RESEARCH ARTICLE

Comparison of frequency of pain in root canal treatment using sodium hypochlorite and chlorhexidine as root canal irrigants

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Abstract

Objectives: To compare the frequency of pain in root canal treatment using sodium hypochlorite and chlorhexidine as root canal irrigants.

Methods: The cross-sectional study was carried out from January to June 2016 at the Pakistan Institute of Medical Sciences (PIMS), Islamabad, Pakistan, and comprised patients aged 18-40 years with irreversible pulpitis involving a posterior tooth. The patients were divided into two equal groups, with Group-I receiving 2% chlorhexidine, and Group-II receiving 5.25% sodium hypochlorite. Following the use of the irrigants, the selected teeth were evaluated for pain at 72 hours using Visual Analogue Scale.

Results: There were 60 patients divided into groups of 30(50%) each. The overall mean age was 27.97±5.9 years. There were 32 (53.3%) females and 28 (46.6%) males. The mean post-operative pain score was 1.70±1.9 in Group-I and 1.90 ± 2.3 in Group-II (p=0.5). In Group-I, 25(83.3%) patients had no pain while in Group-II, 20(66.7%) had no pain (p=0.1).

Conclusion: There was no difference in post-operative pain at 72 hours between 2% chlorhexidine and 5.25% sodium hypochlorite when used as irrigants.

Keywords: Root canal treatment, Anti-microbial irrigants, Chlorhexidine, Sodium hypochlorite. (JPMA 68: 1334; 2018)

Introduction

A major aim of endodontic treatment is to eradicate bacteria for which a number of antimicrobial irrigants are used to supplement shaping and cleaning of root canal, especially in areas of complex root canal anatomy where the instruments cannot reach.[1,2] Moreover, the use of instruments create a smear layer that prevents the decontamination of the canal by plugging dentinal tubules.[3] It is extremely desirable that root canal irrigants have four important properties: antibacterial activity, organic and inorganic tissue-dissolving properties, ability to debride root canal system, and non-toxicity especially if extruded into the periapical area.[1] Additionally they should have a lubricating effect to reduce instrument friction during canal preparation.[4] Sodium hypochlorite (NaOCl), in a concentration of 0.5%-5.25%, is a commonly used irrigant in dentistry. It is alkaline in nature and has anti-microbial and tissue-dissolving properties. NaOCl has many drawbacks; it has an unpleasant taste, it is toxic, it is unable to abolish the smear layer and has limited antimicrobial effect at low concentrations.[1,5] Another irrigant used for root canal irrigation is 2% chlorhexidine (CHX). It is a strong basic solution and potent antiseptic but since it cannot dissolve the necrotic tissue remnants, it is not recommended as the sole irrigant in routine endodontics.[5,6] Pain, swelling and tissue damage can occur if the irrigant extrudes into the periapical area.[2]

Several studies have looked at the relationship of irrigants with postoperative pain in root canal treatment. One study compared NaOCl 5.25% and CHX 2% for post-operative pain in root canal treatment at 24 hours, 48 hours, 72 hours and 7 days. The results showed that only 3% patients from each group experienced moderate pain at 24 hours. For all the time periods evaluated, no significant difference was found between the two irrigants (p>0.05).[7] A similar comparison was done by another study which concluded that there was no statistically significant difference between the two irrigants at 24 hours, 48 hours, and 72 hours (p>0.05).[8] One study compared the two irrigants at 6hours, 24hours, 4th and 7th day for the assessment of post-operative pain. It found no statistically significant difference (p=0.006).[1]

The previous studies conducted on the comparison of NaOCl and CHX included teeth with irreversible pulpitis and necrotic teeth. In necrotic teeth extrusion of debris can cause pain which could be a confounding variable. The current study was planned to compare the two irrigants while controlling the necrotic teeth variable by including teeth with irreversible pulpitis only. It was hypothesised that there is no significant difference between the two irrigants.

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Patients and Methods

This cross-sectional study was carried out from January to June 2016 at the Operative Dental Department, Pakistan Institute of Medical Sciences (PIMS), Shaheed Zulfiqar Ali Bhutto Medical University (SZAMBU), Islamabad, Pakistan. After approval from the institutional ethics committee, patients of either gender aged 18-40 years with irreversible pulpitis involving a posterior tooth (maxillary and mandibular premolar and molar teeth) were included. Patients with periapical periodontitis, periapical radiolucency and discharging sinus were excluded. With level of significance 5% and power of study 80%, the sample size was calculated using the formula: SS= Z2 × (P 1) × (1- P 2) ÷ C2

Where Z= confidence interval= 95%; P 1 = population 1= 25%; P 2= population 2=65%; and C= confidence interval=0.05.

After informed consent was taken from all the patients, a thorough history was taken and clinical examination was performed. A preoperative periapical radiograph was taken. The patients were randomly divided into two equal groups. The randomisation was carried out using the computer, with Group-I signifying 2% CHX (Canal Pro CHX, Coltene Endo), and Group-II denoting 5.25% NaOCl (Canal Pro NaOCl, Coltene Endo) irrigating solutions. Local anaesthesia was administered to anesthetise the test tooth. Under rubber dam isolation, the tooth was accessed following all the principles of an ideal access cavity preparation. Rubber dam isolation was achieved after preparation of the access cavity in tilted, rotated, heavily restored and mal aligned teeth. After canal location and negotiation (using International Organization for Standardization [ISO] 8 and 10 K files), pulpectomy was performed using barbed broaches. Working length was established using radiographic technique. Canal preparation was done utilising crown-down technique with the help of ProTaper (Dentsply) universal files with simultaneous use of irrigants from each group, according to the manufacturer's instructions. Further, 2ml of the irrigant was used to irrigate the canal after each filing using 30 gauge Max-i-probe syringes with side vented needles (Maillefer, Dentsply). Precautions were taken during irrigation to prevent extrusion. Care was taken not to let the needle bind with canal walls. Irrigant was extruded using finger pressure (instead of thumb pressure). The irrigant was extruded slowly from the syringe. A stopper was used to mark the irrigating needle such that it was kept 1-2mm away from the root apex. During irrigation the needle was constantly moved up and down in the canal. The rate of irrigant extrusion was never greater than 4ml per min.

At the end of the procedure, paper points were used to dry the canals and a temporary restoration placed to seal the access cavity. No intracanal medication was used to confuse the effects of the irrigation solutions. A special type of proforma was given to each patient at the completion of first appointment with instructions for recording their evaluation of the level of pain visual analogue scale (VAS) score (0-10) at 72 hours.

The pain response of each patient was divided into two categories: VAS score 0-3 was considered no pain; VAS score 4-10 was considered as pain.

SPSS 20 was used to analyse the data. For qualitative and quantitative variables, descriptive statistics were used. For age and pain score at 72 hours, Mean ± standard deviation was calculated. Percentages and frequencies were calculated for gender and pain. To compare the frequency of pain between the groups, Chi-square test was used. P<0.05 was considered statistically significant. Stratification was used to control effect modifiers like age and gender.

Results

There were 60 patients divided into groups of 30(50%) each. The overall mean age was 27.97±5.9 years. There were 32 (53.3%) females and 28 (46.6%) males. The mean value of pain score determined post operatively was

Table-1: Pain at 72 hrs according to age.

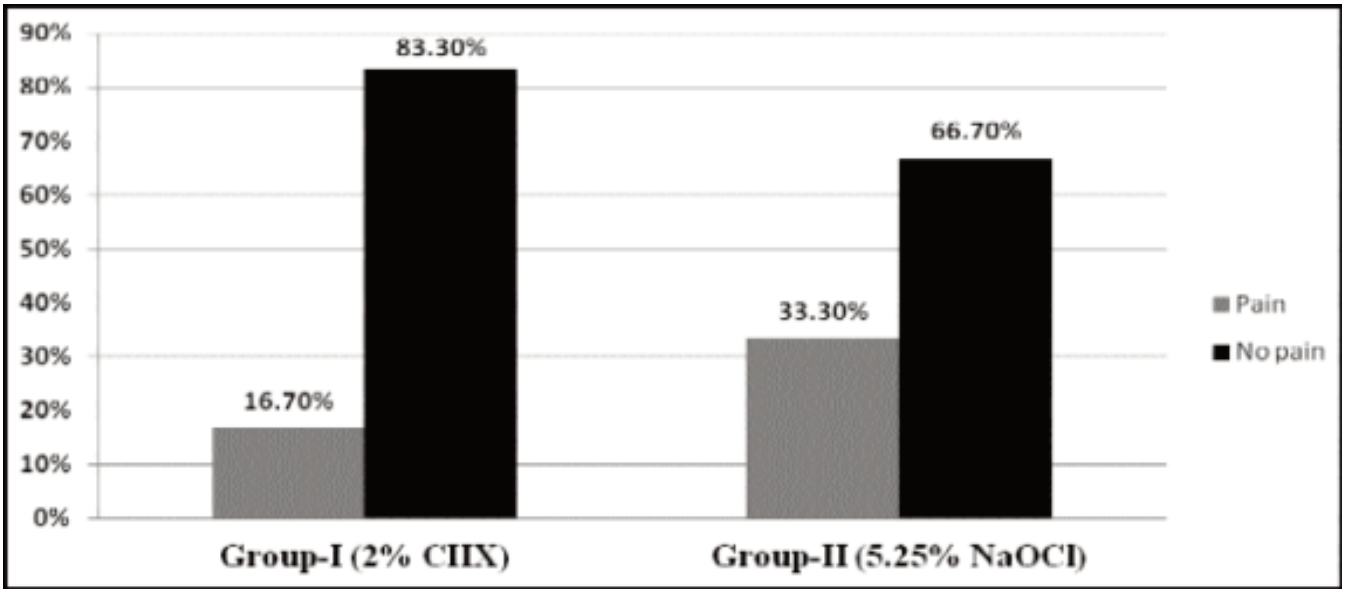
Age Category	Irrigant	No Pain (0-3)	Pain (4-10)	P Value
<25 years	2% CHX	90.9%	9.1%	0.64
	5.25 %NaOCl	83.3%	16.7%	
26-30 years	2% CHX	75.0%	25.0%	0.27
	5.25 %NaOCl	53.8%	46.2%	
31-35 years	2% CHX	100.0%	0.0%	0.09
	5.25 %NaOCl	60.0%	40.0%	
36-40 years	2% CHX	0.0%	100.0%	0.09
	5.25 %NaOCl	83.3%	16.7%	

CHX: Chlorhexidine.
NaOCL: Sodium hypochlorite.

Table-2: Pain at 72 hours according to gender.

Gender	Irrigant	No Pain (0-3)	Pain (4-10)	P Value
Male	2% CHX	76.90%	23.10%	0.34
	5.25 %NaOCl	60.00%	40.00%	
Female	2% CHX	88.20%	11.80%	0.28
	5.25 %NaOCl	73.30%	26.70%	

CHX: Chlorhexidine.
NaOCL: Sodium hypochlorite.



CHX: Chlorhexidine
NaOCL: Sodium hypochlorite

Figure-1: Comparison of post-operative pain at 72 hours in both groups. (n=60, p= 0.13).

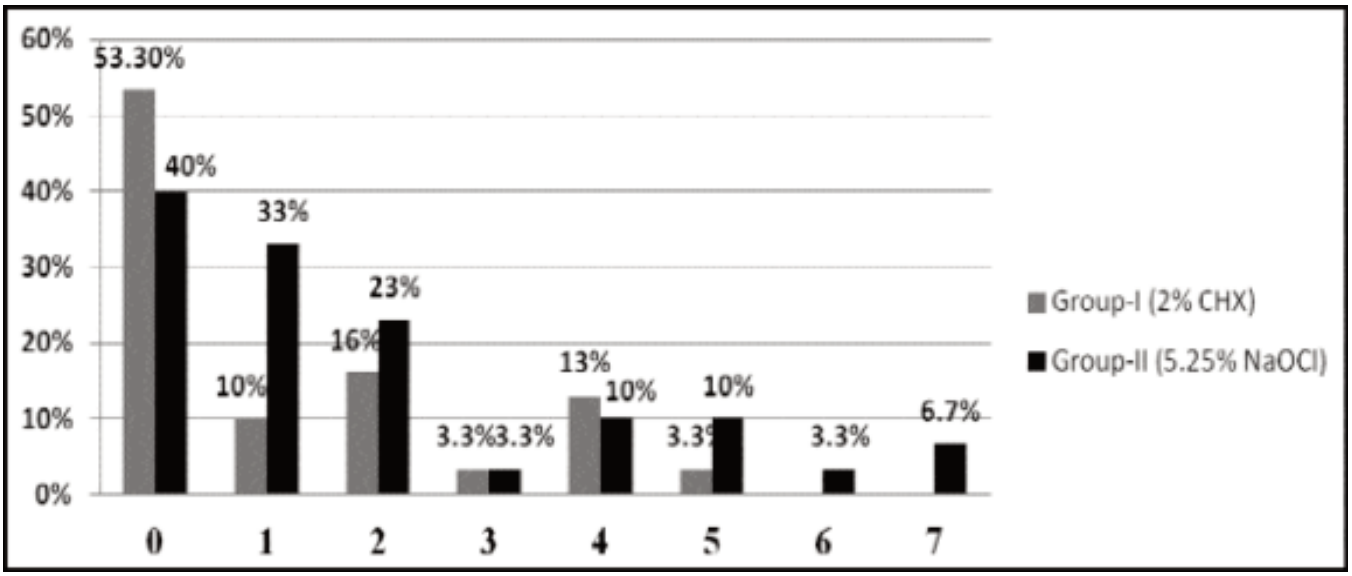


Figure-2: Different pain scores as recorded on visual analogue scale (VAS).

1.70±1.9 in Group-I and 1.90 ± 2.3 in Group-II (p=0.5). At 72 hours, only 5(16.7%) patients reported pain, while 25(83.3%) patients had no pain. In Group-II, 10(33.3%) patients had pain at 72 hours while 20(66.7%) patients had no pain (p=0.13) (Figures-1, 2). IN terms of age (Table-1) and gender (Table-2), there was no significant difference between the two irrigants.

Discussion

Post-operative pain weakens the patient's trust in clinician the and may even provoke the patient to question the clinician's skills.[9] Post-operative pain in endodontic treatment continues to be an issue faced by the dentists. Extrusion of the disinfectant solutions into the periapical area during irrigation is a major cause of

inter-appointment pain.[10] NaOCl possesses antibacterial properties and can cause dissolution of organic tissue.[11] However, it has caustic effect in case it is inadvertently extruded into the periapical region.[1] CHX 2% is another solution used in endodontic treatment. It has acceptable antimicrobial activity but it is not capable of dissolving necrotic tissue remnants.[12]

The current study has investigated 2% CHX and 5.25% NaOCl as irrigating solutions and compared them in terms of their effect on inter-appointment pain in root canal treatment at 72 hours. Patients of age 18-40 years were included in the study. Young patients with teeth with open apices were not included in the study. Patients above age 40 were excluded from the study in order to exclude old patients with sclerosed canals and patients who might be taking drugs that may interfere with the assessment of post-operative pain. Teeth with necrotic pulps were excluded since in necrotic teeth debris extrusion can occur which could be a source of post-operative pain. Furthermore, crown-down technique was used to prepare the canals as it causes less debris extrusion.[1] Strict irrigation protocol was followed and side vented needles were used with the aim of preventing irrigant extrusion into the periapical area. VAS score was used to assess the patients' pain at 72 hours postoperatively since this scale can be a good assessment tool to quantify patients pain when correctly employed. The data from the study revealed that only 5 patients in Group-I experienced pain as compared to 10 in Group II. However the difference was not significant (p=0.136).

Another study followed up 126 patients at 24 hours, 48 hours, 72 hours and 7 days. The results showed that only 3% patients from each group experienced moderate pain at 24 hours post-operatively. For all the time periods evaluated, no significant difference was found between the two irrigants (p>0.05).[7]

Another study comprised root canal treatment of 62 patients in a single visit, after which the patients were followed up at 24 hours, 48 hours and 72 hours to evaluate post-operative pain. On average, the percentage of patients who had pain after 24, 48 or 72h was 22.6%, 11.3% and 4.9% respectively. The study concluded that there was no statistically significant difference between the two irrigants at any observation period (p>0.05).[8] The results of the current study also demonstrated similar results.

Another study compared the two irrigants and the patients were followed up at 6 hours, 24 hours, 4th and 7th day for assessment of post-operative pain. The frequency of pain in NaOCl group was 55% and in the CHX group it was 75% (p=0.006) in terms of post-operative pain between the two groups at 6 hours. At all the other time periods, the difference was not significant.[1] The reason for more pain in the NaOCl group at 6 hours compared to CHX group could be the fact that in NaOCl group there were more patients with necrotic pulp, while in the CHX group, less number of patients had necrotic pulp. Since extrusion of necrotic debris can cause post-operative pain in endodontic treatment, this bias was better controlled in the current study by excluding all the teeth with necrotic pulp and selecting patients with irreversible pulpitis.

When 2% CHX and 5.25% NaOCl were used as irrigants and compared for pain, no difference was seen between the two irrigants at 72 hours in patients with irreversible pulpitis. Short-term follow up period has shown significant pain between the CHX and NaOCl groups as seen in an earlier study.[1]

The limitation of this study is that patients were followed up at only 72hours post-operatively. Furthermore, necrotic teeth were excluded. These teeth should have been included as a separate group and the effect of both irrigants should have been determined. Further studies, therefore, need to be carried out with short-term as well as long-term post-operative follow-up and with better randomisation of necrotic and non-necrotic pulps to determine the effect of these variables on post-operative pain following the use of CHX and NaOCl as irrigation solutions.

It is recommended for the clinicians to use side vented needles for irrigation. Care should be taken not to let the needle bind with the canal walls. The irrigant must be extruded slowly using finger pressure instead of thumb pressure. The irrigating needle should be kept 1-2mm away from the root apex with the needle constantly moving up and down in the canal allowing for irrigant backflow. The rate of irrigant extrusion should not be greater than 4ml per min.

Conclusions

There was no difference in post-operative pain between 2% CHX and 5.25% NaOCl groups in patients with irreversible pulpitis at a follow-up period of 72 hours. With a careful irrigation technique, extrusion of the irrigant, and, hence, post-operative pain could be avoided in endodontic treatment.

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Conflict of Interest: None.

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