Evaluation of Removal of Calcium Hydroxide mixed with Chlorhexidine and Detection of Precipitate

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Introduction

The use of intracanal medication (MIC) helps to reduce / eliminate the microorganisms responsible for endodontic infections and to control symptomatology. It is known that in the reaction between sodium hypochlorite (NaOCl) and Chlorhexidine (CHX), a precipitate (PP) known as "parachloroaniline" is formed and associated with potential immunotoxic effects.

Objectives

To compare the effectiveness of different solutions - Sodium Hypochlorite 3% (NaOCl), EthyleneDiamineTetraAcetic 17% (EDTA) and Citric Acid 10% (AC) - in the removal of Calcium Hydroxide mixed with 2% Digluconate Clorhexidine Gel (CH/CHX) applied as MIC and detection of a precipitate (PP).

Materials and Methods

45 single root teeth, 3 groups (n = 15), inserted in a silicone base, were instrumented with ProTaper Universal® files (Dentsply Sirona, Switzerland) up to F3 and divided in halves with a microtome. Two standardized grooves (coronal and apical) (Figure 1) were filled with CH/CHX and, for their removal, NaOCl or EDTA or CA activated with E1- Irrisonic Helse Ultrasonic® tip (Helse, São Paulo, Brazil) were used (Figura 2) . The grooves were photographed before and after application of CH/CHX. The remaining CH/CHX was evaluated using a scoring system (4 levels) (Figures 3a e 3b). Data were statistically analyzed using the Kruskal-Wallis test and the U-Mann-Whitney test with Bonferroni correction ($p < 0.05$) and using the R system (version 3.4.2).

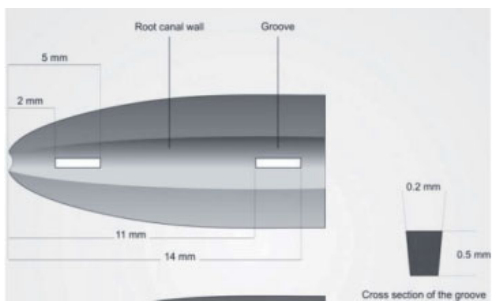
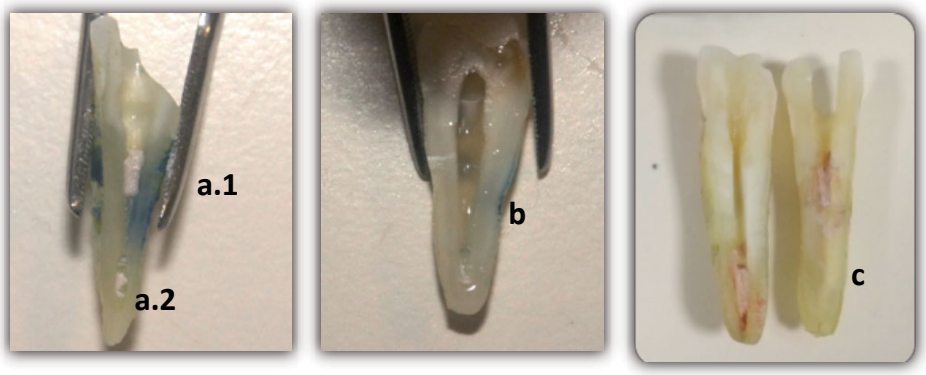


Figure 1 - Schematic of the location and size of the longitudinal grooves (Gokturk et al., 2017).

Figure 2 - Irrigation with tip E1 - Helse Ultrasonic®

Results

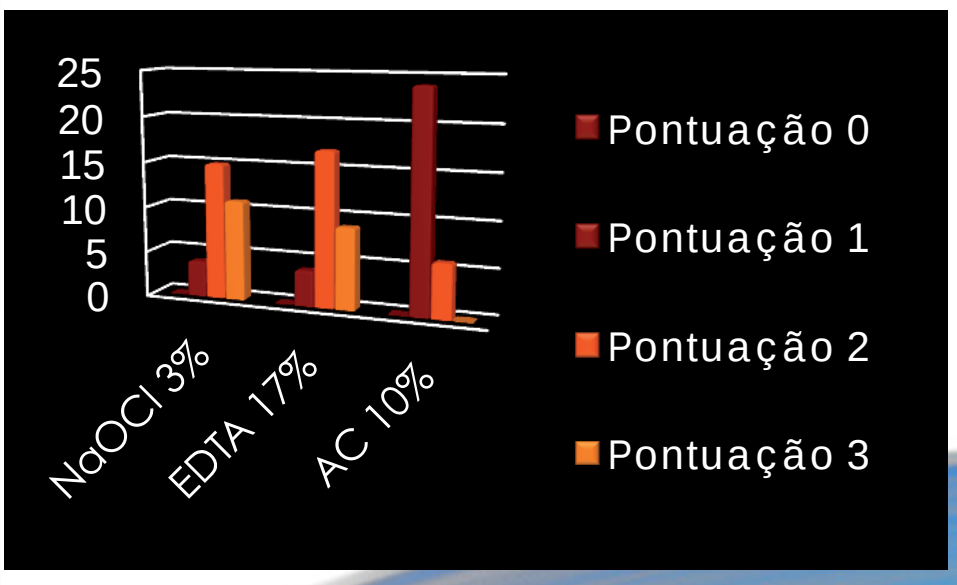
AC was higher than NaOCl and EDTA ($p < 0.05$) - Graphic 1. There were no differences between the other groups ($p > 0.05$). Only, but always, in the NaOCl group, an orange-brown precipitate was observed. (Figure 3c)



Figures 3 - Photograph of the complete filling of the coronal groove (a.1), the mixture covers more than half of the apical sulcus (a.2) and the mixture covers less than half of the apical groove (b) and orange-brown precipitate (c).

Discussion

The presence of MIC in the root canal system may make unfeasible the three-dimensional filling of the pulp space and also lead to insufficient adhesion of the filling material to dentinal walls. In this regard, it is important to improve the effectiveness of MIC' removal. The formation of the precipitate of parachloroaniline should be avoided.



Graphic 1 - Distribution of MIC removal scores according to NaOCl 3%, EDTA 17% and AC 10% groups. Score 0 - the groove is empty; Score 1 - the MIC is present in less than half of the groove; Score 2 - the MIC is present in more than half of the groove; Score 3 - the groove is completely filled with MIC.
Sodium Hypochlorite 3% (NaOCl), EthyleneDiamineTetraAcetic 17% (EDTA) and Citric Acid 10% (AC)

Conclusions

Within the limitations of this study, it is possible to conclude that none of the irrigant solutions tested was able to completely remove MIC; however, CA proved to be more efficient than NaOCl and EDTA, and this difference was statistically significant.

Clinical Implications

Removal of the MIC under test should rather be done with AC. The use of NaOCl should be avoided if the MIC contains Chlorhexidine.

Keywords: "Calcium hydroxide", "Chlorhexidine digluconate", "removal", "EDTA", "Sodium Hypochlorite", "Citric Acid"

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