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# Original Research

## To compare effectiveness of different root canal irrigating solution- An in vitro study

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***ABSTRACT:***
**Background:** Removal of all the material inside the canal is a necessity for success of the root canal procedures. The present study was conducted to compare effectiveness of different root canal irrigating solution. **Materials & Methods:** The present study was conducted on 120 freshly extracted periodontally week mandibular molars. All teeth were divided into 4 groups of 30 teeth each. In group I teeth were irrigated with 17% EDTA, in group II with 5.2% NaOCl, in group III with MTAd and in group IV with 2% chlorhexidine. The samples were prepared and cut into 2 halves. They were observed under a scanning electron microscope (SEM). The photomicrographs were recorded and evaluated with a scoring system. **Results:** In group I, smear score at cervical third was 1.16, at middle third was 1.20 and at apical third was 1.35. In group II, at cervical third was 1.67, at middle third was 1.78 and at apical third was 1.92. In group III, at cervical third was 1.65, at middle third was 1.68 and at apical third was 1.90. In group IV, at cervical third was 2.04, at middle third was 2.12 and at apical third was 2.25. The difference was non- significant (P> 0.05). **Conclusion:** Different irrigating solutions such as EDTA, 5.25% NaOCl, MTAd and 2% chlorhexidine found to be equally effective in root canal therapy.
**Key words:** Chlorhexidine, Irrigating solutions, NaOCl

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### INTRODUCTION

Removal of all the material inside the canal is a necessity for success of the root canal procedures.[1] However, limitations of debridement by hand and mechanical way has been reported in recent studies. The internal anatomy of the canals and lack of practice of the clinician predisposed to transport the main canal, perforations and apical blockage. Removal of debris, microorganisms and other inorganic material from the main canal previous obturation is an important tool to consider of the major targets of root canal therapy. Microorganisms persisting in the canal space following clinical events or re-colonizing the obturated canal, are the principal source of failure.[2]

Bacteria have long been recognized as the primary etiologic factors in the development of pulp and periapical lesions. Successful root canal therapy depends on thorough chemo-mechanical debridement of pulpal tissue, dentin debris, and infective microorganisms. Irrigants can augment mechanical debridement by flushing out debris, dissolving tissue, and disinfecting the root canalsystem. Chemical debridement is especially needed for teeth with complex internal anatomy such as fins or other irregularities that might be missed by instrumentation.[3] Ethylenediamine tetraacetic acid (EDTA), 5.25% sodium hypochlorite (NaOCl), Biopure MTA and 2% chlorhexidine etc. are among different irrigating solutions which may serve to provide bacteria free area.[4]The present study was

conducted to compare effectiveness of different root canal irrigating solution.

## MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It comprised of 120 freshly extracted periodontally week mandibular molars. Maxillary molars were not taken into consideration. The purpose of the study was explained to the institutional ethical committee and approval was obtained.

In all teeth, working lengths were calculated by subtracting 1mm from measurements recorded with size #10 K-files. The canals were enlarged by rotary instrument with size 25 light speed LSX instrument. Rotary debridement was started with size #25 to size #80 light speed LSX instruments in the apical third with a 2000 rpm using in and out movement. Each instrument was changed every 4 canals and the clinical procedures was achieved.

All teeth were divided into 4 groups of 30 teeth each. In group I teeth were irrigated with 17% EDTA, in group II with 5.2% NaOCl, in group III with MTAd and ingroup IV with 2% chlorhexidine. The samples were prepared and cut into 2 halves. They were observed under a scanning electron microscope (SEM). The photomicrographs were recorded and evaluated with a scoring system. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## RESULTS

**Table I Distribution of teeth**

| Group | Group II | Group III | Group IV |
|---|---|---|---|
| 17% EDTA | 5.25% NaOCl | MTAd | 2% Chlorhexidine |
| 30 | 30 | 30 | 30 |

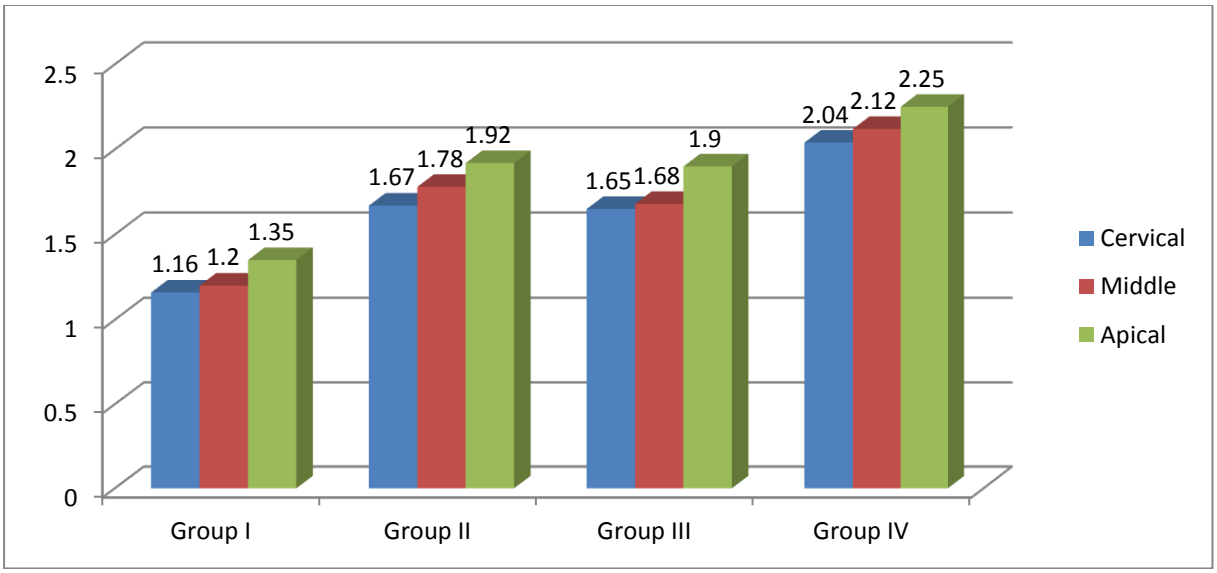
Table I shows that group I teeth were irrigated with 17% EDTA, in group II with 5.25% NaOCl, in group III with MTAd and in group IV with 2% chlorhexidine. Each group had 30 samples.

**Table II Smear layer score in all groups**

| Surface | Group I | Group II | Group III | Group IV |
|---|---|---|---|---|
| Cervical | 1.16 | 1.67 | 1.65 | 2.04 |
| Middle | 1.20 | 1.78 | 1.68 | 2.12 |
| Apical | 1.35 | 1.92 | 1.90 | 2.25 |
| P value | 0.21 | 0.28 | 0.32 | 0.45 |

Table II shows that in group I, smear score at cervical third was 1.16, at middle third was 1.20 and at apical third was 1.35. In group II, at cervical third was 1.67, at middle third was 1.78 and at apical third was 1.92. In group III, at cervical third was 1.65, at middle third was 1.68 and at apical third was 1.90. In group IV, at cervical third was 2.04, at middle third was 2.12 and at apical third was 2.25. The difference was non- significant (P> 0.05).

**Graph I: Smear layer score in all groups**




**DISCUSSION**

Ideal requirements of root canal irrigants are that it should have broad antimicrobial spectrum, high efficacy against anaerobic and facultative microorganisms organized in biofilms, ability to dissolve necrotic pulp tissue remnants, ability to inactivate endotoxins and ability to prevent the formation of a smear layer during instrumentation or to dissolve the latter once it has formed.[5]The present study was conducted to compare effectiveness of different root canal irrigating solution.

In present study, group I teeth were irrigated with 17% EDTA, in group II with 5.25% NaOCl, in group III with MTAd and in group IV with 2% chlorhexidine. Each group had 30 samples. Studies have found that sodium hypochlorite causes complete dissolution of cells with absence of visual evidence, bacterial cells are disrupted and separated from the biofilm and are nonviable, bacterial cells remain adherent within the biofilm but are nonviable, bacterial cells are disrupted and separated from the biofilm but are viable, bacterial cells remain adherent within the biofilm and are still viable.[6]

When hypochlorous acid, a substance present in NaOCl solution, comes in contact with organic tissue it acts as a solvent and releases chlorine, which combines with the protein amino group to form chloramines. Hypochlorous acid (HOCl−) and hypochlorite ions (OCl−) lead to amino acid degradation and hydrolysis.[7] The chloramination reaction between chlorine and the amino group (NH) forms chloramines that interfere in cell metabolism. Chlorine (a strong oxidant) has an antimicrobial action, inhibiting bacterial enzymes and leading to an irreversible oxidation of SH groups (sulphydryl group) of essential bacterial enzymes. Vieyra et al[8] in their study compared the dentinal debris removal capacity of 17% EDTA, 2.5% NaOCl, MTAD and 2% Chlorhexidine when used as an irrigants throughout root canal instrumentation. Eighty maxillary incisors were used and allocated into four groups and instrumented with the same clinical procedure but rinsed with a different irrigant solution. Irrigating solutions employed were: 17% EDTA, MTAD, 2.5% NaOCl and 2% Chlorhexidine. After irrigation with: EDTA and MTAD resulted in little debris residual on canals as related with NaOCl and Chlorhexidine. NaOCl left little debris on canals as compared with Chlorhexidine but the difference was not statistically major. The Q-Cochran test showed statistical significance among the four groups. As the results for each group did not follow a normal distribution, the variables were analyzed using a nonparametric test.

Manzur et al[9] in a randomized clinical trial, assessed the antibacterial efficacy of intracanal medication with Ca(OH)2, 2% CHX gel and a combination of both [Ca(OH)2/CHX] in teeth with chronic apical periodontitis. Bacteriological samples were obtained from the operative field and the root canals before and after instrumentation in the first treatment session. Further samples were taken from the canals at the commencement of the second appointment 1 week later. They concluded that the antibacterial efficacies of $Ca(OH)_2$, CHX and a mixture of Ca(OH)2/CHX were comparable.

Zerella et al[10] investigated the effect of a slurry of Ca(OH)2 mixed in aqueous 2% CHX versus aqueous Ca(OH)2 alone on the disinfection of the root canal system of root filled teeth that required root canal re-treatment because the canals had become infected again. Twelve (30%) of the 40 samples were positive for bacteria before root filling. The control medication disinfected 12 (60%) of 20 teeth including two of four teeth that had been originally diagnosed with enterococci. The experimental medication resulted in disinfection of 16 of 20 (80%) teeth at the beginning of the third appointment. None of the teeth originally containing enterococci showed remaining growth. They concluded that a mixture of 2% CHX and

$Ca(OH)_2$ slurry is as efficacious as aqueous Ca(OH)2 on the disinfection of infected root filled teeth.

## CONCLUSION

Different irrigating solutions such as EDTA, 5.25% NaOCl, MTAd and 2% chlorhexidine found to be equally effective in root canal therapy.

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