Introduction

Traumatic injuries of teeth are the main cause of emergency treatment in dental practice.1-3 Horizontal root fractures are more frequently observed in the maxillary anterior region and in young male patients.1-4 The most common type of root fracture is in the middle third, followed by apical and coronal third.1-3 It was reported that 31% of the patients with root fractures were identified during routine dental radiographic examinations.1-4 Immediate treatment in horizontal root fractures includes repositioning of coronal segment and splitting and delayed management by endodontic treatment of coronal fragment.5 This paper reports the management of a horizontal root fracture using mineral trioxide aggregate (MTA) and fiber reinforced composite.

Case Report

A 32 year old male patient reported to the Department of Conservative Dentistry and Endodontics, with a chief complaint of pain in upper left front tooth for past five days. Pain was moderate, intermittent in nature. History reveals that he had an accident three years back. His upper front teeth were mobile and splinting was done for one month followed by initiation of root canal therapy, which was interrupted because he did not report for the followup. Medical history was non-contributory. Clinical examination revealed discolored 21, 11 and 12 with access cavities prepared palatally (Figure 1). The access cavities of 21, 12 were without any seal or medicament with soft caries within the pulp chamber. Tooth 11 had a fractured cervical fragment. The patient was explained about the different treatment modalities and fibers reinforced composite. Patient consent was taken.

In 21 with horizontal fracture, working length was determined using Ingle’s method as apex locator gave inconclusive results. Cleaning and shaping was done with combination of ProTaper rotary NiTi files and circumferential filing. The canals were enlarged till size F5 with ProTaper in 11 and 12. Cleaning and shaping was limited to coronal fragment of 21. The canals in all three teeth were dried and a calcium hydroxide intracanal medicament was placed. The access cavities were sealed with cotton pellet and temporized with a temporary restorative material. Oral hygiene instructions were given and the patient was recalled after one month. The radiographs after first month revealed decrease in widening of PDL space with 11, 12 and there was no change observed around 21 (Figure 3). Intracanal medicament was removed from tooth 11 and 12, and the canals were obturated with gutta percha and resin based sealer using lateral condensation technique. Intracanal medicament was allowed to remain in tooth 21 for further two more months. After the third month patient was asymptomatic and radiograph of 21 showed a slight decrease in width of PDL space. The intracanal medicament was removed and the fractured tooth was checked for barrier formation at the junction of coronal and apical fragment by passing a #15 K-file through the root canal. The file went past the coronal fragment indicating absence of any barrier. The decision was then made to place MTA plug in the coronal fragment followed by reinforcement with fiber-reinforced composite. MTA plug was prepared according to manufacturer’s recommendations by mixing with a powder: liquid ratio of 3:1 (Figure 4). After placing MTA plug of 4mm in the root canal, a moist cotton pellet was placed in the pulpal chamber and the access cavity was sealed with a temporary restorative material. Patient was recalled after 24 hours. At the following appointment, setting of MTA was verified. The access cavity and remaining root canal space were etched with 37% phosphoric acid for 30secs. Followed by washing and drying two coats of bonding agent was applied to access cavity and remaining root canal space and light cured. A required length of fiber material that was pregipregnated with bonding agent was cut and placed in the access cavity with its two ends extending on buccal and lingual walls of root. A flowable composite was placed in the remaining root canal space and then light cured. The access cavity was sealed with a nanocomposite resin (Figure 5). Follow up appointments were done at 2nd, 4th, 6th and 12th months interval. Patient was asymptomatic and no periapical pathosis developed. 18 months follow up revealed no mobility in teeth with a good clinical and radiographic prognosis (Figure 6).
inforcing the tooth structure. Fiber reinforced composite was undermined tooth structure. This necessitated the need for reconsideration of middle and apical third with periodontal ligament widening. Radiographic examination revealed no periapical lesion in the apical segment and pulp necrosis of the displaced coronal fragment was reported in 25% of cases.\textsuperscript{3,10,11} The necrotic and infected pulp tissue is responsible for the inflammatory changes along the fracture line.\textsuperscript{8,12} However, there are cases of horizontal root fractures with signs of healing without any treatment.\textsuperscript{1,12} In case of displaced coronal fragment, immediate treatment requires re-approximation of the fragments and splinting for four weeks.\textsuperscript{12,13} Following splinting, it is essential to monitor vitality of pulp.\textsuperscript{14} But in cases with delay between time of injury and initiation of treatment, close approximation is not always possible. In such cases, healing mainly occurs by formation of granulation or connective tissue, which is a sign of pulp necrosis and an indication that endodontic treatment of the tooth is necessary.\textsuperscript{15} If endodontic treatment in such cases is limited to coronal fragment, there are difficulties faced with obturation due to apical diameter of fragment, crown-root ratio of remaining tooth structure, inflammation at the fracture site and absence of barrier. Fractures that are in the horizontal plane can usually be detected in the regular 90° angle film with the central beam through the tooth.\textsuperscript{16} In the present case, 21 had horizontal root fracture at the junction of middle and apical third with periodontal ligament widening. Radiographic examination revealed no periapical lesion in apical fragment with favourable crown-root ratio with respect to coronal fragment. So, decision was made to perform root canal treatment in coronal fragment. Placement of calcium hydroxide intracanal medicament was done in an attempt to allow barrier formation at the apical part of coronal fragment. Even though no barrier was formed after three months, long term placement of Calcium hydroxide was not done to avoid compromising the fracture resistance of tooth structure.\textsuperscript{17} Moreover it has a disadvantage of increased treatment time, unpredictable results and delays in completing final restoration.\textsuperscript{18,19} MTA apical barrier technique\textsuperscript{20} was used to create a 4mm apical plug. MTA is a tricalcium mineral complex and is considered to be a potentially ideal material for apexification and perforation repair.\textsuperscript{21} Following MTA placement, 2mm of root canal space was left along with thin dentinal walls and undermined tooth structure. This necessitated the need for reinforcing the tooth structure. Fiber reinforced composite was used to achieve the same.

Conclusion

In conclusion, delayed horizontal root fractures management with MTA and fiber-reinforced composite can lead to acceptable clinical outcome.

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References

Delayed management of a horizontal root fracture - A case report


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