Effectiveness of New Distraction Technique on Pain Associated With Injection of Local Anesthesia for Children

Haytham F.A. El-Sharkawi, BDS, MSc · Azza A. El-Housseiny, BDS, MSc, PhD · Amal Mahmoud Aly, BDS, MSc, PhD

Abstract: Purpose: Distraction is one of the most commonly used techniques for control of pain associated with injection procedures. This study’s purpose was to evaluate the effect of a distraction technique using audiovisual (A/V) glasses on pain perception during administration of local anesthesia for children. Methods: Forty-eight healthy, cooperative 5- to 7-year-olds were selected on the basis of existence of bilateral carious primary mandibular molars, which necessitated an inferior alveolar nerve block anesthesia before treatment. Treatment was done on 2 visits 1 week apart. Children had been randomly assigned to receive the A/V glasses at one visit and no distraction during the other visit. Two different pain assessment scales were used: the pain faces scale (PFS) and the face, legs, activity, cry, and consolability scale (FLACC) scale. Kappa statistics were calculated for the reliability of the observer when using the FLACC scale. A comparison between the 2 study techniques was done using the Wilcoxon signed ranks test. Results: Kappa values ranged from 0.89 to 1.00. The pain scores in both scales were significantly lower when the A/V glasses were used. Conclusion: Distraction induced by audiovisual glasses was an effective way to reduce the pain associated with injection of local anesthesia. (Pediatr Dent 2012;34:142-5) Received June 8, 2010 / Last Revision August 5, 2010 / Accepted August 27, 2010

KEYWORDS: AUDIOVISUAL DISTRACTIONS, PAIN DISTRACTION, VIDEO GLASSES, LOCAL ANESTHESIA

One of the most important aspects of child behavior guidance is the control of pain. When children experience pain during restorative or surgical procedures, their future as dental patients may be damaged.1

Pain is a complex and multidimensional construct that involves sensory, emotional, and cognitive processes. These factors can modulate the experience of pain. Psychological techniques like distraction, cognitive reappraisal, preliminary information, behavioral modification, and hypnosis have been used for pain control.2

Distraction is defined as “a state of mind that draws the attention away from painful or unpleasant stimuli.”3 Distraction techniques tax the patient’s limited attention capacity, resulting in the withdrawal of attention away from the noxious stimulus.4,5 Perceived pain and unpleasantness could be modulated by many different types of distraction and attention.6 Evidence on the efficacy of distraction includes reduction in the activation of brain areas associated with pain,7 and reduction of the regional cerebral blood flow associated with the processing of a pain experience when distraction was used.8

Over a decade, distraction has been investigated and successfully applied in clinical practice to reduce pain associated with medical procedures. The beneficial effect of distraction has also been supported in a meta-analysis9 and systematic review.10 Furthermore, in a Cochrane Database review, Kislely 2006 studied psychosocial interventions for 2- to 19-year-olds undergoing needle procedures. Distraction had the largest effect among other psychosocial interventions in reducing pain intensity.11

Personal Eyewear Cinema IMV260 [Estar Display Tech Co, Ltd, Shenzhen, China; (Figure 1)] is a recent type of audiovisual (A/V) eyeglasses that can play high quality video on its virtual 50-inch-wide vision-of-view LCDs. The lightweight (100 g) device has 2 earphones that offer a high-quality audio output, a built-in memory card that can store up to 4 GB, a USB connection cable that is used to transfer video to the memory, and a rechargeable battery with a 2- to 3-hour duration.12

Few studies were found about the effectiveness of distraction techniques on child dental pain, especially pain during the injection of local anesthesia, which is a very important factor that dictates the success of the entire dental visit and subsequent visits. Thus, the purpose of the present study was to evaluate the effect of distraction using audiovisual glasses on pain perception of children during injection of local anesthesia.

Methods

The study procedure was approved by the Dental Research Ethics Committees of the Faculty of Dentistry, Alexandria University, and informed consent was obtained from each child’s parents/legal guardians. Sample size was estimated using the following assumptions: type I error=5%; type II error=20%; percent of subjects with pain in a group using A/V glasses=0%; and percent of subjects with pain in a group without A/V glasses=19%.13 The minimum required sample size was calculated to be 34 subjects.14 This number was increased to 42 to make up for cases that might be lost to follow-up (~20%). Thus, 48 healthy and cooperative 5- to 7-year-olds (23 males and 25 females)
were selected from those attending the pediatric dentistry clinic, Faculty of Dentistry, Alexandria University, Alexandria, Egypt. Six children (3 males and 3 females) did not complete the 2 sessions of treatment and had only 1 visit. The children were selected on the basis of existence of bilateral carious primary mandibular molars, which necessitated an inferior alveolar nerve block anesthesia before treatment. Children who had a history of unpleasant experiences in medical settings, experience with local anesthesia injection, and any mental, visual, or auditory impairment were excluded.

A split-mouth randomized, control clinical trial was conducted. Treatment was performed over 2 visits 1 week apart. Using the coin toss method, children were randomly assigned by the investigator to receive the distraction intervention (A/V glasses) at one visit, while the tell-show-do technique was used without distraction during the other visit.

The whole procedure and the self-reported pain faces scale (PFS) were explained to each child at the beginning of the study. Topical anesthesia gel containing benzocaine 20% (Ultradent Products, Inc, South Jordan, Utah) and a short fine gauge (0.4 x 25 mm [27 G], SH Care Life Dental Needles, Shanghai, China) needle was used for all injection procedures. Treatment visits were video recorded using a laptop computer with a built-in camera (Lenovo N200 0769-AM2, Lenovo Co, IBM, Beijing, China) and a Debut Video Capture software v 1.40 (NCH Software, Greenwood Village, Colo).

**Distraction intervention.** The A/V glasses (Figure 1) memory card was loaded with a collection of animated children’s movies. Then, the A/V glasses were adjusted to the child and powered on and the movie was played. Each child was taught how to use it, decrease or increase the volume, or change the movie according to his/her desire. Each child was given 5 minutes to get acclimated to the movie before the injection procedure began.

**Pain assessment.** Immediately following the injection procedure, the child was asked to rate his/her degree of pain using PFS. Each was asked to choose 1 of 6 cartoon faces that represented his/her distress level and feeling of pain in an ordered sequence from the least (0) to the most painful (5) after the meaning of each face was explained in comprehensible words. The face, legs, activity, cry, and consolability scale (FLACC) was used to assess each child’s pain behavior during the injection procedure (Table 1). The investigator conducted the assessment while playing back the video record of each visit. The rating of comfort or pain was judged through signs and motor reactions produced by the patient.

The level of response for each observation was given a numerical value rating from “0” to “2,” with “0” being the most comfortable with no pain and “2” being the most painful. Each of FLACC’s 5 categories—(F) face, (L) legs, (A) activity, (C) cry, and (C) consolability—was scored from “0” to “2,” which results in a total score between “0” and “10.” An assessment was performed at 2 different intervals, before application of a topical anesthetic was given and during the injection, for comparison. The investigator performed the assessment after training on the FLACC scale. Twenty video records were reassessed again after 1 week for intraexaminer reliability using Kappa test.

**Statistical analysis.** Descriptive statistics were calculated as means and standard deviations for quantitative variables and number and percent for qualitative variables. The Wilcoxon signed ranks test was used for comparison between the 2 study techniques (distraction/traditional), and the significance level was set at $P \leq 0.05$.

**Results**

The results of the present study include analysis of 84 inferior alveolar nerve block injection procedures for 42 children (20 males and 22 females). Half of these injection procedures were done using A/V glasses (42), and the other 42 were done using the traditional technique without distraction in a split-mouth design.

Kappa statistics values for the FLACC score applied on face, legs, activity, cry, and consolability were 1.00, 0.90, 1.00, 0.91, and 0.89, respectively, denoting excellent agreement for the 5 categories of the FLACC scale.

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Table 1. **THE FLACC SCALE (FACE, LEGS, ACTIVITY, CRY, AND CONSOLABILITY)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td><strong>Face</strong></td>
<td>No particular expression or smile</td>
</tr>
<tr>
<td><strong>Legs</strong></td>
<td>Normal position or relaxed</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Lying quietly, normal position moves easily</td>
</tr>
<tr>
<td><strong>Cry</strong></td>
<td>No cry (awake or asleep)</td>
</tr>
<tr>
<td><strong>Consolability</strong></td>
<td>Content, relaxed</td>
</tr>
</tbody>
</table>

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**Figure 1. Personal eyewear cinema (A/V glasses).**
Table 2. COMPARISON BETWEEN THE DISTRACTION AND TRADITIONAL TECHNIQUES ON USING THE FACES PAIN SCALE (FPS) AFTER INJECTION

<table>
<thead>
<tr>
<th>FPS scale scores after injection</th>
<th>Distraction N (%)</th>
<th>Traditional N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0=very happy, no pain</td>
<td>12 (29)</td>
<td>5 (12)</td>
</tr>
<tr>
<td>1=hurts just a little bit</td>
<td>16 (38)</td>
<td>7 (17)</td>
</tr>
<tr>
<td>2=hurts a little more</td>
<td>5 (12)</td>
<td>9 (21)</td>
</tr>
<tr>
<td>3=hurts even more</td>
<td>3 (7)</td>
<td>4 (10)</td>
</tr>
<tr>
<td>4=hurts a whole lot</td>
<td>3 (7)</td>
<td>6 (14)</td>
</tr>
<tr>
<td>5=hurts as much as you can imagine</td>
<td>3 (7)</td>
<td>11 (26)</td>
</tr>
</tbody>
</table>

Total no. of patients: 42 (100) vs 42 (100)

Median Wilcoxon signed ranks test: 3.66

P-value: <.001*

* Statistically significant at P=.05.

Table 3. COMPARISON BETWEEN THE DISTRACTION AND TRADITIONAL TECHNIQUES ON USING THE FLACC (FACE, LEGS, ACTIVITY, CRY, AND CONSOLABILITY) SCALE

<table>
<thead>
<tr>
<th>FLACC scale</th>
<th>Distraction Mean±(SD)</th>
<th>Traditional Mean±(SD)</th>
<th>Wilcoxon signed ranks test P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before topical injection</td>
<td>0.19±0.94</td>
<td>0.12±0.50</td>
<td>.11</td>
</tr>
<tr>
<td>Median</td>
<td>0</td>
<td>0</td>
<td>.91*</td>
</tr>
<tr>
<td>During injection</td>
<td>2.67±2.55</td>
<td>3.71±2.63</td>
<td>2.40</td>
</tr>
<tr>
<td>Median</td>
<td>2</td>
<td>3.5</td>
<td>.02†</td>
</tr>
</tbody>
</table>

* Not statistically significant; P>.05.
† Statistically significant at P=.05.

There was a statistically significant difference between the distraction technique and the traditional technique in both scales (P<.001 and P=.02 for FPS after and during injection, respectively). The pain scores for both the self-report and the observational pain scales were significantly lower when the distraction intervention was used vs the traditional technique (Tables 2 and 3).

Discussion

The percentage of subjects who hurt a lot or more in the group with distraction and in the traditional group was approximately 14% and 41%, respectively. The study power for these figures was 80% which is within the acceptable limits. Previous studies on modulation of anxiety, pain, and unpleasantness have documented a positive effect of Audiovisual (A/V) video glasses on perceived pain and unpleasantness.

The results of the present study showed that children in the distraction group had lower pain scores than those in the nondistraction group. It appears that the attention of the children had been successfully occupied by the video presented on the A/V glasses.

The findings of the present study agree with the findings of Aminabadi et al., who studied the efficacy of distraction and counter stimulation in the reduction of pain during the administration of local anesthetics. They found that children in the distraction group exhibited significantly less pain vs the control group. This agreement may be attributed to the similarity in the age group of the children and the pain stimulus, which was injection of local anesthesia.

Additionally, there was an agreement with the findings of Frère et al., who investigated the effect of A/V eyeglasses distraction on pain and anxiety during dental prophylaxis in adult patients and found that less anxiety and discomfort were reported when using the A/V eyeglasses.

According to Cassidy et al., watching cartoons on TV did not distract children during needlejection or reduce their pain. The possible reason may be that children were concentrated on the surrounding environment, not the TV, while in the present study they were isolated from the surrounding environment by the A/V glasses and the video presented in the glasses was more impressive than that presented on regular TV.

Conclusion

Based on this study's results, we conclude:

1. Distraction induced by audiovisual (A/V) glasses significantly reduces pain associated with injection of local anesthesia.

References


