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EFFECT OF CALCIUM HYDROXIDE DRESSING ON APICAL MARGINAL LEAKAGE :AN IN VITRO STUDY

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ABSTRACT:

Aim: The aim of this study was to detect the effect of calcium hydroxide medicament on the apical marginal leakage after obturation of root canal system.

Materials and Methods: 40 freshly extracted single rooted human teeth were selected ,all the root canals were hand-instrumented. They were randomly divided into two groups of 20 teeth each. Group A has no intracanal medicament , group B were dressed with $Ca(OH)_2$ paste for 30 days groups. After that all groups were obturated with lateral compaction technique using gutta-percha points and zinc oxide-eugenol cement. Then the access was sealed with GIC cement. The teeth were immersed into 2% mythylene blue solution ,The specimens were placed in an incubator at 37°C ,with moisture at 100%, for 7 days .After that the roots were sectioned longitudinally and examined with stereomicroscope and liner leakage was measured.

Results: The results showed that the leakage in $Ca(OH)_2$ group was significantly less than control group which received no medicament. ($p<0,05$).

Conclusions: Under the conditions of this study, it can be concluded that the use of dressing of Ca(OH)2 for 30 days led to decrease the apical marginal leakage.

Keywords : Apical Marginal Leakage ,Calcium Hydroxide, Dressing.

INTRODUCTION

Endodontic treatment is essentially directed toward the prevention and control of pulpal and periradicular infections. Given the relevance of microorganisms forthe pathogenesis of periradicular lesions, it is clear that the outcome of the endodontic therapy depends on their reduction or elimination. Complete chemomechanical preparation may be considered an essential step in root canal disinfection. However, total elimination of bacteria is difficult to accomplish. [1,2,3] By remaining in the root canal between appointments, intracanal medicaments may help to eliminate surviving bacteria[2]. Since its introduction in 1920[4], calcium hydroxide has been widely used in endodontics. It is a strong alkaline substance, which has a pH of approximately 12.5. In an aqueous solution, calcium hydroxide dissociates into calcium and hydroxyl ions. Various biological properties have been attributed to this substance, such as antimicrobial activity [5], tissue-dissolving ability [6,7], inhibition of tooth resorption [8], and induction of repair by hard tissue formation. [9] Because of such effects, calcium hydroxide has been recommended for use in several clinical situations. [10,11] Currently, this chemical substance is acknowledged as one of the most effective antimicrobial dressings during endodontic therapy.

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The use of the medication for root canal system disinfection has been supported to improve the treatment outcome [12,13], as the complexity of the root anatomy makes more difficult their cleaning and shaping [14]. Intracanal medications such as calcium hydroxide(CH) are used to reduce or eliminate bacteria located in the root canal system and prevent their proliferation between sessions1. Early leakage studies that evaluated the effect of CH dressing on apical seal concluded that their presence reduced the infiltration and determined a significant improvement in the quality of marginal sealing of root canal filling. [15,16,17]

Because of the wide use of calcium hydroxide as a intracanal medicament, the aim of this study is to detect the effect of calcium hydroxide medicament on the apical marginal leakage after obturation of root canal system.

MATERIALS AND METHODS

40 freshly extracted teeth of adult humans with a single straight root, The teeth were stored in 0.2% thymol in normal saline solution until use. Any remaining tissue was mechanically removed using a curette with attention not to damage the root surface. Each tooth was decoronated to give approximately 16 mm of root length from the handpiece and a multipurpose bur (Dentsply Maillefer, Tulsa, OK) using coronal surface to the apex of the root with high-speed air and water spray. working lengths were established 1 mm short of the apical foramen. All the root canals were hand-instrumented by k-files using balanced force technique. Then they were randomly divided into two groups of 20 teeth each. Group A has no intracanal medicament (control group), while group B was dressed with $Ca(OH)_2$ paste for 30 days groups. The calcium hydroxide powder (Sultan Health Care, USA) was mixed with distilled water at a powder to liquid ratio of (1: 1.25). After canals were dried with paper points, calcium hydroxide paste was placed in the canal with the use of a lentulo-spiral (Thomas, ,France). and incubated in 100% humidity at 37°C for 30 days. After that all groups were obturated with lateral compaction technique using gutta-percha points (Hygenic, Akron, OH, USA) and zinc oxide-eugenol cement (ZOE).

Then the access was sealed with GIC cement (RongXiang Dental Material Company,LTP,China). The teeth were stored for 72h at 37°C and 100% humidity to allow the sealers to set. After that the teeth were immersed into 2% mythylene blue solution,The specimens were placed in an incubator at 37 ^{5}C ,with moisture at 100%, for 7 days. After that the roots were grooved in a buccolingual direction withoutpenetrating to the root canal. A chisel was placed in the groove to split the root in half with gentle pressure. leakage were linearly measured using stereomicroscope.

Statistical Analysis: Statistical Package For Social Sciences (SPSS) program was used at (P< 0,05),Independent Samples

(T.test) was used to compare between groups.and Significance level was set at 5%. (Table 1)

RESULTS AND DISCUSSION

It was found that there was a significant difference between two groups ($P < 0.05$). Specimens in group (B) exhibited less apical marginal leakage than the control group(A) which received no medicaments at Significance level 5%.

Intracanal medicaments are routinely used in root canal treatment, however they should only be used for root canal disinfection as part of controlling sepsis in infected root canals and their role is secondary to cleaning and shaping of the root canal. [18] For an intracanal medication to be suitable for clinical application, it must be easy to introduce into the root canal for proper contact with the tissues and easy to remove to ensure the effective seal of the root filling. The intracanal medication performs the antibacterial action by being in contact with the tissues and by diffusing through them.[19] An important consideration in endodontics is the ultimate seal of the root canals in order to prevent possible microleakage that may be the cause of future failure of the root filling. Leakage of the root canal system is an important consideration when placing an intracanal medication. [20]

Calcium hydroxide has been used as an intracanal medicament in different clinical situations. It has been shown to be effective in eliminating bacteria from the root canal space. Calcium hydroxide maintains its antibacterial effect over a long period of time, due to slow release of hydroxyl ions. [21] Calcium hydroxide is available in several formulations due to the number of vehicles that can be used along with it. The most commonly used calcium hydroxide is calcium hydroxide paste mixed with distilled water. The problem associated with it is its incomplete removal resulting in calcium hydroxide remnants on the canal walls. [22]

Leakage at the apex occurs between the root canal wall and the sealer, between the sealer and the gutta percha, or within the sealer itself. In the present study, all the specimens were coated with the nail varnish on their root surface to exclude any possible leakage through the dentin surface to leave only apical pathways. [14]

Results were statistically analyzed by Independent Samples (T.test) . Results revealed that the control group exhibited more apical marginal leakage than group B which received calcium hydroxide dressing for 30 days, and this difference was statistically significant.

An improvement in the sealing quality of root canal fillings with different sealers has been reported when Ca(OH)2 was used as a temporary dressing. [17,23,24] This was explained in the following two hypotheses (i) the residual calcium hydroxide is incorporated into the sealer during obturation, which may cause a decrease in the permeability of the

sealer itself and (ii) Ca(OH)2 is transported or mechanically forced into the dentinal tubules, blocking them off and decreasing dentinal permeability. [17] Pressure during lateral condensation procedures may have been a factor in forcing the Ca(OH)2 crystals into the dentinal tubules.

Other studies using India ink leakage with the same goal showed contrary results to those of the present study. In the studies of Kim and Kim[14] (2002) and Contardo et al.[25] (2007), the highest values of dye leakage were found in the groups that received the CH prior to filling. According to those authors, the presence of CH residues was not the only factor in reducing apical leakage, since the type of sealer used is also important. [17] It may be concluded that the remnants of CH intracanal medication led to lower dye penetration in length and depth at the two different locations evaluated in the study.

CONCLUSION:

The present study showed that the use of Ca(OH)2 plus water as intracanal dressing for 30 days is effective in reducing apical marginal leakage after filling the root canal system with gutta-percha points zinc oxide-eugenol cement (ZOE).

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TABLE:

Table -1: Mean scores of the experimental groups

Mean ± Std. Deviation	N	Groups
6.35 ± 0.51	20	**A (control group)**
3.94 ± 0.41	20	**B (with $Ca(OH)_2$)**

FIGURES:

Figure 1- Lentulo spiral drill is used to spin calcium hydroxide into canals.

Figure 2- calcium hydroxide paste was placed in the canal with the use of a lentulo-spiral

Figure 3- Stereomicroscope

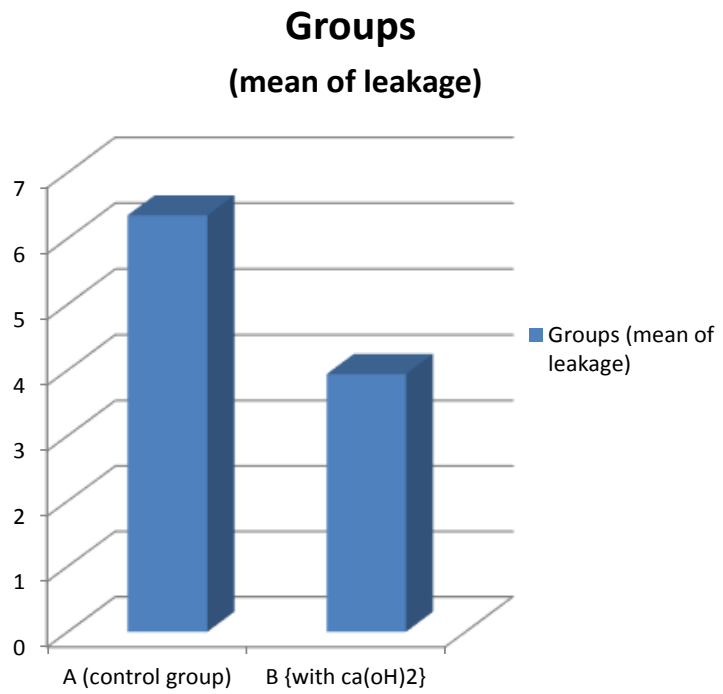

Figure 4: Comparison of mean between control group (without medicament) and group (B) with medicament.