French Dentists' Restorative Treatment Decisions

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Purpose: Variations in decision-making about restorative treatments have been demonstrated among dentists in several countries. This study sought to assess the restorative treatment philosophies based on a representative sample of French dentists.

Materials and Methods: A sample (n = 2000) was randomly extracted from a national list (n = 42,000). Each dentist received a questionnaire, illustrations of carious conditions, and a reply-paid envelope. The questionnaire assessed the stage of lesion progression at which the respondents considered restorative treatment appropriate, their choice of restorative technique and dental material. For all questions, an imaginary 20-year-old patient with low caries activity was described.

Results: After one reminder, the response rate was 40%. Almost half of the respondents would restore an occlusal lesion confined to enamel and 88% would have prepared a cavity for a proximal lesion at the amelo-dentinal junction. The majority of the respondents would not use the Black concepts for cavity preparation. Their preferred restorative material was composite.

Conclusions: Answers indicated a tendency towards early restorative intervention and showed large variations between the treatment decisions of French dentists.

Key words: dental caries, diagnosis, treatment decision, restoration

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Caries occurrence has decreased markedly in most developed countries since the 1970s (Glass, 1982; Burt, 1994; Marthaler et al, 1996). In France, the mean DMFT at 12 years decreased from 4.2 in 1987 to 1.9 in 1998; and the proportion of caries-free children increased from 15% to 40% during the same period (Cahen et al, 1993; Hescot and Roland, 1998). This has been attributed to improved oral hygiene, the use of fluoridated toothpastes and elevated saliva fluoride concentrations (Campus et al, 2003). Fluoride may also lead to slower caries progression and an increased proportion of non-cavitated lesions (Mejàre et al, 1998).

Black's cavity preparation principles have long guided dentists' restorative strategies. Recently, better understanding of the carious process has changed operative treatment philosophies: preventive strategies involving fluoride and remineralization are preferred and operative treatments are undesirable unless the carious lesion has reached an advanced stage of cavitation. Cavity preparation techniques that spare tooth substance are prefera-

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ble, facilitated by new instruments for cavity preparation and new long-term adhesive materials (Mount and Ngo, 2000).

The restorative treatment criteria used by dentists in clinical practice are thus interesting and, have been studied using questionnaires in Norway, Sweden, Denmark, Western Australia and Scotland (Espelid et al, 1985; Espelid and Tveit, 2001; Mejàre et al, 1999; Mileman and Espelid, 1988; Nuttall and Pitts, 1990; Riordan et al, 1991; Sundberg et al, 2000; Tveit et al, 1999). These studies demonstrated the wide variation in criteria between and within dental offices in different countries.

In France, this information is unavailable, so whether dentists have modified their operative treatment practices in the light of recent ideas is unknown. The aim of this study was to investigate restorative treatment decisions for carious lesions on occlusal and approximal surfaces used by dentists in France.

MATERIAL AND METHODS

To allow comparisons, the questionnaire of Espelid et al (2001), also used in other studies (Mejàre et al, 1999; Sundberg et al, 2000; Tveit et al, 1999), was translated from Norwegian to French and then reverse translated from French to Norwegian by two bilingual dentists. Comparisons between the Norwegian and back-translated versions were made and the questionnaire pilot-tested on students and teachers (n = 113) at the Clermont-Ferrand dental school, followed by some minor adjustments.

A list of dentists authorized in France (n = 42,000) was available. Dentists aged 65 years or older and orthodontists were excluded. The questionnaire was sent (June 2002) to a random sample (n = 2003) of dentists on the list, with anonymous reply-paid envelopes. A reminder was sent 15 days later and 830 dentists (41.4%) replied. Of these, 37 were excluded (ceased practice, moved or specialized). Of the remaining 793, 98.7% were private practitioners. The respondents matched dentists on the original list in terms of age, sex and geographical distribution.

The questionnaire uses diagrams of different stages of caries to explore dentists' treatment thresholds for approximal and occlusal caries and their favored types of operative technique and restorative material for hypothetical lesions. Firstly, the questionnaire assessed the stage of lesion progression at which respondents considered restorative treatment appropriate, their choice of restorative techniques (choices were tunnel, saucer-shaped, traditional Cl. II), and of dental materials (choice between amalgam, GIC, composite, GIC plus composite, other) (Figs. 1–2). For all questions, an imaginary 20-year-old patient, who visited a dentist annually, had low caries activity and good oral hygiene, was described.

The items in the questionnaire are detailed below:

- Fig 1 (**approximal**), Item 1: "The figure illustrates different radiographic stages of caries progression. The example refers to the distal surface of an upper second premolar. Which lesion(s) do you think require(s) immediate restorative treatment? That is, the lesion(s) for which you would not postpone restorative treatment under any circumstances?"
- Fig 1, Item 2: "What preparation technique would you choose for the smallest lesion that you would restore?"
- Fig 1, Item 3: "What restorative material would you choose for the smallest lesion that you would restore?"
- Fig 2 (**occlusal**), Item 1: "The figure illustrates different clinical appearances of caries. The example refers to a lower second molar. Which lesion(s) do you think require(s) immediate operative treatment? That is, the lesion(s) for which you would not postpone restorative treatment under any circumstances."
- Fig 2, Item 2: "What preparation technique would you choose for the smallest lesion that you would restore?"
- Fig 2, Item 3: "What restorative material would you choose for the smallest lesion that you would restore?"

The age, sex, dental school and whether the respondent had participated in continuing education about cariology within the last 5 years were also recorded.

A χ^2 test assessed differences between qualitative variables. ANOVA tested the differences of intervention grade between the schools of graduation. The level of significance was set at 5%.

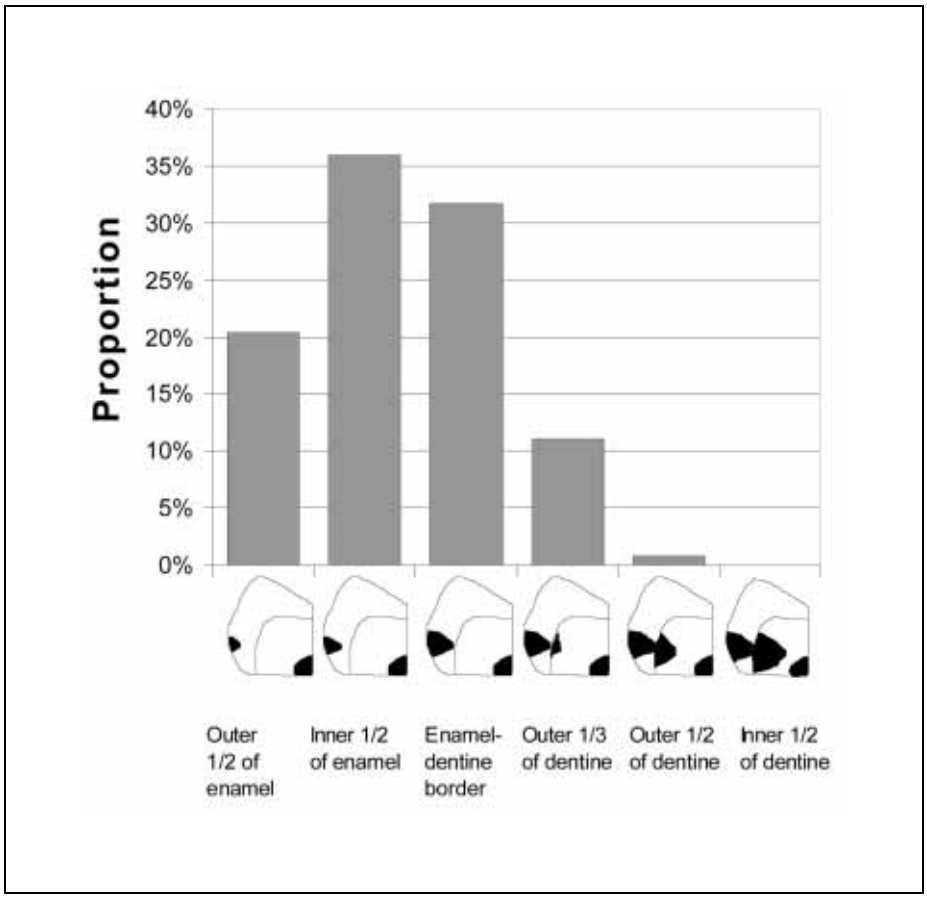

Fig 1 The earliest stage of approximal carious development, judged on radiograph, at which the different respondents (n = 786) would intervene with operative treatment.

RESULTS

Approximal Caries

A carious lesion confined to enamel (grades 1 and 2) would have been operatively restored by 56% of the respondents; 32% would have prepared a cavity for a lesion at the amelo-dentinal junction; and 12% would have waited until the lesion was in dentine (Fig 1). Age, sex, school of graduation or having participated within the last five years in continuing education about cariology ($p > 0.05$) had no effect. The preferred preparation type of 54.7% of respondents was the saucer-shaped preparation while 33.3% preferred tunnel preparations and 12.0% traditional class II preparations (Table 1). Male dentists and dentists who had recently participated in continuing education courses (40% of the respondents) were more enthusiastic about tunnel preparations ($p < 0.05$). The majority of the respondents (65.4%) suggested composite or composite plus GIC for restoring the approximal surface while 20.5% would use amalgam and 10.7% glass ionomer cement (conventional or resin modified). Amalgam was preferred by dentists aged > 50 years and by those who had not recently participated in continuing education ($p < 0.01$).

Occlusal Caries

Almost half (49.8%) of the respondents would restore an occlusal lesion confined to enamel (grades 1 and 2) and half (50.2%) would wait until the lesion was in dentine (grade 3 to 5, Figure 2). Dental school attended was not related to the stage of intervention. Female dentists would restore at a slightly later stage than males ($p < 0.05$). The preferred preparation of 61.2% of the respondents was limited to the carious lesion while 36% preferred a preparation extended to the whole occlusal fissure. The type of cavity chosen was correlated with age; older dentists favored opening the whole fissure ($p < 0.05$). The majority of the respondents (72.9%) suggested com-

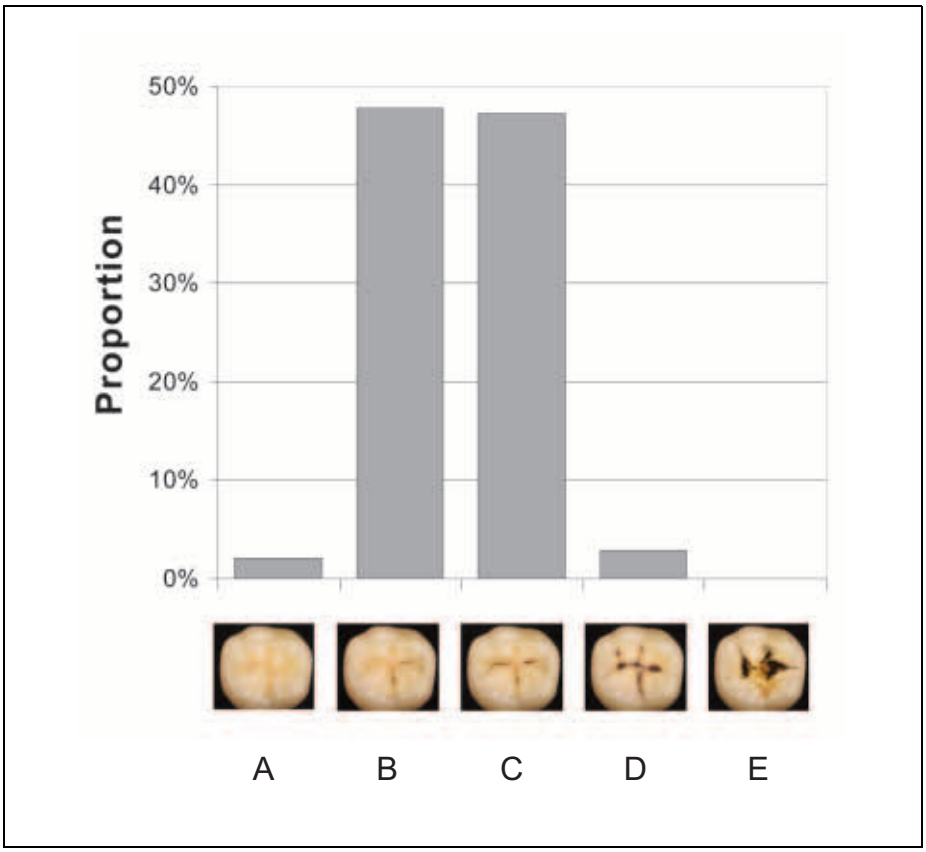

Fig 2 The earliest stage of occlusal carious development, judged clinically and on radiograph, at which the different respondents (n = 785) would intervene with operative treatment. (A) White/brownish discolouration of enamel. No cavitation, no radiographic signs of caries. (B) Minor loss of tooth substance with a break in the enamel surface or discoloured surface or discoloured fissures with grey or opaque enamel and/or caries confined to enamel. No radiographic signs of caries. (C) Moderate loss of tooth substance and/or caries in the outer 1/3 of the dentine according to the radigraph. (D) Considerable loss of tooth substance and/or caries in the middle 1/3 of the dentine according to the radiograph. (E) Considerable loss of tooth substance and/or caries in the inner 1/3 of the dentine according to the radiograph.

Table 1 Numbers (and proportions) of respondents choosing different restorative materials by type of cavity preparation for approximal caries

	Traditional class II preparation	Tunnel preparation	Saucer-shaped preparation
Amalgam	46 (49.4%)	23 (8.9%)	90 (21.2%)
Composite	32 (34.4%)	154 (59.7%)	277 (65.4%)
Composite & GIC	1 (1.1%)	18 (7%)	25 (5.9%)
GIC	0	21 (8.1%)	1 (0.2%)
Resin modified GIC	5 (5.4%)	37 (14.4%)	19 (4.5%)
Other	9 (9.7%)	5 (1.9%)	12 (2.8%)
Total	93 (100%)	258 (100%)	424 (100%)

Not all participants responded to all questions

posite for restoring the occlusal surface while 17.1% would have used amalgam and 7.0% glass ionomer cement (conventional or resin modified).

DISCUSSION

The reference population was extracted from 'Annuaire dentaire' (Labassol (ed), Marne-la-Vallée, France) which is a commercial list of dental information. It covers all dentists including owners and operators of private practices and features the vast majority of practicing dentists. In France, fewer than 5% of dentists work in public dental services. We had first approached the national registration authority for dentists ('Ordre national des chirurgiens-dentistes') for a list of all registered dentists but this list was not made available.

The respondents were representative of the sample in terms of age, sex and residence. The response rate (~ 40%) compares poorly with surveys of dentists in northern European countries (Espelid et al, 2001; Mileman and van der Weele, 1990; Mileman et al, 1992) and North America (el Mowafy and Lewis, 1994). In the present study, a reminder letter was sent to participants 15 days after the original questionnaire had been sent. However, this level of response is typical of questionnaire surveys in medicine and dentistry in France which, in a selection of studies, ranged from 17% to 56% (Clinard et al, 2001; Ferrand et al, 2003; Hennequin and Tubert-Jeannin, 1999; Levy et al, 1997; Mahe et al, 2002). Clinicians in France seem reluctant to provide information for research purposes but Hovland et al (1980) viewed a low response rate among dentists as unbiased.

There is little correlation between dentists' stated intervention thresholds as reported in questionnaire surveys and their therapy decisions in clinical practice (Kay et al, 1992; Kay and Nuttall, 1994; Mileman et al, 1992). In our study, 72.9% of dentists claimed they would use composites for an occlusal lesion in a molar. By contrast, a French study conducted in 1998 on 3,796 patients showed that composite was placed in only 28.6% of single surface molar restorations (Matysiak et al, 2002). These apparently contradictory findings suggest that implementation of dentists' treatment philosophies may be modified by the realities represented by their patients and their practice circumstances. Questionnaire surveys are not able to measure the dentists' clinical decisions but give a good idea of their treatment philosophies (Mejàre et al, 1999; Tveit et al, 1999).

This study was based on a 20-year-old theoretical patient, as described above. With this theoretical patient, we hoped to limit response variance. The results reported in this paper thus apply only to the type of patient described; for a given carious lesion, a dentist's diagnosis and restorative treatment decision will vary depending on patient characteristics. Age, dental status and regularity of attendance affect the clinician's decisions (Bader and Shugars, 1992, 1998; el Mowafy and Lewis, 1994).

The results illustrate a wide disparity among practitioners in the management of the carious lesions. How dentists determine their restorative treatment strategies is unclear. Bader and Shugars (1997) have suggested that dentists do not make individual diagnoses; they recognize a pattern and apply what these authors call a "script" to the situation: an automatic response to a set of circumstances. Practitioner-related factors, linked either to the practitioner's knowledge level or opinions, are integrated into the script. A dentist who believes, for a given stage of carious progression, that a carious lesion is cavitated will treat accordingly. Another dentist who believes that caries progresses rapidly is also more likely to intervene operatively (Espelid et al, 1985; Maupomé and Sheiham, 1997; Riordan et al, 1991). The dentist's concern about the risk of over-treatment versus the risk of caries progression also influences the script (Bader and Shugars, 1997; Kay and Nuttall, 1994). Thus, similar health findings among patients could result in different proposals for restorative treatment. Since much dental treatment is irreversible, patients risk needless or inappropriate interventions, with unknown health and economic consequences for patients and health funds (Elderton and Nuttall, 1983; Elderton, 1996; Shugars and Bader, 1996).

The present findings indicate that French dentists intervene earlier in the carious process than do dentists studied elsewhere (el Mowafy and Lewis, 1994; Espelid and Tveit, 2001; Maupomé and Sheiham, 1997; Mejàre et al, 1999; Tveit et al, 1999). Sequential studies conducted in Norway from 1983 to 1995 demonstrate a drift among dentists towards later intervention (Tveit et al, 1999). Whether a similar evolution in the French dentists' practices is occurring will require sequential studies.

The tendency to early intervention may have a plausible if complex explanation. In areas with high population caries activity, it has been postulated that dentists are very keen to place restorations before lesions become less manageable (Maupomé and Sheiham, 1997). In France, caries occurrence has diminished in recent decades but many dentists may not have modified their treatment practices accordingly. Furthermore, most of today's practitioners were trained according to the principles of Black. It takes time for changes in fundamental philosophies to filter through to practitioners (Haugejorden, 1988). Our results are consistent with other findings suggesting that older dentists who have not recently attended courses in conservative dentistry will favor invasive interventions, use amalgam and over-extend their cavities (Espelid and Tveit, 2001; Mejàre et al, 1999; Tveit et al, 1999). Information dissemination would be assisted by greater participation in continuing education, but of

the present respondents, only 40% had recently participated in courses in operative dentistry.

Dentist remuneration also distorts the link between treatment need and treatment provided (Audit Commission, 2002). In France, patients pay the dentist by item of treatment provided and then seek reimbursement from an insurance fund. To qualify, the treatment has to be on a list of approved procedures. Restorative treatments are listed, but the low payments (e.g. 1 surface restoration EUR 14.18), make it unlikely that dentists perform fillings out of financial necessity. Professionally-provided preventive care is mostly not eligible for reimbursement, thus discouraging prevention and encouraging operative care (Tubert-Jeannin et al, 1998). Patients who can afford it can receive treatment outside the insurance system; for prosthetic care this is common, but it accentuates social inequity and does not suit preventive care.

These results indicate respondents' treatment thresholds. Most French dentists appear not to postpone restorative interventions until a carious lesion has reached dentine. Moreover, the restorations received by a patient seem to be determined by choice of dentist, rather than by the patient's state of health. Further, the system of payment steers treatment in directions that are not in accordance with modern ideas of caries management nor in the patient's interests. An improved remuneration system is required, so dentists may provide more appropriate care, particularly with respect to maintaining health rather than repairing the damage of disease.

This is the first French study of its kind. It will allow future changes to be monitored and comparisons to be made with similar studies elsewhere. Those findings may also help to sensitize dentists to the issue of the restorative treatment thresholds. A challenge for the future will be to assist dentists to converge their ideas on issues related to diagnosis and treatment of dental caries. This could entail continuing education courses, discussion in teaching institutions or dental organizations and development of guidelines about the modern management of the carious process.

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