

## Restoration of anterior teeth with different types of post and core: A case series.

Partha Sarathi Adhya<sup>1</sup>, Niranjan Kumar Chugh<sup>2</sup>, Irfan Islam<sup>3</sup>

<sup>1</sup>Consultant Prosthodontist, Daharpur, Tamluk, Purba Medinipur, West Bengal, India.

<sup>2</sup>Consultant Prosthodontist, Durgapur, West Bengal India.

<sup>3</sup>Private Practitioner, Kolkata, West Bengal, India.

### Abstract

Restoration of endodontically treated or fractured teeth is often considered as challenging. Fabrication of post core not only increases the fracture toughness of the tooth but also increases the retention of the prosthesis. The purpose of this case series is to discuss three different procedures of post and core fabrication in the anterior teeth. Pre-fabricated metal post with composite core, custom made metal post core and glass fiber post with composite core are three different treatment options which can be utilized to save the fractured teeth.

**Keyword:** - Post and core, endodontically treated teeth, pre-fabricated metal post, custom made metal post, glass fiber post, ferrule.

**Address of correspondence:** Dr Partha Sarathi Adhya, Daharpur, Tamluk, Purba Medinipur, West Bengal, India.

Email id: [dr.psadhya@gmail.com](mailto:dr.psadhya@gmail.com) Phone number: 9932847894 . DOI: 10.5281/zenodo.5205433

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### Introduction

Teeth can be termed as jewels of oral cavity which help to maintain various functions like phonations, chewing. Thus saving the teeth specially the anterior teeth is utmost important to maintain various form and function of the oral cavity including the esthetic value of the face.

Traumatic injury and caries are one of the main causes of loss of teeth structure in the anterior teeth. According to Petti et al. (2018), the estimated number of individuals from 7 to 65 years of age, with injured permanent teeth was approximately 900 million.<sup>[1]</sup> In India the incidence of traumatic dental injury is 13% among adolescents.<sup>[2]</sup> The prevalence of dental caries in Indian population aged between 3 and 75 years was 54.16%.<sup>[3]</sup> From the mentioned data it is evident that a large number of populations suffer from problems like fractured teeth, crooked smile and peri- apical infection in India. While pulpal and the periapical infection in such cases can be treated by endodontic treatment, the true challenge lies in the restoration of lost teeth structure. The

absence of coronal and radicular tooth structure in such teeth reduces the capacity to withstand functional loads.<sup>[4]</sup> Also insufficient anchorage due to less tooth structure may cause loss of retention of the prosthesis.<sup>[5]</sup>

Fabrication of post and core in such cases has shown good fracture resistance and has increased survivability of endodontically treated teeth. Over last 250 years the concept of post core fabrication has developed substantially. From wooden stick to metal screw to modern day CAD-CAM milled post core, the materials and techniques required to fabricate the post and core has evolved a lot.<sup>[6]</sup>

This case series deals with three different types of cases which were treated using different type of post core technique.

### Case Reports

#### Case 1

A 23 year male patient came to the clinic with the chief complain of broken upper right front teeth where endodontic treatment was

attempted elsewhere (Picture-1A). On examination it was revealed that patient had an Ellies class III fractured right upper central incisor with only 2 mm teeth structure present buccally and palatally. There was no tenderness on percussion or mobility of teeth and vitality test was negative. Radiograph showed no peri-apical radiolucency and no open apex.

Access opening was done using No.2 round bur and working length determined using apex locator. Bio-mechanical preparation was done and canal was enlarged up to 40K file using step back technique (Picture-1B).<sup>[7]</sup> After 7 days next appointment was given and gutta-percha was removed by No. 4 peeso-reamer (MANI,INC. Japan) leaving 4 mm GP apically (Picture-1C). Stainless steel post (Coltene ParaPost Stainless Steel, 0.90mm) was selected and inserted in the canal to check the fit. Dual cure cement (RelyX U200, 3M India Limited) was used for post cementation. The catalyst and base components of the material were mixed and applied following manufacturer's instruction. The post was seated and excess material removed before light curing (Picture-1D). Core build up was done with composite (Filtek Z350 Xt, 3M India Limited). Tooth preparation was done (Picture-1E) and upper and lower elastomeric Impression was taken and crown cementation was done after 4 days (Picture-1F).

### Case 2

A 26 year male reported to the clinic with a broken tooth with history of trauma 16 years back. On intra oral examination it was noticed teeth had an Ellies III fracture with significant loss of crown structure (Picture-2A). Periapical radiograph showed no open apex and no peri apical infection. The vitality test was negative.

Access opening was done using No.2 round bur. Bio mechanical preparation was done upto 50K file using step back technique.

Obturation was done using cold lateral condensation method (Picture-2B).

After 7 days patient was recalled and gutta-percha was removed by No. 4 peeso-reamer (MANI,INC. Japan) leaving 4 mm GP apically. As a metal post core was planned finish line of the crown was placed subgingivally using torpedo bur on the buccal side and flat end tapered fissure round bur on the palatal side respectively. Ferrule was placed 1 mm above the finish line of the crown. A woden wedge of medium size was taken and was cut using No.15 BP blade for the proper adaptation in and the canal. Separating media was applied in the canal. PATTERN RESIN LS (GC Corporation , Tokyo) was applied to wedge and was inserted into the canal. After setting of the pattern resin wedge was taken out and fit was check by reinserting it into the canal.<sup>[8]</sup> Once proper fit was checked parent resin was applied over the wedge upto the ferrule margin to build up the core. Once post core was made it was invested and casted. Metal post core was cemented using luting cement (Meron,VOCO GMBH, Germany) (Picture-2D), elastomeric impression was taken and crown was fabricated (Picture-2E).

### Case 3

A 28 year male patient came to the department with the complaints of broken front teeth. On intra oral examination it was noted that the patient had Ellies class III fractured maxillary left canine with loss of significant teeth structure (Picture-3A). Radiographic examination showed the tooth was endodontically treated with no peri apical radiolucency. Periodontal condition of the tooth was good with adequate bony support, good oral hygiene and presence of 4 mm of keratinized gingiva.

As only 1 mm of tooth structure was present both buccally and palatally and tooth was endodontically treated crown lengthening with post and core fabrication was planned to

restore the teeth. Impression of the maxillary arch taken and was mockup of prosthesis was done over the cast.

On the next appointment transgingival probing was done around the intended tooth under local anesthesia. It was found that 2 mm of soft tissue present above the alveolar crest. Pointed instrument was used to create the bleeding spots which would act as level of incision. Using a no. 15 Bard-Parker blade, the internal bevel incision was performed 2 mm above the gingival margin both on buccal and palatal aspect. A mucoperiosteal flap was raised. Osseous resection was performed using low speed hand piece and carbide bur under copious saline irrigation to maintain the biologic width. The flap was repositioned and single interrupted suture was given (Picture-3B).<sup>[9]</sup>

On the same day gutta-percha was removed by No. 4 peeso-reamers (MANI, INC. Japan) leaving 4 mm GP apically. Gingival finish line was prepared and core ferrule was placed 2 mm above the gingival margin. Fiber optic post (Angelus Reforpost No.3, Angelus Indústria; Brazil) was inserted the canal and fit of the post was checked. Bonding agent (3M ESPE Single Bond Universal Adhesive, 3M India Limited) was applied in the canal and was cured for 10 seconds. Post cementation was done by dual cure cement (RelyX U200, 3M India Limited). The post was seated and excess material removed after light curing. Core build up was done with composite (Filtek Z350 Xt, 3M India Limited). Tooth preparation was done (Picture-3C). Temporary crown was fabricated over the prepared teeth from the wax mock up. After 14 days patient was recalled and suture was removed. Maxillary and mandibular elastomeric Impression was taken and crown was fabricated (Picture-3D).

### Discussion

As discussed earlier carious and fracture teeth cause peri apical infection. Such

complications can be resolved by endodontic treatment. But endodontic treatment of the teeth often makes certain changes in the tissue structure of the teeth which makes it prone to fracture.

According to Helfer et al. (1972) up to 10% water loss happen to the endodontically treated teeth.<sup>[10]</sup> Changes in collagen cross linkage, reduction in the dentinal micro hardness and reduction in fracture toughness of dentin occur because of endodontic treatment.<sup>[11]</sup> To overcome these drawbacks prosthesis and post and core fabrication can be regarded as a viable treatment option for endodontically treated teeth.

But, the question arises do all endodontically treated teeth need post and core? Various factors like presence of coronal teeth structure, position of the teeth in the jaw, extent of the caries determine the treatment plan for post and core fabrication.<sup>[12]</sup> As mentioned by Peroz I et al. (2005), teeth structure with all remaining cavity wall don't need post and core. But teeth with absence of 1 or 2 cavity wall may need insertion of post. Teeth with absence of 3 cavity walls must be treated by post and core. Teeth with no cavity must be treated with post and core with placement of ferrule.<sup>[13]</sup> According to Faria ACL et al. (2010) teeth with less than 50% crown structure must be treated with post and core.<sup>[10]</sup>

In the first case custom made metal screw post was used. The screw shaped design of these posts helps to engage the dentin actively. The parallel shape and screw shaped design makes such post more retentive than tapered shaped post. Also custom made post can be placed easily with reduction of the clinical timing.<sup>[14]</sup>

In the second case a new technique for the fabrication of metal post and core had been used. The main advantage of using pattern resin is that it is highly dimensionally stable and accurate.<sup>[15]</sup> It also reduces the clinical timing and handling is very easy and this can



also be used in multi rooted teeth.<sup>[8]</sup> In this case 2 mm ferrule was provided all over the tooth structure. The ferrule acts as a 360° metal cover all over the teeth. The function of the ferrule provides hugging action which reduces the wedging effect of a tapered dowel and resists the lateral forces.<sup>[16]</sup>

The fractured tooth in the third case was restored by clinical crown lengthening and fiber optic post and core fabrication. One of the main factors that should be considered in clinical crown lengthening is the maintenance of the crown root ration. As the canine has the longest root in the oral cavity, crown lengthening in such cases does not hamper the crown root ratio. The amount of keratinized gingiva present in this case was 4 mm. This amount was satisfactory as minimum of 3 mm of space between restorative margins and alveolar bone would be adequate for periodontal health, allowing for 2 mm of biological width space and 1 mm for sulcus depth.<sup>[17]</sup> The tooth was restored with fiber optic post with composite core. The main advantages of fiber optic posts are modulus of the elasticity, compressive strength, flexural strength and thermal expansion, similar to that of dentin. This reduces the chance of fracture and transfer less forces along the long axis of the teeth. In addition to that, due to their natural translucency the esthetic outcome of fiber optic post are much superior.<sup>[18]</sup>

Lots of controversies are present regarding the durability of three post core system used in these case series. Makade CS et al. (2011) studied fracture resistance of endodontically treated teeth with no post core, stainless steel post, and custom made metal post and fiber optic post in maxillary anterior teeth. According to them, endodontically treated teeth without post core system showed the least fracture resistance demonstrating the need to reinforce the tooth. Stainless steel post with composite core showed the highest fracture resistance among all the

experimental groups. Teeth restored with the Glass fiber post showed the most favorable fractures making them more amenable to the re-treatment.<sup>[19]</sup> McLaren JD et al. (2009) studied fracture resistance of stainless steel post and fiber optic post. Their study showed fracture resistance of stain less steel post is higher than fiber optic post but both the post core system has higher fracture resistance than teeth restored with no post and core.<sup>[20]</sup> In 2013 Zhou L et al. concluded that endodontically treated teeth were less fracture resistant than compared to teeth resorted with cast metal post and fiber optic post. According to them, cast metal post had higher fracture resistance than fiber optic post.<sup>[21]</sup> According to Creugers NHJ et al. (1993), after 6 years the durability of screw post and metal post were 81% and 91% respectively.<sup>[22]</sup> Piovesan EM et al. (2007) showed 90.2% survival of fiber optic post over the period of 97 months. Wang S et al. (2019) observed no statistical difference was present in the long term survival rate of fiber optic post and metal posts in the anterior region.<sup>[23]</sup>

Regardless of the difference of opinion it is evident that endodontically treated teeth with lose of significant tooth structure are prone to fracture. Post core system with ferrule has shown significant increase in the durability of such cases.

### Conclusion

Three different methods of post core fabrication mentioned in this case series are equally effective to increase the survivability of endodontically treated teeth. Also Crown lengthening is a viable procedure that enables to restore teeth with significantly less teeth structure. Anterior teeth which are essential for esthetics and speech can easily be saved by endodontic treatment, post core fabrication and crown lengthening procedure.

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**FIGURES:**



Picture-1A



Picture-1B



Picture-1C



Picture-1D



Picture-1E



Picture-1F



Picture-2A



Picture-2B



Picture-2C



Picture-2D



Picture-2E



Picture-3A



Picture-3B



Picture-3C



Picture-3D

