



COMPARATIVE EVALUATION OF REMOVAL OF CALCIUM HYDROXIDE INTRACANAL MEDICAMENT DONE WITH ROTARY INSTRUMENTS ALONG WITH INTRACANAL IRRIGANTS USING ENDOVAC SYSTEM – AN ANALYSIS USING CONE BEAM COMPUTED TOMOGRAPHY

Paluvarly Sharath Kumar*, Neetha Raju, Jayashankara C.M, Anil Kumar S, Girish S.A and Mujahid Ahmed

Dept of Conservative Dentistry, Sri Siddhartha Dental College, B.H.Road, Agalakote, Tumkur, Karnataka

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ABSTRACT

Introduction: Thorough instrumentation supported by irrigation reduces the number of microorganisms in the infected root canal. However eradication of microorganisms from canal irregularities is enhanced by using intracanal medicaments. Calcium hydroxide is widely used as intracanal medicament between treatment sessions since it has well documented antimicrobial activity. Calcium hydroxide has various properties such as high alkalinity, antimicrobial activity and tissue dissolving ability. Any calcium hydroxide residues on the root canal walls affect the quality of the root filling. So removal of Calcium hydroxide before obturation is mandatory.

Aim: To evaluate the efficiency of rotary instrumentation and different types of irrigating solutions such as 5% NaOCl, 6% H₂O₂ and 2% CHX in combination with Endovac irrigating system in removing calcium hydroxide residues from root canal system analysed using CBCT.

Methodology: Adequate number of premolars were collected. Coronal access preparation was done. Biomechanical preparation was done using rotary instrumentation. Then the canals were filled with a paste of Calcium hydroxide mixed with synthetic glycerine in a ratio of 1:1. Samples were exposed to CBCT to estimate the filled material in each tooth using software. The teeth were divided into three groups. Rotary instrumentation was done in the groups followed by irrigation with 5% NaOCl and Endovac in Group I, 2% CHX, 6% H₂O₂ and Endovac in Group II and 6% H₂O₂ and Endovac in Group III. A second CBCT was done and volume of remaining material were estimated and statistical analysis was done.

Results: Endovac when used with 2% CHX and 6% H₂O₂ showed better results.

Conclusion: Complete removal of Calcium hydroxide from the root canal walls was not attained under the tested conditions and remnants of Calcium hydroxide was found in all experimental groups.

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INTRODUCTION

Thorough instrumentation supported by irrigation reduces the number of microorganisms in the infected root canal. However eradication of microorganisms from canal irregularities is enhanced by using intracanal medicaments. Calcium hydroxide is widely used as intracanal medicament between treatment sessions since it has well documented antimicrobial activity. Calcium hydroxide has various properties such as high alkalinity, antimicrobial activity and tissue dissolving ability. Any calcium hydroxide residues on the root canal walls affect the quality of the root filling. So removal of Calcium hydroxide before obturation is mandatory.

Aim

To evaluate the efficiency of rotary instrumentation and different types of irrigating solutions such as 5% NaOCl, 6% H₂O₂ and 2% CHX in combination with Endovac irrigating system in removing calcium hydroxide residues from root canal system analysed using CBCT.

Objectives

To compare the efficacy of 5% NaOCl, 2% CHX and 6% H₂O₂ in removing the residues from root canal using Endovac irrigating system.

Inclusion Criteria

- Teeth free from carious lesions
- Fully formed root apices
- No signs of internal and external resorption

*Corresponding author: Paluvarly Sharath Kumar

Dept of Conservative Dentistry, Sri Siddhartha Dental College, B.H.Road, Agalakote, Tumkur, Karnataka

- Without root fractures
- No calcifications

Exclusion Criteria

- Teeth with fracture, decay or restoration

Materials

- Saline (Infutech Health Care Lim.)
- Access kit (Dentsply)
- Hand K files N0. 10, 15, 20
- Mtwo rotary files (VDW Munich)
- 2% Chlorhexidine (DEOR)
- 6% H2O2 (Jyoti Chemicals)
- 5% NaOCl (Vishal)
- Endovac irrigating system (Kerr)
- Calcium hydroxide powder (Deepthi)
- Synthetic Glycerine
- EDTA

METHODOLOGY

Forty five extracted human mandibular premolars were obtained. Coronal access prepared using Endo access kit. Biomechanical preparation was done with Mtwo rotary files under irrigation with 5% NaOCl and a lubricant. Canals were dried with paper points. The canals were filled with a paste of Calcium hydroxide powder mixed with synthetic glycerine in the ratio of 1:1 ratio using lentulospiral. All specimens were stored in moist environment. Intracanal medicament was left in the canal for 2 weeks. 7U shaped wax rims were prepared and teeth were embedded in it. Samples were exposed to CBCT and the filled material was estimated using software.

The teeth were divided into 3 groups of 15 teeth each in a group based on the irrigating solution used for the removal of calcium hydroxide residues.

Group I: Irrigation of the canal to remove calcium hydroxide using 5% NaOCl and Endovac for 30s

Group II: Irrigation with 2% CHX, 6% H2O2 and Endovac system for 30s

Group III: Irrigation with 6% H2O2 and Endovac for 30s

After removal of calcium hydroxide in each group, final rinse was performed with normal saline. A second CBCT was done and the volume of remaining material was estimated as before.

Outcome Assessment

The calculation of Calcium hydroxide in each specimen was performed using ITK-SNAP software.

Technique used is semi-automatic snake segmentation with thresholding of density values, followed by voxel counting and volume estimation.

Volume of Calcium hydroxide was expressed as cubic.mm. The removal of Calcium hydroxide was calculated as:

$$([a-b] 100/a)$$

where,

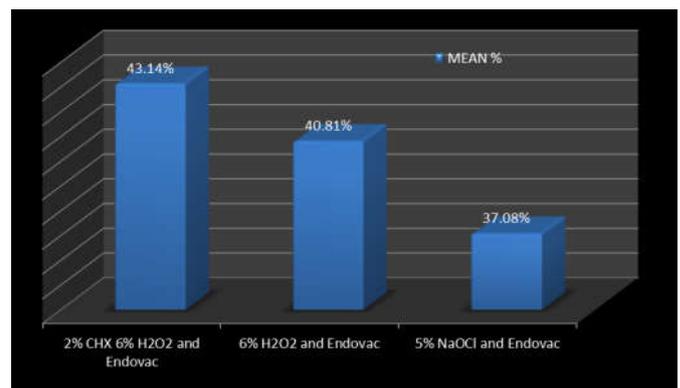
a = the volume of material packed in the root canal

b = the volume remaining after retrieval.

Statistical Analysis

	Mean (%)	Standard deviation	F	Sig.
2% CHX 6% H2O2 and Endovac	43.1400	3.72823	10.526	0.000 (H.S)
6% H2O2 and Endovac	40.8133	3.77754		
5% NaOCl and Endovac	37.0800	3.43307		

	Mean Difference	Standard Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
2% CHX 6% H2O2 and Endovac	6% H2O2 and Endovac	2.32667	1.33259	.200 (N.S)	-.9109 5.5642
	5% NaOCl and Endovac	6.06000	1.33259	.000 (H.S)	2.8225 9.2975
6% H2O2 and Endovac	5% NaOCl and Endovac	3.73333	1.33259	.020 (S)	.4958 6.9709



Photographs



Figure 1 Samples collected

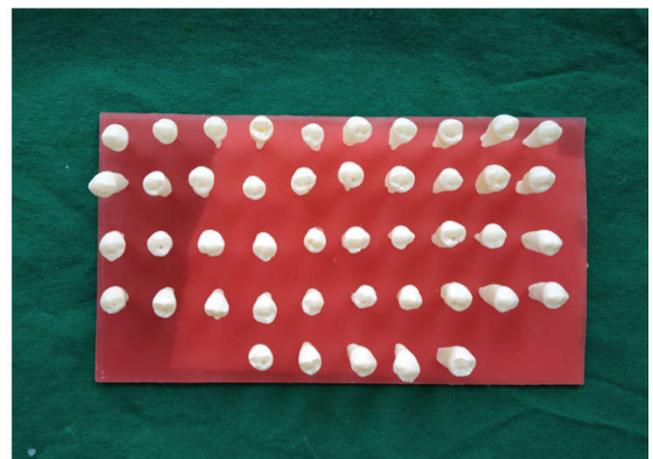


Figure 2 samples mounted after access opening



Figure 3 Samples mounted on wax for CBCT evaluation

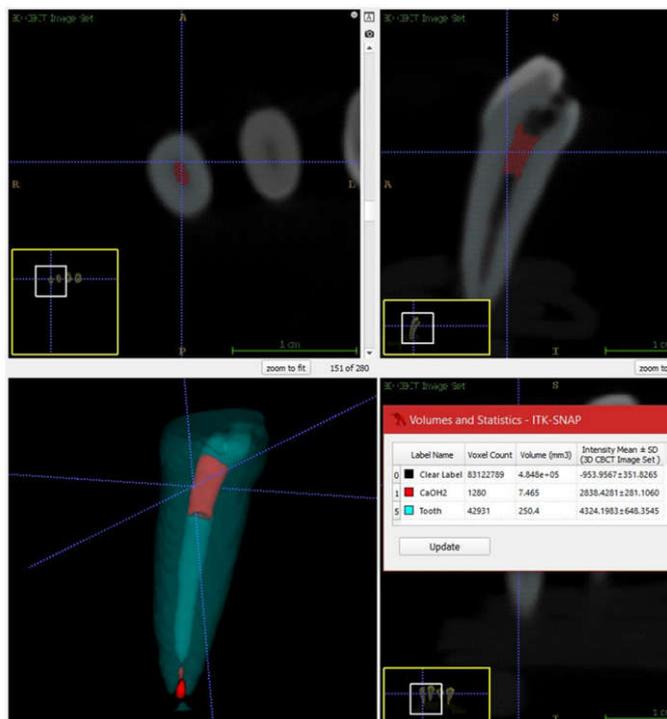


Figure 4 Volume calculation

DISCUSSION

Intracanal medicaments have been recommended with the goal of eliminating bacteria from the root canal, prevent bacterial proliferation between appointments, and to act as physiochemical barriers preventing root canal reinfection. Calcium hydroxide is a universally accepted inter-appointment intracanal medicament because of its biocompatibility, antimicrobial properties, and tissue dissolution ability.

However, removal of the CH is as crucial as removal of smear layer and debris from the root canal before obturation as it will help in better adaptation of the filling material to the canal walls. The residue of CH on root canal walls negatively affects the adaptation of the filling material to the root canal walls and influences the dentine bond strength. Complete removal of Calcium hydroxide is necessary for the root canal therapy.

Many techniques and irrigants have been evaluated for the efficacy in removing Calcium hydroxide from the root canals. Combination of irrigants improves the efficacy in removing Calcium hydroxide (Margelos *et.al*). In this study the volume analysis was done with CBCT cause volume analysis provides accurate results than surface area measurement. Advantages of CBCT are lower radiation dose and shorter acquisition time. Samples were mounted on wax rim in such a way that the position and numbering of the sample remain constant during pre and post irrigation scan.

The results of the present study reveal that Endovac when used with 2% CHX and 6% H2O2 showed better results. This is in accordance with the study done by Yucl. *et.al*. Removal of Calcium hydroxide using NaOCl and Endovac was less effective compared to combination of CHX, H2O2 with Endovac. This is because of the fact that NaOCl has limited ability to dissolve inorganic substance such as Calcium (Rodig *et.al*). This is because of the fact that NaOCl has limited ability to dissolve inorganic substance such as Calcium (Rodig *et.al*).

CONCLUSION

Complete removal of Calcium hydroxide from the root canal walls was not attained under the tested conditions and remnants of Calcium hydroxide was found in all experimental groups. The result is similar to the result of previous studies, which showed that considerable amount of Calcium hydroxide on the canal walls regardless of the removal technique used.

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