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Concepts of restoring endodontically treated teeth among dentists in Saudi Arabia



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KEYWORDS

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Abstract *Objective:* The purpose of this survey was to investigate the current concepts, opinions, techniques and materials used on how to restore the endodontically treated teeth (ETT) among dentists in Saudi Arabia.

Materials and methods: A self administrative questionnaire especially designed for this study was distributed among a conveniently selected sample. A total of 204 questionnaires were completed (Response rate = 30%).

Results: Irrespective of their occupational experience, 62% of the surveyed dentists considered the remaining tooth structure while restoration of ETT while 10% will always place a post in ETT. More than half of the surveyed dentists (52%) believed that a post reinforces ETT either always or sometimes. Majority of the participants agreed that ferrule effect will always (46%) or sometimes (32%) increase the fracture resistance of an ETT. Prefabricated posts were used by 53% and cast posts by 37% of all the participants. The use of parallel sided prefabricated posts, made of metal (29%) or non metal (29%), was the most preferred technique by the surveyed dentists. 60% of the participants agreed that 2/3rd of the canal should be used for the post length. Composite resin (57%) was preferred for core foundation, followed by amalgam (19%) among the participants. Posts are placed primarily with glass ionomer cement (48%), followed by resin cement (22%) and zinc phosphate cement (21%).

Conclusion: The use of the posts was common and the belief that a post reinforces an ETT might explain the reason for its usage by the Saudi dentists. The use of prefabricated post, composite resin

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as core material and glass ionomer as luting cement is common, while restoring ETT by the Saudi dentists. Endodontic failure was thought to be the most common reason for failure of ETT by the Saudi dentists.

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1. Introduction

The aim of endodontic and restorative dentistry is the conservation of natural tooth structure. Endodontically treated teeth undergo loss of tooth structure and changes in physical characteristics, such as reduced modulus of elasticity, which often will lead to increased fracture susceptibility when compared to unrestored vital teeth¹⁻³.

There is a general agreement that endodontic treatment failure is more likely due to restoration failure than endodontic treatment itself. However, it is important to follow a treatment plan with a full respect to the endodontic and restorative techniques. So the final restoration following the root canal treatment is of major importance for a successful outcome otherwise improper restorations may even lead to tooth extraction.⁴

The prognosis of endodontically treated teeth (ETT) is influenced by a variety of different parameters such as the number of adjacent teeth, occlusal contacts, position of the tooth in the dental arch, apical status, collagen degradation, intermolecular cross-linking of the root dentin, amount of hard tissue loss, remaining dentin wall thickness, type of definitive restoration, presence of a minimum of 1.5–2.0 mm of ferrule preparation and type of post and core material used.⁵

Evidence based treatment is becoming increasingly important in dentistry. Treatment decisions and strategies should be based on the best and most up-to-date factual evidence available.⁶

Numerous techniques to restore endodontically treated teeth have been advocated with criteria for success depending on variations in length, shape and surface configuration, amount of dentin structure⁷⁻⁹, materials and techniques used in construction.^{10,11}

A post is a dental material placed in the root of a structurally insufficient tooth when additional retention is needed to retain the core and coronal restoration. The post should provide this

support without increasing the risk of root fracture. It is generally accepted that the purpose of post placement is to retain a core foundation and not to reinforce an ETT.^{5,12-14} The core itself is a dental restoration commonly made of composite resin used to build up missing tooth structure, usually for future restoration with a crown.¹⁵

The longevity of a restored tooth depends on the amount of remaining tooth structure and on the efficiency of the restorative procedure used to replace lost structural integrity.^{13,16,17}

Dentists are confronted with a continuously growing number of various materials for post endodontic restoration and with an increasing occurrence of ETT in need of treatment. However, the scientific literature provides numerous, primarily material-oriented, noncomparable and possibly confusing *in vitro* studies. There is a lack of well-designed randomized controlled clinical trials. Hence, it is not surprising that the manner in which post endodontic restorative care is performed does not fully reflect recommendations from the literature, but is influenced by geographic location, age, and specialty status. These findings suggest that each dentist develops his/her own experience based treatment concept. Thus, surveys are important tools to assess and to understand treatment approaches in postendodontic restorations.^{5,15}

The present survey was conducted to investigate the techniques and materials used in the restoration of endodontically treated teeth by the dentists in Saudi Arabia. This helped to identify the concepts and opinions of the dentists in this region about the restoration of ETT compared to the concepts of the dentists in other parts of the world.

2. Materials and methods

This research project was approved by the ethics committee of the College of Dentistry Research Center, King Saud University, Riyadh. The required information was collected through an anonymous questionnaire. The questionnaire was adopted from previous studies^{5,11} and modified to suit the requirements of the present study.

The questionnaire consisted of two main parts; first part collected the demographic information, while the second part contained 13 multiple-choice questions. The initial section of the second part concerned the treatment concepts, opinions for ETT and the later section contained questions related to the materials and techniques used for the treatment of ETT among the participants.

The questionnaires along with a cover letter stating the instructions, rationale and purpose of the survey were distributed by hand and through emails among the general dentists and specialist dentists (dentists with post graduate degree or diploma) working in the government and private sectors of Saudi Arabia, who were practicing restoration of endodontically treated teeth in their clinics. Dentists who were not treating endodontically treated teeth in their practice were not included in the study. The participants who received the questionnaire by hand, filled it by hand and returned it. And the

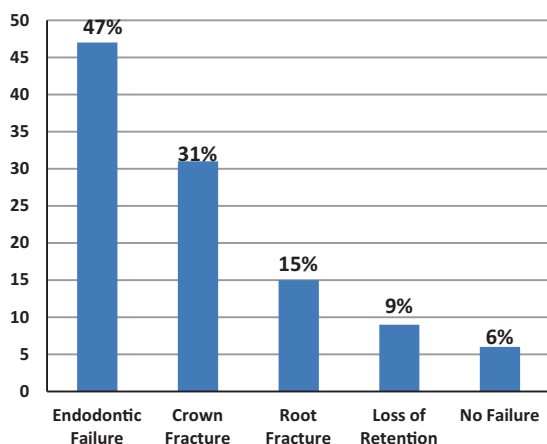


Figure 1 Reasons of failure in endodontically treated teeth.

participants who received the questionnaire by emails, filled it online and submitted it. The participants were asked to disregard the request for participation, in case if they had already participated in the study. The participants were allowed to select more than one answer if they desired. Non responders were not reminded due to the anonymous character of this survey. A total of 400 questionnaires were distributed by hand and over 280 questionnaires were forwarded through emails.

Descriptive statistics and frequency analysis of the collected data were done using Statistical Package for Social Sciences (SPSS) version #17 (SPSS, Chicago, Illinois, USA).

3. Results

Four hundred (400) questionnaires were distributed by hand out of which 185 were received and two hundred and eighty (280) questionnaires were distributed by emails out of which 19 responses were received among the participants. Two hundred and four (204) questionnaires were completed giving a response rate of 30%. The respondents included 104 (51%) general dentists and 100 (49%) specialist dentists. Out of the total 204 participants 133 (65%) were males and 71 (35%) were females. The mean age, experience of the participants in years and the average number of restoring ETT per year are presented in Table 1.

The participants' responses related to the frequency of post placement in ETT, reinforcement of the ETT with a post and fracture resistance of an ETT with ferrule effect of 1–2 mm of sound tooth structure are presented in Table 2. Almost all of the participants irrespective of the age and experience were placing posts for the ETT (Table 2). Majority of the respondents expect reinforcement of the ETT and a decrease of the fracture probability when posts are used (Table 2).

Table 3 describes the participants' responses to the questions about the preferred technique of post placement, choice of post and the most appropriate length for a post. Most of the respondents' preference of the technique for the post placement was prefabricated posts, and the use of the pins with core was the least preferred technique (Table 3). The use of parallel sided prefabricated post was the most preferred technique irrespective of the type of material used (Table 3). Regarding the most appropriate length of the post, 2/3rd of the canal was the most common choice among the participants.

The participants' responses related to the preferred type of core material, preferred rinsing solution before cementation of a post and the choice of cement for luting a post in ETT are presented in Table 4. Use of composite core materials was preferred by the participants compared to amalgam or other core materials (Table 4). Regarding the rinsing solution used before the cementation of the post, use of sodium hypochlorite was more common compared to other irrigation solutions (Table 4). Glass ionomer luting cement was the most common material used for the cementation of the posts (Table 4).

Regarding the most frequent failure of restored endodontically treated teeth, 47% of the participants thought endodontic failure to be the most common reason. The responses for the crown fracture, root fracture and loss of retention were 31%, 15% and 9% respectively Fig. 1.

4. Discussion

The present study has provided information about the dentists and specialists working in the private and government sectors of Saudi Arabia, on the concepts of restoring endodontically treated teeth. This survey found that a majority of the dentists and specialist dentists believed in the reinforcement effect of a

Table 1 Mean age, years of experience and number of ETT treated per year by the participants.

	Age (n = 94)	Years while restoring ETT	No. of ETT per year
Mean	34.23 yrs	9.71 yrs	220/ yr
Std. Deviation	8.514	12.99	641

Table 2 Response to questions on frequency, reinforcement and ferrule effect and esthetic effect on ETT.

	Always	Sometimes	Never	Depends on remaining tooth structure
<i>Q: Frequency of Post placement in ETT?</i>				
Dentist	14(7%)	30(15%)	4(2%)	68(33%)
Specialist	6(3%)	21(10%)	0(0%)	59(29%)
Total	20(10%)	51(25%)	4(2%)	127(62%)
<i>Q: Reinforcement of an ETT with a post?</i>				
Dentist	24(12%)	33(16%)	15(7%)	32(16%)
Specialist	9(4%)	40(20%)	30(15%)	21(10%)
Total	33(16%)	73(36%)	45(22%)	53(26%)
<i>Q: Increased fracture resistance of an ETT with 1–2 mm of Ferrule?</i>				
Dentist	44(22%)	36(18%)	3(1%)	20(10%)
Specialist	50(24%)	30(14%)	8(4%)	13(7%)
Total	94(46%)	66(32%)	11(5%)	33(17%)
<i>Q: Effect of post on the esthetic outcome of the tooth?</i>				
Dentist	27(13%)	41(20%)	20(10%)	15(7%)
Specialist	30(15%)	49(24%)	16(8%)	6(3%)
Total	57(28%)	90(44%)	36(18%)	21(10%)

Table 3 Response to questions on technique, type and length of posts in ETT.

	Prefabricated post	Cast post	Use of pins with core	Use of core with 1–2 mm of ferrule
<i>Q: Preference of Post technique in ETT?</i>				
Dentist	55(27%)	37(18%)	2(1%)	11(5%)
Specialist	53(26%)	39(19%)	3(1%)	10(4%)
Total	108(53%)	76(37%)	5(2%)	21(9%)
<i>Q: Preference of type of prefabricated posts?</i>				
	Parallel sided metal post	Tapered metal post	Parallel sided non metal post	Tapered non metal post
Dentist	26(13%)	9(4%)	31(15%)	9(4%)
Specialist	32(16%)	8(4%)	29(14%)	8(4%)
Total	58(29%)	17(8%)	60(29%)	17(8%)
<i>Q: Appropriate length for a post?</i>				
	1/3rd of canal	1/2 of canal	2/3rd of canal	Depends on the remaining tooth structure
Dentist	14(7%)	12(6%)	63(31%)	13(6%)
Specialist	12(6%)	12(6%)	59(29%)	15(7%)
Total	26(13%)	24(12%)	122(60%)	28(13%)

Table 4 Response to questions on use of core material, rinsing solution and cement type for ETT.

	Amalgam	Composite	Glass Ionomer	Cast Core	
<i>Q: Type of core material preferred?</i>					
Dentist	18(9%)	59(29%)	14(7%)	17(8%)	
Specialist	21(10%)	58(28%)	13(6%)	16(8%)	
Total	39(19%)	117(57%)	27(13%)	33(16%)	
<i>Q: Type of rinsing solution preferred for the canal before cementation of a post?</i>					
	Saline	Sodium Hypochlorite	EDTA	Chlorhexidine	
Dentist	48(23%)	50(24%)	5(2%)	1(1%)	
Specialist	45(22%)	34(17%)	11(5%)	11(5%)	
Total	53(45%)	84(41%)	16(7%)	12(6%)	
<i>Q: Choice of cement used for cementation of ETT?</i>					
	Zinc-phosphate	Glass ionomer	Poly Carboxylate	Resin cement	Resin modified GIC
Dentist	22(11%)	52(25%)	1(1%)	18(9%)	13(6%)
Specialist	20(10%)	47(23%)	5(2%)	26(13%)	9(4%)
Total	42(21%)	99(48%)	6(3%)	44(22%)	22(10%)

post in endodontically treated teeth. Hence the posts are placed frequently. The response rate of the questionnaire was 30%, which was relatively low. The anonymous nature of the survey did not allow for a reminder, but the participation rate was in line with those in other studies.^{5,11} Furthermore, the prosthodontists, restorative dentists and endodontists who were restoring ETT in their practice, were all classified into one group as a specialist dentist. Another shortcoming of the questionnaire was that it did not distinguish between the restoration of anterior and posterior teeth.

Literature review has shown that the primary purpose of a post is to retain a core¹² and the post in endodontically treated teeth does not improve the resistance to fractures.^{1,15,18} Despite this, a number (52%) of general dentists and specialist dentists in the current survey believed that a post always or sometimes, reinforces an endodontically treated tooth. Similar figures are found among general practitioners in Germany⁵, Sweden¹¹ and Northern Ireland.¹⁹ A higher number of prosthodontists (43%) and general dentists (59%) in the United States accept the concept of a post as a reinforcement system for a brittle root.²⁰

Ferrule effect is suggested as a key factor for avoiding failures of endodontically treated teeth. If a post is made with

1–2 mm of ferrule in an ETT, it will have an increased resistance to fracture.^{21–23} In the present investigation, 78% of the participants held this belief. This figure is in line with other investigations in Germany where 72% of the dentists and United States where 73% of the Prosthodontists held the same belief.

In this study, the use of prefabricated posts and casted posts was almost equally preferred by the participating dentists and the specialists. Whereas, the dentists in Germany⁵ preferred to use prefabricated posts dentists in Sweden¹¹ and Britain¹⁹ preferred to use casted posts.

The use of prefabricated parallel-sided posts was more common as compared to the prefabricated tapered posts among the participants in the current study, like the dentists in United States²⁰ compared to dentists in Germany⁵ and Sweden¹¹ where use of tapered screw type of post was more common. Parallel sided prefabricated metal posts are more retentive than tapered posts. And the parallel sided posts induce less stress into the root, because there is less of a wedging effect and are reported to be less likely to cause root fractures than tapered posts.¹²

Amalgam when used as a core material can cause esthetic problems with ceramic crowns and sometimes makes the gingiva look dark. There also is a risk of tattooing the cervical

gingiva with amalgam particles during the crown preparation. Amalgam also has no natural adhesive properties and should be used with an adhesive system for buildup. For these reasons, and potential concern about mercury toxicity, it is no longer widely used as a buildup material. Although, results of studies in United Kingdom^{19,24} and United States²⁰ indicate that amalgam is popular, its use is not common among the participants of the current study. The participants preferred to use composite resin which currently is the most popular core material and has some characteristics of an ideal buildup material.¹²

A tenacious layer of debris, known as the smear layer, is formed when the walls of the root canal are instrumented. This makes rinsing the canal necessary before cementation of the post.²⁵ Various irrigation materials are used for this purpose like sodium hypochlorite, saline, EDTA (ethylenediaminetetraacetic acid) and chlorhexidine.²⁶ Almost all the participants of the current study were following this recommendation and they preferred to use saline (45%) and sodium hypochlorite (41%) for rinsing the canals.

Clinical trials of cemented posts demonstrate no superiority of specific cement with which it is cemented.¹⁸ In the present survey both the dentists and the specialists were using all types of cements for the cementation of the posts. The most common cement used for cementation of the posts was glass ionomer.

An ETT can fail because of many reasons like loss of retention of post, periapical inflammation (endodontic failure), crown fracture, root fracture and secondary caries etc.²⁶ The participants of the current study believed endodontic failure (47%) to be the most common reason for failure of the ETT. This is also found in a similar study in Germany⁵ where 47% of the dentists had the same belief. While another study in Germany²⁷ showed that loss of retention (43%) was the most common reason of failure followed by endodontic failure (16%).

Although the current study provided some information regarding the current concepts and techniques used by the dentists in Saudi Arabia while treating ETT, there is a need for conducting long term clinical studies on the success rates of different techniques and materials used for treating ETT by the dentists in this region.

5. Conclusions

Within the limitations of the study, the following conclusions were drawn:

- (1) The use of the posts for restoring ETT was common among the participants and the majority believed that it reinforces the ETT.
- (2) The use of prefabricated parallel sided posts was the preferred technique irrespective of the type of material used.
- (3) Use of composite resin as a core material and glass ionomer as a luting cement was common.
- (4) The participants thought endodontic failure to be the most common reason for failure of restored ETT.

Conflict of interest

None.

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