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## A study on different irrigation systems for the removal of intracanal medicaments

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### Abstract

**Background:** To evaluate different irrigation systems for removal of intracanal medicaments.

**Materials & Methods:** A total of 40 freshly extracted mandibular premolars were enrolled. The teeth were longitudinally split into two halves and debris were removed. The two halves were then reassembled and filled with Ca (OH)<sub>2</sub> and were divided into four groups. The amount of residual Ca (OH)<sub>2</sub> was calculated. The results were analysed using SPSS software.

**Results:** The mean amount of Ca (OH)<sub>2</sub> remaining was highest with respect to Group I followed by Group II and Group III. The lowest was seen with Group IV.

**Conclusion:** CanalBrush and ultrasonic techniques were significantly better than the other irrigant groups.

**Keywords:** Calcium hydroxide, canal brush, ultrasonic

### Introduction

The main goal of root canal treatment is to enlarge the root canal system and to eliminate and discharge bacteria from it. For this purpose, numerous instruments, irrigation solutions, and medicaments have been used<sup>[1]</sup>. Chemomechanical preparation is often selected as the first option to achieve the goal of eliminating the intracanal bacterial population. Although chemomechanical preparation reduces the bacteria population, none of the contemporary techniques can completely clean the root canal system<sup>[2]</sup>. Therefore, intracanal medicaments are used to eliminate and/or reduce the number of bacteria from the canal<sup>[3]</sup>. Calcium hydroxide (CH) is widely used as an intracanal medicament between appointments to enhance the incidence of bacteria free canals. CH has therapeutic properties, is biocompatible, inhibits osteoclastic activity, can dissolve organic tissue, and has regenerative properties<sup>[4, 5]</sup>. Despite these advantages, CH is insufficient in completely removing bacteria from root canals<sup>[6]</sup>.

Before root filling, the Ca (OH)<sub>2</sub> medicament that has been applied to the root canal should be removed. Any Ca (OH)<sub>2</sub> residue on the canal walls negatively affects the quality of the root filling<sup>[7, 8]</sup>. *In vitro* studies have shown that remnant Ca (OH)<sub>2</sub> can hinder the penetration of sealers into the dentinal tubules<sup>[9]</sup>, hinder the bonding of resin sealer adhesion to the dentin, markedly increase the apical leakage of root canal treated teeth<sup>[10]</sup>, and potentially interact with zinc oxide-eugenol sealers and make them brittle and granular<sup>[11]</sup>. Thus, complete removal of Ca (OH)<sub>2</sub> from the root canal before obturation becomes mandatory. However, removing the Ca (OH)<sub>2</sub> residues from irregular canal walls is difficult<sup>[12]</sup>. The most commonly used technique for the removal of medicaments is recapitulation of the root canal with a master apical file at the working length (WL) followed by copious irrigation with ethylenediaminetetraacetic acid (EDTA) and sodium hypochlorite (NaOCl)<sup>[13]</sup>. Previous studies have reported that the passive ultrasonic irrigation (PUI) and photon-induced photoacoustic streaming (PIPS) techniques removed more medicament than the conventional needle irrigation system<sup>[14, 15]</sup>. Hence, this study was conducted to evaluate different irrigation systems for removal of intracanal medicaments.

### Materials & Methods

A total of 40 freshly extracted mandibular premolars were enrolled. The teeth were longitudinally split into two halves and debris were removed.

The two halves were then reassembled and filled with Ca (OH)<sub>2</sub> and were divided into four groups. In Group I, the teeth were irrigated with 5 mL of 2.5% sodium hypochlorite (NaOCl) and 5 mL of 17% of ethylenediaminetetraacetic acid. In Group II, the teeth were irrigated with 5 mL of 2.5% NaOCl and a rotary ProTaper F3 instrument was used. In Group III, the teeth were irrigated with 5 mL of 2.5% NaOCl and using an ultrasonic unit. In Group IV, the teeth were irrigated with 5 mL of 2.5% NaOCl and a Canal Brush was used to remove Ca (OH)<sub>2</sub>. The amount of residual Ca (OH)<sub>2</sub> was calculated. The results were analyzed using SPSS software.

## Results

A total of 40 samples were included. They were divided into four groups. The mean amount of Ca(OH)<sub>2</sub> remaining was highest with respect to Group I followed by Group II and Group III. The lowest was seen with Group IV. Groups III and IV, while not different from each other, removed significantly more Ca(OH)<sub>2</sub> than the other two techniques. There is no significant difference between Groups I and II.

**Table 1:** Percentage of Ca (OH)<sub>2</sub> remaining in the root canals

Group	Number	Mean	P- value
NaOCl EDTA	10	50.26	<0.001*
Pro Taper	10	37.52	
Ultrasonic	10	25.96	
Canal Brush	10	24.35	

\*: significant

## Discussion

Several studies have shown that the presence of Ca (OH)<sub>2</sub> on dentin walls can affect endodontic treatment success [11, 12]. It has been reported that residual Ca (OH)<sub>2</sub> interacts with zinc oxide-eugenol sealers to produce calcium eugenolate [11]. The residues could also influence the adhesion of sealers to the root canal walls [8, 9], compromising the quality of the seal provided by the root filling [10, 16]. In the present study, a paste of Ca (OH)<sub>2</sub> with polyethylene glycol was used. According to the related literature, the paste composition does not influence the efficiency of mechanical and/or chemical methods in removing residues from root canal walls [17, 18]. Hence, this study was conducted to evaluate different irrigation systems for removal of intracanal medicaments.

In the present study, a total of 40 samples were included. They were divided into four groups. The mean amount of Ca (OH)<sub>2</sub> remaining was highest with respect to Group I followed by Group II and Group III. A study by Bhuyan AC *et al.*, canalbrush and ultrasonic techniques showed significantly less residual Ca (OH)<sub>2</sub> than irrigants and rotary techniques. There was no significant difference between the rotary and irrigant techniques. None of the techniques used were completely able to remove Ca (OH)<sub>2</sub> from the root canals. But the CanalBrush and ultrasonic techniques were significantly better than the rotary instrument and irrigant groups [19].

In the present study, the lowest was seen with Group IV. Groups III and IV, while not different from each other, removed significantly more Ca(OH)<sub>2</sub> than the other two techniques. There is no significant difference between Groups I and II. Another study by Chou K, *et al.*, a total of 168 single roots were prepared with ProTaper® rotary files and medicament pastes applied (Ledermix®, Odontopaste®,

Doxypaste and Pulpdent®), left in for 2 weeks, then removed using filing followed by one of four methods: irrigation with an open-ended notched irrigation needle (Appli-Vac) either at the working length or 5 mm from the canal orifice, or the Max-I-probe or EndoActivator® at the working length. Up to 27% of the Pulpdent® material remained after irrigation. No irrigation technique could completely remove all traces of medicaments. The position of the irrigational needle and the type of medicament used are key factors, which influence the effectiveness of irrigation in removing medicaments [20]. Rödiger *et al.* [21] compared the effectiveness of RinsEndo and ultrasonic irrigation for removal of calcium hydroxide and Ledermix paste from root canal. They split the teeth longitudinally and prepared a groove in the apical part of one segment and then all root halves were reassembled. There was no significant differences between RinsEndo and ultrasonic in the removal of calcium hydroxide and Ledermix from root canal. Maalouf *et al.* [22] compared the removal efficiency of calcium hydroxide dressing from the root canal with RinsEndo, ultrasonic and syringe. They found no statistically significant difference among the irrigation techniques in the whole canal. In Maalouf *et al.* study, when mixed powder was used, RinsEndo and ultrasonics were the most effective in cleaning the apical third of the canal. This difference may be because of the different size of apical preparation and the type of calcium hydroxide used in their study [22].

## Conclusion

Canal Brush and ultrasonic techniques were significantly better than the other irrigant groups.

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## Author's Contribution

Not available

## Conflict of Interest

Not available

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