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Original Research

A comparative study of fracture resistance of endodontically treated teeth with and without post-reinforcement

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ABSTRACT:
Background: Custom cast post core has been regarded as a gold standard in post and core restoration. The present study was conducted to compare the fracture resistance of endodontically treated teeth with and without post-reinforcement. **Materials & Methods:** 30 maxillary central incisor were grouped into 6 groups each consisting of 5 specimens. Group I specimens were not subjected to any restorative treatment. Group II specimens were endodontically treated and crowned. Groups III and IV were restored with custom cast post and core. Specimens of groups V and VI were treated with prefabricated titanium post and composite core. Specimens of groups III and V were restored with porcelain-fused metal (PFM) crown having 2 mm ferrule. Specimens of groups IV and VI were restored with PFM crown having no ferrule. All the specimens were subjected to load. **Results:** Fracture resistance (N) in group I was 1024.8, in group II was 658.2, group III was 1316.8, group IV was 1012.4, group V was 740.2 and in group VI was 702.4. The difference was significant (P< 0.05). The most common mode of fracture was coronal 1/3 root fracture seen in 3 each in group IV, V and VI, crown fracture 3 in group I, crown fracture (2) and coronal 1/3 root fracture (2) in group II. The difference was significant (P< 0.04). **Conclusion:** Endodontically treated teeth restored with custom cast post core were as strong as the untreated group.
Key words: Custom cast post core, Endodontically, Porcelain-fused metal.

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INTRODUCTION

Restoration of endodontically treated teeth is a challenging endeavor. They are more prone to fracture due to loss of moisture supplied by the vital pulp. Extensive structural defects due to decay, trauma, and prior restoration call for post and core restoration.[1] Many techniques have been advocated for post and core fabrication. Custom cast post core has been regarded as a gold standard in post and core restoration.[2]

Dental posts have been performed for decades, and according to the literature, it has been designed with different materials over the past years, like metal, wood, and fiberglass.[3] A post is a tenon, which is placed in the roots to serve as an anchorage to provide appropriate support for a final crown or bridge. This technique is used in prosthodontics to restore fractured teeth when an endodontic procedure can be performed.[4] In prosthodontics, it is not only about the restoration of structures lost; we also must preserve the remaining part of the tooth and assure in the meantime the quality of the treatment.[5] Dental ferrule is an encircling band of cast metal around the coronal surface of the teeth. The use of ferrule as a part of the artificial crown was proposed in reinforcing the root-filled teeth.[6] The present study was conducted to compare the fracture resistance of endodontically treated teeth with and without post-reinforcement.

MATERIALS & METHODS

The present study comprised of 30 maxillary central incisor teeth of both genders. The ethical clearance was obtained before starting the study.

Teeth were grouped into 6 groups each consisting of 5 specimens. Group I specimens were not subjected to any restorative treatment. Group II specimens were

endodontically treated and crowned. Groups III and IV were restored with custom cast post and core. Specimens of groups V and VI were treated with prefabricated titanium post and composite core. Specimens of groups III and V were restored with porcelain-fused metal (PFM) crown having 2 mm ferrule. Specimens of groups IV and VI were restored with PFM crown having no ferrule. All the specimens were subjected to load (newton, N) on the lingual surface at a 135° angle to the long axis with a universal testing machine until it fractured. The fracture load and mode of fracture of each specimen were noted. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Fracture resistance

Groups	Mean (Newtons)	P value
Group I	1024.8	0.021
Group II	658.2	
Group III	1316.8	
Group IV	1012.4	
Group V	740.2	
Group VI	702.4	

Table I, graph I shows that fracture resistance (N) in group I was 1024.8, in group II was 658.2, group III was 1316.8, group IV was 1012.4, group V was 740.2 and in group VI was 702.4. The difference was significant (P< 0.05).

Graph I Fracture resistance

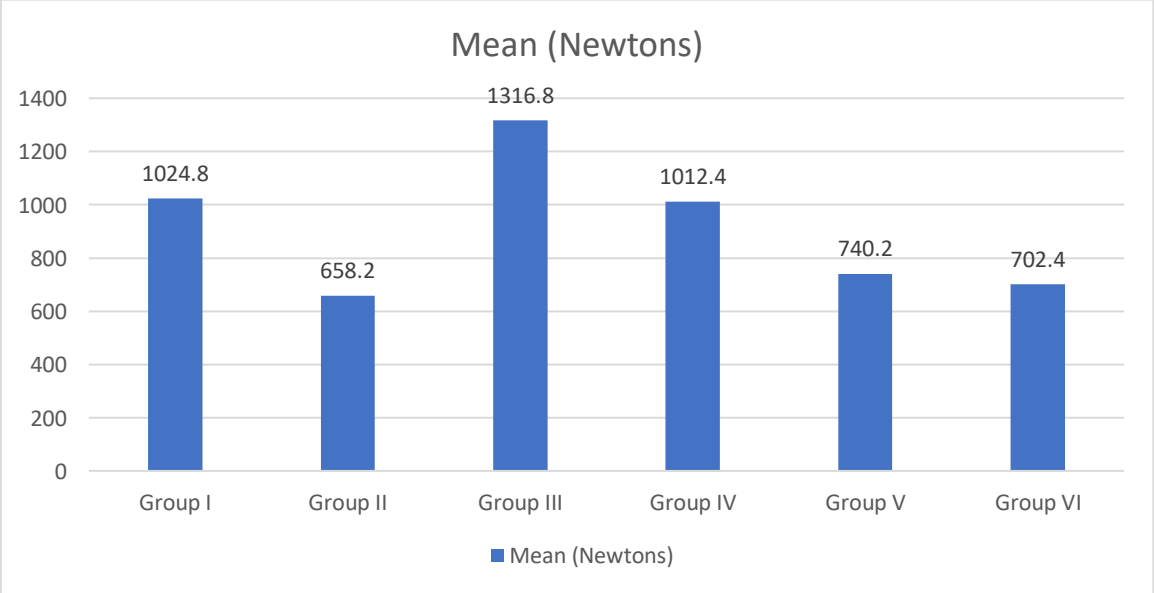
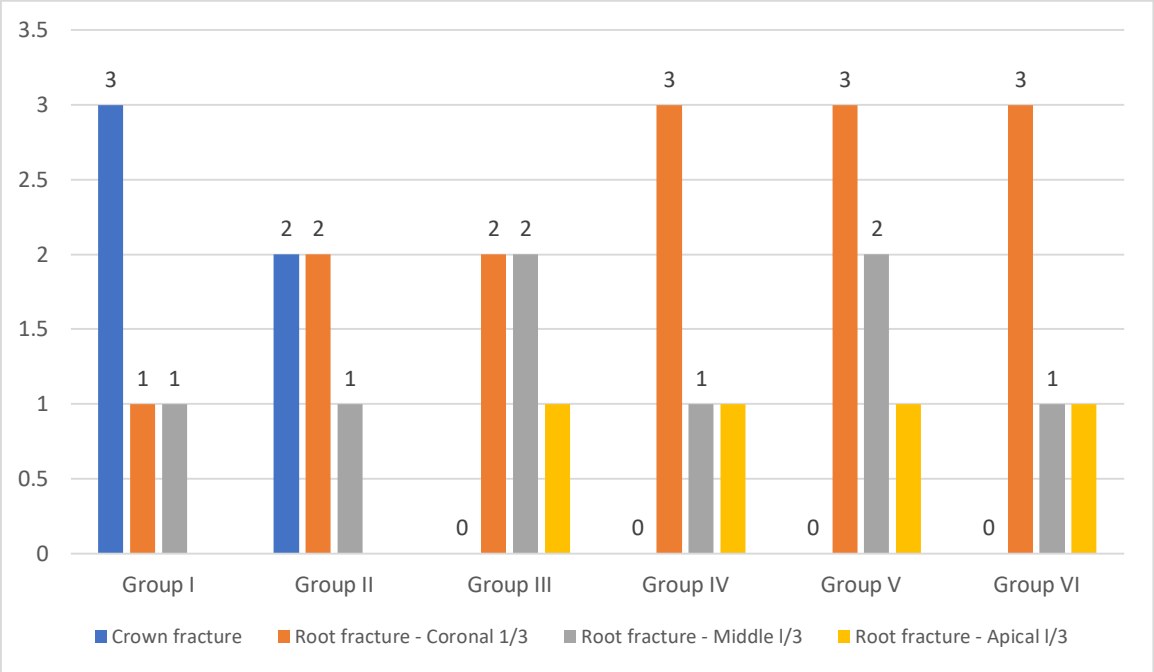


Table II Mode of fracture

Groups	Crown fracture	Root fracture - Coronal 1/3	Root fracture - Middle l/3	Root fracture - Apical l/3	P value
Group I	3	1	1	0	0.04
Group II	2	2	1	0	
Group III	0	2	2	1	
Group IV	0	3	1	1	
Group V	0	3	2	1	
Group VI	0	3	1	1	

Table II, graph II shows that most common mode of fracture was coronal 1/3 root fracture seen in 3 each in group IV, V and VI, crown fracture 3 in group I, crown fracture (2) and coronal 1/3 root fracture (2) in group II. The difference was significant (P< 0.04).

Graph II Mode of fracture



DISCUSSION

Fabrication of custom cast post core is a two-stage procedure. Prefabricated post and composite resin core build-up simplifies the procedure into single stage. Scientific literature reveals many controversies regarding the use of different post core systems in the management of endodontically treated teeth.[7] Lovdahl and Nicholls[8] found that endodontically treated unrestored teeth were twice as resistant to fracture than the post-reinforced teeth. Some factors like the thickness of the dowel (post), the position into the root where it places, and other elements that could create stress on the tooth, have been considered parts of the risks that could cause treatment failure. The literature has also mentioned as a risk factor, the waiting time between the endodontic procedure, regarding the time of filling material, and the one to restore the crown with fixed ceramic. But, what about the relation between dental intraprofessional collaboration on the procedure. Intraprofessional collaborative practice (IPCP) is related to the interaction between at least two professionals in the same field.[9] The present study was conducted to compare the fracture resistance of endodontically treated teeth with and without post-reinforcement.

In present study, fracture resistance (N) in group I was 1024.8, in group II was 658.2, group III was 1316.8, group IV was 1012.4, group V was 740.2 and in group VI was 702.4. Sendhilnathan et al[10] in their study found that there were significant differences among the six groups studied ($P < 0.0001$). The highest fracture strength was recorded with specimen of group C (1376.7 N). There were significant differences between groups A and D versus groups B, E, and F. There were no significant differences between groups B, E, and F. Cervical root fracture was the predominant mode of failure in all the groups except group A.

We observed that most common mode of fracture was coronal 1/3 root fracture seen in 3 each in group IV, V and VI, crown fracture 3 in group I, crown fracture (2) and coronal 1/3 root fracture (2) in group II. Pierrisnard et al[11] in their finite element analysis noted that the cervical region of post-restored teeth was subjected to maximum tensile stress, which increases the risk of fracture. Many studies have been reported stating cervical third root fracture as the major mode of fracture.

The primary purpose of a post is to retain a core in a tooth with extensive loss of coronal tooth structure. However, preparation of a post space adds a certain degree of risk to a restorative procedure. Procedural accidents may occur during post-space preparation. Although rare, these accidents include perforation in the apical portion of the root or into the lateral fluted areas of the midroot, a so-called “strip perforation.” The placement of posts also may increase the chances of root fracture and treatment failure, especially if an oversized post channel is prepared.[12] For these reasons, posts should only be used when other options are not available to retain a core. The need for a post varies greatly between the anterior and posterior teeth.

CONCLUSION

Authors found that endodontically treated teeth restored with custom cast post core were as strong as the untreated group.

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