Threshold of Pain Perception to Intraoral Anesthetic Injections among Egyptian Children

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Abstract: A total of 126 healthy Egyptian children of both sexes aged 5-6 years old; without any history of previous intraoral injection; were included in the present study. They had at least one carious primary tooth. The study design was a double blind; where subjects were randomly allocated into two equal groups. The aim of this clinical investigation was to determine the efficacy of some adjunctives as counterstimulation and distraction in minimizing of pain perception during administration of local anesthetics in pediatric dental patients. Selected sites for maxillary and mandibular infiltration anesthesia; were performed; and the children responses were quantified using the sound, eye and motor (SEM) scale. Administration of anterior maxillary infiltration produced the maximum pain; while that of posterior maxillary infiltration and inferior alveolar nerve block were accompanied by minimum pain (2 and 3, respectively). There was no significant gender-specific difference in pain perception among children. Moreover, the adjunctive methods combined with local administration of anesthesia; namely; counterstimulation and distraction, showed non-significant differences in pain perception. It seems that pediatric pain perception and reaction may be an anatomical location-dependent in nature.
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Key words: Pain threshold, Local anesthesia, SEM scale, Counterstimulation, Distraction.

1. Introduction

There is no exaggeration to mention that, individuals who are hurt while receiving dental care as children are more likely to avoid dental care as adults. Painful management has been shown to be important in the creation of dental fear. Hence, effective pain control is critical in dentistry; with especial interest in pediatric dental practice [1-3].

First and foremost, we cannot deny that; the provision of many dental treatments depends upon achieving excellent local anesthesia. Pain-free procedures are of obvious benefit to the patient. It also helps the operator as treatment can be performed in a calm, unhurried and convenient fashion [4, 5]. On the contrary, failed local anesthesia; therefore can have effects at both ends of the syringe [6, 7].

Furtherly, as intraoral anesthesia is commonly used in conventional dentistry but, paradoxically, its administration produces pain and anxiety that may cause subsequent unfavorable behavior [8, 9].

Therefore, a number of methods have been suggested to reduce the pain induced by infiltration of local anesthetic agents [10, 11]. However, the efficiency of those complementary methods in reducing the pain reaction was a matter of debate, and the site-specific pain reaction to an anesthetic injection has not been studied so far.

The aim of the present study was to evaluate the pediatric reaction to the pain induced by intraoral anesthetic injections of some areas of upper and lower jaws and to determine the efficacy of some adjunctives as counterstimulation and distraction in minimizing of pain perception during administration of local anesthetics in pediatric dental patients; among a restricted sample of Egyptian children.

2. Subjects and Methods

A total of 126 children (65 males and 61 females) aged 5-6 years (mean age 5.4 years); were included in the present randomized clinical trial. The subjects attended from kindergarten and primary schools in the district nearby Nasr city. They presented to the out-patient clinic of Pedodontics Department, Faculty of Dental Medicine, Al-Azhar University; for the treatment of carious primary teeth. The participating children were in complete physical and mental health without any confounding medical history. The required inclusion criteria for participation in such clinical trials were considered [12, 13]. The study procedures as well as probable risks and discomforts were explained to the parents or legal guardians of the patients. Moreover, a written consent was obtained from all participants. The double blind technique was chosen as the study design. Only cooperative children were included in the study procedure; according to the Frankl scale [14]. The 126 children were then randomly allocated into two equal experimental groups (n = 63); by randomized selection of the numbers. All injections were performed by a single pediatric dentist. Topical

anesthesia was achieved with Benzocaine gel 20%; applied over the dried mucosa for 1 minute using a cotton applicator. During the injections, one group received counterstimulation method and the other group received the distraction method [15, 16]. Counterstimulation involved the use of the thumb to create vibration with slight pressure on the soft tissue adjacent to the injection site [16]. The distraction technique involved asking the subject to raise the right and left legs in turn using voice control technique [15]. Assessment of children's behavior during injections was performed by another dentist; according to the sound, eye and motor (SEM) scale [16, 17]. The scale scores were calculated by summing the three "Grade" values. For further reliability of SEM data, a third assistant shared the SEM evaluation along with the second dentist. All quantitative data of SEM scores are presented as the median. Statistical analysis of data was performed using the non-parametric test (Kruskal-Wallis). Individual differences between groups was also used (Mann-Whitney U-test). Moreover, intra-examiner agreement of data was evaluated via kappa statistics. In the present study $P < 0.05$ was considered to indicate statistical significance.

3. Results

No adverse event was observed during the study course. The intra-examiner agreement of data for SEM scale was excellent (r = 0.87). All the children completed their participation in the present study without any disturbances in their attitude and behavior. They were completely interested to share in such investigation. Figure (I) illustrated the median SEM scores for the intraoral anesthetic injections. The maxillary posterior local infiltration and inferior alveolar nerve block showed the least painful reaction (2 and 3 respectively). While the maxillary anterior local infiltration showed highest painful reaction with SEM scale (7). Maxillary injections scored an increased values than those of mandibular injections (4.5 for maxilla; n = 59) versus 4 for mandible (n = 67). The difference in values was statistically significant ($P < 0.05$). Analysis of SEM scores between both equal groups showed a non-significant difference of pain perception between male and female children ($P < 0.05$); a finding which denoted that, pain is not a gender dependent (a data not presented). Injection techniques in both groups showed an almost slight difference of SEM score values; for which there were no statistically significant differences in SEM scores between the members of each group (Fig.II).

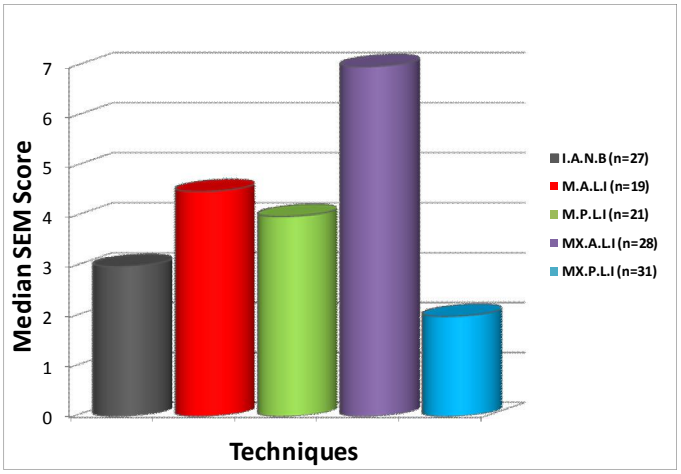

Fig. I: Median SEM score for the intraoral injection techniques

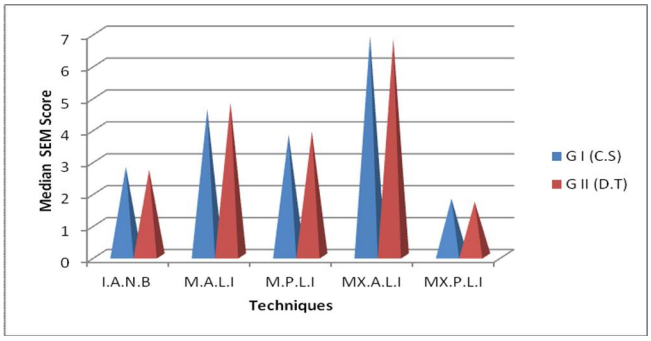

Fig. II: Scale of group to group comparison of injection techniques

Key:
Inferior Alveolar Nerve Block = I.A.N.B
C.S = Counterstimulation
Mandibular Anterior Local Infiltration = M.A.L.I
D.T = Distraction
Mandibular Posterior Local Infiltration = M.P.L.I
Maxillary Anterior Local Infiltration = MX.A.L.I
Maxillary Posterior Local Infiltration = MX.P.L.I

4. Discussion

As a matter of fact, anxiety is one of the major issues in delivering dental treatment to children, and the injection is the most anxiety-provoking procedure for both children and adults [18, 19]. Moreover, the dentist also finds the administration of local anesthetic solution to children as anxiety-provoking task [20]. Furtherly, pain is defined as an unpleasant sensory and emotional experience arising from actual or potential tissue damage or described in terms of

such damage. Clinical pain is characterized by the presence of discomfort and abnormal sensitivity in the general context of patient symptomatology. In addition to the aforementioned facts, administration of local anesthetic via an intraoral injection is associated with acute pain symptoms as a result of the soft tissue injury caused by the needle stick [8-10].

The design of the present study was conducted in a double-blind manner; in which one investigator carried out the local anesthetic injection while another investigator carried out the evaluation. This technique rendered the obtained criteria and values within the actual records; as it became far away from any preferable tendencies evoked by the investigator.

All children completed the present study interestingly and without complaints of duration of visits. There were no encountered reports of adverse effects to be considered as potential side effects due to local injection per se and/or the anesthetic solution.

The effectiveness of some methods in reducing anxiety and pain inherent in dental procedures; namely; intraoral anesthetic injections; were not yet well documented. Among those methods which were used in the present study; are distraction and counterstimulation. Distraction is a tactic designed to divert a patient's attention away from their current behavior to focus their interest in something else. Counterstimulation is defined as a gentle vibration or stroking of the mucosa. Both methods were encountered by several investigators; where they considered them as adjunctive methods for injection pain relief in a contemporary pediatric dental practice setting [15 16, 19]. Moreover, others claimed that, there are only empirical comments regarding the efficacy of such methods [19-21]. The present study clarified also that, no gender, or ethnic characteristics were considered; and only those children in need of dental treatment under local anesthesia and met the inclusion criteria were selected.

Certainly pain is difficult if not impossible to quantify. Moreover, pain assessment is more difficult in children, since they usually have not developed the cognitive skills necessary for self-expression [9, 10, 13]. Hence, in the present study, sound eye-motor scale was used as the observational scale [14, 16]. Its use is justified since none of the existing observational scales are feasible for measuring pain in a dental situation. In the present study, convincing reliability with SEM scale was almost seen. Sounds and movements accompanied one another and rarely were desperate responses were seen. Moreover, children response to painful situations may not only be dependent on the pain experienced during the procedure but may also be influenced by many other factors; a finding which rendered the application of this scale to be almost difficult [18]. This could add to the previous statement that, pain is a personal psychological experience and an observer can play no legitimate part in its direct measurement [4, 6]. Furtherly, no prior instructions were avoid bias due to anticipated pain in the present study.

The present study revealed a maximum pain perception scores in the anterior segment of the maxilla, followed in descending order by the anterior segment of mandible, posterior segment of mandible and the posterior segment of maxilla. These findings are almost in accordance to those of other investigators; who stated also that maxillary injections of the anesthetic agent induced an apparent pain as compared to mandibular injections; whenever the injection site [17, 21]. The difference in pain perception among various sites of oral cavity could be attributed to the nature of tissue per se. Probably, the firmly attached tissue in the palatal and anterior regions of the maxilla and the pressure induced by injections, could explain the levels of pain feeling.

The present study showed that, inferior alveolar nerve block was accompanied by a more or less reasonable reaction; as compared to that of mandibular infiltration. This finding is in agreement with the results of other investigators [19, 21].

It could be concluded that, the anatomical location of intraoral injection rather than the injection technique determines the severity of pain perception and its subsequent reaction. It could be recommended also that, the use of both distraction and counterstimulation might be helpful and effective in reducing pain perception and reaction in pediatric dental patients.

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