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A REVIEW OF MANDIBULAR FRACTURES IN CHILDREN

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ABSTRACT

The pattern of craniomaxillofacial fractures seen in children and adolescents varies with evolving skeletal anatomy and socioenvironmental factors but the general principles of treating mandibular fractures remains the same. Recognition of some of the differences while treating mandibular fractures in childrens and adults should be kept in views for maintyainig aesthetics and functionality.

Introduction

Despite involvement of adventurous physical activities, maxillofacial fractures are paradoxically less in children than adults. The immense capacity of healing and remodeling exist in children than adults. Though the principles involved while managing mandibular fractures in children and adults are same but certain modifications are made in the techniques that are goeverened by anatomic physiological and psychological factors.

General considerations

Mandibular fractures are the most common facial skeletal injury in pediatric trauma patients.[1-3] In Posnick and colleagues' study thirty-nine percent of all fractures were of the mandible. Mandibular fracture sites included the condyle (59 of 107, 55%), parasymphysis (29 of 107, 27%), body (10 of 107, 9%) and angle (9 of 107, 8%).[4] Mandibular growth can be increased or decreased by trauma and its treatment. . Growth accelerates two times in a child's life: once around 9 years of age and the again at the onset of puberty. A baby's mandible and lower lip are retrusive and the chin is virtually nonexistent. This can lead to the misconception of mandibular injury in babies subjected to trauma. Young bone possesses unique physical properties that coupled with space occupying developing dentition give rise to patterns of fracture not seen in adults.The bone of children has a lower modulus of elasticity, a lower bending strength, and a lower mineral content that adult bone, which account for the different patterns of fracture. Commonly, the fracture initiates at the upper border of the mandible and then travels horizontally before reappearing at the lower border. The overlying periosteum in the child, compared to that in the adult, is much thicker, more vascular, more loosely attached to the underlying bone, and capable of more rapid callus formation. This results in the accelerated healing of pediatric fractures.

Bone fragments in children may become partially united as early as 4 days and fractures become difficult to reduce by seventh day.[5] In children the final result is determined not merely by initial treatment but by the effect that growth has on form and function. Between 2-4 years sufficient number of fully formed deciduous teeth are present facilitating application of arch bars or eyelet wires. 5 to 8 years age old group may present with some difficulty owing to loss or loosening of deciduous teeth. the narrow cervix of tooth in relation to crown and roots provides better retention of wires as in Ivy loops or stout wires. Mandibular cortex is thinner in children so care must be taken to avoid pulling a wire through the mandible when placing circummandibular wiring for splints. Presence of tooth buds throughout the body of mandible must be a consideration as trauma to developing tooth buds may result in failure of eruption of permanent teeth and hence narrow alveolar ridge. However according to Koenig et al 82% of tooth buds in line of fracture erupted normally regardless if method of treatment was open reduction with rigid fixation or closed reduction.[6]

SPECIFIC MANAGEMENT BASED ON MANDIBULAR FRACTURE REGIONS

The aims of treatment are to obtain bony union, to normalize the occlusion, to restore normal form and function, and to avoid impediments to normal growth. Conventional wisdom tells us that to best fulfill these aims, the bony fragments must be accurately aligned. Efforts to ensure this alignment have led to complex methods of treatment, including open reduction. However, perfect alignment is not always necessary to ensure complete success. Minor malocclusions left during the deciduous or mixed dentition stages will be corrected by eruption of teeth and growth of the alveolus. Minor bony irregularities will likewise be improved by growth if normal function is maintained. The prevention of secondary deformities associated with derangement of growth demands long-term follow-up and appropriate intervention by the surgeon or orthodontist. It is important to maintain a perspective longer than the 6 to 8 weeks generally required in adults

The treatment of mandibular injuries in children frequently necessitates multiple general anesthetics because taking impressions, placing hardware, and even removing sutures may not be possible in young children when they are awake. Early consultation among all clinicians involved in the child's care is There are many types of fixation that can be applied to mandibular fractures, ranging from maxillomandibular fixation, to lingual splints, to various forms of rigid fixation. Moreover, in certain circumstances, no fixation at all is necessary.important to allow for the development of an efficient, integrated treatment plan.

Body and Symphysis

Majority of body and symphysis fractures in children are undisplaced because of elasticity of mandible and embedded tooth buds that hold the fragments together 'like glue.' Bilateral fractures of anterior mandible occur with much greater frequency in children than in adults. A common fracture pattern not seen in adults run from upper border beside the last tooth anteroinferiorly to the lower border in region of canine. These fractures are generally greenstick and require no active treatment.

In mixed dentition only 6 years molars are adequate for circumdental wires. If possible arch bars are placed and elastic immobilization is done. If teeth are inadequate then fracture site is immobilized with gunning splint or lingual splint. Intermaxillary fixation is used if splint stabilization is not enough as in fracture of posterior body beyond point of extension of splint. Appliance should be fixed in place using circummandibular wires one on either side of fracture and two wires to add stability to the splint. If IMF is also required then wires can be added from circummandibular wires to wires at piriform region or zygoma. Splint should be left in place for three weeks. Alternatively if possible monocortical plate at inferior border can be placed. Short (4 mm) and broader screws 2 mm should be used as they are more

retentive in pediatric bone. The common occurrence of a combined parasymphyseal and condylar fracture will warrant a more stable form of parasymphyseal fracture fixation (miniplates and screws) so that early active mandibular range of motion with TMJ function can occur.

Angle

Fractures at angle proximal to tooth bearing area are not sufficiently immobilized with splint alone so closed reduction and intermaxillary fixation for 3 weeks are required. When a mandibular angle fracture occurs in the presence of a condyle fracture, the combined forces may be significant enough to cause displacement unless ORIF at the angle fracture is carried out. Plating at the tension-band zone is not recommended in the mixed dentition. In open reduction for less than 5 years it is possible to injure tooth buds near angle when placing intraosseous wire or screws which requires caution.

Condyle

Trauma to chin producing temporomandibular joint injury is frequent occurrence in childhood. Mandibular condyle in children is short, stout and highly vascular with thin cortical plate. The impact displaces condyle posterosuperiorly against skull base thus leading to range of injury from capsular tear, hemarthrosis to fracture of condylar head or neck. Occasionally a crush injury to condyle can produce comminuted fracture. Children less than 3 years of age with trauma to condyle are at greatest potential for growth disturbance especially due to ankylosis.[9] Inadequate or overtreatment may lead to growth retardation or excess while excessive immobilization may lead to mandibular hypomobility.[7]So the two main goals for treatment in such patients are :Preservation of function and Maintenance of ramus height. When this is achieved normal growth usually occurs.

The amount of interincisal opening dental age, occlusion and level of pain must be assessed carefully. If these are normal close observation and blenderized diet can be the treatment option. Nonoperative management (observation, exercises, maxillomandibular fixation, training elastics, bite opening splints) are overwhelmingly popular because there are minimal complications and outcomes are good with adults and children alike. Open reduction with internal fixation is rarely indicated for pediatric condylar or subcondylar fractures.

There is ample experimental evidence from the animal studies of Walker[10] and Boyne[11] that fractured condyles have a remarkable recovery potential. Some years later, these findings were substantiated radiographically by studies in children by Gilhous-Moe[12]and Lund.[13] The latter is a prospective study that showed that the younger the child and the smaller the displacement, the greater the likelihood of successful remodeling in the face of early mobilization. Indeed, nearly 80% of Lund's patients did not acquire any asymmetry. Dahlstrom,[14]in a 15-year follow-up study of another group of children, showed no radiographic or functional deficits in those who sustained fractures between 3 and 11 years of age. However, in teenagers, the anatomical and functional restitution was not as good, although it infrequently gave rise to objective symptoms. Thoren [15] concluded that immediate mobilization, even when there was complete dislocation of the condylar process, resulted in a satisfactory long-term functional outcome with minimal asymmetry. when some fixation is necessary, light training elastics rather than maxillomandibular fixation should be used and an active exercise program should be started as soon as the child can cooperate. Extended periods of maxillomandibular fixation can lead to ankylosis in children and should be avoided. The malocclusion seen immediately postinjury in children with condylar process fractures is generally caused by muscle spasm, which dissipates over 3 or 4 days without the use of maxillomandibular fixation. . Once the initial pain is gone, the child should be encouraged to eat a normal diet as soon as possible and to practice opening and closing the mouth in a straight line in front of a mirror. Light training elastics should be used when there is sustained deviation on opening or when there is a developing occlusal discrepancy.[8] Long-term physical therapy may be needed when functional deficits linger. Occasionally, functional appliances or corrective jaw surgery may be necessary to maintain symmetry during the active growth period in the rare child showing asymmetric growth. Open reduction should be rarely employed and saved for when there is condylar displacement into the middle cranial fossa or when normal jaw movements are obstructed. Adolescents with condylar fractures do not have the same adaptive capabilities as those in the younger age groups. However, even though the radiographic appearance may be abnormal, function is usually within normal limits, as pointed out by Dahlstrom.[14]

CONCLUSION

Mandibular fractures in children most commonly occur in condylar region, followed by parasymphysis and angle. The fractures tend to be minimally displaced and in majority of cases can be treated conservatively. Significantly displaced mandibular fractures are reduced and immobilized using rigid internal fixation according to principles used in adults. Fractures in condylar region usually are treated using nonoperative therapies as in most cases fracture heals and condyle is remodeled with successful anatomic and functional result

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