

Reasons for placement and replacement of crowns in general dental practice

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Key points

Investigates the common reasons for placing and replacing crowns in dental practice.

Discusses the potential for subjectivity in terms of replacing existing crowns.

Highlights some of the practical issues in conducting practice based research.

Objectives The aim of this study was to investigate the reasons for placement and replacement of crowns in general dental practice. **Methods** Forty general dental practitioners recorded the principal reason for the provision of new (initial) and replacement crowns for a maximum of up to 20 patients over a 20-week period. **Results** A total of 664 patients received 783 crowns during the period of this study. Of these, 69% (n = 542) were new (initial) placements and 31% (n = 241) were replacements. Overall, tooth fracture (45%, n = 241) was the most frequently reported reason for new/ initial crown placements. Aesthetics (21%, n = 53) and secondary/recurrent caries (20%; n = 47) were the most frequent reasons for crown replacement. Maxillary premolars (27%, n = 145) and mandibular molars (25%, n = 137) were the teeth that received most initial crown placements. In contrast, maxillary incisors (50%, n = 115) were the most common teeth to receive a replacement crown. Dentists were more likely to replace a crown if they had not placed the original crown: 74% of replacement crowns (n = 178) were placed by a different dentist. Most patients had only one crown placed or replaced per course of treatment (n = 611; 90%). **Conclusions** The results of this study reveal the prescribing habits of dentists in relation to provision of initial and replacement crowns. The vast majority of patients had only one crown provided per course of treatment, which is probably a reflection of funding schemes and changing patterns of oral health. This sample reported fewer replacement crowns than previous studies. In keeping with existing literature, crowns were more frequently replaced when the treating dentist had not placed the initial crown. However, against this, more replacements were provided for more long-standing patients (5+ years attendance) compared to those with shorter attendance history (<5 years). In an area where high quality evidence is lacking, further consensus on the need for placement and replacement crowns is needed. Such information would assist dentists to provide high-quality care and commissioners in developing an evidence-based service.

Introduction

The provision of crowns remains an important part of the range of treatments provided by dentists. Among others, the provision of crowns is needed for the management of extensively restored teeth, fractured teeth and

endodontically treated teeth. With advances in the use of alternative, minimum invasive dentistry techniques such as veneers and resin composite reconstructions, crowns are utilised to a much lesser extent than in the past, especially in procedures to improve dental attractiveness.

Within the United Kingdom, the most recent Adult Dental Health Survey (2009) revealed that 37% of adults with teeth had crowns.¹ This survey reported that crowns were mainly provided for older patients: almost 59% of those aged 45-74 years had a crown. It is also estimated that of those adults with crowns, each had, on average, three crowns, amounting to an estimated 47.6 million crowns. Given the increasing numbers of patients retaining teeth

into later life, the need for subsequent maintenance and replacement of existing crowns is likely to increase in the coming years.

The provision of crowns is costly in terms of both time and financial outlay. The provision of crowns also carries a biological cost – almost 20% of vital teeth receiving crowns require a root canal treatment within 15 years.² Therefore the decision to provide a crown should not be entered into lightly. One of the largest databases on restoration longevity, including crown survival within general dental practice, comes from the UK Dental Practice Board, which recorded information on the provision of dental treatments within UK general dental practice and funded by the National Health Service. Analysis of

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this database revealed that between 48%–68% of crowns provided were replaced within 10 years.³ Furthermore this analysis reported that the following factors affected the success of crowns:

- Type of crown (full metal crowns survived the longest, followed by metal ceramic, followed by all ceramic/porcelain jacket crowns)
- Patient age (crowns survived longest in patients in the 30–49-year age bracket)
- Patient attendance pattern (crown survival time was less in patients who attended more frequently)
- Method of remuneration (crowns lasted longer in patients who paid for treatment compared to patients who were exempted payment).

As such, the potential for over-treatment and subjectivity on the part of operators is high.

At present the reasons for placement and replacement of crowns is not well described. A previous study from the North West of England carried out in the 1990s revealed that the most common reasons for initial placement of a crown was tooth fracture (38%) and restoration failure (26%). The most common reason for replacement of crowns was crown failure (27%).⁴ Unacceptable crown margins or secondary caries accounted for 30% of crown replacements. This study also revealed that crown replacements accounted for 33% of crowns placed. However, while having a good sample size, this study was carried out in a group of patients who were regular attenders under the auspices of a privately funded dental insurance scheme.

Within UK primary dental care, treatments are funded in one of the three ways:

- Funded by the National Health Service: the majority of patients pay a contribution for their treatment, and this is 'topped up' by the government, while some patients are exempted payment and their charge is also paid by the government. The number of crowns provided does not affect the fee paid – in practical terms this means that the dentist gains the same remuneration for one, two or many crowns provided to the same individual patient within the same course of treatment
- Funded by private insurance schemes (such as a local scheme run by the individual practice) or widely-available commercial schemes such as 'mydentist'. Patients pay a premium based on their future risk of

Table 1 Reasons for placement of crowns

Failed restorations	Includes all reasons for the failure of restorations such as secondary (recurrent) caries, fractured restorations (bulk and marginal) resulting in the placement of crowns.
Tooth fracture	All forms of tooth fracture, including those that extend into a restoration and fracture due to trauma.
Aesthetics	Crowns placed to improve aesthetics for any reason (tetracycline discoloured teeth, large unsightly restorations).
Wear	Wear of tooth tissues by attrition, abrasion and erosion.
Endodontic reasons	Endodontic reasons for crown provision, for example, crowning following root filling, or need for post and core to obtain adequate retention for a crown.
Occlusal problems	Occlusal reasons for crown placement.
Primary Caries	Is caries on a surface not directly associated with any existing restoration? If approximal caries is unrelated to an existing sound restoration, primary caries is recorded.
Other	Any other reasons for placement of a crown.

Table 2 Reasons for replacement of crowns

Secondary/ recurrent caries	Caries detected at the margins of an existing crown.
Unacceptable marginal adaptation	Degraded or poor margins but without secondary caries.
Lost crown	Cementation failure leading to the need for crown replacement.
Crown fracture	Fracture of any part of the crown that is the reason for replacement.
Tooth fracture	Any form of tooth fracture that does not involve the crown but is the reason for crown replacement.
Aesthetics	Aesthetic reason for the crown to be replaced. Includes gingival recession exposing the crown margin.
Wear	Wear by attrition, abrasion or erosion resulting in the need for crown replacement.
Endodontic reasons	Endodontic reasons that lead to the need for crown replacement.
Change of material	Replacement of a serviceable crown where the change of material was the reason for the replacement rather than failure of the crown.
Occlusal problems	Occlusal reasons for crown replacement.
Other	Other reasons for the replacement of a crown.

dental disease. If treatments such as crowns are required, there are additional costs to the patient

- Funded on an individual basis by patients on a 'fee-per-item' basis.

While some information exists on the prescribing habits and reasons for placement/replacement of crowns, the most recent study in the UK was carried out almost 20 years ago and did not include the full range of funding arrangements in primary dental care.⁴ Since then, philosophies of dental treatment, dental school teaching and materials have changed. The present study was undertaken to establish contemporary reasons for placement and replacement of crowns in general dental practice, to include all methods of remuneration.

Materials and methods

Ethical approval for this study was obtained from the UK North West Centre of Research Ethics Committees, REC reference no: 13/NW/0356. Dentists received a nominal fee, in recognition of their time involved in this study.

All dentists working in general dental practice in Wales were invited to participate in this study. Sixty volunteered to take part. Inclusion criteria for dentists were those working in general dental practice providing new or replacement crowns. To avoid any effects of organisational policies within multi-dentist practices, only one dentist per practice could enter the study.

Participating dentists were asked to invite patients to participate in this study. For each

Table 3 Number of crowns placed per course of treatment

Number of crowns	Placement	Replacement	Total
	n (%)	n (%)	n (%)
1	433 (91)	178 (90)	611 (90)
2	76 (8)	42 (10)	118 (9)
3	6 (0)	3 (0)	9 (0)
4	20 (1)	8 (0)	28 (1)
5	0(0)	10 (0)	10 (0)
6	0(0)	0(0)	0(0)
7	7 (0)	0(0)	7 (0)
Total	542 (100)	241 (100)	783(100)

Table 4 Years patient attending practice when placement/replacement crowns provided

Years patient attending practice	Placements	Replacements	Total
	n (%)	n (%)	n (%)
<1	58 (11)	31 (13)	89 (11)
1–3	66 (12)	29 (12)	95 (12)
4–5	64 (12)	17 (7)	81 (10)
6–10	93 (17)	43 (18)	136 (17)
>10	247 (45)	112 (46)	359 (47)
Data not reported	14 (3)	9 (4)	23 (3)
Total	542 (100)	241 (100)	783 (100)

Table 5 Distribution of the initial placement and replacement crowns according to teeth crowned

Teeth	Placements	Replacements	Total
	n (%)	n (%)	n (%)
Maxillary			
Incisors	75 (14)	119 (49)	194 (27)
Canines	17 (3)	14 (6)	31 (4)
Premolars	145 (28)	30 (13)	175 (22)
Molars	83 (15)	22 (9)	105 (13)
Subtotals	320 (60)	185 (77)	505 (66)
Mandibular			
Incisors	10 (2)	1 (0)	11 (1)
Canines	4 (1)	4 (2)	8 (1)
Premolars	68 (13)	22 (9)	90 (11)
Molars	137 (24)	28 (12)	165 (21)
Subtotals	219 (40)	55 (23)	274 (34)
Data not reported	3 (0)	1 (0)	4 (0)
Totals	542 (100)	241 (100)	783 (100)

patient who required initial and/or replacement crown(s), a pro-forma was completed. Information requested included the tooth being treated, the pre-existing 'restorative status' of the tooth, the rationale for why a new or replacement crown was being provided. The reasons included for new or replacement crowns are summarised in Tables 1 and 2, respectively. These are based on those used previously (Wilson *et al.* 2003),⁴ which were, in turn, developed from the protocol of Mjor (1981).⁵ Reminders were sent to participating dentists via email and telephone.

Each practitioner was asked to collect data on up to a maximum of 20 patients over a 20-week period between July 2013 and January 2014. Data sheets were returned and entered onto an electronic database.

Results

Demographics of participating dentists

Of the 60 dentists who initially agreed to take part, 40 dentists provided data. Twenty dentists withdrew for various reasons such as lack of time, other commitments, and changes in practice arrangements. Of the 40 dentists who took part in the study, 32 were male and 8 were female. Thirty-five had qualified in UK dental schools, one had qualified elsewhere in the European Union and four had qualified outside the European Union. The numbers of participating dentists located in the regions of Wales reflected the population density in those areas, with 20 in South East Wales, 8 in South West Wales, 7 in North Wales and 5 in Mid Wales. Their year of graduation ranged from 1976 to 2011. One dentist had qualified in the 1970s, 11 in the 1980s, 10 in the 1990s, 13 in the 2000s and 5 in the 2010s.

Details of patients and treatments received

A total of 664 patients received 783 crowns during this study. Of these crowns, 69% (n = 542) were new/initial placements and 31% (n = 241) were replacements. The number of new/initial crowns placed in an individual patient during one course of treatment ranged from one to seven, while the corresponding number of replacement crowns ranged from one to five (Table 3). Most patients had only one crown placed (91% (n = 433) of initial placements) or replaced (90% (n = 178) of replacements).

More crowns were placed/replaced in females than males (females: 61%, n = 398; males: 37%, n = 256; data missing: n = 10, 2%). The mean age of the patients was 53 years (with a range of 16 to 87 years). Almost one-half of the patients had been attending the practice for more than 10 years (47%, n = 309), while 32%

(n = 77) of replacement crowns were provided for patients attending the practice for 5 years or less (Table 4).

Care for the majority of the patients was provided via the National Health Service (64%, n = 415). A further 26% of patients (n = 167) funded their own care on a private basis, and

care for the remaining 10% (n = 65) was based on insurance schemes.

The distribution of teeth treated is reported in Table 5. Maxillary premolars (28%, n = 145) and mandibular molars (24%, n = 137) were the teeth that received most initial crown placements. Maxillary incisors (49%, n = 115) were the teeth which most commonly received replacement crowns (Table 5).

Porcelain fused to metal crowns (PFMs) were the most common type of crown provided (70%, n = 545). This was the case for both initial placement (68%, n = 364) and replacement crowns (75%, n = 178) (Table 6). PFMs were used to replace existing crowns of the same material in 86% (n = 132) of cases and were the most commonly used material to replace porcelain (48%, n = 19) and full metal crowns (53%, n = 17).

Reasons for initial placement of crowns and the replacement of crowns

Overall, tooth fracture 45% (n = 241) was the most frequently reported reason for the initial placement of a crown, followed by failed restorations 22% (n = 121) and endodontic reasons 19% (n = 101) (Fig. 1). Aesthetics (21%, n = 53) and secondary/recurrent caries (20%, n = 47) were the most frequent reasons for crown replacement, followed by lost crown (15%, n = 36) and crown fracture (15%, n = 36) (Fig. 2).

The reasons for placing and replacing crowns were significantly different for different funding types (placement p <0.001 and replacement p = 0.005, respectively). NHS (52%, n = 168) and insured (45%, n = 28) patients were more likely to receive an initial crown placement for a fractured tooth than private patients (25%, n = 38). Private patients (33%, n = 26) had more crowns replaced for aesthetic reasons than NHS (17%, n = 24) and insured (12%, n = 2) patients (Table 6). Dentists were more likely to replace a crown if they had not placed it in the first place (74% of replacements were placed by a different dentist (n = 178) compared to 20% of replacement provided by the same dentist (n = 49).

Pre-treatment restorative condition of teeth – new crown placements

For initial crown placements, 91% (n = 442) of teeth had a pre-existing filling. Of these, the average number of filled surfaces was 3.04. Two hundred and fifteen root filled teeth were included in this study, the majority of which received an initial crown placement within 3 years of completion of the root treatment (n = 117; 54%).

Fig. 1 Reason for the initial placement of crowns

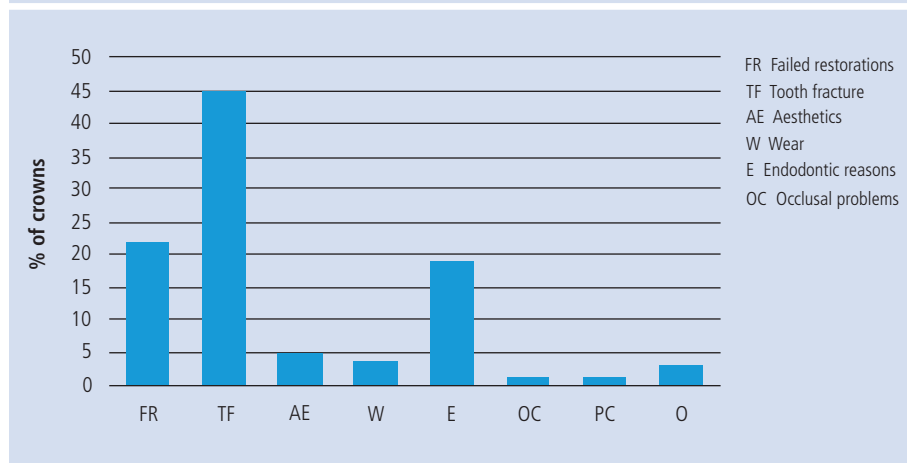


Fig. 2 Reason for the replacement of crowns

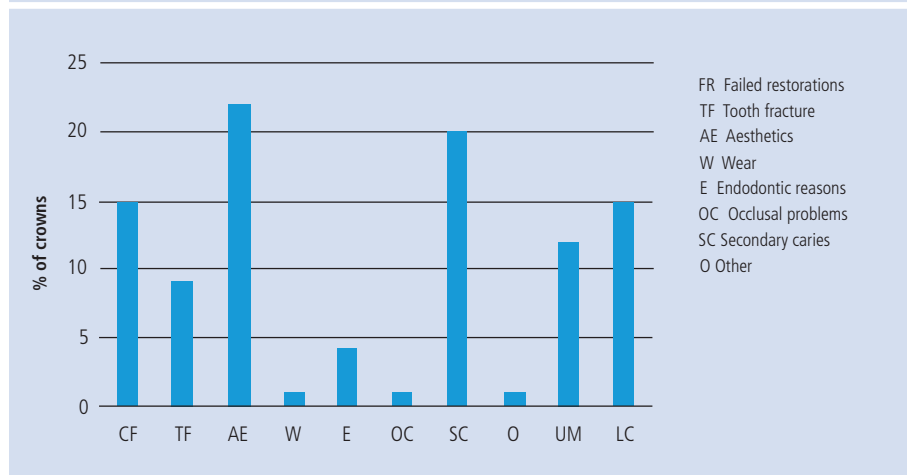


Table 6 Distribution of the type of crown material used in the placement and replacement of crowns

Type of crown	Placement	Replacement	Total
	n (%)	n (%)	n (%)
Metal ceramic	367 (69)	178 (75)	545(70)
Porcelain	94 (17)	33 (14)	127 (15)
Metal	61 (11)	16 (7)	77 (10)
Zirconia	17 (3)	10 (4)	27 (4)
Composite	1 (0)	0 (0)	1 (0)
Data not reported	2 (0)	4(2)	6 (1)
Total	542 (100)	241 (100)	783 (100)

Table 7 Existing crowns affected by caries or marginal gap that received replacement crowns

Number of surfaces affected by caries/marginal gap	n (%)	Distribution of surfaces affected by caries/marginal gap	n (%)	Size of caries/marginal gap	n (%)	Principal reason why repair would not have been possible	n (%)
1	63 (69)	Buccal	43 (33)	Less than width of an explorer	7 (8)	Marginal defect too large	63 (26)
2	21 (23)	Distal	26 (20)	Width of an explorer	18 (20)	Repair unlikely to meet needs/expectations of the patient	63 (26)
3	3 (3)	Mesial	23 (17)	Width of a William's probe	12 (13)	Crown lost	32 (13)
4	0 (0)	Occlusal/Incisal	22 (17)	Width of a BPE probe tip	10 (11)	Shape/shade of crown flawed	23 (10)
5	1 (1)	Labial/Palatal	3 (2)	Greater than the width of a BPE probe tip	39 (41)		
Data not reported	4 (4)	Data not reported	15 (11)	Data not reported	6 (7)	Data not reported	60 (24)
Total	92 (100)	Total	134 (100)	Total	92 (100)	Total	241 (100)

Replacement crowns – information on marginal status and repairability

Thirty-eight percent (n = 92) of crown replacements were due to marginal gap or caries. The majority of these crowns had only one affected surface (61%, n = 63) of which the buccal surface was most commonly affected (43%, n = 33). Most commonly the defect size was greater than the diameter of a BPE probe tip (0.5mm) (37%, n = 39). For 79% (n = 190) of replacement crowns, the respondent dentist reported it would not have been possible to repair the existing crown. The most common reasons for not repairing the crown were due to the marginal defect being too large 26% (n = 63) or the repair was unlikely to meet the needs/expectations of the patient 26% (n = 63) (Table 7).

Longevity of crowns – reported time to replacement

Crowns had been in clinical service for periods between 1 month and 35 years, with a mean average of 12 years and median of 10 years, before replacement. This information was obtained from the patient or the clinical records.

Discussion

Primary dental care research has much to offer in terms of understanding the practice of clinical dentistry in the 'real world' (that is, away from the atypical, unrepresentative environments of dental school and specialist centre practice).⁶⁻⁹ There is merit in considering approaches to treatment in primary care settings, as that is where dental care is delivered to the majority of the population.

However, primary dental care research is often logistically difficult and time-consuming to undertake. Participant dentists are often geographically spread across a large area, standardisation is difficult and collection of data is dependent on the time requirements and enthusiasm of practitioners. In this study, while the participants were not a random sample, they included a range (age, gender) of primary care dentists working under a variety of funding conditions (for example, NHS, privately funded, insured patients and mixed funding practices), as well as those in rural, suburban and urban locations. The data collection tool was based on that used in a previous study into the placement and replacement of crowns by Wilson *et al.* (2003),⁴ which was, in turn, developed from the protocol of Mjor (1981).⁵ This may well have introduced some bias into the data collection, in that only the more motivated and enthusiastic dentists volunteered and subsequently collected data. Nevertheless, the considerable volume of data gathered allows some understanding of the decision-making process on the part of dentists in relation to the placement and replacement of crowns in a primary care setting.

The results of this study are quite revealing in relation to the decision-making process of dentists in relation to when to place initial and/or replacement crowns. It is noted that replacement crowns accounted for 31% of all crowns placed. Across funding types, a greater proportion of replacements were seen in patients who were personally/privately funding their care (35%) compared to those whose treatment was funded by the NHS (29%) and those with

insured care (22%). This resonates with other previous work by one of the authors which found that patients who privately fund their own care were significantly more likely to be offered prosthodontic treatment to replace a missing maxillary first molar than patients whose care was funded by the NHS.¹² Another recent study from a specialist clinic in Turkey of 842 crown placements found that 44% were replacements – somewhat higher than the sample studied here.¹¹

The vast majority of patients (>90%) had only one initial or replacement crown. This is of interest as it may reflect improved oral health within society, changing approaches to dental care, or the availability of alternate, predictable dental treatments (for example, veneers, composite reconstructions). At a more subtle level, the NHS funding scheme in the UK authorises payment of the same fee regardless of the number of crowns placed (that is, same payment for one or many crowns). In this study, 64% of crowns placed were provided under NHS funded care – the relatively low rate of replacement crowns, and the tendency towards single crown placement per treatment episode may reflect the pressures of the funding arrangements.

The maxillary premolars and mandibular molars were the teeth that received most initial crown placements. In contrast, maxillary incisors were the most common teeth to receive a replacement crown. These findings are similar to those of Wilson *et al.*⁴ who proposed that the reason for the greater number of crown replacements for maxillary incisors was due to a previous trend of placing

crowns mainly on maxillary anterior teeth.¹² These results suggest that the change in pattern of crown placement highlighted by Wilson *et al.*⁴ – that is, more initial crowns placed on teeth other than maxillary incisors – is still present. The reason for fewer initial crown placements in maxillary incisors may also be related to the availability of alternate predictable aesthetic treatment such as bleaching and resin composites.

Within this study, it was noted that middle aged patients (31–60 years old) and older patients (61–86 years old) were more likely to receive a new crown for mandibular molars (29%, *n* = 94) and maxillary premolars (30%, *n* = 54), respectively, than other tooth types. This is a reflection of the need for complex restorative intervention in the so-called ‘heavy metal’ generation.¹³ These are a cohort of previously identified patients who have, in the past, received many and extensive mainly amalgam restorations, who, as they age, require expensive and complex treatments. This is again highlighted by the finding that initial crown placements were for so-called ‘damaged’/already heavily restored teeth, such as tooth fracture (for example, adjacent to a large restoration, 45%), failed (often extensive) restorations (22%) and subsequent to endodontic treatment (19%), rather than aesthetic reasons (5%).

In this study, the prescription pattern and decision-making in relation to replacing crowns are of interest. In keeping with existing literature,³ the likelihood of replacing a crown increases if a different dentist to the one who placed the initial crown is involved in the patient’s care (74% of replacements were placed by a different dentist). However, contrary to the findings of Burke and Lucarotti,³ only 32% of replacement crowns were provided for patients who had attended the practice for less than five years (that is, replacement did not seem to be associated with those who changed dentist more frequently).

An area of subjectivity in terms of managing existing crowns relates to the degree to which dentists choose to replace rather than repair a defective crown, potentially exposing patients to over-treatment. In only two of the 241 replacement crowns provided in this study, would the treating dentist have considered a repair as an alternative. There is a lack of clinical evidence relating to the potential for repairing, rather than replacing, crowns with defective/unsuitable margins. In a related approach, the notion of similarly repairing restorations (for example, amalgam, resin composite) with unfavourable/ deteriorating margins has been proposed for many years – yet there is a similar lack of high-quality evidence in relation to the appropriateness of restoration versus repair. It is suggested as a priority that there is a need for high quality clinical evidence to demonstrate the need – or not – for marginal repair as a suitable treatment for the management of crowns which are clinically serviceable notwithstanding marginal deterioration/ caries.

Conclusion

This study, which has been carried out in a primary dental care setting, has highlighted primary dental care practitioner approaches to the provision of initial and replacement crowns. Replacement crowns accounted for almost one-in-three crowns provided, which is less than that seen in other studies. In keeping with existing literature, crowns were more frequently replaced when the treating dentist had not placed the initial crown. However, against this, more replacements were provided for more long-standing (5+ years attendance) compared to those with shorter attendance history (<5 years). Further consensus and evidence is needed in this important clinical area to provide assistance to dentists when aiming to provide high-quality care for their patients.

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1. The Health and Social Care Information Centre. *Adult Dental Health Survey 2009*. 2009. Available at <https://digital.nhs.uk/data-and-information/publications/statistical/adult-dental-health-survey/adult-dental-health-survey-2009-summary-report-and-thematic-series> (accessed January 2018.)
2. Cheung G S P, Lai S C N, Ng R P Y. Fate of vital pulps beneath a metal-ceramic crown or a bridge retainer. *Int Endod J* 2005; **38**: 521–530.
3. Burke F J T, Lucarotti P S K. Ten-year outcome of crowns placed within the General Dental Services in England and Wales. *J Dent* 2009; **37**: 12–24.
4. Wilson N A, Whitehead S A, Mjör I A, Wilson N H F. Reasons for the Placement and Replacement of Crowns in General Dental Practice. *Prim Dent Care* 2003; **10**: 53–59.
5. Mjör I A, Moorhead J E, Dahl J E. Selection of restorative materials in permanent teeth in general dental practice. *Acta Odontol Scand* 1999; **57**: 257–262.
6. Rindal D B, Gordan V V, Fellows N L *et al*. Differences between reported and actual restored caries lesion depths: Results from The Dental PBRN. *J Dent* 2012; **40**: 248–254.
7. Gordan V V, Riley J L, Worley D C, Gilbert GH, DPBRN Collaborative Group. Restorative material and other tooth-specific variables associated with the decision to repair or replace defective restorations: Findings from The Dental PBRN. *J Dent* 2012; **40**: 397–405.
8. Heaven T J, Gordan V V, Litaker M S *et al*. Agreement among dentists’ restorative treatment planning thresholds for primary occlusal caries, primary proximal caries, and existing restorations: Findings from The National Dental Practice-Based Research Network. *J Dent* 2013; **41**: 718–725.
9. Gilbert G H, Williams O D, Korelitz J J *et al*. Purpose, structure, and function of the United States National Dental Practice-Based Research Network. *J Dent* 2013; **41**: 1051–1059.
10. Patel P M, Lynch C D, Sloan A J, Gilmour A S M. Treatment planning for replacing missing teeth in UK general dental practice: current trends. *J Oral Rehabil* 2010; **37**: 509–517.
11. Uzgur R, Uzgur Z, Colak H, Ercan E, Dalli, M, Ozcan M. A cross-sectional survey on reasons for initial placement and replacement of single crowns. *Eur J Prosthodont Restor Dent* 2017; **25**: 42–48.
12. Fyffe H E. Provision of crowns in Scotland—a ten year longitudinal study. *Community Dent Health* 1992; **9**: 159–164.
13. Steele J. *NHS dental services in England. An independent review led by Professor Jimmy Steele*. London: Department of Health, 2009.