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Comparative evaluation on the behaviour and anxiety of children using two rubbber dam systems- A pilot study

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ABSTRACT

Introduction: For isolating the operative field during clinical dental treatments, rubber dams are recommended. Paediatric dentists frequently omit the rubber dam because their young patients refuse to comply or because they believe it would induce stress.

Materials and method: Twenty primary mandibular molars from 10 children between the ages of 6 to 9 requiring endodontic procedures were included and either conventional rubber dam or an optradam were placed. The objective and subjective signs of anxiety and behviour of the child were assessed during placement and removal of the rubber dam.

Results: The time taken for placement of Optradam was longer than the conventional rubber dam.The pvalue was > 0.05 hence the time taken for the placement of the conventional rubber dam is significantly lesser when compared to the optradam. The comparison of the FLACC, VAS and Frankl scores had a pvalue<0.05, hence there was no difference in the behaviour or anxiety of the children druing placement and removal of the two rubber dam systems.

Conclusion: The usage of the types of rubber dams didnot affect the behaviour and anxiety levels of children. Rubber dams provide a superior and efficient treatment for the patient as well as the operator.

Keywords: *Rubberdam, anxiety, behaviour, Optradam, isolation*

INTRODUCTION

Rubber dam is an important tool that is used to isolate a tooth or multiple teeth from the rest of the mouth during dental procedures(Feierabend, Matt, and Klaiber 2011). It consists of a thin, flexible sheet of latex or non-latex material that is stretched over a frame and placed around the tooth or teeth being treated. This isolation technique provides a clear field of view and a dry operating area, which helps in performing the dental procedure more efficiently and effectively. The use of rubber dam in dentistry dates back to the mid-1800s, when Sanford Christie Barnum(Christen 1977), a dentist hailing from New York, introduced it as a method of isolating teeth during restorative and endodontic procedures(Ammann et al. 2013) The initial design consisted of a rubber sheet attached to a metallic frame which has evolved into a design

which concists of a flexible metallic frame("Originator of the Rubber Dam. Sanford Christie Barnum, D.D.S" 1970; Abrams, Drake, and Segal 1982).

Rubber dam systems were used in restorative dentistry, but now it is being used in endonotic therapy, periodontal treatment and even in pediatric dentistry. The benefit of using rubber dam is that it helps in preventing contamination of tooth or teeth beig treated, provides better isolation and improves patient comfort during the procedure.

Based on the rubber dam sheets used in dentistry- it is classfied into latex and non latex. Latex rubbder dams are dervied from natural rubber which is derived from rubber tree sap. This type of latex may cause allergy which can be mild to severe, to avoid this non latex rubber dam sheets can be used an an alternative which is composed to either polyurethane, polyisoprene or silicon synthetic materials(Vanhée et al. 2021). These are hypoallergenic, so they are less likely to cause an allergic reaction. They have the disadvantage of being more expensive. Depending on the size and shape of the tooth being treated, the type of rubber dam can be selected.

In children rubber dams have the advantage of moisture control(Obadiah and Gurunathan 2019), improved isolation, reduced anxiety(Seshadri and Ramani 2021), better infection control(Santhosh Kumar 2022), superior visulaization and prevention of aspiration of foreign bodies(Pol et al. 2018; G et al. 2014; Zou et al. 2016). However to ensure a successful outcome using rubber dams on kids, proper technique and patient management is required(Al-Ahmadi et al. 2021). In order to lessen the anxiety(Ganapathy, Sangar, and Muralidoss 2021), the dentist should explain the procedure to the patient in the beginning and use an adequate size rubberdam clamp to guarantee fit and comfort(Samuel et al. 2021).

There have been various studies which have assessed the comfort of the patient during dental procedures which compared the child's anxiety during the procedures using rubber dam and cotton roll isolation(Cochran, Miller, and Sheldrake 1989; Moorthi and Kumar 2019; Kumar, Naik, and Panwar, n.d.). No studies were conducted comparing two rubber dam systems in children. The objective of this study was to evaluate to the child's comfort and cooperation using two rubber dam systems during routine endodontic procedures and to evaluate the time taken by the operator for its placement and removal.

MATERIALS AND METHOD

The study was conducted in the Department of Pedodontics and Preventive Dentistry. Ethical clearance was obtained from the institutional review board of the institute. Informed consent was taken prior to the commencement of treatment. Children between the ages of 6 to 9 years who required bilateral pulpectomy procedure were included in this study.

The inclusion criteria are

Bilateral mandibular molars requiring pulpeectomy
Adequate tooth structure
Cooperative children of 6 to 9 years of age
The exclusion criteria are:
Unrestorable teeth
Uncooperative children
Children with special health care needs

This study conducted is a pilot study as there are no previous studies conducted. A total of 10 children requiring bilateral mandibular pulpectomy were selected for this study. The selection of the type of rubber dam to be used was done using coin toss method. The two types of rubber dams used were the conventional rubber dam system (Kedo-RD, India) and Optradam(Ivoclar). An interval of one week was kept between the two visits. During each visit the objective and subjective signs were assessed using the FLACC and VAS scale ad the behavour of the child before and after placement of the rubber dam was assessed by a single observer. The time taken to place and remove the rubber dams were timed using a stop watch during each appointment.

Topical anesthetic agent (Precaine B, Pascal International,USA) was applied, and inferior alveolar nerve block was administered with local anesthetic solution containing 2% lignocaine

with 1:2,00,000 adrenaline (LOX* 2% ADRENALINE, Neon Laboratories limited, India) using 2ml syringe with 25 gauge needle (UNOLOCK single use syringe, Hindustan Ltd., Chennai, India) Rubber dam isolation (Kedo-RD or Optradam) was done after confirming the subjective and objective signs of local anesthesia. The caries removal and access opening was done using No.4 round carbide bur in a high-speed handpiece. Roof of the access cavity was removed using a safe ended diamond tapered fissure bur. Coronal pulp amputation was done with a spoon excavator. 15 and 20 size k files (Mani) were used for patency and initial preparation followed by the use of rotary files (Kedo S plus) and filled with obturating material and restored with GIC.

Statistical Analysis

Data were entered in Microsoft Excel spreadsheet and analyzed using SPSS software(IBM SPSS Statistics, Version 20.0, Armonk, NY: IBM Corp.).Descriptive statistics were used for data summarization and presentation. A p value of 0.05 were considered to be statistically significant. Shapiro wilks normality test was used to determine the normal distribution of data and was found to be non parametric. Mann Whitney U test was conducted on the age, time and objective and subjective signs.

RESULTS

An average age of the individuals taken was 6.5 years. Mann Whitney U test was done to check the time taken using the two different types of rubberdam systems and it was found that the time taken for placement of the conventional rubber dam was 1.72+/- 0.63 seconds whereas for the placement of optradam it took 4.58+/- 1.13 seconds which showed a statistical significance with the pvalue> 0.05.

The FLACC score between the groups during placement was shown to have moderate pain in two children using the conventional rubber dam vehicle in optradam only one child experienced moderate pain, but since the pvalue was less than 0.05 this was statistically insignificant. During the removal of the rubber dam, one child in both groups experienced moderate pain with a pvalue <0.05 showing no stastisitcal significance.

In the subjective score (VAS score) 2 children declared severe pain with a high rating in the conventional rubbeerdam group and only 1 from the optradam group experienced moderate pain during the placement of the rubberdam. But during the removal of the rubberdam only 1 child experienced moderate pain. This was statistically insignificant as pvalue<0.05.

To assess whether there was a change in the cooperation level of the child, Frakl's behaviour rating scale was assessed during placement and removal of the rubberdam and it was found that during placement two children from each group turned negative. On removal of the rubberdam it was found that one child from the conventional rubberdam group remained negative.

Wilcoxon sign rank test was done to compare the scores within the groups and found to have no statistical significance.

TABLE 1: Distribution Of Study Subjects Based On Time

GROUPS	N	Mean	Std. Deviation	Mann Whitney U test	P value
CONVENTIONAL	10	1.72	0.63	3.50	0.001**
OPTRA DAM	10	4.58	1.13		

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Table 1 shows the distribution of study subjects based on the time taken for the placement of the rubber dam. The pvalue is > 0.05 hence the time taken for the placement of the conventional rubber dam is significantly lesser when compared to the optradam.

TABLE 2: Comparison Of Flacc Score Between The Groups

FLACC	SCORE	GROUPS		Mann Whitney U test	P value
		CONVENTIONAL n(%)	OPTRA DAM n(%)		
During rubber dam placement	Relaxed and comfortable	0(0)	0(0)	45.00	0.54
	Mild discomfort	8 (80.0)	9(90.0)		
	Moderate pain	2(20.0)	1(10.0)		
	Severe pain	0(0)	0(0)		
During rubber dam removal	Relaxed and comfortable	5 (50.0)	1(10.0)	32.00	0.11
	Mild discomfort	4 (40.0)	8(80.0)		
	Moderate pain	1(10.0)	1(10.0)		
	Severe pain	0(0)	0(0)		

Table 2 shows the FLACC score during the placement and removal of the two rubber dams. The conventional group had more children experiencing pain during placement of the rubber dam (2) but while removing it there was equal number of children experiencing moderate pain and these results were of no statistical significance.

TABLE 3: Comparison Of Vas Score Between The Groups

VAS	SCORE	GROUPS		Mann Whitney U test	P value
		CONVENTIONAL n(%)	OPTRA DAM n(%)		
During rubber dam placement	No pain	1(10.0)	3(30.0)	36.50	0.22
	Mild pain	7(70.0)	6(30.0)		
	Moderate pain	0(0)	1(10.0)		
	Severe pain	2(20.0)	0(0)		
During rubber dam removal	No pain	4(40.0)	6(60.0)	43.00	0.55
	Mild pain	6(60.0)	3(30.0)		
	Moderate pain	0(0)	1(10.0)		
	Severe pain	0(0)	0(0)		

Table 3 shows the comparison of the VAS score between the groups during the placement and removal of the rubber dams. In the conventional group, two children had a higher VAS score when compared to the optradam group during the placement and during removal only one child in the optradam group complained of moderate pain. Pvalue<0.05, hence shows no statistical significance.

TABLE 4: Comparison Of Frankl Score Between The Groups

FRANKL	SCORE	GROUPS		Mann Whitney U test	P value
		CONVENTIONAL n (%)	OPTRA DAM n (%)		
During rubber dam placement	DEFINITELY POSITIVE	6(60.0)	6(60.0)	32.00	0.12
	POSITIVE	3(30.0)	4(40.0)		
	NEGATIVE	1(10.0)	0(0.0)		
During rubber dam removal	DEFINITELY POSITIVE	6(60.0)	5(50.0)	46.00	0.74
	POSITIVE	4(40.0)	5(50.0)		
	NEGATIVE	0(0.0)	0(0.0)		

Table 4 shows the behavior of the child using the frankl behaviour rating scale during placement and removal of the rubber dam. It was observed that only one child turned negative during the lacement of the conventional rubber dam while none of the children turned negative in both the groups during the rubber dam removal.

DISCUSSION

Rubber dam is frequently used in dentistry to isolate the tooth of interest for treatment and reduces the risk of contamination(Nasser 2021). But as a foreign object is introduced into the oral cavity it may cause fear and anxiety in some patients, especially in children(Patel and Hamer 2021). The objective of pediatric dentistry is to provide quality dental treatment in a peaceful environment.

Proper isolation and visibilty as well as patient comfort is oberved with the uasge of rubber dams(Pradeep et al. 2022). However it requires the usage of Local anaesthesia as the placement of rubber dam is often painful(Jaju and Nasim 2021). There have been limited research pertaining to the levels of anxiety (Govindaraju, Subramanian, and Jeevanandan 2021; Naveenaa and Ravindran 2021)and patient cooperation in children with the usage of rubber dams and has been limited to the procedure of pit and fissure sealants(Vishnu et al. 2021; Kotian, Mani, and Ramakrishnan 2021; Selvi and Ravindran 2021; Padmaja and Ravindran 2021).

Previous studies were done which compared rubber dam isolation to other systems like cotton roll isolation and salivary ejectors. Rubber dam isolation was compared to cotton roll isolation during the placement of sealants and no local anaesthesia was placed. It was observed that the anxiety levels in the rubber dam group were lesser than that of the cotton roll group(Ammann et al. 2013; Desai and Ravindran 2021). Another study compared the objective and subjective parameters of stress during sealant placement using rubber dam and a salivary ejector and it was observed that there was comparatively lower stress levels during the usage of the isolating medium and this was found statistically significant.

A study conducted in 2021 assessed the behavior of children during dental care with rubber dam isolation versus cotton roll. It was found that isolation with a rubber dam reduced the child's anxiety levels during dental procedures but it was more time consuming when compared to sotton isolation(Vanhée et al. 2021). This study was also the only other study done under local anaesthesia (LA).

Most of the studies conducted were done on teeth requiring sealants. No previous literature on the comparison between two different types of rubber dam systems was seen in children. However a similar study was conducted in adults which compared the acceptance of the patient to conventional rubber dam versus Optradam system and it was observed that there was no difference in the patient's acceptance towards any particular isolation method(Feierabend, Matt, and Klaiber 2011).

In this study there was no significance in the child cooperation or anxiety levels during the

placement and removal of the rubber dam in both groups. But operators found is more difficult to place the Optradam, the reason being they were not experienced to handle it. Hence more time was taken for the placement of Optradam. The children in general were less anxious and more cooperative since the external sounds produced by the rotary handpiece and suction tube were lesser compared to not using a rubber dam.

The limitation of this study is that only one operator had conducted the study. In the future a larger sample size with more parameters should be taken.

CONCLUSION

In conclusion, using rubber dams during paediatric dental treatments is a successful method of enhancing the standard of care. It offers better isolation, anxiety reduction, moisture control, better infection control and better visibility. But for a successful outcome , good technique and patient management are essential.

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