

## Original Article

### Antimicrobial Activity of 5% Chlorhexidine used as a Root Canal Irrigating Solution

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#### ABSTRACT:

**Background:** Different Ex vivo and in vivo studies show that mere mechanical preparation of the canals can leave the walls non instrumented. Chlorhexidine is a widely used irrigant solution that was developed in the year 1940s at United Kingdom. The present study was conducted to determine the effectiveness of 5% chlorhexidine solution. **Materials and methods:** The present prospective study was conducted in the department of endodontics for the period of 6 months. Sub culturing of all the micro organisms was done on apt culture media and under appropriate conditions. After the intubation period, growth inhibition zone was regarded as the shortest distance in mm from the outside margin of the stainless steel tube to the initial start of microbial growth. All the data thus obtained was arranged in a tabulated form and analysed statistically. **Results:** The areas of inhibition of S. Aureus for 1% chlorhexidine were 9.34 mm, for 2% chlorhexidine was 9.68 mm and for 5% chlorhexidine was 9.99mm. The areas of inhibition of S. sanguis for 1% chlorhexidine were 8.03 mm, for 2% chlorhexidine was 8.34 mm and for 5% chlorhexidine was 8.96 mm. **Conclusion:** From the above study it can be concluded that efficacy of 5% chlorhexidine as an irrigating solution is similar to 2% chlorhexidine solution.

**Key words:** Antimicrobial, chlorhexidine, irrigating.

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#### INTRODUCTION

Microorganisms have a crucial role in the etiopathogenesis of periapical lesions.<sup>1-3</sup> But, removal of bacteria from the infected root canal is a tedious task that needs the usage of different instrumentation techniques, irrigant devices, and intracanal medicaments. This is due to the complicated and unpredictable curvature of the canal system that mechanical preparation of the root canal is not enough to safeguard that a canal is bacteria free.<sup>4</sup> Different Ex vivo and in vivo studies show that mere mechanical preparation of the canals can leave the walls non instrumented<sup>5</sup> and also instrumentation unaccompanied is not able to totally eradicate the microorganisms.<sup>6</sup> Effectiveness of bio-mechanical preparation can be enhanced by the use of appropriate irrigants those are the medicated fluids that wash the canals. There are various irrigants in endodontic practice like chlorhexidine, hypochlorite, normal saline, hydrogen peroxide etc. Chlorhexidine is a widely used irrigant solution that was developed in the year 1940s at United Kingdom.<sup>7</sup> It is hydrophobic and lipophilic in nature that interacts with the lipopolysaccharides and phospholipids

of the bacteria's cell membrane.<sup>8</sup> The present study was conducted to determine the effectiveness of 5% chlorhexidine solution.

#### MATERIALS AND METHODS

The present prospective study was conducted in the department of endodontics for the period of 6 months. The study consisted of 6 microbial species that were commonly isolated, those were *Staphylococcus aureus*, *Enterococcus faecalis*, *Streptococcus sanguis*, *Porphyromonas gingivalis*, *P. endodontalis* and *Prevotella intermedia*. Each strain of the micro organism was evaluated against the commonly used endodontic irrigants like 1% chlorhexidine, 2% chlorhexidine and 5% chlorhexidine. Saline was used as a control medium. Sub culturing of all the micro organisms was done on apt culture media and under appropriate conditions. The facultative micro organisms were inoculated in tubes that had 0.85% of saline suspension. Around 500 uL of microbial suspension were inoculated into flasks containing 50 ml of Brain heart infusion agar and poured into Mueller Hinton agar plates. For anaerobes

inoculation was done onto plates containing 5% sheep blood fastidious agar. The inoculation was sufficient to provide semi-confluent growth of the micro organisms. The stainless steel tubes were filled onto media surface and filled with around 50uL of the test solution that was followed by incubation at 37 degree Celsius under appropriate condition. After the incubation period, growth inhibition zone was regarded as the shortest distance in mm from the outside margin of the stainless steel tube to the initial start of microbial growth. All the data thus obtained was arranged in a tabulated form and analysed statistically.

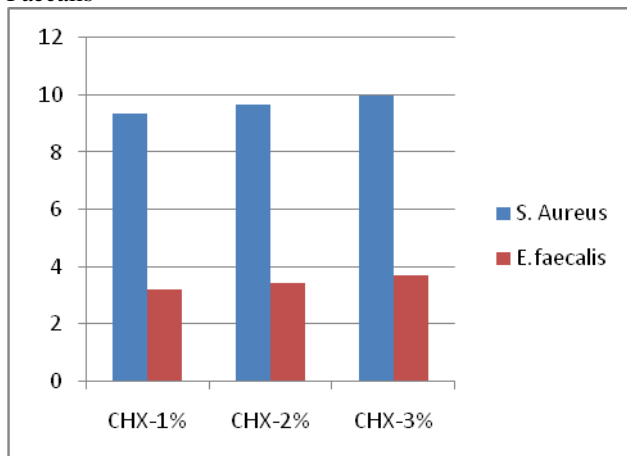
**RESULTS**

Table 1 and graph 1 shows the mean areas of inhibition of microbial growth. The areas of inhibition of *S. Aureus* for 1% chlorhexidine were 9.34 mm, for 2% chlorhexidine was 9.68 mm and for 5% chlorhexidine was 9.99mm. The areas of inhibition of *E. faecalis* for 1% chlorhexidine were 3.18 mm, for 2% chlorhexidine was 3.40 mm and for 5% chlorhexidine was 3.70 mm. The areas of inhibition of *p. ginigivalis* for 1% chlorhexidine were 17.83 mm, for 2% chlorhexidine was 20.45 mm and for 5% chlorhexidine was 21.89 mm. The areas of inhibition of *P. endodontalis* for 1% chlorhexidine were 13.67 mm, for 2% chlorhexidine was 17.89 mm and for 5% chlorhexidine was 19.30 mm. The areas of inhibition of *P. intermedia* for 1% chlorhexidine were 20.21 mm, for 2% chlorhexidine was 20.32 mm and for 5% chlorhexidine was 21.09 mm. The areas of inhibition of *S. sanguis* for 1% chlorhexidine were 8.03 mm, for 2% chlorhexidine was 8.34 mm and for 5% chlorhexidine was 8.96 mm.

Table 1: Mean areas of inhibition of microbial growth

Micro organism	CHX-1%	CHX-2%	CHX-5%
<i>S. aureus</i>	9.34	9.68	9.99
<i>E. faecalis</i>	3.18	3.40	3.70
<i>p. ginigivalis</i>	17.83	20.45	21.89
<i>P. endodontalis</i>	13.67	17.89	19.30
<i>P. intermedia</i>	20.21	20.32	21.09
<i>S. sanguis</i>	8.03	8.34	8.96

Graph 1: Mean areas of inhibition of *S. Aureus* and *E. Faecalis*



**DISCUSSION**

One of the prime and crucial objectives during the nonsurgical Endodontic treatment is disinfection of the complete root canals before one can proceed for obturation.<sup>9</sup> Endodontic treatment chiefly involves removing the potentially noxious stimuli from the complicated root canal system. This management is more challenging when the root canals are infected. During this time what can come to rescue are the irrigating solutions. Irrigants also serve an additional benefit of lubricating the canals during instrumentation. Due to this, a variety of irrigating solutions have been introduced in the field of endodontics.<sup>10</sup> Sodium hypochlorite is an endodontic irrigant that has antimicrobial and tissue dissolving capacity. Few side effects associated with hypochlorite include pungent smell, local tissue toxicity and corrosion of the dental instruments. Due to these side effects, there was a need to introduce another irrigant that was patient friendly. Chlorhexidine gluconate served these ideal characteristics<sup>11</sup>. Chlorhexidine is a broad spectrum irrigant with antibacterial actions. Irrigation using 2% Chlorhexidine solution has shown antimicrobial activity with effects lasting for 48 hours. In our study, the areas of inhibition of *S. Aureus* for 1% chlorhexidine were 9.34 mm, for 2% chlorhexidine was 9.68 mm and for 5% chlorhexidine was 9.99 mm. The areas of inhibition of *E. faecalis* for 1% chlorhexidine were 3.18 mm, for 2% chlorhexidine was 3.40 mm and for 5% chlorhexidine was 3.70 mm. The areas of inhibition of *p. ginigivalis* for 1% chlorhexidine were 17.83 mm, for 2% chlorhexidine was 20.45 mm and for 5% chlorhexidine was 21.89 mm. The areas of inhibition of *P. endodontalis* for 1% chlorhexidine were 13.67 mm, for 2% chlorhexidine was 17.89 mm and for 5% chlorhexidine was 19.30 mm. The areas of inhibition of *P. intermedia* for 1% chlorhexidine were 20.21 mm, for 2% chlorhexidine was 20.32 mm and for 5% chlorhexidine was 21.09 mm. The areas of inhibition of *S. sanguis* for 1% chlorhexidine were 8.03 mm, for 2% chlorhexidine was 8.34 mm and for 5% chlorhexidine was 8.96 mm. It acts as an excellent alternative amongst subjects allergic to sodium hypochlorite. In the ongoing study, modified agar diffusion Substance test was used that is widely used for assessment of the antimicrobial activity of different endodontic substances *in vitro*.<sup>12</sup> Delany et al.<sup>13</sup> evaluated the 0.2% chlorhexidine gluconate irrigating solution in extracted Teeth and found that this concentration can be used effectively as either an irrigant solution or as an intracanal medicament. The results of the ongoing study was in accordance with that conducted by Ohara et al.<sup>14</sup>

**CONCLUSION**

From the above study it can be concluded that efficacy of 5% chlorhexidine as an irrigating solution is similar to 2% chlorhexidine solution. There is no much significant difference in the antimicrobial efficacy of the two. But its antimicrobial efficacy is much more than that of 1% chlorhexidine solution.

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