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Decision Making in OTOLARYNGOLOGY






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Foreword
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JAYPEE

Decision Making in Otolaryngology

Second Edition

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Foreword

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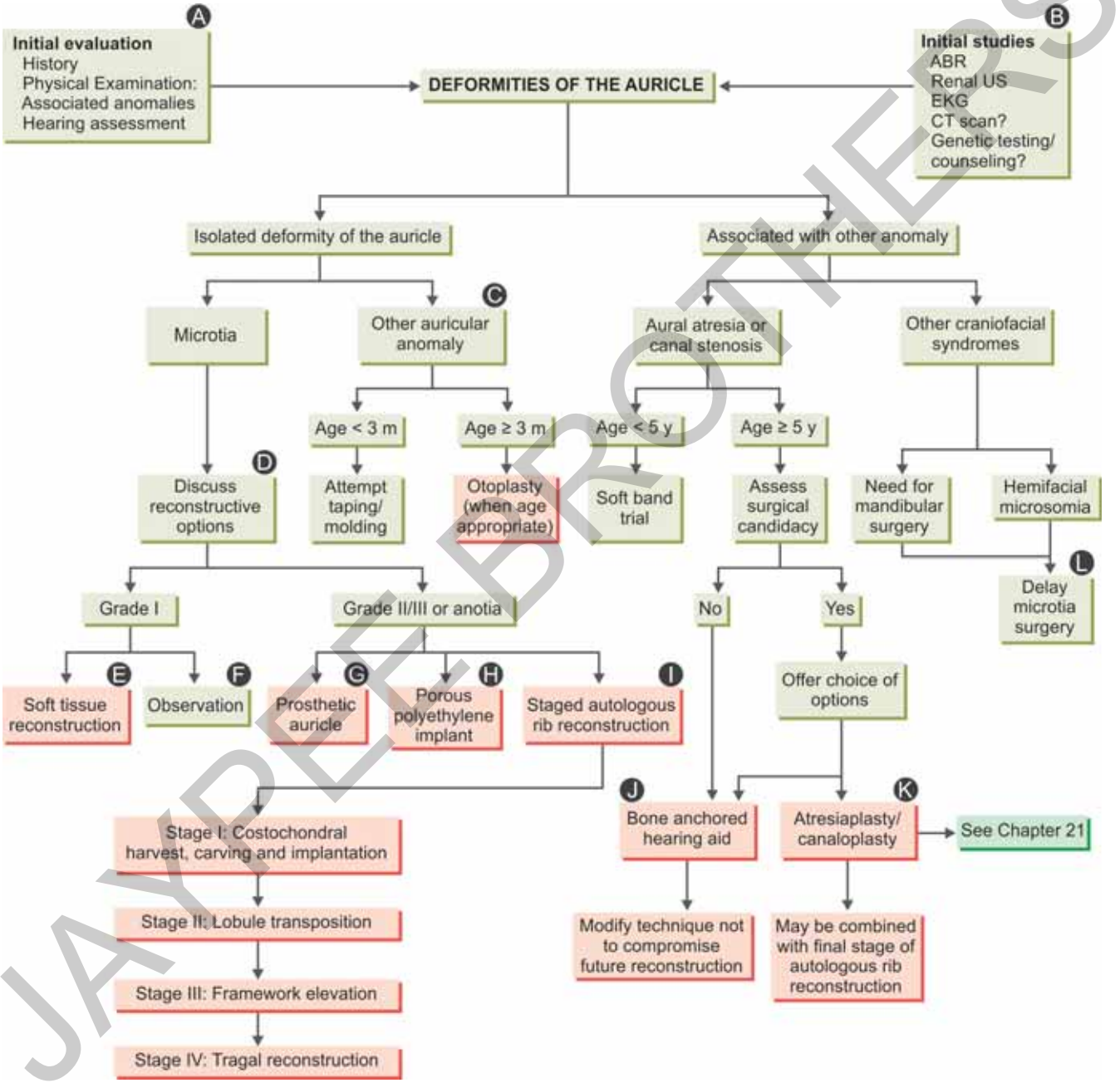
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CHAPTER

20 Deformities of the Auricle

Noel Jabbour



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Microtia and aural atresia occur from 0.83 to 17.4 per 10,000 live births and may be unilateral or bilateral. These anomalies are found in association with other congenital anomalies and in up to 10% as part of known syndromes, such as Goldenhar, CHARGE, or Treacher Collins syndrome. However, more subtle auricular and ear canal anomalies are even more common.

A Initial evaluation should include a careful family history, birth history including potential teratogenic exposures, and medical history including other known anomalies. In the vast majority of cases, no specific cause is identified. Physical examination should include grading the severity of the ear abnormalities as well as a careful search for

other commonly associated anomalies including choanal atresia/stenosis, hemifacial microsomia, cleft palate, hemipalatal paresis, and other craniofacial anomalies, as well as initial hearing assessment to confirm the hearing status in the affected and unaffected ear(s).

B Since development of the auricle occurs at the same gestational time-period as development of the heart and kidney renal ultrasound and EKG may serve as baseline screening tests for associated renal or cardiac anomalies. If there is a question regarding the hearing, auditory brainstem response testing should be performed to evaluate conductive versus sensorineural hearing loss. Some centers perform a CT scan of the internal auditory canal at the time of initial evaluation, though it may be more prudent to wait until a later age, when considering surgical options, in order to reduce the patients exposure to the radiation.

C Other of the auricular anomalies that are not microtia should be identified, such as macrotia, lop ear deformity, Stahl's deformity, prominauris, or cryptotia. There is evidence that children under the age of 3 months may benefit from nonsurgical splinting with either tape or ear molding. After 3 months of age, the circulating maternal estrogen decreases and the cartilage stiffens and these techniques may be less likely to be successful; otoplasty may be considered when the ear is approaching its adult size at 5–6 years of age. Otoplasty is most commonly performed from a post-auricular approach. Incisionless techniques have been described. If the auricle is deficient in cartilage, grafting from the contralateral auricle may be required.

D Treatment options for microtia are dependent on severity. Microtia is graded as follows: Grade I—nearly normal ear with deficiency in at least one dimension; Grade II—ear with structural deficiencies but recognizable anatomy; Grade III—rudimentary soft tissue with "peanut" remnant; Grade IV— anotia (absent external ear).

E Soft tissue reconstructive techniques may be used to address Grade I microtia. These may involve local rotation or advancement flaps as well as cartilage grafts or composite grafts from the contralateral ear.

F Many patients and families express a preference not to proceed with reconstructive options or to wait until the patient is old enough to choose for himself or herself.

G Prosthetic auricles may be constructed by an anaplastologist as a mirror image of the unaffected ear or a chosen model ear in bilateral cases. In the near future, 3-D printing may reduce the cost and improve availability of prosthetic ears. These may be affixed temporarily by tape or glue or more permanently by osseointegrated abutments or magnets.

H MEDPOR auricular reconstruction involves a one- to two-stage surgical reconstruction in which a porous, high-density polyethylene auricular implant is covered by a vascularized temporoparietal fascia flap and skin grafts. The aesthetic results can be excellent, though there are reports of extrusion of the implants. The age at time of reconstruction has been reported as early as 3 years of age.

I Staged-autologous rib reconstruction has been described in two to four stages. Traditionally, the four-stage approach involves rib cartilage framework implantation carved from the contralateral costochondral cartilage. Subsequent stages involve lobule rotation, auricle elevation, and touch-up of the tragus and conchal bowl.

J For transcutaneous abutments, a small, stab incision may be used to minimize any compromise to the blood supply for future microtia reconstruction. For magnetic implants, the location of the incision should be chosen to not preclude the use of a temporoparietal flap in future repair.

K Management of anomalies of the ear canal is dependent upon severity (*see* Chapter 21). Timing of repair, if indicated, may be combined with subsequent stages of microtia repair, most commonly, for formation of the tragus.

L If mandibular surgery is indicated, especially in hemifacial microsomia, microtia surgery may be delayed to ensure proper placement of the reconstructed auricle.

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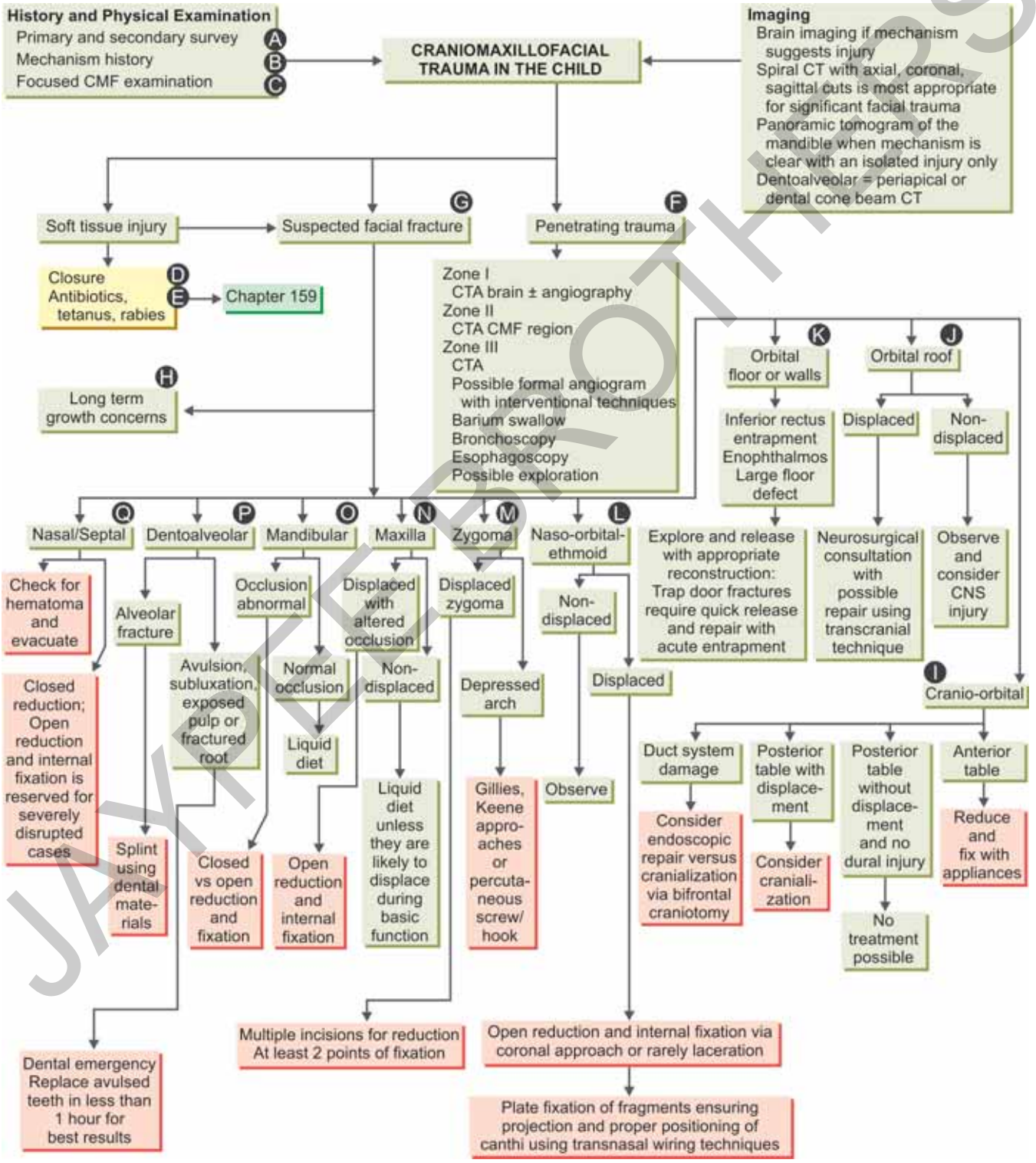
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Craniomaxillofacial Trauma in Children

Bernard J Costello



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Facial trauma in children is rare, when compared with adults, and the patterns vary wildly with age. Falls and nonaccidental trauma are more common in early childhood, while sport, all-terrain vehicle, and automobile injuries tend to be more common in older children. The patterns of facial injuries are significantly different in early childhood and gradually approach the characteristics of adults by adolescence. Differences in anatomy including unerupted teeth, high cancellous-to-cortical bone ratio, limited pneumatization of the sinuses, and protected midfacial structures due to size dictate that mandible, orbital, nasal, dental, and cranial fractures occur much more commonly compared with midface and zygomatic fractures. Children also have improved healing capabilities when compared with adults and this often reduces the time required for healing. The management of these injuries is different from adults and requires an approach that respects growth. This chapter highlights some of those important differences that are important for the surgeon to consider when treating facial trauma in this population.

A A detailed history with mechanism and field information is helpful, particularly in young children who may have unwitnessed craniomaxillofacial (CMF) injuries. The epidemiologic differences in injury presentation based on age and environment are dramatic. A thorough examination coupled with imaging choices that are thoughtful are helpful. Many children with facial trauma have other injuries, usually involving the central nervous system, eye, dentition, and airway.

B Primary and secondary surveys are performed initially, but many CMF injuries are picked up on tertiary survey—including facial injuries. Airway management begins with positioning and a careful assessment of the potential for airway impingement. Intubation is preferable to tracheotomy, and most operative interventions can be done with an oral or nasal tube. Cervical spine injuries are rare when compared with those found in adults, but a careful evaluation is needed when the mechanism suggests an injury. Blood loss can be significant due to the increased vascularity in the head and neck, as well as the decreased blood volume in children.

C Often examination is difficult in young children due to cooperation issues, and imaging is relied upon for a detailed diagnosis. Increased adipose tissue of the face and the primary or mixed dentition occlusion can confound diagnosis in the younger child as well. Some soft tissue injuries can be associated with other critical structures such as the globe, lacrimal system, facial nerves, or salivary gland ducts. Many patients who present with of the condyle fractures can be difficult to diagnose on physical examination in this population.

D Local anesthetics (injected and/or topical) should be used with careful calculation of maximum dosing in small children. Primary closure can almost always be achieved due to the collateral blood supply, except in severe avulsion. The use of 5-0 or 6-0 rapidly absorbing sutures with or without tissue adhesives obviates the need for suture removal in small children. Tissue adhesives provide excellent results in small, clean wounds, or those that have been closed with deep sutures that approximate the skin very well. Scars in children can be unpredictable and should be observed for at least 12–18 months before considering revision.

E Broad-spectrum antibiotics (gram-positive, gram-negative, and anaerobic coverage) are often used prophylactically for contaminated wounds. The literature is conflicted regarding recommendations for antibiotics in typical clean-contaminated lacerations in and around the oral and nasal cavities. Consideration should be given for the use of tetanus and rabies treatment as appropriate.

F Computed tomography with angiography may be used in patients with penetrating injuries, but may volume average with smaller vessel injuries, yielding false negatives. Formal angiography with contrast may be indicated in some cases. Exploration may be indicated with some penetrating mechanisms and locations, and the approach is formalized based on the caliber or size of the penetrating element.

G While some fractures are best treated with no treatment, closed reduction or minimal intervention, the healing potential of children should not be license for inadequate reduction and fixation where needed to achieve a more symmetric and functional result. However, there is a biologic consequence and potential growth restriction associated with aggressive operative intervention in children—so a tempered approach is helpful. Restoring the functional and/or aesthetic aspects of the CMF anatomy is appropriate justification for this potential growth restriction. As such, long-term follow-up to evaluate long-term growth considerations is often necessary.

H Soft tissue elevation and periosteal stripping impair CMF bone growth. The use of conservative, minimally invasive repair techniques, when appropriate, is encouraged. Closed reduction is effective, particularly in young children. Resorbable plates or plate removal should be considered in the upper facial skeleton, but their use does not appear to alter the pattern of growth restriction. It is likely the surgery itself rather than fixation appliances has the effect of restricting growth, although there is significant controversy on this point.

I The frontal sinus does not develop in a standard pattern or time in children. It may act as a "crumple zone" and is often associated with disruption of the dura, anterior cranial fossa floor, orbital roof, and occasionally frontal lobe. Patients should be screened for concussion effects. Depressed fractures of the anterior table are reduced and repositioned with fixation via a coronal approach. Defects that are large may result in pulsatile exophthalmos, and primary reconstruction may be indicated. A team approach with a Neurosurgeon is helpful when anterior frontal craniotomy and/or cranialization of the frontal sinus is indicated. Disruption of the duct drainage system is often an indication for cranialization. I do not recommend obliterating the sinus, as an infection of the material used or the dead space left behind can occur.

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This is often seen with synthetic materials. Follow-up CT scans may be helpful to identify the development of a mucocele in those patients who may be at risk for this late complication.

J and K
Orbital fractures of various types are common in children. The orbital floor can be reconstructed with absorbable collagen film or polymer when the defects are small. Porous polyethylene, nylon, metallic alloy floor implants, or bone grafts may be used larger defects. Orbital dimensions are different in children, and navigation can be helpful in understanding implant placement in larger floor and medial wall defects. Orbital roof fractures are often in association with cranial vault and/or fractures of the supraorbital rim.

L Naso-orbital ethmoid fractures produce substantial facial width disruption in the central third of the face. Restoration of intercanthal distance is important and can be estimated based on age-matched norms. Identifying the small fragment of bone that is typically attached to the medical canthus on one or both sides is one aspect of restoration. Placing the canthus in its appropriate posterior-superior position is another key. Transnasal wiring techniques with plating for contralateral support work best for predictable positioning.

M Fractures of the zygoma are rare in smaller children due to the high degree of force required to break this bone in childhood. The orbital floor is always involved when the zygoma is fractured. However, not all fractures of the floor of the orbit require repair. The need for orbital reconstruction should be assessed intraoperatively after the reduction of the zygoma, as the size of the defect and its effect on potential enophthalmos is not apparent until the zygoma is fully repositioned. Alternatively, the reconstruction can be staged using navigation for implant placement.

N Midface fractures are uncommon in children and present in unusual conformations. The distribution of forces is different in the growing child's facial skeleton, and this results in different fracture patterns than those seen in the adult skeleton. Consequently, LeFort midface fracture classification schemes are not particularly helpful in children. Closed reduction with maxillomandibular fixation (MMF) is not appropriate for most maxillary fractures, as this allows the mandible to distract the loose segments of the maxilla. Open reduction with internal fixation is usually indicated when the occlusion is affected significantly. It is important to avoid developing tooth structures when placing the fixation devices.

O Condyle fractures are very common in children and alter the occlusion significantly in some. Simple closed reduction for a limited time with range of motion physical therapy prevents fibrosis or ankyloses of the temporomandibular joint. Remodeling is common, despite the medial displacement of fragments due to the pterygoid muscle. However, facial asymmetry is often seen in teenagers and adults who have a history of mandibular trauma at a young age. Orthognathic surgery is often used to treat facial asymmetry. Older children typically experience fracture at the condylar neck, rather than at the condylar head itself. Some low condylar neck fractures may be treated with open reduction and internal fixation. However, closed reduction is often suitable. Maxillomandibular fixation is maintained for 10–14 days in young children. Skeletal fixation with circummandibular and piriform rim wires can be used in small children. Care is necessary to avoid the developing tooth buds when using skeletal fixation screws or arch bars using screw-based fixation. Maxillomandibular fixation techniques depend on the developmental stage of the dentition.

In other areas of the mandible, fixation appliances may be used to immobilize segments. When using fixation appliances in the small child, mandibular screws should be placed along the inferior border to avoid injury to developing teeth. Unerupted teeth within the fracture line should be maintained unless reduction is prevented. Typically, monocortical fixation is utilized in the more superior aspects of the mandible, while bicortical fixation is used whenever the neurovascular bundle and teeth can be avoided. Closed reduction techniques may be used for most fractures of any age. The techniques vary based upon the dentition present and may include:

- Primary dentition; skeletal wiring, or acrylic splints.
- Mixed dentition; ancillary methods often required, including occlusal splints and suspensory piriform and circummandibular wiring.
- Adult dentition/permanent dentition; standard arch bar or screw techniques.

Open reduction is indicated for (1) pulmonary insufficiency, seizure disorder or cognitive impairment increasing the risk of aspiration or airway compromise with MMF, (2) condyle displaced into middle cranial fossa, (3) inability to obtain occlusion using closed reduction.

P Avulsed permanent teeth should be immediately replaced or transported in isotonic solution, saline or milk to be reimplanted by a dental professional. Subluxated teeth usually require stabilization with a splinting wire or similar orthodontic device. Primary teeth are not reimplanted. Fractured teeth usually require attention from a Restorative Dentist.

Q Nasal and septal fractures are very common in children and often treated as an outpatient with closed reduction when seen as an isolated injury. "Open roof" deformities may occur more commonly in children due to the developing suture areas. Teenagers tend to have dorsal defects that may require secondary revision if adequate projection cannot be achieved primarily. Parents should be made aware of potential functional and aesthetic issues over the long term. Approximately 15% of nasal fractures may benefit from revision rhinoplasty. Secondary septorhinoplasty is typically delayed until after 5–7 years of age to allow for the majority of growth in the nasal complex to be complete. This minimizes growth restriction and optimizes the definitive result. If possible, consideration is given to waiting until the teen years unless significant psychosocial or functional issues exist.

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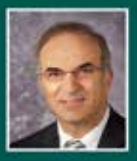
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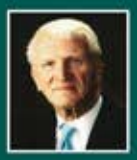
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Eugene N Myers MD FACS FRCS Edin. (Hon) Served as Chairman of the Department of Otolaryngology at the University of Pittsburgh School of Medicine for 33 years. He is now a Distinguished Professor and Chairman Emeritus. Dr Myers also served as an Otolaryngologist in the U.S. Army 97th General Hospital in Frankfurt, Germany. Head and Neck Surgery was his clinical interest and he estimates that he did 9,000 operations during his active surgical career. His rich clinical experience led to more than three hundred publications in peer-reviewed journals and dozens of book chapters. He is the Editor of Operative Otolaryngology—Head and Neck Surgery, Decision Making in Otolaryngology, Cancer of the Head and Neck, and is the Series Editor of Master Techniques in Otolaryngology.

Dr Myers served as President of the American Board of Otolaryngology, American Academy of Otolaryngology—Head and Neck Surgery, American Society of Head and Neck Surgery, the American Laryngological Association and the Pan-American Society of Otolaryngology—Head and Neck Surgery. Dr Myers is currently the Honorary President of the Balkan Society of Otolaryngology and is the AAO—HNS Regional Advisor to the Balkan Countries and remains a member of the AAO—HNS International Committees.



David E Eibling MD FACS has been a faculty member at the University of Pittsburgh School of Medicine and an attending surgeon at the VA Pittsburgh since 1990. Prior to joining the Pittsburgh faculty he served a 20-year tour in the USAF including 3 years as Chairman of the Department of Otolaryngology at Wilford Hall USAF Medical Center in San Antonio, Texas, USA.

For the past 3 decades Dr Eibling has focused his career on the management of head and neck cancer, primarily in the VHA, however medical education has been his real passion. He actively teaches medical students, residents, practicing physicians, and safety fellows. He has authored more than 30 book chapters and co-edited 6 textbooks.

Dr Eibling has been passionate about patient safety for his entire career, with a particular focus on how the healthcare environment impacts human performance. He is the Associate Director of a VA Patient Safety Center of Inquiry that utilizes simulation as a test bed to investigate how design of medical products impacts human performance and patient safety. He has participated in the development of Google Notes, which uses Natural Language Processing to find critical information hidden within millions of words in text documentation in VistA. Many of his safety fellows have gone on to careers that have impacted patient safety in a wide range of roles, within the VHA, the DOD, and in civilian organizations. Although he is now spending less time in the OR, he maintains a busy clinical practice within VA Pittsburgh, Pennsylvania, USA.

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