

Clinical Practice Guidelines For Choice Of Post-Endodontic Restorations

Research Article

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Abstract

The survival of the tooth after endodontic treatment is extremely important for the overall success and improvement of quality of life of the patient. This depends on the choice of the post-endodontic restoration. In the past, post-endodontics, it was advised to crown all teeth with full coverage restorations. Over the years, minimally invasive dentistry has become more popular among restorative dentists. Evidence has made clinicians and researchers realize that full coverage restorations are not advisable and that tremendous amounts of healthy tooth structure may be lost in the process. Recently, many more minimally invasive options are available to restore endodontically treated teeth. They include, partial coverage restorations, inlays, onlays, overlays, and even simple resin composite cores. Although this minimal approach is quite tempting, some teeth do require more coverage. There are numerous factors that must be studied before a choice of post-endodontic restoration is made including, the type of tooth, the occlusal load on the tooth, number of missing teeth, the amount of remaining healthy tooth structure, position of the tooth, etc. Apart from this, newer materials have been introduced by manufacturers like zirconias, lithium disilicate, leucite ceramics, etc. that provide better properties to the restorations. The clinical decision making process might become quite confusing due to these reasons. A proper guideline is thus required, which includes all the parameters that need to be assessed before making a choice of post-endodontic restoration. Hence, this paper aims at reviewing the various options available today for post-endodontic restorations as well as formulating clinical practice guidelines to aid clinicians in making the correct choice of restoration of endodontically treated teeth.

Keywords: Post-Endodontic Restorations; Endodontically Treated Teeth; Clinical Practice Guidelines; Minimally Invasive Dentistry.

Introduction

The success of endodontics majorly depends on proper disinfection of the root canal space, followed by a three dimensional obturation and finally an appropriate post-endodontic restoration [1]. Of these, the latter is quite often ignored by clinicians as well as patients. This may allow the passage of microorganisms and their by-products to the apical region of the root and into the alveolar bone, which may be a potential cause of delayed failures. Olcay et al [2] in 2017 concluded from their cross-sectional study that the most common reason for extraction of endodontically treated teeth was for restorative and prosthetic reasons (40.8%). Ray and Trope [3] observed that a combination of good resto-

rations and good endodontic treatments resulted in absence of periapical inflammation in 91.4% of the teeth, whereas poor restorations and poor endodontic treatments resulted in the absence of periradicular inflammation in only 18.1% of the teeth examined. Poor endodontic treatments that had good permanent restorations had a success rate of 67.6%. They concluded that apical periodontal health depended significantly more on the coronal restoration than on the quality of the endodontic treatment.

In the past, it was believed that endodontically treated teeth were much weaker, more brittle and prone to fracture as compared to vital teeth. Recent evidence has proved that this was in fact not true and that there is no significant difference between the two in

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terms of strength, brittleness or moisture content [4-6]. Dietschi et al, stated that the tooth strength is dependent on proportion of coronal tissue loss, due to either caries or restorative procedures [7]. Hence, preservation of tooth structure even during post-endodontic restorative procedures must be done.

Minimally invasive dentistry has now become a trend especially in restorative dentistry [8, 9]. With more and more developments in technology and materials today, it has become much easier for the clinician to practice with minimal invasion of tooth structure. Overall, there are multiple factors that help determine the choice of post-endodontic restoration. Hence, this paper aims at reviewing the various options available today for post-endodontic restorations as well as formulating clinical practice guidelines to aid clinicians in making the correct choice of restoration of endodontically treated teeth.

Previously our team has a rich experience in working on various research projects across multiple disciplines [10-24] Now the growing trend in this area motivated us to pursue this project.

Recent Trends In Post-Endodontic Restorations

With increasing research done in this field, there is abundant evidence to prove that all endodontically treated teeth do not require a full coverage restoration [25, 26]. The current concepts have given the clinician the liberty to opt for a more conservative approach. These options include:

Partial Coverage Restorations

This includes inlays, onlays and overlays. Inlays are indirect restorations without cuspal coverage. They can be mesio-occlusal, disto-occlusal or mesio-occlusal-distal preparations. They are the least invasive indirect restorations for posterior teeth. Onlays are restorations that partially cover one or more cusps but not the entire occlusal surface. Overlays are restorations that cover all the cusps and the entire occlusal surface but with margins placed high, sometimes coronal to the proximal contact areas [27].

Veneers

Dental veneer is a thin layer of material usually porcelain or composites that cover the labial surface of the tooth [28]. They are the least invasive indirect restoration especially for anterior teeth. They are bonded to the tooth surface and hence provide good strength and fracture resistance.

EndoCrowns

Endocrown is a single prostheses fabricated from reinforced ceramics, indicated for endodontically treated molar teeth that have significant loss of coronal structure [29]. Endocrowns are formed from a monoblock containing the coronal portion invaded in the apical projection that fills the pulp chamber space, and possibly the root canal entrances; they have the advantage of removing lower amounts of sound tissue compared to other techniques, and with much lower chair time needed. They are luted to the tooth structure by an adhesive material.

Resin Composite Core Build-ups

This involves merely filling the endodontic access cavity with resin bonded composite. With minimally invasive access cavity designs, this has become a more commonly used approach for restoration of endodontically treated teeth.

Full Coverage Restorations (Crowns)

This is the oldest approach to restore endodontically treated teeth. Crowns are indirect restorations that completely cover the coronal portion of the tooth. They can be made of ceramics, zirconias, porcelain fused to metals, cast metals, gold, etc.

Post and Core

These restorations are applicable for teeth that have lost a significant amount of tooth structure. A post or a dowel enters the root canal to support the coronal core restoration. It is usually followed by a full coverage restoration like a crown. A number of materials are used for posts including metals, fiber reinforced composites, ceramics, zirconias, etc. Posts can be either custom made or prefabricated. They can be active or passive; parallel, tapered or parallel-tapered.

Factors Determining Choice Of Post-Endodontic Restoration

A number of factors determine the choice of post endodontic restoration. They include:

- Type of tooth
- Position of tooth in the arch
- Amount of remaining tooth structure
- Load on the tooth
- Ability to provide bonded restorations

Clinical Practice Guidelines

In general the teeth can be classified as anterior or posterior. They can then be further classified based on the functional load they need to bear. For anterior teeth with normal functional load, further assessment of the amount of remaining tooth structure must be done. For teeth with upto one proximal surface involved, a resin bonded composite restoration to fill the access cavity is sufficient. For teeth with both proximal surfaces involved, a veneer may be the choice of restoration. For teeth with 1-4mm of remaining tooth structure, post and core restorations followed by crown would be the restoration of choice (Figure 1).

For posterior teeth, with normal functional load and conservative access cavities, resin bonded restoration is sufficient. For teeth with larger cavities or lost proximal surfaces, indirect restorations like inlays, onlays or crowns are preferred while for teeth with more severe loss of tooth structure post and core restorations are recommended (Figure 2).

For teeth with abnormal functional load to be used as abutments, full coverage restorations are recommended (Figure 1 and 2).

Figure 1. Clinical practice guidelines for choice of post-endodontic restorations for anterior teeth.

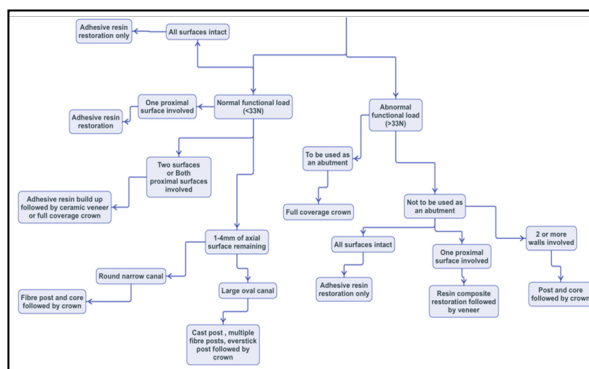
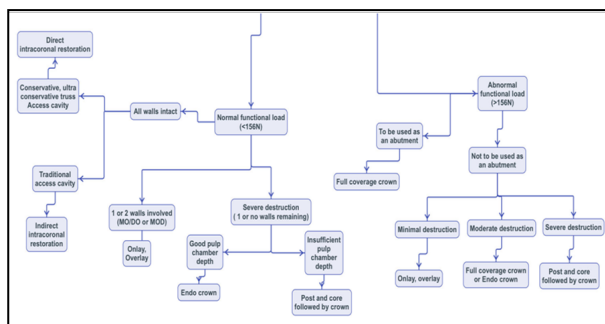


Figure 2. Clinical practice guidelines for choice of post-endodontic restorations for posterior teeth.



Discussion

The choice of post-endodontic restorations is difficult for most clinicians which leads to failure of treatment. This may be due to the reason that clinicians tend to ignore a few of the above mentioned factors while making the decision. Vast research has been done in the recent past with respect to this topic which shall be discussed.

Many authors have studied the effect of loss of crucial anatomical structures like marginal ridges, transverse ridges, peri-cervical dentin, etc on the fracture resistance and strength of the tooth. The most primitive study was done by Vale et al [30] who concluded that the loss of the tooth's resistance to splitting increased upto 45% with loss of marginal and crossing ridges as well as increase in intercusp distance. Reeh et al., reported that one wall loss during cavity preparation along with isthmus width approximately one third of the intercusp distance resulted in around 20% decrease in stiffness. The cavity preparation that destroyed one marginal ridge resulted in a 46% loss in tooth stiffness and a MOD preparation resulted in a 63% decrease in stiffness [31]. Other researchers have observed similar results in endodontically treated teeth as well [32, 33]. Ashwini Gaikwad et al as well as Clark et al have concluded that loss of peri-cervical dentin in endodontically treated teeth resulted in decreased strength as well as success of the tooth [34, 35]. A full coverage crown preparation in teeth with intact ridges and peri-cervical dentin could result in unnecessary loss of these vital structures which may lead to decreased strength and survival of the tooth. Hence resin bonded restorations that provide a good coronal seal may be ideal post-endodontic restorations for such teeth.

In case of teeth requiring partial coverage restorations, tooth position and occlusion must be analyzed to assess the cuspal deflection. Functional cusps of upper and lower premolars and molars

are prone to higher degrees of cuspal deflection [36, 37]. The use of posts or capping of functional cusps can be done to improve the fracture resistance of such teeth.

In terms of post and core restorations, the current concept involves the use of fiber posts or fiber reinforced composite posts over metal posts. Evidence has shown higher survival rate (3-7 years) of teeth restored with fiber posts over metal ones [38, 39]. With new technology it is possible to obtain high strengths even with these posts. In case of wide canals, multiple fiber posts or everstick posts have shown good results [40, 41]. Everstick post is a soft, flexible and adaptable unpolymerized glass fiber post. It has the advantage of being moulded and adapted well to the root canal before being cured.

Overall, any restoration that can be bonded to the tooth will have a higher fracture resistance as well as survival rate. This may be attributed to the monoblock concept [42]. Monoblocks are more stable and have fewer interfaces that are likely to fail, hence are stronger and last longer. An ideal monoblock would be one that forms as a single unit filling the root canal space as well as forming the post-endodontic restoration. Achieving such an ideal monoblock is difficult and hence every attempt must be made towards it. Materials such as composites, fiber posts, ceramics, resin cements, etc are preferred over metals, amalgam, porcelain fused to metals, glass ionomer cements, etc.

Post-endodontic restorations is a vast field in endodontics which is continuously developing and improving. This makes it important for the clinician to keep himself up to date with the latest materials, technology and techniques. As more and more clinical evidence is obtained, the clinical practice guidelines must be updated for ease of the clinician.

Our institution is passionate about high quality evidence based

research and has excelled in various fields [14, 43-52].

Conclusion

Post-endodontic restoration plays an important role in survival and success of endodontic treatment. Conservative approaches are encouraged today with newer materials and technology. Bonded restorations over non-bonded restorations are preferred. More evidence in terms of long term survival and effects of post-endodontic restorations must be gathered to help the clinician make a well-informed decision.

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