Treatment of horizontal root fractures using a triple antibiotic paste and mineral trioxide aggregate: A case report

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This case report describes the treatment of a horizontal root fracture in a maxillary central incisor (tooth #8) using a triple antibiotic paste and mineral trioxide aggregate. A nonsurgical endodontic treatment was performed to a coronal root canal fragment of tooth #8. During the treatment procedure, 1% sodium hypochlorite solution was used for irrigation and a triple antibiotic paste was used as an intracanal medicament. The coronal part of the canal was obturated with mineral trioxide aggregate totally. At follow-up examination after 12 months, the tooth was asymptomatic and radiographically showed repair of the fracture region. Healing was achieved without any need for further interventions. **(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009;108:e63-e66)**

Root fractures—combined injuries of pulp, dentin, cementum, and periodontal ligament—are less frequent injuries, comprising 0.5%-7% of all trauma cases.[1,2] Horizontal root fractures commonly occur at the anterior maxilla, and generally teeth with complete root formation are affected. Root fractures may be located at the coronal, middle, or apical thirds. Middle fractures are the most common, and cervical fractures are rare.[1] The fractures tend to be oblique in the apical and middle thirds and horizontal in the coronal third. A single fracture occurs in most cases, and multiple root fracture is a rare finding.[1,3] Generally, fractured roots are diagnosed shortly after the injury, but occasionally they are identified at subsequent routine dental examinations.[4]

Clinical management of a horizontal root fracture depends on different variables, such as age of the patient, mobility of the coronal fragment, location of the root fracture, and stage of root formation.[5] To date, different procedures (such as stabilization of tooth with a splint only, obturation of the coronal fragment, surgical removal of the apical fragment, removal of the coronal fragment and orthodontic or surgical extrusion of the apical fragment, endodontic implants, and intraradicular splinting to unite the fracture) have been successfully applied for treatment of root fractures.[3,5,6-12] Also, spontaneous healing of the root fractures without treatment has been documented.[13-15]

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Received for publication Feb 20, 2009; returned for revision Mar 12, 2009; accepted for publication Mar 12, 2009.
1079-2104/$ - see front matter
© 2009 Published by Mosby, Inc.
doi:10.1016/j.tripleo.2009.03.028

The following case report describes the nonsurgical endodontic treatment of a horizontal root fracture using a triple antibiotic paste and mineral trioxide aggregate.

CASE REPORT

A 22-year-old man was referred to the Department of Endodontics at the Faculty of Dentistry, Karadeniz Technical University, reporting a history of trauma on the maxillary anterior region. According to his clinical records, he was taken to a general dentist, where the right maxillary central incisor (tooth #8) was splinted and root canal treatment of the coronal fragment was begun. When the patient came to our clinic, 10 days had passed, the composite splint had been broken from the contact region of the teeth, and the temporary filling material in the access cavity had been lost. Therefore, the root canal system was contaminated with oral debris. Past medical history of the patient was noncontributory. On extraoral examination, there was no abnormal condition. On intraoral examination, there was a slight swelling of the vestibule mucosa in the maxillary right anterior region. Tooth #8 was tender to percussion and exhibited grade II mobility. Radiographic examination showed a horizontal root fracture in the middle third of the root of tooth #8 with a diastasis >1 mm in the fracture line (Fig. 1). The periradicular radiolucency was seen only around the fracture site. The apical fragment was radiographically normal. There was no other hard tissue injury detected in that region. Also, all of the adjacent teeth showed positive response to the vitality test. Based on these findings, the patient was diagnosed as having a horizontal root fracture of the right maxillary central incisor. The patient was informed of the long-term prognosis of the tooth, and a decision was made to perform nonsurgical endodontic treatment.

At the same appointment, the broken region of composite splint was repaired. Root canal retreatment of the coronal fragment was initiated on tooth #8. Following isolation of the tooth with a rubber dam, the access cavity was prepared ideally, the contaminated canal remnants was removed, and the working length was obtained. The root canal was instru-

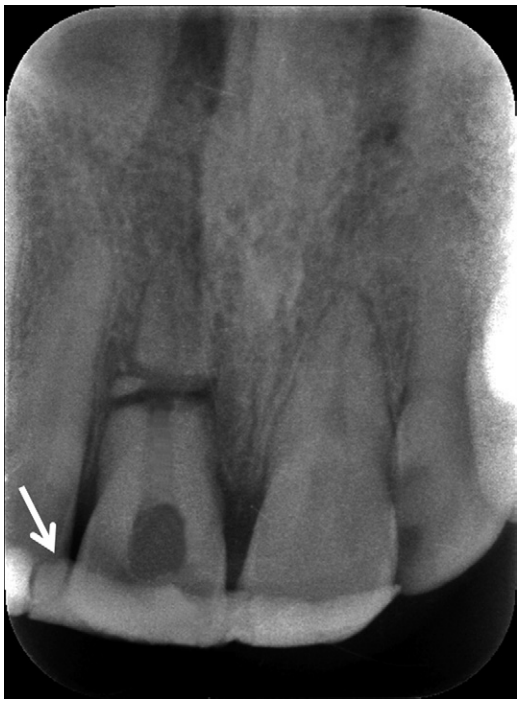


Fig. 1. The radiographic appearance of horizontal root fracture in right maxillary central incisor. Also note the broken composite splint (*arrow*).



Fig. 2. Coronal root fragment obturated with mineral trioxide aggregate. Slight excess material is seen in the apical fracture line.

mented to the fracture line with size 60 K-file (Dentsply-Maillefer, Ballaigues, Switzerland) using a step-back technique. During the instrumentation, the canal was irrigated with 1% sodium hypochlorite (Wizard, Istanbul, Turkey) and distilled water solutions using a 27-gauge endodontic needle after each instrument. The final irrigation was accomplished with 2% chlorhexidine gluconate (Klorhex; Drogsan, Ankara, Turkey) and distilled water solutions. The canal was dried with sterile paper points (Diadent, Chongiu City, Korea), and a triple antibiotic paste was selected for intracanal dressing. A mixture of ciprofloxacin (Ciflosin; Deva, Istanbul, Turkey), metronidazole (Flagyl; Eczacibaşi, Istanbul, Turkey), and minocycline (Arestin; OraPharma, Warminster, PA) paste (0.5 mg of each), as described by Er et al.,[16] was prepared into a creamy consistency and spun down the root canal with a lentulo spiral. The paste was further condensed using sterile cotton pellets before sealing the coronal access with a temporary filling material (Coltosol F; Coltène Whaledent, Altstätten, Switzerland).

One month later, the patient returned. At this appointment the tooth was reopened and the antibiotic paste remnants removed. After irrigation with distilled water solution, the canal was dried with sterile paper points. Mineral trioxide aggregate (ProRoot MTA; Dentsply-Maillefer) was prepared according to the manufacturer's recommendations. A Messing gun (Dentsply-Maillefer) plugger, appropriate to the working length was chosen, and a stopper was placed 1 mm short of the working length. Mineral trioxide aggregate was applied to the root canal of tooth #8 using the Messing gun, and it was pushed into the apical 1 mm part of the coronal fracture line with the plugger. Radiography was taken to ensure control of the filling. Then the plugger was fixed 2 mm short of the working length and the same application was repeated. After the root canal was filled with mineral trioxide aggregate, it was left with a cotton pellet moistened with distilled water for 24 hours. The access cavity was sealed with a temporary filling material.

At the following appointment, the cotton pellet was removed, and, after verifying the setting of mineral trioxide aggregate, the access cavity was sealed with a glass ionomer cement (Ketac Molar Easymix; 3M Espe, Seefeld, Germany) and a composite resin (Quadrant Universal LC) (Fig. 2). The composite splint was removed after 2 months. Twelve-month recall radiograph showed complete healing between the fragments (Fig. 3). The tooth was asymptomatic. There was no mobility, but the tooth was still discolored.

DISCUSSION

The treatment principles for horizontally fractured teeth involve maintaining pulp vitality by immobilizing the coronal segment.[1,5] When no bacteria enter the coronal pulp space through the disrupted epithelial attachment and proper fixation is used, the fractured teeth can heal spontaneously.[10] Although the outcome of a horizontal root fracture is generally favorable (60%-80% cases), complications, such as pulpal necrosis, radicular resorption, and pulpal canal obliteration, can



Fig. 3. 12-month follow-up radiograph.

arise.[17] When pulp necrosis arises, the apical part of the fractured tooth generally remains vital.[1,5] Therefore, root canal therapy is applied only to the coronal fragment, but it is difficult to seal the coronal part, because an apical stop is often impossible to achieve.[11] It is important to make a decision of treatment choice for this type of tooth. In the present case, a general dentist had began the treatment (splint and root canal treatment of coronal fragment) of the horizontal root fractured right maxillary central incisor before the patient came to our clinic. When the patient came to our clinic, 10 days had passed, the composite splint had been broken from the contact region of the tooth, and the temporary filling material on access cavity was lost. After our treatment procedures, the fractured tooth healed with calcified tissue.

Torabinejad and Chivian[18] recommended the use of mineral trioxide aggregate in teeth with necrotic pulp and open apices and reported that mineral trioxide aggregate material was surrounded with new cementum formation. In addition, Hatibovic-Kofman et al.[19] found that the fracture strength of mineral trioxide aggregate was significantly higher compared with calcium hydroxide in 1 year. There are limited reports in the literature regarding the use of mineral trioxide aggregate in root fractures.[11,12,20] Recently, Yildirim and Gencoglu[11] and Kusgoz et al.[12] reported that the use of mineral trioxide aggregate in root-fractured teeth as an apical plug gave excellent clinical results. Therefore, mineral trioxide aggregate was selected in the treatment of the present horizontal root fracture case.

Research with topical antibiotics has shown that a combination of metronidazole, minocycline, and ciprofloxacin is effective in vitro at killing common endodontic pathogens from necrotic/infected root canals.[21] This antibiotic combination is also an effective disinfectant in vivo.[16,22,23] Furthermore, mineral trioxide aggregate and triple antibiotic paste have been used successfully in regenerative endodontic treatments.[24,25]

CONCLUSION

This case illustrates that a tooth with horizontal root fracture can be managed with nonsurgical endodontic treatment which can result in satisfactory healing between fragments. Furthermore, the use of a triple antibiotic paste as an intracanal medicament and mineral trioxide aggregate as a filling material may provide an alternative to the routine treatments.

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