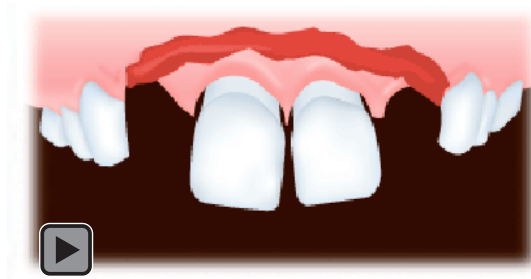


Severe Fracture of the Maxillary Alveolar Process Associated with Extrusive Luxation and Tooth Avulsion: A Case Report

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Abstract

Aim: The aim of this report is to present a case of severe fracture of the maxillary anterior alveolar process with substantial bone dislodgement associated with extrusive tooth luxation and avulsion.

Background: Dentoalveolar trauma is a challenge to dentistry, especially in young patients, for it can lead to early tooth loss which compromises oral function, esthetics, self-esteem, and alter the long-term plan of care for the victim.

Case Report: A 12-year-old girl with severe dentoalveolar trauma to the maxillary anterior region presented for emergency care for her injury. Treatment consisted of fracture reduction of the alveolar process, repositioning of the teeth that had suffered extrusive luxation, placement of a semi-rigid splint, and suturing of soft tissue lacerations. The traumatized teeth presented with pulpal necrosis and were treated endodontically. After 24 months of follow up, the fracture of the alveolar process was completely healed and the displaced teeth presented no signs of ankylosis or root resorption.

Summary: First-aid care contributed remarkably to this case allowing the re-establishment of esthetics, function, and patient's self-esteem. In spite of trauma extension the treatment outcomes were favorable.

Clinical Significance: Cases of dentoalveolar trauma should be evaluated on an individual basis. However, early emergency management and adequate follow-up can prevent further complications and contribute to treatment success.

Keywords: Alveolar process, tooth injuries, tooth avulsion, wounds, injuries

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Introduction

Dentoalveolar trauma is a challenge to dentistry, especially in young patients, for it can lead to early tooth loss which compromises oral function, esthetics, self-esteem, and alter the long-term plan of care for the victim. Its sequelae produce not only biological damage, such as alterations in the stomatognathic system, but also psychological impairment.¹

Dental injuries have been classified according to a variety of factors, namely etiology, anatomy, pathology, and therapeutic considerations. The classification system adopted by the World Health Organization (WHO) in its Application of International Classification of Diseases to Dentistry and Stomatology applies to both permanent and primary teeth. The classification includes injuries to hard dental tissues and the pulp, periodontal tissues, supporting bone, and the gingiva or oral mucosa. Fracture of the maxillary or mandibular alveolar process is a type of injury to the supporting bone.² Fractures of the alveolar process are the second most common type of maxillofacial fractures in children with only mandibular fractures occurring more frequently.^{3,4}

The diagnosis of fracture of the maxillary or mandibular alveolar process should be based on a detailed clinical examination and confirmed radiographically. Because this type of fracture requires reduction^{5,6} and rigid fixation, proper emergency management is of paramount importance for a successful treatment outcome. Traumatized teeth may undergo necrosis and inflammatory resorption, especially when the fracture is associated with extrusive luxation. However, these sequelae can be prevented if endodontic treatment is performed.^{7,8} This type of fracture may or may not involve the alveolar socket. When the socket is involved, concomitant traumatic injuries such as injuries to the periodontal tissues are frequent² making treatment more difficult and the prognosis guarded.

Case Report

A 12-year old female patient sustained severe dentoalveolar trauma to the maxillary anterior region due to a bicycle fall on the street. She received first aid at the accident site from paramedics of the Fire Brigade Service and was taken to the nearest emergency room for further care. After clinical and neurological examination, the patient was referred to the Oral and Maxillofacial Traumatology and Surgery Service of the School of Dentistry of Araçatuba (UNESP, Brazil) for emergency management of orofacial injuries.

Diagnosis

The extraoral examination revealed a lacerated contused wound, abrasion, and edema on the upper lip. Intraoral findings included the following (Figure 1):

- Gingival lacerations extending from the mesial of the maxillary right canine to the mesial of maxillary left canine
- Absence of the maxillary lateral incisors on both sides
- Fracture of the maxillary alveolar process with a substantial bone dislodgement associated with extrusive luxation of both maxillary central incisors
- Loss of buccal alveolar bone
- Bone exposure and bleeding



Figure 1. Pretreatment clinical view.

Treatment

Emergency management consisted of reducing the fracture of the alveolar process under local anesthesia, repositioning the displaced central incisors, placement of a provisional splint using a 0.7 mm stainless steel orthodontic wire (Dental Morelli, Sorocaba, SP, Brazil), and a quick-setting cyanoacrylate ester adhesive (Super Bonder® Instant Adhesive, Rocky Hill, CT, USA). The lacerated extraoral and intraoral soft tissues were then sutured with 5-0 nylon thread and 5-0 catgut (Shalon Fios Cirúrgicos Ltda., São Luís de Montes Belos, GO, Brazil) (Figures 2 and 3). The avulsed lateral incisors were not found.

The following medications were prescribed:

- A cephalosporin antibiotic (Cephalexin 500 mg, every 8 hours for 7 days; Eli Lilly do Brazil Ltda, São Paulo, SP, Brazil)
- An antiinflammatory (Potassium diclofenac 50 mg, every 8 hours for 3 days; Novartis Biociências SA, São Paulo, SP, Brazil)
- An analgesic (Paracetamol 750 mg, every 6 hours in case of pain; Aventis Pharma Ltda, Suzano, SP, Brazil)



Figure 2. Reduction of the fracture of the alveolar process and placement of the provisional splint.

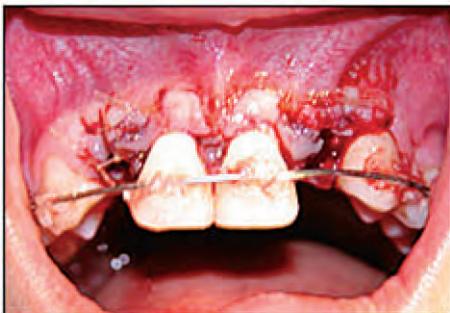


Figure 3. Clinical aspect after reduction of the fracture of the alveolar process, splinting, and suture of the intraoral soft tissue lacerations.

An anti-tetanic vaccine was not required because the patient had been previously immunized. The treatment proceeded at the Integrated Clinic Discipline of the School of Dentistry of Araçatuba, UNESP, Brazil. Two weeks following the initial care pulp necrosis developed in the traumatized maxillary right and left central incisors. Endodontic therapy was initiated with the placement of calcium hydroxide-based intracanal dressing for 15 days followed by definitive root canal filling with gutta-percha points (Tanari; Tanariman Industrial Ltda., Manacapuru, AM, Brazil) and Sealapex root canal sealer (Kerr Corp., Orange, CA, USA) (Figure 4).



Figure 4. Radiographic view after root canal filling.

Prior to root canal therapy the provisional splint was replaced with stainless steel orthodontic wire and light-cured composite resin to provide further retention of the affected incisors and remained in place for two more weeks (total retention time of four weeks). A temporary removable partial denture was then constructed to reestablish esthetics and attenuate the psychological impact caused by the loss of the maxillary lateral incisors until she reached an older age when definitive prosthetic treatment can be rendered (Figures 5 and 6).

Despite the extent of the trauma the treatment approach had favorable outcomes. After 24 months of follow-up, the fracture of the alveolar process was repaired and the displaced central incisors were correctly positioned with no



Figure 5. Provisional rehabilitation with a temporary removable partial denture.



Figure 7. Clinical aspect after 24 months of follow-up.



Figure 6. Patient's frontal view after placement of the temporary removable partial denture.



Figure 8. Radiographic aspect after 24 months of follow-up.

clinical or radiographic signs of ankylosis or root resorption (Figures 7 and 8). The patient has been followed up clinically and radiographically every 6 months to assess the long-term treatment outcomes as well as to establish the best possible definitive rehabilitation treatment when she reaches an older age.

Discussion

A higher prevalence of dental trauma in children and adolescents has been confirmed by different authors in several countries.⁹⁻¹³ The maxillary anterior teeth are the most commonly affected,^{9,14,15} and the central incisors present the highest risk of dentoalveolar trauma.^{15,16} Falls, collision with other people or objects, sports activities, traffic accidents, and violence are the main etiological factors.^{9,17-20} In the present case the fracture of the maxillary alveolar process involved the alveoli of the central incisors, causing the displacement of these teeth within the bone and consequent damage to the pulp and periodontal ligament. Such traumatic events are not uncommon, as reported elsewhere.^{2,7}

Bone and periodontal ligament healing is directly influenced by repositioning the dislodged structures to their original site which was accomplished satisfactorily in the present case. A four week splinting time is usually advised for this type of trauma,⁵ but it can be shortened to three weeks in children because of their faster healing capacity.² In case of injuries to the pulp, the possibility of revascularization is inversely proportional to the level of apexification and narrowing of the apical foramen of the traumatized tooth. Andreasen²¹ investigated the prevalence of complications after traumatic luxations and found 64% of pulp necrosis, 24% of pulp obliteration, 6% of progressive root resorption, and 7% of marginal bone loss in cases of extrusive luxation.

In cases of association of alveolar process fracture and extrusive luxation the occurrence

of pulp necrosis is directly related to the time elapsed between the traumatic injury and tooth repositioning and the stage of root development.⁷ In another study Andreasen and Pedersen²² reported a lower frequency (26%) of pulp necrosis with this type of tooth luxation, which indicates root canal therapy is not required in most cases. In the present case several factors contributed to the occurrence of pulp necrosis. The traumatized teeth had complete root formation, there was a substantial displacement, and the association of fracture of the maxillary alveolar process with bone exposure.

The endodontic treatment started 15 days after trauma with placement of a calcium hydroxide-based dressing whose biologic properties, especially antimicrobial activity²³ and a toxin neutralizing effect,²⁴ facilitates the repair process.²⁵ Progressive root resorption is not common in cases of extrusive luxation^{2,21} so the maintenance of the intracanal medication for a long-time was not necessary in this case.

The rehabilitation of patients who sustain traumatic injuries with tooth loss is frequently a challenge because the most affected age group is young people (children and adolescents). For adolescents, orthodontic treatment seems the most indicated choice, but a detailed examination

should be undertaken by an orthodontist before a final plan of care is formulated. If orthodontics is chosen for teeth involved in extensive traumatic injuries, a waiting time of at least one year is advised before treatment is initiated.² The use of a temporary partial denture is sometimes the only possible option until the injured tissues are completely healed and patient is old enough to receive definitive rehabilitating treatment.

Summary

Early and efficient emergency management is of paramount importance for successful treatment in cases of dentoalveolar trauma. In the present case, the adequate first-aid care contributed remarkably allowing the reestablishment of esthetics, function, and patient's self-esteem. In spite of the extent of the trauma treatment outcomes were favorable in terms of repair of the fracture of the alveolar process and no signs of ankylosis or resorption of the traumatized teeth.

Clinical Significance

Cases of dentoalveolar trauma should be evaluated on an individual basis. However, early emergency management and adequate follow-up can prevent further complications and contribute to treatment success. Dental professionals as well as first responders such as paramedics should be prepared to handle and treat this type of incident.

References

1. Alonge OK, Narendran S, Williamson DD. Prevalence of fractured incisal teeth among children in Harris County, Texas. *Dent Traumatol* 2001; 17:218-21.
2. Andreasen JO, Andreasen FM. Textbook and color atlas of traumatic injuries to the teeth. In: Andreasen JO, Andreasen FM (Editors). Porto Alegre: Artmed Editora; 2001. p.151-180.
3. Iida S, Matsuya T. Paediatric maxillofacial fractures: their aetiological characters and fracture patterns. *J Craniomaxillofac Surg* 2002; 30:237-41.
4. Qudah MA, Bataineh AB. A retrospective study of selected oral and maxillofacial fractures in a group of Jordanian children. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002; 94:310-4.
5. Flores MT, Andersson L, Andreasen JO, Bakland LK, Malmgren B, Barnett F, Bourguignon C, DiAngelis A, Hicks L, Sigurdsson A, Trope M, Tsukiboshi M, von Arx T. Guidelines for the management of traumatic dental injuries. I. Fractures and luxations of permanent teeth. *Dent Traumatol* 2007; 23:66-71.
6. Flores MT, Malmgren B, Andersson L, Andreasen JO, Bakland LK, Barnett F, Bourguignon C, DiAngelis A, Hicks L, Sigurdsson A, Trope M, Tsukiboshi M, von Arx T. Guidelines for the management of traumatic dental injuries. III. Primary teeth. *Dent Traumatol* 2007; 23:196-202.
7. Andreasen JO. Fractures of the alveolar process of the jaw. A clinical and radiographic follow-up study. *Scand J Dent Res* 1970; 78:263-72.
8. Vinckier F, Declerck D. Fractures of the alveolar process. *Rev Belge Med Dent* 1998; 53:152-8.
9. Caliskan MK, Turkun M. Clinical investigation of traumatic injuries of permanent incisors in Izmir, Turkey. *Endod Dent Traumatol* 1995; 11:210-3.

10. Mestrinho HD, Bezerra AC, Carvalho JC. Traumatic dental injuries in Brazilian pre-school children. *Braz Dent J* 1998; 9:101-4.
11. Schatz JP, Joho JP. A retrospective study of dento-alveolar injuries. *Endod Dent Traumatol* 1994; 10:11-4.
12. Silva AC, Passeri LA, Mazzone R, de Moraes M, Moreira RWF. Incidence of dental trauma in Brazil: a 1-year evaluation. *Dent Traumatol* 2004; 20:6-11.
13. Zerman N, Cavalleri G. Traumatic injuries to permanent incisors. *Endod Dent Traumatol* 1993; 9:61-4.
14. Sae-Lim V, Hon TH, Wing YK. Traumatic dental injuries at the Accident and Emergency Department of Singapore General Hospital. *Endod Dent Traumatol* 1995; 11:32-6.
15. Castro JC, Poi WR, Manfrin TM, Zina LG. Analysis of the crown fractures and crown-root fractures due to dental trauma assisted by the Integrated Clinic from 1992 to 2002. *Dent Traumatol* 2005; 21:121-6.
16. Hunter ML, Hunter B, Kingdon A, Addy M, Dummer PM, Shaw WC. Traumatic injury to maxillary incisor teeth in a group of South Wales school children. *Endod Dent Traumatol* 1990; 6:260-4.
17. Altay N, Gungor HC. A retrospective study of dentoalveolar injuries of children in Ankara, Turkey. *Dent Traumatol* 2001; 17:201-4.
18. Cardoso M, de Carvalho Rocha MJ. Traumatized primary teeth in children assisted at the Federal University of Santa Catarina, Brazil. *Dent Traumatol* 2002; 18:129-33.
19. Flanders RA, Bhat M. The incidence of orofacial injuries in sports: a pilot study in Illinois. *J Am Dent Assoc* 1995; 126:491-6.
20. Marcenes W, al Beiruti N, Tayfour D, Issa S. Epidemiology of traumatic injuries to the permanent incisors of 9-12-year-old schoolchildren in Damascus, Syria. *Endod Dent Traumatol* 1999; 15:117-23.
21. Andreasen JO. Luxation of permanent teeth due to trauma. A clinical and radiographic follow-up study of 189 injured teeth. *Scand J Dent Res* 1970; 78:273-86.
22. Andreasen FM, Pedersen BV. Prognosis of luxated permanent teeth--the development of pulp necrosis. *Endod Dent Traumatol* 1985; 1:207-20.
23. Estrela C, Sydney GB, Bammann LL, Felipe Junior O. Mechanism of action of calcium and hydroxyl ions of calcium hydroxide on tissue and bacteria. *Braz Dent J* 1995; 6:85-90.
24. Safavi KE, Nichols FC. Effect of calcium hydroxide on bacterial lipopolysaccharide. *J Endod* 1993; 19:76-8.
25. Trope M, Moshonov J, Nissan R, Bux P, Yesilsoy C. Short vs. long-term calcium hydroxide treatment of established inflammatory root resorption in replanted dog teeth. *Endod Dent Traumatol* 1995; 11:124-8.

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