

Restorative treatment strategies adopted by dentists in Saudi Arabia to restore endodontically treated teeth. A cross sectional study.

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Abstract

Endodontic procedure is not complete until the tooth's entire functionality has been recovered. Unrestored endodontically treated teeth are prone to fracture, which may result in tooth loss. Greater longevity 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 properties similar to dental structure. Multiple factors must be considered when determining the prognosis of endodontically treated teeth. Dentist is often in dilemma regarding selection of the post and core material in different case scenario.

Objective

The purpose of this study was to assess current opinions, applied techniques, and materials for the restoration of endodontically treated teeth (ETT) in a nationwide survey in Saudi Arabia.

Material and methods

Results

Completed responses from 148 dentists were recorded from a total sample size of 180 (response rate 82 %). In general, posts were reported to be used more frequently (51 %) for indirect restorations than for direct restorations (21 %). Fiber posts were preferred by most dentists over metal posts and combined posts.

Conclusion

Composite core build-ups with and without fiber posts were the predominant treatment approach to restore ETT in Saudi Arabia. However, a larger survey needs to be carried out with more participants to determine the overall preference.

Keywords- ETT, restoration, strategies

Introduction

Endodontic procedure is not complete until the tooth's entire functionality has been recovered. Unrestored endodontically treated teeth are prone to fracture, which may result in tooth loss. Greater longevity 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 properties similar to dental structure. Because internal tooth structure is removed during endodontic therapy, endodontically treated teeth are generally thought to be more brittle than sound teeth (1). Coronal leakage is a significant cause of endodontic failure, according to published data. Due to saliva exposure, leakage will weaken the gutta-percha seal, necessitating possible retreatment of the tooth. Modern endodontic therapy has a high success rate that is predictable, so delaying restoration for a long time to ensure endodontic success is unnecessary and could endanger the tooth. There aren't many studies examining the causes of endodontically treated teeth being extracted. (2)

Numerous restorative treatment methods are now available to restore endodontically treated teeth because of significant advancements in restorative dentistry. However, for the restorative dentist, identifying whether cuspal covering is required or not, followed by choosing a suitable treatment approach for each clinical case, could be difficult. (3) In the previous few decades, dental restoration techniques that were once considered traditional, have undergone a paradigm change. The rise in popularity of the minimally invasive dental concept and the creation of more durable materials were cited as the causes of this change. (4) Endodontically treated teeth (ETT) restoration aims to return function, aesthetics, and phonetics. Two additional objectives for restoring ETT, providing coronal seal and protecting against fracture require the preservation of the native tooth structure. Many variables have an impact on ETT's ability to survive. It is generally established that restoration failure rather than endodontic therapy itself is more likely to result in ETT failure. (5)

Aim

The purpose of this study is to gather information on the restorative preferences for endodontically treated teeth among dentists practising in Kingdom of Saudi Arabia.

Material and method

To determine the therapeutic principles for ETT restoration among dentists in Saudi Arabia, an English self-administered questionnaire was created. The questionnaire was created using data from other studies carried out elsewhere in the world. Sample size was calculated to be 180. However, 148 Saudi Arabian dentists who are currently in practice answered the open-ended

questionnaire asking about their preferences and deciding factors when choosing a restorative material to restore an endodontically treated tooth.

This study has been approved by the ethical committee of Riyadh Elm University research center with IRN number "FRP/2021/430/719/694".

Inclusion criteria

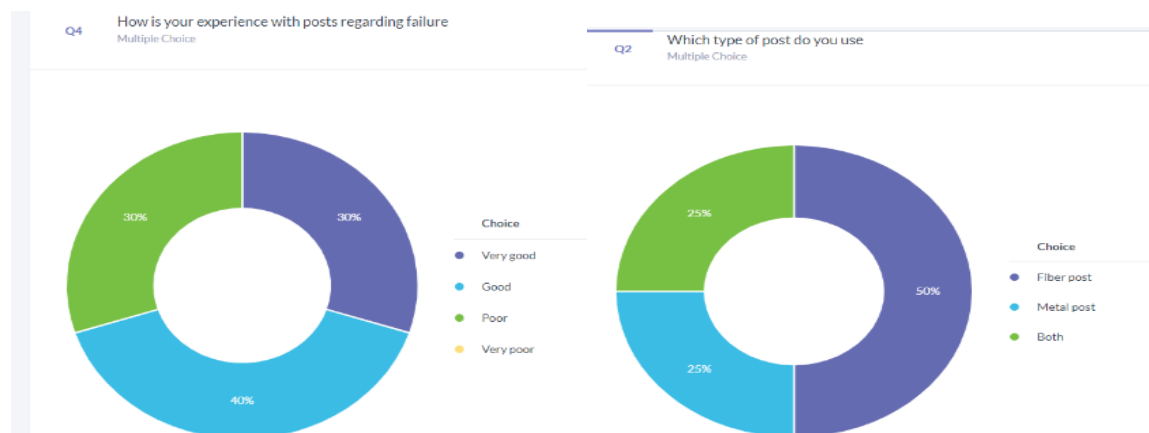
- Practicing specialists and consultants, advanced dental specialists and general dentists across public and private sector
- Dentists practicing in Saudi Arabia

Exclusion criteria

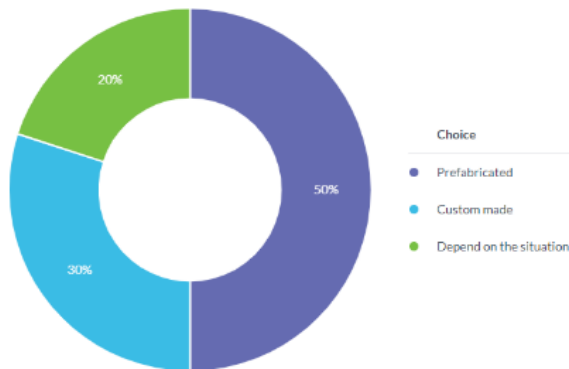
- Students at dental schools
- Dentists from outside Saudi Arabia

Results

A total of 148 dental practitioners responded to the survey out of a total sample size of 180. Among them 60% comprised of general dentists whereas the rest 40% made up restorative dentistry specialists, endodontists and graduates of Advanced education in general dentistry. Most dentists preferred fiber posts (43%) as compared to metal posts (36%). Most dentists used both fiber and metal posts depending on the individual case scenario. Prefabricated posts were preferred by 63 percent while custom made posts were used by 37 percent. There was a sense of satisfaction among dentists to the use of posts and most of them found it to be successful on an average of 10 years of follow up. Among the prefabricated posts most opted for tapered post (35%) followed by parallel sided posts, combination of parallel and tapered, screw type post and split flexible post. On being asked about reasons for failure of posts most responded with failure of endodontic treatment followed by crown fracture and loss of retention. For the core, most used base metal alloy (58%) followed by zirconia (27%). Table 2 shows the posts preferred by dentists for a particular final restoration. For direct restorations, glass fiber posts (62%) were most often used followed by endodontic screws (13%). For single crowns lesser percentage of fiber posts were used (53%) and endodontic screws (14%). For fixed partial denture close to 50% dentists preferred glass fiber posts with 46% to be precise.



Q3 Which type of post do you prefer to use?
Multiple Choice



Q6 Most frequent failure reason?
Multiple Choice

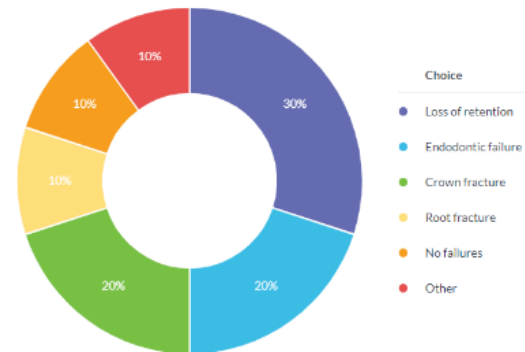


Table 1. Preferred post type

Final restoration	Glass-fiberpost (%)	Passive prefabricated metallic (%)	Active prefabricated metallic post (%)	Cast post-and-core(%)	Others (%)
Direct restoration	62	10	13	0.2	3
Single crown	53	12	14	11	1
Fixed partial denture	46	15	16	16	1

Discussion

The optimal method for restoring teeth after root canal therapy has long been debatable and continues to be so. Several factors need to be considered when using a clinical approach to restore endodontically treated teeth, including the goals of coronal restoration, the standards for establishing the various modalities of coronal restoration, clinical solutions for restoring teeth after endodontic treatment, guidelines regarding restorative materials and techniques, and the potential and restrictions of restoration using direct adhesive materials and techniques. Endodontically treated teeth typically undergo coronal restoration to prevent recontamination of the root canal system and/or periapical space, provide the restoration-tooth complex with the necessary strength to withstand functional stress and prevent crown and/or root fracture. (6,7)

Long-term studies have supported the use of mechanically retained restorations as treatment alternatives for restoring ETT, and these restorations have shown good reliability and predictability. (8,9)

In light of the fact that clinical performance and longevity are dependent on the material, it's crucial to select the best restoration protocol for ETT. Uncertainty persists on the best post type and process, albeit (10). There are numerous materials, styles, and methods for post restorations (11). Posts can either be prefabricated or custom made. Custom cast posts and cores allow for a close adaptation of posts to the post space preparations and should fit optimally (12). Prefabricated posts have an advantage in that the post space can be prepared and the post directly

bonded in a single appointment. Metal, fiber, and ceramic posts are the three different types of intraradicular posts that can be categorized by material. Prefabricated metal posts (PMP) and conventional cast post core (CPC) are two categories of metal posts (MP) (13). For a very long time, the CPC made of various alloys has been used to repair ETT, primarily to restore teeth without ferrules or when the angle of the core in regard to the root needs to be changed (14). The CPC preparation of the root canal, however, might result in a wedge effect in situations of root fracture and enlarges the tooth structure, weakening the ETT. Because of their simplicity, strong resilience to fracture, and shorter chair times, prefabricated posts like PMP can be thought of as preserving the structure of ETT (15). However, the fact that metal has a lower elastic modulus than dentin might lead to stress, which raises the possibility of catastrophic failures and root fracture. The prefabricated fiber post (FP), in contrast, is viewed by most professionals as an alternative to MPs because of its aesthetic qualities and the presence of an elastic modulus similar to that of dentine, which enhances stress distribution and lowers the possibility of catastrophic failures. The majority of FPs consist of a resin matrix with glass, carbon, or quartz fiber for reinforcement. Despite their clear advantages, FPs exhibit reduced post-fracture resistance and a higher likelihood of post-debonding following lengthy follow-up (16). Additionally, a minimum ferrule height of 1.5 to 2 mm was advised by some writers for the remaining healthy teeth. When comparing the CPC or PMP with FP in teeth with poor remaining structure, several studies, however, observed similar results (16,17). Posts made of glass fiber, cast metal, carbon fiber, and prefabricated metal all have unique mechanical characteristics. Metal posts that are cast or prefabricated may perform differently from posts with an elastic modulus that is similar to dentin. Prefabricated glass fiber posts may have better stress distribution because they have an elastic modulus similar to that of dentin. Sarkis-Onofre et al. reported that studies evaluating glass fiber posts with longer follow-up periods are needed. They also reported that posts with a high elastic modulus appear to perform better when restoring ETTs without a ferrule. Sarkis-Onofre et al.'s research¹⁵ also revealed that after 9 years of follow-up, the performance of severely damaged teeth restored with glass fiber posts and cast metal posts was good and comparable. There were no appreciable differences in the survival rates of cast metal and glass fiber posts, according to another study on the 10 years of follow-up of various posts on teeth restored with zirconia crowns. The ferrule effect, which improves fracture resistance, may be preserved by the remaining coronal walls, which is a major factor affecting the performance of posts. A ferrule, defined as "a metal band or ring used to fit around the root or crown of a tooth", is highly desirable when a post is used. An adequate ferrule is considered to need a minimum of 2 mm of vertical height and 1 mm of dentin thickness (18). The ferrule effect however may not significantly lower the failure rate of fiber-reinforced composite post-and-core restorations, according to a meta-analysis (18). There was no discernible difference between the posts in terms of region, even though there were more MP failures in the anterior region and FP failures in the posterior region. The study by Garcia et al., which found that the ETT repaired with posts displayed identical failure rates for the front and posterior teeth, supports the findings (19). While Cloet et al. reported that the anterior region failed 3 times more

frequently than the posterior region did, Sarkis-Onofre et al. reported a high incidence of fractures in the posterior region. The absence of residual walls was cited as the cause of the greater incidence by the authors, while non-axial loads increasing tensile and shear stresses were suggested as the cause of failures in the anterior region. (9) When dental posts are subjected to oblique forces, they typically break owing to shear stress. In their study, Wandscher et al. found that dental restorations anchored with fiber posts failed under shear stress loads of 450 N. (20) Catastrophic failures are typical among teeth that have been restored with metallic posts, including oblique or horizontal fractures in the middle third of the root and vertical fractures of the root. Because of this, the tooth may need to be extracted completely. However, other writers have claimed that fiber post failures in endodontic treatments are easily reparable notwithstanding their occurrence (21). Zhou and Wang postulate that this is because fiber posts, like dentin, have an elastic modulus that helps spread stress throughout the material. (21) In their research, Loney and Moulding, found that the fracture resistance of teeth repaired with metallic posts varied significantly depending on the load angulation. The failure load also increases when the load angle gets closer to being perpendicular to the long axis of the tooth, as discovered by Loney & Moulding (22). However, it is crucial to keep in mind the fact that different dental post brands have vastly varying structural features and fatigue resistance, as reported by Grandini et al., (23).

Regarding luting strategies for posts, dentists tended to favor resin-based materials. A self-adhesive resin-based luting agent increased the retention of glass fiber posts in root canals, according to a comprehensive evaluation of in vitro experiments using various luting techniques and bond strength tests. The use of adhesive luting systems in conjunction with prefabricated posts and direct core foundations has made it possible to perform improved adhesive procedures. A better clinical outcome may come from the luting of prefabricated posts utilizing an adhesive luting technique, which may produce more retention, less marginal microleakage, and good marginal seal. According to several surveys, general dentists, specialists, and dental students from the United States, Sweden, Germany, Saudi Arabia, and India believe that placing a post strengthens ETTs and lowers the likelihood of breakage. (23,24) Additionally, Lithuania and Northern Ireland both reported on this discovery. In contrast, current evidence-based analyses have found that posts do not strengthen ETTs, as a post's only function is to maintain the core or the restoration. (25,26)

Conclusion

Posts are sometimes used to keep crowns and endocrowns in place, but there is scant evidence that they are necessary. They have been linked to an increase in catastrophic failures in the studies that have looked into this. However, when ETT is restored with PFM, posts are related with increased survival. To learn more about postless techniques in biomimetic restorative dentistry, we need further clinical trials comparing adhesively bonded crowns to postless build-ups or post-and-core build-ups. Our study showed that dentists in Saudi Arabia preferred

prefabricated and cast metal posts to restore ETTs and resin-based luting agents for bonding such posts.

APPENDIX I

Questionnaire

- I. What is your position as a clinician
- II. Which type of post do you use
- III. Which type of post do you prefer to use?
- IV. How is your experience with posts regarding failure
- V. When you use a prefabricated metal post, which type do you prefer?
- VI. Most frequent failure reasons.
- VII. Do you believe that every ETT must receive a post?
- VIII. Do you believe that a post reinforces an ETT and reduces the fracture probability
- IX. Do you believe that reducing the level of the finishing line below the core foundation following post cementation increases the fracture resistance?
- X. Which type of custom-made post and core do you mostly use?
- XI. What type of cement do you use for post cementation?
- XII. What type of core build-up material do you mostly prefer to use with prefabricated posts?
- XIII. When do you usually insert the posts into the canal after obturation?
- XIV. Should the tooth (with post and core) be crowned?
- XV. Which crown material do you usually indicate?
- XVI. What is the approximate percentage of failure you have encountered following restoration of endodontically treated tooth
- XVII. What has been the reasons for failure
- XVIII. Do you prefer to do post and core restoration when the remaining tooth structure is less than 25 percent
- XIX. Are you aware of RDES (Restorative difficulty evaluation system)
- XX. Are you aware of post-space treatment used to remove the smear layer?

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