

Conversion of a Partial Removable Dental Prosthesis from Kennedy Class II to Class III Using a Dental Implant and Semiprecision Attachments

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Keywords

Partial removable dental prosthesis; attachments; implants; PRDP.

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Presented at the 2006 American Academy of Fixed Prosthodontics Annual Meeting.

Accepted February 18, 2011

doi: 10.1111/j.1532-849X.2011.00769.x

Kennedy class I and II partial removable dental prosthesis (PRDP) designs have long posed a challenge to dental professionals because hard tissue (teeth) and soft tissue (mucosa) respond differently under pressure. The mucosa depresses more than natural teeth under pressure, leading to unfavorable torque on the abutment teeth. With time, the irreversible and progressive residual ridge resorption¹ exacerbates this unfavorable loading of abutment teeth. Together with a greatly lower biting force restored by PRDP (35% of natural dentition²), this unfavorable biomechanical situation counts for a substantial number of dissatisfied PRDP patients.³ With broad application of dental implants, it has become increasingly practical to use implants to improve PRDP designs for patients. Combining dental implants with the proper selection of attachments, dental professionals could greatly improve mastication, stability, and esthetics of these prostheses.

Case report

Pretreatment

A 65-year-old retired United States Army officer presented to the Graduate Prosthodontics Clinic, College of Dentistry, The Ohio State University, Columbus, OH, with a failing maxillary

Abstract

This article presents a design to convert a partial removable dental prosthesis (PRDP) from Kennedy class II to class III using a dental implant. Incorporating semiprecision attachments, this design provides desired esthetics, phonetics, and function.

PRDP. He complained, "Everything is falling apart. The bar is broken. My prosthesis needs to be replaced." He also expressed dissatisfaction with the maxillary major connector and the visibility of the clasp (Fig 1).

The patient's medical history had no contraindications to dental treatment. Oral examination revealed missing teeth 2 to 5, 7 to 10, 12 to 14, 18, and 30. Recurrent caries was apparent around the facial margins on 6 and 11. The bar between 11 and 15 was broken. Hyperplastic tissue existed distal to tooth 6. The patient was classified as American College of Prothodontists (ACP) Prosthodontic Diagnostic Index (PDI) partial edentulism class III.⁴

Treatment plan

An implant- and tooth-supported maxillary PRDP was planned along with a mandibular fixed dental prosthesis (FDP) 29-Pontic-31.

Treatment

Diagnostic wax-up was completed on mounted diagnostic casts. The bone level was evaluated using a panoramic survey. Crowns 6, 11, and 15 were removed; abutment teeth were evaluated,



Figure 1 Pretreatment images: (A) the hyperplastic tissue distal to tooth 6; (B) tissue side of existing prosthesis; (C) visibility of the retentive clasp on 6; (D) mandibular arch.

and interim prostheses were fabricated. Caries was eliminated, and foundation restorations were completed on 6, 11, and 31.

A surgical guide was fabricated. A Zimmer tapered screw-vent (5.7-mm diameter \times 13-mm long) implant (Zimmer Dental, Carlsbad, CA) was placed in area 2. Hyperplastic tissue in the maxilla was excised. The existing PRDP was

transformed into a temporary prosthesis by relining with soft denture reline material COE-Soft (GC America Inc., Alsip, IL). FDP 29-pontic-31 was fabricated. The locator abutment (Zimmer Dental) was selected for the implant following tissue healing and osseous integration of the implant.

Teeth 6, 11, and 15 were prepared for metal ceramic survey crowns. Extracoronal semi-precision attachments



Figure 2 Strategy-DE attachment: (A) Top row (I–r): plastic pattern for the patrix, metal housing for the matrix. The bottom row shows the plastic inserts of different levels of retention: yellow—least retentive; white-medium retention; gray—most retentive (Provided by Attachment.com, used with permission); (B) full contour wax-up of survey crowns 6, 11, and 15 were checked by a dental surveyor.



Figure 3 (A) The pick-up impression was poured. The metal housing and yellow plastic inserts were placed over the cast metal patrix; (B) metal housing of the Strategy-DE attachment incorporated into the metal framework by autopolymerizing resin. The framework complex was then tried intraorally.



Figure 4 (A) Processed PRDP and metal ceramic restorations at the placement appointment; (B) the locator housing was incorporated intraorally by autopolymerizing resin.

(Strategy-DE, Attachments International, Burlingame, CA) were selected for teeth 6, 11, and 15 (Fig 2A).

A full-contour wax-up for 6, 11, and 15 was performed (Fig 2B). The plastic patterns for the patrix parts of the attachments were attached to the wax-up and checked with a dental surveyor (Ney[®] Surveyor, Dentsply Ceramco, York, PA).

Wax patterns were cut back, and metal–ceramic restorations were fabricated and tried in intraorally. A pick-up impression was made with irreversible hydrocolloid material (Jeltrate[®] Alginate, Dentsply International, York, PA), and a solid cast was poured for PRDP framework fabrication (Fig 3A).

Metal housings of the attachments were connected to the framework using autopolymerizing resin (Lucitone $199^{\text{(R)}}$ Repair Material, Dentsply International). The fitting of the framework and fixed restorations were verified intraorally. Note the design of the lattice work to leave space for the locator attachment (Fig 3B).

The wax trial appointment verified correct occlusion, occlusal vertical dimension, and esthetics. The maxillary PRDP was processed, remounted, and placed (Fig 4A).



Figure 5 Post-treatment photos 6 months after placement.

The locator attachment was picked up intraorally by autopolymerizing resin (Lucitone 199[®] Repair Material). A silicone indicator paste material (FIT CHECKERTM WHITE, GC America Inc.) was used to verify that adequate spacing existed between the denture base and the metal housing of the locator attachment (Fig 4B).

Intra- and extraoral adjustments were performed. Correct occlusion, function, and esthetics were verified. Instructions regarding correct placement/removal of the new prosthesis and home care were explained and demonstrated to the patient. The patient was then seen at 24-hour, 72-hour, 1-week, 3-month, and 6-month recall appointments (Fig 5).

Discussion

Retention

In this case, adequate retention was achieved from the three yellow Strategy-DE attachment inserts. Therefore, the black nonretentive processing insert was used for the implant locator attachment. The implant mainly serves as a distal vertical support for the PRDP. The retentive plastic inserts of different levels of retention can be used in the future at the patient's request.

Patient's satisfaction

Uludag and Celik suggested using a single distal implant to improve retention and support for a unilateral Kennedy class II removable prosthesis.⁵ In this case, the patient's satisfaction and confidence with the implant-supported PRDP were greatly improved compared to his previous distal extension PRDP, which is consistent with reports from others.⁶⁻⁸

Selection of attachments

The selection of the Strategy-DE extracoronal semiprecision attachment is based on its versatility, availability of different degrees of retention, ease of changing plastic inserts when indicated, and low cost. The locator attachments were selected due to their low profile, straightforward fabrication process, and ease of maintenance. Another advantage is that they can accommodate up to 10° deviation (information provided by Zimmer Dental) of implant deviation from the common path

of placement, which gives leeway for implant placement at a location with less-than-ideal access (2 site in this case).

Path of placement (POP)

For relatively complicated PRDP cases with multiple attachments, it is important that all rigid elements follow the POP. An initial decision on proper POP was made at the treatment planning stage. After the full diagnostic wax-up, a surveyor was employed to determine the appropriate POP. The surgical guide for the dental implant at the #2 site was then fabricated, and the guiding hole was drilled following the POP. The distal implant needs to be placed as parallel as possible with the POP, the guiding planes of the survey crown, and the patrix parts of the Strategy-DE attachments. Still, there is the possibility that they are not perfectly parallel. Selection of accommodating attachments can compensate for this potential error. In this case, the locator attachment can forgive up to a 10° error; the Strategy-DE attachment has a ball-shaped patrix part and plastic inserts to compensate for minor angulation discrepancies.

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