



ORIGINAL ARTICLE

THE EFFICACY OF CRYOTHERAPY ON PAIN ASSOCIATED WITH LOCAL ANESTHESIA AMONG PEDIODONTIC PATIENTS

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ABSTRACT

Objective: To determine the efficacy of Cryotherapy on pain perception before local anesthetic administration in a Pediatric patients.

Place of Study: Faryal Dental College, Sheikhpura

Study Design: It was a prospective, randomized controlled trial

Duration of study: The Entire time of trial was 3 months from Sept' 2021 to January, 2022.

Methodology: The present study was a prospective randomized controlled trial which comprised of 80 children aged 5 to 10 years (Female=42 and Male=38). The selected participants were divided into two groups by Lottery method. The 40 participants in the test group were given an ice pack at the site of injection before administration of local anesthesia and the other 40 participants in the control group were given local anesthesia without ice pack. The intensity of pain was estimated by Venham's pain scale and SEM (sound, eye, motor) Scale.

Results: Total no. of participants was 80. Among 40 patients who were administered cryotherapy 5 (12.5%) experienced pain during local anesthesia administration. While all participants of control group (without cryotherapy) experienced pain during local anesthesia. In control group, SEM scale revealed a painful reaction for sound, eye and motor variables. Mean Values of the SEM scale in the study group were 1.00, 1.20, 1.12, while mean Values of the SEM scale in the control group were 2.15, 2.25, 1.90 for Sound, Eye and Motor respectively.

Conclusion: Cryotherapy is an effective method to decrease Nociception senses at site of application of local anesthesia. Cryotherapy can be applied to the children having stress and panic during dental treatment.

Key Words: Cryotherapy, Pain perception, Local Anesthesia

INTRODUCTION

Administration of Local anesthesia is mandatory for pain control during any invasive dental procedures such as root canal, pulpotomies, extractions, minor oral surgical and abscess drainage. However, application of local anesthetics is the most agonizing part in start of dental treatments.(1) Pain associated with needle insertion is provoked by the stress and panic and triggered as soon as children see the needle and is called needle phobia (bleno phobia).(2)

Numerous approaches have been employed to decrease needle insertion pain in local anesthesia delivery. These include pharmacological as well as the non-pharmacological

methods such as, topical anesthesia application (3), distraction techniques (4), hypnosis, trans-cutaneous electric nerve stimulation (TENS), Laser therapy, acupuncture, pre-warming of local anesthesia, adjusting the rate of infiltration, buffering of local anesthesia, (5, 6) vibrating the surrounding tissues during local anesthesia administration, use of modified application techniques to reduce the pain experienced during local anesthesia application in oral cavity.(6, 7)

Historically, Cryotherapy (cooling of soft tissues) has been carried out since ages in Medicine in treating sprains, burns, fractures, insect bite and sport injuries.(3) Researches have revealed the advantage of cooling of skin after operation to decrease the incidence and severity of wound swelling and pain.(8) The results of cooling before the procedure are also encouraging in the literature.(9) Although studies showed use of ethyl chloride (EC) Spray in skin tests that leads to decreased pain incidence and intensity, however the results were insignificant.(10) There are health hazards associated with the use of ethyl chloride due to breathing and exposure of vapor which may lead to frost bite, irritation, contact

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dermatitis, pain and even death.(9)

Cryotherapy is a non-invasive method of pain control that has been used as an essential part of injury management and restoration. (11) Potential benefits of using ice for pre cooling are its ease of availability, convenience of use, reduction in pain incidence and intensity and absence of a dis-pleasing taste.(12) Ice helps in pain control by decreasing local blood flow and nerve transmission rate, decreasing edema, and thus helps inducing local anesthetic effect around treatment area.(13)

The aim of this trial was to find out the effectiveness of pre cooling of injection site with ice packs before administration of local anesthesia in children.

MATERIAL AND METHODS

This present study was a prospective, randomized controlled trial carried out in the department of Peadodontic, Faryal Dental College, Sheikhpura. Permission was obtained from the ethical review committee and consent was taken from the patients before data collection. The duration of study was 3 months from Sept' 2021 to January, 2022. Sample size of 80 children were selected using the prevalence of pain in literature, (aged 5 to 12 years), reporting to Department of Peadodontic. Healthy children with Frankl's behavior rating III or IV requiring buccal anesthesia for dental procedures were recruited in the study. The selected participants were

divided into two groups (40 each group) by lottery method. The 40 participants in the test group were given an ice pack at the site of injection before administration of local anesthesia and the other 40 participants in the control group were given local anesthesia without ice pack. The intensity of pain was estimated by Venham 's pain scale and SEM (sound, eye, motor). Venham's pain scale is a valid, pictorial, self-measured psychomotor test that is used to measure the anxiety level of a pediatric patient. (14) It consists of eight cards with two pictures on every card, one 'anxious' picture and one 'non- anxious picture'. If the child points out the anxious picture, a score of 1 is recorded and a score of 0 is recorded for non-anxious picture. The scale has a range of 0 score (minimum) to 8 (maximum). SEM Scale has three different types of variables; sound (verbal behavior), eye sign and body movement.(15) (table 1) Data was evaluated by using SPSS 21. Each question was analyzed separately. Percentages were used to express the frequency of pain, while relationship among pain in control and study groups was evaluated by using chi-square test. P value of ≤ 0.05 was considered as significant.

RESULTS

Findings of the study revealed that on Venham's scale among 40 patients who were administered cryotherapy, only 5(12.5%) children experienced pain prior to local

Table 1: SEM SCALE for the Assessment of children's Behavior

Parameter	Comfort	Mild discomfort	Moderate Discomfort	Severe Discomfort
Sound	No Sound	Non-specific Sound (probable pain)	Verbal Complaint, Louder Sound	Verbal Complaint, Shouting, Crying
Eye	No Sign	Dilated eyes without tears (anxiety sign)	Tears, Sudden eye movement	Crying, covering the face
Motor	Relaxed Body & Hand Status	Muscular Contraction, Contraction Of Hands	Sudden Body & Hand Movements	Hand Movements For Defense, Turning The Head To The Opposite Side

anesthesia administration (Table 2). While all participants of control group (without cryotherapy) experienced pain during local anesthesia. Among 5 patients who suffered pain after cryotherapy 3 (7.5%) had experienced mild pain and 2 (5%) had experienced moderate pain during local buccal infiltration (table 3). Among the patients who were in control group 5 (12.5%) reported severe pain, while 15 (37.5%) of them reported moderate pain and 20 (50%) had mild pain (table 4). According to the SEM scale findings, a painful reaction for all variables i.e sound, eye and motor was depicted in the controls (without cryotherapy). In the study group (with cryotherapy) no severe pain reaction was reported. Mean values of the SEM scale in the study group were 1.00, 1.20, 1.12, while mean values of the SEM scale in the control group were 2.15, 2.25, 1.90 for Sound, Eye and Motor respectively (table 5). Moreover, the association between the control and study groups was statistically significant ($p < 0.05$). With-in group comparison revealed no significant difference for both the control or study groups.

Table 2: Pain Perception (Venham's Pain Scale)

Group	Pain	
	Yes	No
Study (n=40)	5 (12.5%)	35 (87.5%)
Control (n=40)	40 (100%)	Nil

Table shows the number of pediatric patients who experienced pain with or without Ice packs prior to administration of local anesthesia.

TABLE 3: Pain intensity in study group (with cryotherapy prior to Local Anesthesia administration)

Pain intensity(n = 5)	No. of patients	Percent %
Mild	3	7.5 %
Moderate	2	5 %
Severe	0	0

Table 4: Pain Intensity in Control group (without Local anesthesia administration)

Pain intensity (n = 40)	No. of patients	Percent %
Mild	20	50%
Moderate	15	37.5%
Severe	5	12.5%

Table 4: SEM Values for the study and control groups

Group	Sound	Eye	Motor	Sum
Study Group (Cryotherapy)	1.00	1.20	1.12	3.32
Control Group (without Cryotherapy)	2.15	2.25	1.90	6.30

DISCUSSION

Cryotherapy is a historical, therapeutic method that includes systemic or local administration of cold at the injured side of the body. It works via both neurologic as well as vascular mechanism. When applied topically, it decreases the velocity of conduction of pain in nerve fibers, decreases the threshold of tissue nociceptors that leads to a local anesthetic effect at the site of application. In addition, cold application causes vasoconstriction, altered oxygen utilization, tissue metabolism and hence decreases the inflammation.(16, 17)

Local action of Cryotherapy, is further elaborated in '**GATE CONTROL THEORY**'. According to this concept, painful stimuli carried by myelinated A delta fibers and unmyelinated C fibers are repressed by non-painful concurrent impulses sent by "A" beta fibers to posterior HORN cells which results in decreased ascending nociceptive stimulus.(18, 19)

The findings of the current trial of pre-cooling the injection site are in agreement with previous researches.(20, 21) The recommended time for topical anesthesia application vary from 2 to 5 minutes. Two minutes' ice application time was used in this trial. This is in line with the trial carried out by Aminabadi and Farahami for inferior alveolar nerve block, because a five minutes application of ice would not be bearable by the pediatric patients, however it can be tolerable by adults.(22)

It was concluded in this trial that pre-cooling of the injection area for two minutes before application of local anesthetic agent did considerably decrease the pain observed during application of local anesthesia. This outcome is in agreement with those stated for cooling of skin with laser therapy. A laser system along with cooling instrument was used by Chan et al. to treat patients.(23) They concluded that there was lesser pain perception where cooling was applied. Although, the pain generated by laser therapy might be somewhat different from the pain caused by local anesthesia injection.

In literature, children during various experiments also reported compliance and satisfaction with ice application prior to local anesthesia administration, as they did not experience any displeasing taste which occurs in case of use of topical anesthesia. It might be explained by the local

effect of cryotherapy as well as a part of behavior management therapy because taste less ice improved their confidence and trust on their dentist during intervention. Moreover, Cryotherapy led to decreased chances of self-mutilation and soft tissue biting that could occur after local anesthesia administration.(24)

CONCLUSION

Pre-cooling of the area before application of local anesthesia is a simple, reliable, quick to perform and cost efficient method with little potential side effects. Cryotherapy can be applied to all children presented with panic and stress in dental treatment in which local anesthesia is required.

Conflict of Interest: None

Patient Consent: Inform Consent were taken

Ethical Approval: Ethical approval was taken from the institutional review board of Faryal Dental College on August 2021 vide Letter No. 33

Author's Contribution:

FR & RM: Study design, data collection and analysis

NB & AB: Manuscript preparation, drafting and revising

PI, FR & RM: Review and final approval of manuscript

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REFERENCES

1. Ilana E. Oral psychophysiology: stress, pain, and behavior in dental care: CRC press; 2020.
2. Attia S, Austermann T, May A, Mekhemar M, Conrad J, Knitschke M, et al. Pain perception following computer-controlled versus conventional dental anesthesia: randomized controlled trial. 2022;22(1):1-13.
3. Pranati T, Anjaneyulu K. Comparative Evaluation Of Application Of Cold Stimulus Versus Topical Anaesthesia To Control Pain Caused During Injection Of Local Anaesthetic Solution-A Preliminary Study. Int J Dentistry Oral Sci. 2021 Feb 19;8(2):1665-9.
4. Shekhar S, Suprabha BS, Shenoy R, Rao A, Rao A. Effect of active and passive distraction techniques while administering local anaesthesia on the dental anxiety, behaviour and pain levels of children: A randomised controlled trial. European Archives of Paediatric Dentistry. 2022 Jun;23(3):417-27.
5. de Oliveira Duque-Estrada MD E. The Use of Buffering Solutions in the Pediatrics Local Anesthesia to Reduce the Pain of Minor Procedures. Biomedical Journal of Scientific & Technical Research. 2018;2(1):2363-4.
6. Kazi R, Govas P, Slaugenhaupt RM, Carroll BT. Differential analgesia from vibratory stimulation during local injection of anesthetic: a randomized clinical trial. Dermatologic surgery: official publication for American Society for Dermatologic Surgery [et al.]. 2020 Oct;46(10):1286.
7. Kattan S, Lee SM, Hersh EV, Karabucak B. Do buffered local anesthetics provide more successful anesthesia than nonbuffered solutions in patients with pulpally involved teeth requiring dental therapy?: A systematic review. The Journal of the American Dental Association. 2019 Mar 1;150(3):165-77.
8. Okoro T, Ibrahim Y, Mansour N, Alderman P, Evans A. The use of cryotherapy in the early postoperative period after total hip arthroplasty. Ortopedia Traumatologia Rehabilitacja. 2019 Oct 31;21(5):341-5.
9. Islam S, Rashid S, Shaikh AB, Ali M, Hosein T, Askary SH. Effect of pre-cooling the injection site on pain perception in paediatric dentistry. Pakistan Armed Forces Medical Journal. 2021 Feb 24;71(1):270-74.
10. Selvi F, Bedel C, Akçimen M. Evaluation of vapocoolant spray effect on pain reduction during digital nerve block: A randomized clinical trial. The American Journal of Emergency Medicine. 2021 Dec 1;50:260-3.
11. Dzidek A, Piotrowska A. The use of cryotherapy in cosmetology and the influence of cryogenic temperatures on selected skin parameters a review of the literature. Cosmetics. 2022 Sep 29;9(5):100.
12. Chilakamuri S, Nirmala SV, Nuvvula S. The effect of pre-cooling versus topical anesthesia on pain perception during palatal injections in children aged 79 years: a randomized split-mouth crossover clinical trial. Journal of Dental Anesthesia and Pain Medicine. 2020 Dec;20(6):377.
13. Virdikar SS, Prabhakar AR, Basappa N. A comparative study on pain perception in children, after application of pre-cooled and plain topical anesthetic gel during needle insertion for local anesthetic administration-In-vivo trial. Journal of Updates in Pediatric Dentistry. 2022 Jan;1:39-46.
14. Buchanan H, Niven N. Validation of a Facial Image Scale to assess child dental anxiety. International journal of paediatric dentistry. 2002 Jan;12(1):47-52.
15. Lathwal G, Pandit IK, Gugnani N, Gupta M. Efficacy of different precooling agents and topical anesthetics on the pain perception during intraoral injection: a comparative clinical study. International journal of

- clinical pediatric dentistry. 2015 May;8(2):119.
16. García RA, Manso BJ. Results of the use of post-surgical thermotherapy in oral surgery. Cienfuegos, 2015-2016. *MediSur*. 2020;18(2):148-53.
17. Jain A, Chauhan S, Bahuguna R, Agarwal A, Sharma R, Khan F. Effect of cryotherapy on postoperative pain: Randomized controlled trial. *Indian Journal of Dental Sciences*. 2021 Oct 1;13(4):236.
18. Lakshmanan L, Ravindran V. Efficacy of cryotherapy application on the pain perception during intraoral injection: a randomized controlled trial. *International Journal of Clinical Pediatric Dentistry*. 2021 Sep;14(5):616.
19. Kwon YS, Robergs RA, Schneider SM. Effect of local cooling on short-term, intense exercise. *The Journal of Strength & Conditioning Research*. 2013 Jul 1;27(7):2046-54.
20. Soni H, Saha R, Prajapati R, Pathak S. The effectiveness of pre-cooling the injection site in alleviating the pain of oral injections in pediatric subjects. *Acta Sci Dent Sci*. 2020;4(2):1-5.
21. Aminah M, Nagar P, Singh P, Bharti M. Comparison of topical anesthetic gel, pre-cooling, vibration and buffered local anesthesia on the pain perception of pediatric patients during the administration of local anesthesia in routine dental procedures. *Int J Contemp Med Res*. 2017;4(2):400-3.
22. Aminabadi NA, Farahani RM. The effect of pre-cooling the injection site on pediatric pain perception during the administration of local anesthesia. *Journal of Contemporary Dental Practice*. 2009;10(3):1-9.
23. Chan HH, Lam LK, Wong DS, Wei WI. Role of skin cooling in improving patient tolerability of Q-switched Alexandrite (QS Alex) laser in nevus of Ota treatment. *Lasers in Surgery and Medicine: The Official Journal of the American Society for Laser Medicine and Surgery*. 2003 Feb;32(2):148-51.
24. Davoudi A, Rismanchian M, Akhavan A, Nosouhian S, Bajoghli F, Haghighat A, Arbabzadeh F, Samimi P, Fiez A, Shadmehr E, Tabari K. A brief review on the efficacy of different possible and nonpharmacological techniques in eliminating discomfort of local anesthesia injection during dental procedures. *Anesthesia, essays and researches*. 2016 Jan;10(1):13.