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MANAGEMENT OF MANDIBLE FRACTURES IN PEDIATRIC PATIENTS

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ABSTRACT

Objectives: To present the management of mandible fractures in pediatric patients. Methods: Study Design: This prospective study was done from January 2010- November 2012 in a tertiary care center. Ten pediatric patients in the age group of 4-11 years presenting with mandible fractures were treated. Treatment performed is early and exact method of intervention depends on the chronological age and state of dental development. Interventions: Depending upon the fracture location patients were treated with cap splints, eyelet's wiring, arch bar, inter-maxillary (IMF) splinting, and composite wire splinting. Independent Variables: Displaced or un-displaced fractured segments, occlusion status, open bite. Outcomes Variables: Post Operative healing, occlusion status, deviation of jaw, midline shift, post operative pain, and/or discomfort. Results: Eight cases (80%) presented with fracture para-symphysis followed by one each of fracture angle of mandible and dento-alveolar fracture. Para-symphysis fractures were managed by cap splinting in 4 cases, IMF with eyelet wiring in 3 cases and IMF with arch bar in one case. The fracture angle of mandible was managed with IMF with arch bar while the dentoalveolar fracture was managed with composite wire splinting. All the cases showed good post operative healing regarding occlusion status, no midline shifting or deviation of jaw and discomfort after 1 year follow up period. Conclusion: In pediatric population fracture mandible should be treated early and the intervention is guided by site of fracture of mandible, age of the patient and state of dental development.

INTRODUCTION

Mandibular fractures are the most common facial skeletal injury in pediatric trauma patients [1]. Mandibular fracture sites included the condyle, para-symphysis, body and angle [2]. Slightly male predilection has been reported in children subjected to facial trauma. Road traffic accidents, fall from heights and sports injuries have been reported to be the most common causes of maxillofacial injuries amongst the children [3]. Pediatric patients are more likely than adults to sustain greenstick or incomplete fractures.

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This is because of the relatively high elasticity of the mandible's thin cortical bone and thick surrounding layer of adipose tissue.

Furthermore, because of the presence of tooth buds and developing crypts, pediatric fractures are often long and irregular in character, with the fracture generally running inferiorly and anteriorly. Pediatric fractures are less likely to have multiple comminutions compared with those in adults [4].

The management of mandibular fractures in children differs somewhat from that of adults mainly because of concern for possible disruption of growth. In children the final outcome is determined not merely by initial treatment but by the effect that growth has on form and function. This warrants the need of different forms of fixation as early as possible for comparatively shorter

duration of time in children. In fact, given the pediatric skeleton's capacity for remodeling and the high incidence of minimally displaced or greenstick fractures, conservative therapy alone often is effective. Clinical evidence suggests that many fractures in children remodel with little or no intervention [5].

The principles involved in treatment are same irrespective of the age of patient. However the techniques in children are necessarily modified by certain anatomical, physiological and psychological factors. Non-displaced fractures without malocclusion can be treated by close observation, blenderized diet and avoidance of physical activity. If displaced, closed reduction and immobilization is performed. Exact method of immobilization depends on child's chronologic age and state of dental development. In under 2 years age, very little anchorage can be taken from teeth as most are unerupted or incompletely formed. In mixed dentition only 6 years molars are adequate for circum-dental 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. Appliance should be fixed in place using circummandibular wires to add stability to the splint. Splint should be left in place for three weeks [6,7].

Slight occlusal discrepancies resulting from lack of perfect reduction correct spontaneously as permanent teeth erupt and bone undergoes remodeling with function. Nonunion or fibrous union rarely occurs in children and excellent remodeling occurs under the influence of masticatory stresses even when there is imperfect apposition of bone surfaces.

The purpose of this paper is to present the comprehensive management of pediatric mandibular fracture cases.

MATERIALS AND METHODS

Study Design

This prospective study was done from January 2010- November 2012 in a tertiary care center. Ten pediatric patients in the age group of 4-11 years presenting with mandible fractures were treated. Treatment performed is early and exact method of intervention depends on the chronological age and state of dental development.

Interventions

Depending upon the fracture location patients were treated with cap splints, eyelet's wiring, arch bar, inter-maxillary (IMF) splinting, and composite wire splinting.

Independent Variables

Displaced or un-displaced fractured segments, occlusion status, open bite.

Outcomes Variables: Post Operative healing, occlusion status, deviation of jaw, midline shift, post operative pain, and/or discomfort.

RESULTS

The results of the present study showed that eight cases (80%) of the total studied subjects presented with fracture of para-symphysis region followed by one each of fracture angle of mandible and dento-alveolar fracture. Para-symphysis fractures were managed by cap splinting in 4 cases, IMF with eyelet wiring in 3 cases and IMF with arch bar in one case. The fracture angle of mandible was managed with IMF with arch bar while the dento-alveolar fracture was managed with composite wire splinting. All the cases showed good post operative healing regarding occlusion status, no midline shifting or deviation of jaw and discomfort after 1 year follow up period. The results were shown in table1.

Table 1. Showing different types of pediatric mandible fractures and their management.

Study Samples	Types of Fracture		Management
10	Para-symphysis	8	Cap Splinting- 4
			IMF with eyelet wiring - 3
			IMF with arch bar-1
	Angle	1	IMF with arch bar
	Dento-alveolar	1	composite wire splinting

DISCUSSION

Maxillofacial region, due to its prominent anatomy, is one of the most common regions to be injured in any type of accident. Injury to this region is also important because it may be associated with partial or complete; temporary or permanent loss of vital functions such as speech, esthetics, or mastication [8].

The mechanisms of injury vary from series to series, with motor vehicle accidents, falls, and sports-related injuries contributing significantly. In a series of 81 patients reviewed by Posnick et al [9] motor vehicle accidents accounted for 50 percent of all mandibular fractures, with falls (23 percent) and sports-related injuries (15 percent) accounting for the majority of the remaining fractures. Strikingly, a large proportion of patients with mandibular fractures (30 to 60 percent) also experience a serious associated intra-abdominal, neurocranial or orthopedic injury—attesting to the force required to affect such injuries [10].

The diagnosis of mandibular fractures must begin with a careful history and clinical examination. Immediate attention must always be given to problems associated with airway compromise and bleeding which may endanger the patient's life. When a mandibular fracture is suspected, meticulous clinical examination of the maxillofacial region is critical and should be carried out prior to the ordering of radiographic imaging studies.

A diagnostic-quality panoramic radiograph is the most comprehensive view possible with a single film and allows satisfactory visualization of all regions of the mandible (condyle, ramus, body and symphysis). It is also useful in examining the existing dentition, presence of impacted teeth with respect to the fracture, alveolar process and position of the mandibular canal [11].

The patient in present study was treated with closed reduction using custom-made open cap-splint and circum-mandibular wiring. Various other methods have been suggested for closed reduction using prefabricated cap-splints, modified orthodontic brackets, orthodontic resin and rubber elastics, modified orthodontic splint appliance. The advantage of closed reduction over open reduction is its cost- effectiveness, lesser surgical trauma to the patient and reduced risk of any iatrogenic trauma to the developing teeth and other anatomical structures. Furthermore, the rate of associated complications is less in cases of closed reduction compared to open reduction. However, the main disadvantage is the difficulty and time utilized in fabrication of cap splint [12].

While doing open reduction and fixation 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 [13].

The presence of tooth buds in the pediatric mandible further complicates treatment. During the majority of childhood, tooth buds nearly approximate the inferior border of the mandible. Previous reports suggest that tooth damage and pulp obliteration are not uncommon at mandibular fracture sites. Disruption of these tooths buds, or the developing teeth, with any form of internal stabilization can result in mal-development of permanent teeth [14]. Despite these concerns, a few characteristics of the developing craniofacial skeleton make therapy somewhat easier in children than in adults. Given the high metabolic rate of most developing tissues and the increased osteogenic capacity of the periosteum, rates of healing are much higher in children. As a result, for even complex mandibular fractures, 2 to 3 weeks of immobilization may be all that is required for union. Fibrous union during the healing process is very uncommon and excellent remodeling of fracture sites is standard [15].

Newer Trends

Earlier most of the pediatric cases were treated with conservative measures or closed reduction techniques. Only recently have the distinct advantages of accurate primary repair and the stable fixation of facial fractures been applied to the rehabilitation of injuries in children too. With the advent of better investigative facilities like CT scan and 3D reconstruction, and newer airway management techniques with reliable anesthesia techniques and specifically introduction of mini and micro-plates open reduction and fixation of pediatric facial fractures is getting commoner. Also, resorbable materials have been made available as a fixation option for pediatric cranio-maxillofacial fracture management.

CONCLUSION

By the end of this session the audience will be able to understand the following:

1. The management of pediatric mandible fractures is substantially different from that of the adults primarily due to the presence of multiple tooth buds throughout the substance of the mandible, as well as to potential injury to future growth.
2. Bone fragments in young children may become partially united as early as 4 days and fractures become difficult to reduce by seventh day, hence early treatment is recommended.
3. An understanding of the surgical or treatment options is essential for making informed choices to best manage these injuries.
4. Exact method of immobilization depends on child's chronologic age and state of dental development.

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