

Effect of two intracanal medicaments in the apical seal – A dye extraction study

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ABSTRACT

Aim: The aim of this study is to compare the effectiveness of Calcium hydroxide and Triple antibiotic paste as intra canal medicament. **Objective:** The objective of this study is to determine the analyze the effect of Calcium hydroxide and Triple antibiotic paste used as intracanal medicament. **Materials and Method:** In this study, 30 freshly extracted single rooted teeth were used. Access opening and Cleaning and Shaping were done for all 30 teeth. 30 teeth were divided into 3 groups. In Group A (control group), cleaning and shaping was done in 10 teeth and no intracanal medicament was given. In group B, Calcium hydroxide was used as an Intracanal medicament and in Group C, Triple antibiotic paste was used as Intracanal medicament. Temporary filling was given for all 30 teeth. After One week, cleaning and shaping was again done for all these teeth and obturation was done. The teeth were immersed in India ink and the dye penetration was observed under 10X stereomicroscope. **Result:** The dye penetration level was found to be 21.05 in group A, 25.35 in group B and 27.15 in group C. There was no significant difference between group B and C. There was significant difference ($P = <0.05$) present between group A and B ($P = 0.019$) and group C and A ($P = 0.032$). **Conclusion:** From this study, we can conclude that dye leakage was present in all the three groups, but was found to be more when triple antibiotic paste was used as an intracanal medicament.

KEY WORDS: Calcium hydroxide, Cleaning and shaping, Ink, Obturation, Triple antibiotic paste

INTRODUCTION

The ultimate goal of doing a root canal treatment is to eliminate the existing pulpal or periapical lesion and to prevent any such lesions to reoccur in future. The success of any root canal treatment depends on the elimination of microorganisms responsible for pulpal pathologies during shaping and cleaning of infected root canals. Numerous methods have been established to ensure the above-mentioned reason which includes different methods of instrumentation, techniques of irrigation, and intracanal medicaments.^[1,2] It is impossible to remove those microorganisms with infected pulp, bacterial remains, and other debris from the canal with the help of mechanical instrumentation alone.^[3,4] Hence, various irrigation solutions and intracanal medicaments which remain in root canal between treatment appointments help to eradicate

those microorganisms and their by-products in root canal, thereby aiding in success of root canal treatment.^[5] The modern concept of medicine emphasizes prevention and reversal of the diseases. Only when these attempts fail, we would take on the unfavorable approaches, i.e., surgical intervention and restoration with artificial prostheses. The success of nonsurgical endodontic treatment method is based on appropriate cleaning, shaping, asepsis, and filling of the root canal.

Calcium hydroxide was first introduced in dentistry by Herman in 1920 as a pulp capping agent. After this, various researches were conducted to explore the potential use of calcium hydroxide in field of endodontics such as a root canal medicament, as a promoter for healing of periradicular tissues and also as an obturating material combined with iodoform in primary teeth despite having certain adverse reactions.^[6] However, the microorganism in the root canal producing these infections does not belong to a single category. Polymicrobes are those where there is a presence of both aerobic and anaerobic

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bacteria are considered to be chief microorganisms which produce periapical and pulpal pathologies.

Hence, a combination of intracanal medications would be required to eradicate such polymicrobes from the root canal. One such promising combination is called as triple antibiotic paste (TAP), which contains mixture of metronidazole, ciprofloxacin, and minocycline.^[7] Metronidazole was the first choice drug as an antibacterial agent but even at high concentrations it cannot completely eradicate all the bacteria. Hence, the use of other two medications mentioned earlier was used along in a paste form where propylene glycol was used as a vehicle.^[8] Sato *et al.* was the first person to use TAP for the sterilization of infected root canal *in situ*.^[9]

The aim of our study is to compare the effectiveness of calcium hydroxide and TAP as intracanal medicament and to analyze the effect of calcium hydroxide and TAP when used as intracanal medicament.

MATERIALS AND METHODS

In this study, 30 freshly extracted single rooted, non-carious teeth were used. Teeth with internal or external resorption, caries, calcified canals, curved canals were excluded from the study.

Any soft tissue debris or calculus was removed from the teeth and the samples were disinfected in 5% sodium hypochlorite solution for 1 h and stored in normal saline. Access opening was done and apical enlargement until size 40 was done for all 30 teeth. Canals were enlarged using step-back technique until size 60. The canals were irrigated with normal saline.

Thirty teeth were divided into three groups. Group A (control group) consisted of 10 teeth and no intracanal medicament was given. Group B consists of 10 teeth where calcium hydroxide was used as intracanal medicament, and Group C consists of 10 teeth where TAP was used as intracanal medicament. Temporary filling was given for all 20 teeth. After 1 week, cleaning and shaping were again done for all the teeth. Obturation was done using gutta-percha points using lateral condensation and the access cavity was sealed using resin-modified glass ionomer cement.

After obturation, radiographs were taken to make sure there were no voids. The teeth were stored in an incubator at 37°C for 72 h. After 72 h, the teeth were immersed in India ink and placed in incubator at 37°C for 1 week. After removing the teeth from ink, the teeth were completely washed in running water to remove the ink. The roots were then demineralized in 5% nitric acid for 3 days. They were dehydrated using ethyl alcohol. After dehydration,

the teeth were placed in methyl salicylate until the teeth were cleaned. The teeth were placed under $\times 10$ stereomicroscope and the extent of dye penetration in each group was assessed.

RESULTS

In this study, the mean value of the control group was found to be 21.05 in Group A, 25.35 in Group B, and 27.15 in Group C Table 1.

DISCUSSION

In this study, Group A (control group) had the least leakage value and Group C (TAP) had the highest dye leakage value.

There was no significant difference between Groups B and C. There was significant difference ($P \leq 0.05$) present between Groups A and B ($P = 0.019$) and Groups C and A ($P = 0.032$) Table 2.

The reason for less leakage in the control group can be explained by the natural mechanism of dentin, which itself acts like an intracanal medicament in preventing bacterial activity in the canal. This was explained in a study done by Portenier *et al.* who demonstrated that dentin itself can have an inhibitory effect on the bactericidal activity of intracanal medicaments like calcium hydroxide.^[10]

Porkaew *et al.* have studied apical leakage in teeth filled by lateral condensation technique following medication with calcium hydroxide. They observed significantly less leakage in the experimental groups treated with calcium hydroxide than in the control groups.^[11] Similar results were observed by Holland *et al.*,^[12] Holland *et al.*,^[13] Kontakiotis *et al.*,^[14] and Caliskan *et al.*^[15] However, these studies also noted that when calcium hydroxide dressing was retained in the canal, apical leakage increased with time. Recently, Wu *et al.* have described the possibility of false results occurring with previous dye leakage studies using methylene blue dye because it may lose its color in contact with calcium hydroxide. The

Table 1: Mean leakage value

Groups	n	Mean
Group A	10	21.05
Group B	10	25.35
Group C	10	27.15

Table 2: Significance between groups

Groups	P value
Group A and B	0.019
Group B and C	0.201
Group C and A	0.032

decolorizing effect of calcium hydroxide is related to its high alkalinity and this varies according to its form that is paste, cone, or sealer.^[16]

Raison Bose compared TAP, calcium hydroxide, and formocresol as intracanal medicaments in non-vital young permanent teeth. The triple antibiotic group showed the highest percentage increase in the dentin wall thickness compared with the other two groups. TAP can help promote functional development of the pulp–dentin complex.^[17] Reynolds *et al.* achieved revascularization of a necrotic bicuspid using TAP.^[18] TAP contains both bactericidal (metronidazole and ciprofloxacin) and bacteriostatic (minocycline) agents to allow for successful revascularization.^[19]

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. 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.^[11,12]

Several techniques have been used to analyze the sealing ability with regard to root canal fillings, including evaluation of leakage of bacteria, human saliva, protein complex, fluid filtration, and dye leakage. However, dyes can chemically interact with sealing materials or dentin, which may influence its diffusion or promote tracer decoloration, impairing an adequate marginal leakage evaluation. Due to their small molecular size, dye penetration has been used as a dependent measure of sealing ability; however, whether dyes mimic penetration of microorganisms or antigens is still not known. Moreover, entrapped air in the canal filling may falsify dye penetration depth, suggesting the application of vacuum techniques or centrifugation, even if previous studies showed that dye penetration did not differ whether centrifugation was applied or not. In addition to that Matloff *et al.* reported no correlation between a dye penetration and a radioisotope method. Similarly, a study by Barthel *et al.*^[12] showed no correlation between dye penetration and bacterial leakage test methods.^[20-22]

CONCLUSION

Elimination of microbial contamination from the root canal system is a pre-requisite to the successful outcome of root canal treatment. The use of an effective intracanal medicament will assist in the disinfection of the root canal system. Such medication should be effective throughout its period of application, and penetrate the dentinal tubules, eliminating bacteria that

may be present with little toxicity to the periradicular tissues.^[3,23,24] From this study, we can conclude that dye leakage was present in all the three groups but was found to be more when TAP was used as an intracanal medicament when compared with control group and calcium hydroxide.

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