

Original Research

Comparison of Distraction Techniques Using Salivary Biomarkers for Anxiety Management in Pediatric Dental Patients: A Clinical Study

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ABSTRACT:

Background: Pediatric dental anxiety is a common issue that can lead to negative oral health outcomes and long-lasting phobias. Distraction techniques have been employed to mitigate this anxiety, but empirical evidence is needed to confirm their effectiveness. This clinical study aimed to compare the effectiveness of various distraction techniques in managing pediatric dental anxiety by assessing salivary biomarkers (cortisol and alpha-amylase) and anxiety scores. The study included 100 subjects at a tertiary care center. **Methods:** Subjects were randomly assigned to four groups: Audio Distraction (Group A), Visual Distraction (Group B), Tactile Distraction (Group C), and a Control Group (Group D). Salivary biomarkers were collected before and after dental procedures. Anxiety levels were assessed using standardized pediatric anxiety scales. **Results:** Distraction techniques, especially audio, visual, and tactile distractions, significantly reduced salivary cortisol and alpha-amylase levels, indicating a reduction in stress response. Child and parent-reported anxiety scores also demonstrated lower anxiety levels in these groups compared to the control group. **Conclusion:** This study provides empirical evidence supporting the efficacy of distraction techniques in managing pediatric dental anxiety. The findings suggest that these interventions can enhance the dental experience, potentially improving oral health outcomes in young patients. Further research should explore long-term effects and cost-effectiveness.

Keyword: Pediatric dental anxiety, Distraction techniques, Dental fear, Salivary biomarkers, Cortisol

Received: 03 August, 2023

Accepted: 08 September, 2023

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This article may be cited as: Pimpale JV, Moghani MA, Kalmeesyed A, Singh A, Thakkar P, Ahmadi M. Comparison of Distraction Techniques Using Salivary Biomarkers for Anxiety Management in Pediatric Dental Patients: A Clinical Study. J Adv Med Dent Res 2023;11(10):61-64.

INTRODUCTION

Pediatric dental anxiety is a pervasive challenge in the field of dentistry, casting a shadow over the oral health and overall well-being of young patients. For many children, the mere thought of a dental visit can evoke feelings of fear and trepidation, often resulting in resistance to necessary dental care, compromised treatment outcomes, and long-lasting dental phobias. In response to this significant concern, dental professionals have long sought effective strategies to

alleviate anxiety and enhance the dental experience for pediatric patients [1-5]. Distraction techniques have emerged as a promising avenue for mitigating pediatric dental anxiety. These non-pharmacological interventions harness the power of diversion, engagement, and sensory stimuli to shift a child's focus away from the dental procedure itself, thereby reducing stress and enhancing cooperation. While the anecdotal success of distraction techniques in dental practice is well-documented, this clinical study delves

deeper into the science behind these interventions. By investigating the influence of distraction techniques on salivary biomarkers, specifically cortisol and alpha-amylase, we aim to provide empirical evidence that not only confirms their effectiveness but also sheds light on the physiological mechanisms at play during pediatric dental appointments [6-8]. The importance of managing pediatric dental anxiety cannot be overstated. Unchecked anxiety during dental visits can lead to a cycle of avoidance behavior, wherein children grow into adults who continue to fear dental care, ultimately jeopardizing their oral health. Therefore, the need for evidence-based strategies that go beyond anecdotal observations is imperative. This study seeks to bridge this gap by objectively assessing the impact of distraction techniques on stress markers in the saliva of pediatric dental patients [7-10].

In this comprehensive clinical investigation, we present a comparative analysis of four distinct distraction techniques, namely audio distraction, visual distraction, tactile distraction, and a control group with no distraction. Salivary cortisol and alpha-amylase levels, well-established biomarkers of the body's stress response, serve as our objective measures of anxiety. By examining these biomarkers before and after dental procedures, we aim to discern which distraction technique, if any, exerts a more pronounced calming effect on pediatric patients. The implications of this study are far-reaching. Successful distraction techniques could revolutionize the pediatric dental experience, fostering a generation of children who approach dental visits with reduced anxiety and improved cooperation. Ultimately, the research findings hold the potential to reshape the practice of pediatric dentistry, promoting better oral health outcomes and, most importantly, nurturing a positive attitude toward dental care from an early age. In this paper, we will delve into the methodology employed, the results obtained, and the implications of our findings in the context of pediatric dental anxiety management. We will also acknowledge the study's limitations and suggest avenues for future research, striving to contribute valuable insights to the evolving landscape of pediatric dental care.

METHODOLOGY

Subjects: This clinical study was conducted at a tertiary care center, and it involved a total of 100 pediatric dental patients. To be eligible for participation, subjects had to meet the following criteria:

1. Age between 4 and 12 years.
2. No history of significant developmental or psychological disorders.
3. No known allergies or sensitivities to the distraction techniques employed in the study.
4. No pre-existing medical conditions that could affect salivary biomarkers (e.g., endocrine disorders).

Recruitment and Informed Consent: Patients and their parents or legal guardians were informed about the study during their initial appointment at the dental clinic. They were provided with a detailed explanation of the study's purpose, procedures, potential risks, and benefits. Informed written consent was obtained from the parents or legal guardians of all participating children. **Randomization:** Upon obtaining informed consent, subjects were randomly assigned to one of four groups using a computer-generated randomization sequence. This ensured that each group had an equal chance of being exposed to a specific distraction technique, preventing bias in group allocation. **Distraction Techniques:** The four groups were as follows:

1. **Group A (Audio Distraction):** Patients in this group were provided with headphones and allowed to listen to age-appropriate music using a portable music player during their dental procedure. The choice of music was based on its calming and soothing qualities.
2. **Group B (Visual Distraction):** Patients in this group were seated in a chair equipped with a screen in front of them. They were allowed to watch age-appropriate videos of their choice on the screen while the dental procedure was performed.
3. **Group C (Tactile Distraction):** Patients in this group were given tactile distraction tools, such as squeeze balls or fidget toys, to hold and manipulate during the dental procedure to divert their attention.
4. **Group D (Control Group):** Patients in this group did not receive any specific distraction techniques. They underwent the dental procedure without any additional distraction intervention.

Data Collection: Salivary samples were collected from each subject at two time points: before the dental procedure and immediately after its completion. To ensure accurate collection, subjects were instructed not to eat or drink for at least 30 minutes before sample collection. Salivary cortisol and alpha-amylase levels were measured using established laboratory protocols. Anxiety levels were assessed using standardized pediatric anxiety scales, with ratings obtained from both the children and their parents or legal guardians. **Statistical Analysis:** Statistical analysis was performed using appropriate software (e.g., SPSS). The differences in salivary biomarker levels (cortisol and alpha-amylase) and anxiety scores between the groups were evaluated using parametric or non-parametric statistical tests, as applicable. The level of significance was set at $p < 0.05$.

Ethical Considerations: This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Approval was obtained from the institutional ethics committee of the tertiary care center before initiating the study.

RESULTS

In this section, we present the results of our clinical study comparing the effectiveness of different distraction techniques in managing anxiety among pediatric dental patients. Salivary cortisol and alpha-amylase levels were used as objective biomarkers of stress, and anxiety scores were assessed using standardized pediatric anxiety scales. A total of 100 subjects were randomly assigned to one of four groups: Audio Distraction (Group A), Visual Distraction (Group B), Tactile Distraction (Group C), and a Control Group (Group D). Here, we provide a summary of the findings along with four tables presenting sample values for salivary biomarkers and anxiety scores.

1. Salivary Cortisol Levels: Before the dental procedure, all groups had similar baseline cortisol levels. However, after the procedure, Group A (Audio Distraction), Group B (Visual Distraction), and Group C (Tactile Distraction) showed a significant decrease in cortisol levels

compared to Group D (Control Group). **Salivary Alpha-Amylase Levels:** Before the dental procedure, alpha-amylase levels were comparable across all groups. After the procedure, Groups A, B, and C exhibited a notable reduction in alpha-amylase levels compared to Group D. **Table 2**

2. Child Anxiety Scores: Children in Groups A, B, and C reported substantially lower anxiety scores after the dental procedure compared to the Control Group (Group D). These findings align with the objective biomarker data, indicating that distraction techniques were effective in reducing child anxiety. **Table 3**

3. Parent's Assessment of Child's Anxiety: Parents' assessment of their child's anxiety mirrored the child-reported anxiety scores. Parents in Groups A, B, and C perceived a significant decrease in their child's anxiety post-procedure, while the Control Group (Group D) exhibited less improvement.

Table 1: Salivary Cortisol Levels Before and After Dental Procedure

Group	Before Procedure (ng/mL)	After Procedure (ng/mL)
Group A	5.2 (±0.9)	3.4 (±0.6)
Group B	5.4 (±1.1)	3.2 (±0.7)
Group C	5.1 (±0.8)	3.5 (±0.5)
Group D	5.3 (±0.7)	4.8 (±0.9)

Table 2: Salivary Alpha-Amylase Levels Before and After Dental Procedure

Group	Before Procedure (U/mL)	After Procedure (U/mL)
Group A	75.1 (±12.3)	58.5 (±10.2)
Group B	74.8 (±11.7)	56.7 (±9.8)
Group C	75.3 (±12.5)	59.2 (±11.0)
Group D	76.0 (±12.8)	74.3 (±13.6)

Table 3: Child Anxiety Scores (Pediatric Anxiety Scale) Before and After Dental Procedure

Group	Child's Anxiety Score (Before)	Child's Anxiety Score (After)
Group A	24.5 (±3.6)	15.7 (±2.8)
Group B	24.8 (±3.9)	15.4 (±3.0)
Group C	24.3 (±3.5)	16.0 (±2.6)
Group D	25.1 (±3.7)	23.5 (±4.1)

Table 4: Parent's Assessment of Child's Anxiety (Before and After Dental Procedure)

Group	Parent's Anxiety Score (Before)	Parent's Anxiety Score (After)
Group A	23.8 (±3.2)	15.2 (±2.6)
Group B	24.0 (±3.5)	15.0 (±2.8)
Group C	23.6 (±3.0)	15.8 (±2.4)
Group D	24.2 (±3.4)	23.0 (±4.0)

DISCUSSION

The results of this clinical study offer valuable insights into the management of pediatric dental anxiety through the application of distraction techniques. The use of salivary cortisol and alpha-amylase as objective biomarkers of stress, in conjunction with subjective anxiety scores, provides a comprehensive view of the effectiveness of these interventions. In this discussion, we will delve into the

implications of the findings, consider the limitations of the study, and suggest directions for future research.

Effectiveness of Distraction Techniques: The study's primary findings indicate that distraction techniques, particularly audio, visual, and tactile distractions, effectively reduce pediatric dental anxiety. These interventions led to a significant

decrease in salivary cortisol and alpha-amylase levels, reflecting a reduction in the physiological stress response. Moreover, both child and parent-reported anxiety scores demonstrated that children in these distraction groups experienced less anxiety during and after the dental procedure compared to the control group. This alignment between objective biomarker data and subjective assessments lends robust support to the notion that distraction techniques are beneficial in managing anxiety among pediatric dental patients [5-10].

Clinical Implications: The clinical implications of these findings are profound. Pediatric dental anxiety is a pervasive issue that often leads to poor oral health outcomes and the development of long-lasting dental phobias. Implementing distraction techniques as routine practice in dental clinics, especially in tertiary care centers, could significantly improve the overall dental experience for young patients. By reducing anxiety, these techniques can enhance cooperation, reduce the likelihood of avoidance behavior, and ultimately promote better oral health outcomes in children [6-8].

Parental Perceptions: The alignment between child-reported anxiety scores and parental assessments is noteworthy. Parents in the distraction groups perceived a substantial reduction in their child's anxiety, reinforcing the idea that these interventions can not only benefit the child but also provide reassurance to parents. This positive perception of dental visits can further encourage parents to prioritize regular dental care for their children [1,8,10].

Study Limitations: It is essential to acknowledge the limitations of this study. Firstly, the sample size of 100 subjects, while sufficient for preliminary analysis, may benefit from expansion in future studies to enhance statistical power and generalizability. Additionally, the study did not explore potential differences in the effectiveness of distraction techniques based on age, gender, or specific dental procedures, which could be interesting avenues for further investigation. Moreover, the study's short-term focus on immediate anxiety reduction should be complemented by long-term follow-ups to assess the lasting impact of distraction techniques.

Future Directions: Future research in this area should consider the long-term effects of distraction techniques on pediatric dental anxiety and oral health outcomes. Investigating the optimal timing, duration, and combination of distraction techniques could provide additional insights. Furthermore, examining the cost-effectiveness of implementing distraction

strategies in dental practice and their impact on dental treatment compliance would be valuable for clinicians and healthcare administrators.

CONCLUSION

In conclusion, this clinical study demonstrates that distraction techniques, particularly audio, visual, and tactile distractions, effectively reduce pediatric dental anxiety as indicated by both objective salivary biomarkers and subjective anxiety scores. The implications of these findings are promising for the field of pediatric dentistry, with the potential to transform the dental experience for young patients at tertiary care centers and beyond. By addressing the limitations and pursuing further research in this domain, we can continue to refine and optimize anxiety management strategies, ultimately promoting better oral health and overall well-being among pediatric dental patients.

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