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Effect of Audio-Visual Distraction Technique on Salivary Biomarkers and Vital Signs of Preschool Children

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Abstract

Background: Anxiety may influence dental treatment unfavourably; various methods to overcome the anxiety have been developed in which distraction technique is among it. Distraction technique tax the patient's limited attention capacity, resulting in the withdrawal of attention away from the noxious stimulus. Perceived pain and unpleasantness could be modulated by many different types of distraction.

Aim: This study is aimed to evaluate and correlate the levels of cortisol and alpha-amylase, vital signs and behaviour of children during their first dental visit who receive audio visual distraction technique and in children who do not receive it.

Materials and methods: study sample consist of 20 children aged between 3 to 6 years, with first dental appointment, among which one group received audiovisual distraction technique. In order to analyse the salivary components, i.e. Level of salivary amylase and salivary cortisol, samples of non-stimulated saliva were

collected at before, immediately after the dental procedure, and also blood pressure and heart rate were recorded.

Results: This study showed that there is significant reduction in anxiety measuring parameters in experimental group which receives audiovisual distraction technique.

Key words: salivary biomarkers, first dental visit, audio visual distraction, vital signs

Introduction

During childhood, dental procedures and the dental operatory settings may be sources of anxiety and stress which may interfere with the behaviour of children,⁽¹⁾ and can create an obstacle in dental care.⁽²⁾

Various methods of behavioral interventions have been investigated reduce children's distress during intrusive dental treatment. These interventions have obtained to decrease anxious and disruptive behavior and also teach children more adaptive behavior through provision of information.³

For over a decade, distraction has been investigated and successfully applied in clinical practice to reduce pain associated with medical procedures^(4,5,6) distraction techniques charge the patient's limited attention, which results in the withdrawal of attention away from the noxious stimulus. Although the precise mechanism of distraction is not yet well understood^(7,8), cognitive-affective attention models⁽⁹⁾ may explain this phenomenon. Anxiety may interfere with dental treatment unfavorably; thus, to identify its occurrence and search for solutions to reduce its negative effects, evaluation of psychophysiological reactions is needed. Several methods are available and have been increasingly perfected to contribute more effectively to the physiological (objective measures) and the behavioural analysis, relating hormone, cognitive and emotional processes⁽¹⁰⁾.

One component involves the activation of the Hypothalamic Pituitary Adrenocortical (HPA) axis and the secretion of glucocorticoids (e.g., cortisol) into the circulating blood stream. the second involves activation of the Autonomic Nervous System (ANS) and the release of catecholamines (e.g., norepinephrine) into the blood stream.⁽¹¹⁾

The sympathetic component of the ANS is responsible for a host of effects, including elevated cardiovascular tone, heart and respiratory rate, blood flow to muscles and blood glucose. Individual differences in the activity of the HPA axis and sympathetic SNS can be measured non-invasively in saliva.

Over the past decade, there has been a dramatic increase in studies evaluating salivary biomarkers of stress, as this process minimizes some of the potential confounding variables associated with blood sampling.⁽¹²⁾ recently, the strategy of measuring SNS activity via Salivary Alpha-Amylase (SAA) has become possible.⁽¹³⁾

Salivary components as diagnostic markers have great medical and scientific interest⁽¹⁴⁾ mainly because of the collection procedure, which is easy, non-invasive, and does not cause pain or discomfort like blood sample collections. Assessment of cortisol and alpha-amylase levels in the saliva aim to provide directions to the professionals in the evaluation of the alterations in behavioural and physiological functions for a broader and more accurate understanding of anxiety⁽¹⁵⁾

This study is aimed to evaluate and correlate the levels of cortisol and amylase and vital signs of children during their first dental visit who receive audio visual distraction technique and who do not receive it.

Materials and methods

Twenty healthy children aged between children between 3-6 year of age group, with first dental visit and treatment needed in them was clinical examination and dental prophylaxis were selected from department of pedodontics and preventive dentistry, college of dental sciences and research centre, ahmedabad, india. Children having any history of systemic diseases, pain of dental origin; on corticosteroid therapies, having fever, or medically compromised were excluded from the study. Ethical clearance from the institute and informed consent from the parents was taken prior to study. They were divided in to two groups, among which 10 children operated in normal dental operatory settings and 10 children with audio visual distraction technique

Collection of saliva samples

In order to analyse the salivary components, i.e. Level of salivary amylase and salivary cortisol, samples of non-stimulated saliva of about 1-2 ml was collected from the child after rinsing mouth by half glass of a tap water before the treatment and after the completion of the procedure.

- Unstimulated saliva was collected by asking the patient to expectorate into disposable sterile plastic container. The disposable sterile plastic containers containing the saliva samples were tightly closed and transported to the laboratory for analysis.

Measurement of vital data

- In order to measure the BP (mmhg) and the HR (beats per minute [BPM]), the children were seated on the dental chair, and the measurements were taken on the right arm, which was always supported at the heart level.

The data was tabulated and statistically analyzed by using statistical package for social sciences (SPSS) software. Paired t-test, two independent sample t-tests were used to find the significance for various parameters.

Results

This study showed that there is significant reduction in anxiety measuring parameters in experimental group which receives audiovisual distraction technique except in salivary cortisol level. Table 1 shows mean cortisol level of control and experimental group it shows in both the group salivary cortisol level increases after treatment but in experimental group increase is less compared to control group, and it is not statistically significant.

Table 2 shows comparison of heart rate in both the groups and in experimental group statistically significant decrease is seen, table 3 shows comparison of salivary amylase in both the groups and it shows statistically significant decrease in experimental group, in the same way table 4 and table 5 shows comparison of systolic and diastolic BP and it also shows statistically significant decrease in experimental group.

Discussion

The age group of 3-6 years was selected for the study because they exhibit more disruptive behavior and dental anxiety and are most difficult to manage.

Anxiety measuring parameters, selected were cortisol and amylase levels in the saliva and vital data which includes blood pressure and heart rate which shows response to stress based on the (hypothalamic-pituitary-adrenal axis) **HPA axis** and the (sympathetic nervous system) **SNS**.

Myers Et Al., 1972⁽¹⁶⁾; Messer, 1977⁽¹⁷⁾; Beck And Weaver, 1981⁽¹⁸⁾; Laufer And Chosack 1964⁽¹⁹⁾ And Mccarthy 1957⁽²⁰⁾ these studies concluded that heart rate and blood pressure can be used as reliable indicators of anxiety.

In this study salivary components which were used are salivary amylase and salivary cortisol. Alpha amylase is a major salivary enzyme secreted from salivary glands in response to sympathetic stimuli and regulated by norepinephrine via the sympathoadrenomedullary (**SAM**) system. Its activity is reported to increase during distress and to decrease during comfort, with a good association between the concentration of salivary amylase and blood levels of catecholamines. Currently, it is considered that measurement of this salivary to clinical settings, as well as a useful tool for evaluating the SAM system.⁽²¹⁾

Salivary amylase is a marker related to stress, increases in salivary amylase, indicates increase in stress (Nater Et Al., 2005⁽²²⁾, 2006; Van Stegeren Et Al., 2006⁽²³⁾). Salivary amylase can be a valuable screening tool for dental fear in children (Hina Noorani, 2014⁽²⁴⁾)

Anticipation of the dental treatment is a significant stimulus for the adrenal cortex to release cortisol. The measurement of salivary concentration allows the determination of rapid changes in the adrenocortical activities.⁽²⁵⁾ therefore, it has been suggested that salivary cortisol concentration may be related to the level of dental anxiety. In this study anxiety measuring parameters shows significant reduction except salivary cortisol. Dental anxiety alone is not enough to cause a reaction in hpa axis

and to produce a significant change in salivary cortisol secretion.⁽²⁶⁾

The Application of distraction is based on the assumption that pain perception has a large psychological component in that the amount of attention directed to the noxious stimuli modulates the perceived pain. Although the precise mechanism of distraction is not yet well understood, cognitive affective attention models may explain this phenomenon.⁽²⁷⁾

The Capacity of humans to pay attention is limited. They point out that an individual should concentrate on the painful stimuli in order to perceive pain; therefore, perception of pain decreases when a person's attention is distracted away from the stimulus.⁽⁵⁾

The Overall Results revealed by all the parameters indicated children were relaxed in audiovisual group followed by control group. Similar results were found in the study by prabhakar et al., 2007⁽²⁸⁾ and florella et al., 2010⁽²⁹⁾ madhumita naithani;2014⁽³⁰⁾ in which statistically significant difference was found between control group and audiovisual group. This might be due to the reason that the child while watching the cartoon movie or other audiovisual distraction aids, concentrated on the screen, thereby screening out the sight of dental treatment.

From This study it was concluded that definite positive effectiveness of audio visual distraction technique in managing dental anxiety in children. It was also concluded that compare to normal dental set up child's anxiety had been reduced in set up of audio visual distraction technique.

Conclusion

The need for newer, easier and effective behavior management techniques has been well established. Distraction technique is an alternative to handle a child's dental anxiety in pediatric dentistry scenario. The audio-visual distraction technique came out superior in

managing anxious children in the dental clinic than normal dental setup.

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Tables:

Table 1: Salivary cortisol

Control group	Mean	Std. mean	Error	Mean difference	P value
Baseline	0.133	0.012			
After treatment	0.141	0.010		0.008	0.121

Experimental group	Mean	Std. mean	Error	Mean difference	P value
Baseline	0.131	0.013			
After treatment	0.134	0.012		0.003	0.434

Table 2: Heart rate

Control group	Mean	Std. mean	Error	Mean difference	P value
Baseline	99.60	2.526			
After treatment	102.80	1.526		3.20	0.235

Experimental group	Mean	Std. mean	Error	Mean difference	P value
Baseline	97.30	2.000			
After treatment	92.00	1.660		-5.30	<0.001

Table 3: Salivary amylase

Control group	Mean	Std. mean	Error	Mean difference	P value
Baseline	1.69	0.257			
After treatment	2.32	0.182		0.63	0.002

Experimental group	Mean	Std. Error mean	Mean difference	P value
Baseline	1.80	0.234		
After treatment	1.43	0.186	-0.37	0.001

Table 4: Systolic BP

Control group	Mean	Std. mean	Error	Mean difference	P value
Baseline	116.20	2.118			
After treatment	123.00	1.125		6.80	0.002

Experimental group	Mean	Std. mean	Error	Mean difference	P value
Baseline	123.80	1.800			
After treatment	118.40	1.108		-5.40	<0.001

Table 5: Diastolic BP

Control group	Mean	Std. mean	Error	Mean difference	P value
Baseline	78.00	1.265			
After treatment	81.40	0.991		3.40	0.003

Experimental group	Mean	Std. mean	Error	Mean difference	P value
Baseline	82.80	1.041			
After treatment	78.40	0.884		-4.40	<0.001