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Original Article

Comparative Evaluation of Efficacy of Different Root Canal Irrigation Solutions

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ABSTRACT:
Background: Ideally an irrigant should provide a mechanical flushing action, be microbiocidal and dissolve remnants of organic tissues without damaging the periradicular tissues if extruded into the periodontium. Hence; we planned the present study to compare the efficacy of different root canal irrigants. **Materials & methods:** The present study included evaluation of efficacy of different root canal irrigants. A total of 60 freshly extracted maxillary second premolars with single pulp canal were included in the present study.Biomechanical preparation of all the teeth specimens was done using rotary Protaper system. At every change of instrument, the canals were irrigated with 2 ml of 2.5% NaOCl solutions during procedure. After Instrumentation, three subgroups were made and each had twenty teeth each and different irrigation protocols were used in each group. Group A: The canals were irrigated using 3 ml of physiological saline only for 1 min, Group B: The canals were irrigated using 3 ml of 2.5% NaOCl, and Group C: The canals were irrigated with 2% chlorhexidine (CHX) gluconate. The desiccated specimens were mounted and studied under Scanning Electron Microscope (SEM). All the results were analyzed by SPSS software. **Results:** Mean score observed in group A, B and C specimens were found to be 5, 4.5 and 4.9 respectively. We obtained significant results on comparing the efficacy of all the three irrigant solutions. **Conclusion:** Better understanding of the mechanism of action of different irrigating solutions is required while making a choice for appropriate irrigating solution.
Key words: Efficacy, Irrigation, Root canal

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INTRODUCTION

The root canal system is complex and accessory features, such as fins, cul de sacs, and intercanal communications, are colonized by microorganisms once the tooth becomes infected.[1] Self-aggregates of monobacterial morphotypes and coaggregates of different bacterial morphotypes are also found adhering to teeth. The interbacterial spaces are occupied by an amorphous material, spirochetes, and hyphal-like structures that are suggestive of fungi.[2, 3] Ideally an irrigant should provide a mechanical flushing action, be microbiocidal and dissolve remnants of organic tissues without damaging the periradicular tissues if extruded into the periodontium. In addition, the root canal irrigants should be biocompatible with oral tissues. A large number of substances have been used as root canal irrigants, including acids (citric and phosphoric), chelating agent (ethylene diaminetetraacetic acid EDTA), proteolytic enzymes, alkaline solutions (sodium hypochlorite, sodium hydroxide, urea, and potassium hydroxide), oxidative agents (hydrogen peroxide and Gly-Oxide), local anesthetic solutions, and normal saline.[4- 6] Available literature and studies demonstrate advantages and limitations of each irrigant under consideration and none of them satisfy the requirements of the ideal root canal irrigant completely.[7] Hence; we planned the present study to compare the efficacy of different root canal irrigants.

MATERIALS & METHODS

The present study was planned with the aim of evaluating the efficacy of different root canal irrigants. Ethical approval was obtained from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 60 freshly extracted maxillary second premolars with single pulp canal were included in the present study. Exclusion criteria for the present study included:

- Carious teeth,

- Teeth with calcified root canals,
- Teeth with accentuated curvatures,
- Teeth with more than one root canal

Access preparation was done in all the teeth coronally using access bur. Decoronation of all the teeth specimens was done at the cementoenamel junction using diamond disc. Biomechanical preparation of all the teeth specimens was done using rotary Protaper system. At every change of instrument, the canals were irrigated with 2 ml of 2.5% NaOCl solutions during procedure. After Instrumentation, three subgroups were made and each had twenty teeth each and different irrigation protocols were used in each group.

1. Group A:The canals were irrigated using 3 ml of physiological saline only for 1 min.
2. Group B:The canals were irrigated using 3 ml of 2.5% NaOCl
3. Group C: The canals were irrigated with 2% chlorhexidine (CHX) gluconate

Drying of the canals was done using paper points and the root was divided into three equal halves: Coronal, middle, and apical. After which the roots were split longitudinally using a diamond disk on a low-speed handpiece in the buccolingual plane. The desiccated specimens were mounted and studied under Scanning Electron Microscope (SEM). Hulsmann et al system of debris and smear layer scoring was used for evaluating the cleaning ability of irrigating solutions.[8]

All the results were analyzed by SPSS software. Chi-square test and student t test were used for evaluation of level of significance. P- value of less than 0.05 was taken as significant.

RESULTS

Mean score observed in group A, B and C specimens were found to be 5, 4.5 and 4.9 respectively. We obtained significant results on comparing the efficacy of all the three irrigant solutions.

Table 1: Mean and standard deviation of scores in all the study groups

Group	Mean score	Standard deviation	P- value
A	5	0	0.02
B	4.5	0.62	
C	4.9	0.45	

DISCUSSION

One of the goals of root canal treatment is to eliminate bacteria, bacterial products and debris from the root canal system. Most bacteria found in the canal space may be removed by the mechanical action of endodontic instruments.[8] However, in several situations, due to the complex anatomy of the root canal system, organic residues and bacteria lodged deep inside the dentinal tubules cannot be reached even after careful mechanical instrumentation. In these cases, the use of irrigating solutions is essential to ensure bacterial minimization and elimination of organic tissue remnants.[9] Hence; we planned the present study to compare the efficacy of different root canal irrigants.

In the present study, we observed significant results on comparing the efficacy of all the three irrigant solutions. Kumar VR et al compared 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 needlesNaOCl and EDTA; and Group 4, irrigation with EndoVac using needles NaOCl and EDTA). The mean score ± 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.[9]

Caron G et al examined the effect of different final irrigation regimens and methods of activation on smear layer removal in curved canals after root canal instrumentation. Mesial root canals of 50 extracted mandibular molars were prepared using ProTaper rotary files (Dentsply Maillefer, Ballaigues, Switzerland) and 3% NaOCl. Teeth were then allocated to two control groups and four experimental groups (n = 10) for final irrigation as follows: no-activation group (final rinse with a 27-gauge needle and 17% EDTA/3% NaOCl), manual-dynamic activation group (final rinse 17% EDTA/3% NaOCl + gutta-percha agitation), automated-dynamic activation group (final rinse 17% EDTA/3% NaOCl + RinsEndo [Dürr Dental GmbH & Co KG, Bietigheim-Bissingen, Germany]), and sonic-activation group (final rinse 17% EDTA/3% NaOCl + Endoactivator [Advanced Endodontics, Santa Barbara, CA]). All mesial roots were split with a new approach to allow visualization of every third of the canal, particularly the apical third. The samples were prepared for scanning electron microscopic observation to assess the smear layer removal. Blind scoring was performed by two calibrated observers using a five-score scale. Very high levels of root canal cleanliness (< or = score 3) were found for each test group with activation. For the middle and apical third, the no-activation group was significantly less effective than the three other activation groups ($p < 0.05$). The manual-dynamic activation group (final rinse 17%EDTA/3%NaOCl + gutta-percha agitation) and the sonic-activation group (final rinse 17%EDTA/3%NaOCl + Endoactivator) showed significantly better smear layer removal ($p < 0.05$) in comparison with the other test groups in the apical third. Root canal cleanliness benefits from solutions activation (especially sonic activation and

manual-dynamic activation) in comparison with no activation during the final irrigation regimen.[10]Virdee SS et al carried out a study to establish whether irrigant activation techniques (IATs) result in greater intracanal smear layer and debris removal than conventional needle irrigation (CNI). Six electronic databases were searched to identify scanning electron microscopy studies evaluating smear layer and/or debris removal following the use of manual dynamic activation (MDA), passive ultrasonic irrigation (PUI), sonic irrigation (SI) or apical negative pressure (ANP) IATs in mature permanent teeth. Meta-analyses were performed for each canal segment (coronal, middle, apical and apical 1 mm) in addition to subgroup analyses for individual IATs with respect to CNI. Outcomes were presented as standardized mean differences (SMD) alongside 95% confidence intervals (95% CI) and chi-squared analysis. From 252 citations, 16 studies were identified. The meta-analyses demonstrated significant improvements in coronal (SMD: 1.15, 95% CI: 0.72-1.57 / SMD: 0.54, 95% CI: 0.29-0.80), middle (SMD: 1.30, 95% CI: 0.59-2.53 / SMD: 0.8, 95% CI: 0.58-1.13) and apical thirds (SMD: 1.22, 95% CI: 0.83-1.62 / SMD: 1.86, 95% CI: 0.76-2.96) for smear layer and debris removal, respectively. In the apical 1 mm IATs improved cleanliness; however, differences were insignificant (SMD: 1.15, 95% CI: -0.47-2.77). Chi-squared analysis revealed heterogeneity scores of 79.3-92.8% and 0.0-93.5% for smear layer and debris removal, respectively. IATs improve intracanal cleanliness across a substantial portion of the canal, and therefore, their use is recommended throughout root canal preparation.[11]

CONCLUSION

From the above results, the authors concluded that better understanding of the mechanism of action of different irrigating solutions is required while making a choice for appropriate irrigating solution. However; future studies are recommended.

REFERENCES

1. Orstavik D, Haapasalo M. Disinfection by endodontic irrigants and dressing of experimentally infected dentinal tubules. Dent Traumatol 1990;6:142–9.
2. Estrela CR, Estrela C, Reis C, Bammann LL, Pecora JD. Control of microorganisms in vitro by endodontic irrigants. Braz Dent J. 2003;14:187-92.
3. Torabinejad M, Shabahang S, Aprecio R, Kettering JD. The antimicrobial effect of MTAD: An in vitro investigation. J Endod 2003;29:400 –3.
4. Molven O, Olsen I, Kerekes K. Scanning electron microscopy of bacteria in the apical part of root canals in permanent teeth with periapical lesions. Endod Dent Traumatol 1991;7:226 –9.
5. Estrela C, Ribeiro RG, Estrela CR, Pecora JD, Sousa MD Neto. Antimicrobial effect of 2% sodium hypochlorite and 2% chlorhexidine tested by different methods. Braz Dent J. 2003;14:58-62.
6. Ferraz CC, Gomes BP, Zaia AA, Teixeira FB, Souza FJ Filho. In vitro assessment of the antimicrobial action and the mechanical ability of chlorhexidine gel as an endodontic irrigant. J Endod. 2001;27(7):452-5.
7. Nair PN, Henry S, Cano V, et al. Microbial status of apical root canal system of human mandibular first molars with primary apical periodontitis after “one-visit” endodontic treatment. Oral Surg 2005;99:231–52.
8. Hulsmann M, Rummelin C, Scha¨fers F. Root canal cleanliness after preparation with different endodontic handpieces and hand instruments: A comparative SEM investigation. J Endod 1997;23:301-6.
9. Kumar VR, Bahuguna N, Manan R. Comparison of efficacy of various root canal irrigation systems in removal of smear layer generated at apical third: An SEM study. Journal of Conservative Dentistry : JCD. 2015;18(3):252-256.
10. Caron G1, Nham K, Bronnec F, Machtou P. Effectiveness of different final irrigant activation protocols on smear layer removal in curved canals. J Endod. 2010 Aug;36(8):1361-6.
11. Virdee SS1, Seymour DW2, Farnell D3, Bhamra G4, Bhakta S5. Efficacy of irrigant activation techniques in removing intracanal smear layer and debris from mature permanent teeth: a systematic review and meta-analysis. Int Endod J. 2017 Nov 25.

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