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Michael R. Markiewicz, Veerasathpurush Allareddy, and Michael Miloro

Craniofacial Growth: Current Theories and Influence on Management 167
Ashley E. Manlove, Gerardo Romeo, and Shankar RengasamyVenugopalan

Craniofacial development is a highly coordinated process under tight genetic control and environmental influence. Understanding the core concepts of growth and development of the craniofacial skeleton and the impact of treatment on growth potential is vital to successful patient management. To maximize outcomes and minimize iatrogenic consequences, proper sequencing and timing of interventions are critical. The development of the craniofacial skeleton occurs as a result of a sequence of normal developmental events: brain growth and development, optic pathway development, speech and swallowing development, airway and pharyngeal development, muscle development, and tooth development and eruption.

An Overview of Timeline of Interventions in the Continuum of Cleft Lip and Palate Care 177
David Yates, Veerasathpurush Allareddy, Jennifer Caplin, Sumit Yadav, and Michael R. Markiewicz

This article provides an overview of timeline of interventions and the critical role different providers have in the continuum of cleft lip and palate care. The earliest intervention is the presurgical infant orthopedic treatment, which is initiated in the first few weeks of life. This is followed by several interventions done in a phased manner. These include: lip repair, palate repair, velopharyngeal surgery, maxillary expansion, maxillary bone grafting, limited phase of orthodontic treatment, comprehensive phase of orthodontic treatment (with/without orthognathic surgery), and restorative dentistry.

Dentofacial Orthopedics for the Cleft Patient: The Latham Approach 187
Veerasathpurush Allareddy, Stephen Shusterman, Elizabeth Ross, Victoria Palermo, and Pat Ricalde

Presurgical infant dentofacial orthopedic treatment (PSIOT) is a process by which cleft maxillary and soft tissue segments can be moved before surgical repair of lip. One of the PSIOT approaches used is the fixed PSIOT using Latham appliances. In this article, the authors provide an overview of this approach and the step-by-step process of placing these appliances intraorally. Prospective randomized clinical studies are necessary to definitively answer concerns surrounding the long-term effects of PSIOT.

Nasoalveolar Molding for Unilateral and Bilateral Cleft Lip Repair 197
Hitesh Kapadia, Douglas Olson, Raymond Tse, and Srinivas M. Susarla

Nasoalveolar molding (NAM) is a powerful tool in the treatment of patients with unilateral or bilateral cleft lip and palate. The primary goal of NAM is to improve alignment of critical anatomic elements before surgical repair of the unilateral or bilateral cleft lip. Modifications of the position of the alveolar segments and their associated...
lip elements, the lower lateral cartilages, and the columella achieved with NAM are helpful for creating a suitable platform for tension-free lip repair.

Orthodontic Preparation for Secondary Alveolar Bone Grafting in Patients with Complete Cleft Lip and Palate

Veerasathpurush Allareddy, Richard Bruun, James MacLaine, Michael R. Markiewicz, Ramon Ruiz, and Mark A. Miller

This article provides an overview of the orthodontic preparation prior to secondary alveolar bone grafting of alveolar defects in those with complete cleft lip and palate. Use of cone beam computed tomography in diagnosis and treatment planning for addressing alveolar clefts, the rationale for maxillary expansion prior to alveolar bone grafting, key steps in differential maxillary expansion, potential adverse effects, and outcomes associated with maxillary expansion are provided in this overview.

Obturation and Tissue Transfer for Large Craniofacial Defects

Curtis D. Schmidt, Stavan Y. Patel, Jennifer E. Woerner, and Ghali E. Ghali

Reconstruction of large craniofacial defects requires several factors to be considered before deciding on the best reconstructive option. This article discusses various factors taken into consideration when deciding on which reconstructive option is ideal for a given patient and defect. For large craniofacial defects, reconstruction using tissue transfer is considered preferentially over obturation, although in select defects obturation using a traditional tooth- or implant-borne prosthetic obturator can be considered a viable option.

An Overview of Craniosynostosis Craniofacial Syndromes for Combined Orthodontic and Surgical Management

Shayna Azoulay-Avinoam, Richard Bruun, James MacLaine, Veerasathpurush Allareddy, Cory M. Resnick, and Bonnie L. Padwa

This article provides an overview of epidemiology, genetics, and common orofacial features of those with craniosynostosis. Patients with craniosynostosis require several surgical procedures along with continuum of care. The earliest surgical interventions are done during the first few years of life to relieve the fused sutures. Midface advancement, limited phase of orthodontic treatment, and combined orthodontics/orthognathic surgery treatment are usually required during later years. This article presents several examples of cases with outcomes associated with these procedures.

Orthodontic Considerations for Cleft Orthognathic Surgery

Stephen Yen, Jeffrey Hammoudeh, Sean P. Edwards, and Mark Urata

Preparation and planning for orthognathic surgery in late adolescence depends on the complexity of unresolved problems with which the patient presents. Different strategies are presented to address these unresolved problems in the adult patient with cleft lip and palate. Different surgical and orthodontic treatments are presented to correct the class III malocclusion in patients with cleft lip and palate in ranges that are analogous to the envelope of discrepancy. For complex cases, the principles of achievability, stability, and esthetics should guide the decision-making process for planning the preparation for orthognathic surgery.
LeFort Distraction in the Cleft Patient 269
Stephanie J. Drew and Hitesh Kapadia

The cleft patient may present with significant maxillary deficiency requiring maxillary advancement to establish balanced facial form and function. Often these skeletal advancements require movement of the maxilla of more than 10 mm. The cleft patient poses special challenges because of difficulty of mobilizing tissues on a multiply operated maxilla, as well as long-term stability. Distraction osteogenesis is a technique that may be applied to help move the maxilla over a long distance and slowly expand the soft tissues. A discussion of the orthodontic and surgical considerations when planning and executing the technique is presented.

Orthodontic and Surgical Principles for Distraction Osteogenesis in Children with Pierre-Robin Sequence 283
Stephen Yen, Austin Gaal, and Kevin Smith

Patients with Pierre-Robin sequence recalcitrant to nonsurgical intervention have historically required tracheostomy. Mandibular distraction provides a predictable alternative treatment to tracheostomy for improving airway. Orthodontic perioperative interventions should be considered, including overcorrection, placement of temporary anchorage devices, elastics, and molding the regenerate. Mandibular distraction can be technically difficult and may cause complications. Performed correctly, mandibular distraction provides patients with a better quality of life than tracheostomy.

Orthodontics for Unilateral and Bilateral Cleft Deformities 297
Yassmin Parsaei, Flavio Uribe, and Derek Steinbacher

Orthodontic treatment of patients with unilateral and bilateral cleft palate requires an extensive interdisciplinary approach to achieve optimal functional and esthetic rehabilitation. Intervention is divided into 3 main stages: early mixed, late mixed, and permanent dentition. Treatment modalities can vary according to developmental stage, severity of cleft, and presence of other dentofacial abnormalities. This article describes the use and efficacy of different orthodontic, orthopedic, and surgical approaches at each developmental stage of unilateral and bilateral clefts, whereby the orthodontist plays a pivotal role in the different phases of growth and development of the cleft lip and the patient.

Surgical-Orthodontic Considerations in Subcranial and Frontofacial Distraction 309
Richard A. Hopper, Hitesh Kapadia, and Srinivas M. Susarla

Subcranial and frontofacial distraction osteogenesis have emerged as powerful tools for management of hypoplasia involving the upper two-thirds of the face. The primary goal of subcranial or frontofacial distraction is to improve the orientation of the upper face and midface structures (frontal bone, orbitozygomatic complex, maxilla, nasal complex) relative to the cranial base, globes, and mandible. The various techniques used are tailored for management of specific phenotypic differences in facial position and may include segmental osteotomies, differential vectors, or synchronous maxillomandibular rotation.
Selected Orthodontic Principles for Management of Cranio-Maxillofacial Deformities  
Timothy J. Tremont and Jeffrey C. Posnick

An understanding of fundamental orthodontic principles involving diagnosis, treatment planning, and clinical strategies is essential for achieving successful outcomes in the treatment of craniofacial patients, particularly cleft lip/palate. This article focuses on: customizing a mandibular dental arch form using the WALA ridge; accurately diagnosing the maxillary skeletal transverse dimension (cusp to cusp/fossa to fossa); coordinating the upper dental arch with the lower; using a smiling profile and glabella vertical to assess anteroposterior jaw position; and leveling the mandibular curve of Spee while considering the lower one-third of the face. These concepts influence treatment outcomes to the extent they are used.