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Horizontal root fracture followed for 6 years

CASE REPORT

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Abstract – Intra-alveolar root fractures in permanent teeth are uncommon injuries among dental traumas. Generally, the principles of treating horizontal root fractures of permanent teeth are repositioning and fixation. The present paper reports 6-years follow up of two horizontally root-fractured teeth that were healed with calcified tissue. Both of the teeth were clinically and radiographically symptomless and showed complete pulp canal obliterations.

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Intra-alveolar root fracture is a rare injury in permanent teeth (0.5–7), most commonly involving the maxillary central incisors. Although the diagnosis of root fracture depends entirely upon the radiographic examination, clinically the fractured tooth is often extruded and displaced palatally (1).

Root fracture healing was divided into four events by radiographic and histological observations (2): (i) healing with calcified tissue, (ii) interposition of connective tissue, (iii) interposition of bone and connective tissue, and (iv) interposition of granulation tissue.

The literature indicates that many factors may influence the type of healing which occurs. These factors include the stage of root development, repositioning of dislocated fragments and any associated signs and symptoms such as mobility and pain (3, 4).

Although the outcome of a root fracture is generally favorable (60–80% cases), complications such as pulpal necrosis, radicular resorption and pulpal canal obliteration can arise (5).

The present paper reports two root-fractured teeth treated by repositioning and fixation with good healing at the 6-years follow-up examination.

Case report

A 9-year-old-girl was referred to the Department of Pediatric Dentistry after she had fallen in the school. Her medical history was clear. The intra-oral examination revealed that there were lacerations in the mucosa of the anterior teeth and the maxillary right central (tooth 11) and lateral incisors (tooth 12) and the maxillary left central incisor (tooth 21) teeth were extrusively luxated (Fig. 1). In the radiographic evaluation, horizontal root fractures located in the apical third of the roots of the teeth 11 and 21 were diagnosed. The roots of the teeth 11, 12 and 21 were nearly completed with an open apical foramen, and there was no apparent periapical pathosis (Fig. 2). Antiseptic procedures with 0.12% chlorhexidine gluconate were carried out. After local anesthesia administration, the teeth were gently repositioned by finger pressure. The anterior teeth were splinted with composite resin from the maxillary right primary canine to the maxillary left primary canine. Follow-up examinations were performed at 15–30 days, 2, 4, 6 and 12 months.

In the second month control the splint was removed, but because teeth 11 and 21 were still mobile it was decided to splint the teeth again. The teeth were not tender to percussion or palpation. Tooth 12 gave vital pulp response whereas, teeth 11 and 21 had delayed response on electric pulp testing. The radiographic examination did not show any signs of pathology (Fig. 3). In the 4th month control, the splint was removed. There was no abnormal mobility in the root-fractured teeth. All of the teeth gave positive response to the vitality tests and there was no sign of periapical pathology in the radiograph.

In the first year appointment, teeth 11 and 21 gave positive response to the electric pulp testing and there was a metallic sound to the percussion test. The radiograph indicated that the apices of the teeth were closed (Fig. 4). Partial pulp canal obliterations were observed and the radiopacity of the fracture lines were increased in both teeth. However, tooth 12 gave negative response to the vitality tests and the radiographic examination showed an uncompleted root formation with periapical pathology (Fig. 4). Apexification treatment with calcium hydroxide was performed on the tooth and after the apical foramen was closed, root canal treatment was finished in a conventional manner.

Intra-oral and radiographic views of the case after 6 years are shown in Figs. 5 and 6, respectively. The teeth showed normal color and mobility. Complete pulp canal obliterations were observed in teeth 11 and 21; without any sign of pathology. The fracture lines were healed with calcified tissue.

Fig. 1. Initial intra-oral view of the patient.

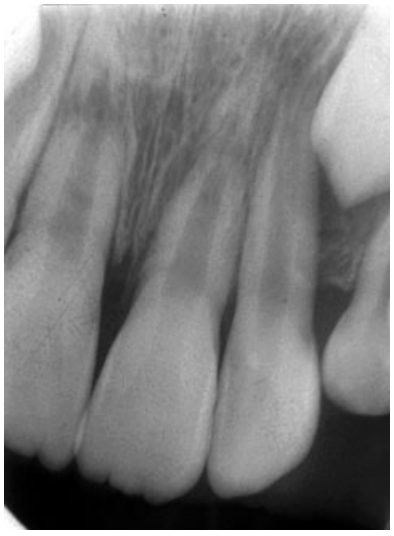

Fig. 2. Initial periapical radiograph of the case.

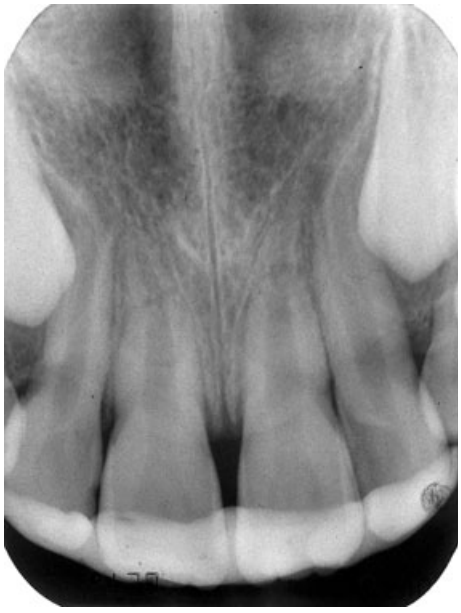

Fig. 3. Periapical radiograph of the teeth after 2 months.

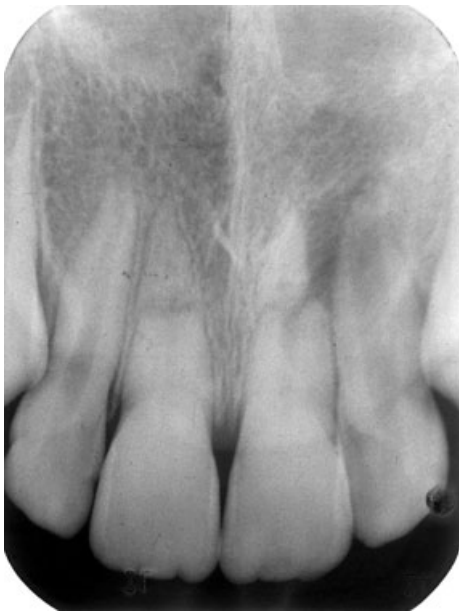

Fig. 4. Periapical radiograph of the teeth after 1 year.

Fig. 5. Intra-oral view of the case in the 6 year-follow up.

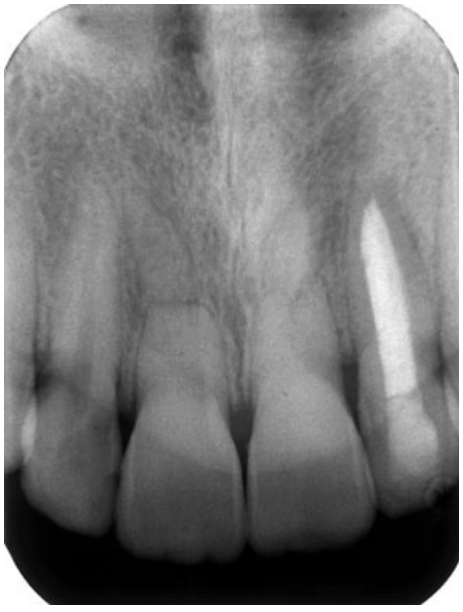

Fig. 6. Radiographic view of the teeth in the 6 year-follow up.

Discussion

Root fracture is a complex injury to the periodontal ligament, pulp, dentin and cementum. The injury to the coronal segment can be considered a luxation injury, with resultant trauma to the periodontal ligament and neurovascular supply to the coronal pulp. In contrast,

the apical fragment remains essentially uninjured. To facilitate healing, optimal repositioning is considered essential (1).

The possibility of spontaneous healing after a root fracture in teeth that maintain pulp vitality is clinically significant (6), and it may occur in approximately 70–80% of intra-alveolar root fracture cases (7). Healing of root fractures without treatment is presented in many reports (8–11).

As the changes of pulp necrosis are relatively low after an apical third root fracture, we did not perform endodontic treatment after the teeth were repositioned and preferred careful monitoring. In fact root canal treatment was not necessary over the 6-year evaluation period. During the follow-up period the clinical appearance of the crowns were normal without color change. However, tooth 12 that suffered only extrusive luxation had lost its vitality. In fact, it was also reported in the literature that teeth with root fracture have more possibility of maintaining a vital dental pulp than luxated teeth without fracture (12).

Both the teeth with root fractures showed complete pulp canal obliterations in the 6th year follow up. Pulp canal obliteration is quoted as being the most common sequela of root fracture and can be found in 69–73% of root-fractured incisors (1, 13, 14).

In a previous study consisting mainly of fractures in the middle and apical parts of the root, splinting of the luxated coronal fragments and the duration of splinting were found to be of minor importance, whereas, factors such as root development, pulp sensibility and repositioning of dislocated fragments were highly predictive of the frequency and type of fracture healing (3).

Andreasen et al. (4) reported that the size of the pulpal lumen at the apical foramen and of the level of the fracture with good vascularity and a high number of cells (represented by age and root development) and rupture or stretching of the pulp at the fracture site (represented by mobility, dislocation and diastasis between fragments) appear to be the factors which have a significant influence upon healing (i.e. whether with hard tissue or pulp necrosis). In this case, at the time of injury the root developments of the root-fractured teeth were nearly completed but the apical foramen were open. After 6 years, the root developments were completed without any pathology and the fracture lines were healed by calcified tissue. In previous studies, healing with formation of calcified tissue between the fragments was reported in 18–30% of the cases (4, 15, 16).

Davidovich et al., (17) reported an advanced cervical root resorption in a mid-root fractured tooth, which was healed with calcified tissue, after 13.5 years. They assumed that trauma and additional infection in the periodontal ligament because of poor oral hygiene and vigorous scaling of accumulated calculus could have been the cause of the resorptive process. So continuous follow up of the patients' oral hygiene and radiographic controls for the detection of early signs of any pathology are required in all of the trauma cases.

References

1. Andreasen JO, Andreasen FM (eds). Root fractures. In: Textbook and color atlas of traumatic injuries to the teeth, 3rd edn. Copenhagen: Munksgaard; 1994. p. 79–314.
2. Andreasen JO, Hjorting-Hansen E. Intraalveolar root fractures: radiographic and histologic study of 50 cases. J Oral Surg 1967;25:414–26.
3. Cvek M, Andreasen JO, Borum MK. Healing of 208 intra-alveolar root fractures in patients aged 7–17 years. Dent Traumatol 2001;17:53–62.
4. Andreasen JO, Andreasen FM, Mejare I, Cvek M. Healing of 400 intra-alveolar 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 disloation. Dent Traumatol 2004;20:192–202.
5. Majorana A, Pasini S, Bardellini E, Keller E. Clinical and epidemiological study of traumatic root fractures. Dent Traumatol 2002;18:77–80.
6. Falomo OO. Spontaneous repair following root fracture. Odontostomatol Trop 1985;8:219–20.
7. Bender IB, Freedland JB. Clinical considerations in the diagnosis and treatment of intra-alveolar root fractures. J Am Dent Assoc 1983;107:595–600.
8. Erdemir A, Ungor M, Erdemir Olgun E. Orthodontic movement of a horizontally fractured tooth: a case report. Dent Traumatol 2005;21:160–4.
9. Oztan MD, Sonat B. Repair of untreated horizontal root fractures: two case reports. Dent Traumatol 2001;17:240–3.
10. Artvinli LB, Dural S. Spontaneously healed root fracture: report of a case. Dent Traumatol 2003;19:64–6.
11. Rintaro T, Kiyotaka M, Minoru K. Conservative treatment for root fracture located very close to gingiva. Dent Traumatol 2005;21:111–4.
12. Mata E, Gross MA, Koren LZ. Divergent types of repair associated with root fractures in maxillary incisors. Endod Dent Traumatol 1985;1:150–3.
13. Hovland EJ. Horizontal root fractures: treatment repair. Dent Clin North Am 1992;36:509–25.
14. Camp JH. Management of sports-related root fractures. Dent Clin North Am 2004;44:95–109.
15. Feely L, Mackie IC, Macfarlane T. An investigation of root-fractured permanent incisor teeth in children. Dent Traumatol 2003;19:52–4.
16. Cvek M, Mejare 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.
17. Davidovich E, Heling I, Fuks AB. The fate of a mid-root fracture: a case report. Dent Traumatol 2005;21:170–3.