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Case Report

A simple antirotational mechanism in a posterior two piece post and core

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canals. In most cases the operators prefer using prefabricated posts and restricting the placement of post into any one canal, however, this does not fulfill the mechanical requirement nor does it improve the resistance form.^{4,5}

This article describes the Prosthodontic rehabilitation of a grossly decayed and endodontically treated posterior tooth with a custom cast post and core placed into both the mesial and distal roots of a mandibular molar with an interlocking mechanism between them.

Case report

A 16 year old female patient was referred from the division of Orthodontics for Prosthodontic rehabilitation of grossly decayed 36 and 46 before orthodontic correction of malaligned teeth. On examination, the patient had a complement of 28 teeth with all the third molars unerupted. Maxillary and mandibular anterior teeth showed crowding with an anterior cross bite in relation to 11. Past dental history revealed that the patient had undergone endodontic treatment of both 36 and 46 simultaneously from a local dentist about 2 years ago following which the post endodontic restoration of 36 fractured about six months ago (Fig. 1). Patient had reported to division of Orthodontics for correction of malaligned teeth but was however advised Prosthodontic rehabilitation of 36 and 46 to optimize their Orthodontic anchorage potential. After thorough clinical and radiologic evaluation it was decided to build up grossly decayed 36 with a post and core followed by a full coverage metal restoration on 36 and 46.

Total obturated length of the mesial root of 36 was 22 mm and the distal root was 22 mm, however there was a sharp

Introduction

An endodontically treated tooth should have a good prognosis. It should resume full function, serve satisfactorily as an abutment for a fixed or removable partial denture and even as an anchor for fixed Orthodontic therapy. However, special techniques are needed to restore such a tooth. The loss of tooth structure makes retention of subsequent restorations more problematic and increases the likelihood of fracture during functional loading.^{1,2} The post and core function as a unit to replace lost tooth structure and provide retention to the crown.³ The post must be designed or selected to prevent the possibility of root fracture from functional forces. Placing a post and core into a posterior tooth is challenging considering the anatomy and the alignment of the root and the root

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Fig. 1 – Pre-operative view.

distal inclination of the mesial root beyond 10 mm and in the distal root beyond 12 mm. Post space preparation was done upto a length of 10 mm in both roots using a piezo reamer at slow speed to remove gutta-percha followed by radiographic evaluation to check for any remnants. Shaping and cleaning of the post space was done. Considering the elliptical shape of the root canal and the difficulty in obtaining a parallel path of insertion it was decided to fabricate a custom cast post and core separately on both the mesial and distal canals. The post space was lubricated with petroleum jelly using a loosely fitting gutta-percha cone. Pattern resin (acrylic resin for patterns, GC Corporation) was mixed according to the recommended powder liquid ratio. When the material reached the dough stage it was manipulated using lubricated fingers and finely placed in to the prepared and lubricated canal space. Once the initial set of the material was completed, it was slowly teased out of the canal and replaced back until completely set (Fig. 2). The procedure was repeated in the distal canal (Fig. 3). The obtained pattern of both the canals were trimmed, relined and adjusted until complete seating into both the canals were achieved without any resistance.

To enhance the retention form between the two posts and core, a “groove and slot” mechanism was provided wherein the distal portion containing the slot is first placed into the canal and the mesial portion containing the groove slides along the slot locking itself around the distal portion as it seats into the canal along its path of insertion (Fig. 4). This

Fig. 2 – Post space recording – distal canal.

Fig. 3 – Post space recording – mesial canal.

mechanism prevents rotation of the individual components and also permits removal only along one path (Fig. 5).

The post and core patterns were invested, cast and finished separately ensuring that the precision of both the groove and the slot remains unaltered. The custom cast post and core was then tried in the patient's mouth and necessary fine adjustments made (Fig. 6). Radiographic assessment is once again done before luting the post and core with tight precision fit into the patients mouth (Fig. 7). A resin based luting agent was used after proper moisture control using absorbent paper points.

Subsequently, the remaining tooth was prepared for a full coverage metal restoration incorporating a ferrule and a chamfer finish line. Impressions were made using elastomeric impression material. The master cast was retrieved and the full coverage metal crown hence fabricated was evaluated for its occlusion before it was permanently luted (Fig. 8). Tooth 46 was also rehabilitated simultaneously using a full coverage metal restoration without any post and core build up.

Discussion

The functional and esthetic rehabilitation of broken down and endodontically treated teeth presents a unique challenge to the Prosthodontist. All the changes that accompany root canal therapy influence the selection of restorative procedures for endodontically treated teeth. Important considerations includes the amount of remaining tooth structure, the anatomic

Fig. 4 – Groove and slot mechanism.

Fig. 5 – Two piece post and core – extraoral view.

position of the tooth, the functional load on the tooth and the esthetic requirements of the patient.⁶

Before restoration, existing endodontically treated tooth needs to be assessed carefully for the following—good apical seal, sensitivity to pressure, exudate, fistula, apical sensitivity, active inflammation and evidence of radiolucency.

Diagnosis and treatment planning is very important in these patients. The post and core functions as a unit. The core replaces lost coronal tooth structure and provides retention to the crown and post provides retention for the core. The post must be designed or selected to prevent the possibility of root fracture from insertion or functional forces. The crown restores function and protects the remaining root and coronal structure from decay and trauma. Endodontically treated posterior teeth are subject to greater loading than anterior teeth because of their closer proximity to the transverse horizontal axis. This, combined with their morphologic characteristics (having cusps that can be wedged apart), makes them more susceptible to fracture.⁷ Careful occlusal adjustment will reduce potentially damaging lateral forces during excursive movements. Nevertheless endodontically treated posterior tooth should receive cuspal coverage to prevent biting forces from causing fracture. Possible exceptions are mandibular premolars and first molars with intact marginal ridges and conservative access cavities not subjected to excessive occlusal forces (i.e., posterior disclusion in conjunction with normal muscle activity).

Fig. 6 – Custom cast post and core insitu.

Fig. 7 – Radiological assessment.

Complete coverage is recommended on teeth with a high risk of fracture. This is especially true for maxillary premolars, because complete coverage gives the best protection against fracture, once the tooth is completely encircled by the restoration. However, considerable tooth reduction is required, particularly when a metal-ceramic restoration is to be used. When significant coronal tooth loss has occurred, a cast post and core restoration is needed.⁸

Root canal preparation

Effective isolation of tooth/root structures is mandatory. Gutta-percha restorative material can be removed by rotary instruments, solvents or heated instruments.² Gates Glidden drills and Peeso reamers should be used with care because of chances of perforation of root canal. Post length and width is very important. At least 3–5 mm of gutta-percha should be left for apical seal. At least 1 mm of sound dentin should preferably be present around the post.

Types of post and core materials

Various types of post and core materials are available. Despite its weakening effect on the tooth, a post is indicated where

Fig. 8 – Post-operative view.

inadequate tooth structure is left to retain the core. Longer posts are associated with higher success rates. As the length increases, its retention also increases. Post length can either be equal to half the length of the remaining tooth or equal to length of the restored crown or equal to half the length of the root contained into the bone. The ferrule effect is very important. The extension of axial wall of the crown to the missing tooth structure provides a ferrule. In an extensively damaged tooth, the ferrule can be provided by surgical lengthening of the crown or orthodontic extrusion.

A contra bevel should be prepared to produce a cast core with a collar of metal that encircles the tooth and act as secondary ferrule. After preparation of the root for the post; the only barrier against the ingress of infection is the remaining gutta-percha. To avoid violation of apical seal, we should retain atleast 4–5 mm of apical gutta-percha. Design of the post should be such that it should preserve the radicular tooth structure which is very important in selection of design of the post. Post may be tapered or parallel sided. Custom made cast post are more conservative than prefabricated and are fabricated either using the direct method or the indirect method. Wax, pattern resin or autopolymerising resin are usually used to obtain patterns which are then invested and cast with an alloy of choice. Relatively long posts with a circular cross section provide good retention and support in anterior teeth but should be avoided in posterior teeth, which often have curved roots and elliptical or ribbon-shaped canals. For these teeth, retention is better provided by two or more relatively short posts in the divergent canals.

Intraoral, post and core–restored teeth are subjected to various types of forces. Torsional forces on the post-core-crown unit may lead to loosening and displacement of the post from the canal, causing failure of the system. Therefore, the ability of the selected post design to resist torsional forces will play a key role in stabilizing and retaining the post-core and crown unit.⁹ The commonest problem in these situation is the different paths of placement of the two posts and the tendency of each one of them to rotate separately. This can be favorably overcome by the inclusion of features like grooves, slots, pins and dove tails between them.¹⁰ Considering the role of the final cast restoration in protection of the dowel-restored pulp-less tooth it has been suggested that the “hugging action” of a subgingival collar of cast metal be provided for extracoronary bracing that could prevent fracture of the tooth structure. Eissman and Radke used the term ferrule effect to describe this 360-degree ring of cast restoration atleast 2 mm apical to junction of the core and remaining tooth structure.^{11,12}

Advantages of cast post and core systems:

- They can be customized to the precise anatomy of the canal and the crown thereby enhancing resistance and retention forms.
- Conventional high-noble metal alloys can be used.
- An indirect procedure can be used, making restoration of posterior teeth easier.

Indications for a sectional custom cast post-core system:

- When upto one half of coronal tooth structure is missing

- More than half of the tooth structure is missing
- All the coronal tooth structure is missing
- Where the inclination of the canal is significantly different from the alignment of the crown

Disadvantages

- Higher ratio of root fracture than preformed dowels.
- Cost is high.
- More appointments.
- Laboratory phase is technique sensitive

Conclusion

There is no specific post and core system or final restoration that can be used in all clinical situations. So we have to understand these variables and the basic concepts of how to use them for maximum advantage and comfort to the patient. As much tooth structure must be preserved as possible the post and core is basically used to provide retention and support for a cast restoration. The presented case, has been successfully managed by incorporating an antirotational mechanism in a posterior two piece custom made post and core system.

Conflicts of interest

All authors have none to declare.

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