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Management of minimally displaced mandibular fracture with customized open cap splint in an 11-year child: A case report

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Highlights

- This case report describes a conservative method of using a customized open cap splint in a minimally displaced mandibular fracture in an 11-year child.
- Modified acrylic open cap splint design is a simple, easy, cost-effective, and reliable method of treatment in minimally displaced fractures of the mandible in child patients.
- Post-operative complications like non-union, malunion and infections are rare in children because of good osteogenic potential and faster healing.

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Abstract

Mandibular fractures are the most common type of facial skeletal injury in children. In descending order, the most common is the condylar region then angle, and thirdly body fractures. Most of the fractures are greenstick type in children, because of the presence of permanent tooth buds which hold the fractured mandibular fragments like glue. Hence, conservative management is preferred and the fractures heal well and rapidly in children. The condylar neck in children being short and thick helps to resist the fracture, making most of them the nondisplaced type of fractures. The purpose of this case report is to present a conservative and effective treatment technique for pediatric mandibular fractures using a customized acrylic cap splint. This method has many advantages like simplicity of design, ease of fabrication, and reliability. This method takes care of anatomical, physiological, and psychological aspects as well as the complexity of developing jaws in children.

Keywords: Children; Closed Fracture Reduction; Mandibular Fracture; Splint

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INTRODUCTION

Facial fractures in children are less common than in adults. Facial fractures are around 1.5% to 8.0% of fractures in child patients aged 12-years or young. These are very less (<1%) in young children below five years of age.[1,2] Among these mandibular fracture is the most common. The occurrence of facial fractures is higher in males than in females (2:1) all over the world and in all age groups of children. This male preponderance has remained constant all over and has been attributed to greater and more dangerous physical activities among boys. In younger age groups, gender differences are less significant and the aetiologies are similar in both sexes.[2]

The anatomical features of the face are protective in children and hence fewer facial injuries are seen. In children (<5-years), the face is in a more posterior position compared to the protective skull, hence there are lower chances of midface and mandible fractures and a higher incidence of cranial fractures. With increasing age and facial growth directed in a downward and forward direction, the midface and mandible become more prominent; thus, the incidence of facial fractures increases, while that of cranial injuries decreases. The high elasticity of young bones, a thick layer of adipose tissue covering them, a high cancellous-to-cortical bone ratio, and flexible suture lines are some of the reasons contributing to the low incidence of facial fractures and minimal displacement of the fracture fragments. In addition, stability is increased by the presence of permanent tooth buds within the jaws and the lack of sinus pneumatization.[2,3]

Management of pediatric maxillofacial injuries is a challenge and mainly depends upon the psychological, physiological, developmental, and anatomical characteristics of children.[4] The present case report highlights a simple and reliable method of using a customized open cap splint in a minimally displaced mandibular fracture in an 11-year-old girl.

CASE REPORT

A young girl, aged 11-years reported with her parents to the department of pediatric and preventive dentistry with severe pain and swelling concerning the right mandibular para-symphysis region. The patient gave a history of self-fall three days back. The patient did not give any history of loss of consciousness or vomiting at the time of trauma. The patient had received first aid treatment from a medical practitioner in the form of analgesics, antibiotics, and tetanus prophylaxis. Extra-oral examination revealed asymmetry of the face with a laceration injury on the right mandibular para-symphysis region (Figure 1).

Intra-oral examination revealed asymmetry of the mandibular arch and step deformity with tenderness along the lower border of the mandible in the region of 84 (Figure 1). Grade-1 mobility concerning teeth 83, 84, 85, 83, 41, and 42 were observed. Panoramic radiographic (OPG) evaluation revealed a radiolucent fracture line in the region of 84 (Figure 1). The fracture line was extended up to the inferior border of the mandible with minimal displacement (<2mm) of fragments. Thus, radiographic examination confirmed the diagnosis of right para-symphysis fracture of the mandible. Conservative management using a modified open cap splint was planned after taking the parent's informed consent.

Fabrication of customized open cap splint

Maxillary and mandibular arch alginate impressions were made under local anesthesia dental stone casts were obtained (Figure 2). The fracture site was simulated and marked on the mandibular cast and split into two segments using an electric saw. The two segments of the lower

cast were rearranged and stabilized using sticky wax and occlusion was established by mounting on an articulator. The occlusal surfaces of all mandibular teeth were blocked with modeling wax. The customized open cap splint reinforced with 19-gauge stainless steel wire was fabricated using self-cure acrylic resin. The cap splint was polished, finished, and tried in the patient's mouth. Occlusion was checked and required adjustments were made using articulating paper.

Under local anesthesia, the minimally displaced mandibular fragments were reduced manually in position and under proper isolation, an open cap splint was cemented (Figure 2) on mandibular teeth using luting GIC (Fuji I). Luting GIC has the advantage of biocompatibility, chemical bonding, and fluoride release as compared to zinc phosphate cement.[5] Hence, GIC was used for cementation of the cap splint.

Figure 1. Clinical (a, b) and radiographic (c) images of the right para-symphysis fracture of the mandible

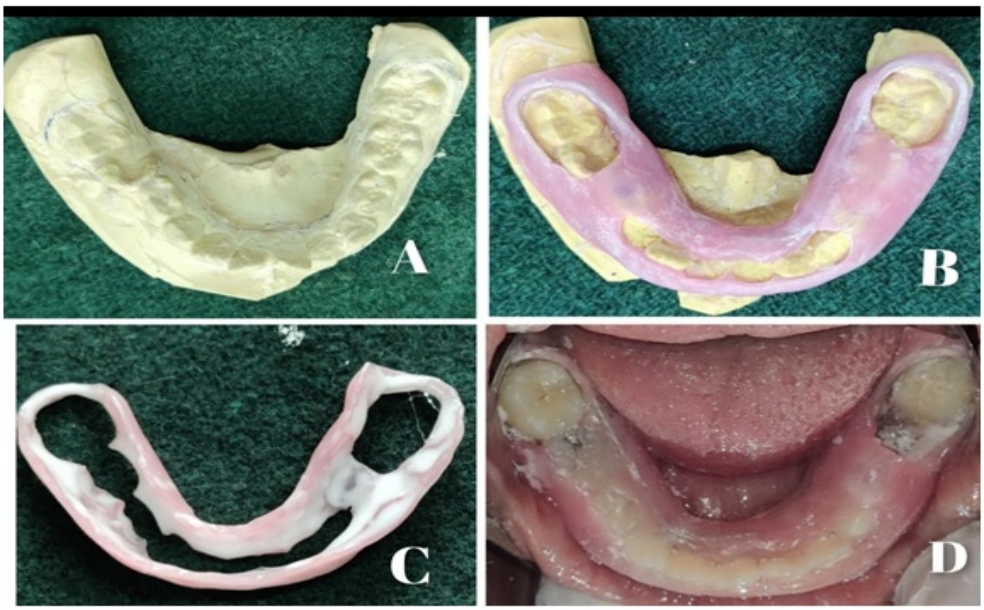

Figure 2. Fabrication (a, b) and cementation (c, d) of modified acrylic open cap splint on mandibular teeth using luting GIC

The patient was advised to take only a liquid and soft diet for six weeks. Analgesics, antibiotics, and 0.2% chlorhexidine mouthwash were prescribed. Oral hygiene instructions were given which included supervised brushing and oral rinsing after every meal. At the end of six weeks, the cap splint was removed and the clinical and panoramic radiographic (Figure 3) evaluation showed successful bony union of the fracture.

Figure 3. Clinical (a) and radiographic (b) images of satisfactory bony healing of fracture at 6-weeks follow-up visit

The patient was evaluated clinically and radiographically during a 3-months follow-up visit. Satisfactory bony healing was achieved and occlusion was established (Figure 4). The patient was scheduled for periodic follow-up visits to assess the growth and development of jaws.

DISCUSSION

Similar to adults, clinical signs of mandibular fractures in children include displacement of the fragments, mobility, crepitus, hematoma, swelling, mucosal tears, malocclusion, pain, and sensory deficits in the distribution of the inferior alveolar nerve, and limited mouth opening. The clinical suspicion of a fractured mandible is to be confirmed by panoramic radiograph (OPG) and then supplemented by posterior-anterior (PA-view), lateral oblique view, and occlusal radiographic views in children. CT scans can also be indicated in condylar fractures which helps us to determine the three-dimensional displacement of the condyles. Treatment of mandibular fractures in children depends on the fracture site and also the stage of skeletal and dental development.[5,6] Depending upon the severity of displacement of fragments, the fractures of the mandible limited to the alveolar process can be treated by open or closed reduction and immobilization by cap splints and arch bars for 2–3weeks. Rarely, long-term mono-maxillary immobilization (via splinting) for up to two months is indicated to prevent malocclusion.[7]

Most pediatric fractures are greenstick types of fractures; therefore, the conservative approach is preferred compared to more invasive ones. The growth of the mandible and development of dentition are the main concerns when treating mandibular fractures during the early years of age. The majority of the mandibular body and para-symphysis fractures in children are un-displaced because of the elasticity of bone and the presence of tooth buds.

Figure 4. Clinical (a) and radiographic (b) images of satisfactory bony healing of fracture at a 3-months follow-up visit

The exact method employed for immobilization depends upon the child's age and stage of dental development.[5] Conservative management is advocated for most cases. Techniques for management need to be modified to adjust to the stage of development, physiology, and psychological aspects of the child at the time of injury. Hence the treatment of choice is closed reduction unless there are fractured segments that are in severely displaced condition.[2] The case reported here was managed conservatively by using a customized open cap splint for a short duration of six weeks.

Mandibular fractures that do not have displacement and malocclusion are managed by closely observing, following a liquid or soft diet, avoiding physical activities, and prescribing a short course of analgesics and antibiotics. Mandibular fractures that are displaced have to be reduced and immobilized. As the tooth buds within the mandible cannot allow internal fixation with plates and screws, the same can be achieved with a mandibular splint fixed to the teeth/to the mandible (circum-mandibular wiring, Gunning splint) or a splint with maxillomandibular fixation (MMF) or intermaxillary fixation (IMF).[8] Displaced symphysis fractures can be treated by open reduction and internal fixation (ORIF) through an intraoral incision after age six years, after the eruption of permanent incisors. ORIF in para-symphysis fractures can be performed after the age of nine years when the tooth buds of the canines have moved up from their inferior position from the mandibular border. Similarly, in body fractures, the inferior mandibular border can be plated, when the buds of the premolar and molar have migrated superiorly toward the alveolus. Growth abnormalities in fractures of the mandibular body are rare in children.[9]

Most treatment of condylar fractures can be done by just periodic observation or by closed reduction and a brief period of MMF for not more than 7–10 days. MMF is generally followed by a period of physical therapy which consists of mouth opening exercises guided by elastics to promote the remodeling of the condylar stump and prevent ankylosis. Open reduction of condylar fractures avoids MMF and may improve functional outcome[10], yet most authors recommend closed reduction. Minimally invasive techniques like ORIF of condylar fractures under endoscopic visualization may gain acceptance.[11,12] Closed reduction using orthodontic brackets and elastics is another innovative and conservative management procedure for minimally displaced mandibular fractures in children.[13]

Postoperative follow-up is recommended periodically to detect and treat early complications such as infection, malocclusion, malunion, or non-union which are luckily rare in children. However, children must be supervised longitudinally for late complications such as damage to permanent teeth, which can occur in mandibular fractures, temporomandibular joint dysfunctions, and any growth anomalies.[9]

CONCLUSIONS

Modified open cap splint is a simple, easy to fabricate, and more reliable treatment method in minimally displaced mandibular fractures in children. This method has many advantages such as easy application and removal, being cost-effective, faster, and very stable during the healing period, and causing minimal trauma to the surrounding structure.

REFERENCES

1. Munante-Cardenas JL, Olate S, Asprino L, de Albergaria Barbosa JR, de Moraes M, Moreira RW. Pattern and treatment of facial trauma in pediatric and adolescent patients. J Craniofac Surg 2011;22:1251-1255

2. Zimmermann CE, Troulis MJ, Kaban LB. Pediatric facial fractures, recent advances in prevention, diagnosis, and management. Int J Oral Maxillofacial Surg 2006;35: 2–13

3. Crean STJ, Sivarajasingam V, Fardy MJ. Conservative approach in the management of mandibular fractures in the early dentition phase: A case report and review of the literature. Int J Pediatr Dent 2000;10:229–233

4. Kaur K, Kaur S, Suneja B, Bansal S, Bahl R, Jodhka S, et al. Role of cap splints in the management of pediatric mandibular fractures- A Case series. European Journal of Molecular and Clinical Medicine 2021;7:5886-5897

5. Kumar N, Richa, Gauba K. Modified closed cap splint: Conservative method for minimally displaced pediatric mandibular fracture. Saudi Dental Journal 2018;30: 85-88

6. Kaban LB. Diagnosis and treatment of fractures of the facial bones in children 1943-1993. J Oral Maxillofac Surg 1993;51:722–729

7. Maniglia AJ, Kline SN. Maxillofacial trauma in the pediatric age group. Otolaryngol Clin North Am 1983;16:717–730

8. Tanaka N, Uchide N, Suzuki K, Tashiro T, Tomitsuka K, Kimijima Y, Amagasa T. Maxillofacial fractures in children. J Cranio-maxillo-facial Surg 1993;21:289–293

9. Mulliken JB, Kaban LB, Murray JE. Management of facial fractures in children. Clin Plast Surg 1977;4:491–502

10. Selle A, Thieme V. Injuries to the facial portion of the skull and their late effects in children and juveniles- a 10-year analysis (author's translation). Zahn Mund Kieferheilkd Zentralbl 1979;67:377–385

11. Dahlstrom L, Kahnberg KE, Lindahl L. 15 years follow-up on condylar fractures. Int J Oral Maxillofac Surg 1989;18:18–23

12. Troulis MJ, Kaban LB. Endoscopic approach to the ramus/condyle unit: clinical applications. J Oral Maxillofac Surg 2001;59:503–509

13. Rai A, Dali M, Shrestha S, Acharya P. Conservative management of mandibular fracture with maxillomandibular fixation using orthodontic brackets and elastics: A case report. Contemp Pediatr Dent 2020;1: 52–56

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Declarations

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