ORIGINAL ARTICLE

Treatment method and restorative material preferences of dental practitioners

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ABSTRACT

Objective: The present study is aimed to investigate the preference profiles of treatment methods used by private dental practitioners in Ankara for deep carious lesions of mature permanent teeth. **Methods:** Private dental practitioners (general/specialist), in five districts of Ankara, were provided with a questionnaire comprising demographic characteristics and their preferred treatment methods for two simulated clinical cases related to deep caries excavation technique for anterior (Case A) and posterior, permanent teeth (Case B) with restorative material choices. The questionnaire was delivered personally to the participants who accepted the invitation. Documentation was retrieved back at another appointment after 1–3 weeks intervals. Data were analyzed using frequency analysis and Chi-square tests. **Results:** A total of 371 dentists, aged 25–69 years, took part in the study representing a response rate of 51.38%. Valid responses were 328 (168 males and 160 females) due to incomplete questionnaires. In Case A, complete caries excavation was the preferred treatment method (62.5%) followed by stepwise excavation (28.4%). Dentists, who had an excessive workload, indicated a stepwise excavation treatment significantly less than the dentists who had less workload ($P = 0.001$). In Case B, the preferences were narrowly distributed between complete caries excavation (50.9%) and stepwise excavation (42.4%). Composite restoration (31.7%) was more selected than amalgam (27.1%) with complete excavation technique. Workload has no effect on the treatment options of the posterior tooth with deep dentin caries. **Conclusion:** Dentists mostly adopted traditional caries removal technique. There is no uniform treatment method of deep carious lesions among dentists in anterior and, especially in posterior regions in Ankara, Turkey.

Key words
Deep dentin caries, stepwise excavation, treatment method, total caries excavation

INTRODUCTION

The treatment of deep carious lesions presents a significant challenge to the practitioner because of the risks for the pulpal exposure and postoperative pulpal complications that jeopardizes the vitality of the tooth.[1] The traditional management of deep dentin caries is removing of all infected and affected dentin to prevent further cariogenic activity to provide a well-mineralized base of dentin for restoration.[2]

In recent years, with the advent of dental materials and the subsequent developments in minimal cavity design, this widely accepted principle has been challenged and is now considered as a too destructive method for caries removal.[3,4] It is clear that when the remaining dentin tissue is reduced, the risk of pulp pathology and loss of vitality are higher.[5]

There are several techniques available for removing decayed tissue and restoring the tooth. Currently, other than direct complete caries excavation, two main techniques have been advocated as stepwise excavation and partial caries removal.[6] Stepwise excavation is a technique by which caries is removed in two separate procedures. In the

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first procedure, only the peripheral caries is completely removed, but no attempt is made to remove soft carious dentine on the pulpal wall, due to the risk of pulp exposure.[7] It is suggested that after 2–24 months, the cavity is re-opened, the remaining caries is excavated, and the tooth is restored permanently.[8] Partial caries removal is a technique where incomplete caries removal is followed immediately by placement of a final restoration.[6] In many studies, direct complete caries excavation was the preferred treatment method[9-11] and has been regarded as the gold standard in cavity preparation.[12]

Several studies were published comparing complete or stepwise excavation,[13] or treatment preferences of dentists in the case of deep dentin caries.[9-11] Bjørndal *et al.*[13] tested the effects of stepwise versus direct complete excavation and recommended stepwise excavation approach for managing deep caries lesions. To the best of our knowledge, there was no study about treatment preferences of deep dentin caries of private practicing dentists working in Turkey. In addition, no study has assessed both treatment preferences and a restorative material selected.

The present study is aimed to investigate the preference profiles of caries removal methods used by private dental practitioners in Ankara for vital and nonsymptomatic permanent anterior, premolar, and molar teeth with deep carious lesions. In addition, evaluation of the restoration material preferences of dentists in posterior region for complete caries removal was tried to be revealed.

METHODS

This study used the data of a questionnaire to evaluate the preference profiles of private dental practitioners in Ankara, the capital of Turkey. This descriptive survey was reviewed and approved by the Committee of the Ethics of Noninterventional Human Experimentation. Verbal consent procedure was approved by the Ethics Committee, and informed verbal consents for the interviews were obtained from all participants after providing a clearly explained study protocol. This research has been conducted in full accordance with the "World Medical Association Declaration of Helsinki."

Pilot study

Prior to the application of the study, the questionnaire was provided to 10 dental lecturers working at the Department of Restorative Dentistry, Faculty of Dentistry. Then, a pilot study was performed with 20 dentists to test its suitability in Kirikkale, a neighbor city of Ankara. After evaluating the responses received from the dentists, the questionnaire was considered appropriate to be used in this survey.

This study was conducted in five central districts of Ankara (Keçiören, Çankaya, Altındağ, Yenimahalle, Mamak), where 1077 private practitioners have been residing. A 155 practitioners were excluded because they were no longer practicing clinical activities, and 148 were excluded because they refused participation, and 27 were not included because the questionnaires were not retrieved back. One hundred and seventy-six dentists could not be approached following 1–3 visits.

General dental practitioners and specialists (a dentist with a Ph.D. degree is recognized as a specialist) were reached by phone at their dental practices, where they currently work and were invited to participate. Instead of face-to-face meetings during first visits, a structured questionnaire was delivered personally to the participants who accepted the invitation. Documentation was retrieved back at another appointment after 1–3 weeks intervals. If they failed to provide information after three on-site visits, the dentists were excluded from the study. The obtained information was kept confidential and anonymous during data processing.

The questionnaire asked for the following information: Dentist identification, including sex, age, graduation year, and educational qualifications (general dental practitioner or specialist). In this part of the questionnaire, participants were asked to answer treatment assessment and justification for two simulated clinical cases; the simulated clinical cases were composed of young patients with no complex medical history or use of medications, reporting the occurrence of pain provoked by chewing or by cold in posterior teeth as their main complaint. Descriptions of the physical examination and periapical radiographs were also explained. The teeth were one permanent anterior (Case A) and one permanent molars (Case B) with the following descriptions: Primary deep carious lesion (lesion depth >2/3 of dentinal thickness, radiographically assessed); presence of soft, wet, and yellowish or brownish dentin; positive pulp sensitivity tested by electrical stimulation; no sensitivity to percussion; no history of spontaneous pulpal pain; and absence of apical pathosis observed through radiographic examination. When complete caries excavation was picked, Case B divided into two subgroups as Case B1 representing complete caries excavation accompanied with permanent composite resin restoration, and B2 representing complete caries excavation accompanied with permanent amalgam restoration. The answers were classified and coded by one investigator (UKV), checked by the senior researcher (SG) and by the epidemiologist (BGD).

Statistical methods

Statistical analyses were conducted using the SPSS Statistics (21.0 IBM SPSS statistics, version 21.0; IBM Corp., Armonk, NY, USA) computer program. A Chi-square test was used to analyze the differences between responses for each clinical case. $P = 0.05$ was considered as significant.

RESULTS

A total of 371 dentists took part in the study representing a response rate of 51.38%, but 43 dentists excluded from the study due to in completed questionnaires. Workload and lack of time were the reason given for not responding questionnaire. Overall, the completed questionnaires were obtained from 328 dentists (160 women and 168 men), aged 25–69 years; 28.4% of them were specialists.

Case A

Ten participants who indicated that they never performed restorative treatments were excluded from the statistical analyses. Younger dentists who have been actively working for 11–20 years (P = 0.012) and female dentists (P = 0.012) significantly indicated the complete caries excavation treatment. Overall, the most commonly indicated procedure was complete caries excavation, followed by stepwise excavation, root canal therapy, and pulp therapies (direct/indirect pulp capping, and deciduous restoration). However, 7.6% of the respondents reported performing root canal therapy [Table 1]. Dentists, whose workload is in excess, indicated a stepwise excavation treatment significantly less than the dentists who had less workload (P = 0.001).

Case B

Table 2 shows the proposed treatments for Case B. The percentage of total caries excavation (50.9%) which is the most commonly indicated method with composite resin or amalgam restoration that is followed by stepwise excavation, root canal therapy, and pulp therapies (direct/indirect pulp capping, and deciduous restoration). The experience was the only variable influencing treatment decision. Dentists, working actively more than 20 years, indicated total caries excavation with amalgam restoration significantly less than composite restoration (P = 0.007) and chose stepwise excavation treatment more than other treatment options (P = 0.009).

However, there was no significant relationship between workload and choosing of stepwise caries excavation (P = 0.457).

Table 1: Association between independent variables and treatment indications for Case A (Ankara 2013)

	Treatments *n* (%)			
	Complete caries excavation + permanent restoration	Stepwise excavation	Root canal therapy	Complete caries excavation + decidious restoration
Sex				
Male	89 (55.6)	53 (33.1)	13 (8.1)	1 (0.6)
Female	116 (69.0)	40 (23.8)	12 (7.1)	3 (1.8)
Specialist				
No	169 (63.3)	77 (28.8)	24 (9.0)	4 (1.5)
Yes	36 (59.0)	16 (26.2)	1 (1.6)	-
Experience (year)				
≤10	91 (67.4)	33 (24.4)	6 (4.4)	-
11-20	64 (69.6)	17 (18.5)	9 (9.8)	3 (3.4)
21-30	36 (51.4)	30 (42.9)	8 (11.4)	-
≥31	14 (45.2)	13 (41.9)	2 (6.5)	1 (3.4)
Total*	205 (62.5)	93 (28.4)	25 (7.6)	4 (1.2)

*Participants, reported never performing restorative treatments, excluded from the analyses (n=10). Multiple responses are available

DISCUSSION

Although data, for the year of 2012 including telephone number and contact information of private practicing dentists, was provided by the Turkish Dental Association for five districts of Ankara city, approximately one-third of practitioners had not been approached initially. Therefore, it is reasonable to assume that the present sample, with a response rate of 51.38%, might be representative for making conclusions about treatment preferences of deep caries among dentists of Ankara.

Several studies have been conducted to examine the response of pulp to different treatment modalities. Orhan *et al.*[14] conducted a clinical study comprising 154 teeth that had deep carious lesions with no preoperative signs and symptoms of irreversible pulpitis. They found a statistically significant difference between indirect pulp therapy and direct complete excavation groups in terms of pulp exposure and reported indirect pulp therapy in both primary and young permanent teeth can be used successfully with a one or two visit approach. Bjørndal *et al.*[13] tested the effects of stepwise versus direct complete excavation. One year after the procedure had been carried out in 314 adults; they recommended stepwise excavation approach for managing deep caries lesions. Leksell *et al.*[15] assessed the prevalence of pulp exposure after stepwise versus direct complete excavation of permanent posterior and reported that the difference was statistically significant. A Cochrane review,[16] published in 2006, indicated that no evidence of incomplete caries removal is deleterious. However, although a stepwise approach should be advocated in young patients that have teeth with large pulps, the need to re-enter the cavity must be questioned.

The present study showed that most clinicians continue to follow the principles of traditional operative dentistry by removing all softened dentin using complete caries excavation technique before the final restoration. Nevertheless, complete caries excavation was indicated for about 62.5% of Case A, followed by stepwise excavation (28.4%). In Case B, complete caries excavation was 50.9%, and stepwise excavation was 42.4%.

In literature, conflicting results were reported on treatment preferences of deep dentin caries in the

Table 2: Association between independent variables and treatment indications for Case B (Ankara 2013)

	Treatments *n* (%)				
	Complete caries excavation + composite resin restoration	Complete caries excavation + amalgam restoration	Stepwise excavation	Root canal therapy	Complete caries excavation + deciduous restoration
Sex					
Male	43 (26.9)	37 (23.1)	76 (47.5)	13 (8.1)	1 (0.6)
Female	61 (36.3)	52 (31.0)	63 (37.5)	6 (3.6)	4 (2.4)
Specialist					
No	80 (30.0)	76 (28.5)	121 (45.3)	18 (6.7)	5 (1.9)
Yes	24 (39.3)	13 (21.3)	18 (29.5)	1 (1.6)	-
Experience (year)					
≤10	44 (32.6)	39 (28.9)	57 (42.2)	8 (5.9)	4 (3.0)
11-20	33 (35.9)	34 (37.0)	28 (30.4)	6 (6.5)	-
21-30	20 (28.6)	13 (18.6)	35 (50.0)	3 (4.3)	-
≥31	7 (22.6)	3 (9.7)	19 (61.3)	2 (6.5)	1 (3.2)
Total*	104 (31.7)	89 (27.1)	139 (42.4)	19 (5.8)	5 (1.5)

*Participants, reported never performing restorative treatments, excluded from the analyses. Multiple responses are available

absence of pulpal exposure and no symptoms. A study from the US[10] showed that complete caries excavation was still preferred by 62%, and partial caries excavation was used by 18% among the American respondents. A study from Southern Brazil[11] reported that the most commonly indicated procedure was direct complete excavation in posterior region (71.1%), followed by stepwise excavation (17.6%). These results did not correlate with the results of the present study. However, partly comparable results with the present study were observed in a study published in 2013 evaluating the Northern Norway dentist population.[9] In this survey, 49% of respondents would use complete caries excavation method whereas 45% would use stepwise excavation.

Although direct complete excavation appears to be a single appointment intervention, which, therefore, makes it the choice procedure of government and public health professionals,[13,15,17] the poor prognosis and the consequent need for endodontic treatment should be matters taken into account by practitioners. Endodontic treatment, besides being a more invasive and radical therapy, is a complex, costly, and protracted procedure that demands the use of more advanced technology and specialized training. However, 25 dentists indicated root canal therapy for Case A and 19 for Case B. Statistical data obtained from the Turkish Dental Association[18] (in 2012) show that the public health services performed 5.6% root canal therapies of all dental procedures. This limited access to secondary care in the public health service could be one of the reasons for the high prevalence of tooth loss observed in Turkey. Tooth extraction was 22.79% of all dental procedures in 2012.[13]

Stepwise excavation represents an alternative to avoid pulp exposure and its consequences.[15,17] Although this technique has been described and investigated scientifically for over 30 years, it has not fully been implemented in daily clinical practice.[10] In the present study, almost an equal proportion of private dental practitioners indicated stepwise excavation in the posterior region. However, clinical experience reveals the difficulties in clearly explaining the treatment protocol, the doubt of the patients against reliability of the treatment because of the remaining carious tissue on the pulpal wall and unwillingness to sign the informed consent form. Necessity of a second appointment and for which not returning to the dental office to receive the definitive restoration leads to deterioration of the temporary filling and consequent caries progression over time and also the need of cavity reopening for additional excavation accompanied with increased cost to the patient and unwillingness to pay are some of the disadvantages leads to why not preferred to this procedure.

Clinical trials with long-term follow-up periods have demonstrated that cavity sealing is an extremely important factor for the success of these techniques, regardless of the material used.[19-21] A study from Scandinavia indicated that, in posterior region, different restorative materials could be used for final restoration in different areas; the composite resin is the predominant material of choice in Sweden while in Denmark the majority of dentists preferred amalgam.[22] Only composite or in combination with glass ionomer cement was the choice of almost 80% of Norwegian dentists.[22] A study conducted in Northern Saudi Arabia showed that posterior composites were not popular among general dental practitioners.[23] The present study indicated that composite restoration was more preferred than amalgam. Dentists with active working time more than 20 years significantly less likely prefer an amalgam restoration followed by complete caries excavation and more likely to choose a stepwise excavation treatment. Although most of the studies have concluded that amalgam is safe[24,25] throughout the world, efforts are underway to phase down or eliminate the use of dental amalgam.[26]

The present study showed that the workload had no effect on the treatment options of posterior tooth with deep dentin caries. It was reported that treatment preferences were affected by the clinical experience of dental practitioners.[16] Year of experience influenced treatment decisions. Experienced dentists indicated treatments based on the latest scientific evidence regarding caries excavation. This finding demonstrates the importance of following contemporary knowledge in daily clinical practice, especially among experienced dental practitioners.

In the clinical decision-making process, not all dentists will make the same decisions when faced with the same clinical situation.[27,28] These differences among professionals are commonly accepted and described as natural variations in dentists' clinical judgments. Variations in dentists' clinical decisions and their consequences have encouraged the development of guidelines that aim to reduce variation and assure the quality of care to any patient. There are recent and continuous changes in knowledge of the caries treatment process, which is transformed every day by new scientific evidence, affecting how dentists make decisions about its diagnosis and management.

CONCLUSION

The dentists participated in this study, adopted traditional caries removal technique but pretty much stepwise excavation preference response rate concludes the confidence, especially among the experienced dentists who have been shown to favor partial caries removal was adopted.

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Conflicts of interest

There are no conflicts of interest.

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