Rubber Dam Isolation during Root Canal Treatment among Dentists in Jordan - a Survey Study

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Abstract

Objectives: The isolation of teeth from the oral environment during root canal treatment (RCT) is strongly recommended and best achieved using a rubber dam (RD). Our study aimed to investigate a) the incidence of RD use during RCT among dentists in Jordan, and b) disincentives to its use.

Methods: A survey study was conducted on a random sample of dentists in Jordan of different sectors, dentist classifications and geographic locations. Participants were asked to answer questions, including demographic and background information, frequency of RD use during RCT and the major disincentives to RD use. Responses were collected, and data were analyzed using the Chi-square test with a significance level of 0.05.

Results: The overall response rate was 52% (N = 260). Only 19.2% of respondents frequently used RDs. While most endodontists (95.2%) frequently used RDs, only 8.6% of general dental practitioners did so ($p < 0.001$). Other factors that significantly influenced the frequency of RD use included the practice sector and the geographic location of practice. The most commonly reported disincentives to RD use were its unavailability and the length of time needed for application.

Conclusion: The frequency of RD use during RCT in Jordan is low and should be improved by efforts such as creating continuing professional development programs for dentists, improving public awareness of the issue and creating strict regulations.

Keywords: Endodontics, Root canal treatment, Rubber dam, Survey.

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Introduction

The main etiology of endodontic and periradicular disease is microbial infection.[1,2] Successful management of endodontic pathology depends on controlling intraradicular infection,[3] which requires working in an aseptic environment. This involves isolation of the tooth being treated from the oral environment to prevent contamination of the root canal system from the oral flora.[4]

Rubber dam (RD) isolation is the standard of care in root canal treatment (RCT). It is strongly recommended by most dental authorities and is taught in most dental schools in North America and Europe.[5,6] Rubber dams not only provide a barrier against salivary ingress and,

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consequently, microbial contamination, but also protect the patient's oropharynx and oral cavity from the instruments, irrigating solutions and medicaments used during RCTs.[7,8] Therefore, RDs also protect the operator from malpractice allegations.[9] A well-fitted RD has been shown to reduce airborne bacteria and the potential spread of infectious diseases in the dental office by up to 98.5%.[10,11] Furthermore, RDs increase treatment efficiency by retracting the surrounding soft tissues, improving visibility, facilitating four-handed dentistry and minimizing patients' conversation.[12] In addition, a recent study reported that RD isolation was associated with a higher survival rate after initial RCT.[13]

However, results of studies on the incidence of RD use have been disappointing. As early as 1962, Ireland discussed the use of RDs, stating, "probably no other technique, treatment or instrument used in dentistry is so universally accepted and advocated by the recognized authorities, and so universally ignored by practicing dentists".[14] Whitworth et al. (2000) reported that less than 20% of UK dentists frequently used the RD in endodontic therapy.[15] A recent survey study on general dental practitioners (GDPs) in the United States reported that only 44% always used a RD during RCTs.[16] Elsewhere, the reported percentages of GDPs who used RD isolation during endodontic treatment was 57% in New Zealand,[17] 31% in Switzerland,[18] 21.9% in Belgium,[19] 18% in Denmark,[20] and 2% in Sudan.[21]

The major health sectors in Jordan include the following: a) the Royal Medical Services, which provide medical and dental health care to military people and their families, b) the Ministry of Health centers, which provide public health service to civilians, c) university hospitals, which are mainly educational centers but also provide specialist health care and d) the private sector. It is generally known that there are distinct variations in funding, average number of patients treated and number of facilities available in each of these sectors. However, all of the dental sectors are governed by the Jordan Dental Association (JDA) regulations. The Jordan Dental Association (JDA) is an independently-funded non-governmental professional association which regulates dental professionals in Jordan. It was founded in 1952 with the aim of organizing the dental profession and protecting the general public from unqualified dental professionals.

The use of RDs in Jordan has been mentioned in only one report, which included GDPs in one sector of dentistry (private practice) in the governorate of Irbid (in northern Jordan).[22] Our study aimed to investigate the incidence of RD use during RCT among dentists of different classifications and practice sectors in Jordan, and to report the disincentives to its use.

Methods:

This study was conducted in accordance with the latest World Medical Association Declaration of Helsinki. Approval to conduct this study was obtained from the Research Ethics Committee at the School of Dentistry at the University of Jordan. The need to obtain consent forms from participants was waived, as all personal information remained confidential in the internet-based surveys.

A pilot study was carried out on 25 dentists to ensure that the questions were clear and could be answered easily. The final questionnaire was constructed online using Google Drive. It included key questions about the frequency of RD use during RCT (Box 1) and disincentives to

RD use. In addition, questions about the background and demographics of the dentist (i.e., age, years of experience, dentist classification, qualifications, practice sector, practice location, and frequency of performing RCTs) were included.

Box 1: How often do you use RD for root canal treatment?
Always
Most of the time
Occasionally
Never

The official register of the JDA consisted of 8,135 dentists at the time of study initiation. After excluding retired dentists and those working outside of Jordan, a total of 5,095 dentists were eligible for the study. Thus, based on a population size of 5,095, a confidence level of 90% and a margin of error of 5%, a sample size of 256 was required for this study. Five hundred dentists were randomly selected from the JDA register, informed about the aim and scope of the study and e-mailed invitations to complete the online questionnaire. For the "disincentives to RD use" part, the dentists were asked to choose the main disincentive from a list of potential disincentives. They could choose the option "other" and freely describe their main reason if it is not included in the list.

Responses were collected and data were entered into an SPSS worksheet (SPSS Statistics 19 for Windows, SPSS Inc., Chicago, IL, USA) and analyzed using chi-square tests and linear-by-linear tests with a statistical significance level of 0.05.

Results:

Response rate and dentist classification:

Two hundred sixty dentists completed the questionnaire (52% response rate) (Table 1). Among them, 186 (71.5%) were general dental practitioners, 21 (8.1%) were specialists in endodontics, 46 (17.7%) were specialists in other dental disciplines and 7 (2.7%) were postgraduate residents. Those who reported using RDs "always" or "most of the time" were considered frequent users (n = 50). Those who reported using RDs “occasionally” or “never” were considered infrequent users (n = 210*)*. Overall, only 19.2% of respondents were frequent users of RDs, while 52.3% never used them during RCTs. Endodontists, and residents were significantly more committed (95.2 and 100%, respectively) to using RDs compared to GDPs and other specialists (8.6 and 15.2%, respectively) (X^2: 100.52, $p < 0.001$*)*. There was no statistically significant difference in RD use among other specialists and GDPs (X^2: 1.8, $p = 0.178$).

Practice sector:

Among the respondents, 144 (55.4%) worked in the private sector, 31 (11.9%) were part of the Royal Medical Services (RMS), 73 (28.1%) belonged to the Ministry of Health (MH) and 12 (4.6%) worked at a university hospital (Table 2). Those who worked at university hospitals used RDs significantly more often than those of the other three sectors ($p < 0.001$). There was no statistically significant difference in the frequency of RD use among the RMS, MH and private sectors ($p= 0.39$).

Geographic location of practice:

Dentists working in Amman, the capital of Jordan, used the RD significantly more often than those working elsewhere in Jordan (X^2: 17.29, $p < 0.01$) (Table 3). There was no statistically significant difference among other locations (X^2: 1.3, $p = 0.73$).

Table 1. Frequency of rubber dam use during root canal treatments according to dentist classification

Dentist classification	Frequent user			Infrequent user			Overall total of N = 260
	Always	Most of the time	Total	Occasionally	Never	Total	
General dental practitioner n = 186 (71.5%)	6 (3.2%)	10 (5.4%)	16 (8.6%)	54 (29%)	116 (62.4%)	170 (91.4%)	186 (100%)
Endodontist n = 21 (8.1%)	12 (57.1%)	8 (38.1%)	20 (95.2%)	1 (4.8%)	0 (0%)	1 (4.8%)	21 (100%)
Other specialist n = 46 (17.7%)	2 (4.3%)	5 (10.9%)	7 (15.2%)	19 (41.3%)	20 (43.5%)	39 (84.8%)	46 (100%)
Resident/trainee n = 7 (2.7%)	5 (71.4%)	2 (28.6%)	7 (100%)	0 (0%)	0 (0%)	0 (0%)	7 (100%)
Total (N = 260)	25 (9.6%)	25 (9.6%)	50 (19.2%)	74 (28.5%)	136 (52.3%)	210 (80.8%)	260 (100%)

Table 2. Frequency of rubber dam use during root canal treatments according to practice sector

Practice sector	Frequent user	Infrequent user	Overall total (of N = 260)
Private practice (n = 144)	25 (17.4%)	119 (82.6%)	144 (55.4%)
Royal Medical Services (n = 31)	6 (19.4%)	25 (80.6%)	31 (11.9%)
Ministry of Health (n = 73)	8 (11%)	65 (89%)	73 (28.1%)
University hospital (n = 12)	11 (91.7%)	1 (8.3%)	12 (4.6%)
Total	50 (19.2%)	210 (80.8%)	260 (100%)

Table 3. Rubber dam use during root canal treatments according to geographic practice location in Jordan

Location	Frequent user	Infrequent user	Overall total (of N = 260)
Amman (n = 108)	34 (31.4%)	74 (69.2%)	108 (41.5%)
North Jordan (n = 62)	8 (12.9%)	54 (87.1%)	62 (23.8%)
South Jordan (n = 69)	6 (8.7%)	63 (91.3%)	69 (26.5%)
Other (n = 21)	2 (9.5%)	19 (90.5%)	21 (8.1%)
Total	50 (19.2%)	210 (80.8%)	260 (100%)

Location of dental qualification:

The countries where the dentists received their dental qualifications are summarized in Table 4. The location had no significant impact on the frequency of RD use (X^2: 7.78, p = 0.17).

RCTs performed weekly:

The average number of RCTs performed weekly was classified into 3 groups: 0 to 5, 6 to 15, and more than 15 (Table 5). Differences between groups were not statistically significant (X^2: 0.72, p= 0.69), and there was no significant correlation between RD use and the number of RCTs performed per week (linear-by-linear association = 0.819, p = 0.4).

Practice experience:

In general, dentists with more than 20 years of experience tended to use RDs less often than those with less experience (Table 6). However, there was a poor correlation between the frequency of RD use and years of experience (p= 0.76).

Disincentives to using RDs:

The main disincentives to using RDs as reported by the dentists are shown in Table 7. Those who responded that they always used RDs were asked to skip this section of the questionnaire.

Discussion:

The overall percentage of dentists in Jordan who frequently used RDs was low (19.2%) and within the ranges reported in different parts of the world.[15,19-21] This presents a major concern, as the evidence supporting RD isolation in RCTs is irrefutable.

Multiple disincentives to RD use were reported in our study, which were similar to those previously reported in the literature.[23-25] The highest proportion of dentists (25.5%) who did not always use RDs reported that they did not use them because they were not available at their workplace. This highlights a very serious issue and calls for a strict regulatory requirement by the JDA regarding RD use during RCT. Dental practices without RD kits should not be allowed to offer endodontic treatments. Perhaps, with the increased availability of RDs, this group of dentists might use them.

Table 4. Rubber dam use during root canal treatments according to location of dental qualification

Location	Frequent user	Infrequent user	Overall total (of N = 260)
Jordan (n = 137)	33 (24.1%)	104 (75.9%)	137 (52.7%)
Arab countries (n = 50)	9 (18%)	41 (82%)	50 (19.2%)
Europe (n = 43)	5 (11.6%)	38 (88.4%)	43 (16.5%)
Asia (n = 23)	2 (8.7%)	21 (91.3%)	23 (8.8%)
Other (n = 7)	1 (14.3%)	6 (85.7%)	7 (2.7%)
Total	50 (19.2%)	210 (80.8%)	260 (100%)

Table 5. Rubber dam use according to the number of root canal treatments (RCTs) performed weekly

Number of RCTs performed weekly	Frequent user	Infrequent user	Overall total (of N = 260)
1 to 5 (n = 68)	11 (16.2%)	57 (83.8%)	68 (26.1%)
6 to 15 (n = 104)	20 (19.2%)	84 (80.8%)	104 (40%)
More than 15 (n = 88)	19 (21.6%)	69 (78.4%)	88 (33.8%)
Total	50 (19.2%)	210 (80.8%)	260 (100%)

Table 6. Rubber dam use according to years of experience

Experience (years)	Frequent user	Infrequent user	Overall total (of N = 260)
1 to 5 (n = 76)	15 (19.7%)	61 (80.3%)	76 (29.2%)
6 to 10 (n = 62)	15 (24.2%)	47 (75.8%)	62 (23.8%)
11 to 20 (n = 76)	15 (19.7%)	61 (80.3%)	76 (29.2%)
More than 20 (n = 46)	5 (10.9%)	41 (89.1%)	46 (17.7%)
Total	50 (19.2%)	210 (80.8%)	260 (100%)

Table 7. Primary disincentives to using rubber dams during root canal treatmentsa

It is not available in my workplace	60 (25.5%)
It takes a long time to apply	58 (24.7%)
My patients do not accept it	32 (13.6%)
It is expensive	41 (17.4%)
It adds no benefit to my treatment	24 (10.2%)
I have not received enough training to use it	20 (8.5%)

[a] Data from surveyed dentists who reported using rubber dams most of the time, occasionally or never (N = 235).

A large proportion of dentists (24.7%) who did not always apply RDs reported that RD application takes a long time, hindering their work flow, while 17.4% reported that RDs were too expensive to use on a regular basis. It is well-known that RD application requires a certain level of skill which can be attained only by regular practice and frequent use. However, studies have demonstrated that RDs may be placed even by inexperienced dentists in a relatively short period of time (1 to 8 min).[26,27] In addition, clinicians may improve their treatment efficiency by working in the clean, well-visualized field provided by RDs. This may, in turn, compensate for the cost of RDs in a busy dental practice.

More than 10% of respondents who did not always use RDs believed that RDs have no influence on treatment outcome. This disincentive was also previously reported as the most common cause for GDPs' negative attitude towards RD use.[23] While the evidence showing the effect of RD isolation on the outcome of RCTs is scarce, a recent study has reported a significantly higher survival rate of endodontically treated teeth when RDs were used.[13] RDs should be used routinely due to this and other benefits, as previously mentioned in this paper.

Dentists who work at university hospitals in Jordan are either consultants or residents. RD use among the latter group is mandatory as part of their clinical training, which would explain why their use of RDs was 100%. Consultants also demonstrated a very high frequency of RD use, possibly because they were exposed to higher level training and a higher level of awareness to the importance of RD compared to other dentists classes. Likely due to these reasons, there was a higher incidence of RD use at university hospitals compared to that of the other three sectors which consisted of larger proportions of GDPs.

Dentists who practiced within the capital

city of Amman also demonstrated a higher incidence of RD use compared to those in other parts of Jordan. While official statistics on this point are not available, a potential reason could be that higher fees which might be charged for RCTs in Amman compared to elsewhere in Jordan, therefore compensating for the RD cost. Reasons for this higher incidence in Amman versus other areas of Jordan would be an interesting subject for future study.

The location of dental qualification did not significantly influence the rate of RD use. In both dental schools in Jordan, the use of RDs is taught at the preclinical stage, which involves practicing RCTs in labs on extracted teeth, and practiced at the clinical stage where they provide actual treatments for patients. Unfortunately, there was still a low rate of frequent RD use among graduates of Jordanian universities (24%). Such a significant drop in RD use after graduation by practicing dentists is well-documented in the literature[28] and might be attributed to insufficient regulations and lack of RD availability in clinics. As for those dentists with qualifications from non-Jordanian universities, it is difficult to assume that they have been trained to use the RD during RCTs as information on this matter is missing. Furthermore, RD isolation is not required to be performed for the dental licensing exam in Jordan.

The following actions are suggested to address the low frequency of RD use during RCT among dentists in Jordan:

- Promoting the importance and advantages of RD use during RCTs with both practicing dentists and the general population.
- Emphasizing the rationale and relevance of RD use during undergraduate and postgraduate dental education.
- Underlining the clinical and medicolegal implications of not using RDs.
- Creating strict JDA regulations requiring use of RDs during RCTs. In addition, application of RDs should be a mandatory part of the dental licensure exam in Jordan.
- Enforcing continuing professional development by the JDA through regular lectures, conferences, workshops and newsletters and including RD use as part of this.

The results of this study reflect the current situation in Jordan regarding RD isolation during RCTs, demonstrating an urgent need for stringent regulations for RD use during RCT.

Conclusion:

- The percentage of dentists in Jordan who regularly used RDs for RCTs was low.
- Endodontists and dental residents used the RD significantly more frequently than GDPs and other specialists during root canal treatment.
- The use of RD during RCT was more frequent among dentists practicing in Amman compared to dentists practicing elsewhere in Jordan
- The most commonly reported disincentives to RD use were its unavailability and the length of time needed for application.

There is an urgent need for stringent regulations for RD use during RCT by the JDA.

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استخدام الحاجز المطاطي خلال المعالجة اللبية بين أطباء الأسنان الأردنيين – دراسة مسحية

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الملخص

الأهداف: من الضروري عزل الأسنان عن البيئة الفموية خلال المعالجة اللبية، وأفضل طريقة لتحقيق ذلك هي استخدام الحاجز المطاطي. هدفت هذه الدراسة إلى دراسة معدل استخدام الحاجز المطاطي من قبل أطباء الأسنان الأردنيين وتحليل أسباب عدم استخدامه.

الطريقة: بعد اخذ الموافقة الأخلاقية، تم تصميم دراسة مسحية على عينة عشوائية (عدد = 500) من أطباء الأسنان الأردنيين من مختلف القطاعات، والمواقع الجغرافية، ومستويات التعليم العالي. وطلب من المشاركين الإجابة عن أسئلة محددة تتعلق بالخلفية الديموغرافية للطبيب، معدل استخدام الحاجز المطاطي والأسباب الرئيسية لعدم استخدامه. ثم تم جمع الردود وتحليل البيانات إحصائيا.

النتائج: بلغ معدل الاستجابة الإجمالي 52٪. عموما، وبلغت نسبة الأطباء المستخدمين للحاجز المطاطي بشكل روتيني 19.2٪. أظهر أطباء الأسنان المختصين بالمعالجة اللبية معدلاً عالياً في استخدام الحاجز المطاطي (95.2%) في حين أن 8.6% فقط من أطباء الأسنان العامين استخدموا الحاجز المطاطي بشكل دوري. العوامل الأخرى التي أثرت إحصائيا على معدل استخدام الحاجز المطاطي هي: الموقع الجغرافي للطبيب، وقطاع الممارسة. اما عن أسباب عدم استخدام الحاجز المطاطي فأكثرها ذكرا كان: عدم توفرها في مكان العمل والوقت الطويل الذي يستغرقه تطبيقها.

الخلاصة: معدل استخدام الحاجز المطاطي من قبل أطباء الأسنان الأردنيين منخفض وينبغي تحسينه من خلال التطوير المهني المستمر لأطباء الأسنان، وتحسين وعي الجمهور بهذه المسألة والتطبيق الصارم لقوانين وأنظمة نقابة أطباء الأسنان.

الكلمات الدالة: الحاجز المطاطي، المعالجة اللبية، دراسة مسحية.