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Management of Pediatric Mandibular Fracture using cap splint - A Report of Case Series

Wairokpam Bhoomika Devi[1]*, Ramakrishna Yeluri[2], Deepak Ningombam Singh[3], Rajesh S Nongthombam[4]

Assistant Professor, Dept. of Pediatric and Preventive Dentistry, Dental College, Regional Institute of Medical Sciences, Imphal
Professor and Head, Dept. of Pedodontics and Preventive Dentistry, Teerthanker Mahaveer Dental College and Research Centre,NH 24, Moradabad-Delhi Road, Moradabad, Uttar Pradesh.
Assistant Professor, Dept. of Oral Medicine and Radiology, Dental College, Regional Institute of Medical Sciences, Imphal
Assistant Professor, Dept. of Prothodontics, Dental College, Regional Institute of Medical Sciences, Imphal.

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*Corresponding author:

Email : bhoomika22@gmail.com
Tel.: +91-9191721416

ABSTRACT

Treatment of pediatric mandibular fracture remains a main concern and a challenge. The treatment is usually performed without delayed with frequent observation and close reduction. The goal of treatment of these fractures is to restore the underlying bony architecture to pre injury position, in a stable fashion, as non invasively as possible, with minimal residual esthetic and least functional impairment. However, these splints are more reliable than those of open reduction or inter maxillary fixation (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 the young patients. Due to the technical difficulties of IMF, plates and screws, acrylic splints with circumferential wiring are recommended and remains the treatment of choice splint in cases of mandibular body, parasymphysis, symphysis fracture in young children.

INTRODUCTION

Trauma and physical injuries are of main concern in children. Impetuous nature and adventurous spirit combine to encourage participation in physical activities with little thought to immediate consequences, still paradoxically facial injuries in children are much less common than in adults.

Operative management requires minimal manipulation and may be modified by the stage of skeletal and dental development. When tooth buds within the mandible do not allow internal fixation with plates and screws, a mandibular cap splint or occlusal acrylic splint fixed to the teeth, with circummandibular wiring has emerged to be the alternative treatment of choice[1].

CASE REPORT

Case1:

A 7 year old male patient reported with the complaint of wound on the right lower chin region since 1 day, when he was hit by a horse. The patient was conscious, well oriented to time, place and person. There was no history of convulsion, vomiting or bleeding from nose and ear. Haematological parameters such as blood count, clotting time, and bleeding time were normal at the time of examination.

Extra oral examination revealed, diffuse facial oedema along with deep cut and laceration running 2 inches vertically from the lower border of left mandible. Step was palpable in the left parasymphysis region and contused lacerated wound was present with respect to the same.

Intra oral examination revealed mixed dentition. Wound was present on the mucosa opposite to 82-83 region. A step deformity leading to malocclusion was observed, Fig. 1(a) below.

In the pre-operative orthopantomogram, mandibular left para-symphysis fractures were evident between 82 and 83 as shown in Fig. 1(b) below.

Emergency treatment included antibiotic and analgesic medication together with anti-tetanus toxoid injection. Immobilization of the mandible with bandage around the head was done and was kept on soft diet. Alginate impressions of both jaws were taken before mandibular reduction. An acrylic cap splint was then constructed on the model of the patient's arches after reducing the fracture on the models.

Under deep sedation, the dislocated segments were reduced by bidigital pressure with the guidance of the surgical splint. A small stab incision was placed at the inferior border of the mandible, 4-5 cm away from the fracture line in the left side. A William Velsey Fry awl was introduced through the stab incision

Fig 1 (a): CASE-1 preoperative intra oral findings

Fig 1(b): CASE-1 pre operative radiographic findings

(Fig. 2). The bone awl was guided along the body of the mandible and taken out lingually. Next the wire was tied in and the awl was gently guided along the lower border of the mandible and passed into the buccal sulcus. The wires were held together and stent stabilized by winding them in clockwise direction at 84-85 region. Same procedure was repeated on the left side.

Fig 2: CASE-1 surgical procedures

Debridement and dressing of the extraoral wound was also performed. Postoperative orthopantomogram was taken with circummandibular wires in place (Fig 3 (a)). The patient was reviewed every week and, on the third postoperative week, the circummandibular wiring and splint was removed under local anesthesia. No mobility was present at the fracture site. Postoperative recovery was uneventful and occlusion achieved was satisfactory. The patient was reviewed monthly for 6 months and postoperative orthopantomogram was taken (Fig 3 (b)). The patient had satisfactory occlusion with good masticatory efficiency.

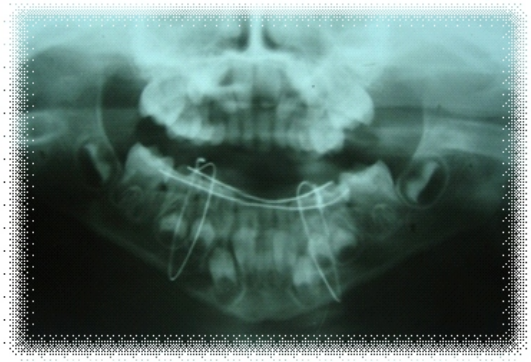

Fig 3 (a): CASE-1 post operative radiographic with cap splint

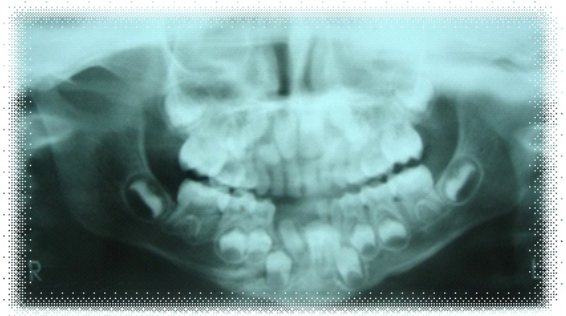

Fig 3 (b): CASE-1 post operative radiographic 6 months follow-up

CASE REPORT 2:

A 5 year old female patient reported with the complaint of pain and swelling on the right side of face since one day, after she was hit by a bike on the road. On intra-oral and radiographic examination, a step deformity was observed in 72-73 region (Fig 4(a)-Fig 4(b)). After thorough examination and history recording it was decided to reduce the fracture with acrylic cap splint under deep sedation. Post-operative examination and radiograph revealed successful result (Fig 4(c)).

Fig 4(a): CASE-2 pre operative intra oral findings

Fig 4(b): CASE-2 pre operative radiographic findings

Fig 4(c): CASE-2 post operative radiographic with cap splint

CASE REPORT 3:

A 7 year old male patient reported with the complaint of injury in the lower front jaw since 4 days, when he had a fall from bicycle. Intra-oral findings show laceration and contusions in the 62-63 region, a de-arrangement in occlusion and step deformity was observed in the 71-81 region (Fig 5(a)). Thorough examination and proper history recording helped to reduce the symphysial fracture with acrylic cap splint under deep sedation, Fig 5(b). Post-operative follow up and orthopantomogram show satisfactory result (Fig 5(c)).

Fig 5(a): CASE-3 pre operative intra oral findings

Fig 5(b): CASE-3 post operative radiographic with cap splint

Fig 5(c): CASE-4 post operative intra oral findings

DISCUSSION

Mandibular fractures are the most common group of facial skeletal injury in pediatric trauma patients[1]. Fractures in children account for approximately 5% of all the facial fractures[2]. The most common causes of fracture observed in children are falls (64%), followed by traffic (22%) and sports-related accidents (9%)[3]. The girl-to-boy ratio is 3:5, and the mean age is reported 7 +/- 4.4 years. Mandible (32.7%) being the most common facial fracture followed by nasal (30.2%), and maxillary/zygoma (28.6%). Patients with a fracture of the mandible are most likely to have an associated dental injury (39.3%). In pediatric patients symphysis and parasymphysis fractures are regular (15%20%) and body fracture are much rare[4]. Majority of the body and symphysis fractures in children are undisplaced because of elasticity of the mandible and embedded tooth buds together “like glue”[5]. Treatment should be initiated without delay and can be limited to observation or closed reduction in non□displaced or minimally displaced fractures. However, open reduction and rigid internal fixation can be indicated for severely displaced fractures. In young children below 5 year of age, the face is in a more retruded position relative to the “protective” skull, therefore, there is a lower incidence of midface and mandibular fractures along with a higher incidence of cranial injuries[6]. Young bone possesses unique physical properties that coupled with space occupying the developing dentition giving rise to patterns of fracture not seen in adults.

Bone fragments in children may become partially united as early as in 4 days and fractures become difficult to reduce by the seventh day. This results in the need for different forms of fixation as early as possible for comparatively shorter duration of time. Non union or fibrous union rarely occurs in children and leads to excellent remodeling under the influence of masticatory stresses even when there is imperfect apposition of bone surfaces[1].

The treatment choice of fractures in the pediatric mandible also depends on the age and the state of tooth development. Such injuries are mainly governed by their psychological, physiological, developmental, and anatomical characteristics[7]. The other factors need to be considered in the definitive treatment of the dentoalveolar injury include, age and cooperation of the patient, the duration between trauma and treatment, location or extent of the injury to primary or permanent dentition, stages of root development, presence of fracture of supporting bone and periodontal health of remaining teeth. The management of mandibular fractures in children also differs somewhat from that of adults mainly because of the concern for possible disruption of growth and the presence of underlying erupting permanent tooth[1]. 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 various developmental anomalies, failure of eruption of permanent teeth and hence narrow alveolar ridge[1]. Closed reduction in the treatment of choice in most of the pediatric facial fractures unless the fracture fragments are displaced severely. Approximately 40% of all pediatric fractures involve the mandible. It is more difficult to make use of the teeth in children for fixation, because deciduous teeth may be either insufficient in number or their roots may be resorbed, and permanent teeth may be incompletely erupted. There is often a greater degree of tolerance permissible in the alignment of fragments and restoration of occlusion, which will subsequently be corrected by alveolar bone growth at the time of eruption of permanent teeth.

Thus, there may be cases in which the fractures can be snapped back into a good reduced position and held by the periosteal sleeve, the fracture surfaces and even by the occlusion. For greenstick/minimally displaced fractures, conservative closed reduction is the most recommended treatment[8]. The goal of treatment of these fractures is to restore the underlying bony architecture to pre-injury position, in a stable fashion, as non-invasively as possible, with minimal residual esthetic and least functional impairment[9].

Several studies have recommended and supported the use of acrylic cap splints as a treatment of choice for the pediatric mandibular fractures. Open reduction or inter maxillary fixation (IMF) interferes with growth due to placement of miniplates. During removal of the hardware after complete healing, general anesthesia and hospitalization is generally needed. Moreover, allergic reactions to the metal can occur which results in inflammation. Stress shielding, especially after rigid plate fixation, has also been reported and may cause weakening of the bone after removal of the implant. Another important drawback accounts for the release of corrosive metal ions which can lead to removal of the fixation device. However, these splints are more reliable than those of 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 the young patients[10].

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