Management of Mandibular Dentoalveolar Fracture in a Seven-year-old Patient with Vacuum formed Cap Splint: Case Report

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ABSTRACT

Dentoalveolar fractures are among the most frequent dental emergencies affecting 20–30% of children globally. Traumatic dental injuries (TDI) are a significant pediatric emergency and a major public health concern. These injuries may significantly impact the quality of life, often leading to long-term functional, esthetic and psychological issues. The management of dentoalveolar fractures depend on many factors such as the site, type and extent of the fracture, associated dental trauma, developmental stage of the tooth, and available adjacent teeth. A seven-year-old female patient reported with pain and swelling in the left lower side of the face following trauma one day earlier. Dentoalveolar fracture was confirmed after radiographic examination. This case report presents the conservative management approach of mandibular dentoalveolar fracture utilizing vacuum formed cap splint highlighting on its numerous benefits like ease of fabrication, precise fit, superior patient comfort, and satisfactory results, over other methods of stabilization.

Keywords: Cap splint; dentoalveolar; fractures; pediatric; trauma; vacuum formed cap splint.

INTRODUCTION

Dentoalveolar fractures are among the most frequent dental emergencies affecting 20–30% of children globally. Traumatic dental injuries (TDI) are a significant pediatric emergency and a major public health concern. These injuries may significantly impact the quality of life, often leading to long-term functional, esthetic and psychological issues.[1] Common reasons include falls, road traffic accidents, assault and child abuse. High prevalence of dentoalveolar trauma in children may be attributed to their less developed reflexive and balancing abilities, in addition to their playful nature and engagement in outdoor activities.[2] Dentoalveolar fractures occur when the alveolar process and teeth fracture as a unit, and may or may not involve the basal bone of maxilla or mandible. A thorough clinical and radiographic examination, proper diagnosis, and treatment planning are essential for favorable outcome.

Citation

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Management involves repositioning the fractured segment into its correct position followed by stabilization. Amongst a wide array of stabilization techniques for dentoalveolar fractures, commonly used options in children include splinting with composite and wire, acrylic cap splints, vacuum-formed thermoplastic splints, rigid arch bars, and modified orthodontic brackets.[3] However, special considerations need to be made in children, particularly in relation to the developmental stages of dentition in their growing jaws and probability of compliance. Recently, vacuum-formed thermoplastic resin splints have become a better alternative in the conservative management of mandibular jaw fractures in children, offering numerous advantages including easy fabrication, cost-effectiveness and better patient compliance.[3] Hence, this paper reports the use of a vacuum formed thermoplastic resin cap splint in the management of a mandibular dentoalveolar fracture in a seven-year-old female patient.

CASE REPORT

A seven-year-old female patient reported to the Department of Pediatric and Preventive Dentistry with the chief complaint of pain and swelling in the left lower side of the face following a fall injury one day back. There was no history of loss of consciousness, vomiting, and bleeding from ears and nose. Patient had received tetanus prophylaxis on the day of injury from the nearby clinic.

Extra-oral examination revealed facial asymmetry with contusion on left side of the mandible (Figure 1a). Temporomandibular joint (TMJ) showed no pain on movement with adequate mouth opening. On intraoral examination, laceration in mandibular anterior gingiva and buccal hematoma on left mandibular region was noted (Figure 1b, 1c). The mandibular anterior segment was mobile between 31 and 73, however, no occlusal discrepancy was observed. While the preoperative Orthopantomogram (OPG) was diagnostically inconclusive (Figure 2a), cone-beam computed tomography (CBCT) showed buccal cortical plate fracture between 31 and 32 with no tooth involvement in the line of fracture (Figure 2b, 2c). Conservative management with a vacuum formed cap splint was planned after taking consent from the patient's parents.

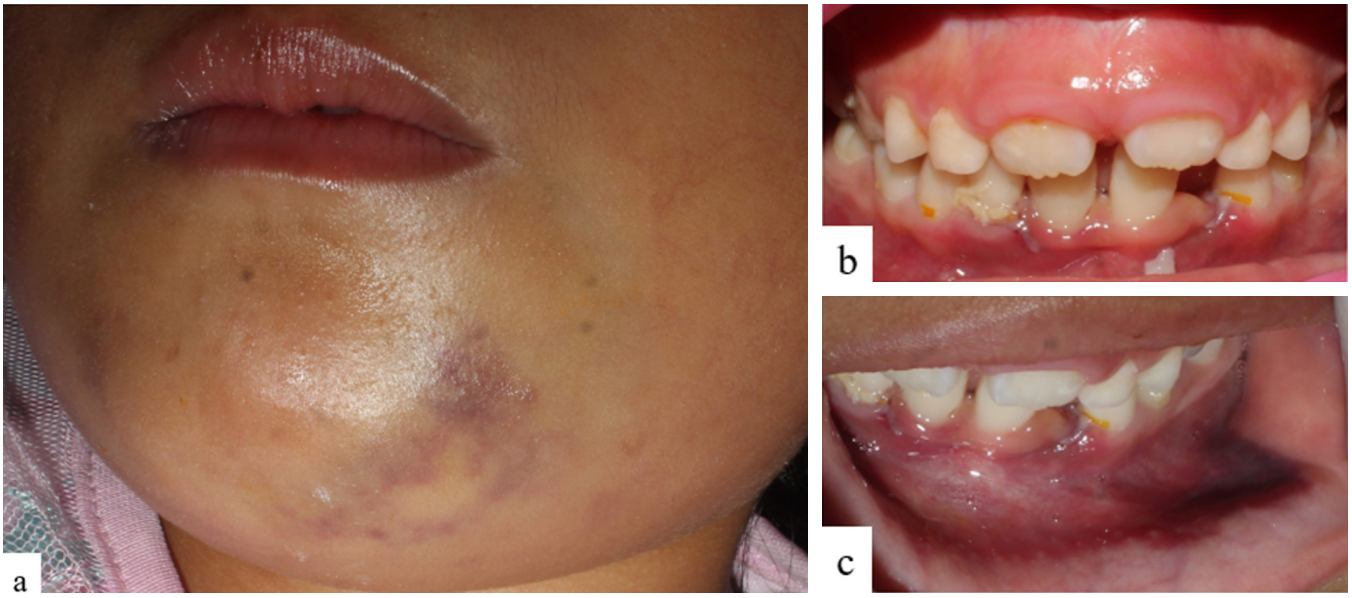

Figure 1: (a) Contusion on left side of the mandible; (b) Laceration in mandibular anterior gingiva; (c) Buccal hematoma on left labial and buccal vestibule.

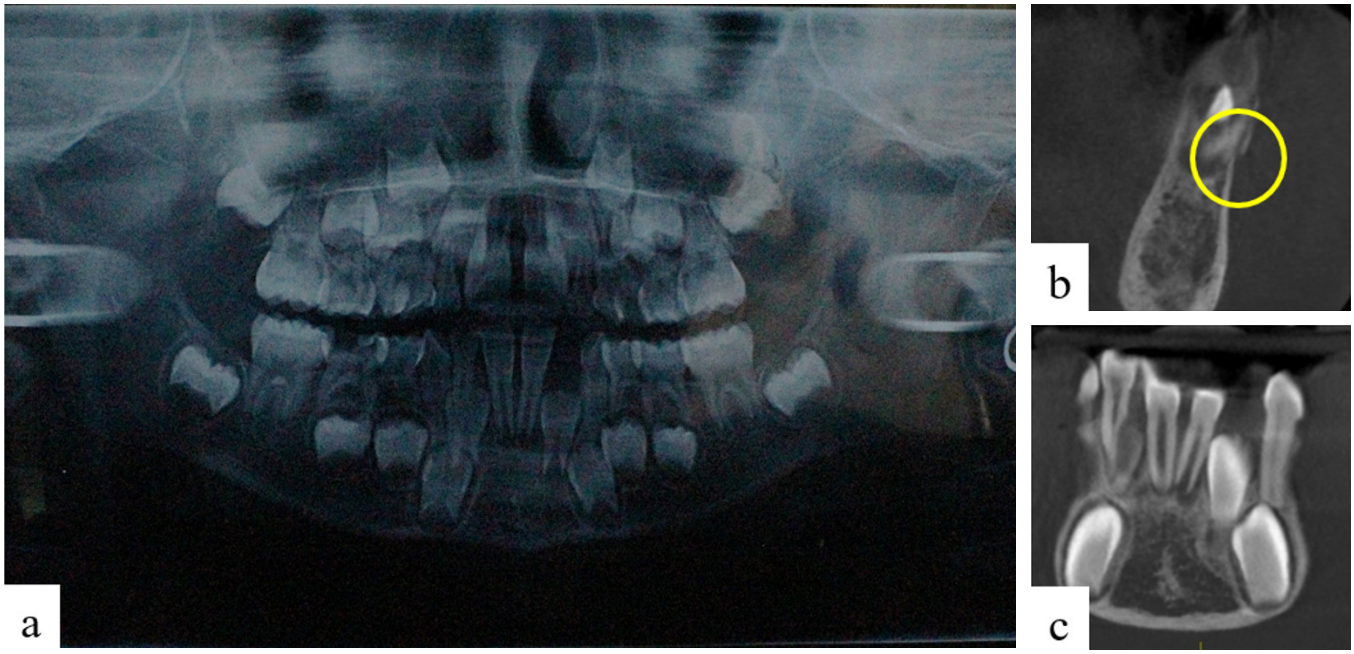

Figure 2: (a) Orthopantomogram inconclusive of any fracture; (b, c) Cone beam computed tomography showing buccal cortical plate fracture in the region of 31 and 32 with no tooth involvement in the line of fracture.

Under local anesthesia, impression of mandible was made using rubber base impression material and cast was prepared using dental stone. A thermoplastic sheet of Placa Crystal® (BioART) of 1.5mm was used to fabricate the splint with a vacuum forming machine (3A Medes Easy-Vac 2 Vacuum Former-Motor Type). The splint was trimmed and smooth borders were ensured before cementing it onto patient's oral cavity with glass ionomer cement (GC Gold Label Type 1 Luting and Lining, Japan) (Figure 3a, 3b). Postoperative instructions included soft diet intake for four weeks and maintenance of good oral hygiene. Antibiotics (Amoxicillin), Analgesics (Paracetamol + Ibuprofen) and 0.2% chlorhexidine mouthwash were also prescribed. A 2-week follow-up was made to evaluate the soft tissue healing. Following the International Association of Dental Traumatology (IADT) guidelines, removal of the splint was done at the end of 4-week stabilization period. Post-operative clinical and radiographic evaluation were suggestive of satisfactory healing of the fractured segments.

Figure 3: (a) Photograph of vacuum formed splint on patient's mandibular cast (b) Intraoral photograph showing vacuum formed splint cemented on patient's mouth (c) Intraoral photograph showing adequately healed fractured mandible on 4-week follow-up.

DISCUSSION

According to International Association of Dental Traumatology (IADT), the estimated prevalence of overall traumatic dental injuries (TDI) is 22.7%.[4] According to a study conducted in a tertiary hospital of Eastern Nepal, out of all facial injuries reported, 16% were dentoalveolar injury.[5] Dentoalveolar fractures involve the facial and/or lingual socket walls that support the teeth and are commonly associated with dental injuries. These fractures affect the tooth-bearing portion of the maxilla or mandible and may sometimes extend into the deeper basal bone. Isolated alveolar fractures typically result from low-impact trauma, such as falls, and are often non-displaced. [6] Our case presents isolated, non-displaced alveolar fracture.

Dentoalveolar injuries are frequently allied with facial fractures, with studies depicting that nearly 20% of patients with facial fractures had associated dentoalveolar injuries, including fractures involving non-tooth-bearing facial bones.[6] Several studies have found that boys are more frequently affected by traumatic injuries than girls.[7] Dentoalveolar fractures are difficult to assess as they often occur with dental or craniofacial trauma. Clinical and radiographic examination help determine the extent of injury for timely management. In children, premature tooth loss can affect function, esthetics, and speech, reducing their quality of life.[6] Common findings include displaced segments, tooth mobility, occlusal disturbance, and mucosal hematoma.[8]

Stabilization of the fractured segments can be achieved by using composite and wire splints, acrylic splints, circum-mandibular wiring, arch bars, or Gunning splints, open reduction and fixation, based on the severity of the fracture. These methods ensure normal occlusal alignment, preserve soft tissues, and promote healing.[9] But in case of pediatric patients, such techniques have limited scope due to poor anchorage/support from adjacent teeth as they are in different stages of development/resorption. Apart from that, there is risk of damaging the developing tooth germs.[8,9]

While managing dentoalveolar fractures in children, special considerations include their anatomical differences from adults, healing capacity, variable cooperation, and ongoing jaw development.[8] Complications are uncommon in pediatric trauma because children have higher osteogenic potential, faster healing capacity, and less frequent need for open reduction and internal fixation (ORIF).[9] Management of dentoalveolar fractures depend on fracture type, site, extent, associated dental trauma, developmental stage of tooth/teeth in the fracture line, and status of the adjacent teeth. Other factors like age of the patient, medical condition, patient compliance, time elapsed since injury, splint type opted, available resources, and surgeon's expertise, should also be considered during the management of pediatric dentoalveolar fractures.[1]

Acrylic cap splints are a reliable alternative to open reduction and fixation in case of pediatric patients. However, it is hard, bulky and lacks precise fit.[10] To overcome the shortcomings of acrylic cap splints, vacuum formed cap splints can be used for the management of dentoalveolar fractures. Vacuum formed cap splints are clear, rigid thermoplastic material commonly used to fabricate dental appliances like retainers, mouthguards, and splints. It was first used for the management of mandibular fracture by Lloyd in 2001. Vacuum-formed splints provide a conservative and effective way to stabilize dentoalveolar fractures. Vacuum-formed splints provide superior patient comfort, a precise fit to the teeth and alveolus, and more efficient fabrication as compared to traditional acrylic cap splints. Compared to arch bars and intermaxillary fixation, vacuum formed cap splints are easier to maintain oral hygiene, are ideal for periodontally weak tooth, widely spaced arch, and mixed dentition stage.[10]

SUMMARY

Traumatic injuries like dentoalveolar fractures are common in growing children. A conservative management approach utilizing vacuum formed cap splints provide efficient fabrication, precise fit to the teeth and alveolus, superior patient comfort, and satisfactory results.

ABBREVIATIONS

TDI : Traumatic dental injuries
IADT : International Association of Dental Traumatology
OPG : Orthopantomogram
CBCT : Cone-beam computed tomography
TMJ : Temporomandibular joint

CONFLICT OF INTEREST: None.

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