

Behavioral changes in preschoolers treated with/without rotary instruments

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Abstract

Background: Behavioral dentistry is an interdisciplinary science which needs to be learned, practiced, and reinforced in order to provide quality dental care in children. **Aim:** To assess the anxiety experienced during dental treatment in preschool children with/without rotary instruments using behavioral scale. **Study and Design:** Sixty pediatric patients of preschool age with bilateral occlusal carious lesions extending into dentin were selected for the study. Carious lesions were removed using conventional rotary instruments on one side and Papacarie – chemomechanical caries removal of approach on contra lateral side. Both cavities were restored with glass ionomer cement (Fuji IX). Anxiety scores were determined using ‘Modified Child Dental Anxiety Scale’ (Wong *et al*, 1998) during the various clinical stages of the treatment course. **Results:** Children experienced relaxed behavior when subjected to Papacarie method of caries removal compared to conventional method using rotary instruments. **Conclusion:** This study helped us to provide behavioral measures and introduce children to dentistry in a nonthreatening setting.

Key words: Anxiety, dental treatment, Modified child dental anxiety scale, preschool children

Introduction

The objective of behavioral dentistry is to develop in a dental practitioner an understanding of the interpersonal social force that influences a patient’s behavior. Managing dental anxiety is a worldwide problem and universal barrier to oral health care.^[1] Dental anxiety in children has been recognized

as a problem in patient management for many years. Furthermore, the effects of this anxiety have been shown to persist into adulthood, which can often lead to dental avoidance^[2] and the subsequent deterioration of oral health.^[3]

Traditional means of cavity preparation involves high-speed handpiece and slow rotating instruments. However, this modality of cavity preparation usually induces pain, annoying sounds, and vibration. It often removes parts of tooth which are healthy, in addition to the decayed areas. This weakens the tooth and makes it less durable in the long run. Hence, chemomechanical removal of caries has been developed as an alternative to the conventional methods of removing caries.^[4] In 2003, a research project in Brazil by Bussadori *et al*.^[5] led to the development of Papacarie that allows the

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maximum preservation of healthy dental structures, with antibacterial and anti-inflammatory effects.^[4]

The aim of the present study was to assess the extent of anxiety experienced during dental treatment in preschool children. This would help the dentists to assess dental anxiety in child patients as early as possible so that they may identify these patients who are in special need with regards to their fear.^[6]

MATERIALS AND METHODS

The sample selected for this study included 60 pediatric patients of preschool age who had consulted Navneet Jain Health Dental Research Centre, Mumbai, India for routine dental check-up. Ethical clearance was obtained from this institution to conduct the present study. The patients with presence of bilateral occlusal carious lesions extending into dentin were identified, which was further confirmed by intraoral periapical radiographs. An informed consent was taken from patients' parents or guardians prior to the start of the study. Healthy patients of the age group of 3-5 years and undergoing dental treatment or visiting dentist for the first time were included in the study. The carious lesions selected were accessible to hand instruments. Patients who were handicapped or medically compromised, and having congenital disorders, rampant caries, nonvital teeth, or developmental anomalies were excluded. Sixty patients were randomly divided into two experimental groups:

- Experimental group I (30 patients): These patients were subjected to rotary approach for caries removal first in one cavity followed by Papacarie approach for caries removal on the contralateral cavity, in the same visit
- Experimental group II (30 patients): These patients were subjected to Papacarie approach for caries removal first in one cavity followed by rotary approach for caries removal on the contralateral cavity, in the same visit.

Mechanical removal of caries involved excavation of the demineralized tooth material by means of stainless steel round burs in a contra-angle handpiece (750 r.p.m.), without water coolant. Demineralized tooth material by Papacarie (Formula and Acao, São Paulo, Brazil) gel was removed by applying the same onto the dentinal carious lesion using a plastic filling instrument. The lesion was completely covered by the gel for 30 s. When the gel turned cloudy, it was removed gently by scrapping with the spoon excavator without applying pressure. The softened tissue was scrapped, but not cut. The gel was re-applied for another 30 s till the

cavity appeared vitreous, which indicated that the cavity was completely free of caries.^[5] In both groups, only demineralized carious tooth tissue and unsupported enamel was removed. After cleaning the cavity, cotton wool rolls were used to isolate the cleaned cavity from contamination with saliva and/or blood. After conditioning dentin for 15 s with liquid Glass Ionomer Cement (GIC), thick hand-mixed GIC was placed into the cavity in both groups. No local anesthesia was used in either group. Tell-show-do, introduced by Addeleston in 1959,^[7,8] was used as behavior management technique in the study. The behavior was assessed by two examiners not involving the operator.

Behavior assessment

The children's behavior was assessed using Modified Child Dental Anxiety scale (MCDAS) developed by Wong *et al.* in 1998^[9] [Figure 1]. The scale is just like a ruler going from 1, which shows that the child is relaxed, to 5, which shows that the child is very worried.

The behavior was assessed during the following four phases of treatment procedure:

- Phase 1: 5 min before the start of the entire procedure
- Phase 2: During caries removal
- Phase 3: Immediately after restoration
- Phase 4: 5 min after the completion of the entire procedure.

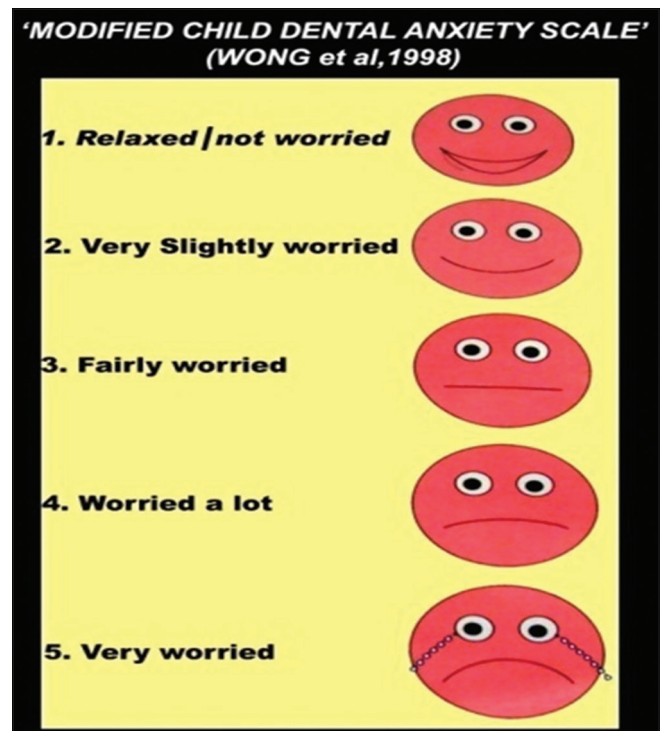


Figure 1: Faces version of the Modified Child Dental Anxiety Scale

RESULTS

Descriptive statistical analysis was carried out in the study. Results on continuous measurements are presented as Mean \pm SD (min.–max.) and results on categorical measurements as number (%). Significance was assessed at 5% ($P = 0.05$) level of significance. Mann Whitney U test (two tailed, independent) was used to find the significance of study parameters on continuous scale between two Chi-square/2 \times 2, Fisher's exact test was used to find the significance of study parameters on categorical scale between two or more groups.

A total of 60 preschool age children were included in the study. The mean age in years in experimental group I and group II was found to be 4.03 and 4.12, respectively. In experimental group I, 56.3% males and 43.8% females were involved, whereas in experimental group II, 81.3% males and 18.8% females were involved. The evaluation of behavior in experimental group I at phase 1 of treatment was not found to be statistically significant, whereas at phase 2 of treatment, strong statistical significance ($P = 0.002$) was found with respect to scale 1 of MCDAS and moderate statistical significance ($P = 0.042$) was found with respect to scale 3 of MCDAS; phase 3 of treatment did not show any statistically significant result and phase 4 of treatment showed moderate statistical significance ($P = 0.015$) with respect to scale 1 of MCDAS. Table 1 shows that the mean score of behavior of children in experimental group I showed strong statistical significance with respect to phase 2 of treatment and moderate statistical significance with respect to phase 3 and phase 4 of treatment.

The evaluation of behavior in experimental group II at phase 1 of treatment was found to show moderate statistical significance ($P = 0.043$) with respect to scale 1 and scale 2 of MCDAS. At phase 2 of treatment, no statistically significant result was found. At phase 3 of treatment, moderate statistical significance ($P = 0.023$) was observed with respect to scale 1 of MCDAS and phase 4 of treatment showed moderately statistically significant ($P = 0.012$) behavior with respect to scale 1 and scale 2 of MCDAS. Table 2 shows that the mean score of behavior of children in experimental group II was moderately statistically significant with respect to phase 3 and phase 4 of treatment.

DISCUSSION

Restorative dental treatment of carious teeth in children, which involves removal of caries with conventional drill,

is associated with psychological trauma, mainly due to fear and anxiety in children and their parents.^[10] The aversion to noise of rotary instruments and anesthesia are the main factors for this situation.^[11] Most of the time, such factors not only delay the dental treatment but also lead to avoidance of dental treatment by children, resulting in the advancement of the caries process to emergency situations. Unfortunately, in these situations, the treatment becomes more complicated, making the use of anesthesia mandatory. On the other hand, in every field of dentistry, awareness toward the importance of preserving tooth tissue, combined with a patient-friendly approach is becoming self-evident. It has been shown that operative dental treatment often leads to an increasing scale resulting in further operative and more invasive treatment. Wherever possible, tissue should be preserved and invasive treatment should be kept to a minimum.^[12]

Chemomechanical caries removal (CMCR) is one such method that eliminates infected dentin via a chemical agent. This process not only removes infected tissue, but also preserves healthy tooth structure, avoiding pulpal irritation and patient discomfort. Instead of drilling, this method uses a chemical agent assisted by an atraumatic mechanical force to remove soft carious structure. With newer materials getting introduced in CMCR, there is renewed interest in this procedure which selectively removes carious dentin and avoids the painful and unnecessary removal of sound dentin.^[13]

Papacarie consists of 10% papain, 0.5% chloramine-T, toluidine blue, salts, and a thickening agent.^[5] It is applied to the contaminated dentin, and its proteolytic, chlorinating, and oxidating properties act on the affected collagen without acting on the sound dentin.^[14] It acts by breaking the partially degraded collagen molecules, contributing to the degradation and elimination of the fibrin "mantle" formed by the carious process. The attack causes cleavage of the polypeptide

Table 1: Comparison of mean score of behavior of children in group I between two approaches of caries removal

Phase of evaluation	Rotary approach	Papacarie approach	P
5 minutes before start of treatment	1.44 \pm 0.51	1.25 \pm 0.45	0.381
During caries removal	2.44 \pm 0.89	1.38 \pm 0.50	<0.001**
After filling of the material in cavity	2.50 \pm 0.96	1.75 \pm 0.46	0.023*
5 minutes after completion of the entire procedure	2.19 \pm 0.86	1.50 \pm 0.52	0.010*

*Moderately significant (P value: $0.01 < P \leq 0.05$), **Strongly significant (P value: $P \leq 0.01$)

Table 2: Comparison of mean score of behavior of children in group 2 between two approaches of caries removal

Phase of evaluation	Papacarie approach	Rotary approach	P
5 minutes before start of treatment	1.31±0.49	1.00±0.00	0.138
During caries removal	1.81±0.98	1.75±0.45	0.724
After filling of the material in cavity	1.94±0.44	1.44±0.51	0.023*
5 minutes after completion of the entire procedure	1.75±0.45	1.25±0.45	0.015*

*Moderately significant (P value: $0.01 < P \leq 0.05$)

chains and hydrolyzes the cross-links of collagen fibrils. After degradation, oxygen is freed, and this explains the appearance of bubbles on the surface and blurring of the gel during the clinical procedure. These signs demonstrate that the carious removal process has been started. The chemical agent was found to have no ability to affect the sound collagen fibers in the inner affected and normal dentin, as papain can digest only dead cells because infected tissues lack or do not show α -1-antitrypsin which inhibits protein digestion.^[15]

Children experienced relaxed behavior when subjected to Papacarie approach of treatment as compared to rotary approach. This finding of our study was in accordance with the findings of several studies conducted by Kleinknecht *et al.* in 1973 which reported that dental anxiety is mainly associated with highly invasive procedures such as “drilling” and “injections.” Neither of these procedures is usually needed in the Papacarie approach for caries removal.^[6] Bergmann *et al.* reported anxiety levels and lower degrees of pain with CMCR group when compared to rotary group.^[16] Geetha and associates reported significant discomfort with rotary technique of caries removal when compared to CMCR technique in children of age 7-11 years.^[17] However, Attari *et al.* found no significant difference in the anxiety levels before and after treatment in both CMCR and rotary groups.^[18]

In our study, an association was also observed between age and behavior. Table 3 shows that worried behavior in preschool children associated with rotary approach of treatment was retained and carried to Papacarie approach at phase 2, phase 3, and phase 4 of treatment. Similarly, the relaxed behavior of preschool children associated with Papacarie approach of treatment was retained and carried to rotary approach at phase 1 and at phase 2 and phase 3 of treatment to some extent. This clearly shows that when exposed to relax dental environment, children showed maximum amount

of cooperation which can help in instilling positive dental health attitude. Venham had shown that younger group of children became more apprehensive about their subsequent phases of dental treatment. However, Koenigsberg and Johnson reported from their study that behavior cannot be predicted from the preceding phases of treatment.^[19]

Various behavioral scales have been used by many authors. But no conclusion has been drawn as to which scale is preferred. Corah’s Dental Anxiety Scale (CDAS) is one of the most frequently used methods of dental anxiety assessment in adults. When applied to children, the wording of the CDAS is considered too complex and modified versions of the scale are used. The MCDAS was thus developed by Wong *et al.*^[9] based on CDAS. A numeric rating scale is usually understood by children who are capable of good cognitive functioning; however, under the potentially anxiety-provoking environment of the dental situation, the child may regress and experience lowering of their cognitive ability. In order to overcome this, a pictorial version of the CDAS was developed. MCDAS was used in this study as Howard reported in 2007 that MCDAS is a reliable measure of child dental anxiety, which demonstrated good test–retest reliability and good internal consistency.^[20] Two examiners evaluated the scale in this study to avoid bias which would have occurred due to favoring any one treatment procedure.

In 2003, Schriks reported that children become anxious due to the presence of dental bur and injection needle.^[21] In future, studies may be conducted using dental bur and injection needle to assess the anxiety levels in preschool children. During the study it was also found that many parents were surprised to know that cavity can be filled without the drilling process. This showed the lack of awareness about chemomechanical approach for caries removal. Hence, various community health programs should educate the masses about the benefits of chemomechanical approach of caries removal. Also, the operator might have influenced the behavior of children. This could be due to cultural aspects, language problem, or technical skills. Hence, future studies should stress on cultural aspects and child coping behavior, so as to optimize the chemomechanical approach for caries removal.

CONCLUSION

- Relaxed behavior was found to be associated with Papacarie approach of treatment as compared to rotary approach

Table 3 : Comparison of mean score of behavior of children in group I and group II

Time of evaluation	Group I			Group II		
	Rotary	Papacarie	P	Papacarie	Rotary	P
5 minutes before start of treatment	1.44±0.51	1.31±0.49	0.317	1.00±0.00	1.25±0.45	0.046*
During caries removal	2.44±0.89	1.81±0.98	0.044*	1.75±0.45	1.38±0.50	0.058 ⁺
After filling of material in cavity	2.50±0.96	1.94±0.44	0.034*	1.44±0.51	1.75±0.46	0.059 ⁺
5 minutes after completion of the entire procedure.	2.19±0.86	1.75±0.45	0.035*	1.25±0.45	1.50±0.52	0.206

*Moderately significant (P value: $0.01 < P \leq 0.05$), ⁺Suggestive significance (P value: $0.05 < P < 0.10$)

- The early assessment of anxiety levels helps dentist to eliminate fear and gain confidence in preschool children
- Overall, it also helps to introduce preschool children to nonthreatening and pain-free dental environment, thereby instilling a positive dental attitude.

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