

ORIGINAL ARTICLE

Reasons for replacement of restorations: dentists' perceptions

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Abstract

Objective. This study aimed at evaluating dentists' perceived reasons for replacement of restorations and ascertaining the differences arising from dentists' gender, time since graduation and working sector (salaried vs private). **Materials and methods.** A postal questionnaire was sent to a total of 592 working-age general dental practitioners in Finland, 57% ($n = 339$) responded. The dentists were asked to rank in order of priority the six most common reasons for replacement of composite in the incisors and posterior teeth and amalgam in the posterior tooth from a list of 12 reasons. Ranking order 1 was worth six points and order 6 one point; the non-ranked reasons were equal to zero. Differences in the means of the summed scores of caries-related (RC), fracture- and failure-related (RF) and miscellaneous (RO) groups were evaluated by ANOVA. The level of significance was set at $p = 0.05$. **Results.** For each of three restorations, the RF group comprised 48–56% of the sum-scores. Of the single reasons, secondary caries predominated (20–24%). For composite restorations in the incisors, the mean sum-score of the RO group was greater for private-sector dentists ($p = 0.04$). For composite restorations in the posterior teeth, the mean sum-score of RF group was higher for male than female dentists ($p = 0.009$). For amalgam, mean score for RF was 10.2, followed by RC (8.5) and RO (1.1). **Conclusion.** Secondary caries and various fractures and failures predominate as dentists' perceived reasons for replacement of restorations. Private dentists included miscellaneous reasons as one of their six reasons more often than did the salaried dentists. The complex process of treatment planning and decision-making is influenced by many as of yet unknown factors, calling for emphasis on investigating of perceptions.

Key Words: amalgam, composite, dentist gender, working sector, treatment practices

Introduction

One of the most common treatments in dental patients is placement and replacement of restorations [1]. A recent study from the US showed that nearly 30% of posterior restorations are replaced during a 2-year follow-up time [2]. The number of dentate elderly is increasing, leading to growing numbers of potential replacements of their previous restorations. However, recording of the reasons for replacement is not a rule for patient files (in Finland or elsewhere). Therefore, current information on the reasons for replacements is mainly based on data collected from longitudinal and cross-sectional questionnaire-based studies [3–7]. During recent decades, the primary reasons for replacement seem to have remained constant, despite the restorative material used. Secondary caries and fractures of the teeth or restorations predominate, according to cross-sectional studies

[8–12]. However, in longitudinal studies with controlled environments and operators, secondary caries seem to play a minor role [13–15].

The wide variation in dentists' treatment decisions is well known [16–18]. In addition, dentist-related factors, such as gender, time since graduation, practice characteristics, location and working sector may influence treatment practices, but have rarely been analyzed as confounders. In Finland, where half of the dental practitioners are private and half are salaried, their working sector has shown a clear impact on the frequency of replacements, but not on the reasons for replacements [19]. Solo practitioners, more often than those in group practices, seem to perform operative interventions for the treatment of existing restorations [20]. In Iceland female practitioners have more often performed replacements than male practitioners [21]. In addition, dentists with longer periods of time since graduation seem

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(Received 11 September 2010; revised 14 June 2011; accepted 14 August 2011)

ISSN 0001-6357 print/ISSN 1502-3850 online © 2012 Informa Healthcare
DOI: 10.3109/00016357.2011.640274

to have cited secondary caries less often than younger colleagues [21].

We aimed at evaluating dentists' perceived reasons for replacement of restorations and ascertaining the differences arising from the practitioners' gender, time since graduation, and working sector (salaried vs private).

Materials and methods

A representative sample ($n = 592$) of working age general dental practitioners was selected by systematic sampling from the membership list of the Finnish Dental Association, in which 98% of Finnish dentists are members; specialists and retired dentists were excluded. Data collection was via a postal questionnaire sent in April 2004; a reminder followed in June [22,23]. The response rate was 57% ($n = 339$); the responding practitioners' distributions in relation to gender and time since graduation were similar to those in Finnish Dental Association statistics [24].

The self-administered questionnaire inquiring about aspects of dentists' restorative treatment practices for adults asked dentists anonymously to assess how common various reasons for replacement are regarding three different types of fillings.

- Composite in the incisors;
- Composite in the posterior teeth; and
- Amalgam in the posterior teeth.

For each case, the dentists were asked to rank, in order of priority, the six most common reasons for replacement of such restorations from a list of 12 reasons. In the ranking order, the reasons chosen were scored from 6 to 1 and the non-ranked reasons were equal to zero. For analysis, reasons for replacement were formed into three groups: (1) RC = reasons related to caries (secondary caries, caries on another surface, erosion/abrasion and due to root-canal treatment), (2) RF = fractures and failures (fracture of restoration, lost restoration, fracture of the tooth, and marginal gap) and (3) RO = miscellaneous reasons (patient's preferences, e.g. esthetics, staining, overhang, and poor anatomical form). In each group, the theoretical maximum of sum-scores was 24.

Background information included dental practitioner's gender, time since graduation, and working sector (salaried vs private) (Table I). Differences in the means of the summed scores for each of the three groups were evaluated by ANOVA. The level of significance was set at $p = 0.05$ throughout the study.

Results

For all three types of restoration, practitioners' ranking of restoration termination for fracture- and failure-related reasons (RF) predominated. Table II shows distributions of the sum-scores in the main

Table I. Distribution (%) of the dentists studied ($n = 339$) by gender, working sector, and time since graduation.

Dentists' characteristics		<i>n</i>	%
Gender ^a	Female	238	70
	Male	100	30
Working sector ^b	Salaried	203	61
	Private	128	39
Time since graduation (years)	27+	84	25
	17–26	151	44
	1–16	104	31

^aMissing $n = 1$; ^b Missing $n = 8$.

groups of reasons (RC, RF and RO) and for each single reason. For replacement of composite restorations secondary caries was the most common of single reasons, both in incisors and posterior teeth; for amalgam restorations in posterior teeth fracture of tooth dominated together with secondary caries.

For composite restorations in the incisors, the mean (SD) sum-score was 11.1 (3.9) for fractures and failures, followed by 5.3 (2.8) for reasons related to caries and 3.5 (2.9) for miscellaneous reasons. For composite restorations in the posterior teeth, the figures were 9.5 (3.6) for fractures and failures, 7.8 (3.1) for reasons related to caries and 2.6 (2.3) for miscellaneous reasons. For amalgam restoration, the figures were 10.2 (3.5), for fractures and failures, followed by 8.5 (3.3) for reasons related to caries and 1.1 (1.7) for miscellaneous reasons.

Regarding the practitioner's gender, the sum-scores of reasons related to fractures and failures were higher for male than female dentists for composite restorations in the posterior teeth (Table III). No difference was apparent for gender in the scores for caries-related reasons or miscellaneous reasons for composite in the incisors or amalgam in the posterior teeth.

Comparison between private sector and salaried dentists is shown in Table IV. The mean sum-scores of miscellaneous reasons by private sector dentists were higher than by salaried dentists for composite restorations in the incisors and amalgam in the posterior teeth. For composite restorations in the posterior teeth, the mean sum-scores for miscellaneous reasons were slightly higher for private than for salaried dentists ($p = 0.07$). There was no difference by working sector in the mean sum-scores for reasons related to caries or fractures and failures.

For each type of restoration, the sum-score distributions were wide for both private and salaried dentists. Figures 1 and 2 show these distributions for composite restorations in the incisors and posterior teeth. For posterior amalgam, the median score for caries-related reasons was 9, both by salaried and

Table II. Sum-score distributions (%) of the reasons ranked by the dentists ($n = 339$) for replacement of restoration in three separate cases.

Reasons for replacements	Composite in incisors, %	Composite in posterior teeth, %	Amalgam in posterior teeth, %
Reasons related to caries	26.6	39.3	42.8
Secondary caries	19.8	24.0	20.3
Caries on another surface	4.0	10.0	16.2
Erosion/abrasion	1.3	0.9	0.3
Due to root-canal treatment	1.5	4.4	6.0
Fractures and failures	55.8	47.8	51.5
Fracture of restoration	15.1	17.7	14.0
Lost restoration	17.1	6.8	8.6
Fracture of the tooth	10.9	10.8	22.1
Marginal gap	12.7	12.5	6.8
Miscellaneous reasons	17.6	12.9	5.7
Patient's preferences	5.7	0.3	2.6
Staining	10.3	0.2	0.1
Overhang	1.1	2.3	1.8
Poor anatomical form	0.5	10.1	1.2
Total (%)	100.0	100.0	100.0

Dentists ranked their six most common reasons for replacement of three types of restoration from a list of 12 reasons, separately for three types of restoration. Ranking order 1 = 6 points and order 6 = 1 point; the non-ranked reasons were equal to zero.

private dentists and for fractures and failures 11 and 10, respectively.

Time since graduation was related to higher scores for miscellaneous reasons among the youngest and oldest dentists for posterior composites ($p = 0.01$) and for amalgams ($p < 0.001$). There was no difference in the mean sum-scores for reasons related to caries or fractures and failures by time since graduation.

Discussion

Fractures and failures predominated as the reasons for which dentists reported performing replacements. Our results indicate, however, that replacements of restorations were performed generally for acceptable reasons. When patients experience oral inconvenience, such as fractured teeth or restorations, dentists best serve their patient by fixing the problem, which is what the patients expect. In Finland, the law

on patients' rights mandates that patients be treated with mutual understanding. One important outcome is certainly patients' well-being and the patients themselves are the only experts on that. However, patients may have different perceptions of their teeth than dentists, especially regarding appearance [25].

Regarding caries-related failures, such as secondary caries or caries on another surface, the golden standard for diagnosis is still lacking. Dentists must settle for clinical pictures, x-rays, and their own experience and knowledge, all of which contribute to variations in outcome. To render treatment practices similarly, best practice guidelines have been published. As in other areas of medical science, there are always those clinicians who see these guidelines as a threat to their clinical autonomy [26]. The implementation of these guidelines as quality improvement instruments is still far from routine acceptance in daily practice [27]. However, future patients may demand evidence-

Table III. Sum-scores of the reasons for replacement of composite in the posterior teeth as ranked by dentists ($n = 339$) according to dentists' gender.

Reasons for replacements	All dentists, M (SD)	Female dentists, M (SD)	Male dentists, M (SD)	p -values
Reasons related to caries	7.8 (3.1)	8.0 (3.2)	7.5 (2.9)	ns
Fractures and failures	9.5 (3.6)	9.2 (3.6)	10.3 (3.5)	0.009
Miscellaneous reasons	2.6 (2.3)	2.8 (2.4)	2.1 (1.9)	0.02

Statistical evaluation of gender differences by means of one-way ANOVA.

Dentists ranked their six most common reasons for replacement of restorations from a list of 12 reasons. Ranking order 1 = 6 points and order 6 = 1 point; the non-ranked reasons were equal to zero.

Table IV. Sum-scores of the reasons for replacement of two types of restoration, as ranked by dentists ($n = 339$) according to dentists' working sector.

	Private ($n = 128$), M (SD)	Salaried ($n = 203$), M (SD)	p -value
<i>Composite in incisors</i>			
Reasons related to caries	5.4 (3.0)	5.2 (2.6)	ns
Fractures or failures	10.7 (4.0)	11.3 (3.9)	ns
Miscellaneous reasons	3.8 (3.1)	3.1 (2.7)	0.04
<i>Amalgam in posterior teeth</i>			
Reasons related to caries	8.5 (3.2)	8.6 (3.2)	ns
Fractures or failures	9.9 (3.4)	10.4 (3.5)	ns
Miscellaneous reasons	1.6 (2.1)	0.8 (1.3)	0.001

Statistical evaluation of gender differences by using of one-way ANOVA.

Dentists ranked their six most common reasons for replacement of restorations from a list of 12 reasons, separately for three types of restoration. Ranking order 1 = 6 points and order 6 = 1 point; the non-ranked reasons were equal to zero.

based oral care, which could motivate dentists to consider the reasons for replacements thoughtfully and to discuss them with patients.

Mjör et al. [28] have strongly pointed out the responsibility of the dentist, especially in diagnosis making, selection of material and further instructions to the patient. In clinical work, example of peers seems to play a major role in decision-making and treatment planning [29]. Opinions and advice from colleagues are very common, but latest scientific findings via continuing education does not reach all dentists [29,30].

In the present study, erosion or abrasion, along with root-canal treatment, were categorized in the group caries-related reasons by the nature of these subjective symptoms. This phenomenon can be seen as a confounding factor in statistical analysis. However, the number of cases falling into this group was few; most dentists did not include them in the six most common

reasons. Esthetic and other miscellaneous reasons were a minority, suggesting that treatment for replacement of restoration has usually been adequate. In addition, staining may no longer apply to long-term performance of modern composites.

The present results show that miscellaneous reasons varied mainly for dentist-related factors such as gender, working sector and time since graduation. Regarding posterior composites, male dentists more often than females included fractures and failures as one of the six most common reasons. This is in contrast to the study of Mjör et al. [21], who found no gender dependence on the reasons cited for replacement among dentists in Iceland; however, females more often performed replacements than males.

For fracture and failure and caries-related reasons, dentist's year of graduation showed no variation. This conflicts with results of a previous cross-sectional

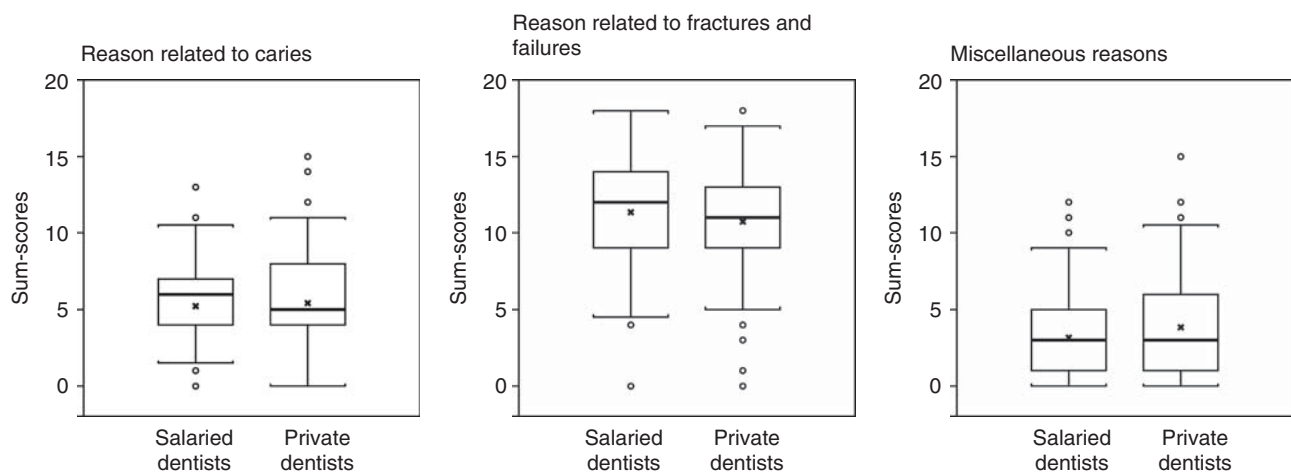


Figure 1. Sum-score distributions for composite in the incisors by dentists' working sector. Dentists ranked their six most common reasons for replacement of restorations from a list of 12 reasons, later categorized into caries-relating reasons, fracture and failure reasons and miscellaneous reasons. Ranking order 1 = 6 points and order 6 = 1 point, the non-ranked reasons were equal to zero. In the box-plot, bold line = median, x = mean, boxes and whiskers = quartiles, circles = outliers.

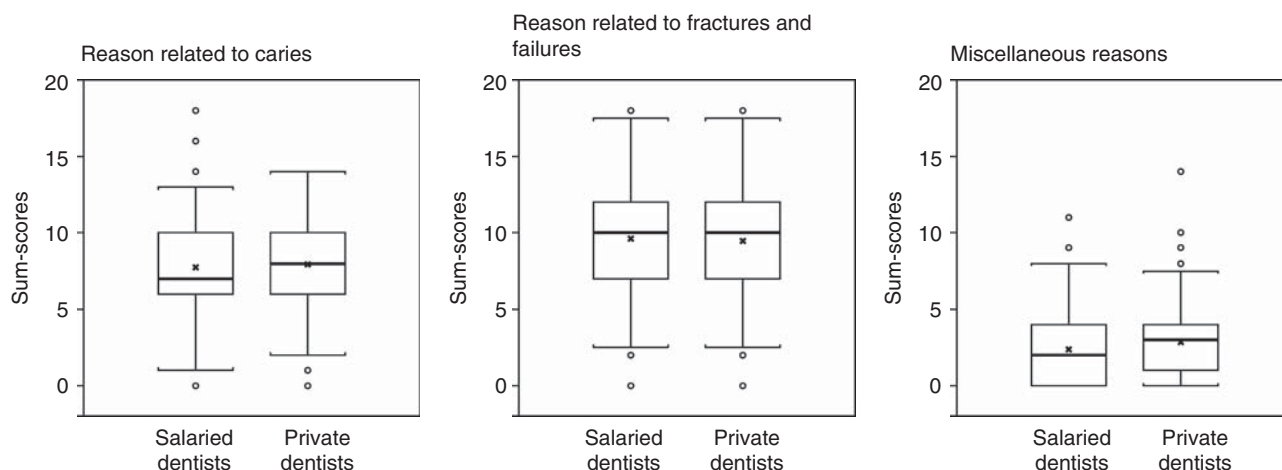


Figure 2. Sum-score distributions for posterior composite by dentists' working sector. Dentists ranked their six most common reasons for replacement of restorations from a list of 12 reasons, later categorized into caries-relating reasons, fracture and failure reasons and miscellaneous reasons. Ranking order 1 = 6 points and order 6 = 1 point, the non-ranked reasons were equal to zero. In the box-plot, bold line = median, x = mean, boxes and whiskers = quartiles, circles = outliers.

study from Iceland, where dentists with more years since graduation have cited fracture and discoloration more frequently than recently graduated colleagues [21]. It has been suggested that treatment practices do not change easily after graduation [31]. Differences in results may be related to different study settings.

In our study, the working sector showed no association with fracture- and failure-related and caries-related reasons, which is consistent with a previous study by Forss and Widström [19]. However, in our study private dentists included miscellaneous reasons as one of their six reasons more often than did the salaried dentists.

In Finland, dentists use a uniform diagnosis coding system ICD-10 (International Classification of Diseases) covering all dental diseases, that unfortunately does not include the reasons for replacement of restorations such as secondary caries, restoration fracture or lost restoration; consequently these reasons are not collected as official statistics. For quality assessment purposes there is a need for such updating of the coding system ICD-10.

Conclusion

Within the limitations of this study, we conclude that various fractures and failures together with secondary caries predominate as dentists' perceived reasons for replacement of restorations in Finland; an attitude favoring unnecessary replacements was not observed. Regarding differences arising from the practitioners' background, our results conflict with previous studies, therefore calling for more research in this field. The complex process of treatment planning and decision-making is influenced by many as of yet unknown factors, consequently investigation of perceptions should be emphasized.

Acknowledgments

Our sincere thanks go to all the dentists who responded to our questionnaire. Grants to U.P. by the Finnish Dental Society Apollonia and the City of Helsinki Health Centre are gratefully acknowledged.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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