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A comparative evaluation of fractured resistance of custom made Post and everStickPOST system in endodontically treated teeth- An *in vitro* study

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Abstract

Purpose: The aim of the study is to evaluate the fracture resistance of an endodontically treated teeth restored with custom made and everstick post and core systems. **Methods:** Twenty extracted premolar teeth with similar size were chosen and randomly divided into 2 groups. After cutting the crowns and endodontic therapy, the teeth were restored with custom made post (group 1), and everstick post (group 2). Fiber posts were cemented with dual cured resin cement and cast posts were luted using luting glass inomer cement. Samples were embedded in the acrylic resin blocks. And a compressive load was applied to the tooth at a crosshead speed of 1 mm/min and fracture loads were recorded. The results then analysed by one way ANOVA F test and POST HOC TURKEY test. **Results** On comparing the mean values and standard deviation observed, it was observed that Everstick posts showed mean fracture resistance of 332 N and Custom cast showed mean fracture resistance of 160.4 N. **Conclusion** It can be concluded that, among the two posts system, used in the present study. The Everstick posts showed the maximum fracture resistance as compared to the custom made post. However, long term clinical studies are required to determine the success rate of the Everstick posts.

Keywords: comparative evaluation, fractured resistance, everstick post system, treated teeth

1. Introduction

When assessing an endodontically treated tooth for restorative treatment, it has to be assumed that good judgments have been made previously concerning the periodontal status of the tooth, the remaining tooth structure, and the prognosis of the endodontic treatment. The tooth to be restored should exhibit a good apical seal when evaluating the radiograph, and also exhibit no sensitivity to percussion or palpation, no exudates, no fistula, no apical sensitivity, and no active inflammation [1].

Although posts are recommended to strengthen the teeth, several investigators have cautioned that posts with inadequate resistance to rotational forces on the posts can weaken the teeth. Consequently, root fractures constitute the most serious type of failure in post restored teeth. To prevent root fractures, a post should have an elastic modulus similar to that of dentin- a property which enables a more uniform distribution of stress by distributing the occlusal load. On the other hand, while it is important to ensure that a post is firmly cemented to provide adequate retention for the restoration and adequate protection of the remaining tooth structure, it should yet be easily removed if retreatment were required [2].

GC everStickPOST is a soft, flexible and unpolymerized glass fibre post which can be individually adapted to the shape of the root canal before light-curing while offering high strength after light curing. By respecting the anatomy of the canal, the risk for root fracture is reduced tremendously [3]. The unique GC everStickPOST is especially suited to fit the morphology of atypical canals such as curved, oval as well as very large root canals.

1.1 AIM

The aim of the study is to evaluate the fracture resistance of an endodontically treated teeth restored with different post and core systems.

1.2 Objectives

To determine

1. The fracture resistance of different posts and core system (custom cast post, Glass fiber posts, Carbon Fiber posts and Everstick post) in endodontically treated teeth

2. Mode of failure of different post and core system (custom cast post, Glass fiber posts, Carbon Fiber posts and Everstick post)in endodontically treated teeth

2. Material and Method

Forty freshly extracted single rooted premolar were selected for the study. The teeth were decoronated 2mm coronal to the proximal cemento-enamel-junction using a diamond disc. (Figure 1)

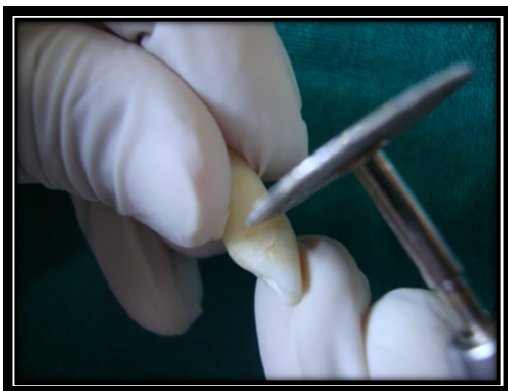


Fig 1: The teeth were decoronated at the cement enamel-junction using a diamond disc

Access opening is done. The canal was prepared by crown down technique using rotary protaper (Dentsply, Mallifer).till F2protaper. A radiograph of each specimen was taken to confirm satisfactory obturation of the canal

Following the post space preparations the canal was irrigated with saline solution and dried with paper points (Denstply, Mallifer).

All the specimens (20 samples) were then being divided into groups of 10 samples each.

- a. Group 1: Custom cast post
- b. Group 2 : Everstick post

Group 1:- Wax pattern is prepared for all the samples. Wax pattern were invested and castings were obtained. Luting glass ionomer cement as mixed according to manufacturer’s instructions, applied to the prepared canal with lentulospiral and applied to the custom made post. The posts were then seated in the canals under finger pressure. Once set excess cement was removed with a sharp hand instrument (Figure 2)



Fig 2: wax pattern

Group 2:- Selfcem self-adhesive dual cure cement is applied on the wall of the canals and everstick post is adapted to the canal walls and it is cured for 40 seconds. Composite core build is done (Figure 3)



Fig 3: everstick post

All the samples are embedded in the acrylic resin blocks by using a mold that provided a flat surface

A device was designed that allowed loading of the tooth at an angle of 90 degree to its long axis. Then the specimens were mounted on the lower plate of the universal testing machine and a compressive loading was applied vertically to the coronal surfaces of the roots at a crosshead speed of 1mm/min until fracture occurred. The load at which failure has occurred was recorded and expressed in Newton. The results were then analysed by one- way ANOVA F test and post HOC Turkey test.

3. Result

Table 1: Mean and standard deviation values

Groups	Mean	Standard Deviation
Custom Made Fiber Post	160.4	6.71
EverStickPOST	332	36.42

There was statistically significant difference between 1 and 2 (mean diff 171.60, p=0.001 On comparing the mean values and standard deviation observed in Table 1, it was observed that Everstick posts (332N) showed maximum fracture resistance and Custom cast(160.4 N) showed least resistance to fracture.

The mode of failure was also observed. Failure mode for each specimen as categorized to 2 typical types of failures – favourable type above the CEJ which has easy possibility to repair (portion of the core fractured or failure occurred at core-tooth interface) (figure 5) and unfavourable type below the CEJ (vertical root fracture) with difficult chance to repair (figure 4)



Fig 4: unfavorable fracture



Fig 5: favourable fracture

The mode of fracture was different among the study group. Group 1(80%) showed vertical root fracture which are unfavorable. Group 2 (100%) showed favorable fracture and the post can place undue force on the root and tooth in function that may put the tooth at risk in the future

3. Discussion

According to Duret and colleagues, an ideal post should have similar shape to the lost dentin volume (the prepared root canal) and mechanical properties identical to the dentin to provide long-lasting bonding. The post should not induce tension while being set, and minimal root canal preparation should be done to fit the post. The same authors also stated that posts of a light shade would improve the final esthetic result in some clinical situations [4].

Cast post and core has been widely used to reestablish the dental structures lost during endodontic treatment. In spite of its popularity, the cast post and core restoration has some disadvantages that may jeopardize long-term success. Disadvantages mentioned in the literature include tooth weakness related to the removal of root structure to accommodate the necessary post length, lack of cement retention, corrosion risks, poor stress distribution leading to root fracture, difficulties in removal of the post, necessity for two appointments to complete the procedure, and laboratory costs [4].

Under the limitation of the present study, it can be concluded that, among the four posts system, used in the present study,

1. The Everstick posts showed the maximum fracture resistance as compared to the Glass fiber posts, Carbon fiber posts and custom made post.
2. Mode of failure for everstick post was favourable with all the samples fracturing at core level with minimum damage to tooth structure. However, for custom cast post the failure mode was unfavourable as all samples showed root fracture and thus resulting in teeth are non-restorable.

However, long term clinical studies are required to determine the success rate of the Everstick posts

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