CASE REPORT

Modified Cap Splint: A Novel Approach to Treating Delayed Mandibular Fracture in Pediatric Patients

Shruti Jha[1], Ruchi Singhal[2], Nancy Goel[3], Ritu Namdev[4]

Abstract

Mandibular fractures in children, when compared to adults are quite less common. The treatment approaches for mandibular fractures differ in children due to their growth and developing dentition. Minimal manipulation of bony architecture is done to achieve a stable position. Thus a closed reduction is preferred in children. This article presents a case of an 8-year-old boy, mandibular left parasymphysis fracture with displacement of the left dentoalveolar segment which was managed by a novel treatment approach using a unilateral cap splint with interelastic traction.

Keywords: Case report, Fracture, Mandible, Occlusion, Pediatric patient.

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Introduction

The incidence of mandibular fracture in the pediatric age-group is less common when compared to that in adults, the range is 0.6–1.2%. The most common site involved in mandibular fracture is the condylar area followed by symphysis and parasymphysis fractures. Falls, traffic accidents, and sports-related accidents are the classic causes of fracture in children.[1] Degree of hard and soft tissue involvement and the extent of fracture line depends on the severity of the injury.[2] It has been observed that mandibular body and symphysis fractures in children are mostly undisplaced, this is because of the elasticity of the mandible which holds the fragments together, and a small dense condylar neck which tends to resist fracture.[3] Compared to adults, the treatment approach for mandibular fractures in children differs and varies because of the presence of permanent tooth buds. The management of these fractures should be directed to achieve the stability of the bony architecture and to restore form and function as less invasively as possible.[2]

In some situations where the fracture is displaced and unfavorable, various techniques have been mentioned in the literature for the management of such fractures like tape muzzles, circumferential wiring, acrylic splints, percutaneous skeletal fixation, open reduction, resorbable plates, orthodontic resin, modified orthodontic brackets, and rubber elastics in combination with orthodontic brackets and nickel-titanium staples.[4] However, the most preferred approach is closed reduction and immobilization.

This article reports a case of mandibular fracture with disturbed occlusion which was managed with a novel treatment approach using a unilateral cap splint with interarch elastic traction.

Case Description

An 8-year-old boy reported to the Department of Pedodontics and Preventive Dentistry, PGIDS, Rohtak, Haryana, India, with a history of falls 15 days back. There was no history of loss of consciousness, vomiting, or convulsion at the time of trauma. Extraoral examination revealed swelling on the left lower half of the face giving an asymmetric appearance (Fig. 1A). On mouth opening deviation of the mandible was seen toward the left side along with limited mouth opening (Fig. 1B). There was no cut or lacerations extraorally. On intraoral examination, the patient was in the mixed dentition stage with erupting maxillary and mandibular incisors. The left mandibular deciduous canine was avulsed after trauma. A step deformity was seen on the left mandibular canine region associated with lateral displacement of the whole left mandibular dentoalveolar posterior segment with left mandibular deciduous first molar to left mandibular permanent first molar altered occlusion and open bite (Fig. 2). To confirm the fracture an orthopantomogram (OPG) was advised. Based on the OPG findings mandibular left parasymphysis fracture was diagnosed (Fig. 3).

Fabrication of Cap Splint

Sectional alginate impression of the upper and lower arch was taken for the left side and stone casts were obtained (Fig. 4A). Acrylic cap splint was made for both the upper and lower arch (Fig. 4B). Cap splints were made in such a way to cover deciduous first, second molars and first permanent molar in both upper and lower jaw. The sectional arch bar was inserted, buccally in the mandibular cap splint and palatally in the maxillary cap splint. Usually, the cap splints are secured by circummandibular wiring. Here in our case, a unilateral cap splint was luted using glass ionomer cement. In order to increase the retention small perforations were made in the splint. Cross elastics or

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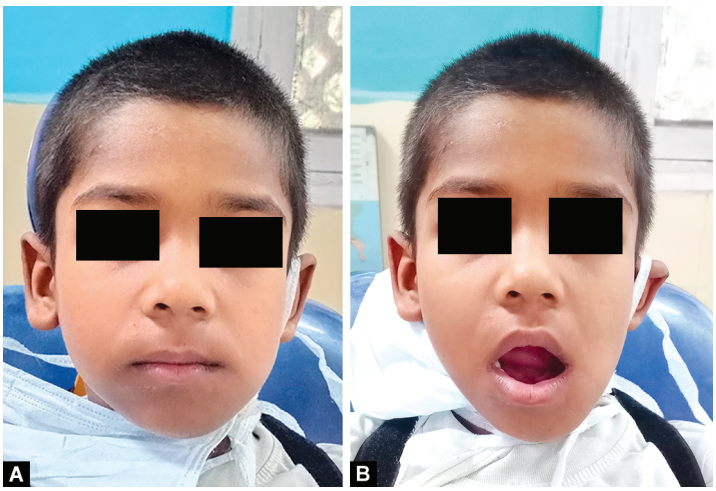
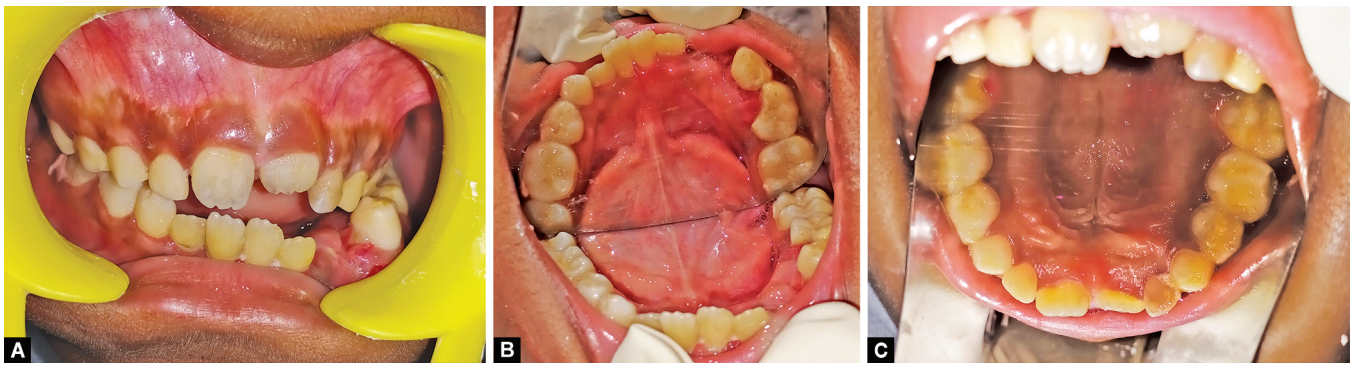


Figs 1A and B: (A) Preoperative extraoral frontal profile view of the patient showing extraoral swelling on the left side; (B) Showing deviation of the mandible on the left side on mouth opening



Figs 2A to C: (A) Preoperative Intraoral frontal view showing lateral displacement of the whole dentoalveolar posterior segment and limited mouth opening; (B) Intraoral mandibular occlusal view; (C) Intraoral maxillary occlusal view

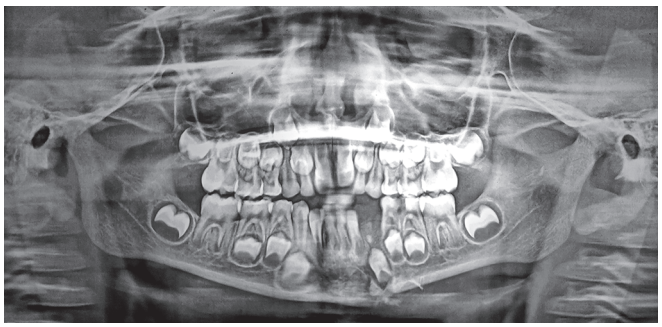
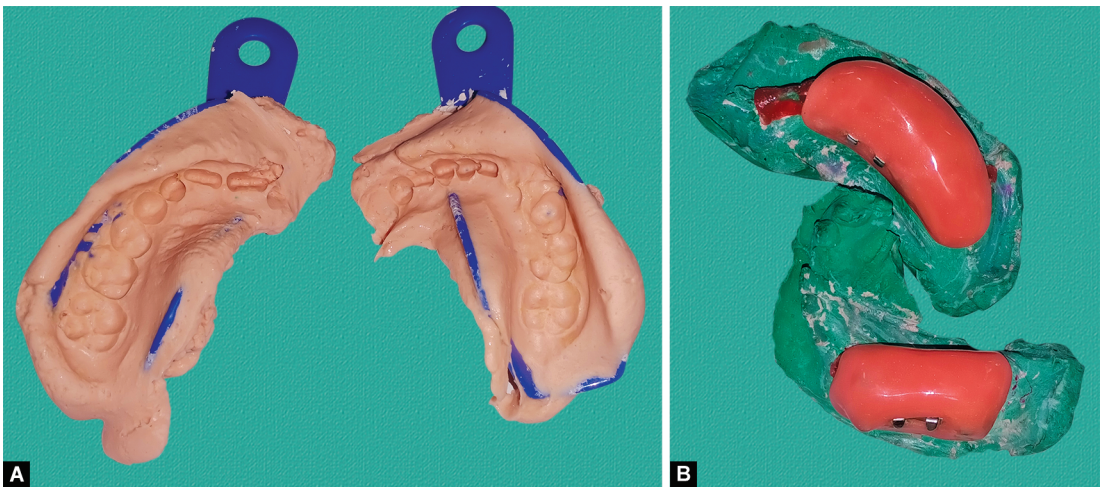


Fig. 3: OPG showing left parasymphysis fracture

guiding red color elastics were engaged from the buccal arch bar of the mandibular cap splint to the palatal arch bar of the maxillary cap splint (Fig. 5). Patient was instructed to change the elastics twice daily and to stay on a soft diet and minimal mouth opening. The guiding elastics were kept for 2 weeks after which the patient was followed up. After 2 weeks the unilateral cap splints were removed. Satisfactory occlusion was achieved by the end of 2 weeks with correction of posterior cross-bite on the left side (Figs 6A and B). The patient was given a slow maxillary expansion appliance for the remaining minor correction. The patient had been kept on monthly follow-up and had not complained of any problems. As the patient was in the mixed dentition stage with a permanent left mandibular canine adjacent to the fracture line, open reduction, and internal fixation was ruled out as treatment option. A conventional cap splint with circumferential wiring was not done as the trauma occurred 15 days back and fibrous callus might have formed and manual repositioning for a cap splint was not possible. Therefore a novel treatment approach was followed in which authors planned to provide a unilateral cap splint with provision for intermaxillary traction using elastics to apply reciprocal forces for correction of unilateral posterior cross-bite.

Discussion

The low incidence of facial fractures and minimal displacement of fragments in children is attributed to the high elasticity of young bones. A child with mandibular fracture clinically presents with similar signs and symptoms as in adults that is pain, swelling, trismus, derangement of occlusion, sublingual ecchymosis, step deformity, midline deviation, temporomandibular joint (TMJ) problems, tenderness, restricted movement, open bite, and crepitus.[2] Handling mandibular fractures in pediatric patients becomes challenging to the dentist due to their anatomic consideration, healing potential, level of cooperation, and growth variation.[5] Mandibular fractures which are nondisplaced can be easily managed by a conservative approach and those with severe displacement should be managed by intermaxillary fixation or open reduction and internal fixation using mini-plates. However, in the pediatric age-group, these techniques are infeasible due to the poor anchorage of resorbed roots of primary teeth and the risk of damage to the developing tooth germs which may violate the



Figs 4A and B: (A) Showing upper and lower arch segmental alginate impression; (B) Showing fabrication of a modified cap splint on the cast

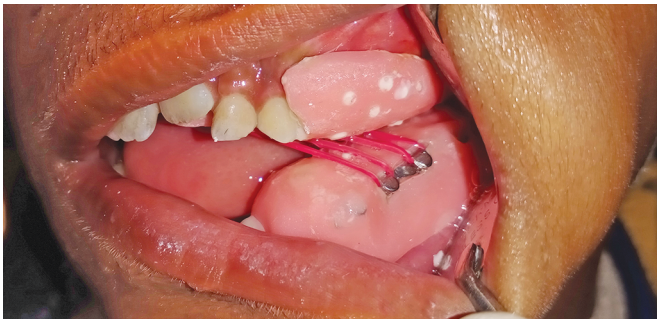
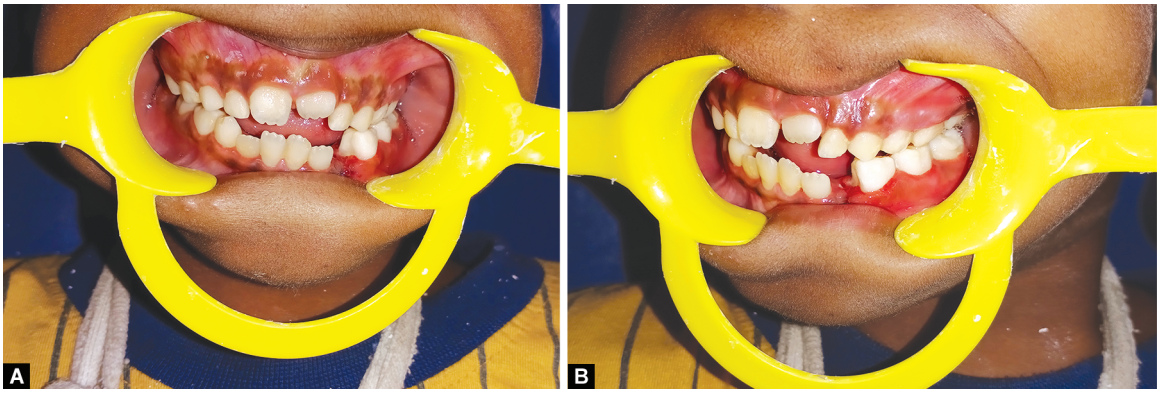


Fig. 5: Showing cementation of cap splint along with inter arch cross elastics



Figs 6A and B: (A) Postoperative intraoral frontal view showing correction of posterior crossbite; (B) Postoperative intraoral side view

normal growth and development of the mandible in a growing child. Intermaxillary fixation (IMF) restricts dietary intake which leads to weight loss and it is also associated with soft tissue and periodontal injury.[6] Prolonged IMF is not advisable in children because of the risk of TMJ ankylosis. Acrylic cap splints are a well-founded alternative to open reduction or IMF techniques as it is less time-consuming, cost-effective, provide better stability during the healing period, are less traumatic to the adjacent structures, easy to place and remove, and also comfortable for the pediatric age-group.[2]

Management of displaced mandibular fracture in children is a matter of debate between a conservative approach (arch bar, eyelets, and splints) and open reduction and internal fixation.[7] In our case, manual reduction was not possible as the patient had reported after 15 days of trauma and because there is excellent bone remodeling in children there would have been chances that the bony fragments might have partially united as early as 4th day and hence, it becomes very difficult to reduce the fragments by the 7th day.[8] Also open reduction and internal fixation (ORIF) was not considered due to the potential risk of injury to deciduous teeth and trauma to permanent tooth germ and the need for general anesthesia, hospitalization for application, and removal of the hardware materials after complete healing. We went for an alternative novel technique in which a unilateral acrylic cap splint was made for both the upper and lower arch in which an arch bar was inserted to engage cross elastics from the buccal of

the mandible to the palatal of the maxillary cap splint. The force exerted by the cross elastics helped in settling the occlusion. The ultimate aim was to reinstitute the underlying bony architecture and the occlusion to its preaccidental position in a firm and stable position as noninvasively as possible without functional or esthetic impairment. Our focus was to establish the occlusion as it is the best guide for the alignment of bony fragments. To the best of our knowledge, this is the first case where a unilateral cap splint was used to correct a displaced mandibular body fracture.

Various other treatment option includes orthodontic functional apparatus, intermaxillary fixation when possible, soft diet physiotherapy, composite splints, craniofacial bandages, and screws for intermaxillary fixation. The one with the least trauma and discomfort to the patient should be chosen considering the age, dentition, and classification of the fracture and its location.[9] A recent study has shown a lower complication rate in mandibular fractures treated by closed reduction than the fractures treated by open reduction. Chances of infection and wound dehiscence were more frequent with open reduction.[2] Development of resorbable osteosynthesis plates have made ORIF a more elective choice as it provides sufficient stability and favor accelerated healing. With time these plates degrade and resorb from the body and thus need for a secondary opening of the site is eliminated.[10] However it is costly and related to bone resorption adjacent to the plate.[11] Periodic long-term follow-up is important in mandibular fracture for early detection of any change in growth pattern, mandibular movements, or any crown root deformation of the teeth located in the fracture line.

Conclusion

Minimally displaced mandibular fractures should be managed by a conservative approach. However manual reduction becomes difficult in cases reporting after 15 days due to fibrous union between the fragments. Cases of mandibular fracture along with displacement of the dentoalveolar segment can be conservatively managed using a unilateral cap splint with interarch elastic traction.

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