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Dental Anxiety and Pain Perception related the Appearance of Dental Injectors: A Randomized Clinical Trial

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Abstract

In clinical issues, the syringe's appearance always influences the level of anxiety. This study aims to evaluate the effect of a cartoon syringe on reducing the pain and dental anxiety in children. In the cross-over clinical trial, two groups with twenty-set each of cooperative healthy children aged 6-8 years were tested with two treatment sessions. At the beginning of appointments and following the display of the relevant syringe (metal or cartoon), the child's dental anxiety was assessed by Children's Fear Survey Schedule-Dental Subscale (CFSS-DS), Venham Picture Test (VPT) and Facial Image Scale (FIS). A score of pain was evaluated by Face Scale at the end of injection. Statistical analysis of data was done using the T-test and paired T-test. Only based on FIS, a lower level of dental anxiety was shown by cartoon syringe comparing with metal injector significantly. We failed to found the pain perception associated with any type of syringe while it was increased by elevating the anxiety level. Within the study limitation, it seems the cartoon syringe might relatively effective in reducing the dental anxiety. Although the pain perception was not affected by different types of syringes, it was directly associated with anxiety level.

Introduction:

Pain is defined as an emotional and subjective experience that may or may not have resulted from tissue damage which is considerably dependent on cognitive abilities (Casamassimo et al., 2013). Whereas Dental anxiety is defined as the feeling of worry concerning the anticipation of the threatening dental situations, considered a multifactorial phenomenon (Klinberg & Broberg 2007). Personal factors such as age, temperament, psychological problems, and coping ability accompanied with family and social factors on the one hand, and dental factors such as painful treatment or unsafe or unsightly practice on the other, influence the child's dental anxiety level (Klinberg & Broberg 2007; Casamassimo et al., 2013).

Both dental anxiety and pain are two critical factors influencing a child's cooperation with dentist (Klinberg & Broberg, 2007; Casamassimo et al., 2013). The psychologists found that the pain perception may increase in stressful conditions. On the other hand, history of painful medical or dental procedures leads to dental anxiety (Bonjar, 2011). Thus, the attempt should be made to

control the child's anxiety and pain in order to gain cooperation and more effective treatment (Bonjar 2011).

Injection of local anaesthetic and importantly syringe appearance seems to be one of the basic factors arising dental anxiety (Ksucu & Akyuz 2006). Several studies were conducted to compare different injection systems such as the computer controlled anesthesia delivery system (WAND technique) and conventional method (Gibson et al., 1999; Palm et al., 2004; Sumer et al., 2006) but the impact of syringe's appearance on reducing anxiety has not been studied much. The stated study was done to evaluate and compare the effect of conventional metal injectors and cartoon-looking syringe on the level of anxiety and pain.

Methodology:

This cross-over controlled clinical trial was conducted on 40 cooperative healthy children aged 6-8 years (20 girls, 20 boys) attending to Babol Dental School (north of Iran) in summer of 2009. The sample size was considered based on a previously published study (Ksucu & Akyuz 2006) and

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convenience sampling method was used for selection of patients regarding the inclusion and exclusion criteria. The patients with at least two decayed upper primary first molars which needed pulpotomy and stainless steel crown was included in this study. No remarkable disability was found in their medical histories and they were not previously under local anaesthesia. Patients with systemic diseases, mental or psychological disorders and who suffered from acute pain were excluded from this study. The study protocol was approved by Ethic Committee of Babol University of Medical Sciences (Ethics code number: 2865) and the written informed consents were obtained from parents. Figure-1 illustrates the Consort flowchart of this project (Fig.-1).

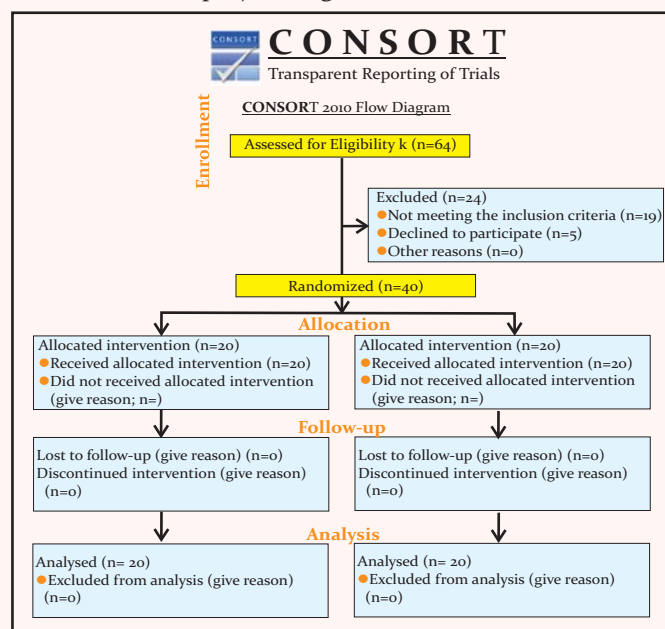


Figure1: The Consort flowchart

Children were visited by a pedodontist within three stages on seven days intervals. In the first session, after recording the child's medical and dental histories, fluoride therapy was done. This stage was considered to familiarize the child with a dentist and dental practice. The participants were then randomly divided into two groups. The girls and the boys separately selected a number card from 1 to 20 randomly. Children who choose 1 to 10 were considered as group A and who selected 11 to 20 were placed in group B. Children in Group A received cartoon and metal injectors in the second and third visits respectively. Nevertheless, children in Group B were anaesthetized by metal and custom made cartoon syringes in the second and third sessions respectively. At the initial stage of the second and third appointments, following display the relevant syringe without needle, children were asked to answer the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS), Venham Picture Test (VPT) and Facial Image Scale (FIS) to assess the anxiety level,

while the examiner told them the instrument would be applied to sleep their teeth. In all cases, after applying the topical anesthetic cream for 20 seconds (Benzocaine 20%, Dentonics Inc.,USA), buccal infiltration of 1.5 ml of 2% Lidocaine with Epinephrine 1:100,000 (Daroopaksh, Iran) was performed by the 27-gauge short needle (12 mm) out of child's vision for 1 minute. Finally, the level of pain was evaluated by Face Scale at the end of injection.

Data collection was done based on the psychometric tests as follow:

Children's Fear Survey Schedule-Dental Subscale (CFSS-DS): this test includes 15 five-choice questions arranged from a score of "1" to "5" with choice ranges from "unconcerned" to "very concerned". The total score ranges from "15" to "75". Scores of "32-35" indicate moderate anxiety and score of "39" or more reveals high fear/anxiety. In this study, children with less than "32" score were placed in a non-distressed group, while those whose score was above "32" were considered the anxious group (Ksucu & Akyuz, 2006). The reliability and validity of this test were reported 0.74 and 0.85 respectively (Arapostathis, Coolidge *et al.*, 2008).

Facial Image Scale (FIS): this scale is the self-reported measures to evaluate the anxiety level including five schematic faces that reflect very happy to very sad. The scores are between "1" (very sad) to "5" (very happy) (Ksucu & Akyuz 2006). There was a strong relationship between this scale and Venham Picture Test ($r=0.7$) indicating a good validity for FIS (Buchanan & Niven, 2002). Figure-2 displays schematic faces of Facial Image Scale.



Figure 2: Schematic faces of Facial Image Scale

Venham Picture Test (VPT): this is a self-reported measure for determination of anxiety level including eight picture cards with two images of non-distressed and distressed faces on each. These cards were shown one by one to children and they were asked to select the image which reflects their feelings better. The anxiety score was recorded "1" or "0" by selecting the distressed or non-distressed faces respectively. The total score ranged from 0 to 8 (Ksucu & Akyuz, 2006). The high reliability (0.7) and moderate validity (0.5) were reported for this test (Javadi *et al.*, 2014). Figure 3 indicates the picture cards of Venham Picture Test. Overall, considering the results of anxiety tests, the children were classified into two groups of non-distressed and distressed. Based on Ksucu & Akyuz (2006)'s study, the patient with scores higher than average in two tests of three was considered distressed, the patient with scores higher than average in two tests of three was considered distressed.



Figure 3: Picture cards of Venham Picture Test

Face Scale: this scale is one of the self-reported methods commonly used for children to assess the pain. The test is arranged into five schematic faces including very happy (score of "0") to very sad (score of "5"). The reliability and validity were reported high (0.7 and 0.6 respectively) (Cohen *et al.*, 2008). Schematic faces of Face scale illustrated in Fig- 4.



Figure 4: Schematic faces of Face Scale

Data were analyzed by statistical software SPSS (version 18) and T-test and paired sample T-test. The significance level was considered at $p < 0.05$.

Results:

Among forty children who participated in this study, 20 patients (50%) were female and 20 (50%) were male. Children in two groups were matched with respect to age and gender. Table1 illustrated the distribution of anxious and relaxed children in second and third visits (Table1).

Only based on FIS, children experienced less anxiety by cartoon syringe comparing with metal injector significantly ($p < 0.003$). There was no significant difference between the pain scores reported by two types of syringes ($p < 0.9$). Table2 indicates the mean values of pain and anxiety scores in children by receiving the

cartoon syringe or conventional metal syringe based on various psychometric tests (Table2).

The mean (SD) score of pain for relaxed and anxious children according to Face scale was 0.94 ± 3 and 1.11 ± 2.22 respectively ($p < 0.04$). Also, the level of pain reported by girls was significantly higher than boys (1.01 ± 2.83 vs. 2.20 ± 1.13 , $p < 0.03$). According to FIS, CFSS-DS and VPT, the mean (SD) anxiety level in females were respectively, 1.34 ± 3.13 , 4.63 ± 27.33 and 1.62 ± 4.65 . The level of anxiety based on FIS, CFSS-DS and VPT for males were calculated 1.30 ± 2.33 , 3.57 ± 22.53 and 1.23 ± 2.389 , respectively. A higher anxiety value was found in girls compared with boys only based on FIS and CFSS-DS ($p < 0.03$ and $p < 0.01$, respectively).

Table:-1: Number of anxious and relaxed children in term of gender and type of injector

Injector	Sex	Second visit (n)		Third visit (n)	
		anxious	relaxed	anxious	relaxed
CMS ¹	F	7	3	6	4
	M	10	0	9	1
C-IDS ²	F	0	10	1	9
	M	0	10	0	10

Table:-2: : Pain and anxiety scores with the conventional and cartoon syringes

Injector	N	FIS	VPT	CFSS-DS	Facescale
CMS ¹	40	1.29 ± 3.57	1.50 ± 2.70	4.28 ± 23.13	1.11 ± 2.88
C-IDS ²	40	0.82 ± 1.88	1.78 ± 4.33	4.59 ± 26.72	1.00 ± 2.15
P-value		*0.003	0.18	0.44	0.9

CMS- Conventional metal syringe;

²C-IDS- Cartoon-looking dental syringe. F- Female; M- Male.

Discussion:

In the current study, the impact of dental syringe's appearance on the level of anxiety and pain in forty children aged 6-8 years was assessed. Although the level of anxiety by receiving the cartoon syringe was significantly less than what was reported by conventional metal injector based on FIS, this outcome was not reached by the other psychometric tests used in this study. Additionally, the same pain perception was recorded by using different types of syringes. However, Kuscu & Akyuz (2006) concluded that the syringe's appearance plays an important role in the child's preference, particularly in the anxious patients. In contrast, the present study failed to demonstrate the effect of cartoon syringe in reducing the anxiety and pain. A lower level of pain and anxiety based on Visual Analogue Scale (VAS) was also found by using the WAND technique, compared with the conventional injection method (Gibson *et al.* 1999; Palm *et al.* 2004; Sumer *et al.* 2006). In the present study, the average score of pain in distressed participants was significantly higher than non-distressed patients ($p < 0.04$). In other words, anxious children felt more pain than relaxed children. In

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agreement with the current results, Okawa et al. (2011) and Sanicop et al. (2011) concluded that by increasing the level of anxiety may enhance reported pain score based on VAS. However, following to VAS, in the study by Campbell & Lewis (1990) no association was found between anxiety and pain levels. Perhaps, this discrepancy justified considering the differences in age limit, various tests and cultural diversities. A higher level of anxiety and pain was reported by girls ($p=0.03$ for pain based on Face scale, $p<0.03$ and $p<0.01$, for anxiety, based on FIS and CFSS-DS, respectively). Altemus and co-workers had also concluded that the level of anxiety in females was higher than males regarding physiological characterizations and some systemic factors (Altemus, 2006). In contrast, Gustafsson et al. (2007) and Klassen et al. (2007) reported no significant difference between anxiety level of girls compared with boys based on CFSS-DS. This diversity may be due to the applications of the different methods of assessment and different under-studied age groups. A limitation of the present study was the small sample size with a limited age range of 6-8 years old. So, further studies with a larger sample size and in a wider age range are recommended by the authors and comparing with the other injection systems.

Conclusively, based on FIS though the appearance of cartoon injectors was relatively effective in reducing the anxiety level of 6-8-year-old children, this finding was not confirmed by CFSS-DS and VPT. The pain perception was not affected by different types of syringes, but it was directly associated with the anxiety level.

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