

**ROLE OF DIFFERENT IRRIGANTS AND INTRACANAL MEDICAMENTS AGAINST
E.FECALIS: AN IN VITRO STUDY**

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Abstract

The aim of the present article was to evaluate the investigate the antimicrobial activity of 2% Chlorhexidine, 1% NaOCl , Ca(OH)₂ and sterile saline against Enterococcus Faecalis infected dentin after a 7 day interval. In this study 80 premolars extracted for orthodontic purpose were used as specimen. The tooth were standardized to a length of 17 mm, the apices sealed with cyanoacrylate and autoclaved. After with the specimen were autoclaved. They were then transferred to a broth containing E. Faecalis and incubated for 7 days. The chemomechanical preparation of the tooth was done using Race files and the specimens were irrigated with their respective irrigants. The orifices were sealed with cynocarylate and incubated for another 7 days. The coronal end was re accessed and dentinal shaving was collected using a size 5 Gates Glidden drill. The dentinal shaving were cultured and statically analyzed. Results should that though none of the medicaments were able to completely eradicate the bacteria, 2% CHX had the best results, followed by 1% NaOCl followed by Ca(OH)₂. Sterile saline was used as a control.

Keywords: Calcium Hydroxide, Chlorhexidine, E. Faecalis.

Introduction

A through disinfection of the root canal space is of paramount importance with regard to the success of an endodontic treatment¹. Yet this goal seems far from achievable. The complexity of the root canal system and the diversity of the microorganism present make this task difficult. The micro biota in a primary root canal infection is mainly gram negative bacteria but in case of a secondary root canal infection, the number of microorganism

have been limited to a few²⁻⁵. Among these few limited organisms E. Faecalis has always been persistently isolated with regard to root canal treatment failures⁶. In order to overcome the failure, various medicaments and irrigants have been used.

CHX

It is a very potent root canal irrigant and intracanal medicament which is effective against various gram positive and gram negative bacteria^{7,8}. It is also has fungicidal properties⁹. Among the many organisms it

has particularly showed to be effective against E. Faecalis, an organism that has been associated in treatment failures^{10, 11}. It has a prolonged action as it absorbed into the Hydroxyapatite crystals in teeth and slowly released with time¹². This property of substantivity has given chlorhexidine an edge over other antimicrobials.

Calcium Hydroxide

It has been used in endodontics for almost a decade now¹³. It has had its application in many conditions. Among then root canal medicament is also one¹⁴. The high alkaline pH of Ca(OH) creates a hostile environment within the root canal system which results in a decrease in bacterial count¹⁵. The dissociation of Ca (OH) into calcium and hydroxyl ions leads to alkalinization of the root canal is the mechanism associated¹⁶. It also neutralizes the action of bacterial lipopolysaccharides(LPS)¹⁷.

Sodium Hypochlorite

It is one of the routinely used endodontic irrigants. The easy availability, good self life and relative low cost make it the irrigant of choice¹⁸. It has a low viscosity which allows it to easily into the root canal system. Sodium hypochlorite also has the property to dissolve the pulp which helps in better cleaning of the root canal¹⁹. Apart from this it also causes liquefaction of the pulp by reacting with the fatty acids and amino acids of the pulp. Sodium hypochlorite can be used in various concentrations ranging from 0.5 % to 5%. There is no unanimous rule as per what is the ideal concentration of the solution

Material and Methods

In this study the three most commonly used intracanal irrigants were used. Sterile saline was used as the control group. 80 premolars with type 1 canal configuration, extracted for orthodontic treatment were taken as sample. The tooth was sectioned. The length of all specimens was standardized by sectioning the roots at 17 mm from the apex. The length of the tooth was determined with a metallic millimeter scale. An indentation

was made on the crown using a high speed airtor handpiece (NSK, Japan) and then the coronal portion extending more than 18mm was sectioned horizontally with the high speed airtor handpiece (NSK, Japan) and a diamond point no.701U. The final reduction in length was done using a diamond disc. The length was determined by inserting a size 10 K file (Dentsply Maillefer) into the root canal until it was visible at the apex (real length). The working length was established by subtracting 1mm from the real length. The teeth were then sterilized in an autoclave.

Contamination of the Specimen

E. Faecalis was used for the study. It is a gram positive facultative anaerobic bacteria that had been commonly associated with root canal failures. E. faecalis (ATCC 29212) was grown in tryptone soya agar for 24 h. The culture was suspended in 5 mL of TS broth and incubated for 4 h at 37 °C and its turbidity adjusted to 0.5 McFarland standards. The entire specimen were then transferred into a vessel containing the broth and incubated for 7 days. The root apices where sealed with cyanoacrylate to prevent contamination. After 7 days, canals were washed with 10 ml of sterile saline to discard excess of the broth. Once the broth was removed the specimen were divided into their respective groups. Group 1 Saline, Group 2 2% Chlorhexidine, Group 3 Ca(OH)₂ powder, Group 4 1%NaOCl
The instrumentation was done by RaCe (FGK DENTAIRE Swiss Dental Products) instruments as per the manufacturer's instruction for anterior teeth. The total number of instruments used was 9, with repeated recapitulations and constant irrigation. All teeth were irrigated with their respective medicaments. 30ml of irrigant was used per tooth. After the irrigation was over a size 5 Gates Glidden drill was used to collect the dentinal shaving. The samples were then transferred to a sterile TS broth. Similarly the samples were taken from the 7th day. The samples were incubated for 48

hours. After which growth of the colonies in the agar plates was counted and noted.

Statistical Analysis

The data was analyzed using X^2 test to compare and appreciate the difference between the experimental and control group at the end of the 7 days. A value of $P < 0.05$ was considered significant.

Results

Group 2: 2% Chlorhexidine had the best results produced a mean of 3 ± 5 CFU/ml

Group 4: 0.5% NaOCl produced the second best with a mean of 7 ± 10 CFU/ml

Group 3: $\text{Ca}(\text{OH})_2$ followed next with a mean of 20 ± 28 CFU/ml

Group 4: Sterile Saline showed the largest growth of colonies with a mean of 150 ± 200 CFU/ml

The entire three group showed statically difference between ($p < 0.05$) when compared with the control group.

Discussion

The prognosis of root canal treatment is directly related to the ability of the intracanal irrigant or medicament to reduce bacterial populations to levels that are not detected by culture procedures (arguably $< 10^3$ to 10^4 cells)²⁰. Unable to achieve this is often associated failure of the root canal treatment. The microorganism most associated with failure is E. Faecalis. Its presence in the root canal of the control group confirms the presence of the bacteria. In the present study Group 3 showed the least favorable result. Though high alkalinity is the primary reason which renders $\text{Ca}(\text{OH})_2$ to be an effective its pH decreases over a period of time^{21,22-24}. This probably relates to the reason for which E. Faecalis survives the root canal medicament. This could be why $\text{Ca}(\text{OH})_2$ showed least effective after sterile normal saline.

The result showed that, 2% chlorhexidine was showed the least growth of bacteria. The hard tissue binding capacity and its bacterocidal and bacterostatic action could be the factor for the following result. Finally sodium hypochlorite showed the second best

result. NaOCl effectively eliminates microbes, and its antibacterial effectiveness may be a function of concentration and contact time²⁴⁻²⁶.

Conclusion

2% Chlorhexidine showed to be most effective against E. Faecalis followed by 1% NaOCl.

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