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Rubber dam in dental care and other related subjects of its use in dentistry: a Scoping review.

Universidade Fernando Pessoa

Faculdade Ciências da Saúde

Porto, 2023

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Thesis presented to the Faculty of Health Sciences

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as part of the requirements for obtaining the degree in Dentistry.

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ABSTRACT

Introduction: The use of a rubber dam for absolute isolation of the teeth is widely recommended to control the operating field and ensure oral treatment success.

Objective: This work carried out a scoping review on rubber dam medical device use for dental care and dentistry and, of the most up-to-date evidence on its related-issues such as, prevalence, safety, environment, and marketing bibliometric data. It also intended to map the number and methodologic categories of the collected studies.

Material and Methods: Search was conducted in PubMed, B-On and Science Direct, and, in Dentistry Grey Literature databases and others between April and May 2023. Inclusions and exclusions criteria were applied according to the research question based on the PCCO strategy. For that purpose, to the #rubber dam/dental dam# and #dental care/dentistry# search terms were added to the issues on “prevalence”, “safety”, “environment” and “marketing”.

Results: Were presented numerical aspects of the dental care fields and other related issues to dentistry, as well as the type of studies and characteristic of any relevant study. Rubber dam engaged to prevalence data, allowed to scope map 7 surveys; Rubber dam engaged to safety data allowed to scope map 13 references: 5 clinical trials, 4 case reports, 2 reviews, 1survey and 1 retrospective review; Rubber dam engaged to environment data, allowed to scope map 7 references: 4 editorials, 1 clinical in situ, 1 case report, 1 review. Rubber dam engaged to marketing data, allowed to scope map 11 references: 5 reviews, 2 case reports, 2 grey sources, 1 experimental trial and 1 editorial.

Conclusion: The rubber dam, a highly recommended device for everyday dental procedures, is still side-lined today, with low usage rates, despite having been used successfully during the pandemic Sars-Cov-2.

Keywords: Rubber dam, Dentistry, Dental care, Prevalence, Safety, Environment, Marketing

RESUMO

Introdução: A utilização do dique de borracha para o isolamento absoluto dos dentes é amplamente recomendada para o controlo do campo operatório e garantia de sucesso do tratamento oral.

Objetivo: Efetuou-se uma análise abrangente do uso dique de borracha no tratamento dentário, como dispositivo médico e da evidência atual abrangendo a prevalência, segurança, meio ambiente e marketing relacionada com a medicina dentária. Pretendeu-se também mapear o número e metodologia dos estudos encontrados.

Materiais e métodos: Efetuou-se a pesquisa na *PubMed, B-On e Science Direct*, e, também, em fontes de literatura cinzenta entre abril de 2023 e maio de 2023. Os critérios de inclusão e exclusão aplicaram-se conforme a questão de pesquisa, com base na estratégia PCCO. Para o efeito, aos termos #rubber dam/dental dam# e #dental care/dentistry# foram adicionados termos de pesquisa "*prevalence", "safety", "environment"* e *"marketing"*.

Resultados: Foram apresentados aspetos numéricos das áreas de medicina dentária e outros assuntos relacionados, bem como, a tipologia de estudos e as caraterísticas mais relevantes de cada estudo. Relativamente aos dados de prevalência, obtiveram-se 7 estudos epidemiológicos com aplicação de inquéritos. Os dados de segurança abrangeram 13 referências: 5 ensaios clínicos, 4 relatos de casos, 2 revisões, 1 estudo com inquérito, 1 revisão retrospetiva. Sobre o ambiente foi possível mapear 7 referências: 4 editoriais, 1 ensaio clínicos in situ, 1 relato de caso, 1 revisão. Relacionado com terminologia de marketing, obtiveram-se 11 referências: 5 revisões, 2 relatos de caso, 2 publicações de fontes cinzentas, 1 ensaio experimental,1 editorial.

Conclusão: O dique de borracha é um dispositivo altamente recomendado para os procedimentos dentários diários, possui atualmente menores taxas de utilização do que seria o esperado apesar de ter sido globalmente utilizado com sucesso durante a pandemia por Sars-Cov-2.

Palavras-chave: Dique de borracha, Medicina Dentária, Tratamento dentário, Prevalência, Segurança, Ambiente, Comercialização.

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I. Introduction

Nowadays, during routine dental procedures, dentistry professionals' resort to several and a wide range of techniques and health materials. In this paper, we focus on one of them, which is presented in many dental protocols for oral field isolation as part of safety procedures recommendations. Rubber dam is a medical device and an adjunct of choice for creating isolation of one or more teeth in the oral cavity (Alqahtani *et al.*, 2023).

The rubber dam was conceived in 1864 by Sanford Barnum and has been used and developed around the world in the last 150 years. The rubber dam is a class I, low risk, medical device (Infarmed, 2023) usually composed of natural rubber latex and most often recommended for root canal treatment and endodontic procedures. However, its use is not restricted to that field of dental practice (Gilbert *et al.*, 2010). It has the shape of a latex/vinyl square, into which, one or more holes need to be pierced with a dental punch to insert the tooth to be treated and the neighbouring teeth. The dental rubber dam measures about 150mm² and can have different thicknesses; it is held in place by stainless metal clamps, with or without wings, positioned with a metal forceps (clamp holder). There are a large number of metallic clamps available on the market. The most important thing is to choose the one that adapts best to the tooth anatomy, the one that best surrounds the cervical part of tooth crown and ideally with 4 points of contact (Patel and Hamer, 2021).

The rubber dam offers many advantages to dental practitioners who use it, in addition to overcome the difficulties encountered during dental procedures, due to the hostile and humid environment of the oral cavity. Therefore, some qualities can be attributed to it, such as, a better clinical view of the field for the operator, the protection of the patient limiting the contact with dental materials or cytotoxic products, the protection of soft tissues adjacent to the teeth, the control of restorative materials contamination by saliva or blood, the potential reduction of patient anxiety and, the cross-infections prevention, among others (Patel and Hamer, 2021).

Currently, this dentistry isolation approach is most often used in endodontics for non-surgical endodontic treatment and in adhesive dental restoration. It can be used in both adult and pediatric patients. However, although several other isolation techniques have emerged and the world of dentistry is constantly evolving, the use of rubber dam remains highly recommended (Vanhée *et al.*, 2021).

This work intends to carry out a scoping Review on rubber dam medical device use for dental care and dentistry and, of the most up-to-date evidence on its related-issues such as, prevalence, safety, environment, and marketing bibliometric data. It also intended to map the number and methodology of the collected studies.

II. Material and Methods

This scoping review was conducted according to the research question, based on the PCCO (population/problem, concept, context, outcome) strategy, and aimed to assess the current knowledge on rubber dam use in dentistry/dental care related-issues.

The research PCCO framework was used for identifying the main concepts regarding rubber dam in dentistry and related-subjects, such prevalence, safety, environment, and marketing:

- **Population/problem**: Rubber dam use in dental care or dentistry
- **Concept**: All methodology literature evidence, from reviews, case reports, epidemiologic surveys, clinical reports, in vitro surveys, in situ studies to clinical trials.
- **Context**: Rubber dam use in dental care/dentistry related-issues evidence
- **Outcome**: To scope map the rubber dam epidemiologic, safety, environment, and marketing data

1. Question and strategy

The search question applied to this work was: *How have rubber dam use been engaged, in nowadays literature evidence, in dentistry/dental care related-issues as, prevalence/epidemiology, safety, environment and marketing issues?*

2. Search methods

The search strategy was conducted in April and finished during May 2023. First, one of the authors (ED) search strategy identified all scoping reviews, in vitro, in vivo, editorial, and other published in the last 5 years, in the following database: MEDLINE/Pubmed, B-On, Science Direct, using the MeSH terms #rubber dam#, #dentistry#, #dental care#, #prevalence#, #safety#, #environment#, #marketing#. An optional keyword “dental dam” was use with all other MeSH terms, in order to complete the search strategy. These databases were selected because of their relevancy to rubber dam use in dentistry, mainly in endodontic fields as well as their ability to track references and cross-check references. This strategy was also supplemented by a grey literature search and reference checking.

The Boolean operators AND / OR were used, making different combinations with the words: “Rubber dam OR Dental dam AND Dental care”; “Rubber dam OR Dental dam AND Dentistry”; “Rubber dam OR Dental dam AND Dental care AND prevalence”; “Rubber dam OR Dental dam AND Dental care AND Safety”; “Rubber dam OR Dental dam AND Dental care AND Environment”; “Rubber dam OR Dental dam AND Dental care AND Marketing”; “Rubber dam OR Dental dam AND Dentistry AND Prevalence”; “Rubber dam OR Dental dam AND Dentistry AND Safety”; “Rubber dam OR Dental dam AND Dentistry AND Environment” and, “Rubber dam OR Dental dam AND Dentistry AND Marketing” (Table 1).

Table 1 – Search strategy used in each electronic database.

Search field 1	(“Rubber dam” OR “Dental dam”)
AND	
Search field 2	(“Dental Care” OR “Dentistry”)
AND	
Search field 3	(“Prevalence” OR “Safety” OR “Environment” OR “Marketing”)

To maximize available resources the search strategy included all literature witch had #rubber dam# or “dental dam” in the title of the publication.

3. Study Selection

Search strategy was developed in an iterative process led by two independent teachers (B.M. and P.M.M.) that peer reviewed all and validated the main search outputs. A first screening of records was done by title, and then by the abstract, according to the inclusion and exclusion criteria. Remaining publications were assessed for eligibility and qualitative synthesis by full-text screening.

4. Eligibility, inclusion and exclusion criteria

The inclusion criteria applied were, all full-text papers and articles published in the last five years (2018-2023 years), mostly in English, containing the scientific evidence on rubber dam used in human dentistry or dental care, such as direct and indirect adhesive restorations, endodontics, pediatric dentistry, and subjects related to dentistry profession such as, epidemiological data, safety, environment, and marketing related to its use. All methodology

types of studies were included, from epidemiological surveys, randomized clinical trials, in-vitro/experimental and in-situ studies, narrative reviews, systematic reviews, case reports and editorials.

As exclusion criteria were considered the scientific theses published in institutional repositories, articles that after reading the title or abstract were not relevant or not had rubber dam/dental dam in the title, and were not related to dental care or dentistry, or even, were outside the scope of epidemiology/prevalence, safety, environment, and marketing rubber dam use, assessments. All articles involving animals as participants or veterinary professionals were not considered for this scoping review.

5. Study Data

Bibliometric analysis was performed recording the following variables: database, authors, and year of publication. The methodology of analysis included the aims, methodology and main results/conclusions of the included studies, i.e. the outputs expressed as the number and methodologies of publications distribution according to the Rubber dam use in dental care/ dentistry and related-issues, as prevalence/epidemiology, safety, environment and marketing data. For the synthesis of outcomes, studies were categorized in terms of number and methodology applied, in the last 5 year.

III. Results

1. Study Selection and Flow Diagram

A total of 119 articles were identified after a thorough screening process in three databases: Pub-Med, B-On, and Science Direct. For eligibility purposes, the articles had to be less than 5 years old and the term “rubber dam” or “dental dam” had to figure in the title. Two additional publications were found in grey literature.

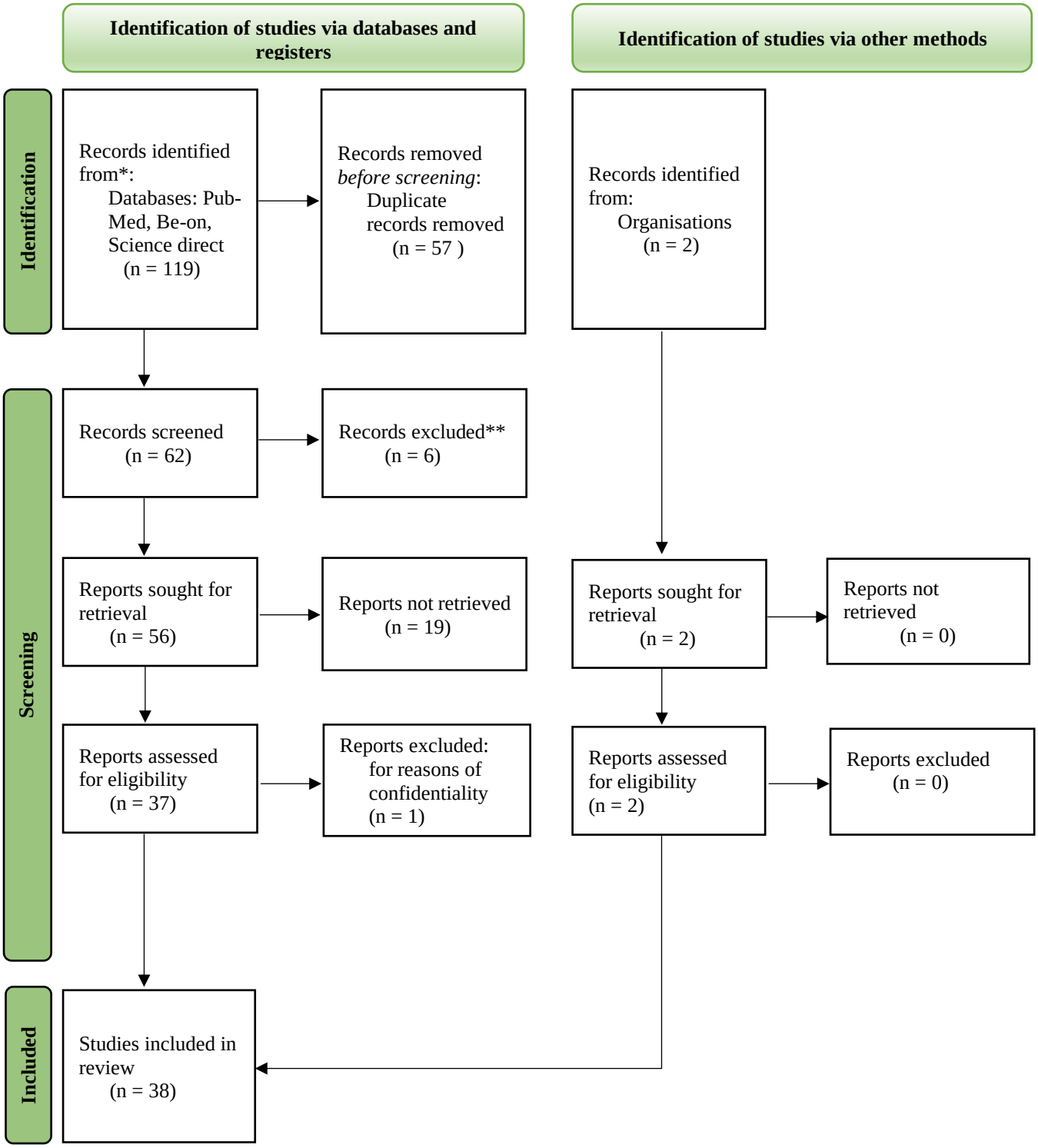
After removing duplicates, 62 publications were selected. Of these 62 papers and articles, 6 were excluded based solely on title screening. After reading the abstracts of these 56 articles, 19 were discarded.

In the end, 37 items and the 2 additional publications were considered eligible for further processing, but one of the 37 items was excluded for confidentiality reasons. After screening titles and abstracts, the articles were finally read in full.

An attentive reading resulted in the retrieval of 38 articles in total for this scoping review.

The results obtained from the screening process are presented according to the recommendations of the PRISMA Extension for scoping reviews, as shown in **Figure 1.**

Figure 1. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers, and other sources (Page *et al.* 2021).



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

** If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

2. Characteristics of the studies included.

The detailed methodologies and description of the 40 included publications in the present scoping review are summarized in **Table 2** (Annex).

3. Outcomes of the Scoping Review for each topic

The number and methodology scoping map of the collected studies is shown in **Table 3.**

3.1. Rubber dam and Prevalence surveys data

The outcomes of this scoping review have been classified under 4 topics. The first topic, Rubber dam/Dentistry and Prevalence/Epidemiology included 7 studies and all of them were surveys (Alqahtani *et al.,* 2023; Yaroslav Vodoriz Y. *et al.,* 2022; Jiang *et al.,* 2022; Çağa, Brennan and Eaton, 2021a; Çağa, Brennan and Eaton, 2021b; Abuzenada, 2021; Imbery and Carrico, 2019).

These studies consisted of questionnaires designed to assess the frequency and prevalence of rubber dam use in different countries. These questionnaires were dispensed to professionals that were inquired about the use of rubber dam according to their specialty and years of clinical practice. Some surveys focused on rubber dam university training and its effective use by students. No other articles or methodology were found regarding Rubber dam and epidemiology data.

3.2. Rubber dam and Safety data

For the second topic, Rubber dam/Dentistry and Safety subject, 13 articles were included. The majority of publications were clinical trials (N = 5) (Pottammal *et al.,* 2023; Doshi *et al.,* 2023; Olegário *et al.,* 2022; Vanhée *et al.,* 2021; Shah *et al.,* 2021). Also, were collected, 4 case reports (Gozon, Rumford and Cervenka, 2023; Jurado *et al.,* 2021a; Romero *et al.,* 2021; Jena *et al.,* 2020), 2 reviews (Miao *et al.,* 2021; Pop, 2020), one survey (Madarati *et al.,* 2018) and one retrospective review (Current *et al.,* 2022).

In this topic, the clinical trials and the survey have focused on patients' behavior when it comes to applying dental dams, specially based on participants apprehension about the material and the pain that it may cause. They have also attempted to develop new techniques and materials to make dental dams directions for use as comfortable as possible. Some of the case reports articles described adverse events that had occurred when a dam had been applied, and others discussed the application of the dam as a safety and success device in oral rehabilitation. The

two reviews collected looked at the importance of using a dental dam in direct and indirect dentistry.

3.3. Rubber dam and Environment

For the third topic, Rubber dam/Dentistry and Environment we had included 7 references: 4 editorials (Frankenberger and Van Meerbeek, 2021; Emery, 2020; Seron *et al.,* 2020; Scott, Hogan and John, 2020), one clinical in situ study (Falacho *et al.*, 2023), one case report (Checchi, Generali and Generali, 2020), one review (Patel and Hamer, 2021).

Editorials and the case report described the use of the dental dam during the global pandemic of SARS-CoV-2 and the impact of it on dentistry. The clinical in situ study discussed the adhesion strength to enamel structures of different adhesive systems when the rubber dam is applied as dental field isolation measure. The review manuscript focused on the description of rubber dam application techniques.

3.4. Rubber dam and Marketing

Finally, the last topic, Rubber dam/Dentistry and Marketing included 11 articles: 5 reviews (Alkhatib, Bissasu and Daud, 2023; Caponi *et al.*, 2021; Henarejos-Domingo *et al.*, 2021; Santos *et al.,* 2021; Brinker, 2019), 2 case reports (Jurado *et al.,* 2021b; Clavijo and Duarte, 2021), 2 grey sources (Dentaladvisor, 2023; Dentaladvisor, 2023), one experimental study (Jingxian *et al.,* 2020), and one editorial (Nock, 2021).

Most of the reviews on this topic, the two grey sources, the experimental study and the editorial focused on the promotion/evaluation of different brands of rubber dams or other rubber dam-related devices. The other reviews and the two case reports focused on promoting the use of intraoral scanner when a rubber dam is in place.

Table 3- Scoping map number of references include (N) and methodologies (n) applied for each topic, of epidemiological/prevalence, safety, environment and marketing data assessed.

Outcomes of the Scoping Review for each topic	Reference (autors, year)	Retrospective review	Editorial	Other literature/ grey literature	Review	Case Report	Survey	Experimental trial	Clinical In Situ	Clinical Trial	Quantitative Outcome (Number of refences; N)
Rubber dam/Dentistry and PREVALENCE/ EPIDEMIOLOGY	Alqahtani *et al.* (2023)						X				N=7
	Yaroslav Vodoriz Y. *et al.* (2022)						X				
	Jiang *et al.* (2022)						X				
	Çağa, Brennan and Eaton (2021a)						X				
	Çağa, Brennan and Eaton (2021b)						X				
	Abuzenada (2021)						X				
	Imbery and Carrico (2019)						X				
Rubber dam/Dentistry and SAFETY	Gozon, Rumford and Cervenka (2023)					X					N= 13
	Pottammal *et al.* (2023)									X	
	Doshi *et al.* (2023)									X	
	Olegário *et al.* (2022)									X	
	Current *et al.* (2022)	X									
	Jurado *et al.* (2021 a)					X					
	Vanhée *et al.* (2021)									X	
	Miao *et al.* (2021)				X						
	Shah et *al.* (2021)									X	
	Romero et *al.* (2021)					X					
	Jena et *al.* (2020)					X					
	Pop (2020)				X						
	Madarati et *al.* (2018)						X				

Table 3-Cont.

Outcomes of the Scoping Review for each topic	Reference (autors, year)	Retrospective review	Editorial	Other literature/ grey literature	Review	Case Report	Survey	Experimental trial	Clinical In Situ	Clinical Trial	Quantitative Outcome (Number of refences; N)
Rubber dam/Dentistry and ENVIRONMENT	Falacho et *al*. (2023)								X		N= 7
	Frankenberger and Van Meerbeek (2021)		X								
	Patel and Hamer (2021)				X						
	Emery (2020)		X								
	Seron et *al*. (2020)		X								
	Checchi, Generali and Generali (2020)					X					
	Scott, Hogan and John (2020)		X								
Rubber dam/Dentistry and MARKETING	Alkhatib, Bissasu and Daud (2023)				X						N=11
	Dentaladvisor (2023)			X							
	Dentaladvisor (2023)			X							
	Jurado *et al*. (2021 b)					X					
	Nock (2021)		X								
	Caponi *et al*. (2021)				X						
	Clavijo and Duarte (2021)					X					
	Henarejos-Domingo *et al*. (2021)				X						
	Santos *et al*. (2021)				X						
	Jingxian et *al*. (2020)							X			
	Brinker (2019)				X						
Total number of methodologies (n)		**1**	**5**	**2**	**8**	**7**	**8**	**1**	**1**	**5**	**38**

IV. Discussion

This scoping review aimed to evidence rubber dams, as medical device, use for dental care and dentistry and, of the most up-to-date evidence on its related-issues such as, prevalence/epidemiology, safety, environment, and marketing bibliometric data. It also intended to map the number of references and methodology of the collected studies, on these issues.

Rubber dam as medical device is usually used in endodontic procedures but is also known as an approach for operative field isolation in other several fields of daily dental care, from pediatric dentistry to restorative dentistry procedures (direct/indirect adhesive restorations) during oral rehabilitation.

For this purpose, all full-text papers and articles published in the last five years (2018-2023 years), mostly in English, containing the scientific evidence on rubber dam used in human dentistry or dental care, such as direct and indirect adhesive restorations, endodontics, pediatric dentistry, and subjects related to dentistry profession such as, epidemiological data, safety, environment, and marketing related to its use, were collected. All methodology types of studies were included, from epidemiological surveys, randomized clinical trials, in-vitro/experimental and in-situ studies, narrative reviews, systematic reviews, case reports and editorials.

Each of the collected publication was allocated to one of the four main dental care/dentistry related subjects namely, prevalence data, safety issues, environment topics and marketing, in order to frame the different themes and methodologies and to visualize the range of rubber/dental dam use. The prevalence data, aimed to evaluate the quantitative analysis of rubber dams use in different countries, in several fields of dentistry and dental care, according to professional years of experience, their specialty but also the use of rubber dams by university students during their graduation training. With respect to safety issues, publications were analysed according to their reference to professional and patient, focusing on events such as discomfort, pain, or allergies that may occur during or after rubber/dental dam use. The subject environment, included studies that reported the impact of the use of the dams on the daily practice environment, including the community and clinical staff, such as reducing the risk of cross-infection in dental procedures during the pandemic SARS-CoV-2. Finally, as regards marketing subjects, publications described the companies and manufactures approaches for

development of different types of dams, how they promote their benefits, and claims new clinical fields for rubber dam use.

The prevalence of rubber dam use, as the first topic of this scoping review, was assessed on the basis of various surveys. Despite being strongly recommended by the benefits that it may promote in most routine dental protocols, the rubber dam is often side-lined. In fact, several studies have highlighted the prevalence of its use, as shown in a questionnaire made by Yaroslav Vodoriz Y. *et al.* (2022), which assessed the frequency of rubber dam use by general dental practitioners in different countries. Most of the participants of this survey were French and Ukrainian and reported 74.3% - 75% of rubber dam use as mandatorily during non-surgical endodontic treatments. But, only 30.69% - 31% and 27.7% - 29% used it always during direct and indirect restorative procedures, respectively. Those authors were able to detect a significant difference in the percentage of rubber dam use during indirect restorations, and observed that French clinicians more frequently (65.5%) used it than Ukrainian clinicians (20.7%), for those procedures.

The survey that took place in the United Kingdom, in 2021, followed a similar pattern, meaning that the frequency of rubber dam use by professionals, was higher for non-surgical endodontic treatments (>80%) and lower for direct restorative procedures. In fact, as regards anterior composite restorations, only 5% of dental practitioners used rubber dam systematically, and for posterior restorations the frequency was about 13%, when the majority of the participants who answered the inquiry never, rarely or occasionally used it, during these procedures. For indirect restorations procedures, the vast majority (75%) reported never having used a rubber dam during the tooth preparation and 60% also not appeal to its use during the crown cementation (Çağa, Brennan and Eaton, 2021a, 2021b). The findings of those 3 surveys showed higher frequency of dental dam use for non-surgical endodontic treatments than for direct or indirect adhesive dentistry, which could be explained by the greater appreciation of its use in endodontic treatments by teachers and dental practitioners, or the higher risk incurred by the patient during this type of dental treatment.

In addition to these high frequency of preferences for rubber dam use in endodontics, another survey conducted by Alqahtani *et al.* (2023), reported the thoughts of several Saudi dental practitioners. When participants were inquired on the importance of applying a rubber dam during non-surgical endodontic treatment procedures with a post and core, the majority (84.67%) stated that the use of a rubber dam was necessary during these types of procedures

and most of them considered that it makes difference regarding the success of endodontically treated teeth.

However, the survey conducted by Jiang *et al.* (2022) at a Chinese University showed lower frequency rates of dams use during non-surgical endodontic treatments (27.2 - 41.9%), and depending on the tooth to be treated. Regarding composite restorations, prevalence of dam use was similar (25.6%) to previous reported studies. Differences on rubber dam use prevalence revelled disparities among countries dental practice. The UK, France, Saudi Arabia and Ukraine showed higher results regarding the prevalence of rubber dam use when compared to China.

The results of Çağa, Brennan and Eaton (2021b) study revelled a very low prevalence of rubber dam use during amalgam restorations, with 84% to 97% of the respondents stating that they never applied it for this procedure. In the same way, for the following procedures, prevalence was low, with 74% of dental practitioners responding that they had never applied a rubber dam for fissure sealing, and 82% to 87% for glass ionomer restorations. Compared to these low prevalence values, dental practitioners were more likely to use a rubber dam during internal tooth whitening procedures, with 44% using it consistently. Concerning pediatric dentistry, in China and in the United Kingdom, the frequency of use of rubber dams in children showed lower results than in adult patients, which could be explained by children's behaviour towards this isolation device, or by dental practitioners' apprehension about how children might behave towards the rubber dam (Çağa, Brennan and Eaton, 2021a, 2021b; Jiang *et al.*, 2022).

This difference on the use of rubber dams in different countries should be studied and be more scrutinize, since there are few numbers of references on this issue. Nonetheless, the data collected of the surveys performed in those countries revelled that rubber dam frequency of use by dental professional is still low during most of dental procedures and regardless the geographical location.

Some surveys focused on dentists' experience and years of practice, in order to understand whether these might have an impact on rubber dam use rates. In Saudi dental practitioners, younger dental practitioners, with 1 to 5 years of experience, where the professionals who used it the most. Among dental practitioners with 6 to 10 years of experience, the percentage dropped to 36.17% and was even lower for dental practitioners with over 10 years of experience (29.23%). Furthermore, as the number of years of experience increases, the frequency of rubber dam use decreases (Alqahtani *et al.*, 2023).

In Yaroslav Vodoriz Y. *et al.* (2022) study, a higher prevalence rate (74.5%) of rubber dam use was stated by dental practitioners with fewer years of experience (less than 5 years of dental practice) and also that they used rubber dam since the beginning of their career, when compared with dental practitioners with more experience, who tended to use the rubber dam with a certain delay. However, in that survey, distribution of the age groups was not equal, with a greater tendency for younger dental practitioners to answer this questionnaire, which made comparison difficult. In this scoping review some limitations were highlighted, regarding the questionnaires applied: most of them were conducted online so, the majority of respondents were young dentists and, moreover, they were probably curious and interested in their work, as they were following groups and answering questionnaires about dentistry of their own free will (Çağa, Brennan and Eaton, 2021; Olegário *et al.*, 2022). If more experienced professionals had responded, the results might have decreased, as showed in the studies of Alqahtani *et al*. (2023) and Yaroslav Vodoriz Y. *et al*. (2022). One difference observed when associating rubber dams with years of experience may be explained by the fact that professionals with more years of clinical practice did not necessarily receive mandatory rubber dam training when they were students.

It also seemed interesting to investigate whether the fact that a dental practitioner was specialized would have an impact on the daily rubber dam use rate. Overall, in the study by Alqahtani *et al*. (2023), it was not evident that specialization influenced the dental practitioners' answer regarding the question "Is a rubber dam necessary during post and core procedures?" More specifically, either interns or residents, general dentists or specialists, the majority responded positively to this question (80.80%-92.16%). However, these frequencies are based on a statement and not on measurements on dam usage. This point seems to emphasize another limitation of the surveys scoped. As the responses are subjective, they may not necessarily be sincere, as dental practitioners may respond according to what is commonly acceptable.

This difference between thought and reality was illustrated when some authors studied the use of dental dams by dental professors. Considering that they are aware of the benefits of rubber dam for daily dental procedures, and probably teach students about their application and advantages, they should have a high prevalence of rubber dam use in their daily practice. Therefore, dental professors from an American University were surveyed and their responses showed that they did not always use rubber dam in their private practice, and that their percentage of usage varied according to their specialization. For example, those who practiced

general dentistry showed higher usage rates (37.2%) than specialized prosthodontic teachers (17.6%). This could be explained by the diversity of the procedures of daily practice (Imbery and Carrico, 2019).

Some of the inquiries have focused on dental dams use by students in general, their appreciation on the graduation training and the rubber dam use in their future practice. The questionnaire Abuzenada (2021) study was conducted at a university in Jeddah and allowed the following answers: 80.9% of the students recognized that they had received adequate training and 85.5% of them intended to use rubber dam for all dental procedures after graduation.

In the survey conducted by Alqahtani *et al*. (2023), only 53.67% of Saudi dental professionals were completely satisfied with their training on rubber dam.

In contrast to the two previous surveys described, other studies results found lower percentages for training satisfaction among students from other universities. Jiang *et al*. (2022), noted that only 19.7% of the Chinese students surveyed were satisfied with their training; although they attended the theoretical sessions (100%), many of them regretted not having had a demonstration by their teachers during the practical sessions. In fact, only 49.2% had the opportunity to observe a teacher positioning a rubber dam on a patient and, as far as their training was concerned, only 47.5% of them had already applied it on a patient during their practical classes. Despite these low percentages of training satisfaction, the vast majority (92.1% - 95.1%) were willing to use rubber dam in the future. Furthermore, to overcome this lack of knowledge, 97.1% of the students surveyed were interested in further training through the following means: watching videos or demonstrations by teachers, simulation exercises or clinical training. The interest for further training on rubber dam application was also found in the questionnaire of Çağa, Brennan and Eaton (2021a), where 54% of the British dental practitioners surveyed where concerned.

The survey conducted by Yaroslav Vodoriz Y. *et al.,* (2022) revealed that only 35.64%-36% of dental practitioners (from different countries) replied that had received the necessary training during their graduation, while the majority (47.52%-48%) answered that they had learned the placement technique by themselves or with the help of their professional peers. This survey also showed that the acquisition of rubber dam application skills differs according to the origin of the dental practitioner. For example, 81.1% of the French practitioners interviewed, declared that the success of their rubber dam placement technique derived from their dental school

training, which was far from being the case among Ukrainian practitioners (3.8%). Also, dental practitioners who had received sufficient university training were more likely to use rubber dams early in their careers, compared to those who had to complete additional training or achieve a level of learning on their own (Yaroslav Vodoriz Y. *et al.*, 2022).

In some countries, learning how to apply the rubber dam was judged to be better than in others. Indeed, the majority of students in Jeddah, France and Saudi Arabia were satisfied with their training, compared to students and dental practitioners in China, the UK and Ukraine. (Abuzenada, 2021; Çağa, Brennan and Eaton, 2021a; Jiang *et al.*, 2022; Yaroslav Vodoriz Y. *et al*., 2022; Alqahtani *et al*., 2023). Although there are disparities among different universities, in general, better absolute isolation training could be offered through better practical classes, videos, lectures, workshops and courses. (Alqahtani *et al*., 2023).

Over the last few years, a variety of oral isolation methods have emerged, including relative isolation with cotton rolls, saliva aspirators, liquid dams and Isovac® systems. Several surveys have been carried out to determine the prevalence of rubber dam use compared to these other systems. For example, in the study by Alqahtani *et al*. (2023), 25.33% of the participants used cotton rolls, 22.66% always used a rubber dam, 20% used saliva aspirators and 7.33% used liquid dams in their daily practice.

Imbery and Carrico, (2019) registered the clinical records among the teachers included in their survey. The results obtained showed that 30% of the procedures recorded were performed with absolute isolation with a rubber dam, 11% with the Isovac® system and, finally, 5% of clinical procedures were done under relative field isolation with cotton rolls. However, those results are not entirely accurate, since 54% of the recorded procedures did not document the isolation method performed during the clinical practice. Therefore, the authors assume that these procedures would have been performed with cotton rolls and, if so, there would be an increase in the use of cotton rolls during these treatments, resulting in a percentage of cotton roll isolation of 59%, making this the most used technique in this study, as noted in the previous study by Alqahtani *et al.* (2023).

In terms of the benefits that the rubber dam brings to everyday dental practice, UK dental practitioners recognized its use as a "higher clinical standard to be achieved" for 89% of them (Çağa, Brennan and Eaton, 2021b). They also reported that restorations on posterior teeth were more easily done with a rubber dam in place (78%). Moreover, for adhesive dentistry, they

recognized that the dam allowed them more efficient access when performing any type of restoration (77%) and that restorations would have a higher longevity rate compared to situations where other types of isolation were performed (65%). In addition, 82% of these dental practitioners agreed that it was difficult to achieve adequate field isolation if absolute isolation was not used, and that the non-surgical endodontic treatment of teeth was not as successful with other isolation methods (85%). The same trends were observed among Saudi dental practitioners in the study of Abuzenada (2021). When asked whether restorations of posterior teeth were better achieved using a rubber dam, 91.8% of the respondents answered positively, and the following phrases were stated: "rubber dam allows better access when performing restorations, and allows restorations to have greater longevity" (by 85.4% and 86.4%, respectively). Furthermore, according to these, the greatest advantage of the rubber dam is its ability to provide a decontaminated working field, followed by the easier access it offers during restorations and, thirdly, its ability to protect the patient against ingesting dental materials.

In terms of limitations encountered and factors that lead dental practitioners not to use the rubber dam, there is, for example, its placement technique. In fact, in the online questionnaire administered by Yaroslav Vodoriz Y. *et al*. (2022), 70.29% - 71% of general dentists answered that they had encountered numerous technical difficulties, placing poor retention of the metal clamp in the lead (72.28 - 73%). Loss of chairside time, problems with rubber dam tearing, extra cost, fluid leaks under the rubber dam and patient fear were also cited as recurrent constraining factors. Other factors were mentioned by students from different universities: 87.3% of the students stated limitations to perform x-rays with the rubber dam in place, 61.8% students revelled chairside time longer; for others, the lack of knowledge and experience in its application limits the rubber dam use (Abuzenada, 2021; Jiang *et al*., 2022). In turn, for Saudi dental practitioners, the reasons for not using the rubber dam were: remaining tooth structure (28.33%), time (20.33%), and cost (18.66%) (Alqahtani *et al*., 2023).

While many dental practitioners consider the rubber dam as the "gold standard" to achieve the best field isolation for optimal treatment success, there are currently several arguments against its use: lack/difficulty of technique, longer chairside time and higher cost. While it is true that mastering the technique is essential, some studies have shown that chair time can be reduced, compared to other techniques (cotton rolls, Isovac®, saliva aspirators), if the rubber dam is positioned correctly (Imbery and Carrico, 2019; Abuzenada, 2021; Alqahtani *et al.*, 2023).

The second topic of this scoping review concerned safety data relating to rubber dam use. In this section, were selected studies from different fields of dentistry and dental care, such as, pediatric dentistry, adhesive dentistry, endodontic treatment and oral rehabilitation.

In a randomized clinical trial children were treated under local anesthesia, with either a rubber dam or cotton rolls, resulting in a generally positive experience in both groups. Heart rate and agitation increased in both children groups. Interestingly, while these two events decreased in the rubber dam group, they tended to increase in the group treated with the cotton roll. Authors concluded the rubber dam would have a beneficial effect on the child's behaviour and stress control during dental procedures (Vanhée *et al.,* 2021).

The same trend was observed in another study. The retrospective study of Current *et al.* (2022), compared the Isovac® and the rubber dam isolations, in children under sedation. The group that used rubber dam showed better behavioural outcomes.

In contrast with those studies, another behavioural study, showed no significant difference (smile scale) between children receiving a rubber dam and those receiving cotton rolls, being the children's behaviour generally good in both cases (Olegário *et al.,* 2022). Treatment times were also recorded, and the time spent when a rubber dam was used was around 12 minutes longer. The most stressful procedure seemed to be attributed to the local aesthetic, since once the child is anesthetized, fitting the metal clamp was not as constraining (Vanhée *et al.*, 2021; Current *et al.*, 2022; Olegário *et al.*, 2022).

About strategies involving metal clamps, a randomized clinical trial compared conventional metal clamps with a SoftClamp^{TM} during a fissure filling treatment. Self-assessment revealed a slightly higher pain perception with metal clamps than with SoftClampTM clamps, however those results were not clinically significant (Pottammal *et al.*, 2023).

Scientific evidence on efficacy of rubber dams in adhesive dentistry is a highly controversial subject, mainly due to the large number of contradictory articles. Recently, the *Cochrane Library* published a review summarizing the trends perceived in different studies regarding the effects of the rubber dam in adhesive dentistry *versus* other types of field isolation (Miao *et al.*, 2021). Two of the studies quoted by Miao *et al.* (2021) showed a favourable behaviour of the rubber dam in terms of restoration failure/survival rates, and, on the contrary, two other studies quoted by the same authors showed no significant differences in restoration survival/retention rates, when compared to the use of cotton rolls. Chair time was also registered, showing a

difference of more 9.36 minutes when rubber dam is used. Olegário *et al.* (2022) also compared the restorations survival rate using rubber dam or cotton rolls as fields isolation. After 2 years of follow-up, the survival rate was of 60.4% for restorations performed under rubber dam and of 54.3% for those under cotton rolls. A limit of 15% was set for the results to be significantly different, so, in this case, cotton roll as method for isolation did not show lower performance than rubber dam in terms of restoration survival rates. The cost was also registered during the 2-year follow-up, being the final cost of rubber dam use 53% higher (Miao *et al*., 2021; Olegário *et al.*, 2022).

When it comes to the studies that tested new techniques for a pain-free placement of the rubber dam, the authors focused on the use of clamps and topical aesthetics, as referred in the paragraph regarding pediatric dentistry. Indeed, adult patients, like children, also behave differently, depending on the type of isolation used.

The clinical trial conducted by Shah *et al*. (2021), presented a new technique which used a modified metal clamps in patients under local anesthesia. It assessed postoperative pain, gingival trauma, and clamp retention/slip. Two groups were formed. The teeth in the first group were isolated with the modified clamp, while the teeth in the second group were isolated with a conventional metallic clamp. Then, the modified clamp was built around the tooth to be treated to ensure a perfect fit. The results were significantly favourable to the customized clamp, with better postoperative pain management. (Doshi *et al*., 2023).

We also collected data on safety in endodontics through the analysis of case reports on the potential damage by dental dam when incorrectly placed or when its use engenders allergic reactions. Indeed, during non-surgical endodontic treatments the use of cytotoxic products (hypochlorite) or the manipulation of fragile instruments (files) increases the procedure risk for the patient (Gozon, Rumford and Cervenka, 2023).

However, professionals should be aware and take some precautions before and during the placement of rubber dam, in order to avoid any type of oral tissue damage. Also, Jena *et al.* (2020) reported 2 cases of patient allergy associated to the rubber dam contact. Due to latex sensitivity (± 9.7% of patients) and reactions of wide severity, some precautions should be taken, such as, asking the patient if it suffers from any type of allergies, as fruit-latex cross-allergies do occur; make a definitive diagnosis when there is a history of allergy episodes; work with a multidisciplinary team; and have a first-aid kit nearby containing

epinephrine/corticosteroids/oxygen. If the allergy is diagnosed in advance, other devices must be latex-free and made from alternative materials (vinyl): gloves, dental dam, endodontic instruments, and other products. Finally, it would be preferable for the patient to be the first patient of the day and also to avoid any extrusion of gutta percha during non-surgical endodontic treatments.

Gozon, Rumford and Cervenka (2023) also described a case of cortical necrosis following the use of a metal clamp. As a rare condition, it was difficult for the professional to diagnose the problem, mistaking it for an abscess; so, computed tomography was the key to diagnose this rare condition. The problem was probably caused by the placement of the metal forceps on the surrounding gum tissue.

With regard to the analysis of adult behaviour during endodontic treatment with a rubber dam, we looked at the survey carried out by Madarati *et al.* (2018). Some factors influenced patient preferences such as, the past experience, duration of treatment, and safety feeling. The majority of patients (81.6%) wished to use the dental dam during their non-surgical endodontic treatment next sessions, and this preference was significantly related to how patients felt during their first session and the rubber dam use. Furthermore, the greatest proportion of patients (44,8%) stated that the main benefit of the rubber dam, was the prevention of instrument ingestion (67,4%) and that, the appointment time for rubber dam placement was reasonable.

A recent review publication (2020) discussed the importance of spending time on rubber dam placement to optimize postoperative care after performing an indirect restorative treatment. The use of a dental dam and saliva aspirators to control field contamination would be the best technique and would allow the gingival margin to be retracted for subgingival restoration placement. If rubber dam and clamps are positioned correctly, it will cause less gingival damage and less bleeding than the gingival retraction cord. Once the protocol has been mastered, it can be used in all the other sessions, from preparing the tooth to the bonding and restorative procedures. The author states that the first step, even before tooth preparation, is to place the rubber dam, and when this is not possible, we can opt for the "open technique" (Pop, 2020).

A clinical case published in 2021 year, focused on the rehabilitation of a patient with anterior ceramic veneers. In contrast to the previous study, the teeth were prepared before receiving the rubber dam, and their gingival margins were retracted using Teflon®. The rubber dam was positioned only for veneer bonding. Metal clamps were placed on the teeth that would receive

the restorations and pulled out after the excess cement had been removed. The authors advised that this technique should be performed with precision to avoid damaging the surrounding tissue (Jurado *et al*., 2021a). The same procedure was used on another patient, whose margins remained adequate after two years (Romero *et al*., 2021). The role of the rubber dam regarding patient and restoration safety in oral rehabilitation is that it provides good gum retraction, and also allows maintaining good restoration margins after several years.

For the third topic of this scoping review, rubber dam and environmental data, one review that could be used as a manual for dental practitioners was collected (Patel and Hamer, 2021).

According to a in situ study by Falacho et *al.* (2023), absolute isolation would increase enamel bond strength, regardless of the adhesive used. Authors suggested that the dental dam would minimize the effect of oral cavity moist environment on restorations, offering greater bonding strength than when cotton rolls are used.

A recent nowadays major event had a considerable environmental impact, the pandemic caused by the SARS-CoV-2. Indeed, this pandemic had a major effect on numerous areas, including the working environment and, in particular, the dentistry working environment**.** Between 2020 and 2021, several articles appeared on the need to use rubber dams during the global pandemic of SARS-CoV-2, reinforcing the idea that their use was vital, not only for their benefits in terms of patient protection and ease of work, but also for their quality as a barrier against the spread of cross-infection. Indeed, the transmission of SARS-CoV-2 during dental procedures was very likely, with dental practitioners on the front line, contacting with contaminated instruments, fluids, mucous membranes and oral aerosols (Checchi, Generali and Generali, 2021). We were able to include several editorials about the impact of the pandemic on dentistry, due to the safety rules/measures taken as part of this state of emergency. In some countries, such as Brazil, dentists were only allowed to perform emergency treatments, and global protection recommendations included the use of the rubber dam during these procedures (Seron *et al.*, 2020). The virus was potentially present in salivary enzymes, and during intra-oral manipulations, as in the case of turbine use, there was a high risk of oral aerosol dispersion being the main route of contamination for dental practitioners. According to Seron *et al*. (2020) strict use of this protective device would reduce the percentage of saliva in oral aerosols generated by dental procedures by at least 70%.

As mentioned above, despite the general agreement on its benefits, the placement of the rubber dam is still perceived by many as restrictive. Although many dental practitioners do not frequently use the rubber dam in their clinical practice, it was viewed as a blessing during the pandemic and used more frequently (Frankenberger and Van Meerbeek, 2021). In one editorial publication, the author wrote that "Given the difficult and troubled time we now work under we must assume that [rubber dam] could be a life saver, and it would seem to be professionally irresponsible not to use it when clinically appropriate" (Emery, 2020). In response to this editorial, Scott, Hogan and John (2020) focused their attention to the matter and reached a consensus in several articles, that the spread of oral aerosols could be reduced by 33% through the use of a rubber dam. However, they also pointed out that this consensus was only true for bacterial spread and that no studies on viral contamination have been carried out to date, therefore it was impossible to claim this reduction in the case of viruses. These editorials allowed us to take a closer look at the question of oral aerosol spread, as well as to observe that this topic is still fraught with doubts. It can also be stated that the pandemic was a difficult period for dental practitioners, as for many other professionals, but a prosperous era for dental dams, as we witnessed a positive trend in its use during this period, which is not negligible and is encouraging (Frankenberger and Van Meerbeek, 2021). In the present scoping review, very few publications were collected regarding the use of rubber dams during the global pandemic but, this dental care/dentistry-related subject would and should be explored in greater detail.

Moreover, Checchi, Generali and Generali (2021), described a case study of an implant surgery performed under rubber dam isolation. Their main purpose of the authors was to demonstrate that, during the pandemic, when the rubber dam was necessary, it was possible to obtain absolute isolation and avoid contamination of the operator during a flapless transseptal sinus lift followed by implant placement. This could be the first case of absolute isolation during such a procedure, and the authors concluded that this device could be considered useful in the future to prevent exposure to blood and oral aerosols, either during the SARS-CoV-2 pandemic or in any other similar context.

For this topic, we might have reflected on an important and contemporary issue, namely, the question of sustainability and the need to collect rubber waste when using a rubber dam, like any other polymer- or latex-based medical devices. In fact, it is in society's general interest to reduce plastic waste, which is a major contributor to environmental pollution. Unfortunately, in our search for articles, we did not find any study making reference to this important issue.

The fourth and final topic of this scoping review concerns rubber dams and marketing. It is important to be informed about the latest dental dams launched in the market, and the innovations and properties of the available ones, but it is also essential that experienced professionals test them and give objective opinions so that dental partitioners can choose the most appropriate brand of dental dam for their daily dental practice. Since 1864, numerous rubber dam devices have appeared on the market, with producers successfully reinventing the product using new materials or improving their properties. In 2019, Cranberry Smart Dam® was reviewed by Brinker (2019) as a high-quality, tensile and tear-resistant rubber dam. In 2021, another rubber dam brand (True Dental Dams®) was deemed in the same journal, by a dental practitioner (Nock, 2021), to be incredibly tear-resistant and durable, extremely easy to manipulate, and offering good flexibility without being overly elastic. Later, in 2023, the *Dental Advisor* journal gave its "top award winner" to the Isodam® rubber dam, a latex-free, powder-free dam that combines strength, robustness and elasticity. It prevents allergic reactions to latex and is, at least, as effective as latex-based dams (Dental Advisor, 2023).

A group of investigators promoted rubber dam use through videos/explanations for 1-year, at a university. As a result of this, the frequency of rubber dam use increased from 20 dams/month to 90 dams/month. As for the causes of the difficulties in using the rubber dam, these were mainly related to gingival bleeding caused by the metal clamp and intraoperative discomfort, leading to the conclusion that better pain control was needed prior to treatment. This experimental study showed that the intensive promotion of the dental dam through courses/videos was a good way of getting dentists to use it more often (Jingxian *et al.*, 2020).

Another way to evaluate different dams available on the market was proposed by Santos *et al*. (2021), who presented a process to test 5 different rubber dam brands. The authors designed a machine capable of recreating the conditions under which rubber dams are normally used. The main factors involved in the degradation of rubber dams would be: oxygen, fatigue, ozone, heat, and the type of vulcanization they are manufactured with. Several elements were examined in this study such as, the sample composition of zinc/sulphide, which would be directly related to the elasticity and ageing resistance; mechanical properties; tear resistance; stress at rupture; stretch relaxation behaviours; among others. This machine was used to evaluate these 5 rubber dams, differentiating those with the best physical-mechanical properties from the others. This article does not provide the classification of the different dams according to their brands, and this process is apparently difficult for a dental professional to reproduce. Although promising, this process would need to be simplified for dental practitioners to use it.

We have also focused our attention on the marketing and promotion of an essential device to position a dental dam: the dental floss. It is common practice to use dental floss to attach clamps or to adapt the dam to the clamp. According to the classification suggested by Alkhatib, Bissasu and Daud (2023), there are 3 types of single ligatures/nodes: the "traditional tie", the "single-loop self-ligating tie" and the "double-loop self-ligating tie". The main advantage of the first type is that it can be applied quickly, but become loose after a few minutes, while the double-loop knot is more stable and easier to tighten (it can be tightened with one hand). They also suggest two composite ligatures/nodes: "single-loop or double-loop self-ligating tie attached to one, two, or multiple overhand knots"; these techniques are especially used in tooth preparation procedures for bridges, crowns or when the prepared tooth cavity has deep margins. All these techniques of dam retention by a dental floss appeared to be less traumatic for the gingival tissues, allowing them to retract properly, and can offer the operator the advantage of a full view of the teeth. The authors' promotion of the idea of using dental floss instead of placing a metal clamp on each tooth (when performing multiple isolations) is very interesting, since it could be advantageous in specific situations. In fact, it would be the best technique to retract gingival tissues when it is not possible to place a metal clamp, for example in the case of patients with brackets. As with any technique, this one has its limitations. It is not recommended for molars, and dental practitioners needed to practice and know how to best attach the floss in each case.

One of the limitations of the rubber dam use is that conventional impressions of fixed prostheses cannot be taken while it is in place so, the rubber dam has to be removed for the impressions to be taken. However, in this ever-changing world, digital technology advances have led to the introduction of intra-oral scanners in dentistry. Several articles detailed the technique to use them correctly in conjunction with the rubber dam. First, the required data are entered into the machine and a bimaxillary scan is taken. Then, rubber dam isolation is obtained. The authors recommend extending the isolation to 2 or 3 neighboring teeth for greater precision. Next, dentin preparation and sealing are performed, and a new, more accurate impression of the tooth is taken with the rubber dam in place (Caponi *et al*., 2021; Henarejos-Domingo *et al*., 2021; Clavijo and Duarte, 2021). A case report using this method showed good results after one year's follow-up, with less procedure time and the patient satisfied with the results (Jurado *et al*., 2021b). As we have just discussed, intra-oral scanners are useful elements in an attempt to overcome the limitations of the rubber dam in impression taking, making it possible to reduce dental chair time. This device also increases the accuracy of the impression and avoids the need

to remove the rubber dam several times (Caponi *et al*., 2021; Clavijo and Duarte, 2021; Henarejos-Domingo *et al*., 2021). It would be also interesting to analyze more articles on the survival of these restorations, in order to measure the effectiveness of these 2 techniques combined (scanner and rubber dam). The rubber dam also provides good retraction of gingival tissue and good contrast with the tooth, making it easier to take a digital impression (Pop, 2020).

In this scoping review the inclusion criteria, namely, the "rubber dam" or "dental dam" in the title considerably restricted this research, as other studies could have been included with a wider screening process. However, the search restricted to the last 5 years allowed us to identify the most recent trends on the rubber dam and related issues evidenced in nowadays for dentistry and for dental care, that needs more attention and research . As reported by other authors (Tricco *et al.,* 2016), we also did not identify any guidelines for reporting scoping reviews or studies that assessed the quality of scoping review reporting. Nevertheless, a bibliometric analysis was performed, recording the variables, authors and year of publication, purposes, methodology, and main conclusions of the studies collected. Scoping reviews like this one are useful to inform research timelines and identify implications for policies, for research needs and best practices regarding rubber dam use and its evidence on dental care and dentistry related-subjects.

V. Conclusion

This work carried out a Scoping Review of the most up-to-date evidence on related issues such us, prevalence, safety, environment, and marketing bibliometric data about the rubber dam medical device used for dental care and dentistry.

For this, a research question was done*: How have rubber dam use been engaged, in nowadays literature evidence, in dentistry/dental care related-issues as, prevalence, safety, environment and marketing purposes?*

As intended, an evidence scope map about the number and methodologies of the collected publications allowing to state the following main conclusions:

- A total of 40 publications, in the last 5 years (2019-2023) were scoped and mapped, on rubber dam use engaged in dentistry/dental care related-issues such as, prevalence, safety, environment and marketing purposes.
- Rubber dam engaged to prevalence data, allowed to scope map 7 references: 7 surveys.
- Rubber dam engaged to safety data, allowed to scope map 13 references: 5 clinical trials, 4 case reports, 2 reviews, 1survey, 1 retrospective review.

- Rubber dam engaged to environment data, allowed to scope map 7 references: 4 editorials, 2 clinical in situ, 1 review.
- Rubber dam engaged to marketing data, allowed to scope map 11 references: 5 reviews, 2 case reports, 2 grey sources, 1 experimental trial, 1 editorial.

Rubber dam which is a highly recommended device for daily dental procedures, is still being put aside nowadays, with low use rates, however, it was quite successfully used during the global pandemic SARS-Cov-2.

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VII. Annex

Table 2 - Detailed methodologies and description of the 40 included publications, in each database.

Database	Year	References	Title	Objective	Methods	Main Results and/or Conclusions
Pub-Med, B-On* and *Science Direct	2023	Gozon, Rumford and Cervenka (2023)	Rubber dam clamp may cause cortical necrosis: a case report.	To clarify alterations in mandibular cortical bone architecture following the application of a stainless-steel rubber dam during an endodontic procedure.	This case report describes the occurrence of a rare condition, cortical case necrosis, in a healthy 22-year-old woman following the use of a rubber dam.	Improving our understanding of the typical course of dental procedures involving isolation of teeth by a rubber dam could be facilitated by recognizing the potential development of cortical necrosis after the use of metal clamps.
Pub-Med* and *B-On	2023	Pottammal *et al.* (2023)	Evaluation of pain response in children to the SoftClampTM as an alternative to the metal rubber dam clamp: a randomized clinical trial.	Assessing children's pain response when using a SoftClamp™ in comparison to the traditional metal clamp.	A randomized controlled, equal allocation ratio, split-mouth clinical trial. *42 children (aged 8-12 years). *2 permanent mandibular molars requiring sealants for each child were categorized into: - Group A= metal clamp - Group B= SoftClamp™ *Pain response was recorded by an objective (Faces Legs Activity Cry Consolability scale and a subjective scale (Wong Baker Faces Pain Rating Scale). The difference in pain response between genders and between two age groups (below and above 10 years of age) was also registered.	- There is no substantial variance in children's pain response to both clamps. - However, the SoftClamp™, with its more child-friendly appearance, may serve as a viable alternative to the metal clamp for children.

Pub-Med* and *B-On	2023	Falacho *et al.* (2023)	Clinical in-situ evaluation of the effect of rubber dam isolation on bond strength to enamel.	To study how the application of a rubber dam isolation affects the shear bond strength of 2 different adhesive systems on enamel.	* 30 human third molars surfaces were prepared (distal /mesial/ vestibular/lingual)- total n = 120. *A custom-made splint was fabricated to adapt conform to the volunteer's jawbone, securing the specimens within the oral cavity. *4 cylinders of composite resin were bonded to each tooth using one of the 2 bonding agents (OptiBond FL® and Prime&Bond active®), isolated or not by a rubber dam. *Shear bond strength was assessed using a machine, and the failure modes were subsequently examined.	- The use of a rubber dam for absolute isolation enhances enamel bond strength, regardless of the adhesive system employed. - In both experimental conditions, OptiBond FL® gave significantly higher bond strength values than Prime&Bond active®.
Pub-Med* and *B-On	2023	Alkhatib, Bissasu and Daud (2023)	Dental floss ties for rubber dam isolation: a proposed classification and a new technique.	To introduce a categorization of dental floss ties employed in conjunction with a rubber dam.	The author proposes a new classification of floss links, which were described in the article.	- This innovative design offers better isolation and maintains more consistent retraction of the gingival tissue. - Advanced techniques ensures greater stability and prevents the sheet from sliding along the wire in all directions.
B-On	2023	Alqahtani *et al.* (2023)	Online questionnaire-based study to evaluate the attitudes and use of rubber dental dams by Saudi dental practitioners.	Creation of a 2-part online questionnaire to assess attitudes to the use of rubber dams among 300 Saudi dental practitioners (interns/general dentists/residents/specialists in prosthodontics, endodontics, and restorative dentistry).	*The questionnaire consisted of 17 items: - 5 on demographic data - 2 on knowledge - 6 on attitudes - 4 on perceptions * Google Forms was used to distribute this survey, and the analysis was performed using the chi-square test.	The organization of workshops and practical training sessions is essential for young dental graduates to gain a favourable view of the application of rubber dams.

Pub-Med	2023	Doshi *et al.* (2023)	Clinical evaluation of winged versus wingless rubber dam clamps in single tooth isolation - a randomized clinical study.	To evaluate/compare postoperative pain levels and clinical efficacy of winged and non-winged metal clamps during rubber dam isolation of permanent molars during Class I restorative procedures.	Ethical approval and Clinical Trials Registry-India were obtained. * 60 patients with mild/moderate Class I deep caries were recruited, and 2 groups were formed: - Group A: winged clamp (n=30) - Group B: wingless clamp (n=30) *A local anaesthetic was administered, and the teeth were isolated with a rubber dam. *Following variable were assessed: - Postoperative pain using the verbal rating scale at 6h and 12h. - Gingival trauma - Sealing ability of the clamp - Slippage of the clamp	- Gingival trauma and postoperative pain were significantly higher in the wingless group at 6 and 12 h - Seepage of fluid was significant lower in the wingless group. - Slippage was insignificant higher in the winged group - Both clamps exhibited satisfactory clinical performance. Their selection should be determined based on the specific needs of the case and the tooth's positioning.
Other source	2023	Dental Advisor (2023)	Dental dams: easy ways to provide patient protection.	Discuss the rubber dam and evaluate ISODAM™ as well as its advantages, features and special characteristics.	E-book in which the author introduces the Rubber dam and promotes the ISODAM™	- The 5 reasons for using a rubber dam are: Infection control, improved visibility, patient comfort, increased precision, safety. - Certain variables influence a practitioner's choice to use it or not. - ISODAM™, a latex-free, biocompatible, tear-resistant, and elastic dam, won the 2023 editors' top award. Its clinical score was around 96%, highly recommended by consultants.
Other source	2023	Dental Advisor (2023)	IsodamTM award winning polyisoprene dental dam	To assess the ISODAM™ and discuss its benefits, characteristics, and features.	Video introducing the ISODAM™ by the journal *"Dental advisor"* on the "*YouTube"* platform.	ISODAM™, a latex-free, biocompatible, tear-resistant, and elastic dam, won the 2023 editors' top award. Its clinical score was around 96%, highly recommended by consultants.

Pub-Med* and *B-On	2022	Olegário *et al.* (2022)	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.	To evaluate the longevity of direct-fill composite resin restorations on primary molars, with different humidity control methods used: - Rubber dam isolation -Cotton roll isolation with saliva ejector.	* 93 children *174 molars with dentin caries lesions were randomly assigned to: - The rubber dam isolation group (local anaesthetic and rubber dam), or, - The cotton roll isolation group (cotton rolls and saliva ejector) * Trained operators performed bulk composite resin restorations. *2 blinded evaluators assessed the restorations over a 24-month period. * Cost analysis and logistic regression for pain/behaviour were evaluated by the Bootstrap Linear regression	- Cotton roll isolation was non-inferior to the rubber dam isolation in terms of composite restoration longevity on primary molars - Rubber dam isolation was associated with the disadvantage of higher costs and longer intervention times.
Pub-Med	2022	Current *et al.* (2022)	Comparing behavior outcomes with rubber dam or Isovac isolation in patients undergoing moderate sedation.	To assess the behaviour of moderately sedated pediatric patients undergoing treatment with either rubber dam or IsoVac® isolation.	A retrospective analysis of patient records was conducted for those who received restorative procedures under moderate sedation. *Frankl and behavioural scores were measured to determine whether Rubber dam or IsoVac® isolation provided better behavioural results.	- The selection of isolation method was related to the medication regimen. - Rubber dam isolation appeared to confer better behaviour, during both placement and post-treatment under moderate sedation.
Pub-Med* and *B-On	2022	Yaroslav Vodoriz Y. *et al.* (2022)	The prevalence of rubber dam among dentists in different countries.	To determine the current prevalence of rubber dam utilization among general dental practitioners.	*14 questions: - Gender - Origin, - Clinical experience, - Acquisition of dam application skills (where and when), - Amplitude of rubber dam use.	- For direct restorations: 30.69% of dentists always use a rubber dam. - For endodontic treatment: 74.26% always use a rubber dam. - For bonding indirect restorations: 36.3% always use a rubber dam. There has been a positive trend in the use of rubber dams by general dentists, but the frequency is still considered insufficient.

B-On	2022	Jiang *et al.* (2022)	Attitudes towards and use of dental dams by final-year dental students in Chongqing, China: a cross-sectional study.	To examine the current and prospective adoption of dental dams and assess the attitudes toward dental dam utilization among dental students in their final year, in dental institutions situated in Chongqing, China.	A cross-sectional study based on a survey conducted from June to July 2021. *245 final-year dental students, based in Chongqing Medical University and Chongqing Three Gorges Medical College *An anonymous online survey was conducted among dental students in the month preceding their graduation. *They were asked about: - Dental dam school training, - Their attitudes towards dental dams, - Their current dental dam use, - Their future utilization of dams.	- While final-year students exhibit a strong awareness of the benefits associated with dental dams and express high enthusiasm for their future utilisation, the current rate of dental dam usage remains low. - There is a need for continuous improvement in dental dam training in all areas, with particular focus on reinforcing the benefits of using dental dams in clinical dentistry in dental school curricula.
Pub-Med **and** ***B-On***	2021	Jurado *et al.* (2021a)	Rubber dam isolation for bonding ceramic veneers: a five-year post-insertion clinical report.	To illustrate the step-by-step sequence and offer clinical insights for a scenario where a rubber dam is used from a second premolar to the opposite.	Case description of an oral rehabilitation treatment with anterior veneers in a 34-year-old Hispanic patient under rubber dam isolation. *The rubber dam is carefully inserted into the sulcus, and the clamps are carefully selected and secured to establish an optimal environment for the bonding of ceramic veneer.	- This sequential guide can be particularly useful for junior dental practitioners, explaining how to gently manipulate soft tissues to ensure effective placement of the rubber dam for subsequent bonding of ceramic veneers. - By following this technique, clinicians can achieve complete isolation, avoiding tissue bleeding, and reducing the duration of bonding procedures.
Pub-Med **and** ***B-On***	2021	Henarejos-Domingo *et al.* (2021)	Digital scanning under rubber dam: An innovative method for making definitive impressions in fixed prosthodontics.	To establish a complete procedure for taking final impressions with intraoral scanning technology in the context of rubber dam isolation.	Explanation of the method used to take impressions with an intraoral scanner while using a rubber dam isolation.	- Given the advantages of scanning under a rubber dam, this protocol is highly recommended for routine use when taking definitive intraoral impressions for indirect adhesive restorations. - This procedure enables stress-free impression taking, with no interference from blood/saliva, good visualization of the final objective and without wasting time taking the final impression.

Pub-Med* and *B-On	2021	Vanhée *et al.* (2021)	Behavior of children during dental care with rubber dam isolation: a randomized controlled study.	To examine children reaction/behaviour during dental treatment with or without a rubber dam isolation.	Interventional randomized study. *51 children were split into 2 groups: - The rubber dam group - The cotton roll group. *During treatment of temporary molars, parameters were evaluated: - Treatment duration, - Comfort (visual analog scale), - Behaviour (modified Venham scale), - Patient heart rate monitoring.	- Rubber dam isolation during dental treatments reduces stress in pediatric patients. - Although it requires a little longer installation time and training for efficient set-up, it creates an optimal environment and reduces anxiety in children.
Pub-Med* and *B-On	2021	Jurado *et al.* (2021b)	Intraoral scanning with rubber dam isolation in place for fabrication of a chairside computer-assisted design and computer-assisted manufacture ceramic restoration.	To describes the process of chairside intraoral scanning with a rubber dam in place before creating a ceramic restoration by computer-aided design and manufacture.	The patient's main complaint was the need for a crown after endodontic treatment. *The patient underwent a digital restoration procedure in a single visit. *Intraoral scanning was performed with a rubber dam in place, facilitating the creation of a chairside Computer-assisted Design and Computer-assisted Manufacture ceramic crown.	- Chairside Computer-assisted Design and Computer-assisted Manufacture ceramic system enables crowns to be scanned, designed, and fabricated while maintaining the rubber dam in place. - An initial scan without the isolation serves as a reference, allowing integration of the next scan taken with the dam. - This combines the advantages of the intra-oral scanning and the rubber dam isolation, allowing a ceramic crown to be created and manufacture in a single visit.
Pub-Med* and *B-On	2021	Çağa, Brennan and Eaton (2021b)	An internet-mediated investigation into the reported clinical use of rubber dam isolation by GDPs in the UK - part 2: clinical applications.	To explore documented clinical applications of rubber dam isolations by general dentists in the UK through an Internet-mediated inquiry.	SurveyMonkey hosted the online questionnaire in *The questionnaire was distributed to general dental practitioners via a private Facebook group. *Percentages reported were calculated based on responses received for each specific question.	- An increase was found in the reported use of rubber dams by British dental practitioners. - The main uses of rubber dams confirm those reported on the previous investigation. - The study also highlighted the correlation between the rubber dam use and various influencing factors. - This has explored clinical applications in greater depth than previous publications, enriching the literature on the use of rubber dams.

Pub-Med* and *B-On	2021	Çağa, Brennan and Eaton (2021a)	An internet-mediated investigation into the reported clinical use of rubber dam isolation by GDPs in the UK - part 1: factors influencing rubber dam use.	An online questionnaire via SurveyMonkey, aimed to explore the use of rubber dam isolation among general dentists in the UK, requesting information on demographic characteristics, perspectives, factors influencing the use of the dam.	Questionnaire was distributed to a group of general dentists randomly selected from a private Facebook community. *Questions were about: - Demographics, - Clinical applications, - Attitudes towards rubber dam - Factors influencing its use *Chi-squared and pairwise Mann-Whitney U tests were used to analyse the data.	- 61% of the dentists surveyed responded with valuables information (n = 403). - This response rate demonstrates the effectiveness of using the Internet for research on dental subjects. - The study provided a better understanding of the attitudes and determinants influencing the rubber dam use by general dentists. - It highlighted the interest of UK general dentists in further training in the use of rubber dams.
Pub-Med* and *B-On	2021	Abuzenada (2021)	Attitude of dental students towards the rubber dam use in operative dentistry.	To assess dental students' attitudes towards the application of rubber dams in operative dentistry clinics, with a particular focus on evaluating their potential use after graduation.	A structured questionnaire-based analysis distributed to internship students of a dentistry program. *In Batterjee Medical College, Jeddah, Saudi Arabia. *The questions were about: - Training, - Latex sensibility, - Selection of dental arch - Intend to use dam post-graduation.	- A favourable attitude among dental students towards the implementation of dental dam in dental procedures appeared. - It is important to incorporate effective rubber dam application methods during clinical training in dental schools, to boosts student confidence, reduces the time required for its application and inspire them to incorporate it into their future practice. - Further studies are needed

Pub-Med* and *B-On	2021	Miao *et al.* (2021)	Rubber dam isolation for restorative treatment in dental patients.	To evaluate the impact of rubber dam isolation compared to other isolation methods when performing direct and indirect restorative treatments on dental patients.	Cochrane Oral Health's information specialist conducted comprehensive searches across multiple electronic databases. *No restrictions on the language *No publication date restriction *Including randomized controlled trials with a minimum duration of 1 month, to compare the rubber dam isolation to alternative isolations. *Results and data were analysed, and the risk of bias was evaluated. *A discussion followed. *Cochrane's statistical guidelines were followed, and the evidence was analysed using GRADEpro GDT software.	- It was highlighted limited, low-certainty evidence suggesting that the use of a rubber dam during direct dental restorative treatment could lead to a reduction in the failure restorations rate compared with the use of cotton rolls, particularly during the first 6 months. - The certainty of the evidence remains questionable at other time intervals - To better understand the effects of using rubber dams in different types of restoration treatment, further high-quality research is needed.

Pub-Med* and *B-On	2021	Shah *et al.* (2021)	Comparative evaluation of novel customized cushees during rubber dam isolation using self-designed evaluation criteria: A randomized clinical study.	To compare the effectiveness and postoperative outcomes of metal clamps with customized cushions to those of standard metal clamps when a rubber dam isolation is to be used.	Institutional ethical approval and informed consent were obtained. *64 patients were randomly divided into 2 groups - Group A: customized cushees (n = 32) - Group B: standard clamp (n = 32). * In Group A, after selecting the clamp, customized cushions were made, and the restoration was done. *Self-designed evaluation criteria: - Postoperative pain, - Slippage - Gingival/tissues trauma - Sealing ability	- A statistically significant difference in postoperative pain, rubber dam slippage, and trauma to gingival tissues with a notable reduction in postoperative pain was observed in favour of the customized cushees compared to the standard clamp.
Pub-Med* and *B-On	2021	Romero *et al.* (2021)	Resin bonding of a lithium-disilicate crown using a ligated rubber dam: a 2-year case report.	Describe a procedure for bonding an indirect ceramic restoration to a maxillary first molar using a rubber dam and dental floss ligature to ensure maximum operator efficiency and effectiveness.	Case report of a 36-year-old woman presented to a faculty practice group, with "pain on the upper left side while chewing." *At Augusta University (dental college of Georgia) *Fractured amalgam and carie have been removed and a bis-acryl provisional crown was fabricated. *Crown preparation was refined 3 months after the surgical procedure. *Crown was cemented under rubber dam isolation (with floss ligature).	- In contemporary restorative practice, all-ceramic restorations are often chosen. - Clinicians have the choice of bonding them using a combination of adhesive materials and resin-based cements, but it's crucial to address the challenge of moisture control, particularly around deep margins, as it can significantly impact the bonding process. - To control and prevent contamination of the surgical field and improve precision, rubber dam isolation, combined with a floss ligation technique would be the best technique.
Pub-Med* and *B-On	2021	Frankenberger and Van Meerbeek (2021)	Editorial: rubber-dam - a blessing not only in the Covid-19 era.	To express an opinion, take a stand, give the reader an indication about the benefit of the rubber dam in the newspaper.	Editorial written by the authors in *"The journal of adhesive dentistry"*.	- This editorial highlight the importance of using a dental dam. - There is a current controversy among dentists, with some using it and others not. - SARS-CoV-2 changed, in a good way, the viewpoint of some dentists who used it as an aerosol protector during the pandemic.

B-On	2021	Nock (2021)	True Dental Dams stand out from the crowd: these clinician's choice rubber dams stand out among others due to their versatility, tear resistance, flexibility, and color.	To examine and engage in a discussion regarding the advantages of using the rubber dam brand: True™ DentalDam.	Editorial written by the authors in the *"Dental products report" journal.*	The True™ DentalDam can stretch to support a variety of isolation procedures, are available in different calibres, allowing different levels of thickness depending on the procedure, and are exceptionally durable and tear-resistant, providing the necessary protection while remaining flexible.
Pub-Med **and** ***B-On***	2021	Caponi *et al.* (2021)	Protocol for indirect restoration intraoral scanning under dental dam isolation: A dental technique.	To outline a protocol for intraoral scanning focused on indirect restorations while incorporating the use of dental dam isolation.	Description of the technique used to make impressions with an intraoral scanner when a Rubber dam is applied.	- This protocol reduces operative time, minimizes potential clinical factors that may influence scanner accuracy, improves visibility of preparation margins, and reduce the operator stress. - It can be used for chairside dentistry or for conventional workflow (transmitting scans to laboratory technicians).
Pub-Med **and** ***B-On***	2021	Clavijo and Duarte (2021)	Digital scan over dental dam: workflow for successful clinical outcome.	To present a detailed protocol for taking final impressions while using rubber dam isolation with an intraoral scanner.	Case report detailing the treatment of a 50-year-old patient with deteriorating composite resin restorations on the mandibular right molars. *Defective restorations were replaced using lithium disilicate glass-ceramic manufacturing technologies. *This procedure was performed in a single appointment.	- Given the advantages of performing scans under rubber dam isolation, this approach can be highly recommended for routine use when taking definitive impressions for indirect restorations. - A stress-free environment, free from blood and saliva, can be created to give the operator a better view of the lens, all in a single session.

Pub-Med* and *B-On	2021	Patel and Hamer (2021)	A simple guide to using dental dam.	To outline the fundamental principles of using a dental dam, and to detail the steps for its proper application.	An enumeration of the advantages of the dental dam was made, as well as a presentation of the dental dam kit, followed by an overview of the techniques used and the presentation of solutions to overcome application problems.	- The advantages of using dental dams are the reduction of aerosol contamination, more successful and efficient workflow, and shorter treatment times. - Further research is needed, particularly into viral transmission in situations involving aerosol production.
Pub-Med* and *B-On	2021	Emery (2021)	Dental dam: the time is right.	To express an opinion, take a stand, give the reader an indication about the benefit of the rubber dam in the newspaper.	Editorial written by the author in the *"British dental journal"*.	- The use of dental dams is particularly important in the context of the global pandemic, as they are effective in limiting the spread of aerosols. - Correct positioning and patient instruction must ensure simple use.
Science Direct	2021	Santos *et al.* (2021)	A new device to simulate the performance of rubber dams for dental applications.	To analyse 5 different brands of rubber dams in terms of physico-mechanical properties, morphological aspects, and elemental analyses.	A custom device was developed to reproduce the real-life conditions of rubber dams use during endodontic procedures. * Each rubber dam was placed and held at 10% elongation (like in an endodontic procedure). *2 different experiments were designed: - 1: Dams were placed in a petri dish, under 60 mL of artificial saliva at 37°C for 60 minutes. Temperature was maintained. Then stress relaxation was tested for these “Saliva” samples. - 2: The same procedure was conducted, then 10 mL of 2.5% hypochlorite were applied every 10 min, on the upper part of the rubber dams, 6 times in a row. Then stress relaxation was tested for these “Hypochlorite/Saliva” samples. *Samples were removed, washed, conditioned for 48 h, and stress relaxation tests were also conducted.	- The device's performance was in line with observations made during clinical activities, confirmed by the stress relaxation test - Samples featuring a sulphur-curing system, with a higher predominance of accelerator, showed superior performance in stress relaxation tests compared to samples with a high sulphur concentration.

Pub-Med* and *B-On	2020	Seron *et al.* (2020)	Letter to the editor the importance of rubber dam isolation in endodontics throughout COVID-19 outbreak.	To express an opinion, take a stand, give the reader an indication about the benefit of the rubber dam in the newspaper.	Editorial written by the authors in the *"Brazilian Dental Journal"*.	- The global pandemic had a considerable impact on dental practice, mainly due to the aerosols generated by dental instruments. - In some countries, it was decided to treat only emergency cases (pulp problems), and they were carried out under strict isolation protocols, using dental dams.
Pub-Med* and *B-On	2020	Checchi, Generali and Generali (2020)	Isolation through rubber dam to prevent COVID-19 exposure during flapless trans-crestal sinus lift procedures.	To present a practical approach that could help minimize the risk of exposure to SARS-CoV-2 during a flapless transcrestal sinus lift procedure.	Case report of a 43-year-old male patient (without systemic problems), with a localized pain in the maxillary left first premolar, aggravated during mastication. *6 months earlier, endodontic treatment and surgery had been performed, with no improvement in pain. *Patient requested tooth extraction followed by implant-supported rehabilitation.	- Employing a rubber dam during transcrestal sinus lift followed by implant placement emerges as a valuable measure for reducing aerosol dispersion and blood exposure. - During pandemic, given the possibility of infection from asymptomatic individuals, every patient must be considered as potentially infected. - The use of a rubber dam during these procedures turned out to be an effective way of mitigating the risk of exposure to SARS-CoV-2.
Pub-Med* and *B-On	2020	Scott, Hogan and John (2020)	Rubber dam evidence.	To express an opinion, take a stand, give the reader an indication about the benefit of the rubber dam in the newspaper.	Editorial written by the authors in the "British dental journal" in response to the editorial of Emery C. (2021).	- Numerous studies have indicated that the use of a dental dam reduces aerosol - There is currently no conclusive evidence of its effectiveness against viruses. - Further research is therefore needed.

B-On	2020	Jena *et al.* (2020)	Endodontic treatment in cases of allergic reaction to rubber dam.	Introduction of 2 case reports featuring patients with latex allergies	→ Case report of a latex-sensitive 67-year-old woman, with pulpitis symptoms. *Referred to an undergraduate clinic for non-surgical root canal treatment of the lower first molar. → Case report of a latex-sensitive 75-year-old retired nurse, with an acute apical abscess *Attended by a general dental practitioner for root canal treatment of the upper left canine.	- Standard endodontic practice needs to be adapted, and dental practices need to incorporate alternative products to safely treat latex-allergic patients. - Dentists have the responsibility to recognize the prevalence of allergies to rubber dams and to ensure life-saving endodontic therapy.
B-On	2020	Pop (2020)	Rubber dam first.	To underlines the importance of optimizing the working time with rubber dam isolation, to significantly reduce the time spent without it and make it as efficient as possible.	Illustration of the rubber dam isolation protocol used in teeth rehabilitation. *Description of an example of posterior rehabilitation *Description of an example of anterior rehabilitation	- The use of rubber isolation dams with high-volume aspiration should always be considered a fundamental precaution in dental procedures, whatever the circumstances. - Specific protocols can be followed to maximize the benefits of using them for optimal infection control. - Point of view: patients are likely to have greater confidence in a dentist who is diligent in applying all available protocols to improve infection prevention. - Current world events are a reminder that we must prioritize responsible dentistry.
B-On	2020	Jingxian *et al.* (2020)	Application of quality control circle in promoting the use of rubber dams in the root canal treatment of primary teeth.	To study the impact of implementing a quality control circle to promote the use of rubber dams during non-surgical root canal treatment of chronic pulpitis in primary teeth.	Creation of a quality control team to improve the use of rubber dams in the treatment of chronic. pulpitis. *Computerized monitoring of monthly statistics use of rubber dams, was carried out. *Questionnaires were used to collect relevant data, to analyse the causes of low utilization, *Improvement measures have been formulated and implemented. *An evaluation of the quality control circle activity has been carried out.	- The activities of the quality control circle have proved crucial in encouraging the adoption of rubber dams in root canal treatment of primary teeth. - This approach can be seen as an effective method of facilitating the introduction of new clinical treatment programs.

B-On	2019	Brinker (2019)	Evaluating the Cranberry Smart Dam.	To evaluate the characteristics of the Smart Dam® from Cranberry	*"Contemporary Product Solutions»* conducted an assessment, seeking feedback from 12 dental assistants, after utilizing the Smart Dam® by Cranberry in over 62 applications.	- All surveyed dental assistants cited that "inconvenience" and that "it was unnecessary", were the main reason for the dental practitioners to not use a dental dam. - If it's true that time and cost are very important to dental partitioners, the time saved by operating in a clean field with good visibility makes up for the time spent applying rubber dam. - The Cranberry Smart Dam received a perfect 5 diamond rating from the team of assistant evaluators.
Pub-Med* and *B-On	2019	Imbery and Carrico (2019)	Dental dam utilization by dentists in an intramural faculty practice.	To gather information from faculty members on their perception of the dental dam, assess its use in their intramural practice, and identify key factors influencing dental dam use.	A survey was created. *11 questions *19 full-time faculty members who teach and maintain an intramural dental practice in operative dentistry received the survey. *30 electronic dental records of the 19 respondents were reviewed to collect the following details on restorative treatments - Isolation methods, - Tooth location - Involved surfaces, - Restorative material used.	- Dentists with military experience strongly support that dental dam is the standard of care, that it improves the quality of their restorative procedures, and that it should be mentioned in dental records - Significant variations in dental dam utilization rates were observed between general dentists and prosthodontists, as well as between dentists with military background and those without such experience.

Pub-Med* and *B-On	2018	Madarati *et al.* (2018)	Dental-dam for infection control and patient safety during clinical endodontic treatment: preferences of dental patients.	To explore the preferences and direct experiences of patients undergoing root canal treatment with dental dam isolation and to investigate the factors influencing these preferences among residents of Madinah Munawara, Saudi Arabia.	Ethical approval and a pilot study have been obtained, and a self-administrated questionnaire was distributed. *305 patients attending endodontic clinics received the questionnaire. *At the Taibah University College of Dentistry *For 6 months. *Patients voluntarily enrolled in the study after understanding the research methods and giving their consent by signing a form. *They were requested to complete a questionnaire concerning their experience and preferences regarding the placement of the dental dam during root canal treatment. *The Chi-square test was used to analyse the data.	- In general, patients tend to easily accept the isolation of the dental dam during root canal treatment, regardless of their country of origin, gender, level of education or knowledge of its benefits - Patients are initially attracted to the use of dental dam because of its role in ensuring their safety. - Their future preference is influenced by factors such as the time required to apply the dental dam, and their initial experience of the first visit during which the dental dam was applied.