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CASE REPORT

Post and Core Restoration of Endodontically Treated Teeth - A Case Series

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Abstract

A tooth becomes structurally and mechanically weak after endodontic treatment due to loss of moisture and dentinal structure during mechano-chemical preparation of the tooth. So following endodontic therapy a tooth need to be restored for replacement of the lost tooth structure and protection of the remaining structure. When sufficient coronal tooth struc- ture is unavailable a post is necessary to be placed inside the root canal anchored to a core to provide retention for the crown. A post should provide maximum protection of the root from fracture and maximum retention of the core and crown. It should also protect the crown margins from deformation under function. This case series represents use of post and core restorations in various clinical situations. (2018, Vol. 02; Issue 02: Page 32 - 39)

Key words: Endodontically treated tooth, Crown, Post and core, Post retention.

Introduction

Many a times a post and core restoration needs to be considered when a sufficient amount of tooth structure has been lost after endodontic treatment. Remaining coronal tooth structure is a crucial factor for the successful rehabilitation of the en- dodontically treated tooth. An adequate amount of ferrule also is important. A fer- rule is a circumferential collar of sound tooth structure braced by the cervical por- tion of a crown (1). A minimum ferrule width of 1mm and height of 1.5-2 mm is necessary for the protection of the re- maining tooth structure from fracture by transferring the occlusal forces to the per- iodontium (2). When optimum ferrule is not available a crown lengthening proce- dure, orthodontic extrusion or a sub gin- gival preparation of the crown margin can be attempted.

The decision of placement of a particular post depends on various factors like the amount and quality of remaining tooth structure, number of remaining dentinal walls, height and thickness of remaining dentin, the anatomic position of the tooth,

biologic width, bone architecture, para-functional habits and aesthetic require- ment (3). A post must provide maximum strength to prevent cervical fracture, opti- mum resiliency to flex without permanent damage under occlusal load, should be rigid enough not to bend, be esthetically compatible and radiographically visible. Posts are available as prefabricated metal- lic posts, Fiber reinforced posts and Zirco- nia posts. Prefabricated posts are classi- fied depending on alloy composition, re- tention mode and shape (4). For example gold, titanium or stainless steel posts de- pending on the alloy , tapered or parallel sided posts, active or passive posts, smooth and serrated posts. Core replaces the missing coronal tooth structure and along with the remaining coronal tooth structure forms the shape of the tooth preparation. The different core materials available are amalgam core, composite core, cast metal, gold and zirconia core.

The restorative options of endodontically treated teeth have changed widely with the advent of newer adhesive techniques. Newer generation of resin cements along with the availability of various light trans- mitting posts like Luminex (Dentatus USA) have provided the clinicians with va- riety of choices.

This case series represents three different cases of post-core and crown restoration of endodontically treated teeth depending on different clinical presentation.

Case report 1 - Custom metal split cast post core

A 27 year old male was referred to the De- partment of Prosthodontics and Crown & Bridge after endodontic treatment of tooth no 46. As the tooth was grossly decayed and roots were divergent a split cast metal post and core was planned. Post space was prepared in the mesio - buccal and distal canal (Fig 1A) with piezo reamer leaving around 5mm of Gutta percha in- side the canal. A metal wire of approxi- mate post space length was taken and bent at the exit. Light body addition sili- cone impression material was injected in- side the canal with a syringe and the metal wire was placed inside the canal and moved up and down. Heavy body addition silicone impression material was loaded simultaneously in the impression tray and an impression was made (Fig 1B). After completion of the casting process the cast metal posts were adjusted to fit in the ca- nal space and cementation was done us- ing resin cements (Fig 2A & B). The tooth was then restored with a PFM crown (Fig 2C & D).

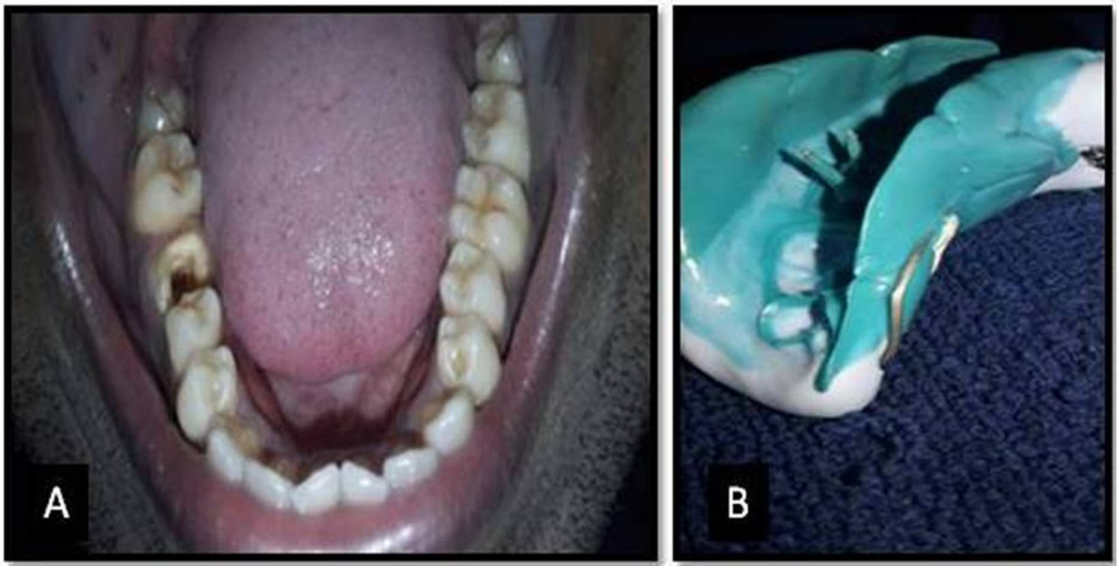

Fig 1: A- Post space and ferrule preparation, B- Addition silicon indirect impression of the post space.

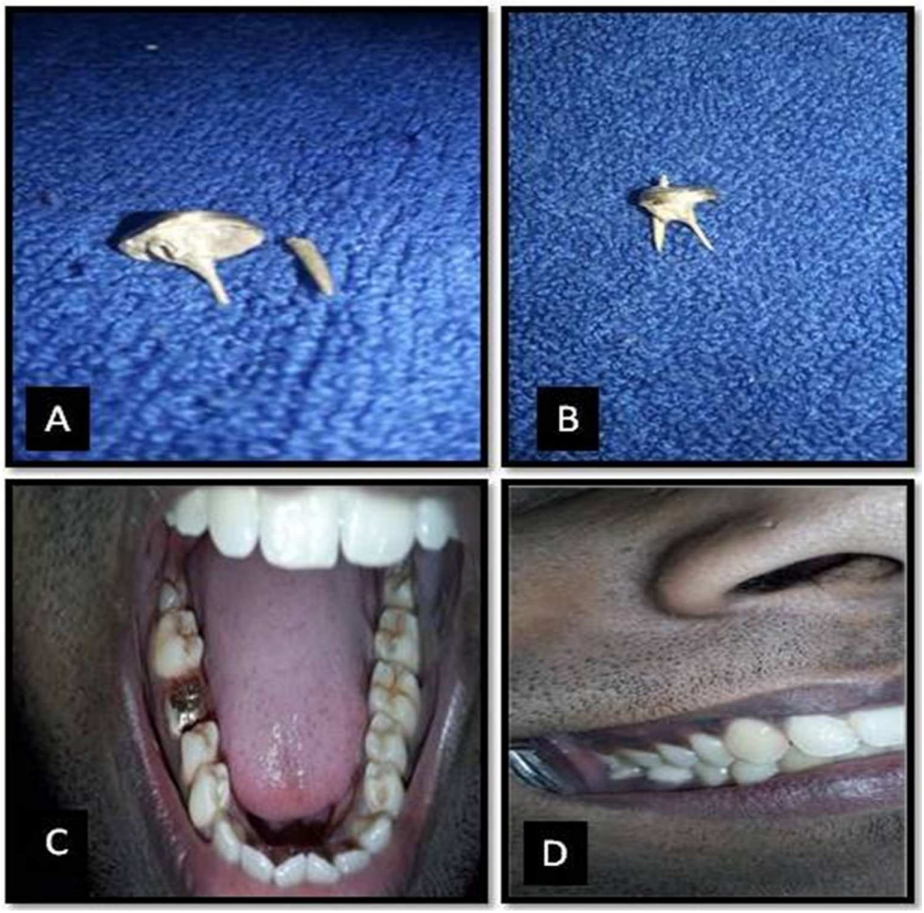

Fig 2: A & B- Custom split cast metal post and core, C- Post and core placed in the pre- pared tooth, D- Tooth restored with PFM crown.

Case report 2

A girl of 24 year old was referred to the De- partment of Prosthodontics and Crown and Bridge after getting treated endodon- tically in maxillary right central, left cen- tral and lateral incisor with loss of tooth structure due to trauma. Pre operative ra- diograph showed good apical seal of the canals (Fig 3A). As more than half of the tooth structure was lost and adequate thickness of wall was not present anterior esthetic fiber post core restoration was planned for both the left central and lat- eral incisor. Maxillary right central incisor was built up with composite core. After re- moval of the thin unsupported tooth structure post space was prepared for left central and lateral incisors leaving behind 5mm of gutta percha in the canal (Fig 3B & C). Glass fiber post as placed in pre- pared post space (Fig 3D & E). Core resin material was used and core build up was done (Fig 4A). Finally all the teeth were prepared for porcelain fused to metal crown and restored (Fig 4B & C).

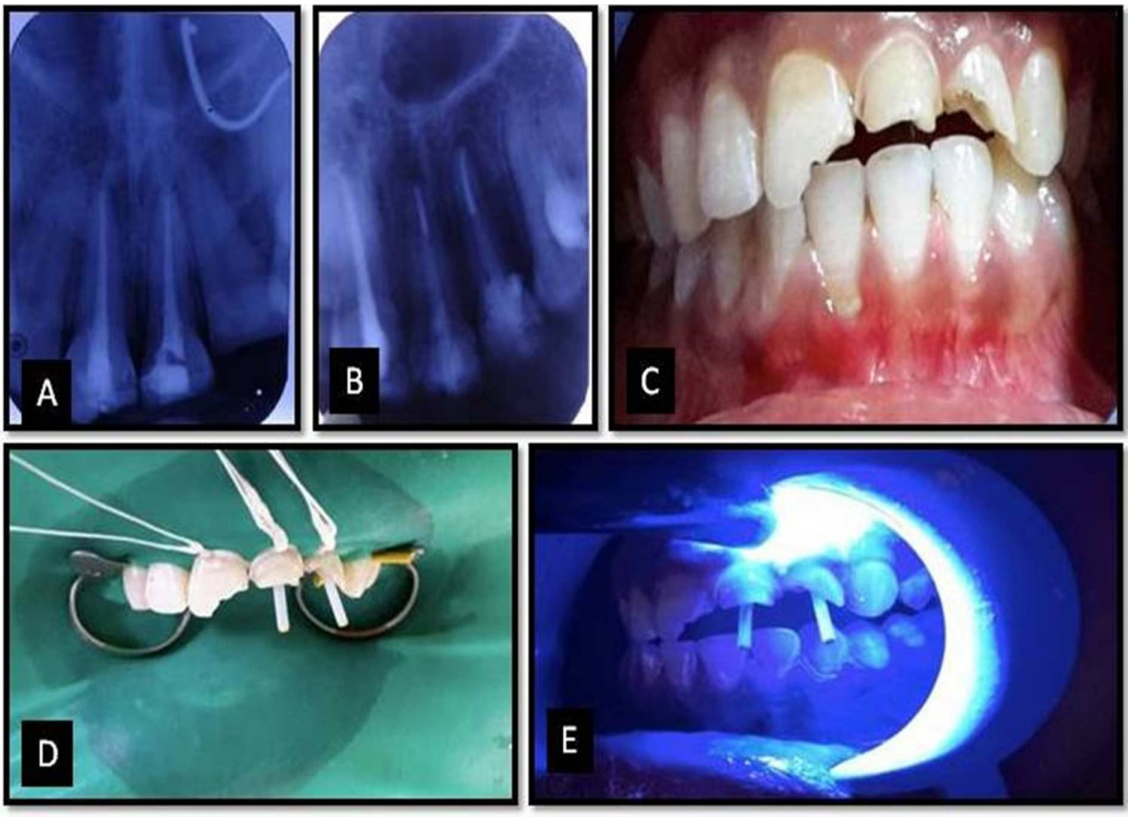

Fig 3: A- Preoperative IOPA, B- IOPA after post space preparation, C- Ferrule prepared, D- Glass fiber posts placed, E- Fiber posts cemented with dual cure resin cement.

Fig 4: A- Core build up done with resin, B- Tooth preparation completed for crown fabrica- tion, C- Teeth restored with PFM crown.

Case report 3

A girl aged 25 years old reported to the de- partment of Prosthodontics and Crown & Bridge with a history of trauma to tooth no11. Intra oral examination revealed Ellis Class 3 fracture with mobile fracture frag- ment extending beyond gingival margin (Fig 5A & B). Full thickness flap was ele- vated and the loose fracture fragment was removed (Fig 5C & D, Fig 6). Immediate single sitting root canal treatment was done and a glass fiber post was placed in- side the prepared canal. The fractured fragment was repositioned with flowable composite resin and flap closed. Proper aesthetics and function was achieved.

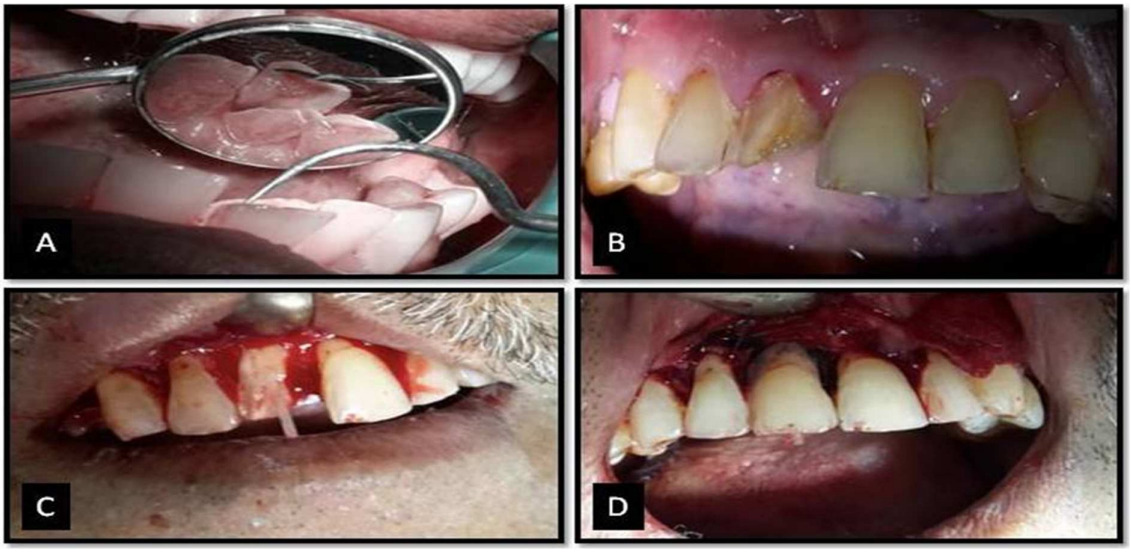

Fig 5: A- Ellis class III fracture of 11, B- Mobile fractured fragment was removed, C & D- Flap raised and crown lengthening was done.

Fig 6: Suture placed and flap closed.

Discussion

Major changes that are observed in an endodontically treated tooth are loss of tooth structure following decay, fracture and cavity preparation and reduced moisture content (9%) due to loss of pulp tissue. It has been seen that tooth stiffness is lost by 5% after a conservative access cavity preparation, whereas 14%-44% loss is seen after MOD cavity preparation (5, 6). Studies have shown that tooth becomes more prone to fracture when root canals are over jealously enlarged. Same applies with the preparation of the root canals for post restorations. Still a post and core restoration may be necessary to provide the additional retention for a crown. Selection of a post depends on presence of an adequate amount of residual tooth structure in the cervical region (ferrule) as it decreases stress concentration, increases resistance to fracture and provides retention and stabilization for the crown. Ferrule length greater than or equal to 1.5 mm provides highly increased resistance to cyclic loading or fatigue failure. This has been confirmed in a 5-year clinical study (7). Fatigue failure is catastrophic since it may result in complete root fracture. Root anatomy also plays a significant role on post selection and placement. A difference in root curvature exists at cervical and apical level within the same canal. So a tooth may get weakened when the natural shape of the canal is obliterated during post space preparation to accommodate a circular post. Position of the tooth in the arch also influences the selection of a post. As the posterior teeth are subjected to a large amount of vertical forces a rigid post is indicated in a grossly decayed posterior tooth than a flexible post since excessive flexing can cause micro movement of the core and open crown margin. However force from a rigid post is transmitted to the root near the apex causing catastrophic root fracture. Custom metal cast post are usually recommended for grossly decayed teeth especially in the posterior region. Choice of custom made post and prefabricated posts depend on the canal configuration. A custom post closely conforms to the shape and size of the canal thus preserves the remaining dentin. Advantage of cast post core is that the core is an integral part of the post which prevents dislodgement of the core from the post when minimal tooth structure is present. But the disadvantage is that it transmits more stresses to the root near the post apex and causes complex root fracture (8). Indication for split cast metal post is in grossly destroyed posterior teeth with divergent roots with canals that hinders a single path of post placement. A cast metal post core can be fabricated in two ways by a direct resin pattern of the prepared canal space in the patients' mouth or by an indirect technique where elastomeric impression material is used for post space impression and sent to the laboratory. A custom made post core restoration can also be made with CAD/CAM zirconium.

Anterior teeth are more predisposed to the horizontal force factor in comparison with the posterior teeth. The rationale behind the use of flexible non-rigid fiber posts in the anterior region is that the non rigid posts flex under the functional load acting as a mono-block thus less amount of force is transferred to the tooth reducing the risk of fracture of the root .They also fulfill the esthetic requirement of the anterior teeth. The disadvantage of flexible posts is that they fail at a lower level of force in comparison with the high modulus rigid posts. Non rigid translucent fiber posts can be of zirconia-coated carbon fiber, glass fiber-reinforced epoxy, fiber- rein- forced composite and zirconia posts.

Zirconia posts are white, radiopaque and rigid. They transfer more stresses to the canal thus causes catastrophic root frac- ture when minimal tooth structure is pre- sent compared to metal and glass fiber posts. Fiber reinforced posts can be of glass fiber posts or carbon fiber posts. A glass fiber post is less rigid than a carbon fiber post (9). Disadvantages of fiber rein-forced posts are that since they flex pro- duces micro- movement of the core, ce- ment breakdown, leakage and failure. The most common failure is due to the fracture of the post itself. Along with the presence of a ferrule and no parafunctional habits an anterior esthetic crown can be success- fully restored with a glass fiber post (10).

Conclusion

A post and core restoration provides the retention and support for a crown. It doesn't increase the strength of the tooth or the crown. Rather more removal of tooth structure during post space prepa- ration can reduce the strength of already weakened endodontically treated tooth. So preservation of the remaining tooth struc- ture is the ultimate goal since no material can substitute the lost tooth structure. To fulfill this we should have the knowledge about the canal anatomy of the tooth par- ticularly those with flared and elliptical ca- nal and should prepare the canal con- formed to the original shape. Selection of the post should also vary according to the esthetic demand, existing occlusal scheme and presence of any parafunctional hab- its. A carbon fiber post is replaced with a glass fiber post when a full ceramic resto- ration of anterior tooth is planned .Simi- larly when restoring a grossly destroyed tooth consideration for a more rigid post should be made.

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