

Buzzing Painless Dentistry with a Bee [†]

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Abstract: Needle phobia is one of the most common fears, inducing painful and uncomfortable procedures in pediatric dentistry. Managing procedural distress can provide both short- and long-term benefits by increasing compliance and reducing avoidance behavior in dental care. Therefore, an expanded focus on fear-reducing interventions is advised for needle operations in addition to pain management. The purpose of the current study is to examine and assess the efficiency of intraoral vibrations, extraoral vibrations, and cooling in alleviating pain perception during the administration of inferior alveolar nerve blocks.

Keywords: local anesthesia; pain; extraoral vibration; cooling

1. Introduction

A fear of needles, especially in young patients, causes noncompliance and treatment avoidance. Despite constant technological advancement, this fear has not decreased among the world's population but has actually increased. Over the past four decades, clinicians and researchers have exhibited a rising interest in this subject and have worked to better grasp its numerous dimensions. As a result of the close relationship between the issue of dental phobia and the dentist, it is more crucial than ever that a dentist has the ability to recognize it and comprehend the best ways to handle it, especially when dealing with the pediatric population. Increased compliance and decreased avoidance can result from managing procedural distress, which has both immediate and long-term advantages in medical care [1]. Pain management during dental procedures therefore becomes of utmost importance in pediatric dental practice [2]. Among injections administered in routine dental care in children, palatal injections and inferior alveolar nerve blocks are deemed to be the most painful injections as opposed to infiltrations [3,4].

Studies on the use of vibration to lessen discomfort during medical procedures such as phlebotomy, vaccinations, and other needle-related procedures in children have been conducted. Multiple methods, such as the application of topical anesthesia [5], modifying the rate of infiltration by lowering the speed of injection [6], distraction techniques [7], vibrating the tissue during the administration of local anesthetic [8], applying pressure to the site of injection and precooling [9], buffered vs. unbuffered [10], and breathing exercise using a bubble blower [11], etc have been studied to reduce the discomfort during local anesthesia.

However, there is no evidence comparing the effectiveness of extraoral vibrations and extraoral vibrations with cooling.



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2. Methods

The present study was carried out in the Department of Pediatric and Preventive Dentistry, D Y Patil Dental College and Hospital, Pune. Clearance from the institutional ethics committee was received and recorded with the university. The parents or guardians of the children participating in this study provided written informed consent.

The majority of the samples were from children who were seeking dental care at the department.

The inclusion criteria are as follows:

- Children aged 7–13 years old;
- Patient requiring an inferior alveolar nerve block for dental treatment;
- Co-operative child with a Frankl behavior rating of 2 or 3;
- Healthy children with no systemic illness;
- Children with informed assent and parental consent;
- Children without previous experience with local anesthetic injections;
- Child is free from any neurological or psychological disorder.

The exclusion criteria are as follows:

- Children with behavioral management problems;
- Children with known allergy to local anesthetic agents;
- History of a specific phobia or unpleasant experience related to dental settings;
- Patients with congenital syndromes or intellectual disabilities.

The samples of 33 children were randomly divided into 2 groups.

Group 1: Extraoral vibration.

Group 2: Extraoral vibration + Cooling.

Group 1: Extraoral vibrations were delivered using the commercially available device Buzzy (Buzzy[®], MMJ Labs, Atlanta, GA, USA). When using the device technique, the parent and child were first shown the device. The gadget was made accessible to the kids so they could touch it and use it. Readings from the pulse oximeter, MCDAS, and FLACC scale were noted. The device was then placed extraorally over the area to be anesthetized and switched on. Vibrations were delivered throughout the injection, and the deposition of the local anesthetic solution was carried out. Throughout this phase, readings from the MCDAS, FLACC scale, and pulse oximeter were recorded. After completing the procedure, the pain assessment was conducted using the Wong-Baker FACES scale, and the child was invited to choose one face (Figure 1).



Figure 1. Extraoral vibration delivered.

Group 2: Extraoral vibrations along with cooling were delivered using the same commercially available device, Buzzy. The ice pack wings of the device were used to

deliver cold stimulus. The readings were obtained in a similar manner as described in group 1 (Figure 2).

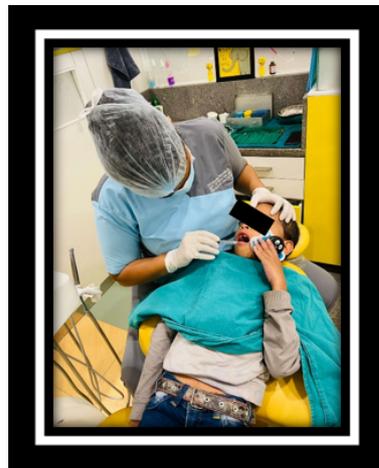


Figure 2. Extraoral vibration with cooling delivered.

3. Results

Following are the tables showing the results in different groups (Tables 1–4).

Table 1. Mean pulse rate among pre-treatment and post-treatment groups.

| PULSE RATE | MIN | MAX | MEAN (SD) |
|----------------|-----|-----|--------------|
| PRE-TREATMENT | 82 | 96 | 88.89 (3.60) |
| POST-TREATMENT | 80 | 96 | 84.96 (3.11) |

Table 2. Comparison of MCDAS anxiety scale before treatment and after treatment in each group using Wilcoxon-sign rank test.

| MCDAS | GROUP 1 | | GROUP 2 | |
|------------------------|---------------|----------------|---------------|----------------|
| | Pre-Treatment | Post-Treatment | Pre-Treatment | Post-Treatment |
| ANXIETY ABSENT | 00 (0%) | 21 (21.21%) | 0 (0%) | 25 (25.25%) |
| ANXIETY PRESENT | 13 (13.13%) | 12 (12.12%) | 18 (18.18%) | 08 (8.08%) |
| SEVERE PHOBIC DISORDER | 20 (20.20%) | 00 (0%) | 15 (15.15%) | 00 (0%) |

Table 3. Frequency and percentage distribution of study subjects in individual groups according to the WBFPS scale.

| WBFPS | | GROUP 1 | GROUP 2 |
|-------|-------------------|-------------|-------------|
| SCORE | LABEL | | |
| 0 | No hurt | 00 (0.00%) | 07 (21.20%) |
| 2 | Hurts little bit | 01 (3.00%) | 11 (33.30%) |
| 4 | Hurts little more | 18 (54.50%) | 9 (27.30%) |
| 6 | Hurts even more | 12 (36.40%) | 6 (18.20%) |
| 8 | Hurts whole lot | 02 (6.10%) | 0 (0.00%) |

Table 4. Frequency and percentage distribution of study subjects according to the FLACC scale.

| FLACC | | N | % |
|-------|-------------------------|----|-------|
| SCORE | LABEL | | |
| 0 | Relaxed and comfortable | 17 | 17.2% |
| 1–3 | Mild discomfort | 63 | 63.6% |
| 4–6 | Moderate pain | 19 | 19.2% |
| 7–10 | Severe discomfort/pain | 00 | 0.00% |

4. Discussion

The gate control theory of pain by Melzack and Wall—1965 [12], proposed that the gate is substantia gelatinosa in the dorsal horn. This gate modulates the transmission of sensory information. This gate is controlled by the activity of A delta and C fibers. A large diameter (C fibers) closes the gate, and a small diameter (A delta) opens it [12]. Stimulation of these large-diameter fibers with appropriate coldness, warmth, or vibration closes the gate and lessens the pain sensation. This forms the working principle of the Buzzy device. Evidence from the literature suggests DentalVibe is one more device to reduce pain. However, this was not effective in reducing injection pain perception. A Buzzy device used in this study showed results comparable to previous studies showing a reduction in pain and controlling anxiety. This device also proved to be a distraction aid for children, helping to calm and familiarize them with dental set-up. Dental fear is a complex phenomenon, and it is affected by various emotional and physiological parameters; therefore, a combination of different scales to measure three variants of anesthesia, namely pain, fear, and anxiety, was undertaken in the current study. The combined application of external vibrations and cold at the site of injection is, therefore, a significant method for reducing acquired pain perception. This innovation offers the pediatric dental community a promising breakthrough in efficient pain management.

5. Conclusions

Within the scope of this study, it can be concluded that a vibratory device with coolant can be an effective alternative for reducing pain and anxiety in children receiving inferior alveolar nerve blocks and can be a promising tool in pediatric dentistry as compared to only vibratory stimuli. Children receiving LA treatment can benefit from the distraction provided by the Buzzy device, which is a useful behavior guidance tool for reducing dental anxiety and panic. Compared to other recently deployed LA devices, the Buzzy device is more affordable, optimized, and accessible, and it can be added as an adjunct to pediatric dental practice.

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Data Availability Statement: Data supporting results can be obtained through email to the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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