

Fabricating a computer-aided design provisional with a customized access opening for root canal therapy

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ABSTRACT

As dentists, we strive to find ways to balance a patient's wants and needs. Many times we are we are challenged to find ways to meet the patient's expectations while simultaneously maintaining the standard of care for the patient. The purpose of this case study is to present an option for extended provisionalization of a tooth requiring retreatment of a previously root canal treated tooth. Using Computer-Aided Design/Computer-Aided Manufactured (CAD/CAM) technology, we were able to fabricate a provisional with a custom lingual access for endodontic retreatment. We found that for this patient, the durability and esthetics of the provisional, and the ability to retreat the tooth without the repeated removal of the provisional presented a positive patient care outcome.

Key words: Computer aided design, computer aided manufactured, root canal, fabricate, provisional

Introduction

Previous research discusses the impact a nice smile can have on an individual's self-esteem. [1] A patient's perception of an attractive smile can be influenced by several factors including tooth color, size and shape of the teeth, and the appearance of the gingiva. [2, 3] As dentists, we strive to find ways to balance a patient's wants and needs. Many times we are challenged to find ways to meet the patient's expectations while simultaneously maintaining the standard of care for the patient. Complicated treatment involving multiple disciplines can extend over a long duration. Patients can find themselves in

provisional restorations for weeks or months at a time. While esthetics is certainly a major concern, both to the patient and to the dentist, a restoration must also be functionally acceptable and durable. The purpose of this case study is to present an option for extended provisionalization of a tooth requiring retreatment of a previously root canal treated tooth.

Case Report

The patient described in this report presented with an existing porcelain fused to metal crown (Fig. 1) on a root canal treated maxillary left central incisor that

required retreatment of the root canal. The root canal retreatment was scheduled over a period of a couple of weeks. Due to retention concerns of the original crown following access preparation,^[4] it was decided that a provisional crown would be made for the patient to wear during the treatment period. In addition, the original crown did not meet the patient's esthetic expectations in neither its shade nor its spatial alignment.



Fig. 1 Existing PFM Crown

The patient works on a ship and is often out to sea for weeks at a time. Taking esthetics and durability into consideration it was decided to fabricate a Paradigm (3M ESPE, St. Paul, MN) provisional restoration using CAD CAM technology (E4D Richardson, TX). The ability to use a computer to design the restoration prior to fabrication enabled us to create a customized access opening on the lingual surface of the provisional. This procedure not only eliminated the preparation of an access opening through the existing crown, it also eliminated the need to remove the interim prosthesis during each appointment.

Technique

The area to be restored was identified and a diagnostic waxing was developed. This diagnostic waxing enabled us to improve

the shape and position of the restoration, creating something more esthetically pleasing to the patient. Using the scanner, the diagnostic waxing was scanned and used as a clone for the planned provisional. The crown preparation of the tooth in question was refined and then scanned using the E4D wand. (Fig. 2) After scanning the prepared tooth, the provisional was designed following the diagnostic waxing pattern. In order to create the access opening, the facial/lingual slice of Slice Plane Option was selected. This overlay of the provisional to the preparation allowed for the thickness of the provisional to be evaluated. (Fig. 3) Using the Rubber Tooth tool to drag the lingual section of the design to a negative position on the preparation, (Fig. 4) we continued to alter the position of the facial/lingual slice until the desired access preparation was achieved. (Fig. 5) Once the design was completed, including the desired access opening, we sent the design to the E4D mill to fabricate the provisional. (Fig. 6) Once milled, the provisional restoration was placed on the tooth and adjusted for fit, contour, and occlusion. Very little adjustment was required. We completed the procedure by cementing the provisional to the tooth using TempBond (TempBond Cement; Kerr Corporation, Orange, CA). (Fig. 7) The endodontist was able to complete the access opening into the canal space using the path provided in the restoration. After the first appointment, the endodontist placed a cotton pellet into the chamber space and a sedative restorative material (IRM, Densply Caulk, Milford, DE) over the access opening. At the subsequent visit, the endodontist was able to regain access simply by removing the IRM and the cotton pellet.



Fig. 2 Scanning Preparation after Existing Crown is removed

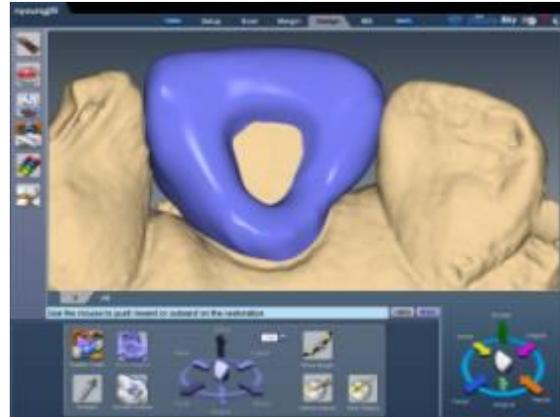


Fig. 5 Lingual Access Design on the Computer

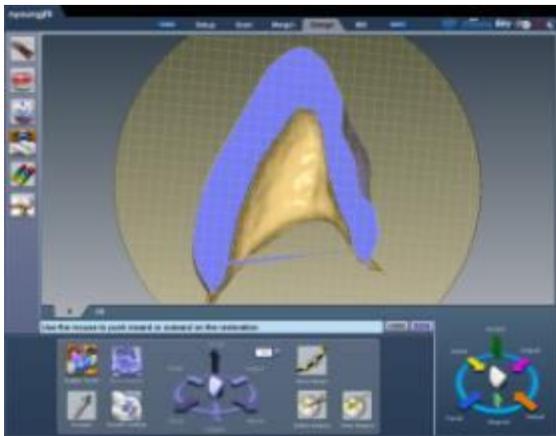


Fig. 3 Cross Sectional of Designing Provisional



Fig. 6 Milled Provisional

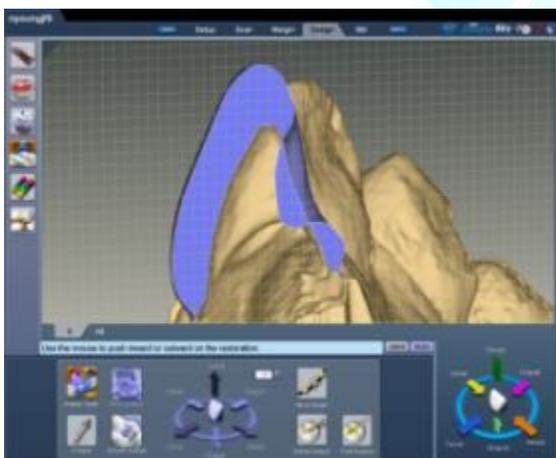


Figure 4. Designing the Lingual Access in the Provisional



Fig. 7 Cemented Provisional

Discussion

Many general practice dentists will refer endodontic retreatment procedures to the specialist. The ability of the general dentist to provide a provisional restoration that will not only address the patient's needs but also enable the endodontist to more effectively and efficiently provide the necessary treatment creates a win-win-win situation for all three parties. Using this provisionalization technique the endodontist can complete treatment in less time and with less potential to damage the tooth, the general dentist is better positioned to provide an acceptable final restoration, and the patient will not be inconvenienced with an unaesthetic provisional restoration that continues to become dislodged between visits. We found that for this patient, the durability of the provisional and the ability to retreat the tooth without the repeated removal of the provisional presented a positive patient care outcome.

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