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Dentistry Section

Concepts and Perception of Restoring Endodontically Treated Teeth among Dental Practitioners in Western Region of Saudi Arabia- A Questionnaire Based Study

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ABSTRACT

Introduction: Endodontically Treated Teeth (ETT) are most likely to get fractured, if left unrestored compared with the vital teeth due to the loss of tooth structure and reduced modulus of elasticity.

Aim: To gain insight into the rationale for choice of endodontic posts and the different endodontic post systems currently used by dental practitioners in western region of Saudi Arabia.

Materials and Methods: For this survey-based study, a questionnaire was designed consisting of eight questions to assess the details of why, when and how general practitioners restore ETT and to determine contemporary use of endodontic post from first November 2018 till the end of January 2019. This questionnaire was sent online to 250 private dental practitioners in western region of Saudi Arabia, out of which 202 participants responded. Data was entered in the excel sheet. Descriptive statistics like frequency and proportion was calculated for qualitative data.

Results: This study included 202 participants with the mean age group of 25-50 years, out of which there were 108 (53.46%) male participants and 94 (46.53%) female participants. Total 120 (59%) of the study sample were general practitioners and 82 (41%) of them were specialists. A total 60 (29.70%) of the general practitioners, reported restoring ETT with post and core followed by the crown, whereas, 30 (14.85%) of them did the crown without post, 15 (7.42%) of them completed restoration with composite and 15 (7.42%) of them did build-up with post and core. An 82 (40.59%) of the specialists, reported restoring ETT with post and core build-up and then proceed with crowns. An 80 (39.60%) of the study sample were into general practice, reported using prefabricated fibre post whereas, 23 (11.38%) of them using cast post and 17 (8.41%) of them using prefabricated metal posts. Total 72 (35.64%) of the specialists reported using prefabricated fibre posts and 10 (4.95%) of them used cast metal post.

Conclusion: Based on the results of the study, it can be concluded that majority of the participants practiced reinforcement of ETT by using fibre posts with resin cements followed by crowns.

Keywords: Cast post, Fibre post, Peeso reamer, Resin cements

INTRODUCTION

Endodontic treatment is largely performed on teeth significantly affected by caries, multiple restorations or fractures. Such teeth are often further weakened by the endodontic procedure and loss of inherent dentinal fluid may also affect the tooth properties. That is why restorative procedures are often necessary to rebuild the tooth [1]. Restoring normal occlusion and function of the tooth after endodontic treatment is very important since, it tends to fracture due to extensive loss of tooth structure and is weaker than a vital tooth [2]. Certain factors affect the selection of restoration of ETT. The most important factors are amount of remaining coronal tooth structure, position of the tooth in the dental arch and whether it serves as an abutment for removable or fixed prosthesis [3,4].

Teeth with minimal coronal damage (more than 50% of tooth remaining) require only direct composite restoration to fill the endodontic access cavity [5]. The usual method of restoring ETT is to do the procedure called as post and core. Post is a dental restorative material, which is placed in the root of extensively damaged tooth and provides additional retention and helps to retain the core build-up [6,7].

Preservation of radicular dentin is important, so there should be minimal enlargement of the canal beyond the shape that was developed during root canal instrumentation. In most cases, it is best that the clinician who performs the root-canal treatment also prepares the post space, because that person is intimately familiar with the canal anatomy. Gutta-percha (root canal filling) can be removed with the aid of heat or chemicals, but most often the easiest and most efficient method is with rotary instruments [8]. A recent article showed that immediate post preparation was better, whereas another showed no difference if it gets delayed [9,10].

Several types of intra-radicular posts are available including cast metal posts and prefabricated posts. Moreover, various luting agents as zinc phosphate and self-adhesive/conventional resin cements may be used to lute these posts. Taking these varieties of materials into consideration, it is essential that dental students as well as dentists should have adequate knowledge about available materials and techniques to improve the patient's aesthetics and function [11].

There are only few studies by Sahar AA in Riyadh and Abdulrahman SFA et al., in Abha region, Saudi Arabia regarding restoration of ETT [12,13]. Most of these studies were pertaining to the particular regions. Therefore, the present study was conducted to investigate the techniques and materials used in the restoration of ETT by the dentists in western region of Saudi Arabia. This would help us identify the concepts followed and opinions of the dentists in this region about the restoration of ETT compared to those in other parts of the world.

MATERIALS AND METHODS

A survey-based study was conducted among the Private Dental practitioners of western region (Jeddah and Makkah) of Saudi Arabia. This study was conducted for three months from first of November 2018 till the end of January 2019. This research project was

approved by the Ethics Committee of the Ibn Sina National College for Medical studies, Jeddah (approval no. RC-49-18102018).

Inclusion criteria: Total of 202 private dental practitioners of western region (Jeddah and Makkah) of Saudi Arabia, who perform post and core treatments and responded with a completely filled questionnaire during the time period of the study were included .

Exclusion criteria: Practitioners who were not treating the patients with post and core, those who were not willing to participate in this study were excluded from the survey.

Sample size calculation: The non-probability convenience sampling technique was used for calculating the appropriate sample size. Reviewing the literature of similar work, sample size ranged from 95 to 300. Total sample size of 200 was well thought out but since dropouts, invalid responses were anticipated [14], hence, 250 sample size was considered appropriate. Using power calculation sample size was assessed from previous studies [1,5,12].

Based on that, an open ended questionnaire was formulated in English and Arabic languages consisting of eight questions. The questions were sourced from the previous studies [1,5,12,13]. Pilot study was conducted on twelve dental practitioners in Jeddah region. Based on the information received from the pilot study, authors reviewed the content of each questions to make sure that study reflected appropriate phrasing, understanding and validation. The Cronbach's alpha value has ranged from 0.72-0.78.

The closed ended questionnaire of eight questions was constructed by the authors. First part of the questionnaire had two questions pertaining to demographic details (gender and general practitioner or specialist) of the participants and second part had six questions, out of which two questions for the assessment of knowledge (reason for restoring ETT and criteria for restoring ETT), and four questions for the assessment of practices (instruments used for preparing the canal, restoring ETT with or without post, most common type of post used for restoring ETT and type of cements used for cementation of the post) respectively (Appendix 1).

Questionnaires were sent to 250 private dental practitioners in western region of Saudi Arabia. Some of the questionnaires were given by hand to nearby dental clinics and most of them through emails among the general dentists (BDS degree holders) and specialists (dentists with postgraduate degree or diploma) working in the private sectors, who were practicing restoration of ETT in their clinics. A covering letter was attached stating the instructions, rationale and purpose of the survey.

All dental practitioners were contacted regardless of their age and were assured of confidentiality. The participants were allowed to select more than one answer, if they desired. The participants, who received the questionnaire physically, filled it by hand and returned it. And the participants, who received the questionnaire by emails, filled it online and submitted it. Approximately, ten days' time was given for participants to fill the questionnaire. Reminder e-mail was sent periodically to improve response rate. A 202 dental practitioners participated in this study and the response rate was 80.8% A score of 1 was allocated for each correct answer or positive response and score 0 was allocated for wrong, or negative response. Only completely filled questionnaire were selected for final data analysis.

STATISTICAL ANALYSIS

Data was entered in the excel spreadsheet Microsoft 365. Descriptive statistics like frequency and proportion was calculated for qualitative data.

RESULTS

This study included 202 participants, out of which there where 108 (53.4%) male participants and 94 (46.5%) female participants [Table/Fig-1]. A total of 120 (59%) of the study sample were general practitioners and 82 (41%) of them were specialists [Table/Fig-2].

Gender	Number	Percentage
Male	108	53.46%
Female	94	46.53%

[Table/Fig-1]: Gender of the participants.

General practitioners or specialists	Number	Percentage
General practitioners	120	59%
Specialists	82	41%

[Table/Fig-2]: Participants who were general practitioners and specialists.

Among the participants of this study, 98 (48.51%) were general practitioners, reported restoring to reinforce ETT, whereas 10 (4.95%) of them were unaware and 12 (5.94%) of them reported due to some other reasons. In addition 82 (40.59%) were specialists, reported restoring to reinforce ETT [Table/Fig-3].

Reason for restoring ETT	General practitioner (n=120)		Specialists (n=82)	
To reinforce the tooth	Count	98	Count	82
	Percentage	48.51%	Percentage	40.59%
Unaware	Count	10	Count	0
	Percentage	0.49%	Percentage	0
Any other reason	Count	12	Count	0
	Percentage	0.59%	Percentage	0

[Table/Fig-3]: Participant's opinion about restoring Endodontically Treated Teeth (ETT).

Among the participants of this study, 75 (37.12%) of the study sample were into general practice, reported restoration of ETT was based on the remaining tooth structure whereas, 45 (22.27%) of them based on the radiographic evidence of supporting bone. In addition, 65 (32.17%) of the study sample who were specialists, reported restoration of ETT based on the amount of remaining tooth structure and 17 (8.41%) of them used radiographic evidence of supporting bone [Table/Fig-4].

Criteria for restoring ETT	General practitioner (n=120)		Specialists (n=82)	
Amount of remaining tooth structure	Count	75	Count	65
	Percentage	37.12%	Percentage	32.17%
Radiographic evidence of supporting bone	Count	45	Count	17
	Percentage	22.27%	Percentage	8.41%

[Table/Fig-4]: Participant's opinion about criteria for use of endodontic post.

Among the participants, 60 (29.70%) of the study sample were into general practice, reported using Gates Glidden for preparing the canal for post and core whereas, 48 (23.76%) of them using peeso reamer and 12 (5.94%) of them used endo plugger. In addition, 55 (27.2%) of the study sample were specialists, reported using Gates Glidden and 27 (13.36%) of them using Peeso reamer [Table/Fig-5].

Instruments	General practitioner (n=120)		Specialists (n=82)	
Gates glidden	Count	60	Count	55
	Percentage	29.70%	Percentage	27.22%
Peeso reamer	Count	48	Count	27
	Percentage	23.76%	Percentage	13.36%
Endo plugger	Count	12	Count	0
	Percentage	5.94%	Percentage	0

[Table/Fig-5]: Commonly used instrument for removing gutta-percha during preparing the canal for the posts.

In this study, 60 (29.70) of the study sample were into general practice, reported restoring ETT with post and core followed by the crown, whereas, 30 (14.85%) of them did the crown without post, 15 (7.42%) of them completed restoration with composite and 15 (7.42%) of them did buildup with post and core. In addition, 82 (40.59%) of the study sample who were specialists, reported restoring ETT with post and core buildup and then proceed with crowns [Table/Fig-6].

How they restored ET	General practitioners (n=120)		Specialists (n=82)	
Post and core and crown	Count	60	Count	82
	Percentage	29.70	Percentage	40.59%
Without post	Count	30	Count	0
	Percentage	14.85%	Percentage	0
Direct restoration	Count	15	Count	0
	Percentage	7.42%	Percentage	0
Post and core build-up	Count	15	Count	0
	Percentage	7.42%	Percentage	0

[Table/Fig-6]: Participants restoring endodontic teeth with post and without post.

Among the participants, 80 (39.60%) of the study sample were into general practice, reported using prefabricated fibre post whereas, 23 (11.38%) of them using cast post and 17 (8.41%) of them using prefabricated metal posts. In addition, 72 (35.64%) of the study sample were specialists reported using prefabricated fibre posts and 10 (4.95%) of them used cast metal post [Table/Fig-7].

Types of posts	General practitioners (n=120)		Specialists (n=82)	
Cast metal post	Count	23	Count	10
	Percentage	11.38%	Percentage	4.95%
Prefabricated fibre post	Count	80	Count	72
	Percentage	39.60%	Percentage	35.64%
Prefabricated metal post	Count	17	Count	0
	Percentage	8.41%	Percentage	0

[Table/Fig-7]: The most common type of posts used for restoring Endodontically Treated Teeth (ETT).

Regarding use of the luting cement for the cementation of the post, among the participants, 20 (9.9%) of the study sample were into general practice, reported using glass ionomer cement whereas, 82 (40.59%) of them using resin cements and 18 (8.91%) of them using other cements. In addition, 82 (40.59%) of the study sample who were specialists reported using resin cements [Table/Fig-8].

Types of cements	General practitioners (n=120)		Specialists (n=82)	
Glass ionomer cement	Count	20	Count	0
	Percentage	9.9%	Percentage	0
Resin cement	Count	82	Count	82
	Percentage	40.59%	Percentage	40.59%
Other cements	Count	18	Count	0
	Percentage	8.91%	Percentage	0

[Table/Fig-8]: Participants using luting cements for cementation of posts.

DISCUSSION

This survey was conducted to gain insight into the rationale for choice of endodontic posts and the different endodontic post systems currently used by general dental practitioners and specialists working in the private and government sectors in western region of Saudi Arabia.

The questionnaire was sent to 250 dental practitioners, out of which 202 of them responded. The response rate to this questionnaire was 80%, which was relatively very high as compared to the survey by Syed RH et al., where the response rate was only 30%, which was very low [15] [Table/Fig-9]. They concluded that the anonymous nature of the survey did not allow for a reminder and there were other studies, which also reported similar findings [5,16]. A 59% of the general dental practitioners and 41% of the specialists (prosthodontists and Endodontist) participated in this study. Abdulrahman SFA et al., reported in their study that 83.5% of the participants were general practitioners and rest were the specialists and Abdulrahman A et al., reported in their study that 66.5% were general practitioners and 33.5% were specialists in their study [13,17].

A review by Stavropoulou AF and Koidis PT, stated that the main purpose of a post is to retain a core [18]. Among the participants of this study, 37.12% of the study sample were into general practice, reported restoration of ETT was based on the remaining tooth structure whereas, 22.27% of them based on the radiographic evidence of supporting bone. In addition, 32.17% of the study sample who were specialists, reported restoration of ETT based on the amount of remaining tooth structure and 8.41% of them using radiographic evidence of supporting bone. Similar results were found by the surveys done in Germany and Switzerland where 43% of prosthodontists and 59% of general practitioners accept the concept of a post as a reinforcement system for a brittle tooth [5,19].

Based on the results of this study, among the participants, 29.70% of the study sample were into general practice, reported using Gates Glidden for preparing the canal for post and core whereas, 23.76% of them using peeso reamer and 5.94% of them using endo plugger. In addition, 27.2% of the study sample were specialists, reported using Gates Glidden and 13.36% of them using Peeso reamer. Henry FD and Bun SC stated that the instruments used for removal of the gutta-percha were based on the personal preferences and quality of the gutta-percha root filling [20]. However, Maryam K et al., reported in their study that peeso reamers should be used in straight canals and Gates Glidden is more conservative than peeso reamers [21].

S. No.	Name of author and year	Place of study	n	Parameters compared	Conclusion
1	Syed RH 2014 [15]	Saudi Arabia	204	The current concepts, opinions, techniques and materials used on how to restore the ETT.	Endodontic failure was thought to be the most common reason for failure of ETT by the Saudi dentists.
2.	Abdulrahman A et al., 2018 [17]	Riyadh, Saudi Arabia	164	Opinions, techniques and materials used for the restoration of ETT.	Treatment strategies of ETT are in accordance with the current state of evidence-based knowledge.
3.	Amal N and Faraz AF 2017. [24]	Saudi Arabia	293	The basic knowledge and awareness of dental practitioners in Saudi Arabia in restoring Endodontically Treated Teeth (ETT).	Since restoring ETT is still controversial, knowledge of the related new philosophies and techniques should be updated.
4.	Ratnakar P et al., 2014. [1]	North India	110	The frequency of preferred methods of restoring ETT under different conditions.	The unrestored ETT is susceptible to fracture, which could lead to loss of tooth.
5.	Eckerbom M and Magnusson T, 2001. [16]	Sweden	150	Current opinions among general dental practitioners and Prosthodontists in Sweden on how to restore root-filled teeth.	A high proportion of both general practitioners and prosthodontists believe that a post reinforces an endodontically treated tooth.
6.	Magadalena K et al., 2013. [19]	Switzerland	95	The present opinions and the knowledge of Swiss general dentists about current strategies to restore Endodontically Treated Teeth (ETT).	The prevailing strategies for the restoration of ETT are in part in accordance with the current literature.
7.	Present study	Western region of Saudi Arabia.	202	Basic knowledge and the practices of restoration of Endodontically Treated Teeth (ETT) in western region of Saudi Arabia.	Majority of the participants practiced reinforcement of Endodontically Treated Teeth (ETT) by using fibre posts with resin cements followed by crowns.

[Table/Fig-9]: Summary of various studies internationally [1,15-17,19,24].

A glass fibre post is strongly recommended because of its modulus of elasticity being close to that of dentin and good fracture resistance [22-24]. According to the results of this study, 30.60% of the study sample were into general practice, reported using prefabricated fibre post whereas, 11.38% of them using cast post and 8.41% of them using prefabricated metal posts. In addition, 35.64% of the study sample was specialists reported using prefabricated fibre posts and 4.95% of them used cast metal post. Amal N and Faraz AF, in their study reported that most of respondents used either prefabricated post or cast posts in their dental practice [24] [Table/Fig-9]. In addition, Eckerbom M and Magnusson T reported in their study that 79.9% of the participants used prefabricated fibre post [16]. Jindal S et al., concluded in their study that glass fibre posts efficiently increase the fracture resistance of an endodontically treated tooth but the determination of optimal post length is also essential [25]. It is supported with other study by Gonzaga CC et al., [26].

In contrast, dental practitioners in Germany, Sweden, and Switzerland preferred prefabricated metal posts [27-29]. In 2011, Beata D and Andrej M, performed a finite element analysis study and reported that cast metal posts with a high elastic modulus resulted in lower stresses in the cervical dentin than did glass fibre-reinforced posts [30]. Additionally Francesca Z et al., reported that zirconium posts are difficult to be retrieved because of their high rigidity and hardness, and hence may not be recommended [31]. Rafael SO et al., in their study, reported that after completion of follow-up for three years found that there was no difference found between the groups using fibre and cast posts [32].

So also, a systematic review by Fedorowicz Z et al., reported that there is no evidence to support the best way to restore ETT [33]. Ferrari M et al., in their study, reported that presence of 2 mm ferrule is a decisive factor for the success of post and core irrespective of the type of post used [34].

In this study, regarding use of the luting cement for the cementation of the post, among the participants, 9.9% of the study sample were into general practice, reported using glass ionomer cement whereas, 40.59% of them using resin cements and 8.91% of them using other cements. In addition, 40.59% of the study sample were specialists, reported using resin cements. In contrast, a study by Syed RH, in his study concluded that glass ionomer as luting cement was common [15]. Additionally, Ferrari M et al., and Rafael SO et al., stated that most of the dentists preferred resin cements for the cementation of the post [34,35].

Among the participants, 29.70% of the study sample were into general practice, reported restoring ETT with post and core followed by the crown, whereas, 14.85% of them did the crown without post, 7.42% of them completed restoration with composite and 7.42% of them did build-up with post and core. In addition, 40.59% of the study sample who were specialists reported restoring ETT with post and core build-up and then proceed with crowns. In comparison, Sahar AA reported 29.10% chose to restore the tooth with 50% of its remnant structure with a restoration similar to tooth color followed by a crown [12].

Additionally, Ratnakar P et al., and Jindal S et al., reported that when half of tooth structure remains, a prefabricated glass fibre post followed by direct composite resin restoration may be used [1,25]. Maria CC et al., evaluated post-and-core restorations after a 2-year clinical service and found that only 4.3% of cases experienced deboning of fibre posts [36]. It is concluded by Vidhi KB et al., in their study that preservation of tooth structure is paramount for the success of ETT and a minimally invasive restorative approach to restore pulp less teeth. Endocrowns can be considered as an option for restoring ETT [37].

Limitation(s)

Firstly, the sample size of the present study was small. Secondly, only eight questions were included in the questionnaire. Thirdly, no distinction was made between the restoration of anterior and posterior teeth were another limitation. Fourthly, this study was pertaining only to the western region of Saudi Arabia.

CONCLUSION(S)

Within the limitations of the study, it can be concluded that majority of the participants practiced reinforcement of ETT by using fibre posts with resin cements followed by crowns. Commonly used instrument for removing gutta-percha while preparing the canal for the posts were Gates Glidden and Peeso Reamer. Dentists preferred glass fibre posts cemented with resin-based cement to restore ETT. Based on the results of this study, it is recommended to restore the ETT based on the clinical scenario and rigorous diagnosis and treatment planning. It is also recommended to organise relevant scientific presentations and workshops to educate the dental practitioners and dental students to enhance their knowledge and techniques regarding restoration of the ETT. Future studies with large sample size, covering a broader region, with more questions in the questionnaire on several aspects like discrimination of anterior and posterior teeth are recommended for better validation of the results.

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APPENDIX 1

Questionnaires for the study:

1. Gender of the participants.
A. Male
B. Female
2. Whether the participant is general practitioner or specialist?
A. General practitioner
B. Specialists
3. Why to restore endodontically treated teeth?
A. To reinforce endodontically treated teeth.
B. Unaware.
4. Any other reason. Criteria for determining the use of endodontic post?
A. Amount of remaining tooth structure.
B. Radiographic evidence of supporting bone.
C. Any other, please specify.
5. Which is the commonly used instrument for removing gutta-percha during preparing the canal for the posts?
A. Gates Glidden
B. Peeso reamer
C. Endo plugger
6. How they restore endodontically treated teeth?
A. Post and core and crown.
B. Without post.
C. Direct restoration.
D. Post and core build-up.
7. Types of post used?
A. Cast metal post
B. Prefabricated fibre post
C. Prefabricated metal post
D. Any other, please specify
8. Type of cement used for cementation of the post?
A. Glass ionomer luting cement
B. Resin cement
C. Any other cement, please specify