

Clinical Aspects of Restoration of Endodontically Treated teeth Using Fiber Posts- Review

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I. Introduction

Nowadays, patients keep asking for minimally invasive dentistry and therefore demand doctors to do “all is necessary” to save their teeth. Endodontics is not a newer branch of dentistry but its materials, techniques and methods are in a continuous wave of development, forcing the practitioners to constantly adapt to themselves. Furthermore, restoration of endodontically treated teeth represents a small, but largely controversial side of endodontics. It is well-known that restoration with fiber posts and composite core material is one of the most well-documented and scientifically-supported technique available. However, the overall treatment plan should always precede the root canal therapy itself and placing a fiber post in an endodontically treated tooth must be guided by biomechanical concepts, not by empirical ones. This paper’s purpose was to review data from the current scientific literature in order to offer a more clear view of restoring endodontically treated teeth with fiber post and their most common failures, but more important the existing means to reduce the rate of complications. When evaluating the complications regarding the endodontically treated teeth restored with fiber posts, we should keep in mind what these complications are and how we can manage them more efficiently. The assessing data from the literature provided some types of complications frequently involved and some conditions and procedures to prevent them.

Complications of Endodontically Treated Teeth Restored with Fiber Posts

A great majority of studies acclaim as the most common failure of an endodontically treated tooth restored with fiber post as being the debonding, followed by the fracture of the post. [1,2] Debonding may appear at two different levels and may be caused by the weak interface between root canal dentin and fiber post surface or post core and luting agent. What is more, the way the adhesive cement is handled and cured can decrease the strength of the adhesion. [2] In general, the great concern was always the adhesion to the dentin wall, because it was rarely observed a failure between post-core and cement. [3] However, posts should be used in some specific situation and should not become a general method of treatment, regardless of some tooth factors. It is advisable to rigorously review the functional and parafunctional forces that will affect the restored tooth, in order to take a proper decision in a endodontic treatment. [4] The biomechanical aspects of adhesive restorations in endodontically treated teeth were found to perform in a similar way to the functioning of healthy teeth, but there are still some unresolved questions regarding the preferred cavity design and restorative technique used to restore endodontically treated teeth. [5] As the second most common failure of restored endodontically treated teeth with fiber posts is the fracture of the post, authors always keep in mind to evaluate the fracture resistance and stress distribution. [6] The literature points to the fatigue fractures, caused by unfavorable occlusal contacts. [7,8] When compared to cast posts, some authors demonstrated through a finite element analysis that glass fiber post is always a better idea due to its homogeneous stress distribution. [9]

Conditions for Long-Term Success of Post – Endodontically Restoration

As mentioned above, the failures of fiber post restoration following an endodontic treatment are following a sort of pattern, as it follows: marginal staining, loss of restoration – partial or complete, dislodged restoration due to fracture of post and finally, displacement of the post. [10] But nonetheless, when compared with conventional methods of post and core systems like cast metal post and prefabricated metal posts, fiber posts remain the best option in rebuilding an endodontically treated teeth. Collating all data from the articles reviewed, a summarization can be made in order to debate the possible conditions to foresee risks, failures and complications of restorative treatment of endodontically treated teeth:

- Characteristics of fiber posts and luting material
- Characteristics of the remaining tooth structure and the root canal morphology
- Pre-treatment procedures

A. Characteristics of fiber posts and luting material

The most debated aspect of a fiber post is its length. While some authors sustain that the presence of a post and especially its length does not affect significantly the fracture resistance of a tooth [12], there are some others who achieved a perfect length of 10 mm for the post in order to properly reinforce endodontically treated teeth. [13] Some other studies are not that specific when it comes to the fiber post length, but strongly emphasize that extending two-thirds of the root length is an acceptable method of practice. [14,15]

Another factor affecting the fracture resistance of endodontically treated teeth consists of different type of post. According to some authors, tapered posts generated apically placed fracture, while parallel-sided posts had a lower frequency of fracture. [16] When trying to predict long-term effects, resin filling between fiber post and dentin wall is a proper option to reconstruct an endodontically treated teeth [17] and therefore, choosing the right luting agent becomes mandatory. [18] However, there are some statements of which luting material is less important than the selection of the post type. [19]

B. Characteristics of the remaining tooth structure and the root canal morphology

Clinical studies have shown that when it comes to the need of being restored with a fiber post, premolars and incisors have a higher demand for this type of reconstruction, mainly due to their reduced dimensions and therefore, the higher risk of vertical fractures. But still, it should not be abused of placing posts without a proper analysis of the case. [20] It is strongly recommended not to place a fiber post in a maxillary premolar where there are more than two walls of coronal part present. [21] Moreover, a maxillary central incisor that has been endodontically treated but has a class III restoration does not have any need of a fiber post reconstruction. [22] On the other hand, an anterior tooth with a cervical cavity and previously endodontically treated does require placing a fiber post, as it was demonstrated in some studies. Some other studies have been more specific when it comes to the remanent coronal wall thickness and have stated that a less than 2 mm thickness requires a fiber post restoration as well as a full cuspal coverage, in order to positively influence the fracture resistance of an endodontically treated premolar. When it comes to the root morphology, there are some situations when oval shaped root canals place the practitioner in a difficulty of choosing the right type of post. [27] It has been shown that oval posts are similar to regular, circular posts, although it may be believed that increases the fracture resistance in case of oval shaped canal. Therefore, there is no need of using oval-shaped drills when preparing the space for placing a fiber post. The ferrule configuration is of a great concern as some authors state that palatal ferrule can significantly enhance the fracture resistance of the post-restored teeth. Moreover, it is believed that increasing the palatal ferrule can improve the properties of adhesive cement and also protect its integrity. All in all, teeth showing great fracture resistance value are those restored by adhesion and, of course, those with high integrity of the tissue. [32, 33]

C. Pre-treatment procedures

In order to improve adhesion of post to dentin walls and post to luting agent, many authors proposed various methods of pre-treating the fiber post before adhesion. Some of them believe that silicoating followed by silanization of the post would increase the power of bond strength between the multiple interfaces between tooth, post and cement. There are some opinions asserting that silanization does not influence post-to-dentin adhesion, but increases post-to-core strengths. In the same time, these authors recommend using translucent posts for a better photo-polymerization. Browsing the literature, there are two different groups of researchers. One group state that airborne particle abrasion or sandblasting with alumina particles create a rough surface without negatively affect the fiber post surface, as long as it respects some specific indications. They also propose delayed cementation of the fiber post and lentulo spirals for applying the luting cement. There is another group of authors whose opinion is that the real improvement in adhesion is offered by treating the post before the luting procedure with different and various type of acid, such as: hydrofluoric acid, phosphoric acid [36, 37], acid ascorbic [38]. Researching has continued and some of them proposed treating the fiber post with

hydrogen peroxide, ethanol or acetone. Nevertheless, most of the authors prefer etch and rinse bonding, in combination with a dual cured luting agent. Of course, there is the opposite part which believe that self-etching adhesives represent a better choice. [18] A great matter of concern in the compiled data is when exactly to place the fiber post according to the endodontic treatment. There are some voices who claim that delayed cementation offers an higher adhesion. More specific, they recommend that cement layer should overlay the post surface but no more than 0.3 mm. [35] In other researchers' opinions, the procedure should be done immediately after obturation of the root canal system, as it is less time consuming and benefic for the remanent tooth structure. [10]

II. Conclusion

Endodontically treated teeth form an important subject of debate when it comes to their restoration. Despite the great variety available in current endodontics of materials, techniques and procedures for placing fiber posts in order to increase the fracture resistance of a tooth, practitioners still do not have a specific guideline to follow.

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Contribution Note

All authors made equal contributions to the study and the publication.

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