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Can Cryotherapy Reduce Pain During Dental Injections?

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Abstract: ***Background: Pain and discomfort during local anaesthesia administration are prevalent issues in paediatric dentistry. Although topical anaesthetics such as benzocaine are commonly used, their effectiveness varies. Recent research indicates that precooling measures, such as ice application, may alleviate pain. However, there is minimal information to compare these techniques in children. Objective: To check the intensity of pain using VAS scale while administering local anesthetic solution using Benzocaine gel 20% and Cryotherapy. Method: In this study, 30 pediatric patients between 5 years and 8 years of age were selected who needed mandibular infiltration for any procedure. The participants were allocated into two separate groups i.e. Group 1-Benzocaine gel 20% and Group 2-Cryotherapy where frozen ear bud was used. Upon application of the above-mentioned agents VAS reading was recorded Subsequent to inserting the needle. The Mann-Whitney U test was employed to analyze the data statistically. Results: No significant difference in VAS scores was found between the benzocaine and ice groups, according to the analysis (p = 0.656). Conclusion: Both Topical Benzocaine gel and cold ice application provided comparable pain relief, Revealing no significant statistical disparity in patient-reported VAS scores (p > 0.05).***

Keywords: pain relief in children, benzocaine gel, cryotherapy, local anaesthesia discomfort, VAS pain scores

1.Introduction

In paediatric dentistry, effective pain management procedures are critical for directing behaviour and ensuring excellent treatment outcomes. Among the many obstacles faced by dental practitioners, guaranteeing a child's comfort during local anaesthesia administration is particularly tough. Fear and anxiety over needles frequently lead to bad dental experiences, which can last until adulthood, resulting in avoidance behaviour and poor oral health outcomes [1]. Non-pharmacological therapies have sparked recent interest as a result of their ease of use, comfort, and affordability [2]. One such approach, cryotherapy, or the use of cold, has emerged as a promising supplementary strategy for reducing injection discomfort [3]. Cryotherapy works by slowing nerve transmission, which reduces pain perception [4].

Cryotherapy inhibits the propagation of nociceptive stimuli from the stimulus site to the brain by causing transient numbness and reducing tissue temperature [5]. In paediatric patients, who frequently appear with increased fear and anxiety, such a strategy might act as a critical buffer, making the dental experience less unpleasant [6]. While topical anaesthetics like lidocaine and benzocaine gels are commonly used, their efficacy might vary, especially on keratinised mucosa [7]. Cryotherapy, whether delivered by ice packs, refrigerant sprays, or specifically developed cryo equipment, provides a mechanical and neurophysiological alternative or addition to topical anaesthesia [8]. Existing literature in the medical and dental fields has indicated cryotherapy's efficacy in minor surgical procedures, Injuries sustained during sports, and dermatological treatments [9]. However, its use in pediatric dentistry-especially as a pre-injection approach-Has increasingly drawn interest [10]. In pediatric dental care, the key purpose of cryotherapy is to manage pain and inflammation that arise during various soft tissue procedures. This method involves the Precise Exposure to low temperatures through the use of cryotherapy equipment or cold-inducing agents. The pain-relieving property Slows down neural signal, thereby Lowering Perceived pain. It holds significant relevance in endodontic therapy, oral surgical procedures. By lowering postoperative discomfort and Inflammation, “It contributes to a less uneasy and child-friendly dental visit. Beyond Pain mitigation, cryotherapy exhibits Inflammation-modulating attributes, leading to reduced Supportive tissue swelling therefore promotes fast recovery. It offers advantages in pain relief, inflammation reduction, and better patient experiences." [11].

Unlike Systemically administered medication or nitrous oxide sedation, due to its negligible systemic absorption, cryotherapy presents a low risk of adverse effects [12].

2.Material Method

Inclusion Criteria:

- Patients who were between the age group of 5-10 years.
- Patients who were willing to participate in the study.
- Patients were are available during study period.
- Patients who signed the informed consent.

Exclusion Criteria:

- Patient with a history of systemic diseases, psychiatric disorders, insensitive skin and dental abscesses in the procedure site.
- Patients unable to follow instructions.
- Uncooperative patients.
- Those who withheld informed consent.

3.Methodology

The present study was a randomized single-blind (observer) crossover clinical trial.

In this study, 30 pediatric patients between 5 years and 8 yrs who reported the Dept. of Pediatric and Preventive Dentistry in National dental college and hospital, derabassi for any type of dental management whuch required local anesthesia got selected. Patients who needed mandibular infiltration for any dental treatment were selected. Following parental or guardian consent in written form, the subjects were enrolled in the study. Individuals were assigned into 2 groups i.e. **Group 1 Benzocaine gel and Group 2 Cryotherapy (freezed cotton tips)**. For Group 1 involving topical 20% benzocaine gel 20% (control group), using cotton roll the oral mucosa was dried for 30 seconds before application of the pre-injection anesthesia. Topical anesthetic Benzocaine gel 20% (ProGel-B, Septodont) (Figure 1) was applied for 2 minutes using cotton using a tweezer. The procedure was followed by infiltration injection of 2% lidocaine with 1:20,000 adrenaline (LOX* 2% ADRENALINE) using a short 27-gauge needle (Unilock, Dispovan) (Figure 2). **Nociceptive response** during administration of local anesthetic agent was recorded for the group using VAS (visual analogue scale).

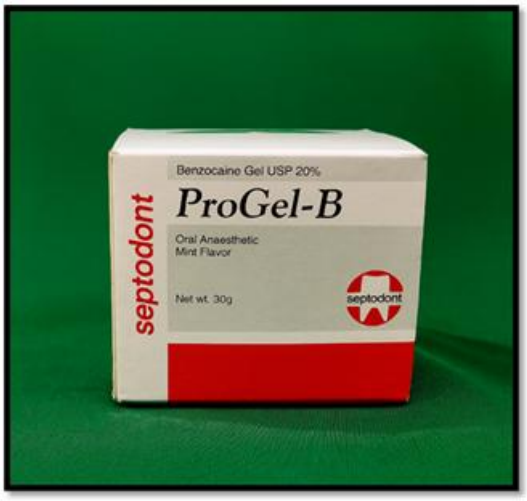

Figure 1: 20% Benzocaine gel

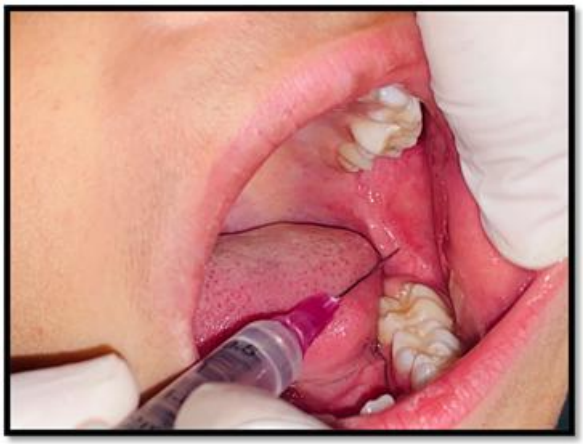

Figure 2: Injection at the site of Benzocaine gel application

In Group 2, the oral mucosa was first dried using a cotton roll for 30 seconds. A freezed ear bud was then placed at site designated for local anesthesia for a duration of two minutes. While the frozen swab remained in place, 0.5 ml of 2% lidocaine containing 1:200,000 epinephrine was administered with a 27-gauge syringe, Administered directly beneath the swab into the mucosa. The patients' pain response during the insertion of needle was Measured using the Visual Analogue Scale (VAS).

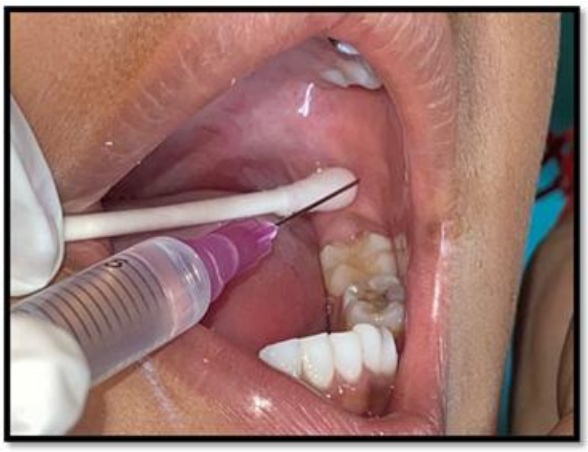

Figure 3: Injection at the site of ice application with frozen cotton swab

Statistical Method:

The dataset was examined with the aid of statistical Packages for Social Sciences (SPSS) ver. 25.0. Wilcoxon and Mann Whitney U Test was employed to compare the means. The Mann-Whitney U test was used to compare group 1 and 2 in terms of the pain scores measured via the VAS.

4.Results

The present study evaluated and compared the analgesic effectiveness of two topical interventions-20% B**enzocaine topical gel** (Group 1) and **Cryotherapy** (Group 2)-in children aged **5 to 8 years** undergoing dental procedures. To assess pain perception, the Visual Analog Scale (VAS), known for its validity in measuring subjective sensations, was employed. Following a thorough description of the research Before initiating the procedures, written consent was collected from each participant's parent before the trial commenced Group 1 received benzocaine gel application, while Group 2 was cryotherapy, managed using cold ice application at the treatment site prior to the procedure. Pain levels were noted promptly after the procedure following the intervention.

The benzocaine group demonstrated a mean pain score of 1.07 with a standard deviation of ± 0.88 on the VAS. In comparison, the **ice application group** recorded an observed mean value on the VAS of 0.93 ± 0.88**,** which was also indicative of minimal discomfort (Table 1). The **median (interquartile range, IQR)** VAS score Among participants who received benzocaine was **1.0 (1.0–2.0)**, whereas in the cryo group, the median was **1.0 (0.0–1.5)**.

The results showed no statistically significant variation in VAS score between the benzocaine and ice application groups (**p = 0.656).** Both 20% Benzocaine Gel & cold ice application provided comparable pain relief, Showing no significant difference in statistical terms in patient-reported VAS scores ($p > 0.05$).

Table 1: Mean VAS score of two groups

Pain scale	Benzocaine Group (n = 15)	Ice Application Group (n = 15)	P-value
VAS score (mm)	1.0 (1.0–2.0)	1.0 (0.0–1.5)	0.656

Table 2: Statistical Comparison of VAS Scores in Benzocaine and Ice Application Groups

Parameter	Benzocaine Group (n=15)	Ice Application Group (n=15)
Mean ± SD (VAS)	1.07 ± 0.88	0.93 ± 0.88
Median (IQR) (VAS)	1.0 (1.0–2.0)	1.0 (0.0–1.5)
Mann-Whitney U	-	123.0
p-value	-	0.656

5.Discussion

The most significant challenges that dentists confront are dental anxiety and needle phobia. Local anesthesia is an imperative part of dentistry. The effective treatment of pediatric children by pacifying their fear and distress during dental treatment is aided by using a profound local anesthetic [13].

Literature suggests that cryoanesthesia can be performed to relieve pain from local anesthetic injections, manage postoperative pain, and prevent edema [16]. By stimulating myelinated A-fibers and activating inhibitory neural circuits, cryoanesthesia helps reduce pain perception. It decelerates the nerve conduction, resulting in temporary vasoconstriction [17].

The fundamental benefit of cryoanesthesia is that it acts on all of the cells in the part rather than just the nerve cells, as other topical anaesthetics do, resulting in rapid anaesthesia. The analgesic properties of cryotherapy might be explained by "the gate control theory of pain". Because the brain can only recognise one feeling at a time, cryotherapy, when used to defend against anaesthetic injections, reaches the brain before the pain experience does. Hence, counterstimulation (cryotherapy) decreases pain perception. [16].

The current research focused on determining how cryotherapy affects the experience of pain in paediatric patients and compares it to topical anaesthetic gel (20% benzocaine).

Empirical evidence from the current research confirm Proposition of cryotherapy administration at injection site greatly reduces discomfort at the moment of needle penetration during local anaesthetic delivery for dental treatment. This was demonstrated in VAS, where A decline in scores was evident in the in the cryotherapy group as compared with the Benzocaine gel group, although the comparison results were statistically not significant.

Whearas in Aminabadi and Farahani's research Cooling the site of infiltration block prior administration of anesthetic solution dramatically lowered Children's response to pain [18]. As reported by Lakshmanan & Ravindran Cooling the area before administering the syringe before local anaesthetics may be recommended for cost-effective supplemental treatment that benefits all paediatric patients with fear and anxiety [19].

Research conducted by Islam and associates compared the mean Sensory (sound), visual (eye), and physical (motor) indicators score of Cryopreparation and topical application at injection site in paediatric patients, discovered that injecting local anaesthesia at a precooled site results in less pain, which reduces child anxiety levels, more effective analgesia, and increased patient comfort [20].

The current study's findings imply Cryoanesthesia is an effective, alternative, and non-pharmacological strategy in lowering discomfort of syringe.

6.Conclusion

The present investigation yielded evidence that Benzocaine gel as well as cold ice application are equally effective in attenuating pain responses during local anesthetic procedures in pediatric populations. Absence of a statistically robust disparity in pain intensity ratings as measured by the scores between the two groups suggests that ice application can serve as a viable, cost-effective, and easily accessible alternative to topical anesthetic gels for pain management in children.

References

[1] Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *Int J Paediatr Dent*. 2007;17(6):391–406.
[2] McDonald RE, Avery DR, Dean JA. *Dentistry for the Child and Adolescent*. 10th ed. Elsevier; 2016.
[3] Bahrololoomi Z, et al. Evaluation of the efficacy of cryotherapy in reducing injection pain in children. *J Clin Pediatr Dent*. 2018;42(5):349–353.
[4] Algafly AA, George KP. The effect of cryotherapy on nerve conduction velocity, pain threshold and pain tolerance. *Br J Sports Med*. 2007;41(6):365–369.
[5] Nadler SF, et al. The physiologic basis and clinical applications of cryotherapy and thermotherapy for the pain practitioner. *Pain Physician*. 2004;7(3):395–399.
[6] Aminabadi NA, Farahani RMZ. The effect of pre-cooling the injection site on pain perception in

pediatric dentistry: a randomized controlled trial. *J Clin Pediatr Dent*. 2009;33(4):289–292.
[7] Malamed SF. *Handbook of Local Anesthesia*. 6th ed. Elsevier; 2012.
[8] Tirupathi SP, Rajasekhar S. Effectiveness of ice application in reducing pain during local anesthetic injection in children: a randomized controlled study. *J Dent Anesth Pain Med*. 2019;19(1):25–29.
[9] Bleakley CM, et al. The use of ice in the treatment of acute soft-tissue injury: a systematic review. *Am J Sports Med*. 2004;32(1):251–261.
[10] Kamatchi D, et al. Effectiveness of pre-cooling with ice stick on pain perception during intraoral injection in children. *Int J Paediatr Dent*. 2019;29(6):713–719.
[11] Pal S. Cryotherapy enhancing pediatric dental care. Journal of the Indian Society of Pedodontics & Preventive Dentistry. 2024 Feb 2;42.
[12] Merrick MA, Knight KL, Ingersoll CD, Potteiger JA. The effects of ice and compression wraps on intramuscular temperatures at various depths. Journal of Athletic Training. 1993;28(3):236.
[13] Giovannitti Jr JA, Rosenberg MB, Phero JC. Pharmacology of local anesthetics used in oral surgery. Oral Maxillofac Surg Clin North Am. 2013 Aug 1;25(3):453-65.
[14] Shilpapriya M, Jayanthi M, Reddy VN, Sakthivel R, Selvaraju G, Vijayakumar P. Effectiveness of new vibration delivery system on pain associated with injection of local anesthesia in children. Journal of Indian Society of Pedodontics and Preventive Dentistry. 2015 Jul;33(3):173-6.
[15] Hindocha N, Manhem F, Bäckryd E, Bågesund M. Ice versus lidocaine 5% gel for topical anaesthesia of oral mucosa–a randomized cross-over study. BMC anesthesiology. 2019 Dec; 19:1-1.
[16] Aminabadi NA, Farahani RM. The effect of pre-cooling the injection site on pediatric pain perception during the administration of local anesthesia. The journal of contemporary dental practice. 2012 Jun; 10:43-50.
[17] 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.
[18] 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. Pak Armed Forces Med J. 2021 Feb ;71(1):270-4.