Post-endodontic rehabilitation using glass fiber non metallic posts: A review

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Abstract

Generally endodontically treated teeth have already undergone significant coronal destruction, loss of radicular dentin and an overall reduction in the capability of the tooth to resist intra-oral forces. The high success rates in modern day endodontics has resulted in an increased demand for an aesthetically convenient post and core system to help restore loss tooth structure. While the metallic post and cores provide a time-tested fulfillment of replacing the missing coronal tooth structure sufficiently to provide the required retention and resistance for the final restoration, yet aesthetic compatibility with the tooth structure is often compromised. Another important issue that is often not taken into consideration while using metallic posts is retreivability, when a metallic post fractures or fails, it is often virtually impossible to remove the residual post from the radicular portion of the tooth without greatly compromising the remaining dentin. Recent development in the field of esthetically viable non-metallic endodontic posts has served to erase these predicaments by providing an esthetically pleasing, easily retrievable post and core anchorage to replace the missing coronal tooth structure. This paper highlights the objectives, advantages and clinical predictabilities in using a luscent glass fiber non-metallic post , thus providing an endo-aesthetic restorative continuum for both the patient and the dentist.

Key words: Post and core restoration, glass fiber nonmetallic post, endo-esthetic restorative monobloc, enhanced bond strength

Introduction

The prosthetic treatment of seriously damaged, endodontically treated teeth often requires an endodontic post as an additional retention element for core build-up prior to crown restoration. Teeth that have been endodontically treated often have little coronal tooth tissue remaining and require a post that have been cast or machined from metal to retain the core and restoration.[1] Generally, such endodontically treated teeth have already undergone significant coronal destruction, loss of radicular dentin and an overall reduction in the capability of the tooth to resist a myriad of intraoral forces.[2] The non-metallic posts serve to bring the concept of an ideal post and core system, nearer to reality by giving an endoesthetic restorative continuum comprising of an esthetic post, a composite resin core and a resin luting cement.[3] This monoblock ensures not only high quality esthetics but is also safe, durable and easy to use by the clinician.

The following article tends to present to the avid clinician, the ease in using a glass fiber reinforced non-metallic post along with addressing the advantages and clinical considerations to be kept in mind while achieving an esthetic homogenous post-endodontic restoration.

Types of non-metallic posts

The basic application of a non-metallic post in the post-endodontic restorative phase of a tooth is based on the usage of the correct post in a given situation. We can generally divide all available non-metallic posts based on their composition into the following six types:

I. Glass fiber posts
ii. Zirconium oxide posts
iii. Ceramic posts
iv. Carbon fiber posts
v. Woven polytage fiber post
vi. Silicate glass ceramic posts

Various three point bending tests and cyclic fatigue measurement studies have found carbon and glass fiber post systems to have comparable strength and fatigue values as of titanium metal posts.[4] Glass fiber posts are being much advocated by clinicians due to their ease of use, adequate strength, easy retreivability and esthetic biocompatibility to form a composite monobloc.

Clinical considerations of glass fiber posts

The methodology of use of a glass fiber post can be clearly understood if we follow the following protocol.

I. A successfully root canal treated tooth, in need of post-endodontic rehabilitation, is evaluated radiographically, to confirm adequate apical seal.
II. The gutta percha is adequately removed keeping a 3-4 mm intact apical seal of gutta-percha.
III. The glass fiber post is inserted and tried after adequate canal preparation.
IV. The selected glass fiber post is luted in place with a dual cure composite resin luting cement.
V. The composite core is build up and impression is taken for an all- ceramic crown restoration

The main function of the post is to anchor the post-and-core complex within the radicular portion of the remaining tooth.[5] A post that can be bonded to tooth structure improves its ability to retain the entire foundation. Therefore, it is important to select a post system that provides maximum retention, yet removes as little as possible of the remaining subgingival tooth structure.[6]

The Luscent anchor post (Dentatus) is a fiber-glass, clear

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resin post that is designed to refract and transmit natural tooth colors for esthetic post-and-core foundations. It is usually placed passively in prepared canals, it is available in three diameters and is size integrated with the light transmitting posts (Table 1). The composite core has excellent adaptation to the remaining tooth structure. The composite core forms strong bonds to remaining tooth structures, bondable posts, resin cements and ultimately, the final restoration, creating a monobloc.[7]

Advantages offered by the non-metallic glass fiber post over the conventional metallic post include enhanced bond strength, formation of a cohesive and strong foundation with light or dual cure composite resin and easy retrieval also. The concept of intraradicular rehabilitation that often plays a key role in the final durability of the restored tooth is achieved with non-metallic posts.[7]

An additional advantage of the non-metallic post is its favourable esthetics in anterior teeth when restored with all ceramic crowns due to their light transmitting capacity in addition to their modulus of elasticity values that are similar to that of dentine and this can reduce the risk of fractures and in turn can increase their survival compared to teeth restored with metallic posts.[8,9]

Trial, before cementing a post in place, is a must, to see the proper placement, position and length of post in dentin.[10] After placement of the post and before curing initiation, the excess flashes of composite should be removed by microbrush to aid in better post placement. Curing of composite at minimum of 40 seconds is advocated, but this variable depends on the type of composite cement used and the manufacturer's instructions. Core build up, is accomplished in the same sitting. Shade matching should be accomplished keeping the variables of Hue, Chroma and Value in mind, so that the core composite material is of the same shade, as the all ceramic crown for an esthetic result.

Discussion

Preliminary analysis of periapical radiographs is compulsory in the restoration of endodontically treated teeth. The root length, shape, amount of tooth structure lost, periodontal status, periapical radiolucency and quality of endodontic treatment, all contribute to the success or failure of the post endodontic restoration. Post placement should be as long as possible for stress distribution and better retention along the dentin. Placement of long posts into short roots may result in the disruption of apical root canal seal.

A lower fracture resistance was reported among roots of periodontally compromised teeth reconstructed with posts and core.[11] Naumann et al., concluded that the reduction of the level of bone support would reduce the fracture resistance of fiber posts restored teeth. Alveolar bone level is considered a critical factor for stress concentration and tooth fracture. Finite element studies reported massive increase in dentinal stresses as the alveolar bone level was diminished.[11] The loss of alveolar support will lower the level of the mechanical fulcrum, which in turn will jeopardize the fracture resistance of post restored teeth.[12] In order to obtain adequate fracture resistance, at least 1:1 crown to root ratio should be ensured and the post should extend beyond the level of alveolar bone . Surgical crown lengthening can reduce the crown to root ratio and predispose tooth fracture. Gegauff reported significantly lower failure loads of teeth that had crown lengthening even with the presence of a ferrule.[12]

One of the most important considerations in the use of non-metallic posts is retrieval. When a metal post fractures or otherwise fails, it is virtually impossible to remove the residual post from the radicular structure of the tooth without greatly compromising the remaining dentin. Resin fiber posts are retrievable easily.[13] The use of a Gates-Glidden drill through the existing post can rapidly and safely access the underlying gutta percha root canal filling. Post retrieval is thus rapid, routine and predictable.

Occasionally, the post endodontic preparation of the canal may be too wide for routine direct restoration, due to extensive decay or aggressive instrumentation of the canal. In such cases, simply placing a post in the canal would leave a very thick layer of cement and also it may be difficult to position the post in an ideal location. In such cases, non-metallic post-systems like the Luminex light transmitting system (Dentatus, NY) may be used to rehabilitate the canal by inserting the post to desired length, using a resin cement that is injected into the canal and after curing, pushing the light transmitting post out by rotating and removing with a haemostat, leaving an ideally shaped and sized post space that can be treated routinely by using a size matched luscent anchor post.

Another important consideration in using non-metallic posts is the use of non-adhesive cements for final luting.

Post	Manufacturer
Luscent anchor post system	Dentatus, U.S.A.
Fiber kor post system	Jeneric Pentron CT, U.S.A
Zirconium oxide ceramic post (cerapost)	Brasseler Savannah, U.S.A.
Zirconium oxide all ceramic Post(cosmo post)	Brasseler Savannah, U.S.A.
Silicate to glass ceramic fiber post	Glasspan, Eyton U.S.A.

Table 1: Types of metal free posts

Luting agents conventionally used in metallic posts like zinc phosphate although being excellent luting agents, do not bond to the tooth structure or the restorative materials. Resin cements on the other hand, bond strongly to both dentin and enamel as well as to other restorative materials like composites. Thus every component of the tooth or restorative material is directly or indirectly bonded to every other component. This integrates the tooth, post and core and the bonded restoration comparable to the original healthy tooth itself generating advantages like better stress distribution and lesser chances of post fracture.[14]

Conclusion

The restoration of the endodontically treated tooth is an important aspect of dental practice involving a range of treatment options of varying complexity. Most endodontically treated teeth suffer massive reduction in their structural stability becauseof the great loss of coronal dental structure caused by caries, fractures, and access preparations.[15]The high success rates for modern day endodontics have resulted in an increased demand for clinically convenient post and core systems to help restore lost tooth structure.Many studies showed better fracture resistance of teeth restored with fiber-reinforced resin posts, when compared with metal or zirconia posts. Cast posts and cores were frequently associated with deep catastrophic root fractures.[16] Hence, the requisites for modern day post-endodontic restoration now includes rehabilitation of lost tooth structure by newer post and cores to provide the required resistance and retention, esthetic compatibility and easy retrieval, if needed, along with giving importance to concepts of intraradicular rehabilitation and use of non-adhesive cements for luting the final posts. Recent developments in the field of esthetically viable, non-metallic endodontic posts has served to provide an esthetically pleasing and easily retrievable post by serving to provide an ideal endoesthetic restorative continuum comprising of an esthetic non-metallic post, a composite core and an dual cure resin luting cement. The glass fiber reinforced non-metallic post is thus an easy and economical method for the clinician to achieve a successful post endodontic restoration.[3]

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