

## Comparative Evaluation of Sodium Hypochlorite, Omeprazole With Sodium Hypochlorite and Triclosan - A Randomized Controlled Clinical Trial

Research Article

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### Abstract

**Introduction:** The success of endodontic treatment depends on the complete removal of microbes from the root-canal system and prevention of reinfection. The root canal is shaped with hand and rotary instruments under copious irrigation to remove the infected tissue, microbes/biofilm, and other debris from the root-canal space.

**Aim:** The purpose of this study was to evaluate and compare the antibacterial efficacy of Omeprazole with Sodium hypochlorite, Sodium hypochlorite and Triclosan irrigation in infected root canals.

**Materials and Methods:** In a prospective randomized clinical trial, 132 patients were selected with mean age between 18 and 60 years according to inclusion and exclusion criteria and base line scores were recorded. Based on block randomization patients were divided in to Group I 5% Sodium hypochlorite (n=44), Group II Omeprazole with 5% Sodium Hypochlorite (n=44) and Group III Triclosan (n=44). After routine root canal preparation, in Group I, Group II, Group III irrigants were delivered using endodontic needle inside the canal 2mm short of apex. Pre and postoperative samples were taken using paper point. Anaerobic culture has been done and number of colony forming units was counted and antibacterial efficacy was statistically analysed.

**Results:** All the three tested irrigants showed reduction in bacterial growth but the results were not statistically significant.

**Conclusion:** Within the limitations of this study, there is no statistical difference between the three irrigants used.

**Keywords:** Omeprazole; Root Canal Irrigants; Root Canal Flora; Sodium Hypochlorite; Triclosan.

### Introduction

The pulpal and periapical lesion is known to be caused by the bacteria present in the caries infected tooth. Various species of bacteria have been isolated from the infected root canal. Even the presence of facultative aerobic bacteria has been demonstrated. Therefore the success of endodontic therapy depends on thorough cleaning, shaping and obturation of the root canal system in a three dimensional manner [1]. The prevention of reinfection of the canals must be the main objective of the root canal treatment [2]. The canals are cleaned, shaped using hand, rotary files under copious irrigation to remove the infected pulp tissue, microbes and other debris. There are many areas in the root canal system which are untouched during cleaning and shaping [3-5]. Studies have been done using computed tomography scanning

which has demonstrated that most of the areas in the root canal remain untouched by the instruments that are used to clean the canal [6]. Therefore the importance of other means of cleaning and disinfecting the root canals is emphasized. Chemical means of using irrigating solutions play an important role in disinfecting the root canal as the solutions can penetrate areas that are difficult to be reached by the instruments [7]. To achieve this goal not a single irrigant meets all the ideal requirements of an irrigant[8]. Sodium hypochlorite has been in use a root canal irrigant for the past seven decades as it has the ability to dissolve the necrotic pulp tissue. But it had other undesirable effects like toxicity and irritation to the periapical tissues. Sole use of sodium hypochlorite alone does not meet all the requirements of root canal irrigants so it has been tried in combination with other irrigants.

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In a study Omeprazole a proton pump inhibitor was used along with  $\text{Ca}(\text{OH})_2$  which showed promising antibacterial activity in comparison with conventional  $\text{Ca}(\text{OH})_2$  dressing [9]. Triclosan is a broad-spectrum antimicrobial agent, which is commonly used in mouthwashes, has never been tried as a root canal irrigant. The aim of this study is to compare and evaluate the antibacterial efficacy of three root canal irrigants Sodium hypochlorite, Omeprazole with Sodium hypochlorite and Triclosan.

### Null Hypothesis ( $H_0$ )

There is no significant difference in the antibacterial efficacy of three root canal irrigants Sodium Hypochlorite, Omeprazole with Sodium Hypochlorite and Triclosan.

### Alternate Hypothesis ( $H_a$ )

There is a significant difference in the antibacterial efficacy of three root canal irrigants Sodium Hypochlorite, Omeprazole with Sodium Hypochlorite and Triclosan.

## Materials and Methods

Approval for the project was obtained from the Institutional Review Board of Saveetha University, Chennai, India [SRB Ref No: SRB/SDMDS12ORT55].

### Inclusion Criteria

1. Age group of 18-70 years who signed the informed consent.
2. Patient requiring endodontic therapy.
3. Molars that were diagnosed as non-vital.

### Exclusion Criteria

1. Patient who are medically compromised
2. Pregnant patients
3. Teeth with incomplete apex formation
4. Teeth with calcified canals
5. Sinus opening
6. Periapical abscess
7. Patients on antibiotic therapy

One hundred and thirty two volunteer patients fitting the inclusion criteria were included in the study. The study participants were recruited from the pool of patients in the Department of Conservative Dentistry and Endodontics at Saveetha Dental College, Saveetha University, Chennai, India.

### Treatment Procedure

Prior to the treatment, a careful medical and dental history was taken. Preoperative data for each patient was recorded in the pre-designed patient's chart which includes age, sex, and tooth number prior to the treatment. The treatment and the study design were explained to the qualifying patients and informed consent was obtained from the voluntary patients who were willing to participate in the study. Patients who signed the informed consent were randomly divided into 3 groups.

Group I - 5% Sodium Hypochlorite

Group II – 5% Sodium Hypochlorite with 8.5% Omeprazole  
Group III - Triclosan

The antibacterial efficacy was evaluated by culturing the paper points in nutrient growth media and counting the number of colony forming units formed.

### Endodontic Protocol

All the treatment was carried out by a multiple operator. Vitality was checked for the teeth. All the patients received a local anesthesia (Lidfast; India). Each tooth was isolated using rubber dam and the access cavity was prepared using sterile carbide burs under an operating microscope (Carl Zeiss). Access of the tooth is done using Endo access bur size 2 (Dentsply). A working length was determined with stainless steel hand K- files size #10 (Mani, Tochigi, Japan) and the use of an apex locator (PropexPixi, Dentsply). It was confirmed using intra oral periapical radiographs and it was repeatedly checked throughout the procedure.

Canals were than preflared using Gates Glidden drills upto size 2 and prepared in a crown down technique.

Preparation started with initial 10 size 0.04% file, and all the instruments were used to the full sequence upto 25 size 0.06% file and to the full working length as recommended by the manufacturer. All the canals were prepared using Hero shaper rotary files (Micro Mega, France) with 25 size .04 and .06 taper file 1mm short of apex following manufacturer's suggested sequence using reduction gear hand piece powered by an electric motor (X-Smart; Dentsply). Apical patency was maintained throughout the shaping procedure using #10 file between each instrument.

### Irrigation Protocol

Prior to cleaning and shaping the pre instrumentation sample (C1) was collected using a sterile paper point. The tooth undergoing root canal treatment in group I were irrigated with 5% sodium hypochlorite. Tooth undergoing root canal treatment in group II were irrigated with 8.5% omeprazole pellets mixed with 5% sodium hypochlorite and the tooth in group III were irrigated using Triclosan. 99.99% Triclosan was freshly prepared by using 6.0mg of 99.99% triclosan in 1mL of 99.99% ethanol and 1mL of distilled water. During the whole preparation procedure the irrigants was delivered with a conventional endodontic syringe (open ended) with 27 gauge needle 2mm short of apex. After completion of preparation post instrumentation sample (C2) was taken using a sterile paper point and transferred to a test tube with 1ml of thioglycollate broth.

### Laboratory procedure

The paper point that was used to collect the sample was removed and from the solution 10  $\mu\text{l}$  was transferred to blood agar plate (Hi-Media, Mumbai) and incubated inside the Gas pack chamber (Hi-Media, Mumbai) for 24 hours at 37°C. After incubation the antibacterial efficacy of the root canal irrigants were evaluated by counting the number of colony forming units formed.

### Statistical Analysis

Data were analysed using Kolmogorov-Smirnov, Kruskal-Wallis test using SPSS 22.0 software.

## Results and Discussion

Table 1 shows the mean values, standard deviation and percentage of the three groups. It shows increased percentage reduction of bacterial growth in all three groups.

Table 2 shows no statistically significant difference in antibacterial efficacy between the three groups.

Eradication of microbial infection from the root canal will lead to a successful endodontic treatment [10]. The necrotic pulp tissue of a primary root canal infection has an average of 4-7 intracanal species which are often gram negative anaerobes [11].

Only teeth with intact pulp chamber walls confirmed by radiographs, necrotic pulps as confirmed by negative response to sensitivity pulp tests were included in this study. Subjects under antimicrobial therapy were not included in this study as it can interfere with the results of this study. Pregnant patients and subjects with systemic complications were also excluded from the study.

Chemomechanical preparation is one of the most important phases of endodontic treatment wherein the root canal system is disinfected with the help of the irrigants being employed during cleaning and shaping. The purpose of shaping is to

- 1) Facilitate cleaning
- 2) Provide space for placing the obturating materials.

All the canals were prepared using Hero shaper rotary files with 25 size .04 and .06 taper file 1mm short of apex in a crown down manner. The most significant property of HERO Shaper is the modified file design. The helix angle has been changed on the cutting edge and it shows a gradual increase starting from the tip

**Table 1. The Table depicting the Mean, Standard Deviation and Percentage Reduction of the three groups before and after treatment. It shows increased percentage reduction of bacterial growth in all three groups.**

Variable	Statistic	Group			
		Group -I	Group -II	Group -III	Total
Before Treatment	N	44	44	44	132
	Mean	2540.25	2615.36	2723.32	2626.31
	Std. Dev	2316.78	1949.99	2012.49	2084.49
	1st Quartile	176.00	905.00	750.00	645.00
	Median	1400.00	2800.00	3000.00	2700.00
	3rd Quartile	4900.00	4300.00	4500.00	4500.00
After Treatment	N	44	44	44	132
	Mean	11.00	10.00	9.09	10.03
	Std. Dev	12.88	18.19	9.98	14.01
	1st Quartile	2.00	1.00	3.00	2.00
	Median	8.00	3.00	6.00	5.50
	3rd Quartile	14.00	10.00	10.00	12.00
Percentage Reduction	N	44	44	44	132
	Mean	96.77	96.95	97.98	97.23
	Std. Dev	10.58	7.59	4.71	7.95
	1st Quartile	98.72	99.33	98.81	98.81
	Median	99.70	99.81	99.75	99.78
	3rd Quartile	99.96	99.95	99.90	99.91

**Table 2. Kruskal-Wallis Test to compare between groups. The table shows no statistically significant difference between the three groups since the P-Value is not less than 0.05. (Statistically Significant if P-Value < 0.05).**

Variable	Group	N	Mean Rank	P-Value
Before Treatment	Group -I	44	63.76	0.84
	Group -II	44	67.47	
	Group -III	44	68.27	
After Treatment	Group -I	44	71.17	0.251
	Group -II	44	58.76	
	Group -III	44	69.57	
Percentage Reduction	Group -I	44	65.42	0.473
	Group -II	44	71.93	
	Group -III	44	62.15	

of the instrument along the working length. The shortened metallic shafts allow a better working ability in the posterior region. In vitro studies, compared the amount of debris extrusion in curved canals, which showed that, HERO shaper has less extrusion of debris when compared to protaper rotary instrument [12]. Mechanical preparation cannot effectively eliminate bacteria from the root canal system [13, 14]. Irrigants are used during endodontic treatment to flush out inflamed and necrotic tissue, microbes/biofilm and other debris from the root-canal space [15]. During irrigation there is possibility of irrigant going beyond the apex in necrotic cases [16], so care was taken by irrigating the canal 2mm short of the working length.

In vitro studies have shown sodium hypochlorite solution lethal to many root canal microbial flora including *E. faecalis* yet when *E. faecalis* infected dentin is exposed to sodium hypochlorite solution, some cells of *faecalis* survived [17]. Besides being the desired irrigant of choice in endodontics, sodium hypochlorite alone does not meet all the ideal requirements of the irrigants. Therefore, the hunt for other irrigants with similar or better properties than sodium hypochlorite began.

The use of omeprazole has never been tested in endodontics clinically therefore; this study was designed considering previous evidence on the relevance of a proton pump for the survival of bacteria resistant to endodontic treatment [18]. Proton pump inhibitors not only aid in reducing the secretion of gastric acid but also increase the bacterial sensitivity to antibiotics [19]. Omeprazole was found to inhibit neutrophil migration and the formation of reactive oxygen species besides inhibiting the production of proinflammatory cytokines [20]. It was also shown that, omeprazole is able to inhibit bone resorption *in vitro* [21].

The other irrigant used in this study is the triclosan; it is a broad-spectrum antimicrobial agent, which is active against gram positive, and gram negative bacteria as well as some fungi and viruses [22]. Triclosan is a potent inhibitor and therefore, a very small quantity is required to produce powerful antibacterial action [23].

A culture-dependent approach was used in the present investigation to assess the antimicrobial effectiveness of the irrigants. Blood Agar the most commonly used medium was used in this study. 5-10% defibrinated sheep's blood is added to melted agar at 45-50°C. Blood acts as an enrichment material and also as an indicator. Certain bacteria when grown in blood agar produce haemolysis around their colonies.

The result from this study proves that all the irrigants used in this study were effective in eliminating the bacterial growth. Therefore, Null Hypothesis was accepted. Although there was no significant differences between the three irrigants employed in this study it can be proved that triclosan and omeprazole mixed with sodium hypochlorite can be used as an alternative to sodium hypochlorite alone because of its undesirable effects it has on the periapical tissues. Furthermore, much research had been carried out in this regard [24-38].

## Conclusion

Within the limitations of this study,

All three irrigants used in this study showed significant reduction of bacterial growth. Omeprazole with Sodium hypochlorite showed better antibacterial efficacy than sodium hypochlorite but the results were not statistically significant. Triclosan showed better antibacterial efficacy when compared to the other two groups but the results were not statistically significant. All the three groups can be used as root canal Irrigants to reduce the bacterial growth.

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