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ORIGINAL RESEARCH

Evaluation of effectiveness of the efficacy of manual and ultrasonic technique for removal of Calcium Hydroxide medicament from root canals

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ABSTRACT:

Background: The present study was undertaken for assessing the effectiveness of manual and ultrasonic technique for removal of Calcium Hydroxide medicament from root canals. **Materials and methods:** A total of 100 freshly extracted maxillary second premolars were included. Carious, grossly decayed and deformed tooth specimens were excluded. All the specimens were stored in normal saline before use. Access opening was done and biomechanical preparation was done in all the specimens. Root canal medicament (CH) was applied in all the specimens. After application all the specimens were divided into two study groups as follows: Group A: CH was removed by manual technique. Group B: CH was removed by ultrasonic technique. After, removal of calcium hydroxide, evaluation of empty canals was done by taking radiographs of roots. The statistical analysis of the data was done using SPSS software for windows. **Results:** Non-significant results were obtained while comparing the mean change in gray levels before and after CH removal in between specimens of both the study groups. **Conclusion:** Techniques are equally effective for removing calcium hydroxide from the root canals.

Keywords: Manual, Ultrasonic, Calcium Hydroxide.

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INTRODUCTION

The presence of microbes within the root canal plays a key role in causing endodontic infections. The main aim of root canal therapy is getting a microbial diminution and subsequent elimination of their byproducts from the root canal system. However, chemo-mechanical debridement cannot completely eliminate the microbes from the root canal. Hence, the use of intracanal medicaments has been recommended.¹⁻³ CH is commonly used as an intracanal medicament with excellent antibacterial activity against most of the

commonly seen bacterial strains identified in root canal infections. CH along with a suitable vehicle, and placed in the root canal for several days or weeks, has been widely accepted in endodontic therapy. However it should be completely removed before the final obturation of the root canals because its remnants may prevent the penetration of the sealers into the dentinal tubules, hinders the sealer adhesion to dentin, and may increase the micro apical leakage of the canal obturation.^{4,5}

Calcium hydroxide (Ca(OH)₂) has been widely used in endodontic treatment as an intracanal medicament, due to its antimicrobial properties against the most of the endodontic microorganisms and its biological effects and also for their capacity to inactivate bacterial endotoxins. Removal of Ca(OH)₂ medicament from root canals are necessary because the remnant of Ca(OH)₂ on the canal walls will influence dentine bond strength and also harmfully affect the quality of root filling material. Therefore, it has to be completely removed before obturation of the root canals is suggested.⁶⁻⁹ Hence; the present study was undertaken for assessing the effectiveness of manual and ultrasonic technique for removal of Calcium Hydroxide medicament from root canals.

MATERIALS AND METHODS

The present study was undertaken for assessing the effectiveness of manual and ultrasonic technique for removal of Calcium Hydroxide medicament from root canals. A total of 100 freshly extracted maxillary second premolars were included. Carious, grossly decayed and deformed tooth specimens were excluded. All the specimens were stored in normal saline before use. Access opening was done and biomechanical preparation was done in all the specimens. Root canal medicament (CH) was applied in all the specimens. After application all the specimens were divided into two study groups as follows:

Group A: CH was removed by manual technique.

Group B: CH was removed by ultrasonic technique. After, removal of calcium hydroxide, evaluation of empty canals was done by taking radiographs of roots. The optical thickness of radio opaque area was recorded in view of a size of 256 conceivable shades of grey, with dark symbolizing zero and white symbolizing 255. The statistical analysis of the data was done using SPSS software for windows.

RESULTS

Mean Gray levels among the specimens of group A before and after CH removal was found to be 128.3 and 142.8 respectively. Mean Gray levels among the specimens of group B before and after CH removal was found to be 123.8 and 147.5 respectively. Non-significant results were obtained while comparing the mean change in gray levels before and after CH removal in between specimens of both the study groups.

Table 1: Comparative evaluation of mean gray level at canals for Group 1 and 2 for both techniques

Study group	Mean gray levels before CH removal	Mean gray levels after CH removal	p-value
Group A	128.3	142.8	0.75
Group B	123.8	147.5	

DISCUSSION

Calcium hydroxide has been widely accepted as the most frequently used intra-canal medicament owing to its antimicrobial properties, inhibition of osteoclast activities and favorable tissue repair response. All interappointment dressing placed inside the root canal have to be removed before obturating the canals. In vitro studies have shown that remnant calcium hydroxide hinder the penetration of sealers into dentinal tubules, hinder the bonding of resin sealer adhesion to the dentin, interact with zinc oxide eugenol sealers, increase the apical leakage of root canal treated teeth. Hence, calcium hydroxide should be removed completely from the root canal system. The elimination may be obtained by the mechanical action of instruments in reaming motion and the chemical and physical action of irrigants. Several studies have been done to assess the efficacy of various devices or techniques in removal of intra-canal dressing. However, conflicting results exist regarding the effectiveness of these techniques in removing the calcium hydroxide.⁷⁻⁹ Hence; the present study was undertaken for assessing the effectiveness of manual and ultrasonic technique for removal of Calcium Hydroxide medicament from root canals.

In the present study, mean Gray levels among the specimens of group A before and after CH removal was found to be 128.3 and 142.8 respectively. Mean Gray levels among the specimens of group B before and after CH removal was found to be 123.8 and 147.5 respectively. Kirar DS analyzed fifty extracted single rooted teeth. After decoronation, the root canals of these teeth were prepared to the size F3 (30 no.) using rotary ProTaper file system. These samples were randomly divided into four groups. Group 1 (n=20) were filled completely with water based calcium hydroxide (CH), Group 2 (n=20) were filled with oil based CH using lentulo spiral, Group 3 (n=5) - the positive control group received the CH as intracanal medication, but no subsequent removal, Group 4 (n=5) - the negative control did not receive CH placement. Further on, Group 1 and Group 2 were divided into four sub-groups (n=5). In sub-group A we performed conventional syringe irrigation with side-vented needle sub-group B) manual dynamic agitation, sub-group C sonic agitation using endoactivator, sub-group D passive ultrasonic irrigation (PUI). Roots were split longitudinally into mesial and distal halves. Digital images of the root canal walls were acquired by a Dental Operating Microscope (DOM) and assessed by using a scoring criteria at different thirds (coronal, middle and apical) of the root canal as follows: score 1, score 2, score 3, and score 4. Statistically significant differences were not found between the experimental groups and the negative group in any one third of the root canal (P>0.05). However, a difference did exist between the

experimental groups and the positive control group ($P < 0.05$). None of the experimental groups totally removed CH substances from root canal walls. Among all experimental groups, removal of CH was best achieved by sonic agitation using endoactivator followed by passive ultrasonic irrigation (PUI), manual dynamic agitation and conventional syringe irrigation with side-vented needle.¹⁰

In the present study, non-significant results were obtained while comparing the mean change in gray levels before and after CH removal in between specimens of both the study groups. Khademi AA et al compared the efficiency of passive ultrasonic irrigation (PUI) and RinsEndo system in the removal of calcium hydroxide from root canal system. Access cavities were prepared in 50 single-rooted anterior teeth. Cleaning and shaping were done using the Flexmaster rotary system up to size no. 30, 6%. The canals were filled with injectable calcium hydroxide (calcipect). After 7 days, the calcium hydroxide were retrieved using RinsEndo system in Group 1 ($n = 20$), with PUI system in Group 2 ($n = 20$). In positive control group ($n = 5$), no irrigation was performed. In negative control group ($n = 5$), root canals were not filled with any medicament. Following the removal of the calcium hydroxide with these two systems, teeth were split buccolingually into two sections and every third of the root canals was evaluated under stereomicroscope ($\times 30$) to analyze the residual medicament in each segment. Data were analyzed using the Kruskal-Wallis and Mann-Whitney tests ($P < 0.05$). There was no significant difference in the removal of calcium hydroxide between RinsEndo and PUI at cervical ($P = 0.67$), middle ($P = 0.51$) and apical ($P = 0.75$) part of the root canals. None of the irrigation techniques was able to completely remove calcium hydroxide from the root canal system.¹¹

CONCLUSION

From the above results, the authors concluded that both the techniques are equally effective for removing calcium hydroxide from the root canals. However; further studies are recommended.

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