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A STUDY TO ASSESS THE ANTIBACTERIAL PROPERTY OF FIVE ENDODONTIC SEALERS

M. Meenakshi * and N. P. Muralidharan

Department of Microbiology, Saveetha Dental College, Chennai- 600077, Tamil Nadu, India.

ABSTRACT: Aim: The study aims to analyze the antibacterial property of various endodontic sealers against *Streptococcus mutans* and *Enterococcus faecilis*. **Objective:** Pulpal tissues are frequently infected by bacteria and are considered to be the commonest etiological agents of pulpal necrosis and periapical lesions, which needs endodontic treatment for its cure. Microorganisms play an important role in endodontic failures, which is commonly due to incomplete elimination of bacteria from the canal or due to the recolonization of bacteria by leakages. Thus it becomes important for the sealers to have antibacterial property. To make long-lasting restorations, the materials should be made antibacterial. The objective of this study is to check for the antibacterial property of the restorative sealers. **Methodology:** The antimicrobial activity of five endodontic sealers (zinc oxide eugenol, amalgam, light cure composite, calcium hydroxide, and glass ionomer) was assessed against *Enterococcus faecilis* and *Streptococcus mutans* using the agar diffusion method. **Reason:** Microorganisms being the commonest reason for endodontic treatment failure, endodontic sealers should possess an antimicrobial property.

Keywords: Sealers, Endodontic failure, Recolonization, Antimicrobial property

Correspondence to Author:

M. Meenakshi

Department of Microbiology, Saveetha Dental College, Chennai- 600077, Tamil Nadu, India.

E-mail: drmeena.mohan23@gmail.com

INTRODUCTION: Secondary caries is the major factor that influences the longevity of dental restorations^{1, 2, 3, 4}. Microorganisms may also be present beneath a restoration as a result of microleakage or incomplete removal of caries during tooth preparation⁵. Secondary caries is found to be the main reason for the restoration failure of dental restoratives, including resin composites and glass-ionomer cement^{6, 7, 8, 9}. To make long-lasting restorations, the materials should be antimicrobial¹⁰. This can be achieved by instrumentation, irrigation, and intra-canal medication.

Endodontic sealers are also known to have inherent antibacterial activity, which may help to control the population of micro-organisms¹¹. Although bacteria superficially adhering to root canal dentin might be more easily killed than those protected in the depths of dentinal tubules, bacteria inside the dentinal tubules might also be affected by antibacterial components leaching from the irrigation solution, intracanal medication, and endodontic filling and sealing materials¹².

The ultimate goal of root canal therapy might be considered to be the complete elimination of all microorganisms from the root canal system. Unfortunately, this appears to be impossible in typical clinical situations¹³. However, the use of endodontic sealers with antibacterial properties may help in reducing the number of infecting microorganisms and in eradicating infection¹⁴. Antimicrobial properties are desirable in endodontic sealers as the sealer is likely to come in

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direct contact with any microorganisms remaining in the dentinal tubules and undebrided parts of the root canal system¹⁵. The success of endodontic treatment depends on eliminating the microorganisms from the root canal and also by preventing them from re-entering the canal system.

Microorganisms play an important role in endodontic failures, which is commonly due to incomplete elimination of bacteria from the canal or due to the recolonization of bacteria by leakages. Cleansing and obturation of the root canal eliminates any pre-existing infection and provide a "hermetic seal" that is desired to prevent the bacteria from penetrating the apical tissue. The cavity is then restored using sealers to prevent leakage. The high success rate of endodontically treated teeth despite the presence of bacterial leakage along the obturated root canal emphasizes the importance of coronal seal. A study found that only 8.6% of the failures were caused by endodontic causes, 59.4% of failures were a restorative failure, and 32% of failures were periodontal. This study aims to evaluate the antimicrobial property of three major restorative sealers - the light-cured composite, glass ionomer cement, amalgam.

MATERIALS AND METHODS: The study analyzes the antibacterial activity of five major endodontic sealers against *Streptococcus mutans* and *Enterococcus faecilis* by agar diffusion method. The five endodontic sealers used in this study were zinc oxide eugenol, Glass ionomer cement, light cure composite, amalgam, and calcium hydroxide. Five pure cultures of *Enterococcus faecilis* and *Streptococcus mutans* were made in a Nutrient agar in which five wells each was made. The endodontic sealers were mixed according to its manufacturer's guidelines and were inoculated into the wells of both *Enterococcus faecilis* and *Streptococcus mutans*. The plates were incubated at 37 °C for 24 h after which the zone of inhibition was measured in millimeter, and a standard mean value of each was calculated.

RESULTS: The study shows that all the endodontic sealers used in this study except light cure composite have an effective antibacterial activity against both the organisms. The mean

diameters of zones of inhibition of 5 endodontic sealers are tabulated above. However, zinc oxide eugenol and amalgam showed the highest antibacterial activity against *S. mutans* and *Enterococcus*, respectively, whereas comparatively, light cure composite shows no antibacterial activity.

TABLE 1: FIG. 1: COMPARING THE EFFICACY OF ENDODONTIC SEALERS AGAINST *STREPTOCOCCUS MUTANS* AND *ENTEROCOCCUS*

Endodontic Sealer	Zone of Inhibition In <i>E. faecilis</i> (in mm)	Zone of Inhibition in <i>S. Mutans</i> (in mm)
Zinc oxide eugenol	19.8	30
Composite	0	0
Glass ionomer cement	20	12.5
Calcium hydroxide	18.3	26.8
Amalgam	22	27

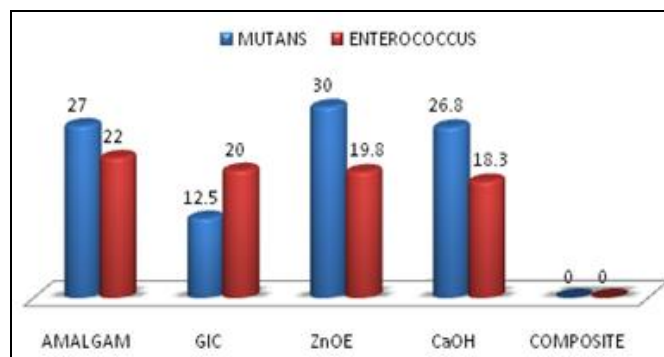


FIG. 1: COMPARING THE EFFICACY OF ENDODONTIC SEALERS AGAINST *STREPTOCOCCUS MUTANS* AND *ENTEROCOCCUS* (Zone size measured in mm)

DISCUSSION AND CONCLUSION: Microbes are considered to be the primary etiologic agents in endodontic diseases. Anaerobic bacteria may be especially well adapted to survive in the environment of necrotic pulp and in dentinal tubules in which the supply of blood and oxygen is limited¹⁶. *E. faecalis* and *S. mutans*, a common isolate from infected root canals, has been used in numerous studies of antibacterial properties. Therefore, *E. faecalis* and *S. mutans* were preferred in this study, and antibacterial properties of the five endodontic sealers were evaluated by agar diffusion method^{17, 18}. Agar diffusion method is one of the most often used methods to assess the antibacterial activity of dental materials^{19, 20}. The agar diffusion assay is one method for quantifying the ability of antibiotics to inhibit bacterial growth. Interpretation of results from this assay relies on model-dependent analysis, which is based on the assumption that antibiotics diffuse freely in the

solid nutrient medium²¹. However, several limitations should be noted, such as lack of standardization of inoculums density, adequate culture medium, agar viscosity, plate-storage condition, size and number of specimens per plate, and time and temperature of incubation²². Numerous root canal sealers are available, which are based on various formulas. The ideal root canal sealer should be inert, dimensionally stable, and possess good antimicrobial activity and low toxicity toward the surrounding tissue²³.

In this study, amalgam, glass ionomer cement, zinc oxide eugenol, calcium hydroxide, and light cure composite were used to assess the antibacterial property. Different results were obtained from the ADT of different root-canal sealers. More than one assaying method can be used in the process of evaluating antibacterial properties of dental materials to compare the results in further studies.

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