



Comparative Evaluation of Insulin Syringe and Conventional Disposable Syringe in Reduction of Pain Perception While Administration of Local Anesthesia in Pediatric Dental Patient

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Abstract:

Background: Pain control can be achieved by using anesthesia. Sight of injection can terrify any patient and if the patient is a child, it is really difficult to convince them for injections. Alternatives to injections have been explored. Various techniques have been attempted to effectively control the pain during injection, such as warming, buffering, and adjusting the rate of local anesthesia infiltration; pre-cooling the injection; vibration using modern devices like Vibra Ject; Dental Vibe; acupuncture; distraction techniques; hypnosis; application of topical anesthesia; and use of computer-controlled anesthesia delivery system (e.g., Wand). However, to date, no standard injection method has been established. For the stated reasons, the purpose of the present study was to evaluate pain perception in children, while providing local anesthesia with conventional disposable syringe and insulin syringe.

Aim: The purpose of this study was to evaluate pain perception in children, while providing local anesthesia with conventional disposable syringe and insulin syringe.

Material and Method: The present in vivo study was undertaken in the Department of Pedodontics and Preventive Dentistry after obtaining the ethical clearance from institutional ethical board. Fifty children who met the inclusion criteria were selected for participation in this study. Patient who satisfied the inclusion and exclusion criteria were randomly divided into two groups consisting 25 patients each i.e. Group I- Conventional disposable syringe group and Group II – Insulin syringe group. Local anesthetic (LOX × 2% adrenaline) is delivered according to assigned group in the area adjacent to the tooth requiring invasive treatment procedure. The SEM scale was used to measure pain.

Result: There was a statistically significant difference between the insulin syringe group and the conventional disposable syringe group ($P < 0.05$).

Conclusion: Insulin syringe is effective during local anesthetic injection administration to alleviate pain.

Keywords: Local anesthesia, Disposable syringe, Insulin syringe

Introduction

Pain is “an unpleasant sensory or emotional experience associated with actual or potential tissue damage” as defined by the World Health Organization in 2015. Effective control of pain in a pediatric patient during dental treatment is the foundation of a successful behavior management.¹ Prevention of pain can promote a positive relationship between the dentist and child, build trust, allay fear and anxiety, and inculcate positive dental attitudes for future treatment.² In pediatric dentistry, pain sensation is generated by stimuli like sound of the drill or touch of the needle at the time of local anesthetic administration and is not necessarily dependent on tissue damage.³

Local anesthetics are chemical agents used to temporarily interrupt the path of signal transmission by the nerves and to eliminate pain during dental procedures. Local anesthesia is a prerequisite for the majority of dental procedures. According to Malamed, 55% of medical emergencies in the dental office setting occur during anesthetic injections, which highlights the significance of pain control and anxiety management when anesthetic injections are performed.⁴ Successful local anesthesia requires adequate

knowledge of the ingredients of the anesthetic agents and the neuroanatomy of the region, as well as selection of an appropriate injection technique.⁵

Most of the pediatric patients are fearful and anxious about the pain that they experience while the local anesthesia is administered.⁶ Thus, various techniques have been attempted to effectively control the pain during injection, such as warming, buffering, and adjusting the rate of local anesthesia infiltration; pre-cooling the injection; vibration using modern devices like Vibra Ject; Dental Vibe; acupuncture; distraction techniques; hypnosis; application of topical anesthesia; and use of computer-controlled anesthesia delivery system (e.g., Wand). However, to date, no standard injection method has been established.^{7,8,9,10} So reducing the anxiety level even before giving a LA injection is necessary, especially in children and this can be done by using a syringe, which is smaller in size, colorful, and less frightening than the usual conventional syringes used. Hence, the purpose of this study was to evaluate pain perception in children, while providing local anesthesia with conventional disposable syringe and insulin syringe.

Material and Method

The present in vivo study was undertaken in the Department of Pedodontics and Preventive Dentistry after obtaining the ethical clearance from institutional ethical board. Fifty children who met the inclusion criteria were selected for participation in this study.

Inclusion Criteria

- Children aged between 6 to 10 requiring local anesthetic administration either in maxillary or mandibular arch.
- Children having their first dental visit.
- Healthy children with no systemic illness, allergies, etc.
- Cooperative child.
- Patient requiring local anesthetic injection for dental treatment either in maxillary or mandibular arch.

Exclusion Criteria

- Infection at the site of infection
- Medically compromised patient
- Uncooperative children
- Children allergic to local anesthetic agents

Patient who satisfied the inclusion and exclusion criteria were randomly divided into two groups consisting 25 patients each i.e. Group I- Conventional disposable syringe group and Group II – Insulin syringe group. Local anesthetic (LOX × 2% with adrenaline) is delivered according to assigned group in the area adjacent to the tooth requiring invasive treatment procedure. The SEM scale (Table 1), an objective scale, was used to measure pain. An assistant was trained to measure and calibrate the SEM scale. The sound, eyes and motor scale is used to evaluate the efficiency of pain control during the anesthetic procedure. The slightest manifestation of the eyes, sound or motion of the patient is graded in four levels: comfort, slight discomfort, moderate pain, and pain. The data were entered over a spreadsheet, and statistical analysis was performed using SPSS software version 16 (IBM, Chicago, United States).

Observations	1. Comfort	2. Mild Discomfort	3. Moderately Painful	4. Painful
Sounds	No sounds indicating pain	Nonspecific sounds; possibly indicating pain	Specific verbal complaints, e.g., "ow", raising voice	Verbal complaints indicating intense pain, e.g., screaming, sobbing
Eyes	No eye signs of discomfort	Eyes wide, showing concern, but no tears	Watery eyes and/or flinching eyes	Crying, tears running down face
Motor	Hands relaxed; no apparent body tenseness	Hands show some distress or tension, grasping chair due to discomfort, muscular tension	Random movements of arms or body without aggressive intention to make physical contact, grimace, twitch	Movements of hands trying to make aggressive physical contact, e.g., punching, pulling head away

Table no. 1: SEM Scale

Result

The mean pain score using SEM for conventional syringe was found to be 3.69 ± 0.76 , whereas mean pain score for insulin syringe was found to be 1.54 ± 0.68 . The mean difference found was statistically significant $P < 0.05$. (**Table no. 2**)

Group	Mean SEM Score	p-value
Group I- Conventional disposable syringe group and	3.69 ± 0.76	$P < 0.05$
Group II – Insulin syringe group	1.54 ± 0.68	

Discussion

Since the introduction of local anesthetics, the injection technique has produced pain and anxiety in the patients. There seems to be no excuse for not using local anesthesia.¹¹ Pediatric dentists commonly face with the task of giving the local anesthetic to the children who are dreaded of the procedure. There has been a focus worldwide to make any procedure as less as possible for all be it adult or child patient. Dentists are competent in techniques that can minimize pain and anxiety, when giving the local anesthesia to children. Before the local anesthetic is given topical anesthetic is also given in the child patients in particularly the dental procedures. However there has been the reports of the patients complaining of the pain and discomfort after the successful administration of the anesthesia. Literature supports the view that there was a reduced pain perception after topical anesthesia. However there has been a variable reports that supports the use of the topical anesthetics before local anesthesia that any be both the anesthesia and patient or technique related.^{12,13} The present study was taken to evaluate and compare the pain perception using two different syringe designs with different syringe for administration of local anesthetic agent. Infiltration technique has been used in this study because of various factors like direct vision of practitioner on it, less depth penetration of needle, less technical errors, less amounts of anesthetic solution, easier application, limited anesthesia of soft-tissues outside the operation field, and shorter duration of being anesthetized and might be used as an alternative to block.^{14,15}

Dental needles are available in three lengths: Long (32 mm), short (20 mm), and ultra short (10 mm). Needle gauges range from size 23 to 30. Needle breakage is a rare occurrence and its primary cause is weakening the needle due to bending it before insertion into the soft tissues and patient movement after the needle is inserted.¹⁶ Donohue et al¹⁷ compared the effectiveness of infiltration technique with block technique and concluded that mandibular infiltration as a possible alternative to mandibular block anesthesia in young children. Jones et al¹⁸ in a study on 308 patients, inferior dental nerve blocks were rated significantly more painful than buccal infiltrations. The visual analog pain scale was found to be unsuitable for use by children under 7 years of age, and keeping it in view, the age group was selected for this study.

In our study it was observed that children have less pain perception while administration of local anesthesia as compared to conventional disposable syringe. Which is in accordance to the study conducted by Kaur G et al. (2017)¹⁹ They found that the diabetic syringes (insulin syringe) exhibit clinical advantage and its use in pediatric dentistry for LA infiltration can prove beneficial for patients as well as for dental caregiver. In this study, insulin syringes were compared with the conventional syringes. Insulin syringe with its miniature needle, bright color, and slim look appears like a toy to the child patient till our job of infiltration anesthesia is over. This study overwhelmingly justifies its use in pediatric patients as supported by the child. The use of insulin syringe for injecting LA solution also

helps in curtailment of dental appointments in child patients as less time is required for convincing them to receive the injection and gaining their confidence as the syringe looks less menacing.^{20,21,22}

The present study justifies the use of diabetic syringe with 30-gauge needle to be used for the delivery of LA using infiltration technique in child patients because smaller gauge needle is less painful; the size and the color of the syringe is such that it does not scare the child patient, cost-effective, and the calibrations at 0.025 mL intervals in insulin syringe provide a drug delivery control, which in turn reduces the pain caused and there is less tissue distension, less chances of local ischemia and necrosis.

Conclusion

Insulin syringes have been found to exhibit a clinical advantage over conventional disposable syringe and its use in children for infiltration has been proved to be beneficial.

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