

Comparative Evaluation of Fracture Resistance in Custom Made And Prefabricated Posts.

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Introduction: Badly mutilated teeth presents a challenge for the clinician to determine whether tooth is to be managed endodontically by performing root canal treatment or surgically by undergoing extraction. Pre fabricated posts poses the advantage of saving precious chair time of dentist where as erodes excessive dentine leading to weakening of sound tooth structure. Custom made posts are technique sensitive; can be prepared directly in mouth (direct technique) or in the model obtained from the patient (Indirect technique). The purpose of the present study is to study the fracture resistance of prefabricated and custom posts.

Materials & Method: 10 prefabricated posts and 10 custom made posts were used in the study. For prefabricated posts, posts of size 2 (11 cm in length and 2.5 mm in width) were used in the study. Impression of prefabricated post was made in addition silicone putty to fabricate the index and casting was carried out using Cr-Co-Ni alloy. All the samples were placed in distilled water for 2 days and loaded for thermocycling of 6000 cycles with 1 minute interval. The head of the universal testing machine was placed at cross sectional speed of 5mm/minute until posts tested were fractured. All the data were recorded and data was analyzed statistically.

Results: In intergroup comparison between the group 1 and group 2, Group 2 recorded mean value of 326.19 ± 20.64 kg where as group 1 recorded mean value of 222.8 ± 56.58 kg. Results were interpreted and one way analysis of variance was carried out.

Conclusion: Custom made posts was found to be more fracture resistant than their counterpart prefabricated posts.

Keywords: Mutilated, Post, Prefabricated, Thermocycling.

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I. Introduction

Management of badly mutilated teeth presents a challenge for the clinician to determine whether tooth is to be managed endodontically by performing root canal treatment or surgically by undergoing extraction.¹ Many times, the lack of coronal portion of a tooth leads us to place post and core followed by final restoration. Before assessing a tooth for post and core, existing endodontically tooth should be checked for good apical seal, no pressure on precursion, no sensitivity or apical inflammation. Posts are classified² in number of ways based on their composition into metal posts, fibre posts, zirconia posts or carbon posts. Posts can also be classified on the basis of their way of retention into active and passive posts. They can also be classified on the basis of whether they are used as prefabricated posts or they are made by the dentist. Pre fabricated posts poses the advantage of saving precious chair time of dentist where as erodes excessive dentine leading to weakening of sound tooth structure.³ Custom made posts are technique sensitive; can be prepared directly in mouth (direct technique) or in the model obtained from the patient (Indirect technique). Different materials are used to fabricate custom posts in patients i.e. type 1 inlay wax or acrylic resin. Authors⁴⁻⁶ also document the snug fit achieved in custom posts whereas cement retained posts in prefabricated posts. The aim of fabricating post is from a material which has a modulus of elasticity equal to that of the tooth which led to increased use of fiber and carbon posts.⁷ Metal posts, on the other hand are cheap and can be prepared easily in simple laboratories sacrificing minimal tooth structure thus making them more patient as well as dentist friendly. Various authors⁸⁻¹⁰ have their own indications and contraindications of post and core. The purpose of placing post is debatable since long times. Some authors^{4,9,10} are of view that post strengthens the mutilated tooth where as some state that post

weakens the tooth rather than strengthening. Thus, the chief purpose of post is to hold the core in its place. Posts can be custom made or factory made both having their own pros and cons. Custom made post is conservative, fits snugly where as needs an extra appointment and technique sensitive. Factory made, on the other hand involves more destruction of tooth structure. The purpose of the present study is to study the fracture resistance of prefabricated and custom posts. Null hypothesis states no difference in fracture resistance of these two types of posts.

II. Materials And Method

10 prefabricated posts and 10 custom made posts were used in the study. For prefabricated posts, posts of size 2 (11 cm in length and 2.5 mm in width) were used in the study. Impression of prefabricated post was made in addition silicone putty to fabricate the index and inlay wax was poured in the putty index. Wax pattern was carefully taken out of the putty index and wax sprue was attached to the post. Whole assembly was placed in the casting ring without ring liner and invested in phosphate bonded investment. Two stage burnout was carried out and casting was carried out using Cr-Co-Ni alloy. Divestment was carried out and sprue was removed using carbide bur. Finishing and polishing was carried out and 10 such custom made posts were prepared. All the samples were placed in distilled water for 2 days and loaded for thermocycling of 6000 cycles with 1 minute interval. The head of the universal testing machine was placed at cross sectional speed of 5mm/minute until posts tested were fractured. All the data were recorded and data was analyzed statistically.

III. Results

The observations recorded during testing of specimens were recorded and were analyzed statistically. In intergroup comparison between the group 1 and group 2, Group 2 recorded mean value of 326.19 ± 20.64 kg where as group 1 recorded mean value of 222.8 ± 56.58 kg. Results were interpreted and one way analysis of variance was carried out. The recordings were found to be statistically significant at $p < 0.001$.

IV. Discussion

Many times, the badly broken teeth or teeth damaged due to sports injury or road accidents forces us to undergo extraction of affected tooth or managing the involved tooth using post and core. Management of badly broken or mutilated teeth basically involves root canal treatment followed by placement of post and core and finally the crown over the structure.⁶ The prime purpose of post is to provide a sub structure for the fabrication of coronal portion. The role of post and core is debatable since ages. Some authors^{4,5,8} suggest that placement of post is a waste procedure which weakens the tooth due to increased dentin loss where as some suggest it a useful thing for strengthening lost walls of the tooth. The concept of post placement was initiated by Pierre Fauchard around 200 years ago.¹¹ Later, concept of Richmond crowns¹² was there in market. Since then, numerous materials with numerous designs¹³ are used in market as post materials, each illustrating their own advantages and disadvantages. Posts can be classified into prefabricated and cast post and core. Prefabricated posts provide the advantage of saving extra appointment and less technique sensitive but cause more removal of residual dentin. We, in our study compared one factory made post with its counterpart cast post. Null hypothesis that there is no difference in terms of fracture resistance between two types of posts stands rejected as a positive difference was found between the two groups. In our study, pre fabricated post was indexed and casted in custom cast group so that to avoid any difference in length and width between the two groups of posts. The specimens were dipped in distilled water to simulate intraoral conditions. 6000 cycles with 1 minute interval were kept keeping in view the replication of chewing cycle. Universal testing machine was used to apply load and measure the fracture resistance. One way analysis of variance was carried out to find out any positive association between the two groups tested in the study. In intergroup comparison between the two groups, group 2 (326.19 ± 20.64) recorded higher values than group 1 (222.8 ± 56.58).

The difference may be attributed due to the difference in the composition of the posts. Both the samples tested in the study exceed the average masticatory load of 20 kg, stating them to have sufficient strength to bear the masticatory loads. The results of the present study are in accordance to the study by Gupta R¹⁴ et al conducted which found Ni-Cr group to have highest threshold and lowest by noble group. Though, the study was carried out simulating intra oral conditions, we should remember that it is an in-vitro study and only compressive loads were applied, which may not exactly reflect the in-vivo conditions where different loads of different intensity are occurring in different directions. Future studies are directed to carry out the study in in-vivo conditions where proper replication of types of forces will be subjected to the subjects.

V. Conclusion

Based on limitations of the present study, Custom made posts was found to be more fracture resistant than their counterpart prefabricated posts.

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Table1 : Distribution set up

Group	No. of samples	
1.	10	Pre fabricated posts.
2.	10	Custom made posts.

Table 2: Failure loads of both groups.

SNo.	Failure load of group 1	Failure load of group 2
1.	257	365
2.	234	328
3.	243	311
4.	211	352
5.	215	332
6.	206	301
7.	210	324
8.	231	338
9.	204	313
10.	217	305

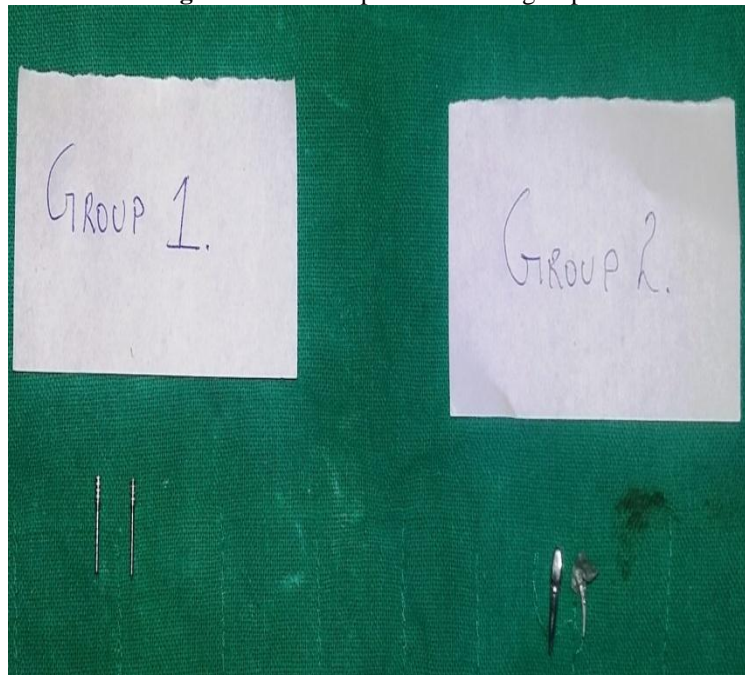
	Group 1	Group 2	Total
N	10	10	20
∑X	2228	3269	5497
Mean	222.8	326.9	274.85
∑X ²	499202	1072473	1571675
Std. Dev	17.6497	20.6476	56.58

Table 3: Results

Source	SS	df	MS	F
Between treatments	54184.05	1	54184.05	
Within treatments	6640.5	18	368.9167	146.87341
Total	60824.55	19		

P<0.001.

Figure 1: Test sample of both the groups.



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