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# Comparison of functional outcomes of two different rubber dam systems in dental practices

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## ABSTRACT

**Background and Objective:** The rubber dam is the only method that can ensure complete isolation during dental procedures. During endodontic and restorative procedures, it improves patient protection, treatment efficacy, and infection control. A novel rubber dam system called Optradam has introduced a remarkably comfortable, user-friendly clamp-free technique. Therefore, this study was conducted to compare conventional rubber and OptraDam®Plus (Ivoclar Vivadent) based on patients' and dentist preferences.

**Methods:** After receiving ethics board clearance, this trial was carried out at the Department of Operative Dentistry at a tertiary care hospital in Islamabad from June to December 2022. A total of 30 participants were assigned to each group; conventional rubber dam (Group-1) and OptraDam®Plus (Group-2). Two questionnaires were designed and validated one to be completed by dental practitioners and the other by patients. The gathered information was analyzed using statistical tests of significance.

**Results:** A total of 60 patients were treated; 31 (52%) males and 29 (28%) females with a mean age of 32.35 years (SD = 4.59). Both the dentists (80% ) and the patients (73.3%) favored the conventional rubber dam system (Group-1). Concerning patient comfort, the conventional rubber dam (96.7%) was considered more comfortable than the OptraDam®Plus (Group-2) (86.7%). More effective moisture management was seen in Group-1 patients (90%). Other factors, such as time, convenience of application, and imaging radiography, had statistically insignificant results among both groups.

**Conclusion:** The results indicate that both patients as well as operators, preferred the use of conventional rubber dams over OptraDam®Plus during an endodontic and restorative procedure..

**Keywords:** Conventional rubber dam, OptraDam®Plus, preference, endodontics, restorative dentistry.

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## Introduction

The success of dental interventions such as root canal treatment, vital pulp therapy, fillings, teeth whitening, and prosthetics procedures rely upon many components specifically, isolation of teeth from saliva, antimicrobials, and anything in the oral cavity that causes hindrance during dental treatment.[1] Sanford Barnum, therefore, suggested a conventional rubber dam method in 1864 that could offer superior treatments by isolating teeth from bacterial contaminations[2]. By protecting teeth from oral contaminants, rubber dams provide standard-grade endodontic and restorative care.[3] Rubber dams have various benefits, including better accessibility and visibility during procedures, soft tissue protection from sharp tools, and elimination of the risk of ingestion of small devices and other dental materials that are toxic to the patients.[4] During root canal treatment, rubber dam reduces bacterial contamination and it also lessens the need for repeated rinsing during the procedure and patient conversation, thereby providing more comfortable treatment.[5,6]

Although having many benefits, the rubber approach is infrequently used in many nations, notably by Pakistani dentists, who view it as a laborious and time-consuming process.[7,8] Different types of rubber dams and methods, such as pre-articulated dams, Optidam, and

OptraDam®Plus, were introduced for the convenience of patients and dental practitioners. In 2005, Ivoclar Vivadent AG invented OptraDam®Plus, a three-dimensional rubber dam that differs from ordinary rubber dams. It can be placed without the need for a separate rubber dam frame because of its good flexibility and anatomical shape. It has a metal-free, double-ring frame, the outer ring fits extraorally on the patient's face, while the inner ring is put in the vestibule. One person can install OptraDam®Plus because of its unique design, which also minimizes the need for conventional rubber dam clamps and flexibility to keep patients comfortable throughout prolonged treatments. OptraDam®Plus is available in adult, standard, and small versions and can be used in either one or both arches. Because of its form, which mimics the curvature of the mouth cavity, it enables improved accessibility, visibility, and a large working area in comparison to conventional rubber dams.[9]

This research was conducted to compare the conventional rubber dams with OptraDam®Plus, to determine the type of rubber dam preferred by the patients and dentists in our set-up. Functional outcomes like isolation, moisture control, time, ease of application, taking radiographs, and being more comfortable for both the patient and the dentist were also assessed.

## Methods

This randomized control trial was carried out at the Department of Operative Dentistry, Pakistan, Institute of Medical Sciences, Islamabad, Pakistan, from June to December 2022 after obtaining permission from the Institutional Ethical Board. The trial is registered on Clinicaltrials.gov under the number (NCT05554757). The sample size of 30 for each group was calculated by using the World Health Organization calculator. In the group-1 patients, a conventional rubber dam was used OptraDam®Plus was applied in the patients of group-2 with a level of significance of 5%, power of the test 80%, anticipated population proportion for group-1 as 88.16 and for group-2 as 9.21%.[10] The sampling techniques used were convenient sampling techniques.

After written and verbal consent, patients who visited the hospital for restorative and endodontic procedures, aged between 18 and 60 years were included in the study. A patient who had grossly carious teeth with poor prognoses, medically compromised, or uncooperative patients were excluded from the study.

Two questionnaires were created, one to be completed by the dental practitioners and the other by patients. The questionnaire was adopted from a published article[10] and later customized and validated. In the patients' questionnaire, three sections were created, In section personal information such as name, age, and gender was included, section 2 included the teeth to be isolated, the type of operation, and the patient's comfort level, and section three included patients' preference between the conventional rubber dam and OptraDam®Plus. The patients and dentists were also asked about the timing and simplicity of application, moisture control, ease of taking radiographs, and the type of rubber dam they preferred. In this investigation, the rubber dam systems and application strategies listed below were used.

Both the rubber dams were placed in the oral cavity according to the manufacturer's instructions.

The patient was made aware of the benefits of the rubber dam before the procedure began, and their informed consent was obtained.

### *Statistical analysis*

The obtained data were subjected to descriptive analysis (percentages, frequency), and a chi-square test using Statistical Package for Social Sciences 20.0 was used to determine the *p*-value.

## Results

In this trial, 60 patients participated out of which 31 (52%) were males and 29 (28%) were females with a mean age of 32.35 years (SD = 4.59). The majority of the teeth that were isolated were posterior [28 (46.7%)]. In the first questionnaire, concerning patients' comfort with rubber dams, 96.7% of patients of Group-1 (conventional rubber dam) felt good as compared to 86.7% of patients of Group-2 (OptraDam®Plus). In terms of rubber dam system preference, 73.3% of patients chose conventional rubber dams as compared to OptraDam®Plus (Table 1).

In the Operator questionnaire (Table 2), asking about operator preferences, 80% of the operators responded that the conventional rubber dam was preferable over (OptraDam®Plus). In terms of moisture control, patients of Group 1(conventional rubber dams) outperformed (90%) patients of Group-2 (OptraDam®Plus) (*p*-value = 0.001) and for other factors like ease of application and ease of obtaining radiographs, the operator noticed no appreciable differences (*p*-value> 0.05) between the two rubber dams.

Regarding the meantime application between the conventional rubber dam (Group-1) and OptraDam®Plus (Group-2), no statistically significant difference was seen in Table 3.

## Discussion

The isolation method is an important component of providing successful and excellent treatment in dental restorative and

***Table 1.*** *Comparison of patients' factors between two groups.*

| Patient factors | GROUP | Responses | Frequency | Percentage | *p*-value* |
|---|---|---|---|---|---|
| Comfort | Group 1 (Conventional) | Good | 29 | 96.7 | 0.12 |
| | | Fair | 1 | 3.3 | |
| | | Bad | 0 | 0 | |
| | Group 2 (OptraDam®Plus) | Good | 26 | 86.7 | |
| | | Fair | 4 | 13.3 | |
| | | Bad | 0 | 0 | |
| Preference | Group1 (Conventional) | YES | 22 | 73.3 | 0.023 |
| | | NO | 08 | 26.7 | |
| | Group 2 (OptraDam®Plus) | YES | 10 | 33.7 | |
| | | NO | 20 | 66.7 | |

*Chi-square test

***Table 2.*** *Comparison of operators' factors between two groups.*

| OPERATOR factors | GROUPS | Responses | Frequency | Percentage | *p*-value* |
|---|---|---|---|---|---|
| Ease of application | Group 1 (Conventional) | Good | 26 | 86.7 | 0.16 |
| | | Fair | 4 | 13.3 | |
| | | Bad | 0 | 0 | |
| | Group 2 (OptraDam®Plus) | Good | 20 | 66.7 | |
| | | Fair | 10 | 33.3 | |
| | | Bad | 0 | 0 | |
| Moisture control | Group 1 (Conventional) | Good | 27 | 90 | 0.004 |
| | | Fair | 02 | 6.7 | |
| | | Bad | 01 | 3.3 | |
| | Group 2 (OptraDam®Plus) | Good | 23 | 76.7 | |
| | | Fair | 05 | 16.6 | |
| | | Bad | 02 | 6.7 | |
| Ease of radiograph | Group 1 (Conventional) | Good | 13 | 43.3 | 0.34 |
| | | Fair | 13 | 50.0 | |
| | | Bad | 02 | 6.7 | |
| | Group 2 (OptraDam®Plus) | Good | 29 | 96.7 | |
| | | Fair | 01 | 3.3 | |
| | | Bad | 0 | 0 | |
| Preference | Group 1 (Conventional) | Yes | 24 | 80 | 0.006 |
| | | No | 06 | 20 | |
| | Group 2 (OptraDam®Plus) | Yes | 11 | 36.3 | |
| | | No | 19 | 63.3 | |

*Chi-square test.

endodontic procedures.[11] The most successful isolation approach is the rubber dam, which additionally improves patient safety and elevates the standard of care.[2] Dental professionals have had access to the rubber dam for more than 145 years, and it may be a very useful device but it is not commonly used for a variety of reasons, including installation difficulty, inadequate training during clinical years, and costly equipment and materials and time-consuming procedure. When used incorrectly, they may be painful for the patient, which might prevent dentists from using them. Various rubber dam methods have been created to make it easier and take less time to fix and remove the appliance.[5,6]

***Table 3.*** *Comparison of time of application between two groups.*

| Time of application (minutes) | Mean | Std. Deviation | *p*-value* |
|---|---|---|---|
| Conventional rubber dam (Group-1) | 6.01 | 1.332 | 0.11 |
| OptraDam®Plus (Group-2) | 4.22 | 0.710 | |

*Chi-square test.

In the current study, a greater number of patients reported feeling comfortable using the conventional rubber dam system than in those patients for whom OptraDam®Plus was used. A study conducted on a pediatric patient by Mahima et al.[12] shows that OptraDam®Plus was more comfortable and caused lesser anxiety in children as compared to the conventional rubber dam isolation, which is opposite to the finding of this study. In terms of patient preference, the conventional rubber dam was favored by most patients. In a study involving Turkish patients, Kaşıkçı et al.[13] discovered that patients' favorable attitudes toward using rubber dams increase when they get accurate information about the rubber dam from their clinician before initiating the treatment. The patient's thoughts and preferences are also influenced by the clinician's experience with the procedure.[13]

The time required to set up a rubber dam in the operation area may be one reason why it is not preferred. In the current investigation, the average time to apply a conventional rubber dam was longer than the average time to apply OptraDam®Plus (4.46 minutes with an S.D. of 4.4), although this difference was not statistically significant. A study by Orafi et al.[14] revealed that the average time required for general practitioners to apply a conventional rubber dam was 4.28 minutes. Based on different studies, installing a rubber dam takes an average of 1 to 2 minutes.[15,16] This duration is insignificant in the context of the entire treatment period, therefore using the rubber dam does not materially extend the period of therapy. It should be mentioned that the duration may be affected by elements such as the number of people present in the working environment (hospital, private clinic), the workload of the dentists, their level of manual dexterity and comfort applying rubber dams, and the fear, terror, and excitement experienced by the patients.[17]

One of the trickiest procedures in adhesive dentistry is maintaining proper moisture management.[18] In the current study, the operators observed that conventional rubber provides better moisture retention than OptraDam®Plus.

According to a study by Falacho et al.,[19] rubber dam placement reduces the negative effects of intra-oral humidity and eventually improves the bond strength to enamel, irrespective of the adhesive method. Other investigations on the longevity of composite restoration in primary molars found that cotton roll isolation was not superior when compared to conventional rubber dam.[20,21]

In this study, the operators favored utilizing the conventional rubber dam system on a larger percentage of patients (80%) than the OptraDam®Plus (36.3%). In both operational dentistry and endodontics, radiographs are essential. To measure the working length during a root canal procedure, radiographs are obtained. Since the patient is often left alone at the radiography location during this stage, a rubber dam should be placed to prevent any potential damage. Therefore, the ease of radiograph shooting is crucial. In this study regarding this parameter, the Operators found that the patients had a better radiographic experience with the conventional rubber dam as compared to OptraDam®Plus.

## Conclusion

This study concluded that the conventional rubber dam was preferred by both patients and operators over OptraDam®Plus. Conventional rubber dams perform better in terms of controlling moisture and dental radiography of posterior teeth. Patients will find endodontic and restorative procedures more pleasant if the rubber dam isolation becomes an integral part of everyday dental care.

### Limitations of the study

The limitation of the study is the small sample size. The results of this study still need to be confirmed by a larger sample size. Furthermore, there are additional aspects to consider, such as costs, color, and membrane thickness as OptraDam®Plus systems have a limited popularity among dentists maybe because of their expensive cost as compared to the conventional rubber dam.

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### List of Abbreviations

None.

### Conflict of interest

None to declare.

### Grant support and financial disclosure

None to disclose.

### Ethical approval

Ethical approval was granted by the ERB of the School of Dentistry, Pakistan Institute of Medical Sciences, Islamabad, Pakistan, vide Letter No.SOD/ERB/2022/07, dated 06-09-2022. The trial is registered on Clinicaltrials.gov under the number (NCT05554757).

### Authors' Contributions

**AW:** Conception and design of the study, drafting of the manuscript, analysis, and interpretation of data.

**SA:** Conception and design of the study, acquisition of data collection, and drafting of the manuscript.
**NS, SA:** Acquisition, analysis, and interpretation of data.
**M, MKS:** Analysis and interpretation of data, drafting of the manuscript with critical intellectual input.
**ALL AUTHORS:** Approval of the final version of the manuscript to be published.

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## References

1. Zahra SF, Yousaf A, Ashfaq S, Ali F, Aslam M. Different techniques for rubber dam isolation: a cross-sectional study. Life Sci. 2021;2(3):5–10. https://doi.org/10.37185/lns.1.1.124
2. Wong MC, Zou J, Zohu X, Li C, Wang Y. Rubber dam islolation for restorative treatment in dental patients. Cochrane Database Syst Rev. 2021;5(5):1–40. https://doi.org/10.1002/14651858.CD009858.pub2
3. Khan HR, Azam S, Qureshi B. Knowledge and attitude of house officers regarding rubber dam use. Pak Oral Dent J. 2018;38(1):97–101.
4. Nasser A. Rubber dam isolation-when and why to use it? Part 1. BDJ Stud. 2021;28(2):40–1. https://doi.org/10.1038/s41406-021-0201-y
5. Jitesh S, Sandeep AH. Assessment of knowledge, attitude and practice based survey towards rubber dam usage in clinical practices among undergraduate dental students. Int J Pharm Res. 2020;9(2):22–8. https://doi.org/10.4103/jpbs.JPBS_764_20
6. Nagarajan H, Karuppanan PS. Knowledge and practice of rubber dam usage among dental practitioners. Int J Community Dent. 2021;9(2):171. https://doi.org/10.4103/ijcd.ijcd_40_21
7. Mirza AJ, Nazir M, Javaid MA, Shafiq MK, Moosa R. Frequency of post-instrumentation symptoms using hand files versus rotary protapers. Dent Open J. 2018;5(1):23–9. https://doi.org/10.17140/DOJ-5-138
8. Batool SZ, Saher U, Bibi Z. Among dentists in Lahore a popular method of field isolation: a research study conducted on rubber dam. *Indo Am J.* 2018;5(9):9537–42. https://doi.org/10.5281/zenodo.1447145
9. Mackenzie L, Waplington M, Bonsor S. Splendid isolation: a practical guide to the use of rubber dam part 1. Dent Update. 2020;47(7):548–58. https://doi.org/10.12968/denu.2020.47.7.548
10. Scott D, Hogan T, John J. Rubber dam evidence. Br Dent J. 2020;229(3):150. https://doi.org/10.1038/s41415-020-2011-y
11. Alzahrani MH. Knowledge, attitude and practice of dental students regarding use of rubber dam during clinical procedures. Saudi J Oral Dent Res. 2022;7(12):333–4. https://doi.org/10.4103/jpbs.JPBS_764_20
12. Mahima S, Karuna YM, Shenoy R, Sudha K, Maimoona TM, Rao A, 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. https://doi.org/10.5005/jp-journals-10005-2519
13. Kaşıkçı S, Özbek SK. Evaluation of rubber dam use in endodontic treatments in terms of patients' awareness level, acceptability, and usage experience. Eur J Ther. 2024;9(1):23–9. https://doi.org/10.58600/eurjther2025
14. Orafi I, Hammad M. Attitudes of Libyan patients towards the use of rubber dam in endodontic treatment in Benghazi. Open J Dent Oral Med. 2018;6(2):7–16. https://doi.org/10.13189/ojdom.2018.060201
15. Vanhée T, Tassignon C, Porta P, Bottenberg P, Charles T, Vanden Abbeele A. Behavior of children during dental care with rubber dam isolation: a randomized controlled study. J Dent. 2021;9(8):89. https://doi.org/10.3390/dj9080089
16. Handa A, Bhullar KK, Kaur S, Batra D, Grover JS, Malhotra S, et al. The acceptance of rubber dam isolation by patients undergoing endodontic treatment and its feedback: a questionnaire based survey. J Pharm Res Int. 2022;34(38B):11–7. https://doi.org/10.9734/jpri/2022/v34i38b36222
17. Bourgi R, Kharouf N, Cuevas-Suárez CE, Lukomska-Szymańska M, Devoto W, Kassis C, et al. Effect of modified triple-layer application on the bond strength of different dental adhesive systems to dentin. J Funct Biomater. 2023;14(10):522. https://doi.org/10.3390/jfb14100522
18. Yalçın A, Kokozçitaker Ö, Bakır Ş. Rubber dam application in clinical practice: a study on the patient perspective. J Dent Educ. 2023;1(1):19–22. https://doi.org/10.51271/JDSE-0004
19. Falacho RI, Melo EA, Marques JA, Ramos JC, Guerra F, Blatz MB. Clinical in-situ evaluation of the effect of rubber dam isolation on bond strength to enamel. J Esthetrestor Dent. 2023;35(1):48–55. https://doi.org/10.1111/jerd.12979
20. Olegário IC, Moro BL, Tedesco TK, Freitas RD, Pássaro AL, Garbim JR, et al. Use of rubber dam versus cotton roll isolation on composite resin restorations' survival in primary molars: 2-year results from a non-inferiority clinical trial. BMC Oral Health. 2022;22(1):1–3. https://doi.org/10.1186/s12903-022-02449-y
21. Vodoriz YY, Tkachenko IM, Nazarenko ZY, Pisarenko OA, Gurzhiy OV. The prevalence of rubber dam among dentists in different countries. Wiad Lek. 2022;75(9 p2):2252–5. https://doi.org/10.36740/wlek202209213