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Case Report

Restoration of fractured endodontically treated mandibular first molar using custom made cast post and core

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ABSTRACT

The successful treatment of posterior tooth with substantial damage to the tooth structure not only depends on root canal treatment but also by prompt restoration of lost coronal tooth structure. Endodontically treated teeth undergo loss of tooth substance due to dental caries, endodontic therapy or previous restoration and changes in physical characteristics, such as a reduced modulus of elasticity, which often leads to increased fracture susceptibility when compared to unrestored vital teeth.¹ Restoration of endodontically treated posterior teeth is more challenging because of their additional functional requirements.

The restorative treatment of such teeth includes the decision of whether or not a post should be used. Post is a dental material placed in the root of structurally insufficient tooth when additional retention is needed to retain the core and coronal restoration.^{2,3} However, preparation of a post space adds a certain degree of risk to restorative procedure like perforations and root fracture, especially if an over sized post channel is prepared.

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Case report

A 45-year-old serving soldier reported to military dental centre with chief complaint of a fractured left lower back tooth. The patient had undergone root canal treatment for the same tooth one year back. The tooth had fractured while masticating some hard food substance a day back. He did not have haemorrhage or swelling in the related area and medical history of the patient was non-contributory. On examination the entire lingual portion of mandibular left first molar was fractured leaving behind only weak buccal cusps and thin proximal walls intact (Fig. 1). The fracture line was just 1 mm above the gingival margin on the lingual side. The fractured tooth was evaluated to rule out any root fracture and periodontal damage. The endodontic treatment status of the tooth

was found to be satisfactory. Hence it was decided to restore the tooth using cast post and core restoration followed by placement of a cast metal crown.

Procedures

The restoration of fractured mandibular molar was carried out in following steps:

1. Preparation of coronal tooth structure of the fractured tooth ignoring the missing tooth fraction was done to receive a cast crown. A ferrule was created by extending the axial wall of the crown apical to the missing tooth structure.

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Fig. 1 – Preoperative picture of the fractured left mandibular first molar.

2. Since the adequate post length should be at least equal to the crown length of the tooth, approximate length of the clinical crown was measured. A rubber stopper was placed to the same measured length on the Gates Glidden drill to guide the depth to which the canals had to be enlarged to receive a post. The root canal fillings were removed from the root canal to the measured depth leaving behind the remaining amount of gutta-percha to maintain an apical seal. The canals were carefully enlarged using the same drills with slow speed to the same depth. Radiograph was taken to verify the post space.
3. The canals were lubricated using petroleum jelly. A loose fitting plastic dowel extending to full depth of the prepared canal was used to record the inner details of the prepared root. The bead-brush technique was used to add autopolymerizing resin to the dowel. The dowel coated with resin was seated, loosened and resealed several times while it was still rubbery. Once the resin polymerized, pattern was removed and checked for its accuracy of recording. The process was repeated several times till the accurate pattern

Fig. 2 – Photograph showing cast post and core fabricated in cast metal.

Fig. 3 – Cast post and core cemented on the tooth and gingival retraction done for impression making.

- was made. Once this process was complete an additional resin was added for the core.
4. The patterns obtained were invested and casted (Fig. 2).
5. The castings were tried on the tooth and necessary adjustments were carried out for their satisfactory seating.
6. The castings were cemented using resin luting cement Multilink Automix (Ivoclar Vivadent) Schaan/Liechtenstein (Fig. 3).
7. An IOPA radiograph was taken to assess position of the post radiographically (Fig. 4).
8. After 24 h impression of the prepared tooth was made using Imprint™ II Quick Step (3M, ESPE) rubber base impression material to obtain the cast.
9. Cast metal crown restoration was fabricated and cemented on the prepared tooth.

Discussion

Endodontically treated posterior teeth are subject to greater loading than anterior teeth because of their closer proximity

Fig. 4 – IOPA radiograph of the tooth after the cementation of custom cast post and core.

to transverse horizontal axis. Thus, combined with their morphologic characteristics (having cusps that can be wedged apart), makes them more susceptible to fracture.⁴ Posts are used to provide retention for the core material, however use of post does not increase the fracture resistance of the tooth significantly.^{5,6}

Preparations of canal for receiving a post

The following points were kept in mind before enlarging the canals to receive the post.

- a Conservation of as much of tooth structure as possible.
- b At least 4–5 mm of gutta-percha should be left at the root apex for the adequate apical seal.
- c Adequate post length; a ratio of crown length to post length should be at least 1:1.⁷
- d Minimal enlargement of the root canal to maintain sufficient dentin around the tooth to prevent root fracture. A minimal dentin thickness of 1 mm around the post should be provided.⁸

The ferrule effect

Extension of the axial wall of the crown apical to the missing tooth structure provides what is known as a ferrule and is thought to help bind the remaining tooth structure together, preventing the root fracture during function.⁴ A ferrule with 1 mm vertical height has been shown to double the resistance to fracture versus teeth restored without a ferrule.⁹

Post selection: the dilemma

Prefabricated posts are recommended for conservatively prepared root canals in teeth with root of circular cross section. Excessively flared and non-circular canals are most effectively managed with custom made posts. However, situation should be evaluated on an individual basis.⁴

Recent advances

Various post materials and designs have been introduced over the years in order to conserve the tooth structure and also to

prevent root fractures caused by the stiffness of the post. The resin fibre posts whose modulus of elasticity is approximately similar to dentin may less likely to cause root fracture than other stiff post materials. There are a number of adhesive cements available today that can bond to all types of post materials as well as to dentin. The modulus of elasticity of the post, root canal material or accompanying resin cement have to match that of root dentin so that loading stresses are evenly distributed and borne by all the single unit components. But the important objective of creating “ideal monoblocks” or mechanically homogenous units with the root dentin is still yet to be achieved.

Conflicts of interest

The author has none to declare.

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