

Content available at: <https://www.ipinnovative.com/open-access-journals>

IP Indian Journal of Conservative and Endodontics

Journal homepage: <https://www.ipinnovative.com/journals/IJCE>

Case Report

Endodontic management of middle third root fracture of upper lateral incisor with glass fiber post & core endodontic restoration: A case report

Neha Agrawal^{1,*}, Rana K Varghese¹, Mansi Tiwari², Anshul Sharma³

¹Dept. of Conservative Dentistry and Endodontics, New Horizon Dental College and Research Institute, Sakri, Bilaspur, Chhattisgarh, India

²Dept. of Oral Medicine and Radiology, Chhattisgarh Dental College and Research Institute, Sundra, Rajnandgaon, Chhattisgarh, India

³Dept. of Oral And Maxillofacial Surgery, Chhattisgarh Dental College and Research Institute, Sundra, Rajnandgaon, Chhattisgarh, India



ARTICLE INFO

Article history:

Received 04-02-2021

Accepted 24-02-2021

Available online 16-03-2021

Keywords:

Glass Fiber Post

Root Fracture

Horizontal Root Fracture

ABSTRACT

In dental accident cases the incidence of root fractures in permanent teeth are just 0.5-7% of the cases. Root fractures in the middle third are more frequently involved than the apical third fracture. Since their management may require an interdisciplinary/multidisciplinary approach to care, root fractures are clinically challenging. Thus, to ensure a good treatment plan and, therefore, the best possible prognosis, a clinician must strive for the right diagnosis of root fractures and have detailed knowledge of various therapeutic approaches. The present case highlights the use of the glass fiber post in the upper left lateral incisor, which is endodontically treated, demonstrating a complicated horizontal root fracture in the middle third of the root, stabilizing the fractured root fragments and monitoring the patient for one year, showing a well preserved assembly of the root fragments and the post.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1. Introduction

The most severe dental injury is root fracture, which occurs due to direct force on the structure of the root. Since the frontal forces create compression zones over the labial or lingual or palatal portion of the root, the root is divided into the coronal and apical fragment.¹ In certain cases, this creates adverse effects on biological structures such as cementum, dentin, tooth pulp and periodontium, and even alveolar bone, leading to complex treatment strategies. Root fractures in the coronal, middle and apical parts can be found depending on the position of the fracture line and the degree of dislocation of the coronal fragment. Due to their location in the arch, mid-root fractures occur more often in the upper anterior teeth and are typically caused by an injury sustained in a battle or sporting event or by an object striking

the teeth. Horizontal root fracture classification and severity are normally transverse to oblique and can be single or multiple, complete or incomplete.² Horizontal root fracture most commonly occurs in the middle third of the root, equal to 57% of cases, and very rarely in the coronal third (9%) and apical third (34 percent). Apical fracture has a favorable prognosis, followed by mid-root and then coronal fracture.

On the basis of comprehensive clinical and radiographic evaluations, horizontal root fracture is best diagnosed. Clinical findings indicate whether the crown is normal or extruded, tooth mobility, depending on the site of fracture (apical/mid/cervical third), teeth percussion and the presence/absence of pain in the palpation of soft tissues for the effective management of Horizontal root fracture. The treatment outcome of horizontally fractured teeth can be influenced by the clinical management of horizontal root fracture depending on multiple variables or several factors, such as the degree of dislocation, the location of the fracture,

* Corresponding author.

E-mail address: drnehaagrawal30@gmail.com (N. Agrawal).

the stage of root formation, the span between trauma and treatment and the type of trauma (no displacement of the coronal fragment as opposed to displacement of the coronal fragment).

There is a favorable prognosis for Middle Third Root Fracture. Repositioning of the fragment when the coronal fragment is displaced, accompanied by stabilization to allow healing of the underlying periodontal tissues, should be the initial treatment.³ There is a different mechanism for mid-root fracture healing. Four types of healing sequelae were mentioned by Andreasen and Hjørtting-Hansen:⁴ (1) calcified tissue healing, (2) interproximal connective tissue healing, (3) interproximal bone and connective tissue healing, and Interproximal bone and connective tissue healing (4) Inflammatory interproximal tissue without healing

The present case study explains, by a non-surgical procedure, horizontal root fracture in the middle third of the maxillary left lateral incisor can be treated successfully.

2. Case Report

A female patient 30 year old reported to the Department of Conservative Dentistry and Endodontics, New Horizon Dental College and Research Institute, Sakri, Bilaspur, Chhattisgarh, India with a chief complaint of pain and mobile tooth in the upper front teeth region of the jaw having a history of traumatic fall one week ago. No extraoral observations were seen. The Intraoral examination showed Grade II mobility with respect to 22 and root canal treated somewhere else with 22 two years ago (Figure 1). Intraoral radiographs showed radiolucent line in the middle third of root of 22, implying horizontal root fracture in the middle third of root 22 (Figure 2).

The treatment plan was explained to the patient and approval was received. Initial care started with fiber splint and flowable composite splinting of the teeth as a rigid splint for duration of 12 weeks according to the Andreason protocol (Figure 3). The patient was placed on painkillers and advised to stop chewing in the area. Gutta percha was carefully removed at the fracture site after one week of splinting, when the mobility was reduced. The post space was extended beyond the fracture line using peso reamer, leaving 3 mm of gutta-percha at the apical third of the root (Figure 4). Next, to maintain the fractured root fragments, glass fiber posts were used. Appropriate glass fiber posts were evaluated in the canal, adjusted to the necessary length until they touched the apical gutta-percha only passively (Figures 5 and 6). With 37% phosphoric acid gel, root canals were etched and dried with paper points, accompanied by application of the bonding agent. The fiber posts were lubricated with dual cure resin cement that has the advantage of higher cement viscosity, inserted into the canal without applying any pressure to minimize the resin flow and then cured for 40 seconds (Figure 7). Only the

post was luted with the cement and deliberately used only in the amount needed to create a desirable bond between the post and dentin. To avoid the excess movement of cement laterally between the root fragments, coating the root canal walls with resin cement was precluded. Then it was given post endodontic restoration with composite.

Splint was removed at the end of three months (12 weeks). The patient was periodically re-evaluated for the good outcome of these events. In the present case, after 12 months of recall, the patient displayed esthetically pleasing results and the fractured root fragments were well maintained with the aid of a post with sound periodontium (Figure 8).



Fig. 1: Preoperative Photograph



Fig. 2: IOPA Radiograph of Horizontal mid-root fracture in relation to 22



Fig. 3: Fiber Splinting

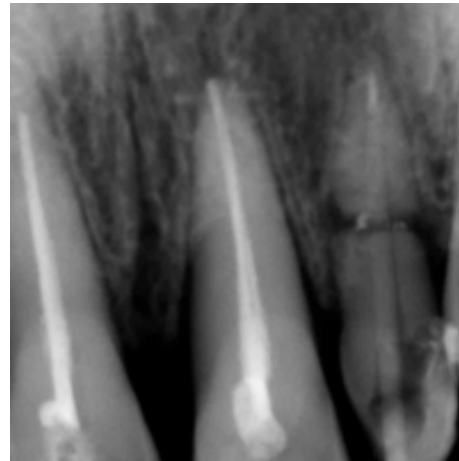


Fig. 6: IOPA Radiograph showing fiber post selection



Fig. 4: Post Space preparation involving Fracture line



Fig. 7: Post cementation



Fig. 5: Fiber Post try in



Fig. 8: One year follow up

3. Discussion

There seem to be uncommon root fractures that lead to the destruction of dental tissues such as pulp, dentin, cementum, periodontal ligament, and alveolar bone.⁵ Clinical management and root fracture prognosis depend on the severity of the fracture line, the situation of the pulp tissue, the occlusion, the fragment dislocation and the general health of the patient.² Most frequently, root fractures occur in the middle third of the root, followed by the apical and coronal third. In permanent teeth with closed apices, mid-root fracture often occurs where the completely developed root is strongly supported by the periodontal tissues. The healing events that occur subsequently depend mainly on two conditions: whether the pulp is severed and whether bacteria invade the fracture line. If the pulp is intact after trauma, after a few weeks, a dentin callus is formed between the two fragments, where after the peripheral aspect of the fracture is healed by cementum deposition, a process that may take place over a period of several years. However, prior to fracture healing, if the pulp has been ruptured, revascularization of the coronal portion of the pulp must take place. Two events are suspected to occur; respectively, invasion of cells originating from the apical pulp or invasion of cells from the periodontal ligament by joining the two fragments through the interposition of connective tissue.⁶ The emergency treatment of the diagnosed root fracture includes repositioning and stabilizing the segments as close as possible to each other and fixing them for 2-4 months in place with a splint to the adjacent teeth.⁷ Factors affecting the extent and prognosis of root fractures depend on the condition of the pulp tissue, occlusion, fragment dislocation, and the patient's overall health.⁸ Horizontal root fractures arise from the rupture of the root's hard structures, affecting dentin and cementum, separating the apical segment from the coronal segment, i.e. the apical segment that is typically not displaced and the frequently displaced coronal segment. With favorable prognosis, middle third horizontal root fracture is most common, cervical third is very rare with poor prognosis, and apical third does not require therapeutic intervention (Karhade et al., 2016). Radiographs are used to validate the diagnosis and several radiographs are analyzed at different angles to detect the fracture angle (Karhade et al., 2016). In addition, the advent of new imaging modalities like cone beam computed tomography (CBCT) has enhanced the precision of traumatic injury diagnosis by resolving the drawbacks of 2-D radiography (projection geometry, anatomical structure superimposition and processing errors (Cohenca, 2017)).⁹

Recently, various types of post materials, such as quartz fiber post, carbon fiber and glass fiber, have been introduced into dental practice. There are many benefits to the fiber posts, such as an acceptable elastic module, lower chair side time, strong post-cement bonding, aesthetics and minimal

tissue removal. In the present case study, the apical fragment was endodontically treated and the two fragments were splinted using a glass fiber post to act as an intraradicular splint. The post is lubricated with resin cement and passively inserted, without adding pressure, into the root canal. The benefit of traditional metal posts is that they have a high elasticity modulus, whereas fiber-reinforced posts have a modulus similar to that of dentin, reducing the possibility of root fractures. The use of a post ensures the tooth's support and stability, according to Gurtu and Singhal. It helps to preserve the root fragments through radicular anchoring, thereby reinforcing the restoration complex that is exposed to tangential stresses. Between the post, reconstructive material, cement, and the tooth, a monoblock is created. In addition to bonding, post placement provides retention through a friction bond and helps to prevent nonaxial forces from dislodging. Light-transmitting fiber posts have also been commonly used to functionally and aesthetically restore the compromised root filled teeth.¹⁰ In this type of case, adequate care in the dental office as well as adequate long-term follow-up are needed to search for any potential pathological alterations. After one year, follow-up of this case demonstrated encouraging results with clinically satisfying esthetics and radiographic healing with the formation of calcified tissue.

4. Conclusion

In this case, treatment with intraradicular splinting of the horizontal root fractured tooth using a fiber post was done. This case shows that intraradicular splinting is an alternative strategy for horizontal root fracture treatment and the findings were satisfactory in one year of follow-up. In some situations, this method can be helpful and may eliminate the need for extraction.

5. Source of Funding

No financial support was received for the work within this manuscript.

6. Conflict of Interests

The author declares that they do not have any conflict of interests.

References

1. Welbury RR, Kinirons MJ, Day P, Humphreys K, Gregg TA. Outcomes for root-fractured permanent incisors: a retrospective study. *Pediatric Dent.* 2002;24(2):98–102.
2. Andreasen FM, Andreasen JO. Root fractures. In: Textbook and color atlas of traumatic injuries to the teeth. 3rd Edn. Copenhagen: Munksgaard; 1993. p. 279–311.
3. Ismail PM, Baby D, Sreedevi PV, Rajeev KG, Gautham A, Babita T, et al. Management of Horizontal Root Fracture with Intraradicular splinting using glass fiber post and biodentin: A Case Report. *IOSR J Dent Med.* 2020;19(9):59–63.

4. Andreasen J, Hjorting-Hansen E. Intraalveolar root fractures: radiographic and histologic study of 50 cases. *J Oral.* 1967;25(5):414–26.
5. Cvek M, Mejare I, Andreasen JO. Conservative endodontic treatment of teeth fractured in the middle or apical part of the root. *Dent Traumatol.* 2004;20(5):261–9. doi:10.1111/j.1600-9657.2004.00272.x.
6. Martos J, Amaral LP, Fernando L, Silveira M, Damian MF, Xavier CB, et al. Clinical management of horizontal root fractures aided by the use of cone-beam computed tomography. *Giornale Italiano di Endodonzia.* 2017;31:102–8.
7. Andreasen JO. Traumatic Injuries of the teeth. In: 2nd Edn.. vol. 1981. Philadelphia, PA: WB Saunders; p. 119–50.
8. Erdemir A, Ungor M, Erdemir EO. Orthodontic movement of a horizontally fractured tooth: a case report. *Dent Traumatol.* 2005;21(3):160–64. doi:10.1111/j.1600-9657.2005.00286.x.
9. Balakrishnan V, Savrimalai KC, Ramachandran AK, Sundaram RM, Padmanabhan S, Pandian APG, et al. Management of a Cervical, Middle and Apical Horizontal Root Fracture Patients. *Int J Curr Res.* 2018;10(2):65109–12.
10. Karhade I, Gulve MN. Management of Horizontal Root Fracture in the Middle Third via Intraradicular Splinting Using a Fiber Post. *Case*

Rep Dent. 2016;2016:1–5. doi:10.1155/2016/9684035.

Author biography

Neha Agrawal, Senior Resident

Rana K Varghese, Professor and HOD

Mansi Tiwari, Dept. of Oral Medicine and Radiology

Anshul Sharma, Reader

Cite this article: Agrawal N, Varghese RK, Tiwari M, Sharma A. Endodontic management of middle third root fracture of upper lateral incisor with glass fiber post & core endodontic restoration: A case report. *IP Indian J Conserv Endod* 2021;6(1):44–48.