Research Article

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Effect of Rubber Dam on Objective and Subjective Parameters of Anxiety During Dental Treatment in Children

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ABSTRACT

Background: Dental anxiety is a widespread phenomenon for paediatric dentistry. Rubber dam is advocated for isolating the operating field during clinical dental procedures. Pediatric dentists often omit rubber dam, in patients assuming that it would cause stress to the patient or because of lack of compliance from the patient.

Aims and Objectives: The aim of this study was to evaluate subjective and objective parameters in patients undergoing dental treatment using rubber dam.

Materials and Methods: A total number of 15 children, aged between 8 to 12 years, randomly selected with bilateral erupted 30 lower permanent molars. From each patient, one tooth was selected for the test group using rubber dam and the corresponding tooth was selected for control group using saliva ejector and cotton roll. During the procedure, objective parameters of stress, such as respiratory rate, pulse rate, anxiety scale were recorded.

Results: The pulse rate and respiratory rate of the patients in the control group was higher than the test group using rubber dam, and it was statistically significant ($P < 0.05$).

Conclusion: This study concluded that isolation with rubber dam caused less stress in patients as compared to cotton rolls and saliva ejector.

Keywords: Rubber Dam, cotton roll, Respiratory rate, Pulse rate, Anxiety scale, Pain Scale.

INTRODUCTION

The oral cavity is a complex environment which is surrounded on all sides by hard and soft tissues. Most of the dental materials used are hydrophobic in nature. Hence for the success of any dental treatment a thorough isolated field is mandatory. When using modern restorative procedures, adequate isolation of the working field is an important prerequisite to assure long-term endurance of the restoration. Use of rubber dam for isolation is a long-established technique within the dental profession, having been utilized for over 100 years [1] and encouraged within the specialty of paediatric dentistry. Apart from providing isolation, numerous advantages have been reported with the use of rubber dam which is given in the literature. Jinks has stated that once the rubber dam is applied

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on patients, they get the impression that the treatment is taking place outside their mouth; hence, they can tolerate treatments for a longer period.[2] Time is saved when the rubber dam isolation method is used by pediatric dentists, mainly because there is better soft-tissue management and changing of cotton rolls can be omitted.[3]

Fear and anxiety are the main protagonists for any pediatric dentists. Fear and/or anxiety are recurrent feelings which influences the child's behavior and plays an important role in pain perception.[4] While anxiety is a systemic response to an imminent danger influenced by memory, personal history and social context, fear represents a normal emotional reaction to specific external stimuli considered threatening.[5] Children gets more anxious when they are subjected to various sophisticated instruments. The aim of this study was to evaluate subjective and objective stress parameters in patients undergoing dental treatment using rubber dam as compared to isolation with cotton rolls.

MATERIALS AND METHODS

This study was conducted in the Department of Pedodontics and Preventive Dentistry. Ethical clearance was obtained from the Institutional Review Board of Rungta College of Dental Sciences and Research. The randomized clinical trial was on 15 patients with bilateral fully erupted 30 lower permanent molars. Children in the age group of 8 - 12 years, who had to undergo pit and fissure sealant application, absence of caries and fully erupted molars were included in the study. Children with other dental issues like pulpitis and its sequalae, systemic conditions, special children, partially erupted teeth and fixed orthodontic appliances were excluded from the study.

The participants were divided into two groups namely group 1 (Study group) and group 2 (Control group). Group 1 contain minor dental procedures will be done on rubber dam isolation. Group 2 contain minor dental procedures will be done on cotton role isolation method.

Procedure

A total of 15 patients with bilateral fully erupted lower first permanent molars were selected for the study. For each patient, one tooth was selected for test group using rubber dam. The corresponding tooth from the opposite quadrant was selected for the control group using cotton roll. On,the first visit, rubber dam application as an isolation method was used for pit and fissure sealing procedure. On the next visit, cotton rolls were used as an isolation method for pit and fissure sealing procedure. An interval of 1 week was kept between the two visits. The patient's parameters such as respiratory rate was measured manually by a dental assistant, pulse rate was measured by pulse oximeter (aadi medicare system, Delhi, India) and anxiety scale were measured by an assistant according to the FLACC scale [Figure 1], which denotes stress levels were recorded at four measuring points [Table 1].[6]

Category	Scoring		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

Fig 1: FLACC scale.

F: –Face; L: Legs; A: Activity; C: Cry; C: Consolability.

Table 1: Definition of measuring points and measured parameters

Measuring point	Treatment Phase	Measured Parameter
1	Baseline values after a waiting time of at least 10 min in the waiting or treatment room	Pulse rate, Respiratory rate
2	After sitting on the treatment chair and applying the	Pulse Rate, Respiratory Rate, Anxiety scale, Pain

	measuring equipment before treatment starts	perception
3	After light curing of the sealant before removing the rubber dam or cotton rolls	Pulse Rate, Respiratory Rate, Anxiety scale, Pain perception
4	After treatment	Pulse Rate, Respiratory Rate, Anxiety scale, Pain perception

The patient's subjective pain perception during the dental procedure at four measuring points was recorded using facial image scale. The child was asked to touch on the facial scale corresponding to his/her feelings before during and after the treatment.

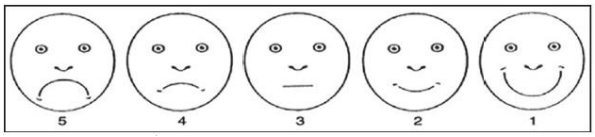

Fig 2: Facial image scale.

Anxiety scale, respiratory rate, and pulse rate of the patient were recorded at different treatment phases such as baseline, after sitting on the treatment chair, after curing of the sealant just before removing rubber dam/cotton roll and after the treatment was completed [Table 1].[6] The teeth were cleaned with a prophylactic paste (Prophy paste United Kingdom) for 30 s. It was then rinsed with water and air dried. Afterward, rubber dam application was done on the tooth to be treated using a suitable rubber dam clamp (GDC Marketing Co., India). The tooth was etched using 37% phosphoric acid gel (3M Scotchbond™ Universal Etchant, United States) for 15 s[7] and rinsed with water for 20 s. The tooth was air dried for 20 s. The fissure sealant (SDI Limited, Australia) was applied using manufacturer's instructions. Ball-shaped plugger was used to remove blebs from peripheral to central and excess material from side of the fissures was removed with cotton pellets. The sealant was then cured with light (Bluephase, Confident Dental Equipments Ltd, India) for 20 s.

In the control group, the cotton rolls were positioned on the buccal and lingual region of the tooth to be treated. A saliva ejector was placed on the lingual side of the tooth, and buccal cheek was retracted with the help of mouth mirror. The pit and fissure sealant were then applied on the tooth isolated as mentioned above. After the treatment procedure, the occlusion was checked. A fluoride varnish (Fluor Protector, Ivoclar Vivadent, Schaan, Liechtenstein) was applied after the treatment was done.[8]

Statistical analysis

Statistical analysis was done using the SPSS version 21 software (SPSS Inc., Chicago IL, USA). For the comparison of the mean values between groups at different measuring points,

Paired *t*-test with ANOVA test followed by *post hoc* test was used. The level for statistical significance was set at $P < 0.05$.

RESULT

Subjective pain perception of the children

Mean values of subjective perception of pain during treatment were found higher for the control group at measuring [Figure 3].

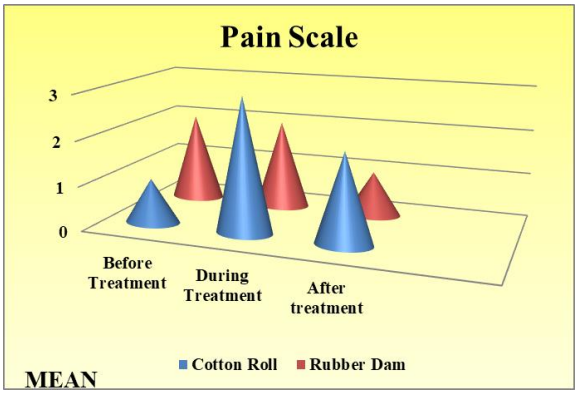

Fig 3: Patient's Pain Scale.

Objective stress parameters of patients during treatment

Pulse rate and Respiratory rate of the patients were slightly higher in the control group as compared to the test group; however, it was statistically significant during and after the treatment. ($P < 0.05$) [Figure 4,5]. There was no statistical difference of anxiety scale in both group before the treatment.

Anxiety of the patients were reduced in the test group as compared to the control group in during and after the treatment, it was statistically significant. [Graph 6]

Fig 4: Patient's Respiratory rate.

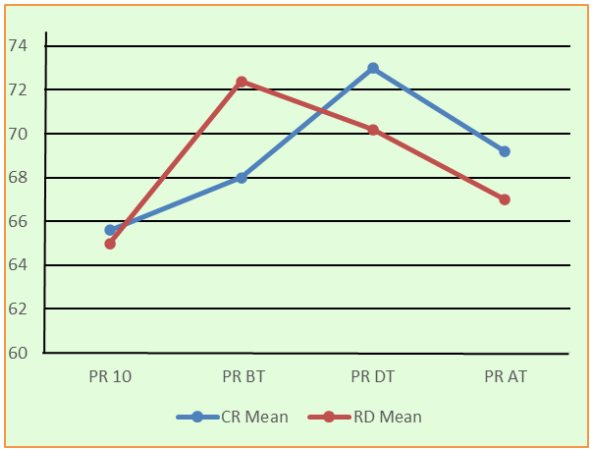

Fig 5: Patient's Pulse rate.

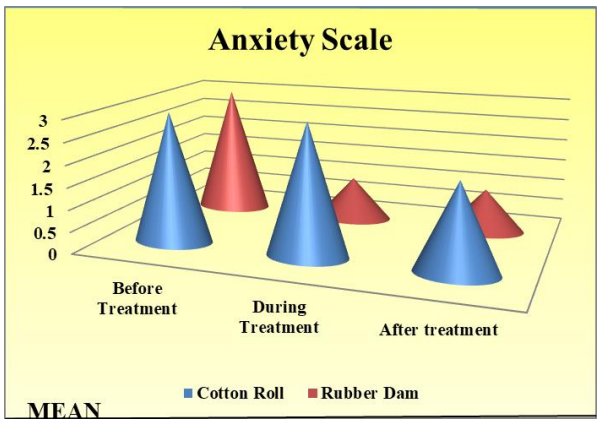

Fig 6: Patient's Anxiety Scale.

DISCUSSION

The fissure sealing procedure was chosen for this trial so as to induce balanced and relatively low-stress level in patients. Other adhesive restorative procedures could have been more difficult to standardize and would have caused a wider variety of stress levels; hence, they were not included in the current study. The subjective view of the children was supported by the objective bio signals collected during the treatment procedure. Anxiety level, respiratory rate, and pulse rate have been reported to be bio signals related to stress; hence, they were measured.

There are very few clinical studies which has been conducted to assess the subjective and objective anxiety parameters in children in conjunction with rubber dam during standard routine dental treatments. In this study, we used FLACC (face, leg, activity, cry, consolability) scale and FACIAL IMAGE scale to objectively and subjectively analyse the stress levels of the children respectively.[9]

A statistically significant positive correlation was observed in the Facial image scale scores in the present study. However, FIS recorded a slightly higher level of pain in the paediatric patient in a study by Kilinç *et al.*, pulse rate was paired with four scales to measure child's pain.[10]

Similarly, the results of our present study also show a significant reduction in pulse rate of the patients during the treatment procedure using rubber dam when compared to cotton rolls, similar findings were seen in *Brandstetter in 1999*[11] *& Winkler R in 1991*[12]. They attributed as a reason that as once rubber dam is in place, it separates the operative field in a way that the patient perceives the treatment procedure being performed outside of his/her body whereas the manipulation of cotton rolls and saliva ejector takes place inside the patient's mouth

Significant reduction in pulse rate and respiratory rate of the patient was also observed during treatment procedure with rubber dam indicating lower stress level in the test group in *Pol s et al. in 2018*[13]. Similar results seen in our study

CONCLUSION

This study concludes that isolation with rubber dam was less stressful for patients than isolation with cotton rolls and saliva ejector. Thus, considering the advantages of using rubber dams, pediatric dentists should be trained adequately in the placement of the device inorder to provide a quality dental treatment for the children.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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