ADVANCED METAL-FREE ENDODONTIC POST SYSTEM: A CASE REPORT

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INTRODUCTION

Contemporary endodontic posts are necessary means for restoration of endodontically treated and considerably damaged dentition. However, the descriptions of their functions differ rather significantly, indeed. Traditional views moved from one extremity to another. In the XVIII century, Pierre Fauchard used wooden posts for crown retention. Since that time until presence, dentistry underwent many technological improvements that provided at the threshold of the new millenium with numerous conservative aesthetic alternatives for the restoration of natural dentition (G. Morig, 1996; N. Fahl, Jr. & R. C. Casellini, 1997; C. Pescatore, 1998; G. W. Tysowsky, 1998).

The most recent restorative materials, based on fiber-reinforced composite (FRC) and ceramic technologies enable dentists of today to prepare aesthetic, functional, and less abrasive restorations. It becomes now possible to repair a whole oral cavity "metal-free", without sacrificing the intact dental structure. This is particularly important when utilizing a newly introduced and innovative prefabricated post system of Sculpture FibreKor (Jeneric Pentron, USA) for endodontically treated teeth.

Improved patients' health education changed the attitude towards the dentistry care offered. Dental professionals mainly address the rehabilitation of previously restored dentition. Unfortunately, however, one often requires a therapy of root canals because of extensive destruction and recurrent decay. The

restoration of a dentition with insufficient supragingival or coronal tooth structure necessitates the placement of a metal post and core prior to preparing the definitive restoration. Until presence, three types of metal posts can be used: a) prefabricated, b) cast, and c) one-piece and crown units. Over extended function, these cemented metal posts commonly cause teeth to fracture which results in the loss and extraction of the tooth (C. E. Guzy & J. I. Nicholls, 1979; D. Dietschi et al., 1996). In order to optimally restore such dentition, the dentist requires a post exhibiting characteristics and physical properties similar to those of natural teeth. A recently introduced prefabricated metal-free post enables such treatment. Its development and fabrication is based on the new metal-free ceramic technologies. In its designing and fabrication, a material has been sought capable of restoring the inside of an endodontically treated tooth to its original strength, avoiding the potentially detrimental harmful side effects of metal. This unique system is a representative of a new category of materials that can greatly reduce, if not eliminate completely, the necessity for metals in modern dentistry. This innovative system consists of special fibres reinforced with ceramic (FRC) and composite. The basis is composed of several fiber wafer layers and uniaxially positioned fiber bundles venereed onto the FRC with a special organic polymer matrix containing 80 % of ceramic and 20 % of composite. The combination of these materials creates a durable alternative with

an increased flexural strength similar to a porcelain-fused-to-metal restoration of 1000 MPa.

As the failure of restored, endodontically treated dentition most commonly results from deficiencies of the post and core, the main advantage of this new nonmetallic post is that it enables reconstruction of a tooth to its natural aesthetic, biolological, and structural condition. Besides, in contrast to other metal-free post build-up techniques utilizing plasma-treated fibres for endodontically treated dentition, the new system offers significant advantages as a result of its superior quality, standardized homogenous fabrication, and less time-consuming insertion protocol.

CASE REPORT

A 50-year-old male patient presented with complicated gangraena of the maxillary right lateral incisor. A long-lasting endodontic treatment resulted in obturation. The gracile tooth structure preconditioned the complete dentin destruction by the caries process. That was why the usage of endodontic retention and crown restoration was necessitated.

CORE PLACEMENT TECHNIQUE

First, a computer-aided radiographic image (CDR, Schick Technologies, USA) (Fig. 1) was obtained to test the quality of filling, the periapical space and root canal dimension. Unsound tooth structure was completely removed. The

preliminarily chosen post size determined the diameter of the bur. Thus a post hole was created using a reamer along the almost whole length of the hole (Fig. 2). The post was then tried in to verify if it firmly enters into the canal. Upon removal, the post was sandblasted by using Microetcher (Danville Engineering Corp., USA) with 50 μm aluminium oxide particles, rinsed with water, and the surface was treated with 37 % phosphoric acid for 10 sec., rinsed again, and dried. A silane primer was applied to the post and dried after 30 sec. The post was placed in a protective container. It was very important to choose an adhesive system based on a composite and dual light and chemical curing.

The tooth preparation was cleansed with a 2 % chlorhexidine solution, rinsed, and lightly dried. The post space and the canal opening was etched with 37 % phosphoric acid and rinsed with a spray of oil-free water for 10 sec. Dentin was blotted with paper points until there was no pooling of water and surface was left moist and glistening. Equal number of drops of Primabond 97 and Auto-Cure Activator (BJM Laboratories, Ltd., Israel) were mixed in a clean mixing well for 2 sec. Generous amounts with a clean brush were applied onto the moist dentin surface. A paper point pre-wetted with the adhesive mixture assisted in wetting the deepest portions of the preparation. It was left undisturbed for 15 sec. The solvents were removed with a vigorous blast of air for 15 sec. until no visible movement of the resin was noted. Equal amounts of High-Q-Bond base and catalyst (BJM Laboratories, Ltd., Israel) were dispensed

onto a mixing pad and mixed for 20 sec. (Fig. 3) until smooth, uniform paste resulted. Working time at room temperature was 2 min. The mixed paste was then applied to post and canal space. The post was seated and then stabilized by light curing of its coronal portions for 20 sec. (Fig. 4). Oral set time was about 3,5 min. At the end, a metal-free core and preparation was built-up.

BUILD-UP TECHNIQUE

Following placement, the post and tooth were light-cured for 3 min. from all the aspects. The core material was placed in increments no greater than 2,0 mm in thickness and cured, too. The preparation was then complete (Fig. 5). The definitive restoration should be a metal-free crown from Sculpture / FibreKor (Jeneric Pentron, USA). The colour of the restoration was estimated using shading set. Gingival retraction was used for polivinyl xyloxane imprint creation to be sent to the dental laboratory for fabrication. The obtained crown was tested for marginal adaptation and occlusal adjustment. Then it was prepared for cementation. First, it was sandblasted on the internal side with Microetcher, rinsed, and dried. A 4 % hydrophilic acid gel (High-Q-Bond) was applied on the inner surfaces for 60 sec. The acid was rinsed and the crown was dried. A silane agent (High-Q-Bond) was dispensed on the working surface for 30 sec. and then dried. Subsequently, the crown was placed in a protective container until its definitive fixation. The built-up core was rinsed and dried. It was etched with 37 % phosphoric acid for 15 sec., rinsed, and dried. Equal amounts of Primabond

97 and Activator (High-Q-Bond) were dispensed onto the build-up and carefully air-blasted for 15 sec. The same dual curing composite cement (High-Q-Bond) was used for adhesive cementation. Equal amounts of it were mixed and dispensed on the inner coronal part with thin spatula. The crown was placed on the already built-up core of the tooth. Composite-cement excess was removed with a silicone tool and the crown was light cured for 5 sec. from the vestibular direction. A special care was required to avoid interproximal composite cement curing. After fixation, contact areas were cleansed of excessive cement. Glycerine was applied onto any margins and the crown was cured in the facial and lingual surfaces for 1 min. each. Proper occlusal adjustments were performed. Finishing and polishing were done with appropriate instruments. The result achieved enabled the stabilization of the tooth and crown by a conservative and aesthetic manner.

CLINICAL ADVANTAGES OF FIBRE/KOR POST SYSTEM

There are obvious clinical advantages of the Sculpture FibreKor Post system that should be especially emphasized. The protocol is much easier to perform. The bonding strength of the adhesive system resulting from the structural similarity between the post and the hybrid fourth-generation composite cement is much greater. Fixation protocol is carried out with dual curing (light and chemical). A light, metal-free restoration is obtained that does not destroy the cement bond during intensive operation. Besides, it does not affect the

periodontal condition of the tooth. The high resistance and bond strength eliminate the danger of fracturing common in conventional metal posts. It is due to the flexibility of the structure and the regular forces' distribution in the rest tooth structure. Because of the absent tooth colourization no additional procedures for masking the metal posts, discoloured roots, or gingival tissues are needed any more. Elasticity enables the loading forces to reach up to 1000 MPa similarly to those of the natural tooth structure. The material is biologically compatible for the human organism. The shape and design make the placement of any tooth possible. The special post retention prevents the appearance of poor bonding areas. The bond strength between the tooth structure and the restorative material is due to the homogenous structure of both post and adhesive.

Many recent publications in the world dentistry literature argue convincingly for the advantages of this technology of the new millenium (R. Spreafico, 1996; T. Trinkner, 1997). U. R. Brodbeck (1997) has performed approximately 3000 successful all-ceramic restorations during a six-year period. D. S. Hornbrook (1997) outlines the role of metal-free restorative materials for achieving aesthetically acceptable and durable anterior results.

CONCLUSION

The newly introduced Sculpture Fibre/Kor Post system offers improved properties aiming at restoring the endodontically treated teeth when compared with the metal post available. Its capacity to be placed using the most

contemporary adhesive and building-up systems along with the proved durability enable the dentists to restore the original tooth strength. One should not be afraid of any eventual root fractures, of the "dark root" syndrome, the gingival discolourization or non-necessary removal of intact tooth structure. Like with any bonding procedures, the instructions for use and technique of placement should be strictly observed in order to avoid failures.

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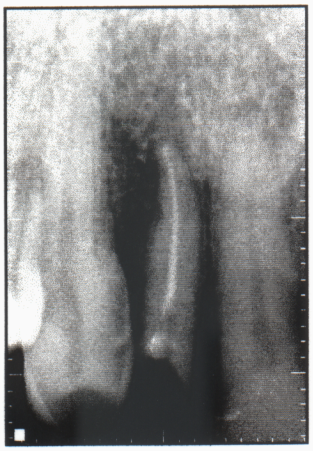

Fig. 1. *CDR when filling the root canal with canal filler and gutta percha points*

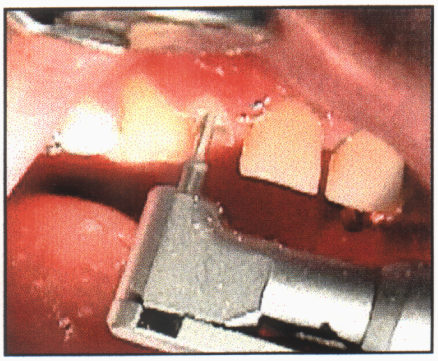

Fig. 2. *Post hole creation*

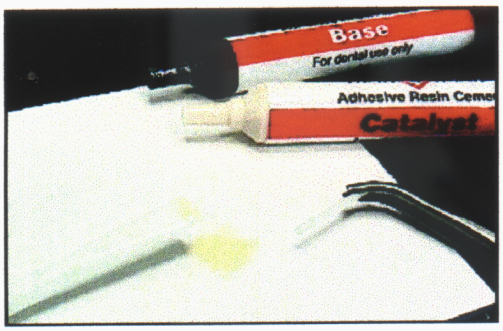

Fig. 3. *Preparation of composite cement (High-Q-Bond) for post cementation*

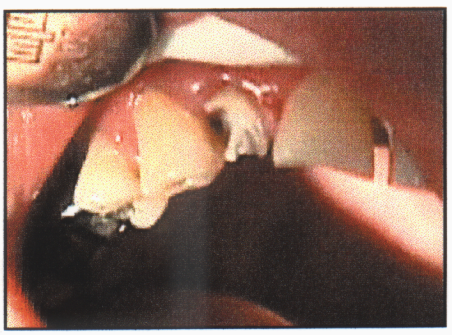

Fig. 4. *Post cemented in the canal*

Fig. 5. *Built-up core with light curing composite of a maxillary right lateral incisor*

Fig. 6. *Cemented metal-free crown*