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Factors affecting pediatric oral and maxillofacial surgery

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Introduction:

Taking care of newborns, kids, and teenagers is what paediatrics is all about. There are notable physiological changes between neonatal and baby patients, and the care of older paediatric patients is affected by the fact that they are constantly evolving towards adulthood. Paediatric Oral & Maxillofacial Surgery (OMS) is a subspecialty of oral and maxillofacial surgery that has developed to address the unique needs of children, including those with cleft lip and palate, trauma, abnormal jaw growth, dysfunctions of the temporomandibular joint (TMJ) in children, abnormalities of the dentoalveolar bone structure, paediatric pathology, and obstructive sleep apnea. Tertiary paediatric institutions in Australasia and large cities throughout the globe handle the more challenging areas of paediatric OMS. When caring for children undergoing maxillofacial surgery, this chapter will give you the rundown on the most important aspects (Mukhopadhyay et al,2020).

Injuries involving the face are very rare in children, making up about 1.5% to 8.0% of all injuries in children under the age of 12, and less than 1% of all injuries in children younger than 5 years old1. Some reasons why maxillofacial injuries are less common in children include their more malleable facial bones, a larger skull to face ratio, adipose tissue thickness, and the absence of pneumatization of paranasal sinuses. Furthermore, compared to older children, preschoolers are less independent and receive more care from their parents. Having said that, kids are more likely to sustain facial injuries from playing outside as they grow older (Kenawy et al,2019).

The most common causes of maxillofacial injuries, as reported in the literature, include car accidents, falls from great heights, injuries sustained in sports, and violent incidents between individuals.2-4. 9. Because of variations in socioeconomic status, cultural norms, and environmental conditions, the frequency and pattern of maxillofacial trauma can vary greatly among geographic regions 4-6. Clinical audits, better patient care, and the creation of preventative measures all rely on epidemiological data pertaining to maxillofacial injuries (Shand,2018).

Cleft Lip and Palate:

Two fusion diseases that impact the mid-facial skeleton are cleft lip and cleft palate. Clefting can manifest alone or in conjunction with other syndromes. Globally, factors such as birthplace, gender, ethnicity, and maternal traits influence the prevalence of cleft lip and palate. Some of the most frequent facial deformities include cleft lip, cleft palate, and cleft alveolus (maxillary cleft), which can happen alone or in a combination like cleft lip and palate (Shuxratovich & Erkinovich.2021).

In addition to a cleft lip and palate, patients with maxillary cleft will also have an alveolar cleft, which can lead to oro-nasal regurgitation through labial and palatal oro-nasal fistulae (Fig. 1). An alar base asymmetry is made more noticeable by a contour depression near the pyriform aperture. Typically, the dentition is deformed in the area of the alveolar cleft. Complete alveolar clefts typically have a missing or deformed permanent lateral maxillary incisor, although they can also have one or more tiny, conical extra teeth (Fig. 2).

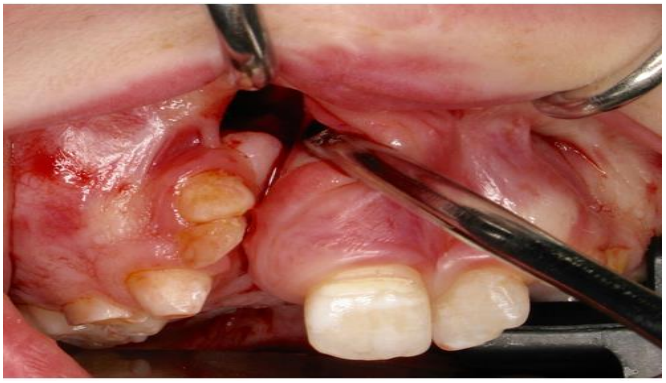


Figure 1:Maxillary cleft with oro-nasal fistula.

Numerous dental abnormalities, including extra teeth, impacted teeth, or missing teeth, necessitating treatment with orthodontic space closure or replacement, are common in patients with cleft deformity. Prior to the alveolar bone graft, the maxilla may need to be expanded due to its limited width and transverse discrepancy.

Secondary cleft deformity care is a multi-stage process that presents unique challenges. Secondary alveolar bone grafting of the maxillary cleft follows primary treatment of the cleft lip and palate in infancy. For a long time, people have argued about when is the best time to do alveolar bone grafting, and different groups have given different recommendations. Some clinics recommend primary bone grafting, which is typically done when the child is two years old, although it has been found to significantly slow the

maxilla's growth and development. All signs point to secondary bone grafting being the way to go for the best results (Shuxratovich & Erkinovich.2021).

Congenital conditions affecting the development of teeth and skeleton:

Teeth can be affected by several disorders, including those that cause them to be born missing, deformed, or extra. The areas of the mouth where extra teeth develop most frequently are the third molars, mandibular premolars, and maxillary incisors. Some disorders, like Down syndrome or ectodermal dysplasia, can cause oligodontia; in rare cases, ectodermal dysplasia can also cause anodontia. Multiple extra teeth can be a sign of cleft lip and palate, cleidocranial dysplasia, or Gardner syndrome, among other diseases (Bhutia et al.,2019).

Cleidocranial dysplasia, also known as dysostoses (CCD), is a complex disorder that affects people of all ages and necessitates interdisciplinary treatment and ongoing management throughout their lives. Bone and dental abnormalities, such as scoliosis, malocclusion, frontal bossing, multiple extra teeth, skeletally small or nonexistent clavicles, and delayed primary tooth loss or eruption are hallmarks of this autosomal dominant disorder. In order to get the best possible result and to align as many permanent teeth within the arches as possible, it is necessary to create individualized treatment plans for each patient in collaboration with the orthodontist, oral and maxillofacial surgeon, and pediatric dentist.

Aiming for an orderly eruption of teeth, treatment begins with the incisors and first molars and progresses to the premolars and canines. At every step of treatment planning, orthodontic considerations for anchorage to enable traction and alignment are crucial. The last step is to take care of the back teeth, specifically the second and third molars. Deciduous teeth and additional teeth may be extracted one after the other as part of this procedure. In cases when the permanent replacement does not erupt, orthodontic traction may necessitate surgical exposure and bonding of teeth. It is common for extra teeth to keep coming in and need treatment as they mature (Fontes,2008).

Paediatric Pathology and Cysts of the Jaws:

The pediatric population can exhibit a wide spectrum of cysts, the most common of which involve the mandible and maxilla. Similar to adult patients, most of these cysts have an odontogenic origin, meaning

they are dentigerous cysts. But there are a handful of cysts that only affect children. As an example, non-vital deciduous teeth may be accompanied with inflammatory follicular cysts, which might manifest as gingival cysts or eruption cysts. One particular cyst-related illness necessitates ongoing therapy for both children and adults. Although symptoms of the Naevoid Basal Cell Carcinoma Syndrome (NBCCS) or Gorlin-Goltz Syndrome have been known for a long time, it wasn't until the 1960s that the syndrome was defined thanks to the work of Gorlin and Goltz. Multiple basal cell nevi, odontogenic keratocysts (OKC), and skeletal abnormalities, such as bifid ribs, were the three hallmarks of the condition they characterized. Within the spectrum of the illness, a variety of other variable traits have been identified. There are two main characteristics and two secondary aspects that must be present for NBCCS to be diagnosed.6 Recent research has confirmed that NBCCS is a hereditary condition characterized by a chromosomal alteration known as 9q22 microdeletion, which results in the loss of a small portion of chromosome 9. The syndrome is caused by the PTCH1 gene, a tumor suppressor gene.7 The initial sign of the illness is usually an odontogenic keratocyst, which is discovered by chance during radiographic screenings for orthodontic or dental treatment in the first or second decade of treatment. Aside from the tendency to produce many cysts, the clinical and radiological aspects of OKCs are indistinguishable from those of solitary cases (Ataíde et al.,2016).

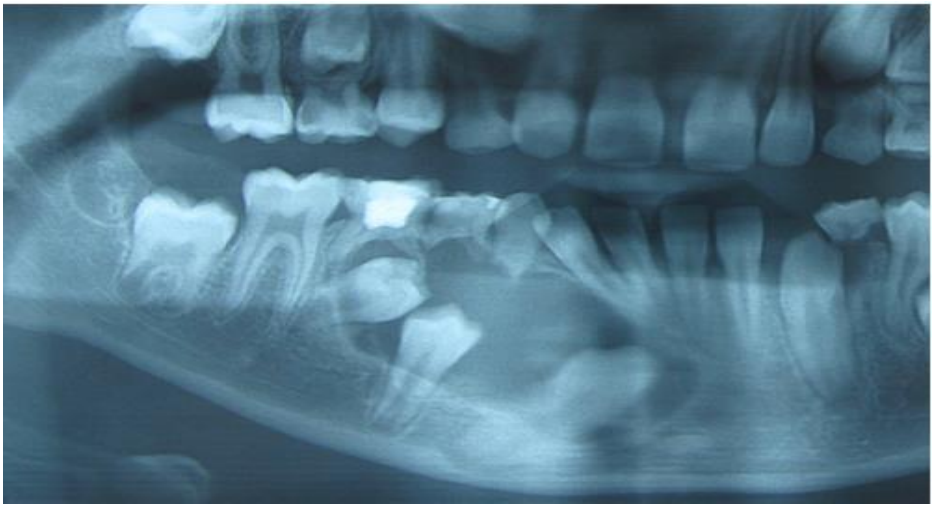


Figure 2: Inflammatory follicular cyst right mandible.

With a mixed dentition presentation at a younger age, many OKC lesions, and the possibility of recurrence, it is tough to care these children into adulthood since patients with OKC require lifelong follow-up. Because losing several teeth could be the consequence of gradually extracting each damaged

tooth, treatment plans are tailored to each patient's unique needs. Furthermore, it is crucial to take the patient's ongoing growth into account while managing recurring lesions in children, as severe surgical resection techniques might cause permanent deformities. One of the safest ways to treat a cyst in a child is to remove it entirely before adding any other treatments, such as Carnoy's solution or the careful extraction of any teeth that may be involved. Displacement of tooth buds as a consequence of the lesion or surgical therapy can lead to teeth not erupting. In some cases, a referral to an orthodontist may be necessary to expose the impacted teeth and straighten them orthodontically at the same time.

Some more maxillofacial disorders that can manifest in children and infants include paediatric jaw tumors, giant cell granulomas (both central and peripheral), Langerhans histocystosis, and congenital granular cell tumors of the newborn (covered in the craniofacial surgery chapter). Congenital granular cell tumors, often known as congenital "epulis," can range in size from tiny to large, and they are surgically removed when they become a problem with the newborn's eating. Presenting with everything from small, localized exophytic lesions to large, aggressive intra-bony lesions, giant cell granulomas of the jaw can take several forms. Peripheral giant cell granulomas, sometimes called "giant cell epulis," make up the vast majority of giant cell lesions found in the mouth. Some of these nodules, known as exophytic, are believed to be reactive in origin and caused by irritation or trauma, whereas the exact cause of others remains unknown. Local excision is used to manage the lesion. Central giant cell granulomas can manifest in a variety of ways, from a small, well-defined lesion around the eye to a large, dispersed lesion affecting multiple organs. Enucleation and peripheral ostectomy are the main surgical procedures used to treat these lesions. Adjunctive therapy, like Carnoy's solution, are supported by some medical professionals. Combination surgical and pharmacological approaches using intra-lesional steroid injections, alpha interferon, calcitonin therapy, and, more lately, bisphosphonate and denosumab therapies have been described for uncommon, aggressive lesions that do not respond to surgical treatment alone (Joachim et al.,2018).

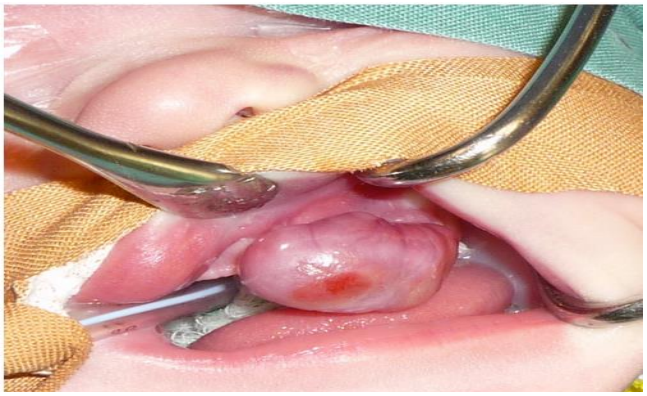
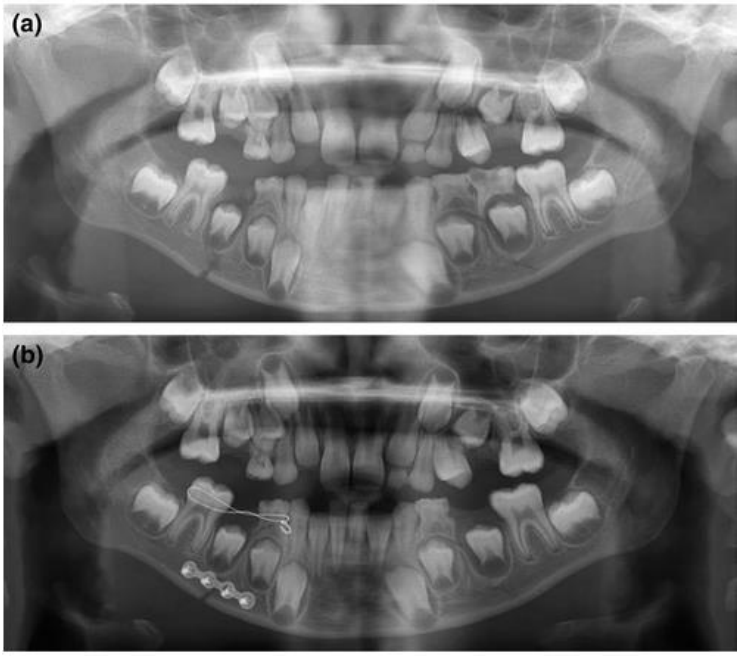


Figure 3:Congenital granular cell tumour in a neonate.

Mandibular and Condylar Fractures:

Children, especially those younger than five years old, rarely suffer from facial bone fractures as opposed to adults. Bony injuries following dento-alveolar trauma most commonly manifest as mandibular fractures. The pattern of mandibular fractures in children differs from that in adults. Parasymphyseal, body, and ramus areas follow the most prevalent ones, followed by the condylar and subcondylar regions. Bone elasticity can cause monocortical or incomplete ('green stick') fractures. Due to these anatomical variances, the rate of healing compared to adults, the existence of developing tooth buds, and the level of patient cooperation, the management of mandibular fractures in children also vary (Joachim et al.,2018).

The choice between an open and a closed reduction is influenced by the location of the fracture in reference to the growing tooth buds. In rare cases, intermaxillary fixation may be used in conjunction with arch bars or tension band wires to accomplish closed reduction around the teeth, as well as for elastic traction.If you experience pain in the preauricular region after a trauma, it is important to rule out a condylar fracture. Haemarthosis in the temporomandibular joint is one type of condylar area injury; others include intracapsular or extracapsular fractures, and so on. Conservative management of hemostasis and the majority of condylar fractures in children entails mobility exercises, a soft diet, and anti-inflammatory medicine (Powers,2017).



In order to diagnose a malocclusion, such as an open bite on the opposite side and premature contact on the ipsilateral side, it is necessary to look for signs of vertical shortening in displaced condylar fractures. When symptoms are modest, it's best to take it easy at first and then assess. Applying elastic tension for a few weeks is an option, though, if the malocclusion is noticeable or continues after treatment. The likelihood of ankylosis and limited opening increases as the child's age increases at the moment of damage. Open reduction with internal fixation is rarely necessary for the conservative management of most condylar fractures in children. As a child grows, minor occlusal irregularities in their primary and mixed teeth will naturally straighten out.

When mandibular parasymphyseal, body, or angle fractures are not displaced or only slightly displaced, conservative management may be an option. A closed reduction of the fracture can be performed using tension-band wires if the teeth are spaced too far apart as a result of the displacement of the fracture. In order to restore the mandible and its proper alignment after severe mandibular injuries caused by falls, car accidents, or horse kicks, an open reduction and internal mini-plate fixation procedure may be necessary(Shi et al.,2014).

Upper airway Obstruction:

Multiple conditions, some of which may occur alone and others in combination, can cause upper airway obstruction in children and infants. Causes such as micrognathia, choanal atresia (nasal tube blockage),

macroglossia, laryngo-tracheomalacia, and subglottic stenosis are uncommon, whereas more prevalent ones include tonsillar and adenoidal hypertrophy. It is important to identify the central component of apnea in children using polysomnography (sleep study) because this will affect patient management. Our institution's comprehensive evaluation of the airway requires a multi-disciplinary team approach that includes neonatal medicine, respiratory medicine, ENT (Ear, Nose & Throat) specialists, oral & maxillofacial surgery, craniofacial surgeons, and others, due to the fact that respiratory compromise can have numerous causes. Children with obstructive sleep apnea (OSA) have worse neurocognitive performance, but the exact cause is yet unknown.8 During the period of fast cerebral development in early childhood, there is a possibility that neurocognitive abnormalities could be caused by prolonged episodes of hypoxia.It has also been acknowledged that there is a significant correlation between airway obstruction and increased intracranial pressure (ICP). It has been shown that increased intracranial pressure (ICP) occurs during apnea episodes. It would appear that central perfusion pressure, respiratory blockage, and intracranial pressure all interact in a vicious cycle (Bhutia et al.,2019).

By advancing the bony skeleton and its soft tissue attachments, distraction osteogenesis can enlarge the airway and overcome airway obstructions caused by substantial mid-facial or mandibular hypoplasia in growing children. Apert Syndrome and other forms of syndromic craniosyntosis in children are characterized by airway constriction and severe mid-facial insufficiency.10 The craniofacial surgery chapter delves into the various surgical procedures that are linked to the treatment of these disorders.

The oro-pharyngeal airway becomes narrowed at this level due to glossoptosis, a condition when the tongue base is posteriorly positioned in a severely retrognathic mandible. Our service was the first in Australasia to apply distraction osteogenesis, a technique that has been successful in moving the mandible and tongue bases forward and relieving blockage.

Patients with syndromic conditions, like Treacher-Collins Syndrome or Craniofacial Microsomia, need further CT scan investigations to determine the bony anatomy and availability of bone for distraction appliance fixation; this is in addition to the careful case selection that must precede distraction osteogenesis (Eskander et al.,2019).

The craniofacial skeleton has benefited from distraction osteogenesis for the last two decades, thanks to advancements in the devices that facilitate this process. Historically, this method has been used to the long bones. Mandibular appliances are often inserted using a submandibular method in neonates and infants, whereas an intra-oral approach is an option for older children. The distraction appliances are placed after a bilateral osteotomy is performed in the area where the posterior body of the mandible and ramus meet. The appliances are activated daily until they are extended, including the associated mandible. During the consolidation phase, when the bones mend, the appliances are left in place. After 6-8 weeks, they are removed (Kumaraswamy,2009).

Conclusion:

When planning and treating pediatric patients, it is important to keep in mind that they have unique anatomical and physiological characteristics as well as behavioral considerations. The development of these young patients—infants, children, and adolescents—influences both the management of their condition and the results that will be seen in the long run. Expertise from a variety of fields is necessary for the comprehensive care of children who suffer from congenital abnormalities and disorders. There has been significant growth in the field of paediatric oral and maxillofacial surgery, which currently serves as a distinct subspecialty of general surgery.

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