

# Evaluation of Anxiety Levels in Children While Using Rubber Dam and OptraDam Isolation Techniques

Mahima S<sup>1</sup>, Karuna YM<sup>2</sup>, Ramya Shenoy<sup>3</sup>, Sudha K<sup>4</sup>, Maimoona TM<sup>5</sup>, Ashwin Rao<sup>6</sup>, Anupama P Nayak<sup>7</sup>

## ABSTRACT

**Aim:** The aim of the study was to evaluate the anxiety levels in children while using rubber dam and OptraDam isolation techniques.

**Materials and methods:** This study was a crossover trial conducted on 27 selected 6–12-year-old children. The procedure of placement of either of the isolation techniques was told and demonstrated using audiovisual aid. The sequence of the proceedings on each child (rubber dam or OptraDam) was determined randomly using toss of coin. Second demonstration was carried out 7 days after the first demonstration. The anxiety experienced was recorded using Venham's anxiety scale at two time points—after verbal explanation and after the audiovisual demonstration. The study also objectively assessed the anxiety by measuring the salivary malondialdehyde (MDA) levels of two patients.

**Results:** When mean values of Venham's anxiety scores after verbal explanation and after audiovisual demonstration were compared for each of the two techniques using paired Student's t test, there was statistically significant decrease in the anxiety score following audiovisual demonstration in both the techniques. When the scores between two groups after verbal explanation and after audiovisual demonstration were compared using repeated measures of analysis of variance (ANOVA), the reported anxiety scores were significantly lesser for the OptraDam technique ( $p = 0.000$ ).

**Conclusion:** Audiovisual demonstration reduced the anxiety of children when compared to verbal explanation for both isolation techniques. OptraDam isolation was found to be less anxiety generating in children compared to rubber dam isolation.

**Clinical significance:** When using modern adhesive techniques, a good isolation of the working field is an important requirement for better prognosis. OptraDam being the latest addition to the rubber dam family, if found to be more children friendly can solve majority of the problems related to isolation in pediatric dentistry.

**Keywords:** Anxiety, Children, Malondialdehyde, OptraDam, Rubber dam.

*International Journal of Clinical Pediatric Dentistry* (2023): 10.5005/jp-journals-10005-2519

## INTRODUCTION

When using modern adhesive techniques, a good isolation of the working field is an important requirement for better prognosis.<sup>1</sup> There exists evidence in the literature to support better quality of a restoration or fissure sealing with the usage of rubber dam.<sup>2,3</sup> Rubber dam not only offers isolation, but also has additional advantages, such as protection from aspiration, provision of good access/visibility, protection of the soft tissue, and minimize aerosol-related cross infections.<sup>4</sup> Rubber dam can also omit the fear of intrusion as while the rubber dam is in place, the child patients perceive that the treatment is taking place outside of their mouth. This accounts for children tolerating longer treatments.<sup>5</sup> It may even reduce the stress, pain, and anxiety of a pediatric patient during a dental procedure.<sup>1</sup>

OptraDam is a latest addition to the rubber dam family. It is even more flexible and enables the operator to position it easily and appropriately into the oral cavity of the patient.<sup>6</sup> It involves no clamp placement.<sup>7</sup> Thus, the anxiety and pain associated with the placement of OptraDam could be lesser for the child patient and easier usage could reduce anxiety levels of the dental operator too. However, to the best of our knowledge till date there is no literature supporting this claim.

Venham Picture is a psychometric test used widely to estimate the prevalence of dental anxiety among children.<sup>8</sup> Anxiety and stress also affect the presence or absence and amount of the presence of an oxidative stress marker.<sup>9</sup> MDA the principal and most studied product of polyunsaturated fatty acid peroxidation is an oxidative stress marker quite frequently isolated in different samples, including saliva.<sup>10,11</sup> The aim of the present study was to

<sup>1</sup>Manipal College of Dental Sciences, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India

<sup>2,5-7</sup>Department of Pediatric and Preventive Dentistry, Manipal College of Dental Sciences, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India

<sup>3</sup>Department of Public Health Dentistry, Manipal College of Dental Sciences, Mangalore, Manipal University, Manipal, Karnataka, India

<sup>4</sup>Department of Biochemistry, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India

**Corresponding Author:** Karuna YM, Department of Pediatric and Preventive Dentistry, Manipal College of Dental Sciences, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India, Phone: +91 964116229, e-mail: karuna.ym@manipal.edu

**How to cite this article:** S Mahima, YM Karuna, Shenoy R, *et al.* Evaluation of Anxiety Levels in Children While Using Rubber Dam and OptraDam Isolation Techniques. *Int J Clin Pediatr Dent* 2023;16(2):287–291.

**Source of support:** Nil

**Conflict of interest:** Dr Ashwin Rao is associated as the National Editorial Board member of this journal and this manuscript was subjected to this journal's standard review procedures, with this peer review handled independently of this national editorial board member and his research group.

evaluate the anxiety levels in children while using rubber dam and OptraDam isolation techniques. The null hypothesis was set as there is no difference in the of anxiety levels experienced by children

while using rubber dam and OptraDam isolation techniques as measured subjectively as well as objectively.

## MATERIALS AND METHODS

The study was conducted after obtaining the clearance from Institutional Ethics Committee (reference number: 19129). This study was registered under Clinical Trials Registry – India (CTRI)—CTRI/2020/04/024907.

The study was carried out in Department of Pediatric and Preventive Dentistry, Manipal College of Dental Sciences, Mangaluru, Karnataka, India in association with Department of Biochemistry, Kasturba Medical College, Mangaluru, Karnataka, India. This was an explorative study conducted on 6–12-year-old children. The parents/guardians of the selected patients were explained about the objectives of the study and a written informed consent was taken from them. Signed assent form was taken from the child as applicable. Children having any psychological disorders, under psychotropic medication, with any systemic illness, or any coronavirus disease 2019 (COVID-19) related signs and symptoms were excluded.

### Sample Size Calculation

Sample size for the study was based on effect size as 0.5, at 95% confidence interval and 80% power. The software G\*Power 3.1.2. was used to calculate and final sample size for the study was arrived.<sup>1</sup> Considering attrition factor as 10% the final sample size was arrived at 27 in each group.

### Procedure

The study consisted of two groups. In group I, the procedure of placement of the rubber dam apparatus on a mandibular molar tooth was told and demonstrated using audiovisual aid. In group II, the procedure of placement of the OptraDam apparatus was told and demonstrated. The audiovisual aid consisted of a filmed model undergoing the application of conventional rubber dam or OptraDam. Since it was a crossover trial, every selected child underwent proceedings related to both the groups. The sequence of the proceedings on each child (group I or group II) was determined randomly using toss of coin. Second demonstration and data collection were carried out 7 days after the first demonstration and data collection. Though following each demonstration both subjective and objective assessment of anxiety were planned, due to the unexpected pandemic crisis (COVID-19) throughout the world, we could carry forward only the subjective assessment of anxiety. However, the objective assessment of anxiety was done with two children, who were recruited and completed before the pandemic condition (Table 1).

### Subjective Assessment of Anxiety

The anxiety experienced by the child patient was recorded using Venham's anxiety scale at two time points—after verbal explanation and after the audiovisual demonstrations of rubber dam and OptraDam isolation techniques.

## Objective Assessment of Anxiety

The time points of collection of saliva were before and after the audiovisual demonstrations of rubber dam and OptraDam isolation techniques. Thus, for each child, the saliva was collected four times (two times for each of the two techniques). The collected samples were sent to Department of Biochemistry, Kasturba Medical College, Mangaluru, Karnataka, India, for analysis of MDA stress marker. MDA was estimated by spectrophotometric method.<sup>12</sup>

### Statistical Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS), version 11.5 (SPSS Inc., Chicago, Illinois, United States of America). Descriptive statistics was calculated. Paired Student's *t*-test and repeated measures of ANOVA were applied to check the association within and between groups at different time intervals. Using this method, variables selected were those which shows the significant difference at the 95% level ( $p < 0.05$ ).

## RESULTS

Frequency distribution of Venham's anxiety scores after verbal explanation and after audiovisual demonstration of rubber dam and OptraDam is as given in Table 2. When mean values of Venham's anxiety scores after verbal explanation and after audiovisual demonstration were compared for each of the two techniques—rubber dam and OptraDam using paired Student's *t* test (Table 3), there was statistically significant decrease in the anxiety score following audiovisual demonstration in both the techniques. However, the anxiety scores did not significantly vary between the gender in all the categories. When the scores between two groups after verbal explanation and after audiovisual demonstration were compared using repeated measures of ANOVA (Table 4), the reported anxiety scores were significantly lesser for the OptraDam technique following both verbal explanation and after audiovisual demonstration ( $p = 0.000$ ).

## DISCUSSION

Undoubtedly usage of rubber dam has several advantages including good infection control, improved quality of care, and patient safety, especially during operative and endodontic procedures.<sup>13,14</sup> However, while the dental authorities, such as European Society of Endodontology<sup>15</sup> and American Association of Endodontists<sup>16</sup> recommend the mandatory usage of rubber dam, it's not routinely used by the practitioners in many countries.<sup>17,18</sup> The reasons for the avoidance of rubber dam placement by the dental practitioners could include their assumption that rubber dam technique is difficult and time consuming and their concerns about patient acceptance.<sup>19–21</sup> Though the modern day literature is discordant with these opinions,<sup>22–24</sup> the hesitation toward the regular usage of conventional rubber dam still prevails among the practitioners.<sup>13,14,20,25</sup>

**Table 1:** Malondialdehyde levels ( $\times 10^{-5}$   $\mu\text{mol/L}$ ) in saliva before and after audiovisual demonstration of rubber dam and OptraDam

No.	Age (in years)	Gender	Rubber dam		OptraDam	
			After verbal explanation	After audiovisual demonstration	After verbal explanation	After audiovisual demonstration
1	9	F	0.518	0.28	0.55	0.303
2	8	M	0.342	0.301	0.399	0.349

To overcome the technical barriers associated with the conventional rubber dam, one of the solutions given by the manufacturers was in the form of OptraDam for easier and faster application. In contrast to conventional rubber dam, the OptraDam features a metal free design, patented anatomical shape, and an integrated frame all of which owe for its high flexibility. The frame is in the form of double ring, wherein the inner ring gets secured at the vestibules and outer ring holds the dam extra orally against patient's face. Placement of OptraDam is easier even during two-handed dentistry and usually it does not require the support of conventional rubber dam clamps. The printed dots allow easy punching of the holes as per the tooth to be isolated. The company manufacturers OptraDam in different sizes and designs to suit the shape of the patient's oral cavity and thus claims to provide improved access and visibility than the conventional ones.<sup>26</sup>

Tell-show-do technique is one of the most accepted and commonly used nonpharmacological behavior management techniques in children.<sup>27</sup> Filmed modeling is yet another efficient method to prepare the children for the dental treatment.<sup>28</sup> The methodology of the present study made use of tell-show component of tell-show-do technique and filmed modeling. The anxiety level of children toward two different isolation techniques was evaluated

after verbally explaining the procedure and after audiovisual demonstration of the filmed model.

The results of the present study showed audiovisual demonstration of a filmed model significantly decrease anxiety levels for both the tested rubber dam techniques. This was in accordance with the findings in the literature that audiovisual modeling technique helps pediatric dental patients get rid of their overall and specific fears related to dentistry.<sup>28</sup> The study findings also showed that anxiety scores of children after both verbal explanation and audiovisual modeling technique were lesser for the OptraDam technique than the conventional rubber dam technique. However, these findings do not match the findings of a study by Feierabend et al.<sup>7</sup> who concluded that patients and dentists preferred conventional rubber dam over OptraDam. The differences in the findings could be attributed to the methodology. In the later study, patients of age 15–81 years were included and the procedure of rubber dam or OptraDam application was done on them.

Ammann et al.<sup>1</sup> in their clinical pilot study reported that isolation with rubber dam caused less stress in children and adolescents compared to relative isolation with cotton rolls if applied by an experienced dentist. While using conventional rubber dam isolation in children lack of patient cooperation was

**Table 2:** Frequency distribution of Venham's anxiety score before and after audiovisual demonstration of rubber dam and OptraDam

Venham's anxiety score	Rubber dam				OptraDam			
	After verbal explanation		After audiovisual demonstration		After verbal explanation		After audiovisual demonstration	
	M	F	M	F	M	F	M	F
2							3 (27.3)	5 (31.3)
3			1 (9.1)	6 (37.5)			6 (54.5)	7 (43.8)
4			8 (72.7)	7 (43.8)		2 (12.5)	2 (18.2)	4 (25)
5	2 (18.2)	1 (6.3)	2 (18.2)	3 (18.8)	4 (36.4)	5 (31.3)		
6	6 (54.5)	6 (37.5)			5 (45.5)	7 (43.8)		
7	2 (18.2)	6 (37.5)			2 (18.2)	2 (12.5)		
8	1 (9.1)	3 (18.8)						

% in parenthesis

**Table 3:** Mean values of Venham's anxiety score before and after audiovisual demonstration of rubber dam and OptraDam

Rubber dam				OptraDam			
After verbal explanation		After audiovisual demonstration		After verbal explanation		After audiovisual demonstration	
M	F	M	F	M	F	M	F
6.18 ± 0.87	6.69 ± 0.87	4.09 ± 0.53	3.81 ± 0.75	5.82 ± 0.75	5.56 ± 0.89	2.91 ± 0.70	2.94 ± 0.77
0.25*, 25**, 0.152***		3.01*, 25**, 0.095***		0.72*, 25**, 0.403***		0.23*, 25**, 0.633***	
6.48 ± 0.89		3.93 ± 0.67		5.67 ± 0.83		2.93 ± 0.73	
12.46*, 26**, 0.000***				12.60*, 26**, 0.000***			

Number of boys, 11; Number of females, 16; \*F value, \*\*df, \*\*\*p value

**Table 4:** Comparison of the scores between two groups before and after audiovisual demonstration using repeated measures of ANOVA

Rubber dam		OptraDam	
After verbal explanation	After audiovisual demonstration	After verbal explanation	After audiovisual demonstration
6.48 ± 0.89	3.93 ± 0.67	5.67 ± 0.83	2.93 ± 0.73
28.93*, 1**, 0.000***			

\*F value, \*\*df, \*\*\*p value

one of the common challenges faced by pediatric dentists.<sup>29</sup> Pain and discomfort are commonly encountered during the rubber dam clamp placement, which often calls for the usage of local anesthesia.<sup>30</sup> Change is the only constant, so with the rubber dam techniques. Rubber dam techniques have evolved over a period of time since their invention by Barnum in 1869.<sup>7</sup> The search is on for an efficient isolation technique as a replacement for conventional rubber dam system.

The present study was formulated to compare both the subjective and objective anxiety levels in children while using rubber dam and OptraDam isolation techniques. With the unexpected emergence of COVID-19 pandemic, saliva sample collection was not possible and we had to drop evaluation of the objective anxiety levels. However, we did MDA analysis of the already collected saliva samples of two patients. The MDA analysis showed a reduction following video demonstration for both conventional rubber dam and OptraDam groups when compared to the verbal explanation alone. However, these values cannot be statistically analyzed and thus, no conclusions can be drawn about the objective anxiety levels experienced by children during the placement of two rubber dam techniques used in this study. Also, there are no similar studies present in literature on the same context to add on to these findings. A study by Ammann et al.<sup>1</sup> evaluated the subjective and objective stress associated with rubber dam isolation. But, the objective assessment was in the form of recording skin resistance and breath rate and they compared the stress levels with the relative isolation using cotton rolls. This brings out the scope for studies in future evaluating the objective anxiety levels of children during the placement of different rubber dam techniques.

## CONCLUSION

Within the limitations, the findings of the study suggest that:

- Audiovisual demonstration reduced the anxiety of children when compared to verbal explanation for both rubber dam and OptraDam isolation techniques.
- OptraDam isolation technique was found to be less anxiety generating in children compared to rubber dam isolation technique.

## Clinical Significance

Anxiety affects a child's behavior, which determines the success of a dental treatment. On the contrary, good isolation is the key to achieve good treatment outcomes. Usage of rubber dam is perceived as a bulky apparatus and hence introduction of OptraDam has led to easier placement. OptraDam being the latest addition to the rubber dam family, if found to be more children friendly can solve majority of the problems related to isolation in pediatric dentistry.

## ORCID

Ramya Shenoy  <https://orcid.org/0000-0003-3126-4415>

## REFERENCES

1. Ammann P, Kolb A, Lussi A, et al. Influence of rubber dam on objective and subjective parameters of stress during dental treatment of children and adolescents - a randomized controlled clinical pilot study. *Int J Paediatr Dent* 2013;23(2):110–115. DOI: 10.1111/j.1365-263X.2012.01232.x

2. Smales RJ. Rubber dam usage related to restoration quality and survival. *Br Dent J* 1993;174(9):330–333. DOI: 10.1038/sj.bdj.4808167
3. Raskin A, Setcos JC, Vreven J, et al. Influence of the isolation method on the 10-year clinical behaviour of posterior resin composite restorations. *Clin Oral Investigations* 2000;4(3):148–152. DOI: 10.1007/s007840000069
4. Samaranayake LP, Reid J, Evans D. The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination. *ASDC J Dent Child* 1989;56(6):442–444.
5. Jinks GM. Rubber dam technique in pedodontics. *Dent Clin North Am* 1966;10:327–340. DOI: 10.1016/S0011-8532(22)01648-2
6. Kapitan M, Sustova Z, Ivancakova R, et al. A comparison of different rubber dam systems on a dental simulator. *Acta Medica (Hradec Kralove)* 2014;57(1):15–20. DOI: 10.14712/18059694.2014.3
7. Feierabend SA, Matt J, Klaiber B. A comparison of conventional and new rubber dam systems in dental practice. *Oper Dent* 2011;36(3):243–250. DOI: 10.2341/09-283-C
8. Agarwal M, Das UM. Dental anxiety prediction using Venham Picture test: a preliminary cross-sectional study. *J Indian Soc Pedod Prev Dent* 2013;31(1):22–24. DOI: 10.4103/0970-4388.112397
9. Bouayed J, Rammal H, Soulimani R. Oxidative stress and anxiety: relationship and cellular pathways. *Oxid Med Cell Longev* 2009;2(2):63–67. DOI: 10.4161/oxim.2.2.7944
10. Del Rio D, Stewart AJ, Pellegrini N. A review of recent studies on malondialdehyde as toxic molecule and biological marker of oxidative stress. *Nutr Metab Cardiovasc Dis* 2005;15(4):316–328. DOI: 10.1016/j.numecd.2005.05.003
11. Subramanyam D, Gurunathan D, Gaayathri R, et al. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent* 2018;12(1):67–70. DOI: 10.4103/ejd.ejd\_266\_17
12. Sudha K, Rao AV, Rao S, et al. Lipid peroxidation hemolysis and antioxidant enzymes of erythrocytes in stroke. *Indian J Physiol Pharmacol* 2004;48(2):199–205.
13. Kapitán M, Suchánková Kleplová T, Suchánek J. A comparison of three rubber dam systems in vivo—a preliminary study. *Acta Medica (Hradec Kralove)* 2015;58(1):15–20. DOI: 10.14712/18059694.2015.86
14. Gilbert GH, Litaker MS, Pihlstrom DJ, et al. Rubber dam use during routine operative dentistry procedures: findings from the Dental PBRN. *Oper Dent* 2010;35(5):491–499. DOI: 10.2341/09-287C
15. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int Endod J* 2006;39(12):921–930. DOI: 10.1111/j.1365-2591.2006.01180.x
16. American Association of Endodontists. AAE position statement: dental dams (Reaffirmed as of 2017). Available from <https://www.aae.org/specialty/wp-content/uploads/sites/2/2017/06/dentaldamstatement.pdf>
17. Kapitán M, Šustová Z. The use of rubber dam among Czech dental practitioners. *Acta Medica (Hradec Králové)* 2011;54(4):144–148.
18. Anabtawi MF, Gilbert GH, Bauer MR, et al. Rubber dam use during root canal treatment: findings from The Dental Practice-Based Research Network. *J Am Dent Assoc* 2013;144(2):179–186. DOI: 10.14219/jada.archive.2013.0097
19. Hill EE, Rubel BS. Do dental educators need to improve their approach to teaching rubber dam use? *J Dent Educ* 2008;72(10):1177–1181.
20. Lynch CD, McConnell RJ. Attitudes and use of rubber dam by Irish general dental practitioners. *Int Endod J* 2007;40(6):427–432. DOI: 10.1111/j.1365-2591.2007.01212.x
21. Marshall K. Rubber dam. *Br Dent J* 1998;184(5):218–219. DOI: 10.1038/sj.bdj.4809584
22. Filipović J, Jukić S, Miletić I, et al. Patient's attitude to rubber dam use. *Acta Stomatol Croat* 2004;38(4):319–322.
23. Reuter JE. The isolation of teeth and the protection of the patient during endodontic treatment. *Int Endod J* 1983;16(4):173–181. DOI: 10.1111/j.1365-2591.1983.tb01321.x

24. Slaus G, Minoodt I, Bottenberg P. The rubber dam, a problem for the dentist or the patient? *Rev Belge Med Dent* 2005;60(4):301–309.
25. Madarati AA. Why dentists don't use rubber dam during endodontics and how to promote its usage? *BMC Oral Health* 2016;16:24. DOI: 10.1186/s12903-016-0175-2
26. <https://www.ivoclarvivadent.com.au/explore/OpraDam>.
27. Khandelwal D, Kalra N, Tyagi R, et al. Control of anxiety in pediatric patients using "tell show do" method and audiovisual distraction. *J Contemp Dent Pract* 2018;19(9):1058–1064.
28. Mungara J, Injeti M, Joseph E, et al. Child's dental fear: cause related factors and the influence of audiovisual modeling. *J Indian Soc Pedod Prev Dent* 2013;31(4):215–220. DOI: 10.4103/0970-4388.121815
29. Soldani F, Foley J. An assessment of rubber dam usage amongst specialists in paediatric dentistry practising within the UK. *Int J Paediatr Dent* 2007;17(1):50–56. DOI: 10.1111/j.1365-263X.2006.00796.x
30. Wambier LM, de Geus JL, Boing TF, et al. A randomized clinical trial evaluating rubber dam clamp pain reduction from a new topical liposomal anesthetic gel. *Pediatr Dent* 2018;40(3):190–194.