Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Push-out bond strength of different post systems

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ABSTRACT:

Background: Teeth treated with root canal treatment have less moisture content and experience coronal damage from dental caries, which lessens the stiffness of previously placed restorations and increases the risk of fractures. The present study was conducted to evaluate the push-out bond strength of posts systems. **Materials & Methods:**90 single rooted maxillary human teethwere endodontically treated. 3 groups were prepared. Group I used custom cast metal post (Ni–Cr alloy), group II used biological post, group III used everstickfiber post. The consecutive posts were luted and sections were made. Push-out test was test using universal testing machine. **Results:** Group I had custom cast metal post, group II had biological post, and group III had everstickfiber post. The mean push bond strength in group I was 75.8 N, in group II was 62.8 N, and in group III was 51.7 N. The difference was significant (P< 0.05). **Conclusion:** Conventional custom cast metal post showed the highest bond strength followed by biological post, everstick electrical glass fiber post.

Key words: bond strength, biological post, everstickfiber post

Received: 22-08-2021 Accepted: 25-09-2021

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This article may be cited as: Soni S. Push-out bond strength of different post systems. J Adv Med Dent Scie Res 2021;9(10):186-188.

INTRODUCTION

Teeth treated with root canal treatment have less moisture content and experience coronal damage from dental caries, which lessens the stiffness of previously placed restorations and increases the risk of fractures.[1] As a result, there is a higher chance that the treated tooth will shatter during function. The pulpless tooth's resistance to fracture should be strengthened by the restoration. It is recommended that posts be kept in teeth that have significant dental decay since the core restores lost coronal structure.[2,3]

The quality of the restoration and the clinical state of the hard and soft tissues supporting it are key factors in the long-term effectiveness of any restorative or prosthetic rehabilitation of teeth that have had endodontic treatment.[4] An assessment of the physical characteristics and bonding strength of the posts to the tooth structure is essential for the long-term health of a restored tooth. Pull-out and push-out procedures are the most commonly used research protocols for determining the binding strength of various adhesive systems or post systems.[5] In the push-out bond strength approach, the post is pushed toward the coronal direction by applying a compressive stress in an apical-coronal direction to the apical aspect of the root slice.[6] Because the push-out test's stress pattern is more consistent, it offers a more accurate assessment of the bond strength.[7]The present study was conducted to evaluate the push-out bond strength of posts systems.

MATERIALS & METHODS

The present invitro study consisted of 90 single rooted maxillary human teeth. Teeth were endodontically treated and post space was prepared.

Teeth were divided into 3 groups. Each group consisted of 30 teeth. Group I used custom cast metal post (Ni–Cr alloy), group II used biological post, and group III used everstickfiber post.The consecutive posts were luted in each sample and sections were made. Push-out test was performed using universal testing machine (0.5 mm/min). The values were noted at bond failure. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of posts

Groups	Group I	Group II	Group III
Post	Custom cast metal post	Biological post	Everstickfiber post
Teeth	30	30	30

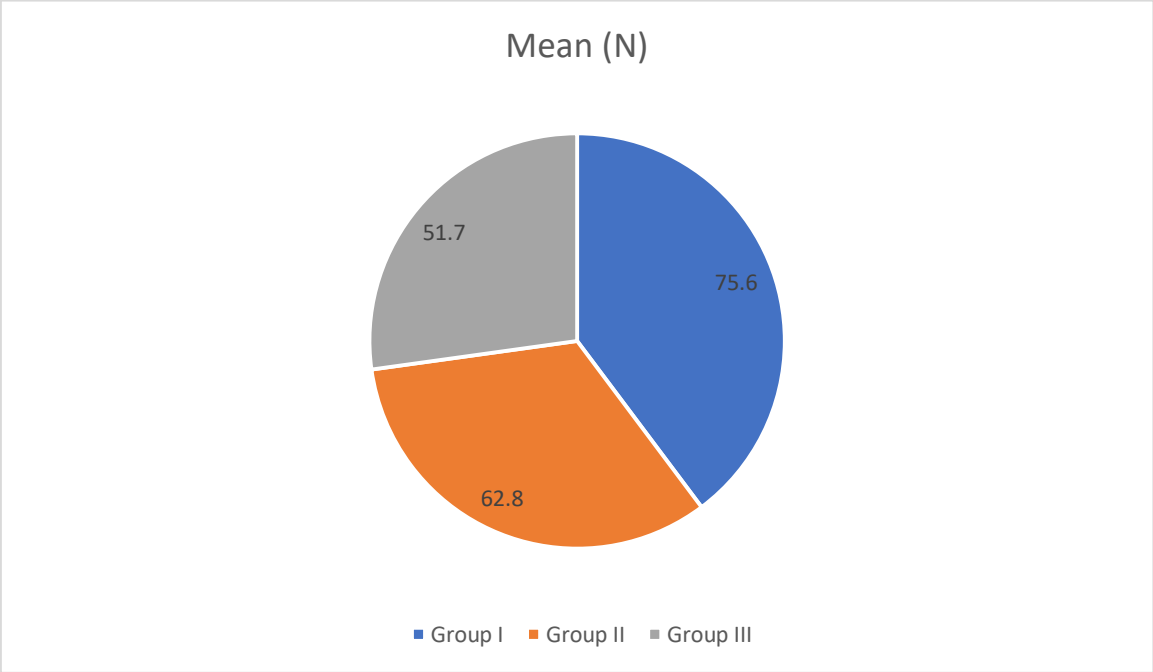
Table I shows distribution of teeth based on posts used.Group I had custom cast metal post, group II had biological post, and group III hadeverstickfiber post.

Table II Recording of push bond strength

Groups	Mean (N)	P value
Group I	75.6	0.01
Group II	62.8	
Group III	51.7	

Table II, graph I shows that mean push bond strength in group I was 75.8 N, in group II was 62.8 N, and in group III was 51.7 N. The difference was significant (P< 0.05).

Graph I Recording of push bond strength



DISCUSSION

It has been found that teeth restored with fiber-reinforced posts have a success rate of 95–99%, and no root fractures have developed.[8] Fiber posts have a number of benefits, including a modulus of elasticity that is comparable to dentine, high fatigue and tensile strength, and the ability to be cemented with an adhesive luting material to prevent friction from forming between the post and the root canal walls, allowing force to be applied uniformly along the post's length.[9] Using mechanical or chemical agents in surface treatment techniques has been recommended as a way to improve the binding strength between resin cement and pre-fabricated posts.[10]The purpose of the chemical treatment is to improve the mechanical interaction between resin cements and posts by roughening the post surface. According to recent research, post-surface pre-treatment strengthens bonds.[11,12]The present study was conducted to evaluate the push-out bond strength of posts systems.

We found thatgroup I had custom cast metal post, group II had biological post, and group III had everstickfiber post.Kanzleret al[13]evaluated the prefabricated post systems' binding strength at various root levels in teeth that had undergone endodontic treatment. Human premolars with one root (N = 70; n = 10) were removed to a height of 2 mm above the cement-enamel junction. Following treatment, root canal patients were randomized to one of the seven post systems: E1: Fiber (Direct) (Everstick post), E2: Fiber (Indirect) (Everstick post), PP: Fiber (PinPost), LP: Injectable Resin/Fiber composite (EverX Posterior), ZrO: Zirconia (Cosmopost), G: Fiber (FRC Postec Plus). The roots were sectioned at the coronal, middle, and apical root levels, and all posts were luted using a resin cement (Variolink II). The Universal Testing Machine was used to conduct push-out tests at a speed of 0.5 mm/min.The findings indicated that the E2 posts had the maximum bond strength (mean ± SD) at 5.3 ± 2.7, followed by the posts systems for PP

(4.1 ± 2.0), G (4.0 ± 1.6), LP (2.6 ± 1.9), T (2.2 ± 1.5), and ZrO (1.9 ± 1.0). For every post system, there were no discernible variations in binding strength. At 3.6 ± 2.2 MPa, the binding strength was maximum at the coronal root level. The FRC post systems exhibited a considerably better binding strength compared to rigid titanium or ZrO2 posts. For all post systems evaluated, the coronal root level yielded the strongest bond strength values; however, there was no significant difference between the other two root levels.

We found that the mean push bond strength in group I was 75.8 N, in group II was 62.8 N, and in group III was 51.7 N.Habib et al[14]analyzed the prefabricated fiber and metal posts' push-out bond strength (PBS) when they are luted with resin cement to the natural dentin. For the metal and fiber posts, extracted premolars with comparable root diameters were divided into two groups of thirty each. Acrylic blocks were used to mount the teeth, revealing 2 mm of the coronal root. Endodontic therapy and post-space preparations were applied to teeth. Based on the size of the postings (# 4, 5 and 6), two groups were further split into three sub-groups (n = 10). Resin cement was used to cement the posts. The PBS test was performed on specimens that had been sectioned into 4 mm slices. A statistically significant result was observed, as the mean PBS for the fiber and metal posts joined with resin cement was similar. Although there was an initial increase in bond strength with a larger post, there was no discernible change with subsequent size increases. 71.66% of the specimens that were tested experienced an adhesive failure mode.

Different push-out bond strengths depending on the type of post-matrix system were found in a study by Alnaqbi et al.[15] They showed, in contrast to this study, that the push-out bond strength was lowest in IPN Everstick posts (mean ± SD: 0.41 + 0.4 MPa).

CONCLUSION

Authors found that conventional custom cast metal post showed the highest bond strength followed by biological post, everstick electrical glass fiber post.

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