International Journal of Research in Health and Allied Sciences

Journal home page: www.ijrhas.com

Official Publication of "Society for Scientific Research and Studies" [Regd.]

ISSN: 2455-7803 Index Copernicus value [ICV] = 68.10;

Original Research

Comparative analysis of efficacy of root canal sealers to prevent fracture resistance

Dr. Vidhi R. Shah

Dental Surgeon, Ahmedabad, Gujarat, India

ABSTRACT:

Background: Ideal sealer should be able to kill the remaining bacteria present on the dentinal walls of root canals along with those present deep inside the dentinal tubules. To achieve this, the sealer should not only kill the bacteria by contact action, but also should be able to diffuse inside the dentinal tubules. This is possible only if the sealer has good flow properties. Hence; the present study was to compare efficacy of root canal sealers to prevent fracture resistance. **Materials & methods:** A total of 120 extracted mandibular first premolars were included for the study. De-coronation of the specimens was done at the length of 15 mm from the root apex, followed by biomechanical preparation using K files. Afterwards; all the samples were divided into three study groups with 40 specimens in each group as follows: Group A: AH Plus root canal sealers and Gutta-percha points, Group B: MTA Fillapex and Gutta-percha points, and Group C: Control group (unobturated teeth).After completion of obturation according to their respective groups, the access cavity was sealed with temporary cement. Afterwards, embedding of the apical end of the specimens was embedded in acrylic resin upto the depth of 5 mm. All the blocks were placed in universal force testing machine and amount of force required to fracture the root was measured in Newton. **Results:** In the present study, a total of 120 extracted tooth specimens were analysed. Mean force required to fracture the root among the specimens of group A, Group B and Group C was found to be 242.36 N, 172.35 N and 92.56 N respectively. **Conclusion:** Within the limitations of the present study, this can be concluded that AH Plus root canal sealers provide comparatively better fracture resistance than MTA Fillapex root canal sealer.

Key words: Sealer, Root canal, Endodontic.

Corresponding Author: Dr. Vidhi R. Shah, Dental Surgeon, Ahmedabad, Gujarat, India

This article may be cited as: Shah VR. Comparative analysis of efficacy of root canal sealers to prevent fracture resistance. Int J Res Health Allied Sci 2020; 6(5):14-17.

INTRODUCTION

Microbes and microbial products are the main etiologic factors of pulpitis and apical periodontitis. The main aim of endodontic therapy is to eliminate microorganisms from the root canal. Instrumentation, irrigation, and intracanal medicaments significantly reduce the population of microorganisms. However it does not completely eliminate the microorganisms from the root canal; hence, a good canal filling material with antibacterial property would be beneficial in further reducing the number of residual microorganisms. [1] One of the major causes for failure of root canal treatment is the presence of facultative and resistant microbial species of the oral cavity like Enterococcus faecalis (E. faecalis), Candida albicans (C. albicans), and Staphylococcus aureus (S. aureus).[2] Ideal sealer should be able to kill the remaining bacteria present on the dentinal walls of root canals along with those present deep inside the dentinal tubules. [3] To achieve this, the sealer should not only kill the bacteria by contact action, but also should be able to diffuse inside the dentinal tubules. This is possible only if the sealer has good flow properties. [4] So while planning to measure antibacterial properties of a sealer, the contact and diffusibility of the sealer should be taken into consideration along with its flow property. In endodontically treated teeth, the root canal system is reinforced by obturating the root canal in order to increase the resistance of the tooth to compressive strength. [5] To provide a hermetic seal, the bonding of root canal sealer to the dentine is paramount in maintaining the integrity of the seal in a root canal filling. [6] Thus, a root canal sealer with the property of strengthening the tooth against root

fracture would be of obvious value. Hence; the present study was conducted for evaluating the efficacy of two different root canal sealers during endodontic therapy.

MATERIALS & METHODS

The main objective of the study was to evaluate the efficacy of two different root canal sealers during endodontic therapy. A total of 120 extracted mandibular first premolars were included for the study. Carious and grossly deformed teeth and teeth with evidence of resorption were excluded. After extraction, all the tooth specimens were kept in 10 % NaOCl for few hours and then stored in normal saline till further usage. De-coronation of the specimens was done at the length of 15 mm from the root apex, followed by biomechanical preparation using K files. Sodium hypochlorite was the irrigant used during biomechanical preparation. Drying of the canals was done using paper points. Afterwards; all the samples were divided into three study groups with 40 specimens in each group as follows:

Group A: AH Plus root canal sealers and Gutta-percha points,

Group B: MTA Fillapex and Gutta-percha points, and

Group C: Control group (unobturated teeth).

After completion of obturation according to their respective groups, the access cavity was sealed with temporary cement. Afterwards, embedding of the apical end of the specimens was embedded in acrylic resin upto the depth of 5 mm. All the blocks were placed in universal force testing machine and amount of force required to fracture the root was measured in Newton.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

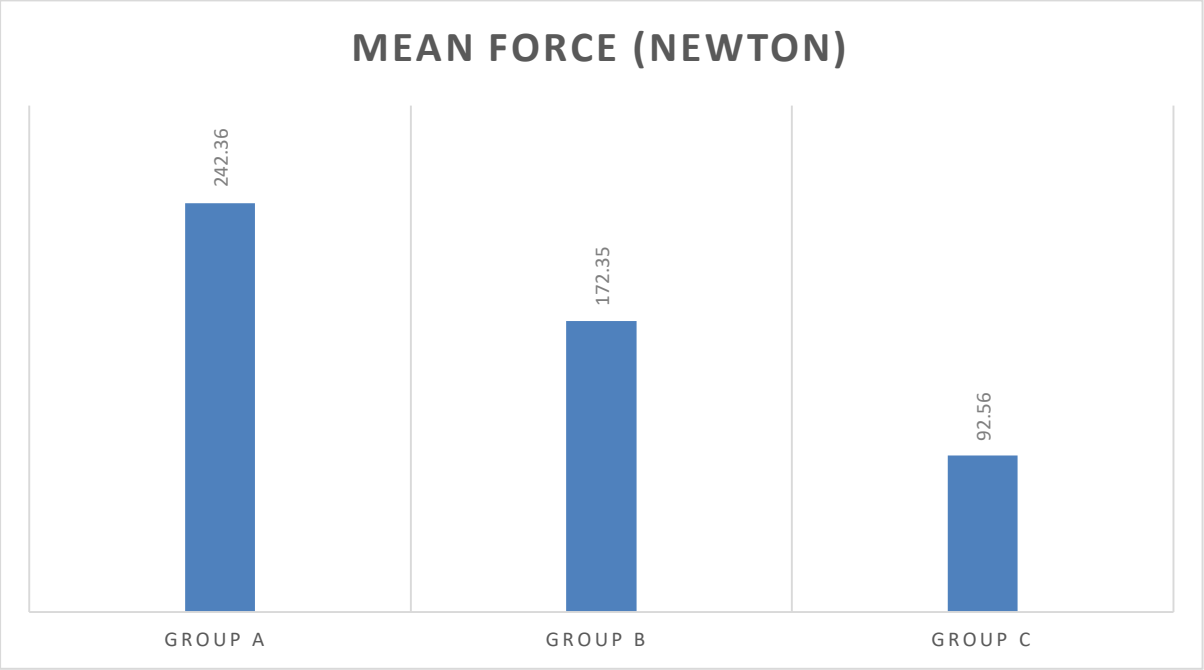
RESULTS

In the present study, a total of 120 extracted tooth specimens were analysed. All the specimens were divided into three study groups: Group A (AH plus root canal sealer), Group B (MTA Fillapex sealer) and Group C (Control) [Table 1]. Mean force required to fracture the root among the specimens of group A, Group B and Group C was found to be 242.36 N, 172.35 N and 92.56 N respectively. {Fig 1} While analysing statistically, it was seen the maximum force required for fracturing the root was among specimens of Group A, followed by Group B and minimum for Group C.

Table 1: Distribution of tooth specimens

Group	Sealer	Number of tooth specimens
Group A	AH Plus root canal sealers and Gutta-percha points	40
Group B	MTA Fillapex and Gutta-percha points	40
Group C	Control group (unobturated teeth)	40

Fig 1: Comparison of mean force required to fracture the root



DISCUSSION

In the present study we observed that maximum fracture resistance of an endodontically treated tooth was seen with AH Plus root canal sealers and Gutta-percha points, followed by teeth treated with MTA Fillapex and Gutta-percha points. Thus, AH Plus root canal sealer provides higher fracture resistance as compared to MTA Fillapex. The results were statistically significant and were compared with previous studies and found to be consistent. Dalmia S et al compared the antimicrobial efficacy of four different endodontic sealers against Enterococcus faecalis. Four different endodontic sealers, namely, resin based (AH Plus), zinc oxide-eugenol based (Tubliseal), calcium hydroxide based (Sealapex), and mineral trioxide aggregate (MTA Fillapex) based were tested for their antimicrobial efficacy against E. faecalis using agar diffusion method. Four wells were made by the removal of agar at equidistant points and filled with freshly mixed respective root canal sealers and were inoculated with E. faecalis. All the three plates were incubated for a period of 72 h at 37°C under aerobic conditions. The diameter of inhibition zones was measured at 24, 48, and 72 h time intervals. All the tested sealers showed some bacterial growth inhibition of E. faecalis. Their efficacy in descending order of antibacterial activity was as follows: Sealapex > AH Plus > Tubliseal > MTA Fillapex. The efficacy of the root canal sealers decreased marginally with increase in their duration of action. They concluded that antimicrobial efficacy of calcium hydroxide-based sealer was highest followed by resin-based sealer and was the least with MTA based sealer. Arora S et al evaluated the efficacy of root canal sealer's antimicrobial activity against Enterococcus faecalis. Root canal sealers with the brands Endoflas FS, AH Plus, and Tubli-Seal EWT were selected. Enterococcus faecalis organisms' zone of inhibition was measured. The maximum zone of inhibition was shown by Endoflas FS sealer; AH Plus and Tubli-Seal showed the inhibition zone of and respectively, following Endoflas FS. AH Plus and Endoflas FS showed a statistically significant difference of 0.04 and 0.001 in between groups, and there was no statistically significant difference in the Tubli-Seal group from Tukey post hoc test. The study showed that Endoflas FS sealer has a significant antimicrobial effect against E. faecalis. [7, 8]

Seelan RG et al compared five different root canal sealers against Enterococcus faecalis in an infected root canal model by using real-time polymerase chain reaction (RT-PCR). Sixty human mandibular premolars were sectioned to standardize a uniform length of 14 mm. Fifty microliters of the inoculum containing E. faecalis were transferred into each microcentrifuge tube. The samples were divided into six groups Tubli-Seal, Apexit Plus, Fillapex, AH Plus, RoekoSeal, and Positive control, respectively. Five groups after the incubation with the microorganism E. faecalis were coated with different root canal sealers and obturated using F3 ProTaper Gutta-percha point. The dentinal shavings were collected and analyzed for RT-PCR. The highest antibacterial activity was achieved with Tubli-Seal and least by RoekoSeal. They concluded that the maximum antimicrobial activity was achieved AH Plus and Tubli-Seal. RT-PCR can be used as a valuable and accurate tool for testing antimicrobial activity. Phukan AH et al compared the in vitro effects of four different root canal sealers on the fracture resistance of endodontically treated teeth. Seventy-five freshly extracted human mandibular premolars were used for the study. Teeth were divided into five groups based on type of root canal sealers used. Gutta-percha was used for all the samples: Group I: AH Plus root canal sealer, Group II: MTA Fillapex root canal sealer, Group III: Apexit root canal sealer, Group IV: Conventional zinc oxide-eugenol (ZOE) sealer, Group V: Control (unobturated teeth). The teeth were embedded in acrylic resin blocks and fracture force was measured using a universal testing machine. Group I and Group II showed higher resistance to fracture than other three groups. There was comparable difference in fracture force between Group I and Group II. Moreover, there was no statistically significant difference between Group III and Group IV and between Group IV and Group V. Based on this in vitro study, resin-based sealer was more effective as compared to other sealers and the control group. However, no significant differences were observed between ZOE and control group. [9, 10]

CONCLUSION

Within the limitations of the present study, this can be concluded that AH Plus root canal sealers provide comparatively better fracture resistance than MTA Fillapex root canal sealer.

REFERENCES

1. Zhang H, Shen Y, Ruse ND, Haapasalo M. Antibacterial activity of endodontic sealers by modified direct contact test against Enterococcus faecalis. Journal of Endodontics. 2009;35(7):1051–1055.
2. Gomes BPFDA, Pedroso JA, Jacinto RC, et al. In vitro evaluation of the antimicrobial activity of five root canal sealers. Brazilian Dental Journal. 2004;15(1):30–35.
3. Lai CC, Huang FM, Yang HW, Chang Y, Huang MS, Chou MY, et al. Antimicrobial activity of four root canal sealers against endodontic pathogens. Clin Oral Investig. 2001;5:236–39.
4. Siqueira JF, Favieri A, Gahyva SM, Moraes SR, Lima KC, Lopes HP. Antimicrobial activity and flow rate of newer and established root canal sealers. J Endod. 2000;26:274–77.
5. Bhat SS, Hegde SK, Rao A, Shaji Mohammed AK. Evaluation of resistance of teeth subjected to fracture after endodontic treatment using different root canal sealers: An in vitro study. J Indian Soc Pedod Prev Dent. 2012;30:305–9.
6. Uppalapati LV, Mandava J. Evaluation of push-out bond strength of two different adhesive root canal obturation systems: An in vitro study. J Dr NTR Univ Health Sci. 2012;1:111–5.

7. Dalmia S, Gaikwad A, Samuel R, Aher G, Gulve M, Kolhe S. Antimicrobial Efficacy of Different Endodontic Sealers against Enterococcus faecalis: An In vitro Study. J Int Soc Prev Community Dent. 2018;8(2):104-109. doi:10.4103/jispcd.JISPCD_29_18
8. Arora S, Mir S, Gautam A, Batra R, Soni S, Lata K. Evaluation of Antimicrobial Efficacy of Root Canal Sealers against Enterococcus faecalis: A Comparative Study. J Contemp Dent Pract. 2018;19(6):680-683. Published 2018 Jun 1.
9. Seelan RG, Kumar AA, Emil Sam RJ, Maheswari SU. Antimicrobial efficacy of different root canal sealers by using real-time polymerase chain reaction: An ex vivo study. J Conserv Dent. 2015;18(6):474-478. doi:10.4103/0972-0707.168814
10. Phukan AH, Mathur S, Sandhu M, Sachdev V. The effect of different root canal sealers on the fracture resistance of endodontically treated teeth-in vitro study. Dent Res J (Isfahan). 2017;14(6):382-388. doi:10.4103/1735-3327.218558