

Original ARTICLE

To determine antimicrobial efficacy of different endodontics sealers against *E. faecalis*

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ABSTRACT

Background: Root canal disinfection is one of the main determinants which aids in the healing of the periapical tissues. The present study was conducted to determine antimicrobial efficacy of different endodontics sealers against *E. faecalis*. **Materials & Methods:** The present invitro study was conducted in the department of Endodontics. It comprised of three endodontic sealers such as resin based (AH Plus), calcium hydroxide based (Sealapex), and mineral trioxide aggregate based (MTA Fillapex) based against *E. faecalis*. The study protocol was approved from institutional ethical committee. The diameter of the growth inhibition zones was measured. **Results:** The mean bacterial inhibition zone at 24 hours in group I was 9.1, in group II was 14.3 and I group III was 6.5, at 48 hours in group I was 7.3, in group II was 12.4 and I group III was 4.1, at 72 hours in group I was 7.1, in group II was 11.5 and in group III was 0. The difference between groups was significant ($P < 0.05$). **Conclusion:** Authors found that maximum bacterial inhibition zone against *E. faecalis* was obtained with calcium hydroxide-based sealer (Sealapex) followed by resin-based sealer (AH plus) and MTA sealer.

Key words: Calcium hydroxide, *E. faecalis*, MTA

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INTRODUCTION

For a successful endodontic treatment, complete chemomechanical preparation, irrigation, obturation, and post-endodontic restoration are essential to achieve optimal results, thus eliminating bacteria from the root canal.¹ Root canal disinfection is one of the main determinants which aids in the healing of the periapical tissues. Irrespective of thorough cleaning, shaping, and the use of intracanal medicaments, it is difficult to completely eradicate all microorganisms from the root canal system, which may lead to the failure of endodontic treatment.² Microorganisms and their by-products are considered as primary etiological factors for pulp necrosis and apical periodontitis.³

The persistence of microorganisms may be due to ineffective intracanal irrigation, mechanical preparation that leaves much of the root canal surfaces untouched and ineffective chemo-mechanical preparation due to anatomical limitations. It has been demonstrated that microorganisms of teeth with failed endodontic treatment significantly differ from that normally found in untreated teeth. *Enterococcus faecalis*, facultative Gram-positive cocci, is present in over one third of the canals of teeth with persisting periapical lesions.⁴

Since complete eradication of microorganism from the endodontic space is not predictable; the antimicrobial activity of root canal sealers may help to eliminate residual microorganisms unaffected

by chemomechanical preparation of the root canal system.⁵ The present study was conducted to determine antimicrobial efficacy of different endodontics sealers against *E. faecalis*.

MATERIALS & METHODS

The present invitro study was conducted in the department of Endodontics. It comprised of three endodontic sealers such as resin based (AH Plus), calcium hydroxide based (Sealapex), and mineral trioxide aggregate based (MTA Fillapex) based against *E. faecalis*. The study protocol was approved from institutional ethical committee.

Three groups were made. Group I used resin-based sealer (AH plus), group II comprised of calcium hydroxide-based sealer (Sealapex) and group III had MTA-based sealer (MTA Fillapex). The microorganisms were grown in solid media, and culture containing broth suspensions was prepared and, thus, standard strains of *E. faecalis* were obtained (MTCC 2093). Microorganisms were subcultured in appropriate culture media to confirm their purity. Aliquots of the suspension containing *E. faecalis* were spread on three Petri dishes containing Mueller-Hinton agar medium.

Each agar plate was equally divided into 3 sections. In each section of each plate, a 4 mm diameter well was prepared with a sterile stainless steel cylinder by the removal of agar at equidistant points. A freshly mixed sample of each sealer was placed into the

wells in all the 3 sections of the three plates. All plates were incubated for 72 h at 37°C under aerobic conditions, and zones of inhibition were measured at 24, 48, and 72 h. The diameter of the growth inhibition zones was measured. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I shows that group I used resin-based sealer (AH plus), group II comprised of calcium hydroxide-based sealer (Sealapex) and group III had MTA-based sealer (MTA Fillapex).

Table I Distribution of media

| Groups | Group I | Group II | Group III |
|--------|-----------------------|-------------------|-----------|
| Sealer | Resin based (AH Plus) | Calcium hydroxide | MTA |

Table II Bacterial inhibition zone

| Groups | 24 hours | 48 hours | 72 hours | P value |
|-----------|----------|----------|----------|---------|
| Group I | 9.1 | 7.3 | 7.1 | 0.15 |
| Group II | 14.3 | 12.4 | 11.5 | 0.12 |
| Group III | 6.5 | 4.1 | 0 | 0.01 |
| P value | 0.02 | 0.01 | 0.01 | - |

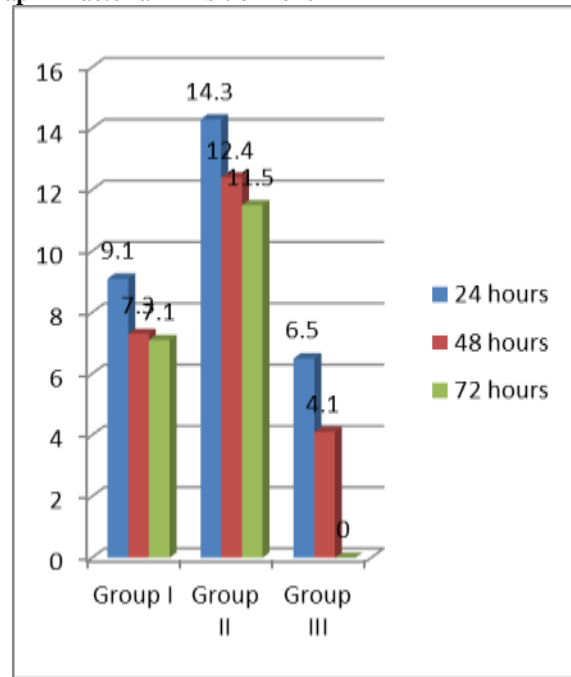
Table II, graph I shows that mean bacterial inhibition zone at 24 hours in group I was 9.1, in group II was 14.3 and I group III was 6.5, at 48 hours in group I was 7.3, in group II was 12.4 and I group III was 4.1, at 72 hours in group I was 7.1, in group II was 11.5 and in group III was 0. The difference between groups was significant (P<0.05).

DISCUSSION

Enterococcus faecalis is Gram-positive bacterium that can mostly resist endodontic therapy and has been frequently found in root canal-treated teeth with signs of chronic apical periodontitis. When lodged in the dentinal tubules of the canal, it is difficult to remove these species through root canal medicaments.⁶ Although *Enterococcus* species comprise a small proportion of the initial flora in infected root canal, they are most commonly recovered from unsuccessful endodontic treatment and has also been associated with existing root canal infections.⁷ The success of obturation is directly related to the elimination of microorganisms through mechanical cleaning and shaping, supplemented by antibacterial irrigants, adequate filling of the empty space, and the use of antimicrobial dressings between appointments, if necessary.⁸ The present study was conducted to determine antimicrobial efficacy of different endodontics sealers against *E. faecalis*.

In present study, we used 3 endodontic sealers which were divided into 3 groups. group I used resin-based sealer (AH plus), group II comprised of calcium hydroxide-based sealer (Sealapex) and group III had MTA-based sealer (MTA Fillapex). Regende et al⁹ compared in vitro the antimicrobial activity of different root canal sealers against *Enterococcus faecalis*, prior and subsequent to setting. Agar diffusion test (ADT) was used for evaluating the antibacterial activity of non-set sealer while the direct contact test (DCT) was used for after setting. ADT: Except for TotalFill BC Sealer all the others sealers tested showed antibacterial activity. BioRootTMRCS, MTA Fillapex and Sealapex Root Canal Sealer showed the lowest antibacterial activity, a significant increase in antibacterial effect for both Pulp Canal SealerTM and AH plus sealers were found.

Graph I Bacterial inhibition zone



Significantly higher were the mean diameters of the bacterial inhibition zone by both EasySealor N2 sealers. DCT: AH plus and Sealapex Root Canal Sealer doesn't show any bactericidal effect after 6 min of contact. After 15 and 60 min of contact a significant increment for AH plus and for Sealapex Root Canal Sealer of the bactericidal effect was found. Significantly much higher was the antibacterial effect of Sealapex Root Canal Sealer compare to that observed for AH plus. BioRootTMRCS, MTA Fillapex, Pulp Canal SealerTM and N2 showed at least means of the number of colonies formed in milliliter after 6 min of contact.

In present study, mean bacterial inhibition zone at 24 hours in group I was 9.1, in group II was 14.3 and I group III was 6.5, at 48 hours in group I was 7.3, in group II was 12.4 and I group III was 4.1, at 72 hours in group I was 7.1, in group II was 11.5 and in group III was 0. The difference between groups was significant (P<0.05).

Vibha et al¹⁰ used 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.

CONCLUSION

Authors found that maximum bacterial inhibition zone against *E. faecalis* was obtained with calcium hydroxide-based sealer

(Sealapex) followed by resin-based sealer (AH plus) and MTA sealer.

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