comparative changes in the pharyngeal airway of patients with cleft after two-jaw orthognathic surgery

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Abstract

Background: The present study evaluated the three-dimensional changes of the pharyngeal airway after orthognathic surgery (OGS) in patients with unilateral and bilateral clefts, and in unilateral cleft patients with and without pharyngeal flap (PF).
Methods: Forty-five patients with unilateral or bilateral clefts receiving OGS were enrolled. Cone-beam computed tomography images were obtained before (T0) and after (T1) OGS. We measured the pharyngeal airway volumes, minimal cross-sectional area, and the horizontal displacement of facial landmarks.
Results: The patients with bilateral cleft exhibited smaller initial velopharyngeal volume (unilateral: 8623 mm3; bilateral: 7781 mm3; p = 0.211), while the velopharyngeal volume increased significantly with median of 744 mm3 after OGS (p = 0.031). The median horizontal displacement of A point was 2.9 and 2.6 mm among the patients with unilateral and bilateral clefts, respectively (p = 0.276), and the median horizontal displacement of B point was −2.9 and −3.3 mm among patients with unilateral and bilateral clefts, respectively (p = 0.618). The unilateral cleft patients with PF exhibited lower initial velopharyngeal volume (PF+: 7582 mm3; PF–: 8756 mm3; p = 0.129) and a lower increase in velopharyngeal volume (PF+: 437 mm3; PF–: 627 mm3; p = 0.739) after OGS.
Conclusions: Midface hypoplasia and the decrease in the velopharyngeal volume were more prominent among the bilateral cleft patients and the unilateral cleft patients with PF. After OGS, the velopharyngeal volume considerably increased among the bilateral cleft patients, but no considerable differences were noted among the unilateral cleft patients with PF.

Objectives

(1) compared the severity of midface retrusion between unilateral and bilateral cleft patients based on 3D pharyngeal airway volume analysis (2) compared the pharyngeal airway differences in the aspects of linear, area and volume before and after orthognathic surgery between unilateral and bilateral cleft (3) compare the airway change in cleft patients with pharyngeal flap receiving two-jaw orthognathic surgery

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Microsurgical Reconstruction of Skull Base Oncologic-Related Defects

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Justin Cheng


Solomon Lee


William Hoffman


Esther Kim

Abstract
Background: Reconstruction following surgical extirpation of skull base tumors remains challenging to reconstructive surgeons. We review our free flap coverage for skull base reconstruction to elucidate associations between clinical characteristics and postoperative outcomes.
Methods: We retrospectively reviewed our patients who underwent microsurgical reconstruction of skull base defects. Various demographic, perioperative, and postoperative variables were recorded.
Results: 83 patients underwent reconstruction between 1996-2019. The average age was 55.8 +/- 17.5 years. 74.6% of reconstructions were done immediately following oncologic resection. Over 83% of patients had a history of radiation prior to reconstruction.
Most defects (61.9%) were in the anterior cranial fossa. Free flaps included: rectus abdominis (56%), radial forearm (18%), anterolateral thigh (15%), latissimus dorsi (9.5%), and fibula (1.1%). The most common recipient vessels were the superficial temporal (56%) and facial vessels (35.7%). 25.9% of reconstructions required subcutaneous tunneling of flap pedicles to reach recipient vessels. Implantable venous dopplers were utilized in 65.2% of reconstructions.
The overall complication rate was 38.1%, with 21.4% of patients returning to the operating room. 3% returned to the operative room for removal of bone flap secondary to swelling. Common complications were infection (13.1%), wound dehiscence (8.3%), and CSF leak (4.7%). Age greater than 65 years and history of coronary artery disease were significantly predictive of any postoperative complication ($p<0.05$). Flap success rate was 96.3%. Three patients had partial or total flap loss.
Conclusions: Our experience is one of the largest series of microvascular skull base reconstructions reported. Despite expected complications, there were few CSF leaks, with no instances of meningitis. This demonstrates the high success of microvascular flaps in reconstruction of skull base defects.

Objectives
1) Participants will be able to elucidate significant associations between clinical characteristics and postoperative outcomes. 2) Participants will appreciate the high success rate of microvascular flaps in reconstruction of skull base defects. 3) Participants will be able to identify common complications post skull base reconstruction.

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The Sternocleidomastoid Muscle–parotid Space Approach Reduces the Risks of Postparotidectomy Salivary Fistula

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Lin Lan


Wei Wang


Diancan Wang

Abstract
Background:Parotid gland tumors are common and mostly benign. The main treatment is surgical excision. Postoperative fistulas are frequent surgical complications of parotid tumor resection. Extracapsular dissection by the sternocleidomastoid parotid space(SPS; “Diancan’s space”)approach can significantly reduce the probability of salivary fistula.
Methods: We enrolled 52 patients who underwent extracapsular dissection by SPS without salivary fistula prevention measures.This procedure comprises two steps; the first is a direct approach to the tumor through the SPS with simultaneous adenocutaneous flap establishment; and the second is extracapsular dissection of the parotid tumor through the exposed SPS. Postoperative sialoceles and fistulas were evaluated during 2 months of follow-up.
Results: Among all the 52 patients, only one male patient developed a mild sialocele. No salivary fistulas occurred. The overall rate of sialocele/fistula formation was only 1.92%.
Conclusions: When treating clinically benign tumors that involve the sternocleidomastoid parotid space, extracapsular dissection by the sternocleidomastoid parotid space(SPS; “Diancan’s space”) approach can generally avoided most surgical complications, postoperative sialocele, and salivary fistulas without using any specific intraoperative and/or postoperative measures to prevent or treat sialocele/fistula.

Objectives
sternocleidomastoid parotid space; parotid gland tumors; salivary fistula

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Outcomes of patient and public involvement for a European clinical guideline on Robin sequence

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Elin Weissbach

Abstract
Background: A European Guideline on Robin sequence (RS) was initiated by the European Reference Network for Craniofacial Anomalies and ENT disorders (ERN-CRANIO). To gain insight in parents' experiences and to identify encountered obstacles and needs in the organization of care, a so called patient and public involvement (PPI) was performed.
Method: A survey in eight languages was shared with parents of RS patients in twelve participating hospitals of ERN-CRANIO with closed-ended and open-ended questions. Open-ended questions were utilized to invite parents to specify positive and negative aspects in the organization of care. Quantitative survey data was analyzed using descriptive tools such as cross tables. The open-ended questions were reviewed and ordered by open descriptive and thematic coding.
Results: 94 parents from eight countries participated in the survey. 58.5% of the parents reported difficulties in the organization of care in the first few weeks after birth. The following themes were most commonly addressed: (1) problems with early recognition of the disease and referral to specialized multidisciplinary teams; (2) importance of prenatal suspicion of RS and early access to specialized care takers and facilities; (3) improving information and practical instructions on feeding and breathing in non-expert centers as well as accessory material; (4) need of multidisciplinary expert centers with a contact point for parents and a coordinator for both, specialized care and communication with external/ regional health care providers; (5) importance of structural psychological counseling.
Conclusion: Parents report common obstacles in the care for children with RS, often related to the first weeks of life. Their experiences emphasize the need of early recognition of RS, the multidisciplinary aspect of care and the importance of practical support for breathing and feeding in the first weeks of the child's life. Recommendations regarding the organization of care are addressed in the European guideline.

Objectives
1) Participants will be aware of possible obstacles encountered by parents in their care process. 2) Participants can use the information to evaluate their care process 3) Participants can develop care paths for RS patients considering parents needs

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Neurocognitive outcome in Sagittal synostosis patients

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Melissa Kurniawan

Abstract
Background: The aim of this study is to evaluate the neuro-cognitive profile of sagittal synostosis patients (SS) with behavioral or developmental problems, and to assess the results after three different surgical techniques, Frontobiparietal remodeling (FBR), Extended Strip Craniotomy (ESC), and Spring-assisted Craniotomy (SAC)
Methods: 544 patients with SS were born between 2000 and 2018. If parents or their environment, noticed developmental or behavioral problems, physicians offered a referral to the child psychologist. Patients were then offered an intelligence test.
Results: 103 patients were invited, of which 78 patients were tested. Of these, 31 (39.7%) were diagnosed with ADHD. In the complete cohort, the prevalence of ADHD is 7.35%. 77 patients were operated with an FBR (n = 28), ESC (n = 23), or SAC (n = 26).
The mean Full Scale Intelligence Quotient (FSIQ), Verbal Intelligence Quotient (VIQ), and Performance Intelligence Quotient for SS patients were 96.34 (SD 13.75), 98.21 (SD 14.51), and 96.10 (SD 12.98), respectively. The mean FSIQ and PIQ were significantly lower compared to the norms provided by the test (p = 0.02). Additionally, a significantly lower Visual Spacial Index was found compared to the norm (mean 91.82, SD 16.80, p = 0.005). There are no significant differences in FSIQ, VIQ, PIQ, or any of the intelligence index scales between surgical techniques, in both uncorrected and corrected analyses for possible effects of sex, age at surgery, and parental education level. Additionally, the timing of surgery is not correlated with the neuro-cognition.
Conclusion: In 18.9% of the patients with sagittal synostosis, parents have concerns about behavior or developmental level. In this group, intellectual ability was mildly lower compared to the norm, which can be explained by the high percentage of ADHD in this subgroup. In addition, surgical technique and timing of surgery do not affect the neuro-cognitive profile.

Objectives
Participants will understand the longterm neuro-cognitive outcome in sagittal synostosis patients. Participants will understand the effect of type and timing of surgery on neuro-cognitive outcome Participant will understand the prevalence of behavior or developmental problems and its relation to the neuro-cognitive outcome

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Health-related quality of Life in children and adolescents with sagittal synostosis

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Melissa Kurniawan

Abstract
Background: This study aims to evaluate the quality of life in patients with sagittal synostosis who are previously treated, and compare them with a cohort of unaffected children. The secondary aim is to assess the influence of the occurrence of frequent headaches and surgical technique on the quality of life.
Methods: All patients with sagittal synostosis between 8 and 18 years old were invited to participate between June 2016 and February 2017. The Child Health Questionnaire (CHQ PF-50) was used to evaluate the health-related quality of life. To assess information regarding headache symptoms, a detailed questionnaire was used. The control group consisted of 353 schoolchildren, aged 5 – 14 years.
Results: 94 parents of patients with sagittal synostosis were approached to participate in the study, of which 68 (72.34%) parents participated in the study by completing the CHQ-PF50. The average age of the participating children was 12.04 years. The CHQ for patients with sagittal synostosis was similar to those of the normal population, with exception of mild differences in Family cohesion ($p = 0.02$), Psychosocial summary ($p < 0.01$) and Physical summary ($p < 0.01$). All items of the CHQ-PF50 did not show any differences as a result of type of surgery, and were not correlated with age at surgery.
In total, 32 patients (47.1%) reported having headache complaints at least once a month. The CHQ of patients with frequent headache complaints showed a significantly lower score in 4 items between sagittal synostosis patients with and without headaches.
Conclusion: 47.1% of the sagittal synostosis patients had frequent headache complaints and a lower quality of life. Sagittal synostosis patients without headache complaints had no major differences compared to the normal Dutch population. The type of surgery, age at surgery, and age at CHQ completion did not affect the results.

Objectives
Participants will be able to understand the quality of life in sagittal synostosis patients compared to the normal population Participant will be informed about headache symptoms in sagittal synostosis patients and its effect of the quality of life Participants will be able to understand the effect of type and timing of surgery on the quality of life

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(Epi)genotype-phenotype correlations of Beckwith-Wiedemann syndrome in China

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Dongyi Lan

Abstract

Background:
Beckwith-Wiedemann syndrome is a rare congenital overgrowth disorder with various clinical features and (epi)genetic errors. The study aims to characterize the clinical features, (epi)genetic errors, and (epi)genotype-phenotype correlations in Beckwith-Wiedemann syndrome (BWS) in the last ten years.
Methods:
A retrospective study was performed on patients with Beckwith-Wiedemann syndrome between July 2013 to October 2022 from Children's Hospital of Fudan University. Clinical data, including demographics, clinical features, and molecular testing results, were collected, and the (epi)genotype-phenotype correlations were systematically analyzed. The clinical diagnosis standard and scoring were referred to the international experts' consensus. Patients clinically suspected or diagnosed with BWS were tested by MS-MLPA for (epi)genotyping.
Results:
242 BWS patients (119 males and 123 females) aged from 0 to 69 months were in the study. The most common clinical features were macroglossia (96.3%), followed by lateralized overgrowth (63.6%), and ear creases/pits (50.4%). Two hepatoblastomas and one Wilms' tumor were found in the cohort. The average BWS clinical score was 5.74±1.73 points. The (epi)genotyping results identified the three most common (epi)genetics errors: IC2 LOM, pUPD11, and IC1 GOM accounted for 37.2%, 13.6%, and 6.6%, respectively, of all patients who underwent molecular testing. A characteristic pattern was found in the three different molecular groups. Macroglossia, exomphalos, and facial nevus flammeus were more common in IC2 LOM than in IC1 GOM and pUPD11 ($p < 0.05$). Lateralized overgrowth was more common in pUPD11 than in IC2 LOM and IC1 GOM group ($p < 0.001$). Nephromegaly or hepatomegaly was more common in IC1 GOM than in IC2 LOM and pUPD11 ($p < 0.001$).
Conclusion:
The (epi)genotype-phenotype correlations delineate different phenotypic profiles. Molecular testing and standardization of BWS diagnostic procedures are of great significance for the early diagnosis and surveillance of BWS.

Objectives

Participants will be able to learn the genetic background of Beckwith-Wiedemann syndrome. Participants will be able to acknowledge the cardinal features such as macroglossia of Beckwith-Wiedemann syndrome. Participants will be able to acknowledge the study of (epi)genotype-phenotype correlations of Beckwith-Wiedemann syndrome.

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Prenatal Ultraviolet Exposure and Risk of Orofacial Clefts: A United States Birth Analysis

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Giap Vu

Abstract

Background: The etiology of orofacial clefts is thought to be multifactorial. Among the environmental factors, maternal ultraviolet (UV) exposure has not been shown to influence the risk of orofacial clefting in newborns. This study investigated the association between prenatal UV dose and cleft lip with/without cleft palate (CLP) and cleft palate only (CPO) in the U.S.

Methods: The U.S. 2014 and 2015 Natality Data were utilized (n = 7,986,908). Mean daily county-level population-weighted erythemally-weighted daily UV dose was calculated over two specific periods for each live birth, namely the first trimester and the three months prior to conception. Multivariable logistic regressions controlled for household demographics, prenatal characteristics, infant characteristics, and socioeconomic factors.

Results: Of 7,692,735 live births included, 3,895 (0.05%) had CLP and 1,483 (0.02%) had CPO. Higher mean daily UV dose during the first trimester was associated with statistically significantly lower odds of CPO (aOR = 0.99 [0.99, 0.99], $p < 0.001$); this effect was not significant for CLP (aOR = 0.99 [0.99, 1.00], $p = 0.596$). The odds of CPO and CLP were independent of the mean daily UV dose during the three-month pre-conception period ($p = 0.117$ and 0.357, respectively). The models confirmed several known risk factors for CLP, including lower maternal education level, delayed prenatal care, and maternal obesity (all $p < 0.001$), and those for CPO, such as presence of other congenital disorders ($p < 0.001$) and maternal gestational diabetes ($p = 0.039$).

Conclusions: Higher daily maternal dose of UV during the first trimester was associated with decreased odds of CPO after controlling for risk factors for orofacial clefting. Given that palatogenesis occurs in the first trimester, our study suggested that UV and UV-mediated metabolic processes may be implicated in palatal development. Further studies are needed to confirm this association and elucidate its mechanism.

Objectives

Participants will be able to: - Be aware of a previously unknown environmental association with orofacial clefts, namely prenatal ultraviolet dose. - Be aware that the timing of the ultraviolet dose matters in the association with orofacial clefts. - Review the risk factors for orofacial clefts.

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^{99m}Tc-MDP Bone scintigraphy can be a novel method for distinguishing condylar osteochondroma from unilateral condylar hyperplasia: A retrospective diagnostic test study

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Abstract

Background: Condylar hyperplasia and condylar osteochondroma can lead to similar clinical symptoms and the differential diagnosis is complicated. However, these two diseases exhibit different biological behaviors and require different therapeutic principles. Thus, accurate clinical evaluation and differential diagnosis are crucial before surgery. To explore the diagnostic value of 99mTc-MDP bone scintigraphy for these two diseases, we conducted this retrospective diagnostic test.
Methods: 57 consecutive cases were recruited in this research. 20 were diagnosed with condylar hyperplasia and 37 were diagnosed with condylar osteochondroma. All of the patients' basic information and presurgical examination, including presurgical 99mTc-MDP bone scans results, related presurgical laboratory tests results, and the systematic inflammation index, were applied as clinical indicators to distinguish these two diseases.
Results: Patients with condylar osteochondroma had higher bone scintigraphy values than patients with condylar hyperplasia ($p < 0.01$). No significant differences existed among the other indicators ($p>0.05$). All three variables (the uptake ratio, the relative uptake, and the difference of condyle to reference) showed a moderate association with the final diagnosis (the coefficient, $\rho=0.45$ or 0.40, respectively). These results suggested that the higher the value of bone scintigraphy, the greater the probability of diagnosis of condylar osteochondroma. Further diagnostic tests showed a promising diagnostic effect of bone scintigraphy (AUC=0.77 or 0.74, respectively).
Conclusions: The retrospective study suggested that 99mTc-MDP bone scintigraphy has the capacity to distinguish condylar osteochondroma from condylar hyperplasia, and patients who exhibit higher bone scintigraphy values have a higher probability of a condylar osteochondroma diagnosis.

Objectives

1.Participants will be able to use bone scintigraphy to distinguish condylar osteochondroma from unilateral condylar hyperplasia. 2.Participants will be able to know the therapeutic principle of condylar osteochondroma and unilateral condylar hyperplasia. 3.The introduction of this method will bring a radical innovation in diagnosing these two diseases, transferring from the previous qualitative diagnosis to quantitative diagnosis.

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A validated computational model of normal craniofacial growth up to 4 years of age

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Ce Liang

Roman Hossein Khonsari

David Johnson

Paul O'Higgins

Mehran Moazen

Abstract

Background: Predicting craniofacial growth using computational models enable us to compare different reconstruction techniques for the management of craniofacial abnormalities. We previously developed a model of calvarial growth and applied it to optimise the management of sagittal craniosynostosis. The aim of this study was to further advance our computational framework to predict whole craniofacial growth up to 48 months of age using the finite-element method.
Methods: In vivo data were collected as a series of 2D and 3D measurements, including 47 linear cranial dimensions and 4 inner cavities (intracranial, orbital, nasal cavity and palatal volumes), on normal head CTs (n=217, 0-48 months). Skull model derived from a 3-month-old individual using manual segmentation to identify and isolate 22 cranial bones, 44 sutures, 6 fontanelles, and 4 cranial volumes. Three methods were implemented to simulate growth: (1)linear thermal expansion of craniofacial volumes; (2)directional expansion of the midfacial complex and skull base; (3)bone formation at sutures/fontanelles using various in vivo fusion rates. Elastic moduli of bones/sutures/fontanelles were updated with age to replicate tissue differentiation across the sutures. Contact algorithm was implemented across the inner cavities and surrounding skeletons.
Results: Cranial cavities were expanded to target volumes with less than 3% differences at each loadstep. Key cranial size measurements obtained from the in silico models matched the mean in vivo model at the predicted ages (within 5%), with the exception of the zygomatic arch. Overall morphological variances were quantified by comparing the in silico models to in vivo crania at the ages of 6,12,24,36&48 months. The predicted crania match the real ones well, with the largest differences of ~8% found at the posterior skull base at 48 months.
Conclusion: This study presents a validated computational framework based on finite-element methods to model postnatal craniofacial growth in humans.

Objectives

1. Characterize the normal craniofacial growth up to 4 years of age; 2. Establish a validated computational framework to predict whole craniofacial growth; 3. Generate in silico skull models at specific ages from 0-4 years.

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Comparative assessment of orthodontic and aesthetic outcomes after orthognathic surgery with clear aligner or fixed appliance therapy

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Shin-Shi Tzeng

Abstract

Background: Clear aligner therapy has an aesthetic advantage over fixed appliance therapy. However, to our knowledge, no study has objectively compared patient orthodontic and aesthetic outcomes between clear aligner and fixed appliance therapies administered after orthognathic surgery (OGS).
Methods: This study included patients with no history of congenital craniofacial deformities who underwent surgery-first OGS and received clear aligner or fixed appliance therapy. The patients' grades on the Dental Health Component (DHC) and Aesthetic Component (AC) of the Index of Orthodontic Treatment Need and scores on the Peer Assessment Rating (PAR) index were calculated before OGS (T0), after OGS (T1), and after orthodontic therapy (T2).
Results: This study included 33 patients (clear aligner therapy, 19; fixed appliance therapy, 14). No considerable between-group differences were noted in the DHC and AC grades at T0, T1, or T2. Furthermore, %reduction in the PAR index score was more significant in the clear aligner group (74.4%) than in the fixed appliance group (63.2%) from T0 to T1 ($p = .035$); however, no between-group differences were noted from T1 to T2 or from T0 to T2. Both groups exhibited substantially improved DHC grades, AC grades, and PAR index scores at T1 and T2.
Conclusions: Patient outcomes were similar between the clear aligner and fixed appliance groups after orthodontic therapy. However, the former group exhibited more favorable immediate results after OGS than did the latter group. Thus, as an adjunct therapy for patients with malocclusion, clear aligner therapy may be more effective than fixed appliance therapy.

Objectives

1. Participants will be able to understand the difference between the clear aligner and fixed appliance. 2. Participants will be able to understand clinical outcomes between the clear aligner and fixed appliance groups after orthodontic therapy. 3. Participants will be able to create new idea of clinical selection after orthodontic therapy.

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Early Intervention Services in Single Suture Craniosynostosis

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Dylan Choi


Alexis Johns


Jeffrey Hammoudeh


J. Gordon McComb


Mark Urata

Abstract

Background: Given the higher risk for delays among children with craniosynostosis, early developmental interventions are often recommended. This study describes the early intervention services provided to children with non-syndromic single suture craniosynostosis with and without delays to inform multidisciplinary care.

Methods: The Bayley Scales of Infant and Toddler Development – Third Edition (Bayley-III) was administered to patients with isolated single suture craniosynostosis preoperatively, at 6 and 18 months postoperatively, and at age 36 months to identify delays in development, defined as one more score(s) below the 10th percentile. Caregivers reported on intervention services.

Results: Participants (N=268) had sagittal (50%), unicoronal (26%), or metopic (24%) craniosynostosis with surgery completed at a mean age of 8.3±4.4 months. Participants were mostly male (67%), were either Latinx (49%) or European American (27%), and had public insurance (57%). Familial socioeconomic status was generally evenly distributed. Across time points for the total sample, 25% of patients had received any developmental intervention, including: speech therapy (16%), early child development (12%), occupational therapy (10%), and physical therapy (8%). Services were provided at any time for participants with delays in development on the Bayley-III for 49% preoperatively, 63% six-months postoperatively, 67% 18-months postoperatively, and 65% at age 36 months. Delays in development were broadly unrelated to sociodemographic factors. Families with public insurance (30%) accessed early intervention services significantly more than those with private insurance (18%), X^2=4.88, P=.023, likely reflecting statewide funding for services for lower income families.

Conclusions: While a quarter of children with single suture craniosynostosis received at least one developmental intervention by age 36 months, a third to half of children with delays did not receive intervention services. Craniosynostosis providers should help address barriers to accessing early intervention, including advocating for interventions with third party payers for families that may not be eligible for public services.

Objectives

1) Participants should be able to list the rates of early intervention services provided to children with non-syndromic single suture craniosynostosis. 2) Participants should be able to describe the rates of early intervention services provided to children with non-syndromic single suture craniosynostosis who had a delay in their development. 3) Participants should be able to identify barriers to receiving developmental intervention.

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Destructive nasofrontal dermoid cyst in a female toddler: A case report.

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Sarayuth Dumrongwongsiri

Abstract
Background:
Nasal dermoid is a rare developmental anomaly with an incidence of 1 per 20000 to 40000 births. The lesion can present as cyst, sinus or fistula and may extend intracranially. We present a case of a 21-month-old girl who presented with a bulging mass at her glabella area. The bulge had been noticed by her parents after a falling accident 4 months ago.

Method:
Initial examination at a local hospital was unremarkable except for the midline bulge at her glabella. She was referred to our center where the diagnosis of nasofrontal dermoid cyst was made. According to the CT scan, her lesion seemed to be destructive, evidenced by progressive osteolysis of the frontal bone.
An urgent operation was performed to remove the affected part and to immediately reconstruct the frontal bone unit.

Result:
The postoperative period was uneventful. She recovered very well in a short period of time. Her development was uninterrupted. Postoperative CT scans were followed at early postoperative days and at 6 months after surgery.

Conclusion:
We present a case of nasofrontal dermoid cyst and sinus with a frontal bone destruction. The lesion was initially misdiagnosed. After the thorough evaluation, the correct diagnosis and management had been performed to achieve the beautiful result.

Objectives
Participants will be able to 1. Evaluate a child presented with frontal bone bulge 2. Manage nasofrontal dermoid cyst with frontal bone defect 3. Apply the technique of split calvarium graft in a toddler patient

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Combining Microsurgery with Craniofacial Techniques for Challenging Problems: a Multi-Institutional Experience

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Naji Bou Zeid


Akriti Choudhary


Pravin Patel


Chad Purnell


Lee Alkureishi

Abstract

Background: Craniomaxillofacial surgery encompasses a wide spectrum of surgical problems of varying complexity. Traditionally, craniofacial problems are treated with osteotomies, distraction, and local flaps. However, in complex situations, the collaboration between craniofacial and microsurgeon is needed to optimize outcomes. In this study, we review our multi-institutional experience in performing craniofacial reconstruction employing microsurgical techniques.
Methods: Patients with craniofacial deformities at two university-affiliated hospitals, who underwent combination surgeries employing microsurgical and craniofacial techniques between 2014 and 2022 were identified and retrospectively reviewed.
Results: Eleven patients were identified; the mean age at surgery was 22.18 ± 9.4 years. Six patients (55%) were male and 5 (45%) were female. Of these, 3 (27%) had syndromic craniofacial defects, 2 (18%) had previously been surgically treated for oncologic reasons, and 2 (18%) had traumatic injuries to the face. Craniofacial techniques employed included Lefort 1 osteotomy (3), Split Sagittal Osteotomy (4), Temporomandibular joint arthroplasty (1), and mandibular distraction (3). Free flaps included fibula osteoseptocutaneous (6), radial forearm (4), and second metatarsophalangeal joint with metatarsal (1). The mean estimated blood loss was 761 ± 451 mL and the mean length of stay in the hospital was 15 days (min:5, max: 42). Mean operative time was 11h 8min (±53.3 min). There were 4 early reoperations for venous congestion (n=1) or hemorrhage/hematoma (n=3). There were 6 late flap revisions for partial flap necrosis (n=3), wound healing problems (n=3), and 6 post-operative infections.,and one patient (9%) required temporary tracheostomy. All patients were discharged home, and the surgical goals were met in all cases.
Conclusions: Craniofacial and microsurgical techniques are safe and efficient to perform together with a two-team approach. Furthermore, widespread adoption of microsurgical techniques in plastic surgery training is likely to further cement microsurgery's place as a useful tool in the armamentarium of the craniofacial surgeon.

Objectives
Participants will be able to review our experience in performing craniofacial procedures employing microsurgical techniques. Participants will also be able to discern the different complications and complication rates in complex surgical cases employing both techniques. Participants will finally be able to discern the safety and efficiency of the use of microsurgical techniques in craniofacial surgery, especially in complex cases.

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Craniometric and Aesthetic Outcomes in Craniosynostosis Surgery: A Systematic Review and Meta-analysis

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Chad Purnell

Michael Edgar

Akriti Choudhary

Shreya Raman

Lee Alkureishi

Abstract

Background: Controversy exists as to whether minimally invasive cranial procedures or open cranial vault remodeling (CVR) is the ideal procedure to treat craniosynostosis. A large portion of this centers around degree of head shape correction. We aimed to systematically review the comparative aesthetic outcomes in available literature to assess to what degree this question is answered.

Methods: A PRISMA-compliant systematic review was performed. Articles were included if they compared spring cranioplasty, strip minimally invasive craniectomy or CVR for outcomes related to aesthetics or head shape. Meta-analysis was performed, when indicated, using a random-effects model using cranial index (CI) as a continuous variable. Egger regression and Funnel plots were utilized to assess for publication bias.

Results: Forty-two studies were included, with 2402 patients in total. Twenty-five studies (59%) evaluated sagittal craniosynostosis, with metopic (7; 17%) and unicoronal (4; 10%) the next most prevalent. Thirty-eight studies (90%) included CVR, 24 (57%) included strip craniectomy with helmeting, 9 (22%) included strip craniectomy without helmeting, 11 (26%) included spring cranioplasty, and 3 (7%) included vault distraction. A majority of studies only used 1 (42.9%) or 2 (14.3%) craniometric measures to compare techniques. In sagittal synostosis, 13 (59%) studies showed no difference in craniometric outcomes, 5 (23%) showed better results with CVR, 3 (14%) with strip craniectomy, and 1 (5%) with springs. In studies describing other synostoses, 10/14 (71%) showed equivocal results. Subjective outcome measures followed similar trends. Meta-analysis showed no significant difference in CI outcomes between CVR and less invasive procedures in patients with sagittal synostosis.

Conclusion: There is no difference in CI outcomes between CVR and less invasive procedures in sagittal craniosynostosis. The majority of literature comparing craniometric and aesthetic outcomes between CVR and less invasive procedures shows equivocal results. As continued comparative studies are published, more detailed craniometric analyses should be performed.

Objectives

At the end of this presentation, the learners will be able to- 1. Summarize the published data on comparative outcomes of open techniques and the minimally invasive surgical procedures available to treat patients with craniosynostosis 2. Design studies comparing aesthetic outcomes between techniques in craniosynostosis with more detailed and robust craniometric measures. 3. Counsel patients using data-driven knowledge to better guide treatment plans for craniosynostoses.

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Application of submental intubation for simple airway management in panfacial fracture. A report on 31 cases.

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TUYEN LE


Binh Nguyen


Quang Dong


Tu Doan

Abstract

Background: The fracture of the craniomaxillofacial complex usually involves both the occlusion and the skull base. Therefore, this hinders the use of the traditional nasal and oral intubation. As a result, elective tracheostomy is the method of choice for intubation in these situations. However, tracheostomy also associates with several complications such as hemorrhage, trachea collapse or pneumothorax. So, the utilization of submental intubation is advocated as a quick and simple method to secure the airway while leaving the occlusion free for manipulation.
Methods: 31 patients with panfacial trauma which involved the occlusion and had nasal intubation contraindicated were included in the study. All patients underwent submental pathway for endotracheal intubation. The operation time, complication, occlusion and scar esthetic were assessed.
Results: The average operation time for submental intubation only was 10.32 min. No complication such as bleeding, hematoma, Wharton's duct injury was noted. The occlusion was good in all cases. There was one case with unesthetic scar formation however it was well hidden in the submental area.
Conclusion: Submental intubation is a quick and easy method for panfacial trauma which may replace elective tracheostomy in cases which do not require prolonged intubation.

Objectives

Participants will be able to understand the contraindication of nasal and oral intubation in panfacial trauma. Understand the advantages of the submental intubation. Understand the technique of submental intubation.

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Development of Craniofacial Surgery in India

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Rajiv Agarwal

Abstract
Craniofacial Surgery can be considered a later addition to the repertoire and armamentarium of the plastic surgeon in the Indian context. It is one of those subspecialties of plastic surgery which requires specialized training, state of the art infrastructure, sophisticated instrumentation, teamwork with neurosurgeon and intensivists. These were the very reasons for its late start in India. Before the 1970s there were no craniofacial surgery procedures that were being done in India. Craniofacial surgery kickstarted in India with the arrival of Dr. Ian Jackson who can be considered as the first trained foreign plastic surgeon to have performed these procedures in the 1980s. The credit of this milestone event goes to Dr. Ramesh Chandra of Lucknow who invited Dr. Jackson to perform the very first craniofacial surgery procedure of orbital hypertelorism correction which was successfully executed by him. Surgeons in India performing craniofacial surgery can be conveniently categorized into three groups. The first group are the ones who could gain entry into these accredited training programs across the globe with training duration of one year. Dr. Ramesh Sharma of Chandigarh trained with Dr. I.T Jackson in Michigan unit in 1993-1994. Dr. Rajiv Agarwal trained with another pioneer craniofacial surgeon, Dr. Kenneth E Salyer at International Craniofacial Institute in Dallas Texas from 1999-2000. Dr. Surajit Bhattacharya and Dr. Anil Murarka trained at the Australian Craniofacial Unit in Adelaide with Dr. David David. The second group of surgeons in India are the ones who underwent a very short term observership in craniofacial surgery as PSEF / ASPS fellows. They started doing craniofacial procedures with only a short exposure without hands on training. The third group of surgeons are the ones who did not undergo any formal training in craniofacial surgery but are performing these procedure as “self trained craniofacial surgeons”.

Objectives
1. Development of craniofacial surgery in India 2. Problems in craniofacial surgery in India 3. Types of craniofacial surgeons in India

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Mandibular Fracture Patterns and Associations with Other Craniofacial Fractures

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Allison Karwoski


Bashar Hassan


Seray Er


Eric Resnick


Michael Grant

Abstract
Background: Mandibular fractures occur in up to 55% of facial and skull fractures and are often associated with other craniofacial fractures. Our purpose is to determine mandibular fracture patterns and associations with other craniofacial fractures.
Methods: A retrospective review was conducted of trauma patients who presented with mandibular fractures in 2018 and 2019. Excluded were patients <18 years old. Demographics, mandibular fracture location, and other craniofacial fractures were reported. Descriptive statistics were calculated. Chi-squared and Fisher's exact tests were performed.
Results: Of n=242 patients, the median (interquartile range [IQR]) age was 32 (25-49) years, and n=192 (79.3%) were males. A total of n=166 [68.6%] patients had multiple mandibular fractures. The two most common mandibular fractures were body (n=106 [43.8%]) and angle fractures (n=91 [37.6%]). A total of n=102 (42.1%) patients had another facial fracture, most commonly orbital floor fracture (n=38 [15.7%]), pterygoid fracture (n=36 [14.9%]), and maxillary sinus fracture (n=36 [14.9%]). A total of n=24 (9.9%) patients had skull fractures, most commonly skull base fracture (n=12 [5.0%]). Cervical spine fracture was present in n=12 (5.0%) patients. Patients with multiple mandibular fractures were more likely to have orbital floor compared to those with a single mandibular fracture (n=20 [12.0%], n=18 [23.7%], P=.024). Patients with subcondylar fracture were more likely to have fracture of the frontal process of the maxilla compared to those without subcondylar fracture (n=6 [13.3%], n=5 [2.5%], P=.007). Patients with coronoid process fracture were more likely to have orbital floor (n=8 [38.1%], n=30 [13.6%], P=.008), orbital wall [n=6 [28.6%], n=19 [8.6%], P=.012), zygoma (n=7 [33.3%], n=27 [12.2%], P=.016), maxilla (n=7 [33.3%], n=28 [12.7%], P=.019), and maxillary sinus fractures (n=7 [33.3%], n=29 [13.1%], P=.022) compared to patients without coronoid process fracture.
Conclusions: We highlight mandibular fracture patterns and associations with other craniofacial fractures which physicians should be aware of.

Objectives
1. The audience will appreciate the incidence of facial, skull, and cervical spine fractures associated with mandibular fractures. 2. The audience will be made aware of certain mandibular fracture patterns and significant associations with other craniofacial fractures. 3. The audience will be able to recognize these patterns in their clinical practice and look for them when encountering patients presenting with mandibular fractures.

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A decision algorithm for selection of spring driven posterior vault expansion design for treatment of craniosynostosis.

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Juling Ong

Abstract

Background

Posterior cranial vault expansion (PVE) operations are an effective technique to enlarge the cranial vault in children with craniosynostosis. At GOSH we use different designs of spring driven Posterior Vault Expansion (sPVE) surgery to increase volume and alter shape to address the individual functional and aesthetic indications of our patients. These include Classical and Vertical Vector sPVE designs with additional modifications to address shape. This study assesses the indications and outcomes for children undergoing sPVE operations and proposes a decision algorithm.

Methods

100 Consecutive children undergoing sPVE at Great Ormond Street Hospital from 1/3/2018 were included. Data for demographic, clinicopathologic and operative factors were prospectively recorded in the electronic patient record and statistical analysis was performed with SPSS.

Results

Between 2018 – 2023, 100 sPVEs were performed. The majority (90/100) of these patients had multisuture synostosis. Equal numbers of each type of sPVE were perfomed. Children in the classical group were younger (1.4 vs 4.7 yrs of age; $p<0.001$) and weighed less (10.3 vs 19.3kg; $p<0.001$) at surgery. The majority (80/100) of patients had surgery for functional indications. Of the 20 patients undergoing PVE for aesthetic reasons 18 had a Classical PVE. The Vertical Vector sPVE was used in 9/15 cases of secondary surgery. The classic PVE was most likely to be used for brachycephalic head shapes with the Vertical vector design used for normocephalic and scaphocephalic head shapes ($p<0.001$). There was no significant difference in volume of expansion between the two techniques. There was no significant difference in operative morbidity or length of stay different between groups.

Conclusions

SPVE techniques with similar efficacy and safety profiles can be selected to address individual aesthetic and functional indications in children with craniosynostosis. An algorithm to aid selection of each sPVE technique is proposed to aid decision making.

Objectives

Participants will be able to: 1. describe the different types of spring driven PVE 2. select the appropriate spring PVE for patients with different clinical indications 3. understand the risks and benefits of each spring PVE technique

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Does the Low and Short Medial Cut Affect Lingual Nerve Recovery After Sagittal Split Osteotomy?

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Philip Tolley

Abstract
Purpose: To evaluate the recovery of lingual nerve (LN) neurosensory function in patients undergoing sagittal split osteotomy (SSO) of the mandible with a low and short medial horizontal cut.
Methods: This was a prospective study of patients with mandibular deformities undergoing SSO at a tertiary care center over a 4-year period. All study subjects underwent SSO with a low and short medial horizontal cut. The outcomes of interest were neurosensory recovery of the LN, as assessed objectively using functional sensory recovery (FSR) and subjectively by patient report.
Results: The sample included 123 SSOs with a low and short medial cut were performed in 62 subjects with a mean age of 19.3 + 3.1 years. Thirty-seven (61.7%) subjects were female. Mandibular advancements were performed in 52 SSOs (42.3%); mandibular setbacks were performed in 71 SSOs 57.7%). One subject underwent revision BSSO. Fixation was miniplate at 108 sites, bicortical screws at 5 sites, and a combination of miniplates and bicortical screws at 10 sites. FSR was achieved at 122 LNs (99.1%) within 6-weeks post-operatively, with 120 sites (97.5%) having S4 sensation at 6-weeks. Decreased LN sensation was reported at 10 (8.3%) sites at 1-week post-operatively. At 6-weeks post-operatively, 118 sites (97.5%) had reported normal sensation. By 3-months post-operatively, all LN sites had S4 sensation and there were no subjective complaints. Revision sagittal split osteotomy was associated with prolonged (>6 weeks) subjective complaint of decreased sensation ($p = 0.02$) and prolonged time to S4 sensation ($p = 0.02$).
Conclusion: When using a low and short medial horizontal osteotomy in the SSO, LN sensory recovery occurs rapidly, with 99% of sites achieving FSR and subjectively normal sensation within 6-weeks of surgery and all patients achieving FSR with S4 sensation by 3-months post-operatively. LN sensory recovery may be prolonged in patients undergoing revision SSO.

Objectives
-Participants will learn the difference between short and low vs. traditional (higher) medial cuts in sagittal split osteotomy (SSO) of the mandible. -Participants will learn why the lingual nerve is at risk of damage during SSO and the likelihood of recovery of function with the short and low medial approach. -Participants will be able to apply this knowledge of safety to patients that may benefit from a short and low medial osteotomy.

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The effect of helmeting on head circumference following endoscopic strip craniectomy for metopic craniosynostosis

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Natalie Bishop

Juling Ong

Abstract

Background

Endoscopic strip craniectomy and helmeting (ESCH) is an effective treatment for metopic craniosynostosis. A key feature of this treatment is the focal restriction of cranial growth by a custom cranial orthosis following surgery. Reductions in growth velocity may raise concern for the development of multisutural craniosynostosis. This study examines the effect of helmeting on cranial growth velocity throughout treatment.

Methods

Analysis was performed on Imaging from patients undergoing ESCH for metopic craniosynostosis between 2019 to 2022.

Results

Forty-five children who underwent endoscopic strip craniectomy with helmeting were included. Of these, 27 completed helmet therapy, while 18 were still undergoing helmet therapy at the time of the study. 25 children received three and two children received four helmets. No helmeting information was available for two children (excluded from the analysis). Forty-three, 40 and 27 children had z-scores for head circumference measured during helmet 1 (for up to 199 days), helmet 2 (for up to 195 days) and helmet 3 (for up to 208 days) that were not significantly different from 0 (helmet 1 mean z-score: 0.1171, 95% CI -0.0685–0.3027; P=0.2140; helmet 2 mean z-score: 0.1171, 95% CI -0.0685–0.3027; P=0.2140; and helmet 3 mean z-score: 0.0251, -0.2185–0.2687; P=0.8373). Z-scores for helmets 2 and 3 were not significantly different from helmet 1 (helmet 2 z-score mean difference: 0.0885, 95% CI -0.2353–0.4123; P=0.7766; and helmet 3 z-score mean difference: 0.0920, -0.2647–0.4488; P=0.7999). However, 2 children (4%) had a z-scores measured during helmet 4 (for up to 126 days) that were near-significantly different from 0 (mean z-score: -1.840, -3.684–0.0036; P=0.0502) and were significantly less than helmet 1 (z-score mean difference: 1.957, 0.7424–3.172; P=0.0004).

Conclusion

Variation in head circumference throughout helmeting is not significant and not associated with any restriction of head growth throughout helmeting treatment following ESC.

Objectives

1. Demonstrate that helmeting does not constrict head growth following endoscopic strip craniectomy

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Change in Lower Lip Position After LeFort I Osteotomy In Patients with Bilateral and Unilateral Cleft Lip and Palate

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Andre Alcon

Abstract

Background: Historically, change in the lower lip position following LeFort I advancement has been poorly defined in patients with a cleft lip and palate (CLP). The purpose of this study was to compare the change in lower lip position following LeFort I osteotomy in patients with bilateral vs. unilateral CLP.

Methods: Sixty four patients with CLP who had a single-jaw LeFort I osteotomy between 2013 and 2022 at a single institution were retrospectively analyzed. Patients were included if they had a lateral cephalogram or CBCT scan preoperatively and at least 6 months postoperatively, and excluded if they had a genioplasty, anterior dental restorations, or missing > 2 incisors. Lateral cephalometric landmarks were digitized and superimposed by a single investigator. Paired student's t-test, Wilcoxon Signed Ranks Test and Pearson correlation coefficients were used to compare pre- and post-operative changes.

Results: Pre-surgically, there was greater horizontal lip discrepancy for the BCLP group (B: 6.7mm, U: 4.4mm, p = 0.0015). The groups were similarly advanced at A point (B: 7.2mm, U: 6.4mm, p = 0.1353), resulting in concomitant advancement of the upper lip, which was greater for the BCLP group (B: 6.3mm, U: 4.6mm, p = 0.0133). The lower lip point moved posteriorly for both groups (B: 0.9mm, U: 1.0 mm, p = 0.7694), but was only statistically significant for the UCLP group. The change in lower lip position had strong correlation with small changes in mandibular landmarks, moderate correlation with changes in the upper lip position and weak to moderate correlation with changes in maxillary landmarks.

Conclusion: Change in the lower lip position was most greatly correlated with small changes in the mandible despite no mandibular surgery. It was also moderately correlated with changes in the upper lip position, suggesting an important role of lip competence in the resting lower lip position.

Objectives

1. To understand the lower lip deformity associated with cleft lip repairs. 2. To understand how the lower lip changes after LeFort I maxillary advancement surgery. 3. To understand any patient or surgical characteristics associated with lower lip movements after LeFort I maxillary advancement surgery.

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Incorporating Buccal Fat Pad Flaps in Infants' Cleft Palatoplasty Reduces the Incidence of Future Orthognathic Surgery

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Raquel Ulma

Kian Pourak

Christian Vercler

Steven Kasten

Steven Buchman

Abstract

Background: Teens with repaired cleft palate often develop class III skeletal malocclusion secondary to post-surgical scar leading to maxillary hypoplasia. This malocclusion is often treated with orthognathic surgery. We posit that the addition of vascularized pedicled buccal fat pad flaps (BFPF) during palatoplasty will diminish palatal scarring thereby enhancing maxillary growth. We expect that patients with BFPF as part of their palatoplasty during infancy are at lower risk for developing class III skeletal malocclusions and requiring corrective operations when compared to those that did not.
Methods: A retrospective chart review was conducted for cleft patients that were eligible for orthognathic surgery (OGS) between 2010-2022. Data collected included sex, age at jaw surgery, and operative details (plate fixation vs. rigid external distraction/RED). Details of prior palatoplasty were documented. Cleft severity scores were based on a scale of 1-4 as a weighted mean to reflect the frequency of each cleft type (Veau I-IV).
Results: The charts of 131 patients were reviewed. Sixty had BFPF as part of their palatoplasty. Three BFPF patients (5.0%) and 20 non-BFPF patients (28.2%) underwent OGS. BFPF patients had an overall decreased incidence of OGS compared to the non-BFPF group in age-matched groups. This was evident in the early RED (3.8% for BFPF vs. 10.0% for non-BFPF, RR 0.4) and in skeletally mature groups (14.3% vs. 31.1%, RR 0.5). Cleft severity scores were 3.7 (BFPF group) and 2.7 (non-BFPF group) demonstrating a severity bias against BFPF patients.
Conclusion: Patients that had BFPF as part of their palatoplasty during infancy had up to a 2.6 times decreased incidence of OGS than those that did not, despite having a higher cleft severity score. The findings of this study demonstrate that incorporating BFPF during infants' cleft palatoplasty favorably impacts maxillary growth and can reduce surgical burden in the cleft population.

Objectives

1. Participants will be able to describe the impact of post-surgical scar tethering associated with palatoplasty on maxillary growth. 2. Participants will be able to calculate cleft severity scores based on the Veau classification. 3. Participants will be able to compare the incidence of orthognathic surgery in patients that had buccal fat pad flaps as part of the infant palatoplasty versus those who did not.

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Evaluating Relapse Following Fronto-orbital Advancement For Metopic and Unilateral Coronal Synostosis: The Lateral Brow Projection Angle

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Abstract
Background: Fronto-orbital advancement (FOA) overcorrection accommodates for high rates of relapse in treatment of metopic synostosis (MS) and unilateral coronal synostosis (UCS). We present the lateral brow projection angle (LBPA) method to assess relapse following FOA.
Methods: Patients with MCS or UCS who underwent FOA from 2012-2019 were retrospectively reviewed. Only patients with pre-operative, immediate post-operative, and 2-year follow-up CT data were included. LBPA was defined as an angle between a line made at maximal medial skull projection and maximal lateral brow projection. The % of advancement maintained was calculated by (degrees advanced - degrees relapsed) / degrees advanced X 100).
Results: 22 patients with MCS were included. Mean for right and left LBPAs were 20.5° (SD 4.2°) and 19.5° (SD 4.6°) pre-op, 6.5° (4.4°) and 5.8° (3.7°) immediately post-op, and 12.6° (SD 3.7°) and 11.0° (SD 3.6°) at follow-up, respectively. Average right percent advancement maintained was 54.3 (SD 37.0). Average left percent advancement maintained was 61.6 (SD 39.1). Total average percent advancement maintained was 58.0 (SD 35.8).
17 patients with UCS were included. 13 patients had right-sided UCS and 4 had left-sided UCS. Mean LBPA on the affected side was 13.9° (SD 2.7°) pre-operatively, 4.6° (SD 1.9°) post-operatively, and 11.3° (SD 2.6°) at follow-up. Average percent advancement maintained was 17.7 (SD 51.0). On the unaffected side, mean LBPA immediately post-operatively was 4.5° (SD 3.1°) compared to 9.1° (SD 2.5°) at 2-year follow-up. The mean CVAI immediately post-op was 4.5 (SD 1.3) compared to 3.0 (SD 2.8) at follow-up.
No patients required revision for increased intracranial pressure or aesthetic concern.
Conclusions: LBPA helped easily determine the average percent advancement maintained was 58.0 for MCS bilaterally and only 17.7 for UCS at two years, despite UCS increased symmetry. This helps to guide presurgical counseling to parents regarding expected outcomes.

Objectives
1) We present a simple, reproducible method of measurement called the lateral brow projection angle to analyze the % of advancement maintained in FOA for MCS and UCS. 2) This can be applied in order to guide pre-surgical counseling to parents regarding expected outcomes following FOA 3) This will guide surgical planning with respect to amount of overcorrection necessary during FOA

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Skeletal and Soft-tissue Imaging Findings predictive of Obstructive Sleep Apnea: A Systematic Review and Meta-Analysis

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Sobhi Kazmouz


Nathan Calzadilla


Lander McGinn


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Abstract
Background: Polysomnography remains the diagnostic gold standard for obstructive sleep apnea (OSA), but it cannot be easily and quickly performed within the practice of a craniomaxillofacial surgeon. The goal of this systematic review and meta-analysis is to determine the radiographic findings associated with OSA that indicate a likely OSA diagnosis.
Methods: Following PRISMA guidelines, a PICO-structured systematic search strategy was designed and undertaken utilizing the PubMed and Embase databases. Studies were included if they compared radiographic findings between healthy adult controls and patients with polysomnogram-confirmed OSA. Research quality was assessed using the Cochrane ROBINS-I tool for cohort studies and the Newland Ottawa scale for case-control and cross-sectional studies. Meta-analyses using a random effects model were conducted on SPSS Version 28.0.1 (IBM Corp).
Results: Ultimately, 109 full-text studies were included for a total of 3509 controls and 6308 patients with OSA. Overall, 79% of the controls and 85% of the OSA patients were male. The average age and BMI were 44.4 years and 26.4 kg/m2 for the controls, and 51.5 years and 29.8 kg/m2 for OSA patients. The imaging modalities utilized by the included studies were CT (36 studies), MRI (23 studies), and lateral cephalogram X-ray (50 studies). A meta-analysis of select measurements showed that across studies, OSA was associated with an increased soft palate length (SPL) and thickness (SPT), increased mandibular plane to hyoid bone distance (MPH), decreased sella-nasion-A point angle (SNA), and decreased basion-sella-nasion angle (BaSN).
Conclusions: The SNA angle, BaSN angle, SPL, SPT, and MPH are predictors of OSA on lateral cephalogram. These measurements show that posterior maxillary displacement, a depressed hyoid bone, and increased soft palate length and thickness are predictive of patients with OSA. These data will be used to further help calculate a risk score for OSA based on X-ray imaging.

Objectives
At the end of this presentation, the learner will be able to- 1. Explain the imaging modalities and findings associated with OSA. 2. Gain insight into cephalometric measurements that reflect underlying anatomical etiologies of an OSA diagnosis. 3. Refine the selection of patients who should undergo polysomnography, which can lessen both patient and provider burden.

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Case Report: Orthognathic Surgery on a patient with Osteogenesis Imperfecta Type IV

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Nicholas Yim

Abstract
Background: Osteogenesis Imperfecta (OI) is a heterogeneous group of connective tissue disorders, in which type I collagen genes COL1A1 and COL1A2 are altered, exhibiting bone fragility and skeletal deformity, predisposing to fractures after minor trauma or spontaneous fractures in severe cases, and presenting with dent-facial deformities. Although orthognathic surgery has been demonstrated to be successful, it is associated with multiple risks and complications in this group of pediatric patients. Herein, we report the outcomes of a pediatric patient presenting with OI type IV and class III malocclusion who underwent corrective orthognathic surgery.
Methods: A 16-year old male with a past medical history of osteogenesis Imperfecta type IV and class III malocclusion underwent a comprehensive corrective intervention to address his underbite. The surgical goals were to correct the maxillary cant, center the mandible, and achieve positive overate. The comprehensive orthodontic-orthognathic treatment plan was comprised of orthodontic Invisalign clear aligners and retention, orthognathic LeFort I maxillary advancement, and bilateral sagittal split osteotomy mandibular setback. The patient had a follow up visit 3 years later.
Results: At the 3-year follow up visit, the maxillary can't was resolved by impacting the right side 1.6 mm and down grafting the left side 1.3 mm. Anterior-posterior (AP) discrepancy was corrected by 5.1 mm maxillary advancement (A-point), and 6.4 mm mandibular setback (B-point), to achieve a total of 11.5 mm AP correction. The pre-operative ANB angle was -4.7 degrees, and the post-operative planned ANB angle was 3.5 degrees.
Conclusion: Early diagnosis, careful evaluation, and comprehensive treatment planning are important in patients with osteogenesis Imperfecta. Orthognathic surgery can correct severe and complex dent-facial deformities. Multidisciplinary care is critical in achieving satisfactory functional and cosmetic outcomes.

Objectives
Participants will be able to explain the pathophysiology of osteogenesis imperfecta. Participants will be able to clinically assess a patient's maxillary and mandibular relationship, facial profile, and dental characteristics. Participants will be able to appreciate the orthodontic and orthognathic treatment plan of patients affected by osteogenesis Imperfecta with class III malocclusions.

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Predictors of Postoperative Complications Following Mandibular Fracture Repair

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Michael Grant

Abstract
Background: Complications following mandibular fracture repair (MFR) may carry significant morbidity to patients. The purpose of our study is determining the predictors of postoperative complications following MFR.
Methods: A retrospective review was conducted of trauma patients who underwent MFR in 2018 and 2019. Excluded were patients <18 years old and those with postoperative follow-up <2 weeks. Descriptive statistics were calculated. The primary outcome was the incidence of at least one postoperative complication following MFR. Demographics, mandibular fracture location, and postoperative complications were reported. The mandibular injury severity score (MISS) of each patient was calculated. Bivariate analysis and multivariate logistic regression were performed.
Results: Of n=154 patients included, median (interquartile range [IQR]) age was 30 (24-41) years and median (IQR) follow-up was 48 (30-89) days. A total of n=96 (62.3%) patients had postoperative complications including jaw pain (n=55 [35.7%]), mental nerve paresthesia (n=42 [27.3%]), infection (n=18 [11.7%]), unplanned reoperation (n=15 [9.7%]), malocclusion (n=11 [7.1%]), malunion (n=6 [3.9%]), and wound dehiscence (n=6 [3.9%]). Patients with past medical history were at significantly greater odds of developing at least one postoperative complication and jaw pain (adjusted odds ratio [aOR] [95% confidence interval (CI)] 4.1 [1.0-16.6], 3.0 [1.3-7.0], respectively). Female sex was significantly associated with greater odds of malunion, unplanned reoperation, postoperative jaw pain, and infection (aOR [95% CI] 41.8 [2.6->100], 3.6 [1.0-12.3], 3.8 [1.4-10.2], 4.4 [1.3-15.0], respectively). A greater MISS was associated with greater odds of unplanned reoperation and mental nerve paresthesia (aOR [95% CI] 1.11 [1.02-1.20], 1.12 [1.05-1.21], respectively). The most common reason for unplanned reoperation was removal of infected hardware (n=4/15 [26.7%]).
Conclusion: Past medical history, female sex, and greater MISS were significant predictors of postoperative complications following MFR. Our findings can help guide informed decision making and surgical planning in patients with mandibular fractures.

Objectives
The audience will understand the incidence of postoperative complications following mandibular fracture repair and be aware of the most common ones. The audience will appreciate the risk factors that can put patients at greater odds of postoperative complications following mandibular fracture repair. The audience will be able to apply our findings to their clinical practice for proper surgical planning and informed decision making.

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Novel Multimodal Blood Management Protocol in Open Craniosynostosis Surgery

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Abstract

Background

Open surgical correction of craniosynostosis is performed in infants to expand cranial volume and repair distortions of the cranium. Left unaddressed, elevated intracranial pressure and permanent neurologic sequalae may develop. However, this surgery carries a significant transfusion risk, ranging from 79% to 95% nationally and with transfusion, the risks of infection, allergy, and crossmatch reactivity. To decrease allogenic transfusion where possible, the authors instituted a novel blood management protocol involving a preoperative checklist, tranexamic acid, tumescent infiltration, use of cell saver with sponge washing, preference for colloid resuscitation, and preoperative transfusion triggers. The authors aim to retrospectively compare the transfusion rates pre and post protocol implementation.

Methods
Patients who underwent open craniosynostosis surgery between 2016 and 2022 were included in this quality improvement project. Records were retrospectively queried for surgical date, age, weight, red blood cell (RBC) transfusion, and transfusion of other blood products. Student's t-test was used for analysis.
Results
A total of 69 records met inclusion criteria, 30 pre and 39 post protocol implementations in 2019. Red blood cell transfusion rate decreased from 40% pre to 21% post protocol (p=0.04). In the subset of patients under 2 years old, transfusions were reduced from 50% to 23% (p=0.03). Intraoperative average transfusion increased in the postimplementation group (14.7 to 22.3 ml/kg). Where cell-saver was employed with sponge washing, the average volume returned to the patient was 9.6 mL/kg. There were no mortalities. Operative times, postoperative hemoglobin, and ICU days were not statistically different. The total hospital length of stay reduced from 4.8 to 3.9 days (p=0.017).
Conclusions
A novel blood management protocol for craniosynostosis surgery demonstrates a decrease in allogenic red blood cell transfusion rate without decreasing the postop hemoglobin, increasing operative times, or complications, while reducing patient length of stay.

Objectives

1. Participants will review and critique evidence-based approaches to decreasing perioperative blood loss. 2. Participants will learn effective interdisciplinary communication in the perioperative period. 3. Participants will formulate a model that may be better implemented into their own practice.

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Clarifying the Anatomy of the Zygomatic Cutaneous Ligament: Its Application in Midface Rejuvenation

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Jing Duan

Abstract
Background: Anatomical knowledge of the zygomatic cutaneous ligament is crucial for rejuvenation of the anteromedial midface. However, there is a lack of satisfactory descriptions of the anatomy of the zygomatic cutaneous ligament, and the exact range and location are still controversial. The present study attempts to clarify the anatomy of the zygomatic cutaneous ligament to provide vital information for clinical operations.
Methods: Facial dissection was performed on 36 cadaver hemifaces. The location of the zygomatic cutaneous ligament was investigated and recorded relative to the Frankfort horizontal line and several vertical reference lines. The relative relationship of the zygomatic cutaneous ligament with surrounding anatomical structures was also investigated.
Results: The zygomatic cutaneous ligament is a septum-like osteocutaneous ligament originating from the periosteum of the maxilla and zygoma. The overall range of the zygomatic cutaneous ligament starts at the origin of the levator labii superioris and then extends laterally, following the curvature of the inferior bone margin. After merging with the ligamentous part at the origin of zygomaticus minor and zygomaticus major muscle (11.65 mm inferior to the horizontal line), it continues as the zygomatic retaining ligament on the zygomatic arch. The vertical distances between the zygomatic cutaneous ligament and horizontal line along the L1, L2, L3, L4, and L5 reference lines are 9.1, 19.5, 22.1, 21.7, and 18.7 mm, respectively.
Conclusion: The anatomical data obtained in the present study regarding the location of the zygomatic cutaneous ligament might be valuable for understanding the appearance of the midcheek fold and be helpful for surgical procedures to rejuvenate the anteromedial midface.

Objectives
1.Participants will be able to understand the overall range of the zygomatic cutaneous ligament in detail, and its anatomical relationship with peripheral vessels, nerves and facial spaces. 2. In facial rejuvenation surgery, the junction of the zygomatic cutaneous ligament and the zygomatic retaining ligament is a key part of access to the anteromedial midface, which requires a sharp transection, and participants will be able to know the location of this vital ligament, as well as the location of the surrounding blood vessels, nerves to reduce the damage. 3.The potential space between the zygomatic cutaneous ligament and the orbital retaining ligament can be seen as a natural separation called the prezygomatic space. For anteromedial rejuvenation surgery, participants will be able to know how to use this space for blunt dissection, which can reduce damage to blood vessels and nerves during rejuvenation surgery.

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Characterizing Intranasal Anatomy and Airway Morphology in Patients with Dentofacial Deformities: A Retrospective Study

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Nicolas Kaplan


Chiara Santiago


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Akriti Choudhary


Linping Zhao


Lee Alkureishi


David Morris


Pravin Patel


Chad Purnell

Abstract

Background: Dentofacial deformities are common morphological, physiological, and aesthetic problems. Their frequent co-occurrence alongside nasal, septal, and turbinate morphology often requires multiple corrective surgeries. During a Lefort I osteotomy, there is easy access to the intranasal structures after down fracture. In this study, we aim to assess the intranasal morphology and three-dimensional nasal airway volume among patients presenting for orthognathic surgery, for consideration of simultaneous correction.

Method: We conducted a retrospective chart review for patients diagnosed with dentofacial deformities presenting for orthognathic surgery between ages 16-21 years. Patients with syndromic diagnoses or clefts were excluded. Maxillary and mandibular deformities were classified based on cephalometric analyses. We collected linear measurements of the inferior nasal turbinate, the septal deviation area, and nasal airway volume from preoperative CT scans. All cephalometric analyses were conducted on Materialise Mimics (Belgium). Statistical analyses were conducted using comparative tests and regression models.

Results: A total of 61 patients met inclusion criteria-9 (15%) Class I, 12 (20%) Class II, and 39 (64%) Class III skeletal jaw relationship. Sagittal position of the maxilla was normal in 20 (33%), hypoplastic in 23 (38%), and hyperplastic in 18 (30%) patients, while that of the mandible was normal in 14 (23%), hypoplastic in 12 (20%) and hyperplastic in 34 (56%) patients. Mean septal deviation area was 49.5sqmm and was not significantly different among groups. Class II and III patients had more turbinate asymmetry posteriorly, and patients with maxillary hyper-or hypoplasia

had more turbinate asymmetry throughout. After controlling for other factors, the distance from nasion to upper incisal tip (vertical maxillary height) significantly predicted left, right, and the total nasal airway volume (B=1.44, R2=0.173, p< 0.001).
Conclusions: Nasal airway anomalies are common in patients with dentofacial deformities. These should be anticipated, assessed, and considered for treatment at the same time as orthognathic surgery.

Objectives

At the end of this presentation, the learner will be able to- 1. Explain the nasal airway abnormalities associated with different dentofacial abnormalities. 2. Formulate a treatment plan for patients with dentofacial deformities addressing the airway and associated obstructive sleep apnea. 3. Consider simultaneous correction of intranasal structures during orthoganthic surgery.

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Medial epicanthal fold correction using a Y-W epicanthoplasty in Asian Eyelids

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Abstract

Background

Many surgical techniques to manage epicanthal folds have been reported, but their main drawbacks include a noticeable scar in Asians, an acute medial canthal angle, and being applicable only in mild or moderate epicanthal folds. This study described a novel surgical technique, Y-W epicanthoplasty, and assessed medial canthal shape and medial canthal scarring in patients who underwent Y-W epicanthoplasty.

Methods

From January 2004 to February 2017, the patients with moderate or severe epicanthal folds were included in the study. The preoperative and postoperative intercanthal distance (ICD) and interpupillary distance (IPD) were measured. The ICD ratios (ICD/IPD) and extent of postoperative scarring were evaluated.

Results

Y-W epicanthoplasty was performed in 18 cases. The ICD ratio of the total study cohort showed significant reduction following surgery (preoperative ICD ratio = 0.62 ± 0.04, postoperative ICD ratio = 0.5 8 ± 0.03, $p < 0.001$). Eleven patients showed no apparent scar, and six patients were found to have a minimal scar that was visible only under close inspection. One patient had a hypertrophic scar, which was successfully managed with triamcinolone acetonide injections.

Conclusion

The Y-W epicanthoplasty provides good aesthetic results in moderate to severe degrees of epicanthal fold. It is found to minimize the visible scar on the medial canthal region by avoiding a medially extended incision and reducing the tension. A small triangular flap can prevent the medial canthus from becoming too acute or webbed after surgery. The Y-W epicanthoplasty is simple and straightforward and is applicable regardless of epicanthus severity.

Objectives

Participants will be able to know novel surgical method for Y-W epicanthoplasty. Participants will be able to know outcome of Y-W epicanthoplasty.

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When to Call a Plastic Surgeon for a Cranioplasty?: A Risk Assessment Scoring System

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Abstract

Background: Cranioplasty is a common procedure performed by craniofacial plastic surgeons and neurosurgeons. However, complication rates after this procedure remain high and it is often unclear when a plastic surgeon should be involved in a cranioplasty. We aim to present an evidence-based risk assessment tool, developed using the NSQIP database, for stratifying patients on their risk of developing 30-day postoperative complications.

Method: The 2005-2020 NSQIP database was screened for CPT codes for cranioplasty procedures. Using multivariate logistic regression analysis, we identified significant predictors of postoperative (medical or surgical) complications. These were used to develop a scoring system to allow preoperative risk determination for cranioplasty.

Results: A total of 3126 cranioplasty procedures were included. A concurrent flap CPT code was used in 177 (6%) cases. 689 (19.6%) patients had a medical or surgical complication postoperatively. Using significant predictors of 30-day complications found on multivariate analysis, a weighted risk score (0-15) was devised- 1 for hypertension, 3 for ventilator dependence, 2 for sepsis, 2 for an open wound, 2 for a bleeding disorder, 1 for chronic steroid use, 2 for a contaminated or dirty wound, 0.5 for a BMI over 30 and 1 for a BMI over 40, and 0.5 for a CPT code of 62141 (a skull defect > 5 cm in diameter, treated with an alloplastic implant). A patient with a score of 0-1.0 is classified as 'Low' risk, 1.5 is at 'Moderate' risk, 3.0-4.0 is at 'High' risk, and 4.5 or greater is at 'Very high' risk, based on relative risk. On validation testing, risk scores were a significant predictor of surgical complications, medical complications, and pooled complications ($p<0.001$).

Conclusion: Our risk assessment tool provides a way to guide preoperative assessment in adult cranioplasties and the decision of whether a plastic surgeon should be pre-emptively involved to help decrease complications.

Objectives

At the end of this presentation, the learner will be able to- 1. Identify significant predictors of 30-day post-cranioplasty complications. 2. Explain the incidence of 30-day postoperative morbidity and mortality. 3. Evaluate and stratify adult patients undergoing cranioplasty for their risk of developing 30-day postoperative complications and decide whether a plastic surgeon needs to be consulted.

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Factors Predicting Final Jaw Position in Skeletally Mature patients with Cleft Lip or Palate: A Retrospective Study

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Abstract

Background: Patients with cleft lip or palate (CLP) undergo multiple surgeries over their lifetime and often present with maxillary hypoplasia requiring orthognathic correction. There is limited information regarding predictors of the need for orthognathic surgery in these patients. Our aim is to investigate the factors associated with maxillary hypoplasia and its associated craniofacial morphology in patients with CLP.

Method: We retrospectively reviewed the charts of 82 patients with cleft lip or palate with cone beam CT scan data between ages 16-21 years and analyzed the 3D DICOM files for cephalometric landmarks. The number, type, and date of cleft-related surgeries were determined from chart review. All statistical analyses were performed on SPSS Statistical Package Version (IBM Corp, Version 28.0.1.0). Multivariate linear regression was used to assess relationships in craniofacial morphology, surgical data, and patient demographics.

Results: Of the included patients, 44 had unilateral and 38 had bilateral CLP. Skeletal jaw relationship was Class I in 24, Class II in 5, and Class III in 53. The median number of cleft surgeries by age 16 was 4 (range 1-8). Multivariate linear regression identified that the number of cleft surgeries was a predictor of facial convexity angle when controlling for other factors (R2 = 0.127, B= -0.372, p= 0.001). The maxillary width was predicted by gender and history of undergoing secondary palatal repair (R2= 0.260, B= -0.384, p=0.02). The sella-nasion-A point (SNA angle) was lower in patients with bilateral cleft (p= 0.009). Continued analyses are ongoing to determine which specific surgeries are associated with maxillary growth restriction.

Conclusion: An increase in number of cleft-related maxillary surgeries prior to age 16 predicts maxillary growth restriction as indicated by decreasing facial convexity angle and maxillary width. This should be carefully considered when planning the surgical care of patients with orofacial clefting.

Objectives

At the end of this presentation, the learners will be able to- 1. Explain the possible need for eventual orthognathic surgery to patients with cleft lip and/or palate while counseling them. 2. Predict the risk of developing maxillary hypoplasia based on the number of cleft-related surgeries. 3. Identify specific cleft-related surgeries that most significantly affect maxillary growth.

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Comparison of Methodologies for Craniofacial Soft-Tissue Cephalometrics: The Value of Virtual Reality

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Abstract

Background: Soft-tissue cephalometrics play an important role in perioperative evaluation within plastic surgery and research with myriad options available for analysis. The objective of this study was to compare the accuracy, precision, and efficiency of multiple imaging modalities in conducting facial soft-tissue measurements.

Methods: Twenty soft-tissue cephalometric measurements were performed by five measurers of various experiences on five adult subjects using each of the following six methods – manual calipers, cone-beam computed tomography (CBCT), CBCT with measurements performed in virtual reality (VR) (ImmersiveTouch), 3D photogrammetry (3dMDFace), iPad-based three-dimensional (3D) photogrammetry (Crisalix), and two-dimensional (2D) photography. Measurement sessions were timed and performed in triplicate, totaling over 9,000 measurements. Statistical analyses were performed on SPSS (IBM Corp, Version 28.0.1.0). The intraclass correlation coefficient was calculated to assess accuracy across measurers. One-way ANOVA was used to compare differences in measurements between methods, with Bonferroni posthoc analysis. A coefficient of variation was used to compare precision of different methods across measurements, with caliper measurements considered the gold standard.

Results: The intraclass correlation coefficient among raters was 0.932, indicating excellent reliability. Measurements on VR were significantly faster than all other methods (137 seconds vs. 217 seconds for caliper, $p<0.001$). The coefficient of variation was highest for 2D photographs and lowest for VR (6.4 vs 11.0, $p<0.001$). It was significantly greater for 2D than caliper measurements (11.1 vs. 8.3, $p=0.006$); coefficients of variation of all other methods did not differ significantly from calipers. Measurements around the eyes (Left exocanthion-Right exocanthion), tragion - antitragus, and tragion - exocanthion showed the greatest absolute difference from caliper measurements.

Conclusion: Two-dimensional photography is not an accurate or precise method for measuring absolute cephalometric distances. Analysis on VR was the fastest, had the lowest variation among measurements, and showed equivalent accuracy to calipers. For studies involving extensive cephalometric landmarking, VR may improve study throughput.

Objectives

At the end of this presentation, learners will be able to- 1) describe multiple methods available for conducting soft-tissue facial measurements 2) compare the accuracy, precision, and efficiency of various 3D imaging modalities. 3) describe the benefits and limitations of different 3D imaging methodologies for both clinical and research applications.

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Virtual Surgical Planning (VSP) Cutting Guides for Genioglossus Advancement

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Abstract
Background: Genioglossus advancement (GGA) is a helpful surgical technique to treat obstructive sleep apnea (OSA). Computer-aided design, particularly for the production of cutting guides, has arisen as a modern modification to ensure that the genial tubercle is accurately located since it is not visible from the anterior mandible during dissection. This study aims to demonstrate the utility of virtual surgery planning (VSP) cutting guides in a series of genioglossus advancement cases.

Method: We included 8 patients presenting for genioglossus advancement. All patients had OSA in addition to-dentofacial deformity (4), bilateral cleft lip and palate (1), history of nasal fracture (1) retrogenia (1), and Down Syndrome (1). Concomitant procedures included genioplasty (7), Lefort I/BSSO (4), rhinoplasty or intranasal surgery (7), and cleft lip revision (1). Computed Tomography (CT) data were preoperatively collected and rendered in three-dimension (3D). The surgeon designed patient-specific cutting guides registered to the occlusion to ensure the genial tubercle was included in the osteotomy as well as to stay below the incisor tooth roots. Surgical guides were 3D-printed. Typically, this was incorporated into an extension of a genioplasty osteotomy.

Results: All VSP-designed guides fit appropriately. The genial tubercle was successfully included in the osteotomy in all cases. In one case, the posterior table of the mandible at the tubercle fractured, requiring an extra lag screw to ensure the genioglossus origin was appropriately fixated into place. No tooth roots were injured.

Conclusions: Occlusal-based 3D printed cutting guides are a useful adjunct to help guide a genioglossus advancement to accurately incorporate the genial tubercle. This provides a safe way to incorporate additional OSA correction into patients undergoing other procedures.

Objectives
1. Learners will understand the role of virtual surgical planning in increasing intraoperative surgeon confidence via localization of the genial tubercle 2. Learners will appreciate how virtual surgical planning enables patient-specific 3D-printed cutting guides 3. Learners will observe how virtual surgical planning of genioglossus advancement synergizes with related surgeries of the head and neck

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Is It Safe To Continue Estrogen Therapy in Gender Diverse Individuals Undergoing Facial Feminization? A Pilot Study of 588 Patients.

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Ruth Tevlin


John Henry Pang


Shane Morrison


Thomas Satterwhite

Abstract

Background:
The association between exogenous estrogen and venous thromboembolism (VTE) in plastic surgery is well-established. There is no standard of care however regarding the continuation of exogenous estrogen in the setting of facial feminization surgery (FFS) and diverse practice patterns exist. Acute reduction or cessation of estrogen may exacerbate gender dysphoria, resulting in patient distress. Prior research has shown that continuing estrogen perioperatively is potentially safe for patients undergoing vaginoplasty. We performed a pilot study at two institutions with different hormone management protocols to compare the rate of VTE in patients undergoing FFS.
Methods:
We retrospectively reviewed patients who underwent FFS at a private practice (2021-2022) and at a tertiary academic center (2018-2022). At the private practice, patients were advised to continue estrogen if taking a total daily dose of ≤4 mg and were advised to half their dose if taking >4mg. Private practice patients were asked to stop progesterone 2 weeks preoperatively. At the academic center, patients continued all hormone therapy perioperatively. No VTE chemoprophylaxis was prescribed. Patient demographics and VTE incidence were analyzed.
Results:
588 patients were identified (n=122, private practice; n=466, academic center). At the private practice, the mean age was 34 years, mean BMI was 25kg/m^2, and mean Caprini score was 3. The 90-day incidence of VTE was 0% based on clinical examination. On initial review of the patients at the tertiary academic center, demographics were similar, and the 90-day incidence of VTE was 0%.
Conclusions:
No VTE was diagnosed in either the private practice or academic center following FFS. This study is underpowered and thus we have expanded this study by recruiting 5 institutions (2 private practices and 3 tertiary academic centers) to adequately power comparisons of VTE occurrence between hormone practices, with the goal of establishing an evidence-based standard of care.

Objectives

Participants will learn about the lack of standardization regarding hormone management in patients undergoing facial feminization surgery (FFS). Participants will review the rate of venous thromboembolism (VTE) in patients undergoing FFS. Participants will compare the rate of post-operative VTE in patients undergoing FFS in the setting of hormone continuation, cessation or reduction.

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What defines 'Success' in Autologous Alveolar Cleft Bone Grafting? : A Meta-analysis of 132 studies with 8751 patients

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Bianca Di Chiaro


Akriti Choudhary


Sofia Aronson


Chad Purnell

Abstract

Background: Alveolar bone grafting (ABG) is a critical part of the comprehensive reconstruction in patients with orofacial clefting. A wide range of success is reported for this procedure, and what constitutes success appears somewhat nebulous. We aim to assess the ways in which success is determined across literature, estimate and standardize the overall success rate, and identify any common predictors of success.

Method: We conducted a PRISMA-guided systematic review and meta-analysis. Databases were searched for studies on secondary autologous ABG. Differing clinical and radiographic success scales were recoded into standardized scales. A meta-regression analysis was performed to determine predictors of success.

Results: The initial search delivered 1213 titles, of which 132 full-text studies were included, with 8751 patients. A total of 120 (91%) studies used a formal definition of success- 19 (16%) primarily employed clinical criteria, 12 (10%) used a combination of clinical and radiographic criteria and 88 (74%) primarily used radiographic criteria. The clinical and radiographic criteria used for success varied, with the most common being the Bergland (Oslo) Scale (61%). Radiographic success rates varied from 15-100% (mean 84%), while clinical success rates ranged from 42-100% (mean 83%). The mean standardized radiographic and clinical success rates were both 84%. The standardized success rates were found to be significantly lower when ABG was performed after canine eruption (79 vs. 86 %, p=0.006). Meta-analysis of comparative studies showed the same trend (effect size 1.06, p<0.001). On meta-regression, we found a significant decrease in success rates with increasing age at the time of ABG (p=0.01).

Conclusion: There is significant variability in the methods used to determine success in secondary autologous ABG across the literature. Grafting prior to canine eruption (early secondary ABG) improves radiographic success. Patients can be counseled that the mean success rate in ABG is around 86% with proper timing.

Objectives

1. Participants will be able to explain the wide variety of success ranges and methods used to determine success for Secondary autologous alveolar bone grafting in patients with a cleft. 2. Participants will identify the need for a standardized scale for determining success objectively for alveolar bone grafting. 3. Participants will be able to counsel patients for early secondary alveolar bone grafting using Level 1 meta-analysis data.

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Can Automated and Semi-automated tools Replace the Human Eye for conducting Periorbital measurements? : A Comparison of Three Modalities

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Alvin Nguyen


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Abstract

Background: Precise characterization of the eyelid and periorbital soft tissue position is instrumental in perioperative evaluation as well as oculoplastic research. However, performing these measurements can be laborious. Automating this task is challenging, especially for syndromic patients. We developed an artificial intelligence (AI) algorithm, *Orbitmap*, for automating periorbital measurement using pre-developed *Google MediaPipe Facemesh* and *Iris* C++ models. Additionally, our team created a novel ImageJ program to streamline these measurements. Here, our aim is to compare the accuracy of these modalities against manual measurements.

Methods: Twenty-five front-facing standardized photographs of patients with craniofacial diagnoses were included. Twenty periorbital measurements were conducted using our semiautomated ImageJ tool, Orbitmap, and by two raters manually on ImageJ (Control).

Results: For ImageJ, while there was no significant difference in marginal reflex distances (MRD1, MRD2), superior and inferior scleral shows (SSS, ISS), canthal tilts, and vertical dystopia when compared to the Control group, medial and lateral canthal heights (MCH, LCH) and medial and lateral brow heights (MBH, LBH) were significantly higher compared to Controls. Additionally, the medial intercanthal distance (ICD) for ImageJ was significantly lower than Controls. For Orbitmap, MRD1 and MRD2, MCH, SSS, ISS, canthal tilts and vertical dystopia were not significantly different from Control, whereas, the LCH, ICD, and LBH were significantly lower, and the MBH was significantly higher compared to Controls. The time taken in conducting each set of measurements was the longest for controls (36 minutes), followed by when using the ImageJ (3.3 minutes), and was the quickest on Orbitmap (2.3 seconds).

Conclusion: Orbitmap and our semi-automated ImageJ tool report accurate values for 13/20 (65%) and 11/20 (55%) periorbital measurements, respectively. There is some discrepancy in measurements involving the canthi.

Further work is ongoing in increasing their precision in conducting these measurements and testing them for curvilinear eyelid and eyebrow measurements.

Objectives

At the end of this, the learner will be able to- 1. Appreciate the use of artificial intelligence and its potential application in automating otherwise laborious periorbital measurements. 2. Consider the semi-automation of periorbital and eyelid measurement using programs such as ImageJ. 3. Compare the accuracy of an artificial intelligence algorithm and novel ImageJ program against manual measurements for periorbital measurements.

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Scalp reconstruction in patients with intracranial antibiotic-resistant bacterial infections using microvascular free tissue transfer

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Jun Won Lee

Abstract

Background

When a scalp infection occurs after craniectomy and cranioplasty, it has the potential to be recurrent and fatal. Without the skull acting as a barrier, the infection can spread to underlying tissue and eventually lead to epidural abscesses and encephalitis. In cases of widespread infection, the reconstruction of the scalp and skull defects after surgical debridement of infected tissue poses a great challenge for plastic and neurosurgeons.

Methods

Six patients with infections of the forehead, scalp, and underlying dura were referred to our clinic for treatment due to recurring infections. We investigated the duration and features of the infection, the presence of foreign bodies, the cultured bacterial species, the types of free flaps used, and postoperative complications.

Results

All cases included in this study were patients who had intracranial infections following neurosurgery, and the average duration of infection was 4.3±2.6 months. Three cases had foreign bodies, including artificial bone, titanium mesh, plates, and screws. Antibiotic-resistant bacteria were identified in five cases, including methicillin-resistant Staphylococcus aureus, methicillin-resistant coagulase-negative staphylococci, and carbapenem-resistant Acinetobacter baumannii. To control the infections, the foreign bodies were removed, and free tissue transfer was performed. Successful control of the infections was achieved during follow-up periods averaging 59.3±42.0 months.

Conclusions

Post-neurosurgical intracranial infections of the skull can have serious and long-term consequences. In cases of antibiotic-resistant bacteria, treatment involves the use of well-vascularized free tissue transfer, followed by the removal of any foreign bodies. After successful control of the infection through free tissue transfer, secondary procedures such as cranioplasty with titanium mesh or fat injection can be safely performed, without the risk of recurrence of infection.

Objectives

Participants will be able to explain the reconstruction process after craniectomy. Participants will be able to develop a management plan of a scalp infecion after craniectomy or cranioplasty. Participants will be able to apply microsurgical techniques for a scalp infection.

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Differences in Practice Patterns in Orbital Fracture Management: A National Survey

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Abstract
Background: Orbital fractures are challenging to treat due to their impact on vision and globe position. Although many surgical specialties treat orbital fractures, the variation in practice is not well described. Our objective was to determine differences in orbital fracture management by specialty and by experience.
Methods: A de-identified online survey regarding orbital fracture practices was sent to members of the American Society of Maxillofacial Surgeons, a listserv of academic oral and maxillofacial surgeons, and a listserv of the American Society of Ophthalmic Plastic Surgeons via REDCap.
Results: The survey was completed by 91 Oral and Maxillofacial Surgeons (OMFS), 89 Plastic Surgeons (PRS), and 143 Ophthalmologists (OPHTH). Respondents generally agreed on the timing of orbital fracture treatment. Although most used a combination of operative indications, OMFS more often used a defect size of 50% or more, PRS used a defect size of 1-2 sqcm., and OPHTH more often waited for enophthalmos as the threshold for surgery. Transconjunctival-pre septal was the preferred approach to orbital floor fractures (53%). Intraoperative imagining was used more by OMFS/ PRS (12%) compared with OPHTH (1%). Postoperative imaging and antibiotic use was preferred by OMFS (72% and 81%) over PRS/ OPHTH (combined 21% and 53%). Porous polyethylene was the most common implant choice; OMFS more often used titanium plates (38%), PRS more often preferred resorbable plates (17%), and OPHTH preferred nylon foil (34%) as alternative choices. Increased surgeon experience (> 15 years in practice) is associated with a preference to observe patients with diplopia, less implant, and antibiotic use, and conservative management of medial wall fractures without entrapment.
Conclusion: Significant differences exist in the management of orbital fractures between specialties and by surgeon experience. The most significant differences are in the indication for repair, the routine use of antibiotics, perioperative imaging, and implant type used.

Objectives
1. Participants will be able to identify the indications and different modalities used widely for the treatment of orbital fractures. 2. Participants will be able to analyze the difference in the approach to orbital fracture management by different specialties. 3. Participants will be able to analyze the difference in the approach to orbital fracture management by surgeons with different experiences.

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ARHGAP29 regulates the proliferation of mouse embryonic palatal mesenchymal Cells

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Abstract
Background: NSCL/P is a polygenic inherited disease caused by gene and environment,which account for 50% ~ 75% of the total number of cleft lip and palate. ARHGAP29 (Rho GTPase Activating Protein 29) is one of susceptibility genes related to NSCL/P . In this study, Arhgap29 gene have been synthesized through in vitro design using small interfering RNA (siRNA) technology,To study the effect of palatal mesenchymal cell proliferation, and lay a foundation for exploring the mechanism of cleft lip and palate.
Methods: The pregnant mice of 13.5-day were constructed to generate embryos and palatal shelves of embryos were isolated to primary culture EPM cells in vitro. Immunofluorescence technique was used to identify the cellular characteristics. The primary cultured EMP cells were transfected with three pair of Arhgap29-siRNA to establish a gene knockdown cell model. The efficiency of gene knockdown was detected by Real-Time PCR and Western blot methods. The effects of Arhgap29 gene silencing on the proliferation of EMP cells were assessed by CCK8 assay, and the results were analyzed by GraphPad Prism 8.0.2 softer package.
Results: Immunofluorescence detection showed the strong positive green fluorescence staining of Vimentin in cytoplasm and the negative staining of Cytokeratinc. Real-time PCR and Western blot results indicated that the mRNA and protein level of ARHGAP29 were significantly down-regulated in Arhgap29-siRNA group comparing with Blank and Negative control, and Arhgap29-siRNA3 showed the best silencing effect ($P<0.001$). The results of CCK8 assay showed that the proliferation ability of EPM cells began to increase after 48 hours Arhgap29-siRNA3 treatment, and the OD value was significantly increased after 72 hours ($P<0.05$).
Conclusion: Our results indicated that Arhgap29 can promote cells proliferation of the mouse EMP, which may increase adhesion of the palatal shelves and oral epithelium during the embryonic stage, and affect the palate normal development .

Objectives
1、To investigate the effect of ARHGAP29 on cell proliferation of mouse embryonic palatal mesenchymal (EPM). 2、Participants will be able to use small interfering RNA (siRNA) technology 3、To understand the genetic research progress of cleft lip and palate

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Patient-Specific Cutting Guides in Le Fort II Distraction with Zygomatic Repositioning: A Case Report

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Nathan Calzadilla


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Abstract
Background: Computer-aided surgical planning has evolved to include virtual surgical planning (VSP) which permits modeling bone cuts, desired distraction, and customized osteotomies. Specifically, VSP offers a promising approach for the generation of surgical cutting guides. In a Lefort 2 distraction with zygomatic repositioning (LF2ZR), the movements of the zygomas can be challenging because of limited bone contact and superior vector with rotation. We report a case where we performed LF2ZR using patient-specific cutting guides designed via VSP, and outline our novel planning technique.
Methods: We retrospectively reviewed the chart of a patient with Apert syndrome, with previous history of fronto-orbital advancement for bicoronal craniosynostosis. The patient was scheduled for LF2ZR procedure to address severe central midface hypoplasia and obstructive sleep apnea, and milder exorbitism with canthal dystopia. The CT data and the planning performed via virtual reality (VR) were reviewed.
Results: In VR, the normal maxilla was overlayed onto the 3D-rendering of the patient which allowed for the determination to move both zygomatic pieces 7.0 mm anteriorly and 4.0 mm superiorly while moving the anterior maxillary piece 14.0 mm along the vector 45° to the Frankfurt horizontal (FH) plane to achieve the desired position. We designed 6 surgical guides- 2 superior marking guides with 2.0 mm and 4.0 mm cutting slots each, 2 bilateral lateral marking guides, and 2 bilateral inferior orbital marking guides which were then 3D-printed. Intraoperatively, the cut vector of the zygoma cutting guides allowed the osteotomy to “self-guide” by sliding along a bevel. A rigid external distraction (RED) device was placed for midface distraction and removed 12 weeks postoperatively with good results and patient satisfaction.
Conclusion: Use of VR-designed, patient-specific 3D-printed surgical cutting guides offers a novel way to aid an inherently complicated LF2ZR osteotomy, by allowing controlled intraoperative vertical and anteroposterior movements of the zygomas.

Objectives
1. Learners will understand the role of virtual surgical planning in increasing intraoperative surgeon confidence via localization of the LF2ZR osteotomy. 2. Learners will be able to explain the osteotomies involved in an LF2ZR distraction procedure. 3. Learners will observe how virtual surgical planned cutting guides can aid an inherently complicated LF2ZR distraction by allowing controlled intraoperative vertical and anteroposterior movements of the zygomas.

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Expected Outcomes of Maxillomandibular Advancement on Obstructive Sleep Apnea - A Systematic Review and Pooled Analysis

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Philip Bystrom

Christopher Juarez

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Chad Purnell

Abstract

Background: The effectiveness of CPAP in obstructive sleep apnea (OSA) may be compromised for patients who are intolerant of CPAP, have inadequate CPAP fit, or possess upper airway abnormalities. In these patients, maxillomandibular advancement (MMA) is a powerful surgical option. However, there are no clear guidelines on how much advancement to perform to adequately treat OSA beyond anecdote. We conducted a systematic review to evaluate the amount of improvement in polysomnography outcomes following MMA and to correlate morphological adjustments to changes in OSA severity.

Method: We performed a PRISMA-compliant systematic review. Studies that examined adult patients before and after isolated MMA for OSA were included. Studies were excluded if patients had syndromic diagnoses, previous history of jaw surgery, or combined additional surgical interventions for OSA treatment.

Results: A total of 5904 titles were identified from the initial search and 39 full-text articles were included evaluating a total of 898 patients. We found a significant reduction in apnea-hypopnea index (AHI) and respiratory disturbance index (RDI) following MMA (46.1 to 9.5, and 42.7 to 6.5, respectively; $p<0.05$). The mean improvement in AHI was 36.59 ±17.27 and mean improvement in RDI was 36.17 ± 23.00. MMA also led to significant increases in airway volume (11.0mL vs 17.6mL, $p<0.001$) and airway length (12.4mm vs 18.2mm, $p<0.001$). Overall, 22 studies reported an average mandibular advancement of 9.3 ± 2.7 mm and 21 studies reported an average maxillary advancement of 7.8 ± 2.2 mm. Regression analysis did not yield a correlation between the amount of improvement in AHI/ RDI and jaw advancement.

Conclusion: MMA is an effective treatment for patients with OSA, leading to significant improvements in polysomnography outcomes. There does not appear to be a direct correlation between the amount of advancement and degree of improvement in OSA, at least at the level of measuring study-level mean data.

Objectives

1. Participants will be able to report the amount of improvement in OSA polysomnography outcomes for patients with OSA treated with MMA. 2. Participants will be able to correlate and assess the relations between morphological adjustments and changes in OSA severity.

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Problem mapping in craniosynostoses in an institutional cohort, using our previously published work on nomenclature.

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Suhas Udayakumaran

Abstract

Background

The goals for craniofacial surgery are common, but the nomenclature based on phenotype, genotype, sutural involvement, or syndromic nature does not highlight issues and management workflow.
Amidst the complexity and nosological chaos, the key to ideal management is to have clarity of purpose for each patient amongst the treating subspecialists.

Objective

To create a problem map of an institutional cohort of craniosynostoses based on the previously described taxonomy.

Methods

The taxonomy described by **(Udayakumaran et al., 2022)** was adopted on the institutional cohort between 2015 and 2023. The nomenclature was assessed for its

1. Interobserver reproducibility,
2. Ease of adaptability,
3. Interpretation and
4. Utility

Nomenclature

Categorisation (C) has three components:

1. Functional
2. Aetiological
3. Treatment status

1. **INCORPORATING FUNCTIONAL INFORMATION**

Based on the investigation and the patient evaluated at the presentation, clinically are categorized. All categories involve aesthetic issues.

Category(C1)

Patients with predominantly aesthetic issues (ICP and airway issues).

C2/I

Patients with raised ICP

C3/IA
Patients with raised ICP + Functional airway issues
C4 (Age>5) Delayed diagnosis.

1. **DEPICTING THE NOMENCLATURE**

The letter **"C"** would represent the category. The subsequent letter would describe the presence of raised ICP represented **"I"** and/or "**A"** for airway.

Incorporating the phenotype, aetiological and genetic information is identified.
CATEGORY followed by (PHENOTYPE) AND(AETIOLOGICAL DIAGNOSIS)
Or if the aetiological diagnosis is unavailable, it will be denoted as **"Not otherwise identified (NOI)".**

Incorporating treatment status If treated, superscript **"T"**; if not treated **"0."**

Result
The cohort (n=194) had the following distribution.
C1 n=88 [Commonest C1(Plagiocephaly)^{T}(NOI]
C2 n=42 [Commonest C2/I^{T}(NOI)]
C3 n=47 [Commonest C3/I^{T}A^{T}(Crouzons)]
C4 n=17 [Commonest C4 (Crouzons)]
The nomenclature scored high on all counts-viz. adaptability, reproducibility, third-person interpretation and utility.

Conclusion
We have proposed and applied a goal-based universal language for interdisciplinary communication.

Objectives
1) Develop interdisciplinary communication between the subspecialties involved 2) Organize and map their cohort for regular analysis 3) Facilitate interinstitutional research-based on the cohort map

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The Rise of Online Medical Education During COVID-19: The International Craniofacial Chang Gung Webinar

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Junior Tu

Abstract
Background
International travel has been radically disrupted by coronavirus disease 2019 (COVID-19), leaving traditional medical conferences on a two-year hiatus. The International Craniofacial Chang Gung Group (ICC) was thus created to disseminate knowledge related to craniofacial surgery. This study aims to reveal how webinars fundamentally transformed the traditional format of medical conferences.
Materials and Method
In total, 53 ICC webinars held between December 13, 2020, and December 11, 2022, were documented and reviewed. A questionnaire was designed and sent to ICC members. The questionnaire collected information on attitudes and habits relating to videoconferencing in general before and after the start of COVID-19 and on the ICC webinars specifically. Responses were analyzed to inform our understanding of respondents' experience and satisfaction with the webinars.
Results
The webinars covered a variety of topics related to craniofacial surgery. In total, 49 webinars were included for analysis. The mean number of attendees at each webinar was 86.7. In total, 111 respondents (Fig. 1) were more satisfied (4.25 ± 0.72 out of 5) with ICC webinars than with other media of online meetings ($P < .001$). The main advantages were saving travel time and costs and can participate from a location of choice, while the main disadvantages include internet connectivity and technical problems (Fig. 2). Participants rate content of meeting as the main reason for attending with the speaker's reputation coming in second, but also states that inappropriate timing is the main cause for not participating (Fig. 3). In total, 89.2% of respondents were willing to continue attending ICC webinars after COVID-19 restrictions have been lifted.
Conclusion
Webinars are an effective format for imparting knowledge, especially in the ICC, and will become key in continuing medical education.

Objectives
1.Educate that even with the lifting of COVID-19 restrictions, webinars will continue to have a role in medical education. 2. Participants will learn what the webinar participants look for when they are deciding whether to join a webinar or not. 3. Similarly, reasons that deter participants from joining the online webinars will be discussed as well.

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Prevalence of ocular torticollis in patients with unicoronal craniosynostosis (UCS) and its related ophthalmic features

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Mieke Pleumeekers

Abstract

Background

Ocular torticollis (OT) is abnormal head posture adopted by patients secondary to strabismus optimizing the eyesight and maintaining binocular vision. Strabismus in UCS is often due to the abnormal position of the trochlea of the superior oblique muscle leading to excyclotorsion and elevation in adduction. This is assumed to be the ocular reason to adopt a torticollis. Different causes require different treatments. We aimed to determine the prevalence of OT in patients with UCS and to assess the related ophthalmic features.

Methods

A retrospective case-series was performed in patients with non-syndromic UCS who have been seen at Erasmus Medical Center Rotterdam between 1994 and 2022. Data was collected from the electronic medical records including all eye examinations. Patients with any syndromic, multi-suture involvement or other craniofacial disorders were excluded.

Results

So far 153 patients have been analyzed; 103 (67.3%) female. Mean age at initial examination was 3.5 years (SD 4.4). Torticollis was present in 54 patients (35.3%). Age at which torticollis was first identified was 2.9 years (SD 2.7). Manifest strabismus was present in 40.6% and latent strabismus in 9.4%. Follow-up examination at 4 years was available in 14 patients, of whom 50.0 % had manifest strabismus and 7.1% latent. Binocular vision was present in 40.0% at initial examination, and in 71% at follow-up. Motility disorders were present in 81.2%, of whom 75% had elevation in adduction and 6% depression in adduction in one or both eyes. At follow-up 78% had still an elevation in adduction and 1% had a depression in adduction. Furthermore, 47% had a V-pattern at initial examination, and 79% at follow-up.

Conclusions

A third of the patients with UCS had torticollis. Ocular torticollis was related and due to manifest strabismus, motility disorders and a V-pattern. Important to note was that torticollis was revealed at different ages.

Objectives

Participants will know more about the incidence of OT in UCS. Knowledge about the disease will get more insight in proper treatment strategies. Better insight in the timing of ophthalmologic examniation and treatment.

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Machine Learning Applied to Cranioplasty Outcomes

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Sonia Hamilton

Abstract

Background

Cranioplasty carries significant risk of post-operative complications. A wide variety of risk factors have been reported. While machine learning (ML) is increasingly utilized in medical fields to predict patient outcomes, none have applied ML to predict cranioplasty outcomes.

Methods

Data were collected from 681 consecutive cranioplasty cases performed by a single surgeon at a single institution using a consistent operative technique between 2011-2022 thereby reducing confounding effects of variations between cases. The primary outcome studied was the occurrence of any complications which required repeat surgery. Machine learning algorithms were used to predict the risk of reoperation based on 53 pre-operative variables, including demographic data, cranioplasty material, and past medical history. Testing sets were trained on a retrospective cohort then applied to a prospectively collected cohort set. The following models were used: Support Vector Machine (SVM) with Radial Basis Function (RBF) kernel, SVM with linear kernel, Random Forest, Extreme Gradient Boosting, Logistic Regression, Multi-Layer Perceptron, and K Nearest Neighbors. For each, receiver operating characteristic curves were graphed and corresponding area under the curve (AUC) metrics calculated. Reduced models with only 18 clinically motivated input variables were then trained and evaluated.

Results

The SVM with RBF kernel model performed the best with both the full and reduced variable sets (AUC = 0.795, 95% CI [0.665, 0.904]; AUC = 0.81 95% CI [0.69,0.92]). In the full model, BMI, skull defect size, and number of prior surgeries with bone flap removal and replacement were the three variables with the highest feature importance. In the reduced model, BMI, sunken scalp, and number of prior cranioplasties had the highest feature importance.

Conclusions

We demonstrated the capability of machine learning algorithms to predict reoperation for cranioplasty patients. Further studies are needed to validate the generalizability of our findings.

Objectives

1. Identify cranioplasty cases with higher risk of complications. 2. Provide patients with personalized guidance on their complication risk following cranioplasty. 3. Provide a framework for creating a standardized pre-operative cranioplasty risk stratification algorithm.

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CRANIO CERVICAL INSTABILTY IN SYNDROMIC CRANIOFACIAL PATIENTS

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Syril JAMES

Abstract
Background
Craniovertebral anomalies, associated to Chiari malformations and/or syringomyelia, have been increasingly described in syndromic patients; the incidence, the mechanism and the possible influence of previous surgery have not been well defined.
We propose a complete evaluation protocol to study all CVJ anomalies and we present 3 cases treated with cranio-vertebral junction fixation to threat the instability responsible of severe central SAS or worsening symptomatic syringomyelia.
Methods
Prospectively, since year 2018, all syndromic patients with CVJ anomalies older than 4-y-old benefited from a standardized screening: dynamic cervical X-rays; medullary MRI and dynamic cervical MRI; Cervical CT scan; Sleep study; SEP. 2 Crouzon patients (8-y-old and 10-y-old) and one patient 7-y-old with Mercedes syndrome, previously operated on several cranial vault surgeries and foramen magnum decompressive surgery, present progressive aggravation of the syringomyelia and in one case a severe central apnea syndrome (> 45 AIH/h). In 2 cases a cranio-vertebral fixation and in one patient a C1-C2 fixation have been realized.
Results
In all cases an immediate reduction of syringomyelia has been observed and the central apnoea disappeared after surgery (in this case a stent between fourth ventricle and cervical subdural spaces has been inserted 6 months after surgery for the persisting syringomyelia). At 2 years of follow-up the radiological and clinical observations confirm the good results.
Conclusion
Different mechanism could participate to develop CVJ anomalies and subsequent Chiari/syringomyelia in multi operated syndromic patients.
All available tests to understand the possible physiopathology need to be performed and critically analysed.
The craniovertebral junction fixation can be a therapeutic approach in selected situations.

Objectives
Participants will be able to: Find and check craniovertebral junction, instability How to follow them up How to treat stenosis and instability in craniofacial patients

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A Normative 3D Imaging Sample to Assess Cranial Growth Following Bifrontal Orbital Remodelling for Metopic Synostosis: An Open Access Methodology to Promote Global Collaboration in Long-term Outcome Assessment

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Abstract

BACKGROUND: Surgical interventions for children with craniosynostosis aim to change head shape towards the norm and facilitate ongoing cranial growth. Primary surgical procedures tend to be performed in the first few years of life, yet head shape and cranial growth continue to evolve well beyond infancy, therefore long-term follow-up is essential to fully appreciate outcomes following surgery. 3D images are increasingly being collected internationally and have potential to be used as a non-invasive measurement of both cranial shape and growth.
METHODS: Patients with metopic synostosis undergoing treatment at the Royal Children's Hospital in Melbourne had 3D images captured pre- and post-operatively with the 3dMD 7-pod digital camera system (3dMD Corp., Atlanta GA, USA). Growth trajectories were compared with age and sex matched controls from a normative 3D image sample of 894 Caucasian children without a craniofacial anomaly. Using an automated warping template, all heads were scaled to unit centroid size and both rotation and location were standardized using GPA with a robust Procrustes transformation. Patient images were superimposed onto the corresponding normative face and visualized as a colour map. The difference between the two growth trajectories was calculated by a subtraction of values in the normative growth images from the patient growth trajectory.
CONCLUSIONS: This method of automated 3D image analysis will facilitate long term assessment of cranial growth and development in the setting of craniosynostosis and its surgical intervention. The normative 3D image sample of 0-18 year old's can be accessed by researchers around the globe and will facilitate comparison of long-term outcomes between international craniofacial teams.

Objectives

1.Participants will have the opportunity to be involved in a collaborative international investigative research project and have the opportunity to compare outcomes with a large normative database of patients collected by the Royal Children's Hospital, Melbourne. 2. Values measured will provide valuable insight into long-term outcomes of patients treated for metopic synostosis. It will assist in guiding the appropriate management of all patients with metopic synostosis and whether they need surgical versus non operative management. 3.It will allow the treating team to compare outcomes of those with mild versus severe trigonocephaly and the expected outcomes of each patient that presents to the craniofacial team.

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Hard- and soft-tissue changes after midface surgery in patients with craniofacial deformities: a three-dimensional quantification method

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Abstract

Background: Orbital malformations including hypertelorism, vertical orbital dystopia, and midface hypoplasia may be corrected by Le Fort III (LFIII), monobloc (MB), and facial bipartition (FB). We aimed to determine the effect of these procedures on hard- and soft-tissue changes on different age categories.
Methods: This retrospective study consisted of syndromic patients with congenital craniofacial deformities who underwent midface surgery. A 3D-mesh was created from their pre-operative CT-scan and the postoperative CT-scan was automatically registered to the pre-operative scan. Eighteen hard and 10 soft-tissue landmarks were manually annotated. Postoperative 3D-meshes were projected on top of the pre-operative 3D-meshes with a vector for each landmark to visualize the local magnitude and direction of the advancement.
Results: In total, 76 patients were included, of which 34 were treated by LFIII, 30 by MB, and 13 by FB. Their syndromic diagnoses included Apert (n=25), Crouzon (n=40) and craniofrontonasal dysplasia (n=11). Mean age for LFIII was 14.7 years, 7.7 years for MB and 7.9 years for FB. LFIII at a younger age (7-12 years), effectuated a higher mean advancement on maxillary (15.8 mm) and zygomatic (7.7 mm) level compared to patients treated >13 years (10.9 mm and 6.1 mm). After MB, the total mean advancement of the fronto-orbital region (15.3 mm) was higher at <7 years, and more equally at ages 7-12 (12.9 mm) and >13 (12.8 mm). In patients undergoing FB (n=13), mean pre-operative interdacryon distance (32.0 mm) and intercanthal distance (48.9 mm) were reduced by 8.6 mm and 7.6 mm respectively. Additional surgeries were performed in 13 patients after LFIII, 4 after MB and 2 after FB.
Conclusions: More advancement after midface surgery was seen at a younger age. This study provides more insight into the outcomes at different ages, which may be used for timing of surgery and predictions of postoperative outcomes.

Objectives

1: Gain more insight into effect of midface surgery at different ages 2: Gain more knowledge about the amount of advancement for the different types of midface surgery in patients with syndromic craniosynostosis 3: Will be able to use these outcomes for postoperative predictions

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A pilot study for use of machine learning to predict spring assisted cranioplasty outcomes in sagittal synostosis

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Abstract

Background: Spring assisted cranioplasty (SAC) is a treatment to correct sagittal craniosynostosis (SC). Finite element modelling (FEM) is used to predict SAC surgical outcomes, but requires computed tomography (CT) imaging, engineering expertise and long calculation times. Hereby, a novel method combining machine learning (ML) and FEM was created to perform real-time prediction of SAC outcomes in SC patients on table, as relies on 3D-photography alone.
Methods: 10 SC patients [3.8-9.4 months] were recruited: head shape, skull and scalp thickness, and suture locations were extracted from preoperative CT data. A simplified skull model was created by offsetting the head surface and implementing sutures and skull thickness from population average values. For each patient, postoperative outcomes from 30 different surgical scenarios (differing by osteotomy parameters and spring locations) were simulated using FEM (=300 SAC simulations). Statistical shape models (SSMs) were calculated to describe the population pre-operative shape features and FEM calculated postoperative outcomes. A Multioutput Random Forest algorithm (66/33% training/validation split) was trained using the preoperative SSM modes and surgical parameters as inputs, and the FEM postoperative SSM modes as output. Mean square (MSE) and mean absolute (MAE) errors, and R^2 were calculated to assess FEM vs. ML SSM modes outcome differences.
Results: Average skull and scalp thickness were 2.0±0.3 and 3.4±0.5 mm, respectively. The ML algorithm correctly reproduced the postoperative head shape modes (MSE = 0.015; MAE = 0.06; R^2 = 98%). Overall modelling time was reduced from several hours to a few seconds.
Conclusion: This preliminary study shows the potential of FEM trained ML models for real-time predictions of SAC surgical outcomes in SC. More input data, together with deep learning approaches will be tested to improve accuracy. Validation on new cases will be performed prospectively using on table pre- and postoperative 3D photography.

Objectives

Predict spring assisted cranioplasty surgical outcome to help presurgical planning. Develop a machine learning algorithm to allow real-time prediction of spring assisted. Analyse different surgical scenarios to identify patient specific optimal surgical strategies

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The natural history of untreated metopic synostosis: a morphological study

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Ahmed Elawadly

Abstract
***Background**:* The natural history of unoperated metopic synostosis is poorly understood, however critical to select children for surgery and to evaluate surgical results. In this study, we used 3D surface scans to objectively report morphological changes in unoperated trigonocephalic patients in different age groups.
***Methods**:* 3D scans of children with unoperated (pre-surgery or from children whose parents declined surgery) trigonocephaly were identified (2011-2021). Multisutural cases and benign metopic ridge were excluded. 3D surface scans (3D stereophotogrammetry or CT with skin reconstruction) for untreated patients were analysed. 9 previously published parameters were used: frontal angle (FA30), antero-posterior volume ratio (APVR), antero-posterior area ratio (APAR), antero-posterior width ratio 1 and 2 (APWR1 and APWR2), and 4 antero-posterior diagonal ratios (rAPDR30, lAPDR30, rAPDR60, lAPDR60).
Results: 97 scans were identified for analysis from a total of 316 trigonocephaly patients. Of the whole cohort, the male to female ratio was 2.7:1. Age at time of scan ranged from 9 days to 11 years stratified into 4 age groups: group 1: <6 months, group 2: 6-12 months, group 3: 1-3 years, group 4: >3 years. Significant improvements were detected in 5 parameters (APVR, APAR, APWR1, rAPDR30, lAPDR30) over time (i.e. older children were less severe). No significant differences were found in FA30, APWR2, rAPDR60, and lAPDR60 between age groups. These data indicate that the anterolateral forehead recession, as well as the surface area and volume of the forehead, improve over time, whereas the central forehead angulation and narrowing does not.
***Conclusion**:* By defining which aspects of trigonocephalic deformity improve naturally without treatment and which do not, we may be able to better advise families of potential aesthetic outcomes both with and without surgery. This data may lead to refinement of surgical techniques to concentrate correction on the aspects that do not improve with time.

Objectives
3D analysis of Trigonocephalic deformity. Better understanding of the morphological changes in untreated metopic children. Help in decision making and parental counselling of what expected if the deformity left untreated

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High incidence of non-synostotic posterior plagiocephaly in children with trigonocephaly

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Ahmed Elawadly

Abstract

Background:
Trigonocephaly, the characteristic deformity of metopic synostosis, is often manged surgically. Most approaches to correction deal solely with the forehead deformity, however we have noted a high incidence of positional plagiocephaly in these children. Anecdotally the posterior deformity is more noticeable in this group than in non-synostosis cases, possibly due to the narrow forehead and widened occipital area. In this study we use morphometric techniques to report the incidence and severity of non-synostotic plagiocephaly in pre-operative trigonocephaly patients.

Methods:
97 3D scans (3D photogrammetry or CT with skin reconstruction) of pre-treatment children with trigonocephaly were analysed. Age ranged between 9 days to 11 years, and was stratified into 4 groups. Frontal angle (FA30) was used to report trigonocephalic severity. Cranial Vault Asymmetry Index (CVAI) was used to report plagiocephaly severity. CVAI of 2 (range 1-5) or above was designated as significant plagiocephaly.

Results:
CVAI in the cohort ranged from 0.1 to 15. Plagiocephaly was seen in 39% of infants below 1 year of age and in 35% of the patients across all groups. 50% of the patients with plagiocephaly were in CVAI category 2 (mild plagiocephaly), 29% of them were in category 3, 9% in category 4, and category 5 formed 12% of the patients. No significant difference in CVAI was found between age groups. No significant correlation was found between frontal angle and CVAI among age groups. [GJ1]

Conclusion:
Significant plagiocephaly is seen in over a third of patients with trigonocephaly, and does not seem to improve with age. No correlation was found between severity of trigonocephaly and plagiocephaly. This information may influence surgical decision making as endoscopic strip craniectomy with helmeting may address the posterior deformity whereas traditional fronto-orbital correction addresses the forehead only.

Objectives

Determining the incidence of non-synostotic plagiocephaly in metopic synostosis. To evaluate the change in plagiocephaly in metopic synostosis patients without treatment To consider surgical options for correction of both deformities.

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A 360-degree approach to syndromic faciocraniosynostoses- An early experience with a functional concept

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Abstract
Background: The early period in brain development is a very crucial time. Estimating the brunt of disturbed physiology secondary to raised Intracranial pressure and airway cannot be quantified, especially secondary damage due to the airway, which is substantially underestimated.
We propose an early approach to address the issues that may affect cognitive development in children with Faciocraniosynostoses.
Objective: To evaluate the timing and sequencing of surgeries addressing issues in children of Faciocraniosynostoses comprehensively
Methodology: We analyse the surgical protocol of a retrospective cohort of syndromic craniosynostoses of children operated on between July 2015-October 2022.
Inclusion criteria:

1. All children addressed for calvarium and midface before five years, with clinically significant ICP and OSA.

Treatment protocol: In children with Faciocraniosynostoses, posterior calvarial distraction (PCVD) was the first option unless older. In older children, frontal advancement (FOAR) was preferred. Midface distraction was indicated whenever airway issues were clinically significant.
Result: The total number of children operated was 20. The average age at the first procedure is 16.68 months. The first procedure was PCVD in 13; 2 had Robotic assisted frontofacial advancement (RAFFA), 3 had Robotic assisted midface distraction (RAMD), 2 had Frontorbital advancement and remodelling (FOAR)
The second procedure was RAFFA in 4 and RAMD in 9, and FOAR in 2. The third procedure was RAMD in 3, FOAR in 2, and repeat PCVD in 1
The average age at the last procedure was 26.7 months. Follow-up ranged from 6-99 months (Mean 60 months)
None of the patients with midface distraction required revision surgery until the last follow-up.
Limitation
This is a functional concept, and understanding the long-term advantage objectively over the conventional approach is difficult.
Conclusions
We propose early addressal of all functional issues in children with Faciocraniosynostoses. This functional strategy aims to optimise cognitive development in its crucial timeline.

Objectives
1. Explain a strategy of early addressal of issues in faciocraniosynostoses to optimize cognitive development 2. Understand management algorithms 2. And create management strategy for children with faciocraniosynostoses

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Speech and language development, hearing, and feeding in patients with genetically-confirmed Crouzon Syndrome with Acanthosis Nigricans: a 36 year longitudinal retrospective review of patients in the Oxford Craniofacial Unit.

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Sarah Kilcoyne


Paula Scully


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Gregory Thomas


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Steven Wall


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Abstract

Background:
Crouzon syndrome with acanthosis nigricans (CAN) is caused by the mutation c.1172C >A (p.Ala391Glu) in the fibroblast growth factor receptor 3 (FGFR3) gene, and has an estimated prevalence of 1:1,000,000 births, with a female preponderance. Most cases occur de novo, however autosomal dominant inheritance may occur. The clinical presentation typically includes craniosynostosis, midface and maxillary hypoplasia, choanal atresia/stenosis, hydrocephalus, and intracranial hypertension. Patients develop acanthosis nigricans, a hyperkeratotic skin disorder. We present the first known study to investigate the speech, language, hearing and feeding of patients with CAN.

Methods:
A retrospective case note review of seven patients with a genetically-confirmed diagnosis of CAN attending the Oxford Craniofacial Unit during a 36-year period 1987-2023 was undertaken.

Results:
Participants were seven patients with genetically-confirmed CAN (6 females, 1 male), 6/7 cases arose de novo, one was familial. All patients had craniosynostosis (n=6/7 = multisuture synostosis, n=1/7 left coronal synostosis). Patients with available data had a significant multifactorial feeding history complicated by choanal atresia/stenosis (100%; n=6/6), or cleft palate (n=1/7). Most patients required airway management via tracheostomy (66%; n= 4/6); or CPAP (33%; n=2/6). All patients underwent adenotonsillectomy (100%; n=7/7). Initial failure to thrive, low weight and/or height were seen in 100% (n=7/7) of patients; 80% (n=4/5) had reflux; 100% (n=5/5) were NG or PEG fed. Hydrocephalus was managed via ventriculoperitoneal shunt in 85% (n=6/7) of patients. All patients with available data had hearing loss (100%; n=6/6). Communication difficulties were common: receptive language disorder (60%; n=4/7); expressive language disorder (80%; n=4/5); and speech sound disorder in 72% (n=5/7) necessitating the use of Makaton in 80% of patients (n=3/5).

Conclusions
Patients with CAN experience significant respiratory, neurological and structural obstacles to hearing, speech, language and feeding. We present a recommended pathway for management to support patients in these domains.

Objectives

1. Participants will be able to identify factors that may contribute to feeding difficulties in patients with Crouzon syndrome with Acanthosis Nigricans. 2. Participants will be able to identify factors that may contribute to speech and language difficulties in patients with Crouzon syndrome with Acanthosis Nigricans. 3. Participants will be able to list three recommendations for the management of communication and feeding of patients with Crouzon syndrome with Acanthosis Nigricans.

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Dental Complications following mid-facial advancement surgery in patients with syndromic craniosynostosis: a 20-year review.

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Abstract

Background

Patients with syndromic craniosynostosis commonly undergo mid-facial advancement surgery as part of their surgical management. Due to the age that this is undertaken, the surgical cuts, and fixation for the distractor are often in close proximity to the developing dentition. The aim of the study was to determine the frequency, and nature, of dental complications following mid-facial advancement surgery.

Methods

A retrospective cohort study was undertaken at the Supra-Regional Craniofacial Unit at Alder Hey Children's Hospital, Liverpool, UK. All patients with syndromic craniosynostosis who underwent mid-facial advancement surgery with RED frame over a 20-year period between 2000-2020 were identified from the departmental database. The pre- and post-operative clinical records, radiographs and CT scans were assessed for dental complications by two experienced orthodontists. Complications were classified into direct trauma from screws or plates, and indirect trauma; failure of eruption, altered development and morphological changes.

Results

49 patients were identified from clinical case records; after application of inclusion and exclusion criteria 40 cases were included in the final analysis. The most common diagnoses were Crouzon (n=19), Apert (n=14) and Pfeiffer Syndrome (n=4). The mean age at time of surgery was 11.2 years (range 4-28 years) with mean follow up of 10.9 years (range 1-20 years). 57.5% (n=23) of patients had dental complications in the permanent dentition comprising; direct trauma in 27.5% (n=11) and indirect trauma in 60% (n=24). Some patients experienced >1 type of complication. The most common complication was failure of eruption in 55% (n=22). Direct trauma most commonly affected the anterior dentition and indirect trauma the posterior dentition.

Conclusions

Patients with syndromic craniosynostosis who undergo mid-facial advancement surgery are at an increased risk of dental complications following surgery. They should be closely monitored by specialists in paediatric dentistry, orthodontics and restorative dentistry as part of the multi-disciplinary team.

Objectives

Participants will have an increased awareness of the potential for dental complications after mid-facial advancement surgery Participants will have an understanding of the incidence and types of dental anomalies that may occur Participants will have an appreciation for the need to include dentists and orthodontists in the monitoring of these patients

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The impact of obstructive sleep apnea on growth in patients with syndromic and complex craniosynostosis

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Abstract

Background: Given the high prevalence of OSA in children with syndromic and complex craniosynostosis (SCC) and the consequences of untreated OSA, it is important to assess their nutritional status and growth. Yet, literature regarding growth in children with SCC remain scarce. Therefore, this study aimed to 1) illustrate the growth pattern in SCC, 2) determine the impact of OSA on this growth pattern, and 3) to evaluate the effect of surgical treatment of OSA on growth over time.
Methods: A retrospective study was performed in children with SCC, who are treated at the Dutch Craniofacial Center (Rotterdam, The Netherlands). Growth variables (height, weight, weight-for-age standard deviation score, weight-for-height standard deviation score, and height-for-age standard deviation score) and degree of OSA (obstructive apnea-hypopnea index) were assessed.
Results: Of the 153 children with SCC, 38 (25%) were acutely malnourished at some point during follow-up, of whom 21 had disease-related acute malnutrition. Children with moderate-severe OSA had significant lower weight-for-height SDS compared to children without OSA ($p = 0.0063$). Growth parameters (weight-for-age SDS, weight-for-height SDS, height-for-age SDS) in children with SCC without OSA were not impaired as it did not differ from the normal healthy population, with exception of the patients with Saethre-Chotzen syndrome (SCS) who had a significantly lower SDS for height-for-age.
Conclusions: Children with SCC have a substantial chance of developing acute malnutrition at some point during growth. Additionally, in children with moderate-severe OSA a significant lower SDS for weight-for-height is present, indicating the importance of assessing the weight and growth pattern in children who are clinically suspected for OSA.

Objectives

Our objective was: 1. To illustrate the growth pattern in children with syndromic craniosynostosis 2. To determine the impact of obstructive sleep apnea on the growth pattern in children with syndromic craniosynostosis 3. To evaluate the effect of surgical treatment of obstructive sleep apnea on growth over time

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Social Media and Website Use: The experiences of parents and carers accessing care at the Oxford Craniofacial Unit.

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Abstract

Introduction

Historically, medical professionals have been the providers of specialist information about rare medical conditions. Now, increasingly, patients and the public are using the internet to access and generate information about medical diagnoses. This research investigated the use of website and social media in parents of children with craniosynostosis.

Methods

A cross-sectional survey-based design was employed. Participants were parents of children with craniosynostosis attending multidisciplinary craniofacial clinics within the Oxford Craniofacial Unit. A questionnaire was administered which assessed social media and website use adapted from the questionnaire created by Khouri et al. (2016) and Huggons et al. (2019). The surveys were administered over an 18-month period (November 2020 – May 2022).

Results
The final sample comprised 82 parents (70 mothers; 10 fathers; 1 sister/carer and 1 parent [mother/father unspecified]). The children were aged 11 months – 16 years of age (average age 6 years 3 months).

Results showed that 93% (n=76/82) of parents used the internet to find out more about craniosynostosis, with 72% (n=59/82) of parents specifically using social media to find out more about craniosynostosis. The social media platforms used included: Facebook 64% (n=53/82), Instagram 24% (n=20/82), Blogs 12% (n=10/82), Twitter 4% (n= 4/82), Tik Tok 2% (n=2/82), and Snapchat 0.01% (n=1/82).

Parents reported that Facebook was the most helpful source of information about craniosynostosis (52%: n=43/82). Parents indicated the key timepoints they used social media included: when their child received a diagnosis (70%: n=58/82), before their child's surgery (34%: n=28/82), before their first craniofacial clinic appointment (83%: n=25/30), and when child was older (17%: n=14/84).

Conclusion
Results highlight that parents use social media and other websites to access information relating to craniosynostosis. Future research should examine whether parental use of social media changes across their child's lifespan and evaluate the quality of this information.

Objectives

1. Participants will be able to identify key time points that parents access social media across their child's treatment pathway. 2. Participants will be able to identify which social media platforms that parents use to learn more about craniosynostosis. 3. Participants will be able to reflect on the risks and benefits of social media in relation to information-sharing about craniosynostosis.

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A novel, team approach to providing craniofacial surgery in the era of COVID-19

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Sumit Das

Abstract

Background

The advent of COVID-19 resulted in an interruption of craniofacial operating lists during March-October 2020. As of November 2020, the Oxford Craniofacial Unit had a backlog of 773 hours of operating. We had a waiting list of 83 transcranial operations, equivalent of 627 hours operating, of which 49 patients awaiting transcranial operations were overdue their clinical timeframe for operating on (equates to 300 hours operating).

Methods

Faced with 20 P2 category children, (need surgery <1month),the trust considered outsourcing these cases to another Craniofacial Unit. The proposal for outsourcing this work required a revenue investment of £1M.

Results

As a team, we explored alternate options with the surgical and nursing staff.

Conclusion

Suggested recovering these children overnight in recovery with two highly trained nursing staff (avoiding the need for an HDU bed- 20 cases cancelled the previous year due to lack of HDU bed.) Robust protocols were written and overnight support from plastic surgery was provided. I offered to anesthetise an extra day for craniofacial surgery, from March 2022. I also offered to anaesthetise two major transcranial cases on my usual list (routinely do 1 major and 1 minor case). Planned overrun extended to a 3 session day. I anaesthetised 3 major transcranial cases per week March-April 2022. No cases cancelled. Parental feedback for overnight stay in recovery was excellent in all domains “I can’t fault the experience of recovery overall. For us it was a very quiet calm and exceptionally well staffed environment for my child to recover”. This initiative and immense team work allowed our unit to complete 20 P2 cases and completely clear our backlog. This saved the trust £1 million. All 20 cases uneventful. I received an Excellence Report Award from the Oxford University Hospitals Trust for this initiative.

Objectives

1. Demonstrate the importance of good team work in the delivery of craniofacial surgery 2. Demonstrate the importance of clear, robust protocols for the safe delivery of craniofacial surgery. 3. Illustrate that non-syndromic patients can be safely recovered in a ward environment with adequate training and medical supervision in place.

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Posterior Vault Distraction with Foramen Magnum Osteotomies for Treatment of Multisuture Craniosynostosis and Chiari I Malformations

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Jacob Dinis

Abstract

Background

Early treatment of multisuture craniosynostosis often involves posterior vault distraction (PVD) to increase intracranial volume and relieve symptoms of intracranial hypertension (ICH) and/or associated Chiari I malformations (CIMs). The inferior osteotomy is traditionally performed above the torcula due to patient safety concerns. Recently, an emerging trend lowering the inferior osteotomy exists. At our institution we have coupled PVD with suboccipital decompression by carrying the lateral osteotomies through the foramen magnum (Magnum PVD). This study aims to describe the safety and efficacy of PVD through the foramen magnum at our institution.

Methods

Patients with multisuture craniosynostosis treated with Magnum PVD between 2021 and 2023 were analyzed retrospectively. Distraction was performed twice daily at 1 mm/day after a 3 – 6 day latency period. 3D software analysis of pre and postoperative imaging (KLS Martin) was performed to evaluate changes in intracranial volume, posterior fossa morphology, and degree of cerebellar tonsil herniation.

Results

Six patients were identified, 5 of which had concomitant CIM. All patients were male with mean age 49.7 ± 40.6 months. Four patients (66.7%) had confirmed genetic syndromes. Estimated intra-operative blood loss was 150 – 750 ml; no dural venous sinus injuries occurred. Average distraction distance was 28.4 ± 3.6 mm. The intracranial volume expanded by 15.8 ± 7.2% with 0.56 ± 0.25% per mm of distraction. Expansion of the posterior fossa was achieved in all patients. Cerebellar tonsil herniation was improved in all patients. Clinical symptoms attributed to CIM resolved in two patients and improved in two patients. Two patients (33.3%) had preoperative elevated ICP, which resolved postoperatively. Operative technique to perform low osteotomy to foramen magnum will be described.

Conclusion

Magnum PVD can be performed safely. This technique expands intracranial volume, resolves ICH, improves radiographic severity of CIM, and improves clinical symptoms from CIM and brain compression.

Objectives

1) Participants will become familiar with the safety profile of utilizing foramen magnum osteotomies in posterior vault distraction for multisuture craniosynostosis 2) Participants will evaluate the efficacy of foramen magnum posterior vault distraction in addressing Chiari 1 Malformations 3) Participants will be able to compare the utility of foramen magnum posterior vault distraction to standard surgical designs.

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Morphological and quantitative study of the inferior alveolar nerve canal in hemifacial microsomia

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Xin Li

Abstract

Background: This study aimed to probe into the anatomic course of inferior alveolar nerve canal (IANC) in hemifacial microsomia (HFM) on a large scale, morphological observations and further quantitative study were performed.
Methods: Patients were classified by Pruzansky-Kaban classification. The anatomic course of IANC was analyzed morphologically with three-dimensional (3D) imaging software among 248 patients. Seven distances between fixed landmarks on both sides were measured for 236 patients. The differences between affected and unaffected sides were compared.
Results: Significant differences were found in the entrance ($P< 0.001$), route ($P< 0.001$), and exit ($P<0.05$) of IANC in type IIb and III HFM. The higher the degree of mandibular deformity was, the higher the incidence of IANC variation was ($P<0.05$). The distances in the horizontal aspect of IANC including from mandibular foramen to mental foramen ($P<0.05$) and from mental foramen to gonion ($P<0.05$) were significantly shorter on the affected side.
Conclusions: Abnormalities of the anatomical course of IANC exist in patients with Pruzansky-Kaban type IIb and type III HFM. The reduction of IANC on the affected side in the horizontal distance is more obvious. Three-dimensional imaging assessment is recommended before surgery.

Objectives

1.Participants will be able to know about the clinical manifestation of hemifacial microsomia; 2.Participants will be able to learn about the use of 3D imaging reconstruction in craniofacial surgey. 3.Participants will be able to know about the abnormality of inferior alveolar nerve in hemifacial microsomia.

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Visualization Mapping and Current Trends of Facial Contouring Procedures: A Bibliometric Analysis Based on Web of Science

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Xin Li

Abstract
ABSTRACT
Background： Facial contouring procedures become popular in recent years, there has no bibliometric analysis focused on this field. This study aimed to construct visualization maps and analyze the hotspots and current trends in this field using bibliometric analysis.
Methods: Publications on facial contouring procedures were extracted from the Web of Science Core Collection database from 2003 to 2022. VOSviewer, CiteSpace, and “Bibliometrix” R package were used to analyze data.
Results: 721 publications on facial contouring procedures between 2003 and 2022 were included. USA was the leading country both in publications (206) and citations (3,941). Shanghai Jiao Tong University was the institution with the greatest contribution (35 publications with 379 citations). Hu J (17 publications) from China had the most outputs, while the most cited author was Rohrich RJ (321 citations) from the USA. Journal of Craniofacial Surgery (135 documents) published the most research and Plastic and Reconstructive Surgery was the most cited journal (2,755 citations). The most cited article focused on virtual surgical planning in mandibular reconstruction. Keywords co-occurrence analysis identified five clusters centered on “reconstruction”, “augmentation”, “reduction malarplasty”, “face rejuvenation”, and “orthognathic surgery”, separately. “Hyaluronic acid”, “facial feminization”, “orthognathic surgery” might be related to trend topics.
Conclusions； The research on facial contouring procedures is booming. In past two decades, hotspots in this field included: facial defects reconstruction, facial augmentation cosmetology, facial skeletal contour plasty, and facial rejuvenation surgery. The following aspects may be trend frontiers: precision and personalization, combined treatments, transgender facial contour, and facial contour shaping with fat and hyaluronic acid.

Objectives
1.Participants will be able to know about the most productive authors, institutions, countries/regions, and journals in the field of facial contouring. 2.Participants will be able to learn about the leading author, affiliation, country/region, journal, and document in facial contouring. 3.Participants will be able to know about the current study hotspots and topic trends in this field.

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Concurrent Plagiocephaly and Craniofacial Clinics

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Abstract
Background: Since 2015, our craniofacial center has run concurrent deformational plagiocephaly and craniofacial clinics. The plagiocephaly clinic is staffed by a dedicated pediatric neurosurgery advanced practice provider and a dedicated physical therapist. The craniofacial clinic is staffed by a dedicated pediatric neurosurgeon and a craniofacial plastic surgeon. The clinics run concurrently so that surgeons are readily available to plagiocephaly clinic providers to answer questions, look at images, or see patients. When surgeons do see patients in plagiocephaly clinic, craniofacial clinic encounters are generated if appropriate. All plagiocephaly patients undergo photogrammetry at every appointment when available. The current presentation is a review of our plagiocephaly clinic structure and our experience with running concurrent plagiocephaly and craniofacial clinics.
Methods: We retrospectively reviewed all plagiocephaly clinic encounters since 2015 for whether patients 1) also had craniofacial clinic encounters and 2) underwent craniofacial surgery.
Results: A total of 1811 unique patients were seen in 1877 total visits. 210 patients also had craniofacial clinic encounters and 163 eventually underwent craniofacial surgery.
Conclusions: Concurrent plagiocephaly and craniofacial clinics allow providers in the plagiocephaly clinic to have direct access to surgeons in craniofacial clinic and therefore streamline patient care. At our craniofacial center, significant numbers of plagiocephaly clinic patients were also seen by craniofacial clinic surgeons and eventually underwent craniofacial surgery. We are currently investigating variables such as how many plagiocephaly clinic patients underwent CT scanning and how many were diagnosed with craniosynostosis. We are also investigating deformational plagiocephaly treatments and outcomes.

Objectives
Participants will 1) be able to discuss advantages of running concurrent plagiocephaly and craniofacial clinics 2) be able to discuss various models of incorporating treatment of patients with deformational plagiocephaly into a craniofacial program 3) be able to discuss the benefits of photogrammetry in a plagiocephaly clinic

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Eye and orbital anatomy in metopic synostosis

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Pauline Tio

Abstract

Background

Metopic synostosis patients have a high prevalence of orthoptic anomalies such as hyperopia, astigmatism, amblyopia, and strabismus. We hypothesize that altered orbital anatomy in metopic synostosis could contribute to suboptimal visual outcomes by adversely affecting eye anatomy and growth from early life onwards. Therefore, the aim of this study is to investigate the eye and orbital anatomy in young patients with metopic synostosis.

Methods

We conducted a retrospective study in non-syndromic metopic synostosis patients (n = 134) with non-syndromic sagittal synostosis patients (n = 134) as controls. Our primary analysis focused on eye dimensions (axial length, width and globe height) using linear regression and orbital dimensions. All measurements were obtained from pre-operative CT-scans.

Results

Axial length and width in metopic synostosis patients did not differ from sagittal synostosis patients, but globe height was significantly smaller ($p = 0.0002$). Lateral wall interorbital length, lateral orbital wall length, anterior medial interorbital length and maximal medial interorbital length were significantly smaller and anterior vertical orbital height and maximal vertical orbital height were significantly larger ($p < 0.001$). The central orbital axis and interorbital angle were significantly narrower and medial-to-lateral orbital wall angle wider ($p < 0.001$).

Conclusions

To conclude, metopic synostosis patients have more shallow, wider and higher orbits with a decreased interorbital distance. Eye dimensions are similar to sagittal synostosis patients, although globe height was slightly smaller. Altered dimensions of the orbits and globes probably have a causal relation with an unknown order of development. How these dimensions relate to orthoptic anomalies needs further investigation.

Objectives

1. Participants will be able to describe how eye and orbital anatomy differs in young patients with metopic synostosis. 2. Participants will be able to use techniques to measure eye and orbital anatomy on CT-scans. 3. Participants will be able to use the new knowledge to discuss how the altered dimensions of orbits and globes relate to orthoptic anomalies.

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Correcting the Broad, Flat and Short Chin Using Modified M-genioplasty

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Guoping WU

Abstract
Background:
Several genioplasty techniques can narrow the width of the chin. Nevertheless, patients with a broad and short chin who received these methods were unsatisfied with the outcomes. The goal of this study was to analyze the clinical outcomes of modified M-shaped genioplasty for broad, flat and short chin deformity.
Methods:
Thirty-eight patients with broad, flat and short chins were included in this study from January 2019 to December 2021. The preoperative design was performed individually according to the data of the chin and the patient's desire of final chin shape. Narrowing and vertical elongating genioplasty was performed for all the patients with modified M-shaped genioplasty under general anesthesia according to the preoperative designs. All patients have completed the FACE-Q preoperatively and 3 months postoperatively. The results were evaluated by clinical appearances and FACE-Q scores.
Results:
The vertical lengthening of the chin was 2–5 mm, with an average of 3.02 mm. The horizontal narrowing width was 3–6 mm, with an average of 5.6 mm. FACE-Q scores in satisfaction with the chin increased significantly from 35.34 ± 9.57 to 72.95 ± 6.81. There were no severe complications took place during the time frame of 3–24 months postoperatively.
Conclusions:
The modified M-shaped genioplasty preserved the bone structure in the midsymphyseal area and suprahyoid muscular attachments as far as possible, and the bone segments may be repositioned quickly. This technique produced reliable and esthetically satisfying results in correcting a short, flat and broad chin, with altered vertical length, slope, width and protrusion three-dimensionally.

Objectives
Participants will be able to know the advantages and clinical outcomes of modified M-shaped genioplasty,

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Tessier 0 cleft: Epidemiology and Management in Zimbabwe

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Salma Eltoum Elamin

Waynne Manana

Abstract

Background

Tessier 0 is a rare anomaly with scarcity of the relevant literature. Resultant defect might involve the lip, upper labial frenulum, the premaxillary bone, the nasal septum, and the central nervous system. Decision regarding timing and technique of repair is challenging due to the rarity of the condition and paucity of evidence.

Aim

In this report we present our experience in managing Tessier 0, detailing the morphological subtypes, surgical techniques and outcomes.

Methods

We reviewed the epidemiological and clinical data on seven Tessier 0 clefts. We describe our cases classification in comparison to published literature. We report the clinical presentation, classification, operative findings and the postoperative outcomes.

Results

Seven patients with midline clefts were treated by the senior author (WM) over the period of 5 years (from 2016 to 2023). The midline cleft morphology varied among the study population with incomplete lip being the commonest type (three out of seven). All cases were sporadic, with no familial pattern of inheritance. Surgery was performed at a mean age of three years (age range four month to fifteen years). Surgical technique varied according to the type of the midline cleft and involvement of the upper lip, alveolus, columella or nostrils. Mean follow up period was 27 months. Facial aesthetics and functional outcomes were reported.

Conclusions

Tessier 0 clefts are rare and their surgical management can be challenging. This is the 1st report of management of these type of cleft in middle and low income african population.

Objectives

1) Participants will be able to revisit the Tessier classification for cleft + indepth understanding of the published classification systems for midline clefts with special emphasis on reclassifying our cases 2) Participants will be able to see the surgical challenge presented by each case and the various elements to be considered in planning and executing the surgery and the possible outcomes- this is an important discussion point for us where we would like also to draw from the audience experience 3) The participants will be able to develop a strategy for dealing with these rare type of craniofacial clefts.

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Osteogenic potential of different mesenchymal progenitor cells from clinically relevant harvesting cites for 3D bioprinting of artificial bone tissue

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Patrick Dinkelborg

Abstract

Background: Free vascularized autologous bone grafting is still considered as standard of care for reconstruction of extensive facial bone defects but presents challenges including anatomical availability and potential donor site morbidity. Advancements in 3D bioprinting, the application of 3D printing for the assembly of living tissue, opens new possibilities for highly personalized tissue implants. A crucial hurdle for the clinical translation of 3D bioprinting is the choice of a suitable cell source.
Methods: Mesenchymal progenitor cells from different harvesting sites including alveolar bone, iliac crest, fibula, bone marrow and periosteum were 3D-bioprinted using projection-based stereolithography. After cultivation of 28 days, the osteogenic potential was assessed my measurement of viability and mineralization as well as gene expression analysis.
Results: Over the course of cultivation, viability rates of all cell sources showed comparable results. 3D bioprints containing periosteal derived cells showed higher mineralization rates and gene expression analysis suggested advanced osteogenic differentiation in this subgroup.
Conclusions: Periosteum-derived mesenchymal progenitor cells represent a promising cell source for bioprinting of artificial bone tissue. Our results showed a high osteogenic potential when compared to different assessed cell source while they can be minimally invasive obtained.

Objectives

Participants will learn about advancements in the field of 3D bioprinting. Participants will learn about different harvesting sites and isolation techniques of mesenchymal progenitor cells. Participants will learn about different methods for the assessment of mineralization, viability and gene expression for artificial bone tissue.

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Black bone MRI as a radiation-free alternative to CT for imaging craniofacial structures: a survey of physician knowledge and practice patterns

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Rachel Pan

Abstract

Background

Computed tomography (CT) is the gold standard imaging modality for evaluation of craniofacial morphology, though there is concern regarding adverse effects of CT-related radiation exposure, particularly in pediatric patients. Black bone MRI (BBMRI), a variation of traditional MRI, can visualize cortical bone which appears black with distinct contrast against soft tissues with resolution comparable to CT images. This study aims to evaluate physicians' knowledge of BBMRI and their willingness to utilize it in practice.

Methods

A cross-sectional questionnaire, which included brief background information on BBMRI and proof-of-concept images, was distributed to practicing US physicians, surgeons, and residents. Survey data was compiled and responses analyzed for statistical significance.

Results

Of 18 respondents, two-thirds were plastic surgeons. Respondents also included neurosurgeons, general surgeons, ENTs, urologists, and vascular surgeons. One-third were residents. Approximately 78% order 1-10 imaging studies per week and 56% evaluate greater than 4 suspected craniofacial abnormalities per week. The majority (78%) selected CT as the highest-resolution imaging modality for the craniofacial skeleton. While almost half (55%) reported hearing of BBMRI before, only one-third self-reported knowing what BBMRI is. Only one respondent has ordered a BBMRI for a craniofacial abnormality, though 94% stated they would consider BBMRI for future craniofacial patients and 61% would consider BBMRI for imaging other skeletal structures. Most (83%) indicated a preference for radiation-free, similar-resolution modalities over CT despite increased costs. All respondents accepted additional imaging time as a reasonable tradeoff to eliminate radiation exposure, though fewer were willing to order BBMRI in emergent cases compared to low-acuity cases.

Conclusions

When informed of the benefits and drawbacks of BBMRI, physicians and residents across specialties appear willing to utilize BBMRI for evaluation of craniofacial and other skeletal abnormalities. Widespread exposure and use of radiation-free imaging have wide clinical relevance and a ready audience for elective cases.

Objectives

Participants will compare advantages and disadvantages of BBMRI and CT for imaging of the craniofacial skeleton. Participants will assess their own willingness to incorporate BBMRI into practice. Participants will identify indications for which BBMRI may be appropriate.

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Temporomandibular Joint ankylosis. Personal experience and literature review.

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riccardo tieghi

Abstract
Backgroud:TMJ ankylosis may be defined as the fusion of the articular surfaces with bony or fibrous tissue. It can be secondary to rauma, infections or systemic diseases such as psoriasis, reumathoid arthritis, ankilosing spondylitis. TMJ ankylosis is a disabling condition leading to serious problems in eating, digestion and hygiene, resulting in physical and phsycological disability.
Treatment is generally surgical and poses significant challenges due to technical difficulties and a hign incidence of recurrences. Several surgical techniques have been proposed but neither of them has produced uniformly succesful results. The most frequently reported techniques include, arthroplasty with (interpositional) or without (gap) interposition of alloplastic materials or temporalis muscle flap, joint reconstruction with autogenous material such as costocondal graft or prostetic total joint replacement.
Methods: in this paper 8 patients were included in the study with different aethiology (50% malformation, 25% trauma, 12.5% infection 12.5% idiopatic).
All of them underwent to surgical corrrection with different techniques.
Resultrs: In all patients an improvement in mouth opening and motility was observed with better and long lastin results when associated with a rehabilitative physiotherapy protocol for at least 6 month after surgery to prevent relaps and maintain the results.
Conclusions: TMJ ankylosis is a severe disabling condition with different aethiology.
Treatment goal in TMJ ankylosis is to improve the patient's mandibular function, correct or avoid associated facial deformity, and prevent reankylosis.
The main factors determining the results are: customized treatment choice according to aethiology, age and severity, and patient’s compliance in the post-operative rehabilitative protocol.

Objectives
Tha author present his experience in the treatment of TMJ ankylosis

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The Application of Guide Plate with Malleableness and Memory in Mandibular Angle Osteotomy

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Houbing Zheng

Abstract

To investigate the application of malleable memory digital guide plate in mandibular angle osteotomy,in order to obtain accurate osteotomy and correction of lower facial prominent.
Craniomaxillofacial CT scan was taken before surgery and 3D data were reconstructed with digital technology.The mandibular model was made by 3D printing technology,and the osteotomy range of mandibular angle was determined according to the model.Osteotomy guide plate was made according to the simulated osteotomy line,which was used to guide the mandibular osteotomy.
From 2020 to 2022,15 cases were performed,with postoperative symmetry and satisfactory clinical results.There were no severe complications such as massive bleeding,respiratory obstruction,fracture,etc.There were 2 cases of unilateral lower lip numbness,the sensation recover in 3 months.
3D printing digital technology has been widely used in craniomaxillofacial surgery.Mandibular angle osteotomy is popular in Asia.Due to the limitation of intraoral visual field,accurate osteotomy and symmetry are the biggest challenges that we have to meet.The osteotomy guide plate can solve this problem well.The plate used in the past is hard,which is not conducive to installation,and it is not easy to fix after installation.The guide plate is prone to shift,leading to the osteotomy line deviation,so that the osteotomy result will be affected.The guide plate we apply is soft,easy to install,and has the characteristics of memory,there will be no deformation after installation.It is fixed on the teeth and maxillary surface during installation,there will be no displacement of the guide plate and no offset of the osteotomy line during the surgical osteotomy. So that,the fixation of the digital guide plate can ensure the accuracy of the osteotomy line and achieve good surgical results.In conclusion,the application of malleable memory guide greatly improves the accuracy,safety and expected results of mandibular angle osteotomy.

Objectives

Mandibular Angle osteotomy, prominent mandibular angle, osteotomy guide plate

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Prevalence of reading difficulties in 9-10 year old children in Sweden born with non-syndromic craniosynostosis

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Justin Weinfeld

Abstract

Background
A majority of studies conclude that individuals with non-syndromic craniosynostosis perform in the average range on assessments of reading ability compared to norms. There are however some studies that report a large proportion of participants with reading and/or spelling difficulties in the absence of global delay. Differences between individuals with different affected sutures are hard to interpret due to small groups. In Sweden, Tillman et. al. (2020) reported a higher risk of receiving any psychiatric diagnosis in non-syndromic craniosynostosis, although the absolute incidence of specific reading impairment was low (0,3%).
Methods
Caregivers of participants aged 9-10 years of age were mailed two questionnaires: Short Dyslexia Scale (SDS) comprising seven questions asking caregivers aspects of their children's reading abilities and a background questionnaire with questions about comorbidity, gender of child, parent's educational level and school type. 158 questionnaires were mailed and 104 questionnaires could be analysed.
Results
The prevalence of reading difficulties in the whole group was 14%, in the range of the prevalence figures stated for the general population ranging between 5-17%. The lowest frequency of reading difficulties was reported for individuals born with non-syndromal sagittal craniosynostosis (11%) and the highest prevalence was found in the group of individuals born with metopic and complex non-syndromal craniosynostosis (20-22%).
Conclusions
This study supports previous research which has not found any differences in the results on reading ability between the general population and individuals born with non-syndromal craniosynostosis. The study suggests that individuals born with metopic or complex non-syndromic craniosynostosis need to be more closely monitored for reading difficulties.

Objectives

Participants will be able to compare prevalences of reading difficulties in different types of non-syndromic craniosynostosis Participants will be able to review and critique the use of questionnaires in obtaining prevalence data Participants will be able to plan assessment of reading ability in different types of non-syndromic craniosynostosis

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Mandibular Distraction Osteogenesis: Respiratory, Dental, Neurological, and Scar Outcomes at Four-Year Follow-Up

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Jesse Taylor


Jordan Swanson

Abstract
Background: Mandibular distraction osteogenesis (MDO) shows effective early relief of tongue-based airway obstruction, however, long-term outcomes and complications are not well established.
Methods: Patients with prior MDO were evaluated at a minimum 4-year follow-up. Motor/sensory nerve function, temporo-mandibular joint function, dental development, and postsurgical scarring were prospectively assessed. Data describing respiratory outcomes and feeding patterns were abstracted from the medical record.
Results: Forty-eight patients with a median age of 7 years were evaluated. Of 20 non-syndromic patients, none required additional airway procedures, none required continuous positive airway pressure (CPAP) during sleep, and 19 (95%) fed exclusively by mouth. Among 28 syndromic patients, 7 (25%) required CPAP and 8 (29%) were tube fed. Permanent first molar differences were seen in the majority of subjects (74%); patterns of damage interfering

with function were more common in syndromic (43%) compared to non-syndromic (21%; p=.014) subjects. MDO prior to age two was associated with more frequent and worse dental damage (p=.001). Inferior alveolar nerve and marginal mandibular nerve function were fully intact in 38 (79%) and 39 (81%) of patients, respectively. Three patients (6%), all with associated genetic syndromes, demonstrated severe nerve impairment. No cases of temporomandibular joint ankylosis were encountered, though maximal incisal opening was severely reduced in 20% of syndromic patients. By the Vancouver scar scale, ≥80% of surgical scars were rated in the most favorable category for each quality assessed.
Conclusions: MDO shows favorable long-term respiratory, feeding, nerve, and scar outcomes in non-syndromic patients, although permanent molar changes not precluding tooth viability are commonly seen. Patients with associated syndromes demonstrate respiratory and feeding benefits, but higher rates of dental and nerve abnormalities. Overall, MDO is effective and rarely associated with severe long-term complications, though monitoring of dental development in anticipation of permanent molar injury requiring intervention is advisable.

Objectives

1. Participants will identify long-term complications of mandibular distraction osteogenesis 2. Participants will evaluate clinical risk factors for complications, including syndromic diagnosis and age at surgery 3. Participants will consider the long-term impact of mandibular distraction osteogenesis and weigh risks and benefits of this intervention

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MAP2K1 Mutant Murine Model Recapitulates Human Cutaneous Arteriovenous Malformation

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Michal Ad

Abstract
Arteriovenous malformation (AVM) is a congenital vascular anomaly caused by somatic activating mutations in MAP2K1 in endothelial cells (ECs). We generated a conditional Map2k1-K57N mouse model by inserting a Map2k1-K57NcDNA-IRES (independent ribosomal entry side)-GFP cassette in the ROSA locus under control of the CAG promoter. Mice develop vascular malformations in the brain, ear, and intestines causing lethality between 23-71 days post-birth. The purpose of this study was to extend the lifespan of mutant animals and develop cutaneous AVMs. We inserted a LoxP flanked gene trap (GT) downstream of the promoter to prevent expression of the mutant allele (R26GT-Map2k1-GFP). Using tamoxifen-inducible EC specific Tg-Cdh5CreER transgene, we activated Map2k1-K57N expression at P1. We reduced the amount of tamoxifen to a 1/10th dose (5 ul of 1 ug/ul 4-OH-tamoxifen in acetone), which was applied topically on the left ear. We obtained 4 Tg-Cdh5Cre+/-;R26GT-Map2k1-GFP/+ mice that survived 4 months post-birth. The mice exhibited cutaneous AVMs involving the orbit, neck, and ear. The mice all exhibited intestinal lesions but not brain malformations. The integument lesions shared a similar phenotype to human AVMs. Decreasing the tamoxifen dose extends Tg-Cdh5Cre+/-;R26GT-Map2k1-GFP/+ mice lifespan. These mice develop AVMs of the integument, progressing from Stage 1 to Stage 2 as mice age. This murine model can be used to study the pathophysiology of AVM as well as test novel pharmacotherapy against the lesions.

Objectives
Participants will learn about arteriovenous malformations (AVMs). Participants will be presented with this murine model and how it can be used to study the pathophysiology of AVMs. Participants will learn about possible novel pharmacotherapy against AVMs using this model.

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Comparison of Furlow and Straight-Line Repair Techniques on Transverse Dental Arch Dimensions and Extent of Orthodontic Intervention

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Abstract

Background

The Furlow and straight-line repairs are common palatoplasty techniques. Many studies have advocated for the Furlow technique as it provides an increase in palatal lengthening, contributing to positive speech outcomes. However, the Furlow technique's impact on the transverse axis of the dental arch has yet to be explored. This study aims to compare the impact of palatoplasty techniques on the transverse palatal dimensions and the extent for postoperative orthodontic interventions.

Methods

A retrospective chart review of all patients with cleft palate at an urban tertiary pediatric hospital between 1997-2022 was completed. All patients undergoing palatoplasty were included, patients without orthodontic records were excluded. Variables including cleft phenotype, palatoplasty technique, and orthodontic evaluation and interventions were collected. Patients were compared based on palate repair technique. Data were analyzed using Wilcoxon and Chi-Squared analyses in RStudio 4.2.1.

Results

Of 1,552 patients with cleft palate anomalies, 53% underwent Furlow repair and 47% underwent straight line repair. Straight line repairs were associated with increased rates of orthodontist reported maxillary narrowing compared to Furlow (47% vs 33%, p=0.013). Additionally, patients undergoing SLR demonstrated higher rates of orthodontic transverse palatal expansion compared to the Furlow cohort (45.88% vs 30.19%, p=.002). Subgroup analysis based on Veau classification demonstrated this relationship was only maintained in Veau IV clefts and not in Veau I-III, where the repair technique did statistically affect rates of transverse palatal expansion.

Conclusions

This data associates straight line repair with increased prevalence of maxillary narrowing and transverse palatal expansion, particularly in Veau IV clefts. Independent of the soft palate repair technique, hard palate repair is relatively standardized. These results implicate the soft palate repair method may affect maxillary development and subsequent orthodontic needs in patients with bilateral cleft lip and palate.

Objectives

1. Participants will be able to articulate the impact of surgical technique on transverse dental arch dimensions. 2. Participants will be able to identify Veau type most associated with transverse palatal narrowing. 3. Participants will be able to articulate the patient population demonstrating highest need for orthodontic palatal expansion based on palatoplasty technique.

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Considering the Third Dimension: Maxillary and Mandibular Asymmetry in Patients with Cleft Lip and Palate Undergoing Orthognathic Surgery

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Jesse Taylor

Abstract

Background: Improving occlusion and aesthetics is the primary objective of orthognathic surgery in patients with cleft lip and palate (CLP). However, these patients often suffer from horizontal, vertical, and rotational asymmetry in addition to maxillary retrusion. This study aims to describe maxillary and mandibular asymmetry in patients with CLP undergoing orthognathic surgery and analyze its anatomic basis.

Methods: Patients with isolated CLP undergoing CT imaging prior to orthognathic surgery were retrospectively reviewed. Maxillary and mandibular positioning relative to the Frankfort horizontal and midsagittal planes as well as dimensional symmetry between the left and right sides was evaluated. Incidence of clinically significant asymmetry, correlations between types of local asymmetry, and associations with clinical history were analyzed.

Results: Fifty-eight patients, with median age 17 (range 13-24) years, were analyzed, including 32 patients with unilateral CLP and 26 with bilateral CLP. Twenty (34%) patients demonstrated chin deviation ≥4mm and 21 (36%) had a ≥5% difference in mandibular ramus length. Horizonal occlusal plane cant of ≥ 2° was seen in 20 (34%) maxillae and 28 (48%) mandibles, with dental arch yaw ≥ 2° noted in 32 (55%) of both maxillae and mandibles. Chin deviation of ≥4mm was associated with greater maxillary cant (p=.003), mandibular cant (p=.003), discrepancy in ramus length (p<.001), discrepancy in mandibular body length (p=.005), and discrepancy in condylar volume (p=.008). Bilateral and unilateral CLP showed equivalent incidence of asymmetry on all measures.

Conclusions: Both maxillary and mandibular asymmetry is common in skeletally mature patients with CLP and frequently results in notable chin deviation. Bimaxillary orthognathic surgery is an underrecognized opportunity to

correct facial asymmetry in this population, a process made easier by three-dimensional imaging and virtual surgical planning. A better understanding of the mechanisms causing asymmetric growth of the jaws may help us design both interceptive and definitive treatments of it.

Objectives

(1) Participants will appraise the severity of jaw asymmetry in skeletally mature patients with cleft lip and palate. (2) Participants will consider the types of asymmetry observed in the maxilla and mandible and understand their frequencies in patients with cleft lip and palate. (3) Participants will analyze how compensatory changes during jaw and dental development may lead to asymmetry in patients with cleft lip and palate.

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Changes in mandibular position during midface distraction in patients with syndromiccraniosynostosis

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Abstract
【Background】 The purpose of this study was to evaluate changes in mandibular position during midface distraction. Midface distraction was performed in patients with syndromic craniosynostosis to increase upper airway volume. Although this treatment resulted in changes in occlusion, the concomitant changes in mandibular position were poorly understood.
【Methods】 In this retrospective study, three-dimensional (3D) cephalograms were obtained before and after midface distraction in 15 patients with syndromic craniosynostosis. Perioperative polysomnography scores and changes in maxillary and mandibular position, mandibular volume, and upper airway volume were analyzed.
【Results】 Results showed a significant improvement in apnea-hypopnea index (AHI) (from 20.6 ± 21.3 to 6.9 ± 5.1, $p < 0.05$) and upper airway volume (from 2951.65 ± 2286.38 to 5218.04± 3150.05 mm3, $p < 0.001$). When the lowest point of the sella turcica was set as the reference point, the mandible moved significantly in an anterior direction (from 47.9 ± 11.5 to 51.9 ± 9.8 mm, $p < 0.05$). Mandibular volume did not change significantly perioperatively (from 32530.19 ± 10726.01 to 35590.50 ± 14879.21 mm3, $p = 0.10$). There were positive correlations between the rates of improvement in AHI and the amount of mandibular movement in the anterior and inferior directions (both $p < 0.05$). Within the limitations of the study it seems that the mandible moved in the anterior-inferior direction after midface distraction, and the amount of movement correlated with improvement in respiratory function.
【Conclusions】 Therefore, it is important to consider the position of the mandible when determining the direction of midface distraction, as it may influence the therapeutic effect.

Objectives
In this study, we performed three-dimensional cephalometric analysis of a case series of midface distraction surgery for syndromic craniosynostosis and found that anterior advancement of the mandibular played an important role in improving respiratory function.

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Twist1 Mutation and Environmental Factors Synergistically Exacerbate Craniosynostosis

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Eloise Stanton

Abstract
Background: TWIST1 gene mutation leads to Saethre-Chotzen syndrome, characterized by unilateral or bilateral coronal synostosis. Studies have shown that in utero exposure to a serotonin selective reuptake inhibitor (SSRI), citalopram, increases the incidence of craniosynostosis in mice, suggesting environmental risk factors may interplay with genetic mutations in craniosynostosis etiology. In this study, we sought to determine how Twist1 mutation interacts with maternal usage of citalopram to disrupt cranial suture MSCs, leading to craniosynostosis.

Methods: Twist1+/- mutant mice with or without in-utero citalopram exposure (20 mg/kg per day) were generated, including (1) wild type (WT) (n=14), (2) Twist1+/- (n=150), (3) WT + citalopram (n=, (44) Twist1+/- + citalopram (n=30). MicroCT and histologic analysis was completed to confirm suture fusion. RNAscope was also conducted to allow for quantitative molecular analysis.

Results: WT mice had 0% cranial suture fusion. Twist1+/- mice without citalopram had between 70-80% suture fusion. WT mice with citalopram exposure had 36.4% suture fusion or skull dysmorphology. Importantly, Twist1+/- mice with in-utero exposure to citalopram had the highest rate of suture fusion, 93.3%. Importantly, there was 77% bilateral fusion and only 17% unilateral fusion in citalopram-exposed Twist1+/- mice. This is in contrast to Twist1+/- mice without citalopram exposure, who demonstrate a 50:50 split of bilateral vs. unilateral fusion. Histological analysis of the craniosynostotic mice treated with citalopram also demonstrated suture fusion. RNAscope gene expression analyses demonstrated that Gli1+ cells were diminished in mice exposed to citalopram in utero.

Conclusions: Exposure to citalopram in utero leads to an increased frequency and severity of craniosynostosis. Our data suggest that there is a combinatorial effect of genetic mutations and environmental factors in the development of craniosynostosis. Developing a fuller understanding of the signaling mechanisms that mediate suture morphogenesis and underlie the gene-environment interactions will provide crucial insight into the pathophysiology of this disease.

Objectives
1) The participant will understand how citalopram impacts suture development in mice. 2) The participant will be informed of how there are potential gene-environment interactions in the development of craniosynostosis. 3) The participant will gain an understanding of some of the important molecular mechanisms involved in premature suture fusion in Twist1 mice.

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Mandibular Subcondylar Fracture:Improved functional outcomes in selected patients with open treatment

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Alex Gibstein


Meghan Miller


James Bradley


Kevin Chen


Elisa Atamian

Abstract

Background: Subcondylar fractures represent 25 to 35 percent of all mandibular fractures, yet the treatment paradigm has remained controversial. Closed treatment relies on the plasticity of the condyle head during recovery, whereas open treatment is challenging and risks facial nerve injury. Perioperative, functional, and patient-reported outcomes were measured to compare methods of open versus closed treatment of subcondylar fractures.

Methods: Selected displaced subcondylar fracture cases with open (open reduction and internal fixation of subcondylar fracture with maxillomandibular fixation) versus closed (maxillomandibular fixation) treatment were compared (n = 60). Demographics, perioperative data, complications, persistent symptoms, chin deviation, malocclusion, change in mouth opening, functional scores, and FACE-Q patient satisfaction were recorded.

Results: Open versus closed groups had similar demographics and perioperative data, except the open group had longer operating room time (76.39 minutes versus 56.15 minutes). In long-term follow-up, open-treated patients had fewer symptoms (9 percent versus 67 percent), less chin deviation (0 percent versus 40 percent), a less restricted mouth opening (3mm versus 5mm), and better functional scores (1.92 versus 0.861). Transient facial nerve weakness was seen in 6 percent of open cases.

Conclusion: For selected subcondylar fracture patients, open treatment with endoscopic assistance, nerve monitoring, and specialized plates provides superior long-term results compared to closed treatment when considering symptoms and functional parameters.

Objectives

Explain open and closed treatment of subcondylar fractures. Compare the processes of open and closed treatments of subcondylar fractures. Analyze the long term results of open and closed treatments and decide which to recommend to other surgeons

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A modified technique for medial canthal reconstruction with titanium plates in children with blepharophimosis syndrome

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Amitabh Thacoor

Abstract

Background: Blepharophimosis syndrome, characterized by blepharophimosis, epicanthus inversus, blepharoptosis and telecanthus, is a rare developmental anomaly which is associated with significant functional and aesthetic morbidity. Several techniques, including medial canthoplasty, have been described to correct these deformities, often with associated complications.
Methods: We present a comparison of the previously described technique of medial canthoplasty using titanium miniplates and screws and a Y-Y plasty with the modified technique. A retrospective review of our electronic patient database was performed to identify all patients who underwent surgical correction of blepharophimosis syndrome using our modified technique at Great Ormond Street Hospital for Children between 2019-2023.
Results: Fifteen patients underwent medial titanium canthoplasty with a median age of 7 years (range 5-10 years). Eight patients (3 males: 5 females) underwent the original technique. Seven patients (5 males: 2 females) underwent medial canthoplasty using the modified technique. All operations were performed jointly by an oculoplastic and a craniofacial surgeon. No cases of poor scarring, implant extrusion, eyelid malposition or implant failure were reported. Two patients experienced complications; one case of superficial infection managed by oral antibiotics and one case of early wound dehiscence secondary due to trauma requiring surgical re-suturing.
Conclusions: Medial titanium canthoplasty for blepharophimosis syndrome is easily reproducible and produces a strong and stable medial canthal reconstruction covered by well vascularized skin flaps with minimal overall morbidity. Modifications facilitate improvements in the stability of the final canthal position, scar and contour of the medial canthal area.

Objectives

1. Participants will understand the patient characteristics associated with blepharophimosis syndrome 2. Participants will understand the principles of surgical correction of blepharophimosis syndrome 3. Participants will be aware of common complications of surgery for blepharophimosis syndrome and how to reduce these complications

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Characterizing Mandibular Growth Patterns in patients with Craniofacial Microsomia

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Abstract
Background: Craniofacial microsomia is associated with varying degrees of mandibular hypoplasia that results in facial asymmetry. Whether this asymmetry is progressive or static is a subject of debate in the literature. We seek to characterize this mandibular growth pattern which has implications for the optimal timing of surgical intervention.
Methods: Patients with craniofacial microsomia seen at our institution from 2009-2022 with multiple CT scans were identified. Mandibular cephalometric measurements, including mandibular ramus height and body length, were obtained from head CT scans which were rendered in three dimensions using Materialize Mimics, version 20 (Materialise NV, Belgium). Mandibular growth rates were modeled using multivariable linear regression and compared using a linear mixed effects model.
Results: Eighteen patients with unilateral craniofacial microsomia were included in the analysis with CT scans acquired from ages 5-22 years. Based on Pruzansky-Kaban scoring, there were two class I, ten class IIA, five class IIB, and one class III mandibles. Eleven patients underwent mandibular distraction. There was no statistically significant difference in growth rates between affected and unaffected mandibular body lengths (0.8mm/month vs 0.9mm/month; p=0.581) or mandibular rami heights (1.2mm/month vs 1.0mm/month; p=0.450). Patients who underwent mandibular distraction surgery saw accelerated changes in rami height (1.8mm/month vs 0.8mm/month; p=0.001). There was no difference in growth discrepancy between the Pruzansky-Kaban subtypes.
Conclusions: Mandibular asymmetry in patients with craniofacial microsomia is static and non-progressive. Interestingly, mandibular distraction may even accelerate rami growth in the postoperative period. As we continue to analyze more data, we hope to further delineate any differences between Pruzansky-Kaban mandibular subtypes and the effects of differing surgery on mandibular growth.

Objectives
1. The participants will be able to gain insight into the mandibular growth pattern in patients with craniofacial microsomia. 2. The participants will be able to explain the nature of the facial asymmetry in craniofacial microsomia to determine whether it is static or progressive in nature. 3. The participants will be able to make an informed plan of mandibular reconstruction for patients with craniofacial microsomia.

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Effect of midface surgery on nasal outcomes in patients with craniofacial deformities: a two- and three-dimensional quantification method

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Abstract

Background: Nasal septal deviations have been observed in patients with congenital craniofacial deformities following midface surgery which seem to correct without additional surgery. This study aimed to determine if patients develop septal deviations following midface surgery and whether predictions can be made based on the preoperative septal shapes.
Methods: This retrospective study included patients who underwent midface surgery (Le Fort III (LF3), monobloc (MB), or facial bipartition (FB)). Preoperative septal shape was determined on the coronal plane on the preoperative CT-scan. A 3D-mesh was created from the preoperative scan and the postoperative scan was automatically registered to the preoperative scan. Three nasal soft-tissue landmarks (nasion, pronasale and subnasale) were manually annotated.
Results: A total of 70 patients were included (22 Apert, 37 Crouzon, and 11 craniofrontonasal dysplasia), of which 32 had received a LF3, 25 MB, and 13 FB. Mean age at LF3 was 14.5 years (± 4.7), at MB 7.8 years (± 6.3), and at FB 7.9 years (± 3.6). Preliminary results (n=30) on the preoperative septal shape demonstrated a straight septum in 11 (37%) patients, a C-shaped septum in 12 (40%), and a dislocation of the caudal septum in 7 (23%). Postoperatively, 6 (20%) clinically showed septal deviation, of which 2/6 had a straight septum preoperatively, 3/6 had a C-shaped septum, and 1/6 had a dislocation of the caudal septum. Septal defects were seen in in 19 (63%) postoperatively. Anterior nasal septal deviation appeared to be most severe after MB; the mean postoperative deviation of the pronasale was 0.6 mm (± 0.4) after LF3, 1.3 mm (± 1.1) after MB, and 0.9 mm (± 0.7) after FB.
Discussion: Septal deviations and defects following midface surgery were frequently seen in patients with craniofacial malformations. With the current data it is hard to determine whether preoperative shape influences the risk of developing postoperative septal deviations.

Objectives

- Learn that patients with craniofacial malformations can develop septal deviations following midface surgery - Learn that is is hard to predict the risk of developing postoperative nasal septum deviations after midface surgery based on preoperative 3D measurements - Learn that Monobloc correction causes the most severe anterior nasal septal deviations

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Polysomnography Metrics as Predictors of Extubation Failure Following Mandibular Distraction Osteogenesis

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Abstract

Background:
Mandibular distraction osteogenesis (MDO) is a surgical alternative to tracheostomy for obstructive sleep apnea (OSA) treatment in patients with congenital micrognathia. Historically, patients remained intubated after mandibular distractor placement for airway protection with extubation timing varying between clinicians and institutions. This study aimed to assess the impact of postoperative intubation duration and polysomnography (PSG) metrics on reintubation risk following mandibular distraction placement.

Methods:
Patients undergoing MDO from 2004-2022 were included. Patients with preoperative tracheostomy or MDO performed at an outside institution were excluded. Patient demographics, preoperative and postoperative PSG variables, and length of postoperative intubation were analyzed in a stepwise logistic regression to identify factors contributing to reintubation risk. Additionally, extubation timing, outcomes and length of hospital stay were compared between patients who required reintubation and who were successfully extubated.

Results:
Ninety-nine patients met inclusion criteria. Median time of extubation was nine days postoperatively (range: 0-36 days). Eleven (11.1%) patients went on to require reintubation and three (3.0%) required tracheostomy. Patients who required reintubation were intubated longer (11 vs 9 days; p=0.054), had higher tracheostomy rates following completion of distraction (27.3% vs. 0.0%; p=0.001) and longer average hospital stays (75.1±67.1 vs. 37.0±24.1 days; p=0.004) compared to those not reintubated. Stepwise logistic regression analysis demonstrated that preoperative end tidal CO_2 ($EtCO_2$) was the only significant contributor to reintubation risk (p=0.031).

Conclusions:
Our study identified an 11% reintubation rate after MDO, with 97.0% of patients avoiding tracheostomy. $EtCO_2$ was the only significant predictor of increased reintubation risk suggesting that the PSG metric may be a helpful tool to

consider in extubation planning. Additional studies are needed to further characterize the predictive power of $EtCO_2$ to further decrease the burden of care and improve outcomes of extubation following MDO.

Objectives

1. Participants will be able to describe polysomnography metrics associated with extubation risk. 2. Participants will be able to articulate how duration of intubation and distance of mandibular distraction at extubation affects reintubation risk. 2. Participants will be able to describe pros and cons of various extubation protocols following mandibular distractor placement.

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Application of Augmented Reality in Craniofacial surgery: a feasibility study and application on patients

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Abstract

Introduction: Augmented Reality (AR) is an advanced technology which allows overlapping and integrating the virtual information with the reality related to a subject. This technology can be applied by means of Head Mounted Displays (HMD) such as Hololens2. Hololens 2 by Microsoft allows for both augmented and mixed reality and is becoming increasingly successful in the medical field. The Authors hereby present a preclinical feasibility study on AR application by means of HMD on craniofacial surgery. We also present our first clinical cases.

Materials and methods: Prior to its application on real patients, the Authors performed a preclinical study to assess the accuracy of HoloLens2 navigation on 3D printed stereolithographic models of a patient presenting metopic synostosis.

The authors tested the AR application for HoloLens 2 by performing the nasal and the frontal osteotomy of the Fronto Orbital Remodeling (FOR) under its guide. Each user repeated the procedure six times on the same 3D printed case. Accuracy was then measured by means of calibrated CAD CAM cutting guides. A system of target registration for navigation with AR was developed. The Authors also present a clinical cases serie.

Results: 97% of the individuals traced the frontal and nasal osteotomies trajectory with an accuracy level of ±1.5 mm. 80% and 52% of the candidates were able to correctly draw the nasal and the frontal osteotomy line respectively, with an accuracy level of ±1mm. The 61% and 33% of the users were able to perform the nasal and the frontal osteotomy respectively with an accuracy level of ±0.5mm
Conclusions: Our encouraging results, have led to the promising application on patients.The Authors also present a case serie.

Objectives

- the participants will be able to recognize the difference between mixed and augmented reality obtained by means of head mounted display - the participants will be able to critically evaluate the feasibility of augmented reality in Craniofacial surgery both on printed models and on patients - the participants will be able to compare the feasibility, the ergonomics and the learning curve of augmented reality by means of head mounted display on models vs patients

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Advanced Reconstructive Management for Severe Unilateral Mandibular Hypoplasia

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Raymond Harshbarger


Patrick Kelley

Abstract
Background: Unilateral mandibular hypoplasia is a challenging surgical problem. Mild cases can be addressed with orthognathic surgery alone, but severe cases require complex approaches to optimize outcomes. Distraction osteogenesis is a useful technique in craniofacial reconstruction; however, unidirectional distraction techniques are insufficient in isolation to treat the multidimensional bone deficiencies of severe unilateral mandibular hypoplasia. To provide optimal results, a combination of advanced techniques, including distraction, orthognathic surgery, and free tissue transfer, may need to be applied. Virtual surgical planning (VSP) can be a powerful and useful tool. We present our experience utilizing advanced multimodal surgical approaches in unilateral mandibular hypoplasia.
Methods: A retrospective review was conducted of patients with unilateral mandibular hypoplasia who underwent multimodal surgical management consisting of a combination of orthognathic surgery and free tissue transfer between January 1, 2011, and January 1, 2023. Operative details, surgical outcomes, and complications were assessed.
Results: Five patients were identified. The initial 2 cases were completed with conventional pre-operative planning and splints. VSP was utilized for the last 3 cases with preparation of custom plates, splints, and models. Three patients underwent a one stage procedure consisting of simultaneous jaw surgery and free fibula flap. Two patients underwent a two-stage reconstruction with the first consisting of jaw surgery and placement of a rigid external distraction system for soft tissue distraction, and free fibula reconstruction at the second stage. Two patients required return to the operating room for venous congestion and 1 patient underwent washout for a hematoma. All patients had durable long-term results with significant improvement in occlusion and facial symmetry.
Conclusions: Management of severe unilateral mandibular hypoplasia is challenging, but excellent long term outcomes can be achieved by combining multiple advanced reconstructive techniques.

Objectives
Participants will understand treatment options for severe unilateral mandibular hypoplasia. Participants will understand the benefits of combining advanced reconstructive techniques in severe unilateral mandibular hypoplasia. Participants will understand the utility of virtual surgical planning in the management of severe unilateral mandibular hypoplasia.

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Evaluation of Optimal Outcome Reporting (OOR) in Cleft Palate Repair

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Abstract
Background
Outcome assessment following palatoplasty varies significantly across institutions and no widely applied standardized outcome metric exists. We created a novel quality metric called "OOR" (Optimal Outcome Reporting) reflecting patients with cleft palate who experienced the best outcome: single operation, velar competence (no hypernasality or audible nasal escape), and no unintended fistula. We assessed OOR at ages 5 and 8 in a cohort of patients following primary palatoplasty (single surgeon, J.G.M.) from 2007-2013.
Methods
Data included sex, ethnicity, Veau classification, age at operation, presence of fistulae, and speech assessments at ages 5 and 8. We included syndromic diagnoses and excluded submucous clefts.
Results
Cohort comprised 94 patients. Median operative age was 10 months. 45 percent were male and 46 percent non-Caucasian. Syndromic diagnoses existed in 23/94 patients (24 percent), predominantly Robin. Most common cleft type was Veau I (32 percent), followed by Veau III (28 percent), and Veau II/IV (20 percent). OOR at age 5 identified in 69 percent (65/94), while suboptimal outcomes resulted from multiple operations (9), velar incompetence (19), and fistula (1). OOR at 8 years noted in 73 percent (61/83), and failed OOR stemmed from multiple operations (12), velar incompetence (9), and fistula (1). Mean repair age was significantly associated with OOR, while syndromic diagnosis and cleft type approached significance. A group (9) of velar competence-related suboptimal outcomes at age 5 proved optimal at 8 years with speech therapy alone. Failed OOR experienced significantly more clinic visits and accrued higher costs.

Conclusion

Cleft palate OOR describes the ideal outcome for patients and families following primary palatoplasty. This simple surgical outcomes metric can be determined for individual surgeons and across centers, allowing for benchmarking and facilitating quality improvement initiatives. We continue to evaluate OOR metric durability to determine whether a suitable single time point exists for analysis.

Objectives

(1) Develop familiarity with a novel quality metric called “OOR” (Optimal Outcome Reporting) in the context of cleft palate repair (2) Analyze the impact of patient diagnosis and timing of repair on cleft palate repair outcomes (3) Consider cleft care in the context of value-based health care initiatives

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Virtual Surgical Planning for Staged Craniopagus Conjoined Twin Separation: Reports from the Cutting Edge

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Abstract

Background: Craniopagus twin separation is a rare, high-risk, technically challenging procedure that mandates interdisciplinary collaboration. The difficulty of these cases is compounded by their rarity, as few centers have been able to build significant institutional experience with this procedure. This study aims to synthesize the experiences of centers who have used virtual surgical planning (VSP) and computer-aided design and manufacturing (CAD/CAM) to successfully separate craniopagus twins.

Methods: Surgical teams publishing successful craniopagus twin separation using VSP or CAD/CAM were contacted and surveyed.

Results: Four of six teams responded. All used CAD/CAM anatomical models, commonly creating layered representations depicting relationships between abnormal cerebral vasculature and crania. All but one respondent used these models to facilitate communication within their multidisciplinary team. Two teams used virtual reality for surgical planning, and all groups used computerized simulations to predict changes achieved throughout staged intervention. This included one center where simulated soft tissue expansion was used to plan optimal expander

placements and volumes. Two teams used CAD/CAM guides to translate virtual surgical plans into the operating room. Only one team used patient-specific hardware, in the form of a custom distraction device. Considering future directions, surgeons expressed desire for increased fidelity of virtual reality simulations including vascular flow data, incorporation of augmented reality, and manufacture of patient-specific reconstruction plates or other hardware.
Conclusion: VSP and CAD/CAM are critical tools for surgical teams endeavoring to separate craniopagus twins. Web-linked virtual reality conferencing may also facilitate the transfer of knowledge from experienced teams to those with less familiarity, an important step toward increasing the global success rate with these rare and challenging operations. Still, many possible advantages of these technologies have yet to be fully realized, particularly in rendering virtual plans into the physical world through augmented reality or custom-manufactured devices and hardware.

Objectives

(1) Participants will identify current applications of VSP and CAD/CAM technologies in complex and highly individualized operations. (2) Participants will compare strategies used by different surgical teams leveraging these technologies in craniopagus twin separation. (3) Participants will consider avenues by which VSP and CAD/CAM technologies can further optimize craniopagus twin separation in the future.

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Craniofrontonasal dysplasia: Outcomes of hypertelorism correction in late presenting patients.

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Cassio Eduardo Raposo-Amaral

Abstract
Background: Craniofrontonasal dysplasia (CFND) is a rare congenital craniofacial syndrome characterized by single suture synostosis, hypertelorism, other clinical facial features, and abnormalities in the upper extremities. There is few studies in the literature that address hypertelorism management in a series of late CFND patients with long and mid-term outcomes.
Methods: A retrospective study was performed on consecutive late presenting CFND patients referred to our hospital with substantially completed craniofacial skeleton growth, who underwent hypertelorism correction between 2007 and 2019 and received at least 2 years of follow-up care. None of the patients in this study underwent prior craniofacial surgery. Only those patients with a confirmed mutation of the EFNB1 gene were included in this study. All patients underwent hypertelorism correction by facial bipartition or box osteotomy. Intracranial pressure screening was based on the following parameters: (1) clinical, (2) ophthalmological (3) Radiologic to detect obliteration of basal cisterns and signs of Chiari type I malformation.
Results: A total of ten late presenting CFND patients (all female) were treated at our hospital. None of the patients presented signs of elevated intracranial pressure. The average patient age was 13.4 ± 7.68 years. Average interorbital distance (mm) changed from 34.27 ± 5.76 to 19.72 ± 5.31. Average blood transfusion was 21.53 ± 4.56 (ml/kg) Strabismus was present in 9 out of 10 patients, and resolved in 5 patients. Those who improved presented divergent strabismus. Major complications were infection of the frontal bone, which required partial bone removal, and cerebrospinal fluid leak, which was completely resolved by insertion of a lumbar shunt.
Conclusion: The absence of elevated intracranial pressure enables hypertelorism correction in late presenting CFND patients via facial bipartition or box osteotomy without the need for additional operations that provide for cranial expansion.

Objectives
Understading the surgical outcomes of late presenting patients with Craniofrontonasal dysplasia, a rare craniofacial disorder.

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Information material for patients with craniosynostosis and their parents

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Abstract
Background: The Dutch guideline for children with non-syndromic and syndromic forms of craniosynostosis describes medical, organizational, social and psychologic aspects during the care process and formulates recommendations regarding treatment based on available literature with grading the level of evidence. To make this information more accessible to the patients and parents a translation of the medical guideline into understandable patient information was needed.
Method: In the past years, our team has developed diverse forms of information material together with the Dutch patient society to give patients the opportunity to be informed about the background of their treatment and the current care paths.
Results: Different information material has been developed together with the patient advocacy group to inform patients and their care givers: 1) graphics that illustrate the general care paths per diagnosis over time 2) animations to give insight in surgical techniques and 3) a patient version of the Dutch guideline. In the poster presentation examples of the graphics and animations will be given.
Conclusion: Parents and patients are offered various options of information regarding the long-term care paths and the (surgical) procedures. The amount of information material can be expanded and adapted in the future, based on the needs that parents and patients express.

Objectives
1) The participants will be aware of the information material that's been created 2) Participants will be enabled to access the created material 3) Participants will be able to tell how the long term care paths is organized for a specific diagnosis

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Stratification of ophthalmologic diagnoses following correction of non-syndromic craniosynostosis

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Abstract
Background: Ocular anomalies are prevalent in patients with non-syndromic craniosynostosis, thus patients must be risk-stratified for appropriate screening.
Methods: Non-syndromic craniosynostosis patients operated between January 2006 and December 2020 at a single institution, with >12 months follow-up, were reviewed for demographic, perioperative, and long-term annual ophthalmology consultations. Syndromic patients, identified via formal geneticist consultation or multidisciplinary diagnosis, were excluded.
Results: A total of 150 non-syndromic craniosynostosis patients were identified (63% female;55% sagittal,16% metopic,9% coronal,7% lambdoid,13% >1 suture) were surgically treated (mean age 16.7 months;70% cranial-vault remodeling, 30% endoscopic) and followed up for mean 3.8 years. Ophthalmic diagnoses were reported in 18.0%, with strabismus most common (7.3%).
Female patients were significantly older at surgery (27months vs 11months;p=0.004), and more often underwent secondary cranial procedures (14% vs 7%;p=0.006). Cranial remodeling was associated with older age at surgery (17months vs 3months;p<0.001), heavier weight (10kg vs 6kg;p<0.001), increased intraoperative blood loss (EBL;173mL/kg vs 42mL/kg;p<0.001) and intra-op (140mL/kg vs 34mL/kg;p<0.001) as well as post-op transfusions (8mL/kg vs 4mL/kg;p=0.005), without differences in ophthalmologic concerns. Pre-operative papilledema was associated with increased post-operative transfusion (21cc/kg vs 4cc/kg;p<0.001), and future cranial operations (12% vs 2%;p=0.020).
Overall ophthalmic disorders were associated with older age at surgery (36months vs 12months;p<0.001) and use of tranexamic acid (25% vs 7%;p=0.025), without differences in EBL/transfusions. Ophthalmic diagnoses were comorbid with developmental delay(p=0.049), myopia(p<0.001), and strabismus(p<0.001). Myopia was more common with older surgical age (61months vs 15months;p=0.003) increased EBL (29mL/kg vs 19mL/kg;p<0.001), and non-Hispanic white race (39%;p=0.005). Strabismus was more common with older surgical age (36months vs 15months;p=0.043) and non-Hispanic white race (64%;p=0.029).

Conclusion: Ocular sequelae were correlated with older surgical age, race, use of tranexamic acid, post-operative transfusions, need for secondary revision, and seen comorbid with developmental delay. Ophthalmologic screening must be compulsory with emphasis on patients at higher risk.

Objectives

1. Participants will recognize the most common types and frequencies of ophthalmologic disorders encountered in non-syndromic craniosynostosis patients 2. Participants will be able to identify risk factors associated with ophthalmologic disorders in non-syndromic craniosynostosis patients 3. Participants will recognize the importance of ocular screening in high risk non-syndromic craniosynostosis patients

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Treatment of children with syndromic craniofacial dysostosis with frontofacial advancement in a bibloc fashion using a customized rigid external distraction system (RED II).

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Ira Maistreli


Matthias Schulz


Ulrich-Wilhelm Thomale


Tobias Ebker

Abstract

BACKGROUND: Craniofacial synostosis encompasses a wide range of syndromic as well as non-syndromic conditions sharing the common feature of the premature ossification of cranial sutures. The results are potentially serious adverse effects including restriction of cerebral growth with increased intracranial pressure, visual and respiratory impairment as well as facial deformity. Frontofacial advancement plays a crucial role in the treatment of complex craniofacial deformities and various surgical concepts have been introduced.
METHODS: We present the concept of frontofacial advancement in a bibloc technique (simultaneous fronto-orbital advancement and Le Fort III advancement) using a customized rigid external distraction system which has been applied in a series of 5 patients. Customized temporal, frontal and maxillary fixation plates were virtually designed (KLS Martin, Tuttlingen, Germany) based on a preoperative CT scan. The bibloc frontofacial advancement was carried out in a maxillofacial and neurosurgical team approach. The distraction osteogenesis was started 1 week postoperatively and was continued after discharge from the hospital by the family with regular outpatient follow-ups.
RESULTS: Successful frontofacial advancement results with significant improvement of the midface retrusion and exophthalmos were achieved. The distractor was removed after a consolidation phase of 3 – 6 months.
CONCLUSION: The reported concept of bibloc frontofacial advancement with a customized rigid external distractor system resulted in significant improvement of the skeletal growth deficiencies while no significant complications were observed. The simultaneous fronto-orbital and Le Fort III osteotomy followed by distraction offers the advantage of a one-step procedure with a potentially reduced risk of CSF fistula and infection compared to the monobloc frontofacial advancement. Additionally, the bibloc distraction concept using a customized rigid external distraction system allows separate correction of adjusted magnitude for the neurocranium and midface while the

possible adjustment of the distraction vector during the treatment may guide and optimize the direction of distraction.

Objectives

1.Participants will be informed about the indication as well as the advantages of treatment of syndromic faciocraniosynostosis utilizing the technique of bibloc frontofacial advancement with a customized rigid external fixation system (RED II) 2.Participants will be introduced to the treatment planning of syndromic frontofacial hypoplasia using the above-mentioned method. 3.Presentation of treatment results and recommendations of frontofacial advancement with a bibloc frontofacial advancement and a customized rigid external distractor system as a reliable treatment method for syndromic frontofacial hypoplasia

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Blood loss in Fronto orbital advancement surgery (FOAR): a review of blood product use in over 1370 consecutive cases over 11 years in the UK designated craniofacial units.

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Martin Evans

David Johnson

David Dunaway

Chris Parks

Christian Duncan

Abstract

Background: The four designated craniofacial units in the UK (England, Wales and Northern Ireland) have collected blood loss and blood product usage data for consecutive fronto orbital advancement and calvarial remodelling (FOAR) procedures for craniosynostosis carried out in our units since 2012. This excludes other operative procedures undertaken in other cases (and not discussed in this paper), such as total calvarial remodelling, spring mediated cranial expansion and endoscopic suturectomy plus helmet.

Methods: We have prospectively collected blood loss/ product usage data since 2012 annually. This data is submitted and discussed at the annual UK Craniofacial meeting and critically appraised. This study collates the data collected, and shows trends in evolution of practice in the past 11 years.

Results: Since 2012, the 4 units have undertaken 1374 consecutive cases of fronto orbital advancement with calvarial remodelling (FOAR) for craniosynostosis. The use of blood products as a surrogate marker for surgical quality has shown that there has been a gradual reduction in blood product usage in the perioperative period over the 11 yrs. This has been complemented with other adjuncts such as the use of intraoperative tranexamic acid and also cell salvage where appropriate.

In 2012 the mean donor unit per patient ratio was 1.6 and there has been a gradual reduction so that in 2022 this ration was 0.76. The number of patients having no donor units transfused in 2022 was 34% compared to 0% in 2012.

Conclusions: In the 11 years since data collection has been undertaken and appraised annually, there has been a reduction of blood product usage in the 4 designated UK craniofacial units. Safe surgery and reduction in surgical morbidity in our units is very much a team approach between surgeons and anaesthetists, and these figures illustrate this team working both in units and in collaboration nationally.

Objectives

1. To see how blood loss and product replacement can be used as a surrogate marker for surgical quality. 2. Collaboration between 4 units in the UK allows the large series to expose advantages to the comparison of craniofacial surgical practice. 3. Critique of blood loss figures between the 4 UK craniofacial units has driven up surgical standards, in our opinion.

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Optimization of the Electronic Health Record for Craniofacial Team Care

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Daniel Cho

Abstract
Background: Electronic Health Records (EHR) are ubiquitous in healthcare globally. The EHR serves multiple functions in healthcare including clinician documentation, sharing of test results, and billing. For complex craniofacial conditions, a specific and accurate diagnosis may not be readily available within the EHR, limiting accuracy of some EHR-incorporated registries. Development of databases outside the EHR may be a useful tool for teams to track patients, but is also dependent upon input of information into the system, which requires time and personnel. We sought to develop a "craniofacial snapshot" integrated within our EHR that could be efficiently entered and updated at the point of care, benefit multiple specialties, and improve our ability to follow this subset of patients longitudinally in our clinic.
Methods & Results: A craniofacial team-specific "Episode of Care" was designed within our Health Link EHR (Epic Systems, Verona, WI). At the point of care, cleft and craniofacial-specific conditions, care team members, prior surgeries, current therapies, and needed follow-up may be efficiently entered or updated. All team members can easily view or update information relevant to their specialty. Clinic staff can track patient contacts between visits and set reminders for needed follow up. Reports can be run to understand trends at our craniofacial center over time and support quality improvement efforts.
Conclusions: The EHR is a necessary, but time-consuming aspect of providing modern healthcare. Optimizing it to capture the unique multidisciplinary care needs for patients with craniofacial conditions has promise to improve efficiency and communication among the care team. We successfully created a mechanism to capture the specific information of interest to our craniofacial team directly within the EHR. While refinements are in evolution, we believe this is a first step which can aid in streamlining patient care among multiple specialties and teams over many years of follow up.

Objectives
Participants will understand the current benefits and limitations of the EHR. Participants will engage with the EHR to optimize delivery of team-based care. Participants will be able to apply a strategy for EHR optimization at their home institution.

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Posterior vault distraction osteogenesis in older syndromic patients following strip craniectomy.

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Cassio Eduardo Raposo-Amaral

Abstract

Background: There is few studies in the literature regarding postoperative posterior vault distraction osteogenesis (PVDO) in older pediatric syndromic population who underwent previous strip craniectomy procedure. Thus, the objective of this study is to describe outcomes of older pediatric syndromic patients and compare to those primary infants.

Methods: An observational retrospective study was performed on consecutive patients (n=75) with Apert, Crouzon, Pfeiffer, or Saethre-Chotzen syndromes, who underwent PVDO between 2012 and 2022 with a minimal follow up of 6 months. Data (demographic and outcomes) from 9 patients who underwent PVDO greater than age 5 and had previous strip craniectomies were retrieved and compared to those infants who underwent primary PVDO less than 1 year of age (n=39). Intracranial pressure (ICP) screening was based on the following parameters: (1) clinical, (2) ophthalmological (3) Radiologic to detect obliteration of basal cisterns and Chiari type I malformation. Presence of important infra-torcula sinus pericranii were also described.

Results:. Older children had less relative blood transfusion volumes per kilogram (11.40± 5.94 vs 15.05± 7.63), but higher total volume (263.78±14.55 vs 117.48±8.88). Data from hospital stay, distraction length, time in consolidation and surgery duration were statistically similar. All older patients presented signs of elevated ICP, being papilledema (n=8), clinical (n=9) and Chiari type I (n=4) and sinus pericranii (n=3). Older patients improved clinically and ophthalmologically. Chiari improvement without total resolution occurred in all older patients. Infra-torcula sinus pericranni was still detected following PVDO in all older patients. Three patients from the younger group presented hydrocephalus and a shunt was placed following PVDO.

Conclusion: Posterior cranial vault distraction osteogenesis can improve ICP in older patients who underwent strip craniectomy. Sinus pericranii as a result of brain venous outflow alteration was not corrected.

Objectives

Understanding the outcomes of posterior vault distraction osteogenesis in older pediatric syndromic patients who underwent strip craniectomy.

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Mandibular bone behavior in patients with craniofacial microsomia and Goldenhar syndrome treated by distraction osteogenesis technique.

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Jose Rolando Prada


María Fernanda Vergel


Daniela Arias


Yvonne Pereira

Abstract

Introduction

The treatment of choice for mandibular hypoplasia in craniofacial microsomia and Goldenhar syndrome is distraction osteogenesis. The stability of the neoformed bone after mandibular distraction is not clearly defined, as bone resorption may occur. It is necessary to know the behavior of bone over time during the different stages of growth. Based on the Prada classification, the prognosis of the treatment is established and its cost-effectiveness is determined.

Methods

Cohort study of patients diagnosed with craniofacial microsomia and Goldenhar syndrome treated by distraction osteogenesis at the Children's University Hospital of San José during the period from January 1, 2007 to April 30, 2022.

Results

A total of 36 patients were identified who, after applying inclusion and exclusion criteria, 18 patients were analyzed, of which twelve (66%) have craniofacial microsomia, and six (34%) Goldenhar syndrome. Distraction osteogenesis was performed, achieving stability of the length of the neoformed bone in 90% (5/18 patients) of cases in patients between 0 – 5 years old. In patients older than 6 years, the success rate was 100% (13/18 patients). We were able to determine that the success of the procedure is based on the presurgical preparation using maxillary orthopedic techniques that was performed in 15 patients in the study. We determined that the range of variability of the bilateral comparison (comparison between the healthy side and the unhealthy side) at 5 years post-distraction was between 16 – 22 mm according to the age
group.

Conclusions

With our study we can show how after distraction osteogenesis, the length of the neoformed bone is maintained, with the accompaniment of maxillary orthopedics being a complement that favorably influences the result.

Objectives

Objectives Determine the behavior of the distracted mandibular bone and compare it with the contralateral healthy side. Findings will be described according to patients' teething stages, classification of mandibular hypoplasia, and

type of treatment in patients with craniofacial microsomia and Goldenhar syndrome. With these characteristics, we can identify the variables that affect the stability of the neoformed bone after distraction osteogenesis.

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The Burden of Care for Caregivers of Children Undergoing Orthotic Helmet Therapy: A Qualitative Study

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Tega Ebeye

ABSTRACT
Background: There is a paucity of research regarding the caregiver burden of Orthotic Helmet Therapy (OHT) for craniosynostosis following Endoscopic Strip Craniectomy (ESC). To engage in informed consent, both caregivers and providers must understand the multidimensional impact OHT might have on the caregivers' lives during the treatment period. This cohort study aims to elucidate the caregiver burden of Orthotic Helmet Therapy (OHT) following Endoscopic Strip Craniectomy (ESC) to treat craniosynostosis in an effort to inform clinicians and future caregivers navigating this therapeutic option.
Methods: Fourteen caregivers of children with positional plagiocephaly (6) and craniosynostosis treated by ESC (8) undergoing OHT at a single center were recruited via convenience sampling. Using a phenomenological qualitative approach, semi-structured interviews were conducted to understand the experience of OHT for caregivers. Data collection and analysis were iterative and conducted until thematic saturation was reached.
Results: Emerging themes revealed five domains of caregiver burden: emotional, cognitive, physical, psychosocial, and financial. No caregiver felt the therapy was too burdensome to complete. Caregivers of both groups also expressed positive aspects of OHT related to support from the team, the non-invasive nature of treatment, and the outcomes of therapy. Furthermore, caregivers report overall satisfaction with the process, stating willingness to repeat the treatment with subsequent children if required.
Conclusions: OHT is associated with five major domains of caregiver burden, however, none of the caregivers regret choosing this treatment option, nor was the burden high enough to encourage treatment cessation. This study will inform future prospective analyses that will quantify real-time caregiver burden throughout OHT.

Objectives
1. To understand the experience of caregivers of children undergoing orthotic helmet therapy
2. To appreciate the challenges caregivers experience while children are undergoing orthotic helmet therapy.
3. To begin to understand the degree of burden that caregivers might encounter while a child undergoes orthotic helmet therapy.

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Evaluation of epilepsy in patients with syndromic craniosynostosis

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Ana Carolina Coan

Abstract
Background: Syndromic craniosynostosis (SC) patients may develop epilepsy during craniofacial growth. The association between brain malformations and changes in intracranial physiology may result in potential epileptiform disorders. There are few detailed studies about the prevalence of epilepsy in the SC population, epileptic syndromes, and natural history of seizures. Interestingly, during one discussion at the ISCFS meeting in Paris, none of the attendees raised their hands after being asked about the incidence and prevalence of epilepsy in the SC population. This study aims to investigate the incidence of epilepsy in the SC population.
Methods: We performed an observational retrospective study on 127 consecutive patients with Apert, Crouzon, Pfeiffer, or Saethre-Chotzen syndromes who underwent any craniofacial surgery or hand surgery between 2007 and 2022 at our facility. The International League Against Epilepsy (ILAE) Classification of the Epilepsies validated to Portuguese questionnaire was handed out to all syndromic patients or families who completed at least one operation at our Institution. Demographic and clinical data about the seizures were collected.
Results: Ninety-two SC families answered the questionnaire, having 23.9% (n=22) of patients presenting at least one episode of non-provoked seizure and are being investigated to have their diagnoses based on the classification proposed by the ILAE.
Conclusions: The prevalence of epilepsy seems to be profoundly higher in the SC population than in the overall population. Primary anatomic brain malformation or encephalomalacia following various insults due to multiple craniofacial surgeries may result in epileptic disorder.

Objectives
-Attendees will be able to compare epilepsy in the global population and in craniosynostosis -Participants will be able to explain that there is a difference in the prevalence of epilepsy between these two groups - Participants will be able to interpret that there is possibly a relationship between these diseases

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Comparison of long term cognitive outcomes of school age children with nonsyndromic sagittal craniosynostosis after treatment with either endoscopic strip craniectomy or open surgery

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Abstract

Background

We compared long term cognitive outcomes of school age children with nonsyndromic sagittal craniosynostosis who had previously undergone either open cranial vault remodeling (open) or endoscopic strip craniectomy with orthotic therapy (ESC) across three institutions: Children's National Medical Center (Washington, DC), St. Louis Children's Hospital, and Children's Hospital of Orange County (Orange, CA).

Methods

School-age children (4-18 years of age) with previously corrected sagittal craniosynostosis were enrolled between 2018 and 2022. Cognitive development was measured using the Patient Reported Outcomes Measurement Information System (PROMIS) and the Differential Ability Scale-II General Cognitive Ability (GCA) score.

Results

81 participants (46 ESC, 35 open) met inclusion criteria. 46 underwent ESC, and 35 underwent open repair, with 59 males. Median age at time of surgery was 3 months (range 2-6) for ESC, and 9 months (range 3-34) for open. Median operative time was 68 min (ESC) and 179 min (open). Transfusion rate was 9 percent (ESC) and 77 percent (open). Median age at time of assessment was 8 years (range 5-15 years). After controlling for assessment age, sex, and socioeconomic status, ESC (100 [96, 104]) and open (103 [98, 108]) demonstrated no

statistically significant or clinically meaningful difference in GCA scores (p=1.0). There was also no significant difference between repair types in verbal ability, nonverbal reasoning, working memory, and processing speed. We found no significant difference between repair types in patient or parent reported Neuro-QoL cognitive function scores (54 ESC, 50 open, p=0.143). We found a trend that patients who had undergone ESC (48) had higher Hollingshead socioeconomic scores compared to patients who had undergone open repair (43), but this was not statistically significant (p=0.132).

Conclusion

This study finds no statistically significant difference between cognitive outcomes and type of surgical procedure (open or ESC) used to repair nonsyndromic sagittal craniosynostosis.

Objectives

1. Participants will learn about measures of cognitive outcome in children after craniosynostosis surgery. 2. Participants will learn that there was no significant difference in cognitive outcomes in children who had undergone either open surgery or endoscopic surgery for craniosynostosis. 3. Participants will learn about differences in socioeconomic scores of patients treated for craniosynostosis.

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Where Do We Grow from Here? A Matched Long-term Analysis of Oculo-orbital Outcomes after LeFort III and Monobloc Distraction Osteogenesis

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Abstract

Background: In syndromic craniosynostosis, symptomatic exorbitism is often managed by LeFort III (LFIII) or Monobloc (MB) distraction osteogenesis. This study compares postoperative short- and long-term volumetric and positional orbital changes.

Methods: Pre- and postoperative computed-tomography (CT) scans of patients undergoing LFIII or MB from 2000-2021 were analyzed and categorized as early postoperative (<1yr) or late (>1yr). Measurements included inferior and superior orbital rim position relative to the sella, relative globe position, orbital angle, and orbital volume. In the sagittal plane, relative globe position was measured as the distance from the globe center to a plane through the orbital rims, and the orbital angle as the angle between the orbital rims and the Frankfurt horizontal. Late imaging was compared to age-matched controls.

Results: Thirty-four patients (16 LFIII, 18 MB) were included. Cohorts were matched by age at imaging and surgery, sex, and syndrome. Late imaging interval was 6.8±2.7 years. Inferior orbital rim distance did not change from early to late timepoints in the LFIII group (p=0.527), but decreased in the MB group (59.3±5.5mm to 51.6±10.2mm, p=0.005). The superior orbital rim was advanced 16.2±4.5mm in the MB group and was stable at the late timepoint (p=0.055). The orbital angle in controls (n=40, 81.0±9.6°) was less than the LFIII group (88.3±10.3°) and exceeded the MB group (71.2±5.8°, p<0.001). Orbital volume increased more in the MB group (12.8±3.1cm3) than the LFIII group (6.8±3.0cm3) at the early timepoint (p<0.001), however was similar at the late timepoint (MB: 28.8±6.4cm3, LFIII: 29.0±4.3cm3, p=0.905).

Conclusions: Interval postoperative assessment following midface advancement informs distraction targets and sheds insight on growth and/or relapse of the craniofacial skeleton. Equivalent results were seen at the superior orbital rim and with improved correction maintenance at the inferior orbital rim after LFIII.

Objectives

1. Participants will understand the long-term changes of the bony orbit after LeFort III and Monobloc Distraction Osteogenesis 2. Participants will understand how these changes may suggest growth of certain segments of the facial skeleton and lack of growth of others. 3. Participants will learn how to use this information to help improve target endpoints for each procedure.

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Sagittal Sinus venous outflow assessment in 79 syndromic craniosynostosis patients candidates for posterior vault distraction osteogenesis

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Enrico Ghizoni

Abstract
Background: Posterior vault distraction osteogenesis (PVDO) has become the treatment of choice to manage or prevent intracranial hypertension in syndromic craniosynostosis patients. The venous outflow study is paramount to identifying large emissary veins, sinus pericranii, or aberrant intracranial venous outflow. We present our venous outflow findings and treatment algorithm in 75 patients who underwent PVDO.
Methods: An observational retrospective study was performed on consecutive patients (n=79) with Apert, Crouzon, Pfeiffer, or Saethre-Chotzen syndromes, who were candidates for PVDO between 2012 and 2022 with a minimal follow-up of 6 months. We studied the cerebral venous outflow to evaluate if PVDO was possible. We calculated a cross-sectional area of the superior sagittal sinus (SSS) before (AB) and after (AA). The venous anomaly and a ratio were established by dividing the AA by the AB. Once a severe constriction of the SSS is detected, one should avoid the venous anomaly. Patients underwent PVDO if it was feasible without disturbing such veins. On the contrary, the patient underwent FOA.
Results: We retrospectively evaluated 79 patients, and 75 underwent PVDO. The average age at surgery (months) was 24.2 (range from 153 to 4). The mean total posterior advancement distance (mm) achieved was 22 (12 to 30). The average hospital stay (days) was 3.21 (range from 14 to 2). The median sagittal sinus ratio (SSR) was 1.64, and the standard deviation was 0,59. Six patients presented large emissary veins and or large sinus pericranii; the median SSR was 0.38. In two, PVDO was possible using a Z-plasty, and the other four underwent FOA.
Conclusion: A diligent brain venous circulation of patients candidates for PVDO is paramount to avoid disastrous results. The sagittal sinus ratio can be a warning sign to prevent such venous anomalies or even allow us to face them and perform the PVDO safely.

Objectives
Participants will be able to understand the necessity of a pre-surgical brain venous outflow study. Will be able to recognize venous outflow disturbances in syndromic craniofacial patients. Will be able to decide between PVDO and FOA according to pre-surgical venous outflow findings.

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Three-Dimensional Animated Videos Improve Caregiver Craniosynostosis Education

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Abstract
Background: Craniosynostosis involves various surgical options early in a patient's life. While recent literature showed that caregivers prefer three-dimensional (3D) tools for learning about craniosynostosis, few 3D tools exist for caregivers. This study aims to assess the efficacy of 3D animated videos for enhancing craniosynostosis education in caregivers and laypersons.
Methods: We created 3D animated videos describing anatomy and surgical options (e.g., fronto-orbital advancement, posterior vault reconstruction) for three craniosynostosis diagnoses: bicoronal, metopic, and sagittal. A cross-sectional survey was distributed to caregivers through Facebook groups and to laypersons through Amazon Mechanical Turk. Respondents rated their understanding of craniosynostosis on 10-point Likert-scales, labelled anatomic sutures, and answered true/false general (e.g., "The sutures have fused too early") and diagnosis-specific (e.g., "The distractors are not removed after surgery") questions on craniosynostosis. Caregivers were shown the video that best corresponded to their patient's diagnosis while laypersons were randomized to a diagnosis video. After the video, respondents were asked the same set of questions asked before the video.
Results: A total of 69 craniosynostosis caregivers (mean age 35 years, 73% Caucasian, 64% female) and 111 laypersons (mean age 37 years, 100% Caucasian, 41% female) completed the survey. Caregivers scored significantly higher on the knowledge questions (mean score difference: 1.27, $p<0.01$). Laypersons did not score significantly higher on the knowledge questions (mean score difference: 0.32, $p=0.08$). Both caregivers (mean value pre-video:

38.87, mean value post-video: 41.49, $p<0.01$) and laypersons (mean value pre-video: 45.29, mean value post-video: 52.84, $p<0.01$) rated their understanding as higher.
Conclusions: Our 3D animated videos significantly improved caregiver craniosynostosis understanding and knowledge. Thus, these animations provide an accurate instrument to improve caregiver spatial and anatomical understanding of craniosynostosis. In addition, these videos can be easily incorporated into a surgeon's discussion with caregivers about craniosynostosis, improving shared decision making.

Objectives

1. Evaluate the efficacy of 3D animated videos for craniosynostosis education 2. Understand the importance of 3D educational modalities for complex craniofacial diagnoses 3. Compare the effects of craniosynostosis educational tools on caregivers and laypersons

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Reconstructive Management Using Thoracodorsal Artery Pedicled Compound Free Flap, Gap Arthroplasty for Temporomandibular Joint Ankylosis

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Abstract

Background

Mandibular hypomobility can be caused by various causes such as temporomandibular joint(TMJ) ankylosis, osteoarthritis, fascial space infection, etc. If it is not properly treated, permanent loss of mandibular mobility can remain as an deformity. We introduce a case of restoration of normal motion and function in a patient with temporomandibular joint ankylosis accompanied by extensive tissue damage.

Method

A 55-year-old man came to the hospital with contact burns of the face and oral cavity caused by being hit in the right face by an iron torch while working at a copper smelter. Delayed closure was performed after parotidectomy and debridement due to extensive foreign body in the face and buccal mucosa, soft tissue defect, and necrosis in the parotid gland, facial nerve trunk, and surrounding tissues.
At 3 months after closure, pus came out of the wound intermittently due to osteomyelitis of the mandible, and temporomandibular joint(TMJ) ankylosis was observed on computed tomography(CT) and simple X-ray. Surgery was planned for restoration of the mandibular hypomobility due to TMJ ankylosis.

Result

After scar and infected tissue resection, latissimus dorsi musculocutaneous free compound flap with serratus anterior muscle flap and gap arthroplasty for TMJ ankylosis were performed.
At postoperative 2months, the patient was well healed without acute or chronic complications. Facial muscle function is still incomplete yet.

Conclusion

Gap arthroplasty must be successfully performed for the recovery of TMJ ankylosis, allowing maximal incisal opening to enter the normal range. Through this management, the patient can recover normal mandibular mobility and minimize discomfort in daily life such as eating and speaking. In addition, using a compound flap based on the thoracodorsal neurovascular bundle, it is possible to simultaneously restore multiple functions, such as sufficient skin defect repair and volume replacement, reanimation, and infection control.

Objectives

(1) Microsurgery(Latissimus dorsi musculocutaneous free flap for facial trauma) (2) Temporomandibular joint ankylosis (3) Facial nerve injury

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Evaluating Surgical Outcomes Following Reduction Cranioplasty for Hydrocephalic Macrocephaly: A Systematic Review

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Steven P. Moura

Abstract

Background: The surgical outcomes of reduction cranioplasty (RC) for the treatment of hydrocephalic macrocephaly are not well understood. The primary objective of this systematic review is to evaluate the surgical outcomes of RC for hydrocephalic macrocephaly.
Methods: A systematic review was performed using PubMed, Scopus, and Web of Science, following modified Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA). Two independent reviewers screened 350 studies and 24 studies reporting on RC for hydrocephalic macrocephaly were included. Data on study design, patient demographics, operative details, and surgical outcomes were collected. Levels of evidence were defined in accordance with the criteria set by the American Society of Plastic Surgeons.
Results: In the 24 included studies, there was a total of 64 reduction cranioplasties with a mean cohort size of 2.6 (SD 2.5) patients. Sixteen (64%) studies presented level V evidence, 7 (28%) presented level IV evidence, and 2 (8%) presented level III evidence. Single-stage reconstructions were employed in 64% of studies, while 32% of studies presented multi-stage reconstructions and one study (4%) presented both single and multi-stage techniques. Improved postoperative head positioning after RC was reported in 92% of studies, improved postoperative aesthetics was reported in 88% of studies, and improved postoperative neurologic functioning was reported in 76% of studies. All studies that examined pre- and post-operative differences in head circumference or intracranial volume reduction were successful in head size reduction. There was a mortality rate of 5.0% in the 60 RCs.
Conclusions: Most studies on RC report improvement in head size, head positioning, cosmesis, and neurologic functioning. However, these studies have small cohort sizes and low levels of evidence due to the rarity of hydrocephalic macrocephaly. These findings suggest that RC is a promising surgical technique for hydrocephalic macrocephaly that merits further investigation.

Objectives

- Participants will learn about challenges in intraoperative shunt management during reduction cranioplasty for hydrocephalic macrocephaly. - Participants will learn about neurologic, head positioning, and aesthetic outcomes after reduction cranioplasty for hydrocephalic macrocephaly. - Participants will learn about complications and mortality outcomes after reduction cranioplasty for hydrocephalic macrocephaly.

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Neurosurgical nuances of 75 syndromic craniosynostosis patients who underwent PVDO

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Abstract
Background: Syndromic craniosynostosis (SC) patients can present several neurosurgical nuances, such as intracranial hypertension, cerebellar tonsil herniation, ventriculomegaly, hydrocephalus, and cerebral venous hypertension. We present the neurosurgical findings and their management in 75 patients who underwent PVDO.
Methods: An observational retrospective study was performed on consecutive patients (n=75) with Apert, Crouzon, Pfeiffer, or Saethre-Chotzen syndromes, who were candidates for PVDO between 2012 and 2022 with a minimal follow-up of 6 months. Our protocol recommends PVDO before any ventricular shunt or ETV if hydrocephalus is detected. We do not address the posterior fossa. If cerebellar tonsil herniation is detected, we offer follow-up with annual cranial and cervical spine MRIs. We calculated the Evans index and looked for cerebellar tonsil herniation presence, hydrocephalus incidence, and cerebral venous circulation.
Results: We retrospectively evaluated 75 patients who underwent PVDO. The average age at surgery (months) was 24.2 (range from 153 to 4). The mean total posterior advancement distance (mm) achieved was 22 (12 to 30). The average hospital stay (days) was 3.21 (range from 14 to 2). 68% of patients presented ventriculomegaly (median Evans 0.32, SD 0.12). 19.6% of those were classified as having hydrocephalus and required a shunt; two patients already had a previous shunt (no complication related). All had Evans > 0.5 (median 0.59). 41% of the patients presented with cerebellar tonsil herniation, and no syringomyelia was detected. Trans-osseous emissary veins were frequently detected (82.7%), but only four patients were not eligible for PVDO.
Conclusion: We found a high incidence of ventriculomegaly (68%) in SC patients, but only 19.6% developed hydrocephalus. The Evans index superior to 0.5 suggested the need for hydrocephalus treatment. Emissary veins were also frequently detected (82.7%) but prevented PVDO in only four patients. CS patients present several neurosurgical nuances; a multidisciplinary craniofacial team is mandatory for the best outcome.

Objectives
Participants will be able to learn about neurosurgical nuances in craniofacial surgery. Will be able to tell the difference between ventriculomegaly and hydrocephalus. Will be able to learn about cerebellar tonsil herniation.

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Towards minimally invasive robotic craniosynostosis surgery: development of a novel articulating bone cutting tool

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Dale Podolsky


Jones Law


James Drake


John Phillips

Abstract

Background: Endoscopic techniques in craniosynostosis surgery use straight rigid tools, which limits the extent of osteotomies possible along the curvatures of the skull. Expanding the indications for minimally invasive techniques requires the development of a novel tool that can overcome these limitations. We have developed a novel bone cutting tool that can navigate along the curvatures of the skull using small access incisions and have tested its use in a high fidelity pre-clinical simulator.
Methods: The tool was developed using computer-aided design, three-dimensional printing and computer numerical control machining. The tool comprises a cable driven articulating bending section with adjustable curvature that navigates along the curvatures of the skull. The end-effector comprises a cable driven bone punch, dural protector, scalp retractor and channel with a flexible endoscope for visualization. A driving unit controls the bending section, and a handle actuates the bone punch. Mechanical testing was performed using simulated bone. A virtual workspace analysis assessed the deflection of the tool tip during articulation. A craniosynostosis simulator was developed and prototype testing was conducted to determine the reachability of the tool along the skull.
Results: The tool successfully performed osteotomies on simulated bone. Workspace analysis demonstrated a maximum deflection of the bending section during articulation of 23.7 mm allowing for navigation along the different curvatures of the skull. Simulator testing demonstrated the tools ability to adjust its curvature to reach all areas of the frontal, parietal, temporal and occipital bones using a single vertex minimal access incision.
Conclusions: A novel bone cutting tool was developed that can perform osteotomies along all areas of the skull using a minimal access incision. The tool has the potential to change the paradigm of how craniosynostosis surgery is performed and is the first stage development of a minimally invasive robotic approach to craniosynostosis surgery.

Objectives

1. Participants will understand how a novel articulating bone cutting tool can expand the indications for minimally invasive craniosynostosis surgery. 2. Participants will learn about the mechanical design, features and functions of a new craniosynostosis bone cutting tool and how the tools design and function will evolve to a minimally invasive robotic assisted approach to craniosynostosis surgery. 3. Participants will learn about the methods and results of designing, developing, and testing of a novel complex surgical instrument intended for use during minimally invasive craniosynostosis surgery.

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Calvarial Vault Remodeling Technique for Lambdoid Craniosynostosis

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Kaamya Varagur

Abstract

Background: Premature fusion of the lambdoid suture is the most uncommon single suture synostosis. It presents with a classic "windswept" appearance, with a trapezoid-shaped head and significant skull asymmetry notable for an ipsilateral mastoid bulge and contralateral frontal bossing. The proximity of the lambdoid suture to critical intracranial structures such as the superior sagittal and transverse sinuses represents a potential for significant intraoperative bleeding. Due to the rarity of lambdoid synostosis, little is known about optimal techniques for treatment. Prior work has shown that parietal asymmetry often persists after repair. Here, we present a calvarial vault remodeling technique for the treatment of unilateral lambdoid craniosynostosis.

Methods: This technique requires the removal of both ipsilateral and contralateral parietal bones. These are moved across hemispheres and re-inset on opposite sides to help correct parietal asymmetry. Obliquely orientated barrel stave osteotomies are performed to provide a safe mechanism for correction of occipital flattening. We examined the postoperative courses of two patients treated using this technique. We also describe volume asymmetry outcomes calculated from 3D photographs in one patient treated with the new technique compared to patients treated with prior calvarial vault remodeling techniques between 2008 and 2017.

Results: Postoperative courses of two patients treated using this technique were uncomplicated. Pre-operative and one-year post-operative three-dimensional photos were available from one patient treated by this technique and five patients treated with our earlier techniques. Volume asymmetry was corrected by over 50% with the new method, while correction among patients treated with prior calvarial vault remodeling techniques ranged from 6 to 22%.

Conclusions: The technique presented here corrects the windswept appearance and volume asymmetry in patients with lambdoid craniosynostosis while also reducing the potential for complications. Further work will be necessary to confirm this technique's long-term efficacy in a larger cohort.

Objectives

Each learner will be able to describe the steps of this calvarial vault remodeling technique for lambdoid craniosynostosis. Learners will discuss the relative correction of volume asymmetry compared to prior calvarial vault remodeling techniques. Learners will evaluate the overall safety of this technique.

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DOES SEQUENCING INFLUENCE ACCURACY OF MAXILLARY POSITIONING IN BIMAXILLARY CLEFT ORTHOGNATHIC SURGERY?

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Philip Tolley


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Abstract
BACKGROUND: The sequence of osteotomies for bimaxillary surgery and the effects on accuracy of the surgical result remains unresolved and understudied in patients with cleft-related malocclusions. The purpose of this work was to evaluate whether the sequence of osteotomies (mandible first versus maxilla first) influenced the post-**operative** accuracy of maxillary positioning.
METHODS: This was a prospective study of patients with variable cleft palate (+/- cleft lip) morphologies who underwent bimaxillary orthognathic surgery (bilateral mandibular sagittal split, BSSO, and Le Fort 1, LF1, osteotomies) to address dentofacial disharmony. Patients undergoing single jaw procedures, those who did not have computer-assisted surgical (CAS) planning, and those wherein customized fixation devices were used were excluded. All subjects underwent pre-surgical orthodontic treatment, CAS planning, and standard technique for LF1and BSSO by a single surgeon. The primary predictor variable was the sequence of jaw osteotomies, classified as mandible-first (BSSO then LF1) or maxilla-first (LF1 then BSSO). The outcomes of interest were concordance between the surgical plan and post-operative maxillary positioning, as assessed on standardized lateral cephalometric films taken <2 weeks post-operatively.
RESULTS: Twenty-two skeletally mature patients were identified and met the study criteria. Eleven subjects underwent maxilla-first surgery and eleven subjects underwent mandible-first surgery. The groups were comparable in regard to age, gender, cleft type, segmental maxillary osteotomy, and magnitude of maxillary movement ($p > 0.09$). The mean discrepancies between planned and achieved maxillary vertical and sagittal positions were 1.0 +/- 0.5 mm and 1.0 +/- 0.8 mm, respectively and were not different based upon sequence ($p > 0.17$). The mean discrepancies between SNA and occlusal plane changes were 0.9 +/- 0.7 degrees and 1.2 +/- 0.6 degrees, respectively and were not different between groups ($p > 0.51$).
CONCLUSIONS: In patients with cleft palate (+/- cleft lip) undergoing bimaxillary orthognathic surgery, accuracy of maxillary positioning does not appear to be influenced by surgical sequencing.

Objectives
Participants will be able to: 1. Identify the indications for bimaxillary surgery in patients with cleft-related dentofacial deformities. 2. Consider the effect of surgical sequencing on the accuracy of maxillary positioning. 3. Discuss the benefits and limitations of mandible-first versus maxilla-first surgical sequencing in bimaxillary orthognathic surgery.

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Microvascular Surgical Techniques for Mandibular Reconstruction of Self Inflicted Gunshot Wounds

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Abstract
Background: With the rise in gun violence over the last decade, self-inflicted gunshot wounds (GSWs) have become a common injury encountered by craniofacial surgeons. Management of these GSW injuries is surgeon dependent and often variable with the mandible presenting complex decisions involving fracture reduction/fixation techniques and best autologous bone sources.
Methods: A retrospective chart review was performed for a single craniofacial surgeon's experience at two tertiary academic medical centers managing complex craniofacial injuries. All subjects who sustained a self-inflicted GSW to the mandible were included in this study. Techniques to manage mandibular injuries necessary to provide definitive reconstruction were investigated.
Results: Forty-eight subjects with survivable facial GSWs were identified. Twenty-seven (56.3%) subjects met inclusion criteria as having a self-inflicted GSW involving the mandible. All subjects achieved successful anatomic continuity of their mandible following reconstruction utilizing primary open reduction internal fixation (n= 19, 70.4%) vs temporary external fixation and staged reconstruction (n=8, 29.6%). Autologous mandibular reconstruction was performed utilizing anatomic fracture reduction/fixation (n=10, 37.0%); osteocutaneous free tissue transfer (n=9, 33.3%); and cancellous iliac bone grafting (n=8, 29.6%). Microvascular reconstruction utilized 5 fibula flaps (defects > 5 cm) and 4 radial bone flaps (defects 2-5 cm).
Conclusions: Facial GSWs that involve the mandible have become a common craniofacial reconstructive problem. Multiple reconstructive techniques including microvascular reconstruction are necessary to establish autologous mandibular continuity.

Objectives
1. Participants will be able to understand the utility of primary fixation vs temporary external fixation in mandibular gunshot wound reconstruction. 2. Participants will be able to understand the selection of autologous bone sources (primary bone reduction, microvascular tissue transfer, bone grafting) for mandibular gunshot wound reconstruction. 3. Participants will be able to understand microvascular flap selection in mandibular gunshot wound reconstruction based on defect size.

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Factors influencing functional outcomes in pediatric orbital trapdoor fracture: A retrospective study

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Ching-En Chen

Han-Tsung Liao

Abstract

Background: Due to the relatively elastic bone, pediatric patients may suffer from periorbital tissue entrapment. Previous studies suggested early intervention to prevent tissue infarction and permanent extraocular movement (EOM). To investigate the appropriate timing and indication of operative intervention, we reviewed patients aged under 18 years old retrospectively and analyzed the functional outcome.
Methods: Twenty-three patients (under 18 years old) who underwent surgery at Chang Gung Memorial Hospital for trapdoor fractures between January 2001 and September 2018 were enrolled. Their demographics, clinical features, surgical timing and outcome were collected.
Results: The mean age was 10.8 ± 3.6 years old. The male-to-female ratio was 17:6. There were 12 muscle and 11 soft tissue entrapments. The average time interval from injury to operation was 12.95 ± 16.8 days with 6.0 ± 8.8 and 20.5 ± 20 days in muscle and soft tissue trapdoor fracture respectively. There was no significant difference in diplopia and extraocular movement (EOM) recovery rate in patients who underwent surgery within 3 days and those over 3 days. However, in patients with interval to surgery over 3 days, patients with rectus muscle entrapment required a longer time to recover from EOM restriction (P=0.03) and diplopia (P=0.03) than those with soft tissue entrapment. Regardless of the time interval to surgery, patients with muscle entrapment tended to have more obvious preoperative EOM restriction (P=0.002) and had the trend of worse EOM recovery rate compared to patients with soft tissue entrapment.
Conclusion: Cases with preoperative EOM restriction may indicate rectus muscle entrapment. Surgical intervention performed over 3 days after injury may lead longer time to recover from EOM restriction and diplopia compared to pure soft tissue entrapment. Hence, we suggested that trapdoor fractures with rectus muscle entrapment should be managed within at least 3 days for a better outcome.

Objectives

1. Participants will be able to tell an appropriate surgical timing for pediatric trapdoor fracture. 2. Participants will be able to identify clinical presentations that indicate muscle entrapment. 3. Participants will be able to tell the difference between soft tissue and muscle entrapment

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Early Tongue Stitch Removal Following Palatoplasty- Challenging the Status Quo

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Abstract
Background: A tongue stitch (TS) is used by cleft surgeons as a protective airway maneuver following palatoplasty. Although no evidence-based protocol exists, many institutions retain a TS until postoperative day one (POD1). This study describes and evaluates an early tongue stitch removal protocol (ETSRP).
Methods: An IRB approved retrospective chart review evaluated patients who underwent primary palatoplasty prior to 24 months of age and received a posteroperative TS from September 2019 – September 2022. Evaluation included time to feed, narcotic use, length of stay and need for airway intervention postoperatively. All patients followed ETSRP with TS removal in PACU if: no TS use for 20 minutes after arrival in PACU, no physical signs of increased work of breathing, no supplemental oxygen use >2L/min, no fresh blood or clots in pharynx, and the patient is able to protect airway when asleep in supine position.
Results: 85.9% (67/78) had TS removal in PACU, while 11 patients had removal POD1. Anesthesia and surgical duration were not statistically different between the two groups (p=0.23, p=0.95). Six patients (9.0%) who underwent PACU TS removal had documented desaturations < 90% SPO2 that resolved spontaneously or with blowby oxygen. No patients required reintubation. PACU TS removal patients mean time to feed was 9.1 hours compared to 15.4 hours for POD1 TS removal patients (p=0.01). Mean morphine equivalent usage was lower (3.4 mg versus 6 mg (p=0.051)) and length of stay was shorter (1.6 days vs 2.0 days (p=0.22)) for the PACU TS removal group but was not statistically significant.
Conclusions: Outcomes of our study support the airway safety profile of our postoperative tongue stitch protocol status following palatoplasty in patients less than 24 months of age. Patients with stitch removal in PACU fed earlier and likely required less narcotics and may discharge earlier.

Objectives
1. Participants will be able to understand the safety profile of early postoperative tongue stitch removal protocol status following palatoplasty. 2. Participants will be able to incorporate the early tongue stitch protocol into practice. 3. Participants will be employed with methods to limit post-operative narcotic use status post palatoplasty, earlier time to feed, and limit length of stay with earlier removal of the tongue stitch.

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The Accuracy of a Patient Specific Three-Dimensional Digital Ostectomy Template for Mandibular Angle Ostectomy

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Guoping Wu

Abstract
Background: Although three-dimensional (3D)-printed digital ostectomy templates (DOTs) can help surgeons perform mandibular angle ostectomy (MAO) more precisely and safely, the clinical application of such templates is problematic.The aim of this study was to evaluate the accuracy of a novel DOT and improve the precision of MAO.
Methods: A total of 20 patients with a prominent mandibular angle (PMA) were allocated into 2 groups (10 patients per group). A conventional DOT and a novel DOT were applied to guide MAO in Groups A and B, respectively. The mean time taken for curved osteotomy and the volume of postoperative drainage on 1 side within 24 hours were recorded. The deviations between the simulated and postoperative lower border of the mandible were measured on both sides.
Results: All the patients were satisfied with the cosmetic outcomes. Statistical results showed that the mean time taken for curved osteotomy was shorter in Group B than in Group A, and that the volume of postoperative drainage on 1 side within 24 hours was similar between the 2 groups. The deviations at the anterior and posterior parts of the inferior border showed that the accuracy of osteotomy was higher in Group B than in Group A, and that there was no significant difference between the 2 groups in the middle part.
Conclusions: The novel DOT is easy to locate and fix tightly, which reduced the operating time and increased the safety and precision of the procedures.

Objectives
Participants will be able to tell the difference between conventional digital ostectomy templates(CDOT) and novel digital ostectomy templates(NDOT)

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Pesticide Use is Associated with Increased Risk of Cleft Lip and Palate in the United States

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Abstract
Introduction: Pesticide exposure has been linked with male and female reproductive infertility. We hypothesized that incidence of non-syndromic cleft lip with or without palate (CL/P) and cleft palate (CP) in the US would be correlated with pesticide exposure.
Methods: The incidence of CL/P and CP per 1000 live births from 2016-2019 was extracted from the Centers for Disease Control and Prevention (CDC) Vital Statistics Database and combined with the United States Geological Survey pesticide level estimates by county. Pesticides included were those reported by > 80% of counties with CL/P and CP. Multiple linear regressions evaluated the incidence of CL/P and CP as a function of individual pesticides.
Results: There were 4,747 CL/P births per 14,835,527 live births (incidence of 0.32/1000 births) and 741 CP births per 4,931,152 (incidence of 0.15/1000 births). Out of n=48 pesticides, those significantly associated with increased risk of CL/P were Metribuzin (CE=1.098e-04, p-value < 0.001), Dimethenamid & Dimethenamid-P (CE=4.880e-05, p-value=0.001), Dimethenamid-P (CE=5.584e-05, p-value=0.002), Clopyralid (CE=2.563e-04, p-value=0.002), Imazethapyr (CE=0.0006521, p-value=0.008), Metolachlor & Metolachlor-S (CE=5.847e-06, p-value=0.014), Metolachlor-S (CE=6.380e-06, p-value=0.027), and Ethalfluralin (CE=9.502e-05, p-value=0.036). Out of n=65 pesticides, those significantly associated with increased risk of CP were Mesotrione (CE=3.620e-05, p-value=0.037), Clopyralid (CE=1.124e-04, p-value=0.039), and Metolachlor & Metolachlor-S (CE=4.662e-06, p-value=0.042). All other pesticide CEs were not significant.
Conclusion: County levels of herbicides are associated with an increased incidence of CL/P and CP. More research is needed to understand causality.

Objectives
1) Participants will be able to learn about pesticide exposure and fertility. 2) Participants will be able to learn about associations with pesticide exposure and cleft lip with/without palate. 3) Participants will be aware of populations that may be vulnerable.

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New Vision ~ Application of Hybrid Operative Room in Plastic Surgery

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Po-Cheng Huang

Abstract
Background: Hybrid operative room, combine high resolution cone-beam CT and operative facility, is generally used by the field of cardiovascular surgery, neurosurgery, chest surgery and anesthesia. Is there any possible application for the plastic surgery?
In our Craniofacial center, we try to use integrated procedure in the hybrid OR , and present our limited preliminary experience.
Material and method: In our hospital, integrated Hybrid OR was open to the devision of plastic surgery. We used the facility preliminary in severe facial bone fracture and peripheral vascular malformation treatment. According different case, we choose combine pre-operative virtual simulation, surgical navigation, 3D printing model, and workstation of Hybrid OR. The 16 patients diagnosis are including bilateral condylar head fracture, panfacial fracture, orbital complex fracture, NOE with frontal bone fracture, nasal bone fracture in adult and pediatric patient with severe facial bone fracture, arteriovenous malformation (AVM) since 2022.02~2023.03.
Result: Under pre-operative computer simulation, intra-operative navigation and intra-operative cone-beam CT in Hybrid OR, patient did not to transfer to receive another image study a different date and different place, or post operative following up, the immediate high solution image was reconstructive smoothly and no transportation risk. We found the Hybrid OR workstation (HOW) doing the pre-op and post operative series images superimpose fast and quickly, and augmentation reality (AR) application including the HOW could be used for facial bone reconstruction. Intervention radiologists are easily cooperative to plastic surgery to safely excision the peripheral vascular malformation, not to embolization before operation date, we can arrange the totally procedure at one day and one place.
Conclusion: Hybrid OR is a good facility for plastic surgery, especially in facial bone reconstruction and peripheral vascular malformation treatment. In our experience and patient's feedback, the new vision maybe happened in precision surgery in plastic surgery.

Objectives
1.Participants will be able to innovate the application of Hybrid OR in plastic surgery. 2.Participants will be able to develop and organize the preparation process of using Hybrid OR. 3. Participants will compare the benefit and effectiveness from conventional and new method.

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Translation of Virtual Reality Surgical Plans to the OR With Pre-Contoured, Patient-Specific Fixation Plates for Craniofacial Trauma

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Sydney Mathis

Abstract

Background: Facial fractures frequently require surgical intervention with an open reduction and internal fixation. Manual contouring of plates can be time consuming and relies heavily on direct visualization and surgeon expertise. 3D-printed models can serve as physical references of the desired reduction and allow for efficient patient-specific contouring of plates. However, significant collaboration with remote engineers for the construction of surgical plans and 3D models is often required. Virtual reality (VR) surgical planning allows for rapid reduction of fractures, construction of virtual plans, and fabrication of 3D anatomical models by the surgeon. This study explores the application of VR planning for intraoperative customization of plates for craniofacial trauma.

Methods: Eighteen patients with fractures of the zygomaticomaxillary complex or mandible received preoperative planning with Immersive Touch ® Virtual Reality Software. The preoperative CT was loaded into the VR planning software where the virtual reduction was performed by the surgeon and subsequently 3D-printed with a biocompatible resin. The models were sterilized and used perioperatively for contouring patient-specific titanium fixation plates. The post-operative anatomy was compared to the VR plan using a minimum of 16 landmarks in Mimics Medical.

Results: On average it took the surgeon 8.5 minutes to segment and reduce the fractures in the VR environment. It took approximately 3 hours to 3D-print the models. Plate contouring using the 3D-printed models as guides took on average 12 minutes. The average difference between the post op CT and the VR surgical plan at 16 landmarks was 1.82 ± 1.7 mm.

Conclusions: Contouring fixation plates to anatomical models is a cost and time efficient means of plate customization and execution of virtual reduction plans. VR surgical planning by the surgeon streamlines the production of patient- specific models, allowing for a broader application to time sensitive craniofacial trauma.

Objectives

Participants will evaluate the use of virtual reality surgical planning for user-friendly and efficient design of 3D models for patient- specific plate contouring. Participants will develop an understanding for a new feasible timeline for plate customization in the setting of craniofacial trauma. Participants will be able to visualize the application of virtual reality on a variety of craniomaxillofacial fractures with ranging complexity and the ease of translation to the OR.

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Low rate of psychiatric diagnoses despite high prevalence of developmental delay following non-syndromic craniosynostosis surgery

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Brian Sweeney


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Peter Lorenz

Abstract

Background: Neurodevelopmental diagnoses are accepted sequelae of craniosynostosis, yet exact associations are frequently debated.

Methods: Non-syndromic craniosynostosis patients operated between January 2006 and December 2020 with >12 months follow-up, were reviewed for demographic, perioperative, and long-term developmental/psychiatric outcomes. Syndromic patients, identified via geneticist or multidisciplinary diagnosis, were excluded.

Results: 150 non-syndromic craniosynostosis patients (63% female; 55% sagittal,6% metopic,9% coronal,7% lambdoid,13% >1 suture) were surgically treated (mean age 16.7months; 70% open cranial-vault remodeling, 30% endoscopic) with average 3.8years follow-up. Developmental delays were diagnosed in 20.7%, with global motor/speech delay most common (14%). Psychiatric diagnoses were seen in 3.3%, with oppositional disorder most common (2.7%).

Open-vault remodeling was associated with later surgical age (17months vs 3months;p<0.001), heavier weight (10kg vs 6kg;p<0.001), increased intraoperative blood loss (EBL; 173mL/kg vs 42mL/kg;p<0.001) and intra-operative (140mL/kg vs 34mL/kg;p<0.001) as well as post-operative transfusions (8mL/kg vs 4mL/kg;p=0.005), without differences in developmental/psychiatric outcomes.

Developmental delay was more common in males (25% vs 6%;p=0.022) and associated with global delay(p<0.001), speech delay p=0.002), and ophthalmic issues(p=0.049). Autism was associated with global delay(p=0.019), attention-deficit/hyperactivity disorder(ADHD; p=0.013), and psychiatric disorders(p=0.005). ADHD was more common with higher EBL (19mL/kg vs 17mL/kg;p=0.028), and associated with global delay(p=0.036), oppositional disorder(p<0.001), and psychiatric diagnoses(p=0.008).

Patients who later developed psychiatric disorders were older at surgery (77months vs 15months;p<0.001) and heavier surgical weight (31kg vs 9kg;p<0.001). Psychiatric diagnoses were concurrent with developmental delays(p=0.028), autism(p=0.008), ADHD(p=0.008), and oppositional disorder (p<0.001).

Conclusion: While the rate of developmental diagnoses in non-syndromic craniosynostosis remains high (20.7%), psychiatric diagnoses were uncommon (3.3%). No difference in developmental or psychiatric disorder rate was found between open vs. endoscopic groups. Long-term follow-up identified associations between developmental and psychiatric diagnoses and sex, surgical age, and intraoperative blood loss, but not surgical procedures.

Objectives

1. Identify risk factors for open and closed craniosynostosis procedures. 2. Understand the relationship between non-syndromic synostosis and psychiatric diagnoses. 3. Understand the prevalence of psychiatric diagnoses in relation to developmental delay in patients with non-syndromic craniosynostosis.

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Intraoperative ultrasound-assistance improves outcomes in reduction of zygomatic arch fracture

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Jia-Yuan Hsu

Po-Cheng Huang

Abstract

Background:
Using intra-operative ultrasound would improve postoperative results in zygoma fracture. The purpose of this study was to evaluate which classification of zygoma arch fracture is more effective and correctly by intra-operative ultrasound.

Materials and Methods:
We retrospectively reviewed the NTUH systems database, and enrolled one experience surgeon's patients during Jan. 2018 to Jan. 2022. These patients all received surgical reductions with or without ultrasound assistance. The zygomatic arch fracture types were subgroup using Jose/Sebastian and Yamamoto classification. If patients with incomplete pre- and postoperative radiographic data were excluded.
All patients underwent the same reduction surgical procedure under general anesthesia. In the ultrasound group, the transducer was applied on the skin surface overlying the zygomatic arch, checked zygoma position immediately by the surgeon. After the operation, we followed the X-ray in one week to measure the zygomatic arch reduction quality based on postoperative cortical step and angle of displacement.

Results:
Overall, 33 patients who were treated using intra-operative ultrasound group, 73 patients in control group. No significant differ between two groups in patient's gender, age, approach method, total operative time, and blood loss. Both cortical step (0.61 vs 1.19 mm; P = 0.0497) and dislocation angle(2.08 vs 5.13 degree; P = 0.021)showed statistically different between two groups. In subgroup analysis in Jose/Sebastian classification, a significant decrease of both cortical step (0.83 vs 1.51mm; P = 0.0081) and dislocation angle (2.36 vs 7.1 mm; P = 0.0254) was seen in class 3 subgroup. A significant decrease of both cortical step (0.48 vs 1.59 mm; P = 0.0101) and dislocation angle (1.94 vs 5.99 mm; P = 0.0148) was seen in Yamamoto class 3 subgroup.

Conclusion:
Intraoperative ultrasound was feasible to complement the surgical procedure and resulted in marked improvement for postoperative outcomes, especially in complicated fracture patterns.

Objectives

1. Participants will be able to apply the ultrasound in facial bone surgery. 2. Participants will know which kind of classification more effective and precise for reduction. 3. Participants will evaluate the quality of surgical result.

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Three-dimensional Printing for Bone Graft Surgical Planning in Facial Clefts

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Abstract
Background: Rare facial clefts are congenital disorders that affect face in varying degree of severity, from soft tissue only to the skeletal. Surgical repair was individualized to each patient based on the specific anomalies and functional issues. Three-dimensional printing is very useful in craniofacial surgery, since it is a valuable tool preoperatively, intraoperatively, for medical education, and for improved patient satisfaction.
Methods: Reporting two cases of facial clefts who had bone grafting . Clinical presentation, procedure details and complications are reported. CT scans and computer software to perform 3D simulation of the facial defect and planning of patient- and defect specific grafts. An individual graft mold was designed for each defect and 3D printed for intra-operative use. .
Results: First patient, a girl, 4 years old with bilateral Cleft Tessier 4,5 Right and 6,7 Left, presented with skeletal defect at both cheeks and vertical orbital dystopia. The second patients was a boy, 18 year old with bilateral Cleft Tessier 4,5. He had labiopalatoplasty previously. Diagnosis and surgical planning were made by CT scan and 3D printing. All patients using illiac crest graft. During the surgical intervention, the mold was used to harvest the most appropriate amount and precise shape of graft material. The surgical complication profile was bone graft infected in one side of cheek in one patient. Soft tissue reconstruction/ augmentation would be performed in another stage after the bone graft and soft tissue surrounding settled.
Conclusion: Applications of 3DP included presurgical planning allowing them to visualize defects, particularly in craniofacial surgery, employed 3D printed templates to fit the bone grafts to its defect during skeletal reconstruction and also as educational tools for patients. The production cost is affordable in Indonesia.

Objectives
3DP is useful for bone graft surgical planning in facial skeletal defect, Harvesting appropriate amount of bone and forming to its defect.

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Advantage of Endscope-Assisted Suturectomy for syndromic craniosynostosis.

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Masafumi Kamata

Abstract
Background:
Endoscope-assisted suturectomy is widely performed for correction of craniosynostosis as a less invasive approach compared to other techniques. However, there is a few reports of morphologic and cranial volume improvement in syndromic patients undergoing the surgery. At National Center for Child Health and Development (Tokyo, Japan), endoscope-assisted suturectomy is a part of treatment protocol for all craniosynostosis patients under or equal to the age of 3 months. In the present study, we evaluate an advantage of this technique for syndromic patients.
Methods:
This is a retrospective analysis of the patients who underwent endoscope-assisted suturectomy between 2017 and 2021 in our hospital. The bone width of 2cm was removed so as to connect to the adjacent patent sutures.
Result:
12 syndromic patients were included out of 28 who underwent endoscope-assisted suturectomy. The median age at the time of surgery was 2 months, and median duration of following-up was 53 months.
The forehead and fronto-orbital morphology improved in all patients. Postoperative head circumstance was over or parallel to the average growth curve in 10 patients.
Secondary surgery, mainly posterior cranial vault expansion, was performed for 7 patients to get larger cranial volume.
Conclusion:
Endoscope-assisted suturectomy for syndromic synostosis patients achieved significant morphologic improvement and head enlargement. Compared with traditional cranial vault remodeling techniques, better forehead and fronto-orbital morphology and earlier intracranial volume expansion are accomplished with this less invasive technique. The latter advantage leads to earlier bone formation and makes it possible to perform a posterior cranial expansion with lower risks of unexpected bone fracture.
Considering these advantages, endoscope-assisted suturectomy is useful as a part of a treatment protocol for syndromic synostosis patients.

Objectives
My presentation will analyze and explain the advantages of Endoscope-assisted suturectomy for syndromic craniosynostosis. Participants will be able to manage syndromic craniosynostosis patients with Endoscope-assisted suturectomy.

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Application of artificial intelligence algorithm in the design of a guide plate for mandibular angle ostectomy

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Yingjie Yan

Abstract

Background: Surgical guide plate can improve the accuracy of surgery, while its design process is complex and time-consuming. This study aimed to use artificial intelligence (AI) to design standardized mandibular angle ostectomy guide plates and reduce clinician workload.

Methods: An intelligence algorithm was designed and trained to design guide plates, with a safety-ensuring penalty factor added. A single-center retrospective cohort study was conducted to test the algorithm among patients who visited our hospital between 2020 and 2021 for mandibular angle ostectomy. We included patients diagnosed with mandibular angle hypertrophy and excluded those combined with other facial malformations. The guide plate design method acted as the primary predictor, which was AI algorithm vs experienced residents and the symmetry of plate-guided ostectomy was chosen as the primary outcome. The safety, shape, location, effectiveness and design duration of the guide plate were also recorded. The independent-samples t-test and Pearson's chi-squared test were used and P-values < 0.05 were considered significant.

Results: Fifty patients (7 male, 43 female; mean age, 27 years; range, 19–37 years) were included. There were significant differences between the two groups in terms of safety and design duration. The minimal distances between the mandibular canal and the ostectomy plane were 7.02 ± 1.15 mm in the study group and 5.25 ± 1.37 mm in the control group ($p < 0.05$) The durations of plate design were 24.98 ± 16.24 s (study group) and 1685.08 ± 273.96s (control group) ($p < 0.05$). There was no significant difference in ostectomy symmetry and shape, location, and effectiveness of the guide plates between the two groups.

Conclusions：The intelligent algorithm can improve safety and save time for guide plate design, ensuring the symmetry of the ostectomy as well as shape, location, and effectiveness of the guide plates. It has good application prospects for accurate mandibular angle ostectomy.

Objectives

1） Participants will get to know about the application of artificial intelligence in craniofacial surgery. 2） Participants will have an idea of the advantages and disadvantages of artificial intelligence. 3） Participants will learn about the application of surgical guide plates in mandibular angle ostectomy

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Microsurgery in craniofacial reconstruction in pediatric population

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Krzysztof Dowgierd | **Maciej Borowiec** | **Łukasz Krawczyk** | **Dominika Lech**

Jeremi Matysek | **Robert Maksymowicz** | **Cyprian Strączek** | **Robert Marguła**

Abstract
Background,Craniofacial reconstruction in children and adolescents has specific implications. Our goal is to identify the best reconstructive options for cranio-maxillo-mandibular defects in children based on our experience.
Methods,Patients were evaluated in terms of the patient's age and the type of the free flaps used for the reconstruction of individual elements of the craniofacial skeleton and face. The use of free flaps was evaluated depending on the location and the possibility of further reconstruction of the oral cavity and face. We assessed the types of flaps depending on the disease and use in the appropriate age groups.
Results,The material includes 135 patients with various pathologies requiring of lover and a midface microsurgical reconstruction. The patients ranged in age from to 5 months to 25 years. The material presents oncological patients, patients with defects and post-traumatic patients.In many cases, reconstruction had to be performed at the same time as resection. In addition to free flaps, individual alloplastic prostheses were often required to improve function. In selected pathologies, they can be combined with free bone flaps. In cases involving the floor of the orbit, it is necessary to reconstruct the bone support of the eyeball. In cases of reconstruction of bone elements and soft tissues of the maxilla and mandible, it is also crucial to rebuild the teeth together with orthodontic treatment, which prevents the development of deformities and promotes facial growth.
Conclusion,The key element is long-term observation of the patient and proper surgical treatment facial defects respect of facial growth.The main goal of treatment is restore function and then correct the structure. Treatment of head and neck problems in children must be multi-disciplinary and multi-stage. Surgical treatment is associated with many years of observation of patients and must be based on growth and changes over time.

Objectives
Participants will learn what free grafts can be used in the treatment of deformities in children. They will understand the relationship between childhood reconstructive treatment and its effect on facial growth. They sees a new approach to treating specific defects in children

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Neglected fractures in maxillofacial injuries in the year 2020-2022 in a national referral hospital, epidemiological study with case series

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Windy Cendrick


Kristaninta Bangun

Abstract

Background: Neglected facial fractures may result from various factors, including limited access to medical care, lack of awareness about the importance of seeking treatment, or a delay in seeking medical attention. Facial fracture is a leading global burden responsible for over 41 million years of healthy life loss.
Method: This research is a retrospective study of all patients' medical records with neglected facial fractures undergoing secondary reconstruction in the Indonesian national referral hospital, Dr. Cipto Mangunkusumo Hospital, from 2020 to 2022. The collected data, i.e., patients' characteristics, diagnosis, delayed duration, cause of delay, treatment given, and length of stay, will be analyzed with the statistical analysis software SPSS 25.00 and presented in descriptive analysis format. This study will also report 4 cases treated with different modalities.
Results: There were 378 patients suffering from maxillofacial injuries in Dr. Cipto Mangunkusumo Hospital from 2020 to 2022, of which 165 (43.7%) underwent surgery, and 39 patients (10.3%) experienced delay. Among 39 patients with neglected facial fracture recorded, 46.2% (n=18) came in the year 2022, 79.5% (n=31) were male, 79.5% (n=31) were within the age of 19-60 years old, 64.1% (n=25) had midface fracture, and 41% (n=16) were referrals from other provinces. The median duration of fracture neglect was eight weeks. The most common complaint was malocclusion (74.4%; n=29), followed by dystopia, morphologic abnormalities, diplopia, enophthalmos, and pain. Treatment modalities included refracture, LeFort I osteotomy, closed reduction, and diced cartilage grafts. Eighty-four percent (n=33) of patients experienced a delayed reconstruction, mainly due to stabilization of general condition (30.3%; n=10) and national health insurance activation (30.3%; n=10).
Conclusion: The neglected fracture is more devastating regarding the complexity and burden obtained. As a national referral hospital, we can report that there are multiple factors contributing to the cause of delay.
Keywords: maxillofacial injuries, fractures

Objectives

1. To describe the characteristics of neglected craniomaxillofacial fractures in Indonesia. 2. To analyze the causes of surgery delay in Indonesia's craniomaxillofacial fracture cases. 3. To present several neglected craniomaxillofacial fracture cases.

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The Cost of Delay: A Systematic Review Investigating Risk Factors for Delayed Craniosynostosis Treatment

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Abstract

Backgrounds: Given the serious implications of delayed diagnosis and treatment of craniosynostosis, this study aims to systematically review the literature on risk factors for delayed craniosynostosis treatment.

Methods: PubMed, Embase, and Scopus were queried. Two independent reviewers screened articles by title and abstract followed by full text. Pooled means and proportions were calculated for age at presentation/intervention and racial composition.

Results: Of 273 resultant articles, 19 were included, representing data from 31,568 patients. Pooled mean age at presentation was calculated for 14 studies and was found to be 9.38±5.08months. Pooled proportions revealed a racial/ethnic distribution of 56% White patients (n=17 studies), 12% Hispanic patients (n=11 studies), 6% Black/African American patients (n=15 studies), <2% Asian patients (n=8 studies), and <1% American Indian/Alaska Native and Native Hawaiian/Pacific Islander patients. Minority racial/ethnic status was a risk factor for delayed presentation (n=8 studies), increased incidence of open rather than minimally invasive surgery (n=4 studies), higher hospital costs (n=3 studies), higher complication rates (n=3 studies), increased length of hospital stay (n=2 studies), increased duration of anesthesia (n=2 studies), and increased transfusion requirement (n=1 studies). The pooled average delay in initial presentation for non-White patients was 5.7 months (range 4.0–9.3 months) compared to

White patients, with an average delay-to-surgery of 3.0 months (range 2.7-10.1 months). Government-funded insurance was associated with an increased risk of open surgery (n=5), delayed intervention (n=3), complications (n=2), and transfusion (n=1).

Conclusions:
Minority patients demonstrate both a delay in presentation, and also a delay in time to surgery even after evaluation. Moving forward, it is essential to collect demographic data systematically in this population so we may investigate how these observations trend over time.

Objectives

1. Understand factors that contribute to delay in presentation for craniosynostosis 2. Review and critique the disparity in time to surgery based on demographic variables 3. Formulate solutions to the inequity in craniosynostosis treatment

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Epidemiology of maxillofacial injuries in Indonesia in the year 2020-2022, a single-centre national referral hospital study.

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Windy Cendrick


Vika Tania


Prasetyanugraheni Kreshanti


Kristaninta Bangun

Abstract

Background: Maxillofacial injuries is a potentially disabling injury and a pathological condition commonly found by reconstructive plastic surgeon requiring complex surgical care. The GBD Study by University of Washington mentioned the global incidence and prevalence of facial fracture in 2017 are respectively 98 and 23 cases per 100.000 population. Moreover, it is one of the leading health problem. However, Indonesian national health insurance covers this pathological condition as an emergency case.

Method: This is a retrospective study of all patient's medical record with maxillofacial injuries undergoing correction surgery in the Indonesian national referral hospital, Dr. Cipto Mangunkusumo Hospital, during the year 2020 to 2022. The data collected includes gender, age, facial fracture type based on Level 2 AO CMF classification, injury onset, payment method, delay of surgical procedure, and the reason for delay, will be analyzed with the statistical analysis software, SPSS 25.0, and presented in descriptive analysis format in %(n).

Results: A total of 165 patients were recorded with 37.0% (n=61) of the cases found in the year 2022, male prevalence of 80.0% (n=132), and 80.6% (n=133) of patients within the age group of 18-60. Most of the cases include fracture of the zygomatic arch (53.9%; n=89), of new onset (76.4%; n=126), and undelayed to surgical procedure (70.9%; n=117), since most of the patients are covered by national health insurance (83.0%; n=137). The payment method used is stastistically significant with delay in surgical procedure ($p<0.001$). While other variables are not significant.

Conclusion: The epidemiological distribution of maxillofacial injuries in Dr. Cipto Mangunkusumo Hospital aligns with the global epidemiological distribution. Patient's insurance coverage is an important aspect in determining surgical timing. Therefore, the government should need to increase the coverage of national health insurance.

Objectives

1. To describe about the epidemiology of maxillofacial injuries in Indonesia. 2. To describe the common cases of maxillofacial injuries in Indonesia. 3. To analyze the problems faced by plastic surgeon in maxillofacial injuries cases in Indonesia.

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Pre-opertaive Management of Sagittal synostosis

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Peter Anderson

Abstract

Ojectives:
Many children born with sagittal synostosis have the condition recognised in the neonatal period. While some maybe referred for opinion and management, few undergo active treatment. We wished to investigate if active positioning could improve the cranial shape and reduce the morphological sequelae of synostosis, particularly an “occipital bullet”, by early sustained intervention.

Method:
All children with sagittal synostosis referred in the post-natal period were given advice regarding positioning – specifically to lie on their back with the aim to reduce the “occipital bullet”.

Results: Although some parents were unable to comply only a few incorporated the management into the child’s daily routine. An example of images and radiological studies which demonstrates a marked morphological improvement, particularly of the occipital region, and resulted in less extensive dissection and operative posterior remodelling was required when definitive calvarial remodelling was undertaken at 7 months of age.

Conclusion: This demonstrated case highlights that significant improvement in cranial morphology can occur, if parents can be motivated and reduce the severity of deformity and then the subsequent surgical intervention.

Objectives

Natural history of Craniosynostosis Cranial morphology changes with time Cranial morphology can be sucessfully managed prior to surgical intervention

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Multidisciplinary Cleft Charity Mission in Indonesia

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Marini Mihardjanti


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Abstract
Background The key to successful cleft treatment is multidisciplinary management. In Indonesia, there is difficulty to reach remote areas resulting in many untreated cleft patients. In 2013 - 2022, Indonesian Association of Plastic Surgeons (InaPRAS) organized 28 charity missions with a total of 798 patients. However, there was a lack of a multidisciplinary charity missions. To answer this gap, Cleft Craniofacial Center (CCC) in Dr. Cipto Mangunkusumo Hospital held multidisciplinary charity missions involving plastic surgeons, orthodontists, physical medicine and

rehabilitation specialists, and ENT. This paper aims to present results of our charity missions, identify problems, and suggest future recommendations.
Methods This is a retrospective study of multidisciplinary cleft charity missions in 2018 and 2022 held by CCC.
Results In 2018 and 2022, CCC went on 2 missions across 2 provinces with a total of 75 patients. Our charity mission involved cleft and palate surgeries, speech, dental, and nasoendoscopy evaluation. Our event also included seminars for parents of cleft and palate patients. Furthermore, we aimed to provide mentorship to specialists in local hospitals to provide them with the knowledge to build their own comprehensive cleft care centers. On average, the missions duration was 2 days. The median age range was 19 months (4 months to 24 years old). Fifty-five percent of patients were operated for labioplasty. Forty-eight percent of patients undergoing dental evaluation showed multiple caries. While 47% patients evaluated for speech therapy were suspected of VPI and recommended to seek further treatment.
Conclusion Our study shows that multidisciplinary management is crucial in patients with cleft lip and/or palate. Going forward, we recommend annual charity missions should be done with proper longterm follow-up. CCC as an established cleft center will take leadership in areas where we have previously conducted the charity mission.

Objectives

1. Participants will learn about comprehensive cleft care center in Indonesia 2. Review of cases in charity missions 3. Participants will learn how to conduct comprehensive cleft charity mission

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A case review of a patient with craniosynostosis after PVDO who underwent another PVDO to improve central apnea

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Daiki Senda

Abstract

Background

Craniosynostosis patients with shortened occipitofrontal diameter are mainly treated with posterior cranial vault distraction osteogenesis (PVDO) in our institution. If further intracranial volume (ICV) expansion is needed, additional treatment with frontal orbital advancement (FOA) is done. On the other hand, frontal orbital remodeling (FOR) is done for better aesthetic results. However, some patients develop central apnea after these treatments in childhood. In these cases, we perform the PVDO once again to further enlarge the intracranial volume and improve the constriction of the posterior cranial fossa. In this study, we have investigated post-treatment changes in patients with craniosynostosis with the aforementioned methods.

Methods

Patients who underwent 2nd PVDO in addition to PVDO our institution between 2018 and 2022 were reviewed. Patient characteristics, length of distraction, and pre- and postoperative CT scan and PSG findings were evaluated. Morphological changes over time were also assessed.

Results

Four patients (4 female) aged from 1-year 9months to 6 years 86months at the time of 2nd PVDO were reviewed. All four patients were syndromic craniosynostosis. The details were Beare Stevenson syndrome, 2 Pfeiffer syndrome and Robinow syndrome. For 2nd PVDO, the distraction length was 25 to 40mm. CT showed an enlarged spinal fluid cavity and improved narrowing of the posterior cranial fossa in all cases. Furthermore, in all patients, central sleep apnea improved after 2nd PVDO was performed. However, in two cases, dural injury occurred during surgery due to strong dural adhesion at the previous osteotomy site.

Conclusions

In patients with severe deformity craniosynostosis, PVDO and FOA/FOR is performed. Even with these treatments, central apnea due to narrowing of the posterior cranial fossa may occur in syndromic craniosynostosis as the patient grow up. In such cases, performing another PVDO is effective, but the surgical risk is higher than the first PVDO.

Objectives

Participants will learn about the advantages and disadvantages of performing PVDO twice for craniosynostosis.

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Complex Mandibular Fracture reconstruction using vascularized free fibular flap.

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Kristaninta Bangun


Mohamad Rachadian Ramadan


Parintosa Atmodiwirjo


Jasmine Athiyya Wibowo

Abstract
Introduction: A free fibular flap can be used for mandible reconstruction due to trauma. In this paper, we report a case of mandibular fracture involving bone loss that was reconstructed using vascularized free fibular flap. **Methods/Presentation of Case:** We report a case of a 35-year-old male who presented to the emergency department unconscious with multiple trauma, including complex facial trauma. The mechanism of injury was unknown. On examination, multiple lacerations were seen in the nasal, periorbital, and left zygoma areas. Palpation showed discontinuity in the nasal, left inferior orbital rim, left zygoma, and mandible. CT scan revealed multiple facial fractures, as well as mandibular fracture. In the ED, the patient was intubated, and their wounds were closed primarily. The patient was then scheduled for ORIF; however, the patient developed an infection in the mandible. Hence, debridement was performed. Intraoperatively, segments of the mandible needed to be debrided due to necrosis, resulting in ±8 cm bone loss of the mandible body. Nine days after debridement, we performed ORIF and mandibular reconstruction using free fibula flap to replace the bone loss. Preparation of the mandibular reconstruction was aided by a 3D model. **Results:** Our patient demonstrated a good outcome from mandibular reconstruction using vascularized free fibular flap. Monitoring of the patient found that the flap was vital with no signs of infection. A Follow-up CT scan showed adequate bone placement. **Conclusion:** A free fibular flap is commonly used and is considered the gold standard in mandibular reconstruction with a good success rate. Fibular bone matches the jaws with its length structure, allowing for the reconstruction of the maxilla and mandible after

extensive bone resection. It can be harvested as a single flap, allowing bulk bone and soft tissue replacement. Long term follow-up is needed to evaluate outcome.

Objectives

Objective: Participants will learn about management of complex mandibular fractures Participants will learn about free fibular flap as an option for complex mandibular fracture reconstruction Participants will learn about the monitoring of patients post vascularized free fibular flap

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The utilization of Surgical Navigation in Acute Zygomatic Fracture Reduction and Fixation and its quantitative outcome assessment

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YU YING CHU

Han Tsung Liao

Abstract

Background

Inadequate reduction of zygomatic fracture brings unsightly facial asymmetry and poor functional outcomes. Therefore, a surgical navigation system has been applied to post-traumatic zygomatic reconstruction. Our study aims to quantitatively assess the operative outcomes between the surgical navigation group and the conventional method group to reflect its benefit and effectiveness in zygomatic fracture reduction.

Methods

During 2006 and 2021, we recruited 48 patients with unilateral zygomatic fractures in this retrospective study who received primary zygoma open reduction and internal fixation. The comparative outcome variables involved 5 zygomatic suture displacement assessments and the projection of zygomatic eminence and arch. The Chi-square test and the Wilcoxon signed-rank test and the Mann-Whitney U test were used for statistics.

Results

The mean age was 36.4 ±16.0 vs 29.1±11.6 years in the navigation group and control group respectively. The average of each suture displacement in the navigation group vs. the control group revealed no significant difference (3.12± 1.41 vs. 4.13 ± 1.95) ($p = 0.067$) preoperatively. After surgery, the navigation group was significantly less than the control group (0.55 ±0.49 vs. 0.98 ±0.63) ($p = 0.017$). For the 3D image of the zygomatic protrusion profile, at zygomatic eminence, the differences between D-ZSL and D-ZSR in the navigation group and control group revealed (3.52± 2.27 v.s 5.37±8.39) ($p=0.718$) and (0.42±0.34 v.s 1.85±1.13) ($p<0.001$) pre-and post-operatively. At the zygomatic arch, the differences between D-ZAL and D-ZAR in the navigation group and control group revealed (4.52 ± 2.65 v.s 4.95±3.4) ($p=0.756$) and (0.75 ±0.45 v.s 2.49 ±2.39) ($p<0.001$) pre-and post-operative. Both eminence and arch width displacement showed significantly less than the control group.

Conclusions

A surgical navigation system is a helpful tool in reducing and reconstructing zygomatic fractures that promotes better facial symmetry and reaches accuracy within 1mm without gaining significant operation time.

Objectives

Participants will be able to learn the advantages of using the surgical navigation system for zygomatic fracture reconstruction. Participants will be able to know the level of accuracy using the surgical navigation system. Participants will be able to evaluate the zygomatic suture displacement both in 2D and 3D manners.

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Reduced asymmetry with growth in patients with a less severe phenotype in Unicoronal synostosis

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Hanna Lif


Maxime Taverne


Johan Nysjö


Maya Geoffroy


Roman Khonsari


Daniel Nowinski

Abstract

Background

Unicoronal synostosis present great variability without any identified cause or standardized method to determine severity. The aim of this study was to use image analysis to identify explanatory factors behind the phenotypic variability.

Methods

Patients with non-syndromic Unicoronal synostosis from Uppsala University Hospital and Necker Hospital, Paris between 2006-2021 with preoperative CT scans of sufficient quality were included and age matched to healthy controls. Skulls and orbits were semi-automatically segmented (OrbSeg, BoneSplit). Mirroring, alignment, and calculation of objective 3D asymmetry as the Dice similarity coefficient was automatically conducted in Python.

Results

129 patients and 94 controls met the inclusion criteria. Patients had a mean age of 8±6 months, the right to left lateralisation ratio was 2:1. Skull and orbital asymmetries were significantly higher in patients compared to controls ($p < 0.001$) and there was a substantial linear correlation between skull and orbital asymmetry ($p < 0.001$). Lateralisation was unrelated to differences in asymmetry ($p = 0.42$, $p = 0.89$), but age at CT was related to orbital asymmetry which was significantly higher in the younger patients ($p = 0.001$). Separate analysis of patients with two preoperative CT scans (mean days between scans = 172) indicated that patients with an early first CT could not improve spontaneously over time whereas patients with a later first CT improved up to 8% in skull asymmetry before surgery.

Conclusions

Growth decreases asymmetry in patients with a less severe phenotype. A more severe phenotype is found in patients with early CT. There is a clear correlation between skull and orbital asymmetry, but future studies are needed to correlate these findings to aesthetic and ophthalmological outcome. Dice similarity coefficient is a promising 3D objective severity measure in Unicoronal synostosis.

Objectives

Participants will be able to objectively determine 3D severity in Unicoronal synostosis, separate groups of different severity such as those diagnosed at different ages, and quantify changes in asymmetry with growth for patients with different severity.

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Caregiver Challenges in Nursing a Patient with External Craniofacial Distractors

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Herni Lutfiah Hussein


Joanne Jovina Siow Huey Cheng


Yong Chen Por

Abstract
Background
Crouzon syndrome is one of the most common craniosynostosis facial syndromes with premature fusion of coronal sutures involving the skull and facial deformities. A.F. was born and diagnosed with Crouzon syndrome. He had undergone fronto-orbital advancement and ventriculoperitoneal shunt insertion for hydrocephalus with bilateral papilloedema during the first two years of life. With worsening exophthalmos, he recently underwent Lefort III distraction osteogenesis with internal distraction at 6 years old.
Method
Lefort III distraction osteogenesis was performed to correct A.F.'s proptosis. The activation arms of the distractors were brought through the coronal incision bilaterally, and the extrusion sites were dressed. Distraction was started on the second postoperative day with two turns per side (2 turns = 1 millimeter) and continued daily till an overjet outcome was achieved.
Caregiver training on distractor turning and distractor site dressing was conducted, and mother was taught to document the daily distraction event on a checklist. A.F. was discharged uneventfully on postoperative day six with dressing consumables, pain medications, and the activation screwdriver.
Results
Distraction was completed after twenty-six days, with twenty-two millimeters on the right side and twenty-three millimeters on the left side. The final outcome achieved an overjet of twenty millimeters beyond the cornea margin.
Challenges faced were caregiver compliance and patient cooperation in performing the daily distraction turning and maintaining a clean distraction pin site. There were occurrences where distractions were not performed due to mother's non-compliance and patient's pain, and wound infection over the pin sites. The patient's mother was also insistent to stop distraction earlier as she feels her child has already achieved the desired aesthetic outcome.
Conclusion
Lefort III distraction osteogenesis has shown good surgical outcome in correcting proptosis. Caregiver compliance, patient cooperation, following up, and reinforcement are crucial in achieving a favorable outcome.

Objectives
1. Managing parental expectations on the use of external craniofacial distractors 2. Managing parental perception of the aesthetic outcome of external craniofacial distractors 3. Evaluating caregiver training education on craniofacial distractor nursing care

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Assessing retinal status in children with non-syndromic trigonocephaly, using Spectral-Domain Optical Coherence Tomography

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Sumin Yang

Abstract

Background: Little has been described in the literature regarding ophthalmic abnormalities in non-syndromic trigonocephaly. A few studies have shown that trigonocephaly is associated with a greater risk of ophthalmic abnormalities, which in turn may accompany anomalies in the retinal thickness of the macula and peripapillary. The purpose of this study is therefore to detect the presence of abnormalities of retinal thickness in children with trigonocephaly, using spectral-domain optical coherence tomography.
Methods: A cross-sectional study of patients with trigonocephaly between the ages of 4 and 10 years was conducted. Patients with mental retardation resulting in a lack of concentration or instructability were excluded. Three OCT protocols were performed on each eye: (1) the total retinal thickness (TRT) map of the optic nerve head (ONH), (2) the peripapillary retinal nerve fiber layer (RNFL) map, and (3) the fast macular volume map. All OCT scans were examined by ophthalmologists to assess the presence of visible retinal abnormalities.
Results: Eighty-nine patients with trigonocephaly between the ages of 4 and 10 years were included in the study. No clinical suspicion of elevated intracranial pressure was present in all 89 patients. None of these patients had any visible retinal abnormalities on the OCT scans. No difference in OCT parameter thicknesses were found between patients with trigonocephaly and subject of the healthy pediatric population. No association with age, gender, and refractive error was found in all retinal thickness measurements, except for a thinner central macular thickness in female patients with trigonocephaly.
Conclusions: The mean retinal thicknesses of the optic nerve head, macula and peripapillary RNFL in children with trigonocephaly did not differ from the thicknesses found in the healthy paediatric population.

Objectives

1. Assess whether patients with non-syndromic trigonocephaly are more prone to anomalies of the retina 2. Assess the presence of changes of the optic nerve head in children with non-syndromic trigonocephaly using SD-OCT 3. Detect presence of abnormalities of macular retinal thickness in children with non-syndromic trigonocephaly using SD-OCT

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Growth and morphology of the endocast in bicoronal FGFR2-related craniosynostosis.

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Abstract

Background

In FGFR-related craniosynostosis, premature ossification of the vault sutures leads to progressive skull deformation. The endocast, or the volume bordered by the intracranial surface, serves as a measure for the total capacity for brain growth. This study aims to quantify variation in growth trajectories of intracranial morphology between patients with bicoronal craniosynostosis due to Crouzon syndrome and healthy controls up to 24 months of age.

Methods

23 Crouzon patients with bicoronal craniosynostosis and 26 controls (47.8% vs 38.5% male, mean age 7.7±5.8 vs 11.6±7.5 months) from the Hôpital Necker-Enfants Malades database were included. Endocasts were digitized from pre-operative CT images, and reconstructed 3D surfaces were analyzed using geometric morphometrics. All meshes were annotated with 31 anatomical landmarks and 307 semilandmarks of curve. 390 surface semilandmarks were then projected onto the calvarium and skull base by means of a non-rigid registration of a template to the target mesh of each specimen using a thin-plate spline algorithm. Samples were rigidly aligned and scaled using generalized Procrustes superimposition. Principal component analysis was applied to quantify variability of Procrustes coordinates across the dataset. Finally, two-block partial least squares regressions were applied to test for allometry, integration, and age-related morphological changes.

Results

The first two principal components demonstrated a shape change towards a shortened anteroposterior dimension of the endocast, corresponding to brachycephalic shape. Preliminary results show that variance in morphology is greater in the Crouzon population than in healthy controls. Further analyses are being performed at time of abstract submission.

Conclusions

This study investigates the allometry patterns underpinning fine variation in the endocast shape in bicoronal FGFR-related craniosynostosis. Quantification of the intracranial morphology can contribute to a better understanding of mechanical growth anomalies in craniosynostosis, and may in the future contribute to the improvement of tailored treatment protocols.

Objectives

1. To interpret shape changes related to bicoronal synostosis patterns in Crouzon syndrome. 2. To analyze intracranial deformities by use of geometric morphometrics. 3. To compare regional morphology between the healthy and the bicoronal synostotic population.

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ART and craniosynostosis

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Madiha Søfteland

Abstract
The etiology of isolated craniosynostosis (CS) is largely unknown and assisted Reproductive Technology (ART) has been suggested as a risk factor. With increasing maternal age there is an increase in the rate of ART. Two studies are presented where impact of ART on CS is studied.
Methods: The first study included infants born between 2006 and 2012 in the Netherlands and Sweden with sagittal (SS) and metopic synostosis (MS). In the second study, all cases with CS during 1995-2016 were identified from the Gothenburg Craniofacial Registry. Exclusion criteria was a positive family history of CS. Maternal data from the Swedish Medical Birth Registry (MBR) included: maternal age, ART, single or multiple births, parity, fetal malpresentation and smoking. In both studies, all births during study period were included as a reference population.
In the first study, continuous data were compared using an independent t-test, and categorical data were compared using a chi-square test. In the second study, uni- and multivariate analysis were performed with further diagnose specific subgroup analysis for SS and MS.
Results: The first study included 424 patients (MS- 152, SS- 272) and 1.954.141 controls. A higher rate of assisted reproductive technology (ART) was found in patients with MS (13%) and SS (7%) compared to controls (3%, $p < 0.001$).
In the second study 814 cases and 2,228,126 controls were identified. There was a higher overall rate of ART in cases (5.5%) than controls (4.3%). For MS, independent risk factors were ART, AOR = 1.79; (CI: 1.08–2.98), twins AOR = 1.98; (CI: 1.11–3.53) and male sex AOR = 4.18; (CI: 2.94–5.95). For SS, maternal age AOR = 1.02; (CI: 1.00–1.04) and male sex AOR = 3.07; (CI: 2.43–3.88) were independent risk factors.
Conclusions: High maternal age and ART are independent risk factors for MS.

Objectives
1. To study the association between Assited reproductive technology and craniosynostosis. 2. To study the association between parental age and craniosynostosis. 3.To study the association between constraint related factors such as multiple births and craniosynostosis.

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The bone-forming activity of the periosteum after prelamination of periosteum-fascia complex.

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Hojin Park

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Abstract

Background

Controversy exists over the optimal revascularization period and retention of osteogenesis after prelamination of periosteum. The duration required for neovascularization and osteogenesis after prelamination is still uncertain. This study aims to evaluate whether prelaminated periosteum maintains its function as an osteogenic graft after the prelamination process.

Methods

The experiment was conducted on 24 Spraque-Dawley rats divided into two groups: prelaminated periosteal flap (PPF) and conventional periosteal flap (CPF) groups. In the PPF group, calvarial periosteum was harvested and folded in half with cambium layers inside, and collagen was inserted. The periosteal pouch was placed under saphenous pedicles in the inguinal area. In the CPF group, periosteal flaps were elevated based on the right side superficial temporal artery and vein, folded in half, and collagen was inserted. After 6 or 8 weeks, the periosteofacial flaps were assessed with radiologic and histologic analysis.

Results

The calcium deposited area of the PPF group was 18.1±3.8% at eight weeks and 7.7±2.9% at six weeks, and the cambium layer thicknesses of the PPF group were 95.4±9.8um and 83.6±16.3um at 8-week and 6-week, respectively. The thickness of the 8-week PPF group was similar to that of the 8-week CPF group. (CPF 8 weeks = 112.5 ±7.6um, CPF 6 weeks = 113.3±6.7um) The osteocalcin level at 6 weeks was higher in CPF than in PPF, and the osteopontin level was higher in CPF groups than PPF groups. The osteocalcin of the 8-week PPF group was measured higher than the 6-week PPF group. (p=0.114)

Conclusinos

This study demonstrated that the PPF group maintained its osteogenic activity after prelamination. The prelaminated periosteum seems to recover its function as the ischemia is resolved. The prelaminated periosteofascial flap is expected to be used as an isolate flap and be applied to the complex bone defects.

Objectives

This study aims to evaluate whether prelaminated periosteum maintains its function as an osteogenic graft after the prelamination process.

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Full-automatic segmentation and volume measurement of masseter muscle based on three-dimensional computed tomography using U-shaped network: a validation study in East Asians

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Wenqing Han

Abstract

Method: A database containing 840 individuals (253 males and 587 females) with a negative head CT was employed. According to the sample size calculated by G. Power, 15 cases of data were randomly selected for the clinical validation of the proposed algorithm. Bilateral masseters were manually contoured in Group A using Mimics 19.0 and automatically segmented in Group B. The masseter muscle volume was the primary endpoint, and morphological score and running time were the secondary endpoints, where the manual segmentation was the ground truth. The reliability test and paired t-test were used to verify the intra- and inter-group differences and evaluate the clinical application of the proposed algorithm.
Subsequently, volumetric measurements were performed using an automatic algorithm. Asymmetry was calculated using (L-R)/(L±R)°¡100%, and the correlation of clinical parameters was analyzed using the Pearson correlation method.
Results: Automatic segmentation was significantly equivalent to the manual delineation in volume (P>0.05). The manual running time was (937.3 ± 95.9) s, longer than that of the automatic algorithm <1 s (p<0.001). The masseter asymmetry was 4.6 ± 4.6% in 840 patients, and the masseter volume in adult males and females was (35.5 ± 9.6) and (26.6 ± 7.5) cm3, respectively.
Conclusion: The U-net algorithm significantly agreed with the manual segmentation of masseter muscles, which is a stable and effective CT-based masseter segmentation for healthy individuals in East Asia.
Keywords: Convolutional neural networks; U-net algorithm; Automatic segmentation; Masseter muscle

Objectives

We proposed and evaluated a coarse-to-fine learning framework based on a U-shaped network to automatically perform segmentation in healthy volunteers. It is helpful for masseter measurement.

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How does jaw-closing muscle morphology relate to variation in mandibular shape in infants?

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Abstract

Background

Understanding the interplay between the skull and soft tissues is important from clinical and evolutionary perspectives. This study assesses how change in mandible morphology relates to changes in adductor muscles during growth.

Methods

Computed tomography data were collected for 31 healthy children aged between 0 and 24 months from the Necker-Enfants Malades Hospital database, France. One to two individuals per month were sampled, with equal gender balance whenever possible. 3D-virtual meshes of the cranium, mandible, masseter, and temporalis muscles were generated from DICOM-files. Variation in mandibular shape and its relation to musculature was quantified using 3D geometric morphometrics. Mandible morphology was captured using 21 landmarks and 20 sliding semi-landmarks. General Procrustes superimposition of landmark data was performed and the pattern of variation in mandibular shape was assessed with Principal Component Analysis. Muscle volumes were measured on the 3D-virtual meshes, and their relation to mandibular shape was tested using linear regressions, with and without allometric corrections.

Results

The first two axes of the PCA explain about 60% of the variation in mandibular shape. The first axis separates newborns from oldest individuals, with shape change being driven by an increase in the height of the condyle and coronoid process, an elongation of the ramus, and a narrowing of the mandible. Mandibular shape and muscle volume scale positively with mandibular size, with temporalis volume increasing at a greater pace than that of the

masseter. After allometric correction, mandibular shape covaried with masseter volume, but not with temporalis volume.

Conclusions

Variation in the shape of the mandible in relation to its musculature during growth was characterized using 3D geometric morphometrics. Further analyses will be performed to decipher the musculoskeletal relationships of the masticatory system during growth, which will serve to better characterize pediatric craniofacial conditions and the pattern of human head evolution.

Objectives

1. Participants will be able to interpret the development of a method to visualize mastication muscles in three-dimension (3D). 2. Participants will increase knowledge about the interplay between mastication muscles and the mandible in humans. 3. Participants will learn about the application of geometric morphometrics in the medical field.

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An innovative virtual reality training tool for the pre-hospital treatment of cranialmaxillofacial trauma.

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Abstract

Abstract
Virtual reality (VR) surgery using the High Technology Computer Corporation Very Immersive Virtual Experience professional 2(HTC VIVE Pro2) suite is a multi-sensory, holistic surgical training experience. A multimedia combination including videos and three-dimensional interaction in VR has been developed to enable trainees to experience a realistic battlefield environment. The innovation allows trainees to interact with the individual components of the cranialmaxillofacial （CMF） anatomy and apply surgical instruments while watching close-up stereoscopic three-dimensional videos of the surgery. In this study, a novel training tool for the pre-hospital treatment of CMF trauma based on immersive virtual reality (iVR) was developed and validated. Twenty-five CMF surgeons evaluated the application for face and content validity. Using a structured assessment process, the surgeons commented on the content of the developed training tool, its realism and usability, and the applicability of VR surgery for CMF trauma rescue simulation training. The results confirmed the applicability of VR for delivering training in the pre-hospital treatment of CMF trauma. Modifications were suggested to improve the user experience and interactions with the surgical instruments. This training tool is ready for testing with surgical trainees.
Keywords Medical training · Surgical simulation · Virtual reality · Cranialmaxillofacial trauma ·

Objectives

1.Our research group plans to use VR technology to present a simulation training system for the pre-hospital treatment of CMF trauma. 2.Participants will be able to tell how to use the simulation training system for the pre-hospital treatment of CMF trauma. 3.Participants will be able to learn other knowledge.

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A preliminary clinical study on the effectiveness and safety of mandibular angle osteotomy assisted by craniomaxillofacial surgery navigation system

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Gang Chai

Abstract

BACKGROUND: A multicenter, prospective, randomized, controlled, subject- and evaluator-blinded clinical study was designed and initially completed on the efficacy and safety of a craniomaxillofacial surgical navigation system in mandibular angle ostectomy.
METHODS: Subjects undergoing bilateral mandibular angle osteotomy were randomly assigned to the robotic and control groups in a 1:1 ratio. In the control group, the surgeon performed the preoperative plan based on clinical experience. In the robotic group, the system determined, simulated and completed the surgical planning path with the selected subterminal guide plate. Patients underwent 3dCT scans preoperatively and 7 days postoperatively. The positional and angular errors of the design and the postoperative results were compared to assess the operative accuracy. The mandibular ramus, the mandibular angle, the ostectomy volume and the symmetry were measured to analyze efficiency. Minimum distance of the mandibular nerve canal from the ostectomy plane was calculated for safety. Additionally, intraoperative bleeding, drainage, surgical operation time, osteotomy operation time, satisfaction, pain rating scale and adverse events were recorded in both groups.
RESULTS: 32 patients, 17 in the robotic group and 15 (one fell off) in the control group, were enrolled from June 2022 to November 2022. The positional error in the robotic group was significantly lower than the control group, and so was the angular error. The ostectomy time was greatly reduced. The minimum distance met the clinical application requirements. Validity evaluation indexes suggested that both groups had reduced mandibular ramus height, increased mandibular angle, and good postoperative mandibular symmetry. Perioperative data, satisfaction (5-point Likert scale) and pain rating scale did not reveal a statistical difference between the two groups. No serious complications occurred in both groups.
CONCLUSION: Robotic navigation-assisted mandibular angle osteotomy is safe and effective. It has broad application prospects in high-precision craniomaxillofacial surgery with its non-invasive, accurate, and obscure-independent characteristics.

Objectives

1. Participants will be able to introduce a cutting-edge technology for mandibular angle osteotomy. 2. Participants will be able to verify the accuracy and the safety of robotic navigation-assisted mandibular angle osteotomy. 3. Participants will be able to explore the application prospects in high-precision craniomaxillofacial surgery.

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Preliminary study of the accuracy and safety of robot-assisted mandibular distraction osteogenesis with electromagnetic navigation in hemifacial microsomia using rabbit models

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Ziwei Zhang

Abstract

Background: This study aimed to investigate the accuracy and safety of mandibular osteotomy and distraction device positioning in distraction osteogenesis assisted by an electromagnetic navigation surgical robot.
Methods: Twelve New Zealand white rabbits were randomly divided into two groups after computed tomography. The control group underwent a procedure based on the preoperative three-dimensional design and clinical experience. Animals in experimental group underwent a procedure with robotic assistance after registration. The accuracies of osteotomy and distraction device positioning were analysed based on distance and angular errors. The change in ramus length after a 1cm-extension of the distraction device was for assessing distraction effect. The preparation, operative and osteotomy times, intraoperative bleeding, and teeth injury were used for safety assessment.
Results: In the experimental group, the distance($t=2.591$, $p=0.011$) and angular($t=4.276$, $p=0.002$) errors of osteotomy plane, and the errors in distraction device position ($t=3.222$, $p=0.009$) and direction ($t=4.697$, $p=0.001$) were lower; the distraction effect was better ($t=4.096$, $p=0.002$). There was no significant difference in the osteotomy time and bleeding; however, the overall operative and preparation times were increased in the experimental group, with a reduced rate of teeth damage.
Conclusions: Robot-assisted mandibular distraction osteogenesis with electromagnetic navigation in craniofacial microsomia is feasible, safe, significantly improves surgical precision.

Objectives

1. Participants will be able to introduce a cutting-edge technology for mandibular distraction osteogenesis for hemifacial microsomia. 2. Participants will be able to preliminarily verify the accuracy and the safety of robotic navigation-assisted mandibular distraction osteogenesis. 3. Participants will be able to explore the application prospects in high-precision craniomaxillofacial surgery.

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The role of airway management on feeding difficulties in children with Pfeiffer syndrome

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Abstract

Background: Pfeiffer syndrome is characterised by craniosynostosis, midface hypoplasia, broad thumbs and often multilevel airway obstruction. Airway management is often required, including the use of positive airway ventilation, nasopharyngeal airway or tracheostomy. Objective is to assess the impact an airway adjunct on feeding difficulties in children with Pfeiffer syndrome.
Method: Retrospective review of patients diagnosed with Pfeiffer syndrome from January 1998 to January 2020 at one of England's four supraregional Craniofacial Units, Alder Hey Children's Hospital. Speech & Language Therapy case notes and medical notes were used to gather data, as well as the Oral Feeding Score component of the UK Craniofacial Outcome Score (COS).
Results: Eleven patients were included. Six patients had no airway adjunct (55%): 3 had tracheostomy (27%) and 2 patients had nasopharyngeal airway (NPA) (18%). All patients with airway adjuncts were PEG/PEJ fed. Those who did not require an airway adjunct had an Oral Feeding Score of 4.60 (SD 0.49). The children who went on to have an airway adjunct had a mean pre-intervention Oral Feeding Score of 2.4 (SD 0.8). The mean feeding score (post-airway adjunct) in the NPA group was 2.0, compared to the tracheostomy group scoring 3.0.
Conclusions: Children with Pfeiffer syndrome who require airway intervention have more significant feeding problems requiring feeding intervention. Although there were small numbers included in this study, there is a suggestion that airway adjuncts can contribute to feeding difficulties, particularly nasopharyngeal airways.

Objectives

1) participants will have a clearer understanding of the feeding difficulties associated with pfeiffer syndrome 2) participants will have a clearer understanding of the role airway management has on feeding difficulties in children with pfeiffer syndrome 3) participents will have a greater understanding of the importance of managing children with pfeiffer syndrome in a multi disciplinary way.

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Keeping an Eye on Metopic Craniosynostosis: Effects of Severity on Orbital Dysmorphology

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Abstract

Background

The trigonocephalic deformity associated with metopic craniosynostosis (CS) induces orbital morphologic changes. This study aims to determine how these orbital changes differ between affected patients and controls.

Methods

Patients with preoperative three-dimensional reformatted computed tomography (3DCT) scans who underwent surgical correction for metopic CS between 2005-2022 were reviewed. Metopic CS severity was assessed by the interfrontal angle (IFA) between the supraorbital notches and metopic ridge in a single axial plane. Eye dysmorphology was assessed by the following angles: supraorbital notches and nasion (SNS), infraorbital foramina and nasion (INI), zygomaticofrontal suture-supraorbital notch-dacryon (ZSD) and orbital long axis relative to midsagittal plane. Results were compared to age and gender-matched controls.

Results

One-hundred and forty-two patients (68 metopic CS, 74 control) were included, and all orbital measurements differed significantly between cases and controls. SNS, INI and left/right ZSDs were smaller than controls ($p<0.001$) and orbital long axis angles were larger ($p=0.02$). IFA was significantly associated with all orbital measurements, the strongest of which was SNS ($\beta=0.80$, $p<0.001$). The SNS had the highest area under the curve (AUC) of the orbital measurements at 0.91. Mandating 95% sensitivity, the optimum diagnostic cut-off was a SNS angle of 129.27°

(60.81% specific, 95.56% sensitive), while 125.32° was the optimum diagnostic cut-off overall (78.38% specific, 86.76% sensitive).

Conclusion

This study suggests that the medial rotation of the orbits correlates with trigonocephalic severity. This rotational dysmorphology is more pronounced superiorly, rather than inferiorly. For this reason, it is captured by the SNS angle, which was found to be highly predictive of metopic CS diagnosis— a measure greater than 129.27° yields odds of metopic CS diagnosis under 5%. This straightforward measurement can be reproduced within seconds on any 3DCT, and it provides additional information to assist in ruling out ambiguous cases.

Objectives

1. Participants will be able to calculate the SNS angle in metopic craniosynostosis. 2. Participants will be able to explain the orbital dysmorphology in metopic craniosynostosis. 3. Participants will be able to compare orbital morphology between unaffected patients and those with metopic craniosynostosis

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Congenital Orbital Anomalies: A Novel Classification System

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Tyler Stumm


Krish Shah


Kelly Hoerger


Howard Wang


Anand Kumar


Edward Davidson

Abstract
Background: Congenital orbital anomalies are challenging to characterize and manage due to the wide spectrum of pathology with variability in morphology, etiology, and severity. Multiple classification systems exist within the realm of craniofacial deformities and have been successful in organizing the discussion surrounding and treatment of these defects. The proposed system allows for more effective communication and would help direct treatment of congenital orbital anomalies.
Methods: A systematic review of the literature was performed to identify previously proposed congenital orbital anomaly classification systems. Studies were identified using a standardized search string on PubMed and reviewed by two independent reviewers. Congenital orbital anomalies were categorized by deformities of orbital size, position, and shape.
Results: The review yielded 983 results published between 1966 and 2023. Sixteen results were identified for detailed review. Seven were excluded given inability to access full manuscript; all were published in 1990 or earlier. None of the identified studies proposed a classification system for congenital orbital anomalies. A comprehensive classification system was then devised. Type 1 was defined as disorders of size: Macro-orbit e.g. neurofibromatosis type 1; or Micro-orbit e.g. craniofacial microsomia, anophthalmia. Type 2 was defined as disorders of position: Hypertelorism e.g. Apert syndrome or Tessier 0-14 cleft; Hypotelorism e.g. metopic craniosynostosis; Pseudohypertelorism e.g. nasal dermoid cyst, frontonasal encephalocele; Vertical Orbital Dystopia e.g. craniofacial microsomia; or Cyclopia e.g. holoprosencephaly. Type 3 was defined as disorders of shape: Exorbitism e.g. Crouzon syndrome; or Orbital Clefts.
Conclusions: Congenital deformities of the orbit are complex, variable and can include rare phenotypes. Management requires an understanding of etiology and morphology to determine an approach that successfully corrects the specific anatomic differences. The proposed system is practical and comprehensive. It addresses distinct abnormalities in morphology as opposed to individual syndromes which more directly guides treatment.

Objectives
Participants will be able to: 1. Understand the complexity of congenital orbital anomalies 2. Organize known congenital orbital anomalies into one classification system 3. Apply the new classification to simplify treatment of congenital orbital anomalies

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Neuromuscular electrical stimulation therapy improves masseter muscle function in craniofacial microsomia: A randomized controlled trial

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Yan Zhang

Abstract

Background: Craniofacial Microsomia (CFM) is a congenital deformity often accompanied by masseter dysplasia functionally. This RCT assessed neuromuscular electrical stimulation therapy (NMES) and exercise therapy on masseter muscle function in patients with CFM.
Methods: Unilateral CFM patients with masseter dysplasia from 2018.6 to 2020.6 were enrolled and randomly divided into two groups: the PT Group received masseter exercise therapy only and the NMES+PT Group with an additional NMES intervention. The primary endpoint was the functional Asymmetry Index (fAI) of masseter action amplitude at 6 months, denoting the root mean square of the action potential value differences bilaterally. Secondary outcomes contain a 12-month following and complication rate. T-test and chi-square test were used to explore intra- and inter-group differences. Spearman correlation was used to analyze the correlation between clinical features.
Results: A total of 30 patients (mean age 5.53±2.66) were enrolled. fAI improved in both groups with significant difference within 6 months without an intergroup difference. At 12 months, the improvement of fAI in the NMES+PT Group was bigger than the PT group (P = 0.007). No complications were observed in all patients.
Conclusions: NMES combined with exercise therapy is viable and beneficial for improving masseter muscle functional asymmetry in CFM patients.

Objectives

1.Participants will be able to know about the clinical manifestation of craniofacial microsomia. 2.Participants will be able to know about the research strategy of neuromuscular therapy. 3.Participants will be able to learn about the neuromuscular electrical stimulation therapy on craniofacial microsomia.

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The Effect of Chin Position on Perceived Femininity: A Crowdsourcing Study

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Abstract

Background

Genioplasty can improve facial gender congruence and perceived femininity in surgical facial feminization. However, little data exists on how specific changes in chin position can best improve perceived femininity. This study used crowdsourcing to assess which chin changes were perceived most favorably.

Methods

Photographs of 6 male and 6 female subjects were digitally combined to simulate frontal and lateral images of 6 trans women. The mental region of each of the 12 resulting images was further manipulated through either narrowing, changing the vertical height, or sagittal advancement/setback. Images were rated on perceived femininity, masculinity, attractiveness, friendliness, and trustworthiness by layperson raters on an online crowdsourcing platform. The effects of chin position on perceived gender and personality were assessed using linear mixed-effects models.

Results

79,980 ratings from 1333 raters were included. 3% of raters identified as transgender/non-binary/other gender; 16% identified as LGBT. On lateral view, 2mm increased chin height was perceived as most feminine (β=0.08, p=0.03) and most attractive (β=0.08, p=0.002), while 4mm decreased height was rated least masculine (β=-0.08, p=0.03). 6mm sagittal advancement was perceived as least feminine (β=-0.07, p=0.04); 3mm advancement was rated most masculine (β=0.08, p=0.02). On frontal view, 3mm chin narrowing was perceived as most feminine (β=0.07, p=0.04) and least masculine (β=-0.06, p=0.04), while 2mm increased chin height was least feminine (β=-

0.10, p=0.004) and most masculine (β=0.07, p=0.02). 9mm narrowing was perceived as most attractive (β=0.07, p=0.01), while 4mm decreased height was found least attractive (β=-0.09, p<0.001).

Conclusion

Chin position modifications have a significant impact on perceived facial femininity, with narrower and less prominent chins rated as most feminine. Interestingly, the effects of changes in chin height on femininity perception differed depending on the angle of view, suggesting a trade-off. Careful consideration of three-dimensional facial features is necessary to achieve optimal feminizing outcomes.

Objectives

1. Participants will be able to explain which changes in chin position confer the greatest benefit in perceived facial femininity 2. Participants will be able to explain how perceived femininity may vary by angle of view, leading to trade-offs in the feminizing effect of genioplasty 3. Participants will be able to apply findings from this study to improve preoperative counseling for patients seeking facial feminization surgery

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Facial Feminization Surgery: Region-specific importance recognized byArtificial and Human Intelligence Gender Recognition correlates with Patient Satisfaction

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Joshua Choe


Meghan Miller


Dana Bregman


James Bradley

Abstract

Introduction: Facial Feminization Surgery (FFS) has emerged as an important aspect of social gender confirmation for the trans-women. It is not known which of the many FFS procedures are the most important. To determine this, individual FFS procedures or regional changes were compared using gender typing from artificial intelligence and public opinion.

METHODS: 12 different individual FFS procedures (eg. osseous genioplasty vs rhinoplasty) or regions (eg. Forehead vs chin) (n=303 patients) were compared based on four neural networks (AI trained to recognize facial images to assess gender) and crowdsourcing public opinion of gender type (n=917). The nasofrontal region (frontal sinus setback/rhinoplasty) preoperative severity and change was compared for success in FFS. FACE-Q surveys were used to measure patient-reported facial aesthetic outcome.

RESULTS: For all four neural networks, cis-male, cis-female gendered correctly (98%, 99%); Preoperative FFS misgendered 52%. With postoperative FFS a combination of 'all the procedures' followed by the 'nasofrontal region' had superior outcomes (98%, 96% correct gendering) compared to other regions (range 68-86%); With public opinion similar results were recorded with a combination of 'all the procedures' followed by the 'nasofrontal region' having superior outcomes (97%, 95% correct gendering with improved confidence level 8.9+1.2 and 8.1+2). For nasofrontal region improved outcome was seen with more severe preoperative state (Type 3 brow/dorsal hump) and increased change in measured nasofrontal angle (Forehead-Radix-Dorsum (FRD) from 90o to 135o). FACE Q scores demonstrated patient satisfaction for facial appearance (75.1+8.1), quality of life (82.4+8.3). There was a positive correlation between less AI and public misgendering and patient reported scores FACE-Q for appearance, quality of life, and overall satisfaction.

CONCLUSION: Both 'all procedures' and 'nasofrontal region' are the most important for misgendering based Artificial and Human intelligence; these outcomes correlated with patient satisfaction. Nasofrontal junction angle change is also important for improved gendering.

Objectives

Determine which facial regions are the most important in appearing feminine. Apply the newfound understanding of facial regions to understand which FFS procedures specifically contribute to the greatest correction in misgendering. Analyze if patient reported FACE-Q satisfaction scores for appearance, quality of life, and overall satisfaction correlate positively to proper gendering from AI neural networks.

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Clinical Presentation and Management of Isolated Squamosal Craniosynostosis

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Abstract

Background

Premature squamosal suture fusion is rare, but most often seen with multi-suture craniosynostosis and branchial arch syndromes. There are few reports discussing isolated squamosal synostosis (ISS). This study examines the presentation and management of ISS including laterality, intracranial pressure (ICP), and treatment.

Methods

Three-dimensional computed-tomography (CT) scans from 2010-2011 were screened for ISS. Demographic, radiographic, and perioperative data was analyzed. Elevated ICP was suggested by soft signs (persistent headaches, unexplained developmental delay) or hard signs (papilledema, thumbprinting, sulcal effacement, Chiari I malformation, elevated opening pressure). Cranial vault remodeling and helmeting was documented, as was treatment response.

Results

Seventeen patients had ISS (13 bilateral, 4 unilateral). Of the 4 unilateral, 2 were partially fused (age at scan 1.2±0.6 years) and 2 were completely fused (age at scan 1.3±0.8 years). All unilateral cases initially presented as deformational plagiocephaly. Two pursued helmeting therapy, and none had surgery. Of the 13 bilateral, 7 were partially fused (age at scan 2.0±2.2 years) and 6 were completely fused (age at scan 4.2±3.8 years). Two presented with elevated ICP without head shape abnormalities, and 11 presented with head shape abnormalities. One patient (14%) with partial bilateral ISS had headaches, and 4 of 6 patients (66%) with complete bilateral ISS had signs of elevated ICP. Two patients with hard signs of elevated ICP were 8 and 9 years old. Eight patients with bilateral ISS

were offered surgery, and all with hard and soft signs of ICP responded to surgery. One patient with preoperative developmental delay still exhibits head banging behavior.

Conclusions

ISS presentation varies greatly. Signs of elevated ICP were rare, but more common in complete bilateral synostosis. Late presentation was common to both patients with hard ICP signs. Unilateral disease was not associated with ICP signs and was treated successfully with helmeting.

Objectives

1) Participants will appreciate the wide variability in observed presentation of squamosal craniosynostosis 2) Participants will understand the association between bilateral squamosal craniosynostosis and a relative increased risk for signs of ICP elevation when compared to unilateral disease 3) Participants will be able to describe the hypothesized progressive nature of squamosal fusion, which owes to the observation of older patients presenting with complete fusion.

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AI-driven real-time evaluation of 3D photogrammetry to quantify surgical outcomes of patients with non-syndromic craniosynostosis in a clinical setting.

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Antonio Porras

Abstract

Background: The quantification of cranial anomalies is essential to evaluate developmental pathology, optimize treatments and quantify their outcomes. 3D photogrammetry has become a popular imaging modality to assess cranial anomalies, but existing analysis tools are inefficient, prone to errors and rarely consider age and sex.
Methods: We present a fully automated method to evaluate cranial anomalies and surgical outcomes using non-invasive 3D photogrammetry accounting for patient age and sex. We designed a novel geometric deep learning method to detect craniofacial landmarks from 3D photogrammetry in real time. The landmarks at the cranial base were used to isolate the head surface around the calvaria. Then, we leverage our recent model of normative head anatomical development built using imaging data from 2,020 children (age 0-10 years, 1,081 male, 939 female) to calculate a head shape anomaly (HSA) index, which quantifies how many standard deviations away from normality the head anatomy of a patient is accounting for age and sex. We quantified the HSA index from the pre- (4 ± 7 days before surgery) and post-surgical (258 ± 63 days after surgery) 3D photograms of 75 children (54 male, 21 female, 184 ± 109 days old at surgery) with single-suture craniosynostosis (15 underwent endoscopic and 60 open surgery) to evaluate treatment outcomes.
Results: The HSA index significantly decreased from 1.39 ± 0.37 before surgery to 1.14 ± 0.29 after treatment ($p < 0.001$). Despite the quantified anatomical normalization, the post-surgical values remained higher than the normative population (1.03 ± 0.75, $p<0.001$). There were no significant differences between patients who received endoscopic and open surgical treatments before ($p=0.51$) or after surgery ($p=0.61$).
Conclusion: Our study shows that AI-driven quantitative methods enable real-time, accurate and repeatable quantification of head anomalies and surgical outcomes in patients with craniosynostosis using 3D photogrammetry in a clinical setting.

Objectives

Participants will learn about the latest advances of artificial intelligence that enable the real-time evaluation of craniofacial anomalies using non-invasive 3D photogrammetry in a clinical setting. Participants will learn about the importance of normative anatomical references of development to quantify craniofacial anomalies and objectively evaluate surgical outcomes. Participants will understand the differences in the surgical outcomes of patients undergoing endoscopic and open surgical treatment of craniosynostosis.

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Assessing the variability of inferior alveolar nerve anatomy in patients undergoing extended sliding genioplasty

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Ezgi Mercan


Ryan Badiee


Philip Tolley


Srinivas Susarla

Abstract

Background: Extended sliding genioplasty (ESG), in which osteotomies are made bilaterally from the mandibular symphysis to the antegonial notch parallel to the occlusal plane, is associated with increased risk of inferior alveolar nerve (IAN) injury due to the superiorly positioned osteotomy. We assessed the risk of nerve injury by quantifying distance to IAN across the planned osteotomy.
Methods: Patients who underwent preoperative computed tomography (CT) and virtual surgical planning for ESG were identified. 3D models of the mandible were reconstructed using 3D Slicer, and planned osteotomies were superimposed on the models. Perpendicular plumb lines were drawn to identify the distance from IAN to the osteotomy at three anatomic landmarks: the mental foramen, the mandibular cuspid, and the center of the first molar. These distances were also compared bilaterally within subjects to assess symmetry of IAN anatomy.
Results: Eleven patients were included, of which seven (63.6%) were male. The median age was 18 years (IQR 17-21years). The mental foramen was on average 18.4±3.8mm superior to the osteotomy. Osteotomies passed 7.1±1.8mm and 7.39±2.2mm inferior to IAN at the level of the cuspid and the first molar, respectively. There were zero cases of IAN injury. At the mental foramen, the median difference in distance to IAN was 1.0mm (IQR 0.7mm–2.3mm), with three subjects (27.3%) demonstrating asymmetry greater than 2mm. This degree of asymmetry was consistent throughout the IAN course, with 0.8mm (IQR 0.7mm–1.1mm) difference at the cuspid and 1.1mm (IQR 0.5mm–1.6mm) difference at the first molar.
Conclusions: When performing ESG parallel to the occlusal plane, the distance between the IAN and planned osteotomy can decrease by over one centimeter as it is advanced posteriorly. Within a patient, IAN anatomy commonly varies in the cranial-caudal axis by about one millimeter, which must be accounted for in surgical planning.

Objectives

1. Participants will understand the general course of the inferior alveolar nerve from the mandibular foramen to its terminal branches. 2. Participants will understand the variability of inferior alveolar nerve anatomy within an individual patient. 3. Participants will understand the increased risk of IAN injury by mandibular osteotomies oriented parallel to the occlusal plane and extending distal to the mental foramen.

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Osseous Transformation with Facial Feminization Surgery: Improved Anatomical Accuracy with Virtual Planning

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Sabrina Sam


Meghan Miller


Joshua Choe


Christopher Aiello

Abstract
Background: Facial feminization surgery entails a series of surgical procedures that help transwomen pass as their desired gender. Although virtual surgical planning, with intraoperative cutting guides, and custom plates have been shown to be helpful for craniomaxillofacial reconstruction, they have not been well studied for facial feminization surgery. The authors used cadaveric and patient analysis for morphologic typing and to demonstrate the utility of virtual surgical planning in facial feminization surgery procedures.
Methods: Male cadaveric heads underwent morphologic typing analysis of the frontal brow, lateral brow, mandibular angle, and chin regions (n=50). The cadavers were split into two groups: (1) virtual surgical planning intraoperative cutting guides and (2) no preoperative planning. Both groups underwent (1) anterior frontal sinus wall setback, (2) lateral supraorbital recontouring, (3) mandibular angle reduction, and (4) osseous genioplasty narrowing. Efficiency (operative time), safety (dural or nerve injury), and accuracy (three-dimensional tomographic preoperative plan versus postoperative result) were compared between groups, with significance being $p < 0.05$. In addition, clinical accuracy was determined with surgical FFS patients (n=445)
Results: For frontal brow and lateral lower face, morphologic type 3 (severe) predominated; for lateral brow and chin, type 2 (moderate) predominated. For frontal sinus setback, virtual surgical planning improved efficiency (19 versus 44 minutes; $p < 0.05$), safety (100% versus 88%; $p < 0.05$; less intracranial entry), and accuracy (97% versus 79%; $p < 0.05$) compared with no preoperative planning. For mandibular angle reduction, virtual surgical planning improved safety (100% versus 88%; $p < 0.05$; less inferior alveolar nerve injury) and accuracy (95% versus 58%; $p < 0.05$). Clinical accuracy was determined to be 88%+5 when postoperative imaging was compared to virtual plan.
Conclusions: Preoperative planning for facial feminization surgery is helpful to determine morphologic typing. Virtual surgical planning with the use of cutting guides/custom plates improved efficiency, safety, and accuracy for FFS.

Objectives
Decide if virtual surgical planning with intraoperative cutting guides and custom plates are significantly helpful for craniomaxillofacial reconstruction. Determine which FFS craniofacial procedures specifically partner best with virtual surgical planning with intraoperative cutting guides and custom plates. Analyze which types of morphologic facial typing is best benefitted by intraoperative cutting guides and custom plates.

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Two Year Comparison of Sagittal Synostosis Morphometric Outcomes Following Open Posterior Expansion Versus Endoscopic Strip Craniectomy with Helmet Molding Performed before Four Months of Age

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Abstract

BACKGROUND: Open middle and posterior cranial vault expansion (OPVE) or endoscopic (ES) strip craniectomy are two surgical techniques for normalization of head shape in isolated sagittal synostosis. This study aims to compare two-year cranial morphometrics after these two approaches.

METHODS: We performed morphometric analysis on preoperative (t0), immediately post-operative (t1) and 2-year (t2) postoperative CT scans of patients who underwent OPVE or ES prior to 4 months of age. Perioperative data and morphometrics were compared between the two groups and age-matched controls.

RESULTS: Nineteen patients were included in the ES cohort, 19 age-matched patients in the OPVE cohort, and 57 as controls. Median surgery time and blood transfusion volume were less for the ES approach (118 min; 0cc) compared to OPVE (204 min; 250cc). Anthropometric measurements after OPVE were closer normal controls at t1 compared to ES, but the skull shapes were comparable at t2. In the mid-sagittal plane, anterior vault was higher after OPVE at t2 compared to both ES and controls, but the posterior length was shorter and closer to controls than the ES cohort. Cranial volumes were like controls for both cohorts at t2. There was no difference in complication rate.

CONCLUSIONS: Both OPVE and ES techniques result in normalization of cranial shape in patients with isolated sagittal synostosis after two years with minimal morphometric differences. Family decision-making between the two approaches should be based on age at presentation, avoidance of blood transfusion, scar pattern, and availability of helmet molding and not on expected outcome.

Objectives

1. Participants will understand the difference between open and endoscopic approaches to normalize head shape in isolated sagittal synostosis. 2. Participants will learn about modern methods morphometric analysis for cranial shape in craniosynostosis. 3. Participants will be able to discuss differences in 2-year outcomes following open and endoscopic repair for sagittal synostosis.

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Using artificial intelligence to predict development from imaging data in real time for longitudinal patient evaluation.

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Connor Elkhill

Abstract

Background: The personalized prediction of cranial growth is essential to identify developmental anomalies associated with pathology. However, current clinical metrics of head development have low sensitivity to identify pathology, and existing anatomical growth models struggle to make personalized predictions of development due to the scarcity of pediatric longitudinal imaging datasets.
Methods: We present a deep learning method to make personalized predictions of head anatomical development accounting for age and sex given a single CT image or 3D photogram of a patient's head. It leverages the statistical distributions in a cross-sectional imaging dataset (N=2,020, 1,081 male, 939 female, range 0-10 years) to create age- and sex-agnostic patient phenotype representations from an image observation. These representations are combined with sex and a future age to predict the anatomy of a patient any time before ten years of age. We trained this method using our cross-sectional dataset and evaluated its predictive accuracy using an independent longitudinal CT image dataset of 61 subjects (36 male, 25 female, age 2.24 ± 2.22 years). We also investigated the role of sex by modifying patient sex and comparing with previous results.
Results: Our method achieved an error of 2.21 ± 1.42 mm predicting local development at each location on the head surface, and a volume growth error of 0.11 ± 0.09 L, significantly outperforming other state-of-the-art methods ($p<0.005$). Finally, incorrect introduction of sex information caused increased predictive errors (0.13 ± 0.10 L, $p<0.005$), which shows its crucial role as a modulator of development.
Conclusions: Our method is the first to create age- and sex-agnostic phenotype representations to predict development, which could be leveraged to study diverse pediatric datasets. Our personalized predictions improve existing population models to quantify developmental anomalies associated with pathology. Finally, our real-time method enables predictions using either CT images or 3D photograms in a clinical setting.

Objectives

Participants will learn about how to leverage artificial intelligence and large retrospective imaging datasets to predict personalized anatomical development in the pediatric population. Participants will understand how the creation age- and sex-agnostic representations of patient phenotypes could aid in the evaluation of phenotypically diverse pathologies. Participants will learn how the prediction of personalized anatomical development can be used to evaluate developmental anomalies on a patient-specific level.

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Cranial Shape Changes in Non-syndromic Unilateral Lambdoid Synostosis after Open Posterior Vault Remodeling: An Observational Study of Two-Year Outcomes

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Ezgi Mercan


Amy Lee


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Richard Ellenbogen


Richard Hopper

Abstract

Background: The purpose was to quantify morphological change in non-syndromic unilateral lambdoid craniosynostosis (ULC) patients from presentation (t0), after open posterior switch-cranioplasty (t1), and at two-year follow-up (t2).

Methods: Volumetric, linear and angular analysis were performed on computed tomographic scans at the three timepoints and against normal controls.

Results: Twenty-two patients were included. ULC cranial vault asymmetry index (CVAI) was higher than controls before surgery but decreased after surgery to become comparable to the normal asymmetry range present in the controls. After surgery both diagonals increased, but more on the fused side. From t1 to t2, both diagonals in ULC grew proportionately, but the fused diagonal remained slightly shorter than the patient side. Total cranial volume was higher in ULC than controls after surgery but became comparable at t2. Cranial base angulation improved by t2 but did not approach normal and ear position remained unchanged. The facial twist was higher than controls at t0 and t1 but was comparable at t2. Coronal asymmetry improved with surgery but remained under-corrected at t2, with the greatest residual asymmetry at opisthion. Immediate and two-year CVAI were both correlated with the degree of asymmetry at presentation.

Conclusions: Open switch cranioplasty normalizes CVAI by increasing the fused cranial diagonal more than the patent and is stable at two years. Skull base twist does not normalize but facial twist approaches normal. Technique improvement should focus on residual coronal asymmetry present at opisthion, however 2-year symmetry is impacted by the degree of pre-operative deformity.

Objectives

1. Participants will be able to list the head deformities associated with unilateral lambdoid synostosis. 2. Participants will learn about the surgical technique used for correcting unilateral lambdoid synostosis deformities. 3. Participants will understand the changes in cranial shape following open surgical correction for lambdoid synostosis.

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A Case Series of Midline Sagittal Skull Indentation in Adolescence

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Mandy Flor


Arlene Rozzelle


Deniz Altinok


Neena Marupudi

Abstract
Background
Skull indentations without history of trauma are rare. Congenital types have been described with majority of them in the tempoparietal region; they often resolve spontaneously. However, there are no case reports describing midline skull indentation diagnosed during adolescence.
Methods
We report a case series including three patients who presented to Children's Hospital of Michigan Neurosurgery clinic in 2021-2022 with incidental midline skull indentations without history of trauma.
Results
Patient #1: 8-year-old female who was referred to the neurosurgery clinic for a palpable indentation at the midline posterior vertex. Parents reported it was not present at birth but unsure the onset of this finding. CT imaging demonstrated a small indentation overlying the area at the posterior sagittal suture which was closed; without any calvarial defect. MRI five years prior did not demonstrate any anomaly.
Patient #2: 15-year-old female was referred by her pediatrician for a two-year history of midline skull indentation at the level of the sagittal sinus. She had no neurological complaints. CT showed a linear depression at the posterior calvarium at the level of the sagittal suture to the lambdoid suture without defect in the inner table.
Patient #3: 18-year-old female with a midline parietal region indentation noted within the past year. CT demonstrated a broad depression of the outer table along the posterior sagittal suture. There was no involvement of the inner table. Interval follow-up at 10-months did not demonstrate any changes.
Conclusion
The etiology or physiology of the development of such skull defects are unclear. On imaging, there appears to be a loss of the cancellous bone along a segment of the suture line without violation of the inner table. Whether congenital or acquired, these anomalies are alarming to patients when initially identified but do not require any surgical intervention for cosmetic or clinical concerns.

Objectives
Learning goals of this poster will be to 1) Identify and understand CT findings of midline skull indentations 2) Stimulate discussion regarding the hypothesis of how midline skull indentations develop 3) Determine if there may be any indications for surgical treatment of skull indentations based on other clinicians' experience

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Amplified rhinoplasty with fixed central axis: proposal of technique for hyperteleorbitism correction

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Daniella Camargo


Jullyana Heinen Peixoto


Alessandra Santos Silva


Vera Lucia Nocchi Cardim

Abstract

Background

Tessier defined hyperteleorbitism as an increase in the interorbital distance (IOD) usually associated with congenital craniofacial malformations. Tessier classified hypertelorbitism according to IOD in the first degree, 30mm < IOD<34mm; second degree, 34mm<IOD<40mm; and third degree, IOD>40mm.

Evolving from Tessier's orbital box, Van der Meulen proposed the facial bipartition technique, which respects the morphofunctional units of the face, offering more lasting results for third-degree hyperteleorbitisms.

Although the Tessier box and the Van Der Meulen facial bipartition are appropriate for third-degree cases, these techniques prove to be excessively invasive in first- and second-degree hyperteleorbitism, for which we propose amplified rhinoplasty.

Methods

Since 2003, 23 patients with moderate hypertelorbitism without transethmoidal meningoenphalocele and with bones of the nose and glabella have been operated on by Dra Vera Cardim in São Paulo, SP, Brazil.

The medial walls of the orbits are released by vertical osteotomy in the ethmoid and oblique in the maxilla from the piriform fossa to the orbital floor. The nasal bone dorsum is maintained by parallel osteotomies and the medial walls of the orbits are brought together behind this axis.

Results

In all cases, there was an aesthetic improvement with a decrease in the intercanthal distance. No strabismus, enophthalmos or other complications were observed.

Conclusions

It is a good technical option due to its low morbidity, short surgical time, good aesthetic result, and stability. As a limitation of the technique, its indication is restricted to cases of mild/moderate hyperteleorbitism, without meningoencephalocele, and with the preserved central bone structure on the nasal dorsum.

Objectives

1. Develop and explain a new technique for hyperteleorbitism correction 2. Our technique has lower morbidity, shorter surgical time, good aesthetic result and stability 3. Participants will be able to reproduce this technique from description

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Case Report of an Infant with Frontal Congenital Outer Table Skull Depression

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Arlene Rozzelle


Mandy Flor


Neena Marupudi

Abstract
Background
Congenital skull depression is a rare clinical entity and is estimated to occur in 1 in 10,000 neonates. It is commonly associated with obstetrical trauma, such as the use of delivery forceps. Majority of cases reported in the literature were skull depressions in the temporoparietal region. Indication, timing, and modality of treatment remain controversial.
Methods
We report a patient with frontal congenital skull depression, without history of instrumentational trauma at delivery.
Results
This patient presented to craniofacial clinic at the Children's Hospital of Michigan at 18 months of age. She was born at 30 weeks as a product of fraternal twin pregnancy via Caesarean section. Mother was a 36 year-old G4P2 with gestational diabetes and Hashimoto thyroiditis. Fetal ultrasound did not demonstrate any craniofacial deformities. Infant was in vertex presentation in utero. There was no reported trauma or use of instrumentation during the delivery.
Patient required a 39-day NICU stay for prematurity but had been developing well since. Her twin sister did not have any head shape deformities. On exam, she has a 3 cm area of depression near the anterior fontanelle. CT scan showed a 3.5 cm x 2 cm focal indentation of frontal calvarium external table with a smooth non-deformed inner table.
Conclusion
An extensive review of literature on congenital skull depressions demonstrated that majority of these are at the temporo-parietal region with full thickness cortical involvement, and almost all of them resolved by 6 months of age. Congenital midline frontal skull depression is an extremely rare entity. Close follow-up will be required for our patient to determine if this type of deformity will lead to any neurologic sequalae or if it will spontaneously resolve.

Objectives
1) Recognize CT finding of skull depressions involving only outer table 2) Initiate discussion regarding treatment indication for skull depressions involving only outer table 3) Develop an understanding of natural history of congenital skull depressions reported in literature

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Disparities in Craniofacial Surgery Treatment and Outcomes: Results of a Systematic Review and Meta-Analysis of International Research

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Michaela Hitchner


Natalie Plana


Carrie Morales


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Matthew Pontell


Scott Bartlett


Jesse Taylor


Jordan Swanson

Abstract

Background

Increased emphasis on health equity questions whether non-white and lower socioeconomic status patient families have proportionate access and outcomes of pediatric craniofacial surgery. Several case series have yielded inconclusive findings. Neither patterns of inequity, nor successful strategies for mitigating inequity, are well-established. We performed a systematic review and meta-analysis of international craniofacial disparities research to highlight targets for investigative efforts.

Methods

Studies pertaining to sociodemographic disparities in pediatric craniofacial surgery were identified by systematic review of PubMed and Embase. Publications were categorized as either identifying, understanding, or addressing disparities. Meta-analysis was used to compare outcomes between sociodemographic groups.

Results

Two thousand, five hundred twenty-seven articles were screened, and thirty met inclusion criteria. Twenty-three studies (77%) were focused on identification of disparities. Disparities in craniosynostosis care (18, 60%) were the most common, followed by orofacial injuries/trauma care (5, 17%). On meta-analysis of disparities in timing of vault remodeling for craniosynostosis, the results from four studies of 3,961 patients showed that Black patients underwent surgery 2.81 months (95% CI 1.67-3.95) later than white patients ($p<0.001$). Two studies reported increased hospital charges for non-white patients on the order of $10,000-$12,000. Meta-analysis of six studies

representing 11,627 patients showed that Black and Hispanic patients were less likely to undergo minimally invasive cranial vault remodeling than white patients (OR 0.36, 95% CI 0.19-0.70, p=0.002). Two studies including 4,853 patients showed that patients in the lower half of estimated income are less likely to undergo minimally invasive cranial vault remodeling than those from the upper half (OR 0.65, 95% CI 0.48-0.89, p=0.008).

Conclusions

Non-white and lower socioeconomic status families tend to receive later diagnosis of craniosynostosis, are more likely to undergo open rather than minimally invasive cranial vault surgery and are faced with higher hospital charges. Strategies to mitigate these inequities are not reported.

Objectives

1) Participants will understand a framework for appraising disparities research 2) Participants will be able to explain the mounting evidence for delays in surgery and disparities in open versus minimally invasive operative techniques among patients of marginalized backgrounds. 3) Participants will appreciate the current state of disparities literature in craniofacial surgery and understand the predominance of studies which seek to identifying rather than address inequity.

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Quantitative Evaluation of Changes to Nasal Septum and Inferior Turbinate Morphology following Le Fort III Midface Advancement

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Abstract

Background: For patients with craniofacial syndromes associated with midface hypoplasia, a LeFort III level midface advancement is the standard method for achieving favorable functional and aesthetic outcomes. The procedure involves making oblique osteotomies of the nasal septum and, variably, the turbinates. Our aim is to assess the impact of craniofacial dysjunction on these nasal cavity structures and the nasal airway postoperatively.

Methods: We identified patients with LeFort III-level midface advancements, including Lefort II, III, and monoblocs at our center who had appropriate pre-and postoperative CT scan data. Measurements of nasal septum deviation, inferior turbinate dimensions (length, height, breadth), nasal piriform aperture width, and nasal airway volume were conducted using three-dimensional software analysis of patient CT scans obtained before midface advancement surgery and at least 6 months after surgery (Materialize Mimics Version 24). The extent of midface advancement was measured using the Sella to Nasion (S-N) distance.

Results: Seven patients were included with a mean age at surgery of 15.3 ± 4.2 years. The S-N distance increased significantly by 8.4 mm (95% CI: 2.1, 14.7) postoperatively. There were no statistically significant differences in septal deviation, inferior turbinate dimensions, and piriform aperture width. Linear regression analysis did not reveal a significant correlation between the change in S-N distance and nasal septum deviation or inferior turbinate dimensions. Qualitative analysis of the CT scans by the treating surgeon showed that 4 patients developed septal and turbinate synechiae postoperatively while 4 patients developed a partial loss of the bony septum.

Conclusions: Craniofacial dysjunction procedures induce significant septal and intranasal secondary deformities that will likely require further surgical intervention later. This is important for patients and parents to understand prior to undergoing these complex procedures. We intend to enroll multiple centers in the future to further characterize the intranasal pathology related to these procedures.

Objectives

1. Readers will be able to identify what impact a LeFort III midface advancement has on the morphology and deviation of the nasal septum and nasal airway volume. 2. Readers will be able to identify what anatomic changes occur to the inferior nasal turbinate after undergoing a LeFort III midface advancement. 3. Readers will be able to determine whether the extent of midface advancement is correlated to any identified changes to the nasal cavity morphology.

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Is the Standard Algorithm in the Management of Frontal Sinus Fractures Still Valid? Evaluation of 125 patients with Long-Term Results and Craniometric Measurements

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Abstract

Background: The management of frontal sinus fractures is still a matter of debate for many authors. Over time, treatment modalities have evolved into less invasive strategies rather than major surgeries. The main aim of this study is to evaluate the long-term results and craniometric measurements of 125 patients treated in our clinic and to reveal the treatment algorithm that can be safely applied in frontal sinus fractures.
Methods: Retrospective study to review the demographics, perioperative variables, interventions, outcomes of all patients with frontal sinus fractures between years 2003-2020 was planned. Craniometric analysis were performed on CT images. The analysis of CT scans involves, amount of maximum depletion (mm), fracture surface area (mm2), maximum angulation of the fracture (degree).
Results: 125 patients (101 male, 24 female) with frontal sinus fractures with an average age of 22,4 years (range,17 to 66 years) were reviewed. All patients with isolated anterior table fractures without displacement were followed up on conservative basis. 33 patients with anterior table fractures with displacement and 39 patients with anterior and posterior table fractures were also followed on conservative basis without surgical intervention. The cut-off value of the maximum amount of displacement was confirmed to be 4.5 mm in prediction of late-term contour deformities ($p<0.001$). The maximum amount of displacement was decreased by an average of 1.8 mm at late-term.
Conclusions: Apart from the standard protocols, here it is additionally proposed that isolated anterior table fractures with a maximum depletion of less than 4.5 mm can be treated conservatively without leading to contour deformities. CSF leakage in the acute setting might not always require cranialization and this may spontaneously resolve within 10 days. Cranialization should be considered whenever CSF leakage lasts longer than 10 days.

Objectives

At the end of the presentation participants will be able to review the standart treatment algorithm for management of frontal sinus fractures, learn minimal invasive strategies for reduction of anterior wall fractures and learn the proposed cut-off limit of maximum depletion amount of anterior sinus wall fractures for conservative follow-up in selected patients.

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The Gift of a Fresh Start: Results from A Single-Center Surgical Gift Program

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Gabriela Sendek


Caitlyn Belza


Miriam Becker


Amanda Gosman

Abstract
Background:
Since 1991, the Fresh Start Surgical Gifts Program has provided an avenue for low-income and international patients to receive surgical care at no direct cost to the patient or their family. In 2009, the program transitioned to Rady Children's Hospital of San Diego (RCHSD). By utilizing pre-existing hospital infrastructure, we were able to offer complex surgical care with a dedicated craniofacial team as well as the necessary multidisciplinary team members to provide these patients with comprehensive care regardless of their ability to pay. Our program provides a model for long-term, sustainable surgical care to low-income patients with unmet surgical needs.
Methods:
A retrospective chart review was conducted of patients who were treated via the Fresh Start Program at RCHSD from January 2009 to January 2023. Patient demographics and medical history were collected. Total cost per patient was collected, including housing, transportation, hospital, and surgical costs.
Results:
318 patients were treated in the period described. The average age at enrollment was 13.2 years (SD=12.8), and patients were followed for an average of 2.87 years (SD=2.5). 78% of patients were treated by plastic surgery. Of those, 81% were treated for craniofacial conditions, 7% for congenital hand conditions, 4% for burn reconstruction, and 7% for reconstruction of other congenital, oncologic, or traumatic conditions. The most common pathologies seen were dermatologic conditions of the head and neck (19%), cleft lip and/or palate (18%), and microtia (18%). Patients underwent an average of 3 surgeries (SD = 2.35), with a minimum of 1 surgery and a maximum of 16. The mean total cost per patient was $110,837, with a minimum of $771 and maximum of $1,212,044.
Conclusions:
Our surgical gift model represents a community-focused alternative to surgical mission trips where we can provide the gold standard of multidisciplinary care in a safe environment.

Objectives
1) Participants will be able to discuss the pros and cons of global health care, including surgical mission trips. 2) Participants will be able to compare the use and impact of a local surgical gift model with that of surgical mission trips. 3) Patients will be able to identify the pre-existing infrastructure that makes a surgical gift model feasible and accessible.

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Endoscope-Assisted Fronto-Orbital Distraction Osteogenesis Reduces Blood Loss Without Increasing Operative Time in Unicoronal Craniosynostosis

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Connor Wagner


Matthew Pontell


Carlos Barrero


Lauren Salinero


Jordan Swanson


Scott Bartlett


Jesse Taylor

Abstract

Background

Distraction osteogenesis is a safe and reliable method for improving head shape and increasing intracranial volume and has been used in the treatment of patients with unicoronal craniosynostosis. Our institution has adopted an endoscope-assisted, minimally invasive approach to this procedure due to the potential benefits of scar minimization and reduced scalp dissection and blood loss. The present study compares perioperative outcomes in patients with unicoronal craniosynostosis undergoing open and endoscope-assisted fronto-orbital distraction.

Methods

Patients with unicoronal craniosynostosis undergoing fronto-orbital distraction from 2013-2023 were included. In the minimally invasive group, incisions were made at the anterior fontanelle, pterional region, and brow at the location of a lateral blepharoplasty incision. The conventional group contained patients with a traditional coronal incision. Operative time, total anesthesia time, blood loss, transfusion volume, and length of stay were compared between groups.

Results

Twenty-seven patients (18 conventional, 9 minimally invasive) were included. Patients were 6.5±3.1 months of age at surgery with no difference between groups (p=0.663). Operative time was similar between groups (conventional 114±27 minutes, minimally invasive 105±22 minutes, p=0.392), although time under anesthesia was shorter in the minimally invasive group (conventional 240±30 minutes, minimally invasive 213±27 minutes, p=0.031). Estimated blood loss was 13.5±7.3mL/kg in the minimally invasive group and 21.5±8.4mL/kg in the conventional group (p=0.023). Blood transfusion volume was lower in the minimally invasive group (18.2±7.7mL/kg) than the conventional group (35.0±12.2mL/kg, p<0.001). Length of stay did not differ between groups (p=0.728).

Conclusions

An endoscope-assisted, minimally invasive approach to fronto-orbital distraction offers not only reduced scalp dissection and scar burden but may also reduce transfusion requirements without increasing operative time. Given these benefits, use of this technique should be considered in the management of unicoronal craniosynostosis.

Objectives

1) Participants will be able to explain the proposed benefits of an endoscope-assisted unicoronal distraction 2) Participants will understand the incision pattern and operative technique of this minimally invasive approach 3) Participants will appreciate technical pearls of the approach following our growing experience with the operation

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Mandibular distraction to correct severe non-isolated mandibular hypoplasia: the role of drug-induced sleep endoscopy (DISE) in decision making

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Eppo Wolvius

Abstract

Objectives: The aim of this study was to evaluate the effect of MDO on tongue-based airway obstruction found by DISE within a non-isolated patient population with severe upper airway obstruction (UAO). Furthermore, we aimed to assess the additional value of DISE in clinical decision making by correlating DISE findings to functional airway outcomes after MDO.
Methods: Findings on DISE in children who underwent MDO were retrospectively gathered and evaluated. According to DISE findings, severity of tongue-based obstruction was scored using a 4-step classification similar to the one that is used by Bravo et al.. Intubation conditions were scored according to the Cormack Lehane score (CLS). Pre-and postoperative DISE findings were compared and correlated with functional airway outcomes following MDO.
Results: In 19 out of 28 MDO procedures, both a pre-and postoperative DISE was available. Tongue-based obstruction scores improved in 13 procedures, which correlated to a functional improvement in seven. Postoperative tongue-based obstruction differed significantly between patients with successful MDO and patients treated unsuccessfully (2.00 ((Interquartile range (IQR) 1.00-2.00) vs. 3.00 (IQR 2.00-4.00), p=0.028), whereas this difference was not significant for the CLS (1.00 (IQR 1.00-1.50) vs. 2.00 (IQR 1.00-4.00), p=0.066). If no improvement of tongue-based obstruction was seen, MDO is very unlikely to be successful on the functional airway.
Conclusion: DISE provides information on the site and nature of airway obstruction and can visualize the effect of MDO on the severity of tongue-based airway obstruction. Therefore, it can be of additional value in understanding the differences in functional airway outcomes after MDO and aids in deciding appropriate and targeted treatment. Hence, standardized use of DISE, in addition to the clinical assessment of mandibular position and a polysomnography, during MDO management is highly recommended.

Objectives

- Participants will learn about the indications for drug-induced sleep endoscopy (DISE) in patients with craniofacial anomalies - Participants will increase knowledge about the value of DISE pre and post distraction in craniofacial anomalies and the impact on the management of these patients - Participants will understand the limitations of the MDO to improve upper airway obstruction

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Revolutionizing Craniosynostosis Care through AI Integration: A Systematic Review

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Heli Patel

Abstract

Background

Craniosynostosis is a medical condition in which one or more of the sutures of an infant's skull close prematurely, leading to problems in normal brain and skull growth. An objective algorithm using artificial intelligence (AI) can enhance the accuracy and efficiency of diagnosing craniosynostosis through automated analysis of medical images. This systematic review analyzes different approaches to utilizing AI in assessing craniosynostosis.

Methods

Two reviewers independently reviewed PubMed/MEDLINE, Scopus, OVID, and Web of Science databases using Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA). 131 studies evaluating the role of AI in diagnosing and treating craniosynostosis were screened, and 11 studies met the inclusion criteria. Data on study design, modality of artificial intelligence, level of accuracy, and outcomes were collected.

Results

Of the AI studies, 36.4% used convolutional neural networks (CNN), a type of artificial neural network widely used for image/object recognition and classification, vs. 63.6% used machine learning to automatically identify and classify craniosynostosis cases based on various features and measurements. While 63.6% of studies were based on 3D photographs, 36.4% relied on 2D imaging. Only two studies focused on the use of AI in nonsyndromic craniosynostosis. The results of these studies show that the CNN and machine learning models performed with promising accuracy of ≥90.6% and≥93.3% in detecting and classifying craniosynostosis, respectively. 3D photogrammetric scans are a promising alternative to computed tomography scans in cases of single suture or nonsyndromic synostosis for diagnostic imaging.

Conclusion

Integration of AI has the potential to improve outcomes for patients with this craniosynostosis by enabling earlier and more accurate diagnosis, personalized treatment planning, and more comprehensive monitoring of long-term development. Our review highlights that further research is warranted to develop novel AI technologies and their implementation in the clinical environment.

Objectives

1. Participants will assess the role of artificial intelligence and machine learning in diagnosing and treating craniosynostosis. 2. Participants will learn about the different forms of artificial intelligence previously analyzed for managing craniosynostosis. 3. Participants will interpret the accuracy artificial intelligence provides in diagnosing craniosynostosis.

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The Near InfraRed Spectroscopy: A device to monitor the child during surgical correction of scaphocephaly.

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Alexandru Szathmari


Pierre-Aurélien Beuriat


Julie Chauvel-Picard


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Abstract

BACKGROUND: NIRS (Near InfraRed Spectroscopy) is a non-invasive technique to monitor hemodynamic parameters and hemoglobin oxygen saturation of the brain. Therefore, we have applied this technique during the surgical correction of craniosynostosis which is a surgery at high risk of blood losses, to analyse perioperative modifications in cerebral blood flow.
METHODS: We included all children aged from 3 to 18 months old with a scaphocephaly requiring a surgical correction in ventral position in a monocentric, prospective clinical study.
RESULTS: Among 35 children operated, 23 were boys, 12 girls. The mean age at surgery was 6.9 months. 10 patients required a per-operative transfusion. We observed a decrease in the oxygen saturation of brain haemoglobin at key moments of the surgery, during osteotomy with sagittal sinus decompression, during cranial parietal decompression, during arterial hypotension episodes but also after high blood loss before the transfusion. There is a significant decrease in the haemoglobin oxygen saturation of the brain ($p<0.05$) in the transfused group compared to the non-transfused group at several surgical times: after induction stabilization, just before prone position, at the instant of incision procedure, during the cranial parietal decompression and during arterial hypotension episode(s).
CONCLUSIONS: Our results suggest that in decompression surgery for scaphocephaly, the reduction in brain oxygen saturation can be detected very early using NIRS before the hemodynamic modifications due to the blood losses that occurs. NIRS seems to be a valuable tool to facilitate the monitoring of the child during the anaesthesia.

Objectives

Participants will be able to understand the NIRS technology, its potential role during surgery and its benefits.

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Automated Head Measurements from 3D Photogrammetry in Young Children

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Tareq Abdel Alim

Abstract

BACKGROUND:
Occipitofrontal circumference (OFC) is an important measure for monitoring cranial development. To extract cephalometric measurements, including OFC, cephalic index (CI), and approximated intracranial volume (ICV) from 3D images, a semi-automated method is proposed. This study aims to evaluate the reliability and agreement between automatically and manually obtained OFC measurements and determine if they can be used interchangeably. Inter- and intra-rater reliability are evaluated for the OFC, CI, and Volume.

METHODS:
264 3D images were collected from 188 scaphocephaly patients up to the age of six years, who underwent 3D imaging and regular cephalometric measurements between 2000 and 2019. CraniumPy was used to process the images and to automatically extract head measurements. Blant-Altman analysis was performed to evaluate the measurement agreement. Inter-rater and intra-rater reliability of automated measurements were also assessed. A paired t-test was used to compare manual and automated OFC measurements.

RESULTS:
Manual and automated OFC measurements showed excellent agreement with a high regression score (R2=0.969) and a mean difference of -0.1 cm (-0.2%). Limits of agreement ranged from -0.93 to 0.74 cm, and a standard error of 0.03 cm was found. These values fall within the reported limits of agreement for manual OFC measurements. Excellent inter-rater and intra-rater reliability were found for OFC, CI, and volume measurements.

CONCLUSION:
The results of this study indicate that the proposed open-source method for automated OFC measurements from 3D images can serve as a reliable alternative, with a similar level of agreement to that observed in manual measurements. This method may be beneficial in young children who already undergo 3D imaging in craniofacial centers as part of their treatment protocol and in research settings that require a reproducible and transparent pipeline for anthropometric measurements. The method is implemented in CraniumPy, an open-source tool that is publicly available on Github *https://github.com/T-AbdelAlim/CraniumPy.*

Objectives

1. Understand the relevance of automated head measurements compared to manual measurements for monitoring cranial development in young children. 2. Gain knowledge of the algorithm used to extract cephalometric measurements, including occipitofrontal circumference (OFC), cephalic index (CI), and approximated intracranial volume (ICV) from 3D images. 3. Recognize the importance of open-source code, such as CraniumPy, for conducting reproducible and transparent research in craniofacial centers and beyond.

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Retrospective longitudinal bi-centric study of posterior encephalocele from antenatal management to post-surgical follow-up.

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Claudia Pasquali


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Isabelle Verlut


Matthieu Vinchon

Abstract

BACKGROUND: Encephaloceles are a herniation of intracranial structures secondary to a congenital skull anomaly. Posterior encephaloceles are the most frequent form and may occur on the parietal (parietal encephalocele, PE) or occipital region (occipital encephalocele, OE). The associated malformations and clinical outcomes are poorly documented.

METHODS: Bi-centric retrospective longitudinal study. Patients' files with posterior vault encephalocele, followed at the Hôpital Femme Mère Enfant in Lyon and at the Hôpital Roger Salengro in Lille, from 2009 to 2022 were analyzed. The data studied were MRI images and multidisciplinary postoperative follow-up.

RESULTS: A total of 83 patients followed for posterior vault encephalocele: 51 PEs, 32 OEs. 48% of OEs diagnosed in antenatal versus 18% of PEs ($p< 0.00001$). All patients presented a skin-covered lesion at birth excluding one with a giant OE. Craniocerebral anomalies were more frequent in OEs (52% vs. 24%, $p=0.000045$). Extracerebral malformations were present in 25% of OEs and in 12% of PEs (p not significant). In PEs there were severe malformations (heart disease, VACTREL syndrome). The mean age of surgical correction was 6.3 months. 6/32 patients with OE presented CSF disorders requiring surgical management (4 hydrocephalus, 2 arachnoid kysts). The mean follow-up was 35 months.Postoperative follow-up was characterized by delayed acquisition in 45% of the OEs and 22% of the PEs ($p =0.000104$). Visual disorders were present in 32% of the OE group, no disorders in the PE group. During the follow-up, 5 patients died (0 – 5 years), 4 with OE (0 – 5 years), 1 with PE (6 months), who died of severe cardiopathy.

CONCLUSIONS: As expected, the clinical evolution of OEs is significantly more unfavorable than PEs. However, PE evolution is abnormal in a significant number of patient.Their diagnosis and distinction during the antenatal period are fundamental to provide accurate information and adapted management.

Objectives

Participants will be able to differentiate between parietal and occipital encephaloceles from a prognostic point of view, anticipate potential complications and anticipate the outcomes.

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3D Printed Beta-Tricalcium Phosphate (β –TCP) Scaffolds Augmented with Dipyridamole Stimulate Bone Regeneration in an *In Vivo* Translational Pediatric Pig Model without Disruption of Facial Symmetry

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Abstract

Background

3D printed beta-tricalcium phosphate (β –TCP) scaffolds augmented with dipyridamole (DIPY) have been shown to regenerate bone in immature small animal models. This study assesses the bone generation capacity and effects on craniofacial development of 3D printed β –TCP scaffolds + DIPY compared to autogenous bone graft using a large translational growing animal model. Assessments were made during interim growth and after full craniofacial development.

Methods
Unilateral critical-size calvarial defects and alveolar defects were created in six-week-old Göttingen minipigs (n=12). Six pigs were treated with a 3D printed β –TCP scaffolds + 1000µM DIPY, while the remaining six were treated with autologous grafts. At 12 weeks and 24 months postoperatively, the calvaria were scanned using computed tomography imaging ex vivo. Cranial symmetry, 3D-reconstruction volumetric analyses, and histological analyses were performed. Facial symmetry was evaluated using the Asymmetry Index (AI), with lower values indicating less asymmetry.

Results
At 12 weeks, the average bone volume fraction was 84.6%, comparable to that of autologous bone graft, and at 24 months, the 3D printed β –TCP scaffolds + 1000µM DIPY showed complete closure of defects. Histological analysis at the interim time-point demonstrated vascularized woven and lamellar bone with haversian canals. At 24-months, calvarial and alveolar defects filled with scaffolds did not demonstrate significant asymmetric growth compared to the autologous grafts when assessing global, calvarial, and alveolar right-left mediolateral asymmetry. All sutures remained patent, and there was no evidence of ectopic bone formation.

Conclusions
3D printed β –TCP scaffolds + 1000µM DIPY can generate bone across critical sized bone defects in a large translational animal model in a manner comparable to autogenous bone graft. All growth sutures remain patent and normal craniofacial growth appears to be preserved. Histologic analysis confirms the development of vascularized bone.

Objectives
1. Participants will compare the utility of DIPY-3DBC scaffolds and autologous bone grafts in treating bony defects. 2. Participants will review and critique the scaffold's impact on facial maturation and symmetry. 3. Participants will analyze the difference in bone composition and osteogenic regeneration between autologous bone grafting and specialized, 3D-printed scaffolds.

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A Single Institution Comparison of Furlow and Straight Line Palatoplasty Techniques in Bilateral Cleft Lip and Palate

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Abstract

Background

Children with bilateral cleft lip and palate (BCLP) account for approximately 1 in every 3000 live births. The most widely used palatoplasty techniques include Furlow double opposing Z-plasty (Furlow) and straight-line repair (SLR) with muscle approximation. This study aims to compare patient speech outcomes and fistula rates between the Furlow and SLR techniques.

Methods

A retrospective review of patients with BCLP who underwent palatoplasty at an urban academic institution from 2003 to 2022 was conducted. Patients with less than two years of follow up were excluded from speech analysis. Patients with index operations at an outside institution were excluded. Patient demographics, surgical variables (i.e., palatoplasty technique and vomer flap usage), and outcomes (i.e., fistula, fistuloplasty, speech correcting surgery) were compared based on the palatoplasty technique.

Results

Of 1,552 patients undergoing palatoplasty during the study period, 192 (12.4%) met inclusion criteria with a diagnosis of Veau IV anomalies. 161 patients had sufficient follow-up for speech analysis. 52.1% of patients had SLR

and 47.9% Furlow repair. There was no significant difference in fistula rates between SLR and Furlow repair cohorts (29.3% vs. 33.0%; p=0.697). In terms of speech, SLR was associated with lower rates of speech-correcting surgery compared to the Furlow repair (12.5% vs. 29.6%, p= 0.011).

Conclusions

Our findings suggest that SLR resulted in an almost three times lower rate of velopharyngeal insufficiency requiring surgical intervention in patients with BCLP, while the overall fistula rate remained similar. Based on our findings, we recommend using the SLR technique in patients with wide BCLP, or if Furlow palatoplasty remains the surgeon's preferred repair, addition of buccal flaps could be considered to augment the length of the soft palate.

Objectives

1. Participants will be able to describe the effect of palatoplasty technique on speech outcomes. 2. Participants will be able to describe the impact of palatoplasty technique on fistula rates. 3. Participants will be able to compare the limits of the Furlow and straight line palatoplasty techniques in the bilateral cleft lip and palate population.

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Treatment of Delayed Presentations of Craniosynostosis: Utility of Virtual Surgical Planning

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Elizabeth Danial


Elizabeth George


Peter Sun


Jason H. Pomerantz

Abstract
Background:
Virtual surgical planning (VSP) may improve intraoperative precision and reduce operative times for craniosynostosis repair. Patients with delayed presentations of craniosynostosis at >12 months of age pose unique challenges including limited postoperative remodeling. The purpose of this case-control study is to compare intraoperative outcomes, patient satisfaction, intracranial volume (ICV), and costs of VSP in patients with delayed presentations.
Methods:
Patients with delayed presentations of craniosynostosis underwent VSP using a protocol that closely matches normative shape and volume. Age and synostotic suture-matched control patients who did not undergo VSP were selected. To compare surgical outcomes, we utilized chart review, conducted a phone survey to assess satisfaction with long-term healing, and calculated preoperative and postoperative ICV. We also compared preoperative ICVs to published normative data. Lastly, we conducted a cost-analysis of VSP. Descriptive statistics were used.
Results:
Twelve VSP and 16 control patients were identified. There were no statistically significant differences in mean operative times (minutes) (VSP 378.5 +/-76.61, control 370.5 +/-147.40; p=0.87) and intraoperative blood loss (mL) (VSP 333.33 +/- 185.22, control 370.5 +/-147.40; p=0.44). There was similar satisfaction with overall surgical healing (p=0.21) and overall head appearance (p=0.39). All but one VSP and one control patient had preoperative ICVs that fell within a normative range for their age at the time of surgery. The median % ICV change was 10.03% in the VSP group and 8.63% in the control group (p=0.82). VSP, including templates, costs at least $10,000.
Conclusions:
VSP did not have clear advantages in correcting single and multi-suture craniosynostosis in patients with delayed presentations. Operative times and estimated blood loss were not improved with VSP for cranial vault expansion. Although VSP allows for greater precision during planning, this may not be necessary to achieve optimal volume and appearance outcomes in this patient category.

Objectives
1. Participants will be able to compare intraoperative outcomes between patients who underwent virtual surgical planning and those who did not in patients with delayed presentations of craniosynostosis. 2. Participants will be able to compare patient satisfaction with long-term healing between patients who underwent virtual surgical planning and those who did not. 3. Participants will be able to compare intracranial volume measurements to help determine which surgical technique is more optimal for cranial vault expansion in patients with delayed presentations of craniosynostosis.

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A Critical Examination of Antibiotic Administration in Septorhinoplasty and Endoscopic Sinus Surgery: A Systematic Review

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Michelle L. Demory

Abstract

Background: Due to the infectious potential of the natural nasal flora, it is thought that septorhinoplasty(SRP) alongside endoscopic-sinus-surgery (ESS) exposes the underlying tissue to bacteria that necessitate antibiotic use to prevent infection. The objective of this review is to evaluate the available evidence for the use of antibiotics in these settings and explore the trends of antibiotic administration among physicians.

Methods: A systematic review using PubMed, OVID, and Web of Science databases through Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA) yielded 475 papers. Based on the inclusion criteria, antibiotic use during SRP and ESS procedure was extracted from 9 studies.

Results: Seven studies contained data relevant to preoperative use of antibiotics during SRP or ESS procedures, and 2 were used for a longitudinal analysis of ENT physicians' opinions on antibiotic use for surgery. Three (33%) studies concluded that prophylactic antibiotics were not necessary; 2 (22%) that prophylactic antibiotics were only indicated for complicated rhinoplasty procedures, with one advising the use of culture-directed antibiotics only. One (11%) recommended prophylaxis in patients with pre-existing risk factors and one (11%) asserted that single-shot prophylactic antibiotics are safer and more useful in preventing infections than traditional postoperative regimens. Lastly, a 2018 survey of the American Rhinologic Society (ARS) found that 62% of ENT physicians endorse the use of post operative antibiotics for infectious postoperative prophylaxis, down from 77% in 2001.

Conclusion: These findings do not support routine antibiotic use in low-risk patients and demonstrate a downward trend of physician-ordered antibiotic prophylaxis. This is likely due to the lack of evidence showing any antibiotic regimen efficacy and growing concerns regarding antibiotic resistance. Additional research is warranted to redirect clinical practice guidelines for ENT surgeries utilizing evidence-based decisions and motivating factors for prophylactic antibiotics use in high risk SRP and ESS patients.

Objectives

1. Participants will be able to appraise the available evidence of antibiotic use in SRP and ESS procedures. 2. Participants will be able to explore the factors that physicians consider when deciding whether to prescribe prophylactic antibiotics for patients undergoing SRP and ESS. 3. Participants will be able to analyze the trends of physician-ordered antibiotic prophylaxis for postoperative infections in select ENT surgeries.

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Bite Worse Than Their Bark? Pediatric Facial Nerve Injuries Secondary to Dog Bites

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Raghave Upadhyaya


Samuel Cole


Michael Klebuc


Amy Xue

Abstract
Background
Traumatic facial injuries secondary to dog bites, although rare, can have longstanding negative implications for pediatric patients. Their complexity is compounded by the limited volume of literature, and lack of consensus in their management.

Methods
A retrospective review was conducted of patients referred to the plastic and reconstructive surgery service between 2012-2022 at a Pediatric Level 1 Trauma Center for facial nerve (FN) injuries from dog bites. Data pertaining to perioperative findings, Sunnybrook facial nerve grading system (SB), surgical technique, and postoperative outcomes was analyzed.

Results
Of 939 patients with craniofacial involvement, 199 were managed operatively while 740 were managed in the acute setting. 246/740 patients underwent laceration repair, of which there were no missed FN injuries on follow up nor scar revision procedures. Of 199 surgically managed facial injuries, 15 patients underwent FN exploration with 8/15 positive for FN injury. Out of these 8 patients (mean age = 5yrs, pre-op SB = 77.5, post-op SB = 92.5), 5 underwent primary nerve repair, 1 primary nerve graft, 1 no primary repair due to lack of distal targets, and 1 no primary repair due to extent of structural and nerve injury, requiring secondary reanimation. One case of postoperative wound infection required additional intervention (6.7%). Primary nerve repair demonstrated full functional recovery in 80% of the patients. Primary nerve graft demonstrated partial recovery with residual deficit. 80% of the patients with facial nerve injury demonstrated preoperative findings. An algorithm is proposed based upon location of laceration, extent of facial nerve injury and wound condition.

Conclusion
FN injuries secondary to dog bites present unique challenges, particularly in the pediatric population. Successful management requires a high index of suspicion coupled with meticulous and judicious surgical exploration and repair. Intraoperative explorations can be limited by diminutive nerve size and traumatized field.

Objectives
Participants will be able to formulate a treatment plan for facial nerve related injuries in pediatric patients Participants will be able to evaluate facial nerve related injuries in pediatric patients Participants will be able to analyze and manage suspected facial nerve injuries in the pediatric population

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Characterizing Mandibular Morphology in Robin Sequence – A 3D Statistical Shape Analysis

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Abstract

Background

The mandibular deformity in Robin sequence (RS), i.e. the triad of micrognathia, glossoptosis and airway obstruction, has been widely described in conventional measurements on two- and three-dimensional imaging. However, no previous studies have applied a geometric morphometric approach. Utilizing such methods can aid in characterization of patients with RS for diagnostic and therapeutic purposes. The aim of this study was to characterize mandibular morphology in patients with isolated and non-isolated RS and a control group.

Methods

CT-scans of patients between 0-4 years with isolated or non-isolated RS, i.e. including syndromic cases, at the Boston Children's Hospital and Erasmus Medical Center were included. Three-dimensional reconstructions of the mandible were obtained from CT-imaging. CT-scans with incomplete mandibles were excluded. A pre-existing

dataset of unaffected individuals between 0-4 years with maxillofacial CT-scans was used as control group. Following sample alignment retaining size and non-rigid registration, PLS-DA and MANOVA were used to characterize mandibular shape differences between RS and the control group.

Results

A total of 73 patients with RS were included (mean age 7.3±11.4 months, 52.1% female, 38.4% non-isolated). The control group consisted of 242 samples (mean age 20.6±13.4 months, 59.9% male). The first shape variable from the PLS-DA model captured 91.0% of variance with a significant correlation with observed variance between the two groups (Spearman's R = -0.50, p-value<0.001). For RS, deformation of the mean mandible along the first shape variable showed a retruded mandibular body, less prominent condyle and wider mental angle. Furthermore, significant differences in shape variables were noted between the two groups with MANOVA (p-value<0.001).

Conclusion

This study showed distinct differences in mandibular morphology in patients with RS and a control group. Further studies could leverage the quantitative and comprehensive description of variation in mandibular morphology in elucidating clinical associations with characteristic mandibular deformities.

Objectives

1) Participants will be presented with a comprehensive and quantitative description of mandibular morphology in Robin sequence. 2) Participants will be informed on characterization of subgroups in Robin sequence by mandibular deformity.

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A step closer into understanding mandibular shape abnormality in patients with Apert Syndrome

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David Dunaway

Abstract

Background

Mandibular shape abnormalities have been postulated in FGFR-related craniosynostoses, such as Apert syndrome; however, no large 3D comparative studies versus normal mandibles exist. Quantification of the Apert's mandibular shape could contribute to understand its craniofacial development, and comparison with normative data to improve surgical outcomes. The aim of this study is to assess mandibular morphological variations in Apert patients under the age of 4, compared to an age-matched control group using three-dimensional morphable models (3DMM).

Methods

CT scans of children [0-48 months] with Apert syndrome and no history of mandibular surgery were sourced from Great Ormond Street Hospital for Children and Necker Hospital Enfants Malades. 3D meshes were constructed and annotated using a defined set of 52 landmarks. A 3DMM was calculated; size was removed from the analysis to evaluate shape alone. A readily available dataset of unaffected mandibles was used as control group (n=242, mean age=20.6±13.4months [0-48 months], 60%male). Partial least squares discriminate analysis and multivariate

analysis of variance were used to compare and characterise the mandibular shape in Apert and unaffected population.

Results

The 3DMM was constructed from a total of 73 Apert mandibles (n=43 individuals), mean age =18.0±13.7months, 51% male, and validated for good generalisation, compactness, and specificity. Large variation in shape was noted within the Apert population, where shape changes were mostly correlated to age. No significant shape differences were observed between male and female participants. Preliminary results demonstrate statistically significant differences in shape between Aperts and controls, with most variation observed along the first shape variable (90.5%).

Conclusion

This study constructed a successful 3DMM of the Apert's mandible and demonstrated large variability without significant differences in sex. Significant shape differences were noted between Aperts and controls. Future research will focus on correlations between functional/aesthetic problems and mandibular shape.

Objectives

- Participants will learn about mandibular shape abnormality in patients with Apert Syndrome - Participants will learn about the application of 3D morphable models in answering clinically related questions - Participants will gain insight into the mandibular shape development of patients with Apert Syndrome as compared to a control population.

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Craniofacial microsomia: Accelerating Research and Education (CARE)

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Craig Birgfeld


Nicola Stock


Carrie Heike

Abstract
Background:
Craniofacial microsomia (CFM) is a complex condition that is typically associated with microtia and mandibular hypoplasia. Despite advances in health care, little information exists about the holistic outcomes, burden of care, and the psychological needs of those affected by CFM. In 2020, the NIH funded a 5-year research program to address these gaps. We describe the development of this international project and its overall objectives.
Methods:
Drawing on the experience of large research collaborations, we designed CARE to be inclusive of national and international specialists with expertise in CFM and craniofacial care along with family representatives, researchers and advocates. The CARE team structure includes a multidisciplinary Advisory Council and discipline-specific subcommittees. The study aims arose from the need to validate a conceptual framework based on multiple perspectives and began with 160 narrative interviews with caregivers and patients across age groups and with varying degrees of medical complexity.
Results:
We completed 115 interviews and thematic analysis is in progress. Interviews will be followed by an international survey of 800 individuals with CFM and caregivers using standardized outcome measures to identify predictors of psychological distress and well-being. We will conduct 60 semi-structured interviews with healthcare providers and advocacy leaders and examine the extent to which current healthcare provisions address identified needs. Finally, CARE is establishing an international registry for the CFM community. A dedicated website will serve as an educational resource, a recruitment tool, and a way to share research findings with the CFM community. The registry will answer patient-oriented research questions of a longitudinal nature.
Conclusions:
The CARE program provides a comprehensive approach for assessing the psychological health and healthcare experiences of individuals with CFM and their caregivers. The resulting data will guide subsequent investigations of screening tools and interventions to optimize quality of life in this under-researched population.

Objectives
1. The participant will understand the structure of the CARE network. 2. The participant will learn how they can participate in the registry. 3. The participant will understand the diagnostic criteria for inclusion as a patient with craniofacial microsomia.

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Orbital Dysmorphology Corrects after Endoscopic Strip Craniectomy in Metopic Craniosynostosis

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Christopher Forrest


Johanna Riesel

Abstract
Background: Children with metopic craniosynostosis have distinct orbits characterized by perceived hypotelorism and symmetric, elliptical orbital apertures canted toward the synostosed suture. Oculomotor imbalances may also result. We aim to quantify the anthropometric changes in the orbits of children with metopic craniosynostosis after endoscopic strip craniectomy (ESC).
Methods: A retrospective, three-dimensional craniometric analysis was performed on pre- and post-operative CT scans of children undergoing ESC and helmet therapy for metopic synostosis. All patients had post-operative CTs documenting complete suturectomy. Twelve craniometric parameters were obtained. The modified orbital index (MOI) was used to quantify changes in the minor and major axes of the elliptical orbital apertures in metopic synostosis.
Results: Nine children (5 males, 4 females) were included. The mean age at pre-operative CT was 69.3 days (± 9.5). The mean age at post-operative CT was 14.8 months (± 0.5), for a mean follow-up of 11.4 months post-ESC. 36 orbits were analyzed. MOI improved from 0.83 (± 0.01) to 0.93 (±0.01; $p<0.0001$). The greater and lesser axes of the orbital aperture increased in length by 8.50% and 24.1%, respectively ($p < 0.0001$). The angle created by the anterior nasal spine and paired supraorbital notches increased from 39.9° (±0.96°) to 49.6° (±1.39°; $p<0.0001$). Dacryon-dacryon distance and orbital volume increased from 12.20 (± 0.54) to 16.11 mm (±0.69; $p=0.0002$) and 11910 (± 515) to 18490 mm3 (± 526; $p<0.0001$), respectively. These latter two parameters follow a normal trajectory when compared to historical data. No patients in our series had pre- or post-operative strabismus.
Conclusions: ESC allows for differential growth of the orbits, creating a more square-shaped orbital aperture with glabellar expansion after one year. Further study is required to compare our data to age- and sex-matched controls in order to better understand the impact of ESC on intercanthal distance as well ocular muscle imbalances in this patient population.

Objectives
(1) Participants will learn the morphologic changes of the orbit associated with isolated metopic craniosynostosis. (2) Participants will understand how endoscopic strip craniectomy affects orbital change in children with metopic synostosis. (3) Participants will understand the oculomotor imbalances that can occur with metopic synostosis.

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CRANIOFACIAL SURGERY IN A LOW-RESOURCE SETTING: THE SUCCESSES, CHALLENGES AND PROSPECTS

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Robert Nii Lamy Larmie


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Peter Donkor

Abstract

Background:
The management of Cleft palate and craniofacial anomalies requires highly skilled personnel and the approach should be multidisciplinary. Craniofacial surgery is practised mainly in the advanced countries of Europe and America. There are no well-established craniofacial surgery services in the West Africa sub-region. This report reviews six years of n experience in craniofacial surgery in a low-resourced country, counting the successes, challenges and prospects.

Methodology:
From January 2016 to December 2022, a retrospective review of craniofacial surgery cases was conducted. We report on the successes, challenges, and prospects.

Results:
Teach a man to fish model.
Two Local surgeons (oral and maxillofacial and neurosurgeons) were trained in Alabama, USA, then returned to Kumasi to begin a centre.

Successes
A total of 667 cases were done, with the majority being cleft lip and palate (92.4%), craniofacial trauma 3.9%, craniofacial anomalies 3.2%, and others 0.5%. The outcomes were good. Seventeen surgeons have been trained in craniofacial cleft surgeries, two local surgeons and fifteen within the Sub-Saharan African sub-region. A new centre is being built by Smile Train for cleft and craniofacial care, training and research.
Challenges:

Lack of understanding of the team care approach, lack of equipment, instruments and material, inadequate human resources, especially in paediatric intensive care and high cost of treatment are the main challenges of craniofacial surgery in our centre.

Prospect

With the upcoming cleft and craniofacial centre, many more children born with cleft palate and craniofacial anomalies will receive care. Build capacity for the subregion and become a hub of cleft and craniofacial research in the sub-region.

Conclusion: Despite many challenges, some successes have been achieved, and the future looks bright for craniofacial care in Sub-Saharan Africa

Objectives

1. Participants will appreciate the concept of "teaching a man to fish' as the best model for the LMIC. 2. Participants will know what is feasible in craniofacial management in low-resource certain 3. Participants will appreciate the prospects and the need for collaboration for capacity building and research in low-resource countries.

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Buccal Flap during Primary Furlow Palatoplasty Decreases Likelihood of Velopharyngeal Insufficiency in Patients with Cleft Palate

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Shuyan Wei

Abstract

Introduction

There has been an increase in the use of buccal flaps during primary palatoplasty, however their efficacy in improving surgical outcomes is unknown. We aim to determine if use of buccal flap during primary Furlow palatoplasty in children with cleft lip/palate (CLP) decreases the likelihood of developing velopharyngeal insufficiency (VPI).

Methods

Retrospective cohort study of children with CLP who underwent primary palatoplasty between 1999 and 2022 at a single institution were reviewed. Patients < 2 years old at time of surgery, who underwent primary Furlow alone (FA) or Furlow with buccal flap (FB), and had speech-language pathologists (SLP) evaluation to determine presence of VPI were included. Bayesian multivariate logistic regression with a neutral prior was used to determine the posterior probability of VPI development after FB.

Results

Forty-eight patients were included in the study (73% FA vs 27% FB). Median age of patient at surgery was 12.6 months. Median age of SLP assessment was 4.7 years (range 1.8 – 10 years). There was no significant difference in baseline patient characteristics between those who did and did not develop VPI, except for fistula rate, which was higher in VPI group (3 vs 1, p = 0.01). Nine-percent of FB developed VPI versus 32% of FA (p = 0.126). After adjusting for postoperative fistula, buccal flaps were found to have an OR of 0.216 (95% CI 0.009–1.633) in VPI development, with a 92% likelihood of decreasing the odds of VPI.

Conclusion

Performing buccal flap during primary Furlow palatoplasty for CLP patients has a 92% likelihood of decreasing the odds of VPI. Expansion of this database as new SLP evaluations become available is needed to further elucidate the beneficial therapeutic effects of buccal flap for preventing VPI in this heterogeneous patient population.

Objectives

1) Participants should be familiar with a buccal flap 2) Participants should be familiar with Furlow palatoplasty 3) Participants should have a basic understanding of velopharyngeal insufficiency

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Gun violence in America and the impact on craniomaxillofacial injury

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Abstract
Background: Gun violence in the U.S. has risen dramatically over the last decade. Craniomaxillofacial gunshot wound data is lacking. Our aim is to assess the recent trends in severity and incidence of craniofacial gunshot injuries.
Methods: A retrospective analysis was performed utilizing the 2019 and 2020 ACS-TQP (American College of Surgeons Trauma Quality Programs). Adult patients sustaining an injury to the head/face secondary to firearm were identified using ICD-10 coding. The primary outcomes were incidence and severity. We used the Abbreviated Injury Severity (AIS) Score for face. Secondary outcomes included mortality, self-inflicted gunshot wounds, ICU and overall length of stay. Descriptive analyses were performed using chi-square testing and Wilcoxon rank-sum testing. P Values ≤ 0.05 were considered statistically significant.
Results: A significant rise in incidence of craniomaxillofacial gunshot wounds was seen from 4,267 patients in 2019 to 10,583 by 2020 alone ($p<0.001$). Severity also significantly increased with mortality rate from 24.3% in 2019 to 34.9% in 2020 ($p<0.001$) and median AIS-face from 2.4 in 2019 to 2.8 in 2020 ($p<0.001$). Self-inflicted wounds increased from 19.8% in 2019 to 24.2% in 2020 ($p<0.001$). There were no statistically significant differences in hospital or ICU length of stay (6.84 vs 7.21 days, $p=0.123$). Victims were predominantly male (86.2% in 2019 and 85.1% in 2020), median age was 30 for both groups and majority race/ethnicity was African American (45.3% in 2019 and 46.2% in 2020).
Conclusion: The rise in craniomaxillofacial injury parallels the overall increase in gun violence in the U.S with an increase in both incidence and severity of injury. The impact of this will likely increase the burden of care for craniomaxillofacial surgeons and healthcare systems.

Objectives
1. Participants will develop an understanding of the rise in incidence of craniomaxillofacial gunshot injuries in America 2. Participants will develop an understanding of the rise severity of craniomaxillofacial gunshot injuries in America 3. Participants will develop an understanding of the potential impact of craniomaxillofacial on the burden of care for craniomaxillofacial surgeons and healthcare systems

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Deviation of the Superior Sagittal Sinus from the Sagittal Suture in Unilateral Lambdoid Craniosynostosis

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Abstract

Introduction: Previous reports have shown that the superior sagittal sinus (SSS) may not directly underly the sagittal suture (SS) in unicoronal craniosynostosis. We are unaware of any equivalent literature relating the relative positions of the SSS and SS in unilateral lambdoid synostosis. Knowledge of this relationship is invaluable for surgical planning. After having recent unilateral lambdoid synostosis cases in which the SSS did not directly underly the SS, we reviewed our cases of unilateral lambdoid synostosis to quantify this relationship.

Methods: We reviewed all cases of unilateral lambdoid synostosis treated at our craniofacial center between December 2008 and January 2023. All cases included preoperative CT scans. On each CT, we measured the distance between the SSS and SS at the bregma (or immediately behind the anterior fontanelle), at the lambda, and at 2 cm intervals in between.

Results: 8 patients with unilateral lambdoid synostosis were analyzed. Along the length of the SS, the mean deviations from the SS of the middle of the sinus and the edge furthest from the SS were 0.5mm and 5 mm, respectively, toward the side of the synostosis. The sinus consistently trended from closely underlying the suture at the bregma to deviating toward the side of the synostosis at the lambda. On average the sinus was 3.5 mm further lateral from the suture at the lambda than it was at bregma, with the mean deviation of the lateral edge of the sinus from the lambda being 6 mm.

Conclusions: In unilateral lambdoid synostosis, the SSS can deviate from the SS toward the side of the synostosis and deviate more closer to the lambda. This is important to know when planning craniofacial surgery in children with unilateral lambdoid synostosis. We are currently investigating the distance between the SSS and SS in unilateral coronal and sphenofrontal synostosis.

Objectives

1. Participants will understand that the superior sagittal sinus is often deviated toward the side of the synostosis in unilateral lambdoid synostosis. 2. Participants will recognize that the superior sagittal sinus deviates more as it travels posteriorly. 3. Participants will be able to incorporate this knowledge into their surgical practice.

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Analysis of ACPA COVID-19 Guidelines on 30-Day Post-Operative Surgical Outcomes of Cleft Repair: An ACS NSQIP Pediatric Analysis

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Christopher Schilson


Emily Littman


Andrew Broda


Aseela Samsam


Joseph Lopez


Rajendra Sawh-Martinez

Abstract

Background: The effects of COVID-19 on the new American Cleft Palate Craniofacial Association (ACPA) surgical guidelines have not been fully elucidated. Therefore, the purpose of this study was to identify the effect of the COVID-19 pandemic and ACPA guidelines on peri- and post-operative outcomes using the NSQIP Pediatric Database.
Methods: The ACS NSQIP Pediatric database was analyzed from 2016-2021 using CPT codes 40700, 40701, 40702 and 42200, 42205, 42210 which consist of cleft lip, cleft palate, and cleft lip and palate repairs. These groups were then stratified by year and statistical analysis was performed comparing pre (2016-2019) and during COVID-19 (2020-2021) outcomes. Exclusion criteria consisted of patients ≥18 years old, multiple cases within 30 days, transplant, trauma, and abuse cases.
Results: A total of 25,695 patients were identified during the 2016-2021 study period. After stratifying by COVID group, there were 16,399 cases in pre-COVID, 4,568 cases in 2020 (COVID1), and 4,788 cases in 2021 (COVID2). The average age of patients in days decreased when comparing pre-COVID to COVID1 (n=1,262 vs n=1,166, p<.001) and when comparing pre-COVID to COVID2 (n=1,262 vs n=1,234, p=.293). Post-operatively, there was a no statistical difference for readmission, reoperation, and death in 30 days between pre-COVID vs COVID1 and between pre-COVID vs COVID2. However, there was a statistically significant increase in occurrence of post-operative bleeding/need for transfusion between pre-COVID and COVID1 (2.79 [1.39-5.61], p=.004) (OR [95% CI] p-value).
Conclusions: While there was a decrease in age at time of operation, this did not result in significant changes in peri- and short-term post-operative outcomes based upon national database. There was a significant increase in bleeding/need for transfusion on average for the covid cohort. Further investigation of patients in the years 2020 and 2021 is warranted to better understand these changes on a national level.

Objectives

1: Participants will gain an understanding of demographic data of orofacial cleft patients undergoing surgery from the years 2016-2021. 2: Participants will learn the implications of the ACPA guidelines on patients' outcomes according to a national database, representing over 25,000 patients. 3: Participants will learn the implications of COVID-19 on patients' outcomes from the years 2016-2021.

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Investigation of cleft palate repair outcomes in patients with 22q11 deletion syndrome: An ACS NSQIP Pediatric analysis.

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^


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Abstract

Background: 22q11 Deletion Syndrome is one of the most common syndromic diagnoses associated with facial cleft abnormalities. In-depth analysis of this patient population with adequate sample sizes in the literature are lacking. We performed a detailed analysis of outcomes and patient characteristics for patients undergoing cleft palate repair with 22q11 Deletion Syndrome via the NSQIP national database.

Methods: Patients were identified from the 2014–2018 American College of Surgeons National Surgical Quality Improvement Program Pediatric (ACS NSQIP Pediatric) database. Cleft palate repair was defined with the following CPT codes: 42200, 42205, 42210. Trisomies Patau, Edwards', and Down's syndromes, were excluded. 22q11 Deletion Syndrome was defined by ICD-9-CM and ICD-10-CM codes 279.11, 758.32 and D82.1, Q93.81. The remaining cohort was the Control group.

Results: A national cohort of 11,267 patients were studied. 123 patients with 22q11 Deletion Syndrome were identified. The average age of patients with 22q11 Deletion Syndrome and the Control group were 1,754 days and 1,610 days, respectively. The gender distribution among the two groups were 52% and 55%, and premature births were 13.8% and 10.5%, respectively. Significant differences were appreciated for 30-day postoperative outcomes: Ventilator Use (22q11=3.3% vs Control=1.1%, p=1.027), Postoperative Pneumonia (22q11=1.6% vs Control=0.2%, p=.001), and Readmission Rate (22q11=7.3% vs Control=1.7%, p=<.001). Regression analysis demonstrated increased risk of 30-day postoperative outcomes in 22q11 Deletion Syndrome (Ventilator Use=2.96 [1.08-8.15] p=.035; Pneumonia=7.66 [1.79-32.77] p=.006; Readmission Rate=4.63 [2.31-9.26] p<.001; OR [95% CI] p value).

Conclusions: While isolated cleft palate repair is safe, the data demonstrates that patients with 22q11 Deletion Syndrome are at a higher risk of 30-day postoperative readmission, ventilator use, and pneumonia.

Objectives

1. Participants will identify the 22q11 Deletion Syndrome subgroup within primary cleft palate repairs utilizing the ACS NSQIP database. 2. Participants will assess the impact of 22q11 Deletion Syndrome on patient outcomes in primary cleft palate repair. 3. Participants will identify 30-day post-operative outcomes at increased risk in 22q11 Deletion Syndrome patients.

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Managing Late Onset ERF-Related Craniosynostosis with Cranial Vault Distraction Osteogenesis

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Abstract

Background:

ERF-related craniosynostosis presents postnatally with progressive multi-suture craniosynostosis. The resultant cranial dysmorphism is subtle given the cranial sutures remain open during rapid brain growth. ERF-related craniosynostosis is a recently described, syndromic form of craniosynostosis, and there is little discussion surrounding appropriate management of these patients. Given the older age at diagnosis and intervention, cranial vault expansion with distraction osteogenesis (CVDO) permits effective and safe treatment. CVDO has been shown to provide greater intracranial expansion, prevent acquired skull defects, and limit total dissection and blood loss during surgery. This report examines ERF-related craniosynostosis treatment indications and outcomes supporting intervention with CVDO.

Methods:

Our institution treats several families with known ERF mutation, including patients treated with various cranial vault expansion techniques. We identified two carriers of ERF mutations with a positive family history and followed them in our interdisciplinary care team. During initial workup, both patients had open sutures and had reached developmental milestones appropriate for their age.

Both patients' natural history of disease was consistent with other reported cases of ERF-related craniosynostosis including developmental delay and symptoms concerning for elevated intracranial pressure (ICP) at around 3.5 years of age. Follow-up CTs demonstrated delayed onset multi-suture synostosis in both patients.

Surgical intracranial volume expansion using CVDO was pursued given their elevated ICPs, subtle cranial dysmorphology, and older age at the time of intervention.

Results:

After CVDO, both patients had resultant expanded intracranial volume. Follow-up demonstrated improvement of headaches and sleep disturbances, and progression of development without signs of elevated ICP. Aesthetically, these surgeries improved the patients' cranial dysmorphology and resulted in relatively normal head shape.

Conclusions:
Successful management of patients with ERF-related craniosynostosis requires early detection and careful monitoring. CVDO should be strongly considered in the treatment algorithm of ERF-related craniosynostosis with elevated ICP.

Objectives

Participants will be able to describe the typical clinical course of patients with ERF-related craniosynostosis. Participants will be able to identify indications for surgical management of ERF-related craniosynostosis with cranial vault distraction osteogenesis. Participants will be able to identify appropriate ways to modify their cranial vault distraction osteogenesis technique based on suture related cranial dysmorphology.

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Springs vs. Helmet: A 15-year Experience with Minimally-invasive Treatment for Craniosynostosis

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Lawrence Lin

Abstract

Background: Minimally-invasive surgery (MIS) for craniosynostosis has decreased the morbidity for treatment of craniocerebral disproportion. Postoperative helmet therapy (PHT) and spring-assisted cranioplasty (SAC) are the two main options for MIS. We investigate perioperative morbidity and long-term clinical outcomes of a 15-year experience performing MIS with PHT or SAC at a tertiary pediatric institution.
Methods: Patients treated with MIS with PHT or SAC from 2008 to 2023 were evaluated. Peri-operative parameters including blood loss and transfusion were recorded. Post-operative parameters including ED visits, readmissions, revision surgery, and complications were recorded. Student's t-test, Mann-Whitney U test, and chi-square test were utilized.
Results: 133 patients (age 3.1 ± 1.11 mo) underwent MIS. 96 (72.2%) had sagittal, 26 (19.5%) metopic, 8 (6.0%) unicoronal, and 3 (2.3%) multisuture craniosynostosis. 79 (59.4%) underwent PHT, and 54 (40.6%) underwent SAC. 25 (18.8%) received a perioperative blood transfusion (PHT 21.5% vs SAC 14.8%, p = 0.331). 9 (6.8%) experienced a complication – 3 hematomas, 1 surgical site infection, 3 spring displacements, 1 CSF leak, 1 wound dehiscence (PHT 5.1% vs SAC 9.3%, p = 0.485). 14 (10.5%) presented to the ED within 30 days (PHT 10.1% vs SAC 11.1%, p = 0.856). 5 (3.8%) were hospitalized within 30 days (PHT 3.8% vs SAC 3.7%, p = 0.999). 14 underwent cranial revision surgery (PHT 13.9% vs SAC 5.6%, p = 0.14). 26 (19.5%) had a persistent cranial defect at 36 months of age (PHT 20.3% vs SAC 18.9%, p = 0.897) with 1 undergoing a split calvarial bone graft reconstruction. Follow-up was 42.4 mo (IQR: 21.6, 55.4, p = 0.895).
Conclusions: Perioperative morbidity is low and similar between patients who undergo minimally-invasive suturectomy with postoperative helmet vs. spring-assisted cranioplasty. Long-term follow-up indicates similar rates of cranial revision surgery between helmet therapy and spring-mediated therapy for the treatment of craniosynostosis.

Objectives

1. Participants will be able to define two minimally-invasive methods for treatment of craniosynostosis 2. Participants will understand perioperative outcomes in patients undergoing minimally-invasive surgery for craniosynostosis 3. Participants will understand long-term clinical outcomes in patients undergoing minimally-invasive surgery for craniosynostosis

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Eight Years After One- versus Two-Stage Cleft Lip and Palate Repair: Are there any outcome differences?

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Karen Leung

Abstract
Background: There remains significant controversy regarding speech outcomes, facial growth, and fistula formation rates around 1- vs 2-stage cleft lip and palate (CLP) repair. This study compared long term speech outcomes, orthodontic outcomes, and fistula formation between patients who received 1- and 2-stage CLP repair.

Methods: 80 patients (n=32 for 1-stage, n=48 for 2-stage) with complete CLP (47 unilateral, 33 bilateral) who underwent 1 or 2-stage repair from 2006 to 2012 at a single institution were reviewed. Speech outcomes were evaluated by assessment of speech resonance, articulation, intelligibility, and acceptability scored on the Americleft speech scale, presence of velopharyngeal insufficiency (VPI), and secondary speech surgery rates for VPI. Orthodontic outcomes were examined using cephalometric measurements, Angle's classification of malocclusion, and the Goslon Yardstick scale in addition to descriptive data. Rates of fistula formations were additionally noted. Statistical analyses included 2-tailed t-tests and chi-square tests.

Results: The mean age at first stage CLP repair was 13 months (1-stage cohort) and 4 months followed by second stage at 12 months (2-stage cohort). The mean age at follow-up was 9 years. There were no significant differences between the two cohorts in speech assessment scores, VPI diagnoses, or secondary speech surgery rate (all $p>0.05$). Both cohorts had similar mean SNA, SNB, ANB, and Wits Appraisal measurements, and similar distributions of Angle malocclusion classes and Goslon scores (all $p>0.05$), although there was more frequent descriptive of crossbite ($p=0.01$) in the 2-stage (92%) compared to 1-stage (67%) cohort. There were no significant differences in fistula formation between both cohorts ($p=0.15$).

Conclusions: Both 1- and 2-stage CP repair demonstrate comparable long-term speech and orthodontic outcomes without significant differences in fistula formation, allowing for flexibility in timing of CP repair upon shared decision making between surgeon and patient families.

Objectives
Participants will be able to identify differences in 1) speech outcomes, 2) orthodontic outcomes, and 3) fistula formation rates between 1- and 2-stage cleft palate repair to ultimately provide more informed counseling and decision making when discussing timing of cleft palate repair with patient families.

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Self-Inflicted Gunshot Wound To The Orbits: A Case Report And Systematic Review

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Dieter Brummund


Angela Chang


Joseph Michienzi

Abstract
Background:
Self-inflicted gunshot wounds to the orbits are devastating injuries. Tissue is damaged directly from the projectile, fragmentation, and indirectly from cavitation resulting in secondary injury. Open globe and traumatic optic neuropathy are patterns of injury that require distinct management. Reconstructive techniques aim to provide a robust structure to restore the facial buttresses and orbital volume.
Methods:
The authors present two cases of self-inflicted orbital gunshot wounds including a 27 year-old male with bilateral open globes and a 40 year-old male with left traumatic optic neuropathy and left hemiface injuries. A literature review was performed for articles related to self-inflicted gunshot injuries to the orbit with data related to outcome and complications extracted. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed.
Results:
Four case series and two case reports met inclusion criteria with a total of 61 patients. The most common ocular injury was orbital fractures in 27 patients (44%), followed by open globe in 19 patients (31%) and traumatic optic neuropathy with intact globe in 15 patients (24.5%). Open globe injuries were salvaged in 2 patients (10.5%) and treated with enucleation in 17 patients (89.5%). Traumatic optic neuropathy improved in 3 patients (20%) and failed to improve in 12 patients (80%). In our first case of open globe injury, enucleation was performed followed by autologous reconstruction of the orbits. In our second patient's case of left traumatic optic neuropathy and hemifacial fractures, delayed orbitozygomatic reconstruction was performed 3 months post-injury to allow for optic nerve recovery.
Conclusions:
Open globe and traumatic optic neuropathy following self-inflicted gunshot wounds are particularly devastating. This case report presents the unique approaches to these patterns of injury with early exploration versus delayed reconstruction. Autologous reconstruction of these wounds can durably restore orbital volume and facial buttress integrity

Objectives
Participants will be able to distinguish between different patterns of self-inflicted gunshot wounds to the orbits and their management. Participants will be able to evaluate the benefits of autologous reconstruction in gunshot wounds to the orbits. Participants will be able to lead the orbital reconstructive team in conjunction with related specialities including ophthalmology, otolaryngology, and neurosurgery.

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Resorbable Plating Systems in Craniofacial Surgery: Adverse Events Reported in the MAUDE Database

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Carol Wang

Abstract
Background: Resorbable plating systems allow for osteosynthesis in craniofacial surgery without the drawbacks of permanent implants. To our knowledge, this is the first study analyzing the FDA's Manufacturer and User Facility Device Experience (MAUDE) database to assess reported adverse events associated with resorbable plating systems in craniofacial surgery.
Methods: The FDA's MAUDE database was queried on March 1, 2023 for adverse events related to resorbable plating systems in craniofacial surgery reported between January 2013 and December 2022. Duplicate, vague, and unrelated reports (not regarding craniofacial surgery or bone plating) were excluded. Reports were then summarized and analyzed.
Results: Of 420 identified reports, 121 met inclusion criteria. The most commonly reported adverse event was broken hardware (40.5%), which was significantly associated with resorbable screws (55.1%) compared to plates (22.5%) ($p< 0.001$). In 28.6% of events involving device breakage, the fractured hardware was left in situ without further complication. Other commonly reported adverse events included infection (19.8%), edema (17.4%), visual disturbance (11.6%), and device extrusion/exposure (10.7%). Of reports noting delay in operating time, there was an average 8.9 minute delay. 57% of cases reported no delay. Revision surgery was performed for 33.1% of adverse events, most commonly involving removal of the implant (67.5%). The mean time between initial and revision surgery was 187 days. Overall, 49.5% of patient complications occurred without an identifiable device complication, and 24.0% of device problems resulted in no impact to the patient.
Conclusion: Resorbable screws may be associated with increased odds of hardware breakage. Retained hardware may have no harm for patients. Adverse events often either did not impact the patient, significantly delay surgery time, or have an identifiable device problem.

Objectives
1. Participants will be able to describe common device and patient complications associated with resorbable plating systems. 2. Participants will be able to characterize consequences of reported adverse events and their association with resorbable plating systems. 3. Participants will be able to explain the nature of interventions for adverse events associated with resorbable plating systems.

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Adverse Events Associated with Craniofacial Distractor Use

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Mathew Saleem

Abstract

Background: Distraction osteogenesis is used to correct a variety of congenital malformations of the cranial vault, midface, and mandible. However, published reports on adverse events associated with distractors are limited. In this study, we evaluate the adverse events associated with craniofacial distractors using the Food and Drug Administration's Manufacturer and User Facility Device Experience (MAUDE) database.

Methods: The MAUDE database was queried on March 1, 2023 for adverse events related to use of cranial vault, midface, and mandibular distractors from January 2013 – December 2022. Of 525 reported events, 217 met inclusion criteria after removal of duplicates and reports unrelated to craniofacial distractors. Adverse events were then categorized to assess problem types and frequencies.

Results: Mandibular distractors had the most reported adverse events (159), followed by midface distractors (41), and cranial vault distractors (17). The most common device problem for mandibular and midface distractors was malfunction (37.1%, 31.7% respectively), specifically difficulty advancing the distractor (72.9%, 84.6% respectively). Cranial vault distractors were most associated with component breakage (76.5%). Infection rates were also similar for mandibular (12.6%) and midface (14.6%) distractors, with similar rates of debridement as well (25.0%, 33.3% respectively). The most reported intervention for all adverse events was early removal of the distractor (20.7%). However, adverse events overall often did not have any impact on the patient (41.0%).

Conclusion: Mandibular and midface distractors had similar rates of infection requiring similar levels of care. Infection rates were notably low despite the percutaneous nature of craniofacial distractors. Adverse events often did not affect the patient, or were commonly resolved with earlier removal of the distractor. These findings can be used by craniofacial surgeons to foresee and manage patient expectations on complications associated with distraction osteogenesis.

Objectives

1. Participants will be able to compare and contrast common device problems for cranial vault, midface, and mandibular distractors. 2. Participants will be able to describe rates of infection among the different types of craniofacial distractors. 3. Participants will be able to discuss the general impact of adverse events on patients and common procedural interventions used for management.

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Botulinum Toxin for Scar Modulation in Primary Cleft Lip Repair: A Meta-Analysis

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Leonardo Alaniz


Joseph Mocharnuk


Jagmeet Arora


Melinda Lem


Justin Cordero


Miles Pfaff

Abstract
Background: Primary cleft lip (CL) repair leads to variable degrees of postoperative scarring. The underlying orbicularis oris muscle exerts perpendicular dynamic tension on the suture line, which can lead to increased scarring. The purpose of this study was to systematically review the efficacy of Type A Botulinum Toxin (BTA) in improving postoperative scarring following primary CL repair.
Methods: A systematic review and meta-analysis of randomized controlled trials was conducted by searching PubMed, MEDLINE, and the Cochrane Library. Jadad scoring was performed by two independent reviewers to screen trial quality. Primary outcomes included Vancouver Scar Scale (VSS) and Visual Analogue Scale (VAS) scores. A fixed-effects model was used for analysis, and Cohen's d standardized effect sizes were calculated to compare outcomes between studies.
Results: Three randomized controlled trials were included with a total of 103 treatment and control patients. Primary cleft lip repair studies demonstrated that BTA significantly improved the overall appearance of postoperative CL scarring (VAS) (ES: 1.78; 95% CI [1.26, 2.30], p<0.001). However, there were no significant differences in scar pigmentation, vascularity, height, or pliability (VSS) (ES: -0.31; 95% CI [-0.71, 0.09], p=0.13).
Conclusion: This systematic review and meta-analysis of randomized controlled trials demonstrates that BTA can effectively improve the appearance of scarring following primary CL repair. Although no benefits were found for scar pigmentation, the literature suggests that BTA may have an essential role as an adjunct for scar mitigation.

Objectives
1. Participants will be able to understand the biomechanics of Botulinum Toxin A for scar modulation. 2. Participants will be able to assess the effects of Botulinum Toxin A on scar appearance following primary cleft lip repair. 3. Participants will be able to assess the effects of Botulinum Toxin A on scar pigmentation following primary cleft lip repair.

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Hypertelorbitism Corrected by Facial Bipartition Improves Exotropia

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James P. Bradley


Joshua Choe


Meghan Miller


Mark Fisher


Kevin Chen


Henry K. Kawamoto

Abstract

Background: The purpose of this study was to detail perioperative ophthalmologic evaluations to characterize functional ocular outcomes after facial bipartition surgery in patients with hypertelorbitism.
Methods: Patients with hypertelorbitism who underwent facial bipartition surgery were studied specifically for eye motility disorders by separating patients into rare craniofacial clefts (midline and paramedian) (n = 34) and craniofacial dysostosis (Apert, Crouzon, and Pfeiffer) (n = 74). Preoperative and postoperative (12 months) ophthalmologic examinations (with depth perception tests), computed tomography scans, and magnetic resonance imaging scans were analyzed.
Results: Among craniofacial cleft patients, mean interdacryon distance was reduced from 39 ± 4 mm to 17 ± 2 mm, with strabismus improved from 88 percent (exotropia 82 percent) preoperatively to only 29 percent postoperatively. Depth perception improved to a lesser degree, with abnormal tests at a rate of 79 percent preoperatively to 56 percent postoperatively. Wider hypertelorbitism had a higher degree of strabismus. Among craniofacial dysostosis patients, mean interdacryon distance was reduced from 37 ± 3 mm to 17 ± 2 mm, and strabismus improved from 55 percent to only 14 percent. Depth perception improved to a lesser degree, with 68 percent abnormal tests preoperatively and 46 percent postoperatively. Apert patients had more V-pattern strabismus and exotropia (79 percent) than did other craniofacial dysostosis patients (42 percent).
Conclusions: The authors' data indicate that facial bipartition for hypertelorbitism—known to improve periorbital aesthetics—also improves eye motility disturbances. Thus, vision problems related to exotropia should be considered a functional indication for facial bipartition surgery in patients with hypertelorbitism.

Objectives

1. Analyze whether facial bipartition for hypertelorbitism—known to improve periorbital aesthetics—also improves eye motility disturbances. 2. Explain perioperative ophthalmologic evaluations to characterize functional ocular outcomes after facial bipartition surgery in patients with hypertelorbitism. 3. Decide whether vision problems related to exotropia should be considered a functional indication for facial bipartition surgery in patients with hypertelorbitism.

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Utilizing Patient-Specific Virtual Reality Planning for Free Fibula Mandibular Reconstruction: A Case Series

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Nicolas Kaplan


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Abstract
Background: Web-based surgical planning sessions can be lengthy and require an intermediary engineer to interpret the surgeon's instructions into the planning software. The maturation of virtual reality (VR) based planning software offers enhanced visualization of patient anatomy and enables the surgeon to personally direct presurgical planning. This study reports on the use of a VR platform for the planning and execution of free fibula-based mandibular reconstructions.
Methods: Patient-specific CT data was collected as DICOM files and imported into the VR platform software "ImmersiveRecon" (ImmersiveTouch, Chicago IL). The surgeon set resection margins, drew the desired path for reconstruction, and adjusted the position of each segment directly. The resultant reconstruction was then exported to standard data formats for the creation of surgical guides. Postoperative CT images were compared with the presurgical plan and deviation between the datasets was measured according to standardized criteria (Van Baar & Brown). To compare the planned and postoperative scans, we calculated the euler angles needed to rotate the normal vector of the postoperative plane to become parallel to the normal vector of the planned osteotomy plane. This provides information on the magnitude and direction of osteotomy plane deviance plan vs postoperative.
Results: All preoperative plans were completed and the resultant surgical guides were utilized. 11 linear and 4 angular data points were collected. Excluding outliers, average deviation from the preoperative plan was 2.32 mm for linear measurements (SD 2.33) and 3.78 degrees for angular measurements (SD 2.96). Large SD were attributed to intraoperative changes.
Conclusions: Virtual reality-based surgical planning for complex facial reconstruction offers several advantages, including a more streamlined process and direct control of patient anatomy by the surgeon. This study demonstrates feasibility and accuracy of the VR planning platform which has since become the standard at our institution.

Objectives
Learners will appreciate the enhanced clinician-as-user capabilities of our VR workflow for presurgical planning Learners will be able to follow the frameworks for the creation of cutting guides using VR planning Learners will appreciate the accuracy enabled by our VR platform via a statistical analysis

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CRANIOSYNOSTOSIS SURGERY: 15 YEAR EXPERIENCE IN PAKISTAN

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Ali Naqvi

Abstract

Background:

Craniosynostosis develops through premature fusion of one or more cranial sutures and can lead to calvarial growth restrictions and compensatory deformations of aesthetic and neurological sequelae. The incidence of craniosynostosis is approximately 1 in 1700 to 1900 live births and it is divided into single versus multiple suture fusion or syndromic versus non syndromic cases. Early surgical intervention is the treatment of choice and leads to an appropriate craniofacial growth, reduces neurological complications secondary to increased intracranial pressure and prevents morbidity.

Materials & Methods: This retrospective review conducted from jan 2008 to jan 2023 included patients who presented with various forms of craniosynostosis. Patients with syndromic, non syndromic, single suture and multiple suture craniosynostosis were included in our study. After thorough assessment and evaluation patients were operated and outcomes were evaluated by intraoperative complications, Infection and Re- operation.

Results: A total of 232 patients were operated, 141 males and 91 Females. The age of patients ranged from 3 months to 24 years. Intraoperative, there was no sinus tear, minor dural tears were encountered which were managed. Infection developed in 7 cases postoperatively and reoperation for raised ICP was conducted in a single case.

Conclusion: Craniosynostosis if untreated or delayed can lead to severely dysfunctional abnormalities of physical and mental capacities. Proper preoperative diagnosis , planning and effective postoperative management is crucial in management of these patients.

Objectives

To present our experience in management of Craniosynostosis patients To enlist outcomes of Craniosynostosis surgery Enumerate Complications and management.

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Geospatial and socioeconomic disparities influencing craniosynostosis management and clinical outcomes: A Retrospective Review

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Caitlyn Belza


Lucy Sheahan


Amanda Gosman

Abstract

Background:
Social determinants of health have been described as predictors of management for craniosynostosis, however, literature lacks a granular depiction of geospatial and socioeconomic factors which impact clinical outcomes. This study describes the impact of geospatial dependency and socioeconomic disparities on diagnosis and treatment of craniosynostosis.

Methods:
This retrospective review evaluated patients with single suture craniosynostosis who presented to a tertiary children's hospital between 2000 and 2019. Patient addresses were geocoded and plotted on shapefiles containing socioeconomic block group information. Multivariate linear, logistic, and polynomial regression models analyzed the relationship between geospatial and socioeconomic predictors and clinical outcomes.

Results:
There were 614 patients with craniosynostosis included. The mean age at operation was 12 months (SD=7.30). Patient race and ethnicity were mostly white (87.3%) and Hispanic (61.8%). Mean distance from the patient's home to the hospital was 105.17 miles (SD=317.3). After adjusting for suture fused, polynomial regression yielded a significant association between distance to the hospital and age at surgery, such that further distance corresponded with older age at surgery (p=.012). There was not a significant association between distance and incidence of reoperation (p=.49) or distance and duration of follow up (p=.56). Additionally, adjusting for suture fused, lower parental educational attainment and lower median household income correlated with older age at presentation (p=.01 and p=.01 respectively), but not with reoperation (p=.60 and p=.65 respectively) or duration of follow up (p=.12 and p=.11 respectively).

Conclusions:
The results offer evidence that living a greater distance from the hospital and socioeconomic disparities may serve as barriers to prompt recognition of diagnosis and timely care in this population. However, the geospatial and socioeconomic factors studied do not seem to hinder incidence of reoperation or length of follow up, suggesting that once care has been initiated, longitudinal outcomes may be less impacted.

Objectives

1) Participants will discover a method of data collection and analysis that improves the validity of geospatial studies. 2) Participants will gain an understanding of clinical outcomes that are impacted by geospatial and socioeconomic disparities. 3) Participants will be challenged to recognize and consider similar social determinants of health in their own practice.

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Le Fort III distraction for severe midface hypoplasia in very young children - Interim outcomes

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Pramod Subash


Suhas Udayakumaran


Shibani Nerurkar


Arjun Krishnadas

Abstract

Background:
Severe midface hypoplasia associated with syndromic facio-craniosynstosis results in obstructive sleep apnea (OSA) and ocular issues like globe subluxation or exposure keratitis. Though a definitive treatment option in severe infantile OSA cases, early tracheostomy results in delayed decannulation. Early midface advancement can improve airway, correct OSA, prevent tracheostomy and provide adequate globe support. The aim was to evaluate our experience and report the interim outcome of Robot Assisted Midface Distraction (RAMD) with transfacial pins in syndromic facio-craniosynstosis .

Materials and methods:
24 patients who underwent RAMD for severe midface hypoplasia were included in the study. Objective assessment in terms of weight gain, imaging (CT or MRI) and subjective assessment based on patient reported treatment outcome (PROM) questionnaire was done prospectively.

Results:
24 patients aged 8-43 months with a mean follow up of 4.2 years were included. A mean of 8.75mm and 19.03mm advancement was recorded at the infraorbital rim and maxillary incisal level respectively. 17 patients who had failure to thrive at surgery recorded an average weight gain of 1.76 kgs at 3 months follow-up. None needed tracheostomy in the follow up period. One patient reported globe subluxation and required tarsorrhaphy. There were no hospitalizations for URTI. PROM concluded that 94.33% had reduction in URTI, sleep pattern improved in all patients with 80% having complete resolution of respiratory effort related arousal episodes. Snoring reduced in 40% while 46.6% cases snoring completely stopped. All parents found improvement in the overall performance of the child.

Conclusion:
RAMD provides good functional outcome during interim assessment. Follow up till completion of growth is required to understand long term implications of early intervention.

Objectives

1. Rationale for early midface distraction 2. Sequencing pediatric midface distraction with cranial procedures 3. Interim outcomes fo pediatric midface distraction

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Midface Growth Outcomes Following Staged Rotation Advancements for Bilateral Cleft Lip Repair

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Erin Wolfe

Abstract
Background: Single-stage bilateral cleft lip repair is espoused as the gold standard for bilateral cleft lip repair **procedures**. Two-stage bilateral cleft lip repair follows the principles used for the unilateral cleft deformity. It is an alternative method that, while not as universally accepted, may result in acceptable functional and aesthetic long-term outcomes.

Methods: This is a 16-year retrospective review of all patients in mixed dentition who underwent two-stage repair for complete bilateral cleft lip deformity, performed by a single surgeon. Patients were treated with the following protocol: (1) Pre-surgical naso-alveolar molding and approximation of alveolar segments, (2) Staged rotation advancements with gingivosupraperiosteoplasty and closure of alveolar defect, (3) McComb nasal correction, (4) Rotation advancement lip repair (5) Repetition of the procedure on the contralateral side after 3 months, (6) Closure of the remaining hard palate and soft palate with levator muscle retroposition at 18 months. Cephalometric and anthropometric evaluation at mixed dentition was conducted. Mean Farkas anthropometric measurements (nasolabial angle, cutaneous/total upper lip height, nasal tip protrusion/nose height) and mean cephalometric values (SNA, SNB, ANB) were compared to mean values for non-cleft patients.

Results: Thirty-two patients were identified. There was no significant difference between anthropometric values for our cohort and non-cleft patients ($p > 0.05$). Anthropometric measurements fell within 1-2 SD of the norm. Cephalometric films were evaluated for 15 patients. Mean SNA was 78.9±4.3, SNB was 74.1±3.8, and ANB was 5.0±3.4, with no significant difference between values for our cohort and values for non-cleft patients ($p > 0.05$).

Conclusions: Using the staged method, noses are normal with normal nasolabial angles and normal columellae, lips are full, and there is no ventroflexion of the premaxilla. Long-term follow-up of this patient population demonstrates results that resemble the dimensions and ratios of the lip and nose of unaffected children.

Objectives
Participants will be able to learn about techniques for staged bilateral cleft lip repair. Participants will be able to learn about alternatives to synchronous bilateral cleft lip repair. Participants will be able to learn about the differences in long-term outcomes between stages and synchronous bilateral cleft lip repair.

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Tubed Pedicles: A Relic from the Past or Still a Useful Adjunct?

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S. Anthony Wolfe


Erin Wolfe

Abstract
Introduction: In 1990 the senior author published a paper on the use of tubed pedicles from the chest transferred by the use of a post-auricular way-station for facial resurfacing. At a time when competent microsurgery is widely available, one may ask if the use of tubed pedicles is ever justified. This presentation demonstrates that their use can indeed be justified: in some cases a free flap is not necessarily better. Furthermore, many complex facial reconstruction patients have exhausted many of their options for microsurgical reconstruction, and tubed pedicles can serve as a useful adjunct in craniofacial reconstruction when microsurgical reconstruction is not an option.

Methods: A retrospective chart review was performed of patients who underwent tubed pedicle reconstruction between 1975-2022 under the care of the senior author (S.A.W.). Procedural characteristics and post-operative outcomes such as complications and revisions were recorded.

Results: 34 patients underwent facial reconstruction with the use of tubed pedicles between 1975 and 2022. Most males underwent tubed pedicle reconstruction with the tubed pedicle being taken from the anterior chest to the post-auricular region, and subsequently transferred to the face. Most females underwent tubed pedicle reconstruction with a posterior shoulder flap attached to the post-auricular region and subsequently transferred to the face. Mean duration of tubed pedicle reconstruction was 2.44 ± 0.56 months (range 2-3 months). Mean quantity of delay procedures was 1.61 ± 0.49 (range: 1-2). No tubed pedicles were lost.

Conclusions: Tubed pedicles can provide similar results with less donor site morbidity and good color match for facial reconstruction. This is of particular importance in the setting of complex craniofacial reconstruction cases in which all flaps have been used, in settings where microsurgical reconstruction is not available, such as mission trips, or in patients who are not good candidates for certain type of microvascular reconstruction.

Objectives
Participants will learn about the history of tubed pedicles in craniofacial reconstruction. Participants will learn about alternatives to microsurgical craniofacial reconstruction. Participants will learn about the indications for tubed pedicle facial reconstruction as compared to microsurgical facial reconstruction.

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Minimal Access Le Fort III Osteotomy (MALO) for distraction osteogenesis in young children - A retrospective comparative study

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Pramod Subash

Suhas Udayakumaran

Abstract

Introduction:
Cranial and midface procedures are indicated at various stages in children with syndromic facio-craniosynostosis to alleviate raised ICP, ocular and OSA issues and for aesthetic reasons. These procedures warrant multiple bicoronal access which can lead to thinning of the scalp, bone resorption, increased operative time, excessive blood loss leading to subsequent blood transfusions.

Method:
Bilateral brow incisions provide vision and access to the lateral orbital wall, inferior orbital fissure, lower part of medial orbital well as well as the zygomatic arch and pterygomaxillary junction. Midline stab incision at radix exposes the fronto-nasal junction and medial orbital walls. Pterygoid junction is accessed through the brow incision. After osteotomy, midface is mobilised with modified pediatric Rowe's disimpaction forceps. Linear external distractors are then connected to a transfacial pin and fixed to the temporal bones bilaterally.

Results:
We compared the efficiency of minimal access incisions done in 14 patients versus conventional bicoronal incisions in 10 patients (Age ranging from 8-43 months). Minimal access technique reduced blood loss in the patients, with 66% less blood transfusion compared to the bicoronal group. The average drop in hemoglobin and intraoperative time in minimal access incisions was 0.93 mg/dl and 3.5 hours compared to 2.32 gm/dl and 5 hours in bicoronal incisions respectively. No significant complications related to the osteotomy were encountered during the procedure.

Conclusion:
Minimal access LeFort III osteotomy technique is a safe and effective method for midface distraction osteogenesis by limiting dissection and thus reducing blood loss and operative time while maintaining vascularity to osteotomised segments. Additionally, performing Le Fort III osteotomy though minimal access incisions preserves the bicoronal flap for future cranial procedures or prevents repeated scalp raising incisions.

Objectives

1. The need to perform Pediatric le fort III osteotomy 2. Technique of Minimal access Le Fort III osteoetomy 3.Safe way to perform minimal access Le Fort III osteoeotmy in young children

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Fronto-orbital advancement and remodelling (FOAR) with distraction in syndromic craniosynostosis – a new voyage of discovery

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David Johnson

Abstract

Background: Fronto-orbital advancement and remodelling (FOAR) is a routine procedure performed in patients with syndromic craniosynostosis either as a primary procedure or following previous posterior vault distraction (PVD). The degree of frontal advancement is often limited by scalp laxity that may itself be reduced by previous PVD. In such circumstances and when advancements of over 1.5 cm are required, FOAR with distraction allows greater advancement of the frontal complex.
Methods: A Retrospective review of the Oxford Craniofacial database was undertaken to identify all cases who underwent FOAR with distraction since its inception in 2015.
Results: 18 cases of FOAR with distraction have been performed in the Oxford Craniofacial Unit since 2015. All have been in cases of syndromic craniosynostosis with a mean age of 40 months at the time of surgery. The majority have previously undergone posterior vault distraction (PVD). In all cases 2 -4 KLS Martin Arnaud style internal distractors have been used. Variable latency and consolidation periods were used. Distraction distances of >18 mm have been achieved with no evidence of relapse with significant intracranial volumes increases of up to 35%.
Conclusions: FOAR with distraction is a useful technique in cases of syndromic craniosynostosis when large advanacements are required and when there is a significant reduction in scalp laxity such as occurs in cases where previous calvarial surgery such as PVD has taken place. This is one of the largest series reported in the world.

Objectives

1. Participants will learn the advantages of FOAR with distraction. 2. Participants will learn when to apply distraction to FOAR 3. Participants will learn the technical aspects of FOAR with distraction

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Craniosynostosis and Chiari I malformation Managed with Middle 1/3 Calvarial Vault Expansion

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Krystal Tomei

Abstract
Background: Chiari I malformation is known to be associated with craniosynostosis, both in single-suture as well as multi-suture craniosynostosis. This is postulated to arise from development of craniocephalic disproportion. Historically, discussion of treatment has revolved around posterior vault distraction or reconstruction as the primary consideration for calvarial vault expansion. Secondarily, the Chiari malformation can be directly treated with a suboccipital craniectomy with or without a C1 laminectomy. This suboccipital craniectomy has been described both separately from the CVR, or in tandem through a large posterior exposure extending to the foramen magnum. Few studies have discussed a primarily supratentorial vault expansion outside of patients with pancraniosynostosis.
Methods: Patients within the craniofacial clinic were evaluated to identify patients presenting with a late diagnosis of craniosynostosis and concurrent diagnosis of Chiari malformation. Symptoms at presentation and following a middle 1/3 supratentorial calvarial vault expansion were compared to evaluate efficacy of this treatment in alleviating symptoms of the Chiari malformation.
Results: Three patients with diagnosis of craniosynostosis and Chiari I malformation were identified. Age at diagnosis were 4 years, 4 years, and 9 years. Two patients had isolated sagittal craniosynostosis. One patient had sagittal and bilateral lambdoid craniosynostosis. Primary symptoms were occipital headaches. No patient had papilledema. All three patients underwent a middle 1/3 supratentorial calvarial vault expansion utilizing the Pi-Hungspan technique. At delayed follow-up all patients had improvement and/or resolution of their initial presenting symptoms consistent with their Chiari Malformation. At least one patient had radiographic improvement in their Chiari malformation.
Conclusions: In patients with associated craniosynostosis and Chiari malformations, a supratentorial approach may be a viable treatment option in patients with occipital headaches. Additional follow-up is indicated to determine whether the Chiari malformation improves or resolves with this approach.

Objectives
1) Participants will learn the association of craniosynostosis and Chiari malformations with single and multiple-suture synostosis. 2) Participants will learn variations in management of craniosynostosis with Chiari malformations. 3) Participants will learn considerations in follow-up management following supratentorial vault expansion for craniosynostosis with associated Chiari malformation.

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The Oxford Craniofacial Unit experience with 67 cases of Muenke's Syndrome (Pro250Arg Mutation) over 40 years-Demographics, Surgical Management and Outcomes in a Single UnitS.A.Wall, D.Johnson, G.P.L. Thomas, A.O.M. Wilkie

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Steven Wall

Abstract

We present a 67 patient case series of patients with confirmed Muenke's Syndrome (Pro250Arg Mutation) treated in a single Unit.
Patients of the Oxford Craniofacial Unit were identified from note reviews and the Unit Database.
67 patients who fitted the criteria of primary assessment /treatment and follow-up in Oxford were identified and their Files analysed for demographics,sutural involvement,surgical events and techniques and the need for unplanned further surgery for documented secondary Raised ICP(Intra-Cranial Pressure)..
Of the 67 the M:F ratio was 33:34.
11 had no synostosis (9M,2F)
56 synostosis cases consisted of :-
Bicoronal (synostosis) 41 (15M,26F)
Unicoronal 14 (7M,7F) RC 11 LC3
Isolated Sagittal Synostosis 1
Mean Follow-up was 11.9 years (3months-24.6 years)
Surgery historically was Early Fronto-Orbital Advancement and Remodelling(FOAR),which progressed over time to Staged Surgery (Simple Posterior Release (PR) or Posterior Calvarial Distraction (PCD) as it evolved, followed by planned FOAR) in an attempt to improve morphological outcomes and decrease the risk of secondary raised ICP (as previously published by the Unit.)
Outcomes:
56 Primary operations -FOAR 34, Posterior release 11, Posterior Distraction 9, Subtotal Calvarial Remodelling 1, Primary FOAR with Distraction 1.
Unplanned Re-operation for documented raised ICP 7, overall re-op 12,5%
FOAR Primary – 34 , -6 =17,6%
Staged Posterior then FOAR -15- Unplanned Re-Op-1 -6.6%
Mean age of Secondary Raised ICP- 6.5 years(4,2-8,8)
Morphological outcomes on Photographic analyses and Cephalic Indices showed substantial improvement using Planned 2 Stage surgery.
Our series shows a substantial benefit in planned 2 stage surgery in terms of decreased risk of Secondary raised ICP (17,5%vs 6.6%) and improved morphological outcomes.

Our series also demonstrated the need for careful vigilance for signs of secondary raised ICP in all cases but particularly if single stage Frontal surgery is performed.

Objectives

In Muenke Syndrome substantial benefit in planned 2 stage surgery in terms of decreased risk of Secondary raised ICP (17,5%vs 6.6%) There is a need for careful vigilance for signs of secondary raised ICP in all cases but particularly if single stage Frontal surgery is performed. Morphological assessment showed substantial improvement using Planned 2 Stage surgery.

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Endoscopic strip craniectomy with post-operative helmet orthosis for craniosynostosis in the United Kingdom - experience from the first 100 cases

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Greg James

Abstract

Background: our institution was the first in the UK to offer endoscopic strip craniectomy with post-operative helmeting (ESCH) for early correction of craniosynostosis. We report our experience with our first 100 patients treated with ESCH.
Methods: prospective cohort study of the first consecutive 100 children undergoing ESCH at our institution from 2017-2022.
Results: 42 girls and 58 boys underwent ESCH. Type of synostosis was metopic in 60, unicoronal in 28, sagittal in 7, bicoronal in 5 and other multisutural in 3. Mean chronological age at surgery was 4.9 months (range 2.6-8.5 months). 94 children spent 1 night in hospital, 6 spent 2 nights. 17 children required blood transfusion peri-operatively. Mean transfusion volume (packed red cells) in those transfused was 95ml (range 50-160ml). No child received more than 1 donor exposure. 3 were identified to have a relevant mutation (TCF12 in all 3) on routine screening. 3 children had superficial wound infections requiring oral antibiotics. There were no significant peri-operative complications and no returns to theatre. All children completed the course of helmet therapy, 2 had skin issues (1 pressure sore, 1 dermatitis) which resolved with orthosis modification. 3 children developed torticollis requiring physiotherapy. 3 children were noted to have speech delay requiring speech therapy during follow-up. 1 child who underwent metopic ESCH was found to have new bicoronal synostosis post-operatively, further investigation demonstrated metabolic bone disease. At last follow up, 90 patients had a Whitaker I result, 9 Whitaker II and 1 Whitaker III. No children have as yet required revision surgery.
Conclusions: our institution also offers early spring cranioplasty for sagittal synostosis explaining the relative lack in this series. ESCH is safe and appears to have good early aesthetic and functional outcomes in the largest UK cohort to date. Long term follow up data is required.

Objectives

1. Participants will learn the indications for ESCH in craniosynostosis 2. Participants will understand the peri-operative and post-operative risk profile in our cohort 3. Participants will evaluate longer term outcomes of ESCH in our cohort and be equipped to counsel families regarding the safety and efficacy of this technique

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Incidental Craniosynostosis in Paediatric patients – a review of 590 CT scans

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Ahad Shafi

Abstract
Background
Craniosynostosis (CS) is traditionally considered to have an incidence of 1 in 2500 births, with Sagittal CS considered to represent 40-55% of these cases. It was incidentally noted, on retrospective review of Computed Tomography (CT) imaging, that there appeared to be a higher incidence of undetected normocephalic Sagittal CS. The object of this study was to help detail and understand the rate of undetected CS in CT scans in our paediatric unit.
Methods
All CT head scans, carried out in Birmingham Children's Hospital, from the 1st of January 2022 to 30th June 2022 were reviewed. This represented 590 CT head scans. All patients were 16 years, or younger. Patients with brain or cranial pathology, VP shunts and known syndromes were excluded. The remaining 555 scans were reviewed for evidence of CS. All scans were reviewed in cross section and 3D reconstruction. Patient demographics, indication for the scan, cranial index (CI), suture affected and evidence of associated pathology was recorded.
Results
Of the 590 scans reviewed, 555 met the inclusion criteria. 16 scans illustrated CS, an incidence of 2.8% amongst this group. The average age was 10 years old. The commonest suture affected was the Sagittal suture (15 cases) and the other case was a Unicoronal CS. Average CI was 78%, with only one case showing features of Scaphocephaly. One case had an associated Chiari malformation. None of the cases were reported on the formal CT scan report.
Conclusions
The 2.8% incidence of CS in our group, represents a significant variance from the traditionally published rate of 1 in 2500 (0.0004%). Almost all patients in our group were normocephalic. The clinical significance of normocephalic Sagittal CS requires further research. The study also highlights the importance of assessing the cranial sutures when reviewing and reporting CT scans.

Objectives
To raise participant awareness of undetected Craniosynostosis in often normocephalic patients. To raise Radiologist awareness of the need to ensure the cranial sutures are reviewed in the reporting of CT head imaging. To illustrate to participants that the incidence of Craniosynostosis may be higher than previously thought - the clinical significance remains unclear.

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Clinical findings and surgical correction for Tessier Cleft number 4: an analysis of 86 cases.

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Nivaldo Alonso


CRISTIANO TONELLO

Abstract
Background- Tessier cleft number 4 (TC4) is described as an oblique facial cleft with a very low incidence, like the others. Its clinical presentation ranges from a simple unilateral cleft to broad bilateral defects including orbits. A review of the literature demonstrates 173 patients with TC4.
Methods- Data and images of 86 cases from three craniofacial centers were collected. The authors distributed the patients, using Tessier's publications and according to clinical findings and anatomical types of involvement of the bone, soft tissues, and facial structures.
Results- We analyzed 52 females and 34 males, 40 unilateral and 46 bilateral. One-third of the patients have another cleft associated different from Tessier cleft number 3, whereas almost 50% had other facial malformations. Additional observations were 12 choanal atresias in this series of patients and critical clinical findings for early diagnosis and treatment. Tessier cleft 10 was noted in only 03 patients, but Tessier cleft 5, 6, and 7 were present in 33 patients. We observed in 10 patients a bigger size of the upper eyelid on the side of TC4 and abnormal eyelashes that we do not consider any kind of cleft. Only one patient had Tessier Cleft 3 associated. Differences between clefts 3 and 4 besides lateral facial gap seem very clear when we look at this associated facial malformation, reinforcing the idea of different embryological moments. Most of the patients with unilateral TC4 had incomplete or no cleft palate. One patient with a phenotype of TC4 had a radiological image suggesting Tessier Cleft 3, with no bone in the piriform aperture on the left side in the radiological evaluation, but soft tissue was typical of TC4.
Conclusions- TC4 could be frequently associated with other malformations. These malformations significantly change the number of procedures and final cosmetic results.

Objectives
The participants will be able to evaluate and compare the differences among clinical presentations of Tessier Cleft number 4 to conduct the cases regarding the particular condition of each case.

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Analysis of Routine Intensive Care Unit Admission Following Palatoplasty in Patients with Robin Sequence

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Esperanza Mantilla-Rivas

Abstract

Background: Previous management of upper airway obstruction (UAO) in patients with Robin Sequence (RS) may impact the need for admission to the pediatric intensive care unit (PICU) following primary palatoplasty (PP). This study sought to determine if PICU admission after PP in patients with RS was safer than surgical ward admission, based on prior upper airway management.
Methods: We conducted a retrospective review of patients with RS who underwent PP at Children's National Hospital between 2006-2020. Need for postoperative PICU admission was determined by the craniofacial surgeon, anesthesiologist, and otolaryngologist. Patient demographics, perioperative characteristics, PICU admission, and postoperative airway and non-airway complications were compared upon conservative (n=30), tongue-lip adhesion (TLA) (n=14), and mandibular distraction osteogenesis (MDO) (n=14).
Results: Fifty-eight patients were included. Median age at PP was 12.9 [10.8, 15.6] months. PICU admission was significantly higher in patients who underwent TLA and MDO (conservative, 33.3%; TLA, 85.7%; MDO, 85.7%; p<0.001). Likewise, the rates of overall airway-related complications were significantly higher in patients with prior TLA and MDO (conservative, 26.7%; TLA, 64.3%; MDO, 57.1%; p=0.034). Rates of major post-PP airway events (prolonged intubation >4h or reintubation) that would have required ICU care were low between groups (6.7-14.3%; p=0.095); post-hoc analysis documented significant differences in overall airway events between TLA vs. conservative airway groups (64.3% vs. 26.7%; p=0.02). No statistically significant differences were found among the rates of non-airway complications. Lastly, the median length of stay (LOS) was higher in patients with MDO and TLA compared to conservative (p=0.024).
Conclusion: Postoperative admission to the surgical ward after PP may not be appropriate for patients with RS who had UAO management by TLA during infancy. On the other hand, routine PICU admission may not be necessary for patients with RS whose UAO had been successfully treated by prior conservative measures or MDO.

Objectives

1. Determine the impact of previous upper airway obstruction treatment in postoperative care of primary palatoplasty in patients with RS. 2. Understand factors that associate with higher postoperative airway complications after primary palatoplasty in patients with Robin Sequence 3. Determine indications for routine PICU admission in patients with RS after primary palatoplasty

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Pedicled Buccal Fat Pad Flap Inclusion in Primary Palatoplasty Mitigates Velopharyngeal Insufficiency Risk and Severity in Patients with Cleft Palate

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Nathan Sheppard


Melissa Daniel


Megan Dietze-Fiedler


Christian Vercler


Steven Kasten


Steven Buchman


Raquel Ulma

Abstract

Background: Palatoplasty subjects the cleft maxilla to post-surgical scarring and growth restriction. This can lead to velopharyngeal insufficiency (VPI) with detrimental effects on a child's speech development. Utilizing a buccal fat pad flap (BFPF) at time of palatoplasty to provide vascularized soft tissue over denuded palatal bone or into the posterior void between oral and nasal tissues can mitigate scarring and growth restriction, thereby 1) reducing the need for invasive secondary speech surgery and 2) decreasing the severity of associated VPI.
Methods: A single center, retrospective chart review identified patients who underwent palatoplasty with or without BFPF from 1995-2015. Data collected included cleft type, surgical technique, follow-up duration, and complications. Outcomes included need for speech surgery, and development of palatal fistulas. Cleft severity scores were computed on a scale of 1-4 as a weighted mean to reflect the frequency of cleft type (Veau I-IV) in BFPF and non-BFPF groups.
Results: Charts of 806 patients were reviewed; 210 met inclusion criteria. Of these, 89 had a BFPF. Average follow-up duration was 11.5 years. Despite a greater cleft severity score in the BFPF group (3.06 vs. 2.45, $p<0.001$), these patients had a lower incidence of speech surgery (10.1% vs. 30.6%, $p<0.001$). Mild cases of VPI were treated with a single fat injection (FInj) to the posterior pharynx (9.1% for BFPF group vs. 5.0% for non-BFPF group). The BFPF group developed fewer fistulas (7.1% vs. 14.5%).
Conclusion: Despite the presence of more severe clefts, the BFPF group had a significantly lower rate of invasive speech surgery. These patients were more likely to resolve hypernasality with a single FInj, implying milder severity of VPI. We recommend considering a pedicled BFPF in cleft palatoplasty to actively reduce the risk and severity of VPI in patients with a cleft palate.

Objectives

1) Participants will be able to describe the benefits of the pedicled buccal fat pad flap in primary repair of the cleft palate. 2) Participants will learn about a novel strategy to mitigate the problem of velopharyngeal insufficiency and significantly reduce the need for secondary speech surgery. 3) Participants will learn how using vascularized soft tissue as filler in cleft palate repair can ameliorate scarring and contracture and significantly decrease the burden of disease.

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A Modified Technique to Address the "Locked-Out" Premaxilla in Bilateral Cleft Palate Repair

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James Vargo


Todd Thurston


Steven Buchman

Abstract
Background: The bilateral cleft deformity with a locked-out premaxilla presents one of the most challenging deformities in cleft surgery. Despite its frequency, traditional hard palate repair techniques do not address the prominent premaxilla. Conventional palate repairs with a locked out pre-maxillary deformity often result in a large horseshoe fistula at the anterior aspect of the repair, greatly increasing morbidity for the patient and creating unnecessary challenges during alveolar cleft bone graft later in childhood. The 270- degree technique described herein addresses the bilateral cleft with a prominent premaxilla to improve outcomes and minimize development of a large anterior fistula
Methods: A retrospective review was performed for all patients undergoing palatoplasty for a locked-out premaxilla between 1997 and 2015. Charts were abstracted for demographics, length of follow-up and post-operative complications.
Results: 41 patients were included. The mean age at time of primary palatoplasty was 1.6 (0.93-3.71) years. Mean follow-up was 10.8 (6.10-15.83) years. There was an overall complication rate for this enormously challenging deformity of 7.2%. There was 1 (2.4%) failure of the technique with development of a mid-palatal fistula, and 1 (2.4%) fistula at the hard/soft palate junction. One patient had a traumatic dehiscence of the palate (2.4%) though the anterior portion remained intact.
Conclusions: Our previously undescribed 270-degree closure technique fills the void in the literature for managing the immense challenge of the locked-out premaxilla. When presurgical orthopedics are not a viable option, this approach can minimize the risk of large or complex fistula formation posterior to the premaxilla.

Objectives
1) Participants will be able to describe the unique challenges of bilateral cleft palate repair for the locked out pre maxilla 2) Participants will be able to describe the 270 degree premaxillary closure technique for complete closure of a cleft palate through the maxillary alveolus 3) Participants will be able to discuss differences between traditional hard palate repair and modified 270 degree premaxillary closure

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Concomitant Orthognathic Surgery & Fibula Free Flap Reconstruction after Hemimandibulectomy – A Unique Case Combination

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Tiffany Lee

Abstract
Background: The osteocutaneous free fibula flap is the workhorse for providing vascularized bone and soft tissue for mandibular reconstruction. Orthognathic surgery is the gold-standard surgical treatment for maxillofacial occlusal abnormalities. The coexistence of these two clinical entities in the same patient provides unique challenges. Oncologic safety, surgical prioritization and staged approaches often dictate the separation of these surgical plans, despite the potential benefits of a combined approach. Herein we present a novel approach to complex facial reconstruction, in a patient with a rapidly growing lytic lesion with an existing Class III open bite malocclusion who underwent a single-stage operation with complete tumor extirpation and facial balance restoration.
Methods: Virtual surgical planning was employed to plan the tumor extirpation including sacrifice of the unilateral condyle and free fibula reconstruction. Anticipating surgical feasibility and oncologic safety, a concurrent LeFort I and sagittal split osteotomy was also planned. Cutting guides and splints were designed and printed, along with a custom reconstruction plates for free fibula and maxillary bony fixation. Operative steps, timing and outcomes were monitored to determine feasibility, reproducibility, and safety.
Results: The concomitant procedure was performed efficiently with acceptable surgical times and oncologic safety. Free Fibula mandible reconstruction along with Le Fort 1 advancement and Sagittal Split Osteotomy was performed concurrently, with stable mandibulo-maxillary repositioning with optimal occlusion with no operative complications. Follow-up at 9 months revealed well-healed incisions, improvement of the facial contour, occlusion and no TMJ ankylosis.
Conclusions: Concurrent Free fibula mandible reconstruction after tumor resection and concurrent orthognathic surgery for occlusal abnormalities is feasible and safe at the index operation. The combined approach saves overall operative time, allows for a complete facial restoration and potentially reduces complications from adjuvant radiation.

Objectives
1. Surgeons will benefit from learning an approach to single-stage free fibula flap for mandibular reconstruction with concurrent orthognathic surgery, as opposed to performing a higher-risk staged procedure after radiation therapy. 2. This study will inform surgeons on how free fibula reconstruction for mandibular reconstruction after tumor resection and concurrent orthognathic surgery for occlusal abnormalities is feasible and safe when performed with preoperative planning and a multidisciplinary team approach. 3. Participants will understand the benefits of performing the free fibular flap mandibular reconstruction and orthognathic procedures concurrently, as part of the immediate reconstruction after tumor extirpation.

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Novel Quantification of the Levator Veli Palatini for Cleft Palate Repair via Intraoperative MRI

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Tiffany Lee

Abstract
Background: Cleft palate repairs continue to have high VPI and fistula rates. The levator veli palatini (LVP) muscle is principally responsible for velar elevation and its adequate reconstruction is critical for speech outcomes. Herein we report the first use of intraoperative MRI imaging in the immediate pre and post-op period of a secondary cleft palate and fistula repair to objectively quantify the preoperative LVP and evaluate its postoperative reconstruction.
Methods: A previously reported unique MRI capture sequence of the velum was taken immediately prior to- and after cleft palate repair procedures in a toddler. A standard evaluation of previously reported linear and angular measurements were made of the preoperative velum. Immediate post-repair imaging was attained to evaluate the reconstruction of the velum, determine adequacy of reconstruction, and guide surgical decision-making. Measurements included overall LVP excursion, thickness, position, and angulation along with overall velum length, width, and position.
Results: The preoperative velum was analyzed with a noted LVP a muscle gap of 10mm and 5mm fistulous opening. The origin to origin distance of the LVP was identical pre and post-op at 54.24mm. The total pre-op LVP length was 57.25mm with measured average thickness of 4.25mm. Immediate post-op imaging demonstrated clear cohesion of the entire muscle with minimal muscle gap, and noted overlap. The post-op LVP length was 64.6mm with average of 7.2mm thickness. The measured sagittal velar length preoperatively was 10.46mm and width of 4.45mm, with a postoperative length of 29.0mm and a width of 13.0mm.
Conclusions: Herein we describe the first-ever objective measure of the levator veli palatini immediately before and after palatal surgery. The data demonstrate an increased length of the velum and significantly increased thickness with cohesion throughout the entire muscular sling. The novel use of intraoperative MRI allowed for an immediate objective measure of the underlying defect.

Objectives
1. Participants will learn a novel use of intraoperative MRI for the visualization and understanding of cleft palate defects and the levator veli palatini. 2. The audience will learn the opportunities and challenges involved in determining cleft severity and levator veli palatini imaging. 3. This study will present the audience with information on the best available option to immediately evaluate and improve upon surgical correction of the cleft palate defect.

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Machine Learning Analysis of Post-operative Results in Metopic Craniosynostosis

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Abstract

Introduction

There are varying degrees of surgical correction of metopic craniosynostosis, ranging from achieving normal head shape to significant overcorrection. The purpose of this study is to objectively quantify the degree of overcorrection in our current practice and to evaluate long-term morphological changes using CranioRate, a novel machine learning skull morphology assessment tool.

Methods

This study includes patients with preoperative and postoperative CT scans who underwent fronto-orbital advancement (FOA) for metopic craniosynostosis. CranioRate was used to evaluate head shape at each time point; Metopic Severity Score (MSS) measures the degree of metopic dysmorphology, and Cranial Morphology Deviation (CMD) quantifies the deviation from normal in a non-specific direction.

Results

Fifty-five patients were included; average age at surgery was 1.3 years. Mean preoperative MSS was 6.3±2.5 and CMD was 199.0±39.1 (control MSS = 0.0±1.0; CMD = 85.2±19.2). Immediate postoperative MSS was -2.0±1.9 (CMD 208.0±27.1). Sixteen patients underwent long-term CT imaging at an average of 3.1 years; long-term MSS was 1.3±1.1 (CMD 179.8±28.1). There was no correlation between pre-operative severity (MSS) and immediate post-

operative MSS (correlation coefficient=0.01); however, MSS regressed in a metopic direction at long-term follow-up and preoperative severity (MSS) correlated with long-term MSS (correlation coefficient=0.70).

Conclusion

MSS quantifies overcorrection and normalization of head shape as patients with negative values were less "metopic" than normal postoperatively and approached 0 at long-term follow-up. CMD worsened postoperatively due to postoperative bony changes associated with surgical displacements following FOA. All patients had similar immediate postoperative MSS, as degree of overcorrection was not associated with preoperative severity. More severe patients pre-operatively had worse long-term dysmorphology, reinforcing that regression to the metopic shape is a postoperative risk which increases with preoperative severity.

Objectives

1) Participants will learn how CranioRate objectively quantifies the degree of overcorrection in surgical repair of metopic craniosynostosis. 2) Participants will be able to view objective changes in metopic severity (MSS) as head shape transitions from metopic pre-operatively to anti-metopic following overcorrection, and to normal at long term follow up. 3) We will objectively demonstrate the relationship between pre-operative severity and long-term post-operative morphology.

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Role of Onlay Computer-Aided Design (CAD) implants in the management of relapse in Syndromic Craniosynostosis

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Abstract

Background: Patients with syndromic synostosis are at high risk of craniofacial morphology relapse. Custom alloplastic implants, designed using computer-aided design (CAD), may play a role in correcting such deformities. However, the use of CAD implants as onlay grafts is not widely approved, as they are typically indicated for replacing full-thickness calvarial defects. This case series aims to demonstrate the clinical efficacy and medium-term safety of onlay CAD implants after failed traditional autogenous methods.
Methods: We reviewed the cases of six patients with Muenke syndrome who had undergone correction of supraorbital bar and forehead asymmetry using onlay CAD implants.
Results: All six patients had uni- or bicoronal synostosis and experienced marked relapse of craniofacial asymmetry following 9 secondary and tertiary autogenous fronto-orbital advancement or remodeling procedures (1.5 secondary procedures per patient). The patients' age at the secondary procedure ranged from 3-12 years, and they received onlay CAD implants for the supraorbital/low frontal region between the ages of 12 and 16 years. After a mean follow-up of 3.5 years, the morphological result was stable, and no infections or adverse side effects were reported.
Conclusion: Traditional autogenous remodeling often results in morphological relapse in certain syndromic craniosynostoses. Computer-aided onlay grafts can provide safe and stable early and medium-term correction of relapse after autogenous fronto-orbital remodeling. Longer-term follow-up is required, but the use of onlay CAD grafts should be considered as part of the treatment strategy in selected cases.

Objectives

Participants will be better able to explain morphologic relapse in Syndromic Craniosynostosis Participants will be better informed about the use of CAD implants for morphologic relapse Participants will be better able to justify use of such implants with third party payers.

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Intraoperative Augmented Reality Navigation Reduces Dural Sinus Injury and Blood Loss During Craniofacial Surgery: A Pilot Study

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Christian A El Amm

Abstract

Background: Augmented/Extended Reality technologies have the potential to improve the safety and consistency of surgery. However, the potential downsides include user impairment and increased length of surgery. This study aimed to investigate the impact of intraoperative use of Augmented Reality Navigation on rate of injury to dural sinuses, relative blood loss, dural injuries, and duration of surgery in Craniofacial Surgery.
Methods: Pre-operative imaging was segmented to generate patient- and case-specific 3D models, which were then uploaded into a Microsoft Hololens and worn during surgery. Injury to dural sinuses during initial craniotomy or during bone flap elevation were noted, and dural tears were similarly recorded. Blood loss was calculated using pre- and post-operative hematocrit levels, and RBC volume transfused. Comparison groups included all "intracranial" craniofacial procedures performed between 2019 and 2022, as well as an age- and procedure-matched control group.
Results: Surgeries performed with Augmented Reality Navigation were not significantly longer than the non-matched group (163 vs. 183 min, p=NS) or the matched control group (163 vs. 164 min, p=NS). The number of dural sinus injuries during craniotomy was significantly smaller in the Augmented Reality Navigation group (0/17 vs. 11/62, one-sided t-test $p<0.05$), and the relative blood loss was significantly lower (41% vs. 65% ERCV, one-sided t-test $p<0.05$) (32.8 mL/kg vs. 52 mL/kg). There was no significant difference in the incidence of dural tears between groups.
Conclusion: Intraoperative Augmented Reality Navigation may decrease blood loss and reduce the incidence of dural sinus injury during craniosynostosis surgery, possibly due to improved awareness of the location of the sagittal and transverse sinuses, anatomy of the endocranial surface, and location of intraosseous vascular channels. Larger controlled studies are needed to confirm these findings and to fully explore the benefits and limitations of this technology in craniofacial surgery.

Objectives

Participants will learn about specific beneficial case-uses of Augmented Reality Navigation Participants will learn about specific limitations of the technology, such as depth inaccuracy and performance under extreme lighting conditions Participants will learn about methods to visualize posterior fossa vasculature and intraosseous calvarial vessels.

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The Digital Prosthesis for Microtia

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Kai Wang

Abstract

Background: Microtia patients in the absence of surgical indications, the prosthesis is an option, at present, the development of prosthetic reconstruction has also entered the digital era, not only its shape is done by reverse engineering, but its color can also be completed by computer digitization.

Methods: 1.Adopt mold and color matching. 2. Build digital models 3.Boolean operations for the model. 4.Mold design and mold printing 5.CNC color grading 6.Infusion of prosthesis 7.Paste the prosthesis to rehabilitate Microtia.

Results: Patients wearing prosthesis had a satisfaction rate of approximately 31.39% after the first trial, but after the second adjustment of shape and color, the satisfaction rate reached 90.33%.

Conclusions： The digital fabrication process of an auricle prosthesis includes color matching, creating a digital model, performing model Boolean operations, detailed design of the substructure of the auricle, mold design, mold printing, color calibration using numerical control, and casting the hearing aid. This technology allows for repeated adjustments of color and shape, which is not possible with other restoration methods. This technique can also be applied to other craniofacial restorations, such as nose and eye prostheses.

Objectives

Participants will be explained the prosthetic reconstruction therapy for microtia. Participants will be introduced of digital reverse engineering techniques. Participants will be able to plan the therapeutic choice with optimized outcome for microtia patients.

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Deep learning-based segmentation of intracranial volume and calvarial bones in pre- and postoperative CT-images of children with sagittal craniosynostosis.

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Jesper Unander-Scharin

Abstract

Background

Image-based analysis of intracranial volume (ICV) and calvarial bones is highly valuable when assessing surgical outcomes in craniosynostosis patients. However, manual segmentation of ICV and calvarial bones is both time-consuming and beset with measurement errors. Here, we present a deep learning-based approach to perform fully automated image segmentation of the ICV and calvarial bones in patients with non-syndromic sagittal craniosynostosis (SC).

Methods

A modified UNet architecture, hereby referenced to as CranioNet, was developed to accelerate conventional analysis workflows. The cohort was constructed by aggregating pre- and post-operative CT scans from 50 patients with SC that had undergone surgery in Uppsala University Hospital, Uppsala, Sweden. All participants underwent surgery between ages 3-6 months, using the H-craniectomy technique. Manual reference annotations of the ICV and calvarial bones were generated with custom software (BoneSplit) and refined in 3DSlicer. Multiple U-net based architectures were trained using the manual reference segmentations and evaluated locally on a single NVIDIA RTX 2080 graphics card and evaluated using 5-fold cross-validation. Ethical approval was obtained by the Uppsala-Örebro Regional Board for Ethical Vetting (dnr 2013-402).

Results

Our method achieved an average Dice similarity coefficient (DSC) of 0.966 ± 0.022 and a mean absolute error (MAE) of 6.20 ± 4.5 ml for ICV segmentations in pre- and post-operative CT images. Furthermore, the method achieved an average DSC of 0.812 ± 0.102 for segmentation of all calvarial bones (frontal-, parietal- and occipital).

Conclusions

We introduce a fully automated approach to segment ICV and calvarial bones in SC patients that had undergone H-craniectomies. Our results suggest that CranioNet can facilitate clinical analysis workflows and handle large datasets when assessing surgical outcomes in patients with SC.

Objectives

The role of AI in image segmentation Training of a neural network How AI can facilitate craniofacial research

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Using Latent Disentangled Convolutional Variational Autoencoders in the Identification of Beckwith-Wiedemann Syndrome

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Abstract

Background

Beckwith-Wiedemann Syndrome (BWS) is a congenital disorder caused by imprinting defects within the chromosome 11p15.5 region. BWS may present with several characteristic factors, including macroglossia in 90% of patients, and distinctive maxillofacial morphology.

The recently proposed Swap Disentangled Variational Autoencoder (SD-VAE) is an artificial intelligence (AI) tool. SD-VAE proved able to accurately identify different craniofacial syndromes, when looking at the complete face on models created using 3D head shape meshes derived from CT, MRI & 3D Photogrammetry. Our primary objective was to distinguish BWS patients from the general population by applying SD-VAE to 3D head shape meshes.

Methods

Most head shapes were obtained from 3D photos collected as part of routine clinical practice using a 3dMD Head System (3dmd Ltd). When available, routine CT scans were used. The raw scan head shapes were pre-processed into meshes by fixing missing, inverted or overlapping polygons. Since SD-VAE requires the head shape meshes to be properly aligned and in dense point correspondence, we use a 68-landmark-guided Non-rigid Iterative Closest Point (NICP) registration, followed by Gaussian Processes if needed.
The obtained meshes were used to train SD-VAE. To demonstrate the results, latent vectors with high dimensionality were embedded into a two-dimensional space, applying linear transformation computed via Linear Discriminant Analysis (LDA). Latent vectors were also classified with Quadratic Discriminant Analysis (QDA), a generalization of LDA.

Results

A total of 72 syndromic scans were used, belonging to 56 different BWS patients. 69 were 3dMD scans and 3 CT-scans. The median age at time of scan was 3.0 years (IQR 1y5mo - 7y3mo). The model demonstrated a high diagnostic accuracy for BWS, with the lower face being a clearly distinguishable area.

Conclusion

The high diagnostic accuracy of SD-VAE makes it a promising tool in aiding the diagnosis of different craniofacial syndromes.

Objectives

• Participants will learn about the characteristic facial features of BWS patients • Participants will analyze the process of 3D photogrammetry and how to pre-process 3D photos into meshes • Participants will learn how to interpret the results of SD-VAE

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A Comparative Assessment of Midterm Outcomes following Mandibular Distraction and Tongue-Lip Adhesion in the Treatment of Robin Sequence

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Sameer Shakir


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Robert Havlik


Kant Lin

Abstract

Background: Controversy persists regarding the utility of tongue-lip adhesion (TLA) and mandibular distraction osteogenesis (MDO) to resolve obstructive sleep apnea (OSA) in Robin Sequence (RS). We hypothesized that TLA offers a comparative improvement in OSA based on the apnea-hypopnea index (AHI).
Methods: A retrospective cohort study was performed of subjects presenting to a tertiary care pediatric center who underwent either primary MDO or TLA for RS over a 17-year period. Study variables included AHI, postoperative complications, feeding status, and dentofacial development.
Results: 59 subjects met inclusion criteria (n=34 MDO, n=25 TLA) with median length of follow-up of 8.8 and 6.7 years (MDO v. TLA, $p<0.27$). There were no significant differences in patient characteristics except age at surgery (31 v. 17 days, $p<0.05$). Preoperative AHI was comparable (33.9 v. 46.7, $p<0.38$). Subjects undergoing MDO demonstrated improved AHI at two-week postoperative PSG (3.4 v. 11.6, $p<0.01$), however AHI at second postoperative timepoint (270 v. 142 days, $p<0.007$) was not statistically different between cohorts (2.8 v. 2.6, $p<0.89$), indicating resolution of tongue-based airway obstruction in the TLA cohort. Using linear mixed modeling, MDO resulted in AHI improvement of 4.3 [-3.5, 12.1], which was not statistically significant ($p<0.24$). 14.7% of subjects undergoing MDO required repeat distraction, while 20% of subjects undergoing TLA required revision or conversion to MDO ($p<0.43$). 3% of subjects undergoing MDO demonstrated trismus and 14.7% demonstrated marginal mandibular nerve injury. Injury to the first permanent molars were noted in 47% of subjects in the MDO cohort postoperatively. There were no significant differences in enteral nutrition needs at last follow-up (5.4% v. 9.1%, $p<0.59$).
Conclusion: MDO and TLA ultimately achieve similar correction of OSA. While MDO offers a more immediate airway improvement, the procedure carries a nonzero risk of neurosensory, temporomandibular joint dysfunction, and dental injury when compared to TLA.

Objectives
Participants will be able to compare treatment options for obstructive sleep apnea in Robin Sequence patients.
Participants will be able to explain complication rates for mandibular distraction osteogenesis and tongue-lip adhesion.
Participants will be able to investigate patient outcomes in the treatment of OSA in Robin Sequence patients.

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The Fate of the Frozen Bone Flap: Quantitative Assessment of Bone Flap Resorption Following Delayed Autologous Cranioplasty

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Abstract

Background: Bone flap resorption following cranioplasty with frozen, autologous bone flap is poorly defined. We sought to assess bone flaps within this context to delineate the degree and timeframe of resorption.
Methods: Patients who had craniectomy and eventual cranioplasty with stored bone flap between 2012 and 2022 were reviewed. Patients without a high-definition postoperative CT with slice thickness <1mm following surgery and at follow-up were excluded. CT scans underwent volume analysis using Mimics Innovation Suite (Materialise, Leuven, Belgium).
Results: Forty-four patients (68% male) met the inclusion criteria. Median follow-up duration was 16.6 months (range 3.4-85.4 months). Cranioplasty occurred at a median time of 40 days (range 8-266 days) following craniectomy. Radiographically-detectable bone resorption occurred in 27 patients (61%). These patients had a mean volume decrease of 31.4% at 12 months following cranioplasty. Seven patients had clinically-significant bone flap resorption requiring revision alloplastic cranioplasty at median time of 9.2 months. Their mean bone flap retention at the time of revision cranioplasty was 25.7%. In comparing patients with resorption to patients without resorption, there was no statistically significant difference (p value > 0.05) in mean age [36.4 vs 45 years], mean days to cranioplasty [72.3 vs 43.2 days], mean volume of cranioplasty bone flap [62.2 cm3 vs 48.7 cm3], median follow up duration [22.6 vs 36.2 months], or comorbidities.
Conclusions: Frozen bone flaps undergo a variable degree of resorption in the following delayed cranioplasty. Clinically-significant bone flap resorption requiring alloplastic cranioplasty tends to develop in the first 10 months from surgery. Hence, regular clinical follow-up in the first year is necessary to identify this subset of patients. Understanding the pattern and risk factors for bone flap resorption provides surgeons with valuable information that guides the frequency of clinical and radiographic follow-up and may help guide alloplastic reconstruction discussions.

Objectives
Participants will be able to understand which patients are susceptible to bone flap resorption after autologous cranioplasty following decompressive hemicranectomy. Participants will be able to understand which patients develop clinically significant bone flap resorption requiring alloplastic cranioplasty after autologous cranioplasty. Participants will understand why follow-up is crucial after autologous cranioplasty.

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Utilizing Machine Learning for Objective Assessment of Craniosynostosis Severity

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Marie-Lise van Veelen

Abstract

BACKGROUND:
Craniosynostosis treatments aim to promote healthy brain development and enhance esthetics, however severity scores and postoperative evaluations remain subjective. Applying machine learning techniques to 3D imaging opens new opportunities to identify and quantify the distinct features of each subtype.

METHODS:
We trained a fully connected neural network to distinguish normocephaly and craniosynostosis (trigonocephaly, scaphocephaly, and plagiocephaly). The model was trained using synthetic data generated from a statistical shape model, with 100 samples in each group. Each 3D image was converted into a unit sphere of normal vectors. Density estimates of these normal vectors, suggesting in which direction the shape has a high or low curvature, was used during training. After the model was trained, attention maps were utilized to highlight areas of importance in making predictions.

RESULTS:
The machine learning model was able distinguishing the four cranial shapes. The attention maps revealed that the model relied on specific areas of the 3D models that correlated with the known features of each subtype. The magnitude of the predicted probabilities strongly correlated to subjective severity scores, indicating that the model is able to quantify the different dysmorphologies in a clinically meaningful way.

CONCLUSION:
These results demonstrate the potential of neural network applications in the assessment of craniosynostosis by accurately distinguishing between subtypes and providing a direct measure of severity. The model's shape descriptor, based on clusters of normal vectors, can be shared across centers without privacy concerns, allowing for the evaluation of large datasets from multiple centers. Future studies should aim to validate the model using larger and more diverse datasets. Ultimately, this study highlights the potential of machine learning to improve the assessment and treatment of craniosynostosis. Additionally, we propose to use the predicted probabilities to serve as a direct measure of severity instead of subjective scores.

Objectives

Participants will learn about the opportunities of assessment by 3d photogrammetry for craniosynostosis. Participants will learn about the additional value of machine learning in using 3d photogrammetry. Participants will learn about an objective assessment to grade severity of craniosynostosis or success of treatment.

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Toward a Normative, Optimal Interfrontal Angle Atlas for Objective Diagnosis of Metopic Craniosynostosis

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Abstract

Background: Metopic craniosynostosis causes a triangular forehead (trigonocephaly), hypotelorism, and differentiation between minor trigonocephaly and metopic ridges is subjective and difficult. This study presents a simple, quantitative, and reproducible radiographic method to measure normal forehead shape variation.
Methods: Head computed tomography scans for a retrospective cohort of 368 infants (0-2 years old) were obtained between 2010-2023. Patients were divided into monthly intervals based on age, with at least 5 per group. Patients included had no craniosynostosis or structural abnormalities. The cohort was 56.3% male, 60.1% African-American, 3.3% Asian, 13.9% Caucasian, 7.6% Hispanic, and 15.2% other. Each patient underwent a robust and well-established shape analysis pipeline developed by our group that produces and quantifies the infant's cranial vault mesh. Then, a patient's optimal interfrontal angle (oIFA) and transverse forehead width (TFW) were calculated using three landmarks, which were determined as the maximum average deformations of frontal bones for each patient of the cohort. Average oIFA and TFW were calculated overall and by age group. Differences between groups in relation to gender and race were measured by multinomial regression.
Results: Overall oIFA from 0-2 years was 131.6±6.9°and TFW was 73.0±8.3mm. For age groups, trends of oIFA and TFW were inversely proportional - with oIFA decreasing with increasing age from 138.4±6.6° to 126.4±2.93° and TFW increasing from 61.5.0±5.9mm to 78.2±3.22mm. No differences in oIFA or TFW were found in relation to the patients' reported gender or race.
Conclusion: This study presents work toward normative atlases that would guide objective diagnosis of metopic craniosynostosis. Our computational approach provides a value range wherein significant oIFA and forehead shape norm deviations can be assessed.

Objectives
Explain: Participants will be able to explain the importance of a standardized method that assesses the severity of metopic craniosynostosis. Compare: Participants can compare the current methods for assessing metopic craniosynostosis to our presented method. Evaluate: Participants may use our presented method to evaluate new patients for metopic craniosynostosis.

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Does Stripping of the Pterygomasseteric Sling in Sagittal Split Osteotomy Result in Bony Reabsorption?

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Abstract

Background: The aim of this study is to assess the level of resorption of the inferior mandibular border and the resulting aesthetic changes following bilateral sagittal split osteotomy (BSSO) with complete stripping of the masticatory muscles.

Methods: Pre-operative and post-operative cone beam CT scans were obtained for 29 patients who underwent BSSO. All patients had complete stripping of the pterygomasseteric sling intraoperatively. Linear, angular and volumetric measurements were performed on scans using Mimics 24.0 (Materialise NV, Lueven, Belgium). Paired and unpaired t-test were performed to determine differences in measurements at the late postoperative time point.

Results: Twenty-seven patients had a mean advancement of 2.67mm and 31 had a mean setback of 2.47mm, with no significant relapse. The mandibular body height decreased significantly for both advancements (A) and setbacks (S) (A: 2.06 ± 2.7 mm, S: 2.11 ± 2.92 mm; $p<0.004$). The mandibular ramus had a significant loss in height for both advancements and setbacks (A: 2.25 ± 3.17 mm, S: 1.63 ±3.61 mm; $p<0.05$). The mandibular angle volume significantly increased for both advancements and setbacks (A: 426.69 ± 690.48 mm3, S: 476.08 ±1059.48 mm3; $p<0.05$). Antegonial notch height did not change significantly. If the mandibular rotational movement was

counterclockwise, the body height increased on average. There was a significant soft tissue difference at the antegonial notch between the setback and advancement groups with a greater change in the setback group (A: 1.88 ± 1.80 mm, S: 3.69 ± 2.44 mm; $p<0.005$). However, there was no correlation between the soft tissue changes and the hard tissue changes at the antegonial notch.

Conclusion: Changes to the mandibular bony contour do occur after BSSO, but are typically not large enough to be aesthetically significant. Complete stripping of the pterygomasseteric sling appears to be a safe maneuver if needed to achieve proper mandibular position.

Objectives

1. Participants will be able to explain the contour and volumetric changes that occur in the mandible after a bilateral split sagittal osteotomy procedure. 2. Participants will be able to differentiate between the effects of different types of BSSO movements on the mandibular size and contour. 3. Participants will be able to perform stripping of the pterygomasseteric sling without concerns about aesthetic changes in the lower jaw.

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Long-Term Results of Distraction of Fronto-Orbital Segment as a Non-Vascularized Bone Graft in Craniosynostotic Patients

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Gokhan Tuncbilek

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Abstract

Fronto-orbital advancement using distraction techniques involves the osteotomized bone segment left attached to the dura to preserve vascularity of the transport segment, whereas it is impossible to reshape the supraorbital bar and the frontal bone complex when necessary. Our approach combines advantageous parts of conventional and distraction osteogenesis techniques as remodel and distract frontal bone complex as a free bone graft. However, it may raise concerns such as the resorption of the frontal bone graft and bony defects due to a decrease in the power of distraction. Frontal bone density was measured and compared with the occipital bone. The total bone defect area and the number of defects were measured. Pre-operative and late-term cephalic index measurements were made, and measurements at each time point were compared to normal values. Twenty-seven patients were included, and the mean follow-up was 86,04 ± 34,98 months. The mean total number of bone defects was 4,8 ± 2,2, and the mean total area of bone defects was measured 4,79 ± 4,43 cm2. There were no bony defects in the frontal bone, and all the defects were located in the distraction zone. No significant difference was found between the frontal bone and occipital bone density. The mean preoperative cephalic index was found to be 98.5 ± 6.3, and the mean late-term cephalic index was calculated as 87.6 ± 4.5. Pre-operatively, all 27 (100%) patients were outside the normal range; however, 16 (59.3%) patients reached the normal range in the late period. Serious complications such as bone resorption and necrosis are not seen in the reshaped and advanced frontal bone. As a result, fronto-orbital reshaping and distraction appear to be a safe and effective approach in the management of severe craniosynostosis, especially in patients with abnormally shaped frontal bones.

Objectives

Participants will be able to Understand the operative technique of the fronto-orbital reshaping and distraction. Summarize the advantages and disadvantages of the fronto-orbital distraction techniques. Discuss combining fronto-orbital reshaping and distraction techniques with other methods in the treatment of craniosynostosis.

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Full Thickness Cranial Defect Healing following Fronto-Orbital Advancement for Non-Syndromic Craniosynostosis

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Paymon Sanati-Mehrizy


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Amy Lee


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Richard Hopper

Abstract

Background: Calvarial defects created during cranial vault expansion in infants are anticipated to ossify spontaneously. We aimed to investigate the effect of diagnosis, age, size and location of the defect, and use of particulate bone graft on defect healing following fronto-orbital advancement (FOA) for non-syndromic craniosynostosis.
Methods: Patients who underwent FOA for isolated metopic (MS), left coronal (LCS), right coronal (RCS) and bi-coronal (BCS) synostosis were reviewed for imaging and clinical data. Preoperative (t0), immediately postoperative (t1) and 2-year postoperative (t2) were annotated in 3D Slicer and analyzed using custom software to calculate defect areas. Individual defects were tracked from t1 to t2 using non-rigid registration and defect healing rates were calculated. Linear regression was used to determine the effect of diagnosis, age, defect size and location on defect healing.
Results: One hundred nineteen patients with 545 individual defects were included. The average age at surgery was 10 months. Fifty-nine patients had MS, 43 had UCS and 10 had BCS. Defect area decreased in all cases with an average rate of 82%. Defects within patients with MS healed faster (87%) compared to BCS, LCS and RCS (66%, 72% and 80%). Initial defect area and age at surgery had a negative effect on bone healing ($p=0.003$) while particulate bone graft increased the healing rate ($p=0.003$). When defect location was added to analysis, initial area was no longer significant. Defects around pterions and in parasagittal regions healed significantly faster than lateral and midsagittal regions.
Conclusions: When designing osteotomies for FOA, defect healing factors should be taken into consideration to prevent residual cranial defects. The use of particulate bone graft harvested during surgery can increase the healing rate of larger defects, especially in lateral and midsagittal regions. Older patients and patients with bi-coronal synostosis are particularly impacted by larger cranial defects.

Objectives

1) Participants will be able to describe the common locations for persisting full thickness defects following fronto-orbital advancement. 2) Participants will be able to list the factors affecting bone healing in infants. 3) Participants will learn about strategies to prevent persistent calvarial defects following FOA in non-syndromic populations.

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Surgical Outcomes in Children with Craniofacial Desmoid Tumors: A Systematic Review of the Literature

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Abstract

Background:
Currently, there is a paucity of data on the management of pediatric desmoid tumors (DT). The purpose of this study was to compile the most comprehensive systematic literature review to date examining the characteristics, management, and outcomes of pediatric DT of the head and neck. We aimed to examine differences in outcomes (e.g. recurrence, complications) between younger (0-11 years) and older (12-21 years) age groups.

Methods:
A systematic review of the literature between January 1990 and December 2022 was conducted using data variables, including study characteristics; patient characteristics; management details; and post-operative recurrence or complications (major and minor).

Results:
The systematic review resulted in 345 articles, of which 44 studies met the inclusion criteria for this study. A total of 121 cases of pediatric DT were identified. The most common locations of presentation were mandibular (46%), neck (15%), and cranial (11%) areas. 63% of patients underwent local surgery at an early age (mean = 4.18 years old), with positive margins occurring in 35% of cases. Younger patients experienced higher rates of recurrence (29.6%), reconstruction (18.18%), and complications (19%). When analyzed by age, we found no significant difference between younger and older pediatric patient complication rates (21% vs 17%, p = 0.675), the likelihood of positive or negative surgical margin presence (81% vs 100%, p = 0.201), or recurrence rate (23% vs 42%, p = 0.154). No significant difference was calculated in the recurrence rates experienced between patients with positive or negative surgical margins (31% vs 42%, p = 0.299).
Conclusion:
DT recurrence rate seems to not be associated with age. Furthermore, no significant correlation was identified between margin status and desmoid-tumor recurrence.

Objectives

Objectives: 1. Participants will gain an understanding of pediatric head and neck desmoid tumors and their location of predominance. 2. Participants will gain an understanding of the intervention and management of pediatric head and neck desmoid tumors and be able to consider recurrence and complications in treatment options. 3. Participants will understand how age is correlated with recurrence and complications when treating pediatric desmoid tumors of the head and neck based on our systematic review.

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Perinatal features of metopic craniosynostoses in Finland 1987-2010. Population-based study.

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Iina Elfving


Pia Vuola


Mika Gissler


Arja Heliovaara

Abstract

Background

Craniosynostoses are known to complicate the delivery, since the open sutures allow molding of the head. The aim of our study is to investigate the rate of caesarean sections and other perinatal features in children born with metopic craniosynostosis (MS).

Methods

Data of births with MS in 1987-2010 were collected from the nation-wide registers of Finnish Institute for Health and Welfare: the Register of Congenital Malformations, the Medical Birth Register, and the Hospital Discharge Register. We checked the individual records to confirm the MS diagnosis. We found 80 patients with MS and compared their Medical Birth Register data with the data of all Finnish newborns in 2010 (61 372 births).

Results

Out of 80 MS patients, 71.3% were boys (in general population 51.4%, p<0,0001). Mean birth weight was 3243 g (3485 g in general population). Nine of the 80 MS patients were twins and two pairs of twins both had MS. Rate of twins was significantly higher in MS group than in general population (11.3% vs 3.0%, p<0.0001). The rate of caesarean sections was 27.5%, which is significantly higher than in general population (16.3%, p=0.005). The rate of planned c-sections in MS group did not differ from general population (8.75% vs 6.4%, p=0.368), whereas urgent/emergency c-sections were more common in MS group (18.75% vs 9.9%, p=0.007). The rate of assisted vaginal births was alike between the groups (10%vs 8.7%, p=0.209). There were no stillbirths, three children needed resuscitation of which two were twins.

Conclusions

Metopic synostosis was significantly more common in boys and twins. The rate of urgent or emergency c-sections is significantly higher in metopic synostosis group than in general population. We found similar result in our previous study in patients with sagittal synostosis. The diagnostics of craniosynostoses during pregnancy should be improved especially in multiple pregnancies.

Objectives

Participants will understand why diagnostics of craniosynostoses is important during pregnancy. They also will understand what complications undiagnosted metopic synostosis causes in delivery. Participants will know when to pay extra attention to search of possible craniosynostosis in pregnancy controls.

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Billing Practices in Pediatric Fronto-orbital Advancement Surgery: Review of National Billing Database

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Abstract
BACKGROUND: Fronto-orbital advancements (FOA) for craniosynostosis is the gold-standard of treatment to prevent future neurological deficits from restricted calvaria growth. Due to many centers operating in isolation, FOA surgery techniques have limited analysis completed on a national level. This retrospective analysis aims to use a multicenter billing database with more recent data to identify the current demographics of patients undergoing FOA and indirectly analyze the surgeries concurrently done with FOAs though CPT code analysis.
METHODS: Consecutive patients needing forehead advancement between 2010 and 2020 were identified from a PearldiverTM, a national deidentified aggregate database. Patients were eligible for inclusion if they underwent operative treatment of a FOA and were billed with CPT-21175 between the ages 0 and 16 years old. Craniosynostosis descriptions and procedure types were queried using identified CPT codes.
RESULTS: A total of 1,905 patients between 0 to 5 years old and 121 patients between 6 to 16 years old were identified to have undergone FOA based on CPT-21175. In both groups, the most common procedure codes billed were for bifrontal bone flap craniectomy; multiple cranial suture recontouring with bone autograft; and muscle, myocutaneous, or fasciocutaneous flap. In the younger age group, 45.29% of patients recontoured with autografts and were more likely to have single cranial suture craniectomies than the older patients. More older patients statistically were billed for a procedure using an allograft.
CONCLUSION: FOAs are more likely to be concurrently billed with bifrontal bone flap craniectomy and recontouring with bone autografts. Awareness of FOA treatment trends may help surgeons standardize surgical approaches to FOA and better treat patients whose gold-standard therapy is surgical intervention.

Objectives

Participants will be able to: (1) Evaluate pediatric patients needing fronto-orbital advancements for craniosynostosis (2) Direct attention to the diversity of how fronto-orbital advancements are completed (3) Lead the field in standardizing fronto-orbital advancement surgeries for craniosynostoses

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Orbital and Eyelid Characteristics, Strabismus Severity, and Intracranial Pressure Control in Children with Apert Syndrome Treated by Early Endoscopic Strip Craniectomy versus by Fronto-Orbital Advancement

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Mark Proctor


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Sanjay Prabhu


Melissa Kanack


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Abstract

Background: Apert syndrome is characterized by eyelid dysmorphology, V-pattern strabismus, extraocular muscle excyclorotation and elevated intracranial pressure (ICP). We compare eyelid characteristics, severity of V-pattern strabismus, rectus muscle excyclorotation and ICP control in Apert syndrome patients initially treated by endoscopic strip craniectomy (ESC) at about 4 months of age, versus fronto-orbital advancement (FOA) performed at about 1 year of age.

Methods: Twenty-five patients treated at Boston Children's Hospital met inclusion criteria for this retrospective cohort study. Primary outcomes were magnitude of palpebral fissure downslanting at 1, 3, and 5 years of age, severity of V-pattern strabismus, rectus muscle excyclorotation, and interventions to control ICP.

Results: Prior to craniofacial repair and through 1 year of age, none of the studied parameters differed for FOA versus ESC treated patients. Palpebral fissure downslanting became statistically greater for those treated by FOA by 3 ($p < 0.001$) and 5 years of age ($p = 0.001$). Likewise, severity of palpebral fissure downslanting correlated with severity of V-pattern strabismus at 3 ($p = 0.004$) and 5 ($p = 0.002$) years of age. Palpebral fissure downslanting and rectus muscle excyclorotation were typically coexistent ($p = 0.053$). Secondary interventions to control ICP were required in 4/14 patients treated by ESC (primarily FOA) and in 2 /11 patients initially treated by FOA (primarily 3rd ventriculostomy) ($p = 0.661$).

Conclusions: Apert patients initially treated by ESC had less severe palpebral fissure downslanting and V-pattern strabismus, normalizing their appearance. Thirty percent initially treated by ESC required secondary FOA to control ICP.

Objectives

(1) Participants will see the evolution of eyelid morphology in Apert syndrome patients initially treated by fronto-orbital advancement versus by endoscopic strip craniectomy and orthosis. (2) Participants will learn about the relationship between downslanting of the eyelids and severity of strabismus in the Apert syndrome population. (3) Participants will better understand challenges in intracranial pressure control in Apert syndrome patients treated by both endoscopic strip craniectomy and by fronto-orbital advancement.

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THE RATE OF CESAREAN SECTION IS INCREASED IN BIRTHS OF CHILDREN WITH SAGITTAL SYNOSTOSIS - A POPULATION- BASED STUDY

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Iina Elfving


Arja Heliovaara


Mika Gissler


Pia Vuola

Abstract

Background

The calvarial sutures allow molding of the head during the delivery. Premature ossification of a suture, craniosynostosis, can complicate the delivery. The aim of this study is to evaluate perinatal features and the rate of cesarean section and assisted vaginal delivery in children with sagittal synostosis (SS).

Methods

Births with non-syndromic SS in 1987–2010 were collected from the nation-wide registers maintained by the Finnish Institute for Health and Welfare: the Register of Congenital Malformations, the Medical Birth Register, the Hospital Care Register and from the Cause of Death data, Statistics Finland. The SS diagnosis was confirmed from the individual medical records. Data for 568 patients with SS were extracted from the registers. The Medical Birth Register data of all cases were evaluated and compared with the official statistics of Finnish newborns (2010, 61 372 births).

Results

There was no perinatal mortality (deaths under the age of seven days). Infant mortality (deaths under the age of one year) was 2/568, both postoperative. The birth data of 539 patients whose diagnosis was confirmed were more closely studied. 147 had a cesarean section (27.3%) which was significantly higher rate than in general population (16.3%, $p<0.0001$), including planned c-sections 10.4% (6.4%, $p<0.0001$), and urgent/emergency c-sections 16.9% (9.9% $p<0.0001$). 41 patients had an assisted vaginal delivery (7.6%) with vacuum extractor, forceps or a breech delivery. Assisted vaginal delivery was more common in the general population (9.4%. $p=0.155$). Six children were resuscitated (5 c-sections, 1 vacuum extraction). In addition, 20 children in SS group suffered from asphyxia (11 were c-sections, 6 were vacuum extractions).

Conclusion

The cesarean section rate was significantly higher in sagittal synostosis group compared to the general population and was associated with serious complications. Diagnostics of sagittal synostosis during pregnancy should be improved and the deliveries should be planned individually.

Objectives

Participants will understand how sagittal synostosis (SS) can complicate the delivery. They will know what to tell families about the risks associated with delivery if baby is diagnosed with SS. They will know that SS delivery needs individual planning.

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Minimally invasive paediatric craniofacial surgery – a new anaesthetic paradigm?

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Abstract
Background: Minimally invasive surgical techniques for the treatment of craniosynostosis is becoming increasingly common due to favourable surgical outcomes of shorter procedure time, reduced length of stay and lower estimated blood loss. This transition away from major cranial vault remodelling has resulted in an increase in the number of infants having treatment for craniosynostosis. Anaesthetic complications are known to be greater in younger children. This transition to a new younger patient cohort having different procedures has presented new challenges for craniofacial anaesthetists. We present the anaesthetic experience of a major craniofacial centre.
Methods: A prospective observational cohort study. The study is registered as a service evaluation, registration number 3457, formal ethical approval was waived. All patients undergoing elective minimally invasive craniofacial surgery at Great Ormond Street Hospital, London, UK over the period of 12 months are eligible for study participation. Demographic, anaesthetic, laboratory, surgical and transfusion data is being collected.
Results: Interim results from 19 patients (12 males, 9 female) have been analysed. Median (IQR) operative patient age was 5 (1.25) months. 11 patients underwent endoscopic strip craniectomy, 8 underwent spring cranioplasty. Following minimally invasive surgery, mean (SD) base deficit increased from 2.79 (1.48) to 3.57 (1.90). Mean (SD) lactate increased from 0.92 (0.28) to 1.58 (0.92). Four patients, all having endoscopic strip craniectomy, required intraoperative blood transfusion (ranging 9-21mls/kg). No patients required blood transfusion post-operatively. All patients were discharged on the day following surgery. No major anaesthetic incidents were reported.
Conclusions: Early trends from this study show performing minimally invasive paediatric craniofacial surgery in a specialist paediatric centre, with a dedicated craniofacial anaesthetic team can reduce the risk of anaesthetic complications in a potentially high risk patient group.

Objectives

1) Understand the anaesthetic challenges of minimally invasive craniofacial surgery. 2) Review the experience of a dedicated craniofacial anaesthetic team undertaking minimally invasive craniofacial surgery. 3) Understand the care pathway for patients referred for minimally invasive craniofacial surgery at a major paediatric craniofacial centre.

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Preliminary observation of free autologous fat transplantation(AFT) in the treatment of mild to moderate hemifacial microsomia(HFM) in children

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Xinhai Ye

Abstract

Background: Hemifacial microsomia(HFM) generally deals with the facial soft tissues, including subcutaneous tissue, muscle, parotid gland, and even nerves. Currently, there are flap transplantation, the AFT and synthetic substitute material transplantation for soft tissue treatment, among which the AFT has become a popular method. However, the AFT for children with HFM still has many controversies. '
Objective: To observe the clinical effect of AFT in correction of mild to moderate HFM in children
Material and Methods: A total of 48 children with mild to moderate HFM, ranging in age from 5.3 to 14.6 years old, with an average age of 8.1 years old, were admitted from April, 2018 to April, 2022. Surgical approaches: fat was aspirated by negative pressure in the inner thighs bilaterally, then small fat particles were extracted after static settlements and stratification. After that, these were injected to the defect area by three different directions, with an average volume of 45.0ml for each patient, and then gentle massage followed by pressure dressing for 1 day. Postoperatively, the scale evaluation for facial appearance is divided into four stages, excellent, good, medium, poor , respectively.
Results: the wound healing of the all cases was good, without infection and induration occurred, and has not any complications occurred in the donor site. After 3-6 months of follow-up, there were excellent rehabilitation for 28 cases, good for 14 cases, medium for 4 cases, and poor for 2 cases, and there were of 95.8% cases with efficiency and 87.5% cases with satisfaction.
Conclusion: the AFT is effective in the treatment of mild to moderate HFM, which can be maintained relatively stable in a period of time. However, as the children developing along with the disease progression, the deformity to be reappeared, so multiple AFT are considered necessary.

Objectives

soft tissue reconstruction in the mild to moderate hemifacial microsomia

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Clinical Analysis of Le Fort Ⅲ Osteotomy Distraction for Obstructive Sleep Apnea in Children with Syndromic Craniosynostosis

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Yue Liy

Abstract

Objective: This study evaluated the three-dimensional changes in the airway after the mid-face advance through Le Fort Ⅲ osteotomy distraction and compared it with PSG results to guide clinical and future studies.
Methods: A total of 21 children having syndromic craniosynostosis with OSAS were treated in the Department Oral and Maxillofacial Surgery of XX Hospital from October 2017 to October 2022. The imaging CT data of patients before surgery (T0), three months after surgery (T1), and one year after surgery (T2) were progressed in 2D and 3D measurements, to have the main results of PSG in different periods compared. The position change was assessed by comparing different phases for each measurement item. SPSS 26.0 was used for the paired T-test, and $P<0.05$ was considered as significant difference. And study the related factors of improving sleep breathing results though Pearson correlation analysis.
Results: 21 children with syndromic craniosynostosis were treated effectively. Three months after surgery, each two-dimensional measurement index and three-dimensional volume (nasopharynx, palatopharynx, oropharynx airway) had significant differences. Three months after surgery, PSG-related indexes AHI, average SpO2 level, minimum SpO2 level, 3% oxygen hypoxia index were obviously improved. One year after surgery, imaging measurements and PSG re-examination showed good stability.
Conclusion: Le Fort Ⅲ osteotomy traction can cause changes in nasopharynx, palatopharynx and oropharynx upper respiratory tract. Effective improvement in sleep apnea was achieved by traction osteogenesis at Le Fort Ⅲ and it was stable within one year after surgery.

Objectives

Syndromic craniosynostosis, Le Fort Ⅲ osteotomy distraction, OSAS

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The Spectrum of Severity in 368 Patients with Metopic Craniosynostosis: An Update to the CranioRate™ Machine Learning Algorithm

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Abstract

Introduction:
CranioRate™ is a publicly available, point-of-care analysis tool which utilizes machine learning to quantify morphologic severity in patients with metopic craniosynostosis. Here, we present a detailed examination of a large cohort of imaging samples to understand the spectrum of severity and to quantify drivers of clinically appreciable severity in metopic craniosynostosis.

Methods:
The CranioRate™ machine learning algorithm provides two objective, holistic metrics for quantifying severity in metopic craniosynostosis: Metopic Severity Score (MSS) and Cranial Morphology Deviation (CMD). De-identified CTs from normal and metopic patients from multiple institutions across the U.S. were compiled and analyzed using descriptive statistics, demographic associations, and regression analyses.

Results:
A total of 460 CT scans (92 normal patients, 368 metopic patients) from five institutions across the U.S. were uploaded to CranioRate™. Average age at CT was 0.75 ± 0.51 years, and 74.0% of patients were male. Among normal controls, average MSS was 0.00 ± 1.04, and average CMD was 85.23 ± 19.32. Among metopic patients, MSS averaged 5.02 ± 2.41, and CMD averaged 192.20 ± 44.62. Both MSS and CMD were significantly different between control and metopic patients ($p<0.0001$); no severity differences were noted between centers ($p>0.05$). There was a positive correlation between severity and earlier age at CT (MSS: $r= 0.0043\pm0.00037$, $p<0.0001$; CMD: 0.2676 ± 0.02667, $p<0.0001$). Regression analysis identified the central frontal bone, lateral orbit, and supraorbital rim as the regions most associated with severity differences ($p<0.05$).

Conclusion:
Our results are the first to objectively derive the regions of the skull most associated with phenotypic severity in metopic craniosynostosis and to establish a temporal relationship between severity and patient presentation. As we collate more scans from across the U.S., we hope to approximate the full spectrum of severity among the broader population of metopic patients.

Objectives

1) Participants will be able to view the spectrum of severity in metopic craniosynostosis. 2) Participants will understand the relationship between phenotypic severity and age at presentation in metopic craniosynostosis. 3) Participants will learn which areas of the craniofacial skeleton are most associated with phenotypic severity in metopic craniosynostosis.

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Multidisciplinary treatment of a complex pediatric dermatofibrosarcoma protuberans of the scalp

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Eugene Zheng

Abstract

Background

Often thought of as a locally destructive cutaneous tumor with frequent recurrence, dermatofibrosarcoma protuberans (DFSP) has shown the potential to involve underlying bone and extend intracranially. Therefore, a DFSP located on the scalp requires special consideration of neighboring anatomy during excision and reconstruction. We present a case of a pediatric scalp DFSP that underwent a successful multidisciplinary, single-stage resection and reconstruction involving Mohs surgery, Neurosurgery, and Plastic Surgery.

Method/Description

A six-year-old girl presented with vertex midline DFSP measuring 4.4 cm x 5.5 cm in size. Advanced imaging showed underlying bone thinning without any bony defects. Given the location over the sagittal sinus and potential calvarium involvement, a multidisciplinary team of a Mohs microsurgeon, neurosurgeon, and plastic surgeon was formed.

Peripheral skin margins were first cleared by the Mohs team. Biopsies of the underlying pericranium showed tumor infiltration which lead to the decision to proceed with craniectomy. The resulting bone defect was 8.0 x 11.0 cm, and the skin defect was 5.5 x 7.3 cm. Both centered on the vertex overlying the sagittal venous sinus. The reconstruction then proceeded with a titanium cranioplasty. Soft tissue reconstruction through a combination of local tissue rearrangement, subgaleal scoring, and intraoperative tissue expansion.

Results

The patient progressed without complications. She was discharged on post op day four. Pathology confirmed the diagnosis of DFSP with pericranial invasion. The patient remained disease-free at her 19-month follow up visit.

Conclusions

The formation of a multidisciplinary team to treat a pediatric scalp DFSP with potential calvarial invasion allowed for a single-stage resection of the soft tissue and calvarial disease. The high degree of certainty in margin clearance allows immediate calvarial and soft tissue reconstruction and negated the need for a second surgery.

Objectives

1. Understand the special considerations that lead to the formation of the multidisciplinary team - type of lesion, location of the lesion, preoperative imaging showing bone thinning 2. Understand the benefit of a multidisciplinary team in providing full insurance of margin clearance allowing for single stage reconstruction 3. Understand the clinical decision making for craniectomy and modality of hard and soft tissue reconstruction

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Challenges of Establishing A Craniofacial MDT From Scratch In A Developing Country : Borneo Experience

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Prabu Rau Sriram

Abstract

Background :
Craniofacial anomalies comes with a significant functional, aesthetic, and social consequences to the patient. A patient centered multidisciplinary care is paramount to deliver the best treatment. Establishing this MDT in Borneo where craniofacial surgery was not offered prior to that was a huge challenge but not impossible.

Methods :
We have established our Craniofacial MDT in 2018 being supported by various disciplines. We have went through all the documentations of the MDT from 2018 till 2023 and listed down the setbacks that we have come across and how we overcome it in subsequent MDT. Patients and parents feedback were also listed as drawbacks. Literature search was done to identify similar challenges in another centre.

Results :
Various challenges and complaints were received since the establishment of our MDT. As we have successfully overcome most of them, some of them still remain despite every effort has been taken to solve them. We discuss all of them in this article. One of the key solutions we have taken is converting from MDT meeting to MDT clinic. The success of the team is seen after 5 years where various craniofacial procedures from minor to complex has been carried out successfully.

Conclusion :
Establishing a brand new craniofacial centre might seem to be like an impossible task, but it is achievable with a great multidisciplinary team dynamics. The Borneo experience should be an inspiring guidance and motivational to the new centres aspiring to establish a Craniofacial Unit.

Objectives

Participant will be able to organise and build a craniofacial unit from scratch To understand the challenges of craniofacial unit in developing country with scarce resources As a model for new craniofacial unit with limited resources to understand the difference in patient and care dynamics between developed & developing countries.

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Evolution of The Craniometrics After Posterior Cranial Vault Distraction Osteogenesis : Case Control Study of Two-Year Outcomes

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Abstract

Background: The main goals in treatment of syndromic craniosynostosis are correction of skull dysmorphology, normalizing cranial growth and prevention of intracranial hypertension. Posterior vault distraction osteogenesis (PVDO) is the initial surgical step for treatment. We aim to quantify the posterior volume expansion and investigate effects of clinical and surgical variables.

Methods: Patients who underwent PVDO were reviewed for clinical and imaging data. CT images at immediately after PVDO (t1), at device removal (t2) and at 2-year postop (t3) were analyzed using custom scripts to calculate posterior vault volumes. Student's t-test and multivariate linear regression were employed to investigate the effect of diagnosis, age at surgery and distraction vector angle on volume expansion.

Results: Thirty patients with t1 and t2 imaging were included, of whom 28 had t3 scans available. Average age at PVDO was 1.09 years ± 1.25 years (IQR 0.59-1.00 years). Distraction vector angle ranged from -21 degrees to +30 degrees with an average of 0 degrees. Posterior volume increased by %28 on average from t1 to t2, and %52 by t2. Complex syndromic cases (Apert, Pfeiffer, Crouzon) achieved higher volume expansions (33% by t1 and 60% by t2) compared to others (24% by t1 and 46% by t2) but differences were not significance, p=0.06 and p=0.14, respectively. Volume increase was not correlated by the age at surgery (p=0.65) or the angle of the distraction vector (p=0.51). Four patients had shunts in place for hydrocephalus and did not require any shunt revisions following PVDO.

Conclusions: PVDO achieves significant volume expansion regardless of timing of surgery, angle of distraction vector and number of internal distractors. It is safe and effective in variety of clinical entities both in syndromic and non-syndromic patients. This study supports that PVDO protocol is also safe for patients with intracranial shunts due to hydrocephalus.

Objectives

- Summarize the posterior vault distraction procedure -Discuss the clinical benefits of PVDO in syndromic patients -Learn the craniometric changes with PVDO depending on the timing of surgery, distraction vector and presence of intracranial shunts

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Can Computational Anthropometry Distinguish Metopic Ridge from Metopic Synostosis?

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Ezgi Mercan


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Abstract
BACKGROUND: The diagnosis of metopic craniosynostosis can be challenging to make, due to the physiologic closure of the metopic suture early in infancy. Therefore, at our center, the decision to intervene surgically is made by a subjective team assessment of head shape. Comparing surgical outcomes between centers is complicated by the spectrum of phenotypic severity as well as the need to distinguish true synostosis from an isolated metopic ridge, which is a non-operative condition. We summarize our team's decision-making for all patients referred for trigonocephaly with objective computational measurements to determine which measure could be used to compare decision-making between centers.
METHODS: Consecutive patients referred for trigonocephaly between 2011 and 2021 were reviewed. CT images were annotated to calculate inter-dacryon distance (IDD), endocranial angle (ECA), inter-frontal angle (IFA), metopic index (MI) and metopic severity index (MSI). Area under the receiver-operator characteristics (AUC) was used to compare measurements to distinguish metopic synostosis and metopic ridge cases.
RESULTS: Four hundred thirty-three patients were included, of whom 110 (25%) underwent surgical correction. Of the 323 non-operative cases, 305 (70%) were determined to have metopic ridge, 16 (4%) mild metopic synostosis and 2 (<1%) declined surgery. From the anthropometric measurements, ECA and MSI performed best for separating ridges from metopic cases with AUCs of 0.98 and 0.95, respectively. IFA, MI and IDD did not perform as well, with AUCs of 0.87, 0.75 and 0.73, respectively.
CONCLUSION: Trigonocephaly is a spectrum ranging from metopic ridge to severe metopic synostosis that require surgical intervention. ECA and MSI anthropometric measurements correlated best with our multi-disciplinary team assessment and can be used to compare treatment protocols between centers.

Objectives
1. Clinically distinguish metopic synostosis from metopic ridge 2. Understand five objective CT measures of trigonocephaly 3. Identify which objective measures align best with an interdisciplinary team's subjective differential diagnosis

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Novel Machine Learning Models to Facilitate Objective Clinical Assessment of Facial Form and Deformity

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Abstract

Background: What is a normal face? A fundamental task for the craniofacial surgeon is to answer that question as it pertains to any given individual. We describe here two new machine learning (ML) models that can place the facial appearance of individuals with congenital or acquired deformity numerically along their own continuum of normality, rather than relative to any population norm or archetype. Using these novel ML techniques, we objectively measure facial changes resulting from surgical intervention.

Methods: We employed the StyleGAN generative adversarial network in a transfer learning approach to generate normalized versions of real images of patients affected by various craniofacial anomalies. To quantify the degree of abnormality, we devised two methods: pixelwise subtraction and a notch discriminator. The former generates heatmaps highlighting pixel variation and transforms them into difference scores, while the latter filters conventional facial features and structural noise to isolate anomalous feature maps for comparison. Machine-generated scores were compared to 100 human ratings of normality-abnormality for a set of 100 images depicting various types of facial difference.

Results: Anomaly maps derived from 100 raw/normalized facial image pairs highlighted the abnormal areas of the face in a manner consistent with human visual inspection. The scoring from both pixelwise subtraction and notch discriminator techniques were highly correlated with human ratings of the same images (r of 0.91 and 0.94, respectively). Both these techniques outperformed pre-existing, state-of-the-art image distance measurement models in terms of structural anomaly detection.

Conclusion: These approaches allow for quantification of difference between any raw image and its own counterpart normalized version, providing a useful proxy for the degree of abnormality of any reference face. We advance these new methods with the expectation of delivering a universal and clinically practical standard for the gauging of facial deformity both at baseline and following surgical reconstruction.

Objectives

Learners will become aware of new machine learning models for measuring facial form and deformity. Learners will be exposed to the concept of interpreting any given patient's facial deformity with respect to that patient's own face, rather than vis-a-vis a population norm or archetype. Learners will be exposed to the ideas of pixelwise subtraction and noise discrimination with respect to the processing and analyzing of digital facial images.

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3D Printing of Orbital Floor Stamps: Feasibility and Efficacy in Reconstruction of Orbital Floor Fractures

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Eric Zeng

Abstract
Background: Three-dimensional (3D) printing is widely used in craniofacial surgery to enhance pre-operative planning, surgical precision, and patient outcomes. However, this technology comes with high costs and lengthy turnaround times that hinder its broad application in craniofacial trauma cases. Industry-printed orbital floor implants cost $8,000 on average and require days of production time. We previously innovated a novel approach using in-house 3D printers to create contour models to generate patient-specific orbital floor implants.

Methods: A retrospective cohort study was performed for 14 patients who have undergone orbital floor reconstruction using either in-house or industry-printed 3D models at our institution from 2019 to 2022. Demographic information, perioperative data, and postoperative results were collected. In-house orbital floor 3D stamps were designed using mirrored patient CT scans and printing costs were retrieved from our in-house 3D printing lab.

Results: In-house 3D-printed stamps were used as contour models to press absorbable plates (Sonicweld®, KLS Martin) into patient-specific implants, and associated costs were compared to those for industry-created custom implants. Implants created with the help of in-house 3D printing costed 85% less than industry 3D printing ($998 and $6,701, respectively). In-house 3D printing averaged a turnaround time of 3.5 hours and was quicker than the industry average of several days. There were no significant differences found in complication and re-operation rates.

Conclusions: This new method of in-house 3D printing to treat orbital floor fractures is rapid, low-cost, and as clinically effective as industry 3D-printed implants. Due to its quick turnaround time, this approach contributes unique value in acute trauma settings where patients may require urgent operation. With greater adoption of this technology, we hope that trauma centers can offer more patients access to custom orbital floor implants, shaped to their own individual anatomy.

Objectives
Participants will be able to identify a novel approach in utilizing in-house 3D printers to repair acute orbital floor trauma. Participants will be able to evaluate the cost-benefit of using in-house 3D printers versus industry 3D printers. Participants will be able to analyze the unique application of integrating in-house 3D printing technology into craniofacial trauma centers.

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DESIGN AND MANUFACTURING OF A NOVEL DISTRACTOR FOR UNICORONAL CRANIOSYNOSTOSIS CORRECTION

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Abstract
Background: Extensive reconstructive surgery is required to remodel the skull of babies affected by Unicoronal Craniosynostosis (UC). While Spring Cranioplasty is successfully used in the treatment of sagittal craniosynostosis, a more complex distraction pattern is required for the treatment of UC. In this project, metal Additive Manufacturing (AM) was used to manufacture a novel UC spring-shape distractor.
Methods: UC patients (n=19) with preoperative CT scans were retrieved (age = 1.5 ± 0.4 years). 3D head models were extracted; the average calvarial thickness was obtained and Statistical Shape Modelling (SSM) was used to obtain the mean shape and shape variability of the studied population. The resulting mean shape was then used to simulate surgery by Finite Element Modelling (FEM). Surgical Cuts were designed following expert surgeon recommendation. Design of experiment (DoE) was used to optimize surgical cut location and distraction force. Head shape changes were quantified by measuring the Cranial Vault Asymmetry Index (CVAI). A novel device was designed, consisting in 3 pairs of unit spring cells (i.e. spring-shaped distractors); each spring unit was designed using information on optimal distraction force and free length. The AMed spring unit prototype was manufactured in Nickel-Titanium (NiTi) and characterized. Mechanical testing allowed validation of the design.
Results: SSM resulted in a mean 3D model with a CVAI of 4.17%. DoE allowed to estimate and optimize surgical parameters and localized distraction forces (ranging from 24N to 32N), required to correct the UC shape (CVAI = 1.21%). Experimental NiTi parameters were implemented in the spring unit model to simulate distraction. Experimental tests on the AMed spring validated the computational model.
Conclusions: In this work a design process for the development of a novel NiTi AMed spring-shape distractor for UC correction was proposed and validated. Next steps aim to finalize the spring unit design and test in-vitro.

Objectives
Partecipants will learn about numerical modelling of Unicoronal Craniosynostosis correction. Partecipants will learn about statistical shape modelling applied to a Unicoronal Craniosynostosis patient population. Partecipants will learn about the potential of shape memory alloys to design and manufacture novel distractors.

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A US National Review of Crowdsourcing for Plagiocephaly Helmets

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Abstract
Background: Custom helmet therapy is a common treatment for skull deformities, such as plagiocephaly. When not covered by insurance, these helmets can lead to significant financial burdens, pushing some families towards crowdsourcing. To date, no studies have investigated US-based GoFundMe campaigns for helmet therapy.
Methods: Campaign data, including demographics, story themes, and unique characteristics, were analyzed by two independent reviewers. Logistic regression was used to determine each variable's impact on success, defined as attaining ≥75% of a campaign's goal. Statistical significance was set at p≤0.05.
Results: Overall, 413 campaigns from 2011 to 2022 were analyzed with an average raised 71% (range: 0%-206%), donated $2,005 (range: $0-$7,799), and requested $3,151 (range: $160-$30,000). In all, 228 (54%) achieved success, 167 (40%) met their goal, and 35 (8%) raised no funds. In total, campaigns raised $828,256 of a requested $1,301,317.
Factors positively influencing success were military affiliation (OR=2.480, p=0.008), providing multiple images (OR= 1.764, p=0.005), including a quoted cost (OR=2.090, p<.001), providing campaign updates (OR=1.070, p=0.042), indicating a sense of urgency (OR=1.540, p=0.036), indicating a torticollis diagnosis (OR=1.560, p=0.043), and mentioning possible complications without treatment (OR=1.803, p=0.004).
Factors negatively influencing success were raising additional funds for physical therapy (OR=0.359, p=0.029), unrelated medical costs (OR=0.339, p=0.009), and multiple helmets for one patient (OR=0.0233, p=0.029).
Racially, Black (OR=0.306, p=0.012) and Hispanic (OR=0.485, p=0.003) campaigns performed worse versus White campaigns.
Regionally, 220 (53.3%) resided in the South, 76 (18.4%) in the West, 52 (12.6%) were anonymous or territory-based, and 42 (10.2%) in the Midwest. Campaigns in the Midwest (OR=2.356, p=0.017) and Northeast (OR=5.016, p=0.004) performed better versus Southern campaigns. Northeastern campaigns performed better versus Western (OR=3.272, p=0.047) and anonymous/territory-based campaigns (OR=4.071, p=0.023).
Conclusion: For those suffering from financial burdens from helmet therapy, this study may help navigate some unknowns of crowdsourcing.

Objectives
1)Participants will be better able to advise families on how to use successfully utilize crowdsourcing to cover financial burdens associated with helmet therapy. 2)Participants will understand various factors that positively influence crowdsourcing campaigns for helmet therapy. 3)Participants will understand various factors that negatively influence crowdsourcing campaigns for helmet therapy.

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A Novel Algorithm for Pediatric Microsurgical Maxillary and Mandibular Reconstruction Using Custom Endoprosthesis

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Abstract

Background: Treatment of pediatric maxillary and mandibular tumors can cause significant post-resection disfiguration and masticatory dysfunction.This study evaluates reconstructive outcomes of custom endoprosthesis (CE) compared to stock reconstructions and introduces an algorithm using CE to optimize available free tissue transfer.

Methods: An IRB-approved retrospective review of all patients undergoing maxillary or mandibular reconstruction from 2016 and 2022 was performed. Variables including demographics, pathologic diagnosis, volume of resection, hardware exposure/failure, complications and revisions were compared based on reconstruction type. Patients undergoing mandibular or maxillary reconstruction were analyzed separately.

Results: During the study period, 51 patients (37 mandible, 14 maxilla) underwent CE/stock reconstruction combined with osteocutaneous, fasciocutaneous, and axial patterned local flaps. 37.2% (n=19) of patients received CE. Overall, the rates of hardware failure and exposure were 25.5% (n=13) and 27.5% (n=14), respectively. Of patients undergoing mandibular reconstruction there were significantly lower rates of hardware exposure (14.3% vs. 47.8%, p=0.018), failure (7.1% vs. 43.5%, p=0.048), major complications (28.6% vs 78.2%, p=0.008), and revisions (11.1% vs 50.0% , p=0.002) in the CE cohort compared to the stock reconstruction cohort. The rates of hardware failure, hardware exposure, major complications and revisions did not significantly differ in maxillary

reconstructions. However, CE reconstructed significantly larger defects (179.5 cm^3 vs 74.6 cm^3, p = 0.020) than stock reconstructions. The average follow up time was 1.90 ± 1.80 years.
Conclusion: Pediatric maxillary and mandibular masses present a reconstructive challenge that could benefit from CE with free tissue transfer, optimizing the reconstructive ladder. Deviating from stock reconstructions, we propose an algorithm considering anatomical location, extent of resection, and patient age for free tissue selection. This algorithm yielded improved mandibular reconstructive outcomes and insignificant differences in maxillary reconstruction despite larger resection defects. Overall, incorporating CE into pediatric maxillary and mandibular reconstruction may facilitate improved form and function in pediatric patients.

Objectives

1. Participants will be able to articulate the benefits and limitations of custom endoprostheses in maxillary and mandibular reconstruction. 2. Participants will utilize patient age to determine when osteocutaneous flaps can be combined with custom endoprostheses in the pediatric population. 3. Participants will be able to utilize a novel algorithm to select the optimal microsurgical reconstruction types based on the extent of the tumor resection defect and patient age.

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All Monoblocs are equal, but some Monoblocs are more equal than others.Correlating indications and results of RED-monobloc surgery with age at operation; a review of 91 consecutive cases

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Abstract

Background

The transcranial monobloc incorporating Rigid External Distraction (RED) can address raised intracranial pressure, corneal exposure/exorbitism, airway obstruction and appearance-related concerns but exposes patients to the risk of CSF-leakage and ascending infection.

The aim of this study was, by relating its outcomes (benefits and complications) to its indications, their urgency and age at surgery, to provide a more realistic view of the procedure than that obtained from reports of its overall results.

Methods

A retrospective study of consecutive RED-monoblocs performed between January 2005 and December 2022. Patients were divided into 0-3; 4-9; 10-15; 16+ years age groups and surgical indications (raised ICP; Eye protection; Airway; Appearance change), outcomes and complications recorded for each. Complications were graded by severity from I – IV using the Oxford scale. Outcomes broadly defined as Improved, No change and Worse for each surgical indication.

Results

91 patients were enrolled. Diagnoses: 84 Crouzon/Pfeiffer; 4 Apert; 3 others. Ages at surgery: 23 Group I; 26 Group II; 30 Group III; 13 Group IV.

Indications varied according to age at surgery: 72% of Group I were for eye protection; 70% of Groups III and 69% IV for appearance change. Mean grade of complications were higher in group I (1.26 Vs 0.84, 0.9 and 0.8) and complications were significantly higher in a younger age group (Standard T test, $p = 0.05$).

Conclusion

These results demonstrate why outcomes following urgent RED-monobloc surgery for an eighteen-month-old with threatened corneas cannot be realistically compared to those following the same operation performed electively for appearance change in a fifteen-year-old.

Age at surgery, its urgency and its indications must be considered when results from the transcranial RED-monobloc are compared with those from alternative Subcranial approaches.

Objectives

1. Describe technique of monobloc procedure 2. Describe age related complications 3. Describe learning experience and risk statefying

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Facial Bipartition Surgery with Rigid External Distraction: benefits and complications in 41 consecutive cases

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Abstract

Background

While the monobloc fronto-facial advance with Rigid External Distraction (RED) can address raised intracranial pressure, corneal exposure/exorbitism, airway obstruction and some appearance-related concerns, additional facial bipartition deals also with the hypotelorism, central maxillary retrusion and lateral/downward orbital slant typical of Apert syndrome. Disadvantages include an extra element of complexity and potentially greater exposure to complications including CSF-leakage and ascending infection.
The aim of this study was to examine its benefits and risks to provide an overview with which alternative approaches can be compared.

Methods

A retrospective study of consecutive RED-frame bipartitions performed between January 2005 and December 2022. Patients were divided into year groups 0-3; 4-9; 10-15; 16+ years. Indications for surgery, outcomes and complications were recorded. Complications graded from I – IV (III & IV involving threatened or actual neuro/ophthalmic injury). Outcomes defined as Improved, No change and Worse for each surgical indication.

Results

Patients enrolled: 41. Diagnoses: Apert 39; Pfeiffer 1; Midface Hypoplasia 1. Ages at surgery: Group I: 3; Group II: 5; Group III: 22; Group IV: 11.
Indications varied with age at surgery: from 100% of Group I for eye protection to 91% Group IV for appearance change. Mean hospital stay: xxx/365.
1 patient had a worse outcome. Improvement (patient and family satisfied with appearance change, for example): 40/41.
Overall complications by age group: Group I: 14; Group II: 8; Group III: 52; Group IV:35. CSF leaks: 5. Overall complications highest in Group III and severe (Grades III & IV) complications in Groups III & IV (neither reaching statistical significance.) No deaths.

Conclusion

This study sets out the benefits (gratifying reduction in facial stigmata of Apert syndrome) and complications of RED-frame bipartition with which alternative, subcranial approaches can be compared.

Objectives

1. Participants will be able to describe technique used for facial bipartition 2. Participants will be able to describe rate of common complications 3. Participants will be able to apply these complications to age groups

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Two-stage treatment strategy for Hemifacial Microsomia Type II: Prior ramus distraction followed by maxillomandibular osteotomy and fat grafting

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Masanobu Yamashita


Fumiya Kinoshita


Kenichi Shimada

Abstract

Background: Hemifacial microsomia (HFM) is a congenital condition affecting the growth of the facial skeleton. Various treatment strategies have been described for HFM, but there is no consensus on the optimal approach. Here, we report a two-stage treatment strategy for HFM Pruzansky type II.
Methods: Surgical intervention is planned after skeletal maturity. The first stage involves distraction osteogenesis (DOG) of the mandibular ramus on the affected side. An osteotomy is performed intraorally, and an internal distraction device is placed. Distraction is initiated after a one-week latency period at a rate of 1 mm per day, twice a day. After completion of distraction, a 3-month consolidation period is observed. A bite splint is not used during the consolidation. In the second stage, the distraction device is removed, and a maxillary Le Fort I osteotomy, sagittal osteotomy of the contralateral mandibular ramus, and fat grafting are performed.
Results: Two patients with HFM type II underwent the two-stage treatment. Both patients were 18-year-old males with right-side HFM. The DOG of the mandibular ramus was 25 mm in both cases, followed by upper and lower jaw osteotomy and fat grafting. Both patients achieved normal occlusion without tilt and improved facial symmetry.
Conclusions: We present a two-stage treatment strategy for HFM type II, which allows for sufficient bone formation in the mandibular ramus and a stable occlusal position without relapse. This approach also yields improved facial symmetry through simultaneous fat grafting.

Objectives

Understanding the pathogenesis of hemifacial microsomia. Learning about the DOG of the mandibular ramus. Comparing with repeated DOG methods.

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Pediatric Craniofacial Quality Improvement Rounds: A Combined Multi-Disciplinary Australian and New Zealand Initiative

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David Moon


Damian Marucci


Michael Rtshiladze


Christopher Forrest

Abstract
Background: Quality Improvement (QI) is the collaboration of physicians, health care providers, patients, administrators and policy makers to make changes leading to improved patient outcomes and experiences with better system performance. As the result of the recent pandemic, irregularity and disruption to national and in person, meeting schedules, remote meeting access has become an integral component of care and provided a unique opportunity for enhanced communication and interaction. In 2022, the Pediatric Craniofacial QI rounds were established linking the 6 pediatric craniofacial units across Australia and New Zealand. The purpose of these rounds was to create a forum for collaborative discussion, case-sharing, problem solving and consensus around controversial topics such as ICP and craniosynostosis in a multi-disciplinary fashion.
Methods: Using Zoom technology, monthly meetings were established linking members of the 6 pediatric craniofacial units in Australia and New Zealand. Participants included consultants and trainees in plastic surgery, neurosurgery, nursing and ophthalmology. Units were assigned “host” status for each session and the agenda was set by them. Geographic advantage exists with all unit members demonstrating familiarity with each other.
Results: To date, 4 sessions have been held with 26 to 32 participants from plastic surgery, neurosurgery, ophthalmology, orthodontics and nursing. Topics have included complications, use of prophylactic antibiotics in craniofacial surgery, minimal access surgery for craniosynostosis, surgical approach to cloverleaf skull deformity and a survey on increased intracranial pressure (ICP) and craniosynostosis. Response from all units has been highly positive. The results of the ICP survey will be used to demonstrate the advantage of this QI initiative.
Conclusion: This project demonstrates the importance of QI initiatives in pediatric craniofacial surgery and takes advantage of advances in remote meeting technology to create collaboration for consensus and discussion. Learning points will be highlighted.

Objectives
Participants will learn that Quality Improvement in pediatric craniofacial surgery is a collaborative effort to enhance delivery of patient care and improve outcomes. Participants will become aware of the advantages of remote meeting access technology in creating linkages between pediatric craniofacial centres separated by geography. Participants will gain knowledge about the advantages of establishing a QI initiative in gaining consensus on controversial topics in pediatric craniofacial surgery.

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Reconstruction of the Orbit in patients with Neurofibromatosis Type 1 (NF-1)

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Simon Eccles

Abstract
Background
Orbital complications of NF-1 pose a unique challenge addressed combined approaches utilising neurosurgery, craniofacial and oculoplastic surgery. Orbital growth can be significantly affected by NF-1 with increase in orbital volume due to plexiform neurofibroma, sphenoid wing dysplasia with resultant temporal lobe herniation, and consequences of elevated intra-orbital pressure.
Methods
Via a multi-disciplinary approach, at risk patients were identified based on clinical and radiological features. Orbital volume was calculated assessing size discrepancy and increased rate of growth. Multimodal planning developed bespoke 3D printed implants allowing orbital reconstruction to be performed in a staged manner maintain orbital function and optimal orbital growth.
We describe our series of 7 patients who have undergone orbital reconstruction, emphasising principles of patient selection, surgical technique and outcomes (follow up: 2-6 years).
Results
Utilising combined surgical approaches, we have reduced plexiform neurofibroma volumes within the orbit and reconstructed sphenoid wing defects with restoration of orbital form and shape from bespoke 3D implants. Patients were monitored radiographically and clinically including advanced ophthalmic monitoring of intra-ocular pressure, ocular movements and vision. In 6/7 patients, growth rate of reconstructed orbits appear to be consistent with that of the contralateral orbit. There have been no complications to date.
Conclusion
We propose our algorithm for management of the orbital disease in NF-1 and our early results. NF-1 is progressive, with surgery classically reserved to reconstruct an already enlarged orbit with visual compromise. We propose earlier surgery to reduce volume of plexiform neurofibroma to optimise more normal growth and development of the orbit.

Objectives
1. To understand the complexity of orbital neurofibromatosis 2. Have a plan for managing orbital reconstruction 3. Understand there role of 3 D planning in orbital evaluation and implant design

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Planning Chin Height, Width, and Shape in Feminizing Genioplasty: An Anatomical Study

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Abstract
BACKGROUND: This study aims to compare female and male facial skeletal morphology to provide guidance for planning feminizing genioplasty.
METHODS: Dry skulls stored at the Cleveland Museum of Natural History were included for analysis. Sex, age, and ethnicity were documented. Chin height, lower facial height (LFH), chin width, chin projection, chin shape, intergonial width, and interzygomatic width were assessed. Independent-sample t-tests were used to detect significant differences in chin dimensions between groups.
RESULTS: Forty-three male (43.58±12.52-year-old) and 43 female (40.48±12.04-year-old) skulls were included. Within each group, 25 skulls were of African origin and 18 were of European origin. Male chin height (24.44±1.96mm) was greater than females' (chin height: 21.53±2.25mm, $p<0.0001$). Chin height was larger in males, even after normalization to LFH (female: 0.34±0.03; male: 0.35±0.026; $p=0.015$). Females had narrower parasagittal plane chin widths (female: 31.30±2.26mm; male: 33.0±82.12mm; $p=0.0003$), interforaminal chin widths (female: 44.00±2.59mm; male: 45.23±2.72mm; $p=0.0340$), intergonial widths (female: 90.57±5.20mm; male: 97.15±6.85; $p<0.0001$), and interzygomatic widths (female: 123±8.07mm; male: 129.87±6.00mm; $p<0.0001$). After normalizing chin width in the parasagittal plane to intergonial (female: 0.35±0.030; male: 0.34±0.030; $p=0.4382$) and interzygomatic widths (female: 0.25±0.024; male: 0.26±0.021; $p=0.8237$), no significant differences were found. The ratio of interforaminal chin width-to-interzygomatic width was not significantly different between sexes (female: 0.36±0.027; male: 0.35±0.026; $p=0.1503$). The ratio of interforaminal chin width-to-intergonial width was lower in males (female: 0.49±0.034; male: 0.47±0.043; $p=0.024$) due to larger intergonial widths. Chin projection did not differ by sex (male, 75.40±7.96mm; female, 75.63±7.02mm; $p=0.89$). Male chins displayed prominent lateral tubercles, producing a square-shaped chin; female chins were rounded.
CONCLUSIONS: The central component of feminizing genioplasty appears to be correction of chin shape; width reduction is not necessary for most subjects.

Objectives
1) Participants will be able to identify sexually dimorphic facial features that may be addressed with facial feminization surgery, specifically feminizing genioplasty 2) Participants will learn principles for planning feminizing genioplasty based on observed sex-based norms of facial morphology 3) Participants will be able to give guidance to patients regarding the importance of multiple facial feminization procedures (specifically how to alter the chin in concert with other facial features, such as the jaw).

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Examining the Efficacy of Bone-Anchored Maxillary Protraction to Correct Class III Malocclusion in Patients with Clefts: A Case Series

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Elizabeth Danial


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Abstract

Background: Maxillary hypoplasia is associated with several craniofacial anomalies, including cleft lip and palate. Bone-anchored maxillary protraction (BAMP) has potential to correct maxillary hypoplasia. The purpose of this study is to evaluate efficacy of BAMP in advancing the maxilla, to determine whether the effects reduce or eliminate the need for LeFort I procedures, and if the benefits outweigh risks of complications, revisions, and difficulty with compliance.
Methods: This case series included patients who underwent BAMP therapy at a single institution. Demographic information and BAMP therapy characteristics were extracted from patients' charts. All patients included had class III malocclusion and pre-Bollard plate placement and post-Bollard plate removal lateral cephalogram or cone-beam computed tomography imaging. Cephalometric measurements were made using these images. Descriptive statistics were calculated using two-tailed t tests with a significance cutoff of $p<0.05$.
Results: Ten patients were included. The mean age at time of Bollard plate placement was 11.6 years and the mean length of BAMP therapy was 21.2 months. Five patients were compliant with wearing elastics full-time, two patients were not compliant, and three additional patients had variable compliance secondary to plate loosening in the maxilla. Three patients had plate loosening requiring surgical fixation. One patient had a fractured plate in the maxilla. Three patients with good compliance with elastics and no loosening had an average +2.07° increase in SNA. Nine patients had plans for LeFort I surgery following BAMP therapy.
Conclusions: We found a high prevalence of hardware loosening and poor compliance with wearing elastics. One patient with good compliance and no hardware loosening had sufficient maxillary advancement to avoid LeFort I repair. The high complication rate makes the utility of BAMP therapy questionable. To avoid future hardware loosening and fracturing, our institution is creating a new Bollard plate that will have better fixation in the maxilla.

Objectives

1. Participants will be able to identify the complications associated with bone-anchored maxillary protraction. 2. Participants will be able to weigh the risks and benefits of using bone-anchored maxillary protraction to correct maxillary hypoplasia. 3. Participants will be able to counsel patients on the importance of good compliance with wearing elastics to avoid or reduce the need for LeFort I repair.

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Designing the Prolabial Flap in Revisional Bilateral Cleft Lip Surgery: Clinical and Quantitative Analysis of Post-Operative Widening with Longer-Term Follow-Up

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Jeffrey Goldstein

Abstract

BACKGROUND: One of the hallmarks of contemporary primary bilateral cleft lip repair is the emphasis on designing a narrow prolabium due to subsequent growth and stretch. Yet literature is lacking on the growth/stretch of the prolabium segment after total revisional bilateral cleft lip surgery. This information would be critical to decisions made in surgical design. The aim of this study is to present a consecutive series of patients who underwent secondary bilateral cleft lip revision and quantify and characterize the post-operative prolabial changes with follow-up of at least 2 years.
METHODS: 19 consecutive patients were identified retrospectively. All patients were examined, measured, and photographed preoperatively, intraoperatively and postoperatively at 1 month, 3 months, 6 months, 1 year, and then yearly in cleft clinic. Measurements of prolabial width were made cephalically and caudally at the level of Cupid's peak. Chart review and data acquisition was achieved.
RESULTS: The age at time of revision ranged from 3 to 18 years old (mean of 10). Of the 19 patients, 4 were syndromic with 1 other having genetic variants of unknown significance. The indication for revision were overwhelmingly whistle-tip deformities. From immediately postoperative to 1 months postoperative, the prolabium widened 20% cephalically and 23% caudally. From immediately postoperative to 3 months postoperative, the prolabium widened 35% cephalically and 37% caudally. At 6 months postoperative, the widening was 44% cephalically and 44% caudally. At 12 months postoperative, the prolabial widening was 40% cephalically and 41% caudally. At 2 years postoperative, the prolabial widening was 41% cephalically and 48% caudally from the immediate postoperative measurements.
CONCLUSIONS: In secondary bilateral cleft lip revision, the prolabial segment stretches significantly (mean 44%) in the first 6 months postoperatively and then stabilizes. As in primary repair, this widening should be considered when designing your revisional prolabial flap.

Objectives

1. Participants will learn that revisional bilateral cleft surgery will require a narrow prolabial segment at the time of repair. 2. Participants will learn that the prolabium grows and strethes post-operatively 3. Participants will learn how to best design a prolabialreconstruction as a component of cleft surgery

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Studies on preventing unexpected fracture in Le Fort III osteotomy by image-guided technique

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Yue Liu


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Tao Xu


Yi Zhang

Abstract

Background: To investigate the clinical feasibility of preventing unexpected fracture during LeFort III osteotomy by using image-guided technique.

Methods: A prospective study was carried out involving 9 Crouzon syndrome patients (5 males, 4 females, mean age 8.5 years) treated with LeFort III osteotomy and distraction osteogenesis by image-guiding technique in Peking University International Hospital. 12 historical patients (7 males, 5 females, mean age 8.2 years) with similar age and condition of illness who carried out by free hand were chosen as control group. Preoperative CT DICOM data were processed using iPlan system (BrainLab, Munich, Germany). The virtual procedure included three-dimensional reconstruction, data segmentation, virtual osteotomy and midface advancement, and then transferred into the image-guided system (BrainLab, Munich, Germany). Patients' registration was completed by surface-registration protocol according to forehead-orbital-nasal skin surface. The registration accuracy was checked according to upper incisors and eyelid canthi. Intraoperative navigation was used to mark the osteotomy lines on nasion, inferior orbital rim, lateral orbital rim, and posterior maxilla, respectively. A Rigid External Distraction was applied to complete the distraction after surgery. The surgical duration and intraoperative blood loss were recorded. Immediate postoperative CT scan were acquired within 24 hours after surgery to observe the osteotomy lines, distractor location and detect unexpected fracture lines or other intracranial complications such as cerebral hemorrhage, which observed by two distinct experienced doctors. The indicators were analyzed using SPSS software.

Results: The mean operation time was 224 minutes vs 282 minutes, the mean intraoperative blood loss was 345 ml vs 625ml, and unexpected fractures accounted for 33.3% (3/9 cases) vs 75% (9/12 cases). The indicators in test group were significantly lower than control group ($P<0.05$).

Conclusion: Image-guided technique is effective to prevent unexpected fracture in LeFort III osteotomy procedure.

Key words: syndromic craniosynostosis, LeFort III osteotomy, image-guided, surgical navigation, unexpected fracture

Objectives

1、Participants will be able to understand the surgical procedure of Le Fort III osteotomy under the guidance of navigation technique 2、Participants will be able to understand the surgical challenges of the Le Fort III osteotomy 3、Participants will be able to understand that Le Fort III osteotomy with computer-assisted navigation is more effective and safer than traditional techniques, significantly reducing intraoperative blood loss and surgical time, avoiding unexpected fractures and perioperative complications.

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Critical Analysis of Feeding Outcomes After Surgical Intervention for Pierre Robin Sequence

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Jesse Goldstein

Abstract

Background:
Feeding and swallowing dysfunction pose significant morbidity to patients with Pierre Robin Sequence (PRS). Limited literature exists evaluating feeding outcomes after surgical intervention. We present a critical analysis of feeding and swallowing outcomes following mandibular distraction osteogenesis (MDO) or supraglottoplasty in pediatric PRS patients.

Methods:
A retrospective review of PRS patients seen at a single institution from 2010-2016 was conducted. Patients were separated into one of three categories: MDO, supraglottoplasty, and no surgical intervention. Variables included medical and surgical history, pre- and post-intervention modified barium swallow (MBS) studies, and polysomnography data.

Results:
93 patients with PRS (35 female and 58 male) were included in this cohort; 47 (50.5%) underwent MDO, 13 (14.0%) underwent supraglottoplasty, 3 patients underwent both (3.22%), and 30 patients had no surgical intervention. Compared to pre-intervention MBS, post-procedure MBS demonstrated significant improvement in sucking tongue movements (p=0.048) and vallecular space obliteration (p=0.001) in MDO patients. Patients who underwent

supraglottoplasty had significant improvements to laryngeal penetration (p=0.003). Type of procedure did not significantly influence subsequent likelihood of pooling or aspiration. 16.7% of patients who underwent supraglottoplasty were deemed unsafe for oral feeding post-intervention compared to only 6.82% of patients who underwent MDO. The average pre-operative total Apnea-Hypopnea Index (AHI) among patients who underwent any surgical intervention was 23.2 compared to 16.32 among those who did not undergo intervention. When looking at post-operative AHI, there was no significant difference in post-op total AHI among the three groups (p=0.54).

Conclusions:
MDO and supraglottoplasty patients showed improvements in post-procedure MBS. However, patients with PRS who underwent supraglottoplasty had a higher rate of adverse feeding outcomes than those who underwent MDO. These findings support additional research on the benefits of MDO or supraglottoplasty for PRS patients and other adverse outcomes associated with treatment modality.

Objectives

1) Participants will be able to describe differences in surgical treatment modalities available for Pierre Robin Sequence patients. 2) Participants will be able to compare pre-operative characteristics between treatment groups. 3) Participants will be able to explain how surgical treatment modality impacts sleep and speech outcomes in PRS.

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Increased Social Vulnerability is Associated with Non-syndromic Cleft Lip and Palate in the United States—a CDC Vital Statistics Review of 2,876,892 Live Births

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Golddy Saldana

Abstract

INTRODUCTION:
Social determinants of health may be associated with non-syndromic cleft lip with or without palate (CL/P) and cleft palate (CP). Exposing these effects can help target resources and bring awareness to vulnerable populations within the US.

METHODS:
CL/P and CP incidence rates from 2016 - 2020 were extracted from the Centers for Disease Control and Prevention (CDC) Vital Statistics Database and combined with CDC Social Vulnerability Index (SVI) by county. SVI domains reported as percentile rank, including socioeconomic status (SES), minority status and language (MSL), household composition/disability, and housing type/transportation. Multiple linear regressions evaluated the incidence of CL/P and CP as a function of individual and composite SVI domains.

RESULTS:
There were 1,292 CL/P births per 2,876,892 live births (incidence of 0.45/1000 births) and 181 CP births per 690,662 live births (incidence of 0.26/1000 births). For CL/P, the SVI composite index coefficient estimate (CE) was -0.35 (p-value = 0.029), SES CE was -0.24 (p-value = 0.096), MSL CE was -0.43 (p-value = 0.015), and housing type and transportation CE was -0.67 (p-value = 0.003). For CP, the SVI composite index CE was -1.95 (p-value = 0.005), SES CE was -1.39 (p-value = 0.034), and MSL CE was -3.67 (p-value < 0.001), and housing type and transportation CE was -0.98 (p-value = 0.297). Household composition/disability CE were not significant.

CONCLUSION:
Social vulnerability was significantly correlated with increased incidences of non-syndromic CL/P and CP. These indexes can be utilized to direct state and national resources to target these areas of need.

References:
https://journals.lww.com/plasreconsurg/Abstract/2022/01000/Poverty_and_Risk_of_Cleft_Lip_and_Palate__An.28.aspx

Objectives

- Participants will learn about the social determinants of health that may be associated with non-syndromic cleft lip with or without palate and cleft palate. - Participants will be able to evaluate other studies using the CDC Social Vulnerability Index. - Participants will be able to review and critique if their state and national resources are targeting these areas of need.

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True Incidence of Marginal Mandibular Nerve Palsy Following Neonatal Mandibular Distraction Osteogenesis

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Abstract

Introduction:
In children with PRS, MDO is routinely performed to alleviate airway obstruction; however, it involves risk of injury to the MMN. We hypothesize that MMN palsy incidence following MDO, reported at 1-15%, is underestimated. This study investigates the true incidence of MMN palsy after MDO to better guide follow-up care and improve treatment of this complication.

Methods:
A retrospective review of PRS patients who underwent MDO at a single, tertiary pediatric hospital between September 2007 and March 2021 was conducted. Patients who underwent MDO under one year of age and had postoperative clinical evaluations detailing MMN function were included. Logistic regression analysis was performed to investigate predictors of MMN injury.

Results:
Of 93 patients who underwent MDO, 59.1% met inclusion criteria. 56.4% were female, 43.6% were syndromic, and average age at MDO was 1.52 ± 2.04 months. The average length of mandibular distraction was 17.3 ± 4.36mm, average duration of intubation was 6.57 ± 2.37 days, and average time until hardware removal was 111.1 ± 23.6 days. Sixteen patients (29.1%) presented with permanent MMN dysfunction, comprised of 8 patients with bilateral weakness and 8 with unilateral weakness. An additional five patients (9.1%) presented with transient MMN weakness that resolved within a year. Average length of follow-up postoperatively was 6.02 years, and no significant predictors of nerve injury were found.
Conclusion:
In this 14-year review of patients with PRS who underwent MDO, 38.2% demonstrated evidence of MMN palsy (29.1% permanent, 9.1% transient), which is much greater than previously described.

Objectives

1) We will present our experience performing MDO for PRS patients. 2) We will explain our institutional protocol for assessing for MMN palsy post-operatively. 3) We will present our rate of MMN palsy following MDO and will explain the spectrum of severity of MMN palsy seen at our institution.

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Biodegradable Metallic Alloys with Nanostructured Surfaces for Distraction Osteogenesis in a Minipig Model

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Abstract

Background:
Titanium-based implants often require surgical removal for planned (distraction) or unplanned (infected/exposed/prominent hardware) indications. Biodegradable metallic alloys exhibit strong mechanical properties and may present an opportunity to create implants that are bioresorbable. This study aims to assess the in vivo biocompatibility and load-bearing ability of bioresorbable metallic implants used for craniomaxillofacial surgery.
Methods:
Internal distraction devices (IDD) (without gearing to open/close) were designed using a metallic alloy. These were then implanted in four Yucatan miniature pigs after making an inverted L osteotomy of the mandible, simulating the first step in mandibular distraction surgery. Each minipig had 2 IDDs placed, one on each hemimandible. Minipigs were evaluated for 12 weeks with biweekly blood draws. CT imaging was done preoperatively, immediately postoperatively, at six weeks, and at 12 weeks for sacrifice. Each minipig's mandible, internal organs, and blood were collected and histologically evaluated to determine biocompatibility, osseous healing, and device degradation.

Results:
At sacrifice, all devices were partially absorbed while there was complete osseous healing of the surrounding mandibular osteotomy. Upon histological analysis of the mandible and masseter muscles, no excess inflammation was noted. Inductively Coupled Plasma (ICP) analysis found no excess metal concentrations in the blood and other major organs (heart, liver, kidney, spleen, and brain). The average decrease in implant volume across the four pigs during the twelve weeks was 12.21% (SD ± 4.34%). There were no surgical site infections.
Conclusion:
Bioresorbable metallic implants appear safe and effective for craniomaxillofacial surgery, with clinically relevant biocompatibility, mechanical strength, and degradation properties. The use of metallic alloys for craniomaxillofacial reconstruction might provide a viable alternative to nonabsorbable titanium implants and minimize the need for secondary procedures. We will next use a metallic IDD with gearing to evaluate bone generation while using these resorbable implants in this minipig model.

Objectives

1. Participants will be able to understand how titanium implants have been historically used for craniomaxillofacial surgery. 2. Participants will be able to understand how bioresorbable metallic implants offer additional antimicrobial and biocompatible properties. 3. Participants will be able to assess the safety and effectiveness of bioresorbable metallic implants for craniomaxillofacial surgery.

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Quality Improvement Rounds in Action: A Consensus Approach to ICP in Craniosynostosis

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Abstract
Background:
Raised Intracranial pressure (ICP) is a well-documented sequalae of both syndromic or multi-sutural and non-syndromic (single suture) craniosynostosis, with a prevalence in the order of 30-40% and 15-20% respectively. Management of raised ICP is mandatory to minimise risks associated with brain development and vision. The clinical symptomology paradigm of progressive headaches, behavioural changes and nausea and vomiting elucidates a suspicion of raised ICP. Radiographic imaging and fundoscopic examination have limitations in their utility to further enhance the clinical picture of raised ICP. ICP monitoring is currently accepted as the gold standard investigation but with well recognised limitations and risks. There is currently no unified approach to the investigation, monitoring and management of craniosynostosis.

Method
A 10-point survey was developed and distributed to Craniofacial Units in Australia and New Zealand. The aim of the survey was to assess individual and geographic nuances in the investigation, treatment and follow up of patients with craniosynostosis, particularly with regard to ICP. Responses were collated and subsequently debated in an inclusive regional quality improvement forum to conclude a position statement for Australia and New Zealand.

Conclusion
Management of raised ICP in craniosynostosis represents a heterogeneous problem. There is currently no recognised consensus approach to the management of these patients. Here we publish a position statement from the Australia and New Zealand group focused on raised ICP investigation, management and follow up.

Objectives
Participants will gain an understanding of the current literature on the management of raised ICP in craniosynostosis and limitations therein. Participants will understand the clinical limitations of ICP monitoring in craniosynostosis patients. Participants will learn of the position statement from the Australasian group on investigation and management of ICP in craniosynostosis, generate further discussion and debate within the faculty.

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Parental knowledge and attitudes towards genetic counseling and childhood genetic testing for congenital anomalies in Qatar

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Houda Kilani


Karen El-Akouri


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Houssein Khodjet ElKhil

Abstract

Background:

Understanding parental baseline knowledge about the implications of genetic testing and counselling may unveil educational gaps or circumstantial fear and reluctance towards this important component in the management of cleft/craniofacial patients. This study was designed to investigate parental knowledge and attitude towards genetic testing and counselling (GTC) as it pertains specifically to an academic cleft/craniofacial practice in an Arabian Gulf location where almost 15% of the population, representing Qatari citizens are highly consanguineous.

Methods:

The study employed a prospective face-to-face questionnaire that was administered online to parents who attended the pediatric plastic surgery clinic at Sidra Medicine between October 2022 and February 2023. The questionnaire considered (i) demographics, (ii) knowledge, and (iii) attitudes (perceived benefits versus barriers) regarding genetic testing and counselling.

Results:

From the 160 participants, 6% were presented with minor anomalies, 73% with major isolated anomalies, and 21% with major syndromic anomalies. Parents were from Asia 27%, North Africa 25%, Middle East 22%, America/Europe 6% and 22% were Qatari citizens.

American and European parents and those holding undergraduate and graduate degrees (p=0.003; p=0.001 respectively), scored higher on genetic knowledge than did the rest of the cohort. Moreover, American and European parents (p=0.028), and parents with a higher knowledge score (p=0.048), had more positive attitude towards GTC. Qataris 46% showed strong knowledge but low attitudes towards benefits and high perceptions of barriers.

Consanguineous Parents (p=0.003) and whose child had been referred for genetic testing (p<0.001) had more positive attitude regarding benefits of GTC. In turn, parents whose child had not been previously tested (p<0.001) or who did not have another child with a genetic disorder (p=0.002) had a more negative attitude.
Conclusion: While prompting further questions regarding parents' proclivities, these findings may help craniofacial surgeons when guiding parents through decision-making regarding genetic testing and counselling.

Objectives

1.To assess parental knowledge about genetic testing and counseling in the context of cleft/craniofacial patients.
2.To examine parental attitudes towards genetic testing and counseling, including perceived benefits and barriers.
3.To identify demographic factors associated with differences in parental knowledge and attitudes towards genetic testing and counseling, such as parental education level, nationality, and consanguinity.

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Application of modern visualization techniques and biomechanical research in virtual preoperative planning in reconstructive surgery of children with syndromic craniosynostoses

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Dawid Larysz

Abstract

Background: Application of modern preoperative planning procedures, including application of engineering software and virtual reality, is nowadays the part of surgical procedure. The study aimed to present the model of preoperative planning based on advanced methods of three-dimensional modelling and biomechanical investigations and advanced surgical techniques based on custom-designed guides, distractors and materials.
Methods: Studied groups consisted of 50 children with syndromic craniosynostoses treated in our Department As a control group we analysed 50 children treated in our Department with classical method, without engineering support. Morphological analyses were performed with engineering software which allows 3D modelling from CT and/or MRI imaging. According to the analysis of morphological abnormalities, it was possible to plan the appropriate and optimal method of surgical correction with an application of customized surgical methods. Biomechanical analyses were also performed. The types of surgery was mainly frontoorbital advancement with custom made distractors, posterior calvarial vault custom mated distraction and LFII distraction with individualized RED frame. In all cases customized surgical guides were used. Volume of transfused blood, time of surgery, complication rate and length of hospital stay were analyzed.
Results: In all operated children preoperative planning process allowed to perform efficient surgery with the desired reconstruction. There were no deaths or severe complications in the whole group. In two cases, because of the CSF leakage, the children required additional surgery. In one child there was skin healing problem because of the necrosis after distraction. The application of modern engineering techniques of preoperative planning and surgery allows to reduce the time of surgery. blood loss and complication rate.
Conclusions: Preoperative planning improved the knowledge about particular deformation, shortened the time of surgery and allows proper and efficient surgical treatment. Close cooperation between biomedical engineers and the multidisciplinary craniofacial team improves the efficacy and safety of treatment.

Objectives

Presentation of our preoperative planning process. Comparison between classical and modern methods of treatment. Evaluation of results of treatment.

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Pattern of Catch-up growth in patients with cleft palate using longitudinal physical growth data from infancy to adolescence

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Sungmi Jeon

Abstract

Background: To characterize the pattern of somatic catch-up growth from infancy to adolescence in patients with cleft palate (CP).

Methods: The subjects consisted of 474 non-syndromic patients with isolated cleft palate (ICP, n=69), and unilateral and bilateral cleft lip and palate (UCLP, n=271; BCLP, n=134), who underwent palatoplasty during 1988-2017 and had longitudinal physical growth data at birth (T0), cheiloplasty (T1), palatoplasty (T2), childhood (T3), and adolescence (T4). The z-scores of weight (ZWT), height (ZHT) and body mass index (ZBMI) were compared between CP types (ICP, UCLP, BCLP) and between timepoints (T1, T2, T3, T4). The subgroup analysis was performed to investigate the growth of malnourished patients (z-score < -1) at T1 or T2. The generalized linear model (GLM) was used to investigate the effect of gestational age and cardiac anomaly on longitudinal changes in ZHT and ZBMI.

Results: Regardless of timepoints, overall z-scores in ZHT, ZWT, and ZBMI remained close to 0 in all CP types, indicating no significant differences from the mean values of non-cleft children. There was significant catch-up growth in ZHT and ZWT from T1 to T4 in all CP types (all $P<0.05$). Despite recovery of ZHT and ZBMI in most of malnourished patients, they remained relatively small until adolescence. Patients who were born at preterm stage or had surgically repaired cardiac anomaly could grow well.

Conclusions: Even in CP infants with malnutrition, preterm birth, or cardiac anomaly, rapid catch-up growth could occur prior to palatoplasty, with a help of comprehensive cleft care.

Objectives

Participants will be able to (1) characterize the pattern of somatic catch-up growth from infancy to adolescence in patients with cleft palate, (2) compare the growth outcomes of malnourished patients during infancy with that of the others, and (3) identify the factors associated with longitudinal changes in height and body mass index.

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Characterization of Cranial Growth Pattern Using Craniometric Parameters and Best-fit Logarithmic Growth Curves

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Sungmi Jeon

Abstract

Background: Few studies have reported a complete quantitative database of cranial growth, from infancy to adulthood, as a reference through three-dimensional analysis. This study aimed to characterize cranial growth patterns using craniometric parameters by establishing sex- and age-specific norms.

Methods: Total 1009 Korean patients (male-to-female ratio, 2:1; age range, 0–18 years) who underwent thin-slice computed tomography (CT) scans for head trauma were divided into 20 groups, with a 6-month interval under 2 years and a 1-year interval above 2 years. After four reference planes [Frankfurt horizontal (FH), midsagittal, and two coronal planes passing Sella (S) and Basion (B)] were established, intracranial volume (ICV), anteroposterior diameter (APD), biparietal diameter (BPD), cranial height (CH), Cephalic index (CI, BPD/APD) and height index (HI, CH-B/APD) were measured using Mimics software. Best-fit logarithmic curves were derived using a linear regression model.

Results: The best-fit curves of ICV(cm3) were y=785.6+157*ln(age) for males (R2=0.5752) and y=702+150.5*ln(age) for females (R2=0.6517). After adjustment for age, males had higher values of ICV, APD, BPD, and CHs than females (all p<0.0001). ICV, APD, BPD, and CHs demonstrated a rapid increase during the first few months of life, reaching 90–95% of the adult size by 5–6 years of age, while CI and HI showed a continuous decline by 4% regardless of sex.

Conclusions: This study presented cranial growth references in more than 1000 Korean population up to 18 years of age. This might provide guidelines for diagnosis and treatment (including timing, amount, and direction) for cranial reconstruction in pediatric patients with craniosynostosis.

Objectives

Participants will be able to (1) characterize the cranial growth patterns of normal children during infancy to adulthood through three-dimensional craniometric analysis, (2) present best-fit logarithmic regression growth curves, and (3) compare the cranial dimension of Asian subjects with that of Caucasians.

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Management of hydrocephalus in a cohort of patients with FGFR mutations and craniosynostosis

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Amparo Saenz

Abstract

Objective: We described the incidence of intracranial hypertension (ICH) in a cohort of patients with FGFR mutations and craniosynostosis and analysed the outcome after surgical treatment (ventriculoperitoneal shunt insertion vs cranial expansion surgery)

Methods: This retrospective study included patients with FGFR mutations and craniosynostosis treated at the Craniofacial Surgery Unit at Great Ormond Street Hospital between 2005-2021.

Results: We retrospectively reviewed 47 patients suffering from FGFR mutations and craniosynostosis. Thirty-nine patients had FGFR 2 mutation, four patients had FGFR 3 mutation, and three had FGFR 1 mutation.

Thirty patients presented with ICH confirmed by clinical symptoms of hydrocephalus and ventriculomegaly in 12/30 patients, positive invasive ICP measurement in 10/30 and positive papilledema in 8/30.

ICH was treated by cranial expansion surgery on 19/30 cases and by ventriculoperitoneal shunt (VPS) insertion on 11/30 patients.

In the 11 patients treated with VPS, the mean FOHR before surgery was 0.5 (SD 0.1) and 0.42 (SD 0.1) after surgery (diff. 0.08; p=0.01).

Six of the 11 patients presented with further episodes of ICH and required a second surgery, with four requiring a third surgery to treat the symptoms. The subsequent surgeries were all cranial expansion surgeries.

For the 19 patients treated with cranial expansion surgery, the FOHR before surgery was 0.35 (SD 0.01) and 0.34 (SD 0.01) after surgery (diff 0.01; p=0.6). Only 1/19 patients developed further symptoms of ICH and required a second cranial expansion surgery.

Cranial expansion surgery proved to be more efficient in treating ICH compared to VPS insertion (OR 15; 95% CI 1.1-115; p=0.02).

Conclusion: ICH was relatively frequent in patients suffering from FGFR mutations and craniosynostosis. Patients with VPS as initial treatment had more prominent ventricles and presented significant changes in the ventricle size after the surgery. However, cranial expansion surgery proved more efficient than VPS in controlling ICH.

Objectives

1) Participants will be able to learn about the effectiveness of different methods to treat ICH in syndromic patients with craniosynostosis 2) Participants will learn about the changes in the ventricular size after different treatments for ICH in syndromic patients with craniosynostosis 3) Participants will be able to learn about the benefits of using one method over the other to treat ICH in syndromic patients with craniosynostosis

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Predicting the future of Craniofacial surgery in Virtual Reality – is this where our surgical practice is heading?

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Noor ul Owase Jeelani


Alessandro Borghi


Silvia Schievano


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FaceValue Team

Abstract

Background: Robust outcome assessment remains the holy grail in Craniofacial surgical practice. Patient selection, multidisciplinary practice, the technical skills of the team, and the underlying genes all have a profound impact on the final outcome for our patients. But what if we could predict the outcome of the surgery, before lifting the scalpel and use this to inform our decision-making – this would be of significant benefit to our practice.
Methods: We present a prediction platform here using a large data set of 60 cases of Spring assisted correction of Scaphocelphaly within our practice between 2013-2020. Finite Element algorithms and statistical shape modeling techniques were used to devise a prediction platform. Spring and skull biomechanics were studied and 3D photogrammetry validation was employed to further refine the model. Growth of the pediatric skull was incorporated using statistical modeling using normative data. The outcome of this body of work was a surgical prediction platform that could predict the outcome of scaphocephaly correction with over 90% accuracy. Machine learning techniques have further been employed to automate this process.
Results: We next used our Virtual Reality platform to project the pre-operative 3D skull shape, the key surgical steps, and the predicted post-operative 3D head shape superimposed on the pre-operative model. The parents were invited into the virtual reality theatre, the surgical steps highlighted and the predicted head shape outcome discussed with them. Parametric modeling allowed us to further tailor the outcome, within border constraints, with the parent's input. Following informed consent, the surgery was undertaken 4 weeks later and the desired outcome achieved.
Conclusions: Significant bias and ambiguity was removed from the entire value chain resulting in higher levels of satisfaction. We believe such prediction algorithms and platforms will play an increasingly significant role within our surgical practice over the coming years.

Objectives

Explain the use of predictive algorithms and platforms within surgical pratice. Highlight the use of virtual reality in facilitating planning and informed consent. Stimulate the development of novel predictive platforms.

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Planning of complex Craniopagus separation surgery in Virtual Reality – the increasing role technology has played in our 6 sets of Craniopagus separations at Gemini Untwined.

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Mickey Gideon


Heron Werner


Luke P. J. Smith


Claudio Capelli

Gemini Untwined

Abstract

Background: Craniopagus Separation surgery remains a highly complex surgical endeavor that delivers mixed results. We have undertaken 6 sets of separation surgery between 2006 and 2022 with technology playing an increasingly important role in planning the surgery for these children.

Methods: Our most recent set in 2022 were twins boys born in 2019, based at the Instituto Estadual do Cerebro Paulo Niemeyer in Rio de Janeiro, Brazil. There were of a Total Vertical Type II classification. Seven staged surgical procedures had been undertaken between November 2019 and September 2021 but separation not completed. Our team at Gemini Untwined were consulted at this stage to plan further steps and final separation.

Given the anatomical complexity of the twins and the previous surgeries, it proved a challenge to discuss the case across continents between the surgical and medical teams. To overcome this we employed our in-house virtual reality platform and loaded the cross-sectional imaging onto it to create a virtual operating theatre.

Results: Surgeons and medical teams met in this virtual space with the virtual models, and this facilitated, to a significant extent, communication and planning the future steps. Whilst this proved helpful the level of detail available was limited, given the resolution of the imaging and the steps required to convert these to virtual models. The Virtual model underestimated the degree of scar tissue between the hemispheres and the fact that the deep venous systems of both twins were opposed and incorporated within the pial surface to the contralateral twin's hemisphere – both details markedly increased the complexity of the final 2 stages of the separation surgery.

Conclusions: Technology has facilitated the understanding and planning of these complex cases, but significant limitations remain that require further work. Teams developing and promoting these technologies ought to remain cognisant of these limitations.

Objectives

Planning of Complex Surgery utilizing Virtual Reality Limitations of Virtual Reality platforms Cross-discipline collaboration to improve outcomes in complex surgeries

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Kaban-Pruzansky Grade Predicts Perioperative Airway Severity in Hemifacial Microsomia

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Carlos Barrero


Matthew Pontell


Isabel Ryan


Larissa Wietlisbach


Connor Wagner


Lauren Salinero


Jordan Swanson


Eric Liao


Scott Bartlett


Jesse Taylor

Abstract

Background

Children born with hemifacial microsomia (HFM) can suffer from airway compromise. There is a paucity of data correlating degree of HFM severity with airway difficulty. This study aims to determine the relationship between degree of micrognathia and airway insufficiency in the HFM population.

Methods

A retrospective review of patients with a diagnosis of HFM between 2000 and 2022 was conducted, and patients without documented Pruzansky grade or Cormack Lehane (CL) laryngoscopic grade were excluded. Patient demographics, Goldenhar syndrome diagnosis, laterality, age at surgery, Cormack Lehane grade, airway designation (critical/difficult), and airway emergency status were compared using chi-square and Kruskal-Wallis tests.

Results

Seventy patients underwent 365 operations with KP grading as follows: 34% I, 23% IIA, 11% IIB, and 33% grade III. Goldenhar syndrome was present in 40% of patients and 16% had bilateral disease. KP grade ($p<0.001$) predicted mean number of airway-affecting procedures undergone and difficult airway status ($p<0.001$), with 75% of difficult airways in KP III patients. There was no association of airway compromise with Goldenhar syndrome, laterality, or age ($p>0.05$). Most CL grades were I (61%) or IIA (13%), with fewer IIB, III, and IV (4-7%). KP grade predicted CL grade ($p<0.001$), with 71% of grade IV views and 64% of grade III views seen in KP III patients.

Conclusions

Kaban-Pruzansky grade correlated with airway severity in HFM. Patients do not appear to outgrow their CL grade, as previously hypothesized, suggesting that KP III patients remain at increased risk for airway insufficiency into the teen years. Given the potential significant morbidity associated with airway compromise, proper identification and preparation for challenging airway is a critical part of caring for patients with HFM.

Objectives

1. Participants will be able to explain the correlation between mandibular hypoplasia and perioperative airway risk in hemifacial microsomia 2. Participants will be able to explain the lack of relationship between age and perioperative airway risk in hemifacial microsomia 3. Participants will be able to contrast the effects of Kaban-Pruzansky I-IIB and Kaban-Pruzansky III mandibles on perioperative airway risk.

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Contouring Cranioplasty with Carbonated Calcium Phosphate Cement in Syndromic Craniosynostosis: Aesthetics and Long-term Safety

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Connor Wagner


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Matthew Pontell


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Emily Xu


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Jordan Swanson


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Jesse Taylor

Abstract

Background

Carbonated calcium phosphate (CCP) cement is an alloplastic material which has been increasingly used for cranioplasty reconstruction, however there is limited data investigating its use in patients with syndromic craniosynostosis. The purpose of this study was to characterize our institutional experience with CCP cement for secondary contouring cranioplasty in these patients to establish safety and aesthetic efficacy.

Methods

Patients with syndromic craniosynostosis undergoing cranioplasty with CCP cement from 2009-2022 were retrospectively reviewed for prior medical and surgical history, cranioplasty size, cement usage, and postoperative complications including infection, cement exposure, and cement extrusion. Aesthetic ratings of the forehead region were quantified using the Whitaker scoring system by two craniofacial surgeons at three time-points: preoperative (T1), < 6 months postoperative (T2), and > 1 year postoperative (T3).

Results

Twenty-one patients were included (6 Apert, 4 Pfeiffer, 3 Crouzon, 4 Muenke, 4 Saethre-Chotzen). Age at surgery was 16.2±2.8 years, forehead cranioplasty area was 135±112 cm2, and mass of cement was 17.2±7.8 grams. Patients were followed for 3.0±3.1 years. Whitaker scores decreased from 1.9±0.4 at T1 to 1.4±0.5 at T2 (p=0.005). Whitaker scores at T2 and T3 were not significantly different (p=0.720). Comparing patients with improved

postoperative Whitaker scores to those who did not improve, those with improved scores had smaller cranioplasty defect areas (89±50cm2 vs 168±90cm2, p=0.046). Two infectious complications (9.5%) were noted, one at 4.5 months postoperatively and the other at 23 months, both requiring operative removal of CCP cement.

Conclusions

Our results suggest that aesthetic forehead ratings improve after CCP contouring cranioplasty and that the improvement is sustained in medium-term follow-up. Complications were uncommon, suggesting that CCP is relatively safe though longer-term follow-up is needed before reaching definitive conclusions.

Objectives

1) Participants will be ale to describe the surgical technique used in the application of CCP cranioplasty 2) Participants will understand the aesthetic benefits of this alloplastic reconstructive material in the shirt term and the long term 3) Participants will appreciate the complications which can arise with the use of CCP cement in cranioplasty and also the frequency of these complications

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Comparative study on the neurodevelopment outcomes in craniosynostosis patients with smad6 gene variants.

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Isabelle Verlut


Sofia Guernouche


Corinne Collet


Massimiliano Rossi


Federico Di Rocco

Abstract

BACKGROUND: Smad6 has been described as pathogenic variant involved in midline craniosynostosis and increases the risk of both nonsyndromic and syndromic presentations especially in metopic synostosis. Craniosynostosis can be associated with developmental delay, whether treated or not. We investigated developmental outcomes in patients with craniosynostosis combined with a Smad6 variant.
METHODS: Monocentric comparative study. We studied two groups of patients among children operated on for craniosynostosis between September 2018 and 2021 who underwent genetic screening for the panel genes involved in craniosynostosis. The first group includes children with smad 6 variant, the control group includes children without smad6 variant or any other variant. Children from both groups received neuropsychological tests according to their age over several years.
RESULTS: 8 patients had the smad6 variant, 4 boys and 4 girls: 6 patients with trigonocephaly, 1 with scaphocephaly, 1 with oxycephaly. They were aged from 18 to 82 months at the first neuropsychological testing. Neuropsychological followup was from 12 to 39 months. One of the trigonocephaly with a Smad6 variant also has a second variant (FGFR1). The scaphocephalic patient showed a normal development with a weakness for global motor. Patients with trigonocephaly and Smad6 were compared with a control group of 18 subjects with trigonocephaly without variant matched according to age, gender and socio-cultural level. Cognitive impairment concerning langage acquisition was more frequent for the trigonocephaly and Smad6 group compared with the control group. Smad6 patients over 48 months benefit of psychiatric care. Delayed expression of language was compared with control group in early stages of development.
CONCLUSIONS: Our results suggest the impact of Smad6 in the functional evolution of patients with craniosynostosis. An early recognition of neurodevelopmental issue, which can be obtained with appropriate tools, as well as long neuropsychological followup in craniosynostosis, is pertinent for the overall patients outcomes.

Objectives

The participants will appreciate the impact of Smad6 mutations on cognitive outcome, They will be able to discuss with the genetists on the investigations to propose, And able to provide better familial counseling.

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Racial and Ethnic Differences of the Upper Third of the Face: A Systematic Review and Meta-Analysis

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Johns Hopkins University, Baltimore, MD, USA


Essie Ghafoor


Madyson Brown


Claudia Taccheri


Stella Seal


Mona Ascha


Fan Liang

Abstract
Background: Facial surgery relies on craniofacial norms to plan for ideal aesthetic outcomes. These values are derived largely from classical Greco-Roman norms and are not representative of the global population. This systematic review aims to investigate how measurements in the upper third of the face differ across race, ethnicity, and sex.
Methods: Adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic review was performed querying EMBASE, PubMed, Scopus, and Web of Science for literature including measurements in the upper third of the face. The following measurements were collected: intercanthal distance, palpebral fissure width , palpebral fissure height , bi-ocular width, palpebral fissure inclination, forehead height, upper third height, face length, and the nasofrontal angle. Pooled means and standard deviations were calculated for each race, ethnicity, and region stratified by sex. Region was defined by the United Nations geoscheme. Descriptive statistics, one-way ANOVA, and independent t-tests were conducted to identify differences in measurements across populations.
Results: Seventy-three studies, including 27,224 patients, were included in the analysis. Asian (n=19003, 69.87%) and White (n=6741, 24.76%) individuals were most represented. The most frequent measurements were the intercanthal distance (n=21,569, 79.23%), palpebral fissure width (n= 10,113, 37.15%), and bi-ocular width (n=9042, 33.21%). Within each sex, statistically significant ($p < 0.001$) differences existed across race, ethnicity, and region in the intercanthal distance, bi-ocular width, nasofrontal angle, and forehead height. Race and region conferred statistically significant differences, by sex, for palpebral fissure height, palpebral fissure inclination, palpebral fissure width, and face length.
Conclusions: Anthropometric norms in the upper third of the face must consider race, ethnicity, and region to account for facial variability beyond sex. The values in this review can inform surgeons' approach to craniofacial surgery among diverse patient populations.

Objectives
Participants will develop an understanding of the current anthropometric literature landscape on the upper third of the face. Participants will be able to describe major differences between upper third measurements of males and females. Participants will be able to explain how differences in the upper third measurements of males and females with varied racial and ethnic backgrounds can inform craniofacial surgery.

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Microvascular Management of the Scalp, Skull, and Skull Base

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Abstract
Introduction: Microvascular reconstruction of the upper facial third is a complex problem in modern microvascular surgery. Flap selection based on the specific anatomic location and techniques to simultaneously reconstruction the skull or skull base are controversial and vary greatly amongst craniofacial surgeons.

Methods: A retrospective chart review was performed for a single craniofacial surgeon's experience of microvascular reconstructions of the scalp, skull, and skull base. All subjects who underwent microvascular reconstruction of the upper facial third were included in this study. Microvascular flap selection, anatomic location, and timing and technique of cranial reconstruction were investigated.

Results: Eighty-four subjects were identified who underwent microvascular reconstruction of the scalp only (n= 24), composite scalp and skull (n= 49), and skull base (n= 11). Twelve subjects required more than 1 microvascular flap reconstruction for a total of 96 flaps with a success rate of 97.9% (n= 96). Combined scalp and skull defects were the most common indication for microvascular reconstruction (n= 49). Thirty-nine of these 49 subjects (79.6%) had successful cranioplasty as part of their microvascular reconstruction care plan. Skull base reconstruction was successful in 81.8% of subjects with n= 2 of 11 subjects (18.2%) developing persistent pneumocephalus despite vascular intact flaps requiring surgical exploration and repositioning.

Conclusions: Microvascular reconstruction of the scalp, skull and skull base is often necessary in modern craniofacial reconstructive surgery. Combined scalp and skull defects are the most common indication and composite reconstruction including cranioplasty is highly successful. Microvascular reconstruction of the skull base is an evolving indication for free tissue transfer.

Objectives
1. Understand the indications and flap selection for microvascular reconstruction of the upper facial third. 2. Understand the techniques for combined cranioplasty and microvascular scalp reconstruction when composite defects of the scalp and skull present. 3. Understand the indications and techniques of skull base microvascular reconstruction.

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A four-year experience of first-stage auricular reconstruction in microtia using patterned and holed 3D cutting guide methods.

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Abstract

Background: For microtia reconstruction, 3D-model assistance has been widely employed. The availability of a 3D-model was supposed to make the construction of a three-dimensional ear framework easier for surgeons. We created a 3D-printed cutting guide with aligned holes consisting of three framework pieces, so that the model not only serves as a visual reference but also aids in the carving process, making it easier, more efficient, and faster. Here we presented 87 ear reconstruction cases of the first stage of ear reconstruction from our four-year experience.
Methods: Prior to surgery, the remnant ear, adjacent skin, normal ear, eyebrow position, lower eyelid crease, lateral alar crease, hairline and rib cartilages had to be assessed. Each patient received a precise and customized three-dimensional reference framework of a normal ear. To create a solid, personalized framework, we adjusted the base frame, helix, tragus, and antihelix with the 3D-model. The framework will have aligned holes for suturing the outline to the sixth to eighth contralateral costal cartilages. These methods cut down on the amount of cartilage needed for ear reconstruction, shortened surgery time, and facilitated the efficient transfer of knowledge among surgeons.
Results: The duration of the surgery, including rib harvesting, was recorded as four hours. After two to three months of waiting for edema to subside, the reconstructed ears were well-formed in color, texture, size, and position. Reconstructed ears were given a harmonious and personalized shape. All complications, including hematoma, skin necrosis, and absorption framework, are predominantly carried on by the patient's current state or past exposure to environmental factors.
Conclusion: Using our modified technique, which provides a solid and advanced framework to be constructed with less cartilage required and shorter surgery time, a harmonized and personalized auricle with detailed anatomical characteristics was established based on preoperative evaluation, tailored design, and meticulous sculpting.

Objectives
Participants will have a better understanding of the creation of the Ear Framework. Participants will have a better understanding of using 3D-model in microtia reconstruction. Participants will be able to apply and improve this technique with patients.

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In house application of Virtual Surgical planning and 3D printing: the surgical design for each type of craniosynostosis

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Ting-Chen Lu

Abstract

Background & Methods

The regular method of total cranial vault remodeling has been quite subjective, depending upon artistic capacity and experience of surgeons. After craniectomy, the bone flaps are placed on the table, and general geometric knowledge applied to reshape the skull to desirable shape. With avent of computer based virtual surgical planning in the field of medicine, it has gained effective popularity in craniofacial surgery including total cranial vault remodeling with encouraging results. By routinely design the ideal skull shape for each type craniosynostosis, the ways of reconstruction could be expected. In this study, we present our in house virtual surgical planning and 3D printing for each type of craniosynostosis. The following surgical results were used for comparison.

Result

From 2018-2022, There were totally 74 patients with craniosynostosis underwent skull reconstruction. 43 patients underwent cranial vault remodeling procedure with computer aided design (CAD) and 3D printing surgical guide. 6 cases with metopic , 4 cases with unicoronal, 6 cases with lamboid, 17 cases with sagittal, 10 cases with multiple suture craniosynostosis. Steps in virtual surgical planning consisted steps such as importing data into workstation, adjusting patients' skull shape and size to age matched skull, determining the final shape and printing cutting and shaping guides, and different designs for each type of craniosynostosis were shown.

Conclusion

The in house application of virtual surgical planning and 3D printing method is reliable and predictable with overall reduction of surgical time and stress.

Objectives

Participants will be able to famillier with the workflow of in house Virtual Surgical planning and 3D printing. Participants will be able to know the surgical design for each type craniosynostosis by 3D simulation. Participants will be able to designed their own way to do the skull reconstruction for craniosynostosis.

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Utilizing our in-house 3D printing service to improve accuracy for microsurgical reconstruction of the mandible and maxilla at Great Ormond Street Hospital

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Theodore Howard

Simon Eccles

Abstract

Aims

Since its development, three-dimensional (3D) printing has been used successfully in many industries, however its use in surgery is still in its infancy. We present two cases where 3D printing technology was used to aid surgical planning and guide free-flap microsurgical reconstruction.

Methods

Our tertiary referral paediatric craniofacial unit has access to a 3D printing service facilitating surgical planning to create our own surgical guides. A free fibula flap was performed following a hemi-maxillectomy for a mucoepidermoid carcinoma of the palate. 3D-technology was used to design the position of the osteotomies, osteosynthesis, osseointegrated dental implants and a custom-made titanium plate. Similarly, during a free DCIA flap for mandibular reconstruction following resection of an ameoblastoma, cutting guides were created to allow aid mandibular resection and ensure accurate bone harvest.

Results

Both patients underwent successful reconstruction, the flaps maintained good perfusion with strong and consistent doppler signals with healthy skin paddles post-operatively. The patients recovered well with satisfactory post-operative imaging.

Conclusion

3D technology has the potential to improve the quality of craniofacial reconstructions. This technology allows the reconstructive surgeon to improve accuracy, demonstrate complex anatomy, plan and execute complex surgical plans with improved functional and aesthetic outcomes.

Objectives

Learning outcomes 1) Identify the different uses of 3D technology in craniofacial surgery and how this can be utilized to improve reconstruction. 2) Our experience with 3D printing and why we find it beneficial for our complex reconstructions. 3) Trials and tribulations with 3D technology and how we have overcome this within our unit.

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Real-time Mixed Reality and Preoperative Virtual Surgical Planning (VSP) Methods for Pediatric Cranial Vault Reconstructive Surgery

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Katelyn Lewis

Abstract

Background: Mixed Reality (MR) is a form of visual augmentation that superimposes interactive 3D virtual content onto the real environment. This technology is revolutionizing the surgical arena via improved pre-operative planning and intraoperative support. VSP has already been shown to increase surgical precision with shorter operative times by fabricating patient-specific cutting guides and intraoperative templates. MR devices in conjunction with VSP have the potential to provide great utility for craniofacial surgeons, which has yet to be demonstrated in current literature. This project sought to evaluate the use of Mixed Reality in complex cranial vault remodeling applying guides and principles of VSP.
Methods: Imaging processing was completed using a fully "in-house approach". VSP was performed to plan the osteotomies and a patient-specific intraoperative cutting template was produced to be uploaded into the Microsoft HoloLens software. Osteotomies from the MR guide and an industry-made counterpart were independently marked on an anatomically accurate skull model of patients with craniosynostosis. Calipers were utilized to determine the precision of the in-house mixed reality guide as compared to industry standards.
Results: We successfully performed pre-operative surgical planning and produced MR patient-specific cutting guides used via augmented visualization. The use of MR guides to 3D printed guides were compared. MR template markings demonstrated an overall difference of 1.89mm (SD 1.52) when compared to markings from commercial cutting guides. The total time invested in producing the final MR template was approximately 1.75 hours (45 minutes for segmentation, 45 minutes for VSP/cutting guide configuration, and 15 minutes processing to the HoloLens device) compared to an average two-week industry production time.
Conclusions: Combining VSP with intraoperative MR is a feasible, cost-effective approach to complex cranial vault reconstruction. Key design restraints to improve functionality hinge upon the ability to register augmented reality projections onto the surgical field.

Objectives

1. Participants will be able to describe the utility of Mixed Reality in pre-operative surgical planning. 2. Participants will be able to understand how to produce MR guides and templates. 3. Participants will be able to describe new approaches to complex cranial vault reconstruction.

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Socioeconomic influence on surgical management and outcomes in patients with craniosynostosis - A systematic review

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Abstract
Background: Disparities in insurance and socioeconomic status (SES) may impact surgical management and subsequent postoperative outcomes for patients with craniosynostosis. This systematic review summarizes and assesses evidence on possible differences in surgical care including procedure type and age at surgery, and differences in surgical outcomes such as complications, length of hospital stay, and child development based on SES.
Methods: The databases Scopus, PubMed, and CINAHL were searched between May and July 2022. Following PICO (participants, intervention, comparison, outcome) criteria, studies included focused on: patients diagnosed with craniosynostosis; corrective surgery for craniosynostosis; comparison of insurance, income or zip code; and surgical management of postoperative outcomes.
Results: The initial search yielded 336 articles. After three stages of screening, 15 studies were included. Assessed outcomes included: type of procedure (6 articles), age at time of surgery (3 articles), post operative complications (3 articles), referral delay (2 articles), length of stay (2 articles), child development (1 article) and hospital costs (1 article). Of the studies with significant results, insurance type was the main SES variable of comparison. While some findings were mixed, these studies indicated that patients with public medical insurance were more likely to have open rather than endoscopic procedures, cranial vault remodeling rather than strip craniectomy, older age at time of surgery, more complications, greater referral delays, longer length of stay, and higher medical charges.
Conclusions: This systematic review demonstrated that SES may be associated with several differences in the management of patients with craniosynostosis, though insufficient data precluded any definitive, quantifiable results. Further investigation into the impact of SES on the management of patients with craniosynostosis is warranted.

Objectives
1. Review existing literature on socioeconomic status impacting craniosynostosis care. 2. Identify common differences in craniosynostosis treatment based on socioeconomic status. 3. Discuss limitations of existing studies and future directions for craniosynostosis health disparity research.

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Development and Preliminary Validation of a Bilingual Health-related Quality of Life Tool for Diverse Craniofacial Conditions

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Abstract

Background

Individuals with craniofacial conditions (CFCs) experience challenges that may diminish health-related quality of life (HRQoL). Currently there is no validated tool that simultaneously measures patient and parent perspectives on HRQoL dimensions across a variety of distinct CFCs. The Craniofacial Condition Quality of Life Scale (CFC-QoL) is an original, bilingual, parent-proxy and patient-report tool designed to assess HRQoL in an international, diverse population. This study describes the development and preliminary validation of the CFC-QoL.

Methods

The CFC-QoL was developed utilizing an iterative process involving a systematic review, expert opinion, and in-depth interviews in English and Spanish with patients with CFCs and their parents. Seven domains were identified, and subscales were developed via item-reduction based on exploratory factor analysis. This preliminary evaluation of convergent validity used correlational analysis to compare scores between the CFC-QoL subscales (Bullying, Peer Problems, Psychological Impact, Family Support, Appearance Satisfaction, Desire for Appearance Change, and Physical Function) and validated pediatric HRQoL measures (PROMIS Peer Relations, PROMIS Stigma, PROMIS Meaning and Purpose, Pediatric Quality of Life Inventory [PedsQL], PedsQL Family Impact, and Patient Health Questionnaire-4).

Results

The sample included 74 patient-parent dyads from USA, Mexico, and Argentina (67% English-speaking, 33% Spanish-speaking). CFC diagnoses included cleft lip and/or palate (50%), craniosynostosis (4%), microtia (13%), hemifacial microsomia (4%), dermatologic conditions (20%) and traumatic injuries (7%). Correlational analysis demonstrated statistically significant relationships with expected magnitude and directionality between most of the patient-report and parent-proxy CFC-QoL subscales and validated pediatric HRQoL scales. With one exception, the CFC-QoL Family Support subscale was not significantly correlated with the other pediatric HRQoL scales.

Conclusion

The CFC-QoL was designed to fill an identified gap in HRQoL assessment and represents a unique, comprehensive tool that allows for evaluation of diverse CFCs. Results support convergent validity for most CFC-QoL subscales for patient and parent report.

Objectives

1. Participants will be able to identify the gap in Health-Related Quality of Life (HR-QoL) assessment for patients with craniofacial conditions. 2. Participants will develop an understanding of the development of the Craniofacial Condition Quality of Life Scale (CFC-QoL). 3. Participants will be able to identify the validity of the CFC-QoL compared to other previously validated pediatric HR-QoL scales.

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Positive Airway Outcomes in Syndromic Pierre Robin Sequence Infants Treated with Mandibular Distraction Osteogenesis: A Single Surgeon's Experience

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Ann Carol Braswell


Grant Wagner


Edgar Soto


Rene Myers

Abstract

Background: Pierre Robin Sequence (PRS) presents as isolated PRS [iPRS] or in conjunction with a genetic syndrome [sPRS] that subsequently leads to feeding difficulties, respiratory dysfunction, and failure to thrive. Mandibular distraction osteogenesis (MDO) remains a mainstay of treatment to address the tongue-based airway obstruction in PRS patients. sPRS patients routinely have a more challenging clinical course, and data comparing the effectiveness of MDO as a treatment for sPRS versus iPRS is minimal.

Methods: A single-institution, IRB-approved, retrospective review was conducted of all PRS patients who underwent MDO by a single surgeon between January 2015-February 2022. Patients were stratified into iPRS or sPRS based on genetic evaluation. Primary measures were demographic and situational data including length of stay, follow-up, and complications; airway outcome measures included avoidance of tracheostomy, Apnea-Hypoxia Index (AHI), and laryngeal view pre-distraction and at distractor removal.

Results: Prior to distraction, the iPRS (N=32) and sPRS group (N=18) showed no significant differences in age (105.1 ± 199.7 days; range 2-1051 days), AHI (17.3 ± 17.1; range 3.6-90), or laryngeal view (65% grade III or IV)($p>0.05$). Six months post-distractor removal, 92% of sPRS and iPRS patients avoided tracheostomy ($p>0.05$). Overall, post-MDO there was a significant decrease in mean AHI from 17.3 to 4.5 ($p<0.001$). sPRS patients in particular had a significant decrease in average AHI following MDO from 15.2 to 4.5 ($p=0.028$). Post-MDO both groups had similar improvement in laryngeal view ($p>0.05$).

Conclusions: Though sPRS patients typically have a more challenging clinical course, we found equivalent improvement in AHI and laryngeal view between sPRS and iPRS patients post-MDO. In our experience, MDO can effectively treat the functional limitations that arise in iPRS and sPRS patients without favoring one subtype. However, the decision to move forward with distraction remains a nuanced one and should be individualized to each patient and family.

Objectives

(1) Participants will be able to explain the difference between syndromic PRS (sPRS) and isolated PRS (iPRS). (2) Participants will interpret data that analyzes airway outcomes in sPRS and iPRS patients following mandibular distraction osteogenesis (MDO). (3) Participants will be able to evaluate the utilization of MDO in both sPRS and iPRS patients.

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Thirty-year experience treating syndromic craniosynostosis: Long-term outcomes following cranial vault expansions.

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Jeffrey Fearon

Abstract

Introduction: Children born with syndromic craniosynostosis undergo multiple cranial expansions prior to reaching skeletal maturity. To our knowledge, no long-term data has been presented that tracks a total history for skull expansion procedures through skeletal maturity. The purpose of this study was to review one center's experience to ascertain how often and how many cranial enlargement procedures are performed, as well as to track complication rates. In addition, trends are explored with the goal of reducing the burden of care.

Methods: A retrospective review was performed of all consecutive patients with syndromic craniosynostosis (e.g., Apert, Crouzon, Pfeiffer syndromes) undergoing cranial vault enlargement procedures by a single surgeon.

Results: Of 444 patients identified with Apert or Crouzon/Pfeiffer syndromes, 349 patients had complete medical records. The mean age at the time of last follow up for this group was 16.9 years. The mean age for initial cranial expansions was significantly younger for those beginning care at outside centers than those beginning treatment in Dallas: 7.7 months versus 21.3 months. 26.4% had ventriculoperitoneal shunts (syndrome-specific incidences: Apert 16%, Crouzon 27%, Pfeiffer 54%), 80% were anterior remodeling, 18% posterior remodeling, and 2% were mid-vault remodeling procedures, with no difference in complication rates identified, per procedure type. The mean number of skull expansion procedures for the group was 2.4, with more total expansions performed for those initially treated elsewhere (2.64 versus 1.95).

Conclusions: The average child with syndromic craniosynostosis underwent a skull expansion procedure approximately once every 7 years; however, those undergoing initial treatment at outside centers were younger at their first expansion and underwent more expansions than those only treated in Dallas. Complication rates did not significantly differ between anterior and posterior procedures. Trends were identified that might help reduce the frequency of skull expansion procedures.

Objectives

Participants will develop insights into the overall care of syndromic craniosynostosis and how many cranial expansions are needed. Participants will develop knowledge of shunting requirements in syndromic craniosynostosis. Participants will be challenged to consider impacts of the timing of first cranial expansion procedures.

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Costochondral Grafts for Hemifacial Microsomia: 24-Year Experience of a Single Surgeon

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Abstract

Background

Costochondral grafts (CCGs) can be used in mandibular reconstruction of Kaban-Pruzansky IIB/III hemifacial microsomia (HFM). Their growth is variable, occasionally necessitating secondary surgery. This study examined one surgeon's 24-year experience to better quantify long-term outcomes and surgical care required in CCG reconstruction of HFM mandibles.

Methods

Serial three-dimensional computed tomography scans, from preoperative to most recent, were analyzed in patients with minimum four years of clinical follow-up following CCG reconstruction. Ramus/graft height, length, volume, bilateral mandibular body length, and chin deviation were measured. Changes in measurements were analyzed at preoperative, immediate postoperative, and most recent imaging. Growth rates per measure were calculated utilizing scans after CCG, but before secondary surgery.

Results

Fourteen patients were analyzed. Mean clinical follow-up was 10.1±3.6 years. One patient developed temporomandibular joint ankylosis secondary to strut-graft malposition, which was repaired without further complications. CCG reconstruction led to immediate improvement in graft/ramus height ($p<0.001$), length ($p<0.001$), volume ($p<0.001$), and chin deviation ($p=0.01$). Growth analysis revealed ramus height ($p=0.9$) and length ($p=0.2$) grew at rates equal to native mandible, but graft volume and mandibular body growth were

significantly lower ($p<0.05$). By latest imaging, 63% of patients required secondary surgery, including distraction osteogenesis and/or orthognathic surgery due to differential graft/hemimandible growth behavior. By most recent clinical follow-up, this proportion increased to 93%.

Conclusion

CCGs provide significant short-term mandibular and facial symmetry improvement in HFM IIB/III. Long-term analysis reveals frequent undergrowth requiring secondary intervention to promote and maintain symmetry.

Objectives

1. Participants will be able to explain the long-term deterioration in facial symmetry commonly seen in CCG reconstruction of the HFM mandible 2. Participants will be able to explain the growth behavior of CCGs 3. Participants will understand that mandibular reconstruction in HFM requires personalized treatment algorithms to tackle each patient's unique growth behavior

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Financial Analysis of Routine Intensive Care Unit Admission Following Palatoplasty in Patients with Robin Sequence

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Nicolle Episalla

Abstract
Introduction: Our institution recently demonstrated that infants with Robin Sequence (RS) whose upper airway obstruction (UAO) was appropriately managed by conservative measures or mandibular distraction may be safely admitted to a surgical ward for post-operative monitoring instead of the pediatric intensive care unit (PICU) after primary palatoplasty (PP). This study aimed to estimate the potential cost savings of admitting patients to the floor instead of the PICU following PP.
Methods: Patients who underwent UAO management and subsequent PP for RS at our institution between 2010-2020 were included. Demographics, type of airway management, admission level of care, total length of stay, and department charges were recorded. Costs of admission per day and total length of stay were compared between patients admitted to the PICU and floor.
Results: Forty-five patients were included. Thirty patients were admitted to the PICU and fifteen were admitted to the surgical ward. Median age at PP was 13.4 months [interquartile range (IQR), 11.4 - 16.7]. Over half of the patients had a syndromic association (53.3%), this subset of subjects showed a higher prevalence in admission to the PICU (60.0%) vs. surgical ward (40.0%) ($p = 0.205$). The average combined physician and hospital charges for total days of admission were $55,912.80 for those admitted to the PICU and $32,660.00 for those admitted to the floor ($p=0.001$). The average combined physician and hospital charges per day were $7,970.33 while in the PICU and $3,193.22 ($p<0.001$) while on the floor.
Conclusions: Patients with RS admitted to the PICU after PP for post-operative care are charged a significantly greater amount of money than those admitted to the floor. Admission of medically appropriate patients to the surgical ward after PP may not only result in significant financial savings, but may also conserve space and resources in the PICU for more critically ill patients.

Objectives
1. Explain types of post-operative care in children with Robin Sequence (RS) who undergo primary palatoplasty (PP).
2. Evaluate differences in costs associated to post-operative care in children with RS who undergo PP. 3. Understand that patients with RS admitted to the PICU after PP for post-operative care are charged a significantly greater amount of money than those admitted to the floor.

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Orthognathic Surgery for Hemifacial Microsomia: Considerations after Costochondral Grafting

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Jordan Swanson


Jesse Taylor


Scott Bartlett


Hyun-Duck Nah

Abstract
Background: Advancements in orthognathic surgery (OGS) have augmented the ability to correct skeletal asymmetries. Hemifacial microsomia (HFM) patients with prior costochondral grafts (CCG) represent a particularly asymmetric cohort. The effects of prior CCG on OGS remain undefined.
Methods: Patients undergoing OGS from 2014 to 2021 with HFM and prior CCG, were compared to a matched cohort of HFM patients without prior CCG. All virtual surgical planning (VSP) movements were analyzed.
Results: Sixteen patients were included (5 prior CCG, 11 no prior CCG). CCG patients required a greater absolute left/right movement at point A (2.6 vs. 0.8mm, p=0.053), with no difference in planned movements at point B, pogonion or menton. Prior CCG increased the necessary advancement at the A (3.4 vs 1.6mm) and B points (10.8 vs 5.2mm), pogonion (20.9 vs. 9.5mm) and menton (22.5 vs. 9.7mm, $p<0.05$ for all). There was no difference between groups regarding impaction/dis-impaction maneuvers. Overall changes in sella-nasion-A (+3.8° vs. +2.0°) and sella-nasion-B (+6.4° vs. +2.2°) were also greater in the CCG group ($p<0.05$ for both). The prior CCG group achieved a more negative A-nasion-B angle (-3.3° vs. -1.5°, p=0.01), with no difference in occlusal plane angle change.
Conclusions: Prior CCG increases OGS complexity in HFM patients. The sum of the movements translates to a large mandibular advancement, likely necessary due to the severe mandibular hypoplasia. Prior CCG is a likely indicator of overall severity as well, which may explain the increase in maxillary movements. The severe asymmetry seen in these patients makes a strong argument for VSP. Postoperatively, prior CCG patients require extended maxillomandibular splint and elastic therapy in an attempt to retrain the masticatory musculature. The manner in which the CCG pseudoarthrosis affects the durability of OGS remains to be seen.

Objectives
1. Participants will be able to articulate differences in orthognathic surgical management in mandibles previously reconstructed with costochondral grafts 2. Participants will be able to explain why virtual surgical planning is necessary in orthognathic surgery of the previously grafted mandible 3. Participants will be able to explain necessary modifications in postoperative management in the treatment of mandibles previously reconstructed with costochondral grafts

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Characterizing the Epidemiology and Biomechanics of Paediatric Facial Fractures Associated with Dental Injuries

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Janina Kueper

Abstract

Background: Pediatric craniofacial fractures associated with dental injuries present a complex challenge to the surgical provider. This study sought to perform an epidemiologic review of pediatric craniofacial fractures associated with dental injuries and analyze the consequences of this combination of traumas.

Methods: 377 patients were identified to suffer from pediatric facial fractures with concomitant dental injuries at a single institution between 2005 to 2021. Demographic indicators, clinical details, imaging, and outcomes data were reviewed in depth and compared to those of patients without dental injuries.

Results: Patients were 10.8 years old on average at the time of presentation, with a statistically significant change in the age distribution when compared to children without associated dental injuries. The most common mechanisms of injury were motor vehicle accidents and non-motorized vehicle accidents (21.8 % and 19.4 %, respectively). The most common craniofacial fractures associated with dental injuries were the mandible (49.3%) and maxilla (43.2 %), followed by the orbit (14.1%) and skull (9.5%). A significantly number of children had discernible soft tissue injuries (69.2%). Most dental injuries were maxillary (59.1%), with only 1.9% of patients being diagnosed with combined maxillary and mandibular dental injuries. The most common dental injuries were root fractures (26.5%) and crown fractures (24.9%). A significantly larger proportion of patients with facial fractures and concomitant dental injuries were transferred to the trauma centre from an outside hospital (41.4 %) and admitted (58.6 %). A significantly smaller percentage of the patients affected by concomitant dental injuries received surgical intervention for their fractures (31.6% vs. 48.4%).

Conclusions: Pediatric patients with craniofacial fractures and associated dental injuries proved to be distinct in both epidemiology and management. Our study was able to highlight an feature of fracture locations that we believe may impact the designation of compound fracture presentation (Le Fort fractures) in the future.

Objectives

Participants will be able to explain the clinical consequences of pediatric facial fractures that occur with dental injuries. Participants will be able to apply their new understanding of pediatric facial fractures that occur with dental injuries in managing affected patients. Participants will be able to challenge the conventional way of characterizing facial fracture patterns in the pediatric patient.

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RESULTS OF CRANIOPLASTY USING BONE DUST FROM THE SCRAPPER IN 115 CASES OF CRANIOSYNOSTOSIS

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Nur EREK

Abstract
Introduction: Craniosynostosis is the premature closure of one or more cranial sutures, occuring in 1 per 2,000-2,500 live births. Craniosynostosis surgery is performed between 6–12 months of age with high morbidity and mortality. The main goal is to remove the barrier restricting brain development, prevent possible functional losses due to compression and ultimately achieve a healthy appearance with aesthetic gains.
Method: A retrospective evaluation of 115 cases underwent calvarial shaping with bone dust alone at Hacettepe University Plastic, Reconstructive and Aesthetic Surgery Clinic between January 2014–January 2023 was conducted. Frontoorbital relapse, resinostosis rates, early&late complications, visual&hearing losses and aesthetic gains were evaluated. Cranial defects, frontoorbital relapse and resinostosis were evaluated by physical examination, three-view skull radiographs and 3D computed tomography; while aesthetic gain by before and after surgery photos.
Results: Of the 115 craniosynostosis cases, 33(29%) were syndromic, 82(71%) were non-syndromic. The mean age of surgery is 18 months (6–66 months) of age. When the relationship between being syndromic and having resinostosis and frontoorbital relapse was evaluated using Fisher's exact test, the P value was 0.763($p>0.5$) and 0.523($p>0.5$), respectively. When the relationship between being syndromic and having early and late complications was evaluated using Fisher's exact test and chi-square test, respectively, the P value was 0.036($p<0.5$) and 0,013($p<0.5$), respectively. 89% of the patients stated that the aesthetic results were “satisfactory, good”.
Conclusions: If the craniosynostosis surgery is performed within the ideal time frame, reshaping can be easily performed with bone benders without using allografts or other materials. It was concluded that a better, satisfactory shape was achieved when the transition points, advancing areas of the frontoorbital bar (as a relapse prevention) were filled with autogenous bone dust.

Objectives
Participants will be able to describe the relationship between being syndromic and early-late complications. Participants will be able to describe that there is no significant relationship between being syndromic and frontoorbital relapse and resinostosis. Participants will be able to understand that better results can be achieved by using bone dust obtained with a bone grater in transition zones after bone shaping with bone benders without using allografts or other materials in craniosynostosis surgery.

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Inhibition of miR-200a regenerates cranial bone in critical-sized rat and sheep skull defects

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Amelia Hurley-Novatny

Abstract
Background: Craniofacial trauma can cause loss of significant portions of cranial bone, resulting in a critical-sized bone defect. Currently, there are no regenerative medicine strategies to repair these defects, necessitating implantation of a prosthetic. However, implants carry risk of infection, failure, and need for explantation. Our team has approached this problem by inhibiting microRNA 200a (miR-200a) via a novel, patented plasmid-based inhibitor system (PMIS). PMIS-miR-200a results in osteogenesis both in vitro and in vivo. We hypothesize that PMIS-miR-200a promotes cranial bone regeneration of critical-sized skull defects in both rodents (rat) and large animal (sheep) models without local or systemic toxicity.
Methods: Full thickness, critical-sized cranial defects were investigated in both rats (10 mm diameter) and sheep (15 mm diameter). Cranial defects were filled with Helistat® collagen sponge and loaded with PMIS-miR-200a in PEGylated peptide nanoparticles vs control. Cranial bone regeneration was evaluated by µ-CT and histology in both animals. Toxicity studies were done in rats by assessing miR expression, blood levels of liver enzymes, and pathology of liver sections.
Results: Critical-size cranial defects analyzed by µ-CT demonstrated near total bone regeneration by 4 weeks in rats. Histological analysis demonstrated new mature bone growth across the cranial defect with integration to existing native cranial bone. Toxicity studies in rats demonstrated no aberrant miR expression, normal liver enzyme values, and normal liver pathology. Sheep studies demonstrated similar success of autologous cranial bone regeneration using PMIS-miR-200a soaked collagen sponges compared to controls with µ-CT demonstrating trabeculated mineralized matrix closely resembling native bone architecture.
Conclusions: PMIS-miR-200a impregnated collagen sponges promote promising autologous cranial bone regeneration of critical-size defects in rats and sheep. This novel technology provides a promising new gene therapy strategy for cranial bone regenerative medicine.

Objectives
Participants will be able to identify weaknesses in current management of critical-size defects resulting from trauma. Participants will be able to identify practical and necessary components of a clinically translatable regenerative medicine strategy for bone regeneration. Participants will be able to evaluate use of microRNA inhibition for regeneration of critical-size cranial defects.

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Three-Dimensional Printed Skulls Improve Caregiver Education on Craniosynostosis: A Randomized Controlled Trial

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Katherine Zhu


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Eric Jackson


Alan Cohen


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Abstract

Background

Achieving caregiver understanding of craniosynostosis is a challenging yet critical component of pediatric craniofacial care. Traditional educational modalities are two-dimensional, which may be ineffective at conveying complex anatomy. Recently, three-dimensional (3D) printing has emerged as a tool to create anatomical models. This study seeks to evaluate how various 3D printed models (generalized, patient-specific) impact caregiver understanding of craniosynostosis.

Methods

A single blind randomized controlled trial was performed on caregivers of patients who presented to our institution for craniosynostosis treatment. One week before surgery, caregivers completed a survey that included anatomical labeling questions, true/false understanding questions, and the Surgical Fear Questionnaire. Caregivers were randomly assigned to three groups: no 3D printed model (control), generalized skull model of patient's craniosynostosis, and patient-specific model (printed from patient's own CT). On the day of surgery, all caregivers

were educated about craniosynostosis pathophysiology, skull suture anatomy, and basic surgical approach. Caregivers randomized to the model groups were given a 3D printed model during the session. Caregivers then completed the same survey. Paired t-tests and one-way ANOVA with multiple comparison-tests were performed with significance at $p<0.05$.

Results

Fourteen caregivers completed the study: five were shown a generalized model, five were shown a patient-specific model, and four were not shown any 3D printed model. Compared to caregivers shown no model or a generalized model, caregivers shown a patient-specific model scored significantly higher on the anatomy questions ($p=0.02$). Compared to caregivers shown a generalized or patient-specific model, Caregivers shown no model scored significantly higher on the true/false understanding questions ($p=0.02$).

Conclusions

Caregivers in all groups were able to improve their craniosynostosis understanding. The results suggest that 3D printed models are effective for improving anatomical understanding. As these models can help caregivers understand craniosynostosis, they can support surgeons performing informed consent for complex surgeries.

Objectives

1. Evaluate the impact of 3D printed models on caregiver education 2. Compare the efficacy of generic vs. patient-specific 3D printed models on caregiver education 3. Understand the importance of caregiver based education for anatomically complex craniofacial diagnoses

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Protocol for records in Mid-face Surgery in Syndromic Craniosynostosis

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Susana Dominguez-Gonzalez


Jennifer Vesey


David Richardson


Anusha Hennedige


Wendy Blumenow


Anna Kearney


Katie Piggott


Christian Duncan


Joanna May

Abstract

Background: Patients born with syndromic craniosynostosis may need mid-face surgery at some stage of their life to improve function and/or appearance.
Deciding optimal timing for mid-face surgery is challenging and coordination within craniofacial specialties involved is extremely important to make the process as streamline and efficient as possible to patients and families.
Accurate collection of records pre- and post-surgery is paramount for analyzing outcomes and future learning.
Methods: Following a preliminary study looking at outcomes of mid-face surgery performed at the Supra-regional Craniofacial Unit at Alder Hey Children's Hospital, UK, it was advised to review surgical and orthodontic records' protocol including follow up visits, pre and post mid-face surgery. Facial surgeons, orthodontists, pediatric dentist, speech and language therapist and psychologists of the Team met to review and discuss the records and follow up visits for mid-face surgery.
Results: The initial assessment for decision-making should commence 12 months before the planned surgery to give time to patients and families to meet the psychology team, unless there are major health issues requiring a quicker approach.
The pre-operative assessment should happen 4-6 months before surgery. This involves psychological questionnaire, speech/articulation and resonance assessment and feeding discussion, dental impressions/intraoral scan, overjet and overbite measurements, photographs, radiographs and CT scan will all be taken.
Immediately post distractor removal, radiographs, photographs and overjet and overbite measurements should be collected and then again at 12 months and 3 years post-surgery.

At 6 and 12months post-surgery, psychological questionnaires, speech/articulation and resonance assessment would be taken.
Conclusions: Multidisciplinary approach and coordination of the Craniofacial specialties implicated directly in mid-face surgery is vital for good outcomes. Setting up the time for follow up visits before and after mid-facial surgery as well as good records collection are important for standardization and auditing the outcomes.

Objectives

Participants will be able to tell which orthodontic records should be taken before and after mid-face surgery
Participants will be able to tell the speech and language assessment needed before and after mid-face surgery
Participants will be able to tell the physiology follow up needed before and after mid-face surgery

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Avascular necrosis complicating orthognathic surgery: it's lurking

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Michael Lypka

Abstract

Background: Avascular necrosis (AVN) is a rare complication of orthognathic surgery, especially segmental maxillary surgery. Sequelae may range from gingival recession, pulpal necrosis, interdental bone loss, to loss of teeth and bony segments. It is the purpose of this presentation to review one surgeon's experience with this complication in a series of consecutive patients who underwent maxillary and mandibular osteotomies.

Methods: Over a ten-year period from 2013 to 2023, all maxillary and mandibular osteotomies performed by a single surgeon were reviewed. Cases of AVN where identified. Characteristics of each case were studied, and trends were recorded.

Results: 269 consecutive patients were reviewed for a total of 748 osteotomies. 66% of patients had cleft lip and/or palate. There were eight instances of AVN, all after maxillary surgery. All were segmental cases except for one. Sequelae ranged from localized gingival recession (n=3) to loss of teeth at interdental osteotomy (n=5). There were no cases of entire segment loss Half of the patients with AVN had cleft lip and/or palate, while 3 of 8 had no other associated condition. None of the cases were large movements (greater than 10 mm). Other factors identified as potential contributors to AVN risk were hypotension (n=2), excessive stripping of bony segments (n=2), inadequate space between teeth (n=1), tear in buccal pedicle (n=1), and history of smoking/vaping (n=2). A cluster of cases (n=4) occurred in the last year reviewed.

Conclusion: AVN is a risk that must be acknowledged when performing maxillary osteotomies. Most cases are probably avoidable with meticulous surgical technique and proper orthodontic preparation. Proportionately, AVN in this series was just as common in the non-cleft group as it was in the cleft population. There was a trend toward an increase in the number of cases as operator experience evolved.

Objectives

Participants will become aware of the risk of avascular necrosis as a complication of orthognathic surgery. Participants will learn risk factors for avascular necrosis. Participants will learn techniques to best avoid avascular necrosis.

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Comparison of Speech Sound Production and Phonological Development in Patients with Unilateral Cleft Lip and Palate with or without Nasoalveolar Molding (NAM).

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Lindsay Schuster


Maryam Arab


Mahmoud Arab


Katherine Katko


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Abstract

Background: Speech development and quality of speech in children with cleft lip and palate may be affected by anatomical differences. Some of the abnormalities described in the literature are disorders of resonance, audible nasal emission, maladaptive articulation placement errors and distortions due structure.To our knowledge, this is the first study to evaluate speech production in relation to history of NAM treatment.
Methods: Retrospective speech analysis for patients with a history of complete unilateral cleft lip and palate who underwent NAM or no NAM therapy were reviewed. Speech was evaluated at different age groups:18 months, 3-4 years, 5-6, and 7-8 years of age. Multiple speech variables were evaluated at different age groups for each patient. These variables include presence of maladaptive or developmental errors, compensations secondary to occlusion, delay in speech, need for speech therapy or secondary surgery for velopharyngeal insufficiency (VPI). A pilot study for 10 patients was conducted, and 50 more patients will to be added for the final sample (45 males and 15 females). Pearson correlation was used to test the relationship between the presence of NAM and all the other variables.
Results: Presence of NAM was significantly associated with 31.3% increase in developmental speech errors ($P< 0.05$). Overall, there is insignificant association between the existence of NAM and all other variables ($P>0.05$). The presence of NAM was insignificantly associated with increased probability of existence of distortions or compensation secondary to occlusion, need for speech therapy, and maladaptive articulations errors.
Conclusion: There was a statistically significant increase in developmental articulation errors in cleft lip and palate patients with a history of NAM therapy. There are no other significant differences in speech and language development in patients with unilateral cleft lip and palate who had NAM therapy vs those w/o NAM therapy.

Objectives

-Participants will be able to tell the differences in speech sound production and phonological development in patients with unilateral complete cleft lip and palate treated with or without Nasoalveolar Molding (NAM). - Participants will be able to compare different variables and results between the NAM and no NAM groups at different age groups up to 8 years of age. - Participants will be able to understand the effect of NAM therapy on speech development at different age groups in patients with UCLP.

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Immediate Cranioplasty Using a Patient-Specific Poly-Ether-Ether-Ketone (PEEK) Implant in Patients with Spheno-Orbital Meningioma and Hyperostosis: Is It Feasible?

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Scott Odorico


Jamie Van Gompel


Samir Mardini


Sai Cherukuri

Abstract

Background: Following total or subtotal resection of sphenoid-orbital meningioma (SOM) and hyperostosis, cranial reconstruction is usually performed using “off the shelf” titanium implants. When patient-specific cranioplasty is performed, it is usually done in a delayed fashion requiring a second surgery. Here, we describe the feasibility, virtual surgical planning (VSP) workflow, and surgical steps of immediate cranioplasty using a patient-specific, poly-ether-ether-ketone (PEEK) implant in a patient undergoing sub-total resection of SOM and hyperostosis.

Methods: Sub-total resection via a frontotemporal craniotomy was planned in a 50-year-old woman with right-sided spheno-orbital meningioma with associated hyperostosis of the greater and lesser sphenoid wings, lateral orbital wall, right orbital roof, inferolateral aspect of the right frontal calvarium, and cranial base. High-resolution CT scan of the cranium was segmented and three-dimensionally (3D) reconstructed by medical modeling company for preoperative planning. In conjunction with the extirpative neurosurgeon, a decision was made with regards to the size, location, and extent of the frontotemporal craniotomy. A virtual meeting was held with a medical engineer to create cutting guides. Mirroring of the normal, contralateral side was done virtually to 3D-print a patient-specific, PEEK implant to replace the planned craniotomy defect.

Results: Using cutting guides, a frontotemporal craniotomy was performed for resection of hyperostotic bone and exposure of tumor. Subsequently, under the microscope, orbital-optic osteotomy, anterior clinoidectomy, and resection of affected dura was performed. The craniotomy defect was reconstructed using a patient-specific 3D implant with seamless inset and contouring with the use of a burr drill. Immediate post operative imaging revealed adequate contour symmetry and no obvious immediate complications.

Conclusions: A single-stage, immediate cranioplasty using a patient-specific, PEEK implant in patients with SOM and hyperostosis is technically feasible with VSP. Close communication between the plastic surgeon, neurosurgeon, and medical engineer is essential for successful planning and precise execution.

Objectives

Participants will be able to understand the virtual surgical planning workflow for a single stage resection and cranioplasty of a spheno-orbital meningioma with hyperostosis. Participants will be able to understand the feasibility of utilizing Virtual Surgical planning for the treatment of hyperostosis secondary to meningioma. Participants will be able to understand the importance of close communication between the plastic surgeon, neurosurgeon and medical engineer in the utilization of virtual surgical planning.

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Is less more? Conservatism in the treatment of trigonocephaly.

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Abstract
Background Since 2017 our unit does not perform routine surgery for trigocephaly anymore, because the risk of raised ICP proved to be very low.
Methods We consult parents about the lack of a functional indication for surgery and offer a conservative treatment next to a surgical treatment. Surgical treatment can be an endoscope assisted strip craniectomy for moderate and severe cases younger than 6 months of age or a fronto orbital advancement for older children. The follow-up protocol is identical for all 3 types of treatment with measurement of the skull circumference every year and fundoscopy annually up to 4 years of age.

Results The majority of parents opt for conservative treatment. One third of parents choose surgery, mostly the strip craniectomy if age allows for it. None of the conservatively treated patients developed signs of raised ICP and none of the parents requested correction for esthetic reasons.

Conclusions Conservative treatment for trigonocephaly independent of severity shows the same very low prevalence of raised ICP as surgical treatment. The majority of parents opt for a conservative treatment if no functional indication arises. Combined with the results from our 3D shape analysis, demonstrating ongoing normalization of the forehead (abstract P. Tio), conservative treatment of trigonocephaly is a safe choice.

Objectives
1.participants will know the very low prevalence of raised ICP in trigoncephaly 2. participants will also know that most parents, in our institution, opt for conservative treatment in trigonocephaly 3. we hope participants will learn to consider conservative treatment for trigonocephaly a safe treatment

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Radiographic Evidence of Dental Complications Following Mandibular Distraction Osteogenesis: Inverted-L versus Oblique Osteotomy

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Jesse Taylor

Abstract

Introduction

Patients with micrognathia undergoing mandibular distraction osteogenesis (MDO) for functional and aesthetic improvement are at significant risk for dental complications. This study investigates association of two osteotomy patterns—oblique and invertedL—with risk to developing dentition.

Methods

Our senior orthodontist performed a retrospective review of dental radiographs of patients undergoing MDO with confirmed oblique or inverted-L osteotomies between 2012 and 2022. Images were assessed for evidence of missing, damaged, or displaced teeth, and proportion of affected hemimandibles by injury type and mean number of affected teeth per hemimandible were compared between groups using appropriate statistical methodology.

Results

Analysis included 45 patients (23 oblique, 22 inverted-L) and 87 hemimandibles (45 and 42). Mean age at surgery was 3.3±4.7 years, and age at imaging was 8.1±4.4 years; there was no difference between groups ($p=0.17$, $p=0.54$, respectively). Oblique osteotomy was associated with greater odds of missing teeth (OR 13.6, $p<0.001$), damaged teeth (OR 3.9, $p=0.01$), and any dental injury (OR 33.5, $p<0.001$) compared to inverted-L, as well as greater number

of missing teeth (β=0.6, p<0.01), damaged teeth (β=0.4, p=0.01), and total number of affected teeth (β=1.0, p<0.001). There was no difference in incidence (p=0.8) or number (p=0.8) of displaced teeth between groups.

Conclusion

Inverted-L osteotomies were associated with fewer dental complications as compared to oblique osteotomy at all ages studied. While longer-term follow up and prospective data are needed prior to making definitive recommendations, this data is helpful to surgeons as they plan MDO.

Objectives

1. Participants will be able to explain the difference in dental injury risk between two common mandibular osteotomy patterns 2. Participants will be able to explain the types of dental injury commonly seen secondary to mandibular distraction osteogenesis 3. Participants will be able to better counsel patients preoperatively of long-term dental injury following mandibular distraction osteogenesis

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A Longitudinal Audit: Language assessment of children with single suture craniosynostosis at 18 months, 3, 5 and 7 years of age and the implications for the development of multi-disciplinary team care pathways.

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Abstract

Background

At Birmingham Children's Hospital all children presenting with single suture synostosis undergo speech and language assessment at 18 months, 3, 5, 7 and 10 years. Based on assessment findings and clinical judgement at these key ages, children are referred on to community speech and language therapy (SLT) services as required.

Outcomes have been presented previously for those children assessed at 18 months, 3 and 5 years. Data collection has continued and it is now possible to analyse longitudinal assessment outcomes from 18 months through 7 years old.

Method

A retrospective, longitudinal audit of SLT notes of more than 80 children with single suture synostosis was carried out. Each child had undergone language assessment at 18 months, 3 years, 5 years and 7 years of age. The outcomes for each child were categorised using a 3 point scale and were plotted and compared. Data on the nature of early intervention offered was also analysed.

Results

Initial findings suggest that normal language assessment outcomes at 18 months or 3 years are predictive of normal outcomes at 7 years in more than 75% of the cohort.

The results also indicate that, of the children found to have language difficulties at 18 months, over 50% had improved to normal language levels by 7 years of age.

Conclusions

Detailed language assessment at 18 months or 3 years by a trained SLT clinician has a predictive value for language outcomes at 7 years. It also allows for effective early intervention in the form of advice or referral to community SLT.

Resource prioritisation and streamlining of care pathways for children with craniosynostosis are indicated and should be implemented.

Objectives

Participants will understand the importance of longitudinal speech and language assessment for the craniofacial child Participants will grasp the importance of Speech and Language Therapist involvement on the Craniofacial Multidisciplinary team Participants will see how resources can be targeted to ensure that the children with greatest speech and language need can be prioritised

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A National Database Perspective on Pediatric Non-Accidental Trauma Patients and Differential Outcomes for Facial Trauma Operations

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Dana Meshkin


Joseph Mocharnuk


Annie Glenney


Raj Vyas


Miles Pfaff

Abstract
Background: The Pediatric Health Information System (PHIS) database collects admissions, diagnostic, and treatment data among 44 children's hospitals across the U.S. Non-accidental trauma (NAT) is a prominent cause of trauma mortality in the pediatric population. However, little has been published on national outcomes for NAT cases shared by otolaryngologists and plastic surgeons and their interplay with measures of the social determinants of health (ie., the Child Opportunity Index or COI). The purpose of this study is to explore this relationship among a subset of NAT patients who underwent these shared facial trauma procedures.
Methods: A retrospective review was performed after querying the PHIS database for ICD codes pertaining to pediatric non-accidental trauma.
Results: Among the 179,688 NAT cases included in PHIS, 4,462 were associated with facial trauma operations performed by plastic surgeons and otolaryngologists. Of these procedures, 2,741 had an otolaryngologist as treating physician, and 1,721 had a plastic surgeon treating physician. The average COI of otolaryngologist-treated patients (44.3 ± 2.4) was significantly higher (p-value <0.0001) than plastic-surgeon-treated patients (mean COI: 28.9 ± 3.1), indicating increased socioeconomic strain. Controlling for this difference in COI, the average length of stay among plastic surgeons for the same subset of procedures was significantly lower by an average of 3.89 days (p-value <0.0001) compared to otolaryngologists.
Conclusions: This study offers a national perspective on the relationship between social determinants of health and length of stay in pediatric non-accidental trauma patients.

Objectives
1. Participants will be able to explain the national trends in pediatric non-accidental trauma. 2. Participants will review and critique how social determinants of health impact perioperative and postoperative outcomes for pediatric patients with non-accidental trauma. 3. Participants will be able to analyze and compare potential differences in patient outcomes by specialty.

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Case report of an anophthalmic, anencephalic neonate with midline cleft lip and palate

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Neena Marupudi


Mandy Flor


Michael Cools


Arlene Rozzelle

Abstract

Background

Bilateral anophthalmia is extremely rare and is estimated to occur in 3 per 1 million live births. When combined with facial clefts, such cluster of craniofacial anomalies has been described as “Anophthalmia-Plus syndrome” (APS). So far, less than 20 cases have been reported in the literature.

Methods

We report a neonate with bilateral anophthalmia, cleft lip and palate, as well as multiple CNS anomalies.

Results

This was a 37-week gestational age male born to otherwise healthy parents. Fetal ultrasound showed intrauterine ventriculomegaly and severe exophthalmos. Parents did not pursue any further testing in the prenatal period of such anomalies. Patient’s APGAR score was 3 and 7; he was intubated shortly after delivery due to respiratory failure. Physical exam showed macrocephaly (HC 47%; 100th percentile), bulging fontanelles, bilateral large cystic swellings at the orbit with partially fused eyelids, midline cleft lip and palate, and low set ears.

CT and MRI Imaging showed absent ocular structures, severe obstructive supratentorial hydrocephalus with aqueductal stenosis, and only a small peripheral rim of cerebral cortex. There were no anomalies involving trunk or extremities. After extensive multidisciplinary counseling, given concern for quality of life, parents elected to not proceed with CSF shunt and patient passed shortly after withdrawal of respiratory support.

Conclusion

We hypothesize that our patient may have features consistent with “Anophthalmia-Plus syndrome”; however, he did not have other anomalies described in other cases such as sacral neural tube defect or midline abdominal wall defect.

Such sequence of CNS and oculo-facial congenital anomalies is extremely rare. There has not been any genetic factors or mutations identified to be associated with such sequence. The importance of adopting a multidisciplinary approach cannot be stressed enough to provide prenatal and perinatal supportive care as well as parental counseling.

Objectives

1. Understand phenotypic features of Anophthalmia-Plus syndrome 2. Recognize CT findings of anophthalmia 3. Initiate discussion regarding prenatal/perinatal counseling for patients with anophthalmia, facial clefts, and CNS anomalies

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“Is oral surgery training required to perform orthognathic surgery?”: an opinion survey of the American Society of Maxillofacial Surgeons

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Zachary Brooks

Abstract

INTRODUCTION Debates surrounding scope of practice and board certification are ongoing in specialties where practitioners have overlapping skill sets. Recently, the American Board of Oral and Maxillofacial Surgery (ABOMS) has petitioned to join the American Board of Medical Specialties (ABMS), to which proposal the American Society of Plastic Surgeons (ASPS) strongly objects. Some plastic surgeons have expressed the opinion that oral surgeons, simply by virtue of their dental training, are more qualified to perform orthognathic surgery than plastic surgeons. This position undermines the integrity of plastic surgery residency and craniofacial fellowship training. If the prestigious ABMS accepts the ABOMS petition, this argument may further threaten plastic surgeons’ standing with patients, colleagues, and referring physicians. Our study attempts to gather opinions from members of the American Society of Maxillofacial Surgeons (ASMS) on whether training in dentistry and oral surgery renders a unique advantage to surgeons who perform corrective jaw surgery.

METHODS ASMS active members received a voluntary 26-question survey intended to address their opinions on whether qualification to perform orthognathic surgery differs based on plastic surgery or oromaxillofacial surgery training. Results were quantified using a 5-degree scale.

RESULTS Survey responses were collected from 77 (23.3%) of the 330 active ASMS members. By degree, 1 respondent (1.3%) obtained a degree of dental surgery (DDS), 55 respondents (71.4%) obtained a medical degree (MD), and 21 respondents (27.3%) obtained a DDS/MD. Notably, 100% of DDS surgeons and 77.4% of MD/DDS surgeons agree that single-boarded surgeons do not understand optimal teeth positioning in orthognathic surgery, while only 30.8% of MD surgeons agree.

CONCLUSIONS The large majority of respondents believe that oromaxillofacial surgery training or plastic surgery training does not give an individual greater qualification to perform, or succeed in, orthognathic surgery. These results suggest that quality is the most important aspect of training.

Objectives

Participants will learn about board certification debates surrounding the ABOMS, ABMS, and ASPS. Participants will be able to understand implications of such debates on the plastic surgery specialty. Participants will understand how this study attempted to quantify opinions surround such debates.

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Objective Measurement of Long-term Shape Outcomes in Spring Surgery vs Cranial Vault Remodeling

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Christopher Runyan

Abstract
Background: Spring-mediated cranioplasty (SMC) and cranial vault remodeling (CVR) are widely used surgical techniques for the correction of sagittal craniosynostosis (SC). This study evaluates changes in regional morphology of SC patients who have undergone SMC or CVR using the frontal bossing index (FBI), occipital bulleting index (OBI), vertex narrowing index (VNI), and scaphocephalic severity index (SCI) to capture differences in anterior protrusion, posterior protrusion, width restriction, and global dysmorphology, respectively.
Methods: The FBI, VNI, OBI, and SCI were measured on CT and 3D photographs (n= 788) of 222 SC patients from 2001 to 2022 who underwent SMC (n=152) and CVR (n=70). Short-term post-operative trends were evaluated based on post-operative time in 6-month intervals from 0-12, followed by a yearly 12-24 interval through two years postoperatively, and long-term trends were evaluated based on age in 2-year intervals up to 10+ years of age.
Results: Mean age at time of surgery was older in the CVR cohort (mean 22.55±16.00) than in the SMC cohort (mean 4.56±2.24; $p<0.05$). Pre-operatively, the SMC cohort had more severe regional dysmorphology in FBI, VNI, and SCI ($p<0.05$) relative to the CVR cohort. Frontal bossing consistently improved over time in both cohorts with the significant difference between cohorts disappearing in the 6–8-year-old interval ($p=0.46$). Head width had improvement as soon as the 0-6 months postoperative period ($p<0.05$); however, it consistently regressed after surgery in both cohorts. Global head shape initially improved in the CVR cohort, but over time regressed. In contrast, SMC maintained improvements in SCI over time trending towards superiority with significantly better percent change in every age interval ($p<0.05$).
Conclusions: SMC and CVR achieve similar morphologic outcomes. CVR has initial improvements that taper with time; conversely, SMC leads to maintained improvement likely due to the craniums-maintained growth potential.

Objectives
1. Participants will better understand the objective assessment of post-operative regional morphology in sagittal craniosynostosis. 2. Participants will be better equipped to understand the impact of CVR and spring surgery on the skull's growth potential. 3. Participants will be able to assess the pattern of long-term growth following surgery for sagittal craniosynostosis.

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Frontofacial Distraction. Personal reflections of 152 cases undertaken over 22 years

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David Dunaway

Abstract
Background
Patients with syndromic craniosynostosis suffer a combination of midfacial retrusion and cranio-cerebral disproportion, resulting in physical deformity and functional issues including ocular exposure, airway obstruction, and inter-cranial hypertension. While frontofacial distraction an effective treatment option, it carries a significant risk of complications.
This study documents the evolution of frontofacial surgery and the changes in outcome over time in a single unit.
Methods
A retrospective case note review of 152 patients with syndromic craniosynostosis undergoing frontofacial distraction between 2001 and 2023 was undertaken. The findings of 39 peer reviewed papers relating to this cohort were analysed.
Results
91 monoblocs, 41 bipartition advancements and 11 Le Fort III distractions were performed with the remainder being complex multipart subcranial osteotomies. Age at surgery ranged from 3 months to 23 years. Syndromic diagnoses were Crouzon 44%, Apert 34%, Pfeiffer 16%, other 6%. Primary indication for surgery was functional in 99 patients and aesthetic in 53.
Over the 22-year period reviewed, operative time and transfusion requirements steadily reduced. Infection rates fell from 32% to 5%, but there was no significant reduction in CSF leak rate. The introduction of perioperative protocols was associated with a reduction in infection.
Functionally, frontofacial distraction provides ocular protection and treats intracranial hypertension and has a variable effect on airway obstruction.
Cephalometric and statistical shape analysis show that deformity is incompletely corrected particularly in Apert syndrome. The introduction of facial bipartition and complex subcranial operations have improved aesthetic outcomes, but most patients benefit from secondary aesthetic procedures.
Conclusions
Over the last 20 years advances in surgical planning and technique have reduced complications and improved functional and aesthetic outcomes. Frontofacial distraction remains a major intervention with a moderate complication risk.

Objectives
Participants will be able to 1.Evaluate the risks and benefits of craniofacial distraction 2. reflect on the processes involved in improving outcome 3. Reflect on a single institution experience of craniofacial distraction

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Avoiding VP shunt in syndromic faciocraniosynostosis: 20 years' experience in Necker Hospital

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Abstract

Introduction:
In Necker's hospital, it has been the policy to avoid it or delay VPS in faciocraniosynostosis
Methods:
Among 236 new syndromic patients operated in Necker Hospital (2000-2020), 203 cases were retrospectively accessible for review.
Only 165 Crouzon and Pfeiffer patients files were analyzed because Apert syndromes almost never present with active hydrocephaly.
An analysis of ventriculomegaly/tonsillar herniation/ craniovertebral junction anomalies/ syringomyelia was undertaken.
The type of surgery (VP shunt/ETV / foramen magnum decompression/posterior expansion/craniovertebral fixation/FFMB), the timing and the sequence of different procedures have been examined and compared.
Results:
Ventriculomegaly was reported in 72/165 patients (43%) among whom 48 patients (29%) required treatment: 21 ETV (16 Crouzon and 5 Pfeiffer), 18 primary VPS, and 6 secondary VPS after ETV failure (24 VPS in 15 crouzon and 9 Pfeiffer).

1. In those 48 hydrocephalic patients, 40 patients presented with Chiari malformation (91%); in 39% a posterior fossa expansion has been realised at 6 months of age and in 30 % an "early frontofacial monobloc advancement" in the first 2 years.
    - In the group of 21 ETV patients, 16 presented a Chiari malformation, operated in nine patients.
    - All 24 cases treated by VPS presented a Chiari malformation (14/24 submitted to FM decompression +/- posterior expansion).
2. In the group of 93 patients without ventriculomegaly, Chiari malformation has been observed only in 36%.

Discussion:
The association of Chiari malformation and hydrocephalus is clear. The surgical treatment of Chiari and extensive cranial vault surgery can help to treat the ventriculomegaly and reduce the number of VP shunt procedures.

Conclusion:
A clear strategy of multi-step surgery can be recommended to avoid or reduce the need for VPS.

Objectives

review and critique analyze plan

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Failure Rates based on Alveolar Cleft Size: An Analysis of the Critical Size Defect for rhBMP-2/DBM and ICGB in Alveolar Bone Grafting

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Abstract

Background: Alveolar bone grafting (ABG) using iliac crest bone graft (ICBG) is the standard of care for children with complete cleft lip and palate. With the advent of recombinant human bone morphogenetic protein (rhBMP-2) and demineralized bone matrix (DBM), donor site morbidity associated with harvesting bone can be avoided. However, a critical-sized defect for graft failure rates for ICBG and rhBMP-2/DBM remains unknown; this study aims to identify this critical size to guide surgeons performing ABG.

Methods: A retrospective review evaluated patients undergoing ABG from 2009-2022. Patients with genetic syndromes, bilateral clefts, and missing preoperative and postoperative cone beam computed tomography (CBCT) were excluded. The 3-dimensional cleft volumes were calculated using preoperative CBCT. The primary outcome was bony bridge formation based on postoperative CBCT. Logistic regression was used to model graft failure rates and identify the maximal point, which defined the critical-sized defect.

Results: Seventy patients met inclusion criteria who underwent ABG with ICBG (n=32) or rhBMP-2/DBM (n=38). There was no significant difference in failure of bony bridge formation between graft types (ICBG: 28.1%, rhBMP-2/DBM: 34.2%; p=0.585). Computational analysis demonstrated similar trends in predictive graft failure for both

cohorts. There was no significant difference in graft failure rates between bone graft types. The critical-sized defect was calculated to be 858 mm^3 and 920 mm^3 for ICBG and rhBMP-2/DBM, respectively. Chi-squared analysis showed an increase in graft failures in clefts beyond the critical-sized compared to below for both ICBG (64.3% vs. 0.0%; $p<0.001$) and rhBMP-2/DBM (80.0% vs. 17.9%; $p<0.001$).
Conclusion: Our findings identified a higher probability of graft failure beyond the predicted critical size for each respective bone graft. Clinicians can better counsel families of patients with larger defects with a higher probability of treatment failure using either ICBG or rhBMP-2/DBM.

Objectives

1. Identify the critical-sized defect for alveolar bone grafting for each graft option 2. Analyze and compare graft failure rates around the critical-sized defects for each graft type 3. Investigate if there are distinct ranges in cleft volume where one bone graft may be more favorable than another

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Quarter Century Review of Velopharyngeal Insufficiency Rates between Palatoplasty Techniques among Patients with Robin Sequence

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Abstract

Background: Children with Robin sequence (RS) have wide U-shaped cleft palates. Following primary palatoplasty, RS patients have high rates of velopharyngeal insufficiency (VPI), often requiring speech-correcting surgery. This study compares VPI rates between palatoplasty techniques among the RS population.

Methods: A retrospective review of patients with isolated RS without concomitant syndromes from 1997-2022 was completed. Clinical and operative data were collected. Surgical techniques were performed by multiple senior surgeons and were categorized as Furlow double-opposing Z-plasty or straight-line palatoplasty. The primary outcome is surgical VPI rates.

Results: Upon review, 91 patients were identified to have isolated RS, of which 79 had a concomitant cleft palate. Overall surgical VPI rate was 11.4%. Follow-up time was 6.3±4.8 years (Furlow) and 4.2±4.0 years (straight-line; p=0.0593). Excluding patients with less than two years of follow-up, 35.7% (15/42) of Furlow patients had clinically diagnosed VPI compared to 11.8% (2/17) of the straight-line cohort (p=0.066). No patients in the straight-line cohort required speech-correcting surgery. The Furlow cohort had higher surgical VPI rates (21.4% vs. 0.0%; p=0.038) compared to straight-line. Upon Kaplan-Meier analysis, the 5-year surgical VPI rate was 11.6% and 0.0% for the Furlow and straight-line cohorts, respectively (p= 0.066).

Conclusions: Our findings suggest the Furlow technique resulted in higher surgical VPI rates than straight-line repair among our RS patients. Though the Furlow technique offers palatal lengthening, this technique may compromise velum function in this wide cleft RS population.

Objectives

1. Evaluate the rates of clinically-diagnosed and surgically-intervened velopharyngeal insufficiency among the Robin Sequence population 2. Distinguish between postoperative velopharyngeal insufficiency outcomes based on different surgical technique following palatoplasty in patients with Robin Sequence 3. Investigate the long-term speech outcomes and variations between techniques following palatoplasty in patients with Robin Sequence

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Objective Tools for Measurement of Lambdoid and Unicoronal Craniosynostosis

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Abstract
Introduction: Lambdoid craniosynostosis (LC) and unicoronal craniosynostosis (uCC) can be difficult to differentiate clinically from benign positional plagiocephaly (PP). We developed an automated surface-based imaging algorithm to identify characteristics between these three populations, with the goal of improving diagnosis and pre- and post-operative evaluation without radiation.
Methods: To compare individuals with LC vs PP and uCC vs PP, the Wake Forest Cranial Imaging Database, a multicenter imaging database, was used to identify individuals with LC (n=53) and uCC (n=99). A control group was established using 200 consecutive patients with positional plagiocephaly. A single preoperative CT or 3D-photograph was used to create a cranial surface model of each individual which was then mirrored as needed so that posterior (LC v PP) or anterior (uCC v PP) restriction was on the left. Cartesian grids were created reproducible landmarks on the scalp's surface using equidistant sagittal, coronal and axial planes in order to study trends and create an index that could differentiate between the two groups.
Results: In LC and uCC anterior compensatory growth occurs contralateral to the fused suture, while in PP anterior irregularity is relatively small. Posteriorly, LC leads to a distinguishing pattern of ipsilateral width restriction and contralateral widening, especially at superior regions. Those with uCC had decreased posterior growth bilaterally, but this finding was not a diagnostic hallmark. When combining measurement of anterior bossing and posterior width asymmetry in LC, patients can be well differentiated from PP (AUC > 0.999, Sensitivity: 100%, Specificity: 98.5%). Similarly, measuring anterior contralateral bossing allows for differentiation of uCC and PP (AUC = 0.989, Sensitivity = 93%, Specificity = 96.5%).
Conclusion: Objective, population-based measures allow for the diagnosis of LC and uCC near CT imaging. Further, implementing surfaced-based tools allows for regular post-operative evaluation and so better outcome assessment and surgical decision-making.

Objectives
1. Participants will better understand the unique patterns of growth restriction and compensation in LC and uCC. 2. Participants will be able to more accurately diagnose those with true LC and uCC using an automated point-of-care tool. 3. Participants will be able to more objectively plan surgical intervention in individuals with unique morphology due to craniosynostosis.

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Fabrication of a patient specific template for fronto-orbital advancement and remodeling

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Jörn Wittig

Abstract

Background

In the last ten years, computer-assisted design (CAD) and computer-assisted manufacturing (CAM) workflows are more commonly used to facilitate the surgical correction of craniosynostosis. In most cases cutting guides and molding templates are designed in an interactive planning session and are then 3D printed. It is debatable, if this costly process is reasonable for standard cases or if it should be reserved for complex cases.

Methods

We have established an in-house workflow to manufacture a patient specific template for the supraorbital bandeau and the frontal bone segments in fronto-orbital advancement and remodeling procedures. A low-dose CT scan is performed prior to surgery and a 3D model is printed. Three 50-hole 2.0mm osteosynthesis plates are then pre-bent according to the planned advancement and forehead shape and screwed to the model. The plates are laser welded by a dental technician and sterilized. The template can be repositioned during the procedure, the reshaped supraorbital bandeau and the frontal bone segments can be fixated to the template by osteosynthesis screws. The bone segments and the bandeau are then stabilized with resorbable plates and the template is removed. This technique was used in 10 cases in fronto-orbital advancement procedures.

Results

Production time for the template by maxillofacial surgeon, computer scientist and dental technician is reasonable. Cost of printing resin and osteosynthesis plates is low. The template could be applied without complication in every case with good reproduction of the planned forehead shape. The temporary stabilization of the segments and the bandeau highly facilitates the application of the resorbable plates.

Conclusion

A craniofacial unit can easily adopt the presented workflow for production of the template. It facilitates the operation, the outcome is more predictable and operation time can be reduced. It is a good alternative for costly manufactured cutting guides and molding templates.

Objectives

Participants will be able to establish a workflow for the production of surgical templates in their unit. Participants will be able to improve the efficiency and accuracy in craniosynostosis surgery. Participants will be able to reduce costs for the fabrication of templates for craniosynostosis surgery.

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Orbital Dysmorphology and its Association with Intra-orbital and Peri-orbital Suture Fusion

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Ryan Layton


Lisa David


Christopher Runyan

Abstract
Background/Purpose: Most children with Crouzon syndrome are characterized by orbital dysmorphology; however, the pathophysiology of this is not well understood. We hypothesize early suture closure in patients with Crouzon syndrome may be associated with their oculo-orbital disproportion, and this study aims to explore the orbital anatomy resulting from minor intra-orbital and periorbital suture fusion in Crouzon syndrome.
Methods/Description: 28 patients with Crouzon syndrome and 31 controls were included. Pre-operative computed tomography images (CT) were used to grade the degree of suture fusion, using 5-point scale proposed by Madeline and Elster. A total of 3 intra-orbital, 4 extra-orbital, and 3 nasal sutures were graded. A combination of linear and angular cephalometric measurements was also obtained from 3D reconstruction of CT images and analyzed using multiple linear regressions.
Results: The average age in each cohort was not statistically different (Crouzon syndrome, 6.3 months; controls, 5.39 months). Degree of suture fusion was significantly higher in patients with Crouzon syndrome ($p<0.05$), except for the metopic suture ($p = 0.06$). Multiple linear regression analysis showed the distance between corneas increased secondary to fusion of the sphenofrontal ($p<0.008$), metopic ($p<0.008$), frontoethmoidal ($p=0.013$), zygomaticosphenoid ($p=0.019$), frontonasal ($p=0.02$), and frontomaxillary ($p=0.013$) sutures. The frontonasal ($p=0.03$) and frontomaxillary ($p=0.046$) sutures correlated with an increase while metopic suture correlated with a decrease ($p=0.016$) in the distance between the globe's uppermost point.
Conclusions: Premature suture fusion largely correlates with the hypertelorism seen in Crouzon syndrome. However, unsurprisingly the distance between bilateral orbital apices regresses with early periorbital metopic suture. We found no association between pathologic suture fusion and globe projection or orbital height. This indicates that craniosynostosis of the surrounding sutures has a greater direct impact on width than height or depth.

Objectives
1. Participants will gain better insight into the pathophysiology of a well-described orbital finding in syndromic craniosynostosis. 2. Participants will be better able to treat orbital morphology by better understanding the precise shape changes in Crouzon Syndrome. 3. Participants will be able to understand the complex interplay of the many orbital sutures and their effect on morphology.

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Outcomes of Conservatively managed Craniosynostosis at Skeletal maturity

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Peter ANDERSON

Abstract

Background:
Children with Premature fusion of the cranial sutures are usually offered corrective surgical intervention to manage any resulting aesthetic deformity and to ensure adequate intracranial space to allow optimal brain development and function. Some children may have minimal adverse appearance and cognitive development is within expectations for their particular social background, and these have been treated conservatively. They are followed up with regular review. As some have now reached skeletal maturity the outcomes measuring aesthetic, cognitive and social parameters can be assessed.

Method:
Case note and clinical review of children with a variety of one or more cranial suture fusion(or fusions) managed with a conservative approach have been undertaken.

Results:
These cases the adults had attained outcomes which would have been considered individually “good” if surgical intervention had been undertaken.

Conclusion:
The clustering of these cases suggests that some children may be successfully managed without surgical intervention. These will need to be very carefully assessed and monitored during childhood.

Objectives

Management of Craniosynostosis Improved Understanding Cranial Suture Biology Outcome measurement

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Immunotherapy-Associated Total and Permanent of Loss Facial and non-Facial Fat Compartments: Have we Found the Optimal Treatment?

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Abstract

Background:
Immunotherapy is an effective treatment for malignancies; however total and permanent loss of facial and non-facial fat compartments is a side effect. We present a novel surgical treatment for a patient suffering from facial and non-facial lipo-atrophy and review the literature.

Methods:
We present the surgical management of facial lipo-atrophy in one patient and perform a literature review (Cochrane, Embase, MEDLINE) to include studies about lipoatrophy/ lipo-atrophy related to immunotherapy.

Results:
A 68 year-old female developed generalized lipo-atrophy secondary to immunotherapy (Pembrolizumab) for treatment of metastatic lung adenocarcinoma. The onset of progressive lipo-atrophy was 13 months after treatment.

Total loss of her facial fat compartments resulted in significant aging effect. Due to the total loss of her body fat, autologous fat grafting wasn't an option. The patient underwent staged (two surgeries, 7 months apart) restoration of her facial fat compartments using dermal grafts from the lower abdomen and bilateral medial thighs. The surgery was performed via standard facelift incision. The superficial musculo-aponeurotic system (SMAS) was attenuated and lacked structure (measured less than 2 mm in thickness). The dermal grafts were tailored to restore facial fat compartments. There was no postoperative complication and patient demonstrated stability of the result without facial atrophy.

Reviewing the literature, we identified 8 case reports with patients that developed generalized lipo-atrophy from immunotherapy. The mean age was 52 years; mean BMI was 35.4. The average onset of lipo-atrophy was 8.9 months. Steroids were used in 4 patients, and immunotherapy was discontinued in 4 patients. None of the studies described facial fat compartments restoration.

Conclusions:
Management of facial lipo-atrophy is challenging due to the lack of autologous fat donor sites. Staged fat compartments restoration using dermal fat grafts from autologous sites allows a stable volume restoration of all facial fat compartments with long lasting results.

Objectives

Participants will be able to: 1) better understand this relative new challenge in facial plastic surgery: facial lipo-atrophy induced by immunotherapy 2) review the treatment options for facial lipo-atrophy induced by immunotherapy 3) implement dermal fat grafts in their surgical armamentarium for treatment of severe facial lipo-atrophy

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Assessment and Validation of Preoperative Three-Dimensional Volumetric Analysis to Predict Bone Graft Success in Alveolar Cleft Reconstruction

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Abstract

Background: The success of alveolar bone grafting (ABG) can be attributed to many factors, such as graft type, preoperative cleft size, cleft phenotype, and timing of repair. We aim to identify the best predictor for successful bony bridge formation in ABG.

Methods: A retrospective review evaluated patients undergoing ABG from 2009 to 2022. Patients with genetic syndromes, bilateral clefts, and missing postoperative cone beam computed tomography (CBCT) were excluded. Cleft width and 3-dimensional volumetric defect sizes were calculated using preoperative CBCT scans. Alveolar cleft volume was calculated based on a trapezoidal pyramid model. The area under the curve (AUC) using receiver-operating characteristic analysis was used to determine the strongest predictor of graft success among age at ABG, preoperative cleft width, and volumetric size. AUC>0.700 was the marker of adequate sensitivity and specificity.

Results: Of the 517 patients screened, 70 met inclusion criteria and underwent ABG with ICBG (n=32) or rhBMP-2/DBM (n=38). There was no significant difference in failure of bony bridge formation between graft types (ICBG: 25.0%, rhBMP-2/DBM: 39.5%; p=0.768). Across both cohorts, preoperative volumetric cleft size had a significantly larger AUC (0.843) compared to preoperative cleft width (0.695; p=0.007) and age (0.649; p=0.024). Individually, volumetric cleft size strongly predicted graft failure among both ICBG (AUC: 0.953) and rhBMP-2/DBM (AUC: 0.780) cohorts. The average follow-up time after ABG among all patients was 26.9±15.9 months.

Conclusions: Our findings identified preoperative volumetric cleft size as the strongest predictor for successful bony bridge formation in ABG. Clinicians can prioritize volumetric analysis via CBCT to better predict graft failure among clefts of varying sizes.

Objectives

1. Assess the validity of a volumetric calculation using cone beam computed tomography to estimate alveolar cleft volume 2. Compare alveolar cleft volume with other predictors of graft success or failure 3. Assess the accuracy, clinical relevance, and feasibility of utilizing alveolar cleft volume for preoperative evaluation

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Exploring Racial and Demographic Associations with Craniosynostosis Severity using Deep Phenotyping

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Abstract

Introduction**:**

CranioRate™ is a publicly available, point-of-care analysis tool which can be utilized to objectively and holistically quantify severity in metopic craniosynostosis. The purpose of this project was to analyze racial and demographic distributions among metopic craniosynostosis patients and to determine whether demographic factors such as race or gender influence phenotypic severity in patients with metopic craniosynostosis.

Methods:

The CranioRate™ machine learning algorithm provides two objective, holistic metrics for quantifying severity in metopic craniosynostosis: Metopic Severity Score (MSS) and Cranial Morphology Deviation (CMD). CTs were uploaded by multiple institutions across the U.S.; metopic scans with appended demographic information were included. Analysis was performed using descriptive statistics and regression.

Results:

Of the 460 CT scans uploaded to CranioRate™, 368 were metopic, and 235 met inclusion criteria. 158 (67.2%) patients were male. 166 (70.6%) patients were white, 61 were (26.0%) Black, and 8 (3.4%) did not have race recorded. Scans were performed at an average of 0.84 ± 0.54 years old. There was no association between race and age at CT scan (p= 0.986), but there was a significant association between gender and time of CT scan, with males more likely to be imaged earlier (OR: 0.456, 95% CI: [0.22, 0.93], p = 0.032). White patients had a higher average MSS (OR: 1.62, 95% CI: [1.11, 2.38], p= 0.013) and CMD (OR: 1.01, 95% CI [1.00, 1.01] p= 0.0259) as compared to Black patients. Male gender was also associated with increased phenotypic severity (MSS OR: 1.58, 95% CI [1.04, 2.40], p=0.0301; CMD OR: 1.01, 95% CI [1.00, 1.01], p= 0.0113).

Conclusion:

These results are the first to show an association between race, ethnicity, and gender and phenotypic severity among patients with metopic craniosynostosis. Future studies will incorporate genetic evaluations to analyze their potential modifying effect on metopic craniosynostosis severity.

Objectives

1. Participants will be able to identify emerging strategies for objectively assessing the severity of metopic craniosynostosis. 2. Participants will better understand the link between race, metopic craniosynostosis severity, and global head shape dysmorphology. 3. Participants will better understand the influence of gender on metopic craniosynostosis severity as well as timing of CT imaging.

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Streamlining cleft treatment strategies through AI-based, fully automated palatal plate fabrication

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Abstract
Background:
Preoperative orthopaedics is a widely used method in cleft care pathways. However, the handmade method relies on specialist knowledge and is time consuming, which limits its application. To simplify this and to enable new treatment concepts, the process has been fully automated and transferred to different clinical applications.
Methods:
Intraoral scanning in awake infants was used to replace airway compromising impression taking. A data-driven and fully automated digital pipeline with a graphical user interface was developed. The pipeline uses a deep learning model to landmark raw intraoral scans of arbitrary mesh topology and orientation. The design type is intended for use in passive plate therapy. The plates are fabricated from biocompatible photopolymer resin material (BioMed Clear, Formlabs).

Results:
Pre-operative intraoral scans (Medit i500) in 52 awake cleft patients showed a median scan time of 115 s. With a near-target distance to the alveolar ridges of 0.1 mm, our pipeline calculates tight-fitting plates in less than 3 minutes. The pipeline has been implemented into clinical routine at three hospitals and 28 patients have been treated with our automated designs. Passive palatal plate therapy from birth to 4 months in UCLP has consistently reduced the palatal cleft to <6mm without plate replacement.
The AI-based fully automated preoperative plate therapy will be demonstrated for three different clinical applications: 1) To facilitate postnatal feeding and weight gain at a cleft centre in India. 2) To relieve upper airway obstruction in a Pierre Robin patient using a pre-epiglottic baton plate. 3) To avoid early lip repair in UCLP and instead combine pre-operative plate therapy with a single stage lip-palate repair without lateral incision at 10 months.
Conclusions:
AI-based, fully automated preoperative plate therapy for cleft patients has been successfully translated into clinical routine for variable clinical care pathways.

Objectives

1) Participants will recognise the need for a three-part nature for a complete digital workflow with the components of scanning, design, and additive manufacturing. 2) Participants will recognise that the palatal cleft consists of two parts: Vomer and entrance into the nose, and that both parts do not respond equally to passive plate therapy. 3) Participants will learn about plate therapy as an option in UCLP to facilitate palatal surgery without separate lip surgery.

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A Nationwide Analysis of Adverse Events and Cost between Inpatient versus Outpatient Alveolar Bone Grafting

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Jeffrey Hammoudeh

Abstract

Background: Historically, patients who undergo ABG are kept inpatient for close postoperative monitoring. However, there's been a recent shift toward outpatient management. The purpose of this study was to compare postoperative outcomes between inpatient and outpatient ABG.

Methods: A retrospective review of the National Surgical Quality Improvement Program-Pediatric database was conducted on patients who underwent ABG from 2012-2020. Patient demographics, perioperative factors, length of stay (LOS), surgical site infection (SSI) rates, and 30-day outcomes were collected. Entropy balancing was performed to match hospital-setting cohorts based on demographics and comorbidities. Costs were derived from Medicaid reimbursement codes. One-way and probabilistic sensitivity analyses were used for cost analysis. The associated costs for inpatient and outpatient procedures were calculated and adjusted to 2022 US dollars.

Results: Upon review, 4,924 patients underwent ABG, with 2,467 in each matched hospital setting cohort. Overall, 30-day readmission, reoperation, and complication rates were 0.6%. 0.4%, and 1.2%, respectively with the inpatient cohort presenting with more postoperative complications (1.6% vs. 0.7%; p=0.004). The inpatient cohort had higher rates of superficial incisional SSI (0.5% vs. 0.1%; p=0.007) and organ/space SSI (0.3% vs. 0.0%; p=0.005) compared to outpatient. Upon multivariate analysis, longer LOS following operation (Odds Ratio [OR]: 1.230; p=0.013) and the inpatient setting (OR: 7.248; p=0.011) independently predicted superficial incisional SSI. The total cost of outpatient ABG was estimated to be $11,433 vs. $19,668 for inpatient ABG, resulting in $8,325 cost savings per patient.

Conclusions: ABG is an overall safe procedure for alveolar cleft repair with reported low complication, readmission, and reoperation rates. However, we found that the inpatient setting and extended postoperative stay independently contribute to slightly increased superficial incisional SSI rates. Based on these findings, we recommend shifting towards outpatient ABG procedures as they may confer a lower risk of hospital-acquired infectious complications and cost.

Objectives

1. Analyze the 30-day readmission, reoperation, and postoperative complication rates for alveolar bone grafting between inpatient and outpatient settings 2. Evaluate the cost implications when performing the procedure for each hospital setting 3. Identify factors unique to each hospital setting that may significantly increase the total cost

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A Single-Center Review of Postoperative Outcomes following Open Surgical Intervention for Craniosynostosis

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Alexis Johns


Gordon McComb

Abstract

Background: Craniosynostosis is a complex condition involving the premature fusion of calvarial sutures. With a paucity of literature describing postoperative outcomes, this study aims to assess the prevalence of postoperative complications and secondary procedures following open surgical intervention.

Methods: A retrospective cohort study of patients undergoing open surgical intervention for craniosynostosis from 2015-2022 was completed. Patients undergoing endoscopic surgical intervention for craniosynostosis were excluded. Patient demographics, comorbidities, syndromic status, age at surgery, calvarial suture(s) involved, and postoperative outcomes, including length of stay, complications, and secondary surgeries, were collected. The rates of surgical intervention to address these major and minor complications were also collected.

Results: Upon review, 455 patients underwent open surgical intervention for craniosynostosis. Eight percent of these patients had a named genetic syndrome. The rates of major and minor complications were 2.2% and 10.3%, respectively. Major complications included CSF leakage (1.3%), full-thickness calvarial defects (0.7%), and encephalocele (0.2%). The most prevalent minor complications were temporal hollowing (4.6%), wound infection (4.2%), seroma formation (1.5%), scar widening (1.1%), and contour deformity (0.4%). Secondary surgeries for both major and minor complications occurred in 2.2% and 6.6% of patients, respectively. Rates of secondary surgery

were highest in patients with multi-suture craniosynostosis (14.2%) and lowest in patients with sagittal craniosynostosis (0.0%).
Conclusions: With low rates of major complications (2.0%) and reoperations (2.2%), our data shows that open surgical intervention for craniosynostosis is safe and effective when performed by an experienced surgical team at a tertiary care hospital. This institution implements an interdisciplinary approach between plastic surgery and neurosurgery to manage the care of patients with craniosynostosis. This approach coupled with long-term patient follow up is critical for the successful management of craniosynostosis.

Objectives

1. Identify minor and major complications associated with open surgical intervention for patients with nonsyndromic craniosynostosis 2. Determine rates of secondary surgical intervention following open surgical intervention for patients with nonsyndromic craniosynostosis 3. Assess the safety of open surgical intervention for patients with nonsyndromic craniosynostosis

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Epidemiology, Key Outcomes, and Advances in Managing Pediatric Facial Fractures Associated with Skin and Nerve Trauma

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Janina Kueper

Abstract
Background: Skin and nerve trauma are common complications associated with pediatric facial fractures. Both can significantly impact a child's quality of life by impeding functional outcomes and cosmesis. As such, the management of skin and nerve trauma in pediatric facial fractures is crucial to optimize patient outcomes.
Methods: Overall, 1,858 pediatric patients were identified with a diagnosis of a craniofacial fractures associated with soft tissue trauma at our Children's Hospital across a 16-year period. Demographic indicators, clinical details, imaging results, and outcomes data were reviewed in depth and compared to those of patients without soft tissue injuries.
Results: In summary, 1,858 patients were identified to have soft tissue injuries associated with craniofacial fractures in pediatric patients (41.7% of all fracture patients overall). There were no significant differences in terms of sex (69.7% male), age (10.9 years average) or race (82.6% caucasian) compared to patients without soft tissue injuries. The mechanisms of injury were distinct, with sports being relatively underrepresented (26.3%) and motor vehicle accidents (20.3%) being relatively overrepresented. Of note, the rate of patients with associated soft tissue injuries who received some form of imaging were significantly higher than those without them. The most common soft tissue injuries were significant lacerations >1cm (48.7%). Nerve injury occurred in 4.8% of cases, while a septal hematoma was identified in 1%. Notably, 14% had concomitant dental injuries. A significantly larger proportion of patients with soft tissue injuries were admitted (43.5%) and required treatment in the ICU (9.4%), while fewer patients received surgery (37.8%). Follow-up appointments occurred at a significantly higher frequency.
Conclusions: Based on the study's results, soft tissue injuries are common in pediatric patients with craniofacial fractures, with almost half of all fracture patients being affected. Further research may be necessary to improve prevention strategies and optimize treatment outcomes.

Objectives
Participants will be able explain the distinct characteristics of patients diagnosed with combined pediatric craniofacial fractures and soft tissue injuries. Participants will be able to manage soft tissue injury in pediatric facial fracture patients with greater finesse. Participants will be able to formulate research ideas that will explore optimization of short-comings of soft tissue injury management in pediatric craniofacial fracture patients in the future.

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Impact of Suprazygomatic Maxillary Nerve Block on Opioid Use and Postoperative Outcomes in Syndromic and Non-Syndromic Children Undergoing Palatoplasty

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Krystof Stanek


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Lisa Nussbaum


Walid Alrayashi

Abstract

Background: While Suprazygomatic maxillary nerve block (SMB) reduces narcotic requirement in non-syndromic children undergoing palatoplasty, the degree to which this benefit extends to more medically complex syndromic children has not been evaluated. This study examines the impact of SMB on opioid use and postoperative outcomes in both the syndromic and non-syndromic cleft palate populations.

Methods: A retrospective review of children ≤24 months old who underwent palatoplasty by a single surgeon from September 2014 to September 2022 was conducted. Those undergoing additional procedures (gastrostomy, circumcision, etc.) were excluded. Collected data included demographics, syndrome, surgical details, and need for respiratory support. Opioid usage, calculated as morphine equivalent units (MEU/kg/hr), was assessed from 0-24 hours, 24–48 hours, and the entire postoperative period.

Results: Among 87 patients, 50.5% received SMB. Median age was 10 months with no difference between SMB and non-SMB groups (p=0.7). Syndromic cleft palate constituted 44.8% of the sample, most commonly Robin sequence (71%) and CHARGE syndrome (7.7%). Narcotic need in the first 24 hours postoperatively (p=0.006) and the entire postoperative period (p=0.01) was reduced by more than half with SMB, even when adjusting for syndromic status. Subgroup analysis within the syndromic population confirmed reduced opioid requirement with SMB. No differences were found in need for postoperative respiratory support or ICU stay, and a trend of decreased hypoxemic episodes with SMB patients was not significant (p=0.09).

Conclusion: SMB is effective for managing postoperative pain in both syndromic and non-syndromic children undergoing palatoplasty. Prospective studies are needed to confirm these findings, better ellucidate whether the trend toward fewer hypoxemic episodes may represent a true benefit of SMB, and explore the impact of SMB on intraoperative management.

Objectives

1. Understand the role of suprazygomatic maxillary nerve block in reducing postoperative opioid requirements for children undergoing palatoplasty. 2. Analyze the impact of suprazygomatic maxillary nerve block on the syndromic cleft palate population. 3. Evaluate the differences in postoperative outcomes between patients undergoing palatoplasty with a suprazygomatic maxillary nerve block and those without.

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Balancing Improved Survival and Long-term Outcomes After Surgical Treatment of Pediatric Head and Neck Cancer

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Jeffrey Hammoudeh

Abstract

Background: With a high density of critical structures in the region, pediatric reconstruction of head and neck cancer (HNC) is further complexed by the priority to preserve future bone growth and optimize functionality. This study aims to examine the survival and functional outcomes of pediatric HNCs.

Methods: A retrospective analysis was conducted evaluating patients that underwent HNC treatment between 2000 and 2017. Patient medical history, demographics, pathological diagnosis, disease stage, margin classifications and long-term outcomes were abstracted from medical charts.

Results: Of 77 pediatric patients with HNC, 56 underwent resection, and 27 (48.2%) had negative margins (R0), of which 15 (26.8%) received adjuvant therapy. Overall survival was 85.7% with increased mortality among patients who did not undergo surgical intervention compared to those who did (p=0.028). Deglutition dysfunction and chronic infection respectively were significantly higher in patients undergoing surgery and chemotherapy (p=0.022, p=0.022), chemoradiation (p=0.007, p=0.022), and any adjuvant therapy (p=0.029, p=0.043) compared to surgery alone.

Conclusion: In pediatrics, HNC most commonly malignant sarcomas, benefit from early, aggressive surgical intervention to balance survivability and morbidity. These data suggest morbidity, like deglutition dysfunction, may be sequelae of adjuvant therapies. This is potentially secondary to chronic mucositis associated with these therapies. Particularly, radiation therapy confers an increased risk for poor functional outcomes and should be prescribed with caution.

Objectives

1. Participants will be able to compare the benefits and limitations of surgical and adjuvant therapy modalities when treating pediatric head and neck cancer. 2. Participants will be able to describe the effect of surgical margins on patient survival following surgical ablation of head and neck cancer. 3. Participants will be able to articulate the effect of adjuvant therapy on postoperative morbidity including mastication dysfunction and chronic infection.

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Unilateral Box Osteotomy: An Under-Utilized Versatile Procedure for Surgical Correction of Orbital Malposition

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Mark Urata

Abstract
Background: Vertical orbital dystopia is often treated with camouflage procedures. However, the orbital complex must be moved to address the underlying bony structure to truly correct the deformity. This study aims to describe the versatile movements and surgical outcomes of the unilateral orbital box osteotomy (BO) for the treatment of vertical orbital dystopia.
Methods: A retrospective review was conducted evaluating patients who underwent unilateral BO at our institution from 2005 to 2022. Patient demographics, medical history, and postoperative complications were recorded. Pre- and post-operative computed tomography scans were analyzed to characterize various movement. Vertical movement was quantified by calculating the distance from a parallel line at the base of the pyriform to the superior orbit. Anterior-posterior (AP) movement was determined by calculating the distance from a line perpendicular to the tip of the nasal bone to the lateral orbital rim. Rotational movement was determined by calculating the angle between: 1) a line passing through the dacryon and zygomaticofrontal suture and 2) a perpendicular line to the occlusal plane.
Results: Seven patients who underwent unilateral BO were included. Patient diagnoses included hemifacial microsomia (n=6, including one with Goldenhar syndrome) and coronal synostosis (n=1). Patients demonstrated an average vertical movement of 5.5±3.8mm, rotational movement of 10.3±5.3 degrees, and AP movement of 5.0±4.1mm of the affected orbit. Patients achieved 50.4% increase in vertical orbital symmetry, 65.8% improved rotational symmetry, and 45.3% improved AP projection of the orbit. There were no intraoperative complications, postoperative complications, or reoperations. All patients maintained a stable skeletal correction at their last follow-up.

Conclusions: The unilateral box osteotomy is a safe and effective operation for correcting orbital malposition when performed at a tertiary children's hospital. Utilizing this technique, the orbital complex can be moved in different vectors customized to the individual patient.

Objectives

1. Analyze the degree of movement of the affected orbit in the vertical, anterior-posterior, and rotational directions following unilateral box osteotomy 2. Evaluate the improvement in symmetry between the two orbits in the vertical anterior-posterior, and rotational planes 3. Assess the safety of these procedures by analyzing intraoperative/postoperative complications and reoperation rates

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Genetic Implications on Behavioral Outcomes in Non-Syndromic Sagittal Craniosynostosis

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Michael Alperovich

Abstract
Background: Previous work has identified an association between de novo and transmitted loss of function mutations in genes under high evolutionary constraint with neurodevelopmental delays in non-syndromic sagittal craniosynostosis. In this study, we investigated the behavioral outcomes of these patients with genetic lesions (high pLI) compared to patients without genetic lesions(non-high pLI).
Methods: Parents of children 6-18 years old with surgically corrected sagittal synostosis were recruited nationally to complete the Child's Behavioral Checklist (CBCL), Conners-3, Social Responsiveness Scale-2 (SRS-2), and Behavior Rating Inventory of Executive Function-2 (BRIEF-2). CBCL assesses behavioral and emotional function, Conners-3 assesses features of ADHD, SRS-2 assesses features of autism spectrum disorder (ASD), and BRIEF-2 assesses executive function. Multivariate linear regression was used to determine the association of high pLI with behavioral scores while controlling for sociodemographic factors, age at surgery, surgery type, and IQ.
Results: Sixteen of 45 total patients in the study were in the high pLI group. There was no significant difference in average age at assessment (8.29±1.87 vs 8.74±2.55 years, p=0.31) between cohorts. A greater proportion of children with high pLI reached at/above borderline clinical levels for aggression (18.8% vs 0.0%, p=0.05) and externalizing problems (31.3% vs 3.7%, p=0.02). Multivariate linear regression showed that high pLI was associated with rule-breaking and aggression($p<0.05$). In a sub-analysis of children with high pLI, factors assessed were not associated with worse scores in any of the assessments. However, in children with non-high pLI, greater age at surgery was associated with worse scores in rule-breaking, aggression and externalizing problems domains, and four out of five ASD domains.
Conclusion: Children with sagittal synostosis and high pLI had worse problems in externalizing behaviors, including rule-breaking and aggression. Among children with non-high pLI, greater age at surgery was associated with social difficulties and externalizing behaviors.

Objectives
Few studies have focused on behavioral outcomes in children with non-syndromic sagittal craniosynostosis in relation to genetic components. Participants will learn about behavioral problems in non-syndromic sagittal synostosis children, genetics, and factors that are associated with worse outcomes.

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Should Prophylactic Antibiotics be Used in Patients with Traumatic Facial Injury?

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Hossein Jazayeri

Abstract

Background: Preventing infectious complications is crucial in managing patients with traumatic facial injury. This study sought to systematically review the potential benefits and harms of prophylactic antibiotic treatment after traumatic facial injury.

Methods: The following databases were systematically searched from inception to June 2022: PubMed, EMBASE, Cochrane Library, Elsevier text mining tool database, National Institutes of Health RePORTER Grant database, and clinicaltrials.gov. Studies that examined the benefits and harms of preventative antibiotics in patients with traumatic facial fractures.

Results: One high-quality meta-analysis, 5 systematic reviews, 8 randomized controlled trials (RCTs), and 12 nonrandomized studies met inclusion criteria. Regarding upper facial trauma, very low-quality evidence from a single RCT suggests no reduction in the risk of local wound infections after postoperative antibiotics in adults with orbital blowout fractures (relative risk (RR): 2.3; 95% confidence interval (CI): 0.2-23.8). Low-quality evidence suggests that preventive antibiotics did not reduce all-cause mortality (RR: 1.5; 95% CI: 0.4-5.5), meningitis-related mortality (RR: 1.0; 95% CI: 0.1-9.6), or incidence of meningitis (RR: 0.8; 95% CI: 0.4-1.6) in adults with basilar skull fractures (208 patients in 4 RCTs). With respect to midfacial fractures, very low-quality evidence suggests that prophylactic postoperative antibiotics did not prevent infections in adults with zygomatic or maxillary sinus fractures (585 adults, 3 RCTs and 2 observational studies). With regards to mandibular fractures, low-quality evidence suggests that preventive postoperative antibiotics did not reduce infections in adults with mandibular fractures (783 adults, 3 RCTs and 1 observational study). Very low-quality evidence from single small RCTs suggests that prophylactic postoperative antibiotics did not decrease infections in adults undergoing orthognathic surgery (34 adults, 1 RCT).

Conclusion: Clinicians should consider not prescribing postoperative antibiotics in addition to pre- and perioperative antibiotics in adults with facial trauma. Doing so may only increase antibiotic associated morbidity without reducing rates of infection.

Objectives

1. Participants should be able to determine whether prophylactic postoperative antibiotics are necessary for upper facial trauma. 2. Participants should be able to determine whether prophylactic postoperative antibiotics are necessary for midfacial fractures. 3. Participants should be able to determine whether prophylactic postoperative antibiotics are necessary for mandibular fractures.

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Optimal treatment order with fibula free flap reconstruction, oncologic treatment, and dental implants: a systematic review

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Lily Zhu


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Abstract

Background: Head and neck cancer (HNC) patients greatly benefit from dental implants in functionality, comfort, and aesthetics, however oncologic treatment and reconstruction methods often affect the success of prostheses. Presently, there is no clear guidance on whether implant placement should occur as a primary or secondary procedure following ablative surgery or reconstruction, before or after radiation therapy (RTX) or chemotherapy (CTR), and in native or grafted bone. This systematic review aims to clarify the relationship between the sequence of oncologic treatment and reconstruction, timing of dental implant placement, and their impact on long-term survival and integration.
Methods: A systematic review of PubMed, Embase, and Web of Science was performed for studies on HNC patients who underwent ablative and FFF reconstructive surgeries with RTX or CTR. Three reviewers performed a blinded, double screen using eligibility criteria. Primary outcomes considered treatment sequence, implant survival rates, radiation dosage, and implantation type. Only studies addressing endosseous implant success in patients after radiation and/or chemotherapy, ablative surgery, and FFF reconstruction were included.
Results: Out of 661 studies, 27 met eligibility criteria, with all implants inserted into grafted bone. Initial analysis of 20 studies, comprising 1142 implants, showed an 80% survival rate for implants after ablative surgery and 78.8% after reconstructive procedures. Thirteen studies included primary reconstruction with a 66% implant survival rate, while secondary reconstruction had an 84.5% rate. Implants placed in grafted, irradiated bone had an 82% survival rate, and those in grafted bone with postoperative radiation had a 70% survival rate.
Conclusion: Implant placement following tumor resection results in favorable outcomes, including implant success and integration, particularly for patients who underwent secondary reconstruction and completed radiation therapy. The overall survival rates of dental prostheses are acceptable, reaffirming their role as a key component in rehabilitating head and neck cancer patients.

Objectives

Participants will gain clarity on the impact of oncologic treatments on the survival of dental implants. Participants will be able to understand the usage of a fibula free flap reconstruction procedure for head and neck cancer patients. Participants can understand the importance of sequence of oncologic treatment in patients who will receive dental rehabilitation.

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Demographic, Comorbidity, and Operative Differences Between Adult and Pediatric Cases of Salivary Gland Malignancy

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Aseela Samsam


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Joseph Lopez

Abstract

Background: Salivary gland malignancy (SGM) is a rare surgical pathology in the pediatric population, with complications capable of generating significant morbidity. Currently, surgical management of SGMs is ambiguous, due to the lack of foundational knowledge and pediatric-specific management guidelines. We used a national database to provide demographic and episode-of-care comparisons between the adult and pediatric population suffering from SGMs to discover baseline characteristic differences and outcomes and assess the overall level of reporting at a national scale.

Methods: The 2012-2019 American College of Surgeons' National Surgical Quality Improvement Program Adult and Pediatric (ACS NSQIP, NSQIP-P) databases were queried to identify diagnoses of salivary gland malignancies based on postoperative ICD-10 codes C07, C08.0, C08.1, and C08.9 for SGM. We investigated parotid, submandibular, sublingual, or other major salivary gland tumors in adults (age ≥22 years) and children (age <22 years). Demographics, comorbidities, and complications were compared between adults and children.

Results: 1,967 adult and 67 pediatric cases were investigated. Parotid gland malignancy dominated both adult (1,678, 85.3%) and pediatric (58, 86.6%) cases. Pediatric male parotid gland malignancies were lower (34.5%) than adult male (58.3%) and had lower comorbidities, lower operative time (pediatric: 199.57 vs. adult: 242.05 minutes), and lower hospital stay (pediatric: 1.26 vs. adult: 2.36 days). Submandibular gland malignancy cases were fewer (adults: 184/9.35% vs. pediatric (9/7.46%) but had lower operative time in pediatric cases (124.4 minutes) versus adults (173.34 minutes) with 49 adult complications but no pediatric problems. There were no significant differences in other SGM.

Conclusion: Documentation of surgical outcomes in children with SGMs is lacking and specific guidelines for children are necessary. Continued reporting is imperative to improve short- and long-term outcomes of both oncologic and related reconstructive surgeries. Optimal management of pediatric SGM demands use of a longitudinal multidisciplinary approach by head and neck and plastic surgeons.

Objectives

1. Participants will understand the current scope of pediatric salivary gland malignancy at the level of a national database 2. Participants will evaluate the adequacy of reporting by the participating hospitals of this database 3. Participants will compare the differences between adult and pediatric salivary gland malignancy as it relates to demographics and outcomes

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Quantifying Facial Feminization Surgery's Impact on Patient Facial Satisfaction

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Mariana N. Almeida


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Abstract
Background: Facial feminization surgery (FFS) has been associated with improving gender dysphoria in transgender patients. However, there are limited studies comprehensively assessing patient facial satisfaction by anatomic region. This study aims to quantify the impact of FFS on patient facial satisfaction preoperatively and postoperatively using the FACE-Q and a quality-of-life (QoL) survey.
Methods: Transfeminine patients were recruited to complete the FACE-Q and the World Health Organizations QoL Scale-Short Form (WHOQOL-BREF) if they were planning to or had undergone FFS at our institution. FACE-Q modules completed included satisfaction with facial appearance overall, facial attributes (forehead/eyebrows, nose, cheeks, cheekbone, chin, jawline, and neck), and the WHOQOL-BREF, which assesses patient QoL through four domains (physical, psychological, social relations, and environment). Statistical analysis was performed comparing preoperative and postoperative cohorts.
Results: Eighty-seven percent (48/55) of patients recruited participated in the study. Sixty-eight FACE-Q surveys were completed, 31 preoperatively and 37 postoperatively. Mean FACE-Q scores increased significantly from preoperatively to postoperatively for all facial attributes and for satisfaction with facial appearance overall ($p<0.05$). The facial region with the greatest increase was the jawline, followed by the nose and forehead/eyebrows. The WHOQOL-BREF's psychological and physical domains both improved significantly ($p<0.05$). Similar results were seen among the 20 matched patients who completed the surveys both preoperatively and postoperatively ($p<0.05$). Wait time for surgery of less than six months ($\beta=22.42$, $p=0.02$) and undergoing surgery at a younger age ($\beta=1.04$, $p<0.01$) were associated with higher scores for satisfaction with facial appearance overall.
Conclusion: Transfeminine patients experienced significant improvements in satisfaction with facial appearance and QoL following facial feminization surgery. Undergoing surgery at a younger age and shorter wait times for surgery were important factors in patients' overall facial satisfaction.

Objectives
Participants are provided with evidence-based practices about the impact of facial feminization surgery on patient facial satisfaction and quality of life. In addition, participants will learn about patient-related factors associated with high satisfaction.

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Wired vs. Rigid Fixation for Traumatic Mandibular Angle Fractures

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Kelly Harmon

Abstract
Background: While both wire osteosynthesis and rigid fixation are accepted methods of fixation for mandibular fractures, rigid techniques may achieve early mobilization, restoration of jaw function, and return to work and social activities, thus improving both physical and psychological wellbeing. This study sought to systematically review the comparative effectiveness and safety between rigid fixation and wired osteosynthesis in patients with traumatic mandibular fractures.
Methods: A systematic review was performed in alignment with PRISMA guidelines. The following databases were searched from inception to June 2022: PubMed, EMBASE, the Cochrane Library, Elsevier text mining tool database, National Institutes of Health RePORTER Grant database, and clinicaltrials.gov. Studies that investigated rigid fixation or wired osteosynthesis in patients with traumatic mandibular fractures were included (primary). Studies that examined rigid fixation and wired osteosynthesis in adults with malocclusion who received a bilateral sagittal split osteotomy were also included (secondary), as they provided indirect comparative evidence of rigid and wire fixation.
Results: Three randomized controlled trials (RCTs) and 1 observational study met primary inclusion criteria, while 6 RCTs met secondary inclusion criteria. Very low-quality evidence suggests that rigid fixation improves functional intermediate measures at the expense of higher risk of intraoperative complications when compared with wired osteosynthesis in adults with mandibular fractures. Very low-quality indirect evidence suggests that there are no consistent differences between the 2 fixation methods. Single RCTs suggest that wired osteosynthesis improves intermediate measures of bone stability but increases the sagittal skeletal relapse.
Conclusions: To improve intermediate functional outcomes in adults with mandibular fracture, clinicians may benefit from rigid fixation over wired osteosynthesis, while ensuring adequate measures are taken to prevent intraoperative complications. The evidence regarding the effects from rigid fixation or wired osteosynthesis on quality of life, treatment utilization, or patient and provider satisfaction is insufficient, therefore further research is needed.

Objectives
1. Participants should understand the potential risks and benefits of wire osteosynthesis for fixation of traumatic mandibular fractures. 2. Participants should understand the potential risks and benefits of rigid fixation of traumatic mandibular fractures. 3. Participants should identify the comparative outcomes between rigid fixation and wire osteosynthesis for fixation of traumatic mandibular fractures.

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Morphology and Outcomes in Combined Sagittal and Unilateral Coronal Synostosis

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Abstract

Background:
Combined sagittal and unilateral coronal synostosis is an uncommon multi-suture synostosis. We describe patient demographics, characterize craniofacial morphology, and report surgical outcomes for children who received either open or endoscopic repair.

Methods:
Between 2000-2021, 10 patients who underwent surgical repair were identified across two institutions. Open repair involved fronto-orbital advancement and calvarial remodeling. Endoscopic repair involved endoscopically-assisted strip craniectomy of fused sutures with subsequent helmet therapy until 12 months age. Craniofacial morphology was characterized from computed tomography (CT) scans with parameters including cephalic index (CI), orbital index asymmetry (OIA), nasal tip deviation (ND), chin deviation (CD), and synostotic to non-synostotic ratio of anterior cranial fossa area (ACFR). Operative and demographic details were obtained via chart review.

Results*:
Patients were predominantly male (70%) with left coronal fusion (80%). Four patients (40%) underwent open repair, six patients (60%) underwent endoscopic repair. Operation length was 87 minutes for endoscopic and 226 minutes for open. Two endoscopic patients (33%) and two open patients (50%) required blood transfusion. Four patients (three endoscopic, one open) underwent secondary operations.
Preoperatively (n=10), patients were scaphocephalic (CI 0.75[0.72-0.80]) with orbital index asymmetry (35%[15-42%]), nasal tip deviation (6.9º[6.2-9.0º]) and chin deviation (9.5º[6.9-13.0º]) contralateral to the involved coronal suture, and cranial base asymmetry (ACFR 0.63[0.55-0.83]). Postoperatively (n=6), patients had improved scaphocephaly (CI 0.81[0.80-0.82]), orbital index asymmetry (22%[15-29%]), chin deviation (5.1º[3.0,5.8º]), and cranial base asymmetry (ACFR 0.75[0.67-0.85]) but slightly worse nasal tip deviation (8.5º[7.4-10.8º]).
*Median or median [IQR] reported

Conclusion:
Patients with combined sagittal and unilateral coronal synostosis share characteristics of their component synostoses. Morphological parameters trended towards improvement postoperatively with the exception of nasal tip deviation. Endoscopic repairs trended towards shorter operative time, length of stay and fewer transfusions, but had a higher secondary repair rate than open repairs.

Objectives

Participants will recognize the demographic and morphologic characteristics of patients with combined sagittal and unilateral coronal synostosis. Participants will understand the operative options available for patients with combined sagittal and unilateral coronal synostosis, peri-operative course, and possible complications to help in patient counseling. Participants will learn the trends in morphology improvement after operative treatment of combined sagittal and unilateral coronal synostosis.

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Scoping Review of Healthcare Disparities in Treatment of Craniosynostosis: Assessing Impacts of Race, Insurance, and Socioeconomic Status

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Abstract

Background: Racial and socioeconomic factors persist as barriers to timely diagnosis and treatment of children with craniosynostosis, contributing to inequitable care. This scoping review aims to better understand how disparities influence differences in services, approach, and outcomes for patients undergoing surgical corrections for craniosynostosis.

Methods: We conducted a PRISMA systematic review of all articles published between 2003 and 2023 within PubMed/Medline, Embase, and a Scopus cited review. Variables of interest included sociodemographic factors such as race, socioeconomic status (SES), and insurance status, and measurements of treatment access or outcomes within craniosynostosis surgical repair.

Results: The final analysis included 28 studies, of which 21 examined race, 13 examined insurance status, and 5 examined household income or other socioeconomic factors. Overall, non-White, minority patients, patients with Medicaid or government-funded insurance, and patients from lower SES were more likely to experience delays in diagnosis and presentation for surgery compared to White and privately insured patients. Black and Hispanic patients and patients with public insurance were more likely to undergo open cranial vault reconstruction (CVR) at an older age and experience longer total surgery time, increasing perioperative complication risk, compared to patients who underwent endoscopic procedures. Sociodemographic factors including non-White race, lower SES, and being underinsured or uninsured predisposed patients to the more expensive CVR procedure, increased hospital length of stay, and a higher rate of readmission, accumulating to greater total cost of care.

Conclusion: Significant disparities continue to exist in craniosynostosis management. It is still unknown whether these discrepancies in the type of operation lead to significant clinical differences in neurocognitive outcomes, revision operations, or patient / parent satisfaction with appearance. This study highlights gaps in the current body of knowledge to better inform future areas of investigation to ensure the best outcomes for all children born with craniosynostosis regardless of patient demographic.

Objectives

Participants will be able to recognize associations between race, insurance status, and SES and impacts on age at diagnosis, referral for surgery, and procedure. Participants will understand how delays in age influence selection of surgical approach and the established differences between open and closed surgical options. Participants will be able to explain how sociodemographic factors and corollaries of the selected surgical approach disproportionately affect total cost of craniosynostosis repair.

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Implications of Distraction Osteogenesis and Fronto-Orbital Advancement on the Skull Base: a Radiographic Metric Analysis in Unicoronal Synostosis

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Kiersten Woodyard De Brito


Gustavo Leon


Scott Rapp

Abstract

Background: Coronal synostosis is a common major vault synostosis with potential for cosmetic, neurological, and ophthalmological sequelae. Previously, authors had used fronto-orbital advancement (FOA) for management of coronal synostosis before implementing Distraction Osteogenesis (DO) as an alternative approach. This retrospective review aims to compare outcomes between FOA and DO.
Methods: Retrospective review was conducted for coronal craniosynostoses treated with either FOA or DO. Data collected included patient demographics, craniosynostosis phenotype, operative time, and estimated blood loss. Radiographic analyses included 3D volumetric analyses of vault volume, skull base asymmetry, and coronal and axial balance of orbital rim. CT evaluation was performed pre-operatively and 3 months post-op. Analyses included Welch's t-tests and Wilcoxon signed-rank tests.
Results: 15 cases had appropriate imaging for analysis, 9 patients treated with FOA and 6 with DO. Operative time for FOA was longer than DO (234±33 vs 116±32 minutes, p=0.000) and blood loss for FOA was higher than DO (152±85 vs 45±34 cc, p=0.013). AFV growth was 0.88 cc/day and ICV gain was 2.98 cc/day in DO, compared with growth of 0.29 cc/day (p=0.014) and ICV gain of 1.04 cc/day (p=0.013) in FOA, respectively. Skull base asymmetry improved from an average pre-operative discrepancy of 2.5 degrees in DO to 0.6 degrees post-operatively. For FOA, the average pre-operative discrepancy was 2.3 degrees, worsening to 3.2 degrees post-operatively. Axial balance improvements were significant only in DO (p=0.02).
Conclusions: Results suggest that DO may be able to increase AFV and ICV expansion compared to FOA. DO has an effect on skull base metrics with correction in axial skull base asymmetry, whereas FOA may have little impact or worsen asymmetry. DO may also significantly correct imbalance of the superior orbital rim with preliminary data suggesting an improvement on nasal radix deviation.

Objectives

Participants will be able to compare how Distraction Osteogenesis and Fronto-Orbital Advancement have varying impact on skull base metrics in unicoronal synostosis. Participants will be able to describe which skull base metrics are significantly impacted from pre-operative measurements to post-operative measurements in both Distraction Osteogenesis and Fronto-Orbital Advancement for unicoronal synostosis. Participants will be able to apply the differences in skull base improvements to hypothesize potential variance in cosmetic outcomes for patients with unicoronal synostosis.

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Patterns of Intracranial Pressure Across Craniosynostosis Subtypes: A Comprehensive Analysis using Optical Coherence Tomography

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Natalie Plana


Matthew Pontell


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Lauren Salinero


Scott Bartlett


Jesse Taylor


Jordan Swanson

Abstract

Background

The epidemiology of elevated intracranial pressure (ICP) is poorly understood in craniosynostosis as noninvasive measures tend to underestimate its prevalence and invasive measures are deployed selectively. Elevated ICP may be implicated in neurocognitive sequelae of craniosynostosis; understanding these patterns may better guide the type and timing of surgical intervention.

Methods

Patients undergoing surgical correction for craniosynostosis were prospectively evaluated using spectral-domain optical coherence tomography (OCT) from 2014-2022. Previously validated OCT parameters found to be highly sensitive and specific surrogates of elevated ICP were compared across ages and affected sutures in patients with craniosynostosis.

Results

217 patients diagnosed with sagittal (n=85), metopic (n=52), multisuture (n=48), unicoronal (n=26), and squamosal (n=6) craniosynostosis were included. Overall, 32 (22%) single-suture synostosis and 53 (28%) total patients had surrogates of ICP>20mmHg at time of initial vault expansion. OCT parameters portending elevated ICP differed significantly by suture type, revealing metopic patients have the lowest incidence (ICP>15mmHg 29%, ICP>20mmHg 9%, p<0.001), and multisuture patients the highest (ICP>15mmHg 72%, ICP>20mmHg 51%, p<0.001). Age positively correlated with elevated ICP across sagittal craniosynostosis, where ICP>15mmHg was identified in only 11% of patients <6mo, but 50% of patients >12mo. (p=0.003). Similar patterns were seen at the ICP>20mmHg threshold (p=0.003). Elevated ICP surrogates trended with increasing age in multisuture (ICP>15mmHg 50% <6mo., 59% >12mo.) and unicoronal (ICP>15mmHg 38% <6mo., 50% >12mo.) craniosynostosis, though this was not statistically significant (p=0.9 and p=0.8, respectively). Highest incidence of elevated ICP surrogacy in metopic patients was

between ages 6-12mos. (ICP>15mmHg 18%; >20mmHg 12%), though age correlation was also not statistically significant (p=0.3, p=0.5).

Conclusions

Risk of elevated ICP varies by suture type and age in craniosynostosis. Multisuture craniosynostosis demonstrates the highest risk of elevated ICP, while metopic craniosynostosis the lowest risk. Correlating ICP patterns with neurocognitive outcomes is the focus of future research.

Objectives

1. Participants will be able to explain the differential incidence of elevated ICP by affected suture in craniosynostosis
2. Participants will understand how incidence of elevated ICP may increase over time in craniosynostosis 3. Participants will understand how the combination of affected suture and patient age may influence operative management secondary to effects on intracranial pressure

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Posterior Cranial Vault Distraction: A 10 Year Review of Surgical Outcomes at a Tertiary Care Center

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Lawrence Lin

Gregory Pearson

Abstract

Background: Posterior vault distraction osteogenesis (PVDO) can significantly increase intra-cranial volume in the setting of craniosynostosis (CS). However, the safety profile for PVDO is unclear with complication rates such as cerebrospinal fluid (CSF) leaks and postoperative infections as high as 30%. The authors sought to describe the clinical outcomes and complication rates for patients with CS undergoing PVDO at a tertiary pediatric institution over a 10-year experience.

Methods: The authors performed a retrospective review of all pediatric patients undergoing PVDO at a tertiary pediatric institution from 2012 – 2022. Demographic data and perioperative and postoperative outcomes including ED presentation and/or hospital readmission within 30 days, reoperation, infection, hardware failure/exposure, shunt malfunctions, and CSF leaks were recorded.

Results: Twenty-nine patients underwent PVDO (age: 22 ± 15.4 months). Twenty-two patients (75.7%) had a CS-associated genetic syndrome , and 27 (93.1%) had multi-suture CS. Ten patients (34.5%) had an abnormal pre-operative fundoscopic examination. Six (20.7%) had an abnormal post-operative fundoscopic exam. One patient (3.4%) experienced an intraoperative dural tear. Nine patients (31.0%) required a blood transfusion during their hospitalization. Postoperatively, 6 patients (20.7%) presented to the ED, and 8 patients (27.6%) were readmitted within 30 days of discharge. Thirteen patients (44.8%) underwent re-operation beyond hardware removal – 6 for hardware malfunction, 6 for wound issues, 1 for shunt malfunction. There was a 12.7% rate of post-operative infections, which were treated primarily with oral antibiotics. Overall complication rate was 58.6% (n = 17) though there were no reported CSF leaks, and no patients required a shunt placement postoperatively.

Conclusions: Most complications following PVDO for CS were hardware-related or infections treated as an outpatient. One patient experienced a dural tear without a postoperative CSF leak. Overall, posterior vault distraction osteogenesis has a favorable safety profile, though hardware-related issues should be thoroughly discussed with caregivers beforehand.

Objectives

1. Participants will be able to describe indications and benefits for posterior vault distraction osteogenesis in treatment of craniosynostosis 2. Participants will be able to describe complication rates for patients undergoing posterior vault distraction osteogenesis. 3. Participants will be able to identify hardware-related complications during posterior vault distraction osteogenesis.

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A Comparison of Three-Dimensional Cone Beam Computed Tomography Outcomes between Early versus Late Secondary Alveolar Bone Grafting in Patients with Unilateral Cleft Lip and Palate

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Mark Urata

Abstract

Background: Early secondary alveolar bone grafting (E-SABG; 4-7 years) occurs before the eruption of lateral incisors, while late SABG (L-SABG; 8-12 years) occurs before the eruption of maxillary permanent canines. This study compares outcomes of early ABG (E-SABG) versus late ABG (L-SABG) among patients with unilateral cleft lip and palate (UCLP).
Methods: A retrospective review was conducted evaluating non-syndromic patients with UCLP who underwent ABG from 2018-2020. Patients with preoperative and 6-month postoperative cone beam computed tomography (CBCT) were included. Demographics, perioperative data, and periodontal information were collected. Preoperative cleft width, bony bridge formation and thickness, incisor root length, and periodontal bone height on cleft-incisor were assessed by Dolphin Imagine software. The Bergland scale score using three-dimensional CBCT rather than traditional occlusal radiograph was applied to assess bone graft outcomes.
Results: Forty-nine patients were included, of which 21 were in the E-SABG group (6.8±1.0 years) and 28 were in the L-SABG group (10.8±1.6 years). The initial alveolar cleft width is significantly smaller in E-SABG group (5.4±1.9mm vs. 6.6±2.0mm; p=0.035). However, L-SABG group had higher graft failure rates compared to the E-SABG group (32.1% vs. 14.3%; p=0.150). The overall Bergland scale scores were 1.7±1.0 and 2.5±1.2 for the E-SABG and L-SABG cohorts, respectively (p=0.009). Compared to the E-SABG group, the L-SABG group had significantly greater bony bridge thickness (6.0±2.2mm vs. 3.5±1.8mm; p<0.0001), longer post-graft incisor root length (8.9±2.6mm vs. 13.3±1.8mm; p<0.001), and greater periodontal bone coverage on the root of the cleft-adjacent incisor (80.9±18.6% vs. 66.7±19.9%; p=0.029).
Conclusion: Our findings suggest that patients who undergo early SABG at 7 years may have better graft outcomes and benefits to the periodontal bone support on cleft-adjacent incisor compared to late SABG at 11 years.

Objectives

1) Compare bone graft success rates between early (approximately 7 years of age) versus late (approximately 11 years of age) secondary alveolar bone grafting 2) Analyze peridontal outcomes for early versus late secondary alveolar bone grafting 3) Understand orthodontic implications based on timing of alveolar bone grafting

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Effects of Posterior Vault Distraction Osteogenesis on Ventricular Morphology and Volume

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Abstract

Introduction
Patients with cephalocranial disproportion may be treated by posterior vault distraction osteogenesis (PVDO) to expand intracranial volume (ICV). The increase in ICV may reverse or prevent increased intracranial pressure and its sequelae and may also affect cerebrospinal fluid (CSF) homeostasis through ventricular changes. Through pre- and postoperative volumetric and morphometric analysis, this study aims to quantify the effects of PVDO on the ventricular system.

Methods
All patients who underwent PVDO between 2008-2022 with pre- and postoperative imaging were retrospectively reviewed. The ventricular system was segmented from computed tomography (CT) images for volumetric and morphometric analysis. Measurements were normalized to total cerebral volume to control for inter- and intrapersonal variations.

Results
The 20 patients analyzed had a mean age at PVDO of 4.51±2.83 years. All patients had craniosynostosis (8 bicoronal, 5 multisuture, 1 unicoronal and 6 pansynostosis), and 12 patients had a syndromic diagnosis (4 Apert, 3 Crouzon, 3 Muenke, 1 Pfeiffer, 1 Saethre Chotzen). Mean ages at pre- and postoperative CT scans were 5.00±4.49 years and 5.76±4.45 years, respectively. PVDO was found to significantly increase normalized total ventricular volume (3.37±6.67% to 3.98±4.74%, p=0.01), as well as the normalized bilateral lateral ventricle volume

(3.09±6.40% to 3.66±4.61%, p=0.01). Normalized volumetric differences in the third ventricle trended toward significance (p=0.08). There was no difference in the fourth ventricle (p=0.25) following PVDO.

Conclusion

This study demonstrates that PVDO not only increases ICV, but ventricular volume, as well. These changes in ventricular morphology and volume likely effect CSF hydrodynamics and could potentially effect conditions in which ventricular drainage is impeded. Future works are critical in quantifying the effects of PVDO on CSF hydrodynamics, and whether the procedure may have an exploratory role in terminally shunted patients.

Objectives

1. Participants will understand the effect of PVDO on the ventricular system 2. Participants will be able to describe the differential effect of PVDO on individual cerebral ventricles 3. Participants will be able to describe potential benefits of PVDO on ventricular-affecting pathology

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Infection of a Calcified Cephalohematoma: Case Report, Literature Review and Proposed Treatment Algorithm

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Abstract

Background: Cephalohematoma secondary to birth trauma is a common occurrence that rarely requires surgical intervention as many resolve spontaneously. When resorption fails to occur, the hematoma may calcify on the superficial surface due to bony deposition from the persistently elevated periosteum. This results in a significant skull deformity that can necessitate surgical correction during infancy or early childhood when cranial appearance is meaningfully impacted. Infection of a non-calcified cephalohematoma is reported in few case reports and may result in cranial osteomyelitis, meningitis, or intracranial abscess. Previous descriptions discuss simple incision and drainage or aspiration of non-calcified cephalohematomas. To date, there is no description of calcified cephalohematoma infection requiring outer lamellar craniectomy and early cranial contouring in a newborn.
Methods: We present a case of a infection of a calcified cephalohematoma in infancy requiring outer lamellar craniectomy, washout, and cranial contouring to simultaneously address osteomyelitis and significant skull irregularity. Review of the literature was also performed to identify common findings and establish a potential treatment algorithm.
Results: The reported patient recovered uneventfully with no short- or long-term post-operative complications. Review of the literature demonstrated >50% of cases identified E. coli as causative organism followed by polymicrobial infection. 100% of patients required IV antibiotic treatment with duration between 5 days and 6 weeks depending on presence of osteomyelitis. 55% of cases were able to be treated with aspiration alone, while 40% required surgical washout and debridement.
Conclusions: This is the only report in the literature of abscess formation within a calcified cephalohematoma requiring removal of the outer lamella of skull with cranial contouring. We present a treatment algorithm for infected cephalohematoma including early antibiotic treatment including E. coli coverage, aspiration and/or surgical washout for non-calcified cephalohematoma, and removal of the outer lamella of skull in cases of calcification.

Objectives

1) Participants will be able to recognize common symptoms for an infected cephalohematoma 2) Participants will be able to describe surgical treatment of a calcified cephalohematoma 3) Participants will be able to discuss potential treatment algorigthm

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Cranial Defect Reconstruction with Custom 3D-printed Hydroxyapatite Scaffolds: A Large Pre-Clinical Model

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Abstract

Introduction: When considering critical bone defect reconstruction, cranial reconstruction is an attractive target due to the presence of adjacent, reliable well-vascularized tissue and the relative lack of load bearing. This study seeks to demonstrate clinical readiness of a bone tissue engineering approach in a non-human primate model.
Methods: Identical 5-cm vertex guided-craniotomies were created in each of 12 rhesus macaques: 3 to demonstrate critical nature of the defect, and 9 to examine the bony bridging and volumetric bone growth when reconstructed with custom-3D-printed hydroxyapatite scaffolds. Three treatment groups were tested: naked scaffold (n=3), 2.8 mL (Infuse® Medtronic) rhBMP-2 (n=3) and 1000 µM dipyridamole (n=3). Serial CT scans (Q2 months) were obtained until 12 months, at which time micro-CT scan, histology and nano-indentation testing were performed.
Results: No new bone formation was identified on serial CT-scans in subjects whose craniotomies were left unrepaired. All craniotomies repaired with scaffolds were successful throughout a 12-month follow up. Micro-CT bridging analysis demonstrated subtotal (90%) circumferential fusion of the BMP-2 treated scaffolds while dipyridamole (9%) and naked scaffold (10%) groups had significantly less circumferential bridging ($p<0.001$). Micro-CT analysis of harvested scaffolds also demonstrated a significantly greater volume of bone formation in the BMP-2 treated scaffolds (7621±145 mm3) compared with the dipyridamole- (6466±693 mm3, $p=0.033$) and naked scaffold (6348±663 mm3, $p=0.021$) groups at 12 months. Nanoindentation showed that BMP-2 scaffolds had a larger Young's Modulus and Hardness than NS and dipyridamole scaffolds ($p<0.05$).
Conclusions: Reconstruction of critical cranial defects was successful with large, custom 3D-printed hydroxyapatite cranioplasty implants over a one year follow up. Bony ingrowth and bridging were most prevalent when scaffolds were pre-treated with the osteoinductive factor BMP-2. These findings demonstrate successful incorporation of large hydroxyapatite cranial scaffolds, and suggest an alternative approach to alloplastic materials for surgical cranioplasty.

Objectives

1. Participants will be informed of an alternative approach to the treatment of large cranial defects. 2. Participants will be informed of a new application of osteoinductive agents in Bone Tissue Engineering. 3. Participants will better understand developments in the application osteoconductive ceramics.

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Correlations between FACE-Q Satisfaction and Craniofacial Changes among Facial Feminization Patients

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Abstract

Background: Facial feminization surgery (FFS) is a key part of gender-affirming surgery in helping patients live according to their gender identity. Identifying standardized measurements and how they relate to patient satisfaction can improve postoperative outcomes. This study aimed to assess the relationship between craniofacial FFS changes and patient satisfaction.

Methods: We analyzed pre- and post-operative CT scans from 19 FFS patients. The bossing angle and the frontal nasal angle were measured to assess changes in forehead contouring. The bigonial width, chin height, and width were assessed for changes in the lower midface. Patients were surveyed postoperatively for satisfaction using the FACE-Q module. Paired t-tests assessed the degree of pre- and post-operative changes and the degree of change in FACE-Q satisfaction. Pearson correlations assessed the associations between post-operative measurements and FACE-Q scores.

Results: The average postoperative FACE-Q score was 72 out of 100. Among completed pre- and post-operative FACE-Q surveys, there was a significant increase in overall face satisfaction from 28.2% to 72% ($p=0.051$). There was no significant change in pre- to post-operative satisfaction in the chin, jaw, or forehead. All measurements decreased significantly postoperatively. The bigonial width had a 6% average decrease ($p<0.001$). The FNA had an average 14% decrease ($p=0.028$), and the BA had an average 58% decrease ($p<0.001$). The chin width had an average 38% decrease ($p<0.001$) while the chin height had an average 11% decrease ($p<0.001$). There was no correlation between the percent change in any specific facial region and FACE-Q assessed satisfaction.

Conclusion: The overall FACE-Q satisfaction score among FFS patients was high postoperatively. While there were significant changes in each region of the face analyzed, the lack of correlation to FACE-Q satisfaction suggests multiple factors contribute to patients' postoperative satisfaction beyond bony changes. Further studies are needed to assess FFS patients' satisfaction following surgery.

Objectives

1. Participants will be able to recognize the importance of measuring craniofacial changes among FFS patients, and the correlation of these changes with FACE-Q-assessed satisfaction, suggesting the need for further studies to assess FFS patients' satisfaction following surgery. 2. Participants will be able to compare the sensitivity of different measurements such as the bossing angle compared to the frontal nasal angle in detecting craniofacial changes in FFS patients. 3. Participants will be able to tell how overall satisfied patients are following FFS.

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Radiographic severity associated with worse executive functioning in children with metopic craniosynostosis

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Abstract

Background: Children with metopic synostosis are at risk for neurocognitive and behavioral deficits. The impact of pre-operative radiographic severity has yet to be fully elucidated. We aimed to explore how radiographic severity, assessed manually and with artificial intelligence, influences neurocognitive and behavioral outcomes at school age.

Methods: Children ages 6-18 years old with surgically-corrected metopic synostosis underwent testing for intelligence quotient (IQ), academic achievement, and visuomotor integration. Parents completed behavioral assessments about their child: Conners-3 (ADHD), Social Responsiveness Scale-2 (autism spectrum disorder), Behavior Rating Inventory of Executive Function-2 (BRIEF-2: executive function), and Child's Behavioral Checklist (overall behavioral functioning). Endocranial bifrontal angle (EBA), adjusted EBA (aEBA), frontal angle (FA), and AI-derived metopic severity score (MSS) were determined. Multivariate linear regressions evaluated the association of age at surgery and severity with neurocognitive and behavioral outcomes.

Results: There were 64 patients, with an average age at surgery of 9.4±7.6 months and average age at testing of 10.9±3.6 years old. Many patients reached borderline clinical levels for symptoms of ADHD as assessed by the inattention (45.3%) and hyperactivity (42.2%) subscales of the Conners-3. Multivariate linear regression identified associations between the FA and verbal (p=0.01) and full-scale IQ (p=0.02). Age at surgery (p=0.02), MSS (p=0.02), EBA (p=0.02) and aEBA (p=0.02) were associated with poorer scores of the executive function subscale of the Conners-3. aEBA was also associated with worse scores of 2 separate executive functioning subscales: cognitive regulation index (p=0.03) and global executive composite (p=0.05) of the BRIEF-2.

Conclusions: Many children with metopic synostosis have signs of ADHD. Pre-operative radiographic severity was associated with neurocognitive and behavioral outcomes at school age. A greater FA was associated with higher IQ scores. Furthermore, later surgery and greater severity assessed by a higher MSS and lower EBA and aEBA, were associated with worse executive functioning.

Objectives

1) Participants will be able to evaluate the factors that contribute to long term neurocognitive and behavior outcomes in children with metopic synostosis. 2) Participants will be able to explain what neurocognitive and behavioral outcomes are implicated in metopic synostosis. 3) Participants will be able to explain how to assess radiographic severity in children with metopic synostosis

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Reconstruction of Severe Frontonasal Dysplasia in Infancy: A Case Report

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Abstract

Frontonasal dysplasia is a rare congenital difference that varies in presentation and severity. There are a few published case reports for reconstruction, but no standardized technique for early correction, particularly in infancy. This report highlights our experience in staged management of this severe case of median craniofacial hyperplasia, while preserving structures for future stages of reconstruction.

The patient presented at 4 weeks of age with a midline dorsal nasal cleft, bifid nose, hypertelorism, and redundant soft tissue from midforehead to nasal tip. Imaging demonstrated absence of bone in the anterior cranial fossa without herniation. We highlight the senior author's technique for sequential intranasal shaping before excision and soft tissue reconstruction of the midline mass and nose at 6 months of age.

Future procedures will be staged to optimize facial growth and will include hypertelorism correction and rhinoplasty at skeletal maturity.

Objectives

1. Identify a staged approach to correction of frontonasal dysplasia in infancy 2. Explain the limitations of reconstruction of frontonasal dysplasia in infancy 3. Plan future procedures for hypertelorism correction and rhinoplasty at skeletal maturity

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Rise in incidence of gunshot wounds to the face: a 12-year retrospective study of changing patterns in management

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Abstract

Background: Gunshot wounds (GSW) to the face present unique challenges regarding effective management and limiting morbidity. This project aims to document changes in presentation, treatment, and clinical outcomes of GSW to the face over the past decade.

Methods: A retrospective chart review of GSW to the face from a Level 1 metropolitan trauma center registry was conducted for patients from January 2009 to December 2020. Patients were included if they sustained a GSW to the face, survived for more than 48 hours, and received care at that institution. Data collected included demographic information, injury details, and specifics of antibiotic therapy, surgical management, and infections. Univariate linear regression models were created for the parameters studied.

Results: From 2009-2020, a total of 432 patients met the inclusion criteria, with an average of 36 per year [range: 19-72]. Patient demographics remained relatively constant throughout the study period. While the total annual trauma volume increased by 56.3% over the study period (6,029 to 9,426), the incidence of GSW to the face tripled, representing a 91.9% increase in the proportion of the total trauma volume. Over the study period, patients requiring facial surgery decreased by 19.4% (1.8% per year, $p<0.001$) and the average length of hospitalization decreased by 4.2 days (0.48 days per year, $p=0.044$). The average duration of antibiotic coverage per patient decreased by 24.6% over the study period (2.0% per year, $p=0.004$). Despite this, the incidence of head and neck infections decreased by 13.9% (1.0% per year, $p=0.067$).

Conclusions: The incidence of GSW to the face is increasing. While the demographic profile of patients sustaining GSW to the face remains constant, there is evidence of reduced operative intervention, decreased infection rates, and better antibiotic stewardship. There is also a potential reduction in hospital costs as evidenced by shorter lengths of stay.

Objectives

1. Participants will be able to evaluate trends in operative management, antibiotic usage, length of hospitalization, and infection rates for patients with gunshot wounds to the face. 2. Participants will be able to identify parameters that have changed and remained constant in the presentation of patients with gunshot wounds to the face over a 12-year period. 3. Participants will be able to observe the frequencies at which various operative techniques were used in the management of gunshot wounds to the face.

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Novel, low-cost ear elevation splint for auricular reconstruction

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Abstract
Purpose: In autogenous auricular reconstruction for microtia repair, maintaining long-term projection of the constructed auricle can be compromised due to insufficient auricular support or scar contracture. To combat these adverse outcomes, we developed a low-cost ear elevation splint that maintains desirable auricular projection with external support.
Methods: An ear elevation splint was designed from Aquaplast, a splinting material that becomes flexible in hot water, to provide rigid support along the posterior auricle. It was held in place by a Neoprene headband. Each splint was custom-made for all patients undergoing second-stage autogenous auricular reconstruction at their two-week postoperative clinic visit and was worn for one month. Ear projection was monitored at 2 months, 3 months, 6 months, and 1 year post-operatively.
Results: Each splint took 15 minutes to make and costs approximately $35. The splint was held in place by a Neoprene headband and was less bulky compared to the previously-used sponge and gauze dressing. Seven patients have been treated with this ear elevation splint since January 2022. After having the splint in place for one month, all patients did not have notable reduction in projection or shallowing of the sulcus at a median postoperative period of six months (range 2 - 12 months). Wound healing was not inhibited by splint placement in all patients.
Conclusions: This novel ear elevation splint is a convenient, low-cost, and non-invasive addition to post-operative management of autogenous auricular reconstruction. Although longer term study is needed to further elucidate significant improvements, reduction in auricular projection usually occurs within the 6-month postoperative period based on the senior author's experience after two decades of practice, signifying promising results based on implementation of this splint.

Objectives
1) Participants will understand the principles of post-operative care following ear elevation procedures following autogenous auricular reconstruction 2) Participants will understand how involving orthotists in comprehensive craniofacial care can be applied to microtia repair. 3) Participants will learn how to create a custom, low-cost ear elevation splint for patients.

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Changes in Surface Area, Width, and Height in the Orbit, Mandible, and Chin among Facial Feminization patients

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Abstract

Background: Measuring craniofacial changes following facial feminization surgery (FFS) can elucidate ideal postoperative measurements to improve patient outcomes. This study examined changes in surface area and direct measurements of the most commonly manipulated regions of the face in FFS: the forehead/superior orbital rim, mandible, and chin.

Methods: Pre- and post-operative radiographs were analyzed from 11 FFS patients. The forehead/superior orbital rim, bilateral mandibles, and chin were isolated utilizing anatomical landmarks to assess for surface area (SA). Measurements included the frontal nasal angle (FNA: glabella-nasion-sella), bossing angle (BA; glabella-nasion-anterior table), bigonial width (distance between bilateral gonions), chin height (menton to central incisor root) and chin width (distance between mental tubercles). Paired t-tests assessed the degree of pre- and post-operative changes.

Results: All measurements significantly decreased post-operatively. The SA of the forehead/superior orbital rim had an average 11.8% decrease (pre-operative:13600.7 mm2 vs post-operative: 11821.7 mm2, p=0.03). The chin had an average 9.4% SA decrease (pre-operative: 13018.8 mm2 vs post-operative: 11732.4 mm2, p=0.02). The average SA of the left mandible decreased by 12.1% (pre-operative: 3327.9 mm2 vs post-operative: 2893.9 mm2, p=0.01), while the right mandible decreased by 7.9% (pre-operative: 3102.9 mm2 vs post-operative: 2841.4 mm2, p=0.04). The FNA significantly decreased from 116.62° to 107.68° (7.42% average decrease, p=0.01), while the BA decreased an average of 40.70% (preoperatively 20.24° vs. postoperatively 12.02° p<0.001). The average chin

height decreased from 23.68 mm to 21.67 mm (8.47% average decrease, p= 0.005), while the average chin width decreased from 22.71 mm to 16.44 mm (27.60% average decrease, p<0.001). The average bigonial width decreased from 97.38 mm to 92.7 mm postoperatively (4.7% average decrease, p=0.002).
Conclusion: FFS causes significant craniofacial measurement reductions. Future studies are needed to assess ideal measurements and percent changes craniofacial surgeons could aim to achieve depending on patient characteristics.

Objectives

1. Participants will be able to identify the most commonly manipulated regions of the face in FFS and explain how changes in these regions are assessed using surface area and direct measurements. 2. Participants will be able to recognize the importance of measuring craniofacial changes following FFS to improve patient outcomes. 3. Participants can compare the changes in craniofacial measurements and surface areas resulting from FFS to help establish norms for gender-specific facial features, in order to better understand the extent to which FFS achieves a more feminine appearance.

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A Critical Assessment of Gender Diversity within Plastic Surgery

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Abstract
Background: This study sought to examine gender distributions within plastic surgery leadership positions in journal editorial boards, society boards and within academic faculty
Methods: A cross-sectional study was performed to evaluate gender in plastic surgery among academic faculty, journal editorial boards, and professional societies' leadership positions. Our sample included 1918 subjects across 879 plastic surgery journal editorial board members, 872 plastic surgery academic faculty members, and 167 plastic surgery association board members. Similarly, the names and gender of editorial and board members were obtained.
Results: The overall percentage of female faculty was 23.7%, with the highest percentage in the Northwest region (35.3%) and the lowest in the Southwest region (11.1%). Faculty members were further subdivided by academic rank. A significant difference was found between the number of male and female faculty members at all academic positions. Of 245 full professors, 7.8% were female. There were 226 associate professors queried with 22.1% identified as female. 401 assistant professors were identified with 33.4% identified as female. Years in practice after completing terminal training were analyzed across the academic faculty. Among faculty with less than 10 years since completion of terminal training, 34.9 % were female. For faculty with 10 to 20 years post-terminal training, 23.5% were female. For those with 20 to 30 years of experience, 13.6% were female. For faculty with over 30 years since graduation, 7.6% were female. There was a significant difference between the number of male and female members across all six journals with over 80% being male. Among the analyzed editorial boards, only 27% were female.
Conclusion: Our results show that representation of women in plastic surgery trails behind recently reported numbers for other specialties. Difficulty finding mentors, family responsibilities, and institutional biases have been cited as barriers to women reaching faculty and leadership roles in plastic surgery.

Objectives
Identify the gender distribution of plastic surgery leadership positions in journal editorial boards, society boards, and academic faculty. Analyze the correlation between years of experience and gender distribution in plastic surgery academic faculty. Understand the potential barriers faced by women in plastic surgery in terms of achieving faculty and leadership roles, including finding mentors, family responsibilities, and institutional biases.

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Race and Ethnicity in Facial Gender-Affirming Surgery: A Gap in the Literature

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Abstract
Background: Ideal facial proportions, originally derived from Eurocentric faces, continue to guide surgical planning in facial gender-affirming surgery (FGAS) for transgender and non-binary (TGNB) individuals. However, the cisgender literature has established that racial and ethnic facial differences exist, and that variability informs surgical planning. It is not evident that FGAS literature incorporates race and ethnicity. With the recent emphasis on racial and ethnic facial differences, this review aims to determine how often race and ethnicity are discussed within FGAS literature.
Methods: A review of the literature was performed by querying five databases, PubMed, EMBASE, Cochrane, Web of Science, and Scopus. The search strategy included the concepts of transgender, race, ethnicity, and facial surgery. Articles unrelated to the TGNB population or FGAS were excluded. Descriptive statistics were calculated to determine the proportions of racial and ethnic groups represented in the FGAS literature.
Results: After screening 436 abstracts, 123 articles were subject to full text review and data extraction. Twelve (9.8%) articles reported race and/or ethnicity in patients' demographics. There were a total of 1,614 patients in the included articles, 70% White (n=1,129), 6.1% Asian (n=98), 10.6% Black (n=171), 9.5% Hispanic/Latinx (n=154), 0.4% American Indian or Alaska Native (n=6), and 3.5% had unknown race (n=56). Only three articles (2.4%) compared the procedures performed according to race and ethnicity. The remaining literature, including 5,536 patients and 10,413 FGAS procedures, did not report on race and ethnicity.
Conclusions: Race and ethnicity are infrequently reported in surgical literature on FGAS, limiting our ability to interpret differences in surgical needs and techniques across racial and ethnic groups. Future research must report on racial and ethnic characteristics of the patient population to better facilitate adapting procedures for populations with diverse backgrounds.

Objectives
Participants will develop an understanding of the current facial gender-affirming surgery literature landscape in relation to race and ethnicity. Participants will be able to describe proportions of racial and ethnic categories represented in the facial gender-affirming surgery literature. Participants will be able to explain how a lack of diversity in the literature can negatively impact outcomes of diverse patients.

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Technique for Cephalometric Analysis of the Craniofacial Skeleton Following Facial Feminization Surgery

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Abstract

Background: Facial feminization surgery (FFS) is a relatively diverse set of procedures. While there are several well-described outcomes from surgical techniques, there is no standardized methodology to provide reliable analyses of post-operative FFS outcomes. We describe the first reliable and reproducible technique to accurately and consistently measure post-FFS changes to guide surgical planning in order to optimize patient outcomes.

Methods: To assess glabellar prominence following the frontal sinus setback, the change in the bossing angle (BA: nasion, glabella, anterior table) and the frontal nasal angle (FNA: glabella, nasion, sella) are used. To assess the degree of frontonasal and supraorbital contouring, surface area measurements are calculated for the fronto-orbital complex using 4 borders: superior (SF: medial temporal ridge bilaterally (TR), 10 mm above the frontal sinus), inferior (IF: frontozygomatic (ZF) sutures bilaterally, nasion), left posterior and right posterior (LPF/RPF: ZF bilaterally, TR bilaterally and alae of the crista galli).To accurately assess the mandibular angle changes following FFS, the surface area change is calculated in-between the superior mandible border (SM: intersection of internal oblique ridge and alveolar margin (3M), posterior mandible) and anterior mandible border (AM: 3M, inferior mandible). Gonial width is measured as the distance between the bilateral inferior gonions. Four borders are used to accurately isolate the bony changes in the chin following a genioplasty: right superior chin and left superior chin (RSC/LSC: anterior of 3rd molar root bilaterally (3AM), central incisors' roots), left posterior chin (LPC) and right posterior chin (RPC) borders (LPC/RPC: 3AM point, inferior chin). The chin height and width are also assessed.

Conclusions: We describe a novel and reliable technique to radiographically measure bony changes in FFS. These anatomical landmarks can be used to isolate and capture modifications made with FFS bony contouring of the upper and lower midface.

Objectives

1. Participants will be able to recognize the importance of reliable and reproducible techniques for measuring post-operative changes following facial feminization surgery. 2. Participants will be able to identify the anatomical landmarks used in the described technique to assess changes in glabellar prominence, frontonasal and supraorbital contouring, mandibular angle changes, and bony structure of the chin in post-operative FFS patients. 3. Participants will be able to evaluate the effectiveness of the described technique in providing standardized measurements for post-operative FFS outcomes and its potential implications for optimizing patient outcomes.

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Long-term behavioral outcomes are different between school-aged children with metopic and sagittal synostosis

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Abstract

Background: Nonsyndromic craniosynostosis has been associated with neurocognitive and behavioral deficits. Small sample sizes, variability in age, and assessment metrics have limited conclusions. We aimed to compare behavioral impairments of school-aged children with metopic synostosis (MS) and sagittal synostosis (SS) using a battery of behavioral assessments.

Methods: Parents of children 6-18 years old with MS and SS completed the Child's Behavior Checklist (CBCL: overall behavioral functioning), Social Responsiveness Scale-2 (SRS-2: autism spectrum disorder [ASD]), Conners-3 (ADHD), and the Behavior Rating Inventory of Executive Function-2 (BRIEF-2: executive function). ANCOVA was used to assess for differences while controlling for sociodemographic risk, age at surgery, surgery type and IQ. Logistic regression was used to determine factors associated with reaching borderline clinical levels.

Results: 106 parents completed the assessments (60 MS, 46 SS). Children with MS were older at the time of assessment (10.41±3.60 vs 8.43±2.13 years, p<0.001). There was no difference in age at surgery (MS: 9.33±7.79 vs SS: 6.83±5.07 months, p=0.06). More children with MS had characteristics of ASD, demonstrated by reaching borderline levels of the restricted interests and repetitive behavior (30.0% vs 10.9%, p=0.01). More children with MS had worse executive function, assessed by the emotional regulation index (33.3% vs 17.4%, p=0.03) and global executive composite (31.7% vs 17.4%, p=0.05). SS had greater problems with somatic (57.59±0.99 vs 54.89±0.91, p=0.05), rule breaking (55.33±0.80 vs 52.53±0.74, p=0.02) and externalizing problems (52.32±1.90 vs 46.88±1.75, p=0.04). Greater age at surgery was associated with borderline scores of ASD characteristics, such as social cognition (p=0.05) and social motivation (p=0.04) and emotional regulation (p=0.01).

Conclusions: Children with MS and SS were found to have varying behavioral difficulties. Children with MS had more problems in executive function, while children with SS had more problems with externalizing behaviors.

Objectives

1) Participants will be able to explain the difference in behavioral outcomes associated with metopic and sagittal synostosis 2) Participants will be able to explain the behavioral assessment tools that can be used to assess school age children with synostosis 3) Participants will be able to explain the factors associated with behavioral impairments associated with non syndromic craniosynostosis overall

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Intraoperative facial nerve monitoring during mandibular distraction osteogenesis in infants with Robin sequence

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Abstract

Introduction: Mandibular distraction osteogenesis (MDO) is used to treat severe upper airway obstruction in infants with Robin Sequence (RS). While MDO is an effective intervention, complications include facial nerve dysfunction (FND) particularly involving the marginal mandibular nerve (MMN). This pilot study aims to evaluate changes in nerve conduction during MDO procedures and analyze if these changes are associated with clinical findings of FND.

Methods: Using electroneuronography (ENoG),we prospectively monitored facial nerve conduction in infants with RS undergoing MDO from 2019 to 2022. ENoG involves electrical stimulation of the facial nerve (FN) near the stylomastoid foramen and subsequent measurement of the motoric response, recorded at the orbicularis oculi and mentalis muscles. ENoG data was recorded at 10 different surgical points from skin incision to closure. Changes in latency and amplitude were compared to baseline measurements. Any increase in latency ≥10% or decrease in amplitude ≥60% from the baseline was considered a significant change in nerve conduction.

Results: Seven bilateral surgical procedures [osteotomy/placement of hardware (4); hardware removal (2); hardware replacement (1)] out of 24 patients were randomly chosen and analyzed, for a total of 14 unilateral investigations. Mean age at surgery was 20.8 months. Retraction during osteotomy was the surgical step most associated with changes in MMN conduction, with a significant decrease in amplitude or increase in latency noted in 35.7% and 14.3%, respectively. Temporary MMN dysfunction was observed in 4 postoperative clinical examinations (28.6%). Sensitivity/Specificity were 50%/50%, while PPV/NPV were 20%/80%. These findings did not reach statistical significance.

Conclusion: Intraoperative injury to the MMN may occur during MDO procedures, particularly during retraction/osteotomy. Real-time facial nerve intraoperative monitoring may be a useful tool that protects MMN function. Larger studies will help determine how to best avoid intraoperative FND during MDO procedures.

Objectives

1. Describe a protocol for intraoperative facial nerve monitoring during mandibular distraction osteogenesis (MDO) procedures. 2. Evaluate intraoperative changes in facial nerve conduction during MDO procedures. 3. Identify key intraoperative steps during MDO procedures that may be associated with greater risk of injury to facial nerve branches.

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Generative Pre-Trained Transformer Large Language Model Develops Novel Innovations in Craniofacial Surgery: A New Method of Creating Patent Ideas?

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Abstract

Background:
Natural language processing (NLP) has prompted new applications. In the form of chatbots, NLP models can be used to execute a variety of tasks in seconds and mimics face-to-face discussions. Although craniofacial surgeons utilize multiple technologies to treat their patients, there is room for innovation. In this study, we use a generative pre-trained transformer (GPT) by OpenAI to assist us in addressing challenges to developing novel craniofacial technologies that could be patented.

Methods:
OpenAI's 2023 ChatGPT March 14 release was used to generate novel patent ideas. ChatGPT was given the following command: "Develop 20 novel devices that have not been patented for craniofacial surgery with detailed descriptions." This was followed by adjusting the command to develop 20 more ideas for each of the following applications: 1) craniosynostosis, 2) cleft lip and palate, and 3) facial feminization.

Results:
A total of 80 “novel” ideas were generated by ChatGPT. The outputs generated assisted with developing potential company names for the innovations. Domains that were explored included three-dimensional imaging, implants, nerve monitoring systems, and facial recognition software, to name a few. The chatbot emphasized that it lacks legal knowledge and expertise, therefore it is best to consult a patent lawyer for guidance on the patent application process.

Conclusions:
ChatGPT offers a unique method of quickly generating ideas for inventions in craniofacial surgery. Although its ideas and responses are presented as novel, not all of them are. New releases of ChatGPT should be compared with other chatbots for this application.

Objectives

1. Participants will learn about the landscape of chatbots and their utility in innovation for 1) craniosynostosis, 2) cleft lip and palate, and 3) facial feminization 2. Participants will review methods to leverage natural language processing in craniofacial surgery 3. Participants will discuss new developments regarding large language models and the evolving technologies being released

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Preference Signaling in the Plastic Surgery Residency Application Process: The Student's Perspective

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Abstract

Background: Given the increased number of applicants and competitiveness in the field, preference signaling allows applicants to formally indicate an increased interest in up to five programs of their choice and increase the likelihood of a successful match.
Methods: A 19-question online survey was designed and distributed to current PRS applicants for the 2022-2023 application cycle. The survey assessed the different factors that went into signaling specific programs, how current applicants felt about the impact this new feature would have on their application and what aspects would they change about the signaling tool.
Results: 43% applicants completed the survey. 63% of participants agreed with the statement "preference signaling is a positive change to the current system", 30% were neutral, and 7% reported disagreement. Additionally, 86% of applicants felt signals should be used to differentiate between similar applicants, and 72% believed signaling would increase their chance of receiving an interview. 37% of responders agreed with the statement "I felt like the 100-word signal statement was helpful", 40% disagreed with the statement, and 23% were neutral. In response to the statement that "preference signaling could help address barriers to equity, diversity, and inclusion," 26% of participants expressed agreement, 26% disagreement, and 48% remained neutral. 58% of responders felt signaling helped show interest in programs where it would be difficult to complete an away rotation due to the financial burden. Overall, 64% of applicants responded that they would prefer more than the current 5 signals, while 31% felt 5 signals were appropriate.
Conclusion: In conclusion the impact of preference signaling on the match process has important implications for both applicants and programs. For applicants, signaling preferences can increase the likelihood of matching with their preferred programs. For programs, preference signaling can help them identify applicants who are most likely to accept their offers.

Objectives

1.To understand the concept of preference signaling in the context of the residency match process for medical professionals, including its purpose and potential impact on both applicants and programs. 2.To explore the various factors that go into signaling specific programs, including the potential role of equity, diversity, and inclusion considerations in the decision-making process. 3.To evaluate applicant attitudes towards preference signaling, including perceived benefits and drawbacks, and to identify areas where improvements could be made to the signaling tool to enhance its effectiveness.

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Management of Sinogenic Intracranial Complications in Pediatric Patients: Role of Plastic Surgery in Treatment

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Abstract
Background: Intracranial complications following pediatric viral upper respiratory infection can lead to serious and life-threatening complications, owing to its proximity to the skull base. Despite the multidisciplinary nature of surgical intervention, there remains a paucity of evidence-based treatment algorithms for operative management in the pediatric population. Therefore, exploration of the involvement of the plastic surgery team in the surgical management of intracranial pathology, reconstruction, and classification of patient outcomes for all sinus etiologies is warranted.
Methods: A retrospective case series from a tertiary children's hospital was conducted from 2016 to 2022. Patient demographics, abscess location, presenting symptoms, pre-hospitalization antibiotic use, and surgical timing were assessed. The primary outcome was the need for and number of revision surgeries, while secondary outcomes included length of hospitalization, 30-day readmissions, and complete resolution of intracranial abscesses.
Results: This study included 18 children with sinogenic intracranial complications. 79% were males, 47% black/African Americans, and the median age was 12 (IQR: 6-16). In 68% of cases, subdural abscesses were the primary cause of intracranial abscesses, and the most common procedure was craniotomy. Repeat surgery was required for 7 patients (37%), primarily due to new intracranial infections (21%). Patients undergoing bur hole procedures experienced the highest re-operation rate (48%). Neurosurgery participated in all 7 re-operation procedures, while otolaryngology and plastic surgery were involved in 2 and 1, respectively. The average infection volume was 3.0 mL for patients undergoing functional endoscopic sinus surgery by ENT, while those receiving only neurosurgical procedures had the highest average infection volume of 42.0 mL.
Conclusion: While endoscopic sinus surgery offers lower morbidity rates and shorter recovery times, open neurosurgical procedures remain the most common initial intervention. A multidisciplinary approach is crucial for successful management of sinogenic intracranial complications, but further research is required to determine precise indications for plastic surgery involvement.

Objectives

1. To understand the various factors contributing to intracranial complications in pediatric patients following viral upper respiratory infections, including the types of abscesses, symptomatology, and the role of prehospitalization antibiotic use. 2. To evaluate the efficacy and outcomes of different surgical interventions, such as endoscopic sinus surgery and open neurosurgical procedures, in the management of sinogenic intracranial complications, as well as the importance of a multidisciplinary approach involving neurosurgery, otolaryngology, and plastic surgery. 3. To identify areas for further research in refining indications for plastic surgery involvement and developing evidence-based treatment algorithms for operative management of pediatric sinogenic intracranial complications, with the aim of improving patient outcomes and reducing complications.

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Assessment of Soft Tissue Changes relative to Bone following Box Osteotomy and Facial Bipartition for Correction of Hypertelorism

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Abstract

Background: Box osteotomy (BO) or facial bipartition (FB) are used for the surgical correction of hypertelorism. There is a paucity in the literature assessing the degree to which bony resection translates into soft tissue movement. This study analyzes the bony and soft tissue changes achieved with BO and FB.

Methods: A retrospective review was conducted evaluating patients who underwent BO or FB at our institution from 2005-2022. Demographics, medical history, and perioperative data were recorded. Correction of the interdacryon distance and intercanthal distance were measured on pre- and post-operative computed tomography scans. Data normality was determined, and independent t-test (parametric) and Wilcoxon rank-sum test (non-parametric) were utilized. The ratio of bone-to-soft tissue change was computed by calculating the change in the intercanthal distance for every 1mm change in the interdacryon distance.

Results: Twenty-seven patients were included, of which 20 underwent FB and 7 BO. Patient diagnoses included Apert syndrome (n=12), Pfeiffer syndrome (n=2), Saethre-Chotzen syndrome (n=1), Crouzon syndrome (n=2), Oculo-auriculo-frontonasal dysplasia (n=1), Craniofrontonasal dysplasia (n=6), and Frontonasaldysplasia (n=3). There was a significant improvement in the interdacryon distance (27.9mm to 21.6mm; $p<0.001$) and intercanthal distance (43.4mm to 28.4mm; $p=0.003$) for FB patients. Similarly, there was a significant improvement in the interdacryon distance (34.8mm to 25.6mm; $p=0.018$) and intercanthal distance (48.9mm to 41.0mm; $p=0.036$) for

BO patients. The percent change in the interdacryon distance was 23.1% (FB) and 28.3% (BO; p=0.216), whereas the percent change in the intercanthal distance was 11.2% (FB) and 16.4% (BO, P=0.041). The ratio of bone-to-soft tissue change was 1-to-0.8 across both cohorts (BO: 1-to-0.9, FB: 1-to-0.7; p=0.224).
Conclusions: Box osteotomy and facial bipartition effectively correct hypertelorism, demonstrating significant bone and soft tissue changes. Our findings revealed that 1mm of interorbital bone resection correlated with 0.8mm change in the overlying soft tissue for both hypertelorism-correcting procedures.

Objectives

1. Participants will compare the bone changes of patients that underwent box osteotomy and facial bipartition. 2. Participants will compare the soft tissue changes of patients that underwent box osteotomy and facial bipartition. 3. Participants will learn about the bone to soft tissue change ratio for both hypertelorism-correcting procedures.

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Creation And Implementation Of Global And Regional Measures Of Scaphocephaly

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Abstract
Background: Scaphocephaly results as bi-parietal expansion is inhibited, and compensatory anterior and posterior elongation occurs. We recently developed regional measures quantifying elongation in the frontal bossing index (FBI) and occipital bullet index (OBI). Creating a width-based measure, would facilitate isolated measurement of the fundamental pathology of scaphocephaly. Further, it would allow for the creation of a global metric which could replace the cephalic index. This combined system would allow surgeons to identify both global and regional morphology in scaphocephaly.
Methods: Surface imaging from CT or 3D photographs of 360 individuals with sagittal craniosynostosis and 221 normocephalic individuals was obtained. Reproducible landmarks were identified to quantify patterns in width restriction. Area under the curve (AUC) analyses was performed to identify trends in regional morphology and create measures capturing population differences. The most distinct was used to create a vertex narrowing index (VNI). Using the FBI, OBI, and VNI, a measure of W/L analogous to the cephalic index was created (Scaphocephalic Index, SCI).
Results: The VNI performed well with an AUC of 0.97, a sensitivity of 91.2% and a specificity of 92.2%. Index score is independent of age (<5 years), sex, and imaging modality. The measures can be combined to form a SCI. SCI measure performance was nearly perfect (AUC>0.999, Sensitivity>99%, Specificity>99%) in distinguishing control vs SC patients. The population means were 63(±5) and 88(±5) for the SC and control populations respectively.
Conclusion: The VNI in combination with the FBI and OBI create cranial shape indices which allow for superior differentiation of SC and control patients compared with other systems as it approaches the accuracy of CT imaging. The system may be further utilized for comparison of operative techniques for SC over time as it avoids the need for serial radiation for long-term shape evaluation and is automatable.

Objectives
1) Participants will learn about the creation of metrics that allow for widespread objective evaluation in scaphocephaly. The previous evaluation was typically limited to the cephalic index in addition to subjective evaluation. Here high performing metrics are created which can be easily implemented. 2) Participants will learn how the implementation of the created metrics can lead to improved referral patterns by primary care physicians 3) Participants will learn how these metrics will lead to improved diagnosis, operative planning, and outcomes evaluation in those treating craniosynostosis. By better understanding operative outcomes, surgeons can make databased decisions preoperatively.

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Epidemiological Trends in Facial Fractures and Dental Injuries related to Leisurely Activities

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Sacha Hauc

Abstract
Purpose: Sports and recreation related maxillofacial injuries are one of the most common etiologies of facial **fractures** and dental injuries. There is no prior study on the distribution of such injuries among various types of recreational activities in large, demographically diverse groups in the United States. As such, the objective of the present study is to offer a detailed analysis of recreation-related facial fractures and dental injuries.
Methods: A cross-sectional study of patients reported to the National Electronic Injury Surveillance System (NEISS) from 2019 to 2021 was performed. Within our own dataset, patients were included if they had suffered a facial fracture or a dental trauma while engaging a leisure related activity.
Results: Male patients represented the vast majority of injuries, with a nearly 3:1 male to female ratio. Except for horse-riding and scooters, all other categories consisted of mostly male patients. Activities with highest prevalence of facial fractures were basketball, soccer and football in the adolescent age group; as for adults (20 years and older) vehicles (two-wheeled vehicles, scooters, mopeds, cycles, all-terrain vehicles) and exercise without equipment were responsible for the greatest number of facial fractures. A vast majority of the group either had a facial fracture (72.1%) or dental injury (24.5%) and solely 3.44% sustained both.
Conclusion: Our study found that roughly 3% of oral-maxillofacial injuries related to leisurely activities had concomitant facial and dental injuries. Overall, incidents with two-wheeled vehicles were the most frequent etiology of facial injuries. More granularly, we found a high prevalence of maxillofacial injuries in children to be most related to playground equipment. In the adolescents age group, recreational ball-sports played a major role in such injuries. While in older patients exercise without equipment, which gained popularity during the COVID-19 shutdowns, were a notable etiology of orofacial injuries.

Objectives
1)To highlight the lack of prior research on the distribution of sports and recreation-related maxillofacial injuries among various types of recreational activities in the United States. 2) To present a detailed analysis of leisure-related facial fractures and dental injuries using the National Electronic Injury Surveillance System (NEISS) data from 2019 to 2021. 3) To identify the activities with the highest prevalence of facial fractures in different age groups and the most frequent etiology of facial injuries overall.

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Midface Hypoplasia after Frontofacial Advancement Procedure: 10 Years Follow Up

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Abstract
Background: Apert syndrome is one of the rare forms of acrocephalosyndactyly, which constitutes craniosynostosis, syndactyly of extremities, and dysmorphic facial features with significant oral manifestations. Midface hypoplasia is a major manifestation of Apert syndrome. Surgery to cut bones followed by distraction osteogenesis to slowly lengthen the bones being one modality to improve their breathing, chewing and appearance. This paper shows the journey of an apert syndrome patient who underwent Lefort III advancement for 10 years
Case: A 20-year-old female patient was diagnosed with Apert syndrome. She underwent a fronto-facial Le Fort III advancement with mid distractor type I was applied bilaterally in 2009. Her complaints were pre-operatively to have snoring and delayed development. The distractor was activated to full range of 30mm from 5 days post-operatively. Her snoring had almost completely resolved and there was a significant improvement in her nocturnal oxygenation. However, after 10 years, she back with persistent snoring and sleep apnea. On physical examination she presented with midface hypoplasia with secondary class III malocclusion and anterior open bite.
Discussions: After 6 to 7 years of life, facial growth occurs mostly because of bony apposition, enlargement of the nasal cavity, and growth of the maxillary alveolar process. Various studies reporting minimal or absent horizontal and sagittal growth with preservation of vertical growth in patients with craniofacial syndromes. Although surgery may have no detrimental effect on skeletal growth, scarring may however impair soft tissue growth. Thus, may make obstructive sleep apnea recurrent after few years. Another advance surgery help with the relapse.
Conclusion: Midface advancement is a keystone intervention in the treatment plan of syndromic hypoplasia of the midface. Timing of the midface procedure should be bound to clear indications and long term follow up is mandatory.

Objectives
1. Explain deformity persist after frontofacial advancement 2. Analyze the possibility of symptom relapse in patient after frontofacial advancement 3. Conduct long term follow up guideline for frontofacial advancement patient

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Detoured sagittal split osteotomy to avoid unexpected fracture of inferior alveolar nerve

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Cheng-Hui Lin

Abstract

Background

Sagittal split is an important surgical design and technique for mandibular osteotomy in orthognathic surgery. Inferior alveolar nerve (IAN) injuries remain the most unwanted complication during the procedure. Anatomical position has been noted highly related to the reason and mechanism of fracture dislocation of canal and injuries to IAN. Along with the application of computer aided surgical simulation (CASS) and ultrasonic cutter, we are able to create a detoured sagittal split design to avoid injury. The study aimed to review the incidence of IAN injury and sensory recovery after detoured sagittal split osteotomy of mandible.

Methods

From July 2021 to June 2022, 68 patients (136 sides) of detoured sagittal splits osteotomy were conducted. Unexpected fracture of IAN canal was recorded. Longitudinal follow up after surgery was performed at one week, two weeks, one month, three months, and six months after surgery. Functional sensory recovery was observed during the follow up period.

Results

Among the 136 sides of detoured splits, the incidence of trans-sectional fracture and sagittal fracture of IAN canal were 5.1% (7 sides) and 6.6% (9 sides) respectively. No unexpected IAN fracture over lower border of mandibular body. The incidence of functional sensory recovery (>S3) was 49.4%(67 sides), 53.7%(73 sides),86.8% (118 sides),92.6% (126 sides), and 99.3%(135 sides) at 1 week, 2 weeks, 1 month, 3 months, and 6 months after surgery, respectively.

Conclusion

Detoured sagittal split osteotomy through CASS and ultrasonic cutting could effectively avoid unexpected fracture of inferior alveolar canal. The functional sensory recovery was found acceptable after surgery.

Objectives

1. Participants will be able to identify the risky position of inferior alveolar nerve canal for sagittl split of mandible 2. Participants will understand the design of detoured sagittal split osteotomy of mandible 3. Participants will be able to apply the ultrasonic cutting in sagittal split osteotomy of mandible

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Suturectomies assisted by cranial orthosis remodeling for the treatment of craniosynostosis can be performed without an endoscope.

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Asaf Olshinka

Abstract

Background- Minimally-invasive endoscopic strip-craniectomy (or suturectomy) for the repair of craniosynostosis combined with postoperative cranial orthotic molding has been widely adopted in the past 2 decades, proving itself as a safe and effective procedure. Over time the authors transitioned from performing an endoscopic strip-craniectomy, to performing the same surgery without the endoscope. The authors here describe our technique and compare its results to those published in the literature for endoscopic suturectomies.
Methods- A retrospective chart review was performed for patients with nonsyndromic craniosynostosis who underwent minimally-invasive nonendoscopic suturectomy between 2019 and 2020 at our institution.
Results- Thirteen patients (11 males; 2 females) were operated including 5 Metopic, 5 Sagittal, 2 coronal, and 1 lambdoid craniosynostosis. The average age at surgery was 4.35 months. The average length of surgery was 71 minutes. Averaged intraoperative estimated blood loss was 31.54 mL. Eleven patients received a blood transfusion (most before performing the skin incision) with a mean amount of 94.62 mL of blood transfused during surgery. The mean hemoglobin at discharge was 10.38 mg/dL. There was only 1 intraoperative mild complication. The mean intrahospital length of stay was 1.77 days with no postoperative complications noted. All patients initiated remodeling orthotic treatment following surgery. Long-term follow-up scans were available for 8 patients (5 metopic, 2 sagittal, and 1 lambdoid) with an average follow-up of 9 months. In all cases, there was a significant improvement in the skull width at the synostosis location as well as in the skull proportions and symmetry. The above outcomes are similar to those published in the literature for endoscope-assisted strip-craniectomies.
Conclusions- Suturectomies assisted with cranial orthosis remodeling for the treatment of all types of nonsyndromic craniosynostosis can be performed without an endoscope while maintaining minimal-invasiveness, good surgical results, and low complication rates.

Objectives

1. Participants can apply this surgical method of treating CS when endoscope assistance is not available. 2. Participants should understand that early diagnosis of CS is important even when endoscopic surgery is not available. 3. Lead the idea that an endoscope is neither necessary nor essential to be able to offer this surgery to patients anywhere in the world. This is of utmost importance as the use of neuroendoscopy is not available worldwide.

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Geographical and Socioeconomic effects on Cleft Lip and palate in South Australia

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Steven Cook

Abstract

Background

Cleft lip and palate are known to be overrepresented in low socioeconomic communities across the developing world. We hypothesize that this trend of increased incidence of clefts in lower socioeconomic communities is applicable to developed nations also.

Methods

We interrogated the cleft database of the two cleft institutions in South Australia examine the cleft patients born in South Australia between 1998 and 2022 and analyze the geographical distribution against the socioeconomic status of these communities. We examined the observed number of cleft patients in each local government area (LGA), against the live birth data for each LGA. These numbers were then compared against the expected number of clefts, as per the Australasian Society of Cleft Lip and Palate's quoted incidence of 1:800 live births. These LGAs were analyzed against their socioeconomic status, as per the Australian Bureau of Statistics Index of Relative Social Advantage and Disadvantage.

Results

We found two clear geographical patterns to cleft patients born in South Australia between 1998 and 2022. These two clusters of patients were significantly larger than the expected number of clefts for the time period of the study. When these geographical outliers were analyzed against socioeconomic data for these areas, we found that more cleft patients were born in low socioeconomic LGAs than would be expected, while less cleft patients were born in high socioeconomic LGAs than would be expected, based on observed incidence and live birth data. These differences were statistically significant.