

# Restorative treatment and use of local anesthesia in free and subsidized public dental services in Helsinki, Finland

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Our aim was to evaluate restorative treatment and the use of local anesthetics in free and subsidized public dental care in Helsinki, Finland. Public dental clinics are open to all patients under the age of 36, and to some specific groups above that age. Patients up to age 19 receive all treatment free of charge and others at highly subsidized rates. Data were collected in May 2001 during a maximum 2-week period covering all public dental clinics in Helsinki. A one-page questionnaire was sent to all dentists ( $n = 140$ ) in clinical fields. The data requested included the patient's gender and year of birth, and details on restorations: which tooth and which surfaces were filled, the reason for placement or replacement, the material used, and use of local anesthetic. The response rate was 96%. Of all restorations ( $n = 3057$ ) placed, 14% were in primary teeth and in permanent teeth: 17% in premolars, 17% in incisors, and 52% in molars; the restorative material most often used was composite resin (69%). Glass-ionomer/comonomers dominated in the primary teeth. Local anesthetic was used least (35%) in patients under 13 years of age. Replacements of restorations accounted for 10% of all in the free service (under 20 years of age) and 46% in subsidized dental care (20 and older). The major reasons for replacement were secondary caries (41%) and fractured or lost restoration (40%). □ *Local anesthesia; public dental service; restorations; subsidization*

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Caries in children, adolescents, and adults has been in continuous decline in Europe (1–4). Primary caries in adults often accounts for less than half of the reasons for restoration, whereas non-carious defects, e.g. fractures, erosion, and esthetics as well as replacements of old restorations, become more numerous with age (5–11). Since replacement of restorations seems to form a major part of restorative treatment in adults, this topic has stimulated wide discussion (6–9, 11–17). As for restorative materials, the proportion of amalgam has been declining in the Nordic countries, the predominant materials today being composite resins and glass-ionomers/comonomers (7, 11, 18–21). The method of funding, i.e., free service versus insured or subsidized and public versus private, seems to influence dental treatment in regard to selection of restorative material and to the choice between restorative and extraction therapy (20, 22–24).

Painful dental treatment is one risk factor for dental behavior-management problems, with injections and drilling being the most stressful aspects of treatment (25–27). The use of local anesthetics in restorative treatment varies among cultures: 54% of Scandinavian patients reported non-use of anesthetics for tooth drilling compared with 90% of Chinese patients (28). Public dentists seem less likely to use local anesthetic than private dentists (29, 30).

The aim of this study was to evaluate the reasons for restoration placement and replacement, and use of local anesthetics in free and subsidized public dental care in Helsinki, Finland. We hypothesize that patient age has an influence on reasons for restoration and restorative materials, but not on use of local anesthetics.

## Materials and methods

Helsinki is the capital of Finland, with over 550,000 inhabitants. In 2001 there were 169 dentists working full- or part-time in 56 Public Dental Clinics (PDCs) (31). Dentists receive a fixed monthly salary with supplementary payments depending on treatment procedures.

In 2001, PDCs were open to all patients under the age of 36 and to some groups above that age, i.e. pregnant women, mentally handicapped patients, head- and neck-radiation patients, referrals by physicians, patients receiving home nursing service, and war veterans. At PDCs, patients up to age 19 receive all treatment free of charge. Adults receive treatment at highly subsidized prices. Between 130,000 and 140,000 patients visit PDCs annually, about half receiving free service. In 2001, a total of 143,000 restorations were made—1 of 5 restorations for patients under age 13 and 2 of 5 for patients aged between 20 and 35. Those 6 to 18 years old had on average 1.4 DMF teeth and 19- to 44-year-olds 12.9 DMF teeth (32).

Data collected in May 2001 covered all PDCs in Helsinki. A one-page questionnaire, accompanied by a letter to motivate and instruct, was sent to all dentists ( $n = 140$ ) in clinical fields, excluding orthodontists and dental surgeons. Dentists were to report details on 25 consecutively placed restorations over a maximum 2-week period, and for each restoration the patient's gender and year of birth, and details about the restoration: which tooth and which surfaces were filled, the reason for placement or replacement, the material used, and use or not of local anesthetics.

Table 1. Restorations (%) by type of tooth and use of local anesthetic by age group

	Age group							
	<13 years (free service)		13–19 (free service)		20–35 (subsidized)		36+ (subsidized)	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Type of tooth								
Primary teeth	418	(65)	16	(3)	3	(0)	0	(0)
Incisors	40	(6)	90	(16)	157	(15)	228	(29)
Premolars	2	(0)	59	(11)	258	(24)	209	(26)
Molars	183	(29)	378	(70)	658	(61)	358	(45)
Total	643	(100)	543	(100)	1076	(100)	795	(100)
Local anesthetic used	226	(35)	283	(52)	624	(58)	298	(38)

Statistical evaluation by  $\chi^2$  test: difference by age and type of tooth  $\chi^2 = 1892$ , d.f. = 9,  $P < 0.0001$ ; by age and use of local anesthetic  $\chi^2 = 123.1$ , d.f. = 3,  $P < 0.0001$ .

For analysis, year of birth was transformed to patient age within 1 year. Patients were further categorized into groups according to age: 1) under 13 years—mixed and primary dentition (free service); 2) 13 to 19—permanent dentition (free service); 3) 20 to 35—young adults (subsidized dental care); 4) 36 and older—adults with restricted rights to public dental care (subsidized).

Reasons for placement of restoration: 1) primary caries; 2) replacement of restoration; 3) changing temporary restoration to permanent one; 4) other, e.g. trauma, fracture of tooth, erosion, abrasion.

Options for restorative materials: 1) amalgam; 2) composite resin; 3) glass-ionomer/compomer; 4) temporary; 5) other, e.g., gold, ceramic.

Reasons for replacement of restoration: 1) secondary caries; 2) fractured or lost restoration; 3) marginal ridge discrepancy, poor anatomic form; 4) discoloration or patient's request; 5) erosion, abrasion; 6) caries on another surface.

Coverage of restoration was recorded by noting all surfaces filled: occlusal, mesial, buccal, distal, or oral. In analysis, surface recordings were categorized by size of restorations as: 1) one-surface restoration; 2) two-surface; 3) three or more surfaces.

Type of tooth was categorized as primary teeth or permanent: incisor (including canines), premolar, or molar.

Statistical evaluation of differences between subgroups

was performed by chi-square test for comparison of frequencies. A  $P$  value of 0.05 was considered significant.

## Results

The 134 (96%) dentists responding provided information on a total of 3057 restorations. Median patient age was 26 years; 39% received free dental care; 56% were female and 44% male.

Of all restorations placed, 14% were in primary teeth and in permanent teeth: 17% in premolars, 17% in incisors, and 52% in molars. Distribution of restorations by type of tooth and use of local anesthetic by age groups is given in Table 1. Restorations in primary teeth dominated in those under 13 (65%), restorations in permanent molars in all others. Local anesthetics were used least in the case of those under 13 and 36 and older, at 35% and 38%.

Local anesthetics were used in 43% of patients under 20 years of age and in 50% of patients aged 20 and older ( $P < 0.001$ ). Among patients under 20, local anesthetics were used for 45% of females and 41% of males ( $P = 0.129$ ), and among those aged 20 and older for 51% of females and 47% of males ( $P = 0.129$ ).

Table 2 gives the reasons for restoration by age group. Primary caries dominated (85%) for those under 20, whereas 59% were due to replacements in those 36 and

Table 2. Reasons (%) for restoration by age group

	Age group							
	<20 years (free service)		20 to 35 (subsidized)		36+ (subsidized)		Total	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Reason for restoration								
Primary caries	1005	(85)	565	(53)	228	(29)	1798	(59)
Replacement of restoration	115	(10)	395	(37)	472	(59)	982	(32)
Temporary restoration to a permanent one	25	(2)	66	(6)	25	(3)	116	(4)
Trauma, erosion, abrasion	41	(3)	49	(4)	70	(9)	160	(5)
Total	1186	(100)	1075	(100)	795	(100)	3056	(100)

Statistical evaluation by  $\chi^2$  test: difference by age and reason  $\chi^2 = 694.6$ , d.f. = 6,  $P < 0.0001$ .

Table 3. Restorative materials (%) by age group

	Age group							
	<20 years (free service)		20 to 35 (subsidized)		36+ (subsidized)		Total	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Restorative materials								
Amalgam	8	(1)	60	(6)	75	(10)	143	(5)
Composite resin	624	(53)	859	(82)	593	(76)	2076	(69)
Glass-ionomer/compomer	495	(42)	67	(6)	78	(10)	640	(21)
Temporary filling	42	(4)	59	(6)	36	(4)	137	(5)
Total	1162	(100)	1045	(100)	782	(100)	2996	(100)

Statistical evaluation by  $\chi^2$  test: difference by age and material  $\chi^2 = 556.5$ , d.f. = 6,  $P < 0.0001$ .

older. Of the restorations, 5% were done because of a non-carious defect (trauma, erosion, or abrasion): 4% in those under 20 versus 9% in those 36 and older. Replacement of restoration accounted for 10% in patients under 20 and 46% in patients 20 and older ( $P < 0.0001$ ).

The restorative material used most often was composite resin (69%) followed by glass ionomer/compomer (21%), amalgam (5%), and temporary restoration (5%). Composite resins dominated in all age groups, but glass-ionomer/compomers were almost equal for those under 20 (Table 3). In those under 13, glass-ionomer/compomers formed the majority (68%). With regard to difference between free and subsidized dental care, composite resins were used in 53% of the former and in 80% of the latter. Percentages for amalgam restorations were 1% among patients under 20 and 7% among those aged 20 and older ( $P < 0.0001$ ). Recording on material was missing in 61 (2%) cases and there were no gold or ceramic restorations.

Distribution of restorations by material and type of tooth showed glass-ionomer/compomers predominant in the primary teeth (88%), in which composite resins were used in only 8% and amalgam not used at all. In the permanent incisors, composite resins were used in 90% of restorations, and 8% were of glass-ionomer/compomer. In premolars, composite resins represented a distinct majority (86%), with glass-ionomer/compomers in 7% and amalgam in 3%. In the permanent molars, composite resins were used in 74%, glass-ionomer/compomers in 12% and amalgam in 8% ( $P < 0.0001$ ).

As to sizes of restorations by type of tooth and use of

local anesthetic (Table 4), one- and two-surface restorations dominated, at 43% and 42%. One-surface restorations comprised the majority in incisors and molars, whereas two-surfaces dominated in premolars and in primary teeth. Local anesthetic was used for about half the permanent posterior teeth, but for only a third of primary teeth and permanent incisors.

One-surface restoration comprised the majority (56%) among patients under 20 ( $P < 0.0001$ ). Two-surface restorations were used for 38% among patients under 20 and for 44% among patients aged 20 and older ( $P < 0.0001$ ). Three or more surface restorations comprised 6% of restorations for those under 20 and 20% for those aged 20 and older ( $P < 0.0001$ ).

Reasons for replacement of restoration among age groups (Table 5) were most often secondary caries (41%) and fractured or lost restoration (40%), the latter more often among those under 20 (47%) and those 36 and older (44%), compared with 34% among those aged 20 to 35. Secondary caries was the reason for replacement in 35% in the free and for 42% in the subsidized dental care, fracture of restoration for 47% and for 39%, and marginal ridge discrepancy and poor anatomic form for 8% and for 11%, correspondingly.

## Discussion

Our hypothesis that patient age has no influence on use of

Table 4. Size of restorations and use of local anesthetic by type of tooth

	Type of tooth									
	Primary teeth		Incisors		Premolars		Molars		Total	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Size of restoration										
1 surface	163	(37)	352	(68)	96	(18)	712	(45)	1323	(43)
2 surfaces	252	(58)	87	(17)	304	(58)	638	(41)	1281	(42)
3 or more surfaces	21	(5)	75	(15)	128	(24)	226	(14)	450	(15)
Total	436	(100)	514	(100)	528	(100)	1576	(100)	3054	(100)
Local anesthetic used	136	(31)	176	(34)	292	(55)	827	(52)	1431	(47)

Statistical evaluation by  $\chi^2$  test: difference by size and type of tooth  $\chi^2 = 353$ , d.f. = 6,  $P < 0.0001$ ; difference by type of tooth and use of local anesthetic  $\chi^2 = 111.7$ , d.f. = 3,  $P < 0.0001$ .

Table 5. Reasons for replacement of restoration by patient age group

	Age group						Total	
	<20 years (free service)		20 to 35 (subsidized)		36+ (subsidized)			
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Reasons for replacement								
Secondary caries	38	(35)	172	(44)	184	(39)	394	(41)
Caries on another surface	5	(5)	28	(7)	18	(4)	51	(5)
Fracture or lost restoration	51	(47)	131	(34)	205	(44)	387	(40)
Marginal ridge discrepancy, poor anatomic form	9	(8)	49	(13)	44	(10)	102	(11)
Discoloration, patient's request, erosion, abrasion	6	(5)	7	(2)	17	(3)	30	(3)
Total	109	(100)	387	(100)	468	(100)	964	(100)

Statistical evaluation by  $\chi^2$  test: difference by reason and age  $\chi^2 = 21.02$ , d.f. = 8,  $P = 0.0071$ .

local anesthetic was rejected, since we found an obvious difference between the youngest and 20- to 35-year-old age groups. Our other hypothesis, however, that patient age is related to reasons for restoration placement and replacement, received support, and is in line with Finnish and Norwegian data (6, 11).

Our 96% response rate was extremely high and can be explained by our collecting of data during dentists' working hours and thus tying it tightly to their clinical work. Other studies involving questioning dentists about placement and replacement of restorations have produced response rates of between 31% and 71% (6, 18). Our data collection was completed in 2 weeks, and periodic changes in dental visits could thus have affected the data. May is not a holiday season in Finland, however: schools are open, and dentists are usually at work, implying normal patient flow.

Restoration is one of the most usual treatments in young adults in Finland (33–34). At PDCs in Helsinki, free-service patients (under 20 years of age) received on average 0.7 restorations in 2001, and those under subsidized dental care (20 years and older) 1.4 restorations (32). On the population level, 29% of dentate adult patients in the United Kingdom reported having received restorative treatment at their most recent dental appointment (3).

Pain management in restorative treatment should be dentists' everyday practice, but half of our study's restorations were done without local anesthetics. However, this is less than in a Swedish study reporting 76% of 9-year-olds having undergone restorative treatment without local anesthetic (26). The limited use of local anesthetics in children is regrettable, because fear-related behavior can be a barrier to good dental care, and pain management in pediatric dentistry would help to prevent dental fear in adulthood (25, 27, 35). Unfortunately, many dentists seem to underestimate children's dental pain (29, 36).

An interesting finding was the difference in use of local anesthetics between those 20 to 35 and those 36 and older, even when local anesthetic is not free for either age group. Older patients may want local anesthetic less often than younger patients, as Moore et al. (28) suggest. The reason

for infrequent use of local anesthetics in incisors (35%) compared with overall use (48%) may be that administering them to the incisor region is particularly painful; moreover, cavity sizes can be smaller than in premolars and molars.

Those under 20 received glass-ionomer/compomer restorations considerably more often than did the older patients. The use of glass-ionomers/compomers in children and adolescents can result in frequent fractures of the restoration, as seen in primary teeth in Norway and Sweden (37–38). In the present study, fractured or lost restoration was the reason for one out of two replacements among those under 20, possibly indicating the limited longevity of glass-ionomer/compomer restorations.

Replacements of restorations become more numerous with age (5–7, 11). Continuous replacement of restorations inevitably leads to loss of the tooth: this problem has already been discussed in the amalgam era and is still true in the era of composite resin restorations (39, 40). Recently, Mjör et al. (41) have suggested that instead of replacement of the whole restoration, it should be repaired, but no studies yet exist on the outcome of this.

The proportion of restorations due to non-carious defects ranged, by age group, from 4% to 15%, in line with figures from numerous other studies of 6% to 11% (5, 7, 8, 11).

Amalgam was used in only 5% of the present restorations, in line with Finnish studies (11, 20). Such a rare use of amalgam can be explained partly by environmental recommendations by the Ministry of Social Affairs and Health. Among Finnish dentists, health risk, and ethical and social factors are reasons for reducing the use of amalgam, but dentists do not want to give it up completely (21, 42).

In conclusion, pain management should be better emphasized in restorative dental care. The fact that secondary caries and fractured and lost restorations dominated as reasons for replacement calls for improvement in the quality of restorative dental care.

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