International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

A Little Numb Tip: Transforming the Paradigm of Topical Anesthetic Delivery.

Dr Akil Prawin S S[1], Dr Sonal Gupta[2], Dr Charu Aggarwal[3], Dr Afsia Saly[4], Dr Rohan Shrivastava[5], Dr Nayana Abraham[6], Dr Antra Saket[7]

[1,3,4,5,6,7]Post Graduate Student, Department of Pediatric and Preventive Dentistry, Kanti Devi Dental College and Hospital, Mathura.
[2]Professor and Head of the Department, Department of Pediatric and Preventive Dentistry, Kanti Devi Dental College and Hospital, Mathura.

Abstract:
Background: Topical anesthesia ensures precision and comfort, making every procedure smoother and stress-free. Topical anesthetic sprays are widely used to ease discomfort during local anesthesia but may lead to hypersalivation and reduced effectiveness due to aerosol spread. The innovative "Little Numb Tip" minimizes these issues with its conical disposable cap, ensuring targeted delivery and enhancing patient comfort. This advancement improves precision and reduces complications during dental procedures.
Aim: To evaluate and compare the levels of pain, discomfort, efficacy, and patient acceptance of the topical anesthetic spray applied with the conventional tip versus the Little Numb Tip.
Materials and Methodology: A total 20 patients were selected and the topical anaethesia was applied using conventional tip and the little numb tip on the consecutive appointments. Random ball selection method was implied to avoid bias in the study. The physical parameters like heart rate and oxygen saturation were recorded before and after the anaesthesia application. Visual analogue scale was implied to measured pain perception and the undesirable effects like hypersalivation, gag reflex, unpleasant patient experience and acceptance were also noted.
Results: There was a significant difference in the pain scores and patient acceptance was seen in the little numb tip group compared to that of conventional tip. Little numb tip also reduced the undesirable affects in the patients followed by topical anaesthesia application.
Conclusion: The Little Numb Tip enhances pediatric dental procedures by improving anesthetic delivery, reducing pain, and increasing patient acceptance.

Keywords: Topical anaesthesia, Hypersalivation, Little numb tip.

Introduction:

Ensuring excellent dental care for pediatric patients requires effectively addressing the anxiety that children often experience during dental treatments. Pediatric dentists utilize a range of sophisticated behavior management techniques, both non-pharmacological and pharmacological, to alleviate this apprehension. These include strategies such as distraction, positive reinforcement, tell-show-do methods, and sedation, depending on the specific needs of the patient. However, even with these approaches, the

administration of local anesthesia often poses a challenge, as children who initially cooperate may become apprehensive or uncooperative when faced with needles.

To minimize discomfort associated with local anesthesia, several innovative techniques are employed, including topical anesthetic formulations, aromatherapy, vibrators for tactile stimulation, needleless injection systems, and acupressure techniques. Of these, topical anesthetic application is the most widely adopted method globally for patients across all age groups, from pediatric to geriatric. Topical anesthetic sprays play an integral role in enabling dentists to administer effective local anesthesia. However, conventional sprays come with a notable drawback: their open-ended tip allows the aerosol to spread freely throughout the oral cavity. This can lead to hypersalivation, an unpleasant bitter taste, and diminished efficacy, which may further complicate the procedure[1].

To address these challenges, a novel innovation known as the "Little Numb Tip" has been introduced, Which is designed and manufactured as a prototype using the night guard sheets in the Department of Pediatric and Preventive Dentistry, Kanti Devi Dental College and Hospital, Mathura, Uttar Pradesh, India. This newly designed tip features a pointed end covered with a conical disposable cap, effectively restricting the spread of aerosol within the oral cavity.

This study aims to evaluate and compare the levels of discomfort, efficacy, and patient acceptance of the topical anesthetic spray applied with the conventional tip versus the Little Numb Tip, thereby aiming to refine pediatric dental practices further.

Methodology:

This study was designed as a randomized, controlled, clinical trial and done in the Department of Paediatric and Preventive Dentistry, K.D. Dental College, Mathura. The study was performed after achieving the ethical clearance from the Institutional Review Board and Ethics Committee and informed consent from parents. Twenty patients, aged 6 to 13 years with Frankl behaviour rating score of 2,3 or 4 and ASA 1 or 2 who reported to the OPD for invasive procedures were recruited in the study. Before selecting patients, a comprehensive verbal and written explanation of the study was explained to both the patient and their parent.

Figure 1- Topical Anaesthetic spray with conventional tip and Little Numb Tip

Patients in good general health with no known allergies to the anesthetic agents being tested who require local anesthesia for at least two dental procedures.

Objectives:

1. Assess discomfort and pain reduction with each tip.
2. Evaluate the incidence of hypersalivation.
3. Comparing the overall preference and comfort level of Pediatric patients with each type of tip
4. To analyse the patient acceptance of both the tips.

During the first appointment, the patient was administered topical anesthesia using the initially assigned tip. The tip was allocated through a random ball selection method (figure 2) to ensure unbiased randomization. Two balls were used: white, representing the conventional tip, and yellow, representing the Little Numb tip. The patient selected one of the balls to determine the assigned tip. After application, the topical anesthetic was allowed to act for a specified period (i.e., 3 minutes).

Figure 2-Randomization using Random ball selection method

Pain Assessment:

1. **Pricking Test**: The gingiva was gently pricked with a sharp probe to evaluate the pain level before proceeding with the injection.
2. **Local Anesthesia Application**: The local anesthetic injection was administered, and the pain experienced was assessed using a standardized pain scale, such as the Visual Analogue Scale (VAS).

Observation: Participants were monitored for any side effects, including hypersalivation.

During the second appointment, the same patient was administered topical anesthesia using the alternative tip on the opposite quadrant of the arch. The same assessments and observations were conducted to compare results effectively.

Figure 3- Application of Topical Anaesthetics using Conventional Tip and Little Numb Tip

After collecting the results from both appointments, the patients who used the Little Numb tip during either the first or the second appointment were grouped together for easier assessment of results. This group was classified as Group A. Similarly, the patients who used the conventional tip during their appointments were classified into Group B for comparison.

Results:

1) COMPARISON OF VAS IN GROUP A AND GROUP B

GROUP	Mean VAS	Std. Deviation	MEAN DIFF	T VALUE	Pvalue
GROUP A	1.70	1.302	-3.400	-7.811	<0.001***
GROUP B	5.10	1.447			

The values in the table indicate that patients experienced significantly less pain with the Little Numb Tip compared to the conventional tip.

2) COMPARISON OF OXYGEN SATURATION BEFORE AND AFTER IN GROUP A AND GROUP B

GROUP	OXYGEN SATURATION	Mean	Std. Deviation	T value	Pvalue
GROUP A	BEFORE AFTER	98.20 98.70	2.858 2.155	-1.097	.29
GROUP B	BEFORE AFTER	97.10 97.50	1.714 2.351	-.927	.37

The results showed that the oxygen saturation was maximum in group A before and after in comparison to group B.

3) COMPARISON OF HEART RATE BEFORE AND AFTER IN GROUP A AND GROUP B

GROUP	HEART RATE	Mean	Std. Deviation	T value	Pvalue
GROUP A	BEFORE AFTER	72.15 74.55	4.902 4.807	-8.430	<0.001***
GROUP B	BEFORE AFTER	72.35 77.80	5.631 6.740	-4.309	<0.001***

In this study, heart rate and oxygen saturation were included as **physiological parameters** to assess the **pain and anxiety levels** of pediatric patients undergoing dental procedures.

Oxygen Saturation: **(Table 2)** While the values remained relatively stable across both groups, Group A exhibited slightly higher oxygen saturation levels both before and after the procedure compared to Group B.

Heart Rate: **(Table 3)** A statistically significant increase in heart rate was observed in both groups after the intervention, indicating a physiological response to the procedure. However, the increase was more pronounced in Group B.

4) OCCURRENCE OF UNFAVOURABLE RESPONSES AND THE PATIENT ACCEPTANCE:

- Unpleasant taste caused by the topical anaesthetic spray is leading to hypersalivation (which is not measured as quantitative wise, only based on the observer's visual experience before and after application of the topical anesthetic spray was noted for each patient by the operator who performed the treatment in such patient) which in turn hinders the treatment procedure was noted in conventional tip group.
- Patient acceptance was more in the little numb tip compared to that of conventional tip of topical anaesthetic spray

Discussion:

Dentists utilize various strategies to manage pediatric dental anxiety, including topical anesthetics. **Koppulu P et al**., found that the Traditional topical anesthetic sprays often result in hypersalivation and a bitter taste due to their open-ended tip[1], reducing efficacy. The "Little Numb Tip" aims to address these issues with its pointed end and conical disposable part that restricts aerosol spread within the oral cavity. This study compares the discomfort, efficacy, and patient acceptance of the topical anesthetic spray when applied using the conventional tip versus the Little Numb Tip, aiming to enhance comfort and overall patient experience during dental procedures.

Meechan J C discovered that the efficacy of topical anesthesia is influenced by two key factors: the duration of application and the needle gauge used, whether the anesthetic is applied as a spray or gel[2]. **Dimarco A.C. et al.**, conducted a clinical comparison between a fast-acting vapocoolant topical anesthetic spray and a traditional topical dental anesthetic gel. Their findings demonstrated that the vapocoolant spray exhibited superior efficacy compared to the traditional anesthetic gel[3].

The results indicate that the Little Numb Tip significantly reduced discomfort and pain during local anesthesia administration compared to the conventional tip. This can be attributed to the design of the Little Numb Tip, which restricts the spread of the aerosol within the oral cavity. According to the study conducted by **Koppulu P et al**., (2016) the use of topical anesthetic gel is more effective than topical anesthetic spray, as the spray tends to spread throughout the entire oral cavity and causes hypersalivation[1].

By directing the anesthetic spray precisely to the target area, the Little Numb Tip ensures a more effective and localized anesthetic effect. This finding aligns with previous research suggesting that precise delivery of topical anesthetics can enhance patient comfort.

In a study by **Pérez-García S et al**., researchers evaluated hemodynamic changes, including **blood pressure, heart rate, and oxygen saturation (SpO2),** in patients before and after the administration of local anesthesia[4]. The study found no statistically significant differences in mean systolic blood pressure and heart rate before and after anesthesia, indicating that needle phobia can indeed impact these parameters. These findings aligned with the study conducted by **Sokolowski C.J. et al.,** in which they analyzed the correlation between needle phobia and physical parameters such as heart rate and oxygen saturation[5]. One of the major side effects associated with conventional tips is hypersalivation, which can lead to discomfort and a bitter taste in the mouth.

Thus, this study found a lower incidence of hypersalivation when using the Little Numb Tip. This is likely due to the controlled application and reduced spread of the anesthetic spray, which minimizes the exposure of the oral mucosa to the anesthetic. Reduced hypersalivation not only improves patient comfort but also enhances the overall efficacy of the anesthesia.

The overall preference and comfort level of pediatric patients were higher with the Little Numb Tip compared to the conventional tip. The pointed and conical design of the Little Numb Tip allows for a more focused application, which is less intrusive and more acceptable to young patients. This is particularly important in pediatric dentistry, where managing patient anxiety and cooperation is crucial for successful treatment outcomes. The positive reception of the Little Numb Tip by pediatric patients suggests that it is a valuable tool for improving the patient experience during dental procedures.

By providing a more focused application of the anesthetic spray, the Little Numb Tip improves the overall effectiveness of the anesthesia and also it improves the patient comfort leading to better clinical outcomes.

Limitations of the study:

1. **Carryover Effect**: Since it's a crossover study, the effects of the first treatment could influence the second treatment. For instance, if the topical anesthetic from the first session has lingering effects, it might alter the pain perception in the second session.
2. **Limited Sample Size**: With only 20 participants, statistical power may be reduced. A larger sample would provide stronger and more generalizable conclusions.
3. **Subjective Pain Assessment**: Pain perception varies between individuals, and even though the Visual Analogue Scale (VAS) is used, responses remain subjective.
4. **Short-Term Observations**: The study focuses on immediate responses rather than long-term effects or patient preferences over time.
5. **Potential Bias in Patient Preference**: Patients may develop expectations or preferences based on their first experience, which could influence their perception during the second appointment.
6. **Hypersalivation Measurement**: While incidence is observed, the study does not quantify hypersalivation precisely, which could make comparisons less rigorous.
7. **Limited External Validity**: The study is conducted in a single dental institution, which may limit its applicability to broader populations with different demographic or clinical variations.

Conclusion:

The novel Little Numb Tip demonstrates clear advantages over conventional tips in pediatric dental proce

dures through its innovative design which reduces common issues like hypersalivation and imprecise anesthetic delivery, leading to enhanced comfort and reduced pain for patients. The focused and controlled application not only improves the efficacy of the anesthesia but also results in higher patient acceptance, particularly crucial in managing pediatric dental anxiety. Overall, the Little Numb Tip proves to be an effective tool for improving clinical outcomes and ensuring a more positive experience for young patients.

References:

1. Koppolu P, Mishra A, Swapna LA, Butchibabu K, Bagalkokar A, Baroudi K. Comparison of efficacy among various topical anesthetics: An approach towards painless injections in periodontal surgery. Saudi Journal of Anaesthesia. 2016 Jan 1;10(1):55-7.
2. Meechan JG. Intra-oral topical anaesthetics: a review. Journal of dentistry. 2000 Jan 1;28(1):3-14.
3. DiMarco AC, Wetmore AO. Clinical comparison: fast-acting and traditional topical dental anesthetic. Anesthesia Progress. 2016;63(2):55.
4. Pérez-García S, Acosta-Ibarra J, Ruiz-Roca JA, Añez C, Gargallo-Albiol J. Comparison of hemodynamic changes with general or local anesthesia during dental treatment in pediatric patients: A prospective clinical study. Special Care in Dentistry. 2024 Mar;44(2):563-74.
5. Sokolowski CJ, Giovannitti JA, Boynes SG. Needle phobia: etiology, adverse consequences, and patient management. Dental Clinics. 2010 Oct 1;54(4):731-44.