Innovations

"Effect of Dental Loupe on Anxiety During Restorative Procedure in Children - A Split Mouth Study"

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Abstract:

Introduction: *Managing dental anxiety in paediatric patients is a significant challenge in paediatric dentistry, often leading to poor cooperation and negative experiences during procedures like cavity preparation. Various distraction techniques, such as visual or auditory aids, have been used to alleviate anxiety, but few studies have explored the use of dental loupes as a potential distraction tool,* ***Aim:*** *The aim of this study is to evaluate the effectiveness of dental loupes as a distraction technique in reducing anxiety and improving cooperation during restorative procedure in paediatric patients of age 6-12 years.* ***Materials and methods****: A split mouth, randomized controlled trial was conducted following Consolidated Standards of Reporting Trials (CONSORT) guidelines. Forty-five children of age 6-12 were selected and randomly assigned to two groups: Group A, the participants will undergo restorative procedure with dental loupe and Group B, the participants undergo restorative procedure without dental loupe. The washout period between the two visits is two weeks. Anxiety was measured at 4 intervals using facial image scale and pulse rate is monitored throughout the procedure. Data were statistically analysed using the chi-square test and independent sample t- test.****Results:*** *Out of the 45 children who participated in the study, 24 were girls [53%] and 21 were boys [47%]. A statistically significant reduction in anxiety levels was observed at TI, T2, T3 and T4. And the children in Group A (with dental loupes) had a significantly lower pulse rate compared to those in Group B (without dental loupes), suggesting that the use of dental loupes may help reduce physiological signs of anxiety during dental procedures.****Conclusion:*** *There was statically significant reduction in both anxiety level and pulse rate which suggests that the use of dental loupes during restorative procedures is associated with lower levels of dental anxiety and lower pulse rates in children, indicating a potentially beneficial effect of this practice in pediatric dentistry.*

Keywords: *dental loupes, paediatric dental anxiety, distraction technique, paediatric dentistry, split mouth randomized controlled trial.*

Introduction:

Dental anxiety, or dental fear, is estimated to affect approximately 36% of the population, with a further 12% suffering from extreme dental fear.[1] Dental fear is common in children.[2,3,4]As McElroy (1895) wrote "Although operative dentistry may be perfect, the appointment is a failure if a child departs in tears." Adapting a child to this alien setting of a dental operatory is a major challenge to the dentist. Fear of the unknown and preconceived notions of dental pain causes anxiety in the pediatric patient. This often leads to disruptive and uncooperative behavior in the dental operatory.[5] Dental anxiety is a prevalent concern in pediatric dentistry, often leading to avoidance of dental care and a negative impact on oral health.[4] Children aged 6-12 years are particularly susceptible to dental fear due to their developmental stage and previous dental experiences.[6] Managing dental anxiety effectively in this age group is crucial for fostering positive attitudes toward oral healthcare and ensuring compliance with treatment protocols.

Dental environment is one of the most anxiety-provoking stimuli for children. Distraction is a non-pharmacological technique to manage anxiety in children during dental treatment.[7] "Distraction" is a tactic designed to divert a patient's attention away from their current behaviour to focus their interest in something else. It is a behaviour strategy useful in helping patients cope with brief stress.[8]Various strategies have been employed to reduce dental anxiety in paediatric patients, including behavioural techniques like Tell-Show-Do.[9] environmental modifications, and technological interventions. Traditionally, the TSD technique is used to familiarise the patient with the dental operatory and instruments to reduce anxiety. The use of audio-visual aids has shown to be an effective distraction technique to manage paediatric patients with anxiety.[10]

Distraction using dental loupes assists dentists in producing higher-quality dentistry.Although the usefulness of loupes is relatively high in endodontics, there are limited studies assessing its use in paediatric dentistry.[11]Hence, the present study aimed to evaluate the effects of a dental loupe on anxiety, during a regular restorative procedure in pediatric patients. The study aim to contribute to the growing body of evidence on strategies to enhance the dental experience for pediatric patients and improve treatment outcomes.

Materials And Method:

This study is a split-mouth randomized control trial design as it would minimize the inter-individual variability ensuring a direct comparison of anxiety levels within the same participant. The study was conducted in consensus with the Consolidated Standards of Reporting Randomized Controlled Trials (CONSORT) guidelines. It was registered in the Clinical Trial Registry of India under register

no. CTRI/2024/09/092126. Approval for the study was obtained from the Institutional Ethics Committee with reference no. IEC/TDCH/06072401.

Participants:
65 children of age 6-12 years of age visiting the OPD of TDCH were assessed for eligibility and 45 participants were included in the study. The study population was chosen to be 6-12-year-old children because of their heightened susceptibility to dental anxiety and the potential for shaping positive oral health behaviours early in life.[6] Inclusion criteria were children of 6-12 years of age, children with occlusal caries in permanent 1st molar, No history of pain, swelling and Frankl behaviour scale III, IV.
Children who are not ready to accept oral examination or treatment, medically compromised children, Frankl behaviour scale I, II are excluded.

Selection and description of participants: The sample size was calculated based on the data obtained from Sayed A et al.[5] with a significance level of 5%, study power of 80%, alpha = 0.05, beta = 0.2. The estimated sample size was 45.

$$n \geq \left(\frac{1+r}{r}\right)\frac{\left(Z_{1-\frac{\alpha}{2}}+Z_{1-\beta}\right)^2}{d^2}+\frac{Z^2_{1-\frac{\alpha}{2}}}{2(1+r)}$$

Randomization: The participants were randomly allocated to either group A or group B by coin toss method (Heads: Group A, Tails: Group B). Randomization was done by a dental assistant not participating in the study.

Study procedure:
In Group A (n=45): tell-show-do was done followed by rotary and hand caries excavation restoration with dental loupe and in Group B (n=45): tell-show-do was done followed by rotary and hand caries excavation and restoration without dental loupe. Each participant act as their own control so the participants of group A underwent the group B treatment and vice-versa after a washout period of 2 weeks.
The entire procedure was recorded, the primary outcome variable is dental anxiety and secondary outcome variable is pulse rate. Both were assessed by an independent observer. The anxiety is measured using the facial image scale and the pulse rate is measured using the pulse oximeter.
The restorative procedures performed in all participants adhered to the standard guidelines. Anxiety and pulse rate was scored at various time points: (T1) start of the procedure, (T2) after the tell-show-do procedure, (T3) after cavity preparation, and (T4) after completion of the restoration. The child was instructed to point to the image that best represented how they felt at these various time

points. Pulse rate was measured using the pulse oximeter which was clipped to the child's thumb.

Data analysis:
All the collected data were statistically analysed. Using the Chi-square test and independent sample t-test and the p value was set to be <0.05.

Result:
Out of the 45 children who participated in the study, 24 were girls [53%] and 21 were boys [47%]. A statistically significant reduction in anxiety levels (Table 1) was observed in all time intervals in group A. The pulse rate was high in both the groups at the start of the procedure with no statistical significance (p = 0.067). The average pulse rate, expressed as mean SD, was significantly lower during caries excavation in group A. (92.60 3.04) compared to group B (100.89 3.47) (Table 2). After the completion of cavity preparation group A participants were recorded with stable pulse rate and was significant lower than group B (p = 0.001).

Discussion:
Pediatric dental anxiety remains a significant challenge in dental practice, often leading to compromised treatment outcomes and negative experiences for both patients and dental professionals.[12] Effective management of dental anxiety in children is crucial to ensure positive treatment experiences and promote long-term oral health.[13]

Mehrabian A and Ferris SR stated that only 7% of comprehension in communication comes from words used, while 55% of understanding that occurs in verbal communication is through visual cue.[14]The TSD technique of behaviour management is a gold standard method for managing paediatric patients experiencing dentistry for the first time.[15] Only 6 to 12 years of age children were included in this study as they can overcome their anxiety about dental procedures as the dentist uses logical reasoning to explain what is being done.[16]

In the present study self-reported anxiety scale (FIS) was used in order to assess anxiety in the participants. FIS is a state measure of children's dental anxiety and comprises a row of five faces ranging from very happy to very unhappy, with scores ranging from 1 to 5, where 5 indicates the highest anxiety.[17] To overcome the drawbacks of self-reported scales due to the influence of the child's cognitive ability and situational factors on the outcome, Pulse oximeter was used for measuring the physiological changes that occurs in the body in response to stress and anxiety during the dental treatment as it gives continuous

measurements of the patient's arterial haemoglobin oxygenation as well as heart rate.[7,18]

The findings of this study reported that there was a significant decrease in anxiety levels at all-time interval in group A, which could be attributed to the child being distracted by viewing the dental loupe. In addition to it there was a significant difference between the pulse rate of group A and group B at T3, T4 suggesting that that the use of dental loupes may help reduce physiological signs of anxiety during dental procedures. Similar findings were reported by Sayeed et al., where use of DOM reduced anxiety in greater percentage of participants.[5] Study by Pavithra et al, reported use of magnification aids like DOM, improved overall behaviour and reduced anxiety and treatment duration.[19]

Pulse rate was high in both the group at the start of procedure due to sight/sound of the hand piece, but remained stable after completion of cavity preparation in group A due to use of distraction aid, which made the procedure to completion in shorter duration. Findings reported by Anusree et al, where use of loupes during pulpectomy procedure reduced treatment duration, which creates positive impact on overall behaviour of the child.[20]

The strength of the study was the stringent methodology followed throughout the trial. Selection bias was addressed by strict inclusion and exclusion criteria, randomization of the participants, and allocation concealment. Investigator bias was avoided by blinding the investigator to the treatment groups. The relatively small sample size may limit the generalizability of the findings so future studies with larger sample sizes and diverse populations are recommended to validate these findings further and explore the integration of magnification tools in routine pediatric dental practice. Understanding the psychological and physiological impacts of such interventions is crucial for advancing patient-centered care in pediatric dentistry.

Conclusion:

Use of dental loupes during restorative procedures in children aged 6–12 years can significantly influence dental anxiety levels and physiological responses. The split-mouth design effectively minimized inter-individual variability, allowing a direct comparison of the anxiety levels between procedures performed with and without dental loupes.The results suggest that magnification tools, such as dental loupes, not only enhance clinical precision but also have the potential to create a more positive dental experience for pediatric patients. This could lead to improved compliance with dental treatment and foster long-term oral health.

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VARIABLE		SCORE	GROUPS		CHI-SQUARE	P VALUE
			A	B		
ANXIETY	T1	1	18	20	7.497	0.024
		2	27	19		
		3	0	6		
	T2	1	34	10	28.9	0.000
		2	11	24		
		3	0	11		
	T3	1	42	5	61.5	0.000
		2	3	22		
		3	0	18		
	T4	1	43	4	67.9	0.000
		2	2	24		
		3	0	17		

Table 1: Results of Dental Anxiety Measurements in Children Undergoing Restorative Procedure

Table 2: Results of Average Pulse Rate for Each Group for All the 4 Intervals along with Standard Deviation

VARIABLE		GROUPS		CHI-SQUARE	P VALUE
		A	B		
PULSE RATE	T1	94.09 (3.67)	97.58 (3.87)	8.148	0.067
	T2	95.81 (3.08)	98.71 (3.81)	8.093	0.063
	T3	92.60 (3.04)	100.89 (3.47)	12.035	0.001*

	T4	91.38 (3.74)	100.56 (3.69)	12.875	0.001*

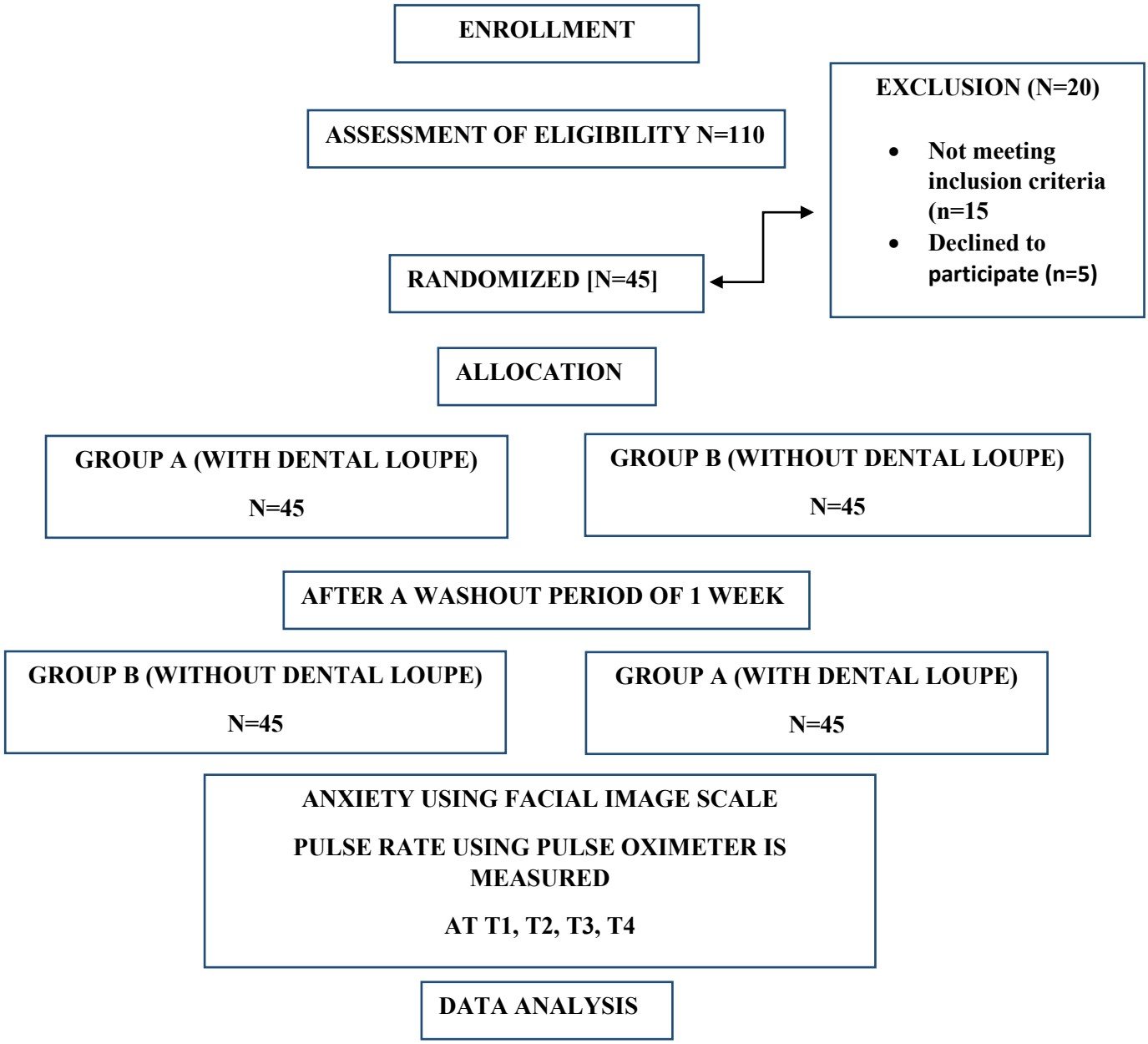

Figure 1: Consolidated standards of reporting trials (CONSORT) flowchart on patient enrolment and study process