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PREFABRICATED POST AND CORE MATERIAL VERSUS CUSTOM-CAST POST AND CORE IN A MAXILLARY FIRST PREMOLAR TOOTH: REVIEW OF LITERATURE AND MANAGEMENT OF A CLINICAL CASE

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ABSTRACT

When an abutment tooth is endodontically treated and is intact except for the access opening, the amount of tooth structure remaining after tooth preparation must be carefully assessed. If only a thin peripheral shell of tooth remains after reduction (which occurs frequently in incisors, canines and premolars), a cast post and core should be fabricated. In this article, the use of a prefabricated post and core material versus a custom-cast post and core is reviewed. A clinical management of an improperly restored endodontically treated maxillary first premolar tooth is also presented.

INTRODUCTION

With increasing numbers of teeth being retained by endodontic therapy, there is a concomitant need for the dentist to have the knowledge and skills to restore them.

Coronal tooth structure may be lost for a variety of reasons. Caries, previous restorative treatment, traumatic injury, attrition, erosion, abrasion and resorption (internal and external) may contribute to loss of coronal tooth structure. The extent of the destruction is an important determinant factor in deciding on the restorative techniques and materials to be used in restoring the tooth to normal form and function.

Endodontically treated teeth demand special restorative attention. Designing a restoration for any of those teeth depends primarily on the amount of remaining tooth structure*[11]. Additional factors include the tooth type and its position in the arch, morphology and the perio-dontal status of the tooth[4,6,11]. The amount of occlusal stress and whether the tooth will serve as an abutment for a fixed or removable prosthesis are also other factors to be considered*[3,4,6]. Goerig and Mueninghoff[4] considered the tooth's location in the arch as the most important criterion. In evaluating tooth location in the arch, the clinician must realize that each tooth group exhibits a unique morphology and structure and is subjected to different degrees of stress during function[4]. In posterior teeth, the occlusal forces are directed more axially than in anterior teeth in whose case the forces are more lateral*[3,1]". The direction and degree of occlusal stress can be increased if the tooth is to be used as an abutment for a fixed or removable prosthesis*[3,4,10].

A previously unrestored tooth requiring endodontic therapy with a minimal access opening through enamel and a slight enlargement of the pulp chamber and root canal may be treated adequately by placing a filling material in the root canal, approximately to the level of bone, and the endodontic access hole[2]. The choice of material can range from a traditional glass ionomer to resin-modified glass ionomer, bonded composite and bonded amalgam[2]. In a recent survey, amalgam was chosen four times more often than composite to restore posterior teeth[10].

When more than one-half or almost all of the coronal tooth structure has been removed in an endodontically treated tooth, it is logical to place a post, attaching the root structure to a core material that is bonded to the remaining tooth structure[2]. The indication of such a post is based on retention and stabilization of the core rather than reinforcement of the root[2,11]. In posterior teeth, with minimal remaining tooth structure that cannot retain an amalgam core, a cast post should be placed to retain the core[11]. The post and core, however, should not jeopardize tooth structure.

This paper presents a clinical management of an improperly restored endodontically treated maxillary first premolar tooth. A clinical report

A twenty three-year-old female dentist patient presented with a chief compliant of staining of a maxillary right first premolar tooth by an old, large amalgam restoration. Clinically, the restoration had defective margins with recurrent caries developing around it. Radiographically, a prefabricated post was misplaced in the palatal canal with a little dentine thickness of less than

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one mm remaining on the mesial side near its apical area (Fig. 1). The case was referred for removal of the amalgam restoration and displacement of the post as much as possible without fracturing the root. The patient was referred back after the amalgam restoration and only part of the post were removed (Fig. 2). Accordingly, the treatment plan for this tooth was changed. The part of the palatal canal coronal to the remaining part of the prefabricated post was cleaned and filled using an amalgam restorative material. The remaining coronal tooth structure and the buccal canal were carefully prepared for receiving a cast post and core (Fig. 3). Canal preparation was done using Peeso reamers (Union Broach Co., Long Island City, N.Y.) followed by a parallel-sided Para-Post drill (Whaledent International, New York, N.Y.). A duralay material (Duralay, Reliance Dental MFG. Co., 111.) was used for building up a post and core utilizing the buccal canal with a slight extension into the palatal canal to reduce the rotational potential of the post. The wax pattern was cast in the usual manner. The post and core were then cemented with a zinc phosphate cement (Fleck's Cement, Mizzy Inc., Cherry Hill, N.J.) mixed according to the manufacturer's instructions (Figs. 4a, b). A metal-ceramic crown was fabricated and permanently cemented using zinc phosphate cement (Figs. 5a, b).

DISCUSSION

Research has shown that endodontically treated teeth are no more brittle than vital teeth with no reduction in dentine hardness[112]. Therefore, the remaining tooth structure, endodontically treated or not, should have approximately the same strength, providing it has no horizontal or vertical cracks[2]. Reeh et al.[9] found that restorative procedures produced the most severe losses in tooth stiffness. This is due to reduction in tooth structure contributing to 63% of the loss of tooth stiffness. The total en-dodontic procedures were found to produce only a small decrease of stiffness (5%)[9]. Guttmann[6] stated that the shear strength and toughness of endodontically treated teeth were lower than the corresponding values for dentine of vital teeth. Lewinstein and Grajower[8], on the other hand, found that root canal therapy does not significantly affect the hardness of dentine even after five to ten years.

Posts and cores and crowns are usually required to restore endodontically treated teeth with insufficient coronal support. The placement of crowns in maxillary premolars was found to demonstrate a significantly higher success rate when compared with maxillary premolars without crowns[12]. In these teeth, full-crown preparation may result in very little tooth structure remaining to support the restoration against shearing forces[4]. Unsupported tooth structure and old restorations are also removed to provide a sound dentine for fabrication of a post and core followed by construction of a crown, as was done in the present case.

Many years ago, custom-cast posts and cores were considered a state of the art for rebuilding endodontically treated teeth. Since then, prefabricated posts have become much more popular than custom-cast posts and cores[2]. In a recent clinical survey of 8143 dentists, 88.3% of them used prefabricated posts and cores, while only 9.2% used custom-cast posts and cores[1]. Prefabricated posts can be used with composite resin, amalgam, or glass ionomer cores.

Cast posts and cores have several advantages. They include preservation of the maximum tooth structure as the post is fabricated to fit the radicular space with a superior adaptation to the root canal[4,1]. The core is an inherent part of the post and does not need to be retained by the post. The anti-rotational property is an additional advantage[11]. However, it has a disadvantage of involving multiple-visit procedures. Prefabricated cylindrical posts, on the other hand, rely principally on the cement for retention[4]. Disadvantages of this type of posts include decreased core retention to the post and the potential for rotation[1]. In the present case, a cast post and core was used to be closely adapted to the remaining tooth structure and to provide anti-rotational properties.

As previously mentioned, treatment goals must be based upon a multitude of factors

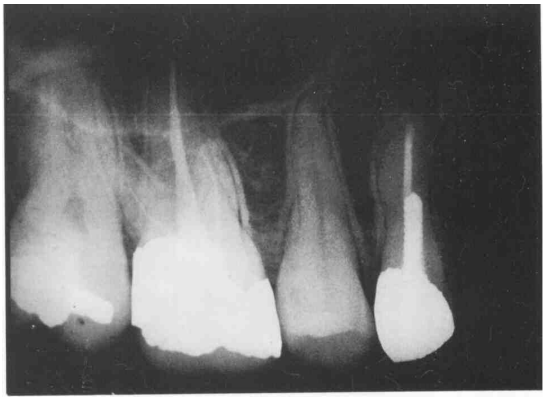


Fig. 1: Pre-operative radiograph of a maxillary first premo-lar tooth restored with a prefabricated post and an amalgam restorative material. Note the thin dentine on the mesial side of the post near its apical area.

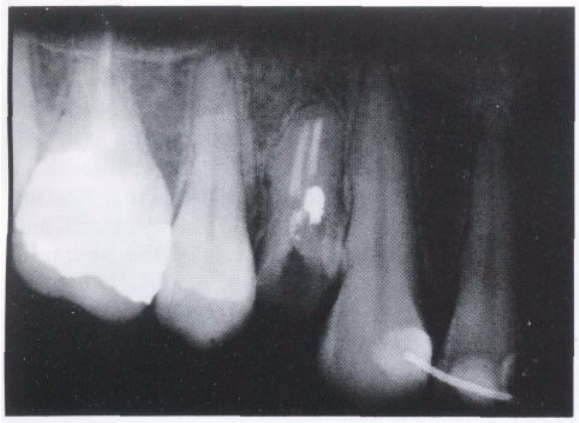


Fig. 2: Radiograph of first premolar after removal of amalgam restoration and part of the post in the palatal canal.

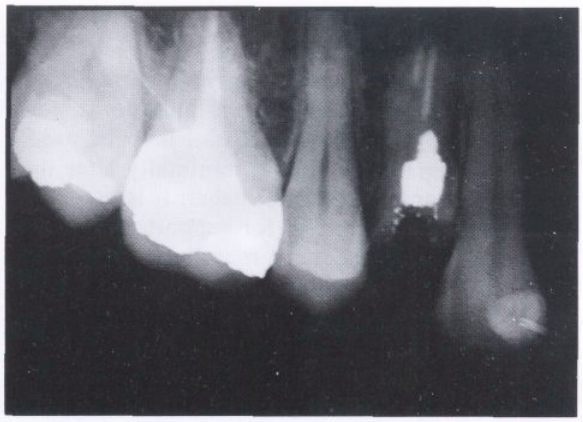
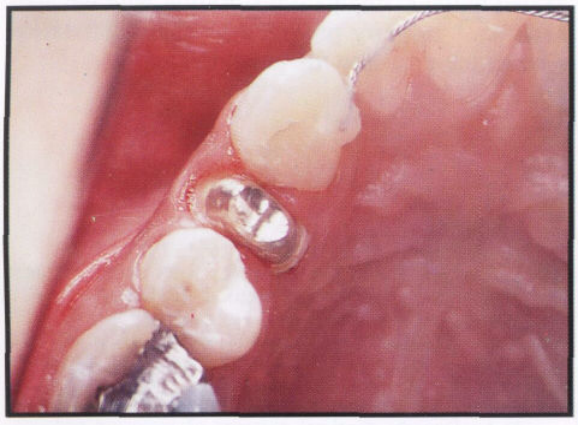
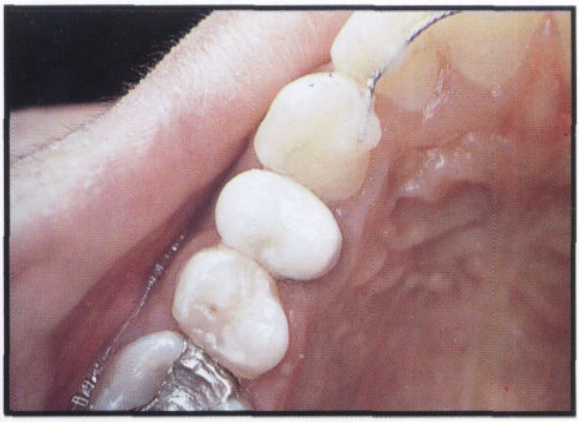


Fig. 3: Radiograph of first premolar tooth after filling the palatal canal with an amalgam restorative material. The buccal canal was carefully prepared to receive a post.



Figs. 4a & b: Clinical photographs of the cemented cast post and core, a: occlusal b: palatal views.



Figs. 5a & b: Clinical photographs of the cemented metal-ceramic crown, a: buccal b: occlusal views.

specific for each patient. The status of the root to be restored is considered to be critical[6]. A brief review of the major concerns in radicular anatomy before restoring an endodontically treated tooth is indicated if a post is to be used. The post preparation should minimally alter the internal anatomy of the root canal. It is essential to leave adequate dentine for support and distribution of post stresses. In maxillary premolars, root walls are commonly thin and roots taper rapidly to the apex, especially when two distinct roots are present[6]. Proximal invaginations and canal splitting are common. Because of the thinness of these roots, removal of dentine for the placement of a post results in a weakened root wall, that is subject to fracture either during cementation or during function[6]. Excessive preparation of the canal, as was found in the present case, may cause perforation of the proximal depressions in the root surface[4]. This results in limiting function and increasing the possibility of root fracture[5]. Cracked and fractured roots appear to be related to the amount of remaining tooth structure, size of the canal preparation, and how closely the dowel is adapted to the side walls of the canal[3]. Heifer et al.[7] found that water content of teeth after pulp extirpation was 9% lower than that of vital teeth. This could result in contraction of dentine tissue inducing stresses leading to crack formation. These cracks and fractures may also be caused by the hydraulic forces generated by the luting material when the dowel is cemented[3]. In the present case, the improper placement of the prefabricated post resulted in a weakened dentine wall on the mesial side of the palatal canal. Using the same canal for constructing a cast post and core would result in a short post and possibly fractured root during cementation due to root weakness. To avoid such a problem, a post space was prepared in the buccal canal and the palatal one was sealed with an amalgam restoration with the anti-rotational property provided by the slight extension of the post into the palatal canal.

REFERENCES

1. Christensen, G.J. and Christensen, R.P.: Product use survey. Clinical Research Associates Newsletter, 19 : 3, 1995.
2. Christensen, G.J.: Posts: Necessary or unnecessary? J. Am. Dent. Assoc., 127 : 1522, 1996.
3. Colman, H.L.: Restoration of endodontically treated teeth. Dent. Clin. North Am., 23 : 647, 1979.
4. Goerig, A.C. and Mueninghoff, L.A.: Management of the endodontically treated i. oth. Part I: Concept for restorative designs. J. Prosthet. Dent., 49 : 340, 1983.
5. Gutmann, J.L.: Preparation of endodontically treated teeth to receive a post-core restoration. J. Prosthet. Dent., 38 : 413, 1977.
6. Guttmann, J.L.: The dentin-root complex: Anatomic and biologic considerations in restoring endodontically treated teeth. J. Prosthet. Dent., 67 : 458, 1992.
7. Heifer, A.R.; Melnick, S. and Schilder, H.: Determination of the moisture content of vital and pulpless teeth. Oral Surg., 34 : 661, 1972.
8. Lewinstein, I. and Grajower, R.: Root dentin hardness of endodontically treated teeth. J. Endodont., 7 : 421, 1981.
9. Reeh, E.S.; Douglas, W.H. and Messer, H.H.: Stiffness of endodontically-treated teeth related to restoration technique. J. Dent. Res., 68 : 1540, 1989.
10. Scurria, M.S.; Shugars, D.A.; Hayden, W.J. and Felton, D.A.: General dentists' patterns of restoring endodontically treated teeth. J. Am. Dent. Assoc., 1*6 : 775, 1995.
11. Silvers, I.E. and Johnson, W.T.: Restoration of endodontically treated teeth. Dent. Clin. North Am., 36 : 631, 1992.
12. Sorensen, J.A. and Martinoff, J.T.: Intracoronal reinforcement and coronal coverage: A study of endodontically treated teeth. J. Prosthet. Dent., 51 : 780, 1984.