



ORIGINAL RESEARCH PAPER

Endodontics

MANAGEMENT OF MID-ROOT FRACTURE IN A MAXILLARY CENTRAL INCISOR: A CASE REPORT

KEY WORDS:

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ABSTRACT

Root fractures in permanent teeth occur in just 0.5–7% of dental accident cases. Compared to the apical third fracture, middle third root fractures are more common. Root fractures are clinically difficult to treat because they may necessitate an interdisciplinary or multidisciplinary treatment. Therefore, a physician must aim for the correct diagnosis of root fractures and possess thorough knowledge of numerous therapeutic modalities in order to guarantee a suitable treatment plan and, consequently, the best potential prognosis. The use of the glass fiber post in the upper central incisor, which is endodontically treated, is highlighted in this example. It shows a complex horizontal root fracture in the middle third of the root, securing the broken root pieces.

INTRODUCTION

Root fractures, which result from direct force on the root's structure, are the most serious dental injuries. The root is divided into coronal and apical fragments because the frontal forces produce compression zones over the labial, lingual, or palatal section of the root.

Biological systems like cementum, dentin, tooth pulp, periodontium, and even alveolar bone may be negatively impacted in some situations, necessitating intricate treatment plans. Depending on the location of the fracture line and the degree of coronal fragment displacement, root fractures in the coronal, middle, and apical sections may be discovered.

Mid-root fractures are more common in the upper anterior teeth because of their position in the arch, and they are usually brought on by an injury received during combat or a sporting event, or by an object hitting the teeth. Horizontal root fractures can be single or many, complete or incomplete, and typically range in severity from transverse to oblique. The middle third of the root accounts for 57% of cases of horizontal root fracture, while the coronal and apical thirds account for just 9% and 34% of cases, respectively. The prognosis is good for apical fractures, mid-root fractures, and coronal fractures. The optimum diagnosis is horizontal root fracture based on thorough clinical and radiological investigations. In order to effectively manage a horizontal root fracture, clinical findings show whether the crown is normal or extruded, tooth movement based on the fracture site (apical, mid, or cervical third), teeth percussion, and the presence or absence of discomfort when palpating soft tissues. The degree of dislocation, the location of the fracture, the stage of root formation, the time between trauma and treatment, and the type of trauma (no displacement of the coronal fragment as opposed to displacement of the coronal fragment) are some of the variables or factors that can affect the clinical management of horizontal root fracture.

The Middle Third Root Fracture has a good prognosis. When the coronal fragment is displaced, the first course of treatment should involve repositioning the fragment and stabilizing it so that the underlying periodontal tissues can heal. 3 The healing process for mid-root fractures is different. Andreasen and Hjørtting-Hansen identified four types of healing sequelae: (1) calcified tissue healing; (2) interproximal connective tissue healing; (3) interproximal bone and connective tissue healing; and (4) inflammatory interproximal tissue without healing.

The current case study demonstrates how a horizontal root fracture in the middle part of the maxillary central incisor can be effectively repaired without surgery.

A 30-year-old male patient arrived at the Department of Conservative Dentistry and Endodontics at Swargiya Dadasaheb Kalmegh Msruti Denta College and Hospital in Nagpur, Maharashtra, India. His main complaint was pain and a mobile tooth in the upper front teeth region of her jaw. A week prior, he had suffered a traumatic fall. There were no extraoral findings. Intraoral radiography revealed a radiolucent line in the middle third of roots 21 and 11, suggesting a horizontal root fracture in the middle third of roots 21 and 11. The intraoral examination revealed Grade II mobility with regard to 11 and 21.

The patient was given an explanation of the treatment plan and gave their consent. According to the Andreason protocol, the initial treatment began with a fiber splint and flowable composite splinting of the teeth as a rigid splint for a period of 12 weeks. The patient was prescribed painkillers and instructed to refrain from chewing in the affected area. Lateral condensation obturation was carried out after access opening and biomechanical preparation. Using a peeso reamer, the post space was expanded past the fracture line, leaving 3 mm of gutta-percha at the root's apical third. Glass fiber supports were then employed to preserve the broken root fragments. In the canal, suitable glass fiber posts were assessed and lengthened until they only passively brushed the apical gutta-percha.

Root canals were etched and dried with paper points using a 37% phosphoric acid gel before the bonding agent was applied. Dual cure resin cement, which has a higher cement viscosity, was used to lubricate the fiber posts. They were then placed into the canal without any pressure to reduce resin flow, and they were cured for 40 seconds. Only the post was luted with the cement, which was purposefully applied in just the quantity required to provide the desired bond between the post and dentin. Coating the root canal walls with resin cement was prohibited in order to prevent excessive cement movement laterally between the root fragments. After that, a composite post-endodontic restoration was done. Splint was removed at the end of three months (12 weeks). The patient was periodically re-evaluated for the good outcome of these events.



CASE REPORT

Figure 1: Pre-Operative Radiograph

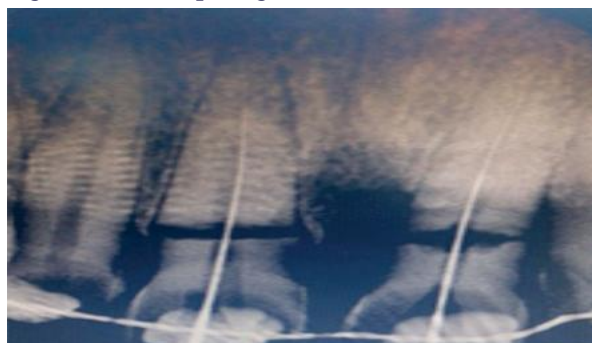
Figure 2: Access Opening with 11 and 21

Figure 3: Working length determination

Figure 4: Post Space Preparation

Figure 5: Fiber post placement with 11 and 21

Figure 5: Fiber post placement with 11 and 21

DISCUSSION

Dental tissues such pulp, dentin, cementum, periodontal ligament, and alveolar bone appear to be destroyed by rare root fractures. The severity of the fracture line, the pulp tissue condition, the occlusion, the fragment displacement, and the patient's overall health all affect clinical therapy and the prognosis of root fractures. The middle third of the root is where root fractures most commonly occur, followed by the apical and coronal thirds. Mid-root fracture frequently happens in permanent teeth with closed apices when the periodontal tissues firmly support the fully formed root. The subsequent healing processes are primarily dependent on two factors: the pulp's severity and the presence of microorganisms in the fracture line.

After a few weeks, if the pulp remains intact following trauma, a dentin callus forms between the two pieces. Cementum deposition then heals the fracture's periphery, a process that may take several years. However, if the pulp has been ruptured, revascularization of the coronal section of the pulp must occur before fracture healing. The invasion of cells from the apical pulp or the invasion of cells from the periodontal ligament by linking the two pieces through the interposition of connective tissue are the two suspected events.

Repositioning and stabilizing the segments as near to one another as feasible and putting them in place with a splint to the neighboring teeth for two to four months constitute the emergency therapy for the identified root fracture. The state of the pulp tissue, occlusion, fragment displacement, and the patient's general health all have an impact on the severity and prognosis of root fractures. 8 Horizontal root fractures, which separate the apical segment from the coronal segment—that is, the apical segment that is normally not displaced and the coronal segment that is regularly displaced—cause the hard components of the root to rupture, impacting the dentin and cementum.

The most common horizontal root fracture with a positive prognosis is the middle third; the cervical third is extremely uncommon and has a poor prognosis; and the apical third does not require therapeutic intervention (Karhade et al., 2016). The diagnosis is confirmed by radiographs, and the fracture angle is found by analyzing many radiographs at various angles (Karhade et al., 2016). Additionally, by addressing the shortcomings of 2-D radiography (projection geometry, anatomical structure superimposition, and processing errors), novel imaging modalities such as cone beam computed tomography (CBCT) have improved the accuracy of traumatic injury diagnosis (Cohenca, 2017).

A variety of post materials, including glass fiber, carbon fiber, and quartz fiber post, have recently been introduced to dental practices. The fiber posts have several advantages, including an appropriate elastic module, reduced chair side time, robust post-cement bonding, aesthetics, and little tissue removal. In this case study, the two pieces were splinted using a glass fiber post that served as an intraradicular splint after the apical fragment underwent endodontic treatment. The post is passively placed into the root canal without applying any further pressure after being greased with resin cement. While fiber-reinforced posts have a modulus comparable to dentin, which lowers the risk of root fractures, traditional metal posts have the advantage of having a high elasticity modulus.

According to Gurtu and Singhal, using a post guarantees the stability and support of the tooth. Through radicular anchoring, it aids in the preservation of the root pieces, strengthening the restorative complex that is subjected to tangential forces. A monoblock is formed between the tooth, cement, reconstructive material, and the post. Post placement helps to keep nonaxial pressures from dislodging and offers retention via a friction bond in addition

to bonding. The compromised root-filled teeth have been frequently been restored both aesthetically and functionally using light-transmitting fiber posts. In this kind of situation, proper long-term follow-up and dental office care are required to look for any possible pathological changes.

CONCLUSION

In this instance, the horizontal root broken tooth was treated with intraradicular splinting utilizing a fiber post. This case demonstrates that intraradicular splinting is a different approach to treating horizontal root fractures. This approach can be useful in some circumstances and might prevent the necessity for extraction.

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