

## Survey on Restoration of Endodontically Treated Anterior Teeth: A Questionnaire Based Study

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### Abstract:

**Background:** The aim of endodontic and restorative dentistry is the conservation of natural tooth structure. Endodontically treated tooth (ETT) undergoes loss of tooth structure and changes in physical characteristics. Therefore, proper selection of restoration for ETT is mandatory. The clinical approach of restoring ETT needs taking into considerations several issues. However, the best way to restore teeth after root canal treatment has long been and still a controversial subject to debate. Therefore, this study was carried out to detect the frequency of preferred methods of restoring ETT under different conditions.

**Materials and Methods:** A questionnaire was framed and distributed among prosthodontists, endodontist and general practitioners of north India region to find out the frequency of best suitable material and method regarding restoration of ETT. 220 questionnaires were sent by electronic mail out of which 110 were received back. The questionnaire contained different methods of restoration of endodontically treated anterior teeth at different conditions (percentages) of remaining sound tooth structure. Respondents were asked to indicate their preferred method of restoration of those teeth.

**Results:** Results showed that majority of respondents (51.82%) preferred to restore the tooth only with a tooth-color restorative material in condition A. In condition B, majority of respondents preferred to use tooth colored crown (44.55%) and prefabricated post and tooth colored restoration (24.5%). Whereas in

condition C, most of the respondents preferred to use a cast post and core/crown (80.91%).

**Conclusion:** From the findings of the present study, it can be concluded that the unrestored ETT is susceptible to fracture, which could lead to loss of tooth and that the maximum preservation of healthy tooth structure and use of restorative materials with mechanical properties similar to dental structure favor greater longevity of tooth restoration complex.

**Key Words:** Anterior teeth, restorative material, survey

### 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 to provide optimal access and by restorative procedures necessary to rebuild the tooth. Loss of inherent dentinal fluid may also affect the tooth properties. It is, therefore, accepted that endodontically treated teeth (ETT) are weaker and have lower lifetime prognosis. They require special considerations for final restoration particularly where there has been extensive loss of tooth structure.<sup>1</sup> An extensive amount of research has been published on the restoration of ETT. As a result, the private practitioner is left with the overwhelming task to read and synthesize this information into logical and evidence-based approach to dental treatment. Innovations in material sciences and clinical techniques have expanded the number of treatment options available for ETT.<sup>2</sup>

When restoring ETT the dentist should find answers to the following two questions: (1) What type of restoration is indicated? (2) Is the post required? The answer to the former question depends on factors like amount of remaining tooth structure, location of tooth in dental arch, the functional demands that are placed on tooth and need of this tooth to serve as an abutment. The latter question is a central issue in the restoration of ETT. Post is a dental material placed in the root of structurally insufficient tooth when additional retention is needed to retain the core. The posts enhance this support without increasing the risk of root fracture.<sup>3,4</sup> With this background the present study was undertaken to determine the frequency of preferred methods, materials, timing and other concerning factors regarding restoration of ETT.

### Materials and Methods

The questionnaire (Appendix 1) was designed and distributed among prosthodontists, endodontists and general practitioners

who work in private and government clinics of north India region. Respondents were asked to indicate their year and institution of graduation. The questionnaire contained different methods of restoration of endodontically treated anterior teeth at different conditions (percentages) of remaining sound tooth structure (>50%: Minimal coronal tooth structure missing; =50%: Up to one-half of the coronal tooth structure missing; and <50%: All or more than one-half of the coronal tooth structure missing). Respondents were asked to indicate their preferred method of restoration of those teeth. 220 questionnaires were sent by electronic mail out of which 110 were received back giving a response of 50%.

**Statistical analysis**

A Statistical Package of Social Sciences (SPSS version 7.5, Chicago, IL, USA) was used for all computational purposes. One-way frequency tables were generated to summarize the responses. Two-way cross tabulation tables were computed to show the relationship between the variables.

**Results**

The findings of the present study have been summarized in Tables 1 and 2, and Graphs 1-3.

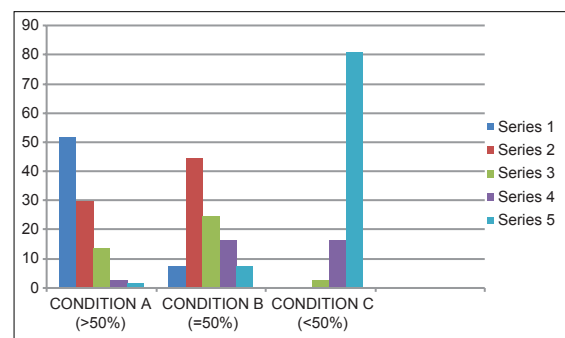
**Condition A (>50% of tooth structure remaining)**

Results showed that the majority of respondents (51.82%) preferred to restore the tooth only with a tooth-color restorative material (Table 1). Both graduates and post graduates preferred tooth-colored restorative material for restoration of ETT if tooth structure remaining is more than 50% (Table 2). Chi-square analysis did not demonstrate any

statistically significant relationship between the degree and the choice of treatment method of restoring ETT.

**Condition B (=50% of tooth structure remaining)**

Results showed that the majority of respondents preferred to use tooth colored crown (44.55%) and prefabricated post and tooth-colored restoration (24.5%). The use of tooth-colored composite restoration was significantly reduced in this condition (7.28%) (Table 1). However, there was a greater difference in restoration method between graduates and post graduates (Table 2). The use of tooth colored crown was more significantly seen in graduates (50%). However, the prefabricated post and restorative material was also seen more in postgraduates (24.29%) than graduates (10%). Chi-square analysis demonstrated statistical significant relationship



**Graph 1:** Overall response of various practitioners of north India region on practising the restoration of endodontically treated teeth. Series 1: Tooth colored (composite) restoration, Series 2: Tooth colored crown, Series 3: Prefabricated post and tooth colored crown, Series 4: Prefabricated post and restorative material core/crown, Series 5: Cast post and crown.

**Table 1:** Frequency and percentage of respondents using different methods of restoration of ETT with different percentages of remaining tooth structure.

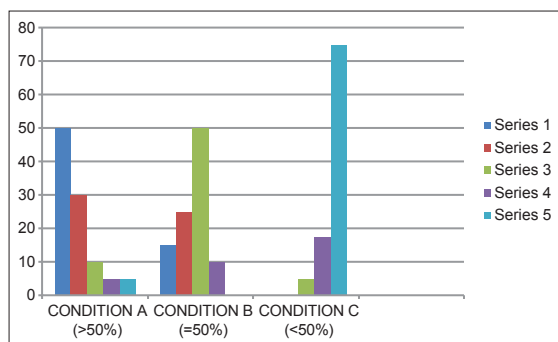
Method of restoration	Amount (%) of remaining sound tooth structure		
	Condition A (>50)	Condition B (=50)	Condition C (<50)
Tooth colored (composite) restoration	57 (51.82)	8 (7.28)	0
Tooth colored crown	33 (30)	49 (44.55)	0
Prefabricated post and tooth colored crown	15 (13.64)	27 (24.5)	3 (2.73)
Prefabricated post and restorative material core/crown	3 (2.73)	18 (16.37)	18 (16.37)
Cast post and crown	2 (1.82)	8 (7.28)	89 (80.91)

ETT: Endodontically treated teeth

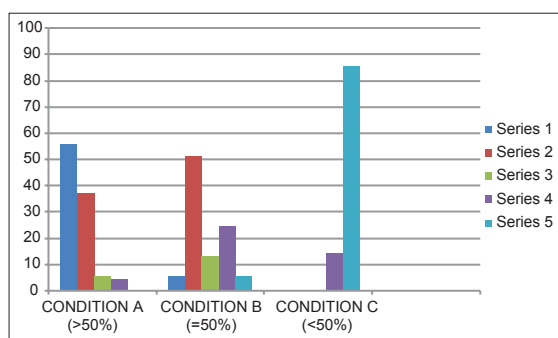
**Table 2:** Frequency and percentage of respondents using different methods of restoration of ETT with different percentages of remaining tooth structure compared to their degrees.

Method of restoration	Amount (%) of remaining sound tooth structure					
	Condition A (>50)		Condition B (=50)		Condition C (<50)	
	BDS	MDS	BDS	MDS	BDS	MDS
Tooth colored (composite) restoration	20 (50)	39 (55.72)	6 (15)	4 (5.72)	0	0
Tooth colored crown	12 (30)	26 (37.15)	20 (50)	34 (48.58)	0	0
Prefabricated post and tooth colored crown	4 (10)	4 (5.72)	10 (25)	11 (16)	2 (5)	0
Prefabricated post and restorative material core/crown	2 (5)	1 (4.29)	4 (10)	17 (24.29)	7 (17.5)	10 (14.2)
Cast post and crown	2 (5)	0	0	4 (5.8)	30 (76.9)	60 (85.72)

BDS: Bachelor of Dental Surgery (graduates), MDS: Mater of Dental Surgery (postgraduates), ETT: Endodontically treated teeth



**Graph 2:** Percentage of respondents using different methods of restoration of endodontically treated teeth with different percentages of remaining tooth structure in graduates. Series 1: Tooth colored (composite) restoration, Series 2: Tooth colored crown, Series 3: Prefabricated post and tooth colored crown, Series 4: Prefabricated post and restorative material core/crown, Series 5: Cast post and crown.



**Graph 3:** Percentage of respondents using different methods of restoration of endodontically treated teeth with different percentages of remaining tooth structure in postgraduates. Series 1: Tooth colored (composite) restoration, Series 2: Tooth colored crown, Series 3: Prefabricated post and tooth colored crown, Series 4: Prefabricated post and restorative material core/crown, Series 5: Cast post and crown.

between the degree and choice of restorative material for treatment of ETT ( $P > 0.05$ ).

#### **Condition C (<50% of tooth structure remaining)**

At this condition, most of the respondents preferred to use a cast post and core/crown (80.91%) as shown in Table 1. Cast post and core was the treatment of choice for both graduates and post graduates when the remaining tooth structure was less than 50% (Table 2).

#### **Discussion**

Unrestored ETT is structurally compromised. Multiple factors must be considered in choosing a final restoration. These include the amount of remaining tooth structure, occlusal function, and position of the tooth in the arch. It is also important to understand that changes occur in the dentin of ETT. Despite these changes, teeth are not brittle from loss

of moisture content. Huang *et al.*<sup>5</sup> compared the physical and mechanical properties of dentin specimen from teeth with or without endodontic treatment and concluded that dehydration did not cause degradation of the properties of dentin. Therefore, they are most likely to break due to loss of tooth structure due to caries, previous restorations, and root canal preparations. Therefore, strongest tooth is one in which most sound dentin and enamel can be retained and used to rebuild the tooth.

The findings of the present study are supported by the findings of other studies which state that when coronal damage is minimal, a conservative treatment in a form of composite resin, glass ionomer or amalgam restorations should be considered.<sup>6,7</sup> When a tooth has more than 50% of the coronal structure missing, the use of post and core foundation is recommended. The main function of the post is to retain the core build up in a tooth with extensive loss of coronal tooth structure. A prefabricated post with a restorative material core build-up is widely used. Christensen<sup>8</sup> stated that core materials that are used under crowns and replace most of the coronal portions of the tooth should have at least the compressive strength of the tooth structure being replaced (40,000 psi). At this time, only two types of core materials were found to meet this requirement: Composite resin (~40,000 psi) and silver amalgam (~65,000 psi). Based on strength, both resin composites and amalgam may be indicated for use as core materials while glass ionomer-based materials are not.<sup>9,10</sup>

Posts can be either prefabricated or custom based post. Prefabricated posts are best suited for circular canals while custom-cast posts and cores possess superior adaptation to all root canals. Custom cast post and core allow for a close adaptation of the post to post space preparation and should fit optimally. Prefabricated post has an advantage in that post space can be prepared and post directly bonded in a single appointment. Cast posts and cores do not require an auxiliary retention such as pins to retain the core as in some prefabricated systems. On the other hand, a prefabricated post with a restorative material core build-up is widely used. Brandal *et al.*<sup>11</sup> reported the highest mean failure load of prefabricated post and composite buildup restorations of endodontically treated anterior teeth. Glass-ionomer/amalgam coronal-radicular build-ups exhibited the lowest failure load. Morgano and Milot<sup>12</sup> and, Morgano and Brackett<sup>13</sup> considered cast posts and cores as the restorative method of choice for endodontically treated anterior teeth with moderate destruction. In most of the anterior teeth, there is an inadequate room for sufficient bulk of the buildup material around the post to provide a solid unit. Thus, a cast post and core is required for restoring these teeth. It was concluded that a cast post and core is indicated where

alignment of the proposed crown is significantly different from the inclination of the canal, which is often the case with anterior teeth.

In the present study, more percentages of respondents at condition B preferred to use a tooth-colored restorative material with and without a prefabricated post and a crown than those seen at condition A. On the other hand, the use of only a tooth-color restorative material is significantly more at condition A. This also reflects the awareness of the respondents regarding the need of an additional reinforcement means by using an occlusal coverage for replacement of the lost tooth structure.

### Conclusion

Until an ETT is restored to full function, treatment is incomplete. The unrestored ETT is susceptible to fracture, which could lead to loss of tooth. Maximum preservation of healthy tooth structure and use of restorative materials with mechanical properties similar to the dental structure favor greater longevity of tooth restoration complex.<sup>14</sup> The proper choice of the method of restoration of endodontically treated anterior teeth by most of the respondents was expected to maximize chances for successful restorative outcomes.

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### Appendix 1: Questionnaire

- Which restorative material you use for endodontically treated anterior teeth when more than 50% of tooth structure is remaining?
  - Tooth colored (composite) restoration
  - Tooth colored crown
  - Prefabricated post and tooth colored crown
  - Prefabricated post and restorative material core/crown
  - Cast post and crown
- Which restorative material you use for endodontically treated anterior teeth when <50% of tooth structure is remaining?
  - Tooth colored (composite) restoration
  - Tooth colored crown
  - Prefabricated post and tooth colored crown
  - Prefabricated post and restorative material core/crown
  - Cast post and crown
- Which restorative material you use for endodontically

treated anterior teeth when there is 50% of tooth structure remaining?

- Tooth colored (composite) restoration
  - Tooth colored crown
  - Prefabricated post and tooth colored crown
  - Prefabricated post and restorative material core/crown
  - Cast post and crown
- Which core material do you prefer?
    - Glass ionomer cement
    - Composite
    - Amalgam
  - When do you prefer to place the post?
    - Immediately after root has been filled
    - After waiting for a week
  - Do you rinse and etch the canal before cementing the post?
    - Yes
    - No
  - If yes, than by which material?

- A. Alcohol
  - B. Alcohol and hydrogen peroxide
  - C. Phosphoric acid
8. Which cement do you prefer for luting the post?
- A. Glass ionomer cement
  - B. Zinc phosphate cement
  - C. Resin cement
9. How do you place luting cement in the canal?
- A. Lentulospiral
  - B. Probe
  - C. Plastic tube
10. By which method do you place luting cement in the canal?
- A. By wetting post in the cement
  - B. By directly putting the cement in the canal