

ORIGINAL ARTICLE

Use of local anesthesia in restorative treatment for adults in Finland

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Abstract

Objective. In this survey we investigated the frequency of use of local anesthesia (LA) in restorative treatment for vital teeth in adults in Finland. **Material and methods.** A postal questionnaire was mailed to 592 dentists selected by systematic sampling from the membership list of the Finnish Dental Association; 57% responded. The questionnaire inquired “How often do you use local anesthesia when restoring vital teeth in adults?” for three types of primary restorations: class III for incisors, class II for premolars or molars, and class V on gingival margin for premolars or molars. Statistical evaluation included chi-square and logistic regression modeling. **Results.** For restorative treatment of class III primary restoration for incisors, 21% of the dentists used LA always or almost always, 47% fairly often, 30% occasionally, and 2% rarely or never. For class II restoration for premolars or molars, 25% of dentists used LA always or almost always, 58% used LA fairly often, 16% occasionally, and 1% rarely or never. Controlling for gender and time elapsed since graduation, public dentists were more likely to use LA always or almost always for Class II (OR = 2.0) and Class III (OR = 1.8) restorations. No such difference appeared for Class V restorations. **Conclusion.** The majority of dentists have accepted LA as part of their everyday practice, with more widespread use among public dentists. Still, to prevent future dental fear among patients, dentists should emphasize pain-free treatment.

Key Words: Dental practices, pain control, private sector, public sector

Introduction

Local anesthesia (LA) has been used in dental practice for tooth extractions for more than 100 years [1]. Nowadays, when dental anxiety and pain control call for a stronger emphasis, the use of LA has become an essential part of restorative treatment. However, administration of LA can be distressing not only for patients but also for the dentists, which may compel them to avoid using LA altogether. Inferior alveolar injection and injections for preschool children have been identified as a source of stress for the dentists and may affect a small number of practitioners both psychologically and physically [2–4].

Furthermore, dentists' frequency of use of LA seems to vary across cultures. In the United States, dentists reported using LA for 99% of their patients, in the Nordic countries for about half of patients, but in China for only 10% [5,6]. According to public dentists' reports from the Helsinki Public Dental Service, public dentists use LA for 1 in 2 patients

aged 20 years and older, and more often for treatment of premolars and molars than for treatment of incisors [7].

In Asia, the dentist usually decides whether to use LA, but in both the United States and in the Nordic countries, adult patients usually decide for themselves [6,8,9]. A dentist's gender and length of practice may influence the decision to use LA, but dental literature on this topic is scarce. Nevertheless, the existing literature reports that female dentists use topical analgesia prior to injection more frequently than do male dentists [4].

The objective of the present survey was to evaluate Finnish dentists' use of LA in restorative treatment for adults by the type of restoration. We hypothesized that dentists use LA more often in posterior teeth than in incisors.

Material and methods

About 4400 dentists currently practice in Finland, roughly half of whom in the public sector and the

other half in the private sector: approximately 70% of dentists are female. For adults, dental treatment in the public sector is highly subsidized, whereas in the private sector treatment fees are about double those of the public sector even after partial reimbursement from the Social Insurance Institution.

The sample ($n=592$) was drawn by means of systematic sampling from the membership list of the Finnish Dental Association; all specialized dentists, such as oral surgeons and orthodontists, were excluded. The pre-tested questionnaire was sent with a pre-paid reply envelope in April, followed by a reminder sent in June 2004. Replies remained anonymous, but respondents had the option to participate in a lottery for a free dental course and three of 100 euros notes by sending their contact information in a separate sealed envelope. The response rate was 57%.

The questionnaire asked dentists "How often do you use local anesthesia when restoring vital teeth in adults?" for three types of restorations:

- class III primary restoration for incisors
- class II restoration for premolars or molars
- class V restoration on gingival margin for premolars or molars.

Options for answers included: (a) always or almost always, (b) fairly often, (c) occasionally, and (d) rarely or never. These responses were combined for the primary analyses into two categories: "often" (a+b) and "seldom" (c+d). For further analyses, we assigned a score (0–3) for each the four options (a)–(d): zero (0) for "rarely or never" to three (3) for "always or almost always". The sum of the scores from the answers on the use of LA for the three types of restorations quantified a dentist's emphasis on the use of LA.

Questions on demographic characteristics inquired about a dentist's gender, main work, and year of graduation. For the latter, the alternatives included 1960–1977, 1978–1987, 1988–1997, and 1998–2003, later combined into three categories of time since graduation: 1–16 years, 17–26 years, and 27 years or more. Main work included four options: public, private, hospital or university, and other. For further analyses categories were limited to public

(including hospital or university) and private; others ($n=4$) and missing answers ($n=4$) were excluded.

The chi-square test served for statistical evaluation of the differences in the frequency and ANOVA for differences in the mean values. Relationships between the use of LA and dentists' demographic characteristics appear first as odds ratios (OR) defined as cross-products for the "at-least-fairly-often" use of LA on basis. Explanations for the "always-or-almost-always" use of LA included dentists' characteristics together in a logistic regression model that simultaneously controlled for all factors in the model. A 95% confidence interval (95% CI) was calculated for each OR.

Results

Of all the respondents ($n=339$), 70% were women and 60% worked in the public sector. Female dentists dominated in both sectors: 77% in the public sector and 61% in the private sector ($p=0.002$). Table I gives respondents' distributions by years since graduation, separately by gender and main work.

For restorative treatment of class III primary restoration for incisors, 21% of all dentists stated that they used LA always or almost always, 47% used LA fairly often, 30% occasionally, and 2% rarely or never. Compared to the private-sector dentists, the public-sector dentists stated that they more frequently ($p=0.01$) use LA for class III restoration of incisors.

For class II restoration of premolars or molars, 25% of the dentists stated that they used LA always or almost always, 58% used LA fairly often, 16% occasionally, and 1% rarely or never. Public-sector dentists ($p=0.04$) and those having graduated no more than 26 years ago ($p=0.03$) stated that they use LA more frequently than did their counterparts.

For class V restoration on gingival margin in premolars or molars, 22% of the dentists stated that they used LA always or almost always, 50% used LA fairly often, 27% occasionally, and 1% rarely or never. Based on the dentists' demographic characteristics, no differences occurred in the use of LA for class V restoration.

Table I. Distributions (%) of dentists ($n=339$) according to years since graduation, separately by gender and sector

Years since dentist's graduation	Dentist's gender ¹		Sector ²	
	Female $n=238$ %	Male $n=100$ %	Public $n=203$ %	Private $n=128$ %
1–16 years	31	30	31	30
17–26 years	43	47	45	44
27+ years	26	23	24	26
Total (%)	100	100	100	100
	$\chi^2=0.44$; d.f. =2; $p=0.80$		$\chi^2=0.38$; d.f. =2; $p=0.83$	

Data missing: ¹for one respondent, ²for eight respondents.

Table II. Use of local anesthesia (LA) in restorative treatment for adults in Finland by class of restoration and type of tooth: odds ratios (OR) for using LA always, almost always, or fairly often, according to dentists' ($n=339$) demographic characteristics

Dentists' demographic characteristics	Class of primary restoration and type of tooth					
	Class III Incisors		Class II Premolars or molars		Class V Premolars or molars	
	OR	95% CI	OR	95% CI	OR	95% CI
Gender ¹						
Female vs male	1.3	0.8–2.1	1.0	0.5–1.8	0.7	0.4–1.1
Sector ²						
Public vs private	1.8*	1.2–2.9	1.7*	1.0–3.0	1.3	0.8–2.2
Years since graduation						
1–16 vs 17–26 years	0.7	0.4–1.3	1.8	0.8–3.9	1.2	0.7–2.1
1–16 vs 27+ years	1.3	0.7–2.4	3.8*	1.7–8.6	1.3	0.7–2.5
17–26 vs 27+ years	1.8*	1.0–3.3	2.1*	1.1–4.1	1.1	0.6–2.0

Data missing: ¹for one respondent, ²for eight respondents.

OR defined as cross product; 95% CI=95% confidence interval; * $p < 0.05$.

Odds ratios produced as cross products of the “at-least-fairly-often” use of LA for the three types of restorations according to dentists' demographic characteristics appear in Table II. For class V restoration, no statistically significant association appeared. For class III and class II restorations, public-sector dentists stated that they use LA almost twice as often as did the private-sector dentists. For class II restorations, those having graduated no more than 16 years ago stated that they use LA almost four times as frequently as dentists having graduated more than 26 years ago.

The overall scores quantifying dentists' emphasis on the use of LA ranged from 1 to 9, with a mean value of 5.9 (SD = 1.8). The difference between the public-sector and private-sector dentists was obvious

(6.1 versus 5.5; $p = 0.005$). No differences occurred based on dentists' gender or time since graduation.

Table III gives the relationships between the dentists' demographic characteristics and their statements on the use of LA “always-or-almost always”, based on three similar logistic regression models fitted to the data. For class III restoration, a longer time since graduation (OR = 1.5, $p = 0.02$), and for class II restoration, working in the public sector (OR = 2.0, $p = 0.02$), were strongly related to the “always-or-almost-always” use of LA. For class V, no such statistically significant relationship appeared.

Discussion

As we hypothesized, the dentists reported using LA more often for posterior teeth than for incisors. We

Table III. Use of local anesthesia (LA) always or almost always in restorative treatment for adults in Finland by type of restoration: odds ratios (OR) based on similar logistic regression models for each type of restoration, fitted to data on the demographic characteristics of responding dentists ($n=339$)

Type of restoration Terms in model	Estimates obtained by logistic regression modeling				
	Impact	s.e.	OR	95% CI ¹	p -value
Class III for incisors					
Gender: 1 = male, 2 = female	-0.17	0.32	0.8	0.5–1.6	0.58
Years since graduation	0.39	0.17	1.5	1.1–2.1	0.02
Sector: 1 = private, 2 = public	0.57	0.30	1.8	1.0–3.2	0.06
Deviance 331.1; d.f. = 326; $p > 0.05$					
Class II for premolars/molars					
Gender: 1 = male, 2 = female	0.07	0.29	1.1	0.6–1.9	0.82
Years since graduation	-0.07	0.15	0.9	0.7–1.3	0.63
Sector: 1 = private, 2 = public	0.69	0.29	2.0	1.1–3.5	0.02
Deviance 362.9; d.f. = 325; $p > 0.05$					
Class V for premolars/molars					
Gender: 1 = male, 2 = female	0.22	0.30	1.2	0.7–2.2	0.42
Years since graduation	0.29	0.16	1.3	1.0–1.8	0.08
Sector: 1 = private, 2 = public	0.38	0.29	1.5	0.8–2.6	0.19
Deviance 338.2; d.f. = 325; $p > 0.05$					

¹95% confidence interval of the OR.

found no differences between female and male dentists in their use of LA, although among dental students young females have previously expressed greater anxiety about giving LA injections [10].

The dentists in the public sector reported using LA more often than did dentists in the private sector. Our finding contrasts with two previous studies on children which report that dentists in the private sector use LA more often than do the dentists in the public sector [5,11].

Unfortunately no proper drop-out analyses could be carried out due to strict legislation regarding the access to citizens' personal information. However, the respondents' gender distribution was similar to that of all dentists in Finland. The response rate must be considered low, which may have made the estimates for the use of LA higher compared to the actual use in everyday practice. Nevertheless, our response rate is comparable to that of many previous surveys on the clinical decisions of dentists in the Nordic countries [12,13]. Dentists working in the public sector returned the questionnaire more consistently than did those from the private sector, which also corresponds with the response rate in previous Finnish studies [14,15].

The use of LA has several implications in clinical practice. Dental fear can to some extent influence the effect and efficacy of LA [16,17]. Invasive dental procedures, such as drilling, and administration of LA can cause dental fear, especially in childhood [18,19]. Previous research has shown that the use of LA can also increase [20] or decrease [21] the longevity of the restoration. In the present study, many dentists indicated that they use LA fairly often, but still the use of LA could be more frequent.

Today's adults have experienced fewer caries and less dental treatment than have previous generations. The occurrence of caries among adolescents and adults has been declining in Europe in recent decades [22–24], and more and more today's patients expect pain-free dental care [25,26]. Recent Finnish legislation requires taking into account the patients' wishes and demands. For dentists, patients' demands for pain-free care certainly raise an unignorable future challenge.

Patients prefer injection-free LA in periodontal treatments [27], which probably reflects their desire for pain-free LA procedures. Consequently, several attempts have been reported to develop pain-free injections and to create methods to reduce the discomfort of the LA injection. Methods employing a transcutaneous electrical nerve stimulation (TENS) or a computed device such as "Wand" have been introduced, but these are still unavailable for use in everyday dentistry [28–30]. Perhaps such new methods will facilitate dental practice in future and increase dentists' use of LA on a larger scale.

In conclusion, a majority of dentists have accepted LA as part of their everyday practice. Still, to prevent

future dental fear among patients, dentists should emphasize pain-free treatment.

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References

- [1] Calatayud J, González Á. History of the development and evolution of local anesthesia since the coca leaf. *Anesthesiology* 2003;98:1503–8.
- [2] Simon JF, Peltier B, Chambers D, Dower JS. Dentists troubled by administration of anesthetic injections: long-term stresses and effects. *Quintessence Int* 1994;25:641–6.
- [3] Dower JS Jr, Simon JF, Peltier B, Chambers D. Patients who make dentists most anxious about giving injections. *J Calif Dent Assoc* 1995;23:35–40.
- [4] Rasmussen JK, Frederiksen JA, Hallonsten AL, Poulsen S. Danish dentists' knowledge, attitudes and management of procedural dental pain in children: association with demographic characteristics, structural factors, perceived stress during the administration of local analgesia and their tolerance towards pain. *Int J Paediatr Dent* 2005;15:159–68.
- [5] Murtomaa H, Milgrom P, Weinstein P, Vuopio T. Dentists' perceptions and management of pain experienced by children during treatment: a survey of groups of dentists in the USA and Finland. *Int J Paediatr Dentistry* 1996;6:25–30.
- [6] Moore R, Brødsgaard I, Mao T-K, Miller ML, Dworkin SF. Perceived need for local anesthesia in tooth drilling among Anglo-Americans, Chinese, and Scandinavians. *Anesth Prog* 1998;45:22–8.
- [7] Palotie U, Vehkalahti M. Restorative treatment and use of local anesthesia in free and subsidized public dental services in Helsinki, Finland. *Acta Odontol Scand* 2003;61:252–6.
- [8] Moore R, Brødsgaard I, Mao T-K, Kwan H-W, Shiao Y-Y, Knudsen R. Fear of injections and report of negative dentist behavior among Caucasian American and Taiwanese adults from dental school clinics. *Community Dent Oral Epidemiol* 1996;24:292–5.
- [9] Moore R, Brødsgaard I, Mao T-K, Miller ML, Dworkin SF. Acute pain and use of local anesthesia: tooth drilling and childbirth labor pain beliefs among Anglo-Americans, Chinese, and Scandinavians. *Anesth Prog* 1998;45:29–37.
- [10] Meechan JG. Differences between men and women regarding attitudes toward dental local anesthesia among junior students at a United Kingdom dental school. *Anesth Prog* 2005;52:50–5.
- [11] Milgrom P, Weinstein P, Golletz D, Leroux B, Domoto P. Pain management in school-aged children by private and public clinic practice dentists. *Pediatr Dent* 1994;16:294–300.
- [12] Mjör IA, Shen C, Eliasson ST, Richter S. Placement and replacement of restorations in general dental practice in Iceland. *Operat Dent* 2002;27:117–23.
- [13] Forss H, Widström E. Reasons for restorative therapy and the longevity of restorations in adults. *Acta Odontol Scand* 2004;62:82–6.
- [14] Forss H, Widström E. From amalgam to composite: selection of restorative materials and restoration longevity in Finland. *Acta Odontol Scand* 2001;59:57–62.
- [15] Heinikainen M, Vehkalahti M, Murtomaa H. Re-treatment decisions for failed posterior fillings by Finnish general practitioners. *Community Dental Health* 2002;19:98–103.

- [16] Meechan JG. How to overcome failed local anaesthesia. *Br Dent J* 1999;186:15–20.
- [17] Nakai Y, Milgrom P, Mancl L, Coldwell SE, Domoto PK, Ramsay DS. Effectiveness of local anesthesia in pediatric dental practice. *J Am Dent Assoc* 2000;131:1699–705.
- [18] Milgrom P, Mancl L, King B, Weinstein P. Origins of childhood dental fear. *Behav Res Ther* 1995;33:313–9.
- [19] Rantavuori K, Lahti S, Hausen H, Seppä L, Kärkkäinen S. Dental fear and oral health and family characteristics of Finnish children. *Acta Odontol Scand* 2004;62:207–13.
- [20] Walls AWG, Wallwork MA, Holland IS, Murray JJ. The longevity of occlusal amalgam restorations in first permanent molars of child patients. *Br Dent J* 1985;158:133–6.
- [21] Palotie U, Vehkalahti M. Reasons for replacement and the age of failed restorations in posterior teeth of young Finnish adults. *Acta Odontol Scand* 2002;60:325–9.
- [22] Marthaler TM, O'Mullane DM, Vrbic V. The prevalence of dental caries in Europe 1990–1995: ORCA Saturday Afternoon Symposium 1995. *Caries Res* 1996;30:237–55.
- [23] Kelly M, Steele J, Nuttall N, Bradnock G, Morris J, Nunn J, et al. Adult dental health survey: oral health in the United Kingdom 1998. London: Her Majesty's Stationery Office; 2000. p. 260–2.
- [24] Aromaa A, Koskinen S, editors. Health and functional capacity in Finland. Baseline results of the Health 2000 Health Examination Survey. Helsinki: Hakapaino Oy; 2004. p. 62–6. Available at: <http://www.ktl.fi/terveys2000/julkaisut/baseline.pdf> [accessed 9 October 2006].
- [25] Chanpong B, Haas DA, Locker D. Need and demand for sedation or general anesthesia in dentistry: a national survey of the Canadian population. *Anesth Prog* 2005;52:3–11.
- [26] Allen EM, Girdler NM. Attitudes to conscious sedation in patients attending an emergency dental clinic. *Prim Dent Care* 2005;12:27–32.
- [27] Matthews DC, Rocchi A, Gafni A. Factors affecting patients' and potential patients' choices among anaesthetics for periodontal recall visits. *J Dent* 2001;29:173–9.
- [28] Meechan JG, Gowans AJ, Welbury RR. The use of patient-controlled transcutaneous electronic nerve stimulation (TENS) to decrease the discomfort of regional anaesthesia in dentistry: a randomized controlled clinical trial. *J Dent* 1998;26:417–20.
- [29] Ram D, Peretz B. Administering local anaesthesia to paediatric dental patients – current status and prospects for the future. *Int J Paediatr Dent* 2002;12:80–9.
- [30] Palm AM, Kirkegaard U, Poulsen S. The wand versus traditional injection for mandibular nerve block in children and adolescents: perceived pain and time of onset. *Pediatr Dent* 2004;26:481–4.