ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)
IJDSIR : Dental Publication Service
Available Online at: www.ijdsir.com
Volume – 4, Issue – 4, July - 2021, Page No. : 313 - 320

Evaluation of the subjective and objective parameters of stress in paediatric patients during a dental treatment procedure, done with or without the use of rubber dam – A clinical study

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Citation of this Article: Dr. Anaya Kulkarni Kale, Dr. Parimala Tyagi, Dr. Ankur Jain, Dr. Saurabh Kale, Dr. Sapna Mishra, Dr. Rinky Sisodia, "Evaluation of the subjective and objective parameters of stress in paediatric patients during a dental treatment procedure, done with or without the use of rubber dam – A clinical study", IJDSIR- July - 2021, Vol. – 4, Issue - 4, P. No. 313 – 320.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Rubber dam is recommended for isolating the working field during various restorative procedures. However, dentists often omit rubber dam, particularly in paediatric dentistry, supposing that it would stress the patient. The aim of this study was to evaluate subjective and objective stress parameters in children and adolescents during dental treatment when using rubber dam compared to relative isolation with cotton rolls and saliva ejector. But often clinicians consider its use an anxiety and fear evoking stimuli which may hamper their rapport with the child and thereby affect the quality of treatment. This creates reluctance among the practitioners to use rubber dam in pediatric population.

Material And Method: 80 children were selected in between the age group of 6 – 14 years indicated for fissure sealants The children were divided into two groups based on the method of isolation used, as the control group and the test group. GROUP A: - Test group (n=40) – Rubber dam isolation GROUP B: - Control group (n=40) – Cotton roll isolation. The Inclusion criteria states that the children indicated for pit and fissure sealants in molars with no past dental treatment were included in this study. And the patients with systemic diseases and lack of compliance were excluded from the study. The anxiety score of the patient was recorded based on the Children's Emotional Manifestation Scale (CEMS), by observing his/her facial expressions. Apart from this the blood pressure, pulse rate and respiratory rate were also assessed, entered and evaluated of each student before, during and after the procedure.

Result: There was statistically no significant difference between the parameters before the treatment amongst Group A and Group B children. However, amongst Group A children, during treatment, a statistically significant increase in the parameters was observed as compared with the Group B children.

Conclusion: Through this study, we can conclude that, though the use of rubber dam is a better technique of isolation, but it is thought be more complicated and arises anxiety among pediatric patients.

Keywords: Rubber Dam, fear and anxiety, restorative procedures.

Introduction

Dental fear is one of the most common problems seen in the general population. Children are known to have unfounded fear and anxiety thus managing dental anxiety and fear is considered to be a challenge for successful component of dental treatment.

Management of disruptive and uncooperative children receiving dental treatment continues to represent a special challenge to dentists. There is a strong relationship between a child's dental anxiety and successful dental treatment and also between anxiety and pain[1].

Though in some cases dentists often omit rubber dam, particularly in paediatric patients, supposing that it would stress the patient, the use of rubber dam in pediatric restorative dentistry is strongly recommended as better access and visualization is attained by retraction of soft tissues and moisture control.

Rubber dam is recommended for isolating the working field during adhesive dentistry procedures. When using modern adhesive techniques, a proper isolation of the working field is an important precondition to guarantee the long-term survival of the restoration. Besides isolation, several additional advantages for the use of rubber dam have been reported in the literature: protection from aspiration, a clearly arranged working field, protection of the soft tissue, and reduction of infectious pathogens in the aerosol[2,3].

For many children placement of a rubber dam results in enhanced cooperation. The rubber dam acts as a barrier so that the procedures are perceived as less invasive and reduces the handpiece water spray from accumulating in the mouth which gives the patients an impression that the treatment is taking place outside of their mouth.

However, the use of rubber dam alters airflow in both the oral and nasal cavities depending on the method of application[4,5].

This study aims at evaluating these stress parameters in the paediatric patients during a standardized dental treatment procedure performed using rubber dam and that without its use.

Materials And Methods

This observational study included a total of 80 children reporting to the department of Paedodontics and Preventive Dentistry with age group between 6-14 years indicated for fissure sealing.

Prior to the study the institutional ethical clearance and written informed consent from parents were obtained.

At the start of the study, a thorough medical and dental history, along with clinical examination was done. The children were divided into two groups based on the method of isolation used, as the control group and the test group.

GROUP A: - Test group (n=40) – Rubber dam isolation

GROUP B: - Control group (n=40) – Cotton roll isolation

Children and adolescents aged 6 -14 years, having molars indicated for fissure sealing and no past dental treatment experience were included in the study. Children with systemic diseases, partially erupted teeth to seal, showing lack of compliance, no consent from the parents, having fixed orthodontic appliances, showing signs of opacity and brown discoloration after cleaning the surface of the tooth to be sealed, patients on psychotropic medication or cardiovascular drugs, already sealed teeth or patients having allergic reactions to used materials, were excluded from the study.

The anxiety score of the patient was recorded based on the Children's Emotional Manifestation Scale (CEMS), by observing his/her facial expressions.

Following this, using a sphygmomanometer, the blood pressure of the patient was recorded and entered in the table. Then, the pulse oximeter machine was used to measure the pulse rate. The left hand index finger of the patients was chosen to measure the pulse rate. The obtained value was noted down. Next, the Respiratory rate of the patient was evaluated by the visual method, that is, by counting the number of times the chest rises in 60sec and recorded.

To begin with, the teeth were cleaned with a prophy paste for 30 s. After rinsing with water spray, the tooth was dried with air for 5 s followed by an evaluation of the fissures.

In the control group, the cotton rolls were positioned on the buccal and lingual region of the tooth to be sealed and fixed by the operator's index finger and middle finger. Additionally, a saliva ejector was placed on the lingual side.

For the rubber dam isolation in the test group, a suitable rubber dam clamp was selected and applied followed by rubber dam placement over the clamp isolating the molar teeth indicated for fissure sealing.

Once the tooth was isolated, the recording of scores of Children's Emotional Manifestation Scale, blood pressure, pulse rate and respiratory rate were repeated in the same fashion as mentioned above.

After cleaning, etching, rinsing, and drying, the tooth was etched using 35% phosphoric acid gel for 60 s and rinsed for at least 20 s. It was air dried for 20 s thereafter. Fissure sealant was applied with the appropriate application system and spread out with a ball plugger. Excess material was removed with pellets. The sealant was cured with light for 20 s. After removing the rubber dam or cotton rolls, respectively, the occlusion was checked and a fluoride varnish was applied.

Once the fissure sealant was applied and checked, the rubber dam clamps were carefully removed using the rubber dam forceps in Group A and in Group B the cotton rolls were removed. The subjective and objective parameters of stress were again measured and recorded.

Statistical Analysis

Statistical procedures were carried out in 2 steps:

1. Data compilation and presentation

2. Statistical analysis

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 20; Chicago Inc., USA). Significance level was fixed at $P \leq 0.05$.

Statistical tests employed for the obtained data in our study were Kolmogorov-Smrinov and Shapiro-Wilk test, Mann Whitney 'U' Test, Friedman Test and Chi-Square (χ^2) Test.

Result

In our study we evaluated the subjective and objective signs of stress and anxiety by comparing the values of these vital signs before, during and after the treatment procedure.

The Children's Emotional Manifestation Scale (CEMS) was used to evaluate the subjective signs of stress/anxiety. It is a facial scale that scores emotional behaviors from score 1 to score 5. Score 1 representing the least anxious (or normal) behavior and score 5 representing the most anxious behavior.

On intragroup comparison, the anxiety levels (CEMS score), in both the groups, were least before treatment and highest during the treatment. Whereas on intergroup comparison, there was statistically significant (P=0.001) increase in anxiety levels during treatment, in group A patient. After treatment, the anxiety scores were found to be reduced in both the groups, still being higher in Group A as compared to Group B but it was not statistically significant (P=0.236).

Blood Pressure, Pulse rate and Respiratory rate (objective parameters of stress) of the patients were evaluated and compared before, during and after treatment to assess the stress/ anxiety among Group A and B subjects.

There was statistically no significant difference between the parameters before the treatment amongst Group A and Group B children. However, amongst Group A children, during treatment, a statistically significant increase in the parameters was observed as compared with the Group B children.

Discussion

Patient anxiety can be a major problem in all branches of medicine, including dentistry. It can present problems for both the dentist and patients, particularly in pediatric dentistry. Factors specific to dentistry that can negatively affect a child on an emotional level include dental instruments with which the child has no prior experience, treatment methods, pain arising from treatments, fear caused by these treatments, and unfamiliar adults working as staff at the dental clinic. In addition, negative experiences that a child may have had at an early age and his/her interactions with the environment are factors that increase anxiety[6].

When using modern adhesive techniques, a proper isolation of the working field is an important precondition to guarantee the restoration's long-term survival. Hence, this study was conducted to evaluate stress parameters during a standardized dental treatment procedure performed with or without rubber dam[7].

This study was designed as an observational study with 80 patients (5–15 years). During standardized fissure sealing procedures, objective (e.g., blood pressure, pulse rate and respiratory rate) and subjective (with the help of Children's Emotional Manifestation Scale) parameters of stress was evaluated.

The evaluation of the Children's Emotional Manifestation Scale, completed immediately before, during and after the treatment, showed that patients had a significantly greater anxiety score if rubber dam was used. Similarly, the values of blood pressure, pulse rate and respiratory rate were found to precisely increase during treatment with rubber dam isolation.

Dental fear and anxiety are very common with people, especially children. Pediatric dentistry faces the biggest

challenges in the form of patient fear, anxiety and uncooperativeness which many-a-times ends up in an improper or incomplete treatment being delivered to the patient [8]. The two main factors of fear of dental procedures in a child are: past painful experience during a dental treatment and fear of dental instruments and setup.

In order to avoid the variation in the results due to the varying past dental experiences of children, we included only those children who came for their first dental visit (that is, had no past dental experience). Hence the results that we got were purely based on the first encounter of the subjects with various dental instruments and were unbiased.

A study was conducted in 2013 in United Arab Emirates by Dunia Al-Hadi et al in which the authors stated that, use of rubber dam causes discomfort to the patients, needed greater time, was difficult to use and technique sensitive and was not cost effective[9].

While anxiety is a systemic response to an imminent danger reflected in a combination of biochemical alterations and is influenced by memory, personal history and social context, fear represents a normal emotional reaction to specific external stimuli considered threatening[10]. In a dental clinic, a child is most often scared of either the dental setup or of the dental instruments.

Some studies suggest a correlation between parents' anxiety levels and those of their children[11,12,13,14]. On the other hand, other studies report that, compared to other factors, parents' fear and anxiety do not have significant effects on children's anxiety and fear [15].

In 2013, A.M.A Leal et al in their study discussed about the levels of anxiety in children concerning different dental instruments and equipment. They used the facial scale validated in Brazil by Buchanan & Niven in 2002 for assessing the children's level of anxiety[16, 17].

Anxiety levels related to instruments/equipment were, in descending order: carpule syringe > paediatric forceps > dental explorer > x-ray machine > rubber dam punch > high speed handpiece > rubber dam forceps > mouth mirror > clinical tweezers > dental chair. Hence the conclusion of this study does relate to the results of our study in the context that the sight and use of rubber dam does increase the anxiety levels in children.

Thus we could conclude that patient does become anxious by the sight of the complicated set of instruments of a rubber dam kit.

In a study published by Brand HS on Cardiovascular responses in patients and dentists during dental treatment, the authors had obtained results that synergize that of our results. The results revealed that there is a correlation of high BP in children without heart diseases undergoing dental treatment[18].

Therefore, anxiety is associated with significant changes in SBP and DBP in healthy children undergoing dental treatment, as has also been demonstrated in some previous studies and these parameters can be seen both as psychological and physiological features [19,20].

Other physiological changes which may be an indicator of anxiety are increase in pulse rate and repiratory rate. It is easy to measure the pulse of a child in any setting, which gives this method an advantage.

Many studies have established a strong relationship between age and dental anxiety levels [21,22,23,24]. Patients' age and gender and family's educational status and socioeconomic level are factors that can affect dental anxiety levels [25,26,27,28,29].

In recent times the everyday clinical practice of dentistry has benefited from major advancements in techniques, technologies and materials, as well as in infection control procedures. Despite these gains, anxiety related to the dental environment and in specific to dental treatments in

children is a problem suffered by many patients worldwide, and it remains a significant challenge in providing dental care [30,31,32,33].

Conclusion

The dentist's awareness of the patient's anxiety level prior to treatment prepares him/her for the patient's reactions and allows him/her to take precautions to reduce the patient's anxiety level. This is crucial, particularly when dealing with pediatric patients.

To help children cope with anxiety, the dentist should know more about the etiology, level of dental anxiety, and psychology of the child. This study on dental anxiety indicated that the etiology involves multiple factors.

Avoiding damage to teeth through sound oral care beats trying to fix problems after they arise. Pit and fissure sealants, for example, are one of several methods for staving off the decay that leads to dental caries. The rationale for the use of sealants as a major preventive intervention is the high prevalence of pit and fissure caries. Evidence suggests that between 90% of caries in children occurs in pits and fissures.

Isolation of the tooth from contamination by saliva is the most important aspect of sealant placement. Of the various methods available for isolation, in our study, we incorporated two methods: rubber dam isolation and cotton roll isolation. The anxiety that either of the methods arise in child patients, was compared.

The results that we obtained stated that the patients demonstrated increase in the scores of subjective and objective parameters of anxiety on rubber dam application.

The reason of the observed behavior was thought to be the appearance of the rubber dam kit (especially the rubber dam forceps), discomfort due to the long duration of time for which the mouth has to be kept open and discomfort due to inability to swallow properly. The use of cotton rolls was perceived as less frightening and more comfortable by children, especially those of a younger age group.

Hence, through this study, we can conclude that, though the use of rubber dam is a better technique of isolation, but it is thought be more complicated and arises anxiety among pediatric patients.

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