

## Effectivity of Needle Free System versus Traditional Way in both Infiltration and Block Anesthesia

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### ABSTRACT

*Dental procedure is one of the most important procedure that require local anesthesia for patients. comfort easier procedure the dentist, but there is always anxiety related to this procedure because of pain related to needle ,which is a classical way of ,local anesthesia administration, so it overcome this problem and relief the anxiety from dental needle new technique available, which is needle free system.*

*This study evaluates the anesthesia done by this technique and compares it with the dental needle in both anterior and posterior teeth. Although these technique is effective to relief anxiety and stress, but it is less chair time and low duration when compare it with dental needle so, recommended in children and simple cases of restoration and not recommended in surgical procedure because of low duration time.*

### Introduction

The human mouth is home to a complex network of nerves that provide sensation to the teeth, gums, and surrounding tissues. The two main types of nerves in the mouth are the trigeminal nerve and the facial nerve. The trigeminal nerve is responsible for sensation in the upper and lower teeth, while the facial nerve provides sensation to the tongue, lips, and cheeks.

The trigeminal nerve branches out into three main divisions, known as the ophthalmic, maxillary, and mandibular divisions. These divisions innervate different areas of the face and mouth, with the mandibular division being responsible for sensation in the lower teeth and gums. [1]

### How Anesthesia Works:

Local anesthetic is frequently needed during dental operations to numb the mouth's nerves and make the patient more comfortable. Infiltration and nerve block anesthesia are both treated using local anesthetics. In general, block anesthesia is usually used in the mandible while infiltration anesthesia is frequently used in the maxilla. [2] There are additional local anesthetic procedures that can be employed after infiltration and block approaches have failed to achieve profound anesthesia. Other methods include intraligamentary, intraosseous, intrapulpal, and interseptal anaesthetic. [3]

Local anesthetics temporarily rob an area of its sensation by temporarily blocking nerve conduction close to its site of application. Inhibition of sodium channels at nerve terminals and along the axon prevents the conduction of nerve impulses. [4] Due to competition with calcium-binding sites that regulate sodium permeability, this lowers the permeability of nerve cell membranes to sodium ions. This alteration in permeability causes a decrease in depolarization

and a rise in excitability threshold, which ultimately stops the formation of the nerve action potential. [5][6]

Traditional anesthesia methods involve the use of needles to inject anesthetic directly into the gums or surrounding tissues. However, these methods can be uncomfortable and anxiety provoking for some patients. [7] For this reason a new anesthesia technique has been developed which it is a Needle free system

Needle free system dental device that uses a patented technology to provide a more comfortable and pain-free alternative to traditional injections. The device delivers a precise and controlled stream of anesthetic through a small, handheld device that resembles a pen. The anesthetic is delivered at a slow and consistent rate, reducing the discomfort and anxiety often associated with traditional injections. [8]

Needle free system characterized by a single-use cartridge that contains a precise amount of anesthetic, ensuring accuracy and consistency in each injection. The device also has a variable speed control, allowing dentists to adjust the flow of anesthetic to suit each patient's needs. The device is easy to use and can be operated by dental professionals with minimal training. The use of this technique offers several benefits for both the patient and the dentist. [10][11]

It also provides a more comfortable and pain-free dental experience for the patient. The precise and controlled delivery of anesthetic reduces the discomfort and anxiety often associated with traditional injections. Patients also experience less numbness and faster recovery times, allowing them to return to their daily activities more quickly. The device also reduces the risk of needle prick injuries, improving the safety of the dental team. [9][8]

This technique delivers drug solutions by creating a micro-thin pressure liquid jet to penetrate mucus membrane and disperse in the soft tissue. [12]

## **Subjects and Methods**

The study protocol was approved by the ethical committee of the Faculty of Dental Medicine by dental students under the supervision.

A Total of 36 patients, 25 were males and 11 female, were recruited in the study, were treated at the operative clinic, Thi qar university college of dentistry. All of them were treated with needle free jet anesthesia.

The inclusion criteria for the study were at medial age(18-40) years,have teeth indicated for conservative restoration, according to the treatment plan.

Exclusion criteria were patients indicated for general anesthesia, patients have systemic bleeding disorder, patient have allergy to local anesthesia and insecure of local infection at injection site.

### **The protocol as follows:**

The "tell-show-do" method was used to teach every piece of dental equipment and procedure, outlining the distinctions between the conventional method and the needle-free jet method.

Firm pressure was applied to the skin/mucosa using the prepared injector. Since the anesthetic departs the injector at a high rate of speed, extending the distance between the bone and injector could harm the bone, so the injector was changed to avoid doing so.

The device comprised a compressed spring, a silicone cap (rectocap), and an ampoule connected to it that contained an anesthetic solution to preserve the periodontal tissues. With a minor compression close to the gingival band inserted at the target tooth, the injector was placed 90 degrees from the maxilla or mandible. By depressing a button, the anesthetic solution was released, and anesthesia was given.

The "pop" sound made by the apparatus during the release of the anesthetic fluid was explained

to every patient.

With a pressure of 2000 psi, 0.3 mL of the anesthetic solution was applied for the infiltration technique and 0.5 mL for the block technique to the cutaneous/subcutaneous region in less than 2 s. Following injection, the injector tip was held firmly against the injection site for a short period of time. [20]

**Result**

We found that the P value has no effect on age, gender and duration as shown in the table 1 below

Table-1-

Infiltration or block		Age	Gender	Duration	tradition away
	P value	0.009	0.089	0.003	0.00

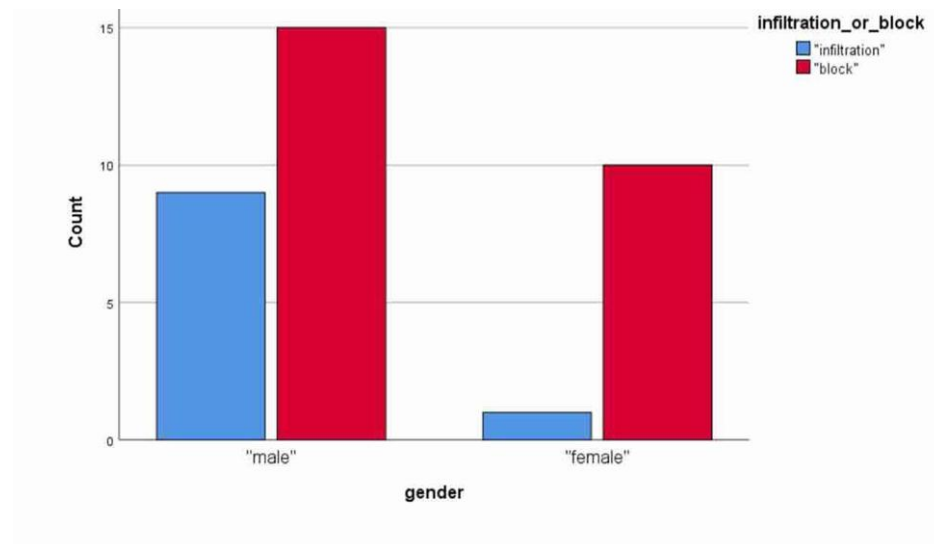
All the 35 patients were successfully anaesthetisation regardless their age or gender, most of the patients submitted to block procedure as shown in table 2 and 3 and bar chart 1

Table -2-

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
gender * infiltration_or_block	35	100.0%	0	0.0%	35	100.0%
age * infiltration_or_block	35	100.0%	0	0.0%	35	100.0%
Duration * infiltration_or_block	35	100.0%	0	0.0%	35	100.0%

Table-3-

gender * infiltration_or_block Crosstabulation				
Count				
		infiltration_or_block		Total
		"infiltration"	"block"	
gender	"male"	9	15	24
	"female"	1	10	11
Total		10	25	35



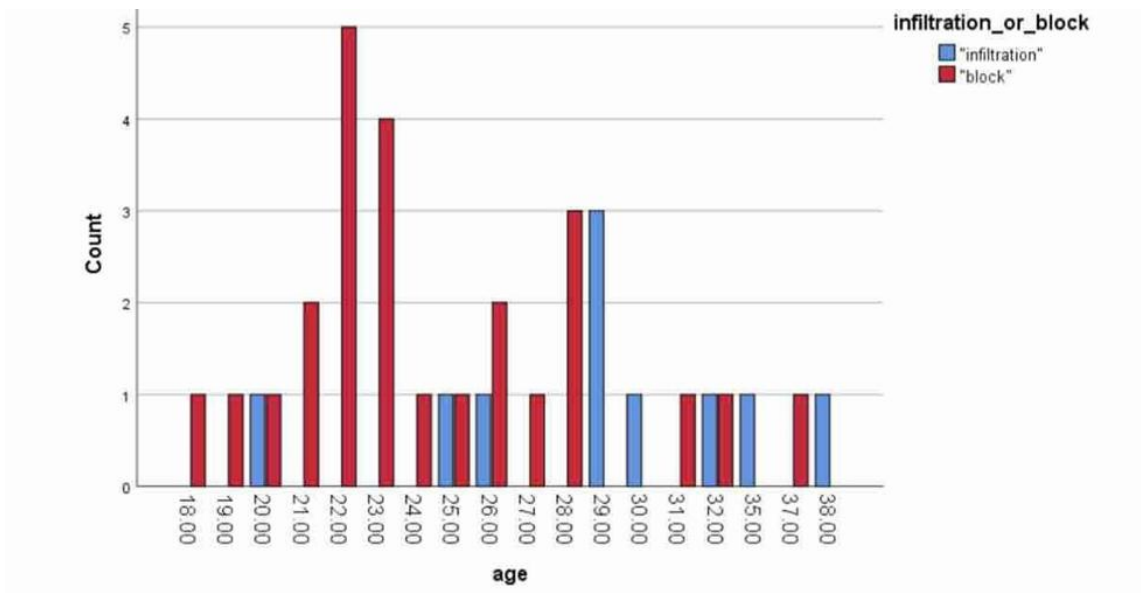
Bar chart -1-

We have done the procedure on age range between 18 and 38 years

10 of the procedures were infiltration and 25 were block with total of 35 procedures as shown in table 4 and bar chart 2 below

Table -4-

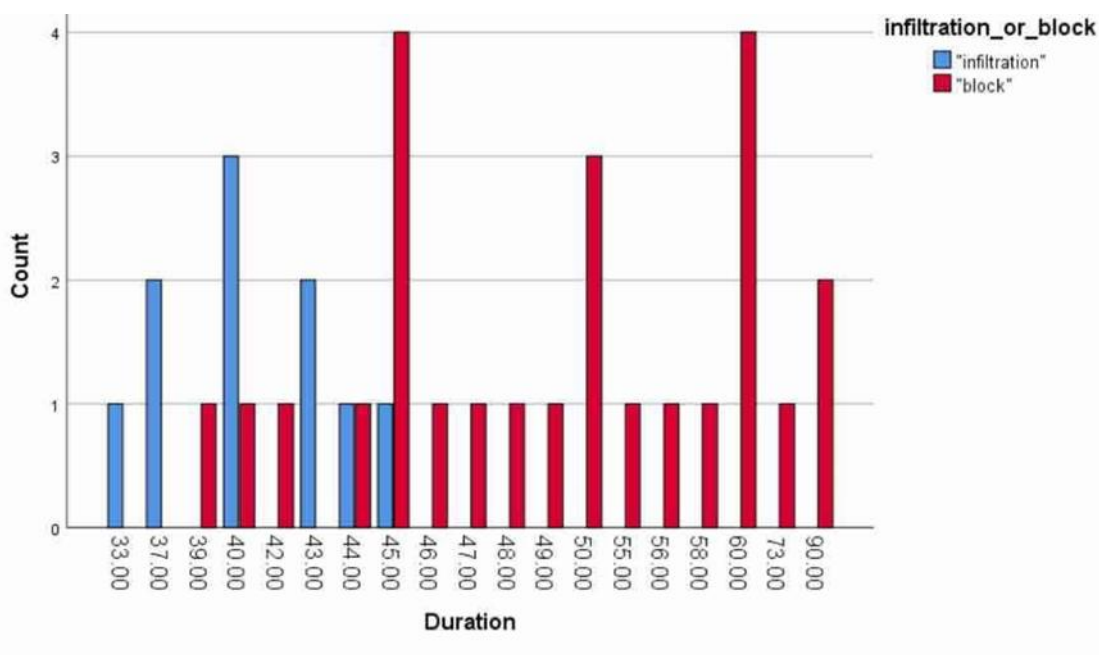
age * infiltration_or_block Crosstabulation				
Count		infiltration_or_block		Total
		"infiltration"	"block"	
age	18.00	0	1	1
	19.00	0	1	1
	20.00	1	1	2
	21.00	0	2	2
	22.00	0	5	5
	23.00	0	4	4
	24.00	0	1	1
	25.00	1	1	2
	26.00	1	2	3
	27.00	0	1	1
	28.00	0	3	3
	29.00	3	0	3
	30.00	1	0	1
	31.00	0	1	1
	32.00	1	1	2
	35.00	1	0	1
	37.00	0	1	1
	38.00	1	0	1
Total		10	25	35



Bar chart -2-

Table -5-

Duration * infiltration_or_block Crosstabulation				
Count		infiltration_or_block		Total
		"infiltration"	"block"	
Duration	33.00	1	0	1
	37.00	2	0	2
	39.00	0	1	1
	40.00	3	1	4
	42.00	0	1	1
	43.00	2	0	2
	44.00	1	1	2
	45.00	1	4	5
	46.00	0	1	1
	47.00	0	1	1
	48.00	0	1	1
	49.00	0	1	1
	50.00	0	3	3
	55.00	0	1	1
	56.00	0	1	1
	58.00	0	1	1
	60.00	0	4	4
	73.00	0	1	1
	90.00	0	2	2
Total		10	25	35



Bar chart -3-

### Discussion

Local anesthetic has developed through a variety of formulations and administration techniques. However, conventional injection is still the most common method of administration all throughout the world. A more recent design for administering local anaesthetic in dentistry uses needleless jet injectors.

for the dentist one of the most important things is how to reduce the pain and anxiety during the dental procedure.

Age, sex, and socio-demographic characteristics all have an impact on dental anxiety and pain. It mostly affects young patients, then declines as they age [13]. There is a positive association between perceived pain levels and anxiety levels, and the discomfort will change depending on the level of anxiety. [14]

Makade et al. [15] observed that in adults, dental injector method pain perception during anesthesia was greater than jet injection system (Madajet).

The pain values of the two forms of injections were comparable, according to Oliveira et al. [16] who compared the oral needle approach with the needle-free injection system with infiltration anesthesia in adults.

Jet injectors do, however, have a few shortcomings. The widespread acceptance of jet injectors has been hindered by complaints of sporadic bruising, pain, and discomfort.

The patient acceptance of Jet injections was higher than that of the conventional injection approach. [17]. Although the high pressure during delivery of the needle-free system results in bruising and hemorrhage in the tissue, we believe that the levels of bruising and hemorrhage are suitable for children in the postoperative period.

Although needle free injection system causes bruising and hemorrhage in the tissue caused by the high-pressure during administration, we consider that the levels of bruising and hemorrhage are acceptable for patients in the postoperative period. [18] [19]

according to our study, we found out that the pain is not markedly varying with age or sex but we agree that the pain level depends on the level of anxiety. the anxiety level is widely decreased when we used needle free system in spite of that the pain perception was higher than with

traditional way

Also when we compare the previous study findings and our study results we found that the needle free injection system is successful method and has a plenty of advantages, however it cannot replace the traditional way because of the much less anesthetic duration and the need for another dose specifically for the block anesthesia.

With needle free system most patients suffer from trauma and sourness and even bleeding sometimes after using the needle free system however the needle free technique has more acceptance among our patients than the traditional method of injections.

### Conclusion

We agree that the device is working but however it has less anesthetic duration compared with the traditional way on the other hand It's very useful for lowering the stress of the patients who are afraid of needles but we recommend to give them another dose by traditional way, after using needle free injection system to provide longer anesthetic effect, and the patients should not feel the needle because the area is already numbed by the device we mentioned before however, we really recommend this device on pediatric patients because the duration is more and the effects are better on them compared to adults and since all procedures done on pediatric patients are relativity required less time than those which are done on adults. [21]

At the end this technique is very innovative , and it's can help a lot of people, but it's cannot replace the old fashion way.

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