Case study

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Management of a fractured endodontically treated tooth with crown lengthening and glass fibre post: A case report.

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ABSTRACT:

Purpose: This clinical case discusses the step-by-step implementation of a core and a post system that uses a single resin composite material for cementation of a glass fibre post and core build up of a fracture endodontically treated maxillary left first premolar with gingivectomy as a crown lengthening procedure. **Clinical considerations:** Several materials and methods has been discussed in the literatures regarding restoration of endodontically treated teeth with minimal tooth structure left which require fibre post and core build up. Gingivectomy as a crown lengthening is also a common procedure that facilitates restorative dentistry. This case presents a restoration of a tooth with a short clinical crown by gingivectomy and post core build up by glass fibre post with a mono-block technique or core-and-post technique with dual cure composite resin as a luting and core build up material. **Conclusion:**Post and core is needed to restored tooth with little tooth structure remaining.Glass fibre post are prefabricated posts which makes it easy to manipulate and reduces chairs side time among other advantages. Use of single material system for post-and-core reduces the steps of manipulation and chair side time compared to conventional techniques. **Clinical significance:** More measures are required when different materials are used for post-cementation and core build-up, increasing the chair time and the number of interfaces between the materials. However, these shortcomings can be overcome by the mono-block technique where only one material is used for both cementation and core build up.

KEYWORDS: post core, post and core, post-core-system, glass-fibre post

INTRODUCTION.

Fracture of tooth due to trauma or biting on hard food is a common clinical scenario we face often. This can happen to a vital tooth or a tooth that had undergone an endodontic treatment as tooth become brittle after endodontic treatment(1,2).Endodontically treated teeth that show loss of coronal structure and have undergone comprehensive restorations are typically restored with post and core accompanied by restoration of the prosthetic crown(1,3–6).

The post has two fold functions; It provides intracanal retention of the core and crown restoration and distribution of functional loading over a large area of the remaining tooth structure to achieve favorable stress distribution in endodontically treated tooth(1,3,7). Two main post and core systems available: prefabricated posts and custom made posts which is fabricated from mold taken from post space(1,8).

Among the several techniques and materials that has been reported in literature regarding post, core and cementation , cast post and core owing to its high mechanical strength and desirable fit in the root channel, were used traditionally(6). However, teeth restored with such systems cause fracture (oblique/horizontal) in the middle one third of the root(6), or vertical roots fracture due to the stress bearing in the apical one third of the post and the difference in the Modulus of elasticity between metal and the dentin(1,3,6,7).

Fibre reinforced posts (FRPs) has emerged as an alternative to the conventional cast or prefabricated metallic posts(3,4). Advantages of FRP over metallic posts include superior esthetics, Lower risk of fracture (Modulus of elasticity similar to dentin) ,decreased chair-side time as they are ready to use(3,7). A recent meta analysis showed that fibre posts present higher 3-7 years overall survival rates compared to cast posts with severe coronal damage(2).

After the application of post system, the establishment of core is usually done with a light cure composite resin or dual cure composite resin.Light cured composite resin can be done incrementally, hence the duration of procedure can be controlled, while giving the desired shape and form to the core. It also ensures the color stabilization of the restoration(3).Dual cure composite resins can be used for both cementation and core build up purpose. As this is more convenient, it has been an interesting alternative to restore tooth with extensive coronal destruction since thicker increments can be used(6). Moreover, bulk fill composites when used in conjunction with adhesive resin application on dentin reduced polymerization shrinkage(9). This case report addresses the clinical use of a two component light cured, self etching adhesive (One Coat Self etching Bond/ Colte'ne/Whaledent, Inc, Cuyahoga Falls, OH, USA) that employs a single material (Clearfil DC Core Plus (Kuraray Medical Inc., Tokyo, Japan) for both cementation of fibre post and core build up.

CLINICAL CASE

At first, the quantity and quality of remaining tooth structure was examined. This was done to ensure the possibility of a ferrule. Clinical examination reveled that sufficient tooth structure was present mesially however the distal fracture of tooth extended subgingivally. After radiographic examination, the tooth appeared restorable although gingivectomy would be required for crown lengthening and to create a ferrule effect.

Figure: Initial Radiograph (on Left) , Surgical Crown lengthening

Crown lengthening

Under all aseptic precautions and proper anesthesia technique by local infiltration, gingivectomy was performed on maxillary left 1st premolar with 12 no BP blade to increase the crown length. Tooth was restored with Temporary filling material after bleeding was controlled by pressure pack.

Figure: Surgical crown lengthening procedure

Post space preparation

At the following appointment, after radiographic evaluation, root canal was accessed by endo access bur.Radiographic examination revealed that the root lengthof palatal canal was 16 mm which was sealed upto full length with gutta percha. So the goal was to remove 9-10mm of gutta percha. Gutta percha was removed with #2 largo peeso reamer of the system and apical sealing was preserved. Then the post space was prepared by #3 post drill. 5mm of gutta percha was preserved apically.

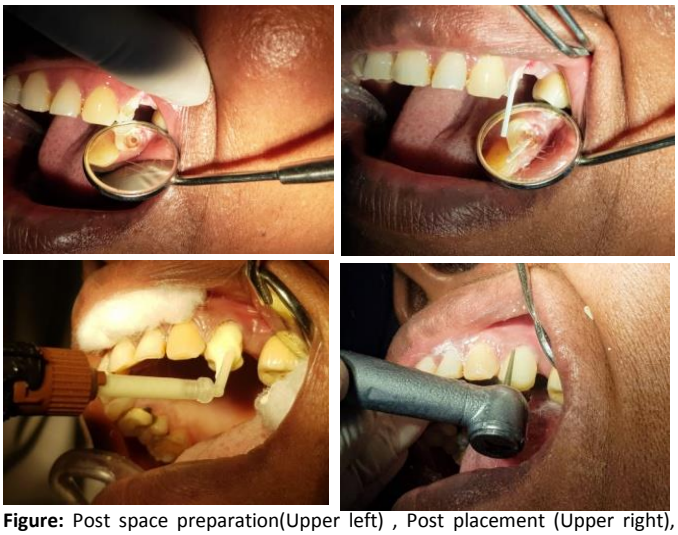

Figure: Post space preparation(Upper left) , Post placement (Upper right), Core Build-up (Lower left), Finishing of Core(Lower right)

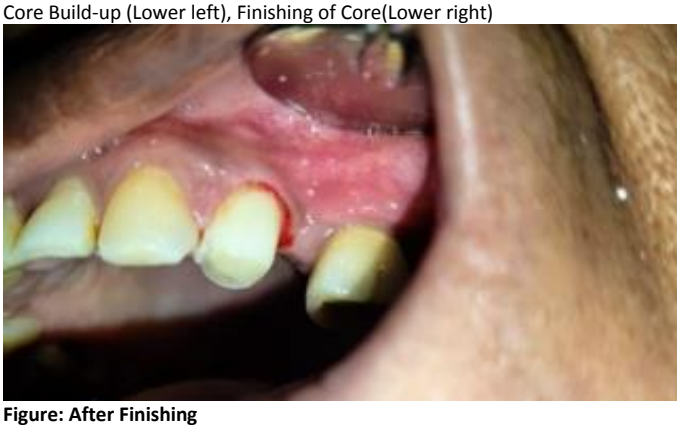

Figure: After Finishing

Fibre post selection and preparation for adhesive luting

After gutta percha removal and root canal preparation, a radiograph was taken to check the quality of preparation. It revealed that 5 mm of gutta percha remained in apically.The selected fibre post (blue x post #3) was demarcated and cleaned with alcohol.Then it was completely wetted by one coat self etching bond (Coltene/Whaledent, Inc,Cuyahoga Falls,OH,USA) mixture bonding system and the solvent was removed by a gentle blow with air syringe for 10 seconds. The x post was protected from light until the cementation procedure.

Root canal adhesive procedures.

The root canal dentin walls were carefully dried with absorbent paper points before bonding. one coat self etching bonding system, (Coltene/Whaledent, Inc,Cuyahoga Falls,OH,USA) was actively applied on to root canal walls for 20 seconds.solvent was evaporated by gentle air blow for 10 seconds.

fibre post cementation and core build up.

The cap of dual cure composite resin (Clearfil DC Core Plus (Kuraray Medical Inc., Tokyo, Japan) syringe was removed and a small amount was discarded. Then resin was directly injected into the canal and pulp chamber and the fibre post was immediately placed into the final position and stabilized. It was light cured for 40 seconds.The same material was used to build up the core. Then the excess material was removed by diamond bur and peri-apical radiograph was taken to confirm the adaptation of fibre post.

DISCUSSION

Since 1728, when Pierre Fauchard mentioned the use of metal screws in the roots of maxillary anterior teeth to hold crowns made of ivory and bone, post and core restorations have been used as a treatment technique for structurally damaged teeth. Since then, posts and cores have been commonly used to maintain teeth that otherwise would not have had enough coronal tissue to retain a crown(10).Endodontic post-and-core systems are intended to provide stabilization in circumstances where, after endodontic treatment, inadequate tooth structure remains(11,12). Furthermore, a natural tooth, after endodontic treatment becomes weaker and more susceptible to fracture(2). A effective outcome of therapy including post and core reconstruction relies heavily on conscientious choosing of cases and recognition of certain variables(10). Some of these variables are discussed below.

Position of tooth.

In most cases, post and core restorations are considered to be an effective treatment choice only for anterior teeth with inadequate coronal tissue to independently hold the crown(10). Posts are typically not recommended for molar teeth since the pulp chamber and the coronal 2 mm of the root canal system will usually be used to achieve retention (Nayyar core)(10). Furthermore Owing to the curvature of the roots, post-preparation in the posterior teeth is more likely to cause lateral perforations(10).However studies have shown that as an alternative to extraction, the use of post-retained crowns in heavily restored molars is successful, with a significant percentage of these restorations remaining intact 4 years after the procedure(10). This emphasizes the significance of case selection and operator technique.

Quality of root canal treatment:

The endodontic treatment should be of a high standard, prior to post placement. If it is not optimal, endodontic re treatment should be done. The quality of obturation must be analyzed radiographically in terms of absence of periapical radiolucency, voids, and perfect length(13). In the present case, the endodontic treatment was evaluated radiographically by RVG and revealed that the quality of treatment is acceptable because the apical seal was good enough to consider it as 3D obturation.

Root anatomy and curvature:

Curved roots have more chances for root perforation during post preparation(10). Hence the root anatomy must be assessed which also aids in selection of post type and material(10).

Root diameter and length:

To optimize dentine preservation and lower the chance of fracturing, the post width should not exceed one third of the root diameter(10). The post length determines the retention and resistance of tooth (16) as it can distribute the applied stresses on the tooth(14). Post dislodgment is one of the most common complications that might occur in post and core system(14).Hence post length should preferably be greater or equal to the length of the crown(15) leaving a minimum of 4mm of remaining gutta percha to maintain the apical seal (10). In contrary tests have shown that to improve root fracture tolerance, the fiber posts do not need to be inserted to a length equal to or longer than the depth of the clinical crown(16).

Ferrule effect

A ferrule is a 360 degree metal crown collar covering the dentine's parallel walls extending coronally to the preparation's shoulder (10). To give the ferrule effect, at least 2 mm of dentin must be present coronally(2). Surgical crown lengthening or orthodontic root extrusion can be considered in the absence of a sufficient quantity of ferrule(10)However the presence of a ferrule doesn't necessarily increase the fracture resistance significantly compared with its absence(4,17) As mentioned earlier in this case, distal wall was not present so we needed to build the coronal part of the tooth to give the ferrule effect.

Post selection

Conventional, indirect posts are typically metal-based cast or prefabricated, requiring extensive tooth preparation of an already damaged tooth(11). Due to high clinical success rates,

with ideal design, noble alloy cast post and core are considered as "gold standard" in comparison to fibre posts(2). Contrarily, fibre posts cause less root fracture as their modulus of elasticity is similar to that of dentin(9) but even if fracture occurs, it occurs at the coronal aspects of roots which makes it easy to repair rather than a vertical root fracture caused by cast metal posts(2,7). As per Mali S and associates, a perfect post should have mechanical properties, shape and volume similar to the lost dentin to provide a stable holding. (5). The glass fibre reinforced post used in this case provides various favorable conditions over other systems. Glass fibre posts are less technique sensitive, single visit application, easier retrievability, have less chance of root fracture in comparison to metallic ones, have more improved aesthetic outcome due to translucency and can be bonded to dentine(2,10,14). However its cementation to intra radicular dentine is technique sensitive(10).

The characteristics of core materials also affect the strength of the post-core framework, apart from the posts.The use of a single material for post cementation and core build up saves up a lot of chair side time and effort. Resin composites reinforced with inorganic particles have been developed over the years which can be used as both cementation and core build up material(6). This has a added advantage of creating a mono-block bond interface between post-dentin-core(6). One of the previous studies showed that low consistency center materials have greater tractable safety solidarity to the fibre reinforced composite post on a smaller scale than ordinary composites using steady strategy. Flowable composites are best paired with fiber post because air pockets and voids are minimal within the center or center/post interface(5). More over roots restored with fiber post relined with resin composite had greater fracture tolerance(16).

The procedure followed in this case report illustrated a predictable and a simple way to restore an endodontically treated tooth. The use of a dispensing syringe reduces the chance of formation of bubbles due to the auto-mixing system. It also has a long narrow mixing tip which facilitates the material to be directly injected into the canal.

CONCLUSION

Endodontically treated tooth will require additional support to anchor the restoration due to compromised dentine and enamel. The choice of restoring a tooth that has fractured is subjective and restoration of endodontically treated anterior teeth has become an integral part of restorative dentistry.The use of glass fibre posts with direct composite restoration is recommended to use to restore tooth with severe loss of tooth structure.However several factors must be taken into consideration

CONFLICT OF INTEREST: None.

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