

The Effect of Intracanal Cryotherapy in Reducing Postoperative Pain in Patients with Irreversible Pulpitis: A Randomized Control Trial

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ABSTRACT

Introduction: An important aspect in endodontic practice is controlling pain during and after root canal treatment; to control the postoperative pain several strategies have been developed including the use of analgesics long-standing anaesthesia and different techniques in root canal preparation. This study was conducted to evaluate and compare the effect of intracanal cryotherapy in reducing postoperative pain in patients with irreversible pulpitis with and without apical periodontitis.

Method: A randomized control trial had been conducted among 40 patients with irreversible pulpitis. The patients were randomly divided according to the temperature of the final irrigant used, into two groups control (1) using saline at room temperature, and study group (2) using cold saline. Then further subdivided into two subgroups according to pulpal diagnosis, either irreversible pulpitis with apical periodontitis (subgroup a) or irreversible pulpitis without apical periodontitis (subgroup b). Visual analogue scale (VAS) was used to evaluate and compare postoperative pain.

Results: A statistically significant difference was found when comparing the pain level in cryotherapy group (subgroup 2a) with control group (subgroup 1a) 24, 48 hours postoperatively. But there was no statistically significant difference when comparing the pain level in cryotherapy (subgroup 1b) with control (subgroup 1b) after 24, 48 hours postoperatively ($p>0.05$).

Conclusion: Using intracanal cryotherapy is effective in reducing postoperative pain in patients with irreversible pulpitis with apical periodontitis. But it does not affect patients with irreversible pulpitis without apical periodontitis

Key words: Intracanal cryotherapy, postoperative pain, Irreversible pulpitis.

INTRODUCTION

Cryotherapy is a term derived from a Greek word that means “cold therapy”. In physiotherapy, cryotherapy means reducing tissue temperature as a treatment method. It is efficient in reducing inflammation, pain, edema and recovery time in the short-term application. ^(1,2)

Cryotherapy is a common technique used in abdominal, hernia, gynecological and orthopaedic operation; its mechanism of action is by affecting the nerve conduction

capacity. The cold application on the skin stimulates the thermo receptors (temperature sensitive receptors), and the stimulation of these receptors can block nociception within the spinal cord spiral cord. ⁽²⁾

Controlling the pain during root canal treatment and after is an important aspect in endodontic practice. ⁽³⁾ Postoperative pain is recorded as high incident rate ranging from 3-58% of the cases. ⁽⁴⁾ It is affected by different factors like the periapical tissues condition, the

presence of periapical radiolucency, preoperative pain and pulp condition. (5-7)

The major cause of postoperative pain is the injury to periapical tissues whether mechanical, chemical or microbiological which leads to the inflammation in periapical tissues known as flare up. (4,6,8,9)

To reduce pain several strategies had been developed including prescribing corticosteroids and prophylactic analgesics, using the crown-down technique in root canal preparation, administering long-lasting anaesthesia and occlusal reduction. (8-12)

Using cryotherapy in the dental field was investigated by Felho et al. 2005 in reducing swelling, pain and trismus after third molar extraction. They found that there was a significant statistical difference in reducing the swelling and pain, while there was no significant difference in reducing the trismus. (13)

In endodontics, only a few studies investigated the use of intracanal cryotherapy. Vera et al. 2015 found a significant reduction in the external temperature of the apical 4mm of root after continuous irrigation with cold saline (2.5 °C) in vitro. (14)

In 2016, Keskin et al. found that the use of intra canal cryotherapy reduced the postoperative pain after single visit root canal treatment in patients with irreversible pulpitis. Another clinical study in 2016, evaluated the intracanal cryotherapy effect with negative pressure irrigation (Endo Vac) on postoperative pain after vital single visit RCT and the authors concluded that clinically intracanal cryotherapy eliminated postoperative pain and negative pressure improved its effect. (2)

Further studies were recommended to investigate the use of intracanal cryotherapy in different pulp diseases. (2,14) So this study had been conducted to evaluate and compare the effect of intracanal cryotherapy to normal saline in reducing the postoperative pain in patients with irreversible pulpitis with apical

periodontitis and patients with irreversible pulpitis with normal apical tissue.

MATERIALS AND METHODS

A randomized control trial study was conducted in Umm Al-Qura University dental teaching hospital to evaluate the effect of intracanal cryotherapy in reducing postoperative pain in patients with irreversible pulpitis using visual analogue scale (VAS).

1-Subject:

A. Selection of the cases: 40 patients selected from the regular pool of patients visiting Umm-Al Qura University dental teaching Hospital.

Inclusion criteria:

1. Patients diagnosed with irreversible pulpitis with either normal apical tissues or apical periodontitis.
2. Patient age ranged from 18-40 years.
3. Medically free patients.
4. Teeth with mature apex were selected.
5. Teeth without root resorption.

Exclusion criteria:

1. Patients with other pulpal diagnoses.
2. Medically compromised patients.
3. Pregnant females
4. Patients taking analgesics or anti-inflammatory drugs.

B. Grouping of the cases:

The patients were randomly divided into two groups (1 & 2) according to the temperature of the final irrigation solution (saline)

Group 1: control group (n=20) where final irrigant was saline at room temperature.

Group 2: cryotherapy group (n=20) where 2.5 °C saline was used as the final irrigant.

Each group was subdivided into 2 subgroups (a & b (n=10) according to preoperative apical diagnosis.

a= teeth with apical periodontitis

b= teeth with normal apical tissues.

Four patients were eliminated From Group A because they didn't submit their pain scales.

2- Method:

To perform randomization we asked the patient to choose from closed envelopes

to give them an equal chance whether to be in control or study group. (2)

Before starting treatment patients signed an informed consent and preoperative pain was recorded using visual analogue scale (VAS). The preoperative apical diagnosis was determined according to the radiograph and percussion test. Then anesthesia (lidocaine 2% with adrenaline 1:80000) was given to the patient, and rubber dam was placed.

For each tooth, proper access cavity preparation was done. followed by pulp extirpation and working length determination then canals were enlarged with the hand files to size 25. The canals were irrigated with NaOCl then final irrigation was done with either 2.5°C saline or saline at room temperature for 2 min using side vented needle, then access cavity

was sealed, and patients were asked to record their postoperative pain after 24 and 48 hours postoperatively using the (VAS) scale. A refrigerator has been used to obtain 2.5°C saline. And thermometer was used to control the temperature.

3- Ethical approval:

Ethical approval obtained from the Institutional Review Board-IRB (Research Ethics Committee) at Faculty of Dentistry, Umm Al-Qura University before starting the study.

4- Statistical analysis:

The data were tabulated and statistically analyzed using SPSS version 24 the comparison between the means was tested using t-test one-way ANOVA test and the percentage using Chi-Square test. The level of significance was set at 0.05.



Side vented apertura lateral



Ice container

RESULTS

Thirty-six patients participated in this study as four were eliminated from the study because they didn't submit their pain scales. Twenty patients were included in the study (Cryotherapy) group 2 (subgroups a & b) and 16 patients in the control group 1 (subgroups a & b).

The percent of pain decreased significantly from 100% to 60% in both cryotherapy subgroups (2a & 2b) after first 24 hours postoperatively ($p < 0.05$).

And after 48 hours postoperatively only 30% of subgroup 2a experienced pain.

While 50% in subgroup 2b had pain during the same time interval. (Table1, figure 1)

In control subgroup 1a the pain was decreased from 85.7% to 42.9% after 24 hours and similarly after 48 hours.

For the control subgroup 1b the pain was decreased from 88.9% to 66.7% after 24 hours. And within 48 hours 55.6% of the patients were having pain.

A statistically significant difference was found when comparing the pain level in patients with irreversible pulpitis with apical periodontitis in cryotherapy group

(subgroup 2a) with control (subgroup 1a) twenty-four hours postoperatively ($p < 0.05$). (Table 1)

But there was no statistically significant difference when comparing the pain level in cryotherapy (subgroup 2b) with control (subgroup 1b) after 24 hours postoperatively ($p > 0.05$). (Table 1)

Also there was a statistically significant difference between subgroup 2a and subgroup 1a1 in the pain level 48 hours postoperatively ($p < 0.05$). While there was no statistical difference between subgroup 2b and subgroup 1b in the pain level after 48 hours ($p > 0.05$). (Table 1)

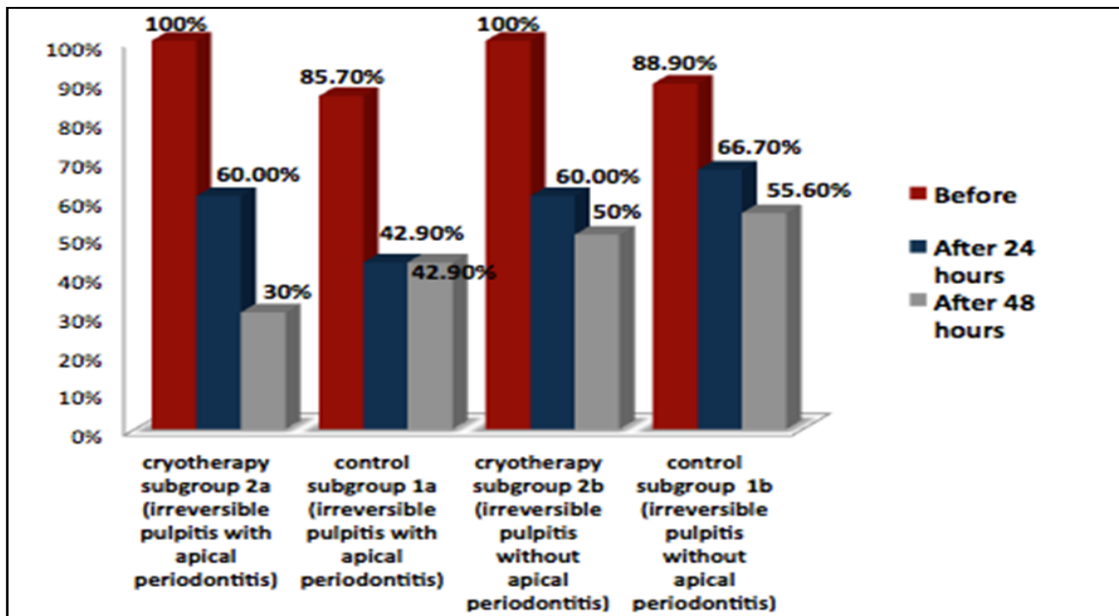


Figure 1: A bar chart showing the pain percentages in the four subgroups before treatment and after 24 and 48 hours postoperatively.

Table 1: Showing the pain percentages in the four subgroups immediately before Treatment and 24, and 48 hours postoperatively.

Before treatment					Chi square (χ^2) (p value)
	Study		Control		
	No pain	Pain	No pain	Pain	
Subgroup1	0%	100%	14.3%	85.7%	
Subgroup2	0%	100%	11.1%	88.9%	
After 24					
Subgroup1	40%	60%	57.1%	42.9%	15.785 (0.01)*
Subgroup2	40%	60%	33.3%	66.7%	1.057 (0.303)
Chi square (χ^2) (p value)	13.652	(0.02)*	10.709	(0.04)*	
After 48					
Subgroup1	70%	30%	57.1%	42.9%	3.242 (0.05)*
Subgroup2	50%	50%	44.4%	55.6%	0.722 (0.395)
Chi square (χ^2) (p value)	6.721	(0.05)*	4.218	(0.05)*	

• Statistical significant difference as $p < 0.05$

DISCUSSION

It is important to achieve the reduction in postoperative pain after

endodontic treatment as it is considered one of the primary problems in the treatment. (2,15)

This study was conducted to evaluate the effect of intracanal cryotherapy in reducing postoperative pain after multi-visit endodontic treatment of teeth with irreversible pulpitis with or without apical periodontitis.

In this study, vital teeth were chosen to eliminate the need to use intracanal medicament and exclude the presence of infected necrotic pulp. The pulp vitality was confirmed when there was bleeding during access cavity as bleeding is the gold standard test for pulp vitality. (16)

The selected patients were systemically free to insure that systemic health-related factors would not interfere with the postoperative pain results.

Postoperative pain is affected by several factors like preoperative pain, pulp condition as well as the periapical tissue condition and the presence of periapical radiolucency. (5-7) That was the reason for selecting the patients with irreversible pulpitis with or without apical periodontitis. Injury to the apical tissues results in inflammation and edema that is considered the main cause of postoperative pain.

Intracanal cryotherapy was used in this study as the effect of the intracanal use of cold saline with a temperature of -2.5°C was found to produce more than 10°C reduction in the temperature of external root surface. (14) Cold application (cryotherapy) produces three basic physiologic tissue responses: decrease in metabolic activity, blood flow and inhibition in neural receptors in the skin and subcutaneous tissues. (17) This makes it efficient in reducing inflammation, pain, edema and recovery time in the short term application. (1,2)

In the present study intracanal cryotherapy produced a statistically significant reduction in postoperative pain for patients with irreversible pulpitis and apical periodontitis compared to the use of normal saline after 24 and 48 hours postoperatively. This can be explained by the effect of cold saline in reducing the edema and inflammation; it worked as a local anti-inflammatory in the apical area.

The intracanal cryotherapy did not produce a significant difference in postoperative pain reduction compared to normal saline in cases with irreversible pulpitis without apical periodontitis. In these cases the inflammation was confined to the root canal and did not extend to apical tissues, since the inflamed pulp tissues were already extirpated, so the source of inflammation was removed in both control and study groups. This could explain why the cold saline did not produce a difference than normal saline in reducing inflammation or edema.

In contrast Keskin et al. and Al-Nahlawi et al. found that using intracanal cryotherapy had a significant effect in the reduction of postoperative pain in patients with irreversible pulpitis treated in a single visit when compared with room temperature saline. (2,15) But they did not separate cases according to their apical conditions; they included all cases with and without apical periodontitis together. Also, they treated their cases in a single visit which might increase the postoperative pain and edema even in cases with irreversible pulpitis without apical periodontitis and so increased the effect of intracanal cryotherapy in all cases.

CONCLUSION

Under the conditions of this study it was concluded that using cold normal saline has an effect on reduction of postoperative pain degree in patients with irreversible pulpitis with apical periodontitis. But it does not affect patients with irreversible pulpitis without apical periodontitis.

The study limitation:

- The teeth included in the study were molars and premolars it would be better if one tooth type included.
- Sample size is small due to limited number of patient visiting Umm Al Qura University dental teaching hospital.

Other pulp diseases like necrotic pulp are recommended for further studies.

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