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# Evaluation of Pain Perception During Local Anaesthetic Administration with Conventional vs Insulin Syringe: An In-Vivo Study

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#### ARTICLE INFO ABSTRACT Aim: This study aimed to evaluate and compare pain perception during the administration Keywords: Local Anesthesia, of local anesthetic solution using conventional syringes versus insulin syringes in pediatric Pain. Pediatric Patient. patients aged 6-8 years. Insulin Syringe Materials and Methods: A total of 40 patients requiring maxillary local infiltration were recruited. Participants were randomly assigned to receive local anesthetic via either a conventional syringe or an insulin syringe. Pain perception was assessed using a Visual Analogue Scale (VAS), where 0 represented no pain and 10 represented the worst pain doi: 10.48165ajm.2025.8.01.7 imaginable. Measurements were taken immediately following the administration of the anesthetic. Results: The analysis of the VAS scores demonstrated that patients who received the anesthetic via insulin syringes reported significantly lower pain levels compared to those who received it via conventional syringes (p < 0.05). The results indicate a clear preference for the insulin syringe method, suggesting reduced pain perception. Conclusion: The study concluded that the use of insulin syringes for local anesthetic administration in pediatric dental procedures may lead to a significantly lower pain experience compared to conventional syringes.

## Introduction

Pain control during dental procedures is essential, particularly in pediatric dentistry, where young patients are often more apprehensive and sensitive to pain. Effective management of pain is crucial for ensuring a positive dental experience and fostering a child's cooperation during treatment. Each pediatric patient's unique response to pain necessitates careful consideration of the methods used to administer local anesthesia.<sup>1,2</sup> Local anesthesia is a common practice in dentistry, allowing for pain-free procedures by blocking sensory nerves in a targeted area. However, the administration of local anesthetic solutions can itself be a source of discomfort and anxiety, especially for younger childrens. Traditional techniques for delivering local anesthesia, notably using conventional syringes, often employ larger needles and can result in heightened pain perception. <sup>3-5</sup>

To address these concerns, several methods have been explored to reduce pain during local anesthesia administration. These include the use of topical anesthetics, pre-cooling the injection site, implementing distraction techniques, and camouflaged syringes. However, the choice of syringe type is equally important and can significantly influence the overall pain experience.

Insulin syringes have emerged as an innovative alternative due to their design featuring finer needles and lower volume capacities. These characteristics may lead to increased patient comfort and reduced pain perception during local anesthetic administration. The ability of insulin syringes to minimize discomfort during injections makes them a promising option for pediatric patients in dental settings.<sup>6-9</sup>

This study aims to conduct a comparative evaluation of pain perception during the administration of local anesthetic solutions using conventional syringes versus insulin syringes in pediatric patients. By assessing the pain levels experienced by patients receiving anesthesia through both methods, this research seeks to provide valuable insights that could inform best practices in pediatric dentistry, ultimately enhancing the overall experience and care for young patients.

## Materials and Method

**Study Design:** This study employed a randomized controlled trial design to assess pain perception during local anesthetic administration in pediatric patients.

**Ethical Considerations:** The study protocol was reviewed and approved by the Institutional Review Board. Informed consent was obtained from the parents or guardians of all participating children. Participants were assured of their right to withdraw from the study at any time without any impact on their dental care.

**Participants:** A total of 40 pediatric patients, aged 6-8 years, requiring maxillary local infiltration were recruited from a pediatric dental clinic. Inclusion criteria included patients who were healthy and had no history of allergies to local anesthetics. Patients with a history of significant dental anxiety or requiring sedation were excluded.

**Randomization:** Participants were randomly assigned into two groups. Group A received local anesthetic via a conventional syringe, while Group B received it via an insulin syringe. Randomization was conducted using a computer-generated random number table.

**Local Anesthetic Protocol:** For both groups, a standard dose of 2% lidocaine with 1:80,000 (Xicaine, <u>ICPA, ICPA</u> <u>Health Products Ltd</u>, Dedhrota, Dist. Sabarkantha-383220) epinephrine was used. The injection site was predetermined, and a similar anatomical location on the maxilla was targeted for all participants.

#### Instruments

## Syringe Specifications

**Conventional Syringe:** Conventional dental syringe with a larger gauge needle (27 gauge), (Nusafe Disposable Syringe, Nubeno Healthcare, Nagpur, Maharashtra).

**Insulin Syringe:** 1 mL insulin syringe with a smaller gauge needle (Dispo van insulin syringe, Hindustan Syringes and Medical Devices Limited, Faridabad, Haryana, India). (**Fig** 1)

**Procedure:** Each participant was informed about the procedure and provided verbal consent, along with consent from their guardians. Patients were positioned comfortably in the dental chair. For both groups, a topical anesthetic spray (Lidayn, Global Dent Aids Pvt Ltd, New Delhi, India) was applied to the injection site for 3-5 minutes prior to the injection to alleviate initial discomfort. Local anesthetic administration was performed by a single trained dentist to ensure consistency.

**Pain Assessment Tool:** Pain perception was evaluated using a Visual Analogue Scale (VAS). Each participant was shown a 10 cm line where one end indicated "0" (no pain) and the opposite end indicated "10" (worst pain imaginable). Participants marked their perceived pain level immediately after the administration of the local anesthetic.<sup>10,11</sup> (Fig 2)

**Statistical Analysis:** The VAS scores obtained from both groups were analyzed using statistical software. Comparative analysis was performed utilizing independent t-tests to determine the significance of the differences in pain perception between the two groups, with a significance level set at p < 0.05.



Figure 1: Armamentarium used in Study



Figure 2: Visual Analogue Scale

### Result

The analysis of the Visual Analogue Scale scores revealed notable differences in pain perception between the groups. The Insulin Syringe Group reported a mean VAS score of 3.2, indicating lower pain levels, while the Conventional Syringe Group had a mean VAS score of 6.5, reflecting higher pain levels. The observed difference in pain perception between the two groups was statistically significant (p < 0.05), demonstrating a clear preference for the insulin syringe method and suggesting that its use is associated with a reduced pain experience during local anesthetic administration. (Table 1)

Table 1: Comparative Evolution of Mean VAS Score				
Group	n	Mean VAS	t Value	p value
		Score		
Group A Conventional Syringe Group	20	6.5	1.11	<0.05*
Group B Insulin Syring Group	20	3.2		
*Significant				

#### Discussion

The perception of pain during local anesthesia administration in pediatric patients is a crucial aspect of dental procedures, significantly influencing patient comfort and overall experience.<sup>12</sup> Pain during the injection can stem from various factors, including the needle gauge, the speed of injection, and the technique employed. Pediatric patients may be particularly sensitive to pain due to their lower pain threshold and the psychological impact of dental visits.<sup>13</sup>

Conventional syringes often possess larger gauge needles that can cause more tissue trauma as they penetrate the skin and mucosa. This, combined with the rapid deposition of the anesthetic solution, can contribute to increased

pain perception. Conversely, insulin syringes are typically equipped with fine needles designed for subcutaneous injections, which may result in less invasive penetration, thereby reducing acute pain. The smaller gauge of insulin syringes also allows for a more controlled and slower administration of the anesthetic solution, which may enhance patient comfort and minimize anxiety associated with injections.<sup>14,15</sup>

The findings of our study clearly indicate that using insulin syringes leads to a significant reduction in pain perception among pediatric patients. This result suggests that the utilization of insulin syringes in pediatric dental procedures could substantially improve the patient's experience. The lower pain reported by participants receiving anesthesia through insulin syringes highlights the need for dental practitioners to consider alternative syringe designs when treating young patients, primarily focusing on patient comfort.

However, this study has limitations that must be addressed in future research. The sample size, although adequate for preliminary findings, may not capture the full variability in pain perception across a larger pediatric population. Additionally, the subjective nature of the Visual Analogue Scale could introduce bias, as individual pain thresholds and perceptions may vary widely among children.

Further studies should aim to include larger and more diverse populations to validate these findings. It would also be beneficial to investigate the long-term implications of using different syringe types on pediatric dental care, ensuring that improvements in comfort do not compromise the efficacy of anesthesia. Overall, integrating insulin syringes into standard pediatric dental practice could be a promising advancement in enhancing patient care and reducing dental anxiety among children.

#### Conclusion

In conclusion, this study suggests that the use of insulin syringes for local anesthetic administration in pediatric patients can significantly alleviate pain during dental procedures. Further investigations are necessary to validate these preliminary findings and explore the broader implications for improving pediatric dental care.

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