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Review Article

Dentistry Section

Unfolding the Hidden Facts of Paediatric Maxillofacial Trauma

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ABSTRACT

Hard tissue injuries are uncommon in the paediatric patient; the paediatric population sustains 1 to 14.7% of all facial fractures. The management of the paediatric patient with maxillofacial injury should take into consideration, the differences in anatomy and physiology between children and adults, the presence of concomitant injury, the particular stage in growth and development and the specific injuries and anatomic sites that the injuries affect. Minimally displaced fractures in paediatric patients can be managed conservatively, while displaced fractures may require open approaches and rigid fixation. Hence, the present article presents an overview of the available published literature on maxillofacial trauma in paediatric patient.

Keywords: Facial bone injuries, Fixation, Fracture management, Injuries in children, Maxillofacial injuries, Paediatric trauma

INTRODUCTION

Maxillofacial region is related with a number of vital functions of the daily life vision, smell, eating, breathing, and talking. It also plays significant role in appearance. The injuries to the facial regions are clinically highly significant for number of reasons. Facial injuries require a prompt diagnosis and management in traumatise patient. The management of maxillofacial trauma includes treatment of facial bone fractures, dentoalveolar trauma, and soft tissue injuries.

Maxillofacial fractures are uncommon in patients under 5 years old; fewer than 1% of maxillofacial fractures occur in this age group [1,2]. Because of the differences between adults and children in anatomic, physiologic, and psychologic development; magnitude and consequences of trauma differs. The management techniques should be modified to address the child's particular stage of anatomic, physiologic, or psychologic development [1]. Multiple factors are responsible for this difference that includes the flexibility of the facial skeleton, the small size of the facial sinuses, the presence of multiple fat pads, unerupted teeth that may buttress the bone and a high level of adult supervision [3]. Among adolescents, an increase in risk-taking behaviour and a reduction in parental supervision result in an increase in the rate of facial fractures. Still, the overall incidence of facial fractures in the paediatric population is less than 15% of all facial fractures [4].

Epidemiology of paediatric maxillofacial injury

The incidence of paediatric facial fractures among Indians is 5.5% in 1988 [5] which increased to 11% in 2007 [6]. These are most frequently boys (53.7%- 80%) [5,6]. The cause is most often a road traffic accident, violence, falls, a bicycle, play, sports, assault and others. [Table/Fig-1] shows findings of relevant studies world wide.

Growth and developmental consideration

The lower incidence of facial trauma in infants and young children is a result of socio-environmental, general physical and cranio-maxillofacial anatomic factors. Fracture sites tend to shift from the upper to the lower aspect of the face with the increasing age of the patient. Around 80% of the cranial growth occurs in the first two years of life and is completed by the age of seven. By the end of the first year of life, the two mandibular halves have joined in the midline. At age 2, complete symphysis fusion from the inferior border to the alveolus and most of the transverse maxillary growth is complete (followed by vertical and then anteroposterior). The sixth year marks the mixed dentition phase, the antrum are present and well developed. Palatal, premaxillary, and midline maxillary sutural growth is complete with suture obliteration by ages 8 to 12. After puberty and eruption of all teeth, the maxillary sinuses reach their full size [1,16].

Anatomical consideration

Children tend to have a smaller body mass than adults, which play crucial role during a traumatic injury. As the children have less BMI it will result in a greater force per unit of body area. This makes the injury more worsen in children compared to adult, if same force was exerted. The child's incompletely calcified skeleton is close to the internal organs with less fat and more elastic connective tissue. These factors result in multiple internal organ injuries, often without external signs [17].

The paediatric patient with craniofacial trauma is more difficult to examine both clinically and radiologically as they tend to be more uncooperative due to fear. Furthermore, it is more difficult to make use of the teeth in children for fixation, because primary teeth may

Study	Country	Study duration in years	No of subjects	Etiology				Ratio	
				RTA (%)	Fall (%)	Sports (%)	Others (%)	Male (%)	Female (%)
Posnik et al., [7]	USA	4	137	50	23	20	7	63	37
Iida S et al., [8]	Japan	15	1502	47.1	25.3	15.5	12.1	67.8	32.2
Gassner et al., [9]	Austria	10	381	30	24	17	29	66	34
K. Subhashraj et al., [6]	India	6	310	85	7	2	5	90	10
Chrcanovic BR et al., [10]	Brazil	3	464	44.6	21.7	7.5	26	77.2	22.8
Karim et al., [11]	India	3	45	28.8	53.3	6.6	11	66.6	33.3
H. V. Kambalimath et al., [12]	India	10	112	10.7	71.4	15.1	2.6	64.3	35.7
Qing-Bin Z et al., [13]	China	10	470	24.8	28.5	5.1	41.6	71.2	28.8
Osunde OD et al., [14]	Nigeria	3	160	45.0	40.6	0.6	11.3	63.8	36.2
S. Kotecha et al., [15]	England	4	897	11.2	59.8	4	24.9	79	21

[Table/Fig-1]: Worldwide epidemiology of maxillofacial injuries in children

be both deficient in number or their roots may be resorbed and permanent teeth may be incompletely erupted. The shape of the primary tooth crown is also not favorable for retention of wires and splints, being bell-shaped with little undercut area. Elasticity of the bone in children, the relatively small size of the face and the growth process in the young bone are also among the factors that influence the pattern of fracture. Ankylosis of the temporomandibular joint causing impairment of function is more common in children and damage to the condylar growth centre can result in facial deformity [1,16,17].

Fixation consideration

Before formulating treatment plan for the paediatric patient several factors should be consider. These include the age of the patient (to maximize growth and development), the anatomic site (to optimize form and function), the complexity of the injury (displacement, comminution and the number of sites), the time elapsed since injury (ideal to treat within 4 days), concomitant injury (fitness for anesthesia and duration of surgery) and the surgical approach (closed versus open).

1. No Fixation

Many authors have suggested that for nondisplaced or greenstick fractures in the paediatric population, observation alone is adequate [18]. No fixation should be required in such cases.

2. Monomandibular Fixation

Monomandibular fixation can be one of the treatment options in complete edentulous new-borns and partially edentulous children (aged 5-12) in mandibular body or symphysis fracture. Monomandibular fixation can be done by arch bar, acrylic splint (or stent), or thermoplastic material. This technique is particularly helpful for greenstick or minimally displaced fractures. This method requires circummandibular wires or some form of skeletal suspension.

3. Maxillomandibular fixation

By age 2, 10 deciduous teeth exist in both arches, and maxillomandibular fixation may be achieved. However the lower height of contour of the primary dentition it may require additional acrylic support, circummandibular wiring, or skeletal suspension. Thinner wire (28 or 30 gauge) is suggested for ligating the arch bar to the dentition. Before age 2 this method cannot be perform as less number of teeth and after age 6 missing or resorbed teeth limit this technique. Maxillomandibular fixation with closed reduction may not permit anatomic reduction. Although nutrition and airway are concerns, child tolerance and subsequent compliance are the major drawbacks of this technique [1,19]. Maxillomandibular fixation is usually maintained for 3 to 4 weeks. This fixation has the disadvantage of limiting anatomic reduction and restricting full function [1,16,19].

4. Internal fixation

Internal fixation involves open approach with subsequent subperiosteal dissection. This invasive method has the potential to interrupt or limit the osteogenic potential of the periosteum, to create scars that may further restrict growth, or both. Advantages of this method are absolute anatomic reduction can be achieved, nutrition is improved by permitting a rapid return to a normal diet, the airway is less of a concern during extubation or reintubation than with maxillomandibular fixation, and tolerance and compliance are less important issues [20]. Care must be taken in patients with a developing dentition to avoid damage to the tooth buds during screw placement [1].

CONCLUSION

Fractures in children are less common than adults due to multiple factors. A methodical system of investigation must be applied in every trauma patient to effect favourable outcome, the hard tissue trauma need immediate attention of the involved mandible and in case of dentoalveolar injuries. Young children are more prone to have greenstick fractures and require observation or minimal fixation measures. Older children with comminuted or displaced fractures frequently require open reduction and fixation. Growth disturbances often occur in the actively growing child who has sustained trauma to the nasal and condylar regions.

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