

### **Effect of Cold Saline Irrigation on Pain after Single Visit Root Canal Treatment**

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#### **Abstract**

**Aim:** The aim of present study was to evaluate the effect of 2.5°C cold saline irrigation as final irrigant on postoperative pain after single visit root canal treatment of teeth with vital pulp.

**Materials and Method:** A total of 40 participants with single rooted tooth were included in the present study. The teeth were randomly divided into two groups (n = 20). In the cryotherapy group, final irrigation was performed with 2.5°C saline solution for 5 min after completion of biomechanical preparation; whereas, in the control group (**normal saline**) same solution stored at the root temperature was used. Single visit treatment was performed in the present study. Participants were asked to rate the intensity of their postoperative pain

using visual analogue scale before irrigation and after 24 hrs. Data analysis was done using SPSS, Mann–Whitney U test was used to determine the statistical significance.

**Result:** A statistically significant difference in pain perception (p value =.001) was seen between the two groups after 24 hrs. Participants with cryotherapy intervention reported low pain perception (1.95+ .83). No significant difference in pain perception was reported between the two groups at baseline.

**Conclusion:** Under the conditions of this study, irrigation of root canals with a cold saline solution held at 2.5°C for 5 min reduced postoperative pain when compared with the pain levels of patients in a control group.

## **Introduction**

Pain has been described as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage<sup>1</sup>. According to Merskey 1991 'each individual learns the application of the word through experiences related to injury in early life'. Patient visit to a dental clinic for many reasons which includes regular check-ups, for advice about a problem, and because the patient is experiencing pain or other symptoms that concern them<sup>2</sup>. One of the main reasons for a patient to visit endodontist is Dental Pain. Management of dental pain with anxiety during and after treatment remains a big challenge. Postoperative pain following instrumentation and obturation is one of the primary problems in endodontic treatment. It is unpleasant and causes discomfort to the patients. The prevalence of postoperative pain has a high incidence rate ranged from 3% to 58%. However, post-treatment pain may last up to several days, depending upon peripheral and central mechanisms of hyperalgesia<sup>3-8</sup>. There are several factors for post-operative pain which include mechanical, chemical, and microbial injuries to the pulp or periradicular tissues which are induced (or) exacerbated during root canal treatment<sup>9-11</sup>. Prescribing several antibiotics, analgesics (NSAIDs) and corticosteroids becomes the most popular paradigm amongst many clinicians for relieving the patient from post-operative pain<sup>2,4,12</sup>. The newest form of technique which can be implicated for relieving post-operative pain is the use cold saline. Application of cold is one the long standing and widespread techniques for treatment of injury or disease in sports medicine<sup>13,14</sup>. Application of cold has shown to be effective in reducing postoperative pain in orthopedic, gynecologic, and hernia operations<sup>15,16</sup>. Furthermore influence of

cold has been reported to reduce swelling, pain and trismus after third-molar extraction, also is has been shown to enhance mouth opening in patients with cerebral palsy<sup>17,18, 19</sup>. One of the benefits of using this technique is its low-cost, has no side effects, is easy to apply and has a wide spectrum of action. The purpose of this study is to evaluate the effect of 2.5°C cold saline irrigation as final irrigant on postoperative pain after single visit root canal treatment.

## **Materials And Method**

For this study a total of 40 patients aged between 18 and 63 years with single rooted tooth requiring endodontic therapy were included in the study. Maxillary or mandibular single rooted teeth diagnosed with asymptomatic irreversible pulpitis or symptomatic irreversible pulpitis with either normal apical tissues or symptomatic apical periodontitis were included in the study. Patients with immature apices or root resorption were excluded from the study. Medically compromised patients, pregnant females, patients using medications such as analgesic or anti-inflammatory drugs, patients who refused to participate in the study were also excluded from the study. Patients were randomly divided into control group (Group A = 20) and cold saline group (Group B = 20). Prior to treatment the patients were instructed to complete a visual analogue scale (VAS) to determine their pain scores. The VAS included a 10 cm straight horizontal line numbered at each centimetre with following criteria ; 0-1, no pain; 2-3, mild pain; 4-6, moderate pain; 7-10, severe pain. In every patient, after recording preoperative pain levels, local anaesthesia with 2% lignocane containing 1:80000 epinephrine (Lignox, Indoco Remedies, India) was administered. The endodontic access cavities were prepared with endo access burs (Dentsply Maillefer, Ballaigues, Switzerland) under rubber dam isolation.

Pulp extirpation was done using a broach and a glide path was established with a #10 K-file (Mani, Tochigi, Japan). Working length was established and confirmed radiographically. The root canals were instrumented with Neo Endo system (Orikam, Gurgaon, Haryana) using endodontic motor (NSK, Tochigi, Japan) under copious irrigation with 3% sodium hypochlorite (NaOCl). The root canals were flushed with 5ml of 17% EDTA solution. In the control group, following completion of biomechanical preparation, final irrigation was performed using 5 mL of 0.9% physiological saline solution at the room temperature. In cold saline group, the root canals were irrigated with 5 ml of cold saline at a temperature of 2.5°C; the solution was stored in refrigerator until use. The final irrigation was performed for 5 min in both the groups using 27 G bevelled needle tip inserted 2 mm short of the WL. In both groups, the root canals were dried with paper points and obturated with cold lateral compaction technique using gutta-percha cones (Sure-endo, Korea) and sealapex sealer (Sybron Endo, United States). Coronal access cavities were restored with direct composite restorations using dentinal adhesives and universal composite resin (Kerr, United States). Post-operative VAS scores were recorded after 24 hrs to determine their post-operative pain. Data were analysed by Mann–Whitney U test using SPSS software (v.21.0; IBM Corp., Chicago, IL, USA). The level of significance was set at 0.05.

### Results

Table 1: Represents post-operative pain perception in participants after 24 hrs.

Pain perception in participants after 24 hrs

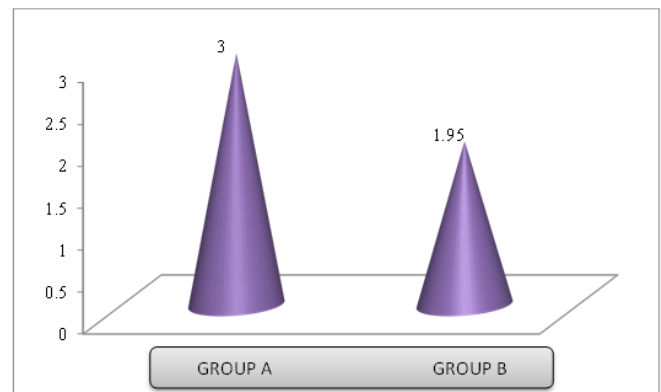
SCALE	GROUP A n=20 (Mean±S.D.)	GROUP B n=20 (Mean±S.D.)	p value
Visual Analog Scale	3.00±.85	1.95±.82	.001*

Statistical test employed: Mann-Whitney U test

p value ≤ .05 = statistically significant

A statistically significant difference in pain perception (p value =.001) was seen between the two groups after 24 hrs. Participants with cold saline intervention reported low pain perception (1.95+ .83). No significant difference in pain perception was reported between the two groups at baseline.

None of the patients reported severe pain or flareups during the period of the study.



### Discussion

One of the major goals of root canal treatment is the pain management. Postoperative pain following root canal treatment (RCT) can be a considerable problem for patients and endodontists. In spite of advances in RCT and better knowledge of pulpal and periapical inflammation, up to 40% of endodontic patients report postoperative pain of different degrees<sup>20,21, 22</sup>.

Post-operative pain most often occurs during the first 24 to 48 hours after obturation, which usually persists for few hours to several days<sup>8, 23, 24</sup>. The possible causes for post-operative pain are related to endodontic instrumentation, irritating irrigants, intracanal

medications, periapical contamination, and temporary restorations in hyperocclusion<sup>4,20</sup>. Postoperative endodontic pain is often linked to inflammatory mediators (such as prostaglandins, leukotrienes, bradykinin, and serotonin) that activate sensitive nociceptors, leading to both peripheral and central mechanisms of hyperalgesia. Among inflammatory mediators, prostaglandins play a critical role in the pathogenesis of pulpal and periradicular disease. Prostaglandins increase vascular permeability, elevate chemotactic activity, induce fever, and increase sensitivity of pain receptors to other active inflammatory mediators.<sup>25,26</sup> A variety of approaches have been recommended for the management of post-operative pain. One of them is the prescription of analgesics and steroidal and nonsteroidal anti-inflammatory agents<sup>5,22,27</sup>. But these drugs could be expensive which can expose the patient to side effects like nausea and diarrhea as well as the more significant risks of anaphylaxis<sup>12</sup>. This study uses cold saline as a form of treatment in which the tissues are briefly exposed to very cold temperatures in order to promote healing and other therapeutic results. It is also very cost effective and does not cause any side effect to patient's health<sup>16</sup>. Vera et al. showed that irrigation of root canals with 2.5°C cold saline solution for 5 min reduced external root surface temperature<sup>27</sup>.

Application of cold reduces tissue temperature, blood flow, pain, and cell metabolism, which minimizes the degree of tissue damage and the lesion caused by secondary hypoxia. An important reduction in local enzyme activity and profound local vasoconstriction occur after cold application. The analgesic effect is produced by a combination of a decreased release of chemical mediators of pain and a slower propagation of neural pain signals. Also, metabolism is lowered more

than 50%, which allows better oxygen diffusion into the injured tissues<sup>17,28,29,30</sup>.

The decreased temperature of the external root surface might constrain inflammatory reactions, production of the release of pain-producing substances, and oedema occurring in the periapical region. Application of cold has been shown to decelerate peripheral nerve conduction. As the temperature decreases, the conduction velocity of nerve fibres decreases until it stops completely<sup>31</sup>.

Activation of the TRPM8 produces profound analgesia in chronic pain state. The analgesic effect of TRPM8 is centrally mediated, and the TRPM8 channel is expressed by a subpopulation of sensory neurons in dorsal root ganglia and trigeminal ganglia where responses for cooling correlate well<sup>32</sup>.

### **Conclusion**

Under the conditions of this study, irrigation of root canals with a cold saline solution held at 2.5°C for 5 min reduced postoperative pain when compared with the pain levels of patients in a control group.

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