

ORIGINAL RESEARCH

Comparative evaluation of efficacy of two different root canal irrigating solutions

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ABSTRACT:

Background: Root canal treatment is performed to eradicate sources of irritation in the root canal and periapical tissues. The use of chemical agents during instrumentation to completely clean all aspects of the root canal system is central to successful endodontic treatment. Hence; the present study was conducted for assessing efficacy of two different root canal irrigating solutions. **Materials & methods:** A total of 45 freshly extracted mandibular first premolars were included. All the specimens were stored in normal saline. Coronal sectioning of all the specimens was done at the level of cement-enamel junction. Biomechanical preparation was done in all the samples. All the specimens were divided into three study groups as follows: Group 1: Physiologic saline, Group 2: 2.5% NaOCl, and Group 3: 10% citric acid followed by 2.5% NaOCl solution. After completion of biomechanical preparation, smear layer scoring was done (scanning electron microscopic evaluation) on a scale of 0 to 5 with 0 indicating no smear layer and 5 indicating heavy non-homogenous smear layer completely covering the root. **Results:** Mean smear layer score among specimens group A, Group B and Group C was 5, 4.12 and 2.39 respectively. Significant results were obtained while comparing the mean smear layer score among the specimens of the three study groups. **Conclusion:** From the above results, the authors concluded that 10% citric acid followed by 2.5% NaOCl solution had significantly higher efficacy in comparison to 2.5% NaOCl.

Key words: Root canal irrigation, Root canal therapy

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INTRODUCTION

Root canal treatment is performed to eradicate sources of irritation in the root canal and periapical tissues. The goal of root canal treatment is the total elimination of bacteria in infected root canals to prevent re-infection during and after treatment and restoration of healthy periapical tissue. Elimination of microorganisms from infected root canals is a complicated task. The chances of a favourable outcome with root canal treatment are significantly higher if infection is eradicated effectively before the root canal system is obturated. However, if microorganisms persist at the time of obturation, or if they penetrate into the canal after obturation, there is a high risk of treatment failure.¹⁻³ Numerous measures have been described to reduce the number of microorganisms in the root canal system, including the use of various instrumentation techniques, irrigation regimens, and intracanal medicaments. The use of chemical agents during instrumentation to completely clean all aspects of the root

canal system is central to successful endodontic treatment. Irrigation is complementary to instrumentation in facilitating the removal of pulp tissue and/or microorganisms. Irrigation dynamics plays an important role; the effectiveness of irrigation depends on the working mechanism(s) of the irrigant and the ability to bring the irrigant in contact with the microorganisms and tissue debris in the root canal.⁴⁻⁶ Hence; the present study was conducted for assessing efficacy of two different root canal irrigating solutions.

MATERIALS & METHODS

The present study was conducted for assessing efficacy of two different root canal irrigating solutions. A total of 45 freshly extracted mandibular first premolars were included. All the specimens were stored in normal saline. Coronal sectioning of all the specimens was done at the level of cement-enamel junction. Biomechanical preparation was done in all the samples. All the

specimens were divided into three study groups as shown in Table 1. After completion of biomechanical preparation, smear layer scoring was done (scanning electron microscopic evaluation) on a scale of 0 to 5 with 0 indicating no smear layer and 5 indicating heavy non-homogenous smear layer completely covering the root. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS Software. Student t test was used for evaluation of level of significance.

Table 1: Distribution of specimens in different study groups

Group	Number of specimens	Irrigant solution used
Group A	15	Physiologic saline
Group B	15	2.5% NaOCl
Group C	15	10% citric acid followed by 2.5% NaOCl solution.

RESULTS

45 freshly extracted mandibular first premolars were included. All the specimens were stored in normal saline. All the specimens were divided into three study groups as follows: Group 1: Physiologic saline, Group 2: 2.5% Sodium hypochlorite (NaOCl), and Group 3: 10% citric acid followed by 2.5% NaOCl solution. Mean smear layer score among specimens group A, Group B and Group C was 5, 4.12 and 2.39 respectively. Significant results were obtained while comparing the mean smear layer score among the specimens of the three study groups.

Table 2: Mean smear layer score

Group	Mean	SD	p- value
Group A	5.00	0.00	0.00 (Significant)
Group B	4.12	0.66	
Group C	2.39	0.89	

DISCUSSION

A conventional root canal irrigation system is generally a system for the slow delivery of an irrigation solution into the root canal by means of a syringe. Conventional irrigation with positive pressure system using needle instrument is a standard procedure but found to be inadequate to reach the apical third of root canal and the apical with difficult anatomical features. Therefore, new instruments incorporated with different irrigation system are developed through several researches which confirmed that there was an increase in smear layer elimination efficacy after the usage of sonic, laser and negative pressure irrigation systems, with the latter having the best results. Based on a literature review of current endodontic treatment and irrigating interventions, the irrigants are most likely recommended due to their capability to dissolve broad spectrum antibiotic and necrotic pulp. These irrigants also help in dissolving inactive endotoxins which are critical in endodontic treatment and are also known to inhibit or completely dissolve the smear layer.⁷⁻⁹ Hence; the present study was conducted for assessing efficacy of two different root canal irrigating solutions.

In the present study, 45 freshly extracted mandibular first premolars were included. All the specimens were stored in normal saline. All the specimens were divided into three study groups as follows: Group 1: Physiologic saline, Group 2: 2.5% NaOCl, and Group 3: 10% citric acid followed by 2.5% NaOCl solution. Mean smear layer score among specimens group A, Group B and Group C was 5, 4.12 and 2.39 respectively. Salgar A et al compared the efficacy of different irrigating solutions on root canal system and analyzing smear layer using scanning electron microscope (SEM). Fifty mandibular premolars were decoronated and split longitudinally. Each root half was divided into five groups (n = 10): Group I - 3 ml of physiological saline, Group II - 3 ml of 2.5% sodium hypochlorite (NaOCl), Group III - 1 ml of 10% citric acid, Group IV - 2% chlorhexidine (CHX) gluconate (Vishal Dentocare, India), Group V - Largal Ultra (ethylenediaminetetraacetic acid [EDTA] 15% + cetrimide 0.75%), Septodont (Saint-Maur-des-fosses, France), and Group VI - Smear Clear (Sybron Endo, Orange, CA, USA) (17% EDTA, cetrimide, and a special surfactant). Irrigation regimens were performed for 1 min. The presence or absence of smear layer at the coronal, middle, and apical portion of each canal were examined under an SEM. A significant difference (P < 0.001) in smear layer removal between smear clear and Largal Ultra at the apical and middle third of the canal was observed.¹⁰

In the present study, significant results were obtained while comparing the mean smear layer score among the specimens of the three study groups. Abbaszadegan A et al compared the antibacterial activity of 2.5% sodium hypochlorite (NaOCl) and 2% iodine potassium iodide (IKI) solutions as intracanal disinfectant in infected root canals during one-visit endodontic treatment procedure. Thirty single-rooted teeth with necrotic pulps in 27 patients were selected according to specific inclusion/exclusion criteria and divided into two random groups. In group I, canals were irrigated with 2.5% NaOCl during instrumentation and in group II canals were initially irrigated with sterile saline during biomechanical preparation and then exposed to a 5-minute final irrigation with 2% IKI. Bacterial samples were taken before treatment (S1), and at the end of treatment (S2). Bacteria were present in all initial samples. NaOCl was able to significantly reduce the number of colony forming units (CFU) from S1 to S2 in approximately 90% of canals. Only 15% reductions in CFUs occurred after irrigation/instrumentation in group II; this degree of disinfection was not statistically significant.¹¹ Karade P et al compared different endodontic irrigation and activation systems for removal of the intracanal smear layer. Forty recently extracted, non-carious human intact single rooted premolars were selected and divided into five groups (n=10) according to the root canal irrigation systems; syringe and needle irrigation (CTR), sonic irrigation, passive ultrasonic irrigation (PUI) and EndoVac irrigation system. The four groups did not differ from each other in the coronal and mid-root parts of the canal. In the apical part of the canal

none of the methods could completely remove the entire smear layer but EndoVac system showed significantly better removal of smear layer and debris than the other methods.¹²

CONCLUSION

From the above results, the authors concluded that 10% citric acid followed by 2.5% NaOCl solution had significantly higher efficacy in comparison to 2.5% NaOCl.

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