Review Article

Root Canal Irrigation- A Mini Review

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Abstract

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Root canal therapy if one of the most common dental procedures employed days in routine dental practice. Its success is dependent upon a number of factors, among which, one is root canal irrigation. Sodium hypochloride is the most commonly used endodontic irrigant, despite limitations. None of the presently available root canal irrigants satisfy the requirements of ideal root canal irrigant. Hence; in the present review, we aim to highlight some of the important aspects of roots anal irrigation process.

Key words: Irrigation, Root canal

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INTRODUCTION

Irrigation has a central role in endodontic treatment. During and after instrumentation, the irrigants facilitate removal of microorganisms, tissue remnants, and dentin chips from the root canal through a flushing mechanism. Irrigants can also help prevent packing of the hard and soft tissue in the apical root canal and extrusion of infected material into the periapical area.[1- 3] Some irrigating solutions dissolve either organic or inorganic tissue in the root canal. In addition, several irrigating solutions have antimicrobial activity and actively kill bacteria and yeasts when introduced in direct contact with the microorganisms.[4, 5] However, several irrigating solutions also have cytotoxic potential, and they may cause severe pain if they gain access into the periapical tissues. None of the available irrigating solutions can be regarded as optimal. Using a combination of products in the correct irrigation sequence contributes to a successful treatment outcome.[6]

Historical perspective

The concept of the germ theory of disease combined with the development of dentistry during the latter half of the 19th century had a direct effect on the practice of endodontics. The significance of root canal irrigation to endodontics strengthened in the period between 1859 when Taft recommended frequent syringing of the root canal to remove "irritants" until the mid-1940s when endodontics became a special field within dentistry and the American Endodontic Society was established.[7- 9] A variety of recommendations on the use of solutions to clean root canals appeared in the dental literature, often innovative and at times entrepreneurial, but invariably empirically based. While it was widely assumed that by wiping the root canal with disinfectants sterilization would be achieved, many of the principles associated with cleaning the root canal published during this period, in particular by Willoughby Dayton Miller in the 1890s and Louis Grossman in the 1940s, remain equally relevant in the 21st century.[10]

It appears evident that root canal irrigants ideally should

- have a broad antimicrobial spectrum and high efficacy against anaerobic and facultative microorganisms organized in biofilms,
- dissolve necrotic pulp tissue remnants,
- inactivate endotoxin,
- prevent the formation of a smear layer during instrumentation or dissolve the latter once it has formed,
- be systemically nontoxic,
- be non caustic to periodontal tissues,
- be little potential to cause an anaphylactic reaction[7, 8]

REVIEW

Homayouni H et al evaluated the effect of the precipitate that was formed by combining Sodium Hypochlorite (NaOCl) and Chlorhexidine Gluconate (CHX) on the sealing ability of root canal obturation materials. The fluid filtration method was conducted on a total of 100 roots. Samples were randomly divided into two control (n=5) and three experimental groups (n=30). The samples in group 1 were irrigated with 1.5 mL of 2.5% NaOCl, and then the smear layers of the teeth were removed by 17% EDTA, while the specimens of group 2 were irrigated by 1.5 mL of 2.5% NaOCl and 1.5 mL of 2% CHX; after the smear layer removal, a final flush with 1.5 mL of 2.5% NaOCl was performed. The samples of group 3 were irrigated the same as group 1 but after the smear layer removal canals were irrigated again with 1.5 mL of 2.5% NaOCl and then a final flush with 1.5 mL of 2% CHX was performed. Teeth were obturated with gutta-percha and AH26 sealer and after seven days, microleakage was evaluated by the fluid filtration technique. The samples in group 3 had significantly greater microleakage compared to teeth in group 1, 2 ($p<0.05$), and the specimens in group 1 showed significantly less amount of microleakage than samples in group 2, 3 ($p<0.05$). The presence of the precipitate that is formed due to interaction between NaOCl and CHX has negative effect on the sealing ability of gutta-percha and AH26 sealer.[11]

Tzanetakis GN et al determined the influence of smear layer removal on through-and-through fluid movement along root canal fillings obturated using 3 different root canal sealers, namely AH26, Pulp Canal Sealer, and Gutta-Flow, and 3 different obturation techniques. The fluid transport model was used for detection of through-and-through fluid movement. Root canals of 230 human extracted teeth were mechanically instrumented using the step-back technique. The canals where the smear layer was not removed were irrigated with NaOCl 2.4%, whereas canals where the smear layer was removed were irrigated with EDTA 17% plus NaOCl 2.4%. The teeth were randomly divided into 10 experimental groups (n = 20) and 3 control groups (n = 10) and treated as follows. In group A, where no attempt was made for smear layer removal, the canals were obturated with lateral compaction of gutta-percha and AH26 as a sealer. In group B, the smear layer was removed, and canals were obturated as in group A. In group C (no attempt to remove the smear layer), the canals were obturated with System B plus Obtura II technique and AH26, whereas in group D, the smear layer was removed, and canals were obturated as in group C. The other 4 experimental groups were treated and obturated in the same way as in previous groups, respectively. The sealer that was used in those groups was the Pulp Canal Sealer. Finally, the latter 2 groups were obturated with Gutta-Flow technique. Fluid movement was measured at 24 hours and 30 days and 6 months. In lateral compaction groups (with and without the smear layer), no significant differences were found regarding the ability of the same materials (AH26 and Pulp Canal Sealer) to prevent the fluid movement ($P > .05$). In warm obturation technique, no significant difference was found between the 2 groups (with and without the smear layer) of AH26 ($P > .05$). On the contrary, in groups of Pulp Canal sealer, fluid transport values were significantly less when the smear layer was removed ($P < .05$). Finally, no significant difference was observed between the groups of Gutta-Flow (with and without the smear layer) ($P > .05$). Under these in vitro conditions, it seems that smear layer removal improves the ability of the filling materials to prevent the fluid movement, at least after the use of warm obturation techniques.[12]

DISCUSSION

Many types of irrigants can be used such as H_2O_2, anesthetic solutions, physiological serum, and de-ionized water. What is proposed is a sequence of irrigation, which may become more complex in order to deal with different clinical situations. The alternate us of urea peroxide, sodium hypochlorite, chlorhexidine, citric acid, distilled water and EDTA is essential for the cleaning of the endodontic system.[8] The time we gain by using rotary Niti instruments is compensated by an

abundant irrigation for a better cleaning of the endodontic system and this will contribute to the increase success rate of endodontic treatment. Chemical preparation is a double-edged sword; it will help us succeed in the adequate cleaning of the main canal its systems. But it must be followed by a three dimensional obturation to fill all of what has been cleansed and prepared. Perfect absorption of the fluid is essential from the main canal and all of its systems. If this is not accomplished then the adherence between the sealer and the dentin will be compromised. In addition, the presence of the fluid inside the systems can have a negative hydraulic pressure preventing the obturation material from entering the complexity of the root canal systems for accomplishing a three dimensional obturation.[10, 11]

CONCLUSION

Irrigation has a key role in successful endodontic treatment. Although hypochlorite is the most important irrigating solution, no single irrigant can accomplish all the tasks required by irrigation. Detailed understanding of irrigation process and its role in the success of root canal therapy requires further intervention.

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