

A Clinical Study

Comparative Clinical Study on Reduction of Pain & Anxiety During Administration of Local Anaesthesia With Nois Vs Dental Vibe

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NOIS (Nitrous oxide inhalation sedation) and dental vibe are widely advocated in dental practice for reducing pain and anxiety produced by administration of local anaesthesia.

Aim: Purpose of this study was to compare efficacy of Nitrous oxide inhalation sedation and dental vibe on the pain perception during intraoral injection using visual analog scale (VAS).

Study design: Spit-mouth design study was used here, total of 50 patients were selected and were divided into 2 equal groups having 25 patients in each group.

Results: Both dental vibe and nitrous oxide inhalation sedation has shown similar results ($p < 0.001$) whereas no significant difference was observed between dental vibe and nitrous oxide inhalation sedation.

Conclusion: Both dental vibe and NOIS had shown significantly same efficacy

Keywords: Dental Vibe, Nitrous Oxide Inhalation Sedation, Visual Analog Scale

Introduction

Local anaesthesia administration achieves painless field, administration of injection itself is painful. Clinician tries to minimize needle prick pain by reassurance, correct technique and local medications. Dental treatment cause anxiety due to various reasons such as negative or traumatic past experiences, experiences of family members, individual personality traits, and visualizing fear-provoking posters or videos of dental surgeons. Anxiety is usually triggered by sight of needles or sound of rotary instruments in dental office.^[1] However, irony of situation is that local an aesthetisis most effective drugs for prevention and management of pain^[2] are themselves associated with the pain and this pain gets further aggravated due to fear and anxiety caused by sight of needle and has been referred to as needle phobia or blenophobia.^[3]

Painless treatment is an integral element of quality paediatric dental care. Fear associated with experiencing and seeing needle penetration, as well as sensation of swelling soft tissues, is most common factor causing children and dental clinicians to experience anxiety regarding use of infiltration local anaesthesia (LA). Recent progress in field of dental pain management has led to development of newer delivery devices and also modification in injection techniques.^[4] Their aim is to allow clinician treatment approach, associated with reduced injection pain, essential for managing anxiety in paediatric patients.

Gate control theory of pain by Melzack^[5] is widely accepted concept

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of pain perception. In recent years, several innovative dental appliances have been developed on its basis—Accupal, DentalVibe (DV), Vibraject and others.^[6] Their concept is to reduce pain of needle injection by applying pressure, vibration, micro-oscillations or combination of them. Applied physical stimuli are hypothesised to modify or interfere with pain signals by closing neural gate of cerebral cortex, aimed to decrease pain perception due to distraction.

Both pharmacological and nonpharmacological techniques have been developed for management of child's behavior at dental office. Now a days, nonpharmacological methods are gaining popularity which includes parental presence and reassurance, tell-show-do, distraction, relaxation, systematic audio analgesia, desensitization, modeling, physical contact by light touching or stroking and music, etc.

One of most commonly used non pharmacologic

behaviour management technique is tell-show-do. It was introduced by Addleston in 1959. In this technique, dentist tells child what is going to be done in words so child can understand, then dentist demonstrates exactly how procedure will be conducted, followed by performing procedure exactly as it was described and demonstrated.^[7]

In present case behaviour management technique Tell-Show-Do technique was used for reducing anxiety which was performed by dentist in operatory with kid. Dental vibe was used on kid hand and cheeks to make her feel vibrations generated by dental vibe. [Figure 1]

Considering the beneficial effect of Dental Vibe and NOIS. The lack of literature about its efficacy among adult population, this study was designed to compare use of DentalVibe against NOIS in reducing pain during administration of local anaesthetic injection during dental procedures. [Figure 2,3]



Fig. 1 Tell show do technique

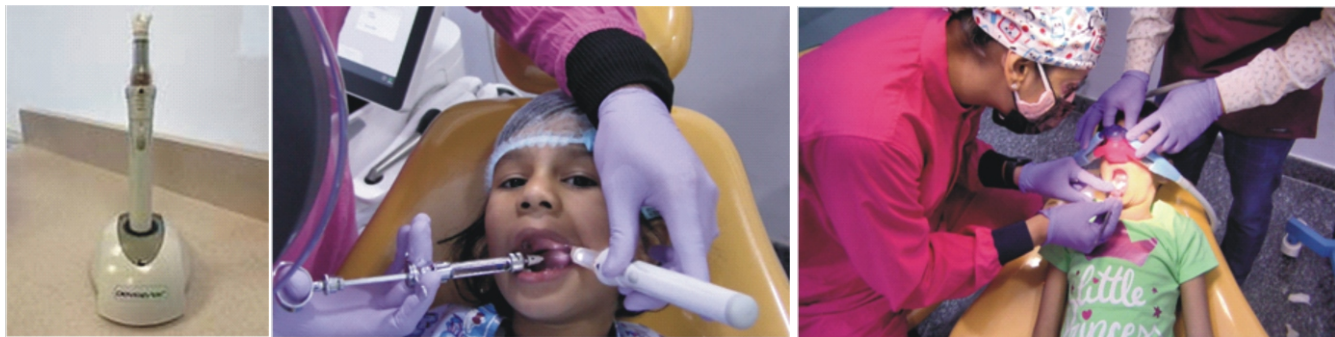


Fig. 2 Dental Vibe

Fig. 3 NOIS

Methods

This was a split-mouth, open-label, randomized, controlled clinical study.

1. Calculation of sample size

The sample size was calculated using the online OpenEpi sample size calculator. A pilot study was

conducted among 50 patients and the results of this study were used for sample size calculation [mean \pm SD = 8.36 \pm 2.76 (group 1), mean \pm SD = 6.4 \pm 4.1 (group 2), power = 80%, confidence interval = 95%]. The calculated total sample size was 50, and it was equally distributed between the two sites.

2. Inclusion and exclusion criteria

Inclusion criteria were patients aged between 8 to 10 years, scheduled for retained lower deciduous anterior and carious lower D extraction requiring infiltrate and IANB, were selected to participate in the study.

3. Patient selection, randomization, and allocation

Fifty patients were screened from 15 January 2021 to 20 June 2023. Twenty-five patients requiring extraction of retained lower deciduous anterior were selected and 25 patients require extraction of lower carious D were selected. Hence, the total number of extraction sites was 50. The investigator randomized the extraction sites into sites A and B using a computer-generated random number table. The sequence of allocation, i.e., which site was to be treated first, was generated using Sequentially Numbered, Opaque, Sealed Envelope (SNOSE) technique. Site A was written on 25 pieces of paper, and site B was on another 25 pieces of paper. These papers were placed in opaque, sealed envelopes. Each participant was allowed to pick an envelope. The investigator then opened the sealed envelope, and the participant was treated accordingly. Site A Group 1 received infiltrate application with nitrous while Group 2 received infiltrate with dental vibe. Site B with Group

1 received vibration with DentalVibe for IANB Group 2 received IANB with nitrous. The time interval between the two procedures was 2 years.

Results

Fifty patients aged 8 to 10 years (mean age, 25.06 ± 7.32) participated in the study. The sex distribution was 25 females [50%] and 25 males [50%]. The VAS score for pain ranged from 0 to 8 for site A and from 0 to 5 for site B. The Mann-Whitney U test showed a statistically significant difference (Mann-Whitney U test value = 51.50, P < 0.001) between the two sites. The median pain scores for sites A and B were 7 and 3, respectively.

Materials & Methods (Flow Chart 1)

A total of 50 healthy children with no history of systemic diseases (ASA Grade I status) and without any allergic history to local anesthesia in the age group of 8 to 10 years were selected.

It was a split-mouth parallel randomized study, so patients requiring local anesthetic block (either infiltrate block or IANB) for any of the dental procedures in lower jaw was recruited. Selected patients were then randomly divided into two equal groups (groups I and II) having 25 patients in each group (Table 1).

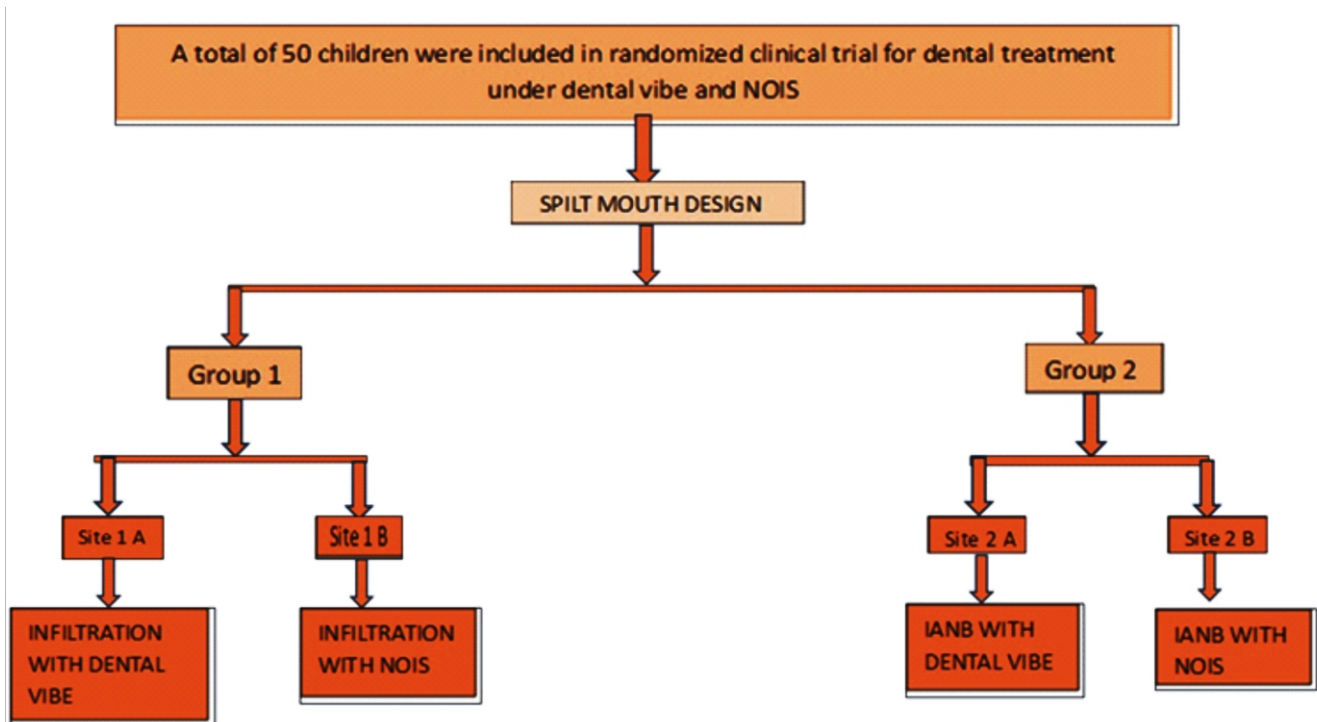


Table 1: Methodology

Once the group was selected, the sites for the application of infiltrate and NOIS was selected randomly by and the selected sites were then named as site IA, IB and 2A, 2B for their respective groups.

In group I, site IA was treated with infiltrate with dental vibe and site IB was treated with infiltrate with NOIS. Whereas, in group II, site IIA was treated with IANB with dental vibe and site IIB was treated with IANB with NOIS. Thus, NOIS was used in both the groups of the study and therefore, acted as control (site IB and site IIB). The procedures were carried out after wiping the mucosa in relation to the area of needle penetration free of saliva and after maintenance of isolation with the help of cotton rolls and suction tips.

In all sites of both the groups after the application of anesthetic agent, administration of local anesthetic injection Cartilage was done.

During the insertion of needle, the patient's behaviour was evaluated for pain perception and visual analog scale (VAS) by the operator (Figure 4).

The statistical analysis was done using Statistical Package for Social Sciences (SPSS) Version 15.0 Statistical Analysis Software. The values were represented in mean \pm SD.

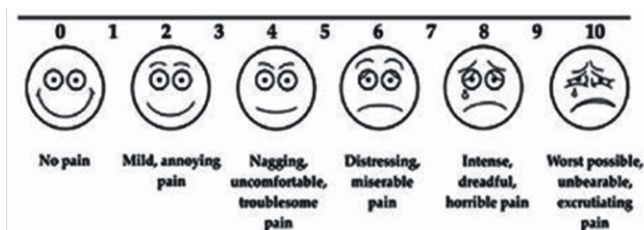


Fig. 4 Visual analog scale for the assessment of child's pain

Observations & Results

Graph shows that there was no significant difference ($p > 0.05$) was observed on comparing dental vibe with NOIS.

Discussion

Pain control is a challenging task in clinical pediatric dentistry. Conventional pain control techniques, however, deal with only one aspect of pain control, i.e. pharmacological/sensory, the psychological component is often left unresolved. This is especially true of the pediatric population where the fear of needle is a major deterrent to quality dental care. It is ironical that to eliminate pain we must momentarily create a painful stimulus.^[8]

In the study, the patient's behavior was evaluated for pain perception using VAS by the operator which is a form of cross-modality matching in which the length of a line is adjusted to match the strength of a perception.^[9]

In this, the child was asked to rate the discomfort of the injection on a 10 cm scale where 0 represented a happy child with no pain at one end and 10 represented a crying child with extreme pain at the other end. Median value 5 represented sad child with taken in order to get more sensitive and accurate representation of pain intensity.

DentalVibe is cordless, rechargeable, handheld device that delivers pulsed micro-oscillations to injection site. It requires no modification to be made to traditional anesthetic technique^[10]. DentalVibe is designed such that it retracts buccal or labial mucosa. It can be held easily and operated with non-working hand, leaving operating hand free for administering injection. Massaging with Vibra Pulse technology at injection site prevents swelling caused by bolus of anesthetic solution and assists in its dissipation, resulting in faster and more profound anesthesia. It has an embedded light source, which helps in better visualization of injection site.^[11]

Nitrous oxide (N₂O) is colorless and virtually odorless gas with faint, sweet smell. It is an effective analgesic /anxiolytic agent causing central nervous system (CNS) depression and euphoria with little effect on respiratory system.^[12]

Technique uses subanesthetic concentrations of nitrous oxide delivered with oxygen from dedicated machinery via nasal mask. Nitrous oxide is poorly soluble with high minimum alveolar concentration; rapid onset of action is therefore coupled with a rapid recovery period; duration of sedation is controlled and patient can quickly return to normal activities^[13].

Conclusion

It was concluded from study dental vibe and NOIS have same efficacy. But cost of installation of NOIS machine is very high in comparison with dental vibe. NOIS administration requires regular update of knowledge through conferences and sessions which also require cost but for use of dental vibe does not require any session or conference. Hence dental vibe is more cost effective than NOIS.

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