

An internet-mediated investigation into the reported clinical use of rubber dam isolation by GDPs in the UK – part 2: clinical applications

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Key points

Part two of this study highlights the reported clinical applications of rubber dam by GDPs in the UK.

This study identified an increased reported use of rubber dam by GDPs in the study population as well as an increased use with paediatric patients.

The main clinical applications using rubber dam isolation included the provision of composite restorations, endodontic and internal bleaching treatments..

Abstract

Aims To investigate the reported clinical applications of rubber dam isolation by UK general dental practitioners (GDPs) using an internet-mediated approach.

Methods The data were collected in 2019, using an online (SurveyMonkey) questionnaire that was distributed to GDPs in a private group on Facebook. The percentages are based on the number of respondents who answered each question.

Results The response rate was 61% with 403 valid completed questionnaires. The majority (395; 98%) of respondents reported using rubber dam in clinical practice. Undergraduate training in rubber dam use was received by 382 (98%) respondents, with greater training reported by younger, more recently qualified graduates. The main clinical applications of rubber dam included its use for composite restorations, endodontic treatments and internal bleaching procedures, while for other clinical procedures, the majority of respondents did not use rubber dam. For posterior and anterior composites, 332 (82%) and 298 (74%) respondents, respectively, reported using rubber dam isolation at least rarely. At least 98% (395) of the respondents used rubber dam for endodontic procedures, irrespective of tooth type and position. Over 70% (281) of respondents reported using rubber dam at least rarely for internal bleaching. Rubber dam was used by 99% (392) and 67% (262) of respondents on adults and paediatric patients, respectively.

Conclusions The main clinical applications agree with previous reports, but highlight an increase in rubber dam use. This study investigated a wider range of clinical applications compared to previous studies, adding to the literature surrounding rubber dam use.

Introduction

This paper is part two of a series reporting the findings of an internet-mediated study into the reported clinical applications of rubber dam isolation by general dental practitioners (GDPs) in the UK. Part one reported the demographic profile of respondents as well as their attitudes towards, and factors

influencing their use of rubber dam.¹ The reported clinical applications of rubber dam by the GDPs in the study population are described and discussed in this paper.

Aim

To investigate the reported clinical applications of rubber dam isolation by UK GDPs using an internet-mediated approach.

study population was a private Facebook group with approximately 13,400 members. Statistical analysis was completed as described previously.¹ A participation letter and information leaflet about the project were given to respondents. Consent was gained using a tick box at the top of the questionnaire. Ethics approval was gained from the Research Ethics Advisory Group of University of Kent's Centre for Professional Practice.

Methods

The methods used in this study were described in part one,¹ in which a piloted online questionnaire was developed based on previously published studies.^{2,3} The questionnaire recorded respondent demographics and the clinical applications of rubber dam, as well as attitudes towards and factors influencing rubber dam use. The

Results

There were 403 valid questionnaires received, giving a response rate of 61%. However, not all participants answered every question.

Use of rubber dam in clinical practice

Use of rubber dam in clinical practice was reported by 395 (98%) respondents, with only eight (2%) reporting not using it.

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Table 1 The reported use of rubber dam for specific clinical procedures (GICs = glass-ionomer cements)

Procedure	Never		Rarely		Occasionally		Often		Mostly		Always		N
	%	N	%	N	%	N	%	N	%	N	%	N	
Posterior composites	18	71	24	97	24	98	8	34	13	52	13	52	403
Anterior composites	26	105	28	111	25	99	8	34	9	35	5	20	403
Posterior amalgams	84	331	9	36	4	15	1	4	1	4	1	4	394
Anterior amalgams	97	380	2	7	1	2	0	1	0	1	1	3	392
Fissure sealants	74	295	13	51	9	35	2	6	1	5	2	6	398
Posterior GICs	82	329	10	41	4	17	1	4	1	3	2	6	399
Anterior GICs	87	346	7	27	3	13	1	2	1	3	2	6	396
Crown preparation	75	302	10	41	9	37	3	12	2	8	0	1	401
Crown cementation	60	238	14	56	17	67	6	22	4	15	1	2	400
Bridge preparation	86	342	7	26	5	21	2	6	1	5	0	0	400
Bridge cementation	61	245	16	66	15	61	4	18	3	12	0	0	401
Anterior endodontics	2	8	2	8	3	11	2	8	8	33	83	336	403
Premolar endodontics	2	7	2	7	3	11	1	3	6	23	87	352	403
Posterior endodontics	1	5	2	9	2	9	1	4	5	21	88	356	403
Internal bleaching	29	117	8	32	7	27	5	19	7	29	44	174	398
Use of adults	1	5	4	14	20	81	23	92	24	96	27	109	397
Use on children	33	130	27	104	20	78	6	24	6	22	9	35	392

Undergraduate training in rubber dam use

The majority of respondents (382; 95%) reported receiving undergraduate training in rubber dam use and 21 (5%) reported having not received training.

Rubber dam use in specific clinical scenarios

Respondents were asked to report how often they would 'use rubber dam isolation for a range of operative procedures', answering either never, rarely, occasionally, often, mostly or always (Table 1). Thirty-eight respondents reported another use for rubber dam isolation (Table 2).

For posterior and anterior composite restorations

In total, 403 respondents answered these questions (Fig. 1).

The reported use of rubber dam for posterior composites was never (71; 18%), rarely (97; 24%), occasionally (98; 24%), often (34; 8%), mostly (52; 13%) and always (52; 13%).

For anterior composites, rubber dam was used never (105; 26%), rarely (111; 28%), occasionally (99; 25%), often (34; 8%), mostly (35; 9%) and always (20; 5%).

More female respondents reported never and rarely using rubber dam isolation for

their posterior composites (48; 22% and 67; 31%, respectively) than male respondents (23; 12% and 30; 16%, respectively). Male respondents reported always using rubber dam for posterior composites (39; 21%) more than the female respondents (13; 6%), which was highly significant ($U = 14041.5$, $p < 0.00001$).

Similarly, more female respondents reported never and rarely using rubber dam isolation for their anterior composites (72; 33% and 65; 30%, respectively) than male respondents (33; 18% and 46; 25%, respectively), while male respondents reported always using rubber dam for this procedure (16; 9%) more than female respondents (4; 2%), which was significant ($U = 14881.5$, $p < 0.00001$).

Respondents from private-only practices reported always using rubber dam for anterior composites (17; 23%) significantly more than respondents from NHS-only (0; 0%) and mixed (3; 1%) practices ($U = 1021.5$, $p < 0.00001$ and $U = 5369.5$, $p < 0.00001$, respectively).

For posterior and anterior amalgam restorations

A total of 394 and 392 respondents answered the questions on the use of rubber dam for posterior and anterior amalgam restorations, respectively.

Rubber dam was never (331; 84%), rarely (36; 9%), occasionally (15; 4%), often (4; 1%), mostly (4; 1%) and always (4; 1%) used for posterior amalgams.

For anterior amalgams, rubber dam was used never (380; 97%), rarely (7; 2%), occasionally (2; 1%), often (0), mostly (0) and always (3; 1%).

The majority of respondents reported never using rubber dam for their amalgam restorations.

Rubber dam use for posterior amalgams in NHS-only compared to private-only practices and mixed compared to private-only practices was significantly different ($U = 2067$, $p = 0.0164$ and $U = 7063$, $p < 0.05$, respectively). Here, fewer respondents from private-only practices (48; 71%) reported never using rubber dam for posterior amalgams compared to respondents in mixed practices (210; 85%) and NHS-only practices (73; 92%), whereas respondents from private-only practices reported always using rubber dam for posterior amalgams (4; 6%) more frequently than those from mixed (0) and NHS-only (0) practices.

For fissure sealant placement

A total of 398 respondents answered this question and rubber dam was used never (295; 74%), rarely (51; 13%), occasionally (35; 9%), often (6; 2%), mostly (5; 1%) and always (6; 2%) by

respondents. The majority of respondents never used rubber dam isolation for sealant placement.

The reported use of rubber dam in the placement of fissure sealant by NHS-only compared to private-only practices and mixed compared to private-only practices was significantly different ($U = 7165$, $p = 0.0001$ and $U = 5390$, $p = 0.00138$, respectively), with rubber dam isolation being used by private only practitioners occasionally (14; 20%), often (4; 6%), mostly (4; 6%) and always (4; 6%), compared to mixed practices (18 [7%], 2 [1%], 1 [$<1\%$] and 2 [1%], respectively) and NHS-only practices (2 [3%], 0 [0%], 0 [0%] and 0 [0%], respectively).

For posterior and anterior glass-ionomer restorations

A total of 399 and 396 respondents answered the questions on the use of rubber dam for posterior and anterior glass-ionomer restorations, respectively.

For posterior glass-ionomer restorations, rubber dam was used never (329; 82%), rarely (41; 10%), occasionally (17; 4%), often (3; 1%), mostly (3; 1%) and always (6; 2%).

For anterior glass-ionomer restorations, rubber dam was used never (346; 87%), rarely (27; 7%), occasionally (13; 3%), often (2; 1%), mostly (3; 1%) and always (6; 2%).

The majority of respondents never used rubber dam isolation for placement of glass-ionomer restorations.

For crown preparation and cementation procedures

A total of 401 and 400 respondents answered the questions on the use of rubber dam isolation for crown preparation and cementation procedures, respectively.

For crown preparations, rubber dam was used never (302; 75%), rarely (41; 10%), occasionally (37; 9%), often (12; 3%), mostly (8; 2%) and always (1; $<1\%$).

For crown cementation procedures, rubber dam was used never (238; 60%), rarely (56; 14%), occasionally (67; 17%), often (22; 6%), mostly (15; 4%) and always (2; 1%).

Most respondents reported not using rubber dam for crown preparation and cementation procedures.

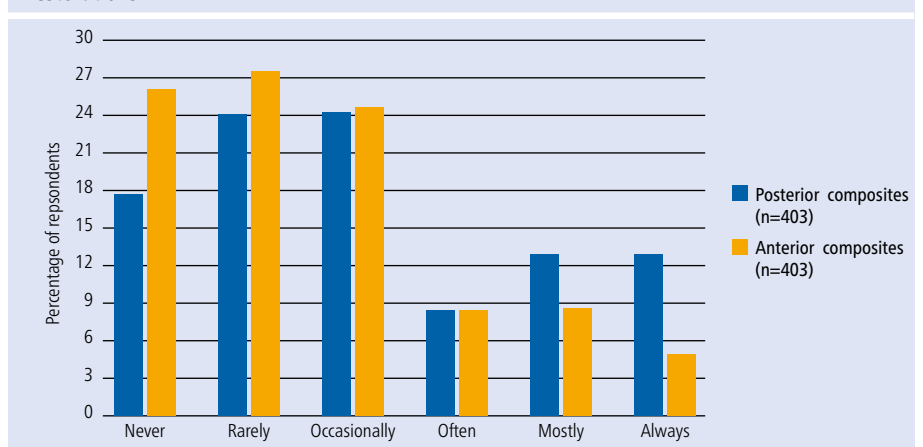
For bridge preparation and cementation procedures

A total of 400 and 401 respondents answered the questions on the use of rubber dam isolation for bridge preparation and cementation procedures, respectively.

Table 2 Other uses for rubber dam isolation

Use	Number of respondents
Primary tooth pulp treatment	1
To stop people talking	1
Mostly for endo	1
Cementation of overlays and preparation of same type of restorative procedures	1
Airway protection	1
Do not do amalgams so unsure how to answer	1
Vital pulp therapy and trauma	1
Posts, veneers and onlay cementation	1
Always when replacing amalgam restorations	1
Bonding ortho composite anchors	1
Bonded retainers, veneer and onlay cementation	1
Any adhesive techniques or endodontics	1
Microabrasion	3
Repair of fractured porcelain using hydrofluoric acid	1
Onlay preparation and cementation	2
Anything private and bonding	1
External bleaching multiple teeth in surgery	1
None	2
Bonding fixed retainer	1
Crown removal, post preparations	1
Veneer, inlay and onlay cementation	1
ICON	2
After endodontic access and composites sometimes	1
For isolation	1
Other anterior restorations; that is, veneer cementation	1
ICON and microabrasion	1
Management of gag reflex in special care patients	1
Removal of amalgam restorations in pregnant patients	1
Diagnosis isolation for vitality tests, use dam for Wedjets	1
Onlay cementation	1
Veneer cementation	1
Removing old amalgams	1
Extirpation before specialist referral	1

Fig. 1 The use of rubber dam isolation for the placement of posterior and anterior composite restorations



For bridge preparations, rubber dam was used never (342; 86%), rarely (26; 7%), occasionally (21; 5%), often (6; 2%), mostly (5; 1%) and always (0; 0%).

For bridge cementation procedures, rubber dam was used never (245; 61%), rarely (66; 16%), occasionally (61; 15%), often (18; 4%), mostly (12; 3%) and always (0; 0%).

The majority of respondents reported not using rubber dam for bridge preparation and cementation procedures.

For endodontic procedures

A total of 403 respondents answered the questions on the use of rubber dam for anterior, premolar and posterior endodontic procedures (Fig. 2).

For anterior endodontic procedures, rubber dam was used never (8; 2%), rarely (8; 2%), occasionally (11; 3%), often (8; 2%), mostly (33; 8%) and always (336; 83%).

Regarding premolar endodontic procedures, rubber dam was used never (7; 2%), rarely (7; 2%), occasionally (11; 3%), often (3; 1%), mostly (23; 6%) and always (352; 87%).

For posterior endodontic procedures, rubber dam was used never (5; 1%), rarely (9; 2%), occasionally (9; 2%), often (4; 1%), mostly (21; 5%) and always (356; 88%).

The majority of respondents reported always using rubber dam for their endodontic treatments, irrespective of tooth position.

For internal bleaching

The question on the use of rubber dam internal bleaching procedures was answered by 398 respondents.

Rubber dam was used never (117; 29%), rarely (32; 8%), occasionally (27; 7%), often (19; 5%), mostly (29; 7%) and always (174; 44%) (Fig. 3).

Rubber dam was used during internal bleaching more frequently by private-only practice respondents than respondents in NHS-only practices ($U = 1831.5$, $p = 0.00016$) and mixed practices ($U = 6994$, $p = 0.01428$), and in mixed practices compared to NHS-only practices ($U = 7998$, $p = 0.03752$).

For adult and paediatric patients

A total of 397 and 392 respondents answered the questions on the use of rubber dam application on adult and paediatric patients, respectively.

For adult patients, rubber dam was used never (5; 1%), rarely (14; 4%), occasionally (81; 20%), often (92; 23%), mostly (96; 24%) and always (109; 27%).

Fig. 2 The use of rubber dam isolation for anterior, premolar and posterior endodontic procedures

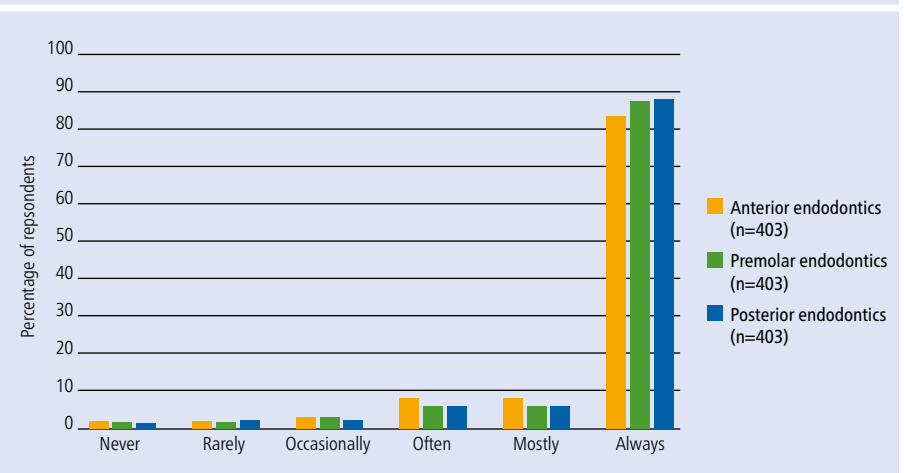
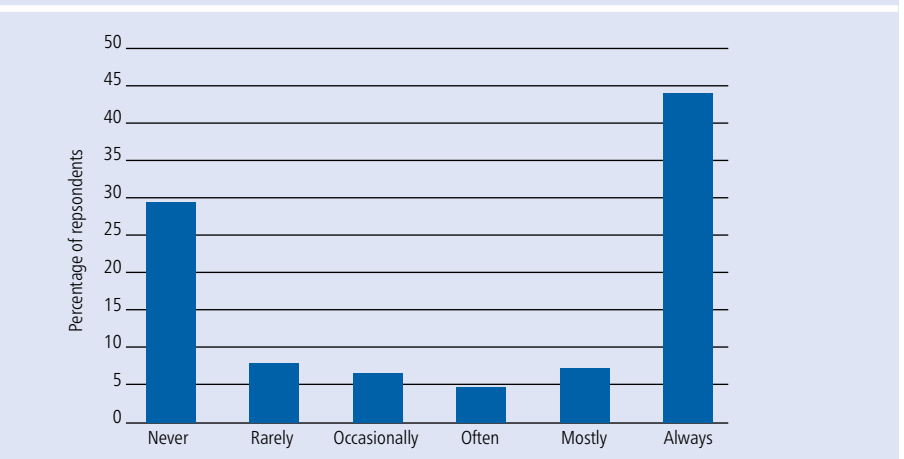


Fig. 3 The use of rubber dam isolation during internal bleaching procedures



Respondents in private-only practices used rubber dam more frequently with adult patients than those in mixed and NHS-only practices ($U = 6783$, $p = 0.002$ and $U = 1745$, $p = 0.00001$, respectively).

For paediatric patients, rubber dam was used never (130; 33%), rarely (104; 27%), occasionally (78; 20%), often (24; 6%), mostly (22; 6%) and always (35; 9%).

Respondents in private-only practices used rubber dam more frequently with paediatric patients than those in mixed and NHS-only practices ($U = 6378$, $p = 0.00084$ and $U = 2067.5$, $p = 0.0056$, respectively).

Discussion

Rubber dam use by GDPs

Of the GDPs in the study population, 98% reported using rubber dam at least for some procedures in clinical practice. This is a higher percentage than previously reported.^{2,4}

Although greater numbers of respondents aged 23–27 (77; 97%), 28–32 (116; 97%)

and 33–37 (64; 97%) years reported having undergraduate training in rubber dam use compared to respondents aged 38–42 years (51; 86%), it is important to acknowledge that over 80% of the study's respondents graduated between 2000 and 2019. Therefore, this result may be biased due to greater numbers of more recently graduated dentists completing the survey. However, this finding does agree with results from a recent survey of Lithuanian GDPs, which concluded that more recently qualified dentists were complying with the recommended standards in endodontic practice better than those practitioners who had graduated in the past.⁵ Furthermore, a recent systematic review highlighted an association between the prevalence of rubber dam application and the number of years post-graduation, with more recent graduates being more likely to use it.⁶

In the current study, no significant differences were found between age of respondent or dental school from which they graduated and their reported use of rubber dam in general practice, both of which have

been previously reported to influence dam use significantly.⁷ This outcome may be due to the demographics of the study population, with a greater number of more recently qualifying dentists completing the questionnaire, and also the fact that greater percentages of respondents reported receiving undergraduate training in rubber dam use. Furthermore, with over 40% of respondents having graduated from just four dental schools (Birmingham, Leeds, Newcastle and King's College London), the results cannot be generalised to represent all dental schools.¹

Rubber dam use and clinical procedures

The main reported uses of rubber dam isolation in this study were for placing composite restorations, endodontic treatment and internal whitening procedures, which confirms previous findings.⁷

However, when comparing this study's results to those reported in a recently published study of dental practice in the UK,⁴ the following comparisons can be made:

1. At least 98% of the respondents in this study used rubber dam for endodontic procedures (compared to 85%)⁴
2. Twenty-six percent of respondents in this study used rubber dam at least rarely for fissure placement (compared to 7%)⁴
3. Seventy-one percent of respondents in this study used rubber dam at least rarely for internal bleaching (compared to 11%).⁴

When considering rubber dam use on adult and paediatric patients, a 2009 survey of final-year dental students in Wales and Ireland reported that 98% of respondents would use rubber dam on adults, but only 38% would use it on paediatric patients.³ In the current study, 392 (99%) and 262 (67%) respondents reported using rubber dam on adults and paediatric patients, respectively. Therefore, these results agree with the 2009 study with respect to its use on adults, but they suggest ten years later that rubber dam use on paediatric patients may have increased.³

With respect to other clinical applications such as amalgam, glass-ionomer restorations, crown and bridge preparations, and cementation procedures, the use of rubber dam isolation is still limited.

Limitations to this study

The limitations discussed below apply to both parts of the current study. Given that it was an internet-mediated investigation, the study population may have been biased because

not all UK-registered GDPs were in the social media group. A greater number of respondents reported being younger and having graduated more recently, and this may have biased the results. In future investigations, some of the questions should be redesigned to try to improve response rates of individual questions. Data gathered by surveys may suffer from respondents answering in ways they feel are expected rather than what they personally do or believe,⁴ and this should be considered too. The results of this study should not be generalised to represent the entire population of UK GDPs. Nevertheless, it should act as a stimulus for future studies and has demonstrated the potential use of internet-mediated research approaches, especially in primary dental care.

Key findings

The key findings for part two of this study include:

1. The majority of respondents (395; 98%) reported using rubber dam at least sometimes in clinical practice – an increase in rubber dam use compared to previous reports
2. The majority of respondents (382; 95%) received undergraduate training in rubber dam use
3. The main clinical applications of rubber dam included composite restorations, endodontic treatments and internal bleaching procedures, while for the other procedures investigated, the majority of respondents reported not using rubber dam
4. At least 98% of the respondents reported using rubber dam for endodontic procedures, irrespective of tooth type and position – an increase on the percentages found in previous studies
5. Use of rubber dam at least rarely for internal bleaching procedures was reported by an increased number of respondents (281; 70%) compared to previous studies
6. Rubber dam was used by 392 (99%) and 262 (67%) respondents on adults and paediatric patients, respectively, with the paediatric usage suggesting an increase over the last ten years
7. Respondents working solely in private practice reported greater use of rubber dam than those working in mixed practices, who in turn reported greater use of rubber dam than those working in NHS-only practices
8. Male dentists reported greater use of rubber dam than female dentists.

Conclusions

This internet-mediated study found an increased reported use of rubber dam by UK GDPs in the study population. The main uses of rubber dam confirm those previously reported. However, the results of this investigation have suggested some increases in rubber dam use by GDPs. Furthermore, associations were highlighted between rubber dam use and other factors. This study reported the clinical applications in more detail than those previously published and has updated the literature surrounding rubber dam use. It would be beneficial to repeat this study again as GDPs return to practice following the COVID-19 pandemic.

Conflict of interest

The authors are not aware of any conflicts of interest.

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Author contributions

Daniel Çağa designed the study, collected and analysed the resulting data, and wrote the first draft of this paper. Anne-Maria Brenman advised on the design of the study in general and the statistical tests in particular, and helped revise and edit drafts of the paper. Kenneth Eaton supervised the study, which included advising on its design and editing of all drafts.

References

1. Çağa D, Brennan A-M, Eaton K A. 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. *Br Dent J* 2021; <https://doi.org/10.1038/s41415-021-3083-z>.
2. Marshall K, Page J. The use of rubber dam in the UK: A survey. *Br Dent J* 1990; **169**: 286–291.
3. Mala S, Lynch C D, Burke F M, Dummer P M H. Attitudes of final year dental students to the use of rubber dam. *Int Endod J* 2009; **42**: 632–638.
4. Wilson N H F, Burke F J T, Brunton P A, Creanor S, Hosey M T, Mannocci F. Dental practice in the UK in 2015/2016. Part 2: aspects of direct restorations, bleaching, endodontics and paediatric dentistry. *Br Dent J* 2019; **226**: 110–114.
5. Peculiene V, Rimkuviene J, Aleksejuniene J, Haapasalo M, Drukeinis S, Mandeliene R. Technical aspects of endodontic treatment procedures among Lithuanian general dental practitioners. *Stomatologija* 2010; **12**: 42–50.
6. Ahmed H M, Cohen S, Levy G, Steier L, Bukiet F. Rubber dam application in endodontic practice: an update on critical educational and ethical dilemmas. *Aust Dent J* 2014; **59**: 457–463.
7. Kapitan M, Sustova Z. The use of rubber dam among Czech dental practitioners. *Acta Med* 2011; **54**: 144–148.