

# A POTION FOR POST - OPERATIVE ENDODONTIC PAIN – CRYOTHERAPY

Ruba Khan, Anu Narang, Manish Agarwal, Rinkal Luhana

Peoples College of Dental Sciences and Research Center,  
Bhanpur, Bhopal, Madhya Pradesh, India

## To access & cite this article

Website: [www.jidam.idamadrass.com](http://www.jidam.idamadrass.com)



## Address for correspondence:

Dr. Ruba Khan, PG Student,  
135- B, Nizamuddin colony,  
Bhopal, Madhya Pradesh, India.  
E-mail: [drrubakhan27@gmail.com](mailto:drrubakhan27@gmail.com)

## ABSTRACT

Post-operative pain is a common occurrence after root canal treatment which occurs few hours to days after commencement of the procedure. It can be mild to moderate in nature and can hamper the comfort of patient and his confidence in dentist. Intra canal cryotherapy is a promising treatment modality which provides a simple, cost – effective and non toxic option for post-operative pain control by decreased release of inflammatory chemical mediators of pain and a slower conduction of neural pain signals, resulting in lesser experience of post-operative pain and enhance comfort of patient.

**KEYWORDS:** Intracanal cryotherapy, post endodontic pain

Received : 01.03.2019  
Accepted : 20.03.2019  
Published : 26.03.2019

## **INTRODUCTION:**

Pain is an undesirable, unwarranted sensation that occasionally follows root canal treatment lamentably<sup>1</sup>. It usually commences a few hours or days following treatment and is unpleasant for both the patient and the practitioner, which may affect the quality of patient doctor relationship. The incidence of this post endodontic pain (PEP) was reported to range from 3 - 58%<sup>2</sup>. Pak and White in their research observed that the prevalence of PEP was 40% at 24 hours, whereas it reduced to 11% at 1 week and regarding the intensity of pain, it was most intense in the first six hours following a gradual decline after a week<sup>3,4</sup>. Since the prevalence of post endodontic pain is vast, its prevention and management becomes integral part of endodontic treatment.

## **CAUSATIVE FACTORS OF POST-OPERATIVE PAIN IN ENDODONTICS (POST ENDODONTIC PAIN –PEP):**

The various factors responsible for PEP are many-fold which include the status of the pulp and periradicular tissues, microbial factors, the effects of inflammatory chemical mediators, immune system mediated phenomena, cyclic nucleotide changes, patients' psychological factors, preoperative pain, gender, type of tooth involved, and changes in the local adaptation and the periapical tissue pressure<sup>5,6</sup>. Also, presence of periapical pathology, insufficient root canal instrumentation, hyper-occlusion, failure to recognize additional/accessory canals, extrusion of apical debris, and apical patency during canal preparation also contribute to the occurrence of PEP<sup>7</sup>. Several irrigants or medicaments employed during root canal therapy can irritate the periapical tissues that can evoke pain stimuli<sup>5</sup>. Whilst this pain may be due to an acute inflammatory response in the periradicular tissues, pain in itself is a poor indicator of pathology and is considered an unreliable predictor for long term success. Hence, the integral part of endodontic treatment must include prevention and management of this post endodontic pain.

## **TREATMENT MODALITIES FOR MANAGEMENT OF POST ENDODONTIC PAIN (PEP):**

PEP can be prevented in clinical situations by adapting meticulous and careful measures during the endodontic treatment procedure. Each clinical step of the procedure must be done with care, which include, accurate determination of working length (WL), proper biomechanical preparation with adequate sequencing of instruments and recapitulation, optimum use and judicious selection of intra canal irrigants, and inclusion of magnifying devices, such as dental loupes and endodontic microscopes in the practice<sup>8,9</sup>. The use of a negative apical pressure irrigation device also results in a significant reduction of post endodontic pain intensity in comparison to conventional needle irrigation<sup>10</sup>. Several other strategies include premedication with prophylactic analgesics and corticosteroids prior endodontic treatment, administration of long-lasting local anesthetics, and occlusal reduction<sup>11-15</sup>.

## **CRYOTHERAPY AS AN ADJUNCT TREATMENT MODALITY FOR CONTROL OF PEP:**

The cryotherapy term derives its origin from the word “cryos” which is a Greek word pertaining to “very cold”<sup>16</sup>. Since ancient times something around 2500 B.C Egyptians treated injuries and inflammation using low temperatures<sup>17</sup>. Cryotherapy works on the principle of extracting heat and thus provides relief by reducing inflammation<sup>18</sup>.

For these reasons cryotherapy has been widely used in providing relief from pain after sports injury and surgical procedures postoperatively<sup>19,20</sup>. Three basic physiological responses of tissues after the application of low temperatures are a decrease in local blood flow, inhibition of neural receptors both in the skin and subcutaneous tissues and also a decrease in metabolic activity<sup>21</sup>.

The amount of temperature change and other biophysical changes in surrounding tissues depend upon temperature difference between object and the heat and cold application, the exposure time, the thermal conductivity of the tissues, and the types of agents employed. This type of therapy causes change

in host's local temperature<sup>22</sup>.

The use of cryotherapy in dentistry was observed and evaluated by Felho et al, 2005. They found reduction in pain, swelling and trismus following third molar surgery with use of cryotherapy<sup>23</sup>.

In Endodontics, not much research has been done to investigate the effects of cryotherapy within the root canal, by means of placing irrigants at a low temperature in the canal and its corresponding effects in the periodontal ligament .

Rather a lot of research is available on the effects of high temperatures used in the canal in procedures like warm hypochlorite irrigation, obturation techniques which require heating of gutta percha , like warm vertical condensation, thermo plasticized gutta percha obturation .

Vera et al in 2015 observed effect of intracanal irrigation with cold saline (2.5°C) solution on the reduction of external surface temperature of apical 4 mm of root after continuous irrigation for 5 minutes. They observed a reduction of external root surface temperature by more than 10°C for over 4 minutes, which according to them was sufficient to produce local anti inflammatory effect<sup>24</sup>.

Some researchers have evaluated the reduction in postoperative pain after use of intracanal cryotherapy. Keskin et al observed reduction in postoperative pain after endodontic therapy by use of intracanal cryotherapy in patients who underwent single visit root canal treatment with irreversible pulpitis. Another study, evaluated the similar effect with use of intracanal cryotherapy in adjunct with negative pressure irrigation using Endo Vac. The authors of both the studies concluded that intracanal cryotherapy was found successful in eliminating postoperative pain. Also negative pressure irrigation was able to enhance the effect<sup>25</sup>.

The possible mechanism of relief provided by application of intracanal cryotherapy includes a combination of physiological effects occurring in the surrounding tissues in response to cold (lower temperatures).

Firstly, cryotherapy causes vasoconstriction

and slows down cellular metabolism by limiting biochemical reactions which reduces tissue damage thereby, decreasing oxygen demand of cells and limiting the production of free radicals in tissues<sup>26,27</sup>. Also after application of cryotherapy the metabolism in tissues is reduced by more than 50%, which allows better diffusion of oxygen in the injured tissues<sup>28</sup>. Vasoconstriction also produces anti-edematous effects<sup>29</sup>.

Secondly, cryotherapy causes blockage of nerve endings<sup>29</sup> and decreases peripheral nerve conduction, particularly as observed when local temperature of tissue reaches at about 7°C there is complete deactivation of myelinated A-δ fibers whereas at about 3°C non myelinated C-fibers get deactivated, as observed by Franz and Iggo<sup>30</sup>.

Also, changes in temperature locally causes activation of specialized temperature sensitive nerve endings called as thermoreceptors. These receptors initiate nerve signals that block the nociception within the spinal cord. Nociception is basically the processing of pain signals that results from noxious stimulus<sup>26</sup>.

Therefore, the analgesic effect of cryotherapy is mainly a result produced by a combination of a decreased release of inflammatory chemical mediators of pain and a slower conduction of neural pain signals.

## CONCLUSION:

In light of these observations found out by different researchers in their respective studies cryotherapy presents a simple, non-toxic, cost effective therapeutic treatment modality for postoperative pain, however more studies are required to evaluate the effectiveness of cryotherapy in other pulpal and periradicular diseases . Also the patients subjected to intracanal cryotherapy can be examined for different inflammatory markers, which may become helpful in understanding the mechanism of action and potential use of this therapy in endodontics<sup>25</sup>. Also, more research is needed to justify its long term benefits and limitations.

## FINANCIAL SUPPORT AND SPONSORSHIP:

Nil

## CONFLICT OF INTEREST:

There is no conflict of interest

## REFERENCES:

1. Paul A Rosenberg .Clinical strategies for managing endodontic pain. *Endodontic Topics* 2002;3: 78-92.
2. Sathorn C, Parashos P ,Messer H. The prevalence of postoperative pain and flare-up in single visit and multiple-visit endodontic treatment: a systematic review. *International Endodontic Journal* 2008; 41(2): 91-99.
3. Pak JG and White SN. Pain Prevalence and severity before during and after root canal treatment: a systematic review. *Journal of Endodontics* 2011; 37(4): 429-438.
4. Luis O. Alonso-Ezpeleta, Carmen Gasco-Garcia, Lizett Castellanos-Cosano, Jenifer Martín-González, Francsico J. López-Frías, Juan J.Segura-Egea . Postoperative pain after one-visit root-canal treatment on teeth with vital pulps: Comparison of three different obturation technique. *Medicina Oral, Patologia Oral, Cirugia Bucal* 2012; 17(4): e721-e727.
5. Seltzer S. Pain in endodontics. *Journal of Endodontics* 2004; 30(7): 501-503.
6. Marc García-Font, Fernando Duran-Sindreu, Carmen Calvo, Juan Basilio, Fransesc Abella, Akram Ali, Miguel Roig, Juan-Gonzalo Olivieri. Influence of preoperative pain intensity on postoperative pain after root canal treatment: a prospective clinical study. *Journal of Dentistry* 2016; 45: 39-42.
7. Alves V de O. Endodontic flare-ups: a prospective study. *Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics* 2010; 110(5): e68-e72.
8. Daniel, JG. *Advanced endodontics for clinicians*. 1st ed. Bangalore: J and J Publication; 1998: 202-208.
9. Bystrom A and Sundqvist G. The antibacterial action of sodium hypochlorite and EDTA in 60 cases of endodontic therapy .*International Endodontic Journal* 1985; 18(1): 35-40.
10. Rubinstein R., et al. *Microscopes in endodontics*. *Dental Clinics of North America* 1997; 41:29-40.
11. Sayeed Attar, Walter R. Bowles, Michael K. Baisden, James S. Hodges, Scott B. McClanahan .Evaluation of pretreatment analgesia and endodontic treatment for postoperative endodontic pain. *Journal of Endodontics* 2008; 34(6): 652-655.
12. Pochapski MT, Santos FA, de Andrade ED, Sydney GB. Effect of pretreatment dexamethasone on post endodontic pain. *Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics* 2009; 108(5): 790-795.
13. Masoud Parirokh, Mohammad Hosein Yosefi, Nouzar Nakhaee, Hamed Manocherifar, Paul V. Abbott, Farshid Reza Forghani . Effect of bupivacaine on postoperative pain for inferior alveolar nerve block anesthesia after single-visit root canal treatment in teeth with irreversible pulpitis. *Journal of Endodontics* 2012; 38(8): 1035-1039.
14. G. Gambarini, D. Al Sudani, S. Di Carlo, G. Pompa, A. Pacifici, L. Pacifici, L. Testarelli .“Incidence and intensity of postoperative pain and periapical inflammation after endodontic treatment with two different instrumentation techniques”. *European Journal of Inflammation* 2012; 10(1): 99-103.
15. Parirokh M, Rekabi AR, Ashouri R, Nakhaee N, Abbott PV, Gorjestani H. Effect of occlusal reduction on postoperative pain in teeth with irreversible pulpitis and mild tenderness to percussion. *Journal of Endodontics* 2013; 39(1): 1-5.
16. Braddom RL. *Handbook of Physical Medicine and Rehabilitation*, 2nd ed. Philadelphia: Saunders; 2004.
17. Stangel L. The value of cryotherapy and thermotherapy in the relief of pain. *Physiother Canada* 1975;27:135-9.
18. Belitsky RB, Odam SJ, Hubley-Kozey C. Evaluation of the effectiveness of wet ice, dry ice, and cryogenic packs in reducing skin

- temperature. *Phys Ther* 1987;67:1080–4.
19. C. Swenson ,L. Swärd , J. Karlsson . Cryotherapy in sports medicine. *Scandinavian Journal of Medicine and Science in Sports* 6.4 (1996): 193-200.
  20. Ammara A. Watkins, Timothy V. Johnson, Adam B. Shrewsbury, Paymon Nourparvar, Tarik Madni, Colyn J. Watkins, Paul L. Feingold, David A. Kooby, Shishir K. Maithel, Charles A. Staley, Viraj A. Maste. Ice packs reduce postoperative midline incision pain and narcotic use: a randomized controlled trial. *Journal of American College of Surgeons* 2014 ; 219(3): 511-517.
  21. Knight KL. *Cryotherapy in Sport Injury Management*, 1st ed. Campaign, IL: Human Kinetics; 1995.
  22. Hubbard TJ and Denegar CR. Does cryotherapy improve outcomes with soft tissue injury? *Journal of Athletic Training* 39.3 (2004): 278-279.
  23. Laureano Filho JR, de Oliveira e Silva ED, Batista CI, Gouveia FM. The Influence Of Cryotherapy On Reduction Of Swelling, Pain And Trismus After Third-Molar Extraction: A Preliminary Study. *J Am Dent Assoc* 2005;136:774–8.
  24. Vera J, Ochoa-Rivera J, Vazquez-Carca~no M, Romero M, Arias M, and Sleiman P. EffectOf Intracanal Cryotherapy On Reducing Root Surface Temperature: *JEndod.* 2015;41(11) :1884-1887
  25. Keskin C, Özdemir O, Uzun I, Güler B. Effect Of Intracanal Cryotherapy On Pain After Single-Visit Root Canal Treatment: *Aus Endod J* 2016;43(2):83-88
  26. Nadler SF, Weingand K, Kruse RJ. The physiologic basis and clinical applications of cryotherapy and thermotherapy for the pain practitioner. *Pain Physician* 2004; 7(3): 395-400.
  27. Muldoon J. Skin cooling, pain and chronic wound healing progression. *British Journal of Community Nursing* 2006; 11(3): 21-25.
  28. Bleakley C, McDonough S, Domhnall MD. The use of ice in the treatment of acute softtissue injury: a systematic review of randomized controlled trials. *Am J Sports Med* 2004;32:251–61.
  29. Modabber A, Rana M, Ghassemi A, Gerressen M, Gellrich NC, Hölzle F, Rana M. Threedimensional evaluation of postoperative swelling in treatment of zygomatic bone fractures using two different cooling therapy methods: a randomized, observer-blind, prospective study. *Trials* 2013; 14: 238.
  30. Franz DN and Iggo A. Conduction failure in myelinated and non-myelinated axons at low temperatures. *The Journal of Physiology* 1968; 199(2): 319-345