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Currently used systems of dental posts for endodontic treatment

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Abstract

An advanced stage of a tooth decay promotes an extremely damaged tooth that needs endodontic treatment to be restored. When satisfactory coronal tooth structure remains, an artificial crown can be placed without a post. On the other hand, the treatment of seriously damaged teeth often require an endodontic post. The main reason for using post is to enable rebuilding of the tooth structure prior to crown restoration. Dentists believe that endodontic posts provide a stable and solid restoration of the tooth, as well as providing strengthening of the tooth root, which constitutes the solid basis for a dental crown restoration. However, some authors reported that the strength of the tooth is directly related to the remaining dentin, and because of that, an endodontic treatment can present a higher risk of biomechanical failure. A number of different materials have been used for the manufacturing of dental posts. The fundamental posts requirements include high tensile strength, high fatigue resistance to occlusal and shear loading and a good distribution of the forces affecting the tooth root. The purpose of this article is to review the current literature and identify the various characteristics of a dental post, as well as some principles on the endodontic treatment for tooth decay.

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Keywords: Dental post, endodontic treatment, post design, post material, mechanical tests;

1. Introduction

Most of teeth failures are due to tooth decay, also known as dental caries. Dental caries are characterized by the appearance of cavities, which are caused by bacteria or acids that are present in human mouth. These cavities begins

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in the main portion of the tooth and progress deeper into the tooth structure, affecting the dentin and reaching the nerve, eventually causing severe pain.

An advanced stage of a tooth decay requires endodontic treatment to rehabilitate the damaged tooth. Being so, as a result of dental caries or trauma, the endodontic restoration of teeth is part of the routine of dental clinics. This kind of treatment is required when a substantial coronal tooth structure is lost. When satisfactory coronal tooth structure remains, an artificial crown can be placed without a post. On the other hand, the treatment of seriously damaged teeth often require an endodontic post. The main reason for using posts is to allow the rebuilding of the tooth structure prior to crown restoration, (1–3).

Generally, in an endodontic root canal treatment the infected tissue, that can cause an infected abscessed tooth, is removed and an opening is made through the crown of the tooth into the pulp chamber. This pulp is removed and the root canals of the tooth are cleaned and molded. After that, the root canals and tooth pulp chamber are filled with an adequate cement or resin. Posteriorly, a metal or plastic post is placed in the root canal to help retain the after core filling material, which will support the restoration - crown. The crown is then restored. With this approach dentists believe that endodontic posts provide a stable and solid restoration of the tooth, as well as they provide the strengthening of the tooth root being the solid base for a dental crown restoration.

However, authors reported that the strength of the tooth is directly related to the remaining dentin, (2), which leads to the fact that an endodontic treatment may pose a higher risk of biomechanical failure than vital teeth, (1). It has also been reported that a post preparation and the post itself can weaken the tooth and make the root more vulnerable to fracture, (1–6), due to structural change in the dentin, which loses water and collagen after the treatment, as well as its natural structural integrity, (7). In this regard, some of the current literature still disputes the potential of posts applied to teeth restorations, (1,2,8,9). Therefore, some authors stated that posts should only be used in cases where the remaining tooth coronal structure is not enough to provide sufficient support to the restorative material (core) and when there is no other options available to retain this core, (6,7,10,11).

This article is a review of the currently used systems for an endodontic treatment. Presently, there are multiple systems in use for this purpose, and the selection of the most adequate is left to the dentist, who ultimately has the responsibility to balance all the factors and select the most suitable system for each patient. Nevertheless, some comparison is made between data published by different authors relating the mechanical characteristics of different posts.

2. Materials and Methods

This article reviews the literature to identify the various characteristics of a dental post, as well as some principles on the endodontic treatment of tooth decay. About forty papers have been revised with publishing date range from 1984 to 2017. The authors then decided to revise the following fields of the literature: post material, post design, core material and mechanical behavior of dental posts.

3. Post Material

A number of different materials have been used for the manufacturing of dental posts. The ideal post would provide core retention without creating unwanted stresses within the residual tooth structure, (2,5). The fundamental posts requirements include high tensile strength, high fatigue resistance to occlusal and shear loading and a good distribution of the forces affecting the tooth root, (5,6). Accuracy, biocompatibility and harmless electro chemical activity are also essential, according to Manhart, (5). As such, metal alloys have been the chosen material for years. The main disadvantage of these structures was the concentrated stresses in zones that are vital to the tooth root, (1,12). Many authors believe that the use of a dental post with a Young modulus higher than the dentin can create stresses at cement interfaces and can cause the separation of the post or a root fracture, (2,6). Moreover, the use of posts with a high elastic moduli is potentially risky. The stress concentration in the area of the dental root may result in root rupture, which can cause the need of tooth extraction, (2,13).