

Delayed Repositioning in Teeth with Horizontal Root Fracture: Two Case Reports

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Abstract

Introduction: Horizontal root fracture (HRF) generally has a good prognosis of healing at fracture line after repositioning and flexible splinting. However, various factors such as delayed referral may unfavorably influence close reduction of firmly displaced coronal fragments and the long-term prognosis of healing at fracture line. Case 1: A 25-year-old woman with HRF in her maxillary central incisors was referred 1 week after trauma. Repositioning of the displaced coronal fragment was not successful for the left central incisor. Despite questionable prognosis for this case, reduction and flexible splinting was performed after removing its coronal fragment, minor curettage in alveolar socket and immediate replanting. Calcium hydroxide dressing and MTA plug placement for the coronal fragment were carried out after 1 and 3 weeks, respectively. The crown was restored and a minor permanent splint was applied after splint removal. Case 2: The above protocol was applied for a 17-year-old boy with HRF in his left maxillary central incisor. He referred 3 weeks after trauma with a firmly displaced coronal fragment. At four-year follow-up in both patients, the teeth were clinically in function and the patients were asymptomatic. The periapical radiographs revealed complete healing at fracture lines.

Keywords: Case report; Dental trauma; Root fracture.

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Introduction

Horizontal root fracture (HRF) is a combined injury of the pulp, dentin, cementum and periodontal ligament. It is a relatively uncommon type of dental trauma with the frequency of 5-7% of all dental traumatic injuries. The location of the fracture line may vary from coronal and middle third to the apical third. The type of healing at the fracture line depends on a number of determining factors including the patient's age, closeness of the fragments after fixation, absence of infection and stage of root development (1-8). Based on the interposition of different kinds of tissues, there are four types of histological reaction at fracture line; type I: calcified tissue; type II: connective tissue; type III: bone and connective tissue and type IV: granulation tissue. Type IV is considered as a non-healing pattern since an infected or necrotic pulp in the coronal fragment causes it (1, 2).

HRF generally has a good prognosis of healing at fracture line after repositioning and flexible splinting, as documented by many studies (1, 2, 8-21). However, various factors such as severe dislocation and/or delayed initiation of the treatment seem to have an unfavorable influence on close reduction of the displaced coronal fragment, which locked firmly and subsequently on the long-term prognosis.

The aim of this report is to illustrate clinical and radiologic outcomes of two cases with HRF with displaced coronal fragments firmly in place.

Case Report

Case 1: A 25-year old woman with HRF and displaced coronal fragments in her maxillary central incisors referred to Dental Trauma Clinic, ACECR,

Mashhad, Iran, 1 week after trauma. Her medical history was noncontributory and no injuries were observed in the adjacent teeth or soft tissues except for a prominent swelling in the buccal area, possibly arising from an alveolar fracture. Fighting was the etiology of root fractures. She presented Class I occlusion with competent lips.

Both coronal fragments had been displaced palatally and had firmed in place, resulting in serious interference with occlusion (Fig. 1). The periapical radiograph showed severe displacement of the coronal fragments in both teeth (Fig. 2). While the right upper central incisor was replaced to its original position correctly, repositioning with digital maneuver was not successful for the left one. Despite questionable prognosis for this case, close reduction and flexible splinting were performed following its coronal fragment removal, minor curettage in alveolar socket and immediate replantation. Calcium hydroxide (Densply/Caulk, Tulsa, OK) dressing and mineral trioxide aggregate (MTA; ProRoot; Dentsply Dental, Tulsa, OK) plug placement for coronal fragment were carried out after 1 and 3 weeks, respectively (Fig. 3). The crown was restored with composite resin (3M Unitek, Monrovia, CA) and a minor permanent splint was applied after removal of the flexible splint (8 weeks). At 4-year follow-up, complete healing at fracture lines was revealed in the periapical radiograph and the teeth were clinically functional and the patient was asymptomatic (Figs. 4 and 5). The CBCT image also showed the proximity of fractured parts (Fig. 6). The healing pattern of the fracture lines seemed to be interposition of connective tissue in both teeth.

Case 2: A 17-year-old boy was referred to Dental Trauma Clinic, ACECR, Mashhad, Iran, 3 weeks after trauma. HRF was observed in his left maxillary central incisor and the displaced coronal fragment had been firmed and locked in place (Fig. 7). The patient history was non-contributory and there were no injuries in the adjacent teeth or soft tissues. Fighting was the etiology of root fractures. Occlusion of the patient was Class I relationship with competent lips.

Close reduction with digital pressure was impossible because of sever dislocation and delayed referral. Therefore, the above-mentioned protocol for case 1 was applied for this case. First, the coronal fragment was loosened by forceps (Dena, Tehran, Iran), then repositioned gently and finally fixed with flexible splint for 8 weeks. Pulpal removal and calcium hydroxide (Densply/Caulk, Tulsa, OK) dressing for coronal fragment were carried out after 1 week and then MTA (ProRoot; Dentsply Dental, Tulsa, OK) plug was placed in the coronal fragment after 3 weeks (Fig. 8). The crown was restored with composite resin (3M Unitek,

Monrovia, CA) and a minor permanent splint was applied after removal of flexible splint.

As evidenced by the periapical radiograph, complete healing at fracture line was obvious at 4-year follow-up and the tooth was clinically functional and the patient was asymptomatic (Figs. 9 and 10). The healing pattern of the fracture line seemed to be the interposition of bone and connective tissue.



Figure 1: Initial photograph indicating the palatally displacement of maxillary central incisors



Figure 2: Initial radiograph indicating the fracture lines in both maxillary central incisors



Figure 3: Final radiograph indicating placement of MTA plug

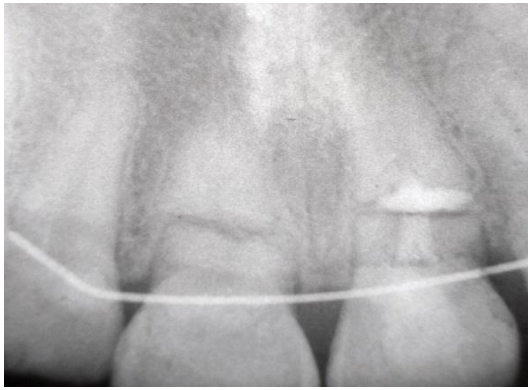


Figure 4. Radiographic view after 4-years follow-up indicates healing in fracture lines



Figure 7. Initial radiograph indicating the fracture line in the left maxillary central incisor, 3 weeks after trauma



Figure 5. Clinical view after 4-years follow-up



Figure 8. Final radiograph indicating placement of MTA plug



Figure 6. The CBCT image showed proximity of fractured parts in both incisors



Figure 9. Radiographic view after 4-years follow-up indicates healing in fracture line



Figure 10: Clinical view after 4-years follow-up

Discussion

HRF most commonly occurs in the maxillary anterior region. The coronal fragment of a root-fractured tooth frequently shows extrusion and displacement to the palatal/lingual region (1, 2). According to the guideline released by International Association of Dental Traumatology (6) and the American Association of Endodontists (7), the emergency treatment for HRF is optimal repositioning as soon as possible, flexible splinting (4 weeks or longer) and follow-up of the healing process at fracture line. In 75% of cases, healing will happen and it will not be necessary to remove the coronal pulp. Whenever there are signs or symptoms of a non-healing process at fracture line (25%), the coronal pulp must be extirpated (1, 2).

Different types of healing may depend on proximity of the fragments, fixation of the fragments as soon as possible and absence of infection (18-21). Success rate for midroot fractures has been estimated to be 80% (1, 2).

In many cases with tooth displacement, the patient requires medical care for concomitant head trauma prior to dental care; also, some patients spend a great deal of time to find a dentist who provides them definitive dental treatment. When the time interval between trauma and treatment is extended, the treatment of tooth displacement becomes more complicated. This may be a major concern in planning the treatment for these patients and therefore the general protocol may be non-indicative in some of these complicated cases. Since there is considerable swelling and fluid accumulation around the displaced tooth, it is very difficult, if not impossible, to reposition it without additional luxation or extraction/reimplantation. In addition, in severe dental injuries, trauma breaks the facial plate of bone or disturbs the alveolar socket wall to the point that it is impossible to replace the tooth in its original position. In both mentioned cases, repositioning with digital pressure was not successful because of delayed referral and the severity of trauma. In these types of situations, the clinician may wish to consider orthodontic treatment as an option to reposition the displaced tooth into the

correct position (22). However, since occlusal interference was too severe, a rather faster approach seemed necessary. Therefore, after loosening the displaced coronal fragment in case 2, and removal with forceps followed by minor curettage of alveolar socket in case 1, close reduction was performed successfully.

For the replanted fragments, pulpal necrosis was an inevitable consequence. To prevent non-healing pattern at fracture lines which compromise the long-term prognosis, endodontic treatment including pulpal removal and intracanal dressing for coronal fragment were carried out 1 week after repositioning.

As this treatment protocol was successful in the reported cases, it seems that in some instances, some modifications in the general protocol may be helpful.

Conclusion

A promising finding from the present cases is that healing at fracture line is very likely to happen even in cases of HRF with delayed referral and severe dislocation, which has been replanted after extraction of coronal fragments.

References

1. Andreasen JO, Andreasen F, Anderson L. Text book color atlas of traumatic injuries to the teeth. 2nd ed. Oxford: Blackwell Munksgard; 2007. p. 625-42.
2. Hargreaves KM, Cohen S. Pathways of the pulp. 10th ed. St Louis: Mosby Elsevier; 2011. p. 635-7.
3. Caliskan MK, Türkün M. Clinical investigation of traumatic injuries of permanent incisors in Izmir, Turkey. *Endod Dent Traumatol.* 1995; 11:210-13.
4. Mata E, Gross MA, Koren LZ. Divergent types of repair associated with root fractures in maxillary incisors. *Endod Dent Traumatol.* 1985; 1:150-3.
5. Michanowicz AE, Michanowicz JP, Abou-Rass M. Cementogenic repair of root fractures. *J Am Dent Assoc.* 1971; 82:569-79.
6. Diangelis AJ, Andreasen JO, Ebeleseder KA, Kenny DJ, Trope M, Sigurdsson A, Andersson L, Bourguignon C, Flores MT, Hicks ML, Lenzi AR, Malmgren B, Moule AJ, Pohl Y, Tsukiboshi M. International Association of Dental Traumatology Guidelines for the management of dental traumatic injuries: 1. Fractures and luxations of permanent teeth. *Dent Traumatol.* 2012; 28:2-12.

7. Recommended guidelines of the American Association of Endodontists for the treatment of traumatic dental injuries. Accessible at: <http://www.aae.org/traumaresources/>
8. Welbury R, Kinirons MJ, Day P, Humphreys K, Gregg TA. Outcomes for root-fractured permanent incisors: a retrospective study. *Pediatr Dent*. 2002; 24:98-102.
9. Majorana A, Pasini S, Bardellini E, Keller E. Clinical and epidemiological study of traumatic root fractures. *Dent Traumatol*. 2002; 18:77-80.
10. Andreasen FM, Andreasen JO, Bayer T. Prognosis of root fractured permanent incisors—prediction of healing modalities. *Endod Dent Traumatol*. 1989; 5:11-22.
11. Andreasen JO, Hjørthing-Hansen E. Intraalveolar root-fractures: radiographic and histologic study of 50 cases. *J Oral Surg*. 1967; 25:414-26.
12. Andreasen FM, Andreasen JO. Resorption and mineralization processes following root-fracture of permanent incisors. *Dent Traumatol*. 1988; 4:202-14.
13. Zachrisson B U, Jacobsen I. Long-term prognosis of 66 permanent anterior teeth with root fracture. *Scand J Dent Res*. 1975; 83:345-54.
14. Cvek M, Mejàre I, Andreasen JO. Conservative endodontic treatment of teeth fractured in the middle or apical part of the root. *Dent Traumatol*. 2004; 20:261-9.
15. Sheikh-Nezami M, Mokhber N, Shamsian KH, Saket S. Management of a midroot and complicated crown fracture: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2009; 107:e65–7.
16. Caliskan MK, Savranoglu S. Delayed Partial Pulpotomy in a Midroot and complicated crown-root-fractured permanent incisor with hyperplastic pulpitis: a case report. *J Endod*. 2010; 36:1250-3.
17. Wolner-Hansen AB, Von Arx T. Permanent teeth with horizontal root fractures after dental trauma. *Schweiz Monatsschr Zahnmed*. 2010; 120:200-6.
18. Andreasen JO, Andreasen FM, Mejàre I, Cvek M. Healing of 400 intraalveolar root fractures. 1. Effect of pre-injury and injury factors such as sex, age, stage of root development, fracture type, location of fracture and severity of dislocation. *Dent Traumatol*. 2004; 20:192-202.
19. Andreasen JO, Andreasen FM, Mejàre I, Cvek M. Healing of 400 intra-alveolar root fractures. 2. Effect of treatment factors such as treatment delay, repositioning, splinting type and period and antibiotics. *Dent Traumatol*. 2004; 20:203-11.
20. Cvek M, Mejàre I, Andreasen JO. Healing and prognosis of teeth with intra-alveolar fractures involving the cervical part of the root. *Dent Traumatol*. 2002 ;18:57-65
21. Cvek M, Tsilingaridis G, Andreasen JO. Survival of 534 incisors after intra-alveolar root fracture in patients aged 7-17 years. *Dent Traumatol*. 2008; 24:379-87.
22. Fields H W, Christensen J R. Orthodontic procedures after trauma. *J Endod*. 2013; 39:S78-S87.

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