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DENTAL TECHNIQUE

Three-dimensional endodontic guide for adhesive fiber post removal: A dental technique

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ABSTRACT

This dental technique describes a protocol for adhesive fiber post removal using a prototyped endodontic guide. The removal of an adhesive fiber post is an important step for endodontic retreatment and the resolution of prosthetic problems. Computer-aided design and computer-aided manufacturing (CAD-CAM) technology was used to generate guides with prototyping and is a useful tool for fiber post removal. (J Prosthet Dent 2019;121:387-90)

Endodontically treated teeth with extensive coronal destruction are typically restored with endodontic posts when the tooth structure does not provide adequate retention for the restoration. In recent years, adhesively bonded glass, carbon, or quartz fiber posts have become popular, replacing metal posts.[1] However, these adhesive posts may require removal because of prosthetic problems or failure of the endodontic treatment. The procedure is challenging, and care must be taken to avoid root perforation, crack propagation, severe deviations from the root axis, or even root fracture.[2-6] Thus, new solutions and better procedures are needed.[7]

Post retention can be influenced by the type of luting cement, cement film thickness, post pretreatment, and the irrigant used during post space preparation,[8-10] and different removal techniques have been evaluated.[11] The experience of the dentist has a major influence on post removal success.[12]

Cone beam computed tomography (CBCT) offers improved diagnostics and may facilitate endodontic treatment.[13] Endodontic guides to remove pulp obliterations offer precision access and treatment of specific root areas.[14] These guides are developed considering root anatomy,[15-17] are obtained from CBCT images,[18] and orient the access cavity for endodontic adhesive post removal, thereby facilitating the procedure, making it safer, and contributing to the preservation of root structure.

TECHNIQUE

1. After clinical examination, obtain a periapical radiograph to evaluate the existing endodontic treatment to confirm the need for fiber post removal and a nonsurgical endodontic retreatment (Fig. 1).
2. Trim the composite resin core (Figs. 2 and 3) and obtain CBCT images (i-CAT Classic; KaVo Ind) to map the affected area and the remaining root.
2. Generate 2 diagnostic casts from the 3D data obtained by CBCT and the oral cavity scanning (TRIOS Color Pod; 3Shape A/S). Align and export these

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Figure 1. Pretreatment periapical radiograph.

casts to virtual planning software (SimPlant 15.0 Pro; Materialise) for planning based on the CBCT scan.

3. Determine the drill diameter according to the endodontic post length and diameter. Create a virtual guide using software (coDiagnostiX; Dental Wings GmbH), export the model as a standard tessellation language (STL) file, and send it to a 3D printer (Objet Eden 260V, Material MED610; Stratasys Ltd) for prototype guide production (Fig. 4).
4. Under local anesthesia, proceed with the adaptation of the guide and stabilize it on the adjacent teeth. Perforate the tissue in the 2 facial fixation pin areas. Insert the fixation pins into the facial locations to stabilize the canal access guide and prevent deviation of the drill.
5. Select the drill to be used through the guide and advance in the correct path until complete removal of the adhesive post (Fig. 5). For this patient, a 1.3-mm-diameter drill (Neodent Drill for Temp implants; JJ GC Ind. e Com. de Materiais Dentários SA) was used with an XSmart IQ motor (Dentsply Sirona) at 350 rpm and 5-Ncm torque with 0.9% sterile saline solution irrigation to a 12-mm length.
6. Remove the fixation pins and the guide and make a new periapical radiograph to confirm the complete removal of the endodontic post (Fig. 6).

Figure 2. Pretreatment view of adhesive post.

Figure 3. Removal of composite resin core.

DISCUSSION

Fiber post removal is challenging even with an endodontic microscope. This dental technique describes a prototyped guide that facilitates the procedure. Traditional techniques may remove excess tooth structure, weakening the tooth.[4] Rotary nickel-titanium instruments can lead to apical crack initiation when removing a fiber post,[5] and the removal of fiber posts with an ultrasonic tip can also decrease the fracture resistance of the roots.[6] A high prevalence of perforations or deviations from the root axis was observed for all types of fiber posts and techniques. There is a high risk of perforation with all the techniques evaluated.[3]

Computed tomography can assist in visualizing the root canal anatomy[13] and localizing the adhesive post, but the authors are unaware of a previous report combining the computed tomography data with prototyping for post removal. The technique described reduces the risk of failure for less experienced professionals given that the endodontic guide made by prototyping orients

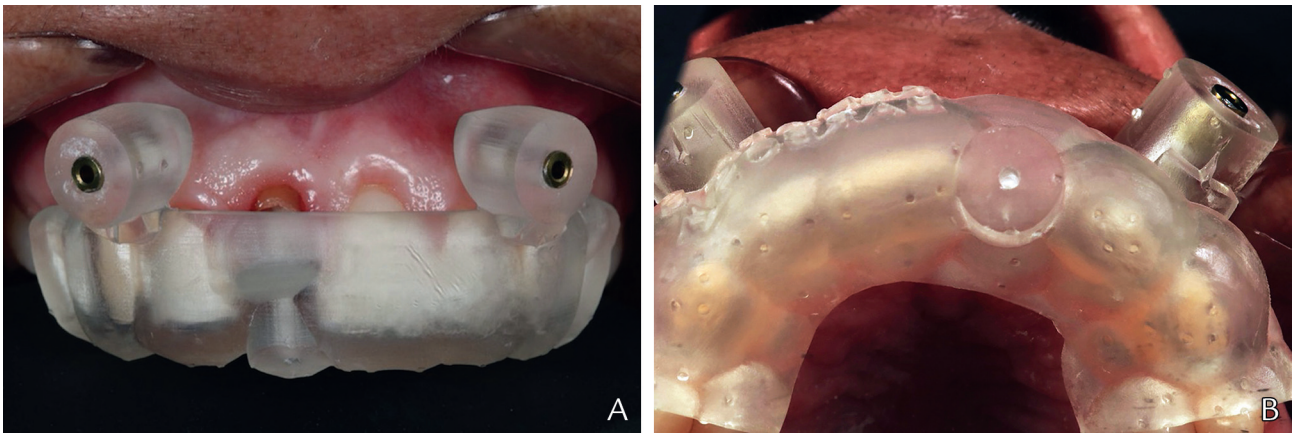

Figure 4. Prototyped endodontic guide. A, Frontal view. B, Occlusal view.

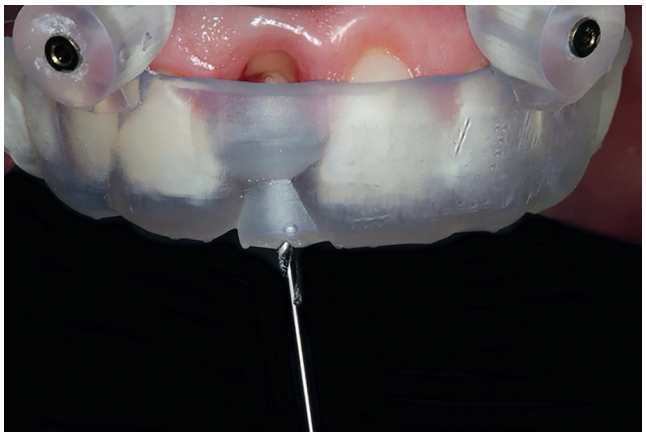

Figure 5. Drill advancing in correct path.

the drill to the target. Thus, the possibilities of excessive trimming, weakening, or perforation of the root structure are avoided.

Prototyping has been used in dentistry for the fabrication of complete dentures,[19] removable partial denture frameworks,[20] reconstruction of extensive mandibular and maxillary defects,[21,22] auricular prostheses,[23] and endosseous implant insertions.[24] Guided endodontics is performed using a 3D cast combined with tomographic data.[18] Digital design and endodontic guide prototypes provide the reliable and predictable location of unusual root anatomy[15] or calcified metamorphosed root canal systems, leading to better long-term prognostics.[16,17]

SUMMARY

The CAD-CAM technology to generate guides with prototyping is a useful tool for fiber post removal. The combination of intraoral scanning associated with a prototyped endodontic guide is a promising option that is straightforward to execute and offers a safe procedure, avoiding radicular structure reduction, crack propagation, root axis deviation, and perforation.

Figure 6. Radiograph after treatment depicting complete removal of post.

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