



# Assessment of Anxiety Accompanied with Three Different Dental Anesthetic Techniques in Orthodontic Patients: A Randomized Clinical Trial

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## Abstract

**Objectives:** This study was done for evaluation of children's anxiety level with three different injection techniques of local anesthesia including the standard concealment technique, showing the dental syringe before injection and camouflaging by sleeves. **Material and method:** 60 patients, ranging from 7 -12 years old, required infiltration anesthesia in the upper arch were selected for this study. They were randomly allocated into 3 groups (n=20) according to the technique used for administration of local anesthesia. Group (1) the control group in which the basic injection technique was used. In group (2) the technique used was showing the dental syringe before injection, while in group (3) the technique used was showing the dental syringe after concealment in a special sleeve designed for children. The anxiety was evaluated using the Venham Anxiety Scale picture test before and after injection. **Result:** The injection with camouflaged dental syringe (group 3) showed a statistically significant difference when compared to the other two group regarding the anxiety level before and after injection, While the comparison between group (1) and (2) showed non -significant difference either before or after injection ( $p>0.05$ ). **Conclusion:** Camouflaging the dental syringe has an effect regarding lowering the anxiety before injection or even in the percentage of anxiety reduction between before and after injection with a significant difference, which could improve patients' acceptance of dental and orthodontic treatment specially which demands injection of local anesthesia. Also, showing or not showing the dental syringe has no significant differences on the children regarding the anxiety reduction.

**Keywords:** local anesthesia, orthodontic treatment, standard concealment injection technique, child behavior, child anxiety, camouflage, dental syringe.

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## Introduction:

One of the most potentially stressful events in dentistry is the administration of dental local anesthesia (LA). Effective behavior management is fundamental to the successful delivery of dental treatment to children. In addition, many orthodontic procedures are invasive to some extent, and adequate anesthesia is an essential prerequisite, such as serial extraction, placement of orthodontic mini-screws, mini-screw-supported palatal cribs, mini-screw supported maxillary expanders and conventional extraction protocols. (1-3)

Some of the orthodontic treatment options that

require injection of local anesthesia may be rejected by some patients. As a result, it will lead the orthodontist to choose an alternative option that may be more compromised, and the outcome of the orthodontic treatment might not be optimal. (4)

The concealed technique considered the standard one. (5) In this technique the syringe is always concealed from the patient's view, and the dental assistant secures the child with one arm across his body in order to prevent any movement of his hands during the injection, while the dentist gently maintains the child's head with his forearm as the syringe is passed below the patient's field of vision.

Other techniques have been developed such as



showing the dental syringe, as a final step in a desensitization process, <sup>(6,7)</sup> and such procedure may reduce the child's fear and anxiety toward the local injection, as he may imagine a needle that is much larger and more painful than it actually is.

On the other hand, camouflaging the syringe is another modality and it is claimed to be an efficient method for hiding the metal dental syringe, and hence reducing the fear and anxiety associated with injection. The technique depends on camouflaging the entire dental syringe with a special sleeve usually made of autoclavable material and designed with special shapes like toys and cartoon characters.

As far as we can tell there are very limited studies comparing the three previous techniques together, so the aim of this study is to compare the anxiety accompanied with these techniques of dental local anesthesia.

### Materials and Methods:

**Study Design and Sample:** Randomized controlled clinical trial. This study was conducted on children who attended to the outpatient clinic of the orthodontics and pedodontics departments, Faculty of Dental Medicine (Boys), Al-Azhar University, Cairo, Egypt.

### Eligibility criteria:

#### Inclusion criteria

- Children age ranges from seven to twelve years.
- Children who indicated for buccal infiltration in maxillary molars areas.
- Children had never experienced dental injection before.
- Children's attitude classified as positive or definitely positive according to Frankel's scale for children behavior in the dental clinic.

#### Exclusion criteria

- Medically compromised child.
- Children with acute pain required fast emergency treatment.
- Children with bad dental experiences.

**Ethical approval:** This study has received approval from the Ethical Committee of Faculty of Dental Medicine (Boys), Al-Azhar University, Cairo, Egypt, with license code EC Ref. No (: 870/384)

#### Sample size calculation:

A Total number of 60 children divided into 20 for each group was found to be sufficient according

to previous study by Khalaf et al (2016) (8) in which the effect size ( $f$ ) = 0.417. The power (1- $\beta$  error) is (80%) and the significance level ( $\alpha$  error) is (5%) for two-sided hypothesis test.

### Randomization and intervention

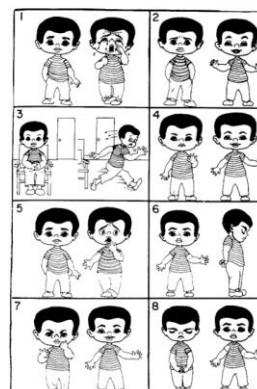
The child who fulfilled the eligibility criteria was instructed to choose between equal numbers of folded papers containing the name of injection method for each technique.

#### Intervention:

Diagnosis and clinical examination were done followed by assessment of the child behavior using Frankle's behavior rating scale. <sup>(9)</sup> The final Diagnosis and treatment plan were recorded and only children with 'positive' and 'definitely positive' rates were included in the study. Consent form typed in Arabic language was obtained from the parents prior to the study.

The same operator conducted the local anesthesia administration in all cases. Before injection assessment of the anxiety levels was done using Venham's picture test (VPS) <sup>(10)</sup> (Fig. 1). This test is composed of eight cards. Each card contains two pictures of two children, one looks happy and the other looks anxious or sad. The child allowed to select one child from each card looks like how he feels in the current situation. The scores recorded (one) for each time the child selects the "high fear" picture then the scores summed to give the final score.

Before injection small gauze was used to dry the tissue and remove any gross debris around the injection site, then topical anesthetic gel benzocaine 20% (Gelato; Keystone Industries, GmbH) after that administration of local anesthesia was done with a 30-gauge short needle, and the technique of injection was varied according to the selected groups.



**Figure (1):** Venham picture test (VPS).

**Group 1 (control group)**

Which included (20) patients who receive dental anesthesia with standard concealed injection technique, in which the syringe is concealed from the patient’s field of view at all times. The dental assistant used his/her hand to control any rapid movement of the child’s arm, while the operator gently maintains the child’s head position with his forearm, and the syringe is passed below the patient’s field of vision. Then the dental assistant removes the needle cap, and the injection was accomplished. The hand of the dental assistant stay in the preventive position and the anesthesia was injected slowly. (Fig.2)



**Figure (2):** Basic injection technique used in group 1.

**Group 2 (showing dental syringe using tell show do technique)**

For this group the assembled syringe, without removal of the protecting plastic cap of the needle, showed to the child, after the child was convinced, the dental chair was reclined and the dental syringe was given to the dental assistant, the LA injection was then administered in exactly the same as in the group (1).

**Group (3) dental syringe camouflage**

The dental syringe was hidden inside dental syringe sleeve (Angelus™) (Fig. 3) and loaded with an extra short needle. Then the child was told that the sleeping juice would come out from the alligator mouth to make the tooth go to sleep and then the injection was completed. (Fig.4)



**Figure (3):** Angelus™ sleeves of dental syringe



**Figure (4):** Injection with camouflaged dental syringe in group 3

**Observation:**

**Evaluation of fear/anxiety.**

The Venham Anxiety Scale picture test (Fig.1) has been used to assess the anxiety level of the children in all groups. It has been recorded before and immediately after administration of the local anesthesia according to the protocol of each group.

**Data analysis:**

The ANOVA test was used for comparison between the three groups. Using version 26. (IBM SPASS statistics [IBM corp. released 2022].

**Results:**

In this study 60 children were included according to the previous eligibility criteria. The first group considered the control group with 10 males and 10 females with a mean age of 8.9, while for group 2 ( show dental syringe group ) 10 male and 10 female with a mean age of 8.3, and the last group ( camouflage group) 11 male and 9 female were enrolled with a mean age 8.6, and there no significant differences was found among the groups regarding the distribution of sex or age as shown in table (1).

**Table (1)** Age and sex distribution between the groups

		Group [1] n=20(%)	Group [2] n=20(%)	Group [3] n=20(%)	P -value
Age (yrs.)	Mean ± SD	8.9 ± 1.6	8.3 ± 1.4	8.6 ± 1.7	0.487
	Range	7-12	7-12	7-12	
Sex	Female	10 (50.0)	10 (50.0)	9 (45.0)	0.935
	Male	10 (50.0)	10 (50.0)	11 (55.0)	

SD=Standard deviation, p<0.05 is statistically significant

Children asked to choose between different cards of VPS and scores recorded before the injection and immediately after injection and all groups showed significant difference between scores before and after procedures as shown in table (2).



**Table (2):** Showing the differences between Anxiety levels before and after injection.

Venham Score		N	Mean	SD	95% CI for Mean			Min.	Max.	p value
					Lower	Upper	Median			
Before	Group 1	20	6.4	1.2	5.8	6.9	7	4	8	<0.001
	Group 2	20	4.7	2.5	3.5	5.9	5	0	8	
	Group 3	20	1.5	1.3	0.9	2.1	2	0	4	
After	Group 1	20	5.2	2.1	4.2	6.2	5	0	8	<0.001
	Group 2	20	4.5	2.5	3.3	5.6	4	0	8	
	Group 3	20	0.8	1.3	0.2	1.3	0	0	4	

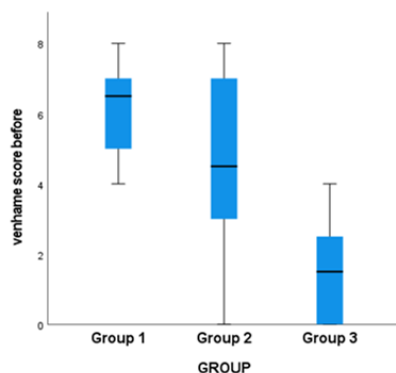
N: number, SD: Standard deviation, p<0.05 is statistically significant

For pairwise comparison between the groups (Fig.5) and (Fig.6), it was found that group (3) showed significant difference when compared to the other two group regarding the anxiety level before and after injection, While the comparison between group (1) and (2) showed non - significant difference either before or after injection as shown in table (3)

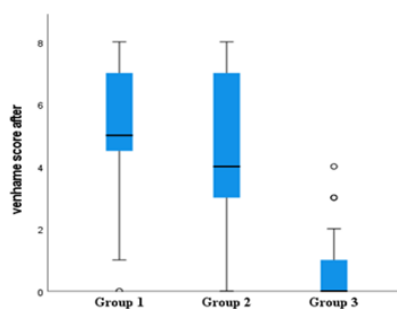
**Table (3)** show the pairwise comparison between groups regarding VPS for before and after injection.

Pairwise Comparisons between groups		
Sample 1-Sample 2	Venham score before	Venham score after
Group 3-Group 2	<0.001	<0.001
Group 3-Group 1	<0.001	<0.001
Group 2-Group 1	0.050	0.369

p<0.05 is statistically significant.



**Figure (5)** plot chart showing the venham score records before injection



**Figure (6)** plot chart showing the venham score records after injection

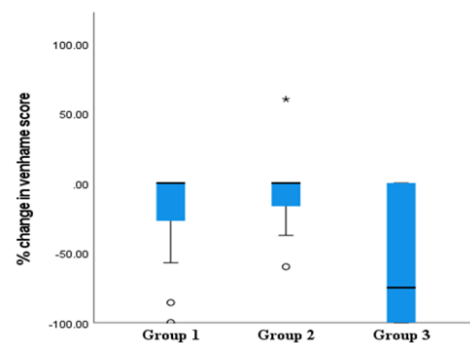
The percentage of reduction in anxiety level also

was evaluated (Fig. 7) and it was found that group (3). has the greater effect of anxiety reduction before and after injection with significant difference between the other two groups as shown in table (4).

**Table (4)** the percent reduction of anxiety level for the groups.

	Group 1			Group 2			Group 3			P value
	Median	Min.	Max.	Median	Min.	Max.	Median	Min.	Max.	
Percent reduction	0	-100	0.0	0.0	-60.0	60.0	-75.0	-100	0	0.026

p<0.05 is statistically significant



**Figure (7)**plot chart showing the percentage of anxiety reduction between groups.

**Discussion:**

This study included sixty children in the age group of seven to twelve years. This age group was selected to ensure good cooperation and understanding for the instruction, as they are corresponding to the concrete operational stage stated in cognitive development theory by Jean Piaget. This also come in accordance to the age group in a similar study by Melwani AM et al 2017(11).

Dental anxiety (DA) is a response to a supposed threat or danger, and it varies between people. For evaluation of anxiety Venham’s picture test (VPS) as a valid method for determining dental anxiety (12). The times for recording anxiety was done before and after injection, as the most expected anxiety time would be before the procedures and it would be expected to be decreased after the injection as concluded by Rayen et al, 2006(13).

Also, in favor of this results a study by Sowjanya et al ,1995 (14) and Sanadhya et al,2013(15) as they showed that there was a statistically significant difference in physiological parameters before and after dental procedures.

In the current study silicon sleeves for the metallic syringe was by AngelusTM, which was commercially available, and designed with cartoon character (alligator), which is helpful in distraction and suitable for children.



This study showed that there was a significant difference in anxiety reduction in favor to group 3 (dental syringe camouflage). This suggests that the toy-like presentation of the camouflaged syringe eliminates the fear-inducing stimuli of a conventional dental syringe, which influence the anxiety level prior to injection and this come in favor with a studies as **S.Ujaoney et al, 2013**<sup>(16)</sup>, **Babaji P et al, 2017**<sup>(17)</sup> and **Vallakatla, Venu, et al, 2020**<sup>(18)</sup> in which they preferred the use of camouflage syringe over conventional syringe as it can lower the anxiety level accompanied with dental injection of local anesthesia .

Also, our results are in accordance with **Melwani AM et al 2017**<sup>(11)</sup> who found that a to camouflaging conventional syringes is a simple and novel innovation that results in improved outcomes related to dental fear and anxiety.

Also in this study the results showed that there is no difference between anxiety level reduction between showing or not showing the dental syringe ( groups 1 and 2), they coincidence with similar studies like **Nikolova et al 2008**<sup>(19)</sup> and **Maragakis et al 2007**<sup>(20)</sup> as evaluated the response of children to dental injection after showing the dental syringe and they concluded that there is no difference in response between showing or hiding the dental syringe.

### Conclusion:

Camouflaging the dental syringe has an effect regarding lowering the anxiety before injection or even in the percentage of anxiety reduction between before and after injection with a significant difference, which could improve patients' acceptance of dental and orthodontic treatment specially which demands injection of local anesthesia.

Also, we concluded that showing or not showing the dental syringe has no significant differences on the children regarding the anxiety reduction before injection or even in the percentage of anxiety reduction between before and after injection.

### Recommendations

This study recommends the use of camouflaged syringes to reduce the anxiety accompanied with injection in children. In addition, we recommend other studies with larger sample size for comparing other modalities of delivery of local anesthesia for children, as this is regarded as the key to successful behavior management.

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