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Attitudes of final year dental students to the use of rubber dam

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Abstract

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Aim To investigate the attitudes of final year dental students in Wales and Ireland to the use of rubber dam.

Methods A pre-piloted questionnaire was distributed to final year dental students in Cardiff and Cork Dental Schools in January 2008. Information sought included attitudes to, and the current and anticipated use of, rubber dam for a variety of operative and endodontic treatments.

Results Of 93 questionnaires distributed, 87 were completed and returned (response rate = 94%; Cardiff: 89%, $n = 51$; Cork: 100%, $n = 36$). Rubber dam was routinely used by 98% of respondents ($n = 85$) on adult patients, but only 32% of respondents ($n = 28$) had used rubber dam on child patients ($P < 0.05$). Rubber dam was never used by 75% of respondents ($n = 65$) when placing posterior amalgam restorations, and by 21% of respondents ($n = 18$) when placing anterior composite restorations. Rubber dam was used by 98% of the respondents ($n = 85$) when performing root canal treatments. Sixty-two per cent of respondents ($n = 54$) believed their use of rubber dam would decrease once leaving the dental school.

Conclusion Whilst dental students believe that rubber dam is relevant to clinical dentistry, there are negative perceptions associated with its use amongst dental students. More than half of those questioned predicted their use of rubber dam would decrease once in independent practice. Greater emphasis should be placed on the advantages of using rubber dam in clinical dentistry whilst at dental school.

Keywords: composite, dental students, endodontics, operative dentistry, rubber dam.

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Introduction

Rubber dam is a useful adjunct to certain operative and endodontic treatments. First described in 1864 (Barnum 1877, Ireland 1962), it offers several benefits during dental treatment, mainly related to safety and quality issues. These include:

- maintenance of an aseptic field during treatments such as cavity preparation or root canal preparation or filling (Cochran *et al.* 1989);
- reduction of the potential risk of transferring infective agents between dentist and patient (Forrest & Perez 1989);
- prevention of ingestion or aspiration of instruments, materials, solvents or irrigants during dental treatment (Cohen & Schwartz 1987);
- protection of gingival and other oral soft tissues from contact with deleterious materials, particularly liquids, used during dental treatments, such as sodium hypochlorite or phosphoric acids (Carrotte 2000, Lynch & McConnell 2003);
- retraction of the soft tissues, including gingivae, during certain operative procedures (Reid *et al.* 1991).

In addition to these advantages, rubber dam improves patient comfort during dental treatment (Gergely 1989, Stewardson & McHugh 2002), and studies have shown that the use of rubber dam can decrease the amount of time spent performing certain clinical procedures (Ireland 1962).

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However, despite these many advantages, rubber dam is not routinely used in general dental practice. A survey of UK general dental practitioners reported that only 19% of respondents used rubber dam routinely and 45% reported that they did not use rubber dam (Jenkins *et al.* 2001). This was confirmed by a similar survey carried out in the UK that noted that rubber dam use, whilst very low, was more likely to used more frequently by newly qualified graduates in comparison with older practitioners (Whitworth *et al.* 2000). A survey of Irish general dental practitioners reported that 26% of those surveyed never used rubber dam when performing root canal treatment on molar teeth (Lynch & McConnell 2007). This trend has been confirmed by a similar survey in the US (Hill & Rubel 2008). This pattern of under-use of rubber dam, particularly for root canal treatments, is of concern when the advantages listed above are considered, as well as guidance from specialist clinical and medicolegal societies. The European Society of Endodontology (2006) recommends that the use of rubber dam is mandatory for isolation when root canal treatment is being performed. In circumstances when a root canal instrument is inhaled by a patient, and a rubber dam has not been used, a medicolegal allegation of negligence is impossible to defend (Reid *et al.* 1991).

The possible reasons for the under-use of rubber dam are not entirely clear. The evidence to support traditionally cited reasons, such as patient acceptance, time, difficulty in use, insufficient training/lack of skill, cost and fees, is equivocal, as there are studies to support and contradict each of these claims (Marshall & Page 1990, McColl *et al.* 1999, Lynch & McConnell 2007). Given this apparent lack of clarity, it would be useful to examine the attitudes and opinions of final year dental students towards the use of rubber dam, as these are the emerging/future generation of dental practitioners, and the attitudes and opinions that they form during dental school will influence general practice trends over the coming years (Gergely 1989). This approach has been considered in other aspects of clinical dentistry, such as the restoration of posterior teeth (Lynch *et al.* 2007). The aim of this study is to report the use, attitudes to, and intended uses of rubber dam by final year dental students in Wales and Ireland.

Materials and methods

A pre-piloted questionnaire was distributed to 93 final year student dentists at the School of Dentistry, Cardiff University, Wales (n = 57), and the University Dental School & Hospital, Cork, Ireland (n = 36). The questionnaire was distributed to these final year students when they were within months of graduation. The questionnaire distributed included both 'open' and 'closed' questions.

Information requested included:

- treatments routinely carried out with and without rubber dam;
- attitudes to the use of rubber dam for a range of clinical procedures;
- intended use of rubber dam in 1-year's time (i.e. when in independent practice).

On distribution of the questionnaires all students were given the opportunity to decline participating in the survey, and all completed questionnaires were returned anonymously. The information and data from the completed questionnaires were entered into an electronic database (SPSS® for Windows® v.13.0, Chicago, IL, USA) and statistical analysis (chi-squared testing, $P < 0.05$) was carried out to interpret the results.

Results

Of 93 questionnaires distributed, 87 were completed and returned (response rate = 94%; Cardiff = 89%, n = 51; Cork = 100%, n = 36).

General information on the use of rubber dam

About 20% of respondents (n = 17) reported that they did not ask their patients if they had an allergy to latex prior to the use of rubber dam.

The reported use of rubber dam on both adult and child patients within each dental school is outlined in Table 1. Ninety-nine per cent of respondents (n = 86) use rubber dam on adult patients (100% from Cardiff Dental School, and 97% from Cork Dental School). Sixty-eight per cent of the respondents (n = 59) had never used rubber dam on child patients (55% from Cardiff Dental School and 86% from Cork Dental School). Statistical testing did not reveal any differences between the schools in their use of rubber dam for adult or child patients. However, there was a significant difference between the use of rubber dam for adult and child patients ($P < 0.05$), where rubber dam is used signficantly more on adult patients than on child patients.

Restoration of anterior and posterior teeth

Participants were asked to outline their choices of direct restorative materials for anterior and posterior teeth.

Table 1 Reported use of rubber dam on adult and child patients

	Adult patients		Child patients	
Reported use of rubber dam	Cardiff *n* (%)	Cork *n* (%)	Cardiff *n* (%)	Cork *n* (%)
Never (0%)	0 (0)	1 (3)	28 (55)	31 (86)
Rarely (1–25%)	11 (21)	7 (20)	21 (41)	5 (14)
Occasionally (26–50%)	33 (65)	12 (33)	1 (2)	0 (0)
Often (51–75%)	6 (12)	12 (33)	1 (2)	0 (0)
Mostly (76–99%)	0 (0)	4 (11)	0 (0)	0 (0)
Always (100%)	1 (2)	0 (0)	0 (0)	0 (0)

One hundred per cent of respondents ($n = 87$) use composite to restore both anterior and posterior teeth. A total of 11% of respondents ($n = 10$) placed amalgam restorations in anterior teeth, whilst 97% of respondents ($n = 85$) placed amalgam restorations in posterior teeth. Ninety five per cent of respondents ($n = 83$) placed glass–ionomer cement restorations in anterior teeth, 68% of respondents ($n = 59$) used glass–ionomer cement to restore posterior teeth. Further information on the choices of direct restorative materials for anterior and posterior teeth are reported in Tables 2 and 3 respectively.

Information on the use of rubber dam for selected operative procedures is reported in Table 4. Seventy five per cent of those respondents ($n = 65$) who placed amalgam in posterior teeth never used rubber dam. Seven per cent of those respondents ($n = 6$) who placed composite in posterior teeth never used rubber dam during this procedure. Twenty-one per cent of those respondents ($n = 18$) who placed composite in anterior teeth never used rubber dam for this procedure. There were no significant differences between the dental schools and the choices or frequency of use of restorative materials.

Table 2 Reported use of direct restorative materials in anterior teeth

	Anterior amalgams		Anterior composites		Anterior glass–ionomer cement	
Frequency of use	Cardiff *n* (%)	Cork *n* (%)	Cardiff *n* (%)	Cork *n* (%)	Cardiff *n* (%)	Cork *n* (%)
Never (0%)	44 (86)	33 (92)	0 (0)	0 (0)	0 (0)	4 (11)
Rarely (1–25%)	5 (10)	3 (8)	0 (0)	1 (3)	11 (21)	21 (58)
Occasionally (26–50%)	0 (0)	0 (0)	2 (4)	0 (0)	31 (61)	9 (25)
Often (51–75%)	2 (4)	0 (0)	8 (16)	3 (9)	8 (16)	2 (6)
Mostly (76–99%)	0 (0)	0 (0)	40 (78)	16 (44)	1 (2)	0 (0)
Always (100%)	0 (0)	0 (0)	1 (2)	16 (44)	0 (0)	0 (0)

Table 3 Reported use of direct restorative materials in posterior teeth

	Posterior amalgams		Posterior composites		Posterior glass–ionomer cement	
Frequency of use	Cardiff *n* (%)	Cork *n* (%)	Cardiff *n* (%)	Cork *n* (%)	Cardiff *n* (%)	Cork *n* (%)
Never (0%)	0 (0)	2 (6)	0 (0)	0 (0.0)	12 (24)	16 (44)
Rarely (1–25%)	0 (0)	0 (0)	10 (20)	5 (13.9)	24 (47)	15 (42)
Occasionally (26–50%)	6 (12)	9 (25)	25 (49)	10 (27.8)	15 (29)	3 (8)
Often (51–75%)	24 (47)	18 (50)	16 (31)	18 (50.0)	0 (0)	2 (6)
Mostly (76–99%)	21 (41)	7 (19)	0 (0)	2 (5.6)	0 (0)	0 (0)
Always (100%)	0 (0)	0 (0)	0 (0)	1 (2.8)	0 (0)	0 (0)

Table 4 Reported use of rubber dam for operative procedures

Reported use	Anterior amalgams *n* (%)	Posterior amalgams *n* (%)	Anterior composites *n* (%)	Posterior composites *n* (%)
Never (0%)	77 (89)	65 (75)	18 (21)	6 (7)
Rarely (1–25%)	7 (8)	16 (18)	23 (26)	22 (25)
Occasionally (26–50%)	1 (1)	4 (5)	21 (24)	25 (27)
Often (51–75%)	2 (2)	1 (1)	10 (12)	15 (17)
Mostly (76–99%)	0 (0)	1 (1)	8 (9)	15 (17)
Always (100%)	0 (0)	0 (0)	7 (8)	6 (7)

Use of rubber dam for root canal treatment

From the completed sample:
- 98% ($n = 85$) performed root canal treatment on anterior teeth under rubber dam;
- 98% ($n = 85$) performed root canal treatment on premolar teeth under rubber dam;
- 98% ($n = 85$) performed root canal treatment on molar teeth under rubber dam.

The frequency of use of rubber dam for each dental school is described in Table 5. There was no significant difference in the use of rubber dam between anterior, premolar or molar teeth, or the dental school that the respondents attended.

Attitudes to the use of rubber dam

Respondents were given a series of statements in regards to rubber dam, to which they were asked if they agreed or disagreed. The statements and their responses are reported in Table 6. Whilst an overwhelming 90% of respondents feel that root canal treatments placed without rubber dam are not as successful as those isolated with rubber dam, more than one-half (53%) consider rubber dam difficult to apply, and almost one-half (45%) felt that patients do not like rubber dam.

Opinions on future use of rubber dam

Respondents were then asked to imagine they had qualified and were working in independent practice. They were asked to answer questions in relation with their intended use of rubber dam. Responses included:
- 62% of respondents ($n = 54$) believed that once working in practice, their overall use of rubber dam would decrease;
- 98% of respondents ($n = 85$) believed that they would use rubber dam with adult patients when necessary;
- 38% of respondents ($n = 33$) believed they would never use rubber dam on child patients;
- 64% of respondents ($n = 56$) believed they would never use rubber dam when placing posterior amalgam restorations;
- 13% of respondents ($n = 11$) believed they would never use rubber dam when placing posterior composite restorations;
- 2% of respondents ($n = 2$) believed they would never use rubber dam when carrying out root canal treatment on anterior, premolar or molar teeth.

There were no significant differences between dental schools the respondents attended and intended use of rubber dam.

Table 5 Reported use of rubber dam for root canal treatments

	Anterior teeth		Premolar teeth		Molar teeth	
Reported use of rubber dam	Cardiff *n* (%)	Cork *n* (%)	Cardiff *n* (%)	Cork *n* (%)	Cardiff *n* (%)	Cork *n* (%)
Never (0%)	1 (2)	1 (3)	1 (2)	1 (3)	0 (0)	2 (5)
Rarely (1–25%)	0 (0)	0 (0)	0 (0)	0 (0)	2 (4)	0 (0)
Occasionally (26–50%)	0 (0)	1 (3)	0 (0)	1 (3)	0 (0)	1 (3)
Often (51–75%)	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	0 (0)
Mostly (76–99%)	5 (10)	2 (5)	2 (4)	3 (8)	2 (4)	4 (11)
Always (100%)	45 (88)	31 (86)	48 (94)	31 (86)	47 (92)	29 (81)

Table 6 Attitudes of respondents to the use of rubber dam

Statement	Agree, *n* (%)	Disagree, *n* (%)
'Posterior restorations can be placed more easily once rubber dam has been applied'	46 (53)	41 (47)
'Proper isolation cannot be achieved for either root canal or operative procedures without the use of rubber dam'	28 (33)	59 (67)
'Root canal fillings placed without rubber dam are as successful as those isolated with rubber dam'	9 (10)	78 (90)
'Rubber dam enables clearer access when placing restorations'	70 (81)	17 (19)
'Rubber dam is difficult to apply'	46 (53)	41 (47)
'Rubber dam enables a higher clinical standard to be achieved'	59 (68)	28 (32)
'Restorations placed under rubber dam have a greater longevity than those placed without'	52 (60)	35 (40)
'Patients do not like rubber dam'	39 (45)	48 (55)

Table 7 Factors influencing future use of rubber dam

Statement	Agree, *n* (%)	Disagree, *n* (%)
Payment scheme	40 (46)	47 (54)
Clinical procedure	83 (95)	4 (5)
Choice of material being placed	81 (93)	6 (7)
Ease of application of rubber dam	68 (78)	19 (22)

Factors influencing future use of rubber dam

Respondents were asked to indicate which factors they thought might influence their future use of rubber dam. Their responses are reported in Table 7.

Discussion

The challenge for contemporary dental educators is to produce competent dentists on graduation who are 'fit for purpose'. This is becoming all the more challenging when considered in light of increasing student numbers, decreased numbers of suitably qualified dental educators, limited educational budgets, and increased time pressures on the curriculum (Wilson 2004, Lynch *et al.* 2007). Despite this, however, there should not be a reduction in the teaching of aspects of clinical dentistry that have treatment quality or patient safety implications.

Within the sample examined, there was greater use of rubber dam for root canal treatments in comparison with reported trends in general practice (Whitworth *et al.* 2000, Jenkins *et al.* 2001, Lynch & McConnell 2007). Overall between 6% and 19% of respondents did not always use rubber dam for root canal treatments, depending on the dental school and tooth under treatment. This is a worrying finding in itself given the relative inexperience of student operators when handling and manipulating root canal instruments and materials. It is of interest, however, to note that 98% of respondents reported that they will continue to place rubber dam when performing root canal treatments when in independent practice. This is in contrast to a recent study from general dental practice that reported that rubber dam was not used by between 26% and 39% of practitioners when performing root canal treatments (Lynch & McConnell 2007). Can we infer that despite the enthusiasm of respondents in this survey that their use of rubber dam will 'drop off' once they are outside the educational environment of the dental school? Or is it possible that the cohort of dental students examined in this study, being educated with contemporary educational approaches and being exposed to contemporary research and opinion, will have a different approach to the use of rubber dam than colleagues in previously reported studies who trained in previous decades? There may be some merit in further investigating this idea, as these results fit well with those of Whitworth *et al.* (2000) who noted that rubber dam use was greater in newly-qualified graduates in comparison with older practitioners. It is heartening to note that 90% of respondents feel that root canal fillings placed without the use of rubber dam are less likely to be successful than those placed with rubber dam (Table 6). This is in keeping with evidence in the literature that root canal systems that become infected with higher numbers of bacteria are associated with a higher prevalence of post-treatment disease than those that contain fewer and no culturable bacteria (Klevant & Eggink 1983, Sjögren *et al.* 1990). As a well-applied rubber dam can control microbial contamination within a root canal system, its use during root canal treatment would seem logical. It would be of interest to survey this same cohort of students again in 5 years time to see if their initial enthusiasm for the use of rubber dam during root canal treatment has remained.

Overall, there are several worrying trends in the results reported. Sixty-two per cent of respondents reported that their overall use of rubber dam would decrease once in independent practice. These findings may give some indication of future trends on the use of rubber dam in general dental practice by this cohort of students. Studies from the international literature indicate that the use of rubber dam in general practice is limited (Going & Sawinski 1968, Joynt *et al.* 1989, Marshall & Page 1990, McColl *et al.* 1999, Whitworth *et al.* 2000, Jenkins *et al.* 2001, Lynch & McConnell 2007, Hill & Rubel 2008). Reasons for not using rubber dam in practice generally reported include patient discomfort, insufficient time, difficulty in use, insufficient training, cost and low fees for treatment (Marshall & Page 1990). In this study, 45% of respondents reported that patients do not like rubber dam. This is despite of the evidence in the literature that in contrast to disliking the use of the rubber dam, many patients prefer to have it placed (Gergely 1989, Stewardson & McHugh 2002). Again, more than one-half of respondents (53%) found rubber dam difficult to apply, and 78% of respondents said that ease of application would influence their decision to use rubber dam. This is in keeping with a previous study that included information on rubber dam use in general practice (McColl *et al.* 1999). In the dental school environment dental students are generally protected from considerations

such as cost and fees for treatment; the influence of these factors may play a role once the realities of working in independent general practice are encountered. Almost one-half of respondents (46%) felt that the payment scheme would influence their use of rubber dam when in general practice. Perhaps there is scope for increased teaching of rubber dam techniques in dental school to overcome problems such as difficulty in placement, and in so doing improve application times and remove associated concerns such as the perception of wasted chair-side time during rubber dam application.

The phenomenon of the under-use of rubber dam in general dental practice, despite its clear medicolegal and treatment quality benefits, could perhaps be considered in the context of other clinical dental treatments. In this study, almost all dental students use rubber dam for root canal and other operative procedures, yet studies from independent practice indicate that this use will decrease, despite the potential risks of inhaling small instruments, when a rubber dam has not been applied (Whitworth *et al.* 2000, Jenkins *et al.* 2001, Lynch & McConnell 2007). In other aspects of clinical dentistry, such as fixed and removable prosthodontics, legal guidelines such as the EU Medical Devices Directive (Lynch *et al.* 2005), and good practice guidelines from specialist societies, place a responsibility on dental practitioners to adequately design and prescribe fixed and removable prostheses such as crowns, fixed bridges and removable partial dentures (Lynch *et al.* 2005). Despite the potential risks to the patient from poorly designed prostheses, such as caries or periodontal disease, studies have consistently shown that dentists underperform in this important area, and that the quality of written instructions provided by dental practitioners for a variety of prostheses is often very poor (Lynch & Allen 2005, 2006, Radhi *et al.* 2007). Does this perhaps outline a further, more deeply embedded problem in general dental practice – that of a different attitude to certain clinically important procedures between academia and general dental practice?

The findings of this study indicate that contemporary dental students are trained to use rubber dam, and demonstrate enthusiasm and commitment to its use. This is in contrast to subsequent trends in general practice (Whitworth *et al.* 2000, Jenkins *et al.* 2001, Lynch & McConnell 2007). This underlies the need to maintain the awareness of dental students and dental practitioners to the need to use rubber dam for improving the quality of treatment, delivering improved infection control, during procedures such as root canal treatment and addressing medico-legal concerns and patient safety. Further investigation is also warranted to consider why general dental practitioners are not using rubber dam, despite the inherent treatment quality and medicolegal risks inherent in its nonuse.

Conclusions

No differences in rubber dam usage or attitudes were noted between Final Year dental students in Ireland and Wales. Whilst dental students receive clinical and didactic teaching in the use of rubber dam when at dental school, there is scope to enhance this teaching to promote increased use of rubber dam whilst in general practice. In focussing the teaching of rubber dam, operator concerns such as difficulty of application could be addressed. Treatment quality and patient safety will be improved as a result.

References

Barnum SC (1877) History of the discovery of the dam. *Canadian Journal of Dental Science* **4**, 88–9.

Carrotte PV (2000) Current practice in endodontics: 4. A review of techniques for canal preparation. *Dental Update* **27**, 488–93.

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

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

European Society of Endodontology (2006) Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *International Endodontic Journal* **39**, 921–30.

Forrest W, Perez RS (1989) The rubber dam as a surgical drape: protection against AIDS and hepatitis. *Journal of the Academy General Dentistry* **37**, 236–7.

Gergely EJ (1989) Rubber dam acceptance. *British Dental Journal* **167**, 249–52.

Going RE, Sawinski VJ (1968) Parameters related to the use of the rubber dam. *Journal of the American Dental Association* **77**, 598–601.

Hill EE, Rubel BS (2008) Do dental educators need to improve their approach to teaching rubber dam use? *Journal of Dental Education* **72**, 1177–81.

Ireland L (1962) The rubber dam: its advantages and application. *Texas Dental Journal* **80**, 6–15.

Jenkins SM, Hayes SJ, Dummer PMH (2001) A study of endodontic treatment carried out in dental practice within the UK. *International Endodontic Journal* **34**, 16–22.

Joynt RB, Davis EL, Schreier PJ (1989) Rubber dam usage among practicing dentists. *Operative Dentistry* **14**, 176–81.

Klevant FJ, Eggink CO (1983) The effect of canal preparation on periapical disease. *International Endodontic Journal* **16**, 68–75.

Lynch CD, Allen PF (2005) Quality of communication between dental practitioners and dental technicians for fixed prosthodontics in Ireland. *Journal of Oral Rehabilitation* **32**, 901–5.

Lynch CD, Allen PF (2006) Why do dentists struggle with removable partial denture design? An assessment of financial and educational issues *British Dental Journal* **200**, 277–81.

Lynch CD, McConnell RJ (2003) The use of micro-abrasion to remove discolored enamel: a clinical report. *Journal of Prosthetic Dentistry* **90**, 417–9.

Lynch CD, McConnell RJ (2007) Attitudes and use of rubber dam by Irish general dental practitioners. *International Endodontic Journal* **40**, 427–32.

Lynch CD, Allen PF, McConnell RJ (2005) Communicating design features for fixed and removable prostheses. *Dental Update* **32**, 502–10.

Lynch CD, McConnell RJ, Wilson NHF (2007) Trends in the placement of posterior composites in dental schools. *Journal of Dental Education* **71**, 430–4.

Marshall K, Page J (1990) The use of rubber dam in the UK. *British Dental Journal* **169**, 286–91.

McColl E, Smith M, Whitworth J, Seccombe G, Steele J (1999) Barriers to improving endodontic care: the views of NHS practitioners. *British Dental Journal* **186**, 564–8.

Radhi A, Lynch CD, Hannigan A (2007) Quality of written communication and master impressions for fabrication of removable partial prostheses in the Kingdom of Bahrain. *Journal of Oral Rehabilitation* **34**, 153–7.

Reid JS, Callis PD, Patterson CJW (1991) *Rubber Dam in Clinical Practice*. London: Quintessence Publishing Co.

Sjögren U, Hagglund B, Sundqvist G, Wing K (1990) Factors affecting the long-term results of endodontic treatment. *Journal of Endodontics* **16**, 498–503.

Stewardson DA, McHugh ES (2002) Patient's attitudes to rubber dam. *International Endodontic Journal* **35**, 812–9.

Whitworth JM, Seccombe GV, Shoker K, Steele JG (2000) Use of rubber dam and irrigant selection in UK general dental practice. *International Endodontic Journal* **33**, 435–41.

Wilson NHF (2004) Curricular issues changing from amalgam to tooth-coloured materials. *Journal of Dentistry* **32**, 367–9.

