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Comparative evaluation of various intraoral topical anaesthetics and precooling agents for pain perception during needle prick in Pediatric Patients – A Clinical Study

[1]Dr Ambreena Khurshid , PG Student , Department of Pedodontics and Preventive Dentistry, swami devi dyal hospital and dental college, barwala, Haryana

[2]Dr Pooja Goel, PG Student, Department of Pedodontics and Preventive Dentistry swami, devi dyal hospital and dental college, barwala, panchkula, Haryana

[3]DR Sanjay Chachra, Head of department and Professor, Department Pedodontics and Preventive Dentistry, swami devi dyal hospital and dental college, barwala, panchkula, Haryana

[4]Dr Abhishek Dhindsa, Professor , Department Pedodontics and Preventive Dentistry , swami devi dyal hospital and dental college, Barwala, panchkula, Haryana

[5]Dr Gurpreet Kour, Senior Lecturer, Department Pedodontics and Preventive Dentistry swami ,devi dyal hospital and dental college, barwala, panchkula, Haryana

[6]Dr Manu Sharma, Senior Lecturer Department, Pedodontics and Preventive Dentistry, swami devi dyal hospital and dental college, barwala, panchkula, haryana

[7]Dr Nadia, PG Student, BRS Dental College, Panchkula, Haryana

Corresponding author: Dr Pooja Goel, PG Student, Department Of Pedodontics And Preventive Dentistry, Swami Devi Dyal Hospital And Dental College, Barwala, Panchkula , Haryana

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Abstract

Newer approaches have been introduced to facilitate various dental procedures but local anaesthesia administration continues to be the fundamental and common modality of pain control during various routine dental procedures. As a pediatric dentist, administering the local anaesthesia is the most difficult part of procedure as needle insertion is always anxiety provoking stimulus and might interfere with appropriate dental management. Topical anaesthesia is widely advocated in pediatric dentistry to alleviate pain and anxiety during administration. Precooling the injection site has also shown promising results in the reduction of needle prick pain. This study was aimed to evaluate the efficacy of

various topical anaesthetics and precooling agents to lessen the pain perception of local anaesthesia administration using Wong Bakers Faces Pain scale and Face leg activity cry and Consolabilty Pain scale.

Keywords: Pain perception, Topical anaesthetics, Precooling agents, Wong Bakers Faces Pain scale, Face leg activity cry and Consolabilty Pain scale.

Introduction

Dental pain management is one of the most challenging and critical aspect of modern dentistry which might affect patient's quality of life. Treating child patient with minimal discomfort and malaise has always been primary concern in pediatric dentistry. Poorly managed pain control can instigate fear and negative response in patients which becomes an obstacle for clinicians to create a positive overall patient experience. Fear of needles has been reported to be the major cause of apprehension and anxiety in dental patients. The dentist must possess certain knowledge, readiness and skills for administration of painless anesthesia.[2] Therefore any procedure that remarkably reduces unpleasantness of dental injection could serve as a positive reinforcer towards obtaining dental care and positive attitude of child patient towards dentistry. Therefore the main objective of this study was to evaluate the effectiveness of various topical anaesthetics and precooling agents on pain perception during needle prick and to compare the efficacy of various topical anaesthetics and precooling agents on pain perception during needle prick.

Materials and Methods

The study was conducted in the outpatient department of Paedodontics and Preventive dentistry after obtaining approval of the ethical committee of the institute. A total of 150 children aged 5- 9 yr irrespective of gender fulfilling the inclusion criteria were randomly divided into five equal groups of 30 children . An informed written consent was obtained from the parents/ quardians before commencing the study. Group A- Ice using latex gloves ,Group B- 5% Lignocaine gel, Group C - 20 % Benzocaine gel , Group D - Refrigerant (Roeko endofrost), Group E- Placebo (Diluted glycerine) Following proper isolation of the desired site sterile guaze piece and suction tip , one of the five material was applied as per manufactures instructions. After the topical application of each agent, inferior alveolar nerve block was given using 2% Lignocaine hydrochloride (Lignospan special, Septodont) from Breech loading metallic, catridge aspirating syringe (SAGIMA CE Argentina). LA Catridge (Lignospan special, Septodont) with 27 G needle (Septoject, Septodont) .The needle was concealed from the child in an attempt not to create fear promoting situation that could alter the child's pain perception. During the injection procedure, assessment of pain perception was done by pretrained and calibrated associate dental surgeon using FLACC observational Scale(Figure 1). Immediately after the needle insertion child quantified the pain perception using Wong Bakers Faces Pain scale (Figure 2). The scores were compiled , tabulated and subjected to statistical analysis. Statistical analysis was done using One way ANNOVA test and pair wise comparison of pain score was done using post hoc tukey test.

Inclusion criteria

- Patients who were willing to participate in the study.
- Children aged 5 to 9 years.
- Children who required inferior alveolar nerve block for any dental procedure
- Children with no systemic disease.
- Children well oriented with time and space.
- No history of exposure to any injection last 6 months.

Exclusion criteria

- Patients who were not willing to participate

- Children below 5 and above 9 yrs.
- Children who required any procedure without inferior alveolar nerve block.
- Presence of underlying systemic disease.
- children who were not well oriented with time and space.
- Children having exposure of any type of injection last 6 months

Results

Greatest pain reduction was observed in refrigerant group followed by benzocaine, ice, lignocaine and placebo with Wong Bakers Faces pain scale and FlACC Scale.

Category	Scoring 0	1	2
Face	No particular expression or smile	Occasional grimace or frown withdrawn, disinterested	Frequent-constant quiver chin, clenched jaw
Legs	Normal position, relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back & forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep) occasional complaint	Moans or whimpers; sobs; frequent complaint	Crying steadily, screams,
Consolabilty	Content, relaxed	Reassured by occasional touching, hugging, or being talked to, distractible	Difficult to console or comfort

Figure 1

Figure 2

Table 1: Depicts mean pain perception of all five agents using Wong Bakers Faces Pain scale and one –way Annova test.

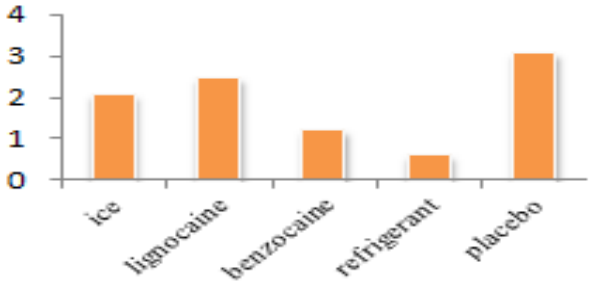
Agent	Mean Pain Score	P Value And Significance
A	2.06	0.000 Highly Significant
B	2.46	0.000 Highly Significant
C	1.20	0.000 Highly Significant
D	0.600	0.000 Highly Significant
E	3.06	0.000 Highly Significant

Interpretation: One way Annova test indicates least pain score in Refrigerant followed by benzocaine, ice, lignocaine and placebo and results were statistically highly significant

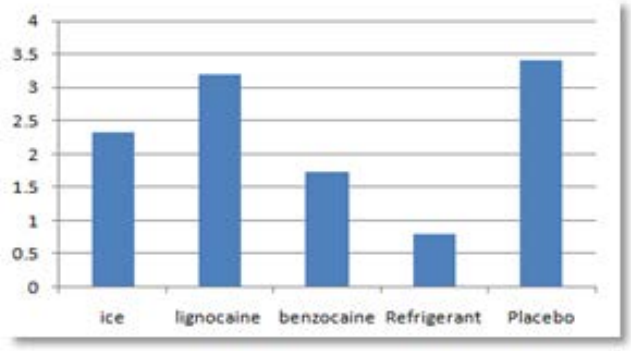
Table 2: Depicts mean pain perception of all five agents using FLACC Scale and one –way Annova test.

Agent	Mean Pain Score	P Value And Significance
A	2.33	0.000 Highly Significant
B	3.20	0.000 Highly Significant
C	1.73	0.000 Highly Significant
D	0.80	0.000 Highly Significant
E	3.40	0.000 Highly Significant

Interpretation: One way Annova test indicates least pain score in Refrigerant followed by benzocaine, ice, lignocaine and placebo and results were statistically highly significant



Graph 1: showing mean of pain scores, least pain score recorded in refrigerant(0.80) followed by benzocaine (1.73), ice (2.33), lignocaine (3.20) and placebo(3.40)



Graph 2: showing mean of pain scores, least pain score recorded in refrigerant(0.60) followed by benzocaine (1.20), ice (2.06), lignocaine (2.46) and placebo (3.06)

Discussion

Pain control is an fundamental element of modern dentistry.Prevention of pain during any dental procedure can nurture the relationship of the patient and dentist , by building confidence , mitigating the intensity of fear and anxiety.[3] Intraoral local anaesthesia is used commonly to control pain during dental procedures. Unfortunately, local anaesthetic administration itself results in greater negative response in children. [4] Therefore the present study was conducted to evaluate the effectiveness of various topical anaesthetics viz 20% benzocaine gel, 5% lignocaine gel and precooling agents i.e endofrost and ice (using latex gloves) in reducing pain of needle prick of local anaesthesia(inferior alveolar nerve block). Glycerine (diluted) was used as placebo for the control group .

In the present study patient's pain perception was evaluated using **Wong Bakers faces pain scale** and **FLACC** scale. Certainly pain is difficult if not impossible to quantify. Pain assessment is more difficult in patients under 5 years since they usually have not developed the cognitive skills..[7] The Wong Bakers Faces pain scale is repeatable, easy to use by children and has proven to have significant positive correlation.[7] FLACC scale is an observational pain tool with improved reliability and validity for pain assessment in children.[8]

Refrigerant showed lowest mean pain score 0.80 and 0.60 using wong bakers faces pain scale and FLACC scale respectively . Post Hoc test showed that refrigerant had stastiscally significant difference when compared with lignocaine, ice and placebo . Refrigerant shows instant cooling effect, reduces edema, causes vasoconstriction and renders tissue unresponsive temporarily. Apart from this Refrigerant had rapid onset of action i.e just 2 to 5 seconds which was sufficient to reduce needle discomfort.

In the present study, Benzocaine showed better results than lignocaine, ice and placebo. It shows rapid onset of action as suggested by **Nidhi**[9] et al 2017 and has better acceptable taste than lignocaine . Benzocaine has also been reported to possess excellent surface anaesthetic properties , has low water solubility and has ability to remain localized at the site of application.

Results of present study showed that ice was more effective than lignocaine in reducing pain of needle prick. The results were similar to the study done by **Leff et al** [10] who concluded that pre cooling the site of operation with ice prior to infiltration of local anesthesia significantly reduces pain perception associated with infiltration. The advantage of ice is that it is comfortable, safe and physiologically effective. Moreover, ice is inexpensive and readily available everywhere in India and is a material which is familiar to the patient's, thereby, is less likely to induce anxiety and subjective fear.

Although lignocaine is considerd as a gold standard for topical anaesthetics, however, in the present study, pain rating of the patients treated with lignocaine showed high pain score in comparison to refrigerant, benzocaine and

ice . This could be attributed to low concentration of lignocaine in comparison to refrigerant, benzocaine as used in present study. Also , the bitter taste of lignocaine might have caused discomfort and anxiety to the child patients leading to higher pain scores. Placebo also showed reduction in pain perception of needle insertion . The positive effect of placebo (glycerine) in relieving needle insertion pain in the present study could be due sweet taste of glycerine and its soothing effects Moreover , placebo acts psychologically rather pharmacologically i.e the child perceives the feeling of application of something that will be beneficial in reducing discomfort of needle penetration. Thus all the agents used in the present study if not completely but to some extend reduced needle discomfort but endofrost showed superior properties in reducing pain perception of needle prick.

Conclusion

It was concluded from the study that Refrigerant had highly significant efficacy in reducing needle prick perception as compared to other groups.

- Refrigerant was easy to accomplish and well received by subjects, indicating potiential for use in dentistry.
- Therefore, Cryoanaesthesia should be considered as an easy , reliable and effective technique to reduce discomfort and to instill positive behavior in children towards dental treatment.
- The investigator is of the firm opinion and believes that Refrigerant should be regularly used in pediatric dentistry because it actually does miracles by allowing pediatric dentist to render painless, comfortable and efficient dental treatment building good rapport with the child patient which might be difficult otherwise.

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