**An in vitro Comparison of Antimicrobial Activity of Three Endodontic Sealers with Different Composition**

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**ABSTRACT**

**Aims:** The aim of the study was to compare the antimicrobial property of newly introduced EndoSequence BC sealer with commonly used zinc oxide-eugenol-based sealer (Zical) and epoxy resin-based sealer (MM-Seal) against Candida albicans, Lactobacillus, Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa.

**Materials and methods:** The agar diffusion test was done to measure the antimicrobial activity of sealers. The sealers were put in the 4 mm wells prepared in the inoculated agar plates. The agar plates were incubated at 37°C for 24 hours and the zones of inhibition that appeared was measured. Chi-square test was done to evaluate intraobserver bias for all study samples. Intergroup comparison was done for all five parameters using Pearson correlation statistical analysis.

**Results:** EndoSequence BC sealer showed maximum mean of diameter of zones of inhibition against all the microorganisms but with no statistically significant difference with other sealers. Zical did not show any zone of inhibition against the P. aeruginosa. MM-Seal did not show any inhibitory activity against the P. aeruginosa and C. albicans.

**Conclusion:** EndoSequence BC sealer showed antimicrobial activity against all the microorganisms and proved to be a better choice when compared with other two sealers.

**Clinical significance:** Antimicrobial properties of endodontic sealers are important to prevent the persistent infection of the complex root canals. EndoSequence BC sealer has been proved to be a better sealer in this aspect.

**Keywords:** Candida albicans, Endosequence BC, Escherichia coli, Lactobacillus, Pseudomonas aeruginosa, Staphylococcus aureus.

**How to cite this article:** Singh G, Elshamy FMM, Homeida HE, Boreak N, Gupta I. An in vitro Comparison of Antimicrobial Activity of Three Endodontic Sealers with Different Composition. J Contemp Dent Pract 2016;17(7):553-556.

**Source of support:** Nil

**Conflict of interest:** None

**INTRODUCTION**

The main objective of root canal treatment is proper cleaning and shaping to reduce the microbial load and helps in healing of the periapex. However, it is difficult to eliminate all the microorganisms from the root canals with biomechanical preparation because of the complex anatomy of the pulp cavity. The endodontic sealers with antimicrobial activity can be helpful to eliminate the remaining microbes from the root canals. Various new sealers are constantly being developed in attempts to meet this criterion.

EndoSequence BC sealer (Brasseler USA, Savannah, GA) is such an example that is based on calcium phosphate silicate. The pH of EndoSequence BC sealer is more than 12 which enhances its bactericidal properties. The composition includes tricalcium silicate, dicalcium silicate, calcium phosphates, colloidal silica, calcium hydroxide, zirconium oxide (radiopacifier), and water-free thickening vehicles to make it in paste form. EndoSequence BC sealer has been promoted as being biocompatible and nontoxic. According to its manufacturer, EndoSequence BC sealer uses the moisture that remains within the dentinal tubules after canal irrigation for its setting reaction.

Epoxy-based resin sealer has been widely used for their long-term dimensional stability, good adhesion to dentin, fluidity, and biocompatibility.
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The data calculated were analyzed statistically. Measured using millimeter ruler by a single investigator. After 24 hours the zones of inhibition were observed and compared with the three endodontic sealers being tested. The aim of this study was to compare the antimicrobial efficacy of EndoSequence BC sealer, MM-Seal, and Zical against the Candida albicans, Lactobacillus, Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa by means of agar diffusion culture test.

**MATERIALS AND METHODS**

In our study, three root canal sealers, EndoSequence BC sealer (Brasseler USA, Savannah, GA), MM-Seal (MICRO-MEGA, France), and Zical (Prevest DenPro, Jammu, India), were tested for antimicrobial activity against C. albicans, Lactobacillus, S. aureus, E. coli, and P. aeruginosa. The broth culture suspensions were prepared and adjusted to no. 0.5 McFarland standard. The microorganisms in suspension were spread on 50 × 100 mm (10 for each microorganism) diameter Petri dishes containing Mueller-Hinton agar medium. The inoculated plates were dried for 15 minutes at 37°C. Three 4 mm wells were prepared in each dish with a sterile paper straw from the agar at equidistant. The three endodontic sealers were placed immediately in the wells. MM-Seal and Zical were mixed according to the manufacturer’s instruction whereas the EndoSequence BC sealer was a premixed paste. The dishes were kept at room temperature for 2 hours for prediffusion of the material and then incubated at 37°C for 24 hours. After 24 hours the zones of inhibition were observed and measured using millimeter ruler by a single investigator. The data calculated were analyzed statistically.

Chi-square test was done to evaluate intraobserver bias for all five study samples. Intergroup comparison was done for all five parameters using Pearson correlation statistical analysis. All statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS) version 20 software, and all the results were evaluated at 5% significance level (p-value > 0.05 is insignificant).

**RESULTS**

The mean diameters of zones of inhibition caused by the three root canal sealers on the microorganisms are presented in Table 1.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Candida albicans</th>
<th>Lactobacillus</th>
<th>Staphylococcus aureus</th>
<th>Escherichia coli</th>
<th>Pseudomonas aeruginosa</th>
</tr>
</thead>
<tbody>
<tr>
<td>EndoSequence BC sealer</td>
<td>13.43 ± 0.524</td>
<td>23.90 ± 0.739</td>
<td>25.43 ± 0.545</td>
<td>16.33 ± 0.753</td>
<td>14.90 ± 0.629</td>
</tr>
<tr>
<td>MM-Seal</td>
<td>0</td>
<td>14.79 ± 0.774</td>
<td>11.07 ± 0.733</td>
<td>10.00 ± 0.588</td>
<td>0</td>
</tr>
<tr>
<td>Zical</td>
<td>11.97 ± 0.744</td>
<td>12.40 ± 0.516</td>
<td>13.53 ± 0.548</td>
<td>10.90 ± 0.447</td>
<td>0</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The microorganisms used in this study are based on the previous literature, which demonstrates their presence in the persistent or refractory infections of the root canals. Candida albicans is one of the most frequent commensals that may become pathogenic yeast in the oral cavity. Candida albicans has been reported to be present in the 21% of the infected root canals. It is found to be causative factor of an acute apical abscess. These reports support that Candida albicans is involved in the etiology of persistent periapical lesions. Candida albicans is associated with persistent secondary endodontic infections that do not respond to conventional root canal therapy.
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Hume reported that eugenol present in ZOE sealer is a potent antimicrobial. On the contrary, Zical did not show any inhibitory effects against the P. aeruginosa. This is in accordance with the study reported by Leonardo et al. Epoxy resin-based sealers have antimicrobial effects related to either bisphenol-diglycidyl ether or the release of formaldehyde during polymerization. MM-Seal (MICRO-MEGA, France) showed minimum mean of zone of inhibition against all the microorganisms, except against the Lactobacillus which was slightly higher than the Zical. In our study, epoxy resin-based sealer did not show any zone of inhibition against the Pseudomonas and C. albicans. The low antimicrobial effect of resin-based sealer might be ascribed to the minimal amount of formaldehyde released over time. The results are in accordance with the Leonardo et al who showed in their study that epoxy resin-based sealer did not show any inhibitory activity against the Pseudomonas.

CONCLUSION

Our study showed that EndoSequence BC sealer had profound antimicrobial effect on several types of microorganisms responsible for primary and persistent infections of the root canal. This sealer may suppress the opportunistic microbial growth in the root canals, but it needs to be further related to the in vivo studies.

CLINICAL SIGNIFICANCE

The endodontic sealers are the important component of the obturation techniques of the root canals. An endodontic sealer with good antimicrobial properties would help in the long-term success of the primary and retreatment cases of the endodontics.

REFERENCES

8. Sundqvist G, Figdor D, Persson S, Sjögren U. Microbiologic analysis of teeth with failed endodontic treatment and the...


