Original Research

Comparison of Inferior Dental Nerve Block Injections in Child Patients Using 30-Gauge and 27-Gauge Short Needles

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Abstract

Introduction: The purpose of the present study was to record their pain sensation and to assess children`s reaction objectively and subjectively while receiving dental local anesthesia with 27- and 30-gauge needles. **Methods:** Forty children (24 boys and 16 girls) participated in this study. A random double-blinded crossover design was used so that each child served as his or her own control, receiving each treatment on the same sides of the same arch at different sessions. Each patient received an injection either with a 27- or 30-gauge needle during the second visit and during the third visit with the other needle. Objective and subjective evaluations were performed. **Results:** Children`s reactions to mandibular nerve block with 27- or 30-gauge needle regarding SEM scale and Face scale demonstrated significant difference, whereas children receiving the injection with a 27-gauge needle presented more sensation of pain objectively and subjectively. **Conclusion:** Significant difference was demonstrated concerning pain when 27-gauge or 30-gauge needle was used, and no difference was found in success of local anesthesia. As to these two variables, measured and reported in this study, it can be concluded that 30-gauge needle exhibit clinical advantage in inferior dental injection in children.

Key words: Face scale, inferior dental nerve block, 30-gauge needle, 27-guage needle, SEM scale,

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Introduction

Pain management during dental procedure can build a good rapport between dentist and the patient, guarantee trust for future visits with positive attitudes toward dental procedures, and reduce fear and anxiety (1-5). In fact, patients are concerned about fear of pain which can induce anxiety and destruct dental attendance (6). On the other hand, the most form of pain control in dentistry, namely local anesthesia, can itself produce anxiety and injections for local anesthesia is the most anxiety-provoking procedure for both children and adults. Besides pain and discomfort, the prospect of an injection can also provoke anxiety, particularly in children and one of the possible causes of fear and behavior problems is a painful past medical or dental visit(7,8), and dental procedures, most of the times, need several visits which takes the issue in to the consideration.

Various techniques have been suggested to alleviate pain during injections, such as the use of topical anesthetics agents prior to the injection (9), lidocaine patches on gingival (10), slow deposition of fluid in to the tissue, warming solution, shaking the lip or cheek, using electronic dental anesthesia, and a computerized device (11-14).

However, some clinicians believe that the best way to reduce the discomfort of the injection is to use a smaller-gauge needle. In fact, the needle gauge recommendations for the administration of the inferior nerve block injections in child patients largely have been empirical (15). Controversies concerning smaller-gauge needles have continued for years. Practicing dentists prefer to use thin needles (16); yet most dental school educators condemn them (17) because of perceived problems of deflection, breakage, and aspiration.

A short or long, 30- or 27-gauge needle may be used for most intraoral injections in children including mandibular nerve blocks (18). Inferior dental nerve block injections are painful, and it is readily thought that the gauge of dental needle may influence the sensation of pain during insertion and injection of dental local anesthesia. In Fuller et al. (19) and Lehtinen et al. (20) studies there was no difference in pain experienced by penetration of thin and thick gauge needles in adult subjects. Although some studies have shown that the gauge of dental needle is irrelevant in relation to injection discomfort (19,21) but Ram et al. (22) showed that mandibular nerve block is less unpleasant when administered with 30-gauge needle than they do when the same injection is delivered with 27-gauge needle.

Based on our knowledge, studies on the influence of needle gauge in perception of pain during local anesthesia injections are scarce, on the other hand; the most important goal of guidelines on behavior guidance for the pediatric dental patient is to ease fear and anxiety in dental procedure in children which pain management is one of the key roots. For these reasons, the purpose of the present study was to record children`s pain sensation and to assess their reaction objectively and subjectively while receiving dental local anesthesia with 27- and 30-gauge needles.

Materials and Methods

Ethical approval was obtained from the university Ethic Committee of Dentistry Research Faculty of Islamic Azad University of Khorasgan, Isfahan, Iran; and it recorded at Registry of Clinical Trials (IRCT) with record No of 2012100911055.

A pilot trial was conducted and on the basis of SEM scale, score of moderate to severe pain sensation was reported 70% with 27-gauge needle and 40% with 30-gauge needle. Total sample size with power of 80% and level of significance of 0.5% calculated forty healthy volunteers between ages 5-8 years who participated in this study.

A total of 40 children (24 boys and 16 girls) who were candidate for pulpotomy of second deciduous inferior molar teeth in one side from October 2012 to May 2013 in one of the dental clinic of Isfahan, Iran, participated in the study.

Subject selection was based on the followings:

1. No history of allergy to anesthetic solution or contraindication of anesthesia administration.
2. No history of systemic diseases or special conditions that compromise general healthiness.
3. No history of taking analgesic medication in the past two months.
4. Need for 3 subsequent treatment sessions.
5. Age between 5-8 years and no suspected or known developmental delay.
6. Positive behavior for cooperation based on Frankle Scale (23)].

All parents were informed about treatment procedures, and an informed consent was obtained.

This study was performed using two types of needle: A standard 27-gauge × 25mm needle with an internal gauge of 0.4mm(manufactured by Sofic, Mazamet, France) and 30-gauge × 25mm needle with an internal gauge of 0.3mm (manufactured by Sofic, Mazamet, France); local anesthetic solution was 2% lidocaine and 1:100000 epinephrine (manufactured by DarupakhshInc, Iran).

Children were selected as a convenience sample and all children that came for treatment during the study period who met the selection criteria. Every patient visited in three consecutive sessions. At first session all patients were undergone fluoride therapy. In the next two sessions a random cross over design was used so that each child served as his or her own control; each patient was randomly assigned to receive the injection either with a 27- or 30-gauge needle for the second visit, while the injection with the other needle was administered during the third visit. The same operator who was pediatrician clinical dentist performed inferior alveolar block in the 2nd and 3rd visit. Injection performed at the same rate of an average duration of nearly 1 minute with standard intra oral injection for all patients.

This study was performed in a double-blind manner in which the pedodontist delivered randomly the topical anesthetic agents with different unknown needle and a trained dental assistant also was blinded to the type of injection who was in charge of recording the behavioral parameters for every patient. During the procedure, parents of children were not in operating room and reframing techniques i.e. using euphemistic phrases such as "putting the tooth to sleep" was used to describe the injection to all the children.

Session intervals for all patients were one week and all patients were seen at approximately the same time of the day in the afternoon.

For objective evaluation during the injection procedure, the trained assistant observed the response of the child with sound, eye, motor (SEM) scale designed by Wright et al. (24). The subjective response was graded on a scale from 0-3 (Table 1).

Table 1. Sound, eye, motor (SEM) scale designed by Wright et al.

Score	Designation	Sounds	Eyes	Motor
0	Comfort	No sound indicating pain	No eye signs of discomfort	Hands, relaxed, no apparent body tenseness
1	Mild discomfort	Nonspecific possible pain indication	Eyes wide show of concern, no tears	Hands show some tension
2	Moderately painful	Specific verbal complaint e.g. ow! Voice raised	Watery eyes	Random movement of arms/body grimace, twitch
3	Painful	Verbal complaint indicates intense pain	Crying tears running down the face	Movement of hands to make aggressive physical contact, pulling head away punching

Immediately after injections, children were asked to complete the Wong-Baker Faces Pain Rating scale (FPS) for subjective evaluation of feeling after the injection. Verbal instructions were given to child on how to utilize the FPS. The FPS measure the unpleasantness or affective dimension of children`s pain experience. The values for this scale range between 0 and 5, where `0` in ` no hurt` and 5 in ` hurt very much (Fig. 1).

Successful anesthesia was described as no pain during procedure or no requirement of re-injection of local anesthesia.

The data was collected and analyzed by SPSS for Windows V. 19.1. The objective and subjective behavioral parameters were evaluated by Wilcoxon Matched-Pairs Signed ranks Test; Spearman correlation Test was performed for two evaluation methods; significance was set at $p<0.05$.

Results

A total of 24 boys and 16 girls participated in this study. 37.5 percent of girls were at age six, and 41.6 percent of boys were at age nine.

Endpoint of successful anesthesia achieved by both 27- gauge and 30-gauge needles which means there was no sensation of pain during procedure or requirement of re-injection for local anesthesia (Fig. 2)

Children`s reactions to mandibular nerve block with 27- or 30-gauge needle regarding SEM scale demonstrated significant difference, whereas children receiving the injection with a 27-gauge needle presented more facial and body expression of pain, so that the mean SEM score for 27-gauge and 30-gauge-needle were 1.5±0.52 and 1.17±0.29, respectively; and Wilcoxon Matched-Pairs Signed ranks Test showed significant difference between these two different needles (Table 2).

Children also by means of face scale reported more sensation of pain with 27-gauge needle and difference for this scale was also significant (Table 3).

The correlation of subjective and objective pain measurement methods was evaluated and as seen in Table 4, SEM Scale and Face Scale measurements methods were significantly correlated in second and third sessions.

Figure 1. The Wong-Baker Faces pain rating scale (FPS)

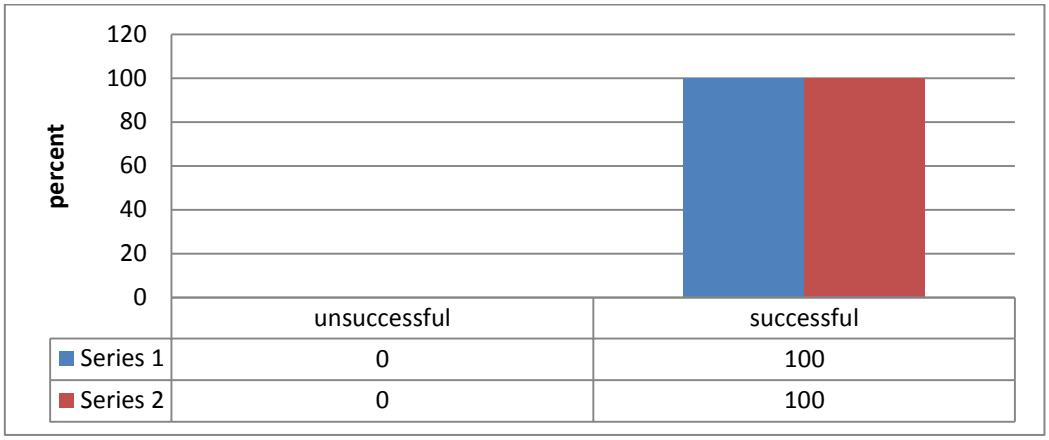

Figure 2. Endpoint of successful anesthesia achieved by both 27- gauge and 30-gauge needles

Table 2. subjective and objective evaluation of children`s pain by means of FPS and SEM scales, respectively

		N	Sum of Ranks	Mean Rank	P Value*
Gauge 30-Guage 27	Negative Ranks	7	18.5	9.25	<0.05
(SEM Scale)	Positive Ranks	33	257.5	12.26	
Gauge 30- Gauge 27	Negative Ranks	8	27	9	<0.05
(Face Scale	Positive Ranks	32	249	12.45	

*Wilcoxon Matched-Paires Signed ranks Test

Table 3. subjective and objective evaluation of children`s pain by means of FPS and SEM scales, respectively

FPS scale		SEM scale		
S.d	Mean	S.D	Mean	
1.02	2.22	0.52	1.5	27-guage
0.76	1.65	0.29	1.17	30-guage

Table 4. Correlation of two different pain measurement methods in two different needle gauge

	SEM Scale (Gauge 30)	SEM Scale (Gauge 27)
Face Scale (Gauge 30)	0.479	……
Face Scale (Gauge 27)	……	0.470
P value	<0.05	<0.05

Discussion

Many children consider injections the least desirable element of dental treatment (25), injection of local anesthesia is a stressful experience for both patient and operator, as demonstrated by cardiovascular changes (26, 27); therefore any attempt to minimize pain is potentially mutually beneficial and leads to good response of a child patient to the demands of dental treatment and also a cooperative behavior.

Various techniques have been suggested to alleviate pain during injection for children, such as topical anesthetic agents prior to the injection, lidocaine patches on the gingival, behavioral management and distraction techniques. In this study, we evaluated the influence of

needle gauge in perception of pain during local dental anesthesia on mandibular nerve block in children.

In our study, patients showed significantly more objective and subjective signs of pain during mandibular block injection with 27- gauge needle than they did when they received the same injection with a 30-gauge needle. On the other hand, no difference was found in anesthesia success rate in the matter of gauge needle in our study group, and local anesthesia with both needles was one hundred percent successful according to our determined end point.

Several authors did not find any difference regarding pain in adult patients when local anesthesia was provided using different gauge needles. Fuller et al. (19) reported no significant differences in perception of pain produced by penetrations of 25-, 27- and 30-gauge needles; and in another study Lehtinen et al. (20) clinically tested two types of disposable needles, the 30-gauge needle required significantly less force than 27-gauge needle and no significant difference in pain was observed between the different needles. These findings are in contrast with our study findings, which as mentioned 30-gauge needle produced less pain in children. Ram et al (22), who studied influence of needle gauge on pain sensation on children, claimed that according to their knowledge and based on their research they are the first that assess this issue, and they reported a significant difference concerning pain when mandibular nerve block was provided using 27- and 30-gauge needles. This finding is in accordance with our findings and also with suggestion of Persson and Jansson-Bolin Handbook of local anesthesia (28) that recommended use of 30-gauge needles for dental injections in children.

These controversies can originate from different study methods and different age range in study groups. For instance, Brownbill et al. who reported no difference between different gauge needles in terms of pain perception, just assessed pain by Visual Analogue Scale which is an subjective assessment tool, but in our study we assessed the patient subjectively and objectively by means of FPS and SEM scale; in this field Versloot et al. (7) concluded that a combination of child`s report as a subjective evaluation and objective observation is advised to assess pain in young children.

This study suggests that another study should be conducted with a bigger study population which will also evaluate the rate of unsuccessful aspiration, needle breakage and needle deflection to propound more assurable results in matter 30-gauge needle usage instead of 27-gauge needle for dental injections mandibular nerve block in children.

Conclusion

In this study, we found a significant difference concerning pain when 27-gauge or 30-gauge needle was used, and no difference was found in success of local anesthesia. In keeping with these two variables that measured and reported in this study, it can be concluded that 30-gauge needle exhibit clinical advantage when used to give inferior dental injection in children.

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