

Horizontal Root Fracture in Maxillary Right Central Incisor: A Case report

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Abstract: Horizontal root fractures are uncommon traumatic dental injuries involving dentin, cementum, pulp, and periodontal tissues. They account for approximately 0.5%–7% of traumatic injuries affecting permanent teeth, with maxillary central incisors being the most frequently involved teeth. The prognosis of root-fractured teeth depends on factors such as the location of the fracture line, degree of fragment displacement, stage of root development, and promptness of treatment. This case report describes the diagnosis and management of a horizontal root fracture in the maxillary right central incisor (11) following traumatic injury. Clinical and radiographic examinations revealed a horizontal fracture involving the root with mobility of the coronal fragment. Immediate repositioning and stabilization using a flexible splint were performed. Periodic clinical and radiographic follow-up demonstrated satisfactory healing and maintenance of tooth vitality. The case highlights the importance of early diagnosis, appropriate splinting, and long-term monitoring in achieving favorable outcomes in teeth affected by horizontal root fractures.

Keywords: Horizontal root fracture, dental trauma, maxillary central incisor, splinting, tooth vitality, traumatic dental injury

1. Introduction

Traumatic dental injuries constitute a significant public health concern, particularly among children and young adults. Among the various types of dental trauma, root fractures are relatively rare injuries, accounting for approximately 0.5%–7% of all traumatic injuries to permanent teeth.¹ Root fractures are characterized by the involvement of dentin, cementum, pulp, and periodontal ligament and are most commonly observed in the maxillary central incisors owing to their prominent position within the dental arch.²

Horizontal root fractures typically result from direct impact to the tooth, causing a fracture line that may occur in the apical, middle, or cervical third of the root. The middle third is reported as the most common site of occurrence. Clinical manifestations vary depending on the location and extent of displacement of the coronal fragment and may include pain, tenderness to percussion, increased mobility, and displacement of the crown. Radiographic examination plays a crucial role in diagnosis, with multiple periapical radiographs and cone-beam computed tomography (CBCT) being valuable tools for accurate assessment.^{2,7}

The prognosis of horizontally fractured teeth is influenced by several factors, including patient age, root maturity, fracture location, degree of displacement, pulpal status, and the time elapsed between injury and treatment. Favorable healing outcomes may occur through calcified tissue formation, connective tissue interposition, bone and connective tissue interposition, or, in unfavorable cases, inflammatory tissue formation.^{2,4} Preservation of pulp vitality is common, particularly when displacement is minimal and prompt treatment is instituted.^{3,4}

Current recommendations from the International Association of Dental Traumatology (IADT) emphasize immediate repositioning of displaced fragments and stabilization with a passive flexible splint for approximately four weeks, followed by periodic clinical and radiographic evaluation.^{1,6} Long-term follow-up is essential because pulpal necrosis, root resorption, and other complications may develop months or even years after the initial injury.^{6,7}

Although many horizontal root fractures can be managed conservatively with repositioning and splinting, endodontic treatment becomes necessary when pulpal necrosis develops in the coronal fragment. In such situations, root canal treatment limited to the coronal fragment, while preserving the vitality of the apical segment, has demonstrated favorable long-term outcomes.^{2,3} The use of fiber posts following endodontic treatment has further improved the rehabilitation of traumatically fractured teeth by providing intracanal reinforcement, favorable stress distribution, and improved fracture resistance due to their modulus of elasticity being similar to that of dentin.²

The present case report describes the successful management of a middle-third horizontal root fracture involving the maxillary right central incisor (11) in a 45-year-old male patient. The case highlights the importance of timely diagnosis, appropriate repositioning and stabilization, conservative endodontic management of the coronal fragment, fiber post rehabilitation, and long-term follow-up in achieving a favorable clinical outcome.

2. Case History

A 45-year-old male patient, Mr. Shiju, reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of pain and mobility in the upper front tooth region for the past four days. The patient gave a history of trauma following a fall four days prior to presentation. There was no history of loss of consciousness or other associated facial injuries. Since the incident, the patient had experienced discomfort while biting and increased mobility of the affected tooth.

On clinical examination, a visible fracture line was observed with respect to the maxillary right central incisor (11). The tooth exhibited tenderness on percussion and grade I mobility, while the surrounding soft tissues appeared healthy without any significant lacerations or swelling.

Radiographic examination using an intraoral periapical radiograph revealed a distinct horizontal radiolucent line

extending across the middle third of the root of tooth 11, consistent with a horizontal root fracture. Separation of the coronal and apical fragments was evident, with mild displacement of the coronal fragment. Based on the clinical and radiographic findings, a diagnosis of **Ellis Class VI fracture involving tooth 11** was established.

Considering the delayed presentation and the mobility associated with the coronal fragment, nonsurgical endodontic

treatment was planned for the coronal fragment of tooth 11, followed by reinforcement with a fiber post to provide intracanal stabilization and facilitate definitive coronal restoration. The patient was informed about the treatment plan, prognosis, and the need for periodic clinical and radiographic follow-up, and informed consent was obtained before initiating treatment.

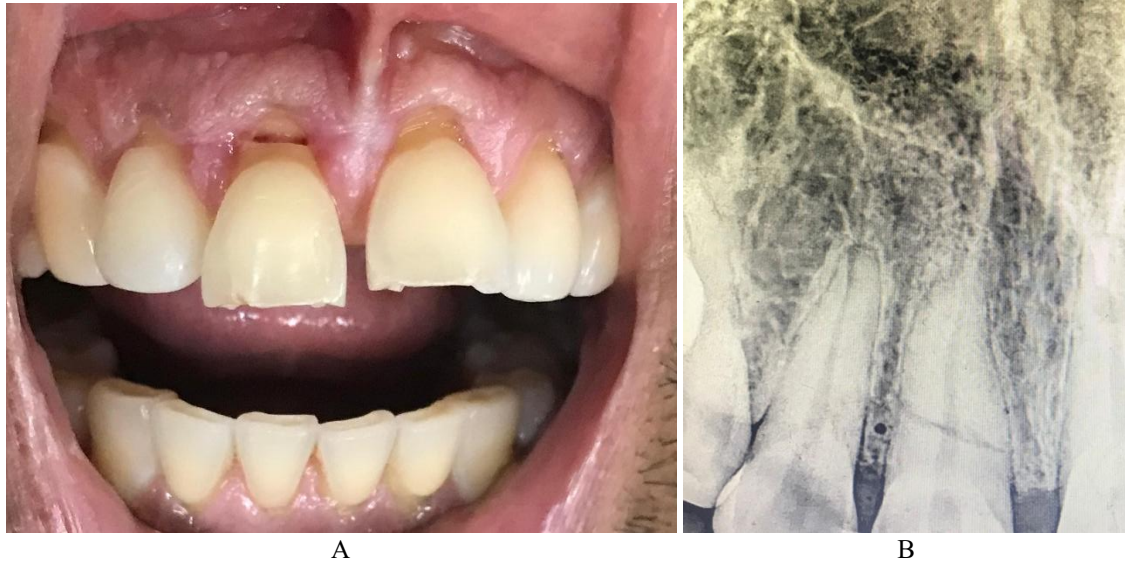


Figure 1: (A) Pre operative photograph of tooth 11, (B) Pre operative radiograph of tooth 11



Figure 2: The tooth was repositioned, and with the help of a flowable composite, single-tooth splinting was done, (A) Application of etchant on the proximal sides of 11, (B) Application of bonding agent and flowable composite to splint the tooth 11 in position, (C) Palatal view of tooth 11 after splinting

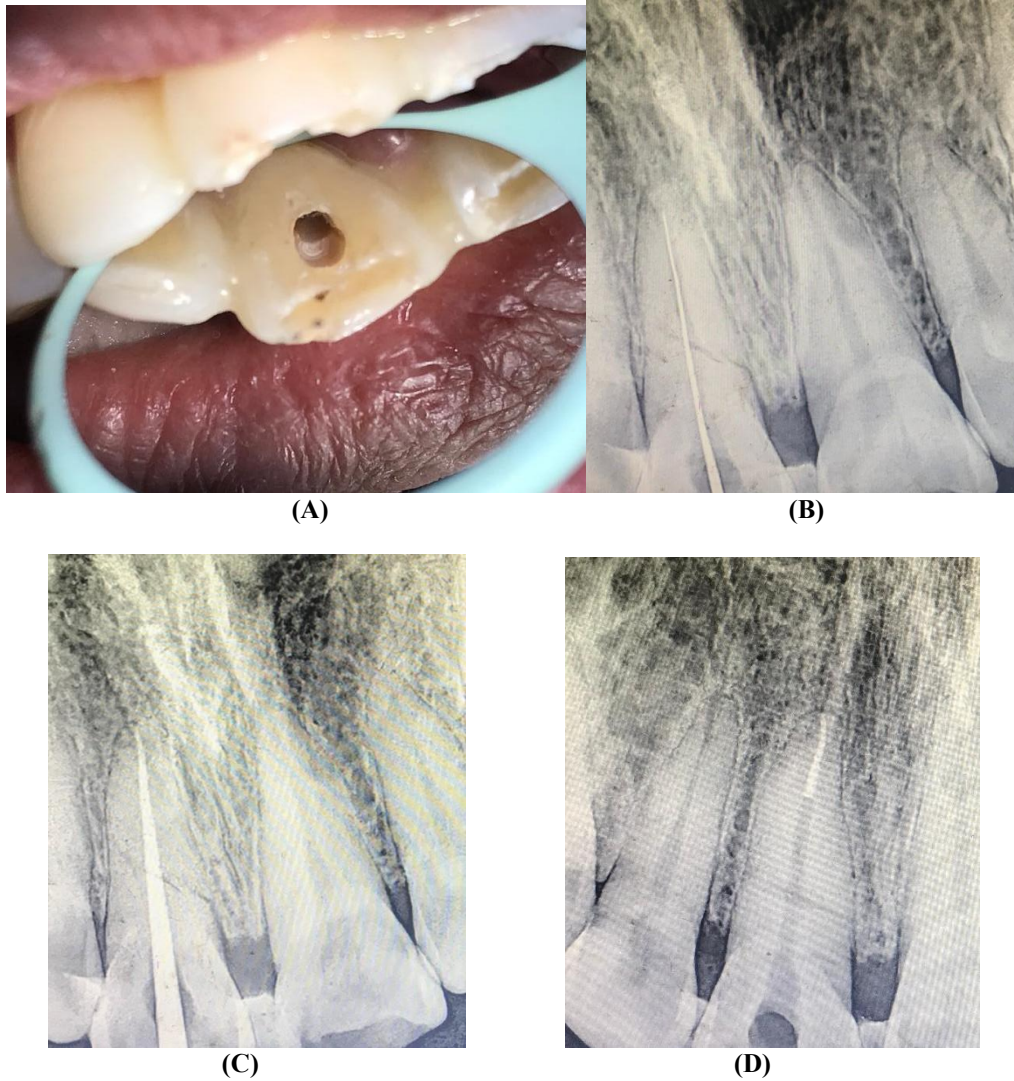


Figure 3: (A) Access opening of the tooth 11; (B) Radiograph showing working length determination; (C) Radiograph showing master cone fit check; (D) Radiograph showing sectional obturation

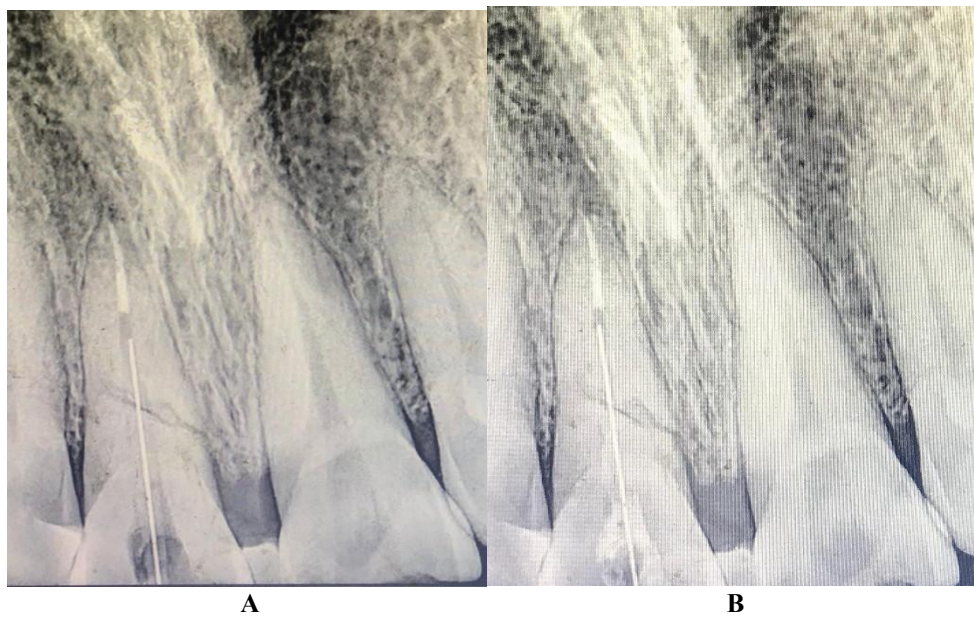


Figure 4: (A) Radiograph showing post space preparation and fit of the fiber post wrt tooth 11; (B) Radiograph showing fiber post cementation wrt tooth 11

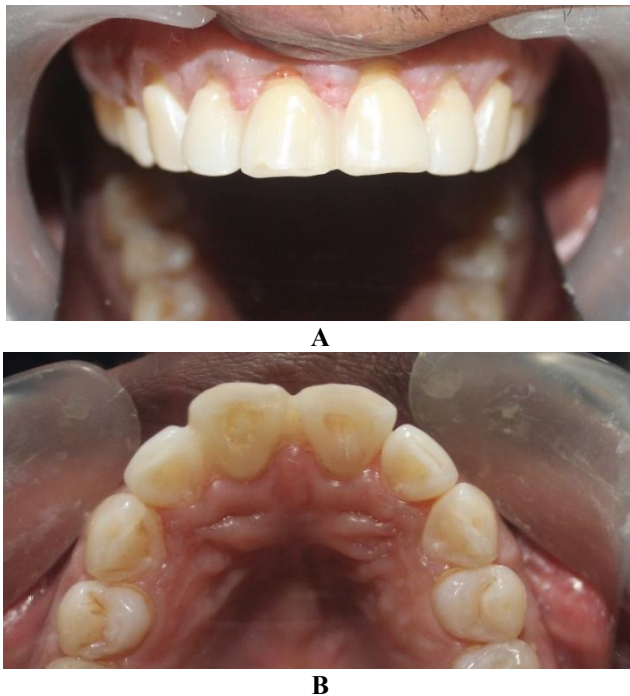


Figure 5: (A), (B); Post-Operative Photographs



Figure 6: Post-Operative Radiograph

3. Discussion

Horizontal root fractures are relatively uncommon injuries of the permanent dentition, accounting for approximately 0.5–7% of all traumatic dental injuries. They most frequently involve the maxillary central incisors because of their anterior position within the dental arch and susceptibility to direct traumatic impact. The prognosis of these injuries depends on several factors, including the location of the fracture, degree of displacement of the coronal fragment, stage of root development, pulpal status, and the interval between injury and treatment.^{9–11}

In the present case, the patient reported four days after sustaining trauma, presenting with pain and mobility of the

maxillary right central incisor. Clinical and radiographic examination revealed a horizontal root fracture involving the middle third of the root with mild displacement of the coronal fragment. Middle-third fractures generally demonstrate a more favorable prognosis than cervical-third fractures because of better periodontal support and a greater likelihood of healing following appropriate stabilization.^{10, 12}

The International Association of Dental Traumatology (IADT) recommends repositioning of the displaced coronal fragment whenever possible, followed by stabilization with a passive flexible splint for approximately four weeks. In the present case, the coronal fragment was repositioned and stabilized using a single-tooth composite splint, which minimized further movement of the fractured segments and promoted periodontal ligament healing. Prompt stabilization plays a crucial role in reducing mobility, preserving vascular supply, and facilitating healing at the fracture interface.^{9, 13}

The vitality of the pulp following horizontal root fracture depends largely on the degree of displacement and disruption of the neurovascular bundle. Although a considerable number of horizontally fractured teeth maintain pulp vitality, delayed presentation and persistent mobility increase the likelihood of pulpal necrosis in the coronal fragment. Since only the coronal fragment usually undergoes necrosis, endodontic treatment is generally confined to the coronal segment, while the apical fragment is left untreated because it often retains its vitality.^{10, 14}

In the present case, nonsurgical root canal treatment was performed only in the coronal fragment. Sectional obturation was carried out up to the fracture line, thereby preserving the vital apical fragment. This conservative approach avoids unnecessary instrumentation beyond the fracture site and minimizes further trauma to the periodontal tissues while maintaining the biological potential for healing.^{14, 15}

Following obturation, a fiber post was placed to reinforce the weakened coronal fragment and provide intracanal stabilization. Compared with metallic posts, fiber posts possess a modulus of elasticity similar to that of dentin, allowing a more uniform distribution of functional stresses and reducing the risk of catastrophic root fracture. Adhesive cementation of the fiber post also improves retention and contributes to reinforcement of the remaining tooth structure, making it an appropriate restorative option in teeth with compromised coronal integrity following traumatic injuries.^{16, 17}

Healing following horizontal root fractures has been described as occurring by calcified tissue, connective tissue, bone and connective tissue interposition, or, in unfavorable cases, inflammatory tissue formation. Long-term clinical and radiographic follow-up remains essential because complications such as pulpal necrosis, inflammatory root resorption, or non-union may develop months or even years after injury. Therefore, periodic assessment of tooth mobility, percussion response, radiographic healing, and periapical status is indispensable for evaluating treatment success.^{9, 10, 15}

4. Conclusion

Horizontal root fractures of permanent teeth require early diagnosis, careful clinical and radiographic assessment, and an individualized treatment approach based on the location of the fracture and pulpal status. Repositioning and stabilization of the coronal fragment, followed by endodontic treatment limited to the coronal segment when indicated, can result in favorable healing while preserving the vitality of the apical fragment. In the present case, the combination of conservative endodontic management, sectional obturation, and fiber post reinforcement provided satisfactory stabilization and restoration of the fractured tooth. Long-term follow-up remains essential to monitor healing and detect any delayed complications, thereby ensuring a favorable prognosis.

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