

Received on 24 June 2016; received in revised form, 12 September 2016; accepted, 19 September 2016; published 30 September 2016

ANTIMICROBIAL ACTIVITY OF ROOT CANAL SEALER- ANTIBIOTIC COMBINATION ON ENTEROCOCCUS FEACALIS - IN- VITRO STUDY

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ABSTRACT: Aim and objective: The aim of the *in-vitro* study is to evaluate the Antimicrobial activity of root canal sealant- antibiotic combination on *Enterococcus faecalis*. **Background:** 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. **Methodology:** The antimicrobial activity of root canal sealer- antibiotic combination on *Enterococcus faecalis* was tested agar well diffusion method. **Results:** Both the sealers tested in combination with clindamycin and amoxicillin showed greater zone of inhibition when compared with sealer with single antibiotic combination.

Keywords: Anti microbial, Antibiotic, Diffusion method

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INTRODUCTION: Elimination of microorganisms from the root canal system is one of the most important objectives of RCT¹. *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 the 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 materials⁴. Endodontic sealers are used to prevent periapical exudates from diffusing into unfilled part of the root canal and to prevent residual bacteria from reaching periapical tissues⁵. 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.

The main advantage of the 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.

	<p>DOI: 10.13040/IJPSR.0975-8232.IJLSR.2(9).145-48</p>
	<p>The article can be accessed online on www.ijlsr.com</p>
<p>DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJLSR.2(9).145-48</p>	

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 antimicrobial 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 min 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 the 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 according to the manufacturer’s instructions.

The plates were incubated aerobically at 37 degree Celsius for 24 h. Mean zone of inhibition of all the sealer antibiotic combinations were measured.

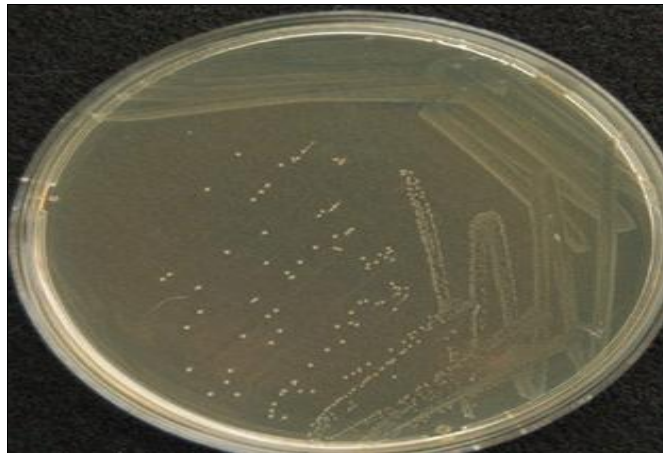


FIG. 1: ENTEROCOCCUS FAECALIS STOCK USING CULTURE

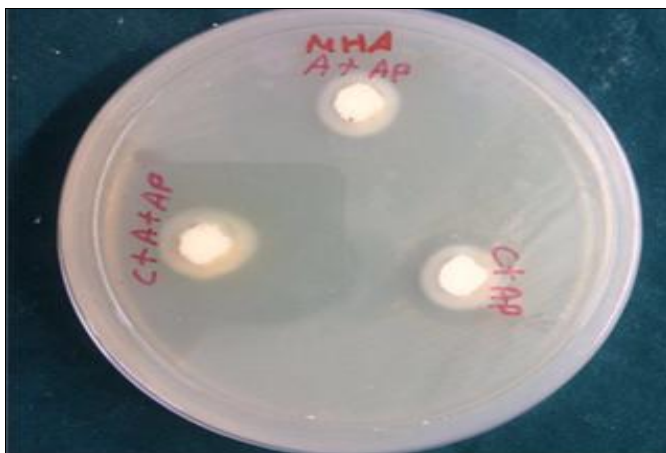


FIG. 2: ZONE OF INHIBITION SHOWN ON ZINC OXIDE EUGENOL



FIG. 3: ZONE OF INHIBITION SHOWN ON USING APEXCIT SEALER

RESULTS AND DISCUSSION: The antimicrobial 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 an antibiotic.

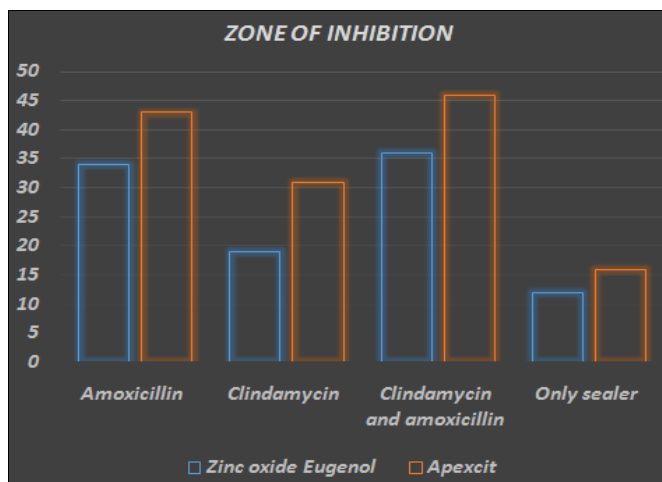
Similarly with apexcit combined with clindamycin and amoxicillin showed a zone of inhibition of (46 mm).

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

**FIG. 4: SHOWS THE ZONE OF INHIBITION CAUSED BY USING AMOXICILLIN AND CLINDAMYCIN AS ANTIBIOTIC**

Multiple factors contribute to the endodontic failures, which include intra radicular infection, extra radicular 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 also 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 the formation of the 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. 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 antimicrobial activity than zinc oxide Eugenol. 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 31.6 mm ¹⁰, in this study the average zone of inhibition of apexcit sealer - amoxicillin is 43 mm and for zinc oxide Eugenol-amoxicillin is 34 mm. 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 antimicrobial 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.

ACKNOWLEDGEMENT: Nil

CONFLICT OF INTEREST: Nil

REFERENCES:

- Gomes BP, Drucker DB and Lilley JD: Associations of specific bacteria with some endodontic signs and symptoms. Int Endod J 1994; 27: 291-8.

2. Sundqvist G, Figdor D, Persson S and Sjögren U: Microbiologic analysis of teeth with failed endodontic treatment and the outcome of conservative re-treatment. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998; 85: 86-93.
3. Bystrom A and Sundqvist G: The antibacterial action of sodium hypochlorite and EDTA in 60 cases of endodontic therapy. *Int Endod J* 1985; 18: 35-40.
4. Shrestha S and Mala K: Evaluation of sealing ability of a root canal sealer with various antibiotic additives: An *in-vitro* study. *J. Interdiscip Dentistry* 2013; 3: 21-24.
5. Evaluation of efficacy of combinations of five endodontic sealers with five antibiotics against *Enterococcus Faecalis*—An *in-vitro* study Deepak Sharma, Rohit Grover., Prasanth Sai Pinnameneni, Subhra Dey, P Ramakrishnan Raju. *Journal of International Oral Health* 2014; 6(2):90-95
6. Haapasalo HK, Siren EK, Waltimo TM, Orstavik D and Haapasalo MP: Inactivation of local root canal medicaments by dentine: an *in-vitro* study. *Int Endod J* 2000; 33: 126-31.
7. Bauer AW, Kirby WM, Sherris JC and Turck M: Antibiotic susceptibility testing by a standardized single disc method. *Am J Clin Pathol* 1966; 45: 493-6.
8. Fabricius L, Dahlen G, Holm SE and Moller AJ: Influence of combinations of oral bacteria on periapical tissues of monkeys. *Scand J Dent Res* 1982; 90(3): 200-6.
9. Molander A, Reit C, Dahlen G and Kvist T: Microbiological status of root-filled teeth with apical periodontitis. *Int Endod J* 1998; 31: 1-7.
10. Hoelscher AA, Bahcall JK and Maki JS: *In-vitro* evaluation of antimicrobial effects of root canal sealer–antibiotic combination against *Enterococcus faecalis*. *J Endod* 2006; 32: 145-7.
11. Kaplan AE, Picca M, Gonzalez MI, Macchi RL and Molgatini SL: Antimicrobial effect of six endodontic sealers: an *in-vitro* evaluation. *Endod Dent Traumatol* 1999; 15(1): 42-5.
12. Sjogren U, Figdor D, Spangberg L and Sundqvist G: The antimicrobial effect of calcium hydroxide as a short-term intracanal dressing. *Int Endod J* 1991; 24(3): 119-25.
13. Razmi H, Yazdi KA, Jabalameli F and Parvizi S: Antimicrobial effects of AH26 sealer /antibiotic combinations against *Enterococcus faecalis*. *Iran Endod J* 2008; 3: 103-8.

How to cite this article:

Vidulasri N and Geetha RV: Antimicrobial activity of root canal sealer- antibiotic combination on *Enterococcus faecalis* - *in-vitro* study. *Int J Life Sci & Rev* 2016; 2(9): 145-48. doi: 10.13040/IJPSR.0975-8232.IJLSR.2(9).145-48.

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