

COMPARATIVE EVALUATION OF FRACTURE RESISTANCE OF ENDODONTICALLY TREATED TEETH WITH EPOXY RESIN BASED SEALERS AH PLUS AND BIO ROOT RCS SEALERS: AN IN VITRO STUDY.

Vivek Tattu¹, Sushil Kumar Cirigiri², Rajeev Khode³, Baig Mirza⁴, Ashwini Kelode⁵, Sudha Mattigatti⁶, Parikshit Barve⁷

¹ PG Student, Department of Conservative Dentistry and Endodontics, Dr HSRSM Dental College, Hingoli,

²Professor (HoD), Department of Conservative Dentistry and Endodontics, Dr HSRSM Dental college,

³Reader, Department of Conservative Dentistry and Endodontics, Dr HSRSM Dental College,

⁴Senior Lecturer, Department of Conservative Dentistry and Endodontics, Dr HSRSM Dental College,

⁵Senior Lecturer, Department of Conservative Dentistry and Endodontics, Dr HSRSM Dental College,

⁶Professor, Department of Conservative Dentistry and Endodontics, School of Dental Sciences, KIMSDU, Karad,

⁷Intern, Department of Conservative Dentistry and Endodontics, School of Dental Sciences, KIMSDU, Karad

Corresponding Author: Dr. Sudha Mattigatti

Corresponding Author Mail Id: mdrsudha269@gmail.com

Abstract

Introduction: It has been observed that the teeth which got treated endodontically are getting fractured easily particularly when we compare it with vital teeth. In current obturation systems Gutta-percha which has the epoxy resin-based AH plus sealer, is considered the gold standard. Our **aim** here is to compare the AH Plus sealer effect with that of BioRoot RCS in reference to resistance of fracture when roots are getting filled with them in combination with gutta-percha. **Method:** Thirty extracted teeth are used. These teeth are without caries. These are single rooted too and at the same time human mandibular premolar. To store the teeth we used de ionized water whereas the temperature has be maintained at 4 °C. For fracture resistance test, roots were mounted in acrylic resin blocks. The middle third of each root was coated with uniform thickness of light body rubber base to provide a simulated periodontal ligament then each root was embedded in acrylic resin cylinder using self-cured acrylic resin except for the coronal 5 mm. **Result:** Bio Root RCS had the highest mean fracture resistance of 254.15N, followed by that of AH Plus group with a mean of 229.5 N, then that of the control group 200.40 N. **Conclusion:** The present study lead us to conclude that Bioroot RCS are higher fracture resistance than the AH Plus.

Keywords: Endodontically, obturation systems, Gutta-percha, AH Plus sealer, BioRoot RCS

INTRODUCTION

It has been observed that the teeth which got treated Endodontically are getting fractured easily particularly when we compare it with vital teeth. This is mostly the reason of the removal of tooth structure during endodontic treatment, dehydration of dentin after mechanical preparation, and excessive pressure during obturation.^{1,2} In addition, intracanal irrigants and medications it may also play role in changing dentin properties and thereby increasing the fracture possibility of the teeth.³ It is due to this reason reinforcing the root becomes one among many goals of root canal filling. It further enhance the fracture resistance, hence

using a root canal sealer that can be strengthen the root would be beneficial^(4, 5) For the reinforcement of the tooth, sealers must have sufficient cohesive strength. So the hypothesis had led to the development of adhesive root canal sealers⁶⁻⁹.

In current obturation systems Gutta-percha which has epoxy resin-based AH plus sealer, is considered the gold standard. There is contradictory results had been reported regarding using this combination on fracture resistance of endodontically treated teeth while some studies¹⁰⁻¹³ showed that this combination had significantly increased fracture resistance however, others showed no significant influence.¹⁴⁻²⁰ Studies showed that BioRoot RCS has lower toxicity than other conventional root canal sealers, may induce hard tissue deposition²¹⁻²³, and has antimicrobial activity²⁴. The AH Plus sealer effect with that of BioRoot RCS in reference to resistance of fracture when roots are getting filled with them in combination with gutta-percha.

METHOD

Sample Selection

Thirty extracted teeth are used. These teeth are without caries. These are single rooted too and at the same time human mandibular premolar. To store the teeth we used de ionized water whereas the temperature has be maintained at 4 °C. The specimens measure by using digital caliper to decoronized and obtain a standardized root length of 14 mm using a diamond saw under coolant. We used the 3 mL of Sodium hypochlorite solution which had the concentration of 5.25% between each file size. After instrumentation of the root canals, the smear layer was removed by rinsing the root canals with 5 mL of 5.25% NaOCl and 5 ml of 17% EDTA solution (Merck, Darmstadt, Germany). For fracture resistance test, roots were mounted in acrylic resin blocks with the apical 9 mm of root ends. The middle third of each root was coated with uniform thickness of light body rubber base to provide a simulated periodontal ligament then each root was embedded in acrylic resin cylinder using selfcured acrylic resin except for the coronal 5 mm.

Statistical Analysis

For finding the fracture resistance multiple analytical tools are used like that of mean, median, standard deviation (SD) along with range. Descriptive statistics such mean and SD was used. Comparison of fracture resistance of endodontically was done by using ANOVA test. We have then applied Post Hoc Dunnett Multiple Comparisons Test too. According to table no 1 statistically significant difference was observed among all groups for fracture resistance of endodontically (p<0.0001). Further by analyzing through Dunnett Multiple comparisons test, it is concluded that all groups shows statistically significant difference between control and AH plus (p<0.01) and Bio Root RCS (p<0.01). Bar graph representing means and standard deviation were used to demonstrate the data.

RESULT:

Results were summarized in Table(1) and table (2). It has been found that there is significant difference between groups the null hypothesis was rejected. Bio Root RCS had the highest mean fracture resistance of 254.15N, followed by that of AH Plus group with a mean of 229.5 N, then that of the control group 200.40 N In table-2: Post hoc Dunnett Multiple Comparisons Test for comparing all the groups with control group are found to be significant

Table-1: ANOVA test done for comparison between groups

Group	N	Mean	SD	SE of mean	F-value	p-value
AH plus	10	229.05	0.37	0.12	13802	<0.0001
Bio Root RCS	10	254.15	1.0	0.32		
Control	10	200.40	0.66	0.21		

Table-2: Post hoc Dunnett Multiple Comparisons Test for comparing all the groups with control group

<u>(I)</u>	<u>(J)</u>	<u>Mean Difference (I-J)</u>	<u>p-value</u>	<u>Remarks</u>
<u>Control</u>	<u>AH plus</u>	<u>115.28</u>	<u>P<0.001</u>	<u>Significant</u>
	<u>Bio Root RCS</u>	<u>26.57</u>	<u>P<0.001</u>	<u>Significant</u>

DISCUSSION

After analysis what we have observed is the significant difference statistically among the groups. There is the certain believe that preparing root canal further deteriorates structure of and results in fracture.²⁵ Hence the selection of a these materials is having potential for assisting structure against fracture.²⁶ It has been reported that, round cross-section preparing root canals which leads to equal distribution of stresses in the root during filling, which is decreases the risk of root fracture²⁷ due to that reason, rotary files were used in this study for root canal preparation.

There were many studies that have been used Universal testing machine for measurement of fracture resistance of teeth. In this study load entirely transfers to the root,so load was vertically applied along the longitudinal axis of the teeth.^{31,32} This would result the decreased bending moments and highest stresses located much more cervical, most important to smaller stresses. This study design is believed to mimic the clinical status, which helps to simulate the sustenance provided to teeth by the alveolarbone⁶.

It has been observed that mean fracture value remain the highest in the GP and Bio Root RCS group. This might be attributed to the higher adhesion of Bio Root RCS to root dentin. When the sealer came in contact with dentin then found that there was a mineral infiltration zone.³³ Camilleri³⁴, has shown that calcium hydroxide is getting formed when the setting process is initiated. The interaction of this sealer with root canal walls which is taking place because of bio-mineralization activity is the reason behind fracture resistance improvement. Epoxy resin-based AH plus sealer and gutta percha, is considered the gold standard in current obturation systems. Contradictory results had been reported regarding using this combination on fracture resistance of endodontically treated teeth. Although some studies¹² showed that this combination had significantly increased fracture resistance yet, others showed no significant influence.¹⁵ Sağsen et al.³⁵ have shown the increment in the resistance ability of the root canal due to the application of AH Plus sealer. It is most important to better penetration into the micro irregularities³⁶⁻³⁸ as well. Present research is showing that the fracture resistance in case of Bio Root RCS with gutta percha is the highest than the gutta percha with AH plus then followed by unfilled control group.

CONCLUSION

In this study the results showed that the fracture resistance of the prepared-unfilled group was lower than prepared-filled group, which proofs that root canal preparation weakens the root. On the other side, the results of all prepared-filled with gutta percha groups were found to be higher when compared with that of the prepared-unfilled group, showing that all tested filling gutta percha and sealers had somehow, reinforced the root against fracture. The present study lead us to conclude that Bioroot RCS are higher fracture resistance than the AH Plus.

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