

Comparative Evaluation Of Anti – Bacterial Efficacy Of Sodium Hypochlorite And Carbolic Acid Against Enterococcus Faecalis As Root Canal Irrigant

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Abstract: Background: Elimination of microorganisms from infected root canal is a complicated & difficult task. Elimination or sufficient reduction of irritants, microorganisms and prevention of recontamination of the root canal after the treatment is the essential factor for successes of the treatment. Methods: Following materials required for this study i.e. 36 teeth prepared for root canal inoculation, Enterococcus faecalis strain, 5 % and 10 % carbolic acid solution, 5.25 % sodium hypochlorite solution, phosphate buffer saline and normal saline solution. An overnight subculture plate of E.faecalis was taken for inoculum preparation and uniform suspension made in normal saline (02 ml) by taking up isolated colonies and adjusted to 0.5 McFarland standard which gives 1.5×10^8 cfu / ml. Result and Conclusion: From this study, we can conclude that 5.25 % NaOCl is one of the superior and successful endodontic irrigant against 5 % and 10% carbolic acid. In our study, result shows that sodium hypochlorite solution is superior to carbolic acid solution. However, as this study is in vitro study, not simulate the oral environment; further few clinical studies are required in evaluation of antimicrobial efficacy of these solutions for predictable and successful endodontic outcome. [Soni R NJIRM 2016; 7(1):101-103]

Key Words: Sodium Hypochlorite (NaOCl), E.Faecalis, Root Canal Irrigant.

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Introduction: one of the most important objectives of endodontic therapy is the complete elimination of microorganisms from the root canal system. Failure of root canal treatment is likely to be caused by the incomplete elimination of bacteria responsible for refractory endodontic infection. Bacteria are the preliminary etiological factor which develops the pulpal and peri apical pathosis. Facultative bacteria such as Enterococcus faecalis isolated from infected root canals and may be related to the failure of the endodontic treatment.

Although chemo-mechanical preparation of root canal system is able to reduce the number of bacteria, complete canal disinfection is very difficult due to internal complexity of the root canal structure. Thus irrigants are used during endodontic treatment, to flush out the loos debris, to lubricate the dentinal walls, to dissolve organic matters in canal and to have antimicrobial effect. Carbolic acid, as an antiseptic, styptic, stimulant and sedative had been used as a valuable agent in dental therapeutics. Previously it was applied to carious dentine, to obtund sensibility and arrest putrefactive changes in devitalised structure and to coagulate the albuminous factor at the end of dentinal tubuli. So the aim of this study is to determine the antimicrobial efficacy of different concentration of carbolic acid i.e.5% and 10 %, as

an irrigant against E.Faecalis as compared to the traditional 5.25% sodium hypochlorite irrigating solution.

Material and Methods: Following materials required for this study i.e. 36 teeth prepared for root canal inoculation, Enterococcus faecalis strain, 5 % and 10 % carbolic acid solution, 5.25 % sodium hypochlorite solution, phosphate buffer saline and normal saline solution.

An overnight subculture plate of E.faecalis was taken for inoculum preparation and uniform suspension made in normal saline (02 ml) by taking up isolated colonies and adjusted to 0.5 McFarland standard which gives 1.5×10^8 cfu / ml.

Then 36 teeth prepared for root canal inoculation taken in a sterile Petri dish and surface of roots were sealed with nail polish before bacterial inoculation. 50 μ l of E. Faecalis inoculums was injected into canal using a tuberculin syringe and these teeth were incubated in a sterile Petri dish at 37 °C for 72 hours and were divided into 03 groups.

- I. 5 % carbolic acid.
- II. 10 % carbolic acid
- III. 5.25 % sodium hypochlorite.

Each group of 12 teeth were inoculated with uniform suspension of E.faecalis and incubated at

37 °C for 72 hours. After the end of incubation period of 72 hours, from each group 9 teeth was irrigated with 5 %, 10 % carbolic acid and 5.25% sodium hypochlorite solution respectively whereas 03 teeth keep as positive control irrigate with normal saline. All these teeth keep at room temperature for 15 minutes and then irrigate with normal saline.

From each group, out of the 9 teeth, sterile paper points from 7 teeth were introduced into tube containing Glucose broth to look for turbidity, so these referred as the turbidity subgroup. This procedure is to check the efficacy of disinfectant. Paper points from the remaining 2 teeth placed in tubes containing Phosphate buffer saline, vortex mixed and plated out for colony calculation, so these referred as colony forming unit (cfu) subgroup. This procedure done to get idea about log reduction of bacteria.

From positive controls, 02 were processed for turbidity and one for colony forming unit.

All the tubes of cfu subunits were mixed and plated out on blood agar and incubated for 37 °C for 72 hours.

Result: in group I (5 % carbolic acid), in the turbidity subgroup both the positive control tubes showed turbidity, whereas teeth exposed to disinfectant only one showed turbidity. In CFU subgroup, positive control yielded 60 colonies and those exposed to disinfectant gave 5 – 25 colonies suggesting almost 1 log reduction.

Table 1: Group I – 5 % carbolic acid solution:

Teeth	1	2	3	4	5	6	7	Positive control	Negative control
turbidity	-	-	-	-	-	-	-	+	+

Teeth	1	2	positive control
Colony unit	05	25	60

In group II (10% carbolic acid), in the turbidity subgroup both the positive control tubes showed turbidity, whereas teeth exposed to disinfectant showed no turbidity. In CFU subgroup, both the positive control showed 25 colonies and those exposed to disinfectant showed 03-29 colonies suggesting almost 0.5 log reduction.

Table 2: Group II – 10 % carbolic acid solution:

Teeth	1	2	3	4	5	6	7	Positive control	Negative control
turbidity	-	-	-	-	-	-	-	+	+

Teeth	1	2	positive control
Colony unit	03	29	25

In group III (5.25 % sodium hypochlorite solution), in the turbidity subgroup both the positive control tubes showed turbidity, whereas teeth exposed to disinfectant showed no turbidity. In CFU subgroup, positive control showed 200 colonies and those exposed to disinfectant showed 02 – 04 colonies suggesting almost 02 log reduction.

Table 3: Group III – 5.25 % sodium hypochlorite solution:

Teeth	1	2	3	4	5	6	7	Positive control	Negative control
turbidity	-	-	-	-	-	-	-	+	+

Teeth	1	2	positive control
Colony unit	02	04	200

Discussion: E. Faecalis is a saprophytic component of the enteric flora, and most commonly isolated in endodontic treatment of apical periodontitis. According to Molander, E.faecalis can survive in silent phase with low metabolic activity for a considerable length of time, and so it is often used in such studies regarding the irrigants efficacy in cleaning the root canal system.

Sodium hypochlorite a proteolytic agent dissolves necrotic material with the help of free chlorine. NaOCl is an efficient organic solvent that causes dentin degeneration because of the dissolution of collagen by the breakdown of the bonds between carbon atoms and disorganization of the proteic primary structure. It forms hypochlorous acid (HOCl) with the contact with organic debris and exerts antimicrobial effect by sulphydryl group’s oxidation and disrupts the microorganisms’ metabolism. Its antimicrobial effect is dependant on the amount of free chlorine available in the solution. It may harm the permanent tooth follicle, peripheral tissues as well as oral mucosa when used as irrigant for deciduous teeth. Though sodium hypochlorite has side effects like pain, swelling, root canal haemorrhage or long term

paresthesia; it remains the most popular and undisputed root canal irrigant.

Carbolic acid is one of the ancient anti microbial agents used in medical science and its various forms like creastin, camphorated phenol and camphorated monochlorophenol like agents have been used in endodontic as root canal irrigants since many decades. In its 1 – 2 % concentration it has optimum antimicrobial effect but up to 30 % concentration it can be used.

Others reported that either 5.25% or 2.5% sodium hypochlorite has the same effect when used in the root canal space. The effectiveness of low concentrations of NaOCl may be improved by using larger volumes of irrigant or leaving the irrigant in the canals for longer periods of time.

The question of whether sodium hypochlorite is equally effective in dissolving vital, non vital or fixed tissue is important since all three types of tissue may be encountered in the root canal system.

Care must be taken with irrigant like sodium hypochlorite to prevent accidents. Sodium hypochlorite can be irritating to the eyes, skin, and mucous membranes. Some practitioners provide protective glasses to their patients to protect their eyes. Also, it can ruin clothing.

Conclusion: From this study, we can conclude that 5.25 % NaOCl is one of the superior and successful endodontic irrigant against 5 % and 10% carbolic acid. In our study, result shows that sodium hypochlorite solution is superior to carbolic acid solution. However, as this study is in vitro study, not simulate the oral environment; further few clinical studies are required in evaluation of antimicrobial efficacy of these solutions for predictable and successful endodontic outcome.

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