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Assessment Of Effect Of 5% Calcium Hypochlorite And 5% Sodium Hypochlorite Solutions On The Modulus Of Elasticity Of Root Dentin- An Original Research

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ABSTRACT
Background: The present study was conducted to assess the effect of 5% $Ca(OCl)_2$ and 5% NaOCl solutions on the modulus of elasticity of root dentin.
Materials & Methods: 72 intact non carious mandibular premolars were divided into 3 groups. Group I teeth were stored in normal saline, and groups II in 5% $Ca(OCl)_2$ and group III into 5% NaOCl solutions. Modulus of elasticity was measured
Results: The mean modulus of elasticity in group I was 0.38, in group II was 0.32 and in group III was 0.27. The difference was significant (P< 0.05).
Conclusion: The modulus of elasticity was comparatively lower with 5% $Ca(OCl)_2$ and 5% NaOCl as compared to normal saline.

Key words: Dentin, modulus of elasticity, Sodium hypochlorite

1. INTRODUCTION

Adequate cleaning, shaping, and debridement of the root canal to eliminate bacteria, remove necrotic tissues, and any remainder of smear layer generated by mechanical preparation are among the clinical challenges faced on a daily basis during endodontic treatment.[1] Accordingly, the adequate action of any irrigant solution used in all of these considered factors can culminate in a predictability of success and longevity of the treatment. This is shown by clinical studies where the recurrence of infection is cited as a major reason for failure.[2] There are a number of irrigant solutions available for endodontic treatment, and many others are being tested; however, none meet all the requirements needed to be

considered an ideal irrigant. For example, the main requirements include a broad antibacterial spectrum, the dissolution of remnants of both vital and necrotic pulp tissue, and avoidance of the formation of smear layer during mechanical preparation.[3]
Calcium hypochlorite [$Ca(OCl)_2$] is commonly used in water purification (35%) and sterilization procedures. When compared to NaOCl, it has a relatively stable pH and greater available chlorine (up to 65%). It is hypothesized that an accidental periapical extrusion of $Ca(OCl)_2$ may cause less tissue irritation.[4] Passive ultrasonic irrigation with $Ca(OCl)_2$ can result in reduction of microbial content within root canal, but it was not statistically significant when compared to passive ultrasonic irrigation with NaOCl. An endodontic irrigant that effectively disinfects the root canal system without altering the properties of the involved tissues may be desirable.[5] The present study was conducted to assess the effect of 5% $Ca(OCl)_2$ and 5% NaOCl solutions on the modulus of elasticity of root dentin.

2. MATERIALS & METHODS

The present study was conducted on 72 intact non carious mandibular premolars extracted for orthodontic treatment purpose.
Teeth were sectioned into standardized plano-parallel dentin bars. Group I teeth were stored in normal saline, and groups II in 5% $Ca(OCl)_2$ and group III into 5% NaOCl solutions. All the three test solutions were changed once in 15 minutes for 30 minutes. The dentin bars were then loaded to failure using three-point bend test. Modulus of elasticity was measured. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

3. RESULTS

Table I Distribution of teeth

Groups	**Group I**	**Group II**	**Group II**
Method	Normal saline	5% $Ca(OCl)_2$	5% NaOCl
Number	24	24	24

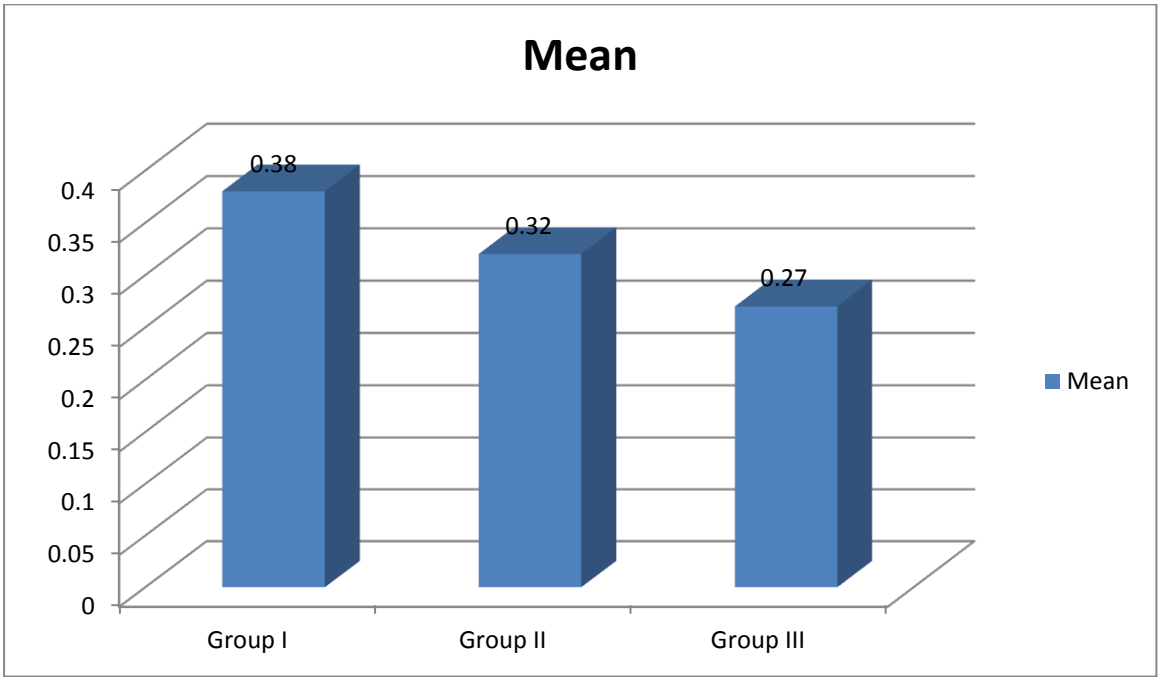
Table I shows distribution of teeth based on storage media. Each group had 24 teeth.

Table II Comparison of modulus of elasticity

Groups	**Mean**	**P value**
Group I	0.38	0.05
Group II	0.32	
Group III	0.27	

Table II, graph I shows that mean modulus of elasticity in group I was 0.38, in group II was 0.32 and in group III was 0.27. The difference was significant (P< 0.05).

Graph I Comparison of modulus of elasticity



4. DISCUSSION

There are a number of irrigant solutions available for endodontic treatment, and many others are being tested; however, none meet all the requirements needed to be considered an ideal irrigant. For example, the main requirements include a broad antibacterial spectrum, the dissolution of remnants of both vital and necrotic pulp tissue, and avoidance of the formation of smear layer during mechanical preparation.[6] However, each solution has unique properties. For example, sodium hypochlorite (NaOCl) and chlorhexidine (CHX) exhibit a broad antibacterial spectrum, but NaOCl is a potential irritant of periapical tissues.[7] Conversely, CHX does not dissolve the pulp tissue but is less cytotoxic to the periapical tissues than NaOCl. Accordingly, it is sometimes necessary to use the irrigant solution combinations or alternate with chelators to address some disadvantages.[8] Irrigant solutions are also important because they could influence the mechanical properties of the dental structure as well as assist in the cleaning of the root canal. Some studies have identified a relationship between mechanical defects in dental structures such as a reduction in the microhardness of root dentin or an increase in the incidence of vertical fracture with auxiliary chemical solutions. Factors such as increased concentrations of irrigant solutions, high capacity to remove smear layer, and time of dentin exposure to solutions are being discussed as possible causes of these faults.[9] The present study was conducted to assess the effect of 5% $Ca(OCl)_2$ and 5% NaOCl solutions on the flexural strength of root dentin.

In present study, in group I, teeth were stored in normal saline, and groups II in 5% $Ca(OCl)_2$ and group III into 5% NaOCl solutions. Reddy et al[10] compared the effect of 5% calcium hypochlorite [Ca(OCl)2] and 5% sodium hypochlorite (NaOCl) on flexural strength and modulus of elasticity of root dentin. Standardized planoparallel dentin bars were divided into two test groups and one control group. The control, group 1, consisted of dentin bars stored in normal saline. The dentin bars in the two test groups were treated by exposure to following solutions: Group 2 to 5% $Ca(OCl)_2$; and group 3 to 5% NaOCl. Available chlorine concentration was 64% in both the test solutions. There was a significant reduction in the flexural strength of 5% NaOCl group compared to 5% $Ca(OCl)_2$ treated ones. A significant difference in modulus of elasticity was observed between the test groups and the control groups and also between the 5% $Ca(OCl)_2$ and 5% NaOCl groups.

We found that mean modulus of elasticity in group I was 0.38, in group II was 0.32 and in group III was 0.27. Dutta and Saunders[11], iodometric titration was used to determine the concentration of available chlorine content in the $Ca(OCl)_2$ solution. Wang and Hume[12] have postulated that $Ca(OH)_2$ does not penetrate dentin well because of buffering capacity of hydroxyapatite. The presence of Ca2+ ions in $Ca(OCl)_2$ could have led to the production of twice as many as hydroxyl ions than in NaOCl solution. This would have neutralized the pH and slowed down the rate of formation of HOCl. Hence it may be assumed that $Ca(OCl)_2$ may have more pronounced effect on the superficial surface of the dentin than its interiors. Thus the null hypothesis was rejected.

5. CONCLUSION

Authors found that modulus of elasticity was comparatively lower with 5% $Ca(OCl)_2$ and 5% NaOCl as compared to normal saline.

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