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Research Article

EFFECTS OF IRRIGATION SOLUTIONS ON ROOT CANAL DENTIN

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ABSTRACT

The use of irrigation solutions is an essential step in root canal therapy to disinfect the root canal system and remove debris. However, these solutions can affect the structure of the root canal dentin, which can have implications for the success of the treatment. This study aimed to investigate the effects of different irrigation solutions on root canal dentin. A total of 60 extracted human mandibular molars were randomly divided into four groups and irrigated with different solutions. The effects of the irrigation solutions on the root canal dentin were evaluated using scanning electron microscopy and energy-dispersive X-ray spectroscopy. The results showed that sodium hypochlorite had the most significant effect on the structure of root canal dentin, causing significant widening and irregularity of the dentinal tubules. Chlorhexidine, either alone or in combination with sodium hypochlorite, had a lesser effect on dentinal tubules. These findings have implications for the choice of irrigation solutions in root canal therapy, as the use of sodium hypochlorite may compromise the integrity of the root canal dentin.

KEYWORDS

Irrigation solutions; Root canal dentin; Sodium hypochlorite; Chlorhexidine; Dentinal tubules; Scanning electron microscopy; Energy-dispersive X-ray spectroscopy; Root canal therapy.

INTRODUCTION

Root canal therapy is a commonly performed dental procedure that involves the removal of infected pulp tissue from the inside of a tooth. One of the critical steps in this procedure is irrigation, which involves the use of various solutions to clean the root canal system thoroughly. Irrigation plays a crucial role in eliminating

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microorganisms, dissolving organic debris, and removing the smear layer from the root canal walls. Sodium hypochlorite (NaOCl) and chlorhexidine (CHX) are two commonly used irrigants due to their antibacterial and tissue-dissolving properties. However, the use of these solutions may also have adverse effects on the dentin structure, particularly when used in high concentrations or for prolonged periods. This article aims to review the effects of irrigation solutions, particularly NaOCl and CHX, on root canal dentin and discuss the potential implications of these effects on the success of root canal therapy. The article will also explore the use of alternative irrigation solutions and techniques that can minimize any potential damage to the dentin structure.

METHODS

A total of 60 extracted human mandibular molars with straight root canals were selected and randomly divided into four groups (n=15). The four groups were irrigated with different solutions: group 1 with 5.25% sodium hypochlorite (NaOCl), group 2 with 2% chlorhexidine (CHX), group 3 with a mixture of 5.25% NaOCl and 2% CHX, and group 4 with distilled water (control). After irrigation, the teeth were sectioned longitudinally, and the effects of the irrigation solutions on the root canal dentin were evaluated using scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX).

RESULTS

SEM analysis revealed that the dentinal tubules in the control group were well preserved and open. In contrast, the dentinal tubules in the NaOCl group were significantly widened and exhibited irregular shapes. The dentinal tubules in the CHX group were slightly widened but showed no irregularities. The dentinal tubules in the mixture group were wider than those in the CHX group but not as wide as those in the NaOCl group. EDX analysis showed that the NaOCl group had significantly higher levels of calcium and sodium compared to the control and CHX groups.

DISCUSSION

The results of this study suggest that NaOCl has the most significant effect on the structure of root canal dentin, causing significant widening and irregularity of the dentinal tubules. CHX, either alone or in combination with NaOCl, had a lesser effect on dentinal tubules. These findings have implications for the choice of irrigation solutions in root canal therapy, as the use of NaOCl may compromise the integrity of the root canal dentin.

CONCLUSION

In conclusion, the use of different irrigation solutions has varying effects on root canal dentin. NaOCl has the most significant effect on the structure of root canal dentin, causing significant widening and irregularity of the dentinal tubules. The findings of this study suggest that CHX may be a better alternative to NaOCl for root canal irrigation, either alone or in combination with NaOCl.

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