Case Report

Journal of Kathmandu Medical College, Vol. 9, No. 4, Issue 34, Oct.-Dec., 2020

Management of dentofacial trauma in an adolescent patient: The conservative and the preservative approach

Rai A[1], Koirala B[2], Dali M[3], Shrestha S[4]

[1]Amita Rai, Lecturer, Department of Pediatric and Preventive Dentistry, People's Dental College and Hospital, Kathmandu, Nepal; [2]Bandana Koirala, Professor and Head; [3]Mamta Dali, Associate Professor; [4]Sneha Shrestha, Assistant Professor, Department of Pedodontics and Preventive Dentistry, College of Dental Surgery, B.P. Koirala Institute of Health Sciences, Dharan, Sunsari, Nepal.

Abstract

Mandibular fractures are one of the most frequent occurrences in maxillofacial trauma. Age of the patient, presence of additional injuries, co-morbid diseases of the patient, trauma type, and localization of the fracture must be considered while choosing the treatment strategy. A 12-year-old female patient reported with the complaint of wound and pain in her face. There was history of fall injury while using tube well three days back. Clinical and radiographic findings revealed symphysis fracture with left sided parasymphysis and subcondylar fracture along with avulsion of 11 and 21. Intermaxillary fixation was done with Erich arch bars and elastics for the management of mandibular fracture, and rehabilitation of edentulous space was done using the avulsed teeth as pontics which were bonded to the adjacent abutment teeth using fiber-reinforced composite.

Key words: Arch bars; Mandibular fracture; Maxillo-mandibular fixation; Ribbond fiber prosthesis.

INTRODUCTION

Mandibular fractures are one of the most common type of maxillofacial injuries, which comprises about 38% of all maxillofacial fractures[1,2]. While treating patients with maxillofacial trauma, clinicians should aim to provide healing to both functional and cosmetic aspects. Various techniques have been developed to manage the mandibular fractures. Age of the patient, presence of additional injuries, co-morbid diseases of the patient, trauma type, and localization of the fracture must be considered when choosing the treatment technique[2]. In this case report, we used Erich arch bars (EAB) and elastics for inter-maxillary fixation (IMF) to manage mandibular symphysis fracture with left sided parasymphysis and subcondylar fracture in a 12-year-old female patient. Since there was avulsion of 11 and 21 also, the avulsed teeth were used as pontics to rehabilitate the edentulous space.

Access this article online

Website: www.jkmc.com.np

DOI: https://doi.org/10.3126/jkmc.v9i4.38097

HOW TO CITE

Rai A, Koirala B, Dali M, Shrestha S. Management of dentofacial trauma in an adolescent patient: The conservative and the preservative approach. J Kathmandu Med Coll. 2020;9(4):234-40.

Address for correspondence

Dr. Amita Rai
Lecturer, Department of Pediatric and Preventive Dentistry, People's Dental College and Hospital, Kathmandu, Nepal
E-mail: amitarai2013@gmail.com

ISSN: 2019-1785 (Print), 2091-1793 (Online)

CASE REPORT

A 12-year-old female patient reported to the department of Pedodontics and Preventive Dentistry, B.P. Koirala Institute of Health Sciences, Dharan, Sunsari, Nepal with complaint of wound and pain in her face. There was history of fall injury while using tube well three days back. On examination, there was swelling on the left side of mandible and temporomandibular joint, abrasion on the right side of chin, (Figure 1A) and decreased mouth opening. Intraorally, there was avulsed 11 and 21; open bite and unilateral posterior crossbite on the left side (Figure 1B); sublingual hematoma (Figure 1C); and deflection on mouth opening. Radiograph revealed, avulsed 11, 21, fracture line between 31, 41, and 32, 33, and fracture line on the left subcondylar region (Figure 2).

Based on the clinical and radiographic findings, diagnosis of symphysis fracture with left sided parasymphysis and subcondylar fracture along with avulsion of 11 and 21, was made. Treatment plan included reduction and immobilization using arch bars for four weeks, IMF using elastics for 10 days followed by guiding elastics, mouth opening exercises, and rehabilitation of edentulous space using avulsed teeth as pontics.

After fracture reduction, Erich arch bars were placed on both maxillary and mandibular arches followed by application of 3/16 inch heavy orthodontic elastics (Shinye, Hangzhou Shinye Orthodontic Products Co., Ltd, China) for IMF (Figure 3D, 4). The procedure was performed under local anesthesia (Lignocaine 2% with 1:200000 Adrenaline, LOX*2% Neon Laboratories Limited, Mumbai, India). Patient was advised to have a liquid diet only and to maintain good oral hygiene. The avulsed teeth were cleaned, root canal treated and placed in normal saline. After 10 days, interarch elastics were removed and guiding elastics were placed (Figure 3E). Patient was instructed to start mouth opening exercises. After one month, the arch bars were removed (Figure 3F, 3G).

The avulsed teeth were trimmed to fit in the edentulous space (Figure 5H). After etching with 37% Phosphoric acid gel (Meta Etchant, Meta Biomed Co., Ltd, South Korea), drying, and application of bonding agent (Tetric N-Bond, Ivoclar Vivadent), the attachment of the pontic teeth was done on the adjacent abutment teeth, using Fiber-reinforced composite (FRC) (Ribbond Bondable reinforcement ribbon, Ribbond-Ultra Ribbond Inc. USA) and composite (Tetric N-Ceram, Shade A1, Ivoclar Vivadent)(Figure 5J, 5K). Restoration of the smile and confidence of the adolescent girl was done (Figure 5I).

Patient was kept under regular follow-up, with good evidence of soft and hard tissue healing, and normal occlusion (Figure 6).

Figure 1: A. Preoperative extraoral frontal photograph; B. Preoperative intraoral frontal view; C. Preoperative intraoral mandibular occlusal view

Figure 2: **Preoperative orthopantomogram**

Figure 3: **D. Intermaxillary fixation using Erich arch bars and elastics; E. Ten-days follow-up photograph; F. One-month follow-up, after removal of arch bars; G. One-month follow-up, intraoral maxillary occlusal view**

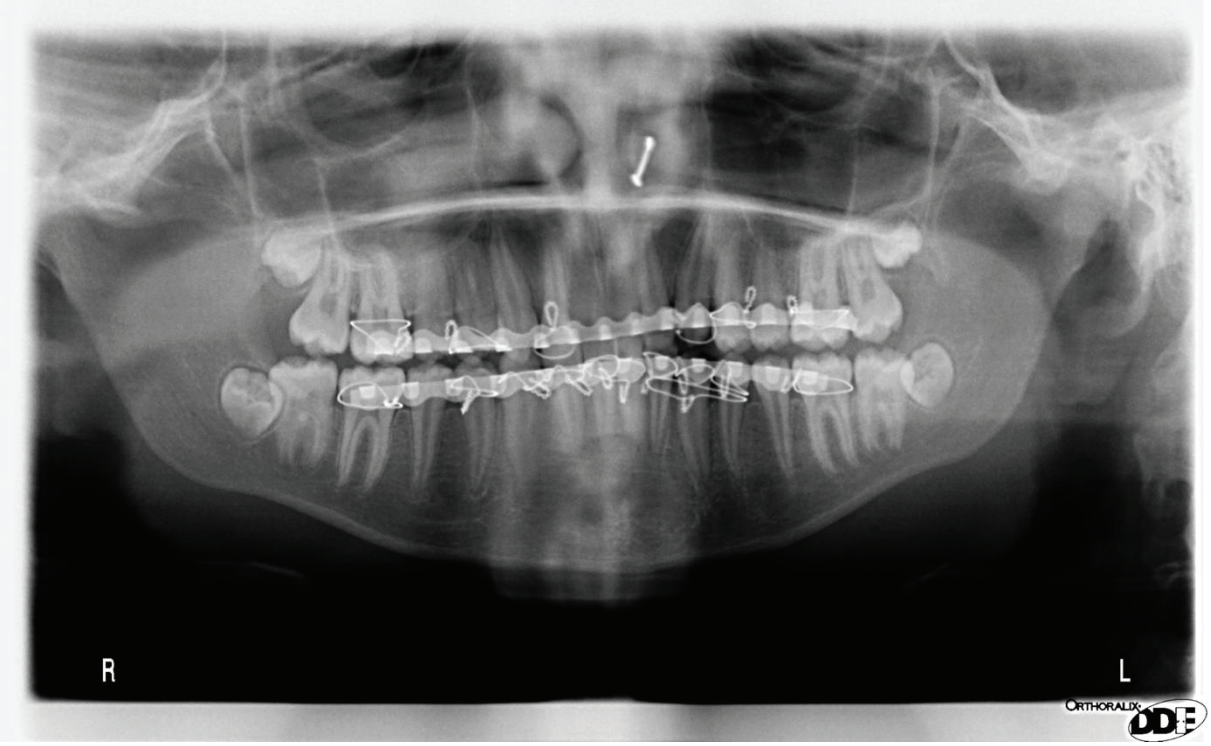

Figure 4: Immediate post-operative orthopantomogram.

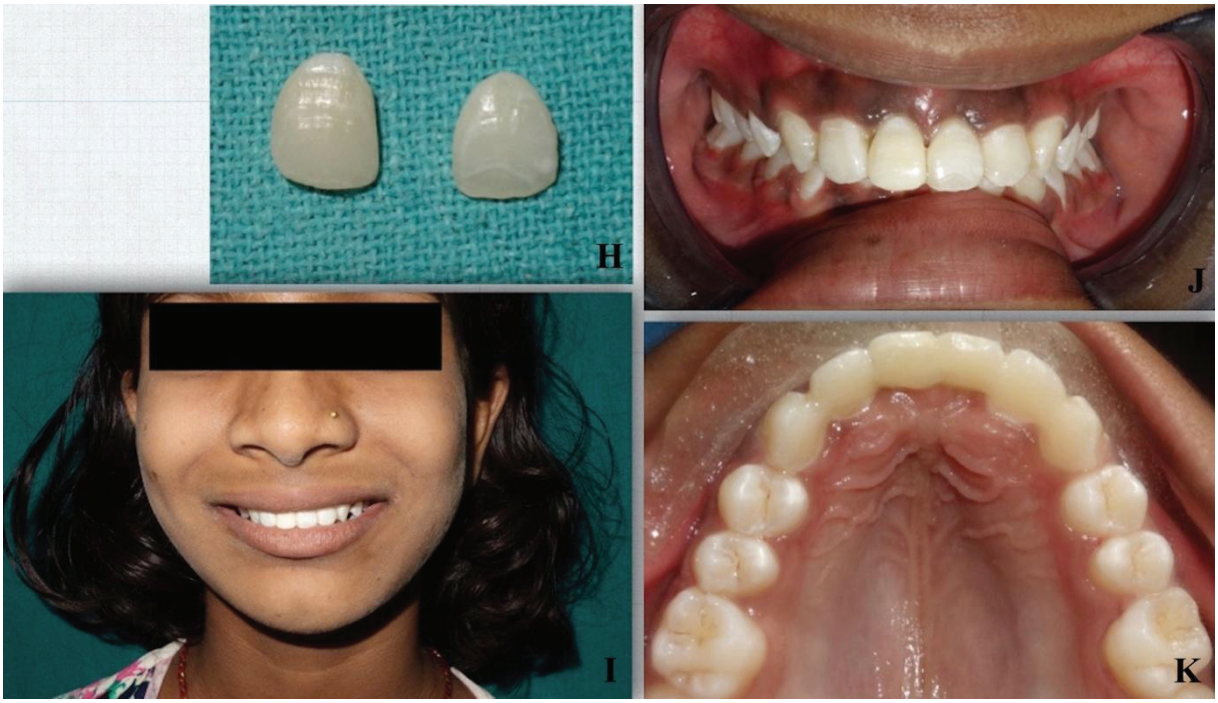

Figure 5: H. Avulsed teeth after preparation as pontics; I. Extraoral frontal photograph, after rehabilitation of edentulous space; J. Intraoral frontal view, after rehabilitation; K. Intraoral maxillary occlusal view, after rehabilitation.

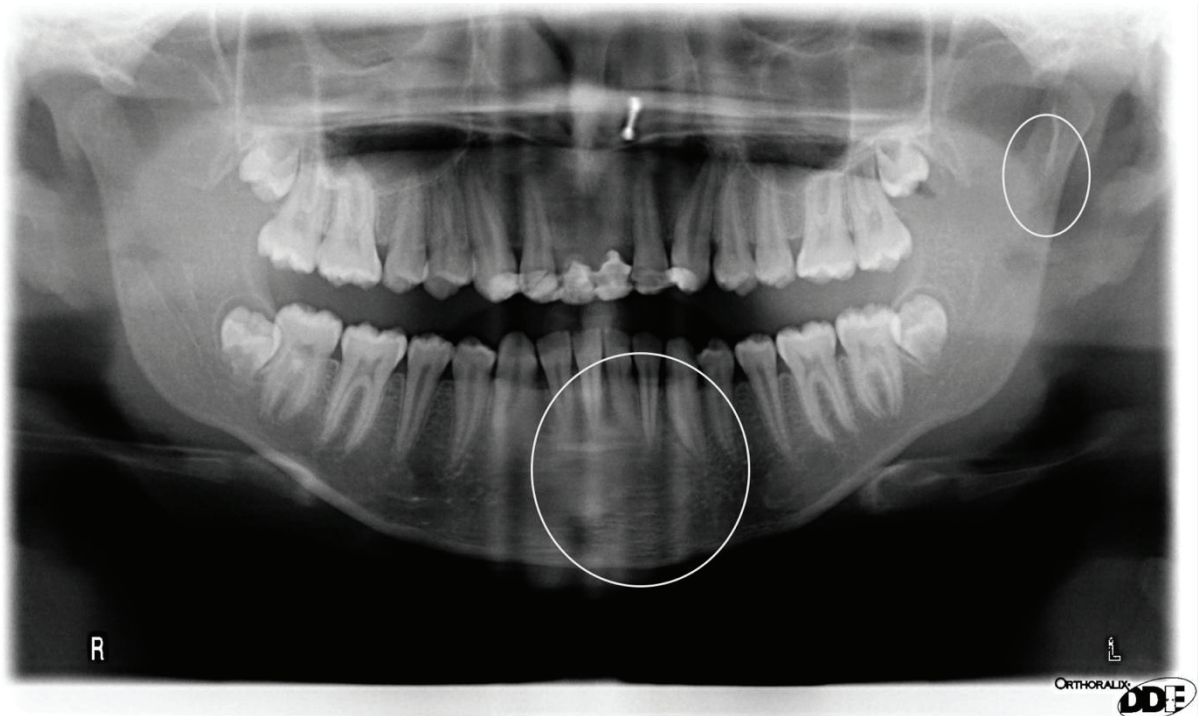

Figure 6: **Follow-up orthopantomogram after 18-months.**

DISCUSSION

Various options are available for management of maxillofacial fractures. Some of the examples are conservative management for undisplaced fractures through soft diet, IMF with the help of eyelet wiring and arch bars, circummandibular wiring with help of various types of splints, use of stents, different types of plates and screws[3].

Before the development of plates and screws, closed reduction with IMF was the treatment of choice for maxillofacial fractures. The EAB was regarded as the gold standard method of IMF, as it promoted better occlusal stability than the other methods available. The IMF time was about four to six weeks, and the IMF required to be stable during all this time[3]. Intermaxillary fixation using EAB is still the preferred method as this method is inexpensive, does not require sophisticated materials, and this can be performed by trained general dental surgeons in general dental set-up also. In addition to that, the advantage of not leaving foreign object in situ is always there. Conservative IMF is also preferred in conditions like, young patients with incomplete root development, unstable fractures or in doubt of the quality of open reduction and internal fixation (ORIF)[3]. There are some disadvantages of EAB application like long operating time, needle-stick injuries, high plaque index, periodontal damage, movement of the teeth in lateral and extrusive direction. EAB should be avoided in situations like presence of anterior open bite, in pediatric fractures with developing tooth-buds inside, patients with mental disorders, and in partial and completely edentulous jaws[3].

Another method of IMF is intermaxillary fixation screws (IFS) which was developed in 1989. IFS eliminates needle-stick injuries and decreases the operating time, as well as favoring better gingival health maintenance. However, IFS also has limitations, such as iatrogenic root injuries, screw fractures, mucosal coverage of the screw and screw loosening[3,4].

Nowadays, the choice of management of mandibular fractures is ORIF. ORIF allows shorter intermaxillary fixation period minimizing patients' inconvenience[3]. ORIF with titanium is a two-stage procedure because these plates are to be removed as they can cause restriction in growth and may act as nidus for infection if left in situ. The placement of screws may cause injury to the permanent tooth buds. Uses of resorbable plates though obviate the need for second surgery and resorb within a specific time frame but it is technique sensitive and requires complex procedure and is not cost-effective. Both methods for ORIF require periosteal stripping and may disturb the functional matrix and can cause developmental disturbances[5].

The factors which complicate the treatment of mandible in pediatric patients are presence of tooth buds of permanent teeth, roots of erupted permanent teeth in various stages of development, jaws in growth phase, anatomy of deciduous teeth not ideal for various types of wiring technique to achieve IMF and compliance of patient[5]. In the context of pediatric condylar fracture, closed treatment yields generally good results and adequate condylar remodeling with few major complications[6]. Therefore, conservative approach for management of mandibular fractures in pediatric patients is recommended[5].

Elastic bands are occasionally used in trauma patients to achieve proper occlusion and preserve it (ElasticIMF). They should be worn all the time without interruption or change when used for purpose of IMF. Elastic traction is placed between the hooks to partially immobilize the jaws as well as to approximate the jaws in good occlusion. Elastics IMF is used in cases of old fractures with mobile segments and bony callus formation; vertical step in occlusion; condylar fractures; minor occlusal adjustment after open reduction and internal fixation of jaw fracture[7]. One of the benefits of elastics for maxillomandibular fixation is that elastic IMF can readily be released by scissors in emergency situations like vomiting[8]. In this case report, conservative treatment modality using EAB and elastics for IMF was opted as the roots of permanent teeth were in various stages of development. We were able to achieve normal occlusion by the help of 'traction action' of the elastics in the follow-up visits.

Edentulism is not desired esthetic and function wise by any patient. In case of young patients, this aspect should be considered more seriously owing to their particular concern about their appearances. So, in our case, rehabilitation of edentulism was also our priority apart from management of fractured mandibles.

Different strategies for anterior prosthetic rehabilitation in children following dental avulsion have been described. The different techniques include attachment of artificial teeth in braces, tooth replantation, removable partial dentures, space closure with fixed orthodontic appliances, followed by reanatomization of lateral incisors and canines, adhesive prosthesis, and modified fixed prosthesis[9,10]. Oliveira et al. have reported placing a mini implant to rehabilitate edentulous area in anterior maxilla in a 10-year-old patient[9]. Some authors have mentioned using 26 gauge stainless steel wires to splint the pontic[11].

In our case, immediate replantation could not be considered as the accident had taken place three days back and the avulsed teeth were kept in dry medium. So, we opted for fiber-reinforced composite (FRC) bridges as FRC have shown good long-term and esthetic results with appropriate case selection, design and adhesion conditions. Clinical studies have also shown that FRC bridges can be used successfully in a period of 5 to 10 years[12]. This prosthesis acts as an interim prosthesis till the patient is fit for definite implant prosthesis later on. The advantage of using the patient's own teeth for rehabilitation is that, patient feels that his/her natural teeth rather than artificial ones have been put back. In addition to that, the concern of shape and shade matching of the pontic is also eliminated.

CONCLUSION

Dentoalveolar and jaw fractures are some of the most frequently encountered dental emergencies in case of pediatric patients. Conservative treatment modalities like closed reduction and IMF can be opted in pediatric dentoalveolar and jaw fractures when possible, as they have shown desirable results in context of healing, function and expenses. Rehabilitation of edentulism by interim prosthesis in young patients should also be a concern of treating clinicians, for which conservative methods are usually adequate to preserve esthetics and function.

ACKNOWLEDGEMENT

We would like to acknowledge Late Dr. Parisha Maharjan, Dental Surgeon, then working at Department of Pedodontics and Preventive Dentistry, and Dr. Vivek Kumar Mahato, Department of Oral and Maxillofacial Surgery, College of Dental Surgery College of Dental Surgery, B.P. Koirala Institute of Health Sciences, Dharan, Sunsari, Nepal for their valuable contribution in the emergency management of the patient.

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