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Original Research

Push-out bond strength of four different Post systems

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ABSTRACT:
Background: The long-term success of any restorative or prosthetic rehabilitation of endodontically treated teeth depends on the quality of the restoration, clinical conditions of the supporting hard and soft tissues. The present study was conducted to assess the push-out bond strength of newer posts systems. **Materials & Methods:** 80 maxillary central incisors teeth were endodontically treated. Four groups were prepared. Group I used custom cast metal post (Ni–Cr alloy), group II used biological post, group III used everstick fiber post and group IV used prefabricated fiber post. The consecutive posts were luted in each sample and sections were made. Push-out test was performed. **Results:** The mean push bond strength in group I was 78.3 N, in group II was 64.1 N, in group III was 54.9 N and in group IV was 48.2 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, and prefabricated glass fiber post.
Key words: custom cast metal post, bond strength, Fracture

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INTRODUCTION

Endodontically treated teeth have decreased moisture content and suffer coronal destruction from dental caries, which reduces stiffness leading to fractures from previously existing restorations.[1] This results in an increase in the likelihood of fracture of treated tooth during the function. The restoration of the pulpless tooth should increase resistance of the tooth to fracture. In teeth with extensive tooth destruction, posts are advocated to retain the core that replaces lost coronal structure.[2]

The long-term success of any restorative or prosthetic rehabilitation of endodontically treated teeth depends on the quality of the restoration, clinical conditions of the supporting hard and soft tissues.[3] For the long-term prognosis of a restored tooth, it is pivotal to evaluate the physical properties and bonding of the posts to the tooth structure. Most frequently used research protocols for the bond strength of different posts systems or adhesive systems are pull-out and push-out methods.[4] In push-out bond strength method, a compressive load is applied to the apical aspect of the root slice in an apical-coronal direction to push the post toward the coronal direction. The stress pattern in the push-out test is more uniform; hence, it provides a better estimation of the bond strength as it mimics debonding in smaller sections of the root as per the clinical conditions.[5] The present study was conducted

to assess the push-out bond strength of newer posts systems.

MATERIALS & METHODS

The present study comprised of 80 maxillary central incisors teeth. The study was approved from institutional ethical committee. Teeth were endodontically treated and post space was prepared. Four groups were prepared. Group I used custom cast metal post (Ni–Cr alloy), group II used biological post, group III used everstick fiber post and group IV used prefabricated fiber post. The consecutive posts were luted in each sample and sections were made. Push-out test was performed. 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	Group IV
Post	Custom cast metal post	Biological post	Everstick fiber post	Prefabricated fiber post
Teeth	20	20	20	20

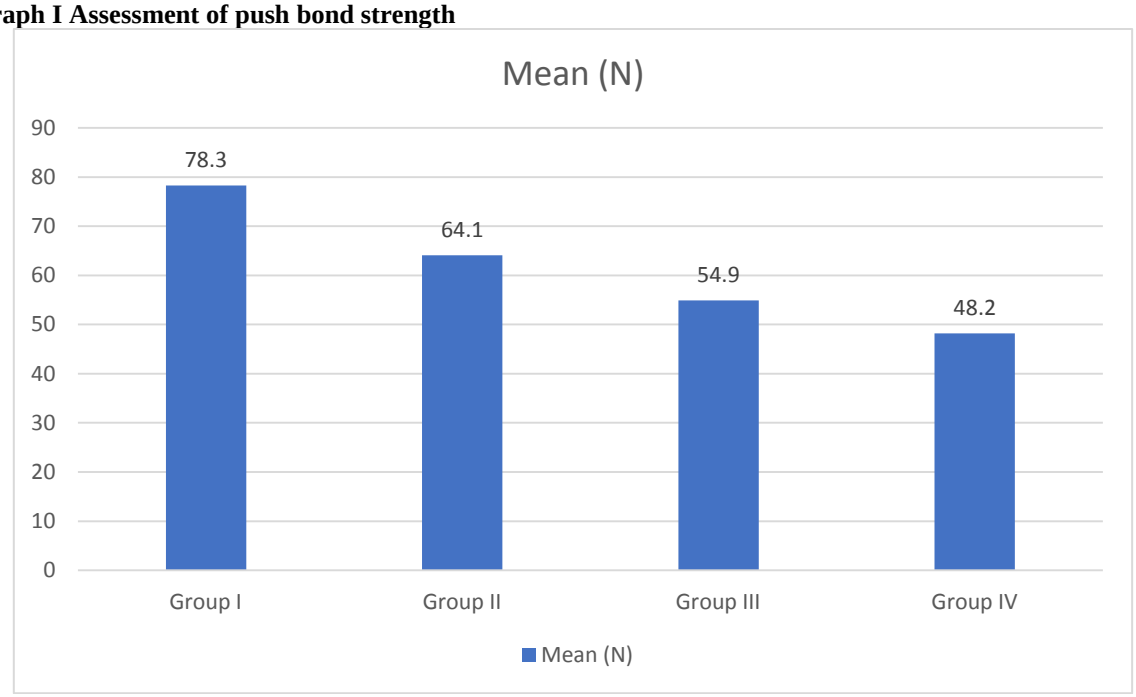
Table I shows distribution of teeth based on posts used.

Table II Assessment of push bond strength

Groups	Mean (N)	P value
Group I	78.3	0.01
Group II	64.1	
Group III	54.9	
Group IV	48.2	

Table II, graph I shows that mean push bond strength in group I was 78.3 N, in group II was 64.1 N, in group III was 54.9 N and in group IV was 48.2 N. The difference was significant (P< 0.05).

Graph I Assessment of push bond strength



DISCUSSION

Clinical studies have reported a success rate of 95-99% for teeth restored with fibre-reinforced posts; with no development of root fracture during study duration. Major advantages of fiber posts are their modulus of elasticity, which is similar to dentine, high fatigue, tensile strength and can be cemented with an adhesive luting material avoiding development of friction between posts and root canal walls so that force applied would be distributed evenly along length of post.[6] In order to improve bond strength between pre-fabricated posts and resin cement, surface treatment procedures have been suggested by using mechanical or chemical agents. The chemical treatment is aimed at roughening post surface enhancing mechanical interlocking between post and resin cements. Recent studies have shown that post surface pre-treatment increases bond strength between fiber and materials used for core build-up.[7,8] The present study was conducted to assess the push-out bond strength of newer posts systems.

In present study, group I used custom cast metal post (Ni–Cr alloy), group II used biological post, group III used everstick fiber post and group IV used prefabricated fiber post. Srivastava et al[9] in their study a total of 60 maxillary central incisors teeth were endodontically treated and Post space was prepared. The obturated teeth were randomly divided into four groups as follows: custom-made cast metal post, biological post, everstick post, and biological post. Custom-made cast metal post showed the highest bond strength followed by prefabricated and everstick post. The least push-out bond strength was shown by prefabricated fiber post. The push-out values differed significantly according to posts systems used custom-made cast metal post showed the highest and prefabricated fiber post the least.

We found that mean push bond strength in group I was 78.3 N, in group II was 64.1 N, in group III was 54.9 N and in group IV was 48.2 N. Das et al[10] assessed push-out bond strength of a fiber-reinforced post system using four different resin cements. In this in-vitro study 40 mandibular premolars were decoronated, and roots were treated endodontically. Following the post space preparation, the roots were grouped into four groups of 10 specimens each. Fiber-reinforced composite posts were cemented with four resin cement systems: (a) Multilink Speed, (b) Rely X Unicem, (c) Calibra, and (d) Permaflo DC. Three sections of each root, with a thickness of 3 mm, were prepared. The push-out test was with a universal testing machine at a crosshead speed of 1 mm/min, and bond strength values were evaluated. The mean push-out bond strength was highest for Rely X Unicem (18.0 ± 1.81), followed by Multilink Speed (13.1 ± 0.75) and Permaflo DC (12.8 ± 0.95). The lowest mean push-out bond strength was seen with Calibra (11.8 ± 0.69). There were statistically significant differences seen in the push-out bond strength of resin cement in different root canal regions.

Balbosh and Kern[11] attained inferior bond strengths and decreased mechanical properties when Rely X Unicem was only auto-cured. No differences in the degree of monomer conversion were found between Rely X Unicem and Multilink speed. Kalkan et al[12] termed “electrical glass” since the posts are translucent, light transmitting and its chemical composition make it an excellent electrical insulator. These posts consist of continuous unidirectional glass fibers and the multiphase polymer matrix. This polymer matrix reveals a semi-interpenetrating polymer network (IPN) with both linear polymer phases, polymethylmethacrylate, and cross-link polymer phase. Due to its high flexibility and moldability, these posts adapt well to root canal anatomy. The dentin removal is minimal, and the angulation of the core can also be changed within limits.

CONCLUSION

Authors found that

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