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Knowledge, Attitude and Practice Survey on Restoring Endodontically Treated Teeth Among the Specialists and General Practitioners

Research Article

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Abstract

Introduction: The success of endodontically treated teeth mainly relies upon meticulous planning before initiating the root canal treatment. A post is placed in the root canal of a tooth when additional retention is needed to retain the core and should provide this support to the core without increasing the risk of root fracture.
Aim: The aim of this survey was to determine the awareness, current approaches, and techniques used in the restoration of endodontically treated teeth among general dentists,post graduates and endodontists.
Methodology: A descriptive questionnaire survey was conducted among 399 participants regarding restoration of endodontically treated teeth,in the month of August to September 2019. Out of 420 distributed questionnaires, 399 participants responded to the questionnaire.Data were analysed by using Statistical Package for Social Sciences (SPSS), Chi -Square Test was used to check the association based on the responses.
Results: The questionnaire was circulated among 420 dentists and 399 responded. It gives a response rate of 95%.Since the p-value is significant there is an association between most of the groups and variables in this study.The Chi-square test results showed that there was a significant impact of most of the variables on restoring endodontically treated teeth among endodontists, concluding that endodontists have more knowledge with regard to restoring endodontically treated teeth ($p<0.05$).
Conclusion: This survey shows thorough knowledge and awareness among postgraduates and endodontists, about restoring endodontically treated teeth and its management, and inadequate knowledge among general dentists.

Keywords: Endodontically Treated Teeth; KAP Survey; Practitioners; Root Canal Treated Teeth.

Introduction

The main outcome of endodontic therapy is to restore normal function, occlusion of the tooth and to maintain stability in the dental arch [1]. Teeth that were considered not restorable and extracted before can be retained now due to the predictable clinical success rate of endodontic therapy of more than 95% [2-4]. The restoration of endodontically treated teeth encounter problems due to loss of tooth structure by caries, trauma, fracture, previous restoration, and Endodontic therapy, all of these decrease the fracture resistance of the tooth [5-8].

The strength of the endodontically treated teeth depend on the bulk of the remaining dentin. Root canal treated teeth with an intact coronal structure have good prognosis [9]. Studies have reported that the main cause of endodontic treatment failure is because of the failure of the restoration failure rather than failure due to endodontic treatment itself. The final restoration of the root canal treated teeth play an important role. Improper restoration after root canal treatment contributes to one of the reasons for tooth extraction [10, 11].

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The different parameters that affect the prognosis of root canal treated teeth are amount of tooth structure that is lost, periapical status, position of the tooth, occlusal contacts, number of adjacent teeth, remaining coronal, root dentin, degradation of the collagen, final restoration, type of post and core material used and presence of a ferrule preparation in some cases [12-20].

Restoration of endodontically treated teeth should be assessed for occlusal function, restorability, periodontal status, biological width and crown to root ratio before initiating root canal therapy. All these factors should be considered in the treatment plan of endodontically treated teeth [21].

Amalgam and composite resin are the commonly used core foundations of root canal treated teeth as they are superior to glass ionomer cement [22]. Traditionally to retain the core in a tooth badly broken-down, a post is inserted into the root canal system which is further followed by a full-coverage crown to protect the tooth from fracture [23]. The main role of post-placement is to retain the core foundation and not reinforce an endodontically treated tooth [24]. Some studies have reported that the stress produced during the post space preparation and subsequent insertion has an impact on the increase in the risk of root fracture.

The literature reveals that post should be used only when there is not enough tooth structure to brace the core restoration [25, 26]. The most important factor in reducing the risk of root fracture is the preservation of dentin as much as possible [27]. Coronal microleakage is another major cause of endodontic treatment failure, well-sealed temporary and permanent coronal restoration is another important factor for the clinical success of endodontic therapy [28].

The present study aimed to determine the awareness, current approaches, and techniques used in the restoration of endodontically treated teeth among general dentists, post graduates and endodontists.

Materials And Methods

This survey was conducted in the month of August to September 2019 among general dentists,post graduates and endodontists. Responses were received from 390 participants out of 420 which consisted of 71% males and 28% females. 93% of the participants belonged to the age group of 20-30 years. Individual survey forms were given for each practitioner and the responses were recorded.

An online survey was done with the structured questionnaire based on knowledge, attitude, practice survey among general dentists,post graduates and endodontists. about restoration of endodontically treated teeth and its management and it was distributed via electronic media.The questionnaire had 25 questions in which 4 questions included basic demographic data,7 questions based on knowledge, 7 based on attitude, 7 questions based on practice were created. The participants were general dentists,post graduates and endodontists. A snowball sampling was followed for this study. The questionnaires were distributed via electronic media and responses were collected. All the participants were allowed to choose one of the given three to four choices for each item in the questionnaire. 399 responses were assessed. The advantages of online surveys are easy collection of data,cost effective and the disadvantage is repeated answers and incomplete answers. Then, it was assessed whether knowledge, attitude, practice were sufficient about restoration of endodontically treated teeth.

Ethical Approval

Ethical permission and approval for the project was obtained from the Institutional Review Board of Saveetha Institute of Medical and Technical Sciences, Chennai, India [SDC/SIHEC/2020/DATA/0619-0320].

Eligibility Criteria

Data Collection: This cross sectional survey was conducted during August to September 2019. The questionnaire was shared online via google forms and responses were obtained from 399 participants. The data for 25 questions was compiled and represented in a chart obtained from the google forms.

Sample Size: Total number of online questionnaires shared was 420. Out of which 21 did not take up the survey and were incomplete forms which were excluded from the study. Hence, the total number of the participants were 399.

Statistical Analysis

After data entry in the Excel sheet,SPSS software was used to analyze the data. The descriptive statistics were used to determine the frequencies and percentage of the responses given by the participants. Analysis was performed to find the correlation between KAP and their application in clinical situations. Chi Square test was performed. The results are obtained in bar diagrams.

Results And Discussion

The response rate of the participants in the present survey was satisfactory. Majority of the participants had good knowledge (65%), attitude (78.30%) and practice (73.72%) regarding restoration of endodontically treated teeth.The questionnaire was circulated among 420 dentists and 399 responded. It gives a response rate of 95%. A snowball sampling was followed for this study. All the participants were allowed to choose one of the given three to four choices for each item in the questionnaire. Lack of awareness of restoring endodontically treated teeth was found among the general practitioners in comparison to endodontists and post graduates. Since the p-value is significant there is an association between most of the groups and variables in this study.The Chi-square test results showed that there was a significant impact of most of the variables on restoring endodontically treated teeth among endodontists, concluding that endodontists have more knowledge with regard to restoring endodontically treated teeth ($p<0.05$).Results of the study were represented in the form of graphs and tables.(Table 1,2) (Figure 1-10)

Surveys can serve as one of the important tools for understanding treatment approaches of clinicians towards Endodontically treated teeth [29-33]. More than half of the participants agreed that a post-placement depends on the remaining tooth structure while more than one third agreed to the placement of a post sometimes. The results were similar to the findings in the study done in

Table 1. Showing distribution of cases which were included for the study based on Age, Gender and qualification.

Demographic Variables	Categories	No of Respondents	Percentage
Gender	Female	285	71.42%
	Male	115	28.80%
Age (years)	20-30 years	375	93.90%
	31-40 years	16	4.01%
	41-50 years	5	1.25%
	>50 years	3	0.75%
Qualification	Postgraduates	134	33.60%
	Endodontist	150	37.60%
	General practitioner	115	28.80%

Table 2. Showing Questionnaire and the Responses.

Question	Options	Number	Percentage
1.What is the most appropriate length of the post ?	1/2 length of root canal	11	2.75%
	1/3 length of root canal	122	30.57%
	2/3 length of root canal	255	63.90%
	Depends on remaining tooth structure	11	2.75%
2.What should be the apical seal after post placement?	2 mm	21	5.26%
	3 mm	17	4.26%
	4-5 mm	353	88.47%
	Depends on remaining tooth structure	8	2%
3.What should be the diameter of the post used?	1/2 Root diameter	29	7.26%
	1/3 Root diameter	255	63.90%
	2/3 Root diameter	103	25.80%
	Depends on remaining tooth structure	12	3%
4.Do you believe every endodontically treated tooth requires placement of a post ?	Always	48	12.03
	Depends on the remaining tooth structure	256	64.16%
	Never	4	1%
	Sometimes	91	22.80%
5.Do you think post reinforces endodontically treated teeth and reduces fracture probability ?	Always	177	44.30%
	Depends on remaining tooth structure	166	41.60%
	Never	8	2%
	Sometimes	48	12.03%
6.Do you think the ferrule effect can increase fracture resistance in an endodontically treated teeth?	Always	190	47.60%
	Depends on remaining tooth structure	133	33.33%
	Never	3	0.75%
	Sometimes	73	18.29%
7.On the basis of material which type of prefabricated post do you prefer from a longevity point of view ?	Ceramic post	30	7.51%
	Fiber post	52	13.03%
	Metal post	315	78.90%
	Others	2	0.50%
8.On the basis of shape which type of post do you prefer from a retention point of view?	Depends on the canal anatomy and available dentin.	148	37.09%
	Parallel sided post	12	3%
	Parallel tapered post	229	74.90%
	Tapered post	10	2.50%
9.Which do you commonly prefer for rinsing the canal before post cementation?	Chlorhexidine	7	1.75%
	EDTA	10	2.50%
	Saline	53	13.20%
	Sodium hypochlorite	329	82.45%
10.What type of cement do you commonly prefer for cementation of the post ?	Glass ionomer cement	13	3.25%
	Resin cement	384	96.20%
	Zinc phosphate cement.	2	0.50%
11.Which core material do you prefer to use frequently?	Amalgam	11	2.75%
	Composite	355	88.90%
	Glass ionomer cement	31	7.76%
	Others	2	0.50%
12.What is the most common cause of failure of ETT in your practice?	Crown fracture	50	12.53%
	Endodontic failure	328	82.20%
	No failure	4	1%
	Root fracture	17	4.26%
13.When do you start post space preparation in an ETT?	Directly 24 after obturation	17	4.26%
	Immediately after root canal obturation	4	1%
	One week after obturation	258	64.66%
	Several weeks after obturation	120	30.07%

14.When using prefabricated post which type do you prefer?	Ceramic posts	23	5.76%
	Fiber reinforced post	355	88.97%
	Metal post	19	4.76%
	Others	2	0.50%
	Always	5	1.25%
15.When do you decide to place an intracanal post ?	When one coronal wall/no wall is left but ferrule of 2 mm remains	28	7.01%
	When three coronal walls remain	65	16.29%
	When two coronal walls remain	301	75.40%
16.What type of post do you use on an ETT anterior teeth?	Cast post and core	11	2.75%
	Glass fibre post	351	87.90%
	Metal post/metal screw post	7	1.75%
	Zirconia post	30	7.51%
17.What type of post do you use on an ETT posterior teeth?	Cast post and core	49	12.28%
	Glass fibre post	15	3.75%
	Metal post/metal screw post	330	82.70%
	Zirconia post	5	1.25%
18.How often do you place a crown in a tooth with a post and core ?	Always	146	36.50%
	Depends on remaining tooth structure	235	58.80%
	Sometimes	18	4.50%
19.Which crown material do you use for ETT with post and core?	Full ceramic crown	38	9.50%
	Full metal crown	8	2%
	Others	4	1%
	Porcelain fused to metal crown	349	87.40%
20.If the remaining dentin thickness of an ETT is less which post do you use ?	Cast post	97	24.30%
	Everstick post	92	23%
	Fibre reinforced post	208	52.10%
	Others	2	0.50%
21.Are you aware of the recent techniques that can be used for the restoration of endodontically treated teeth ?	Yes	359	89.90%
	No	40	10%

Figure 1. Bar chart showing association between field of practice and question as to which is the most appropriate length of the post, X axis represents the field of practice and Y axis represents the total number of responses to the question .Majority of the percentage of participants were aware of the appropriate length of the post. Chi square test (3.17) was done and association was found to be not statistically significant. Pearson's Chi square P value = 0.213, p>0.05.

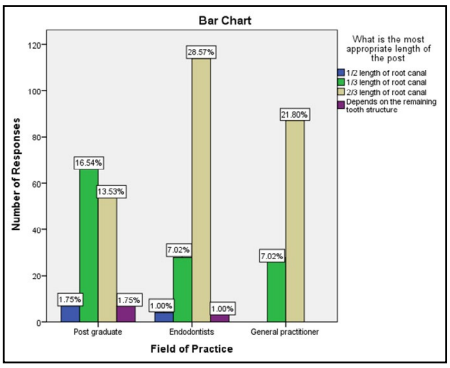


Figure 2. Bar chart showing association between field of practice and question as to which type of post is preffered in terms of retention. X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants preferred the use of parallel tapered post length of the post in terms of retention of the post. Chi square test (2.88) was done and association was found to be statistically significant. Pearson's Chi square P value = 0.044, p<0.05.

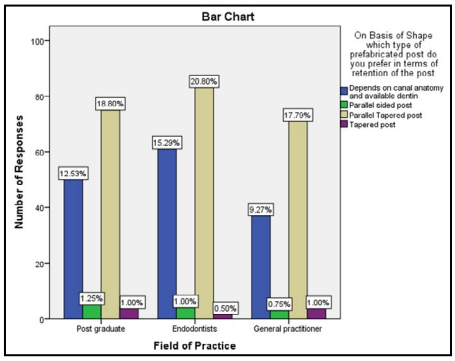


Figure 3. Bar chart showing association between field of practice and question as to on basis of material which type which post was most preferred in terms of longevity. X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants preferred the use of metal posts in terms of longevity of the post. Chi square test (0.58) was done and association was found to be not statistically significant. Pearson's Chi square P value = 0.20, p>0.05.

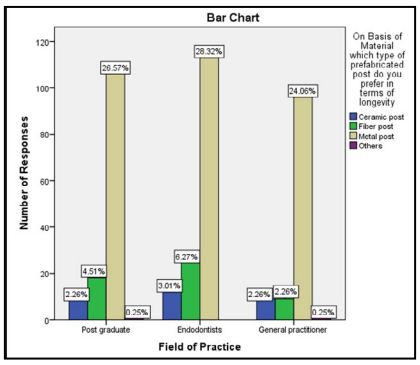


Figure 4. Bar chart showing association between field of practice and question as to what is the most common cause of failure of endodontically treated teeth. X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants responded to endodontic failure accounting for the highest cause of failure of endodontically treated teeth . Chi square test (1.15) was done and association was found to be statistically significant. Pearson's Chi square P value=0.031, p<0.05.

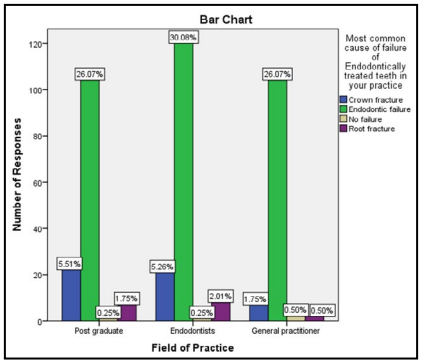
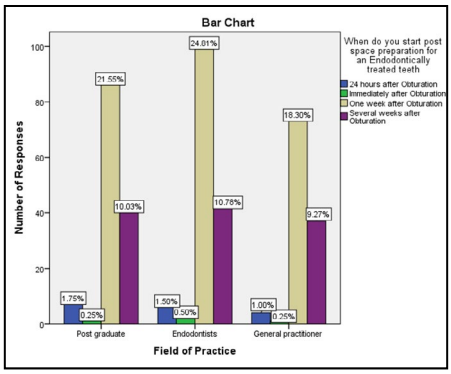


Figure 5. Bar chart showing association between field of practice and question as when is the preferred time to start post space preparation for an endodontically treated tooth. X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants agreed to start post space preparation for an endodontically treated teeth one week after obturation. Chi square test (1.15) was done and association was found to be statistically significant. Pearson's Chi square P value=0.031, p<0.05.



Germany and the United Kingdom which suggested every tooth does not require placement of a post [34]. Most of the participants believed that placement of a post strengthens endodontically treated teeth.The results received were similar to the findings of studies among general practitioners in Sweden, Germany, and Northern Ireland [29, 34, 35]. The placement of a post is generally suggested in restoration of endodontically treated teeth if the amount of residual tooth structure is not sufficient to support the core material [36].

Ferrule effect of 1–2 mm does increase the fracture resistance of teeth [37]. The ferrule effect is a key factor in avoiding clinical failures [34, 36]. The majority of the practitioners believed the placement of a ferrule is an important feature in endodontically treated teeth.The use of prefabricated metal post was more common compared to the use of prefabricated fiber post, various guidelines for optimum post length are that the post length should be equal to 2/3 of the root canal, that it should be equal to the length of the clinical crown and there should be about 4-5mm of apical seal of gutta-percha [38]. Most of the practition-

Figure 6. Bar chart showing association between field of practice and question as to when the remaining dentin thickness of an endodontically treated tooth is less which post is preferred. X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants agreed placement of fibre reinforced post when the remaining dentin thickness of an endodontically treated tooth is less.Chi square test (0.58) was done and association was found to be statistically significant.Pearson's Chi square P value=0.05, p=0.05.

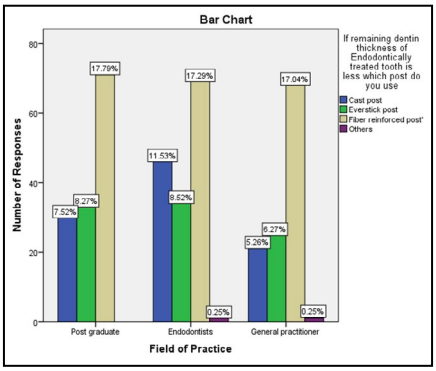


Figure 7. Bar chart showing association between field of practice and question as to which core material was used frequently for restoration of endodontically treated teeth.X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants used composite as the core material for restoration of endodontically treated teeth.Chi square test (0.58) was done and association was found to be statistically significant. Pearson's Chi square P value=-0.72, p<0.05.

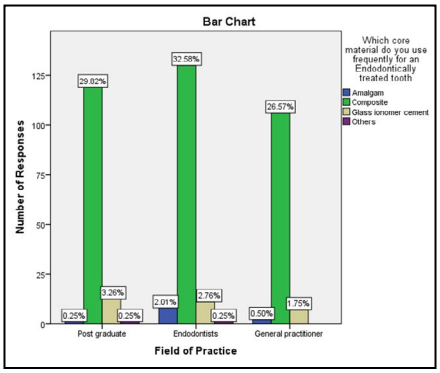
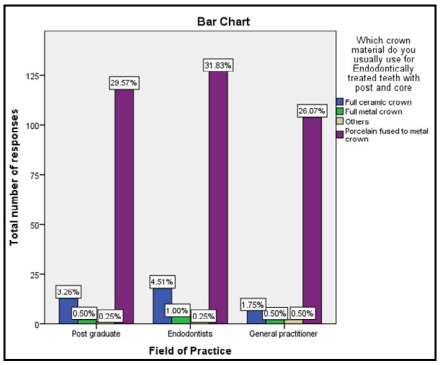


Figure 8. Bar chart showing association between field of practice and question as to which crown material was used frequently endodontically treated teeth requiring post and core.X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants preferred use of porcelain fused to metal crown as the crown material for endodontically treated teeth requiring post and core.Chi square test (1.15) was done and association was found to be statistically significant. Pearson's Chi square P value=0.037, p<0.05.



ers in the present survey considered post length as 2/3rd of the root canal [39].

The diameter of the post should be 1/3rd the root diameter. Studies have proved that as the amount of dentin removal increases, the fracture resistance of teeth decreases [40]. In the present survey majority of practitioners believed post diameter should not exceed more than 1/3rd of the root diameter. The research confirmed that post diameter creates internal stresses within the root and does not contribute to the retention of the post [41, 42].

Parallel tapered posts was the preferred material of choice in regards to the shape of the post by the majority of the practitioners.

The participants of the study preferred to use sodium hypochlorite as the preferred irrigant for rinsing the root canal before post-placement which was followed by saline for rinsing the root canal [4, 43-45]. Sodium hypochlorite was recommended for irrigating the root canal system because of its effective antimicrobial and tissue solving action [46]. More recently resin cement has been introduced for luting the remaining tooth structure [47, 48]. Resin-

Figure 9. Bar chart showing association between field of practice and question as to how often a crown in endodontically treated teeth that requires post and core.X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants decided for crown placement depending on the remaining tooth structure.Chi square test (5.19) was done and association was found to be statistically insignificant. Pearson's Chi square P value=0.074, p>0.05.

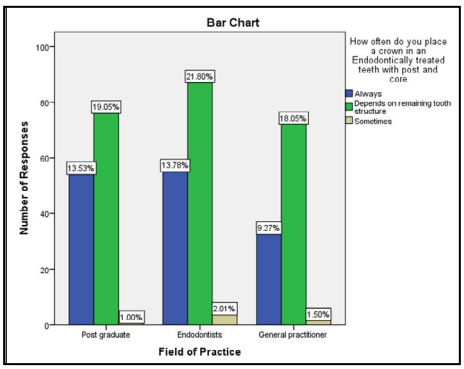
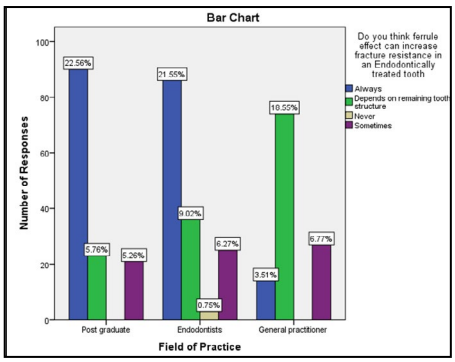


Figure 10. Bar chart showing association between field of practice and question as to whether ferrule effect increases fracture resistances in an endodontically treated tooth .X axis represents the field of practice and Y axis represents the total number of responses to the question . Majority of the participants responded that the ferrule effect has an influence of increasing fracture resistance of an endodontically treated tooth.Chi square test (0.86) was done and association was found to be statistically insignificant. Pearson's Chi square P value=0.24, p>0.05.



based luting cements are reported to have higher bond strengths and significantly increased post retention, as well as it helps to strengthen the endodontically-treated tooth in comparison with other conventional types of cement and glass-ionomer cement [49].

The most frequently used core material used was composite resin followed by glass ionomer and amalgam by the participants of the study. Amalgam, when used as a core material, can cause aesthetic problems with all ceramic crowns and sometimes make the gingiva look dark. There is also risk of tattooing the cervical gingiva with amalgam particles during the crown preparation. Amalgam has no natural adhesive properties and taking into account the potential concern of mercury toxicity, it is no longer widely used as a buildup material. The participants of this study preferred to use composite resin as it adheres to tooth structure, can be prepared and finished immediately, has good color under all-ceramic crowns and has an aesthetically acceptable appearance.

In the current study, endodontic failure was considered the most common reason for the failure of endodontically treated teeth by the majority of the participants followed by crown fracture. In one study in Germany, the loss of retention was considered the reason for the failure of endodontically treated teeth while in another study the endodontic failure was considered the most common reason for the failure of endodontically treated teeth among the participants of the study [50]. A recent literature review on clinical studies of fiber posts reported that the use of fiber-reinforced composite posts out-perform metal posts in the restoration of endodontically treated teeth. The evidence cannot be considered as conclusive. Under conditions of extensive coronal destruction the placement of a fiber-reinforced composite post would seem to protect the tooth against failure, however the most common type of failure with fiber-reinforced composite posts is debonding [51].

The use of cast posts may result in a significantly greater loss of tooth structure compared to fiber posts, and their use should be limited to cases in which no additional dentine has to be removed to allow for their cementation [52]. When two or more walls are missing in a tooth after caries excavation and endodontic obturation, placement of a dowel or post is indicated for retention of the core foundation and final coronal restoration [53]. The majority of the participants agreed to place an intracanal post when two coronal walls were remaining while the rest of the participants agreed to place an intracanal post when three walls were remaining. Considering the time of post space preparation majority of the practitioners agreed preparation of post space in teeth requiring post within one week following obturation while some of the practitioners agreed post space preparation within several weeks following obturation of endodontically treated teeth. When only one to two walls of dentin remain, for both anterior and posterior teeth either an adhesively cemented prefabricated metal or fiber post with a composite resin core buildup foundation can be used.

Fiber posts can be used when there is minimal radicular tooth structure because they offer approximately the same modulus of elasticity as dentin and forces would be distributed more evenly in the shorter root, resulting in fewer root fractures [54]. Majority of participants preferred the placement of fiber posts in the anterior teeth and metal posts in the posterior teeth.

Two systematic reviews examined the outcome of endodontically treated teeth when restored using direct restorations versus crowns [55-56]. One systematic review concluded that endodontically treated teeth restored without crown coverage had a lower long-term survival rate in comparison with teeth covered with crowns [55]. The other concluded that there is currently a lack of well-founded evidence to determine whether restoring a premolar with ample coronal tooth structure restored with composite resin restoration is more effective than a crown [56]. Majority of the practitioners placed a full ceramic crown as restoration of choice for endodontically treated teeth with post and core.When the remaining dentin thickness was less, the majority of the participants preferred the use of fiber reinforced post and remaining participants preferred the use metal post followed by everstick post.

Everstick post is a flexible, resin impregnated, uncured glass fiber post which has an interpenetrating polymer network (IPN) resin matrix that can be cured to the anatomic shape of the crown [57]. After curing these fiber-reinforced posts exhibit high tensile strength and elastic modulus similar to elasticity of dentin thereby causing less root fracture and stresses to be evenly distributed [58].

Clinical Significance

While planning restoration of an endodontically treated teeth effort should be made to preserve the coronal and radicular dentin, to avoid contamination of the root canal system, to restore the tooth immediately after root canal treatment if possible and to use posts only when necessary to retain a core buildup. During selection and placement of post principles to the following include adequate length, resistance form, strength to allow preservation of dentin and an adequate ferrule of 2mm.

Limitations

This study was confined among a smaller number of population, and have not focused on recent techniques used for restoration of endodontically treated teeth.

Future Scope

This study can be conducted in a larger population. The questions can be focused on prognosis, management and longevity of endodontically treated teeth in future studies.

Conclusion

Within the limitations of this study,this cross sectional descriptive study shows a thorough knowledge and awareness among the endodontic specialists about restoration of endodontically treated teeth and its management and inadequate knowledge among general dentists. Therefore, establishing awareness among general dentists regarding restoration of endodontically treated teeth and its management is mandatory.

Author Contributions

Draft Preparation, Data collection, statistical analysis was done by Swathi UB.Reviewing, corrections done by Sindhu Ramesh and Pradeep S.

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