

# Assessment of knowledge, attitude, and practice regarding Deep Margin Elevation (DME) among dental practitioners in Riyadh, Saudi Arabia

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## ABSTRACT

**Objectives:** To evaluate Knowledge, Attitude, and Practice (KAP) regarding deep margin elevation (DME) among dental practitioners in Riyadh city. **Materials and Methodology:** A cross-sectional study that comprised a total number of 535 dental practitioners: 255 (47.7%) were males and 280 (52.3%) females. A self-constructed 21 close-ended self-administered questionnaire was utilized in the study. The data were entered and analyzed by Chi-square test and descriptive analysis using Statistical Package for the Social Sciences (SPSS) software. **Results:** Although the majority of the respondents have heard about DME, only 30.4% have utilized this technique in their clinical practice by having general practitioners and specialists utilize this technique more often than consultants. Among the participants, 65.4% of them have agreed that adhesion by bonding to deep cervical dentin is predictable and related to the success of the final restoration. **Conclusion:** The knowledge level of DME among the study participants was adequate. The findings of this study revealed that the total number of dentists who utilize the technique in restoring large subgingival defects of posterior teeth with proximal caries is very minimal. Thus, it is recommended that dental practitioners have this technique introduced in their dental clinics as an alternative to surgical crown lengthening. Although years of experience and dentist rank may influence the clinical decision, in-depth factorial analysis with a greater sample size is necessary.

**Keywords:** Acceptance, attitude, cervical margin relocation, coronal margin relocation, deep margin elevation, knowledge, proximal box elevation, Riyadh, Saudi Arabia

## Introduction

One of the most common clinical scenarios observed nowadays is restoring large subgingival defects of posterior teeth with proximal caries below the cemento-enamel junction (CEJ).<sup>[1]</sup> The two main problems that may occur when restoring such

defects are related to biological nature and technical-operative obstacles.<sup>[2]</sup> It challenges the clinician in tooth isolation and cementing indirect restorations.<sup>[3]</sup> Using a direct adhesive restoration for large defects is not considered as an ideal solution. However, the use of indirect bonded restorations in localized subgingival margins might be complicated due to insufficient isolation resulting in difficulties in impression taking and luting.<sup>[4,5]</sup>

In the past, large deep carious lesions in posterior teeth were used to be restored with amalgam restorations.<sup>[6]</sup> Most dental procedures had shifted towards a more conservative approach

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over the last few decades.<sup>[7]</sup> Indirect all-ceramic restoration is an alternative restorative material to amalgam, gold, and metal-ceramic restorations. In 1993, a new non-invasive technique known as coronal margin relocation, cervical margin relocation (CMR), proximal box elevation (PBE), or deep margin elevation (DME) were introduced by Dietschi and Spreafico.<sup>[7-9]</sup> This technique was utilized to simplify clinical procedures and to make them less vulnerable to faults. It is a useful substitute for surgical crown lengthening. DME involves immediate dentin sealing and elevating the deep gingival margin of a cavity coronally using flowable composite as a base layer after placing a modified Tofflemire matrix. Furthermore, this technique allows the placement of large direct composite resin restorations.<sup>[10]</sup> It is similar to the idea of the conventional open sandwich technique as the main purpose of both procedures is to facilitate placing the restoration in subgingival cavities by elevating the cervical margin coronally.<sup>[11]</sup>

It was concluded by a study designed to assess the effect of DME on marginal adaptation of ceramic inlays that marginal integrities in teeth treated by DME did not differ from margins of ceramic inlays placed in dentin.<sup>[12]</sup> The clinical and histological outcomes of the procedure are favorable, and thus it allows a routine use in reconstructive dentistry.<sup>[13]</sup> In 2015, Ilgenstein *et al.*<sup>[14]</sup> stated that “proximal box elevation (PBE) had no impact on either the marginal integrity or the fracture behavior of root canal-treated mandibular molars restored with feldspathic ceramic onlays.”

Moreover, it was proved that having well contoured and finished filling margins, in addition to good oral hygiene, are important factors that should be considered to prevent harming or damaging the periodontium surrounding resin composite restorations that are placed subgingivally.<sup>[12]</sup>

Although this paradigm shift in restorative dentistry has various advantages, doubts still linger if they are effectively being practiced in the dental clinics. There is no evidence available in the literature on the assessment of the knowledge, attitude, and practice regarding deep margin elevation among dental practitioners in Riyadh. Therefore, the purpose of this study is to assess the level of knowledge, attitude, and practice toward DME for managing deep proximal caries among dental practitioners in Riyadh.

## Materials and Methods

### Study design

A cross-sectional study was conducted among dental practitioners in the city of Riyadh, Saudi Arabia, over five months (from November 2019 to March 2020). A pilot study was performed among a small group of clinical dentists to test the validity and quality of the questions. The questionnaire items were then analyzed to evaluate the level of difficulty in understanding, interpreting, and answering correctly.

A convenient sampling technique was utilized for the selection of dentists. A self-constructed 21 close-ended paper-based

self-administered questionnaire (Appendix A) written in English was distributed to all the participants and later collected by hand.

The questionnaire was divided into four main categories: socio-demographic characteristics, the knowledge, attitude, and practice of dental practitioners towards the DME technique. The questionnaire was composed of six questions assessing the knowledge of dental practitioners on DME, five questions on their attitude, and five questions on their practice towards DME. The last part of the questionnaire consisted of four different clinical scenarios with clinical photographs and radiographs showing teeth with varying marginal levels due to extensive carious lesions to assess their practice towards such cases.

### Study participants

#### Inclusion criteria

The inclusion criteria of this study included dental practitioners, males and females, who were able to read English literature, working in Riyadh, without any mental or physical disabilities, and with at least one year of experience. Moreover, the inclusion criteria also included general dentists and specialists either working in a private or government sector.

#### Exclusion criteria

Dental practitioners who were English illiterate, not working in the city of Riyadh, and with experience less than one year were excluded from the study.

### Ethical approval

The study was reviewed and approved by the Institutional Ethical Committee at Riyadh Elm University, Riyadh, Saudi Arabia (FUGRP/2019/117/152/148). All the participants were informed that participating in the questionnaire will be anonymous and all the information recorded will be kept strictly confidential and will be used for research purposes only. The approval from the ethics committee is obtained (Date of approval 4 April 2020).

### Statistical analysis

Statistical Package for the Social Sciences (SPSS) software, version 21, was used in the analysis of data. A descriptive analysis was carried out to establish a general understanding of the study population. Categorical variables were reported in frequencies and percentages. Chi-square test was employed to examine there is any correlation between demographic variables and the participants' knowledge, attitude and practice. The significance was judged at *P* value less than 0.05.

## Results

Out of the 535 respondents, 52.3% were male and 47.7% were female. Most of the participants were Saudis (60.2%) and 39.8% were non-Saudis. Most of the respondents were specialists (41.1%), followed by general practitioners (35.5%) and consultants (23.4%). The majority of the respondents worked in private sectors (77.9%) and only 22.1% worked in

the government sector. Most of them worked in the north of Riyadh (43.4%), followed by Central of Riyadh (33.5%), and the rest were equally distributed between East and West of Riyadh. Most of the respondents had less than five years of experience (37.9%) and about 35.3% and 20.4%, respectively, had 5–10 years and 11–20 years of experience. Only 6.4% of the respondent have been working for more than 21 years.

Table 1 describes the responses of the participants towards DME knowledge. The finding showed that the majority of the respondents (66.9%) were aware of the DME. Out of 535 respondents, 65.4% agreed that adhesive bonding to deep cervical dentin is predictable and related to the success of final restoration, 48.2% agreed that there is no difference in the marginal adaptation of the restorations placed directly on subgingival margin, and 67.7% agreed that the biological width is a factor that should be known before performing DME. The majority of the respondents stated that bitewing radiograph should be taken to evaluate the adaptation at the gingival area (85.4%) and 2 mm is considered as the minimum biological width to be applicable for any marginal elevation procedure (76.6%).

There was a statistically significant association between the status of practitioners and the choice of radiograph type to evaluate the gingival area ( $p = 0.033$ ). Meanwhile, there were statistically significant associations between years of experience and the choice of radiograph type ( $p = 0.033$ ) and between years of experience and the decision of using DME based on the biological width ( $p = 0.016$ ).

Attitude towards DME was assessed by asking five questions. Out of 535 respondents, 55% agreed that fracture resistance will be compromised in the case of DME, while 66.2% believed that surgical apical displacement of the tooth-supporting tissues to expose the gingival margins leads to complications. However, only 39.8% of the respondents think that DME should be

performed before endodontic treatment, while the majority opted for post endodontic treatment. Moreover, 67.1% recommend supragingival restoration margin for performing a safe and clean bonded indirect restoration for posterior teeth and only 18.9% suggested equigingival restoration. The majority of the respondents think that DME is performed on posterior and anterior teeth (51%) although 41.3% chose posterior teeth only.

There was a statistically significant association between the status of practitioners and the belief that explosion of the gingival margins from surgical apical displacement of the tooth-supporting tissues may lead to complications ( $p = 0.003$ ), and also between the status of practitioners and performance preference of DME ( $p = 0.015$ ). Table 2 reveals a statistically significant association between years of experience and performance preference of DME ( $p < 0.001$ ) and between years of experience and restoration margin recommendation for performing a safe and clean bonded indirect restoration for posterior teeth ( $p < 0.001$ ).

Regarding the practice assessment towards DME based on five questions, the majority of the respondents, ( $n = 339$ , 63.4%) had never used DME. However, given the second scenario presented in the questionnaire, most of the respondents reported that they would choose DME compared to others (38.9%). Meanwhile, for the first scenario and the third scenario, 71.6% and 40.6%, of the respondents, respectively, preferred final restoration without any additional procedure and crown lengthening. In the fourth scenario, the majority of the respondents opted for extraction (44.1%) rather than crown lengthening (35.7%).

There is a statistically significant association between the status of practitioners and the choice of treatment for the second scenario ( $p = 0.007$ ). Meanwhile, there were statistically significant association between the years of experience and performing DME ( $p < 0.003$ ), between the years of experience and the

**Table 1: Knowledge assessment regarding DME**

Variables		n (%)
Have you ever heard of deep marginal elevation/cervical margin elevation?	Yes	358 (66.9)
	No	177 (33.1)
Adhesive bonding to deep cervical dentin is predictable and related to the success of the final restoration.	Agree	350 (65.4)
	Disagree	101 (18.9)
	I don't know	84 (15.7)
There is no differences in the marginal adaptation of the restorations placed directly on subgingival (deep) margins.	Agree	258 (48.2)
	Disagree	183 (34.2)
	I don't know	94 (17.6)
What type of radiograph should be taken to evaluate the adaptation at the gingival area?	Panoramic radiograph	19 (3.6)
	Periapical radiograph	59 (11.0)
	Bitewing radiograph	457 (85.4)
The space between margin and the alveolar crest (biological width) is a factor that should be known before deciding using DME.	Agree	362 (67.7)
	Disagree	76 (14.2)
	I don't know	97 (18.1)
What is the minimum standard biological width to be applicable for any procedure?	0.5 mm	19 (3.6)
	1 mm	106 (19.8)
	2 mm	410 (76.6)

**Table 2: Attitude assessment of DME in relation to years of experience**

Variables		Years of Experience n (%)				P
		1-5 years	6-10 years	11-20 years	≥21 years	
Fracture resistance will be compromised in case of Deep Margin Elevation (DME)	Agree	112 (20.9)	104 (19.4)	56 (10.5)	22 (4.1)	0.632
	Disagree	46 (8.6)	46 (8.6)	22 (4.1)	5 (0.9)	
	I don't know	45 (8.4)	39 (7.3)	31 (5.8)	7 (1.3)	
Surgical apical displacement of the tooth supporting tissues to expose the gingival margins may lead to complications such as attachment loss.	Agree	132 (24.7)	119 (22.2)	82 (15.3)	21 (3.9)	0.127
	Disagree	31 (5.8)	32 (6.0)	9 (1.7)	9 (1.7)	
	I don't know	40 (7.5)	38 (7.1)	18 (3.4)	4 (0.7)	
When do you think DME should be performed?	Before endodontic treatment	58 (10.8)	87 (16.3)	47 (8.8)	21 (3.9)	<0.001
	After endodontic treatment	145 (27.1)	102 (19.1)	62 (11.6)	13 (2.4)	
What is the most recommended restoration margin for performing a safe and clean bonded indirect restoration for posterior teeth?	Equigingival	39 (7.3)	33 (6.2)	23 (4.3)	6 (1.1)	<0.001
	Supragingival	151 (28.2)	129 (24.1)	64 (12.0)	15 (2.8)	
	Subgingival	13 (2.4)	27 (5.0)	22 (4.1)	13 (2.4)	
On which teeth is DME most preferably performed?	Posterior teeth	96 (17.9)	71 (13.3)	45 (8.4)	9 (1.7)	0.238
	Anterior teeth	15 (2.8)	16 (3.0)	8 (1.5)	2 (0.4)	
	Both	92 (17.2)	102 (19.1)	56 (10.5)	23 (4.3)	

choice of treatment for the second scenario, the third scenario and the fourth scenario with  $P < 0.001$ ,  $P = 0.001$  and  $P < 0.001$ , respectively.

## Discussion

The dental treatment in today's modern society has been shifting toward a more esthetic and conservative approach due to the public's demand and desire.<sup>[15]</sup> Although there has been a paradigm shift in restorative dentistry, dental practitioners are still being challenged in restoring deep subgingival carious lesions. This study evaluated the practitioners' knowledge, attitude, and practice towards DME. The results of this study revealed that more than half of the participating dental professionals had heard about DME and only 30% of the dental practitioners in both government and private sectors have utilized this technique in their dental clinics. This result highlights the fact that DME is still a relatively new technique introduced in dental clinics for most practitioners, although it has been present in the literature for a long period. A study conducted in 2019 reported that further follow up is required for indirect restorations placed on teeth with DME while high survival rates have been recorded. This is because dental restorations need a long time to be degraded.<sup>[16]</sup> Also, only a few studies reported the success rate of using this technique clinically earlier.<sup>[5]</sup>

According to Sarfati and Gil,<sup>[7]</sup> there is little scientific evidence available on the periodontium reaction to different restorative materials. It has been suggested that teeth with subgingival restorations undergo increased attachment loss slowly and this loss is detected within a few years following the placement of the restorations.<sup>[17]</sup> In this study, nearly more than half of the participants have agreed upon the fact that surgical apical displacement of the periodontium to expose the gingival margins may lead to complications such as clinical attachment loss. This is with an agreement with many available published literature.<sup>[4,18]</sup>

Besides, 67.7% of the respondents agreed that the biological width or what is lately introduced by the new classification scheme for

periodontal and peri-implant diseases and conditions as *supracrestal attached tissues*<sup>[19]</sup> is a main factor that should be considered when deciding to perform DME. Most of the dental practitioners in the present study considered 2 mm as the minimum standard biological width to be applicable for any restorative procedure. Evidence has suggested that the average biological width is 2.04 mm, representing the sum of the connective tissue (mean value: 1.07 mm) and the epithelium with a mean value of 0.97 mm.<sup>[20,21]</sup> The biological width is a factor that should be respected while performing any procedure to avoid inflaming the periodontium which may lead to gingivitis or periodontitis.<sup>[7]</sup>

The findings of this study revealed that more than half (67.1%) of the participating practitioners have chosen supragingival finish line as the most recommended restoration margin for performing a safe and clean bonded indirect restoration in posterior teeth. The location of the restoration margin plays an important role in both the longevity and structural integrity of a restoration. The finish line could be subgingival, equigingival, or supragingival. Tooth preparations extending subgingivally are not recommended as it violates the supracrestal attached tissues (biological width) and traumatizes the surrounding periodontal tissues. As Khuller and Sharma<sup>[22]</sup> state, "from a periodontal viewpoint, both supragingival and equigingival margins are well tolerated."

It has been reported by a study published in 2018 that DME shows promising results and benefits on the structural and marginal integrity of CAD/CAM fabricated ceramic inlays.<sup>[23]</sup> The present study indicated that using DME in tooth preparations that extend below the CEJ would still maintain the structural integrity of ceramic inlays.

In the presented clinical scenarios of this study, most respondents have selected the most conservative treatment modality in treating proximal boxes in posterior teeth that are located below the gingival level. Similar findings were reported by a study conducted in India<sup>[24]</sup> which indicated that dentists have moved towards a conservative approach by following minimally invasive

dentistry (MID) in caries management. Thus, it is advisable that all dental practitioners to be conservative by performing DME whenever feasible. DME not only elevates the gingival margin of subgingival preparations, but it also provides immediate dentin sealing (IDS) which produces a reinforced complex interphase of collagen fibril. Other advantages of this technique include improved retention, less marginal leakage, increased bond strengths, and reduced sensitivity.<sup>[25]</sup>

## Conclusion

The knowledge level of DME among the respondents of this study was adequate. The results of this study revealed that a few dentists had utilized the technique in restoring large subgingival defects of posterior teeth with proximal caries. Thus, it is recommended that dental practitioners have this technique introduced in their dental clinics as an alternative to surgical crown lengthening. Although years of experience and dentist rank may influence the clinical decision, in-depth factorial analysis with a greater sample size is necessary. Further studies needs to be conducted in order to discourage the use of this technique in clinical practice as there is few clinical data available.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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## Appendix A: The questionnaire

### 1- Gender

- A. Male
- B. Female

### 2- Nationality

- A. Saudi
- B. Non Saudi

### 3(a)- Occupation

- A. General Practitioner (GP)
- B. Specialist
- C. Consultant

### 3(b)- If you are a specialist or consultant, from where have you granted the postgraduate specialization certificate?

- A. Saudi Board/Arab Board
- B. North America
- C. Europe
- D. Australia and New Zealand
- E. Japan and Eastern Asia

### 4- Workplace

- A. Government
- B. Private

### 5- Area of workplace

- A. Central of Riyadh
- B. North of Riyadh
- C. West of Riyadh
- D. East of Riyadh

### 6- Years of experience

- A. 1-5 years
- B. 6-10 years
- C. 11-20 years
- D. More than 21 years

### 7(a)- Have you ever heard of deep marginal elevation/ cervical margin elevation?

- A. Yes
- B. No

### 7(b)- If yes, have you ever used the technique?

- A. Yes
- B. No

### 8- Adhesive bonding to deep cervical dentin is predictable and related to the success of the final restoration.

- A. Agree
- B. Disagree
- C. I do not know

### 9- There is no differences in the marginal adaptation of

the restorations placed directly on subgingival (deep) margins.

- A. Agree
- B. Disagree
- C. I do not know

### 10- Fracture resistance will be compromised in case of Deep Margin Elevation (DME).

- A. Agree
- B. Disagree
- C. I do not know

### 11- What type of radiograph should be taken to evaluate the adaptation at the gingival area?

- A. Panoramic radiograph
- B. Periapical radiograph
- C. Bitewing radiograph

### 12- Surgical apical displacement of the tooth supporting tissues to expose the gingival margins may lead to complications such as attachment loss.

- A. Agree
- B. Disagree
- C. I do not know

### 13- When do you think DME should be performed?

- A. Before endodontic treatment
- B. After endodontic treatment

### 14- The space between margin and the alveolar crest (biological width) is a factor that should be known before deciding using DME.

- A. Agree
- B. Disagree
- C. I do not know

### 15- What is the minimum standard biological width to be applicable for any procedure?

- A. 0.5 mm
- B. 1 mm
- C. 2 mm

### 16- What is the most recommended restoration margin for performing a safe and clean bonded indirect restoration for posterior teeth.

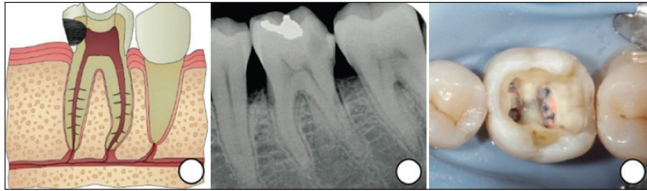
- A. Equigingival
- B. Supragingival
- C. Subgingival

### 17- On which teeth is DME most preferably performed?

- A. Posterior teeth
- B. Anterior teeth
- C. Both

**18- Scenario 1:**

A 51 years old male otherwise healthy presented to dental clinic with a chief complaint of constant pain in lower right molar area. Clinical and radiographic examination had revealed occluso-distal caries affecting tooth 36. Additional canal in the distal root had been observed. Tooth was also diagnosed with irreversible pulpitis and root canal treatment was planned. Upon preparation, distal cavity margin was above the gingival sulcus.



Source: Dablanca-Blanco *et al.*, 2017

**What would be your treatment of choice:**

- A. Final restoration without any additional procedure
- B. Deep margin elevation (DME)
- C. Gingivectomy
- D. Crown lengthening
- E. Extraction

**19- Scenario 2:**

A 53 years old female otherwise healthy, presented to dental clinic with a chief complaint of pain associated with chewing in right lower molar area. Clinical examination indicated that tooth 36 was sensitive to percussion. Radiographic examination showed apical radiolucency at the distal root. Tooth was diagnosed with acute apical periodontitis. The margin was located within the gingival sulcus.



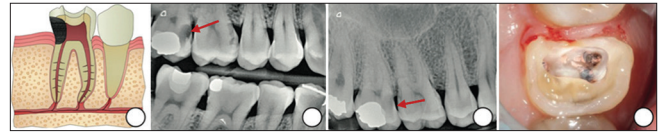
Source: Dablanca-Blanco *et al.*, 2017

**What would be your treatment of choice:**

- A. Final restoration without any additional procedure
- B. Deep margin elevation (DME)
- C. Gingivectomy
- D. Crown lengthening
- E. Extraction

**20- Scenario 3:**

A 33 years old female otherwise healthy, presented to dental clinic with a chief complaint of right maxillary molar area. Radiographic examination had shown secondary mesial caries in tooth 17 under old amalgam restoration, and caries in mesial of tooth #16 can be seen. As a result of diagnostic tests, irreversible pulpitis was diagnosed for tooth #17. The margins of the healthy tissue of the cavity were found to be completely subgingival.



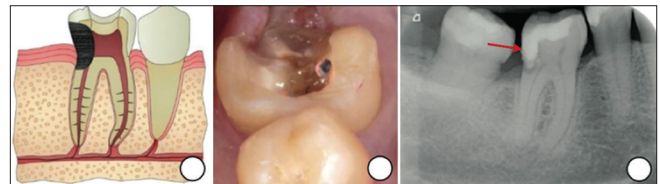
Source: Dablanca-Blanco *et al.*, 2017

**What would be your treatment of choice:**

- A. Final restoration without any additional procedure
- B. Deep margin elevation (DME)
- C. Gingivectomy
- D. Crown lengthening
- E. Extraction

**21- Scenario 4:**

A 55 years old female otherwise healthy, presented to dental clinic with a chief complaint of acute pain in right mandibular molar area. Periapical radiograph had shown, the presence of a class II extensive restoration of tooth #46 distally filtered and secondary caries reaching the bone crest and the pulp chamber can be seen. Irreversible pulpitis was diagnosed. The distal margin of the cavity is completely at the bone level.



Source: Dablanca-Blanco *et al.*, 2017

**What would be your treatment of choice:**

- A. Final restoration without any additional procedure
- B. Deep margin elevation (DME)
- C. Gingivectomy
- D. Crown lengthening
- E. Extraction