

## Case Report

# Management of Fractured Endodontically Treated Tooth by Fibre Optic Composite Post-Core-Crown: A Case Report

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### Abstract

#### **Background:**

The restoration of endodontically treated tooth is a subject that has been evaluated and discussed widely in the dental literature. The goal of dental treatment is to provide optimal oral health, aesthetics and functions. The successful treatment of a badly broken endodontically treated tooth depends not only on the success of the endodontic treatment but also on good prosthetic reconstruction. The prosthetic treatment on a seriously damaged, endodontically treated tooth often requires an endodontic post as an additional retention element for core build up prior to crown restoration. This case report presents a male patient of 22 years of age with prosthetic crown fracture of endodontically treated maxillary left central incisor tooth. The following clinical case represents the clinical steps involved in the utilization of a fibre-reinforced composite post-core in a maxillary left central incisor and the subsequent treatment with a full veneer crown.

**Keywords:** endodontically treated tooth, fibre optic post, composite resin core, full veneer crown.

**Introduction:** Restoration of endodontically treated tooth is becoming an integral part of the restorative practice in dentistry. Endodontically treated teeth are structurally different from vital teeth, major changes include altered tissue physical characteristics, loss of tooth structure, possible discoloration and susceptible to fracture.<sup>1</sup> Endodontically treated teeth are weaker than intact teeth due to loss of tooth structure, reduction in tooth flexural strength,<sup>2</sup> changing the collagen cross-links and moisture content reduction and tooth dehydration.<sup>3</sup> Canal enlargement and cavity preparation can reduce the stiffness of the teeth<sup>4</sup> and brittleness could be a final result of a root canal treatment.<sup>5</sup> When most of the coronal structure of an endodontically treated tooth has been lost due to caries or root canal treatments, the use of post and core systems seems mandatory.<sup>6</sup> The main goal of the post insertion is to provide an optimum retention for the core which eventually supports the crown.<sup>7-9</sup> A post is

a rigid structure, that can be inserted in the root canal after appropriate root canal treatment.<sup>3,7</sup> Recent studies suggest that the rigidity of the post in the best situation should be similar to the root. In addition, they should show an elastic modulus similar to dentin, which can efficiently transmit the stress from the post to the root structure.<sup>2</sup> The important role of anterior teeth in esthetic and function makes these teeth a significant component in dentition. Traumatic accidents are so common in maxillary anterior teeth especially in 8 to 12 year-old children. These traumas often lead tooth to a degenerative cycle which eventually causes necrosis. Root canal therapy (RCT) is often successfully done after apexification but compromised dentinal walls especially in cervical area, makes these teeth susceptible to fracture.<sup>10</sup> The fracture resistance of endodontically treated teeth is highly dependent on the remaining dentine thickness around post and core systems.<sup>11</sup> Thin-walled root

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canals always present a challenge to dentists to select a restorative treatment that does not further weaken the tooth structure. Additional full veneer crown is usually indicated when the remaining coronal tooth structure is less.(7,8) The purpose of this case report is to describe the restoration of a fractured endodontically treated tooth with fibre optic post, composite resin core and full veneer crown.

### Case Report:

A male patient of 22 years of age named Antu Baral came to Out Patient Department (OPD) of Department of Prosthodontics, Bangabandhu Sheikh Mujib Medical University (BSMMU) with fracture of endodontically treated maxillary left central incisor which had crown prosthesis. Cardinal complaint was loss of aesthetics. He gave a history of trauma on that area following bicycle accident.

On extra-oral examination, no abnormality was detected. Intraoral examination revealed a cervical crown fracture of endodontically treated maxillary left central incisor.

Intra-oral periapical radiograph revealed the under-sealed endodontically treated maxillary left central incisor and no radiolucent area around the root apex of the offending tooth with no root or alveolar bone fracture.

The case was diagnosed as a cervical fracture of endodontically treated maxillary left central incisor.

After considering the above conditions, a treatment plan consisting of composite resin core built up by fibre optic post and final restoration by full veneer crown was adopted.

After proper counseling, the consent of the patient was taken. Faulty prosthesis was removed by Tungsten Carbide bar and mouth preparation was done by scaling (Fig 1). Correction of faulty endodontic treated tooth was done by re-RCT. The length of the sealed canal was approximately 20 mm. Preparation of sealed canal for fibre-post was done by removal of gutta percha using peso-reamer leaving 4 mm at the apical region (Fig 2). A radiograph was taken for post direction evaluation into the canal. An anti-rotational groove was applied into the labial wall of the canal. Then application of gingival retractor was done. Then the post space was dried with air and cotton pellet. The glass ionomer luting cement was applied with a lentulospiral #40 into the post space and glass fibre post was inserted into the canal (Fig 3). The post was stabilized for approximately 6 minutes for proper setting.

After proper stabilization of the post, the tooth was isolated with cotton roll and was air dried. Uniform layer of 7th generation self-etching adhesive bonding was applied according to manufacturer's instruction. Light curing was done for 10 seconds. Then the coronal portion was built up incrementally with composite resin. Each increment was light cured for 20 seconds. Then the core was left alone for 10 minutes to allow polymerization shrinkage (Fig 4).

After core built up, the tooth was prepared with a 1.5 mm ferrule in order to ensure long term post and core performance beneath the crown restoration without sharp line angles for the planned metal ceramic restoration (Fig 5). The color of the final restoration was selected with a shade guide. After tooth preparation, impression was taken with C-silicon impression material and cast was fabricated, sent to the dental laboratory for fabrication of metal ceramic crown. Insertion of the temporary crown was done for preservation of finish line and prevention of inclination of the adjacent teeth (Fig 6). Metal try-in, then porcelain try-in was done. Masticatory function, optimal aesthetics and maxilla-mandibular relationship were obtained. Finally, the metal-ceramic crown was cemented by glass ionomer cement (Fig 7). The patient was advised, not tearing hard food with this restored tooth. After one month, the patient was recalled for follow up visit. The patient had no complaint about the metal-ceramic crown.

Figure 8 shows x-ray views of the tooth before and after treatment. The treatment procedure adopted solved the complaints of the patient and the patient was happy after finishing of treatment.

### Figures:



Figure 1: Fractured left maxillary central incisor



**Figure 2: Canal preparation for fibre optic post**



**Figure 3: Insertion of fibre optic post**



**Figure 4: Composite core**



**Figure 5: After tooth preparation**



**Figure 6: Insertion of temporary crown**



**Figure 7: Insertion of full veneer crown**



**Figure 8: Periapical X-rays (before & after treatment)**

### **Discussion:**

Tooth restoration is the final step after appropriate root canal treatment.<sup>14</sup> Root canal treatment is done just to save the root. To restore the fracture resistance of weakened tooth, other methods should be applied.<sup>6</sup> Numerous studies have shown that RCT can decrease teeth fracture resistance; therefore, restoring these teeth has been a challenge to maintain function, aesthetic and serviceability of a teeth. The post core systems with lower modulus of elasticity and higher degree of elasticity showed lower fracture resistance.<sup>15</sup> It has been theorized that tooth bonded posts can significantly increase the tooth strength.<sup>15,16</sup> Fibre posts show good adhesion to resin cement. When the fracture occurs, the pattern of fracture is important as it acts as guidance for the restorability of fractured teeth.

An anterior tooth must be prepared to receive a crown after endodontic treatment because a good amount of tooth structure was lost. A post may be necessary to retain the core so that these teeth can resist functional forces.<sup>16,17</sup> The fundamental requirements of endodontic posts include high tensile strength, high fatigue resistance to occlusal and shear loading, stress free distribution of the forces affecting the tooth root. Excellent fitting accuracy, biocompatibility and innocuous electro-chemical activity are also essential.<sup>18</sup> Prefabricated post can be adjusted and inserted in a single visit.

Some studies, point out that fibre-posts do not strengthen teeth, rather the preparation of a post space and the placement of a post can weaken the root and may lead to root fracture. In other words, the main function of a post is the retention of a core to support the coronal restoration.

Now-a-days, many types of prefabricated posts are available, one of them is fibre optic composite post. Endodontic post fabricated from glass fibre-reinforce composite has favorable biomechanical properties, high tensile strength and at the same time exhibits elasticity characteristic that is similar to dentin. It is fabricated to bond with most resin cements and resin-based composite core materials. Finally, it can be removed easily in case of an endodontic failure requiring re-treatment.<sup>19</sup>

The construction of a core buildup is necessary as the amount of residual tooth substance decreases. The buildup increases the retention and resistance provided by the remaining tooth structure. The core material should have adequate compressive strength to resist intraoral forces, sufficient flexural strength, biocompatibility, resistance to leakage of oral fluids at the core-to-tooth interface, ease of manipulation, ability to bond to remaining tooth structure, thermal coefficient of expansion and contraction similar to tooth structure, dimensional stability, minimal potential for water absorption and inhibition of dental caries.<sup>20</sup>

Fabrication of metal-ceramic crown over fibre optic post composite core system is one of the treatment option. These restorations can provide endodontically treated tooth with the desired protection and aesthetic; however, they require extensive tooth preparation and can be expensive.<sup>21</sup>

### **Conclusion:**

Use of fibre optic post for treatment of fractured endodontically treated tooth is a very good option which is suitable for most of the patients. It has favorable biomechanical properties, high tensile strength and at a same time exhibit elasticity characteristic that is similar to dentin. Since it is metal-free, it does not cause metal allergies or corrode.

### **Conflict of interest:**

The authors hereby declare that no conflict of interest exists on behalf of the authors in conducting this study. Furthermore, the findings of this study do not constitute any conflict of interest for the authors.

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