The acceptance of rubber dam isolation by patients undergoing endodontic treatment and its feedback: A questionnaire based survey

ABSTRACT

Objective: The study was done to evaluate the average time taken by the operators to apply the rubber dam, procedure time and the acceptability or rejection of placement of rubber dam by the patients during endodontic treatment procedures.

Design: The study was carried out during the time interval of May, 2021 to August, 2021, 450 patients requiring endodontic treatment reported to the department. Out of 450 patients, 180 patients were randomly selected for the study by lottery method. All the endodontic procedures were performed under rubber dam isolation and rubber dam application time and time for isolation was determined. Further, a questionnaire survey was performed to evaluate the patient's acceptance or rejection of procedures rubber dam and various reasons for rejection.

Results: The highest number of respondents belonged to 21-30 years of age group i.e. 26.6% followed by 31-40 years i.e. 26.11%. Average rubber dam application time and procedure time were estimated as 4.04 and 44.07 minutes respectively. More than 90 % of the participants were willing to accept the procedure under rubber dam isolation in future. However, on contrary, only 9.44 % of the participants rejected the procedureunder rubber dam isolation and the most common reasons for rejection were uneasiness felt by the patient and difficulty in breathing.

Conclusions: The acceptability of rubber dam isolation while performing endodontic procedures/ treatments was quite significant among the patients.Very few patients had allergy to the latex material of rubber dam sheets and respiratory disorders.

Keywords: Rubber dam isolation, questionnaire, survey, endodontic treatment.

1. INTRODUCTION

Isolation in dentistry is critically important for a variety of reasons. It encompasses isolating an area of the oral cavity, maintaining a dry field and a clear view, preventing objects from being aspirated or ingested, protecting the oral tissues from injury, and providing dental treatment more efficiently and productively while also addressing patient comfort. Rubber dam is one of the most commonly used isolation measures used by the clinician [1]. It was first described by Dr SC Barnum over 150 years ago and acts as a physical barrier between the selected operator field and the oral cavity, which prevents saliva, blood, gingival crevicular fluid, humid exhaled air, and other debris from interfering with the treatment [2]. Rubber dam protects the patient's oropharynx from the possible aspiration of instruments, medicaments, irrigating solutions and material debris [3-4]. These advantages have led to the use of rubber dam being accepted as a standard of care by professional organizations [5-8].

In response to the coronavirus pandemic in 2019, dentistry as a profession globally has been required to become even more focussed on the setting and maintenance of extremely high standards for cross-infection control. The patient's saliva may also harbour infectious disease particles that may pose risk to both the dentist and dental nurse during an aerosol generating procedure (AGP), against which the dental dam acts as a preventive barrier essentially reducing the infection transfer risk [1].

During long operative procedures, it is not uncommon for patients to feel a need to cough, which is considered a ballistic event that releases significant aerosol droplets that may potentially contain infectious respiratory micro-organisms (e.g. SARS-CoV-2). Of course, there will always be a small cohort of patients for whom it may be acceptable to refrain from its use. Contra-indications might include certain patients with disabilities, severe asthmatics and patients with respiratory conditions who rely on mouth breathing, patients with genuine allergy to the material (although latex-free, nitrile-based rubber dams are widely available now), psychosomatic intolerances, known epileptics who suffer from regular seizures, and patients with extreme claustrophobia [1]. So, this survey was done to evaluate the average time taken by the operators to apply the rubber dam, procedure time and the acceptability or rejection of placement of rubber dam by the patients during endodontic treatment procedures.

2. MATERIALS AND METHOD

The present study was conducted in the Department of Conservative Dentistry and Endodontics, Sri Guru Ram Das Institute of Dental Sciences and Research, Sri Amritsar to determine the patient's acceptance or rejection for rubber dam application during treatment and various reasons for rejection. The following criteria was used for inclusion or exclusion of the participants.

INCLUSION CRITERIA:

- Irreversible pulpitis
- Pulp necrosis
- Fully erupted teeth
- Composite restorations
- Patients willing to participate

- North Indian subjects reported at dept.

EXCLUSION CRITERIA:

- Badly mutilated teeth
- Teeth indicated for extraction
- Partially erupted teeth

2.1Selection of sample size:

G Power 3.1.9.7 software was used to select the sample size of the present study. The significance level of probability was fixed at 0.05 per cent as shown in the following table. Non- parametric chi-square test was selected to see the goodness of fit with regard to level of acceptance or rejection among the patients during treatment procedure under rubber dam.

Effect size	0.30
Probability level	0.05
Power	0.95
Minimum sample size required	145

2.2 Procedure:

The study was carried out during the time interval of May, 2021 to August, 2021, 450 patients requiring endodontic treatment reported to the department. Out of 450 patients, 180 patients were randomly selected for the study by lottery method. Participants were treated by 6 post- graduate residents and all the treatment procedures were carried out under the rubber dam isolation. Informed consent for the treatment was obtained from all the participants.

After taking the medical history, local anaesthesia was administered and rubber dam was applied followed by the respective treatment procedure and all the parameters were evaluated after the treatment procedure by questionnaire method which included rubber dam application time, procedure time, acceptance or rejection of rubber dam by the patient and reasons for its rejection. All the data was then put to statistical analysis.

3. STATISTICAL ANALYSIS:

Simple statistical tools like frequency, percentages and average was used to analyse the data. Specifically, the chi- square was selected to see the significance of association between the gender of patients and level of acceptance or rejection of treatment procedure under rubber dam.

4. RESULTS:

The study population constituted 55% males and 45% femaleswith highest number of respondents 48 (26.67 %) belonged to 21-30 years of age group, followed by 31-40 years i.e. 47 (26.11%) as depicted in table- I. Average rubber dam application time and procedure time estimated were 4.04 and 44.07 minutes respectively (table- II). The gender wise history of respiratory disorders among the patients showed that only 2 females reported with history of mouth breathing; also one respondent gave the history of allergy to latex material of rubber dam sheets as shown in table III,IV respectively. Based upon the feedback, 90.56% of participants accepted the procedure under rubber dam isolation. However, only 9.44 % participants rejected the endodontic treatment under rubber dam isolation as explained in table- V. The most common reasons for rejection were, patients felt uneasy, suffocated and pukish while undergoing endodontic treatment under rubber dam isolation (table-VI)

Table 1: Distribution of patients according to age and gender

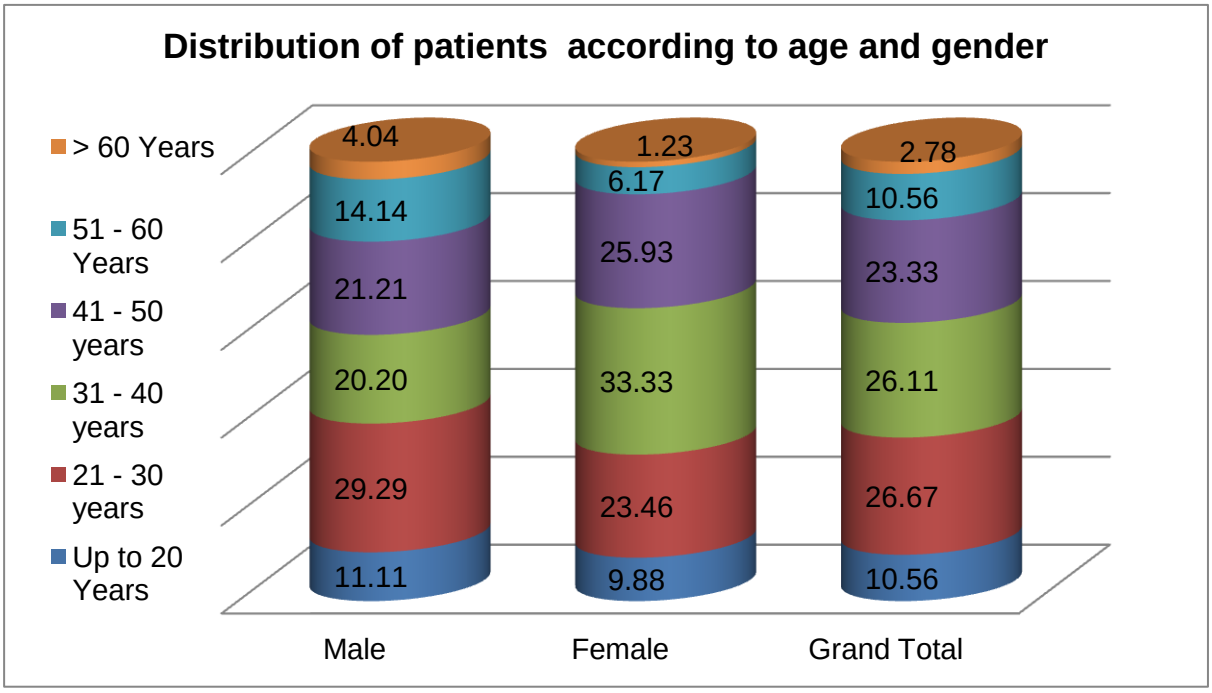

Table II: Average time for rubber dam application and average procedure time

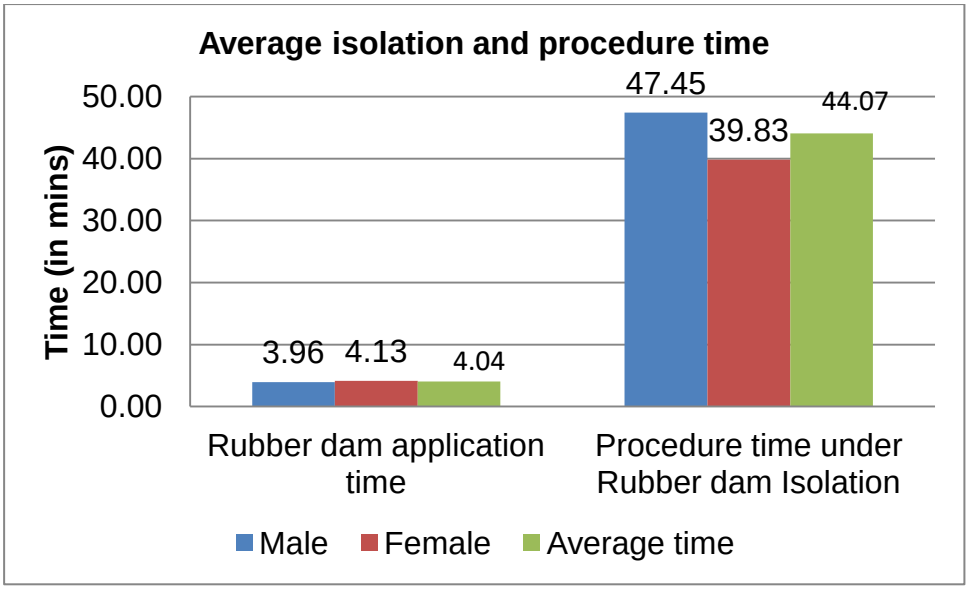

Table III: History of any respiratory disorder in patients

ANY RESPIRATORY DISORDER	Male		Female		Total	
	Number	%	Number	%	Number	%
No	99	100.00	79	97.53	178	98.89
Yes	0	0.00	2	2.47	2	1.11
Total	99	100.00	81	100.00	180	100.00

P-value=0.116 (Non-significant)

Table IV: History of allergy to latex used as rubber dam sheet in patients

Allergy	Male		Female		Total	
	Number	%	Number	%	Number	%
No	99	100.00	80	98.77	179	99.44
Yes	0	0.00	1	1.23	1	0..56
Total	99	100.00	81	100.00	180	100.00

P-value=0.268 (Non-significant)

Table V: Incidence of acceptance/rejection by patients undergoing treatment under rubber dam isolation

Gender	Male (%)	Female (%)	Total (%)
Accept	92.92	87.65	90.55
Reject	7.07	12.34	9.44
Total	100	100	100

P-value= <0.001 Significant

Table VI: Reasons of rejection(as per patient's response)

5. DISCUSSION:

Novel coronavirus disease 2019 (COVID-19) was declared a pandemic by the World Health Organization on March 11, 2020, due to the speed and scale of the transmission of the disease. Immediately, dental practitioners across the world began to investigate ways to protect patients and their teams from infection.

In its algorithm for treating emergency patients during the COVID-19 pandemic, the American Dental Association has included rubber dam use with a high-volume evacuator as a strategy to help reduce the spread of the highly contagious virus [9]. Also, Cochran MA et al (1989) [10] found that the application of rubber dam during restorative procedures could significantly reduce the amount of airborne particles within an approximately 3-ft diameter of the operational field by 70% or more. This reduction in airborne particles reduces the risk of COVID-19 transmission.

In the present study, rubber dam was applied during the endodontic treatment procedures to evaluate therubber dam application time, procedure time, acceptance or rejection of rubber dam by the patient and reasons for same.The distribution of participants according to the age group was more amongst 31-40 years age group in females and 21-30 years age group in case of males. These age groups prefer endodontic treatment the most (table - I) as they are interested in saving their teeth rather than going for extraction and replacements.

All the endodontic procedures were carried out in the department by post graduate residents and the time taken for the application of rubber dam ranged from 3.96- 4.13 minutes.The average time taken to apply rubber dam was 4.04 minutes (table- II). Another, similar study done by Filipovic et al (2004) [11] reported that the mean time taken by undergraduate students and the general practitioners to apply rubber dam for endodontic and restorative procedures was 13.50 minutes and 4.65 minutes, respectively with a range of 1- 30 minutes.

Also, in corroboration with the findings of the present study, Stewardson and McHugh (2002) [12] reported the average rubber dam application time in the range of 4-5 minutes. So, there was no significant difference between the average time taken for the application of rubber dam and this is convenient and comfortable for the patient and operator both.

The average procedure time under rubber dam isolation was in the range of 39.83- 47.45 minutes with average procedure time 44.07 minutes as shown in table-II. Filipovic et al (2011) [11] reported that the mean duration of rubber dam use for all procedures by under graduate dental students was 76.25 min and for dental practitioners was 27.7 min. Longer treatment time in the present study was expected because of the increased difficulty of the cases they deal with and the patients were treated by training post graduate residents in the department.

In the current study, only 2 female respondents had difficulty in breathing (p=0.116, non- significant) as depicted in table-III. Also, 1 respondent female reported with the history of allergy to the latex material of rubber dam sheet as she developed rashes extraorally during her previous dental procedure (p=0.268, non significant) as shown in table - IV. This can be prevented by the use of latex rubber dam sheets and napkins.

The endodontic treatment procedures under rubber dam isolation were accepted by 90.56% (p=<0.001,significant) of the participants and reported a higher level of comfort during the treatment as well as showed preference for use of rubber dam in future treatment procedures;while 9.44% rejected to get their future treatment procedure under rubber dam isolation as illustrated in table-V.

A similar study was done by Gilbert et al (2010) [13] on use of rubber damand concluded thatmost dentists (63%) did not use a rubber dam while during endodontic treatment procedures.
Various authors [14-16] suggested that the use of air turbine resulted in the formation of aerosols and droplets that are usually contaminated with bacteria and blood. These aerosols and droplets represent a potential route for transmission of infectious diseases such as measles, tuberculosis, SARS, hepatitis and AIDS. Also, the use of rubber dam resulted in a significant reduction in the microbial

content of air turbine aerosols produced during operative procedures, thereby reducing the risk of cross-infection in the dental practice as studied by various authors[14- 17].

On the contrary, Suhail H et al (2017) [18] stated that regardless of the collection point, using a rubber dam was associated with more bacterial colony-forming units rather than not using a rubber dam (*P* = 0.009). Despite its clinical value, the rubber dam seems to result in significantly higher aerosol levels on various areas of the dentist's head, requiring that dentists cover their heads with suitable protective wear.

The most common reasons for rejection of rubber dam application in future by the patients were suffocation, unacceptable flavour and fragrance of rubber dam sheet. So, a rubber dam sheet material incorporated with different flavours should be manufactured to improve the acceptance of rubber dam by the patient. Irritation felt by the patient due to latex rubber can be avoided by the placement of napkin below the sheet.

Other common reason for rejection was difficulty in breathing. To improve the acceptance of rubber dam in mouth breathers, a hole should be punctured in the rubber dam sheet to allow the comfortable breathing. Use of topical local anaesthesia should be mandatory.

Also, one subject reported with the traumatic history while rubber dam retainer/clamp application. So, the entire procedure of rubber dam application should be explained to the patient on first attempt in order to make the procedure comfortable for the patient.

As the above result implies, rubber dam should be considered as the gold standard for the endodontic as well as restorative treatment procedures as it offers protective benefits to both patients and the dentists.

6. CONCLUSION:

The attitude of patients to the usage of rubber dam was positive in our study. The overwhelming majority of our patients tolerated treatment with rubber dam to a great extent, they appreciated the benefits and would prefer its usage in further treatments. Rubber dam should be used in all the patients undergoing restorative as well as endodontic procedures as it offers protection to both patients and dentists against cross infection.

7. COMPETING INTEREST: “Authors have declared that no competing interests exist.”

8. AUTHOR’S CONTRIBUTIONS: All the above mentioned authors had contributed well in order to get the best results regarding this research work. The task starting from selection and feasibility criteria, performing statistical analysis, writing the protocol and first draft of the

manuscript to managing the literature searches and analysing the study has been done by the co-operation of all the authors mentioned. The final manuscript has been read and approved by all the authors.

9. REFERENCES:

1. Nasser A. Rubber Dam Isolation-When and Why to Use it? Part 1. BDJ Student. 2021 Apr;28(2):40-1.

2. Abrams R A, Drake C W, Segal H. Dr. Sanford C. Barnum and the invention of the rubber dam. *Gen Dent*.1982; 30: 320-2.

3. Ingle JI, Simon JH, Machtou P, Bogaerts P. Outcome of endodontic treatment and re-treatment. Endodontics. 2002; 5: 747-68.

4. Glickman GN. Preparation for treatment. Pathway of the Pulp. St Louis: Mosby. 2002:77-109.

5. European Society of Endodontology ES. Undergraduate curriculum guidelines for endodontology. International Endodontic Journal. 2001 Dec; 34 (8):574-80.

6. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. International endodontic journal. 2006 Dec;39(12):921-30.

7. American Association of Endodontists. Guide to Clinical Endodontics, 4th edn. Chicago, IL: American Association of Endodontists.2004.

8. American Academy of Pediatric Dentistry Clinical Affairs Committee-Pulp Therapy Subcommittee, American Academy of Pediatric Dentistry Council on Clinical Affairs. Guideline on pulp therapy for primary and young permanent teeth. Pediatric dentistry. 2005;27(7 Suppl):130-4.

9. BW Small.Return of Rubber dam; Inside Dentistry May 2021;17 (5):1-2.

10. Cochran MA, Miller CH, Sheldrake MA.The efficacy of the rubber dam as a barrier to the spread of microorganisms during dental treatment.The Journal of the American Dental Association.1989;119(1):141-4.

11. Filipović J, Jukić S, Miletić I, Pavelić B, Malčić A, Anić I. Patient's attitude to rubber dam use. ActaStomatologicaCroatica, 2004; 38: 319–322.

12. Stewardson DA, McHugh ES. Patients' attitudes to rubber dam. International Endodontic Journal, 2002; 35: 812–819.

13. Cohen S, Schwartz S (1987) Endodontic complications and the law. Journal of Endodontics.1987; 13:191–7.

14. Wong RC. The rubber dam as a means of infection control in an era of AIDS and hepatitis. Journal (Indiana Dental Association). 1988; 67(1):41-3.

15. Forrest WR, Perez RS. The rubber dam as a surgical drape: protection against AIDS and hepatitis. General dentistry. 1989; 37(3):236-7.

16. Harrel SK, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. The Journal of the American Dental Association. 2004 Apr 1;135 (4):429-37.

17. Samaranayake LP, Reid J, Evans D. The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination. Journal of Dentistry for Children.1989; 56:442–4.

18. Suhail H, Al-AmadManal A, AwadFaraj M, EdherKhalil, TarekSA. Omran. The effect of rubber dam on atmospheric bacterial aerosols during restorative dentistry. Journal of Infection and Public Health.2017;10 (2):195-200.