

Comparative Evaluation of Transcutaneous Electronic Nerve Stimulation and Topical Anesthesia in Reduction of Pain Perception during Administration of Local Anesthesia in Pediatric Dental Patients

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Abstract

Aim: The aim of the present study was to compare and evaluate the effectiveness of lignocaine jelly and transcutaneous electronic nerve stimulation (TENS) in reducing pain perception during administration of local anesthesia in pediatric dental patients.

Materials and Methods: Thirty children in the age group 6 to 10 years who required inferior alveolar nerve block for dental treatment were selected for this study. Patients were randomly divided in two equally group i.e. group I- Topical lignocaine group and group II - TENS group. Pain perception was evaluated using Wong–Bakers Face Pain Rating Scale in both the groups. t- test was used to evaluate the differences in mean pain scores between the groups.

Result: Local anesthetic injection along with transcutaneous electronic nerve stimulation resulted in significantly less pain ($p < 0.05$) in comparison with compared to topical application of local anesthetic agent.

Conclusion: The result shows that transcutaneous electronic nerve stimulation can be used as an effective means to reduce the intensity of pain during local anesthetic injection in pediatric dental patients.

Keywords: Pain, Pediatric dental patient, TENS, Lignocaine gel

Introduction: Pain is defined as an unpleasant sensory and emotional experience arising from actual or potential tissue damage or described in terms of such damage.¹ In dental treatment, pain is more connected with invasive procedures, tooth extractions, and surgeries; however, it is also connected with non invasive procedures. Local anesthetics are used in preventing and controlling the pain and are considered the safest and most effective drugs among all medicines for the prevention and management of pain. However, the process of administration of these drugs also ignites fear in the patients as many people have a fear of the needle which is used while injecting.²

Recently, the concept of TENS along with local anesthetic injection has been introduced. TENS is defined as the direct stimulation of the nerves by electrical impulses of short duration and small amplitude.³ Various theories have been proposed such as Gate control theory,⁴ endorphin release theory,^{5,6} and serotonin release theory⁷ to explain the mechanism of action of TENS in controlling pain.

Therefore, the main focus of this study was to compare and evaluate the effectiveness of lignocaine jelly and transcutaneous electronic nerve stimulation (TENS) in reducing pain during administration of local anesthesia in pediatric dental patients.

Material and method: The cross-sectional study was conducted in the department of pedodontics and preventive dentistry. Subjects were randomly chosen from the outpatient department. Since the study requires treatment intervention in the subjects; hence, an ethical clearance was obtained from the institutional ethical committee prior starting the study.

Children visiting the department for dental treatment were the primary source of samples. Thirty children aged 6–10 years were selected for the study. The inclusion and exclusion criteria for the study were as mentioned below.

Inclusion Criteria

- Healthy children with no systemic illness, allergies, etc.
- Cooperative child.
- Patient requiring inferior alveolar nerve block for dental treatment.
- Children with proper parental consent.
- Children with first dental visit

Exclusion Criteria

- Children with emergency treatment needs, such as abscess, cellulitis and space infection, and those who needed premedication for receiving dental treatment.
- Medically compromised patient
- Children with behavioural management problem
- Children allergic to local anesthetic agents.
- Children below 6 years of age.

After the final selection of patients i.e., post the inclusion criteria and after obtaining written consent from the parent/caretaker, the samples were randomly divided into two groups consisting 15 patients each.

Group I- Topical lignocaine group: Injection site was isolated using cotton roll and the topical lignocaine anesthetic gel (Lox 2%) was applied using sterile cotton dipped applicator for 30 seconds to the injection site and left for 3 to 5 minutes after informing the child.

Group II- TENS group: Application of TENS electrodes extraorally on the skin over the coronoid notch and posterior mandibular area. **(Figure no. 1)** The TENS unit has a battery operated electric pulse generator with fixed pulse rate and width parameters, requiring adjustment of amplitude during the procedure. The amplitude was increased until the child felt a warm comfortable sensation. The LA solution was then deposited and a TENS stimulation was maintained until the deposition of solution into the tissue. **(Figure no. 2)**

The LA solution used was 2% lignocaine with adrenaline (Lignox 2%) in each group. Pain assessment was done using Wong–Baker face scale after administration of LA solution in both the Wong–Baker face scale is a subjective scale used to assess pain. A set of six cartoon faces were shown to the child with varying facial expressions ranging from a very smiling face to a very sad face. **(Figure no 3)** A brief explanation was given to the child about each face after which the child was instructed to choose the face that best described his/

her feelings while receiving local anesthesia. The data were entered over a spreadsheet, and statistical analysis was performed using SPSS software version 17 (IBM, Chicago, United States).



Figure no 1: Application of TENS



Figure no 2: TENS Unit

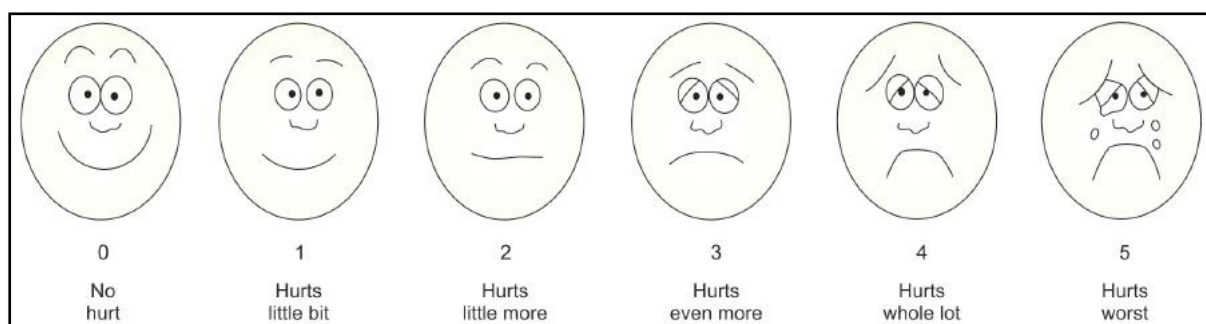


Figure no. 3: Wong-Baker face scale

Result: In present study total 30 children were enrolled; in which 15 children received topical lignocaine application and 15 children received TENS application; it was found that the mean pain score in the TENS group (2.45 ± 0.28) was lower than that of the Lignocaine group (4.06 ± 0.25). (**Table 1**)

t-test was used to determine the differences in mean pain scores between the groups. The result obtained was statistically significant with $P < 0.05$, suggesting TENS application to be more effective in reducing pain sensation.

Table: Assessment of Pain Score		
Group	Mean Pain Score	P Value
Group I- Lignocaine group	4.06 ± 0.25	

Group II - TENS group	2.45 ± 0.28	<i>P</i> <0.05
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Discussion: Management of pain during dental treatment is the most critical subject. Pain sensation is initiated by condition stimuli as sound of the drill or touch of the needle during local anesthetic injections and is not necessarily dependent on tissue damage.⁸

The pain due to injection of local anesthetic can be reduced by a number of methods which include reducing the speed of injection, application of counter irritation, varying the rates of infiltration, distraction techniques, buffering and warming the local anesthesia, use of fine needles with improved syringes, precooling the injection site, application of topical analgesics, and use of mucosal vibrators.⁹

In the present study, comparison of TENS and lignocaine topical anesthetic gel was done in reducing pain during administration of IANB injection. It was found that application of TENS during administration of LA can significantly reduce the pain and discomfort when compared to application of lignocaine gel for 3 to 5 min. Topical anesthetics have a limited capacity of penetrating deep into tissue. Although the discomfort due to surface penetration is reduced, they are ineffective at greater penetration depths which are required for regional block injections such as the IANB.

Results of the present study are in accordance with the study Choudhari SR et al. (2017)¹⁰ conducted by which showed that Application of TENS was more comfortable and significantly reduced pain. TENS is a safe, reliable, and practical alternative to be used in pediatric dentistry. There are two mechanisms by which TENS produces an analgesic effect. First, the dual mechanism of stimulation of muscle contraction and an increase in tissue perfusion helps in removing the products of tissue destruction. Second, the release of endogenous pain control mediators such as endorphins is activated with the continuous use of TENS.

The present study was done with limited number of patients. Similar study involving larger sample size is required.

Conclusion: The result shows that transcutaneous electronic nerve stimulation can be used as an effective means to reduce the intensity of pain during local anesthetic injection in pediatric dental patients.

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Conflict of interest: Author declare that there is no conflict of interest

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