



Effect of Cryotreated sodium hypochlorite, Cryotreated Qmix 2 in 1 and room temperature sodium hypochlorite on postoperative pain after single visit root canal treatment – An in vivo study.

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ABSTRACT:

Context:

Aim: This study aim is to evaluate postoperative pain after a single visit root canal treatment in which canals are irrigated with cryo-treated sodium hypochlorite, cryo-treated Qmix 2 in 1 and room temperature sodium hypochlorite.

Methodology and Material: Thirty patients were selected according to inclusion criteria. After obtaining consent from the patient, the access cavity was prepared followed by cleaning and shaping, then patients were randomly divided into three groups: Group A: Normal Room temperature NaOCl, Group B: Cryotreated NaOCl (2°C–4°C) and Group C: Cryotreated (2°C–4°C) Qmix 2 in 1 each of the canals received 20 ml of the respective irrigants based on the groups allocated. The final rinse was done with saline, and canals were dried and obturated in the same appointment. By using a postoperative visual analogue scale pain levels were recorded at a baseline of 12, 24, and 48 h over the phone.

Statistical analysis used: Data analysis was done using the Statistical Package for Social Sciences (SPSS version 21).

Results: Cryotreated Qmix 2 in 1 showed less postoperative pain followed by cryo-treated sodium hypochlorite and room temperature sodium hypochlorite.

Conclusions: Cryotherapy is one of the safest, easy, and cost-effective techniques for reducing postoperative pain.

Keywords: Cryotherapy, NaOCl, Qmix 2 in 1.

I. INTRODUCTION:

Postoperative pain is one of the reasons for the patient to visit a dentist after root canal treatment. Even performing root canal treatment with the utmost care, postoperative pain is commonly encountered.¹

It is reported because it is dependent on many factors such as microbial, mechanical or chemical factors or combinations of these.²⁻⁴

Techniques that have been tried to reduce the incidence of postoperative pain are prescribing analgesics, optimal instrumentation, and appropriate use of irrigants and occlusal reduction.⁵⁻⁶

The new concept which is gaining importance nowadays is cryotherapy. In endodontics, cryotherapy was tried by Vera et al, and it was found that intracanal delivery of cold saline solution (2.5°C) with negative pressure irrigation reduced the external root surface temperature more than 10°C and maintained it long enough to possibly produce a potential local anti-inflammatory effect in the periradicular tissues.⁷⁻⁹

To the best of our knowledge, no study in literature evaluates postoperative pain after a single visit root canal treatment in which canals are irrigated with cryo-treated Qmix 2 in 1.

Therefore, the aim of this in vivo study was to evaluate postoperative pain after a single visit root



canal treatment in which canals are irrigated with cryo-treated sodium hypochlorite, cryo-treated Qmix 2 in 1 and room temperature sodium hypochlorite.

II. MATERIALS AND METHODS:

Study design

This was a prospective randomized controlled clinical trial; the sample size was calculated based on the data obtained from previous studies. With alpha at 0.05, 95% confidence interval, power of the study at 80% and with an attrition rate of 20%, the minimum sample size required for the present study was 10 patients per group.

The patients who are included in this study are age group of 18–65 years, patients requiring endodontic therapy, teeth with symptomatic irreversible pulpitis/apical periodontitis, patients with pain scores ranging from moderate to severe (3–10) on a visual analogue scale (VAS) (0–10). Patients who are excluded from this study are medically compromised patients, pregnant patients and patients on analgesics and antibiotic therapy. Teeth with incomplete apex formation, calcified canals, with sinus opening and periapical abscess.

After obtaining approval from the institutional review board, patients fulfilling the inclusion criteria were recruited for this study. Preoperative data for each patient was recorded in the predesigned patient's chart, which includes age, sex, and tooth number before the treatment as shown in (fig.1). The treatment and the study design were explained to the qualifying patients, and informed consent was obtained from the voluntary patients who were willing to participate in the study.

PATIENT NAME: _____ OP NO: _____ PHONE NO: _____

ADDRESS: _____

DATE: _____ IRRIGANT USED: _____

TEETH NO: _____

PREOPERATIVE PAIN

0 1 2 3 4 5 6 7 8 9 10
No pain Moderate pain Worst possible pain

Fig:1 predesigned patient chart.

Treatment protocol

Vitality was assessed using an electric pulp test (digitest) before the procedure. All the patients received local anaesthesia (2% lidocaine hydrochloride with adrenaline 1:80,000). Each tooth was isolated using a rubber dam, and the access cavity was prepared using Endo access bur under copious water cooling. After removal of pulp tissues with a broach, working length was determined with stainless steel hand K-files size #10 (Mani, Tochigi, Japan) and the use of an apex locator (propex Pixi). It was confirmed using intraoral periapical radiographs, and it was repeatedly checked throughout the procedure.

Hand instrumentation was done until 15 size K-file. All the canals were prepared using Protaper Gold rotary files (Dentsply Maillefer, Ballaigues, Switzerland) till the file F3 or F5 (25/0.6, 40/0.6) following the full sequence recommended by the manufacturer using an electric motor (X-Smart; Dentsply). Apical patency was maintained throughout the shaping procedure using the #10 file between each instrument. All the canals were irrigated with 10 mL of 5.25%NaOCl (Cerkamed) between each file during the whole preparation procedure that was delivered with side vent needles (Neo-endo). After cleaning and shaping, all samples were divided into three groups:

Group A: 20 ml of normal room temperature sodium hypochlorite (Cerkamed) was irrigated for 5 min in each canal.

Group B: 20 ml cryo-treated sodium hypochlorite maintained at temperature 2°C–4°C was irrigated for 5 min in each canal.

Group C: 20 ml cryo-treated QMIX 2 IN 1 (Dentsply Sirona) maintained at temperature 2°C–4°C was irrigated for 5 min in each canal.



Fig 2: sodium hypochlorite, QMIX 2 in 1



The temperature of the cold hypochlorite was preserved for 5 min irrigation period by keeping the irrigation syringes, which were used one by one, in a special box filled with ice after removal from the refrigerator with a thermocouple inserted inside to confirm the 2°C–4°C temperature range.

After the irrigation procedure, all the canals were flushed with a final rinse of saline and were dried using appropriate size paper points and obturated, and permanent composite restoration was done. All participants received a sheet containing VAS after the procedure. After 12, 24, and 48 h, patients were called by telephone and asked for their general feeling in the area of the root canal, pain intensity and a number of analgesic pills that had been taken by the patient and recorded on the patient chart.

III. STATISTICAL ANALYSIS

Data analysis was done using the Statistical Package for Social Sciences (SPSS version 21). Basic descriptions were presented in the form of mean and Standard deviation. Kruskal Wallis test was used to analyse the overall difference in pain between the three groups. Freidman test was used to know the overall difference at different time intervals within groups. The level of significance was set at $p < 0.05$ for all tests.

Results:

Overall pain scores at different group intervals were shown in the table: I. Pain score was less for cryo-treated QMIX 2 IN 1 followed cryotreated sodium hypochlorite and normal sodium hypochlorite at 12 hours intervals. At 24 hours both cryo-treated sodium hypochlorite and cryo- treated Qmix 2 in 1 showed less pain compared to normal sodium hypochlorite. At 48 hours there is no postoperative pain.

Table I: Overall comparison of pain scores among groups at different time intervals (Kruskal-Walli's test, $P < 0.05$ (significant), $P > 0.05$ (Not significant))

Groups	Mean \pm SD	Mean Ranks	P value
Pre-OP			
Group A	3.50 \pm 0.70	15.50	0.585**
Group B	3.90 \pm 1.19	17.25	
Group C	3.30 \pm 0.48	13.75	
12 Hours			
Group A	0.90 \pm 0.87	17.75	0.415**
Group B	0.70 \pm 0.82	15.75	
Group C	0.40 \pm 0.51	13.00	
24 Hours			
Group A	0.30 \pm 0.48	17.50	0.395**
Group B	0.10 \pm 0.31	14.50	
Group C	0.10 \pm 0.31	14.50	
48 Hours			
Group A	0.00 \pm 0.00	15.50	1.000**
Group B	0.00 \pm 0.00	15.50	
Group C	0.00 \pm 0.00	15.50	

Overall comparison of pain scores at different time intervals among groups was shown in table: II. It shows Pain scores decreased with an increase in time for all the groups.



TABLE: II Overall comparison of pain scores at different time intervals among groups (Freidman test, P < 0.05 (significant), P> 0.05 (Not significant))

Groups	Mean ± SD	Mean Ranks	P value
Group A			
Pre-Op	3.50 ± 0.70	4.00	< 0.001*
12 Hours	0.90 ± 0.87	2.50	
24 Hours	0.30 ± 0.48	1.95	
48 Hours	0.00 ± 0.00	1.55	
Group B			
Pre-Op	3.90 ± 1.19	4.00	< 0.001*
12 Hours	0.70 ± 0.82	2.45	
24 Hours	0.10 ± 0.31	1.85	
48 Hours	0.00 ± 0.00	1.70	
Group C			
Pre-Op	3.30 ± 0.48	4.00	< 0.001*
12 Hours	0.40 ± 0.51	2.35	
24 Hours	0.10 ± 0.31	1.90	
48 Hours	0.00 ± 0.00	1.75	

A Chi-square test was done to assess the rate of analgesic consumption at all tested intervals in table:3. At 24 hrs and 48 hrs, there is no analgesic consumption. At 12 hrs there is no analgesic consumption in cryo-treated Qmix 2 in 1 group and there is less analgesic consumption in the sodium hypochlorite group.

Table III: Analgesic consumption count

Postoperative interval	Number of analgesic tablets	Normal NaOCl group	Cryo - treated NaOCl	Cryo -treated QMiX 2 in 1	Chi-square Value	P-value
At 12 hours	Nil	7	8	10	3.360	0.186**
	one	3	2	0		
At 24 hours	Nil	10	10	10	-	-
	one	0	0	0		
At 48 hours	Nil	10	10	10	-	-
	One	0	0	0		



IV. DISCUSSION:

This prospective randomized controlled clinical trial was conducted to determine whether there is a reduction in postoperative pain after using cryo-treated sodium hypochlorite irrigant and cryotreated Qmix 2 in 1.

Cryotherapy has been used in this study because in medical literature it showed favourable results for postoperative care. According to the medical literature applying cold to tissues may decrease the conduction velocity of nerve signals, haemorrhage, oedema, and local inflammation and it is, therefore, effective in reducing musculoskeletal pain, muscular spasms. This is because cryotherapy causes vasoconstriction which leads to an anti-oedema effect that reduces the number of leukocytes migrating to the affected tissues thus reducing endothelial dysfunction and the inflammatory response.¹⁰⁻¹²

In the present study, care was taken to avoid all possible factors that cause postoperative discomfort. Teeth with necrotic pulp, with periapical pathology, retreatment cases, and calcified canals were not considered due to the complex and extensive microbial load, which could serve as a possible cause for postoperative pain.¹³

In this study, we have evaluated postoperative pain after a single visit root canal treatment in which canals are irrigated with cryotreated sodium hypochlorite, cryo-treated Qmix 2 in 1 and room temperature sodium hypochlorite.

Cryo-treated Qmix 2 in 1 showed less postoperative pain this may be due to the antimicrobial efficacy of QMix™ 2 in 1. EDTA present in QMix™ 2 in 1 effectively removes the smear layer and CHX prevents the colonization of fungi on dentinal walls.¹⁴

In the present study, sodium hypochlorite has used. The reason for using sodium hypochlorite is, it is the most common irrigant used for its excellent tissue dissolving property and antimicrobial activity. The antimicrobial activity of cryo-treated sodium hypochlorite against *Enterococcus faecalis* showed a significant reduction in the number of *E. faecalis* compared to normal sodium hypochlorite.¹⁵

V. CONCLUSION:

Cryo-treated Qmix 2 in 1 showed less postoperative pain followed by cryo-treated sodium hypochlorite. Cryotherapy is one of the safest, easy, and cost-effective techniques for reducing postoperative pain.

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