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Original Research Article

Comparison and evaluation of efficacy of olfactory and taste distraction in managing anxious pediatric patients during radiovisiography

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ABSTRACT

Introduction: Due to dental anxiety & fear, young children tend to be more anxious even at the times of basic clinical examination and investigative procedures such as taking IOPAs, however, with the advent of RVGs, taking X-rays have become less cumbersome.
Aim: A study was planned for comparison and evaluation of olfactory distraction utilizing aromatherapy, taste distraction and conventional method (Tell-Show-Do) in managing fearful children aged 4-7 years during radiovisiography (RVG).
Materials and Methods: A total of 45 children (4-7 years old) were included and 3 groups (15 each) were formed and radiographs were taken with the help of RVG (radiovisigraphy) under aromatherapy, with taste distraction and using control- Tell Show Do technique. Pre- and Post- anxiety scores were measured using physiological measures- pulse and respiratory rate, oxygen saturation and Venham's picture test. Statistical Package for Social Sciences (SPSS) version 21, IBM Inc, was used for statistical analysis.
Results: Both the test groups (aromatherapy and taste distraction group) when compared with control group, exhibited noteworthy post-treatment variation in anxiety level scores. No statistical significance was seen amongst taste distraction and aromatherapy group, although aromatherapy exhibited superior results in comparison to taste distraction.
Conclusion: Both taste distraction using lollipop/candy and aromatherapy employing lavender essential oil are efficacious in management of anxiety among children, however aromatherapy unveils a better result in comparison. To conclude, a combination or individual use of less invasive techniques may be executed effectively in handling pediatric dental patients.

1. Introduction

Dental fear and anxiety are one of the foremost problems in young children visiting a dental clinic are regarded as hindrances in offering superior dental care. It is defined as "an abnormal fear or dread of visiting the dentist for preventive care or therapy and unwarranted anxiety over dental procedures".[1] Increased caries level have been linked to dental anxiety and behaviour management problems in children.[2]

In pediatric dental setup, the varied anxiety provocation factors found are like that of the sound of a drill, sight of injection, smell of cut dentin and those of some pungent smelling medicaments like eugenol, and vibration associated with drilling instruments. On a child's first dental visit, besides, clinical examination, taking radiographs may pose a challenge to a pediatric dentist. However, use of dental radiographs, or x-rays in pediatric patients play a vital role for the purpose of diagnosis and treatment planning. They offer a more comprehensive look at the overall child's

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oral health by detection or determination of any pulpal disease or any dental decay which cannot be seen with naked eyes, and space evaluation for erupting teeth.

Nevertheless, conventional X-rays with bulkier machines and comparatively higher radiation exposure have shown to cause apprehensions in children during first dental visit. Therefore, application of RVG has potentially reduced the exposure, but still has not been completely able to make children stress-free and fully cooperative.

Digital radiography- RVG (Radiovisiography) is the newest form of radiography, producing a very minimal amount of radiation and is thus considered the safest type of radiography replacing film cameras with the digital ones.

Dental fear and anxiety in young children make difficult for the clinician to make radiograph. Thus, modifying the approach of taking RVG might enable the clinician to make the child feel less stressful while taking radiograph. Stress free radiographic examination may further aid in alleviating anxiety of young children making them more cooperative for further invasive procedures. Various non-invasive distraction techniques such as audio-visual, visual distraction using aromatherapy are being opted by the clinicians these days.

Non invasive techniques such as taste distraction and aromatherapy can be used with anxious pediatric patients while taking x rays with RVG. These techniques which include taste a lollipop and experiencing a pleasant aroma during the dental procedure have been used successfully in medical setting and on adult dental patients. Therefore, it is thought that such techniques might be beneficial in managing anxious children.

2. Materials and Methods

2.1. Study design

The present study was designed as an in vivo experimental study. It included a total sample of 45 children aged 4-7 years who reported to the Department of Pedodontics and Preventive Dentistry, Sudha Rustagi College of Dental Sciences and Research, Faridabad, Haryana. Written and verbal informed Parental consent was taken for every participant where parents were explained about the procedure and importance of the study. The study protocol was approved by the institutional ethical committee (Ref no: SRCDSR/ACAD/2022/10828).

2.2. Inclusion criteria

Children between the age 4-7 years who required RVG to aid in any treatment procedure.

Children with Frankel's definitely negative, negative and positive behavior with no previous dental treatment experience.

Those who gave consent for the study.

2.3. Exclusion criteria

Any medically and physically compromised children.

Children who did not require RVG in any treatment procedure.

Those who did not give consent for the study.

2.4. Methods

In total, 45 children were randomly selected and distributed into three groups by computer generator random numbers by the investigator. Group A was the Conventional Radiography (Tell-Show-Do) group (N=15), Group B was the Taste Distraction group via the lollipop/candy method (N=15) and Group C was the Olfactory Distraction method via aromatherapy with lavender essential oil using the Electric Aroma Diffuser (N=15).

2.5. Evaluation method

For every child in all the three groups, pre and post physiological measures like "pulse rate and oxygen saturation" were made to record with a pulse oximeter, whereas manual recording of respiratory rate was done. Venham's picture test (Figure 1) was employed in assessing anxiety levels of child patient where the patient was asked to point out the images that how he/she felt at that moment, pre and post operatively. All the 8 cards of emotions with 2 figures on each card - one "anxious" and other "non-anxious" were shown to each child one by one. The score for "anxious" child was given 1 while "non-anxious" was given 0. At the end the score was totalled for the "anxious" child figures chosen by the child (minimum score is 0 and maximum score is 8), pre and post operatively. In the Group A (Figure 4) that is the conventional/control group, the child was made to get seated and was explained about the procedure with the help of Tell show do technique. In Group B (Figure 3) the taste distraction was done using the lollipop method which involved a lollipop to be attached to the sensor of RVG on the lingual/palatal side and was also given to the child to taste. The flavour of the lollipop for all the age groups was same. After the assessment of anxiety, the child was made to rinse their mouth with a mouthwash. In Group C (Figure 2) olfactory distraction via aromatherapy was done using an electric aroma diffuser with lavender essential oil for all the ages in this group.

Children were not be kept waiting for long and the appointment was kept as short as possible. While taking RVG's, only the child was allowed in the operatory and the parents were requested to stay outside. Pediatric sensor covered with disposable plastic sleeves was used for all the children.

2.6. Pre-validation

A sample of 5 children in each of the three groups were selected and pre-tested to evaluate the clarity of experimental design, accuracy of pulse oximeter recording and the most acceptable flavour of lollipop and fragrance of aromatic oils. The most preferred flavour was strawberry and lavender oil was the most acceptable aromatic oil.

2.7. Statistical analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 21, IBM Inc. Descriptive data was reported for each variable. Summarized data was presented using Tables and Graphs. Data was not normally distributed as tested using Shapiro wilk test ($p<0.05$): Venham's picture. Hence non parametric test, Krusal wallis was used for comparison of two or more groups. Pair wise comparison was done suing mann whitney u Test for two independent groups and Wilcoxon paired T test was used for two dependent groups (pre and post). For other variables:PR, RR, OS, parametric test were used. A level of $p<0.05$ was considered statistically significant.

3. Results

The current research was conducted as an in vivo experimental study with a total sample size was 45. Significant difference in median anxiety levels before and after treatment was found in both test groups when compared to control group during Venham's picture test, that is scores among the control group (Tell-Show-Do) subjects being non-significant (Table - a, b, c).

Also, Table 1 – a, b, c shows pre and post radiographic anxiety in group A, B and C. It was seen that in all the three groups the post radiographic anxiety was lower as compared to the pre radiographic anxiety ($p<0.05$). Also, the reduction in anxiety in group B and C was statistically significant ($p<0.05$) while in group A pertaining to Venham's picture test it was non-significant ($p=0.317$). The aromatherapy distraction group depicted a decrease in mean pulse and respiratory rate with higher levels of oxygen saturation post RVG in comparison to taste distraction and control group. Reduce mean pulse and respiratory rate was present in taste distraction with increased oxygen saturation levels post RVG. However, the change was insignificant compared to the aromatherapy distraction group, whereas control group exhibited increased mean pulse and respiratory rate, together with reduced oxygen saturation levels post treatment.

(a) represents change in pre and post treatment anxiety scores with respect to VPT in all three groups. When compared, control group (A-Tell-Show-Do) with Taste Distraction group and Aromatherapy group, the mean values were significant ($p=0.001$) whereas the p value was insignificant ($p=0.409$) when pre and post treatment anxiety levels were measured on VPT scale in Taste distraction and Aromatherapy group respectively.

(b) showed change in pre and post treatment anxiety scores with respect to vitals (pulse rate, respiratory rate & O_2 saturation) among the three groups. Significant changes were seen in both the test groups in comparison with control group ($p=0.001$) whereas non-significant results were found in between the two test groups ($p=0.522$)

3.1. Intra group comparison (Tables 1, 2 and 3)

Table 1 shows Pre- and post-treatment pulse rate, respiratory rate, and oxygen saturation (mean ± SD) for the conventional Tell Show Do group;

Table 2 shows Pre- and post-treatment pulse rate, respiratory rate, and oxygen saturation (mean ± SD) for the Taste distraction group

Table 3 shows Pre- and post-treatment pulse rate, respiratory rate, and oxygen saturation (mean ± SD) for the Aromatherapy distraction group

3.2. Intergroup comparison (Tables 4 and 5)

Table 4 shows Comparison of Change in pre-treatment andposttreatment anxiety scores among the three groups with respect to Venham's picture test

Table 5 shows Comparison of Change in pre-treatment and post treatment anxiety scores with respect to pulse rate, respiratory rate, and oxygen saturation among three groups

4. Discussion

Radiographic examination forms a fundamental part of clinical dentistry. Dental radiology involves various forms of radiographs necessary on the patients in order to evaluate any underlying pathology. One of the most common forms of investigation in dental radiology is Conventional Intra oral periapical radiograph (IOPAR). In adjunct to clinical evaluation, IOPAR's enable the clinician to establish diagnosis and thus offer a better treatment plan. Besides, compromised radiographic results due to multiples variables viz. poor fixation, under/over developing, inappropriate exposure etc can influence the diagnosis along with the treatment protocol which requires to be followed. Thus, this enables the necessity for adequate interpretation of radiographs.

However, to overcome these shortcomings, in the last few years, Digital radiography has set in and has also replaced the large conventional radiology settings and eradicated the discomfort caused by placement of the large film and due to these advantages use of Radiovisiography (RVG) has gained popularity among dental practitioners.

However, the placement of intraoral sensor (which mimics the IOPA film) during RVG procedure cannot be endured by many people particularly children. This can lead

Table 1: Pre- and post-treatment pulse rate, respiratory rate, and oxygen saturation (mean ± SD) with respect to three group; a): For group A (Tell-Show-Do group)

		Venham's picture [a]		Pulse rate [b]		Respiratory rate [b]		Oxygen saturation [b]	
	N	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Pre	15	2.400	1.0556	105.400	4.6874	21.333	2.1602	97.067	1.7099
Post	15	2.467	1.0601	106.733	4.3665	23.400	2.2297	96.000	1.5584
pvalue		0.317,ns		0.001*, Sig		0.001*, Sig		0.001*, Sig	

[a] Wilcoxon paired t test
[b] pairedt test
level of significance set at p < 0.05, *statisticallysignificant

Table 2: For group B (Taste Distraction group

		Venham's picture [a]		pulse rate [b]		respiratory rate [b]		oxygen saturation [b]	
	N	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
pre	15	2.533	1.0601	105.533	4.2740	22.333	2.6095	97.133	1.5523
post	15	1.400	.7368	101.000	4.1748	19.600	2.2615	98.800	1.3202
pvalue		0.002*, Sig		0.001*, Sig		0.001*, Sig		0.001*, Sig	

[a] Wilcoxon paired t test
[b] pairedt test
level of significance set at p < 0.05, *statisticallysignificant

Table 3: For group C (Aromatherapy Distraction group

		Venham's picture [a]		Pulse rate [b]		Respiratory rate [b]		Oxygen saturation [b]	
	N	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Pre	15	2.467	1.0601	105.667	3.8110	22.667	2.8452	97.400	1.1212
Post	15	.800	.7746	95.667	7.2768	16.333	2.0931	99.800	.4140
pvalue		0.001*, Sig		0.001*, Sig		0.001*, Sig		0.001*, Sig	

[a] Wilcoxon paired t test
[b] paired t test
level of significance set at p < 0.05,*statistically significant

Table 4:

		Venham's picture test	
	N	Mean	Std. Deviation
Group A	15	.067	.2582
Group B	15	-1.133	.7432
Group C	15	-1.667	1.0465
p[c] value		0.001*, Sig	
p[d] value	group A & group B	0.001*, sig	
	group A & group C	0.001*, sig	
	group B & group C	0.409,ns	

Kruskal wallis test[c],
Pair wise: Mann whitney U test[d]
level of significance set at p < 0.05,*statistically significant

Table 5:

		Pulse rate		Respiratory rate		Oxygen saturation	
	N	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Group A	15	1.333	.7237	2.067	1.7099	-1.067	.7037
Group B	15	-4.533	3.3352	-2.733	.7988	1.667	1.1751
Group C	15	-10.000	6.2221	-6.333	2.0237	2.400	1.0556
p^e value		0.001*, Sig		0.001*, Sig		0.001*, Sig	
posthoc	group A & group B	0.018*, sig		0.001*, sig		0.001*, sig	
	group A & group C	0.001*, sig		0.001*, sig		0.001*, sig	
	group B & group C	0.001*, sig		0.001*, sig		0.522,ns	

One way anova^e ,
Post hoc tukey test
level of significance set at $p < 0.05$, *statistically significant

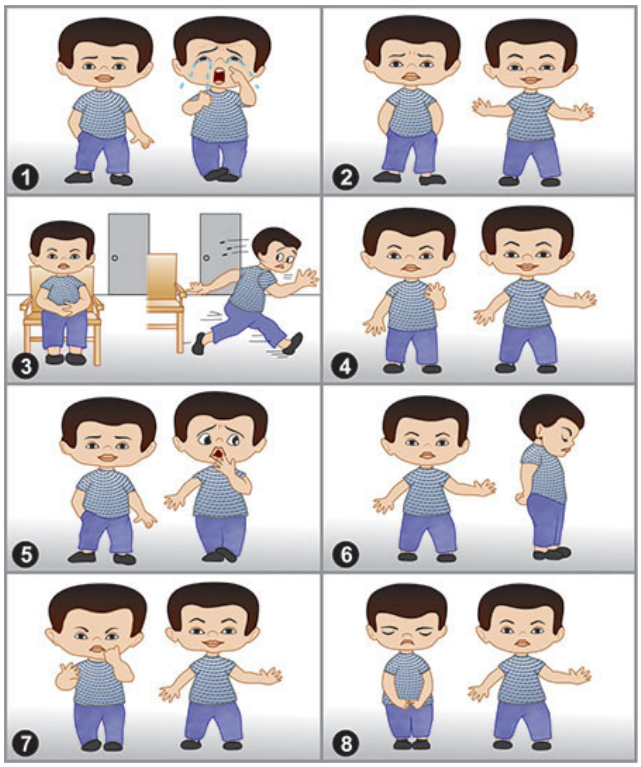

Fig. 1: Venham's picture test for assessing child's anxiety

Fig. 2: Aromatherapy distraction group

Fig. 3: Taste distraction group

to dental anxiety in pediatric patients. In general, dental anxiety presents as a routine problem among pediatric patients. Children can encounter two types of anxiety, on one hand is to specific dental stimuli (e.g. needle, drill, radiograph machine) and on the other hand is inclusive generalised anxiety.

Ivana Meyer Prado et al. (2019)[3] conducted a systematic review on several distraction techniques (audio, audio-visual, camouflaging instruments, biofeedback, toys etc) and concluded that the distraction techniques can prove being efficacious in management of dental fear and anxiety in the course of dental treatment protocols among pediatric patients as well as adolescents.

The present study set side by side two non-invasive distraction techniques, namely, aromatherapy and taste distraction were compared in pediatric dental patients

Fig. 4: Implementation of conventional method- Tell-Show-Do prior to radiovisiography

with those of the Tell-Show-Do group for alleviating dental anxiety. The efficacy of above mentioned techniques was evaluated employing two intuitive measures being Venham's picture test along with FIS, in conjunction with pulse rate, respiratory rate and levels of oxygen saturation being the three objective measures.

Our study evaluated the outcomes of aromatherapy utilizing lavender essential oil as a proposed plan of action for management of anxiety among pediatric dental patients who reported for their primary dental visit. Pediatric patients falling under 4-7 years age group and undergoing their first dental visit were evaluated as it might possibly predispose to producing substantial anxiety in comparison to successive visits. Chhabra N et al.,[4] proposed that in this age group the prevalence of dental anxiety is 6.3% in this age group.

In our present study, aromatherapy was established to be significantly efficacious in reduction of anxiety levels of pediatric dental patients as compared to the other two groups, which was in partial accordance with outcomes of study performed by Jeswin J et al (2021)[5], where when aromatherapy group was compared with music distraction group, the post-operative levels were unable to bring in statistical significance, although better outcome was exhibited by music distraction group with comparably additional reduction in pulse rate as well as respiratory rate levels with scarce raise in oxygen saturation levels. Reduction in anxiety levels in aromatherapy distraction group were in agreement with the studies conducted by Lehrner et al.,[6] Kritsidima et al.[7] although Lehrner et al.[6] reported an increased calmness level among elder patients, while they waited for dental treatment, especially when women were exposed to orange odour. Kritsidima et al.[7] reported that smell of lavender oil helps in anxiety reduction among dental patients, although subsequent visits were found to be unaffected. Interactivity of scented essential oil with a patient's parasympathetic nervous system has come out to be the probable cause in pulse rate reduction for modulation of anxiety.[8] Also, Maybodi FR et al (2018)[9] in their study when investigated the effect of music and lavender's aroma on blood pressure, heart rate and anxiety during periodontal surgery, found that in the control and music groups, anxiety levels didn't change significantly but in the aroma therapy group, anxiety had a significant decrease. The outcomes of the present study were in agreement with a study conducted by Radhalakshmi J et al (2018)[10] where the author when assessed efficacy of lemongrass essential oil in reducing child's anxiety, exhibited significant reduction in anxiety scores.

Our results were in partial corroboration with the study conducted by Parimala Tyagi et al (2022),[11] where the authors compared visual distraction and taste distraction with the conventional Tell Show Do while taking RVG and the results showed that visual distraction group revealed higher mean anxiety reduction and these results were also consistent with another study done by S. Ghadimi et al.,[12] where when author compared the visual distraction technique with the conventional tell show do technique, it was observed that there was additional anxiety reduction in the visual distraction group than in the conventional technique.

There is no literature available comparing the taste distraction and olfactory distraction technique while making an intraoral periapical radiograph in children. Thus, we performed this study and found that both the distraction techniques were found to be very effective in relation to handling patients with olfactory distraction being better than taste distraction technique.

In conclusion we can say that distraction techniques are collectively beneficial when used aptly for children, families, and healthcare professionals. Amongst the conservatively available distraction techniques, such as taste and aromatherapy distraction technique, provide an encouraging environment and make the procedures less stressful and more satisfying. From our study, we can suggest aromatherapy distraction technique with the use of essential oil is better than the other two groups to aid in intraoral periapical radiograph in children.

5. Conflict of Interest

The authors declare no potential conflicts of interest with respect to research, authorship and/or publication of this article.

6. Source of Funding

None.

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