Single unit endodontic stabilizer-core-crown restoration: A case report

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Abstract
Aim: To report a case of middle third root fracture in right maxillary central incisor with compromised root-crown ratio which was successfully managed by a single unit endodontic stabilizer core and crown.

Summary: Conservation is fast becoming the basis of human activity in many fields. Restoration of fractured anterior teeth has long been a test of a clinician’s skill due to the inherent demand for excellent aesthetics. The tooth with fractured root impairing crown-root ratio can be saved by use of endodontic stabilizers. This case report describes an innovative treatment strategy for the management of right maxillary central incisor with middle third fracture of the root with compromised root-crown ratio which was successfully managed by a single unit endodontic stabilizer core and crown.

Key learning points:
- Management of mid-root fractures presents a formidable challenge for clinicians because of the difficulty of achieving a stable reunion of fracture fragments.
- The use of endodontic stabilizers for improving crown root ratio of the tooth is recommended

Keywords: Crown root ratio, Endodontic stabilizer, Implant

INTRODUCTION
Fracture of anterior teeth by trauma is the most frequent type of injury in the permanent dentition (Ojeda-Gutierrez F 2011) with challenging treatment (Bindo et al. 2010). Most commonly involved teeth in traumatic fractures are the maxillary incisors. (Moura et al 2012) The frequency of root fractures in permanent teeth is only 0.5% to 7% (Andreasen et al. 2007). Horizontal root fractures as consequence of trauma are unfortunate accidents that mainly occur in the middle third of the root.

The most common treatment alternative to mid root fractures is immediate repositioning of the displaced fragment followed by application of a passive splint. (Andreasen FM 2007) However it presents a formidable challenge for clinicians because of the difficulty of achieving a stable reunion of fracture fragments. (Moura et al 2012). The other alternative to treat mid root fractures is the extraction of the apical fragment and normalising the crown root ratio by the use of endosseous implants advocated by Frank.

In cases where tooth structure is significantly lost full coverage restorations with additional retention and support are necessary to achieve proper tooth form and function. The Richmond crown can be a good treatment modality for restoration of such teeth. The Richmond crown was introduced in 1878 which incorporated a threaded tube in the canal with a screw retained crown. It was later modified to eliminate the threaded tube and was redesigned as a 1-piece dowel and crown. (Smith CT, Schuman N.1998)

This case report describes an innovative treatment strategy for the management of right maxillary central incisor with middle third fracture of the root with compromised root-crown ratio in which the richmond crown was modified in to single unit endodontic implant core and crown.

Case report
A male patient aged 45 years came to Department of Conservative Dentistry and Endodontics with chief complaint of fracture and mobile right maxillary central incisor. There was history of trauma 5 years ago.

Clinical examination revealed fractured maxillary right central incisor with less than 1/3rd of the crown structure present (Fig 1a).Tooth was grade 2 mobile with no other periodontal finding. Radiographic examination revealed middle third fracture of the root with displacement of the apical fragment (Fig 1b).The medical history of the patient was non contributory.
The apical fractured fragment was displaced and was assumed nonnegotiable. So it was planned to remove the apical fragment of the root surgically followed by placing an endodontic stabilizer to improve the crown root ratio. The endodontic stabilizer was fabricated as single unit implant-core-crown restoration.

After anaesthetizing the tooth and rubber dam application access opening of the maxillary right central incisor was done. Canal coronal to the fracture line was negotiated (Fig 1c) and working length was recorded (Fig 1d). A 5 mm semilunar incision was made through the soft tissue to the bone at a level of the apical third of the root. Apical fractured root fragment was exposed and removed. The flap was sutured back.

The coronal portion of the canal was modified with peeso reamer no 3. The crown cutting of the tooth was done (Fig 2a). The impression of the canal was taken with direct pattern inlay wax (Fig 2b). With impression of the canal in place impression of the arch was taken with putty rubber base impression material. After setting the impression was taken out with impression of the canal embedded in it (Fig 2c). The patient was sent back.

Modelling wax in the form of the post was placed over the first layer of poured impression of the canal which served as impression for the portion of the endodontic stabilizer outside the canal (Fig 3a). Second layer was poured. After the die stone was set the cast was taken out. It was scrapped from the back in the area of maxillary central incisor (Fig 3b). The indirect impression of the canal, core and crown was made with inlay wax.

The prefabricated screw post was taken and impression of the same was made with rubber base. The self-cure acrylic was inserted into this impression. It was removed when set and was attached to the impression of the canal and crown (Fig 3c). The metal casting of the whole unit was done followed by application of porcelain over the crown (Fig 3d).

On the next visit of the patient after one week, the flap was raised again and this single unit was luted into the canal with glass ionomer cement. Radiograph was taken to verify the fit (Fig 4a). Bone graft was inserted into the surgical cavity and flap was sutured back (Fig 4b and c). 8 month follow up radiograph showed successful healing of the periapical tissues. No mobility was observed on clinical examination of the tooth (Fig 4d).
DISCUSSION

It is universally accepted that natural teeth with good prognosis is a superior choice to loss and replacement. Root fractures due to trauma are commonly encountered in day to day practice. The treatment of root fracture may be a painstaking job for both dentists and patients. Therefore, an evidence-based clinical approach should be followed for the successful treatment of root fractures.

According to Andreasen and Hjorting-Hansen there are 4 healing patterns commonly seen in horizontal root fractures.
1. Healing with tissue, giving union across the fracture.
2. Healing with interposition of hard and soft tissue between the fragments.
3. Healing with interposition of only soft tissue.
4. No healing.

In a study with 208 root fractures, cervical third fractures showed the worst prognosis (Cvek et al 2001). The available literature considers the horizontal mid root and apical fractures to have the favorable prognosis but some factors can lead to unfavorable outcomes. One such factor includes crown-to-root ratio that is intended to serve as an aid in predicting the prognosis of teeth.

Strock and Strock in 1943 introduced endodontic endosseous implants which were described by Orlay in 1960 to use the root canal as a channel for placement of the implant into periapical bone. It provides a closed environment that does not communicate with the oral cavity. (Sandra Madison and Arne M. Bjorndal 1988) They are biocompatible and help in maintaining the periodontal attachment of the remaining tooth. They should be considered in the treatment planning of seemingly non retainable teeth when a more desirable crown/root ratio is needed to increase stability.

In the present case it was decided to extract the apical fragment because of the long standing trauma and inability to reposition the fragment. This leads to unfavorable root crown ratio which was corrected using single unit endodontic stabilizer.

In case of horizontal root fractures successful results have been reported, with success
rates ranging from 54% to 77% of cases (Calistan MK 1996). This case report highlights an innovative treatment strategy for the management of mid root fracture which showed successful results. In this case the single unit restoration was planned because of compromised root crown ratio and poor prognosis of the teeth. A single-unit restoration creates a monobloc effect as compared to its multiple unit counterparts. (Vinothkumar TS et al 2011). It helps in providing the long term stability to the restoration. No other case till date have been reported in literature showing similar restoration so long term follow up is still needed for the presented case.

CONCLUSION
Correct diagnosis, clinical management and subsequent radiographic follow-up are essential for the success of the treatment. The presented case of mid root fracture showed good prognosis. Single unit implant core and crown can be used as a treatment option for the badly broken endodontically treated tooth with unfavourable crown to root ratio but should be used judiciously.

References