

Original Research

Assessment of efficacy of two root canal irrigation solutions on smear layer removal during root canal therapy: a comparative study

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ABSTRACT:

Background: The successful endodontic treatment depends on comprehensive cleaning and shaping of root canal system. The main objective of the irrigation is for cleansing that does not take place with biomechanical preparation. Accurate debridement of root canals is recommended in most endodontic treatment. Hence; the present study was undertaken for assessing the efficacy of two root canal irrigation solutions on smear layer removal during root canal therapy. **Materials & method:** A total of 20 freshly extracted maxillary second premolars were included. All the samples were divided into 2 study groups with 10 samples in each group. Group A included samples in which 15 percent EDTA was used while Group B included samples in which apple cider vinegar was used. Assessment of these areas was done under scanning electron microscope (SEM). Scoring system was used which scored smear layer as follows: Score 1: Smear layer completely covering the surface, Score 2: Smear layer partially covering the surface, Score 3: Smear layer half covered with open tubules and remaining of the surface with smear layer, Score 4: Small amount of surface and visible tubules covered with smear layer, and Score 5: No smear layer seen on the surface. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. **Results:** Mean smear score among the specimens of Group A and Group B was found to be 1.89 and 2.18 respectively. Non-significant results were obtained while comparing the mean smear score among specimens of two study groups. **Conclusion:** Both the agents are equally effective in smear layer removal of root canals.

Key words: Irrigation, Root canal, Smear

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INTRODUCTION

The successful endodontic treatment depends on comprehensive cleaning and shaping of root canal system. After the root canal treatment, more than 35% of the root canal surface can be left without preparing with the help of advanced technology such as nickel titanium files.¹ Thus, it is critical to have an irrigation system or intervention as part of the conventional root canal treatment. The main objective of the irrigation is for cleansing that does not take place with biomechanical preparation. Accurate debridement of root canals is recommended in most endodontic treatment.²⁻⁴

Irrigants have traditionally been delivered into the root canal space using syringes and needles of different size

and tip design. Research have shown that this classic approach typically results in ineffective irrigation, particularly in peripheral areas such as anastomoses between canals, fins, and the most apical part of the main root canal.⁵ Hence; the present study was undertaken for assessing the efficacy of two root canal irrigation solutions on smear layer removal during root canal therapy.

MATERIALS & METHODS

The present study was conducted with the aim of assessing and comparing efficacy of two root canal irrigation solutions on smear layer removal during root canal therapy. A total of 20 freshly extracted maxillary second premolars were included. Only non-carious and non-deformed tooth

specimens were included. Initially, the specimens were submerged in 2.5 percent of NaOCl solution for twenty minutes. De-coronation of all the samples was done at cement-enamel junction. Estimation of working length was done and enlargement of the canal was done using ProTaper files. All the samples were divided into 2 study groups with 10 samples in each group. Group A included samples in which 15 percent EDTA was used while Group B included samples in which apple cider vinegar was used. Placement of each tooth sample was done in a falcon tube. Horizontal grooves were made on both buccal and lingual surfaces of the root. With the help of a chisel, separation of the roots was done into two halves. Assessment of these areas was done under scanning electron microscope (SEM). Scoring system, as described previously in the literature, was used which scored smear layer as follows:

- Score 1: Smear layer completely covering the surface
- Score 2: Smear layer partially covering the surface
- Score 3: Smear layer half covered with open tubules and remaining of the surface with smear layer
- Score 4: Small amount of surface and visible tubules covered with smear layer, and
- Score 5: No smear layer seen on the surface

All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test and student t test were used for assessment of level of significance.

RESULTS

In the present study, a total of 20 specimens were analyzed. All the samples were divided into 2 study groups with 10 samples in each group. Group A included samples in which 15 percent EDTA was used while Group B included samples in which apple cider vinegar was used. Mean smear score among the specimens of Group A and Group B was found to be 1.89 and 2.18 respectively. Non-significant results were obtained while comparing the mean smear score among specimens of two study groups.

Table 1: Comparison of mean smear score

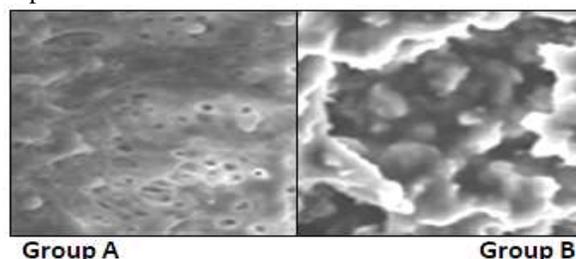
Group	Mean Score	SD
Group A	1.89	0.15
Group B	2.18	0.37
T-statistics	-1.825	
p- value	0.082	

DISCUSSION

One of the prerequisites of a successful endodontic treatment is an efficient removal of smear layer from the dentinal walls. A complete debridement of the root canal is essential to achieve an effective disinfection and a three-dimensional obturation for a favorable long-term prognosis.

Traditional needle irrigation has been proved to be insufficient for a complete cleaning of the complex anatomy of root canal system (especially the lateral canals, isthmuses and the apical third), therefore endeavors are being made to develop new irrigants and irrigating devices to improve the root canal disinfection in everyday endodontic practice.⁶⁻⁹ Hence; the present study was undertaken for assessing the efficacy of two root canal irrigation solutions on smear layer removal during root canal therapy.

Figure 1: SEM analysis of samples of both the study groups



In the present study, a total of 20 specimens were analyzed. All the samples were divided into 2 study groups with 10 samples in each group. Group A included samples in which 15 percent EDTA was used while Group B included samples in which apple cider vinegar was used. Mean smear score among the specimens of Group A and Group B was found to be 1.89 and 2.18 respectively. Kumar VR et al compare the efficacy of different irrigation systems comparing irrigation with syringe and needle (Dispo Van), Max-I-Probe needle (Dentsply Maillefer), EndoActivator (Dentsply Maillefer), and EndoVac (Sybron Endo) in removing the smear layer generated at apical third. Instrumentation was done in 40 extracted premolars using different irrigation regimes (Group 1, saline and syringe; Group 2, Max-I-Probe needles with NaOCl and ethylenediaminetetraacetic acid (EDTA); Group 3, irrigant activation with EndoActivator using needles NaOCl and EDTA; and Group 4, irrigation with EndoVac using needles NaOCl and EDTA). The percentage of debris was seen with scanning electron microscope (SEM) and evaluated using one-way analysis of variance (ANOVA), Kruskal-Wallis test, followed by Mann-Whitney test for significance. The mean score \pm standard deviation for the conventional group was 2.8 ± 0.42 with median value of 3.00 (2-3). The results for the Max-I-Probe needle group were 2.3 ± 0.48 with median value of 2.00 (2-3) The mean debris score for EndoActivator group were 0.8 ± 0.42 with median value of 1 (0-1). The mean debris score for EndoVac group were 0.4 ± 0.52 with median value of 1 (0-1). EndoVac and EndoActivator performed much better than other available systems in removing the smear layer from apical third.¹⁰

In the present study, Non-significant results were obtained while comparing the mean smear score among specimens of two study groups. Mancini M et al evaluated the effectiveness of different irrigating methods in removing the smear layer at 1, 3, 5, and 8 mm from the apex of endodontic canals. Sixty-five extracted single-rooted human mandibular premolars were decoronated to a standardized length of 16 mm. Specimens were shaped to ProTaper F4 (Dentsply Maillefer, Ballaigues, Switzerland) and irrigated with 5.25% NaOCl at 37°C. Teeth were divided into 5 groups (2 control groups [n = 10] and 3 test groups [n = 15]) according to the final irrigant activation/delivering technique (ie, sonic irrigation, passive ultrasonic irrigation [PUI], or apical negative pressure). Root canals were then split longitudinally and observed by field emission scanning electron microscopy. The presence of debris and a smear layer at 1, 3, 5, and 8 mm from the apex was evaluated. Scores were analyzed by Kruskal-Wallis and Mann-Whitney U tests. The EndoActivator System (Dentsply Tulsa Dental Specialties, Tulsa, OK) was significantly more efficient than PUI and the control groups in removing the smear layer at 3, 5, and 8 mm from the apex. The EndoVac System (Discus Dental, Culver City, CA) removed statistically significantly more smear layer than all groups at 1, 3, 5, and 8 mm from the apex. At 5 and 8 mm from the apex, PUI and the EndoVac did not differ statistically significantly, but both performed statistically better than the control groups. In their study, none of the activation/delivery systems completely removed the smear layer from the endodontic dentine walls; nevertheless, the EndoActivator and EndoVac showed the best results at 3, 5, and 8 mm (EndoActivator) and 1, 3, 5, and 8 mm (EndoVac) from the apex.¹¹

CONCLUSION

From the above results, the authors concluded that both the agents are equally effective in smear layer removal of root canals. However; further studies are recommended.

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