

PAIN PERCEPTION IN DIFFERENT INJECTION TECHNIQUES IN PAEDIATRIC DENTISTRY: AN ORIGINAL RESEARCH

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ABSTRACT

Aim: To evaluate and compare the pain perception by the pediatric patients, while experiencing computerized injection device computerized syringe and the conventional injection technique during dental clinical procedures

Methodology: Forty children aged 10-14 years requiring local anaesthesia on two sides of the dental arch were included in the study. The patients served as their own control, and on the appointed day through computerized injection technique local anesthesia was injected and on the second day, anesthesia was achieved with the help of traditional method. Visual analogue scale (VAS) and faces pain rating scale (FRS) were used to evaluate pain perception

of pediatric patients. Along with this, various other physiological parameters were also taken into consideration.

Results: Paired t-test discovered a statistically significant variance in the pain acuity in pediatric patients using VAS and FRS scales to compare amid computerized and conventional technique. No statistically significant difference was observed when physiological parameters (heart rate, blood pressure) were compared at various intervals between the computerized and the conventional technique

Conclusion: Computerized controlled injection technique provides less painful injections when compared to the conventional injection technique.

Keywords: Anxiety, Injection Technique, Local Anesthesia, Pain Perception

INTRODUCTION

Pain has long been associated with dentistry and has an unusual relation. Pain is the main reason that leads the patient to seek dental treatment.¹ In addition, dental fear and anxiety are the main causes that may lead patients to bypass dental appointments.² Fear-related behaviors have long been recognized as the most serious aspect of patient management and can be an impediment to dental care.³ Local anesthetic injections are usually the main reason for fear and anxiety during dental treatment. Therefore, control of pain, anxiety and negative responses during local anesthetic injections has clinical importance in dental practice.^{2,3} Local anesthesia is considered to be the backbone of pain control during dental procedures. In pediatric dental clinics, local anesthesia is mandatory in everyday pediatric dental procedures like extractions, pulpotomies, root canal treatment, etc. The objective fear of the child during administration of local anesthesia ranges from sight of the needle to the pain that might be associated with needle injection, which increases the anxiety of the patient resulting in fear of receiving local anesthesia in the future.⁴ Dentists have used several methods to avoid pain during administering local anesthesia such as applying topical anesthesia,⁵ slow infiltration,⁶ transcutaneous electrical nerve stimulation,⁷ computer-assisted local anesthesia⁸ and using vibrating tactile devices.^{9,10} Still the traditional method of injecting anesthesia is used, which is painful. So, newer methods are being searched which can overcome these difficulties of achieving local anesthesia before various dental procedures to avoid anxiety.^{11,12} Therefore, dental research continues to investigate devices of anesthetizing patients that are needleless. A variety of needleless devices have been developed to deliver anesthesia, depending on pressure which force anesthetic solution into oral tissues.¹³⁻¹⁷

In addition to efficient anesthesia, a needleless method should also be acceptable by patients. Some studies were conducted utilizing the needleless devices so as to study the anaesthetic administration. studies revealed that about 50% to 90% of examined patients obtained sufficient anesthesia with the devices.^{13,14} The results expressed the patients' experiences of the needleless methods and their preference for one method over another.¹⁴ Few controlled trials of needleless device have been carried out, in one of them, the needleless method (INJEX) reported faster anesthetic results with no significant difference.¹⁸ Another study compared a needleless device to traditional injections. All patients in the study required 2 restorations, so a split mouth was used, the patient received the first restoration after using traditional injection technique, while the second restoration was received after using INJEX.

Then the dentist rated the children's facial expressions regarding pain, the researchers concluded no significance difference between both techniques.¹⁹

AIM OF THE STUDY

Purpose of this study was to compare and assess the level of pain perceived by paediatric patients while injecting local anesthesia with computerized as well as traditional technique.

METHODOLOGY

40 children between the age of 10-14 years of age were selected for the present study, who reported to our institution. The children included in the study required local anaesthesia on both sides of the dental arch for various dental treatments; and who were mentally as well as physically fit according to the guidelines of American Association of Anaesthesiologists (AAA).²⁰ Informed consent was also taken from their parents before the start of this study. Patients who were medically compromised and were not willing for participation were excluded from the study. The computerized system injections were given according to the instructions of the manufacturer and only the slow speed mode was used. The traditional syringe injection was given according to the standard technique. The local anesthesia was administered using computerized technique on one side of the dental arch on the appointed day and on the subsequent appointment, i.e., local anesthesia was injected by traditional manner. Lidocaine with 1:80,000 adrenaline was injected with the help of 24-gauge needle. Prior to starting the dental treatment, the researcher explained the 10-point Visual Analog scale (VAS) to the patient, which was used for subjective evaluation. The VAS is a 100mm line anchored at each extreme from 'no pain' to 'pain as bad as it could be' and coloring graduated from blue to red. Immediately after injection, the patients were asked about the amount of pain they had perceived during the injection and asked to point and mark on VAS. Immediately after the injection the child's pain perception was assessed by the VAS and faces pain rating scale (FRS). Various other physiological parameters were also recorded like heart rate, blood pressure variations. The data thus obtained was subjected to statistical analysis using statistical package for social sciences version (SPSS) 25.0 for Windows. Paired *t*-test was used to compare the variables before, during and after the procedure between computerized and the conventional technique.

RESULTS

On comparison, statistically significant difference ($P < 0.05$) in the pain perception by VAS was found between computerized and conventional injection technique. Likewise, pain perception evaluated by FRS also showed statistically significant difference ($P < 0.05$) between the computerized and the conventional injection technique. (Table 1) Minimal difference was observed statistically between both the techniques when physiological parameters were taken into consideration like in case of heart rate (Table 2) as well as blood pressure (Table 3) which was measured with the help of pulse oximeter.

Table 1- Comparison between the computerized and traditional VAS and FRS score in the study subjects

Self-reported measure	Technique	<i>n</i>	Mean	SD	<i>t</i> test	<i>P</i> value
VAS	Computerized	40	20.00	20.40	3.082	0.003
	Conventional	40	28.20	28.88		
FRS	Computerized	40	1.46	1.20	3.155	0.003
	Conventional	40	2.12	1.52		

*VAS-Visual analogue scale; SD-Standard deviation

Table 2- Comparison of the mean heart rate before, during and after computerized and conventional techniques

Heart rate	Technique	<i>n</i>	Mean	SD	<i>t</i> test	<i>P</i> value
Before	Computerized	40	97.18	16.37	0.867	0.390
	Conventional	40	95.50	14.61		
After	Computerized	40	99.94	17.30	0.526	0.601
	Conventional	40	101.16	15.73		

Table 3- Comparison of the mean blood pressure (systolic and diastolic) before and after computerized and the conventional techniques

Blood pressure	Technique	<i>n</i>	Mean	SD	<i>t</i> test	<i>P</i> value
Systolic Before	Computerized	40	111.18	13.20	0.578	0.566
	Conventional	40	112.28	12.92		
Systolic After	Computerized	40	114.50	11.98	1.114	0.271
	Conventional	40	111.96	14.40		
Diastolic Before	Computerized	40	74.92	10.44	1.329	0.190
	Conventional	40	72.84	9.86		
Diastolic After	Computerized	40	75.42	10.43	0.023	0.982
	Conventional	40	75.46	8.70		

DISCUSSION

Computerized version of injecting anesthesia fared better as compared to conventional method of injection local anesthesia. Pain perception and its intensity was measured with the help of VAS scale.²¹⁻²³ This technique uses the images that represent specific feeling, FRS/Wong – Baker pain rating scale was in clinical use mainly in pediatrics since 1984. This rating consists of 6 different pictorial representations from a smiling face to a crying facial

expression.²⁴ In the present study both the VAS and FRS were used to measure the perception of pain. Evaluation of our study results revealed that according to both VAS and FRS techniques, the perception of pain was higher in case of traditional technique. Asarch and Beiraghi²⁵ and Koyuturk²⁶ found no difference in the pain rating between the Wand and the conventional injection technique. In their studies, computerized technique and the traditional technique of injecting local anesthesia was carried out in two different groups of pediatric subjects, which might lead to biased results. In the studies by Gibson et al.,²⁷ and Tahmassebi et al.,²⁸ each child was assigned to either computerized or conventional technique and they found that Wand produced significantly less disruptive behavior when compared to conventional technique. A significant variation in our study was that in the same child anesthesia was achieved with the help of both the techniques. This was similar to the study carried out by Lopez et al.,²⁹ where the children also served as their own control and the computerized injection (Wand) device reduced the pain perception as compared to the traditional syringe. We observed that when various physiological parameters were evaluated, there was no observable statistically significant variation when traditional injection technique was compared to computerized version. This outcome was not similar to the outcomes presented by Lopez et al.,²⁹ who noted a difference was noted in the heart rate between the computerized and conventional techniques. In the computer-controlled syringe, slow rate of anesthesia delivery dose appears to reliably reduce the pain related disruptive behavior in young children. The disadvantages of computerised method is that it is not economical than the traditional syringe and requires more injection time than the traditional injection; the longer duration may cause impatience and stress among the children and also its bulkier look may cause disruptive behavior among the pediatric patients.

CONCLUSION

Computerized injection technique provides less painful injections when compared to the conventional injection technique in the pediatric patients. Further studies are needed to determine the role of physiological parameters regarding the evaluation of pain perception while injecting local anesthesia.

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