



Pesquisa Brasileira em Odontopediatria e
Clínica Integrada

ISSN: 1519-0501

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Universidade Estadual da Paraíba
Brasil

Azoubel Barreto, Kamila; Travassos dos Prazeres, Lady Dayane Kalline; Marques Lima, Daniela Salvador; Maciel Pessoa Redivivo, Rosário Maria; Colares, Viviane
Children's Anxiety during Dental Treatment with Minimally Invasive Approaches: Findings of an Analytical Cross-sectional Study
Pesquisa Brasileira em Odontopediatria e Clínica Integrada, vol. 17, núm. 1, 2017, pp. 1-9
Universidade Estadual da Paraíba
Paraíba, Brasil

Available in: <http://www.redalyc.org/articulo.oa?id=63749543015>

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Original Article

Children's Anxiety during Dental Treatment with Minimally Invasive Approaches: Findings of an Analytical Cross-sectional Study

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Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 06 July 2016 / Accepted: 14 May 2017 / Published: 19 June 2017

Abstract

Objective: To assess children's anxiety before, during and after dental treatment with minimally invasive approaches: Atraumatic Restorative Treatment (ART) and Silver diamine fluoride (SDF) application. **Material and Methods:** This analytical cross-sectional study, in which 1306 children were initially examined, and from these, those that had at least one deciduous molar with dentin caries (score 5 ICDAS) were selected, being indicated to ART and SDF treatments. The final sample consisted of 94 children, 46 girls and 48 boys, aged between 6 and 8 years old. Each child received an ART or SDF procedure, and in all interventions, operators and treatments were randomized. Dental anxiety was assessed by facial image scale (FIS) before, during and after minimally invasive approaches. **Results:** Dental anxiety prevalence was of 34% before the minimally invasive approaches. Children showed a higher anxiety level during interventions (ART and SDF). And, after the service was finished, there was an increase in children with high anxiety, which ranged from 3.1% (before treatment) to 9.6% (after treatment). However, there was no statistically significant difference in the anxiety related to the types of treatment and conformation of the cavities (class I and II). **Conclusion:** Both child groups had higher anxiety levels during treatments, both in ART and SDF approaches.

Keywords: Dental anxiety; Dental Caries; Dental Atraumatic Restorative Treatment.

Introduction

Dental anxiety being mainly developed in childhood, and adolescence [1,2] the effects of this anxiety have been shown to persist into adulthood, which can often lead to dental care avoidance [3,4]. This can also cause different types of undesirable behaviors [5], and somatic effects [6], and these patients are less likely to comply with instructions from the dentist [7,8].

Despite all dental practice advances, the dentist's office remains an anxiety-generating environment for many people [9], as it is usually related to painful sensations [10]. Minimizing patient's discomfort is one of the proposals of minimally invasive approaches [11,12], which is important especially in dealing with pediatric patients' dental anxiety, and fear [13]. These techniques are recommended because they require less time for application or fewer numbers of clinical steps [14]. However, most studies evaluate anxiety associated with invasive dental procedures [15-17].

The Atraumatic Restorative Treatment (ART), and the use of Diamino Silver Fluoride (SDF) are procedures that comply with the minimally invasive approach concepts [18]. Even among minimal invasive treatments for caries lesions, there are operational differences that could interfere in children's discomfort. Thus, this study aimed to evaluate anxiety in children before, during and after minimally invasive approaches.

Material and Methods

Study Design and Participant Selection

This analytical cross-sectional study, in which 1306 children were initially examined, and from these, those that had at least one deciduous molar with dentin caries (score 5 ICDAS) were selected, being indicated to ART and SDF treatments. The final sample consisted of 94 children, 46 girls and 48 boys, aged between 6 and 8 years old. Each child received an ART or SDF procedure, and in all interventions, operators and treatments were randomized. Dental anxiety was assessed by facial image scale (FIS) in all children before, during and after minimally invasive approaches, regardless of the intervention.

All public schools with school classes between 6 and 8 years, from both genders, were eligible to be included in the study. For clinical examination, conglomerate sampling procedure was adopted. The selection of schools was carried out considering a numbered list, sorted alphabetically by the name of all public schools in Recife, Pernambuco, Brazil. Thus, from the initial calculation, 1306 children were examined, 752 were free of caries. And the remaining 554 children, only 200 belonged to the inclusion criteria and were invited to participate in the study. Only 102 of these children's parents / guardians have approved participation in the study.

Even among minimally invasive restorative treatments of carious lesions, there are operational differences that may interfere with the discomfort of children, and thus cause dental anxiety. The hypothesis is that any dental treatment can cause anxiety in the child. And, that ART

treatment can cause more anxiety than SDF treatment. As well as, that the restoration of ART class I, causes less anxiety than class II, since in the latter we use steel matrix.

Inclusion Criteria

Presence of at least one active caries lesion (score 5 according to International Caries Detection and Assessment System – ICDAS) [19], detected by visual, and tactile examination on occlusal or proximal surfaces of primary molars. For this purpose, the tooth to be treated should present pain and mobility history absence.

Exclusion Criteria

(i) Presence of advanced dentine caries lesions (score 6 according to International Caries Detection and Assessment System – ICDAS). (ii) Children that refuse to participate in the study or present negative behaviours. In this study, services were held in the school environment, following WHO precepts [20], and minimizing factors related to the dental office.

Random Allocation

The two parallel groups of interventions are defined as ART and SDF. The children and operators were randomly allocated to each group according to a sequence obtained in appropriate statistical software (Randomizer program). Each child received a treatment (ART or SDF), the operators and treatments were randomized. All individuals enrolled in the study will receive integral dental care according to individual needs, but only one cavity was involved in the research.

Treatments

The first clinical examination and treatment were carried out by two operators, trained and calibrated with 0.75 inter-examiner, and 0.80 intra-examiner Kappa index. The researchers made the first clinical examination selecting children. Each operator held 25 restorations of each type as training. And these were subsequently compared and evaluated by a third investigator. Training the restorations were not included in the final study. Each child had only one consultation, and received only one intervention (ART or cariostatic). The intervention to be performed was random, as was the operator.

The ART restorations were performed using the protocols developed for this approach [21]. Only hand instruments were used for opening, and cleaning the cavities in primary molars. Cleaned cavities were restored with a high-viscosity glass-ionomer.

The SDF was applied in the cavity with carious lesion using cotton rolls and the adjacent soft tissues were protected with Vaseline. Product application was performed with a cotton ball wetted for about 3 minutes, followed by washing with cotton balls soaked in water [22].

Evaluation of Anxiety

The anxiety was assessed using a structured Facial Image Scale (FIS), shown in Figure 1. This scale consists of a row of five faces ranging from "very happy" to "very sad," and numbered from 1 (very happy) to 5 (very sad). The scale score ranges from 1 (the most positive response), to 5 (represents the most negative). This instrument consists of a Likert's scale modified for the use of children, and they were asked to point to the face that looked more like them in that moment. FIS can be used with very young children, unlike verbal self-report based methods that require cognitive and language skills to be already developed. Furthermore, FIS is a validated scale and easy to apply in a clinical context [4]. The recordings were performed by the same researcher who does not actively participate in the clinical procedures. In accordance with the protocols for the FIS application each child was asked to point to the face which they felt most closely depicted their feelings in that moment.

According to the facial scale, children were categorized as "no anxiety" (Face 1), with "low anxiety" (Face 2), "moderate anxiety" (Face 3) and "High Anxiety" (Faces 4 and 5).

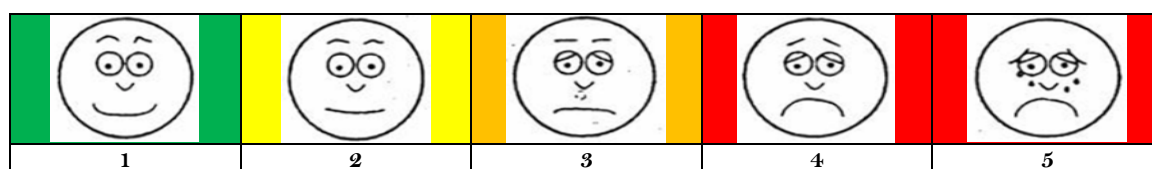


Figure 1. Facial Image Scale (FIS).

Anxiety was assessed in three dental approach different moments (before, during and after treatment), once dental anxiety levels may change during the intervention). Factors that could influence the behavior of the child were minimized, each child was attended individually, and no information exchange occurred. Anxiety assessment occurred in both ART and SDF approaches, and in the two cavity types, Class I and Class II. Class I type cavities were prepared in molars occlusal surface poor enamel coalescence areas, pits and fissures. Class II was prepared in deciduous molars proximal surfaces. It is noteworthy that in class II ART restorations, deciduous molars proximal surfaces were encompassed with steel matrix, without anesthesia addition [23].

Statistical Analysis

From collected information, data were tabulated and processed using SPSS20 version. Data analysis was carried out in steps. First, descriptive analysis was conducted in order to characterize the sample, and the chi-square test was used to describe associations between childhood dental anxiety in the three treatment moments in relation to atraumatic intervention types (ART and SDF), and cavity types (class I and II).

Ethical Aspects

The protocol was previously approved by the Research Ethics Committee of Dental School, University of Pernambuco (Protocol CEP/UPE: 217/11 and CAAE record: 0219.0097.000-11). Parent/guardian approval was obtained by signing the free, and informed consent previous to their allocation in the study. Children that presented other needs for dental treatment were referred to treatment in Dental School. Moreover, all individuals received orientation about dietary, and hygiene habits.

Results

The initial sample consisted of 102 children, of whom two had a no cooperator behavior, and operational problems of 8 children's data are not available. The final sample used in the analyses consisted of 94 children (48 boys and 46 girls). However there was no difference between the sexes of survey participants about the results.

When assessing child's anxiety before treatment, 34% reported having anxiety. The majority of children had become anxious during treatment. During treatment, it was observed that children's anxiety increased (59.5%), and after treatment, most children returned to the initial anxiety percentage, observed before the service. However, there was an increase in the percentage of children with "high anxiety," which ranged from 3.1% (before treatment) to 9.6% (after treatment), which was not enough to infer statistically significant difference (Figure 2).

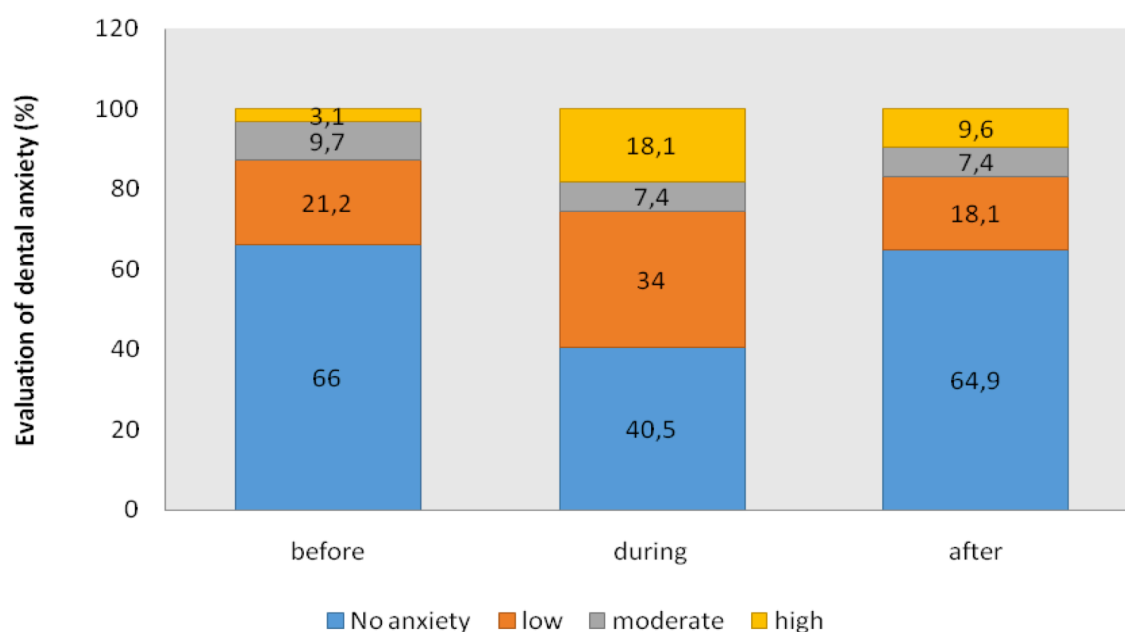


Figure 2. Anxiety level distribution before, during and after treatment (high anxiety was considered at Faces 4 and 5).

When considering the anxiety level, it was observed that during the treatment there was a significant increase in "low anxiety" (34%) and "high anxiety" (18.1%). It can be observed that children have different degrees of anxiety according to the intervention moments: before, during and

after treatment. The types of treatments (ART or SDF) and the conformation of the cavities (class I or II), were also important in the anxiety evaluation (Table 1).

Table 1. Distribution of children's anxiety by treatment group (ART or SDF) and cavity conformation (Classes I and II).

Variables	Moment of treatment	Anxiety (%)				p value
		No anxiety	Low anxiety	Moderate anxiety	High anxiety	
Type of intervention						
ART ⁽ⁿ⁼⁴⁶⁾	Before	63.0	21.7	9.1	6.2	^a 0.352
	During	41.3	28.3	6.5	23.9	^a 0.441
	After	65.3	18.7	6.5	9.5	^a 0.649
SDF ⁽ⁿ⁼⁴⁸⁾	Before	68.7	20.8	6.4	4.1	^a 0.352
	During	39.6	39.6	8.3	12.5	^a 0.441
	After	64.6	14.6	8.3	12.5	^a 0.649
Type of cavity for ART						
Class I ⁽ⁿ⁼²⁴⁾	Before	61.2	28.5	8.3	2.0	^a 0.780
	During	32.7	42.9	8.1	16.3	^a 0.250
	After	60.4	20.8	10.5	8.3	^a 0.566
Class II ⁽ⁿ⁼²²⁾	Before	66.6	17.7	11.1	4.6	^a 0.780
	During	48.9	24.4	6.7	20.0	^a 0.250
	After	68.9	15.5	4.4	11.2	^a 0.566

*Significant at p < 0.05. ^aPearson's Chi-square test.

During treatment, the "high anxiety" group showed an 11.4% difference compared to the ART and SDF group, although it has not been statistically significant compared to anxiety level in both treatments.

Discussion

Anxiety is the major reason for children's "escape" from dental treatment [24]. Dental anxiety has shown to increase the pain perception of the pediatric patient, irrespective of the anesthetic devices used [25,26]. Conversely, uncomfortable dental treatments can also result in increased dental anxiety [27].

The FIS is a valid measure of dental anxiety of young children in the clinical context [4]. As the purpose of the present study was to know the acceptability of two different restorative techniques, the FIS was performed before, during and after the procedures. It is known that evaluating the anxiety before providing the restorative treatment is very important [23].

One limitation of the instrument used is age, since it cannot be used with very young children, they may have problems of interpretation. And, the FIS scale is not a quantitative tool [4,23]. This might have caused a bias. Another limitation of the study is that the assessment of anxiety in each type of intervention was not done in the same child. Each child received only one kind of intervention. Thus, individual aspects of the child's anxiety may interfere with assessment. However, it should be emphasized that the evaluation of anxiety has a subjective factor inherent to this emotion, and may present inevitable variations.

In ART and SDF, the atraumatic technique component can be understood from tooth tissue and patient comfort preservation, in addition to noise and vibrations absence, which are present in

the traditional approach that recommends drills utilization. In this respect, the ART and SDF are definitely less traumatic and more comfortable for the patient than the conventional method. This atraumatic effect is further enhanced by the fact that local anesthesia is rarely used for ART, and is also not required in SDF application [28].

A significant percentage of children who were without anxiety at the beginning of the treatment showed some anxiety degree during the treatment. This can be explained due to dental treatment being considered by many patients, especially children, as a stress and anxiety generating condition [29]. Considerable or slight anxiety degree variations during dental treatment can be justified by the existence of aversive factors related to dental treatment, as instruments utilization, body invasion feeling and interaction with strangers to the child's life. Despite procedures performed in this survey being considered minimally invasive [18,24].

The findings of the present study showed that the anxiety during dental treatment had no relationship with the type of dental treatment used. No significant difference was found in the anxiety levels of children treated using the ART or with the SDF. This result can infer that, in the studied sample, caries curettage used in the ART before the glass ionomer cement insertion, has not significantly influenced children's anxiety level increase. The shape of the treated cavity, class I or II, had no significant effects on anxiety levels.

Other study [23] assessed patient discomfort in three ways, through individual account, heart rate and behavior at different intervention times. The probable discomfort from the steel matrix insertion time, which is necessary in ART class II restorations, showed no statistical difference, corroborating with results shown in this study.

The psychological behavior of the patient after minimal intervention approaches has not been deeply studied. The engine use during cavity preparation is pointed [30] as an unfavorable factor for dental care. In addition, others have indicated children's preference for other techniques, rather than the conventional engine [23,30]. Thus, it is important to think of research aimed at replacing the high rotation engine.

In a meta-analysis conducted by [26] the authors concluded that the ART showed no further reduction of dental anxiety in children. They noted that when ART is performed by a trained professional, it can be a positive influence to the achievement of other dental treatments.

The percentage of children without anxiety after treatment was similar to that observed at the time before treatment. However, the percentage of children with severe anxiety increased after treatment, being not sufficient to infer statistically significant difference.

Thus, it is suggested that ART can cause the same anxiety level in children as SDF simple application in caries treatment. However, studies others are necessary, in order to allow results for comparison, and several aspects related to dental anxiety that should be investigated.

Conclusion

There was no difference in levels of dental anxiety observed in children treated with ART in comparison to the SDF. The anxiety during dental treatment in this study had no relationship with the type of treatment.

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