

# An assessment of rubber dam usage amongst specialists in paediatric dentistry practising within the UK

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**Objective.** Rubber dam is recommended by the British Society of Paediatric Dentistry (BSPD) for various restorative and endodontic procedures. To date, there has been no report of actual usage of rubber dam within the speciality of paediatric dentistry. The aim of this study was to assess the usage of rubber dam amongst paediatric dentistry specialists within the UK.

**Methods.** A postal questionnaire was distributed to all practitioners registered on the UK General Dental Council's 2004 specialist list in paediatric dentistry.

**Results.** Data were available for 162 questionnaires (a 75% response rate), and of these, 85% of respondents worked in the National Health Service

(NHS), 4% were private practitioners and the remainder had a mixed NHS/private practice. Regarding the benefits of rubber dam, 65% and 52% of respondents quoted patient safety and moisture control, respectively. Perceived difficulties of dam usage were lack of patient cooperation and the non-necessity for a particular treatment, as quoted in 64% and 36% of the completed questionnaires, respectively. The most common modes of isolation for anterior and posterior teeth were Dry Dam® (58%), and clamp and dam (80%), respectively.

**Conclusion.** Current BSPD guidelines recommend rubber dam usage for many restorative procedures; however, it would appear that there is wide variability in the application, as well as under-use, of rubber dam.

## Introduction

Rubber dam (RD) is a long-established technique within the dental profession, having been utilized for over 100 years<sup>1</sup> and encouraged within the speciality of paediatric dentistry for almost as long<sup>2</sup>. It is only more recently, however, that its use has been specifically recommended by the British Society of Paediatric Dentistry (BSPD) and the American Academy of Pediatric Dentistry within various policy documents<sup>3,4</sup> and clinical guidelines<sup>5–8</sup>.

Anecdotal evidence suggests that the application of RD is generally limited because of the perception amongst general practitioners that dam application is both problematic and time-consuming<sup>9</sup>. Nonetheless, the reported benefits of rubber dam are numerous and well-documented<sup>2,10,11</sup>, and include the following:

### Box 1. Benefits of rubber dam.

- 1 improved access and visibility of the isolated operating area for both the dentist and dental nurse;
- 2 reduction in contamination of the environment via saliva aerosol;
- 3 protection of the patient from debris and dropped instruments;
- 4 improved management of dental materials and moisture control;
- 5 reduction of nitrous oxide gas levels in room air caused by reduced mouth-breathing;
- 6 reduction in patient and dentist stress during the procedure;
- 7 a higher standard of care in less time; and
- 8 patient sense of isolation from treatment and consequent relaxation.

Although there have been a number of previously published surveys of RD usage, the actual usage of the technique within the speciality of paediatric dentistry has not been investigated to date. Therefore, the aim of this study was to assess the prevalence of usage of RD by specialists in paediatric dentistry working within the UK.

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## Subjects and methods

This was a prospective questionnaire-based study modelled on Dillman's principles<sup>12</sup>. A pilot study was completed with subsequent minor modifications to the questions. Number-coded, modified questionnaires were printed on A3 sheets, folded into four-page, A4-sized booklets, copies of which are available from the authors on request. They were accompanied by a covering letter and a prepaid, self-addressed envelope, and were distributed in February 2005 to all 215 UK resident specialists registered on the 2004 General Dental Council's specialist list in paediatric dentistry. Those unable to respond to the initial questionnaire were followed up with a second mail-shot 6 weeks later. All responses were anonymous and confidential.

The questions are summarized as follows:

### Box 2. Questionnaire sent to UK resident specialists.

- 1 demographic characteristics, including qualifications, age and gender;
- 2 use of RD for various restorative procedures, with a distinction between routine treatment and that carried out under inhalation sedation (IHS) and dental general anaesthetic (DGA) (e.g. 'How often do you use rubber dam, where possible, for the following individual procedures?'); the possible responses were 'always', 'almost always', 'regularly', 'rarely' and 'never';
- 3 perceived benefits and barriers of RD use (e.g. 'What do you feel are the main benefits of rubber dam?'/ 'What do you feel are the main reasons that prevent you from using rubber dam?');
- 4 Differing methods of RD placement for anterior and posterior teeth (e.g. 'If you do use rubber dam in your clinical practice for anterior/posterior teeth, how do you use it?'); and
- 5 Use of local anaesthetic if using RD clamps.

Data analysis was completed via a coding system and the data entered twice into the SPSS Data Entry© computer program (SPSS Inc., Chicago, IL, USA) to ensure accuracy prior to final analysis, which consisted of simple frequencies and cross-tabulation. Where appropriate, chi-square analysis was completed and *P*-values generated.

## Results

In total, 162 questionnaires were returned, a response rate of 75%. Overall, 13 respondents (8%) were no longer involved in clinical paediatric dentistry, and therefore, were not included in the final data analysis.

The majority of respondents were females ( $n = 95$ , 64%), and almost half of respondents were aged between 41 and 50 years of age ( $n = 67$ , 45%). Most respondents worked within the National Health Service (NHS) ( $n = 126$ , 85%), with the remainder in private practice (4%) or mixed practice (9%).

Operator factors related to the frequency of reported RD usage would suggest the following: it is most commonly used in the 31–40-year-old age group (31–40 years = 61%; 41–50 years = 46%; 51–60 years = 34%; > 60 years = 52%); there is minimal difference in RD usage between the sexes (overall rubber dam usage: males = 44%, females = 48%); fixed-term training agreement specialist registrars report the highest use of RD, with community dental officers reporting the lowest usage (Fig. 1); and those based in private practice report RD use more than those within the NHS or mixed practice (private practice = 68%; mixed practice = 55%; NHS = 45%).

Composite was the most commonly reported restoration to be placed under RD, with fissure sealant the least likely; however, where rubber dam was placed under general anaesthetic, its use for fissure sealants and glass ionomer restorations increased ( $\chi^2 = 49.93$ ,  $P = 0.001$  d.f. = 2, and  $\chi^2 = 11.69$ ,  $P = 0.003$ , d.f. = 2, respectively) (Fig. 2). With regard to endodontic procedures, permanent tooth endodontics were more likely to be carried out under RD than primary tooth endodontics ( $\chi^2 = 77.28$ ,  $P = 0.001$ ,

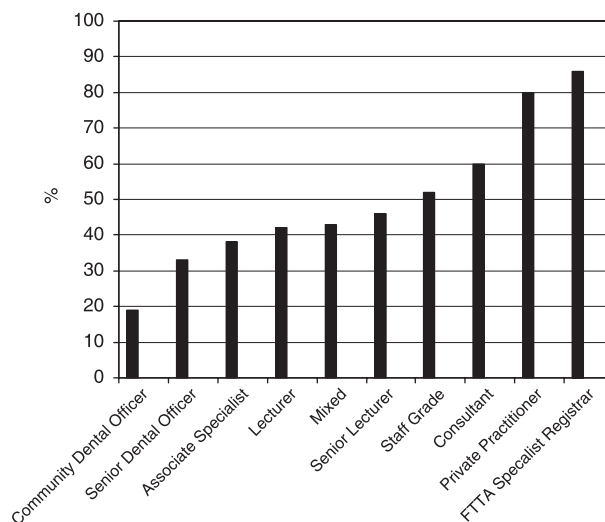


Fig. 1. Use of rubber dam in relation to position held.

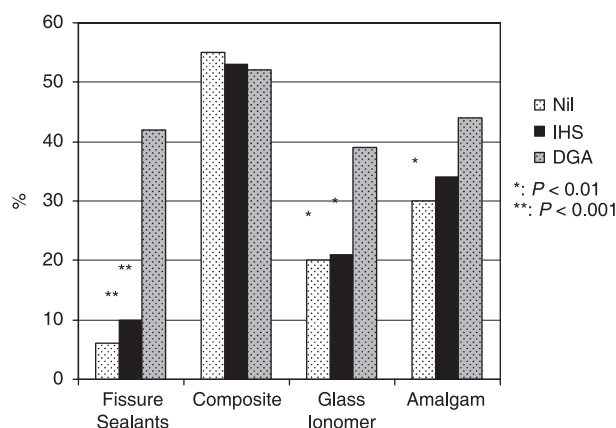


Fig. 2. Use of rubber dam for operative procedures: \* $P < 0.01$ , \*\* $P < 0.001$ .

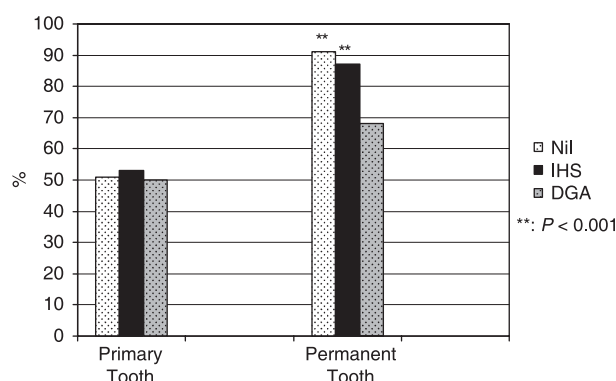


Fig. 3. Use of rubber dam for endodontic treatments: \*\* $P < 0.001$ .

5 d.f.); however, dam use for permanent endodontics decreased under general anaesthetic ( $\chi^2 = 20.46$ ,  $P = 0.001$ , 2 d.f.) (Fig. 3).

Two respondents stated that they no longer used amalgam and six respondents no longer used glass ionomer in their practice. These numbers may underestimate this finding since there was no specific box for respondents to complete should they not carry out a particular restorative treatment.

Concerning mode of treatment for all forms of restorative care, RD usage was reported as regular, almost always or always in 46% of non-sedation cases, 46% of IHS cases and 49% of DGA cases, and this was not statistically significant. These figures do take into account those respondents who reported not carrying out a particular treatment or sedation/general anaesthesia.

Regarding issues preventing clinicians using RD, the most commonly cited reason was of

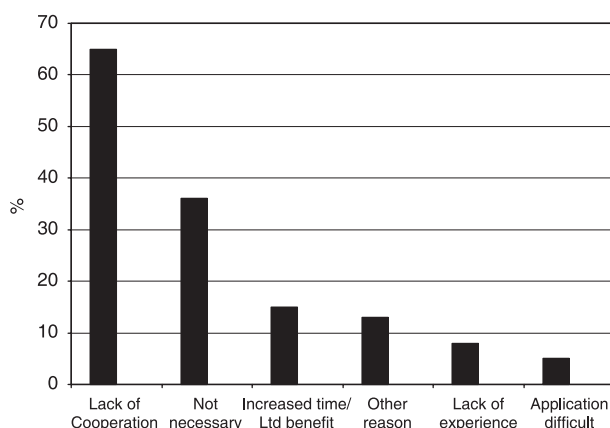


Fig. 4. Factors preventing rubber dam use.

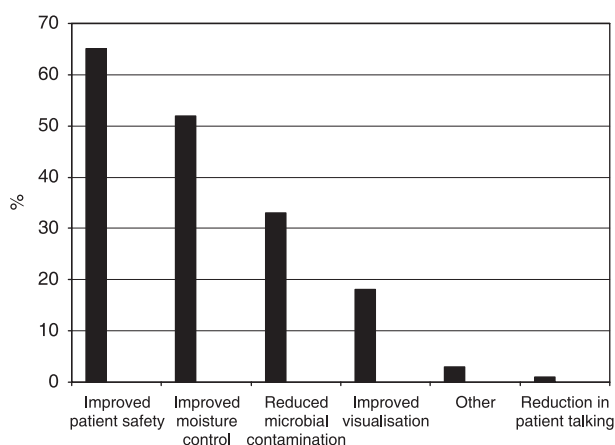


Fig. 5. Benefits of rubber dam use.

lack of patient cooperation (Fig. 4). The most beneficial aspect of RD was deemed to be assurance of patient safety (Fig. 5).

The most common form of RD isolation for anterior teeth was Dry Dam® (Svenska Dental Instruments AB, Upplands Väsby, Sweden) (58%) retained with Wedgets® (Hygenic Corporation, Akron, OH, USA), wooden wedgets or with no form of interproximal device. Posterior teeth were most commonly isolated with a clamp and dam (80%).

In total, 132 respondents (89%) reported using a RD clamp regularly for RD retention, and 72% of these respondents reported using local anaesthetic for the procedure whether or not the tooth was vital.

Finally, a comments box was provided at the end of each questionnaire with varying opinions regarding RD use and some of the responses are given in Table 1.

**Table 1. Samples of respondents' comments.***Not in favour of rubber dam*

'I treat most of my patients with inhalation sedation ... Improved cooperation makes it easier to achieve excellent isolation for teeth'

'Poor patient compliance in primary care setting – I have always found patients (or parents) accept it better in a dental hospital environment, rather than in a community clinic'

'I see my sealants, which have been place in some instances 10 years ago, and therefore, do not believe rubber dam would add any extra benefits ... This does take a lot of experience/expertise though'

*In favour of rubber dam*

'Can potentiate effect of relative analgesia, which can be helpful if care taken not to over-sedate'

'Rubber dam is an invaluable adjunct to paediatric dentistry. The reason most dentists can't use it is because they were taught by dentists who can't (and don't) use it'

'Quality care for children cannot be achieved without it'

*Other comments regarding rubber dam*

'I use rubber dam fairly often – I notice parents'/patients' surprise. Patient awareness and expectation is a factor and parents are surprised/shocked that it has not been used for them! Therefore, better education and overall better standards are needed'

'Must be regularly taught at all levels, teachers must be seen to use it at all times'

'Locally, more equipment, better trained nurses to properly assist its placement'

**Discussion**

Previous studies have reported various rates of RD usage<sup>13–16</sup>, and in general, these have demonstrated that there is under-usage compared to current recommendations, a similar finding to this study. For example, one survey revealed that rubber dam was used in 17–19% of cases for restorative treatment, whilst this increased to 62% for endodontic treatment<sup>13</sup>. Furthermore, it is interesting to note that those working within the US Air Force Dental Services used rubber dam in more cases than their general and specialist colleagues<sup>14</sup>. In 1990, other authors working within the UK reported that 1.4% and 10.9% of operative and endodontic procedures were carried out under RD, respectively<sup>15</sup>, with the British Endodontic Society reporting that dentists in private practice used rubber dam more than those in NHS practice<sup>16</sup>. More specifically, in relation to paediatric patients treated within general dental practice in the UK, there would appear to have been an increase in rubber dam use from 0% to 9% between 1986 and 1996<sup>17</sup>. It may be speculated that it is unlikely that the same financial and time constraints are evident both within the US forces dental practices and

private practice compared to dentists working within general practice. This could perhaps explain the differences in reported usage in both the above studies and this one between those in salaried posts and private practice compared with those in NHS general practice. Nonetheless, it would seem that, within various countries, specialities and methods of funding, rubber dam usage is not conforming to current guidelines and recommendations.

The BSPD guidelines recommend rubber dam isolation 'wherever possible' for many procedures<sup>3–6</sup>. Previous workers concluded that 62.6% of paediatric dentistry specialists reported 'routinely' using rubber dam for vital pulpotomies<sup>18</sup>. These authors suggested, however, that the use of the word 'routinely' may have produced a negative number of responses. The results of this study, where respondents were asked how often RD was used for primary tooth endodontics, would suggest a lower figure than this (they 'regularly', 'almost always' and 'always' use RD reported in 51% of non-sedation patients).

In relation to the mode of treatment, it was interesting to note that there was no significant difference in RD usage with no sedation, IHS or DGA. It would seem reasonable to hypothesize that patient compliance would be improved and complete patient compliance would be achieved with IHS and DGA, respectively, in particular. Furthermore, if patient compliance was no longer an issue and with this being the commonest reason cited by respondents for preventing use of RD, it would again seem logical to conclude that RD would be used more often in such circumstances. This was not the case, however, although the reasons for this are unclear. In addition, the authors note that there was an apparent reduction in RD use for permanent tooth endodontics when carried out under DGA; again, the reasons for this are unclear. One possibility is that the operator assumes that the airway is protected from inhalation of instruments by a throat pack/laryngeal mask, and hence, that rubber dam is not required. If the 'gold standard' irrigant solution of sodium hypochlorite, however, is used for irrigation, the authors would argue that RD would again be the gold standard to protect the soft tissues from potential chemical damage. In relation to IHS and staff safety, RD

can reduce nitrous oxide gas levels in room air by reducing patient mouth-breathing<sup>10</sup>, and therefore, its use is thoroughly recommended during restorative IHS procedures.

The apparent need for RD use to produce high-quality dentistry has been referred to in previous publications<sup>11,13</sup>, with those practitioners who have received training in the placement of rubber dam commenting on an improvement in the quality of their treatment<sup>13</sup>. Some studies, however, have revealed no clinical difference between techniques (namely RD compared to cotton wool and high-volume aspiration) in relation to both the longevity and appearance of the restorations<sup>19,20</sup>, and the retention of fissure sealants<sup>20</sup>. Other papers have reported increased shear bond strength<sup>22</sup> and reduced microleakage<sup>23</sup> of composite when using RD, although these studies only had a 2-week post-restoration placement follow-up. One study reported higher success rates for fissure sealants placed with cotton-wool isolation compared to RD<sup>24</sup>. Based on the current available evidence and until further randomized controlled trials are available with long-term follow-up, the issue of improved quality with RD appears to be ambiguous.

Numerous benefits of RD have been documented in the literature<sup>2,8,11</sup>. In this survey, improved patient safety was quoted by the respondents to be the greatest benefit of RD usage. This finding is reassuring given that previous papers have reported the consequences of not using RD with regard to inhaled dental instruments during endodontic treatment, an unfortunate situation that still occurs<sup>25</sup>. Regarding reduced mercury exposure with the use of RD, the evidence suggests that the effect of RD has only minor toxicological relevance<sup>26</sup>.

Improved moisture control was the second highest ranked benefit, an obvious benefit because of the barrier action of a well-placed RD, which, as one worker described, 'the emphasis in RD usage will, over time, shift from the current preoccupation of the frequency of RD usage to the quality and effectiveness of the isolation achieved'<sup>27</sup>. This study did not investigate either the quality or effectiveness of RD isolation reported by respondents, although the authors may investigate this further in a prospective clinical study.

Reduction of microbial contamination was the third ranked benefit, both for the success of endodontic procedures and also for the reduction in aerosol contamination of the working environment. Various papers have shown previously that atmospheric bacterial contamination increases during dental procedures<sup>28</sup> and that use of RD reduces bacterial air contamination by up to 88–98%<sup>29</sup>. This would suggest a considerable reduction in the inhalation of potentially infective aerosols by dental personnel when RD is used.

Regarding the types of rubber dam and methods of application used, there have been multiple previously published descriptions on this topic, and it is not the objective of this paper to discuss these further. Rubber dam clamp placement has been found to be the aspect of rubber dam application that children are most concerned about<sup>30</sup>, and although, realistically, this is the only method to retain rubber dam when working on posterior teeth, it is worthy of note that 58% of respondents reported using Dry Dam® for anterior teeth with various methods of retention that did not involve a clamp. The authors suspect that this then precludes the use of local anaesthetic, unless specifically required for the restorative/endodontic procedure to be completed. Interestingly, others have found that application of EMLA cream allows comfortable rubber dam clamp placement without the need for local anaesthetic in procedures such as fissure sealant where local anaesthetic is not necessary<sup>31</sup>. In relation to fissure sealants, the European Academy of Paediatric Dentistry guidelines state that:

'The use of rubber dam is obviously the safest way of securing optimal moisture control, but in young and newly erupted teeth this is usually not practical since it demands the use of local analgesia for placement of the clamp.'

In view of this and the inconclusive evidence for rubber dam use, as above, these guidelines state that 'the keeping of a dry field must therefore usually be achieved by the use of cotton rolls and isolation shields, in combination with a thoughtful use of the water spray and evacuation tip'<sup>32</sup>. A number of respondents independently stated they would use rubber dam for fissure sealants as part of quadrant

dentistry. The low rates of rubber dam usage recorded in this study may then not be an accurate estimate of rubber dam usage for this particular treatment.

It was revealing to find that, in relation to the barriers of RD, lack of patient cooperation was cited by respondents as the main factor preventing RD use, which concurs with previous results<sup>15</sup>. Other workers have looked at both operator and patient attitudes towards RD in the paediatric patient, in cases where the operator was an undergraduate<sup>9</sup>. All 100 patients in the above study accepted RD, with 79% having good acceptance of RD and 30% stating that they preferred treatment with RD. Patient anxiety scores recorded revealed low patient anxiety regarding rubber dam application. This would suggest that anxiety is not a universal barrier to the placement of rubber dam in the paediatric patient. Equally, others have found that six out of the 10 paediatric patients included in a study within general practice preferred treatment with RD<sup>30</sup>. The authors of this study, however, have noted that many of the patients referred to a specialist paediatric dentist, rather than those treated by undergraduates or general dental practitioners, are secondary/tertiary referrals, those with severe dental phobia, those with learning difficulties or perhaps patients for whom RD is contraindicated<sup>33</sup>, in which case the use of RD may prove impossible.

Perhaps of more interest, however, was that 36% of respondents stated that they 'do not feel that RD is necessary for most treatments'. As long ago as 1962, Ireland was aware of this view of rubber dam, stating that:

'No other technique, treatment or instrument used in dentistry is so universally advocated by the recognized authorities and so universally ignored by the practicing dentist.'<sup>34</sup>

Indeed, more recent reports have stated that many of the carers who accompany young patients for treatment have not seen RD previously<sup>9</sup>, suggesting under-use of rubber dam within the profession generally, which was reflected in the respondent comments in this study.

Lack of personal experience was referred to by 8% of respondents as a factor preventing RD use. Not surprisingly, Wolcott and Goodman found

that dentists who used RD more frequently encountered fewer patient objections and came to the conclusion that either the dentists' motivation to use RD may be reflected by the presentation of RD to patients or dentists may rationalize their failure to use RD by claiming patient resistance<sup>35</sup>. The section for comments continued this theme of the need for further experience and training in the use of RD, including the need for 'better trained nurses to properly assist its [rubber dam] placement', this finding having been previously noted by other workers<sup>11,30</sup>. Whilst there are currently various options for training in rubber dam usage within the UK, further educational opportunities are perhaps required both for dentists and dental care professionals.

#### **What this paper adds**

- This questionnaire-based study suggests that there is under-usage of rubber dam by paediatric dentistry specialists in the UK, as compared to the suggested level of use of rubber dam, endorsed by the BSPD, for various restorative and endodontic procedures.
- Respondents have highlighted the need for further training in the practical application of rubber dam.
- Dry Dam® is the most commonly used method for anterior teeth, as compared to clamp and dam for posterior teeth.

#### **Why this paper is important to paediatric dentists**

- This study has raised awareness amongst practitioners of the discrepancies in their rubber dam usage.
- The paper highlights the need for further educational opportunities for rubber dam placement amongst the dental team.

## **Conclusions**

Current BSPD guidelines recommend rubber dam usage for many restorative procedures and it would appear that there is wide variability in dam usage amongst specialists in paediatric dentistry working in the UK. Respondents cited a lack of patient cooperation as the most common factor preventing them from using rubber dam, with patient safety rated as the greatest benefit of rubber dam.

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