

# Management of Dentoalveolar Fracture in an Eight-Year-Old Paediatric Patient: A Case Report

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## ABSTRACT

Traumatic injuries, which commonly occur in school-going children, usually result from accidents, falls from heights, contact sports, violence and other outdoor sports activities. The most common type of injury considered a dental emergency is dentoalveolar fractures. Fracture of the alveolar process usually involves the facial or lingual plates or both; most of these fractures are accompanied by injuries to teeth; thus, they are referred to as dentoalveolar fractures. Dentoalveolar trauma usually requires intraoral periapical and occlusal images to obtain adequate anatomic detail. Most of the fractures of the alveolar process are open with trauma to the gingiva and the alveolar mucosa. Radiographic examinations of traumatised teeth may demonstrate the extent of injury to the bone (maxilla or mandible) and the tooth, which may involve the root, periodontal ligament, and alveolar process. A tooth that has been concussed, subluxated, or luxated may demonstrate varying degrees of widening of the periodontal ligament space. This case report describes an eight-year-old male patient who presented with a mobile left upper segment with avulsed primary teeth, which followed the management of an anterior maxillary dentoalveolar fracture and uneventful eruption of the maxillary lateral incisor. The novelty in managing the paediatric dentoalveolar fracture using Ivy eyelet wiring lies in combining the standard Ivy loop with functional refinements- notably the extended eyelet for horizontal support, the loop designed for rapid and safe use, and the clove-hitch for minimal dentition scenarios. Together, these modifications elevate an already trusted method, tailoring it effectively to the needs of an eight-year-old patient.

**Keywords:** Ivy eyelit wiring, Paediatric facial trauma, Tooth eruption, Traumatic dental injuries

## CASE REPORT

An eight-year-old male patient reported to the Department of Paediatric and Preventive Dentistry, with the chief complaint of trauma to the upper front teeth region after he had a fall from the first floor of their building three days back. Three days prior to presentation, the patient fell from the first floor of their building while playing. The injury resulted in the complete avulsion of the maxillary primary lateral incisor.

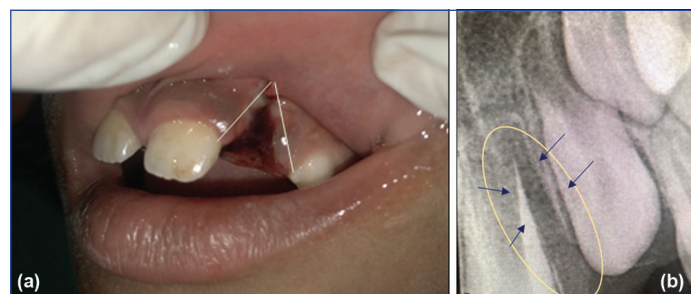
There was no history of loss of consciousness, orientation/mental status, bleeding from the nose, convulsions or vomiting. There was a positive history of bleeding from the site of trauma, intraorally. The patient was taken to a local private hospital, where tetanus toxoid was administered. Medications to relieve pain were prescribed to the patient, the details of which were not known to the parents. Swelling of the upper lip was noted by the parents, which resolved two days later, after taking medications.

On extraoral examination, the patient was conscious and cooperative at the time of examination. Abrasions were present over the right side of the nose and haemorrhage was absent and there was no Temporomandibular Joint (TMJ) deviation/asymmetry.

On intraoral examination, it was revealed that an inverted "V" shaped dentoalveolar fracture, as depicted in [Table/Fig-1a], with dislodgment of the fractured segment involving the maxillary left permanent lateral incisor space. Oedema over the dentoalveolar ridge was present. The fractured segment was mobile and tender on palpation. The permanent left central incisor showed Grade II mobility.

Investigations were carried out, which included radiovisiography (RVG) with respect to 21 and 22 showing fracture line between 21 and 22 (unerupted), as depicted in [Table/Fig-1b]. It also depicts increased space between 21 and 22, discontinuity of lamina dura distal to 21 and an Orthopantomogram (OPG), which revealed a fracture line can be appreciated as there is an increase in distance

between 21 and 22 when compared to the contralateral side w.r.t. 11 and 12, as depicted in [Table/Fig-2]. Radiographic examination ruled out the presence of other concomitant fractures.



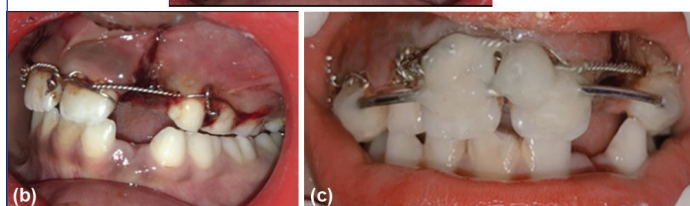
**[Table/Fig-1]:** a) Inverted V-shaped dentoalveolar fracture can be seen clinically; b) Radiovisiography (RVG) showing fracture line between 21 & 22 (unerupted), increased space between 21 and 22, Loss of lamina dura distal to 21.



**[Table/Fig-2]:** Fracture line can be observed as there is an increase in distance between 21 and 22 when compared to the contralateral side w.r.t. 11 and 12. Avulsed 62 and 72 can also be well appreciated on the OPG.

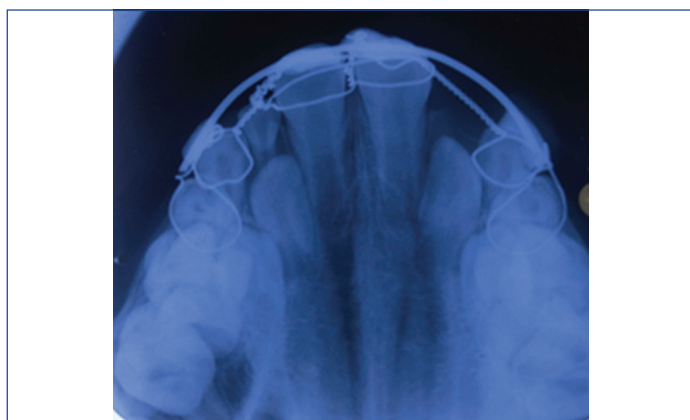
When the alveolar bone segment is mobile and includes permanent or deciduous teeth, closed or minimally invasive repositioning under local or general anaesthesia is preferred. These include splinting

using ligature wires/NiTi wire and stabilising using composites, or acrylic cap splints, which can be luted using type I glass ionomer cement. In the patient, treatment planning was done and closed reduction using Ivy eyelet wiring technique was carried out. Eyelet wiring technique was used to reduce the fracture line involving maxillary primary molars bilaterally because the fragment was very much mobile and the patient did not receive any treatment for three days; hence, to prevent malunion, a rigid reduction technique was also required for the uneventful eruption of the permanent lateral incisor as depicted in [Table/Fig- 3a-c].



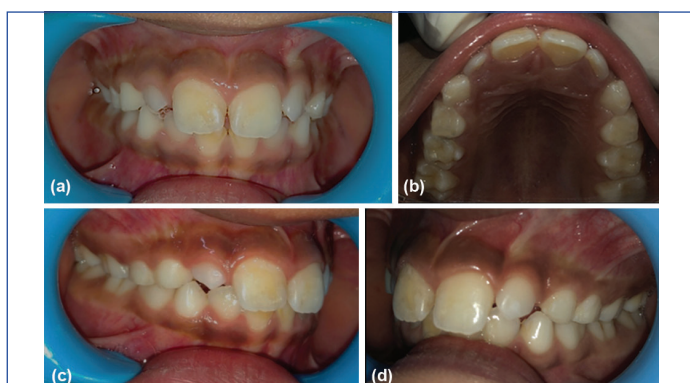
**[Table/Fig-3a-c]:** a) showing immediate postoperative pictures after carrying out the Ivy eyelet wiring with respect to the maxillary arch; 3b) and composite tags; 3c) to prevent injury due to free ends of the wire used, though aesthetically not very pleasant, but was done in order to prevent any injury to the soft-tissues.

The eyelet wiring was performed encircling 54-53, 11-21, 63-64. Nineteen-gauge stainless steel wire was used for additional stabilisation involving 53, 11, 21 and 63, which can be well appreciated in the occlusal view X-ray [Table/Fig-4].



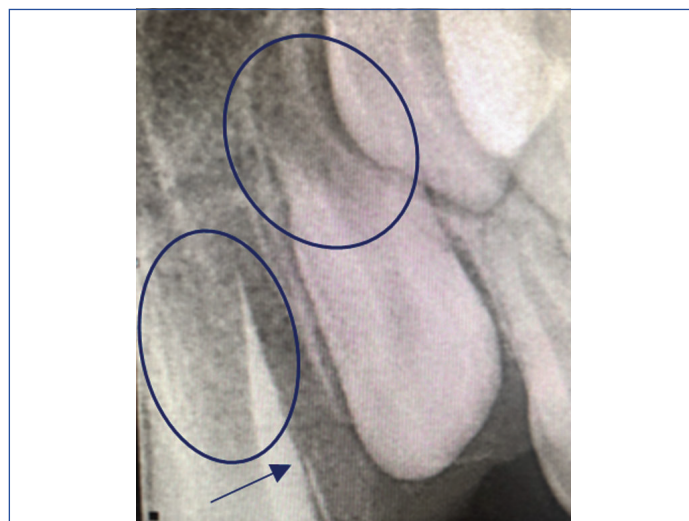
**[Table/Fig-4]:** Showing occlusal radiograph with ivy eyelit wire intact one week postoperatively.

Intraoral pictures in the [Table/Fig-5a] show a frontal view with lateral incisors erupted into the oral cavity. [Table/Fig-5b] shows the occlusal view of the maxillary arch with 22 erupted uneventfully. [Table/Fig-5c,d] shows the right and left lateral views, respectively.

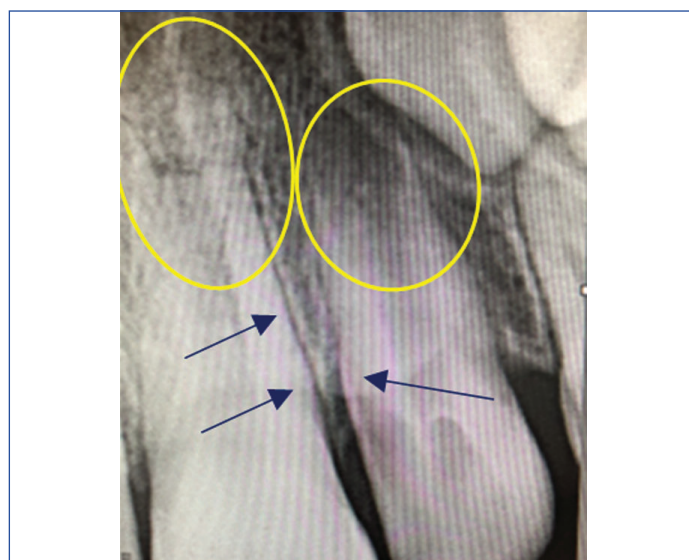


**[Table/Fig-5a-d]:** Intraoral pictures with 12 months follow-up.

Pre-operative RVG [Table/Fig-6] shows tooth number 21 representing Nolla stage 8, tooth number 22 with Nolla stage 7, which can be well appreciated. On the other hand, 12 months follow-up RVG [Table/Fig-7] shows tooth number 21 with Nolla stage 9, tooth number 22 with Nolla stage 8 and can be well appreciated. The uneventful eruption of 22 could also be noted.



**[Table/Fig-6]:** Pre-operative RVG showing 21 Nolla stage 8 22 Nolla stage 7.



**[Table/Fig-7]:** Postoperative RVG showing 21 Nolla stage 9, 22 Nolla stage 8.

## DISCUSSION

Traumatic injuries to the dentofacial region in children and adolescents due to various reasons such as falls, blow injury, sports injury, or road accidents may often lead to avulsion of anterior teeth, dentoalveolar and jaw fractures [1]. The incidence of dentoalveolar injury in children is variable, which most commonly involves the anterior maxillary segment followed by the anterior mandibular segment [2].

Making a decision in regard to the management of paediatric fractures is highly crucial since treating and managing paediatric patients is very challenging as compared to adult patients due to a number of factors responsible such as the type of dentition, smaller jaw sizes, cooperation by the child and unerupted permanent teeth [3,4].

The prime objective to treat a paediatric patient with a dentoalveolar fracture is to reduce the fracture in order to restore the underlying bony structure to its pre-injury position at the earliest and restore the occlusion, function and aesthetics [5].

There are various treatment modalities and ones that are mainly used include acrylic splints [6]. But in this case report, Ivy eyelet wiring was used in a child in his mixed dentition stage.



Acrylic splints or open cap splints are easy to fabricate, but they lack stability and strength. These can get dislodged and may require recementation, causing delay in healing and causing malunion in case of failure to come up for recementation [7,8]. Non-union can occur as a result of a variety of causes, including poor patient compliance with postoperative instructions and systemic conditions, which can result in insufficient repair of the bone [9]. Routinely, these are used in stabilising mandibular fractures, as they can be stabilised using circummandibular wires or using Glass Ionomer cements for luting [10].

The treatment modality used in this study, i.e., Ivy eyelet wiring gives a good decreased position, periosteal sleeve continuity, and soft-tissue preservation, resulting in a favourable environment for accelerated osteogenesis and remodelling processes, as well as the prevention of non-fibrous union, as depicted in [Table/Fig-3a-c] and depicted in occlusal view postoperatively as shown in [Table/Fig-4] [11]. Also, it is a more rigid and stable method to immobilise the fractured dentoalveolar segment. It is done under local anaesthesia and can be carried out if the patient is cooperative [12]. Since, it encircles the teeth gently without exerting any excessive pressure or forces neither on the primary teeth nor on the permanent teeth because excessive forces if encircled around a primary teeth can cause extrusion and if encircled around a young permanent tooth can lead to root resorption of the tooth, but the Ivy eyelet wiring was carried out gently and it just aimed to reduce the dentoalveolar fracture and maintaining space for eruption of the maxillary permanent lateral incisor (#22). Treatment of dentoalveolar fracture involves reduction and immobilisation of the segment and stabilisation for at least two to four weeks [13].

Other surgical interventions, such as bone plating with stainless steel or titanium plates, can cause obstruction for the eruption of the permanent dentition or harm the tooth bud of permanent teeth. Another alternative is a resorbable plating system; however, it is a technique-dependent and cost-effective procedure. Furthermore, the two procedures mentioned necessitate to give a wide vestibular incision, which may result in a sublingual haematoma, postoperative oedema, or it may cause any damage to the facial or to the mental neurovascular bundle [13].

With this case report, we hope to explain the minor surgical method that will have better success results and aid in the uneventful eruption of the permanent teeth, especially in the maxillary dentoalveolar fractures, when compared to conventional methods.

## CONCLUSION(S)

In the presented paediatric case, Ivy eyelet wiring enabled effective closed reduction and stabilisation of the dentoalveolar fracture, ensuring anatomical repositioning with minimal invasiveness. Despite potential technical challenges posed by the shorter deciduous crowns common in five to eight year old, the narrow tooth cervix offered sufficient retention for the wiring method. The approach capitalised on children's superior bone healing and preserved developing tooth buds, thus supporting functional recovery while minimising risk to permanent dentition. This case underscores Ivy eyelet wiring as an expedient, cost-effective option for paediatric dentoalveolar fractures, facilitating prompt occlusal restoration with conservative handling.

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