

Survey on restoration on endodontically treated anterior teeth in Eastern region of Nepal: A questionnaire-based study

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ABSTRACT

Introduction: The preservation of natural tooth structure is the goal of endodontic and restorative dentistry. The optimal method for restoring teeth after root canal therapy is, however, still under debate for a very long time. Therefore, this study was conducted to detect the frequency of preferred methods of restoring endodontically treated teeth under different conditions. **Methods:** A structured questionnaire was distributed among general practitioners of the Eastern region of Nepal to find out the frequency of the best suitable material and method regarding restoration of endodontically treated teeth. The questionnaires were sent by electronic mail and out of 180 individuals, 92 responded. The respondents were asked to choose their favourite technique for restoring those teeth. 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 majority of the respondents 42(45.70%), preferred to restore the tooth only with a tooth-color restorative material under condition A (>50% of tooth structure remaining). Under condition B (50% of tooth structure remaining), the majority of respondents 48(52.20%), preferred to use tooth-coloured crown and prefabricated post and tooth-coloured restoration 21(22.80%). Whereas, in condition C (<50% of tooth structure remaining), most of the respondents 39(42.40%), preferred to use prefabricated post and tooth-coloured crown and prefabricated post and restorative material core/crown 37(40.20%). **Conclusions:** It is recommended to preserve as much healthy tooth structure as possible and to use restorative materials with mechanical properties that are similar to those of the dental structure to increase the longevity of the tooth restoration complex.

Keywords: Anterior teeth, restorative material, survey.

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INTRODUCTION

Endodontic treatment is used to preserve teeth that have fractures, caries, and recurrent restorations. After endodontic treatment a definite coronal restoration is necessary.¹ The most preferred way to restore the endodontically treated tooth (ETT) has long been controversial. It is very crucial to assess for restorability, occlusal function, and periodontal health before initiating the endodontic treatment. The most advisable clinical approach before initiating root canal treatment is to remove previous restorations and all existing caries.²

Studies have reported that the primary cause of endodontic treatment failure is due to restoration failure rather than the endodontic treatment itself.³ While restoring an endodontically treated tooth the practitioner should know why, when, and how to restore an endodontically treated tooth.^{3,4} If certain basic principles are followed while restoring endodontically treated teeth, it is possible to achieve high levels of clinical success with most of the current restorative systems. These principles include; avoidance of bacterial contamination of the root canal system, providing coronal

coverage, preserving radicular and coronal tooth structure, use of post etc.⁴

There are a lot of studies published with regard to restoration of endodontically treated teeth, but the information is not clear enough into a proper treatment protocol for the clinicians.^{4,5} More the tooth loss, weaker is the tooth. In accordance with the above, a variety of restorative materials have been proposed to strengthen and reinforce the weakened tooth structure.⁵ The clinical approach to restoring endodontically treated teeth needs to take into consideration several issues: aims of coronal restoration, criteria for establishing the various modalities of coronal restoration, clinical solutions of restoring teeth after endodontic treatment, guidelines regarding restorative materials and techniques, possibilities and limits of restoration using direct adhesive materials and techniques.⁶ Considering all these above factors the present survey was performed to determine the frequency of preferred methods, materials, timing and other concerning factors regarding the restoration of endodontically treated teeth.

METHODS

An observational, descriptive cross-sectional study was conducted after the approval of the study from the Institutional Review Committee (IRC) of Nobel Medical College and Teaching Hospital, on April 19, 2021 (Ref. No. IRC-NMCTH 424/2021). The duration of the study was from April 2021 to January 2022. A valid and reliable set of questionnaires was used as a study tool in this study.⁵ The study respondents were asked to fill out a pre-designed set of questionnaires. Prosthodontists, endodontists, and general practitioners who operate in private and public clinics in the eastern area of Nepal were given the questionnaire to fill up. Respondents were asked to provide information about their graduation year and school. The survey asked about various methods of restoring anterior teeth that had undergone endodontic treatment at various levels (percentages) of sound tooth structure still present (>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). We asked respondents to choose their favourite technique for restoring those teeth. 180 questionnaires were emailed, and 92 of them responded, yielding a response rate of 50%. The Statistical Package of Social Sciences (SPSS IBM version 20.0, 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 Table 1 and Figure 1. Under condition A (>50% of tooth structure remaining) the majority of respondents, 42(45.7%) preferred to restore the tooth only with a tooth-color restorative material. Under condition B (50% of tooth structure remaining), the majority of respondents preferred to use tooth-colored crowns 48(52.2%) and prefabricated post and tooth-colored restoration 21(22.8%). The use of tooth-colored composite restoration was significantly reduced in this condition 13(14.1%). Under condition C (<50% of tooth structure remaining) most of the respondents preferred to use a prefabricated post and tooth-colored crown 39(42.4%) and prefabricated post and restorative material core/crown 37(40.2%) as shown in Table 1.

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	42(45.7%)	13(14.1%)	5(5.4%)
Tooth-colored crown	34(37%)	48(52.2%)	7(7.6%)
Prefabricated post and tooth colored crown	11(12%)	21(22.8%)	39(42.4%)
Prefabricated post and restorative material core/crown	5(5.4%)	8(8.7%)	37(40.2%)
Cast post and crown	0	2(2.2%)	4(4.3%)

ETT: Endodontically treated teeth

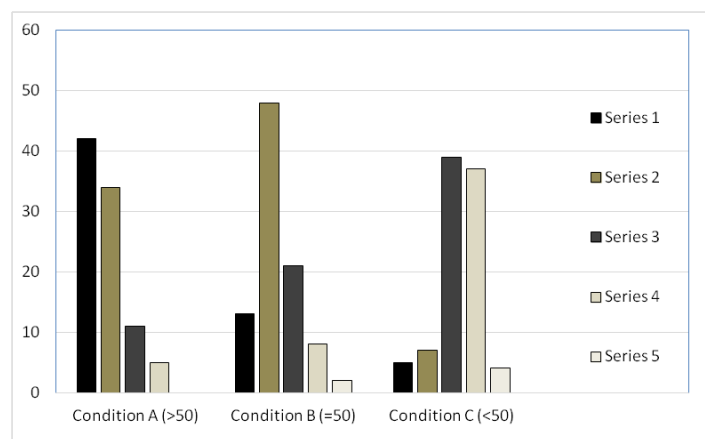


Figure 1: Overall response of various practitioners of Eastern region of Nepal on practicing the restoration of endodontically treated teeth. Series 1: Tooth colored (composite) restoration, Series 2: Tooth colored crown, Series 3: Prefabricated post and tooth colored crown, Series 4: Prefabricated post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

DISCUSSION

The structural integrity of ETT cannot be maintained. When selecting a final restoration, various elements must be considered. These factors include the amount of tooth structure still present, occlusal function, and the tooth's location within the arch. It's also critical to realize that ETT's dentin undergoes modifications. The teeth are not brittle due to moisture content loss, despite these changes.⁷ When Huang et al.⁸ evaluated the physical and mechanical characteristics of dentin specimens taken from teeth that had or had not had endodontic treatment, they concluded that dentin was not degraded by dehydration. As a result, cavities, prior restorations, and root canal preparations all contribute to tooth structural loss, which is what makes them most susceptible to breaking. Therefore, the tooth with the soundest dentin and enamel is the one that is stronger.

In the present study, while comparing between general practitioner and specialists, it was seen that both the group of respondents had similar views while choosing a method of restoring endodontically treated teeth on the basis of amount of remaining tooth structure. A similar study was carried out by Ratnakar et al.⁹ in order to detect the most preferred means to restore ETT. It was observed that in condition A, >50% of the practitioners preferred the usage of tooth-colored materials for restoration which was similar to our study that is 45.7%, whereas almost 45% dentists preferred tooth-colored dental crowns which was similar to this study that is 52.2%. In the last condition C, the major proportion of practitioners opted for cast metal post and core followed by crowns which is contrast to our study that is major proportion of practitioners opted for prefabricated post and tooth colored crown. It was inferred that grossly damaged endodontically restored teeth are susceptible to fracture and should be saved by using optimal restorative means to prevent further loss of tooth structure.

The results of other studies that show that when coronal damage is low, a conservative treatment in the form of composite resin, glass ionomer, or amalgam restorations should be considered to confirm the conclusions of the current study.^{10,11} Post and core foundation should be used when a tooth has more than 50% of its coronal structure removed.¹¹ The post's primary purpose is to maintain the core buildup in a tooth with significant coronal tooth structure loss. Widely utilized is a prefabricated post with a core build-up of restorative material.¹² According to Christensen,¹³ the core materials utilized under crowns and used to replace the majority of the coronal regions of the tooth should have a minimum compressive strength of

40,000 psi. At the time, only two types of core materials: composite resin (40,000 psi) and silver amalgam (65,000 psi)—were discovered to suit this criterion. Resin composites and amalgam may both be suggested for use as core materials based on strength, however glass ionomer-based materials are not.^{13,14}

Posts come in two varieties: prefabricated and custom-based. While custom-cast posts and cores have better adaptation to all root canals, prefabricated posts are excellent for circular canals. A custom cast post and core should fit perfectly and allow for a close adaption of the post to post space preparation. The benefit of using pre-fabricated post is that the post area may be prepared and the post can be directly bonded in a single appointment. In contrast to certain readymade systems, cast posts and cores do not require an additional retention mechanism, such as pins, to hold the core in place. On the other hand, a prefabricated post with a core build-up of restoration material is frequently used.¹⁴ The maximum mean failure load of prefabricated post and composite buildup restorations was reported by Brandal et al.¹⁵ The lowest failure stress was seen in coronal-radicular builds made of glass-ionomer and amalgam. For anterior teeth that had undergone endodontic treatment but had significant deterioration, Morgano et al.¹⁶ and Morgano et al.¹⁷ recommended cast posts and cores as the preferred restorative technique. The majority of the anterior teeth lack enough space to accommodate the bulk of the building material needed to create a strong unit around the post.¹⁷

In another study, which was carried out in Saudi Arabia in order to evaluate the latest concepts and other techniques prevalent to reinforce and restore weak and endodontically treated teeth by Habib et al.¹⁸ For this study, an administrative questionnaire was prepared and distributed amongst the practitioners of the region. Out of 204 completed questionnaires, 62% took into consideration the remaining tooth structure before deciding for the post endodontic restoration. 10% of the practitioners preferred to place a post in almost every care of ETT. More than 50% of the dentists believed that a post and core therapy does reinforce and strengthen the tooth structure in the long run. With regards to the concept of ferrule, as much as 46% of the practitioners believed that it helps to reduce the chances of fracture of tooth structure. More than 50% of the sample doctors preferred using prefabricated posts. Overall, the study inferred that the practitioners believed that the use of post-core therapy does strengthen and reinforce the remaining tooth structure and thus their usage was quite common. Therefore, to restore these teeth, a cast post and core are needed. It was determined that, as is frequently the case with anterior teeth, a cast post and

core is recommended when the alignment of the planned crown differs significantly from the inclination of the canal.

CONCLUSIONS

Treatment is not complete until an ETT is restored to full function. The unrestored ETT is prone to fracture, which can result in tooth loss. Greater lifespan of the tooth restoration complex is favored by the preservation of as much healthy tooth structure as possible and the use of restorative materials with mechanical qualities similar to dental structure. Most respondents believed that selecting the best restoration technique for endodontically treated anterior teeth would increase the likelihood for successful restorative results.

CONFLICTS OF INTEREST: None declared

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AUTHORS' CONTRIBUTION

AKS designed the research, performed statistical analysis, and prepared the first draft of the manuscript, PM contributed on research concept, prepare the draft of manuscript and contributed to prepare the first draft. All authors read and approved the manuscript.

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