Non-surgical management of apical third root fracture with MTA: A case report

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Abstract:
Introduction: Though dentin is flexible still at times the teeth undergoes fractures. Coronal fractures are easy to manage and repair but when it comes to root fractures, treating them has always been a tough job. Though different types of healing patterns have been mentioned in the text, still most of these teeth suffer from either continuous pain or they get extracted. To conserve and salvage such fractured teeth different techniques have been explored and many a times surgical approach has also been used but the results have often not been that promising. This paper describes a case with apical third fracture managed non-surgically with application of MTA.
Case discussion: A female patient reported with severely retroinclined central incisors with apical third fracture in 11 with history of trauma and complaint of dull continuous pain. Multiple appointment endodontic therapy also couldn’t not subside the pain. The canal was obturated by MTA and fiber post was placed to change the angulation of tooth. At same time 21 was intentionally RC treated and obturated by gutta percha followed by post placement for straightening the crown. Both the teeth were given full ceramic crowns. Post operatively the pain reduced within days and there was remarkable stability of root fragment
Conclusion: It was concluded that apical third fractures can be splinted successfully by intra-radicular approach using MTA and thus enhance their healing.

Introduction:
Traumatic injuries of teeth are the main cause of emergency treatment in dental practice¹ and they range from simple enamel cracks to complex dento-alveolar fractures leading to avulsion/ intrusion or complete loss of teeth.

Most of the injuries are often limited to coronal part of the teeth and root fractures of permanent teeth are fairly uncommon ² unless the impact forces are very high and bluntly directed to the roots of the teeth.³ Root fractures seen mostly are either vertical or horizontal and they happen more in the maxillary anterior region owing to long straight roots. This kind of fractures usually occur because of severe trauma, such as traffic accidents and sports injuries, and it has been reported to occur in less than 3% of all dental injuries.¹ Of all the root fractures, apical third fractures have most favourable prognosis⁴ and if left untreated often heal by themselves by one of the healing pattern.⁵ But if the underlying aetiology is not controlled or irradiated, it may lead to non-healing of dental tissues and may cause continuous pain and might lead to loss of tooth.

Case Report:
A 40-year-old woman was referred by a general dentist with complaint of pain in maxillary right central incisor (11) despite multiple sessions of cleaning and shaping and intermittent dressing ranging over a number of days. On clinical examination of the tooth, it showed tenderness and gave positive response to both horizontal and vertical percussion. The maxillary incisors were retroclined giving an Angel’s Class II div 2 appearance.

Also wear facets were seen on teeth indicating bruxism and night grinding of which the patient was not aware. Radiographic examination revealed a clear fracture at the junction of apical and middle third of the root in 11. A widened periodontal ligament (PDL) was apparent surrounding the fracture site, without loss of continuity in lamina dura. It was decided to continue the endodontic therapy for 11 and calcium hydroxide was placed in the canal to render the pulp space free of any infection. Simultaneously intentional RCT was initiated in 21 and canal was shaped to apical size 60 using Hyflex rotary file system (ColteneWhaledent) and K-files. Both the canals were cleaned and shaped to size 70 and 60 respectively. Also the central incisors were relieved by reducing the occlusion from the palatal surface so as to reduce the trauma of bruxism. At consecutive appointment as the teeth showed reduction in tenderness, the canals were irrigated with 10% citric acid and mechanically agitated by canal brush (Coltene Whaledent) to remove calcium hydroxide.

The root canals were dried using paper points and the apical third of 11 was filled by mineral trioxide aggregate(Angelus) using MAP system (Dentsply)and densely compacted by hand pluggers. 21 wassectionally obturated by warm injectable gutta percha using Obtura II ( Obtura Spartan) along with AH plus sealer(Dentsply). Post space was prepared in both the canals till middle third and Tenax glass fibre post (ColteneWhaledent) were
cemented with the help of dual cure resin cement (Paracem from ColteneWhaledent) Crown preparation was done for both 11 and 21 such that the coronal angulation of teeth changed and retroinclination got corrected. Rubber base impression was taken and metal free Emax crowns were fabricated and cemented in the next appointment. Also nightguard was given to control the habit of bruxism.

![Figure: 1 (Pre-operative picture of the teeth)](image1)

![Figure: 2 (Pre-operative radiograph of the teeth)](image2)

![Figure: 3 (Radiograph showing Obturation and repair by MTA in tooth 11)](image3)

![Figure: 4 (Post-operative after post and core)](image4)

![Figure: 5 (Post-operative image of the teeth after crown placement)](image5)

**Discussion:**

Patients coming with dento-alveolar injuries are not uncommon incidence in dental practice. Most of the time such cases are seen in relation to children and adolescents. Majority of such cases present damage to enamel and dentin in coronal part of teeth or avulsions and intrusions of the whole tooth but root fractures are not that commonly seen.

A variety of traumatic conditions can cause root fractures, like falling while playing and running, during sports activities, and blows received on the face. Hovland,\(^6\) reported that horizontal root fractures in the permanent dentition comprise from 0.2% to 7% of all traumatic injuries to teeth. Out of all the teeth it’s the maxillary central incisors which are most vulnerable to injury, sustaining approximately 80% of all dental injuries, followed by the maxillary lateral and the mandibular incisors.\(^7\) This mainly happens due to their being in most forward position and getting the maximum impact of forces. Bruxism is a self-induced pathological condition caused most of the time due to stress and is mostly seen in adults. Chronic bruxism may lead to sensitive, worn-out, decayed, fractured, loose, or missing teeth.\(^8\) Often successful long lasting restoration of such teeth becomes difficult unless the habit is controlled. Bruxism leading to root fractures in middle and apical thirds of single tooth is an uncommon finding.

When it comes to treating root fractures, successful management often involves a multidisciplinary approach,\(^9,10\) but still the repair of root dentin much depends on an intact periodontal ligament, from which the hard tissue forming cells originate.\(^11\) The line of treatment primarily involves repositioning of the fractured segments in as close proximity as possible and stabilizing in that position with a splint to the adjacent teeth for 2-4 months.\(^7\) This splinting allows only micro-movements of the segments thus enabling the cells to proliferate and induce healing without any disturbance. In a recent study on fractures in the middle and apical parts of the root, splinting of the luxated coronal fragments and the duration of splinting were found to be of minor importance, whereas factors such as root development, pulp sensitivity and repositioning of
dislocated fragments were highly predictive of the frequency. 12 Most of the methods of splinting mentioned in the text are extra-coronal like interdental wiring, arch bar, and flexible splints and intra-radicular splinting by use of endodontic instruments stabilized with sealers. 13, 14

Mineral trioxide aggregate is a fine powder which sets in presence of moisture. The major compounds of MTA are tricalcium silicate, tricalcium aluminate, tricalcium oxide and silicate oxide. 15 It promotes healing by inducing cementum formation and has been indicated for a wide range of applications like root-end fillings, perforation repair, and apexification. 16 It has been used for repair of radicular fractures along with intra-radicular splints 14, 17 but not been mentioned in literature for fracture repair without using any splint. MTA was used in this case not just to seal the fracture but also at the same time hold the root pieces together like a splint as it gets bonded with the dentin of pulp space on setting.

Post and core are mainly indicated to reinforce the root and restore the lost coronal part of tooth there by bringing it back in function. Out of all the types of posts available, it’s the glass fibre posts which are most suitable as their resiliency is very close to the dentin. 18, 19 In this case the posts were used to change the angulations of crowns to eliminate the continuous trauma cased by bruxism which is again an unconventional application. On follow up after 6 months of treatment the tooth was found free of clinical symptoms of pain and swelling, also there was no peri-radicular pathology or any sign of mobility hence indicating successful repair of the apical fracture.

Conclusion:

It can be concluded from the above case report that to have good treatment outcome we have to focus not just on line of treatment but also on adequate diagnosis. MTA is a promising material when used for repair of dental tissues and can also be used as sole material for intra-radicular splinting of apical third fractures.

References: