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Finnish dentists' perceptions of the longevity of direct dental restorations

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Abstract

Objectives. To evaluate Finnish dentists' perceptions of the longevity of direct dental restorations; to assess the possible impacts of dentists' characteristics on these perceptions; and to compare the present longevity estimates with those of recent European reports. ***Methods.*** A questionnaire to 592 general practitioners, systematically sampled from the Finnish Dental Association's membership list, was posted in April 2004 and data collection was finished by the end of June. The question "In general, what is your estimate for the mean age of restoration in permanent teeth?" pointed restorations: Class II and MOD composites and amalgam in a posterior tooth and Class III composites in an incisor. Dentists' gender, main work, and year of graduation served as background information. Of the 339 (57%) respondents, only public and private dentists were included; 11 were excluded. Three studies fulfilled the inclusion criteria for recent reports on restoration longevity. Statistical evaluation was by one-way ANOVA, with $p = 0.05$ as the level of significance. ***Results.*** The mean of the estimates for all types of composite was 9.0 years (SD 3.6; 95% CI 8.6–9.3) and 18.7 years for amalgam (SD 7.3; 95% CI 18.0–19.5). Male dentists gave longer estimates than female dentists for posterior composites, but shorter estimates for amalgam. Compared to public dentists, private dentists gave longer estimates for posterior composites. All estimates were longer than those reported in the recent literature. ***Conclusion.*** Dentists' perceptions of posterior composite longevity are significantly longer among males than among females and among private than public sector dentists, and exceed the median longevity reported in recent studies.

Key Words: *Dental practices, dentist's gender, public sector, private sector*

Introduction

In Finland, restorative treatment in adult patients accounts for almost half of all dental treatment. Moreover, the repair or replacement of restorations accounts for about half of restorative treatment, mostly in adults [1–4]. As many as 1 in 5 restorations may be re-treated every 4 years [3]. Greater restoration longevity improves cost-effectiveness [5–9], which is important to patients, dentists, and funding agencies.

Unfortunately, determining "real world" restoration longevity is challenging. The data from clinical trials and other types of study are often complex and difficult to understand [10]. The term "clinical longevity time" (CL_{50}), which means 50% survival of all restorations, was introduced by Bayne et al. [11]: CL_{50} is different depending on whether it is a controlled clinical trial or a practice-based study, i.e. restorations are placed by general dental practitioners (GDPs); the operator's influence is therefore the major factor in restoration longevity [12]. Many studies concerning longevity have been carried out in optimal conditions, and therefore outcomes in the true clinical environment will be poorer [13]. Cross-sectional studies usually result in shorter longevities, but may reflect the "real world" situation better than longitudinal studies [14]. In illustrating the probability of restoration survival at a given point in time, the Kaplan-Meier statistical methodology has been used primarily, and the median survival time for restorations is calculated from the inquiries of dentists, for example, or from insurance and health-care databases [15–21]. Annual failure or non-failure rates for restorations have also been calculated [10,14,17,22].

Amalgam dominated the direct dental restoration market for posterior teeth until the breakthrough of

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composite resin in the 1990s. Today, Nordic dentists use composites more than they use amalgam, even in molars [4,23,24]. This change in restorative materials has occurred even though posterior amalgam restorations in cross-sectional studies are reported to survive longer. Their median longevity is 6 to 10 or even 11 to 20 years, whereas composites last from <5 years to 10 years [14,25–28]. Only a few studies have reported posterior composite longevity >15 years [29].

The longevity of restorations depends on the material, the technical quality of the restoration, patient compliance, the age of the practitioner, and the type of salary structure [2,17,26,30–33]. Few, if any, studies have focused on dentists' own perceptions of restoration longevity. Dentists may perceive the restorations they place as longer-lasting than those placed by a colleague. Greater longevity estimates may also correlate with years in practice [30]. Dentists' treatment decisions have been associated with their demographic characteristics, e.g. age, gender, year of graduation, type of practice, consulting with colleagues, journal-browsing, continuing education, and personal experience [34–37]. However, the relationships of these factors with treatment decisions and restoration longevity are poorly established.

The aims of this study were: 1) to evaluate Finnish dentists' perceptions of the longevity of direct dental restorations, 2) to assess possible impacts of dentists' characteristics on these perceptions, and 3) to compare the present longevity estimates with those in recent European reports.

Material and methods

A total of 592 GDPs were systematically sampled based on their membership in the Finnish Dental Association; specialists and retired dentists were excluded. The pre-tested questionnaire was sent with a pre-paid reply envelope in April 2004, followed by a reminder with a deadline by the end of June. The replies remained anonymous, but respondents had the option to participate in a lottery by sending their contact information separately in a sealed envelope. A free dental course for one and a 100 euro bank note for three were offered as prizes.

The self-administered questionnaire asked dentists: "In general, what is your estimate of the mean age of direct restorations of the following types in permanent teeth?"

- Two-surface amalgam restoration in a posterior tooth.
- Two-surface composite resin restoration in a posterior tooth.
- Three-surface (MOD) amalgam restoration in a posterior tooth.
- Three-surface (MOD) composite resin restoration in a posterior tooth.
- Class III composite resin restoration in an incisor tooth.

Estimates were given in years. Questions on the respondents' demographic characteristics inquired about their gender, main work, and year of graduation. For the last-mentioned, the answer choices were 1960–77, 1978–87, 1988–97, and 1998–2003, later categorized into three: 1960–77, 1978–87, and 1988–2003. Main work included four options: public, private, hospital or university, and other; the analyses covered only public and private dentists.

Recently published restoration longevity studies were reviewed in order to compare our results and our respondents' estimates with the median longevities reported in those studies. The inclusion criteria were: type of study (cross-sectional), year of publication (within 5 years from the present data collection), geographic location (Europe), restorative material (composite and amalgam), size of the restoration (Class II, MOD, or all sizes), and type of patient (adults). Three studies fulfilled these criteria: one from Norway [26], one from Finland [28], and one from the UK [2].

Descriptive statistics included means, standard deviations (SD), and the 95% confidence intervals (95% CI) of the means. Statistical evaluation of differences in the mean values according to gender and main work was performed with one-way ANOVA separately for each type of restoration. The level of significance was set as $p = 0.05$.

The study was approved by the Medical Faculty's Committee of Doctoral Training at the University of Helsinki in October 2007 as part of a doctoral thesis project by U.P.

Results

The response rate was 57% ($n = 339$). Analyses included only public and private dentists, leaving 328 respondents for the final sample. Their characteristics are given in Table I.

Table I. Distribution (%) of studied dentists ($n = 328$) by gender, main work, and year of graduation.

Dentists' characteristics	*n*	%
Gender		
Female	233	71
Male	94	29
Missing data	1	0.3
Main work		
Public sector	200	61
Private sector	128	39
Year of graduation		
1960–77	82	25
1978–87	146	44
1988–2003	100	31

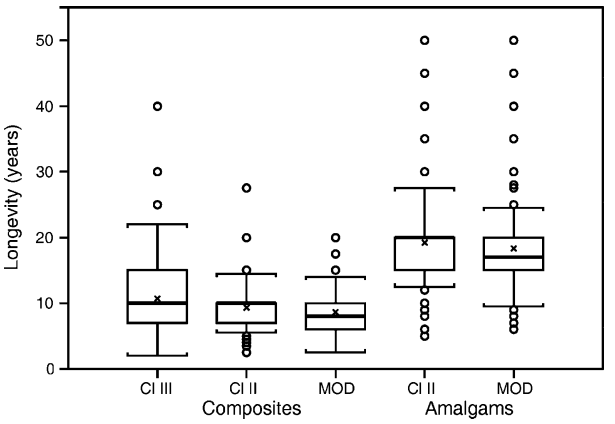

Figure 1. Longevity estimates (years) for different classes of composites and amalgams based on the survey of Finnish dentists ($n = 328$). In the box-plot, bold line = median, x = mean, boxes and whiskers = quartiles, circles = outliers.

The mean of the dentists' estimates for all types of composite restoration was 9.0 years (SD 3.6; 95% CI 8.6–9.3) and 18.7 years for amalgam (SD 7.3; 95% CI 18.0–19.5). The mean of the estimates for MOD was 8.6 years (SD 3.5; 95% CI 8.2–9.0) for composite and 18.3 years (SD 7.5; 95% CI 17.5–19.1) for amalgam. The mean of the estimates for Class III composite was 10.7 years (SD 5.2; 95% CI 10.1–11.3). Figure 1 gives the box-plot descriptions about dentists' estimates for longevity of the five types of restoration.

Male dentists gave longer estimates than female dentists for posterior composite restorations, while female dentists' estimates for amalgam restorations were longer than those of male dentists (Table II).

Private dentists' estimates for composites were longer than those of public dentists, but the opposite was the case for amalgam (Table III). Female dentists in the private sector, more so than those in the public sector, estimated that composites lasted longer than other types of restoration (Class II; $p = 0.006$ and MOD; $p = 0.009$). The difference among male dentists occurred only with composite MOD: private-sector males gave longer estimates than those of the public sector ($p = 0.05$). Year of graduation showed association only with Class III composite estimates: the longer since graduation, the longer the estimates.

Recently published European cross-sectional studies report markedly shorter median longevities for both amalgam and composite restorations than the present findings; these comparisons are given in Table IV.

Discussion

Dentists' estimates of the mean age of restorations were optimistic; indeed, for amalgam, some respondents gave estimates of 30 years or longer.

This questionnaire study had certain limitations: dentist estimates for restoration longevity were not required in relation to gender or age of the patients. Responses thus reflect the dentists' experiences with patients of various ages. In the outcome of restoration longevity, the operator's influence is the major factor [12]. However, detailed information on operator skills and technical ability was not available, although the present study controlled for this aspect by including only GDPs in the target population.

Despite our attempts at response-enhancement, the response rate was low, although in questionnaire studies for dentists this is common [38]. On the other hand, a low response rate does not usually cause any bias [39]. In the present study, the responding dentists' distributions in relation to gender and year of graduation were similar to Finnish Dental Association statistics, which supports the fairly good representativity of our sample. However, the public dentists were overrepresented, similar to previous studies among Finnish dentists [4,24]. Further analyses on drop-outs were out of the question because of the strict legislation in Finland concerning access to the personal information of citizens.

As evidenced by the present results, compared with female dentists and public-sector dentists, male dentists and private-sector dentists gave longer estimates for posterior composites. This may be an indication of their better working conditions, higher self-confidence, or stronger belief that their work will endure. According to the authors' personal clinical experience, patients from a higher socio-economic level and with better dental status are predominant

Table II. Longevity estimates (years) by Finnish dentists ($n = 328$) according to dentists' gender and restoration material and size.

	Dentist gender			
Restoration material and size	Combined Mean (SD)	Women Mean (SD)	Men Mean (SD)	*p*-value
Composites				
Class III	10.7 (5.2)	10.5 (4.9)	11.2 (6.0)	0.3
Class II	9.4 (3.9)	9.1 (3.7)	10.1 (4.2)	0.03
Class MOD	8.6 (3.5)	8.4 (3.4)	9.3 (3.8)	0.04
Amalgam				
Class II	19.3 (7.6)	20.1 (7.8)	17.3 (6.6)	0.003
Class MOD	18.3 (7.6)	19.2 (8.1)	16.2 (5.8)	0.001

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

Table III. Longevity estimates by Finnish dentists ($n=328$) according to dentists' main work and restoration material and size, separately for female and male dentists.

Restoration material and size	Main work	Combined Mean (SD)	Female dentists Mean (SD)	Male dentists Mean (SD)
Composites				
Class III	Public	10.4 (4.9)	10.2 (4.4)	11.1 (6.3)
	Private	11.2 (5.6)	11.2 (5.6)	11.3 (5.7)
		$p=0.18$	$p=0.13$	$p=0.88$
Class II	Public	8.8 (3.4)	8.6 (3.4)	9.6 (3.3)
	Private	10.2 (4.4)	10.0 (4.1)	10.6 (4.8)
		$p=0.001$	$p=0.006$	$p=0.24$
Class MOD	Public	8.1 (3.0)	8.0 (3.0)	8.5 (2.9)
	Private	9.5 (4.1)	9.2 (3.8)	10.0 (4.5)
		$p=0.001$	$p=0.009$	$p=0.05$
Amalgam				
Class II	Public	19.6 (7.8)	20.3 (7.8)	17.4 (7.4)
	Private	18.7 (7.2)	19.6 (7.9)	17.2 (5.8)
		$p=0.26$	$p=0.50$	$p=0.88$
Class MOD	Public	18.7 (7.9)	19.5 (8.2)	16.0 (5.7)
	Private	17.7 (7.1)	18.5 (7.7)	16.3 (5.9)
		$p=0.23$	$p=0.38$	$p=0.75$

Statistical evaluation according to main work differences by means of one-way ANOVA.

in the private sector, which may affect real restoration longevity. Our finding on the longer estimates given by private dentists is in line with a retrospective study on 20 male dentists in the private sector reporting median survival times of >22 years for amalgam and >16 years for composites and concluding that "high quality restorative treatment giving long-term service is possible in selected private dental practices" [33]. Nevertheless, in our study the private-sector dentists gave shorter estimates for amalgam than the public-sector dentists did.

Replacement rates of amalgam and composite are influenced by gender of the dentist and type of practice: in adults, the median age of restoration is markedly longer among private-sector dentists than among dentists who are salaried; this difference being clear also for the female dentists [26] is in line with our results. On the other hand, dentists working for the National Health Service in the UK show higher replacement rates than dentists in other sectors [40]. Surprisingly, dentists in hospitals and dental schools give shorter longevity estimates than the GDPs [30]; to avoid bias due to such special working conditions, our study concentrated on the GDPs only.

A study from England and Wales suggests that older dentists may report shorter intervals from placement to re-intervention [21], but Mjör et al. [26] have reported contrary findings. English dentists replace restorations more frequently than do dentists in Wales, but the reasons behind this trend are unclear [19]. Years in practice seem to have the biggest impact on longevity estimates: a longer career is associated with longer average restoration longevity estimates [30]. Contrary to their findings, our study showed only a minor correlation between dentists' restoration longevity estimates and their years in practice.

There is a noticeable gap between dentists' estimates of restoration longevity and the median longevity estimates established by research, which calls for more emphasis on a quality-targeted approach and on creating "best practice" guidelines for restorative treatment. Certainly for quality assurance procedures, dentists' own perceptions of restoration longevity make a good starting point. For the future, however, we suggest more comprehensive use of the computer-based patient records, which already cover most dental care in Finland. The computerized database would facilitate in producing a realistic picture of restoration longevity

Table IV. Longevity of amalgam and composite restorations. Median or mean longevity from three cross-sectional studies. The mean of the estimates in this study appear below.

		Longevity (years)	
Study	Size of restoration	Composite	Amalgam
Mjör et al., 2000, Norway ($n=243$)	All	8.0 (median)	10.0 (median)
	Class II	6.0 (median)	11.0 (median)
Burke et al., 2001, UK ($n=32$)	All	5.7 (mean)	8.3 (mean)
Forss and Widström, 2004, Finland ($n=548$)	All	6.0 (median)	15.0 (median)
Present estimates ($n=328$)	All	9.3 (mean)	18.7 (mean)
	Class II	9.0 (mean)	19.2 (mean)

individually for each dentist, in accordance with the material, the size and location of restoration, and characteristics of the patients. Such statistics could be helpful in quality assurance of restorative treatment in general, but might also aid dentists in making decisions on his/her restorative treatment.

Conclusions

Within the limitations of the present investigation, it can be concluded that perception of the longevity of posterior composites is longer among male dentists ($p < 0.04$) and private-sector dentists ($p = 0.001$) than among female dentists and dentists in the public sector in Finland. For amalgam longevity, perceptions are longer among female than among male dentists ($p = 0.001$). Generally, dentists' estimates exceed the median longevity reported in recent studies.

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