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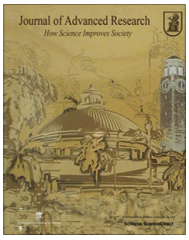

ORIGINAL ARTICLE

Comparative evaluation of passive, active, and passive-active distraction techniques on pain perception during local anesthesia administration in children

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ABSTRACT

Local anesthesia forms the backbone of pain control techniques and is necessary for a painless dental procedure. Nevertheless, administering a local anesthetic injection is among the most anxiety-provoking procedures to children. This study was performed to compare the efficacy of different distraction techniques (passive, active, and passive-active) on children's pain perception during local anesthesia administration. A total of 90 children aged four to nine years, requiring inferior alveolar nerve block for primary molar extraction, were included in this study and randomly divided into three groups according to the distraction technique employed during local anesthesia administration. Passive distraction group: the children were instructed to listen to a song on headphones; Active distraction group: the children were instructed to move their legs up and down alternatively; and Passive-active distraction group: this was a combination between both techniques. Pain perception during local anesthesia administration was evaluated by the Sounds, Eyes, and Motor (SEM) scale and Wong Baker FACES® Pain Rating Scale. There was an insignificant difference between the three groups for SEM scale and Wong Baker FACES Pain Rating Scale at $P = 0.743$ and $P = 0.112$ respectively. The examined distraction techniques showed comparable results in reducing pain perception during local anesthesia administration.

Introduction

Effective pain control during dental treatment of a pediatric patient is the cornerstone for successful behavior guidance [1]. Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage [2]. Prevention of pain can nurture the relationship between the dentist and the child, build trust, allay fear and anxiety, and enhance

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positive dental attitudes for future visits. However, the subjective nature of pain perception, and lack of use of accurate pain assessment scales may oppose successful pain management procedures [3].

Local anesthesia forms the backbone of pain control techniques and is necessary for a painless dental procedure. Nevertheless, administering a local anesthetic injection is among the most anxiety-provoking procedures to children [4]. Thus, several methods have been suggested to reduce pain caused by administration of local anesthetic agents, and these include application of topical analgesic, distraction techniques, counter irritation, warming the anesthetic agents, adjusting the rate of injection, and buffering the local anesthetic agent [5–7].

Distraction is a behavior management technique that successfully reduces pain and behavioral distress by diverting children's attention away from painful stimuli during invasive dental procedures. It is most effective when adapted to the developmental level of the child. Distraction appears to be safe and inexpensive; moreover, it can lead to the reduction in procedure duration, and the number of staff required for the procedure [8–10].

Distraction is divided into two main categories: passive distraction, which calls for the child to remain quiet while the dental health care professional is actively distracting him. Passive distraction includes watching videos, listening to music on headphones, reading a book to the child, or telling him a story. Active distraction, on the other hand, encourages the child's participation in the activities during the procedures. Active techniques include singing songs, squeeze balls, relaxation breathing, and playing with electronic devices [9,11].

Thus, this study was conducted to compare the efficacy of different distraction techniques (passive, active, and passive-active) on children's pain perception during local anesthesia administration.

Methodology

This study was carried out in Pediatric Dentistry and Dental Public Health Department, Faculty of Oral and Dental Medicine, Cairo University. *The ethical clearance for the study was obtained from the ethical committee of the institution. The parents were informed about the aim of the study and associated procedures. The written informed consents were obtained from the parents prior to the study.*

Sample size was estimated based on a previous study [12]. The minimum required sample size was calculated to be 87 (29 in each group) to be sufficient to detect effect size of $f = 0.432$, a power of 95%, and a significance level of 5%. Sample size estimation was done by PASS 2008 (Version 0.8.0.15, For Windows).

A total of 90 children aged four to nine years, requiring inferior alveolar nerve block for the purpose of mandibular primary molar extraction, and who had demonstrated "positive" to "definitely positive" behavior (Frankl 3 or 4), were included in this study, regardless their previous dental experiences.

The study sample was randomly divided into three equal groups 30 children each: Passive distraction group: the children were instructed to listen to the same song on headphones; Active distraction group: the children were instructed to move their legs up and down alternatively as a sort of playing a game together; and Passive-active distraction group: this was a combination between passive and active distraction (the children were instructed to listen to a song on headphones while moving their legs up and down alternatively). The distraction techniques were employed during the administration of local anesthesia.

The study was conducted by two pediatric dentists. One of them gave all explanations, spoke with the children and carried out the anesthesia procedure and the other was observing and assessing the children's pain perception.

Prior to inferior alveolar nerve block administration, topical anesthetic cream (PRILA 5% cream containing lidocaine 2.5%w/w and prilocaine 2.5%w/w, Middle East Pharmaceutical Industries Co. Ltd., Avalon Pharma, Riyadh-KSA, Saudi Arabia) was applied to the injection site approximately 30 s before the procedure. The technique used for administration of the anesthesia involved gradual injection of 1 mL of anesthetic agent Mepecaine-L (Mepivacaine 31.36 mg/1.8 mL and Levonordefrin 0.09 mg/1.8 mL, Alexandria Co., for Pharmaceuticals & Chemical Industries, Alexandria, Egypt) using a short needle (length: 32 mm, gauge: 27) over a period of one minute. Subsequently, extraction of the indicated primary molar was performed.

Pain perception during administration of local anesthesia was assessed by the Sounds, Eyes, and Motor (SEM) scale [13] and Wong Baker FACES Pain Rating Scale [14]. Sounds, Eyes, and Motor (SEM) scale shown in Table 1 was used to assess the observed pain. It is divided into two categories of comfort and discomfort. The discomfort response is further divided into three subscales: mild pain, moderate pain and severe pain.

Wong Baker FACES Pain Rating Scale is a self-reported pain scale, and consists of a number of faces ranging from happy to crying. The scale was explained and shown to the children then they were asked to point out the face which indicated the pain level they experienced during administration of local anesthesia as illustrated in Fig 1.

Statistical analysis

Data were statistically described in terms of mean, standard deviation (±SD), frequency (*n*) and Percentage (%) when appropriate. One way ANOVA was used to compare between tested groups on mean Age. A non-parametric Kruskal Wallis test was used to compare between tested groups for SEM Score and Face pain Score. Spearman's rho correlation between SEM Scale and Face pain Scale. Statistical analysis was performed with IBM® SPSS® (SPSS Inc., IBM Corporation, NY, USA) Statistics Version 22 for Windows.

Results

90 children were enrolled in this study with age range from four to nine years. The means of age in passive, active, and passive-active groups were 7.18 ± 1.94, 7.02 ± 2.2 and 7.65 ± 1.8 years, respectively. There was no significant difference in children's age among the three groups ($P = 0.444$).

SEM scale findings are presented in Table 2. Children in active distraction group exhibited the greatest percentage (60%) of comfort score, followed by passive-active distraction group (50%) while passive distraction group demonstrated the least percentage of comfort score (46.7%). However, there was