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INTRARADICULAR SPLINTING IN HORIZONTAL FRACTURE OF A MAXILLARY CENTRAL INCISOR–A CASE REPORT

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ABSTRACT
Root fracture is one of the consequences of dental trauma.Root fractures are encountered by every dentist in day to day practice. Horizontal root fractures are a type of traumatic dental injury that involves cementum, dentin, and pulp. Several options are available for the management of root fractures. But the difference lies in diagnosis & treatment planning which makes it a failure or a success. Goal of endodontic and restorative dentistry is to retain the natural tooth. This case report presents the endodontic management of a horizontally fractured central incisor using an intraradicular splinting technique. The root canal of the left central incisor was temporarily filled with calcium hydroxide slurry. This was followed by intraradicular splinting of the tooth using a NiTi file and MTA as sealer. This case demonstrates that intraradicular splinting can be used to manage horizontal root fracture. Mineral trioxide aggregate, or MTA, is a new material developed for endodontics that appears to be a significant improvement over other materials for fracture repair. It is the first restorative material that consistently allows for the overgrowth of cementum, and it may facilitate the regeneration of the periodontal ligament.

KEYWORDS: Horizontal Root Fracture, Intraradicular Splinting, NiTi File,Mineral Trioxide Aggregate

INTRODUCTION
Andreasen[1] states that the root fractures in permanent teeth are relatively infrequent occurrences, implicating in 0.5-7% of all dental traumas. Horizontal root fractures occur mainly in the anterior region of the maxilla, usually owing to a frontal impact, more frequently observed in fully erupted teeth with complete root formation. Horizontal fractures occur most frequently in the middle third of the root and rarely in the apical-third.[2,3,4] The prognosis is poorer if the fracture level is in the coronal third.[5] Treatment is usually directed at repositioning and stabilizing a tooth (if necessary) in its correct position and monitoring the tooth for an extended period for pulpal vitality.[6] Root fractures represent complex healing patterns due to concomitant injury to the pulp, periodontal ligament, dentine, and cementum.

Healing in teeth with horizontal fracture is with one of these types: healing with hard tissue, interposition of connective tissue, interposition of bone and connective tissue, and interposition of granulation tissue. While the first three types are considered favorable and the 'healing with hard tissue' is the most desired, the last one represents inflammatory state and is unfavorable.[7] If the dental pulp is necrotic, repair does not occur without root canal treatment. A factor with significant influence in the healing process in cases of horizontal fractures is the presence or absence of communication of the fracture line with the oral environment because of contamination from bacteria present in the sulcus.[8]

Various treatment techniques for managing fractured teeth with necrotic pulp have been suggested. The initial treatment consists of the repositioning of displaced coronal segments, followed by the stabilizing of the tooth to allow healing of the periodontal ligament supporting the coronal segment to occur. The amount of dislocation and the degree of mobility of the coronal segment affect the prognosis.[9]

The treatment of choice for fractured, non-vital teeth consists in using calcium hydroxide dressings for certain periods of time followed by gutta-percha filling.[10] Inspite of the good results with calcium hydroxide, the technique is very time consuming and does not always imply success due to inherent complication of long-term calcium hydroxide therapy.[11] Mineral trioxide aggregate (MTA) is a biocompatible material with numerous

interesting clinical applications in endodontic. The material appears to be an improvement over other materials for some endodontic procedures that involve root repair and bone healing. Current literature supports its efficacy in promoting the overgrowth of cementum and it may facilitate the regeneration of the periodontal ligament because of its alkaline pH of 12.5 and the presence of several mineral oxides in its composition.[12]

This case report presents the novel approach toward approximation, stabilization, and endodontic management of a horizontally fractured maxillary central incisor using stainless steel file and MTA.

CASE REPORT

A 16 year old female visited the department of Conservative and Endodontics in Jaipur Dental College and hospital with the complaint of loose tooth in the upper front region and sinus formation in every 2 weeks. She had suffered a dental injury in the upper anterior teeth while playing in the park near her house. Trauma had happened 5years ago. The patient had visited a general dentist, but did not receive any treatment.

The clinical examination revealed Ellis Type IV fracture of the right central incisors and grade 1 mobility and did not respond to electric and thermal pulp tests. No Discomfort was noted during percussion and palpation. Sinus Opening (Fig i) and Access Preparation (Fig ii) seen in relation to right maxillary central incisor.

Fig i- Sinus opening seen irt 11

Fig ii- Access Preparation irt 11

Radiographic examination revealed crown fracture of the right central incisor and horizontal fracture in the middle third of the root, separating the coronal and apical root fragments from each other. The space between the fractured segments appeared minimal. Intraoral periapical radiograph showed no periapical radiolucency but showed widening of the periodontal ligament in relation to the apical third of 11. There was no significant bone loss. Patient's oral hygiene was satisfactory. (Fig iii) Treatment plan was root canal therapy in relation to tooth 11 followed by intraradicular splinting using a NiTi endodontic file.

Fig iii- Horizontal Root fracture

Endodontic treatment of 11 the incisors was initiated under local anesthesia. Access cavity modification was done. A number 15K file was passed through the fracture in right central incisor to access the apical root segment. (Fig iv)

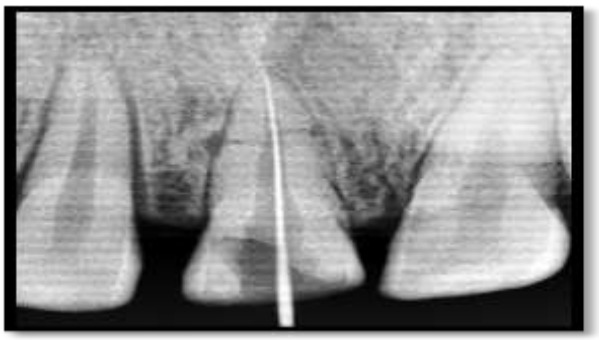

Fig Iv - working length determination

The necrotic pulp tissue was extirpated. The coronal root canal was cleaned, shaped with a no. 80 K file. Fit of the no15 Niti file was checked which will act as intraradicular splint. The canal was filled with calcium hydroxide slurry.(Fig v)

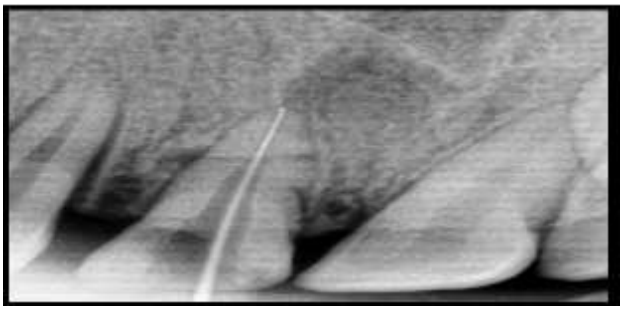

Fig v : coronal preparation and intraradicular splint try in

The patient was recalled two weeks later, the calcium hydroxide dressing was carefully removed from the canal of left central incisor. Then the canal was filled with MTA (ProRoot MTA, DENTSPLY Tulsa Dental) and a NiTi file (Protaper) [which was selected earlier and cut to fit the canal) was coated with MTA and inserted into the canal to act as intracanal splint. Care was taken to position the file 1- 2mm short of the apex. Sufficient amount of MTA was maintained around the file in the canal (figure vi). The access cavity was sealed appropriately.

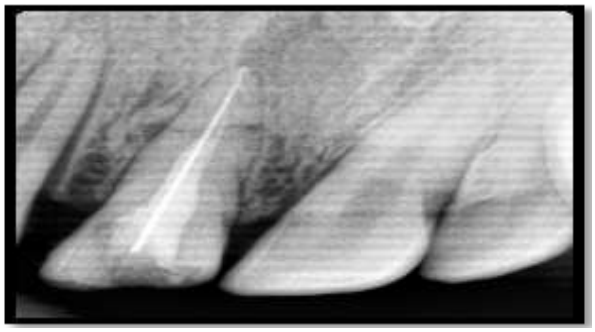

Fig vi- obturation with MTA

The patient remained asymptomatic for the next four weeks, she had no complaints of mobility or sinus formation. The radiographic feature showed healing around the fracture line, radiopacity was seen along the fracture line. (Fig vii).

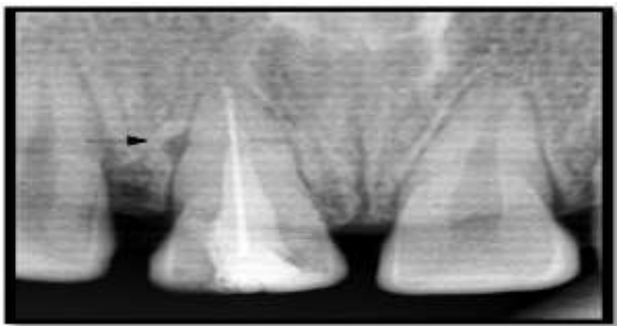

Fig vii –healing seen in four weeks

The patient was recalled for 1year follow up and patient remained asymptomatic and healing was seen radiographically.In this case healing was by bone and connective tissue.(Fig viii).

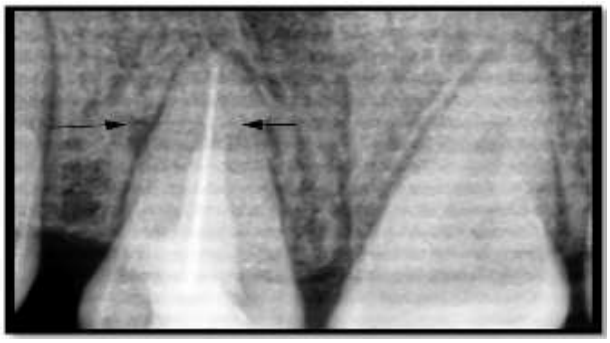

Fig viii- 1 year follow up

DISCUSSION

Preservation of the natural dentition and restoration of the oral cavity to a normal functional state is a primary goal in dentistry.[2] Root fracture is one of the consequences of dental trauma. The treatment principles for horizontally fractured teeth involve maintaining pulp vitality by immobilizing the coronal segment. Four types of healing can be observed following the root fractures: healing with calcified tissue, interposition of connective tissue, the interposition of connective tissue and bone and interposition of granulation tissue.[5] However, in case of nonvital pulp endodontic treatment is required to render the tooth aseptic. The separation of the fragments is an important variable to fracture healing8. Immobilization of the fragments with a rigid splint is arguable. For some authors, the rigid splinting must be maintained for two to three months, to provide matrix position in accordance with principles for root healing.[3,9] However, some studies have found that the matrix deposition occurs to a greater extent in teeth, which are not submitted to immobilization, as root consolidation takes place more efficiently under functional stresses.[16]

Many times, an interdisciplinary/ multidisciplinary appro ach is necessaryfor the re-establishment of function and esthetics in a fractured tooth. Treatment plan is determined by the extent ofubgingival fracture, remainin g coronal tooth structure, locationof fracture line, pulpvit ality and length and morphology of the roots.[17]

Several treatment alternatives exist when the treatment requires removal of the coronalfragment. If the length of the apical fragment is sufficient, it can be restored by post and core.[7] For that, the fragment can be extruded through crown lengthening or orthodontic or surgical repositioning.The disadvantages of such a treatment is that it may be difficult, time consuming.[12]

In the presented case, endodontic treatment was carried out. Although a negative response to the electric pulp test at early examination is not indicative for endodontic treatment, slight discoloration of the crown increased the probability of pulpal necrosis. This was justified when the access was achieved; necrotic pulp tissue was noticed in the canal. Radically, both fragments were treated endodontically because of the insertion of NiTi file into the canal a proper approximation of the fracture fragments was aimed. Previous studies have shown that proper repositioning of the coronal fragment is essential for successful healing of the horizontal root fractures.The risk of apical fragment to have been infected due to the necrosis repositioning healed more frequently with hard tissue repair than those with more space between the fragments. Hence intraradicular splint was attempted to approximate the fragments for a better healing of the fracture. Earlier studies have used AH26 and polycarboxylate cement as the sealer. In this case MTA was used as sealer due to the established advantages of MTA in endodontics. The disintegration of AH26 and

polycarboxylate cement by tissue fluids may cause a foreign body reaction at the fracture site.

MTA is a biomaterial that has been investigated for various endodontic implications such as root-end fillings, pulp capping, apical filling of teeth with open apices, apexification therapy, repair of root, and furcal perforations. MTA has been recognized as a bioactive material that is hard tissue conductive, hard tissue inductive, and biocompatible. MTA has proven to have cementogenic and osteogenic potential.[18] Hence, the fracture line was sealed with the use of MTA and the canals were completely obturated with MTA so that it provides a sort of intra-radicular splint after setting.

Short term follow up for the case showed promising results. Patients should be reviewed after one year to confirm the success of such treatment.

CONCLUSION

In this case treatment of horizontal root fractured tooth was carried out with intraradicular splinting using endodontic file and MTA as sealer. This case demonstrates that intraradicular splinting is an alternative technique for managing horizontally fractured teeth with necrotic and mobile coronal segment

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