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ORIGINAL RESEARCH

To determine fracture resistance of different post and core system- An in-vitro study

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ABSTRACT:

Background: Metal post and cores are commonly used because of their superior physical properties. The present study was conducted to determine fracture resistance of different post and core system. **Materials & Methods:** The present study was conducted on 30 freshly extracted premolars. Teeth were divided into 3 groups of 10 each. Group I teeth were restored with prefabricated zirconia post (CP), group II teeth were restored with milled zirconia post (MZ) and group III teeth with pressable ceramic post (PC). Each specimen from the group was subjected to ''load to fracture'' in universal testing machine. **Results:** The mean fracture load with 1.4 mm post in group I was 314.5 N, in group II was 310.6 N and in group III was 208.4 N. It was 640.2 N, 412.8 N and 378.2 N with 1.7 mm post in group I, group II and group III respectively. The difference was significant. **Conclusion:** Authors found that prefabricated zirconia post with pressable ceramic core exhibited higher fracture resistance.

Key words: fracture resistance, ceramic core, Post

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INTRODUCTION

The longevity of endodontically involved teeth has been greatly enhanced by continuing developments made in endodontic and restorative procedures.[1] Endodontic treatment saves the tooth from extraction, but only adequate restoration is essential for its durability.[2] The endodontically treated tooth must be restored in such a way that it will withstand masticatory forces acting in vertical and lateral direction without being prone to fracture. To reinforce the treated tooth and protect against vertical fracture, some type of stabilization is required that will fasten the restoration to the remaining tooth structure. This is accomplished by using a post, preferably with a core or coping and a crown or onlay as superstructure to give coronal-radicular stabilization.[3]

Metal post and cores are commonly used because of their superior physical properties. Nevertheless, the increased use of all-ceramic crown provides a rationale for tooth colored core.[4] The alternatives for obtaining tooth color core are: Composite core, prefabricated all-ceramic post with pressable ceramic core, and masking of metal core with opaque ceramic or photo-curing opaque resin. Cast post may also create root discoloration and ''blue-gray'' effect; if thin bone and gingival tissue are present.[5] Zirconia has been used as post and core material use since 1993. There is computer aided design/computer aided manufacturing technology, to fabricate yttrium–tetragonal zirconium polycrystalline ceramic post. The pressable ceramic post and core system is widely used nowadays.[6] The present study was conducted to determine fracture resistance of different post and core system.

MATERIALS & METHODS

The present study was conducted with the aim of assessing fracture resistance of different post and core system. All teeth underwent endodontic treatment. Teeth were divided into 3 groups of 10 each. Group I teeth were restored with prefabricated zirconia post (CP), group II teeth were restored with milled zirconia post (MZ) and group III teeth with pressable ceramic post (PC). From each group, 5 teeth were selected for 1.4 mm diameter post and rest of the 5 teeth, was selected for 1.7 mm diameter post. All teeth were restored with metal crowns. Each specimen from the group was subjected to ''load to fracture'' in universal testing machine at 130 angle and the maximum load at failure was recorded. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I	Group II	Group III
Post system	Prefabricated zirconia post	Milled zirconia post	Pressable ceramic post
Number	10	10	10

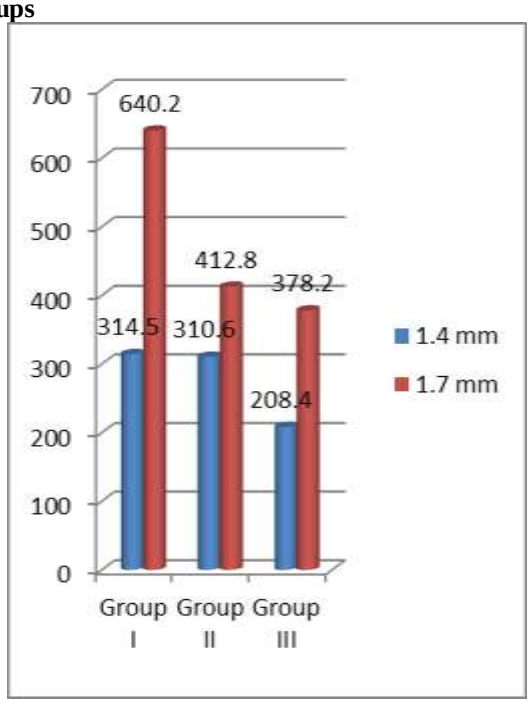
Table I shows that group I teeth were restored with prefabricated zirconia post (CP), group II teeth were restored with milled zirconia post (MZ) and group III teeth with pressable ceramic post (PC). Each group had 10 teeth.

Table II Comparison of fracture load in different groups

Groups	1.4 mm	1.7 mm	P value
Group I	314.5	640.2	0.001
Group II	310.6	412.8	0.02
Group III	208.4	378.2	0.05
P value	0.12	0.01	

Table II, graph I shows that mean fracture load with 1.4 mm post in group I was 314.5 N, in group II was 310.6 N and in group III was 208.4 N. It was 640.2 N, 412.8 N and 378.2 N with 1.7 mm post in group I, group II and group III respectively. The difference was significant (P< 0.05).

Graph I Comparison of fracture load in different groups



DISCUSSION

Various posts systems have been introduced in the market and the research indicates that they can be safely included in the clinical practice. The selected post and core technique must be conservative, morphologic, retentive, aesthetic and resist radicular failure.[7] The available laboratory and clinical evidence validates the utilization of fibre posts as an alternative to metal posts and preferably to other tooth-colored posts, such as zirconia dowels, in post-retained restorations. Each clinical situation will dictate to some degree what post system will be used and for those situations where there is choice, personal preference, familiarity and cost will influence the final decision.[8] The present study was conducted to determine fracture resistance of different post and core system.

In present study, group I teeth were restored with prefabricated zirconia post (CP), group II teeth were restored with milled zirconia post (MZ) and group III teeth with pressable ceramic post (PC). Each group had 10 teeth. Sounder et al[9] in their study statistically significant difference was found between the failure load of the groups studied. In group I (Ni–Cr)—1.4 mm diameter post and core recorded a maximum fracture load of 534.83 ± 1.28 N and 1.7 mm diameter post and core showed 294.33 ± 1.02 N. In group II (PC)—1.4 mm diameter post and core recorded a maximum fracture load of 205.33 ± 1.61 N and 1.7 mm post and core showed 375.00 ± 1.57 N. In group III (CP)—1.4 mm diameter post and cores recorded a maximum fracture load of 313.00 ± 0.73 N and 1.7 mm post and core showed 638.67 ± 0.81 N. In group IV (MZ)—1.4 mm diameter post and cores recorded a maximum fracture load of 312.00 ± 0.86 N and 1.7 mm post and core showed 415.00 ± 0.89 N. Prefabricated zirconia post (1.7 mm) with pressable ceramic core (Cosmo post)—exhibited higher fracture resistance. Milled zirconia and prefabricated zirconia post— showed same value with 1.4 mm diameter post. Pressable ceramic post and core showed satisfactory result with 1.7 mm post, but showed lesser values with 1.4 mm diameter post.

We found that mean fracture load with 1.4 mm post in group I was 314.5 N, in group II was 310.6 N and in group III was 208.4 N. It was 640.2 N, 412.8 N and 378.2 N with 1.7 mm post in group I, group II and group III respectively. In the case of substantial horizontal loss of clinical crown, there is no restorative alternative, to fabrication of a post and core build up. Ideal post and core system should have the following features: physical properties similar to dentine, maximum retention with little removal of dentine, maximum distribution of functional stresses evenly along root surface, esthetic compatibility with the definitive restorations and surrounding tissue, good core retention, ease of use. The post should be as long as possible without jeopardizing the apical seal or the strength or integrity of the remaining root structure. A minimum length of 4.0 mm of gutta-percha should remain at the apex to prevent dislodgement and leakage.[10]

CONCLUSION

Authors found that prefabricated zirconia post with pressable ceramic core exhibited higher fracture resistance.

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