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ORIGINAL ARTICLE

A Prospective Randomized Clinical Study To Evaluate Pattern Of Maxillofacial Injuries In Pediatric Patients – A 2 Years Institutional Study

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Abstract

In Childhood, a highly impetous nature and adventurous spirit generally combine to encourage a child's participation in physical activities, but immediate consequences are never bothered. One of them being maxillofacial injuries.

The purpose of the study was to evaluate maxillofacial injuries in pediatric patients; agewise & sexwise distribution, etiology, location, type, clinical features, radiographic finding & proper management of maxillofacial injuries in pediatric patients at various age groups between 0-16 years.

Material and Method – Study was undertaken at a tertiary hospital Punjab, India. All patients between ages of 0-16 years, who reported with maxillofacial injuries during 2 years period, were included. Complete physical examination was done including intraoral and extraoral examination & Recorded in patient examination form. Radiographs taken and treatment planned accordingly with regular follow ups.

Results - A total of 64 maxillofacial injuries were recorded with Male to female ratio of 1.8: 1. Fall is major cause of injury followed by RTA, sports & other causes. A total of 50% patients range from 12-16 years of age followed by 5-8 (30%), 9-11 (15%), 3-4 (5%) years. Only 20% had dental injuries alone, 10% had soft tissue injuries alone, 15% had facial bone fractures alone while only 20% had combined soft tissue and facial bone fractures, 20% had soft tissue and dental injury, only 15 % had combination of soft tissue injury, dental injury and facial bone fracture. Common site of soft tissue injury was upper lip followed by lower lip, chin, oral mucosa, cheek, eyebrow and gingivae. In only 15 % patient

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open reduction & internal fixation was done. 5% patients managed conservatively with soft diet and mouth opening exercises. In 45% patients splinting was done for alveolar fractures. **Conclusion** – The children in12-16 years of age group were found to be more prone to facial injuries. Mandible being most commonly fractured. The high osteogenic potential of pediatric mandible allows non-surgical management.

INTRODUCTION

Attractive face is the most important asset of an individual's personality. It allows recognition and communication amongst people Facial injuries can range from a minor inconvenience to a life time disfigurement. Any injury to facial region requires the particular attention during treatment to prevent these problems. Facial fractures are less common in paediatric patients than in adults particularly during first 5 years of age.[1,2,3,4,5] The higher incidence being occurred in age group of 8-10 years of age [4] & highest being in age group 11-16 years[6]. There is great difference between adult and paediatric patients with regard to available epidemiological data, but as the child grows to puberty; features resembles that of adults i.e. the pattern found in children are shifted gradually toward pattern found in adult [7, 3, 4]. Diagnosis of facial fractures in children is difficult so inadequately reported, as paediatric patients are mostly uncooperative for clinical and radiographic examination, sedation is needed in cases of maxillofacial injuries especially with suspected condylar fractures (chin laceration or fall from height), if misdiagnosed can later lead to growth disturbances & TMJ ankylosis [2,4,8]. So it is necessary to restore esthetic & functional status of the patient to as normal as possible. Along with paediatric patients, parent's cooperation is also very important.The aim of this study was to evaluate and compare etiology, frequency, distribution of various soft & hard tissues injuries (dentoalveolar and basal bone fractures) in paediatric patients.

MATERIAL AND METHODS

Study was undertaken at a tertiary hospital Punjab, India. All patients between ages of 0-16 years, who reported with maxillofacial injuries during 2 years period, were included. The cases were selected at random regardless of sex, caste, creed and socio-economic status of the patient with age of 16 taken as the end point. Complete physical examination was done including intraoral and extraoral examination & Recorded in patient examination form. Radiographs taken and treatment planned accordingly & followed up for maximum available time

postoperatively regarding the restoration of occlusion, function and aesthetics.

OBSERVATION AND RESULTS

- **Age Distribution-** A total of 20 Paediatric patients ranged from 0–16 years of age who reported with maxillofacial injuries during 2 years period December 2004 to November 2006. The youngest patients treated in the present study were of 3 years of age. The maximum number of patients i.e. 10 cases (50%) who received maxillofacial injuries were from the age group of 12-16 years. It was followed by 6 (30%) cases in the age group of 5-8 years and 3 cases (15%) were in the age group of 9-11 yrs. The minimum number of cases was in 3-4 years of age which had only 1 (5%) case of facial fractures. (Fig 1)

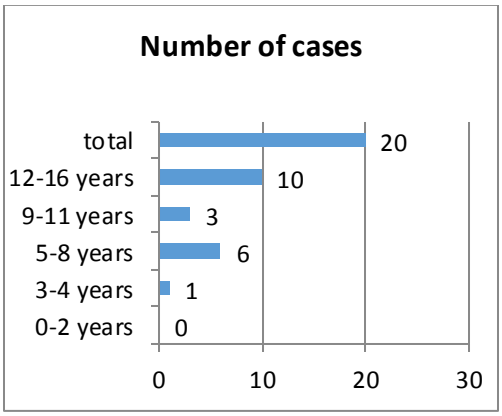

Fig. 1 Age Distribution

- **Gender Distribution-** The incidence of maxillofacial injuries was more common in male patients. The frequency of boys was found to be 65% (14) while that of girls was 35% (6) with ratio of boys to girls is 1.8:1.

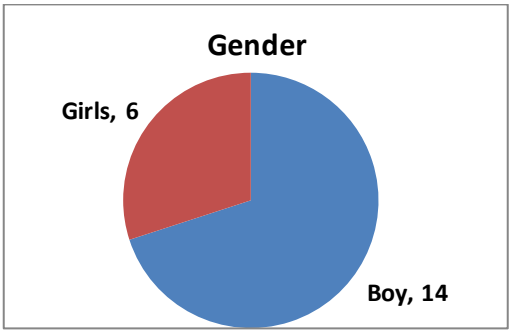

Fig 2 Gender distribution

- Maxillofacial injuries were more common in paediatric patients belonging to urban areas than rural areas. Out of a total of 20 patients with maxillofacial injuries, 8 children belonged to the rural areas.

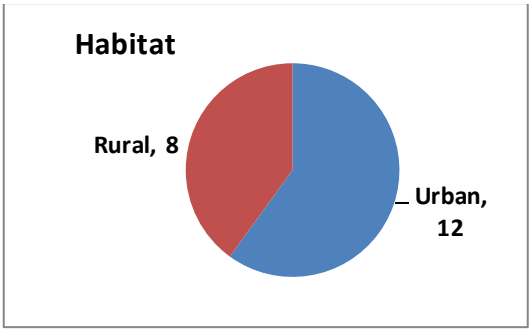

Fig 3 Habitat of Patients

- The study of etiological factors revealed that falls were the most common cause. Twelve of them (60%) were due to falls. Road side accident was the second most common cause which accounted for 4 (25%). Sports involved 3 (15%) and other causes like horse kick involved 1 (5%) case only.

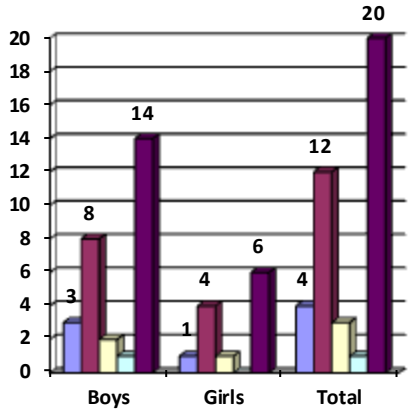

Fig 4 Etiology of Disease

- **Distribution of Various types of Maxillofacial injuries;**

The number of cases with dental injuries alone, soft tissue injuries associated with facial bone fracture and soft tissue injuries associated with dental injuries were 4 (20%) each. The number of cases with facial bone fractures alone and the soft tissue injuries associated with dental injuries and facial bone fractures were 3 (15%) each. The number of cases with soft tissue injury alone was seen only in 2 (10 %) cases.

It was evident that a total of 26 fractures occurred in 18 cases, Mandible was most commonly involved; 14 fractures of mandible were encountered in 8 (40%), followed by Maxillary dentoalveolar fracture in 7 (35%). Maxilla was fractured in 1 (5%) while Mandibular dentoalveolar fractures in 2 (10%) and only soft tissue injuries occurred in 2(10%) cases. No Zygomatic bone and Nasal complex bone were involved

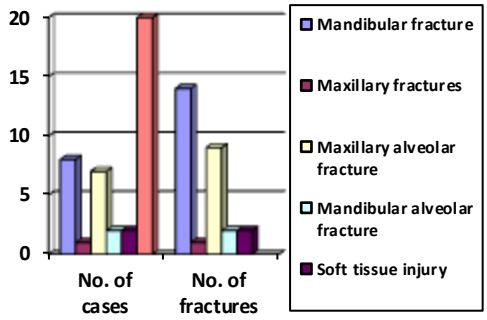

Fig 5 showing distribution of various types of maxillofacial injuries

- Condylar area 6 (42.8%) was the most common site of mandibular fracture followed by parasymphysis region in 3 (21.4%) , body region in 3 (21.4%) and the angle of mandible in 2 (14.28%).

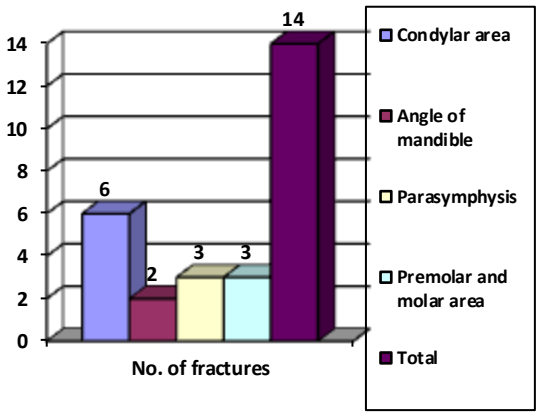

Fig 6. Showing site and relative frequency of mandibular fracture occuring in paediatric patients

- Bilateral subcondylar fracture was encountered in 2 cases while unilateral sub-condylar fractures in 2 cases. Bilateral or unilateral subcondylar fractures in combination with

parasymphysis fracture were encountered in 1 case each. Unilateral condylar in combination with body in 1 case and angle in combination with parasymphysis in 1 case only.

- Among dentoalveolar injuries, crown fractures dominated in permanent dentition and no crown fracture was seen in deciduous dentition, subluxated teeth were 4 in permanent and 2 in deciduous dentition. Intruded teeth were observed only in permanent dentition (2). Extruded teeth were seen in permanent dentition (3 cases). Avulsion of deciduous dentition (2) and permanent dentition (2) were observed. 2 cases were seen with alveolar fractures in permanent dentition.
- In soft tissue injuries highest number of injuries were seen in the upper lip (10) followed by lower lip (6); chin (6), eyebrow or cheek (3 each); oral mucosa and gingiva (2 each).

Treatment

In this study reduction of fracture was achieved by closed reduction in majority of cases except in 3 cases in which open reduction was carried out. In 4 cases fixation and immobilization was done by intermaxillary fixation by various methods of wiring like Erich arch bar splint, risdon wiring and eyelet wiring. Acrylic cap splint with circum-mandibular wiring was used in 1 case only. One case of condylar fracture, in which there was no displacement was treated by conservative method i.e. rest for two weeks, liquid or semi-solid diet and then active exercise. Nine cases of alveolar fracture were treated by splinting of teeth.

Type of treatment	No.	%
Acrylic cap splint with circumferential wiring	1	5
Intermaxillary fixation by various methods	4	20
Open reduction fixation by stainless steel bone plates	3	15
Conservative management (Soft diet and mouth opening exercise)	1	5
Splinting of teeth for alveolar fractures	9	45

DISCUSSION

The pattern of maxillofacial injuries varies from one country to another, perhaps because of differences in social, cultural & environmental factors [11]. In the present study, the lowest incidence of maxillofacial injuries occurred below age of 4 years i.e. 5%, while maximum was reported between 12-16 years of age being 50%. The next highest incidence was 5-8 years of age (30%), followed by 9-11 years (15%) of age. Only one case of facial injury was

encountered in 0-4 years of age group and this can be attributed to the direct parental supervision, limited outdoor activity, greater resilience of bone and higher bone to tooth ratio as compared to late childhood, during which the incidence of fracture is significantly highest. Also during late childhood, children are involved more in outdoor activities. [4,10]

It was observed that males were often affected than females and male to female ratio was 1.8:1. It was attributed to the more boisterous nature and an inherent adventurous spirit characteristic of boys and they used to spend more time outdoors. [1,4,10]

The etiological pattern is the concern of everyone engaged in the field of trauma surgery. Causes of facial injuries differ from age, sex, country to country, socio economic and cultural status, it is important to evaluate the etiology of maxillofacial injuries in children for the prevention of accidents and also for better immediate management.

Falls have been the major contributing etiological factor [11, 12, 13, 16] in children because of their lack of control and judgement. In falls, the major factor causing fracture of the facial skeleton in children was due to falls from roof top. This is because, the children are more fond of playing and flying kites on roof tops and moreover, the roofs are not covered by protective barricades. There is need of hour to encourage for protective barricades on roof tops & parental supervision while playing on roof tops.

The road traffic accidents caused maxillofacial injuries in 20% of children. This may be attributed to the fact that children outside their homes are under parental supervision and also in India; high speed automobiles are less as compared to the western parts of the world where the major contributary factor is automobile accidents. Rowe Thoren & Haug found automobile accidents to be the main cause followed by fall [1,4,11]. In newer studies Motor vehicle accident especially bicycle riding followed by fall is main cause for maxillofacial injuries in children. Laws implemention is required for use of helmets for children, seat belts or special car seat for children.

Sports in this region is not of a very vigorous type and hence did not contribute largely to maxillofacial injuries. Most of the injuries resulted from falling or being bumped by another child while running than from the sports itself.

Types of dental injuries sustained were found to be related to the type of dentition, whether primary or permanent. The crown fracture was dominated in permanent dentition whereas no crown fracture was seen in primary dentition, only subluxation and avulsion was seen.

The difference was attributed to the softness and resiliency of bone at an early age and the ability of bone and periodontal ligament to absorb more thrust. [1,12]

Mandibular alveolar injury has been reported to range between 8.1% and 50.6 % of pediatric facial injuries and maxillary alveolus from 5% to 65%. [1,12]. Upper and lower anterior teeth were found to be more liable to injury as compared to posterior teeth which are considerably protected by the overlying soft tissue. Maxillary central incisors were the most commonly involved teeth because of their relative facial position with the mandibular anterior teeth.[1, 12] The maxillary anterior teeth were predominantly fractured in patients with undue protrusion [1,12]

In our study 9 cases of dentoalveolar fractures were observed. Mandibular anterior region was involved in 2 (10%) cases only and maxillary anterior region was involved in 7 (35%). This is in consistent with previous studies. [1,12,13,14]

In the present study, it was observed that the lower third of the face was most frequently involved in the fractures of the facial skeleton. The mandible was involved in 8 cases, maxillary fracture was found in 1 case only .The comparative rarity of the fractures of the middle third of the face can be attributed to the fact that cranium is large as compared to the middle third of the face, sinuses have not fully developed and moreover, it is covered by a padded soft tissue. It is only after the puberty that the fracture pattern confirm to that found in adults.

In the present study, it was observed that the fracture of the middle third of the facial skeleton was encountered in 16 years of age when the anatomy of the face of the child resembles to that of adults. [4,15]

Out of the 14 mandibular fractures in 8 patients, it was found that condyle was the most commonly fractured with 6 (42.8%) cases, followed by parasymphysis. 3 (21.4%) cases, body 3 (21.4%) cases and angle of the mandible, 2 (14.28%) cases. In the paediatric patients, the mandible is full of developing tooth buds thus having a high tooth to bone ratio, which makes the body of the mandible more prone to fracture. [16, 3, 4, 15, 16]

Dental trauma was most often accompanied by soft tissue involvement in 29 % to 56% of the time [1]. Soft tissue injuries included contusions, abrasions, lacerations and edematous swelling involving upper lip, lower lip, gingiva or soft tissues of face. Soft tissue injury management should be initiated within

hours as healing occurs at faster rate in comparison to adults.

In children early management is of great importance because of high osteogenic potential of the periosteum, high metabolic rate and a very excellent blood supply in pediatric patients which results in a very rapid healing of the fracture.

Before proceeding on the management, the patient must be evaluated thoroughly. A major factor in the surgical management of children is patient co-operation, which is usually difficult to achieve so; most of the patients had to be treated under general anaesthesia.

The management of mandibular fracture in children is quite different from that of adults. The growth centres, tooth buds in line of fracture should not be traumatized. There is difficulty in interdental fixation in children because of the mixed dentition, many teeth are in the process of shedding or eruption, and moreover, the bell shaped deciduous teeth are poor retentive units.

Closed reduction was done in majority of the cases except in 3 cases (15%) because of the displaced fracture in which open reduction and fixation were done. Open reduction and fixation by transosseous wiring was not done in fracture lying in tooth bearing region so as to prevent the hazard of traumatizing the developing tooth buds [4]

The conservative management yields good results in cases of mandibular condylar fractures [4]. It was advocated that fractured and displaced condyle undergoes resorption and reconstruction within 6-12 months under the influence of the physiologic stresses and strains imparted by the masticatory function. The angular deformity of the neck of condylar process is corrected and reconstituted even when there has been bilateral fracture dislocation [4].

CONCLUSIONS

Psychosocial counselling is required for patients & families sustaining these forms of injuries because of deforming nature of injury in child if not treated on time. Moreover education programme should be organized in the schools for the students & parents to prevent the injuries & immediate reporting to emergency department and early treatment.

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Photos of Cases

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