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Case Report

Customizing the prefabricated fiber post: A case report

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ABSTRACT

Customizing the prefabricated fiber post to direct anatomic post possesses advantages of intimate adaptation of the cast metal post and similar modulus of elasticity of prefabricated fiber post, thus optimizing the properties of both. This report presents the case of a 30-year-old female patient with a grossly decayed upper right central incisor having a history of intermittent pain and swelling since 2 weeks. Patient presented with a history of trauma 2 years back and recurring sinus formation since 6 months. A diagnosis of chronic periapical abscess was established and the endodontic treatment followed by direct anatomic post and crown were recommended for the affected tooth. One year conclusive outcome of the presented case highlights that customizing the prefabricated fiber post is relatively simple, minimally invasive and requires only few additional steps in single appointment beyond those needed to lute a prefabricated fiber post.

1. Introduction

The prefabricated fiber post doesn't essentially adapt in oval canals, thus lacking retention and favoring increased thickness of the luting cement to fill voids incorporating between the loosely fitting post and canal walls. Such scenario favors the formation of bubbles, which consequently creates a weak area in the restoration leading to adhesive failure and post debonding.[1] Customizing the prefabricated post to anatomic post yields precise adaptation to the root canal space encircled by thin and uniform layer of resin cement or reducing the cement volume, generating ideal circumstances for post retention, as performed in the present case report.

2. Case Report

A 30-year-old female patient presented with a chief complaint of grossly decayed upper right central incisor with history of intermittent pain and swelling since 2 weeks. Patient gave a history of trauma 2 years back and repeated sinus formation since about 6 months. Medical history was noncontributory. On clinical examination, a discolored tooth #8 with limited crown structure was noted. The tooth was sensitive to percussion and palpation, grade I mobile and did not respond to cold and electric pulp testing. Radiograph showed large periapical radiolucency wrt #8. Diagnosis of chronic periapical abscess was established and treatment plan of endodontic treatment followed by post, core and crown were recommended. Patient was informed about the possibility for surgical intervention in case of an unfavorable outcome. Consent was taken and the treatment was initiated. In the first visit, coronal access cavity was prepared under magnification and purulent exudate from the canal was evident. After copious irrigation, working length

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was established 1 mm short of the apex using an electronic apex locator and radiographs. Canal had an initial apical size of #70 K file, which was then prepared and enlarged with hand instruments till size #80 followed by

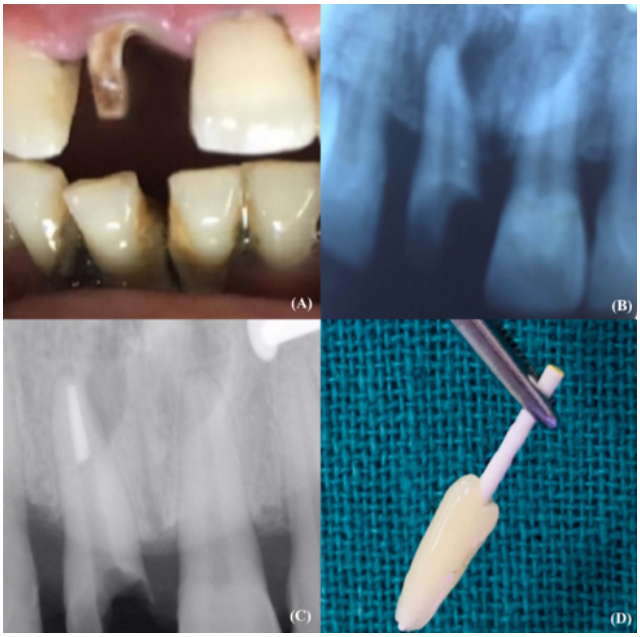

Fig. 1: A:) Preoperative clinical picture wrt #8 B:) Preoperative radiographic picture #8 C:) Removal of gutta-percha using heated pluggers D:) The fiber post covered with hybrid composite resin

Fig. 2: E:) The set (fiber post & composite resin) inserted into the canal F:) Direct anatomic fiber post after incremental core build-up G:) Clinical picture after cementation of anatomic fiber post H:) Radiographical picture after cementation of anatomic fiber post

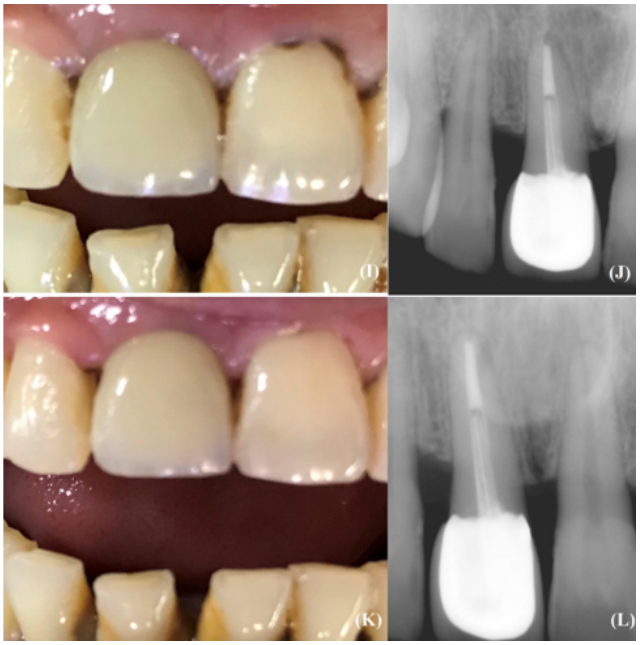

Fig. 3: I:) Immediate clinical picture after crown cementation wrt #8 J:) Immediate radiographical picture after crown cementation wrt #8 K& L:) 1 year follow up

circumferential filling technique under copious irrigation with 5.25% NaOCl. The canal was dried with paper points and dressed with calcium hydroxide paste. The coronal cavity was sealed with temporary filling material. On second visit after one week, calcium hydroxide was removed and no pus discharge was observed, but the patient responded to percussion and palpation. Therefore, the canal was irrigated 5.25% NaOCl and calcium hydroxide dressing was repeated with temporary restoration. One week later, patient became asymptomatic i.e., non-responsive to percussion and palpation with complete sinus healing. Calcium hydroxide dressing was removed and the canal was obturated with gutta-percha and resin based sealer (AH Plusroot canal sealer, Dentsply) using lateral compaction technique. The access cavity was sealed with glass ionomer cement and patient was kept under observation.

Follow-up examinations over 3 months revealed that the patient was asymptomatic and radiographic examination showed signs of healing. Therefore, the definitive post-endodontic restoration of fiber post, core and crown was planned. Gutta-percha was removed with a heated plugger, leaving 4 mm of apical seal followed by removal of undercuts, if any, by H file in circumferential manner.

Prefabricated fiber post #2 (Reforpost, Angelus, Londrina, PR, Brazil) was apically fit but coronally loose, while prefabricated fiber post #3 was short of length. The decision of relining #2 post with composite i.e. direct anatomic post was taken.

The canal was isolated with glycerine-based gel (liquid strip, ivoclar) as a separating medium using a microbrush.

Prefabricated fiber post #2 was cleaned with alcohol followed by silane (Silano®, Angelus) application and dried for 1 minute which was followed by adhesive application and light-curing for 10 seconds. The prefabricated fiber post was then covered with hybrid composite layer (Te-Econom Line, Ivoclar) and gently inserted into the root canal and photoactivated for 10 sec. The so formed anatomic post was gently pulled out of the canal, and an additional 20 sec of light curing was performed in order to completely polymerize the re-lining resin. The anatomic post was tried in again, in order to ensure that it is inserted passively, without any interference. Then, coronal portion of the anatomic post was incrementally filled with composite resin to reestablish anatomic contours to the tooth and photoactivation of 20 sec for each increment was done.

Once the customized fiber post with core was ready, the canal and the relined fiber post was rinsed abundantly with water and air to remove the applied lubricant gel. The post was cleaned with alcohol. Self-adhesive resin cement (RelyX U200, 3M ESPE, Germany) was introduced into the root canal space with an intracanal mixing tip and the anatomic fiber post was seated. Excess resin cement was removed, and the remaining cement was light-cured for 20 seconds to ensure adequate polymerization of the cement. Crown preparation was done, impressions were taken and PFM crown was cemented.

After 3 months, 6 months and 1 year follow up, the direct customized post was perfectly adapted and showed acceptable results both clinically and radiographically. No morphological alterations of the indirect restorations or marginal discoloration were evident.

3. Discussion

Despite constant improvements in techniques and restorative materials, rehabilitation of endodontically treated teeth still exists as a huge challenge as these teeth present with minimal and/or fragile tooth structure, remodeled esthetics and changed physical characteristics like decreased proprioception, altered collagen cross-linking and dehydration.[1–3] Extensive damage of the tooth may occur because of dental caries extension or trauma, while over-preparation of the canal, immature development, internal resorption, or removal of a previously placed excessively large dowel and core leads to thin remaining canal walls, making the definitive restoration more complicated implicating in a poor prognosis for the long-term functionality of the restored tooth.[1]

Using the intraradicular post is a commonly employed method to reinforce strength in an endodontically treated tooth when its remaining coronal portion can no longer provide sufficient/satisfactory support and retention for the restoration.[4] Since quite a while, custom-fabricated cast metal post and core were considered as the first line of treatment for the rehabilitation of endodontically treated teeth having extensive loss. As they are procured from an impression taken directly from the canal, these conventional posts offer an acceptable fit to the canal providing improved retention along with a thin cement layer.However, these posts exhibit certain flaws such as long working time, laboratory costs, lack of true adhesion, possibility of corrosion, trouble in removing them, if needed; and discrepancy of modulus of elasticity when compared to dentin.[1] High rigidity of the cast metal post and core can generate a wedging effect, which can uneventfully lead to extensive root fractures, representing a catastrophic failure.[1–5] Additionally, restoration of anterior teeth with metal post and core will invalidate the entire purpose of an all-ceramic crown by compromising on the esthetics. Metal post has the possibility of reflecting through the all-ceramic crown and thin gingiva and can decrease the depth of translucency of the restoration.

In order to overcome the above mentioned challenges, prefabricated fiber post was introduced in the 1990's. Over the years, continuous research on these has occurred to alter the type of filaments (from carbon to quartz to glass fiber) as well as shape of the posts (ranging from cylindrical, cylindroconical, conical, double-tapered and oval). Also, technological evolution has enabled manufacturers in today's date to provide fiber posts offering enhanced esthetic and mechanical properties. Fiber post offers the benefits of translucency and favorable optical properties, thus providing superior esthetics to the tooth. The fiber post has modulus of elasticity of about 20 GPa, which is close to that of dentin (18 GPa). Similar elastic properties of different components of the restoration i.e., adhesive system, luting agent, post material and dentin allows for a homogenous stress distribution to the tooth and surrounding tissues, thus providing a protective effect and favoring the integrity of weakened roots.[1–7] Fiber posts are chemically inert and non-toxic, can be easily removed in failure cases, has Better light conductivity, high fatigue resistance, low electrical conductivity, resistance to solubility, and resistance to biochemical degradation.[8]

Pulp cavity of the maxillary central incisor is widest cervically where the pulp chamber shape is triangular and pulp canal appears to be rounder at the midroot and apical level. Hence, prefabricated fiber post is tended to be fit apically and loose coronally, while the next larger size prefabricated post could be short of length, and would account for further enlargement using peeso reamer at the expense of radicular dentine. In such conditions, the choice of procedure should be creation of an "anatomic post", i.e., shaping the post to the root anatomy. In the current case report, prefabricated fiber post #2 (Reforpost, Angelus, Londrina, PR, Brazil) was apically fit and loose coronally. To avoid further enlargement and preserve the apical tooth structure, customization of the prefabricated post was done.

There are two ways for preparation of the direct anatomic post. It can be prepared either by directly obtaining an impression of the canal by relining the fiber post with composite or adding accessory fiber posts to fill in the mismatch around the main glass fiber post and the root canal.[1] The latter method is used when the canal size is excessively wide. In this present case, the canal wasn't wide enough for the addition of accessory post therefore the former technique was chosen as the treatment protocol.

Clavijo et al. evaluated the fracture strength and mode of failure of flared bovine roots restored with different intraradicular posts and demonstrated that cast metal post, direct and indirect composite resin relined fiber post strengthened the flared root canals. The favorable failure modes were seen in both direct and indirect composite relined groups whereas cast metal post presented with 100% unfavorable failures. Thus, the use of composite relined anatomic posts in flared roots could be a potent alternative to cast metal post-and-core.[8] *Silva et al.* presented similar results and concluded that relining fiber posts using composite resin could enhance the fracture resistance and decrease the root strain.[9] The retention of relined posts was assessed by *Faria-e-Silva et al.* through a push-out bond strength test and hypothesized that relining the post with composite resin seems to be an efficient way for improving the retention of fiber posts in all thirds of flared root canals.[4] *Rocha AT et al.* in an alike study exhibited that anatomically customized posts with composite resin show greater bond strength as compared to non-customized posts and allowed for a more uniform cement layer.[2] Customizing the prefabricated fiber post is relatively easy, minimally invasive and only a few additional steps in single appointment are required beyond those needed to lute a prefabricated fiber post. It is based on minimizing the preparation need at the deeper parts of the canal, saving dentin and minimizing stress at apical parts of the post. Promising results of the anatomic post technique in laboratory studies can be attributed to the high retention due to custom fit obtained from the root canal. Moreover, the high hydraulic pressure they put on the cement against the dentinal walls, results in better contact between the cement/post set and the dentin. This pressure reduces blister formation in the cement which eliminates sources of flaw-initiating sites; increases the number of tubules filled with the resin cement because of better penetration of resin into dentin; and results in a more uniform hybrid layer, with greater resin tags and adhesive lateral branches.[10] Given the inclination to plan esthetic metal-free restorations, the utilization of anatomic posts offers an answer when confronting flared root canals in everyday practice. However, there are still too few large scale clinical studies involving humans and more research is needed.

4. Conclusion

The clinical procedure of direct anatomic post with composite resin can be used for reinforcing an endodontically treated tooth when the anatomy of the root canal walls post preparation is not perfectly round, and when there is substantial loss of tooth structure at the coronal level. They provide a perfect blend of the properties/advantages of both the custom cast metal post and prefabricated fiber post while eliminating drawbacks. In this manner, it is possible to obtain a fit of the individual anatomic post which is superior to any other post system and improve long term prognosis by just adding few minutes to your routine post cementation procedure.

5. Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

6. Source of Funding

None.

7. Conflict of Interest

None.

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