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

# ORIGINAL RESEARCH

## Evaluation of efficacy of resin based and Mineral trioxide aggregate based sealer against E. faecalis: A comparative study

Samriti Sharma[1], Satish Sharma[2]

[1]MDS (Conservative dentistry and Endodontics), private practitioner, Jammu J&K;
[2]MDS (Conservative dentistry and Endodontics) Assistant Professor, GMC Rajouri, J&K

***ABSTRACT:***
**Background:** Microorganisms and their products are the main aetiologic factors responsible for pulpal diseases and periapical lesions. Multiple commercial endodontic sealers, available on the market, are claimed to have antimicrobial properties. Hence; the present study was undertaken for evaluating the efficacy of resin based and Mineral trioxide aggregate based sealer against E. faecalis. **Materials & Methods:** Agar diffusion test (ADT) was conducted by inserting patches of the sealers on a well of 4×6mm diameter on agar plates. Inoculation of these plates was done with standard suspension of E. faecalis and assessment of the zone of inhibition was done at 24 hours, 48 hours and 72 hours. Preparation of all the sealers was done in accordance with the manufacturer's recommendations. The diameter of the growth inhibition zones was measured. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. **Results:** Mean zone of bacterial inhibition among specimens of resin based sealer at 24 hours, 48 hours and 72 hours was found to be 9.8 mm, 8.1 mm and 7.8 mm respectively. Non- significant results were obtained while comparing the efficacy of resin based sealer at different time intervals. Mean zone of bacterial inhibition among specimens of MTA based sealer at 24 hours, 48 hours and 72 hours was found to be 8.9 mm, 7.8 mm and 6.8 mm respectively. Significant results were obtained while comparing the efficacy of resin based sealer at different time intervals. Also, while comparing the efficacy of both the sealers at different time intervals, non- significant results were obtained. **Conclusion:** Although non-significant, AH plus exhibited maximum efficacy against E. Faecalis.
**Key words:** E. faecalis, Mineral trioxide aggregate

Received: 20 February, 2020 Accepted: 26 March, 2020

**Corresponding author:** Dr. Satish Sharma, MDS (Conservative dentistry and Endodontics) Assistant Professor, GMC Rajouri, J&K

**This article may be cited as:** Sharma S, Sharma S. Evaluation of efficacy of resin based and Mineral trioxide aggregate based sealer against E. faecalis: A comparative study. Int J Res Health Allied Sci 2020; 6(2):22-24.

### INTRODUCTION

Microorganisms and their products are the main aetiologic factors responsible for pulpal diseases and periapical lesions. Microorganisms found in root canals are commonly organized in biofilms, in which they are more resistant to antimicrobials than bacteria in the planktonic state. Endodontic sealers play an important role in controlling endodontic infection by entombing residual bacteria and preventing leakage of nutrients and reinfection of the root canal. Multiple commercial endodontic sealers, available on the market, are claimed to have antimicrobial properties. Many studies have reported that freshly prepared root canal sealers (resin-, zinc oxide eugenol-, calcium hydroxide-, silicate- and silicon- based sealers) are effective against Enterococcus faecalis (E. faecalis), but their antimicrobial effectiveness after 2 to 7 days of ageing has not been reported.[1-3]

Mineral trioxide aggregate (MTA) has several desirable properties such as high biocompatibility and low cytotoxicity, release of calcium hydroxide ($Ca(OH)^2$), sealing ability against the bacteria and saliva, antibacterial features, ability of setting in the presence of bleeding or serum, adequate compressive strength,

and acceptable hardness. Thus, it has been one of the commonly used biomaterials in endodontics. Despite these advantages, long setting time and difficult manipulation are the drawbacks of MTA. To improve these properties, some changes have been made in its liquid or powder. One of the materials that have been mixed with MTA to enhance its manipulation is propylene glycol.[4- 6] Hence; the present study was undertaken for evaluating the efficacy of resin based and Mineral trioxide aggregate based sealer against E. faecalis.

## MATERIALS & METHODS

The present study was conducted with the aim of assessing the efficacy of AH plus (resin based sealer) and Fillapex (MTA based sealer) against E. faecalis. E faecalis was used for testing antibacterial potential of sealers by Agar diffusion test (ADT). ADT was conducted by inserting patches of the sealers on a well of 4×6mm diameter on agar plates. Inoculation of these plates was done with standard suspension of E. faecalis and assessment of the zone of inhibition was done at 24 hours, 48 hours and 72 hours. Resin based sealer (AH plus) was categorized as group A while MTA based sealer was categorized as Group B. Preparation of all the sealers was done in accordance with the manufacturer's recommendations. The diameter of the growth inhibition zones was measured. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. One way ANOVA was used for evaluating the level of significance.

## RESULTS

In the present study, efficacy of AH plus (resin based sealer) and Fillapex (MTA based sealer) against E. faecalis was assessed. Resin based sealer (AH plus) was categorized as group A while MTA based sealer was categorized as Group B. Table 1 shows the distribution of type of sealers according to respective groups.

In the present study, mean zone of bacterial inhibition among specimens of resin based sealer at 24 hours, 48 hours and 72 hours was found to be 9.8 mm, 8.1 mm and 7.8 mm respectively. Non- significant results were obtained while comparing the efficacy of resin based sealer at different time intervals.

In the present study, mean zone of bacterial inhibition among specimens of MTA based sealer at 24 hours, 48 hours and 72 hours was found to be 8.9 mm, 7.8 mm and 6.8 mm respectively. Significant results were obtained while comparing the efficacy of resin based sealer at different time intervals. Also, while comparing the efficacy of both the sealers at different time intervals, non- significant results were obtained.

**Table I Distribution of groups**

| Groups | Group A | Group B |
|---|---|---|
| **Sealer** | Resin based (AH Plus) | MTA |

**Table II Bacterial inhibition zone (in mm)**

| Groups | 24 hours | 48 hours | 72 hours | P value |
|---|---|---|---|---|
| **Group A** | 9.8 | 8.1 | 7.8 | 0.85 |
| **Group B** | 8.9 | 7.8 | 6.8 | 0.00 |
| **P value** | 0.75 | 0.15 | 0.88 | - |

## DISCUSSION

The success of endodontic therapy relies on the three-dimensional sealing of the canal after removing bacteria from the root canal to prevent microleakage and penetration of microorganisms. It is reported that the most common reason for endodontic failure is the inability to achieve a three-dimensional seal. The ideal features of a root canal filling material include tissue compatibility, antibacterial properties, radiopacity, easy handling, insolubility in tissue fluids, three-dimensional seal of the canal and no coronal discoloration. Gutta-percha, the most common root-filling material does not adhere to the canal walls and shrinks after cooling down, resulting in gaps which provide an access route for bacteria. Sealers are required to fill these gaps. There are various types of sealers; zinc oxide-based sealers, resin-based sealers, silicon sealers and mineral trioxide aggregate (MTA)-based sealers.[7- 9] Hence; the present study was undertaken for evaluating the efficacy of resin based and Mineral trioxide aggregate based sealer against E. faecalis.

In the present study, efficacy of AH plus (resin based sealer) and Fillapex (MTA based sealer) against E. faecalis was assessed. Resin based sealer (AH plus) was categorized as group A while MTA based sealer was categorized as Group B. Table 1 shows the distribution of type of sealers according to respective groups. Mean zone of bacterial inhibition among specimens of resin based sealer at 24 hours, 48 hours and 72 hours was found to be 9.8 mm, 8.1 mm and 7.8 mm respectively. Non- significant results were obtained while comparing the efficacy of resin based sealer at different time intervals. Milani AS et al compared sealing ability of mineral trioxide aggregate (MTA)-propylene glycol (PG) with two commonly used resin-based and MTA-based sealers. Seventy extracted single-root teeth were used. Canal preparation was carried out using hand and RaCe rotary files. Ten teeth were used as control. The root canals in positive and negative control groups were left empty. Remaining 60 teeth were randomly divided into following four groups (n = 15): In Group 1, the canals were dried using paper cones and obturated using MTA-PG sealer. In Group 2, saline was removed from

canal using a syring, but paper cones were not used. Obturation was done using MTA-PG sealer. In Groups 3 and 4, the canals were dried using paper cones and obturated with AH26 and MTA Fillapex, respectively. Two-chamber method was used to evaluate bacterial leakage using Enterococcus faecalis (ATCC 29212). Turbidity of the lower chambers was checked every day during 90 days. There was no significant difference among groups regarding rate of leakage throughout the study. However, at the end of the study, the groups were statistically different regarding leaked samples ($P = 0.034$). MTA Fillapex and MTA-PG in dry canal showed the most and least leaked samples at the end of the study, respectively ($P < 0.05$). MTA mixed with PG has superior sealing ability than MTA Fillapex.[9]

In the present study, mean zone of bacterial inhibition among specimens of MTA based sealer at 24 hours, 48 hours and 72 hours was found to be 8.9 mm, 7.8 mm and 6.8 mm respectively. Significant results were obtained while comparing the efficacy of resin based sealer at different time intervals. Also, while comparing the efficacy of both the sealers at different time intervals, non- significant results were obtained. . Shakya VK et al assessed the antimicrobial activity and flow characteristics for Resin based (AH Plus), Mineral Trioxide Aggregate based (MTA Fillapex), Calcium hydroxide based (CRCS) and Flowable Gutta-Percha (Gutta Flow 2) endodontic sealers on Enterococcus faecalis. Enterococcus faecalis ATCC 29212 was used to test antibacterial potential of sealers by Agar diffusion test (ADT) and Direct Contact Test (DCT). ADT was performed by punching the sealers on a well of 4×6mm diameter on Muller Hinton agar plates. These plates were inoculated with standard suspension of E. faecalis and the zone of inhibition was measured at 24 hours and after 7 days. All the sealers were prepared in accordance with the manufacturer's recommendations. Flow of sealers was measured according to ADA specification no. 57. All sealers showed antibacterial activity against E. faecalis except Gutta Flow 2. At 24 hours, zone of inhibition was highest in Calcibiotic Root Canal Sealer (CRCS) and lowest in AH Plus. After 7 days the zone of inhibition decreased in AH plus, CRCS and MTA Fillapex. DCT showed a significant lower number of organisms in AH Plus, CRCS and MTA than controls at both the time intervals. Gutta Flow 2 did not show any significant antimicrobial action. Maximum and minimum flow was shown by AH Plus and CRCS respectively. Highest microbial inhibition was shown by (CRCS), followed by MTA Fillapex and AH Plus. Gutta Flow 2 did not show any inhibition of E. faecalis by ADT. Maximum reduction in antibacterial property with time against E. faecalis was seen with AH Plus. Maximum flow was shown by AH Plus and minimum by CRCS.[10]

## CONCLUSION

From the above results, the authors concluded that although non-significant, AH plus exhibited maximum efficacy against E. Faecalis. However; further studies are recommended.

## REFERENCES


1. Ehsani M, Dehghani A, Abesi F, Khafri S, Ghadiri Dehkordi S. Evaluation of apical micro-leakage of different endodontic sealers in the presence and absence of moisture. J Dent Res Dent Clin Dent Prospects. 2014;8:125–9.
2. Reyhani MF, Ghasemi N, Rahimi S, Milani AS, Barhaghi MH, Azadi A, et al. Apical microleakage of AH plus and MTA fillapex® sealers in association with immediate and delayed post space preparation: A bacterial leakage study. Minerva Stomatol. 2015;64:129–34.
3. Sönmez IS, Oba AA, Sönmez D, Almaz ME. In vitro evaluation of apical microleakage of a new MTA-based sealer. Eur Arch Paediatr Dent. 2012;13:252–5.
4. Storm B, Eichmiller FC, Tordik PA, Goodell GG. Setting expansion of gray and white mineral trioxide aggregate and portland cement. J Endod. 2008;34:80–2.
5. Williamson AE, Marker KL, Drake DR, Dawson DV, Walton RE. Resin-based versus gutta-percha-based root canal obturation: Influence on bacterial leakage in an in vitro model system. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;108:292–6.
6. Al-Shwaimi E, Bogari D, Ajaj R, Al-Shahrani S, Almas K, Majeed A. *In vitro*antimicrobial effectiveness of root canal sealers against *Enterococcus faecalis*: A systematic review. J Endod. 2016;42:1588–97.
7. Grossman L. Antimicrobial effect of root canal cements. J Endod. 1980;6:594–7.
8. Monajemzadeh A, Ahmadi Asoor S, Aslani S, Sadeghi-Nejad B. In vitro antimicrobial effect of different root canal sealers against oral pathogens. Curr Med Mycol. 2017;3:7–12.
9. Vibha H, Rathod R. Assessment of antimicrobial efficacy of bioceramic sealer, epiphany self-etch sealer, and AH-Plus sealer against Enterococcus faecalis: An in vitro study. Endodontology. 2017;29:151–5.
10. Milani AS, Firuzi S, Barhaghi MHS, Shahi S, Abdollahi AA. Evaluation of sealing abilitiy of mineral trioxide aggregate mixed with propylene glycol as a root canal sealer: A in vitro study. Dent Res J (Isfahan). 2019;16(4):216–220.
11. Shakya VK, Gupta P, Tikku AP, et al. An In vitro Evaluation of Antimicrobial Efficacy and Flow Characteristics for AH Plus, MTA Fillapex, CRCS and Gutta Flow 2 Root Canal Sealer. J Clin Diagn Res. 2016;10(8):ZC104–ZC108.