

Original Research

Fracture resistance of endodontically treated teeth restored with different type of post

¹Nadiya Gupta, ²Aayasha Sangal, ³Nadeem Aashiq, ⁴Ajay Babu Gutti, ⁵Vishaal Bader

¹M.D.S, Department of Conservative Dentistry and Endodontics, Aknoor, Jammu, J&K, India;

²M.D.S, Department of Conservative Dentistry and Endodontics, Shamli, UP, India;

³M.D.S, Department of Conservative Dentistry and Endodontics, Budgam, J&K, India;

⁴M.D.S, Department of Conservative Dentistry and Endodontics, Chirala, AP, India;

⁵M.D.S, Department of Conservative Dentistry and Endodontics, Srinagar, J&K, India

ABSTRACT:

Background: The present study was conducted for evaluating fracture resistance of endodontically treated teeth restored with different type of post. **Materials & methods:** 60 freshly extracted maxillary mandibular first molar was included. Following three study groups were made with 20 specimens in each group: Control group: Root-filled teeth without endodontic posts, Group A (ZRP group): Root-filled teeth with prefabricated zirconia post, and Group C (GFP group): Root-filled teeth with prefabricated glass fiber post. Removal of the canal filling material was done followed by post space preparation and coating with freshly mixed self-adhesive resin cement. Each post was seated with finger pressure for 10 s. afterwards; all the specimens were loaded in a universal testing machine (until fracture occurrence (in Newton)). **Results:** Mean fracture load resistance among specimens of group 1, group 2 and control group was 723.1 N, 796.2 N and 513.8 N respectively. While comparing the results, significant results were obtained. **Conclusion:** Prefabricated glass fiber post had maximum fracture resistance.

Key words: Endodontically, Post, Fracture

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Corresponding author: Nadiya Gupta, M.D.S, Department of Conservative Dentistry and Endodontics, Aknoor, Jammu, J&K, India

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INTRODUCTION

The success achieved with esthetic restorative techniques has resulted in increased patient demands for these treatments, particularly for anterior teeth. Consequently, there has been a significant increase in the use of all-ceramic crowns, as well as endodontic post and core materials that do not affect the esthetic results. Many dentists prefer to use prefabricated post systems because they are more practical, less expensive, and, in some situations, less invasive than customized post and core systems.¹⁻³

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, 5}In the early 1990s, prefabricated, finally polymerized fiber-reinforced composite (FRC) root canal posts were introduced to the market. FRC posts have been suggested to have certain advantages over metal posts. The elasticity modulus of an FRC post is closer to that of dentin when compared with rigid metal posts. Lower stress concentrations are therefore transmitted to the root, diminishing the risk of root fractures.⁵⁻⁷ Hence; the present study was conducted for evaluating fracture resistance of endodontically treated teeth restored with different type of post.

MATERIALS & METHODS

The present study was conducted for evaluating fracture resistance of endodontically treated teeth

restored with different type of post. 60 freshly extracted maxillary mandibular first molar was included. Root canals were cleaned and shaped using the step-back technique to apical size and then obturated with gutta-percha points and a eugenol-free epoxyamine resin sealer using the lateral condensation technique Embedding of teeth roots were done in auto-polymerizing resin up to 2-mm apex of CEJ. Following three study groups were made with 20 specimens in each group:

Control group: Root-filled teeth without endodontic posts.

Group A (ZRP group): Root-filled teeth with prefabricated zirconia post

Group C (GFP group): Root-filled teeth with prefabricated glass fiber post.

Removal of the canal filling material was done followed by post space preparation and coating with freshly mixed self-adhesive resin cement. Each post was seated with finger pressure for 10 s. afterwards; all the specimens were loaded in a universal testing machine (until fracture occurrence (in Newton). All the specimens were assessed for fracture load data. All the results were analyzed using SPSS Software.

RESULTS

Mean fracture load resistance among specimens of group 1, group 2 and control group was 723.1 N, 796.2 N and 513.8 N respectively. While comparing the results, significant results were obtained.

Table 1: Fracture load resistance

Group	Mean	SD	p- value
Control group	513.8	52.1	0.000 (Significant)
Group 1	723.1	68.4	
Group 2	796.2	81.7	

DISCUSSION

Fracture resistance of endodontically treated teeth (ETT) is influenced by several factors, such as substance loss, ferrule design, the presence of post and cores, and post location. After root canal treatment, ETT restoration was performed. A post's primary purpose is to retain the final restoration and distribute occlusal stresses along the tooth structure. Numerous techniques and materials have been proposed for ETT restoration. Studies have revealed that anterior teeth are subject to high risks of failure.⁸⁻¹⁰Hence; the present study was conducted for evaluating fracture resistance of endodontically treated teeth restored with different type of post.

In the present study, mean fracture load resistance among specimens of group 1, group 2 and control group was 723.1 N, 796.2 N and 513.8 N respectively. While comparing the results, significant results were obtained. Newman MP et al compared the effect of 3 fiber-reinforced composite post systems on the fracture resistance and mode of failure of endodontically treated teeth. Ninety maxillary central incisors were divided into 8 experimental groups and 1 stainless steel (ParaPost) control group of 10

specimens each. Eighty teeth were assigned to 2 main experimental groups called "narrow" and "flared" canals. For the narrow canal group, post spaces were prepared with the corresponding reamer to restore the teeth with FibreKor, Luscent anchors, and Ribbond posts of 1.5 mm, 1.6 mm, and 2.0 mm in diameter, respectively. For the flared canals group thin-walled canals were simulated. Statistical analysis revealed no significant difference between flared and narrow canals in mean load to failure between the post systems except for the Ribbond posts ($P < .01$). For the narrow canal, the mean load ranged from a low of 4.55 (+/-1.49) kg for the Ribbond standard to a high of 12.9 (+/-1.64) kg for the Luscent anchors.⁹

Torabi K et al compared the root fracture resistance of extracted teeth treated with different fibers reinforced with composite posts and treated teeth with conventional post and core systems. Root canal therapy was performed for 50 mandibular first premolars. The coronal portion of each tooth was amputated, and five post and core systems (cast, polyethylene woven, glass, carbon, and quartz fiber posts) were compared. Acrylic resin blocks were used for mounting, using a layer of elastomeric impression material covering the roots. The load was applied axially and measured with a universal testing machine. Significantly, cast posts and cores had a higher failure threshold including teeth fracture; whereas, fiber posts failure was due to core fracture, with or without fractures in coronal portion of posts.¹⁰ Maccari PC et al evaluated the role of composition of prefabricated esthetic posts in fracture resistance of endodontically treated teeth in vitro. Thirty human, single-rooted teeth (maxillary central incisors and canines) with similar root dimensions, extracted for therapeutic reasons, were used in this study. The crowns were removed below the cemento-enamel junction to obtain a standard root length of 17 mm. The roots were endodontically treated following the conventional manual technique and randomly assigned to three groups (n = 10) according to the post used: Aestheti-Post, Bisco, Schaumburg, Illinois; FibreKor Post, Jeneric/Pentron, Wallingford, Connecticut; and CosmoPost, Ivoclar Vivadent, Schaan, Liechtenstein. Mean fracture resistance was as follows: Aestheti-Post, 83.5 kgf; FibreKor Post, 85.7 kgf; and CosmoPost, 36.5 kgf.¹¹

CONCLUSION

Prefabricated glass fiber post had maximum fracture resistance.

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