Research Article

Anti Microbial Activity of Root Canal Sealer- Antibiotic Combination on *Enterococcus feacalis - in- vitro* Study

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ABSTRACT

The aim of the in vitro study is to evaluate the Anti-microbial activity of root canal sealant- antibiotic combination on *Enterococcus feacalis*. Elimination of microorganisms from the root canal system is the one of the most important objectives of RCT. *Enterococcus faecalis* (EF) has been the most frequently identified species in canals of root-filled teeth with periapical lesions. EF is extremely resistant to current treatment modalities in endodontics. Therefore, the success rate of root canal treatment can be significantly reduced with the presence of this microorganism at the time of obturation. So, the root canal sealant along with antibiotic combinations are used to inhibit and kill the bacteria present in the surface walls of the canals. The anti-microbial activity of root canal sealer- antibiotic combination on *Enterococcus faecalis* was tested agar well diffusion method. Both the sealers tested in combination with clindamycin and amoxicillin showed greater zone of inhibition when compared with sealer with single antibiotic combination.

Keywords: Antibiotics, anti-microbial activity, sealers.

INTRODUCTION

Elimination of microorganisms from the root canal system is the one of the most important objectives of RCT[1]. *Enterococcus faecalis* is the most frequently found microorganism in the root canal and it is resistant to current treatment modalities in endodontics. So, success rate of root canal treatment is reduced due to the presence of this bacteria[2,3]. For a successful endodontic therapy it is necessary to obturate the root canal to get fluid tight seal of the apical foramina and accessory canals. Presence of microbes in the dentinal tubules can be counteracted by the antimicrobial properties of sealing and obturating materials [4]. Endodontic sealers are used to prevent periapical exudates from diffusing into unfilled part of root canal & to prevent residual bacteria from reaching periapical tissues[5]. Antibiotics can be administered both systemically and locally. Systemically administered antibiotics have some complications such as toxicity, allergic reaction and development of resistant strains of microorganisms. Main advantage of usage of local antibiotics is that systemic complications are prevented and that substantially higher concentrations can be used. *Enterococcus faecalis* is susceptible to various antibiotics such as amoxicillin, vancomycin, erythromycin, etc. So, the aim of the present study is "to evaluate and compare microbiologically the antibacterial activity of Endodontic sealers by addition of antibiotics against *Enterococcus faecalis*".

MATERIALS AND METHODS

Two root canal sealer were tested for anti-microbial activity against *Enterococcus faecalis*. The bacteria were cultivated in the solid media, the suspension containing *Enterococcus faecalis* was spread on the Petri dishes containing Mueller-Hinton Agar medium. Inoculated plates were dried for 15 mins at 37 degree Celsius. Eugenol based sealer – (zinc oxide Eugenol) and calcium hydroxide based sealer (apexcit) were used to find out the effectiveness against E.faecalis. Two antibiotics Clindamycin -300 mg and amoxicillin -500 mg were chosen on basis of effectiveness against E.faecalis

Each plate was divided into 3 sections, in each section of each plate, a well of 5 mm in diameter was created with a sterile stainless steel cylinder. Sealer samples were prepared by adding 10% of antibiotic to powder/paste of the sealers weight and were mixed per the manufacturer's instructions. The plates were incubated aerobically at 37 degree Celsius for 24 hours. Mean zone of inhibition of all the sealer antibiotic combinations were measured.

RESULTS AND DISCUSSION

The anti-microbial activity of root canal sealer – antibiotic combination on *Enterococcus faecalis* was tested by agar well diffusion technique. With zinc oxide eugenol combined with clindamycin and amoxicillin, the zone of inhibition was (36mm) which was greater when compared to sealer alone and sealer combined with antibiotic.

Similarly, with apexcit combined with clindamycin and amoxicillin showed a zone of inhibition of (46mm).

Multiple factors contribute to the endodontic failures which include intra radicular infection, extraradicular infection, foreign body reaction, and cysts[6,7]. However, it is believed that most treatment failure occurs due to the survival of microorganisms in the apical portion of the root filled tooth[9]. The persistence of bacteria in the root

canal system often leads to failure of root canal treatment[8]. Enterococci have been shown to survive in root canals as single organisms and it is associated with persistent apical inflammation in clinical situations and it is difficult to eliminate this organism from the root canal system. Agar diffusion method was used in this study, in this method the antibiotics &antibacterial agents from the sealers comes out through the disc and acts on the culture causing formation of clear zone known as 'Zone of Inhibition'. Holescher et al[10] found that the sealer-antibiotic groups exhibited antimicrobial activity peaking around 10% concentration of antibiotic. Hence in the present study 10% antibiotic concentration was used. EF is resistant to clindamycin and sensitive to amoxicillin.

Figure 1: *Enterococcus faecalis* stock

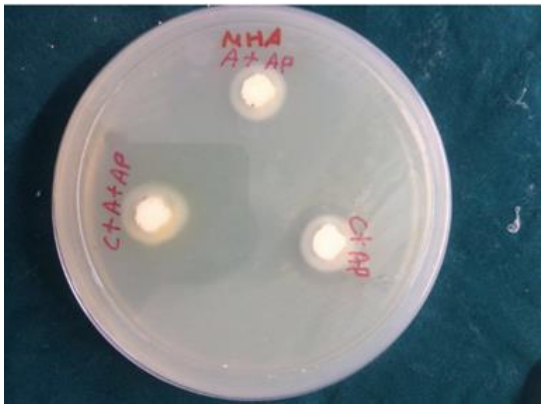

Figure 2: zone of inhibition shown on using culture Zinc oxide eugenol

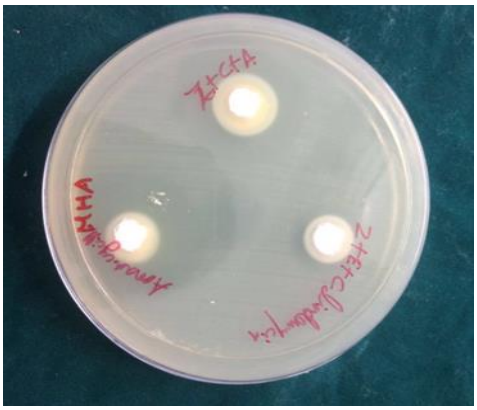

Figure 3: Zone of Inhibition Shown on using Apexcit Sealer

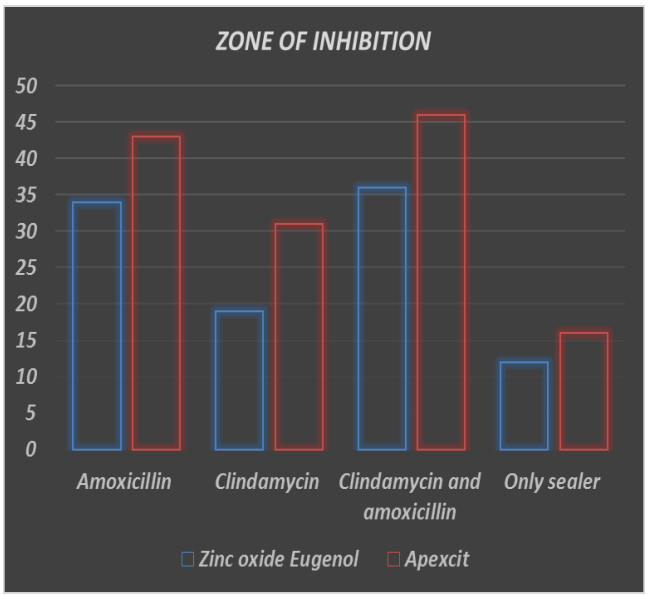

Figure 4: The zone of inhibition caused by using amoxicillin and Clindamycin as antibiotic

Kaplan and others[11] have stated that the most effective antimicrobial sealers contain eugenol and formaldehyde. Root canal sealers with integrated calcium hydroxide, such as Sealapex, apexcit have enhanced antibacterial activity[12]. The antimicrobial effect of this sealer is produced by the release of hydroxyl ions, which increases the pH above 12.5. In the present study, it is stated that apexcit has more anti-microbial activity than zinc oxide Eugenol.

Table 1: shows zones of inhibition using zinc oxide Eugenol with antibiotic combination

Zinc oxide eugenol	Zone of inhibition (mm)
Zinc oxide eugenol+ clindamycin	19
Zinc oxide eugenol+ Amoxicillin	34
Zinc oxide eugenol + clindamycin + amoxicillin	36
Zinc oxide eugenol	12

Table 2: shows the zone of inhibition using apexcit sealer with antibiotic combination

Apexcit sealer	Zone of inhibition (mm)
Apexcit + Clindamycin	31
Apexcit+ amoxicillin	43
Apexcit+ amoxicillin+ Clindamycin	46
Apexcit	16

In a study by Razmi et al[13] and Holescher et al[10] the mean diameter of the zone of inhibition of amoxicillin in sealer-antibiotic combination was larger than any other sealer antibiotic combinations and in the current study also sealer–amoxicillin showed the greatest zone of inhibition which was higher as compared to all other sealer-antibiotic combinations. Further it has been reported that average zone of inhibition of amoxicillin to be 31.6mm[10], in this study the average zone of inhibition of apexcit sealer – amoxicillin is 43 mm and for zinc oxide Eugenol-amoxicillin is 34mm. In this study, it is revealed that when the antibiotic like (amoxicillin and Clindamycin) is added to apexcit and zinc oxide Eugenol sealer it enhanced the anti-microbial activity against E. Faecalis.

CONCLUSION

All antibiotic agents when added to Endodontic sealer showed increased antibacterial activity against *Enterococcus faecalis*. All the sealer-amoxicillin combination showed the maximum zone of inhibition than the sealer – Clindamycin combination. In the present study, we conclude that apexcit sealer has increased antibacterial effect than zinc oxide Eugenol as a sealer.

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