# CLINICAL REPORT

# Fixed Rehabilitation of an ACP PDI Class III Patient

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**This clinical report documents the treatment of a 63-year-old Caucasian female Prosthodontic Diagnostic Index Class III patient using dental implants and a fixed prosthetic reconstruction. The treatment involved the fabrication of single crowns and fixed partial dentures retained by natural teeth in the maxillary arch. The posterior segments of the mandibular arch were rehabilitated with fixed partial dentures retained by endosseous implants.**

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**INDEX WORDS: fixed reconstruction, Prosthodontic Diagnostic Index, implants**

THE AMERICAN COLLEGE of Prosthodontists' Classification System for the Dentate Patient[1] allows the diagnosis of patients based on the oral condition at the time they initially present to the practitioner. The Classification System has recently been renamed as the Prosthodontic Diagnostic Index (PDI), and allows patients to be classified based on the severity of their pre-treatment dental condition. This clinical report documents the treatment of a 63-year-old Caucasian female PDI Class III patient using dental implants and a fixed prosthetic reconstruction.

## Chief Complaint

The patient's chief complaint was: "My lower left bridge is moving, and the porcelain broke off many years ago. My previous dentist made these crowns and bridgework 11 years ago, but I am not happy with the way they look anymore. In addition, my lower right canine is aching."

## Medical History

The patient's medical history was unremarkable. Her last medical examination was 2 months prior to her dental appointment; there were no abnormal findings and no contraindications to dental treatment. The patient denied consumption of alcohol and tobacco products. She exercised three times a week.

## Dental History

The existing restorations were constructed in 1992. Within 12 months of placement of the prostheses, the porcelain fractured on teeth #15 and 18. In 1997, tooth #18 was hemisected and the mesial root was removed due to recurrent caries. From that time, the fixed partial denture #18 to 22 was loose (Figs 1-5). The patient reported visiting her general dentist at least once a year for periodic recall examinations and prophylaxis. She reported brushing twice daily, with infrequent use of dental floss.

## Clinical Findings

### *Extraoral Examination*

The patient presented with no muscle tenderness or palpable lymph nodes. There was no facial asymmetry, and the muscles of mastication were asymptomatic. Examination of the temporomandibular joints revealed that they were asymptomatic, with no evidence of clicking, crepitus, or tenderness to palpation.

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**Figure 1.** Maxillary occlusal view, pre-treatment.

### *Intraoral Examination*

Examination of the soft tissues of the lips, cheeks, tongue, oral mucosa, and pharyngeal tissues revealed that they were within normal limits. Salivary flow was within normal limits. The mucosa appeared to be generally smooth and shiny, with loss of stippling.

Periodontal examination revealed probing depths of 3 to 4 mm, with the exception of tooth #18, which had a probing depth of 5 mm on the mesial surface. The mesial root of #18 had been extracted.

Existing porcelain-fused-to-metal restorations on teeth #3 to 5, 9, 10, 12, 18, 27, 28, and 32 had poor marginal integrity and exhibited recurrent caries. A defective composite restoration with recurrent caries existed on tooth #6. The lingual porcelain had been significantly adjusted on the following restorations: #7 to 10, 12, and 14. The veneering porcelain was fractured on restorations #15, 18, and 27.

**Figure 2.** Mandibular occlusal view, pre-treatment.

**Figure 3.** Maximal Intercuspal Position (MIP) frontal, pre-treatment.

Teeth #1, 2, 12, 14, 16, 17, 19 to 21, and 29 to 31 were missing.

### *Occlusal Findings*

Centric relation was not coincident with maximum intercuspation. Centric relation contact existed between teeth #15 and 18. The right working contacts existed between teeth #6 and 27 with no balancing interferences. The left working contacts existed between teeth #11 and 22, again with no balancing interferences. Protrusion guidance occurred between teeth #8, 9 and 23, 24, 25, 26.

### *Radiographic Findings*

The alveolar bone appeared to have normal density and trabeculation with slight horizontal bone loss. Teeth #3 to 5, 7, 9, 10, 13, 15, 18, 28, and 32 were endodontically treated. Teeth #10, 13,

**Figure 4.** MIP right, pre-treatment.

**Figure 5.** MIP left, pre-treatment.

28, and 32 had endodontic dowels in them. No periapical pathology was present (Figs 6 and 7).

## Diagnosis

1. Generalized mild gingivitis;
2. Partial edentulism;
3. Defective restorations and caries on teeth #3 to 5, 9, 10, 12, 18, 27, 28, and 32;
4. ACP PDI for partial edentulism was determined to be Class III.[1]

## Treatment

### *Diagnostic and Control Phase of Treatment*

The treatment plan was established after consultations with a periodontist and an endodontist. The proposed treatment plan was discussed with the patient. She understood and accepted it, and she then received oral hygiene instructions.

Two preliminary impressions were made and poured with Type III dental stone. A facebow record was made using the Denar Slide-matic facebow (Waterpik Technologies, Fort Collins, CO).[2,3] A centric relation record was made using LA Cohn's wax (Mizzy Inc., Cherry Hill, NJ)[4] (Fig 8). A protrusive and two (right and left) lateral eccentric recordings were made to adjust the condylar settings of the Denar Mark II semi-adjustable articulator (Waterpik Technologies)[5,6] (Fig 9).

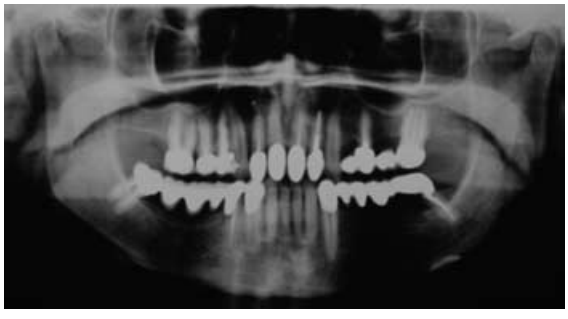

**Figure 6.** Panoramic radiograph, pre-treatment.

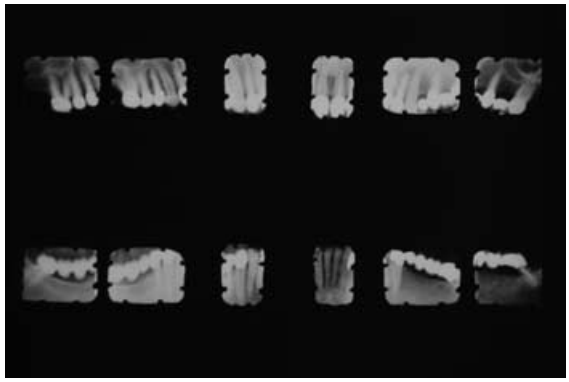

**Figure 7.** Full mouth periapical radiographs, pre-treatment.

The patient's anterior guidance was preserved by means of a custom anterior guide table[7] (Fig 10) constructed in acrylic resin (SR Ivolen, Ivoclar Vivadent, Schaan, Liechtenstein). The diagnostic waxing was completed at the existing vertical dimension of occlusion, duplicated, and a mandibular surgical stent was fabricated of auto-polymerizing polymethyl-methacrylate (PMMA) transparent resin (Orthodontic Resin, Dentsply Caulk, Milford, DE).[8]

The diagnostic waxing was flasked and processed with heat-polymerized PMMA resin (SR Ivocron, Ivoclar Vivadent).[9]

**Figure 8.** Centric relation registration.

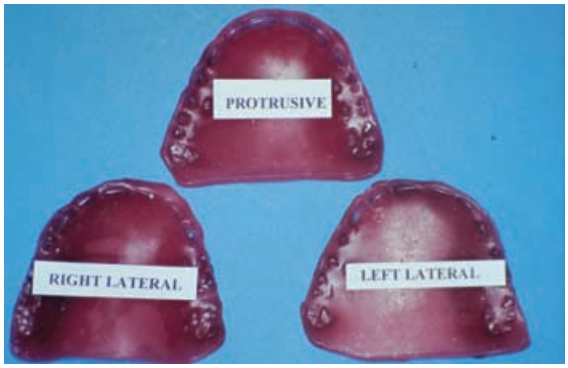


**Figure 9.** Eccentric recordings.

Maxillary and mandibular polysterene templates (Coping Material, National Keystone Products Co., Cherry Hill, NJ) were fabricated from the patient's duplicated diagnostic waxing casts for use in construction of provisional restorations.[10]

### *Definitive Phase of Treatment (Clinical Treatment)*

The existing metal–ceramic restorations were removed and the caries excavated. The existing dowel and cores of teeth #10 and 13 were removed. The initial set of interim restorations was fabricated with autopolymerizing PMMA resin (Temporary Bridge Resin, Dentsply Caulk, Milford, DE) using the previously constructed polysterene templates. At this stage, teeth #18 and 32 were restored with custom cast gold post and cores, and used as posterior abutments for the provisional fixed partial denture. The patient was referred to the periodontist for extraction of tooth #28; ridge preservation surgery was accomplished at this time via placement of autologous bone graft at the extraction site and resorbable collagen membrane (Bio-Gide, Osteohealth, Shirley, NY).[11]

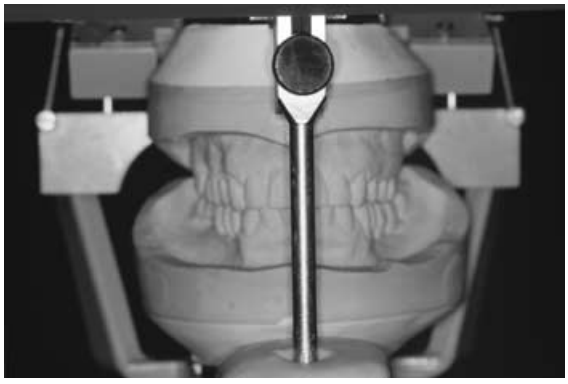

**Figure 10.** Diagnostic casts mounted on a semi-adjustable articulator.

The patient was referred to the endodontist for treatment of teeth #8 and 27, as they exhibited irreversible pulpitis. The root canal spaces were obturated with gutta-percha following accepted endodontic guidelines.

Teeth #4, 5, 7, 8, 10, and 13 were prepared to receive custom cast dowel and cores.[12,13] The patterns were prefabricated using burn-out posts and autopolymerizing PMMA resin (Pattern Resin, GC Corporation, Tokyo, Japan), and cast in type III gold (Minigold, Ivoclar Williams, Amherst, NY). The cast dowel and cores were luted with resin-modified glass ionomer cement (Rely X Luting cement, 3M ESPE, St. Paul, MN).[14]

The patient was referred to the periodontist for placement of four 3i Osseotite implants (Implant Innovations Inc., Palm Beach Gardens, FL) at sites #19 (4 × 11.5 mm), 21 (3.75 × 13 mm),[15] 28 (4 × 11.5 mm), and 30 (4 × 11.5 mm), using a two-stage surgical protocol.

Four months after implant placement, the patient underwent the second stage surgery for all implants placed. Three weeks later, a polyether impression (Impregum Penta, 3M ESPE, Seefeld, Germany) of the mandibular arch was taken and poured in type IV dental stone (Fujirock EP, GC Europe, Leuven, Belgium). Four 3i UCLA abutments with gold hex (Implant Innovations Inc.) were modified, by use of PMMA (Pattern Resin, GC Corporation) resin to provide the contours required for the custom abutments and were evaluated using the polysterene (Coping Material, National Keystone Products Co.) template of the diagnostic waxing for contour accuracy.[16] The custom abutments were cast in type III gold (Minigold).

The custom abutments were tightened to 32 Ncm on the implants using a torque wrench (Contra Angle Torque Driver and Torque Controller, Implant Innovations Inc.). The previously fabricated, heat-polymerized provisionals were relined with PMMA resin (Temporary Bridge Resin, Dentsply Caulk) for both dental arches[17] (Figs 11-13).

The patient was referred to the periodontist for the extraction of teeth #18 and 32.

The patient received a tray and underwent a bleaching process for the mandibular incisors using a 10% carbamide peroxide gel (Opalescence,

**Figure 11.** Provisional restorations, frontal view.

**Figure 13.** Provisional restorations, left view.

Ultradent Products Inc., South Jordan, UT) for 7 days (7 hours/day).[18] Three weeks later, preparations of the maxillary and mandibular arch were finalized with a chamfer margin design, and the provisional restorations were modified to accept the new margin locations.[19]

A week later, gingival tissues were retracted using braided cord (Ultrapak, Ultradent Products Inc.) saturated with ferric sulfate (Astringedent, Ultradent Products Inc.).[20] Maxillary and mandibular full-arch impressions were made using methylmethacrylate acrylic resin custom trays (SR Ivolen, Ivoclar Vivadent) and polyether impression material (Impregum Penta).[21–23] Final impressions were poured in Type IV dental stone, and master casts were fabricated using the Accutrac system (Accutrak Precision Die System, Coltène/Whaledent Inc., Cuyahoga Falls, OH).[24] Impressions of the interim restorations were made with irreversible hydrocolloid and poured with Type III dental stone.

Three centric relation records were made as follows:

*a)* Maxillary prepared teeth opposing mandibular prepared teeth,
*b)* Maxillary prepared teeth opposing mandibular interim restorations,
*c)* Mandibular prepared teeth opposing maxillary interim restorations.

Master casts were mounted on the Denar Mark II semi-adjustable articulator (Waterpik Technologies). Dies were sectioned, trimmed, margins were marked, hardened with cyanoacrylate cement, and two coats of die spacer (Belle de St Claire, Kerr Lab Corp., West Collins Orange, CA) were applied[25,26] (Figs 14 and 15). The casts of the interim restorations were also mounted on the articulator. Working casts and casts of the provisional restorations were interchangeable. Poly(vinyl siloxane) keys were constructed from the casts of the provisional restorations to be

**Figure 12.** Provisional restorations, right view.


**Figure 14.** Master casts mounted, right view.

**Figure 15.** Master casts mounted, left view.

**Figure 17.** Mandibular occlusal view, post-treatment.

used for the fabrication of the full contour waxings. Full contour waxing of the proposed restorations were cut back to provide the appropriate dimension for porcelain application.[27] A 20° angulated abutment was used for implant #19, and UCLA gold non-hex abutments (Implant Innovations Inc.) were used for implants #21, 29, and 30.[28]

The completed wax patterns were cast in a gold–palladium alloy (Olympia, Heraeus Kulzer Inc., Armonk, NY). The castings were evaluated under microscope, and the fitting was verified on the master dies.[29]

The metal frameworks were clinically and radiographically evaluated in the mouth, and they were cut and indexed using autopolymerizing PMMA resin (Pattern Resin, GC Corporation). The frameworks were pre-porcelain soldered (Jelenko Olympia Pre Solder, Heraeus Kulzer Inc.) using a torch. After soldering, the metal frameworks were evaluated again to ensure proper marginal fitting and absence of any "rocking" movement.

Three new centric relation records were made to confirm the articulation of the frameworks in the articulator as follows:

*a)* Maxillary framework opposing mandibular framework,
*b)* Maxillary framework opposing mandibular interim restorations,
*c)* Mandibular framework opposing maxillary interim restorations.

Following framework preparation, dental porcelain was applied, using feldspathic porcelain (Willi Geller Creation, Jensen Industries Inc., North Haven, CT) fired according to manufacturer's recommendations. A mutually protected occlusion was developed,[30] and the restorations returned to the patient for a bisque bake try-in.

**Figure 16.** Maxillary occlusal view, post-treatment.

**Figure 18.** MIP frontal, post-treatment.

**Figure 19.** MIP right, post-treatment.

A new centric relation record was obtained for verification purposes. Casts were remounted and the occlusion evaluated and adjusted on the articulator. The metal–ceramic restorations were characterized, glazed, and polished. The patient approved the final esthetic result and gave permission for final cementation. The metal–ceramic restorations were cemented with resin-modified glass ionomer cement (Rely X Luting Cement), and the fastening screws of the implant abutments were tightened to 32 Ncm, as suggested by the manufacturer.[31,32] Gutta-percha was placed over the fastening screws, and the access holes were covered with light-cured composite resin (Z250, 3M ESPE, St. Paul, MN) (Figs 16-22).

**Figure 20.** MIP left, post-treatment.

**Figure 21.** Panoramic radiograph, post-treatment.

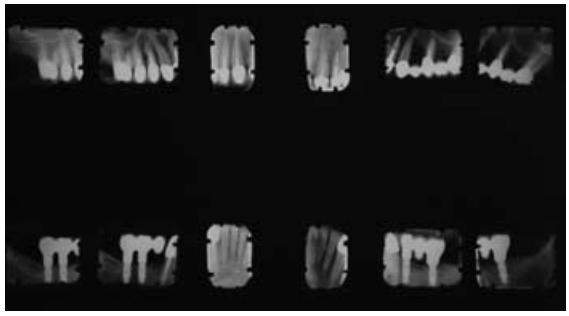

**Figure 22.** Full mouth periapical radiographs, post-treatment.

Post-operative instructions were given to the patient.

## Summary

An ACP PDI Class III[1] partially edentulous patient was treated with fixed restorations retained on both teeth and implants. The patient was very motivated for the preservation of the final result. Both short- and long-term prognoses for the restorations and implants are good, provided that the patient follows a regularly prescribed maintenance program.

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