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Case Report

MANAGEMENT OF PEDIATRIC MANDIBULAR BODY FRACTURE BY OPEN OCCLUSAL ACRYLIC SPLINT: REPORT OF A CASE

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ABSTRACT

Mandibular fractures are the most common facial fractures seen in children and their incidence increases with age. Treatment principles of pediatric mixed-dentition mandibular fractures differ from that of adults due to concerns regarding: tooth eruption, short roots, developing tooth buds and growth issues. One major factor is the inherent instability of the occlusion in the mixed deciduous-permanent tooth phase. This case report documents a child with fractured body of mandible managed by closed reduction using open occlusal acrylic splint and circummandibular wiring.

Keywords: Open Occlusal Acrylic Splint, Circummandibular Wiring, Closed Reduction

INTRODUCTION

Maxillofacial injuries in children may affect function as well as esthetic appearance. Hence these must be diagnosed and managed appropriately to avoid disturbances of future growth and development[1-3].

The reported incidence of pediatric maxillofacial injuries accounts for 4–6% of the total injuries. The prevalence of pediatric facial fractures is lowest in infants and increases progressively with increasing age[4]. Below the age of 5 years, the incidence of pediatric facial fractures is even lower, ranging from 0.6 to 1.2%, whereas 1.0 to 14.7% occurs in patients older than 5 years[5].

Approximately half of all pediatric facial fractures involve the mandible. A fall from a bicycle or fall while playing is the most common cause of mandibular fractures. The goal of treatment of these paediatric fractures is to restore the underlying bony architecture to pre-injury position, in a stable fashion, as non-invasively as possible without hampering the permanent tooth germs, with minimal residual esthetic and functional impairment[2].

The principles of management of mandibular fractures differ in children when compared to adults. While in the adults, absolute reduction and fixation of fractures is indicated, whereas in children open reduction and osteosynthesis of the fracture are thought to have a negative effect on the skeletal growth and unerupted teeth[2,3]. It involves two stage surgeries because of the need for plate removal after complete healing. The use of absorbable plates and screws is less likely to disturb facial skeletal growth but is still associated with the risk of damaging unerupted teeth even when using mono cortical screws. Growth and development of the maxillofacial structures should be considered to avoid malunion and subsequent deformities. Henceforth closed reduction is the favourable treatment modality in these situations[4].

This case report documents a child in mixed dentition state with a mandibular body fracture managed effectively by closed reduction method with utilization of open acrylic splint and circummandibular wiring.

CASE REPORT

A 7 year old girl reported to Department of Pediatric Dentistry with a history of fall while playing two days ago. After the fall the child did not lose consciousness, had no history of vomiting or convulsions. There was history of bleeding from gums, difficulty in closing mouth and chewing food. Child was taken to a general physician where first aid was given and she was referred to the department for further treatment.

Clinical examination revealed a diffuse extraoral swelling in the right lower one third of the face causing a gross asymmetry of the face, difficulty in opening and closing the mouth. Intraoral examination revealed a vertical fracture line

between right mandibular primary lateral incisor and primary canine associated with medially displaced left mandibular dentoalveolar segment with altered occlusion leading to an open mouth appearance Fig 1. There were no other associated fractures present. All the teeth were in normal status without any mobility. Orthopantamogram (OPG) and occlusal radiographs Fig 2, 3 confirmed the clinical findings.

Figure 1: Vertical fracture line between mandibular left primary lateral incisor and primary canine and open mouth posture

Figure 2: Orthopantamogram

Figure 3: Mandibular occlusal radiograph

Under sedation, upper and lower arch alginate impressions were taken and stone casts were poured. Lower model cast was cut along the fracture line and was readjusted and realigned in occlusion with upper cast Fig 4. An open occlusal acrylic splint Fig 5 was fabricated on realigned lower model cast.

Figure 4: Mandibular model cast sectioned realigned in occlusion with maxillary model cast

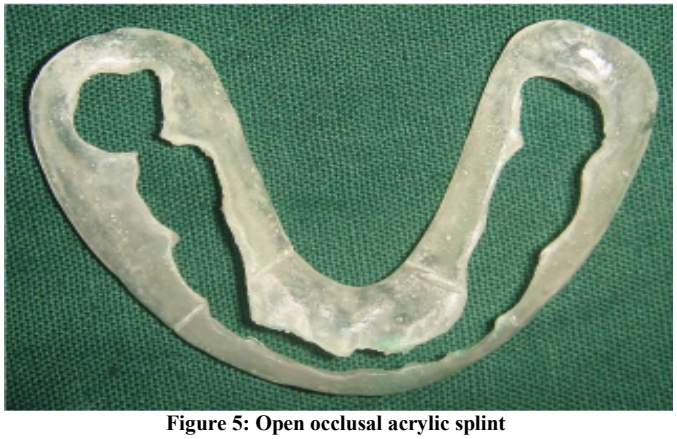

Figure 5: Open occlusal acrylic splint

Under general anaesthesia, the fracture segment was reduced and aligned in occlusion by bi-digital pressure, immobilized with the acrylic splint which was retained by circum mandibular wiring Fig 6, 7. Patient was put under medication advised soft diet and proper oral hygiene care. Patient was reviewed every week, OPG's Fig 8 were taken to evaluate the healing process and on the third postoperative week, the circum-mandibular wiring and splint was removed under local anaesthesia. No mobility was present at the fracture site. Postoperative recovery was uneventful. Patient had perfect occlusion and good masticatory efficiency fig 9.

Figure 6: Acrylic splint placed and circummandibular wiring for retention

Figure 7: Mandible fractured segments reduced and stabilized.

Figure 8: Review OPG showing splint in-situ and healing of fractured mandible

Figure 9: Post operative healing after splint removal

DISCUSSION

The incidence of facial fractures is lower in the pediatric population than in the adult population and represents 1 – 14.7% of the facial fractures in the general population. The reason cited for this low incidence include, small volume of facial mass relative to the calvarium, the relative resilience of the pediatric skeleton and the protected environment in which children lives, leading to less exposure to typical mechanism of injury[2,3,4].

The most common fracture in children requiring hospitalization and/or surgery generally involves the mandible and, in particular, the condyle. Fractures in the condylar region are the most common, followed by angle and body fractures. The etiologies of mandibular fractures in children are usually falls and sports injuries[2].

Children have a great osteogenic potential and faster healing rate than adults and hence anatomic reduction in the children should be accomplished earlier and the immobilization time should be shorter, i.e., 2-3 weeks as compared to 4-6 weeks in adults. The high osteogenic potential in children allows rapid union within three weeks and non-union or fibrous union is almost never seen. These fractures allow for a much greater potential to remodel even in imperfectly reduced fractures[3].

The clinical features of a fractured mandible in a child are the same as in an adult, which includes pain, swelling, trismus, derangement of occlusion, sublingual ecchymosis, step deformity, midline deviation, loss of sensation due to nerve damage, bleeding, TMJ problems, tenderness, movement restriction, open bite and crepitus[6]. Thorough clinical examination, however, may be impossible in uncooperative young trauma patients. Lacerations should be evaluated to reveal injuries to underlying structures. General palpation should be applied over all bony surfaces of the mandible. The mandibular range of motion must be examined as patients actively open and close their mouth[6,7].

Treatment of mandibular fracture in children depends on the fracture type and the stage of skeletal and dental development. Mandibular growth and development of dentition are the main concerns while managing pediatric mandibular fractures. In adults, absolute reduction and fixation of fracture is indicated, whereas in children minimal manipulation of the facial skeleton is mandated. The small size of the jaw, existing active bony growth centres and the crowded deciduous teeth with permanent tooth buds located in great proximity to the mandibular and mental nerves, all significantly increase the therapy related risks of pediatric mandibular fractures and their growth related abnormalities[8,9].

Restoration of the mandibular continuity after fracture is important not only for immediate function but also for future craniofacial development. Accordingly, the goal of treatment is to restore the underlying bony architecture to its pre-injury position in a stable fashion as non-invasively as possible with minimal residual esthetic and functional impairment[10]. The degree of precision required in a child is not quite as great as in an adult, as the adaptive potential of the alveolar bone and the replacement of deciduous teeth by permanent teeth can bring about various degree of self correction. The high osteogenic potential of the pediatric mandible is responsible for a low complication rate[11].

Problems encountered in management of pediatric mandibular fractures are loose anchorage system due to attrition of deciduous dentition, precarious dental stability in the mixed dental teeth and physiologic resorption of roots[4]. Difficulties in securing IMF using arch bars and eyelets as primary teeth are not sufficiently stable and may be avulsed due to the pressure exerted. The use of absorbable plates and screw have nearly no side effects on the growing facial skeleton but there is still the risk of damaging unerupted teeth during the drilling process. In addition, the partially erupted

secondary teeth are not sufficiently stable in the paediatric soft bone. Interference with growth due to placement of miniplates, allergic reactions to the metal resulting in inflammation has also been reported[12,13].

Alternative method is by closed reduction with the use of pre-fabricated acrylic splints as a treatment for pediatric mandibular fractures. These splints are more reliable than open reduction or IMF techniques with regard to cost effectiveness, ease of application and removal, reduced operating time, maximum stability during healing period, minimal trauma for adjacent anatomical structures and comfort for young patients[10] . The closed reduction and immobilization approach can be achieved by means of acrylic splints, circumferential wiring, arch bar or gunning splints. These techniques provide a good reduced position, continuity of periosteal sleeve and maintenance of the soft tissue, thus creating a positive environment for rapid osteogenesis and remodelling process as well as prevention of any type of nonfibrous union. Furthermore in splinted mandible, the fracture segments are tightly fixed and serve in reducing tenderness and pain reactions during a child's daily activity[5,6].

In our case a vertical fracture line extending between left lower lateral incisor and canine was successfully treated by means of open occlusal acrylic splint and circummandibular wiring. The fractured segments and teeth seem to have aligned well over a period of 2 months, the patient neither showed occlusal disharmony nor any TMJ problems. We opted for the open occlusal acrylic splint because of its ease in fabrication, preservation of periodontal tissue integrity, patient compliance and ease in assessing the occlusion after reduction.

CONCLUSION

The anatomical complexity of the developing mandible and teeth and concerns regarding biocompatibility of implanted hardware often mandate the use of surgical techniques that differ markedly from those used in adults. In cases of mandibular fractures of young children, disruption of periosteal envelope may have unpredictable effects on growth. These clinical outcomes indicate that fabricated acrylic occlusal splints for treatment of pediatric mandibular fractures are more effective and comfortable for young patients. The treatment protocol should be expanded to include this approach and applied on children with mandibular fractures in the primary dentition, mixed dentition as well as permanent dentition.

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