

Prosthodontic And Periodontal Reconstruction Of Severely Damaged Endodontically Treated Teeth: A Clinical Report

U Cakan, B Yuzugullu, S Canay

Citation

U Cakan, B Yuzugullu, S Canay. *Prosthodontic And Periodontal Reconstruction Of Severely Damaged Endodontically Treated Teeth: A Clinical Report*. The Internet Journal of Dental Science. 2008 Volume 8 Number 1.

Abstract

Restoration of endodontically treated teeth becomes especially complex when the involved teeth have previously undergone trauma, treatment for caries, fractures, endodontic-access preparation, canal instrumentation and other idiopathic causes. Excessive loss of dental hard tissues and inadequate maxillomandibular relationship possess difficulties for the esthetic result of subsequent prosthetic restorations. In such instances, an interdisciplinary approach is necessary to evaluate, diagnose and resolve esthetic problems using a combination of periodontic and prosthetic treatments. This case report describes the interdisciplinary approach to restore function and esthetics of severely damaged endodontically treated teeth by means of metal ceramic restorations after crown lengthening procedure. Coordinated prosthetic, endodontic and periodontal treatments with careful consideration of patient's expectations and requests were critical for a successful outcome and patient satisfaction. Therefore the importance of the preprosthetic surgical and endodontic interventions is emphasized.

INTRODUCTION

Restoration of endodontically treated teeth had been a challenge to clinicians for years. This procedure becomes especially complex when the involved teeth have previously undergone trauma, treatment for caries, fractures, endodontic-access preparation, canal instrumentation and other idiopathic causes.¹²³ These problems result in loss of tooth structure and consequent reduction in tooth resistance to intraoral forces.⁴⁵⁶⁷ The restoration of endodontically treated teeth with root canal dowels is usually indicated when crown retention is required.²⁶⁸⁹¹⁰¹¹ The main purpose of this procedure is to provide retention for the core, which has replaced lost coronal tooth structure.⁶⁷ Surgical lengthening of clinical crowns is one of the most commonly used procedures in contemporary periodontics.¹² Indications include but not limited to caries removal, unesthetic gingival architecture as a result of altered passive eruption, lack of sufficient length of a clinical crown to ensure a tooth preparation for fixed restorations with retentive and resistance form and the need to develop a ferrule for pulpless teeth restored with dowels.¹³¹⁴¹⁵

Excessive loss of dental hard tissues and inadequate maxillomandibular relationship possess difficulties for the esthetic result of subsequent prosthetic restorations.¹⁶ In such instances, an interdisciplinary approach is necessary to

evaluate, diagnose and resolve esthetic problems using a combination of periodontic and prosthodontic treatments. This case report describes the interdisciplinary approach to restore function and esthetics of severely damaged endodontically treated teeth by means of metal ceramic restorations after crown lengthening procedure.

CLINICAL REPORT

A 33-year-old female was self-referred to Hacettepe University, Faculty of Dentistry, Department of Prosthodontics. The patient was concerned about the long term prognosis of her teeth and her chief complaints were masticatory difficulty, poor esthetics and compromised periodontal health. Prior to treatment, a detailed dental, medical and social history was obtained. The patient was in good general health and the medical and dental histories were noncontributory. An extensive clinical examination was performed. Initial frontal and profile extraoral examination revealed an Angle Class III malocclusion. Maxillary teeth had been restored with fixed partial dentures. The periodontal examination revealed compromised periodontal status with plaque accumulation and gingival inflammation. Clinical examination of the temporomandibular joints did not demonstrate any dysfunction. Functional examination displayed an edge-to-edge incisal relationship. Removal of the existing fixed partial dentures presented excessive loss of coronal tooth

structure of endodontically treated maxillary teeth (Fig 1).

Figure 1

Fig 1. Removal of the existing fixed partial dentures



Figure 2



After irreversible hydrocolloid impressions (Alginoplast, Bayer, Leverkusen, Germany), diagnostic casts were obtained. After completion of mounted diagnostic casts and radiographic evaluation, a multidisciplinary treatment plan was devised that consisted of endodontic retreatment, periodontal surgery for both maxillary quadrants and fabrication of metal ceramic fixed partial dentures.

Periodontal surgery was performed from teeth 17 to 27 to expose additional tooth structure for retention of the final restorations.¹⁷ Surgery was accomplished first on the right quadrant and then on the left at two appointments, to minimize duration of bone exposure. Inverse bevel, submarginal (scalloped) incisions were made from teeth 17

to 11. Papillae were dissected sharply in partial thickness and interproximal connective tissue was not removed or elevated. This incision design preserves papillae height and provides fixed tissue for flap stabilization during suturing. A facial full thickness flap with elevation of the mucogingival junction was made from teeth 17 to 11. The amount of facial alveolar bone to be removed was determined by the need to have a 3 mm distance between the bone crest and the new gingival margins (dentogingival complex or biologic width plus 1 mm for sulcus depth¹⁸¹⁹). Central and lateral incisors required minimal bone removal whereas canines, premolars and molars required most of the osseous resection. As the mesial aspect of teeth 11 and 21 was not involved in flap elevation or osseous surgery, the esthetically critical interdental papilla was not disturbed. After the planned dimensions were achieved, the flaps were sutured with 4-0 silk vertical interrupted sutures

A nonsteroidal anti-inflammatory drug was prescribed (Lodine, 400 mg, 2x1) and postoperative instructions detailed. The patient was instructed to rinse with chlorhexidine 0.12% mouthwash until mechanical removal of plaque was resumed. Postoperative healing was uneventful and soft tissue levels remained stable throughout the healing and restorative phases.

After three weeks of healing period, the patient was recalled and provisional restorations were fabricated at the appropriate vertical dimension and cemented with temporary cement (Cavex Temporary Cement, Cavex, Haarlem, Netherlands). Teeth with numbers 15, 14, 11, 24, 27 had previous endodontic treatments. Root canal treatment for teeth 17, 16, 25 and 26 with excessive loss of coronal tooth structure was planned. Following rubber-dam isolation, aforementioned teeth were prepared for root canal treatment. Gates Glidden drills (Maillefer, Ballaigues, Switzerland) in sizes 2 and 3 were used to obtain straight access in the middle and the coronal third of the root canals. The root canals then were stepback prepared to different sizes of files (Flex R file, Union Broach, York, Pa). Silicone stoppers were placed around the file shaft to control the working length of the files and the accuracy of the internal canal dimensions were ensured. After intermittent rinsing with 2.5 % sodium hypochloride, the canals were dried with paper points (Union Broach) and the roots were obturated with lateral condensation of gutta percha and AH-26 eugenol-free sealer (De Trey, Konstanz, Germany). The master gutta percha point was coated with sealer and seated in the canals

to the working length. A finger spreader (Kerr, Romulus, Mich) was inserted into the canal to a level approximately 1 mm short of the working length. Lateral condensation with non standardized fine gutta percha points (De Trey, Konstanz, Germany) was performed until all canals were obturated at the following appointments.

Caries removal and root canal treatment resulted in a substantial loss of coronal tooth structure. The prognosis of these teeth and the retention of the definitive restorations would have been questionable without the support provided by dowel and core foundations. Several investigators have reported that dowels placed in endodontically treated teeth with severe coronal destruction increase fracture resistance.

²⁰²¹²²²³ Patient's concern for esthetics was the primary factor in the decision to restore maxillary anterior teeth.

Fabrication of metal-free ceramic crowns over ceramic dowel-core systems was a treatment option but not selected due to higher cost and edge-to-edge incisal relationship might be a risk for the long-term prognosis of the restorations. ²⁴²⁵ Prefabricated and cast metal dowel and core foundations were chosen to support metal ceramic restorations.

The root canals of teeth 17, 16, 15, 14, 11, 24, 25, 26 and 27 were prepared for prefabricated dowel insertion. Coronal third of the root canals were prepared with Gates Glidden drills in sizes 2 and 3 and dowel space preparation was performed with Peeso Reamer drills up to size 3 and 4. The prepared dowel spaces were then cleaned with 17% EDTA, followed by a 5,25% solution of sodium hypochlorite for 30 seconds. The canal spaces were then dried out with absorbent paper points. Gold plated titanium dowels (Svenska Dentorama, Sweden) were placed. Dentin was conditioned with the use of Single Bond adhesive system and light-polymerized composite cores (Valux Plus, 3M Dental Products) which were fabricated on the posts with strip crowns (Svenska Dentorama, Sweden).

The root canals of teeth 12, 21 and 22 were prepared for cast dowels with the same procedure mentioned above for prefabricated dowels (Fig 3).

Figure 3

Fig 3. Dowel spaces obtained for teeth 12, 21 and 22 for cast dowels



Plastic burnout dowels with a Duralay acrylic resin (Palavit G, Heraeus Kulzer, Germany) and cores were used to cast Ni-Cr (Ceraplus S, President, Munich, Germany) dowels and cores by using the lost wax technique. After cementation of cast dowel and core foundations with zinc-phosphate cement (Adhesor, Spofa Dental, Prague, Czech Republic) according to the manufacturer's recommendations, maxillary teeth were prepared with a 1,3 mm circumferential chamfer finish line (Intensive Prep Set, Intensive SA, Grancia, Switzerland) (Fig 4).

Figure 4

Fig 4. Preparation of teeth with dowel-core foundations



All tooth preparations were completed without sharp line angles. Gingival retraction cord (Ultrapack #00, Ultradent, Salt Lake City, Utah) were maintained to accurately record the finish lines in the definitive impressions. Vinyl-

polysiloxane impressions (Speedex, Coltene, Whaledent, Switzerland) of the prepared teeth were made and immediately poured with a Type V dental stone (Bego Stone Plus, Bego, Cuxhaven, Germany). A full arch irreversible hydrocolloid impression of the opposing dentition was obtained and immediately poured with Type IV dental Stone (Die-Keen, Heraeus Kulzer Inc, South Bend, Ind). Occlusal vertical dimension (OVD) was established by the Niswonger technique by using facial points of reference placed on the nose and the chin.²⁶ The centric relation of the mandible was registered bimanually with an anterior jig at the desired OVD and secured by means of wax (Modelling Wax, Dentsply De Trey) with aluminium foil layer. The maxillary and mandibular models were mounted in a semiadjustable articulator (Whip Mix series 3000, Elite Dental Services, Inc, Orlando, Fla) by means of facebow transfer and centric relation records. Wax patterns of the metal substructure of the metal ceramic crowns were cast Ni-Cr alloy (Ceraplus S, President, Munich, Germany) and ceramic occlusal surfaces (Ceramco II, Dentsply Ceramco, N.York, PA) were fabricated by conventional methods. The crowns were cemented with zinc polycarboxylate cement (Adhesor, Spofa Dental, Czech Republic). Masticatory function and optimal esthetics were obtained and maxillomandibular relationship enhanced to a certain degree by fabrication of definitive metal ceramic restorations (Fig 5).

Figure 5

Fig 5. Intraoral view of definitive metal ceramic restorations



Definitive treatment outcomes in terms of function and esthetics satisfied the expectations of both the patient and the interdisciplinary team.

SUMMARY

This clinical report describes an interdisciplinary approach with the use of periodontal surgery, endodontic treatment, cast and prefabricated dowel insertion, core build up and fabrication of metal ceramic fixed partial dentures of a patient with both esthetic and functional dental concerns. Compromised periodontal status of the patient was improved and sufficient clinical crown length was obtained by means of crown lengthening procedures and dowel-core restorations. Teeth with severe coronal destruction and insufficient clinical crown length limit the success of the final prosthetic restorations. Several factors have to be taken into consideration such as periodontal condition, the amount of tooth loss and maxillomandibular relationship. The treatment options may vary considerably depending on the above mentioned factors. The prosthetic treatment usually includes complete coverage metal ceramic crowns for functional and esthetic rehabilitation and protection of the remaining teeth. Coordinated prosthetic, endodontic and periodontal treatments with careful consideration of patient expectations and requests were critical for a successful outcome and patient satisfaction. Therefore the importance of the preprosthetic surgical and endodontic interventions was emphasized.

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Author Information

Umut Cakan, DDS, PhD

Private practice, İstanbul, Turkey

Bulem Yuzugullu, DDS, PhD

Assistant Professor, Baskent University, Faculty of Dentistry, Department of Prosthodontics, Ankara, Turkey

Senay Canay, DDS, PhD

Professor, Hacettepe University, Faculty of Dentistry, Department of Prosthodontics, Ankara, Turkey