

# The Use of Dental Implants in Combination with Removable Partial Dentures. A Case Report

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## ABSTRACT

Implant treatment protocols for fully edentulous patients include implant-supported fixed restorations with a minimum of five to six implants or overdentures on two to four implants. However, implant placement in the posterior areas is sometimes not permitted by anatomic and/or financial restraints, or patients' unwillingness to have extensive surgical procedures.

The purpose of this case report is to present a treatment option where bilateral distal extension removable partial dentures (RPDs) are used in combination with anterior fixed implant prostheses with semi-precision attachments.

The initial treatment plan of a 65-year-old female with failing dentition involved the fabrication of overdentures supported by four implants placed in the interforaminal area in both arches. Because of inadequate space for the retentive elements of the overdenture and the patient's objection to surgical procedures for the placement of additional implants to support a fixed restoration, the treatment plan was modified. Fixed ceramometal cement-retained implant restorations with semi-precision attachments adjacent to the distal abutments were fabricated in the maxilla and the mandible. Bilateral distal extension RPDs were placed in both arches. The patient's benefits were increased comfort, good esthetics in the anterior area, improved phonetics, and masticatory function. Retentive element maintenance requirements were similar to conventional RPDs. More extended controlled clinical studies are needed to establish the long-term success of this treatment option.

## CLINICAL SIGNIFICANCE

Removable partial dentures may offer an attractive treatment option for an edentulous patient, as they may combine an FPD in the anterior segment with a removable appliance in the posterior areas. A satisfying restoration can be achieved with fewer implants.

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## INTRODUCTION

The restoration of completely edentulous patients with implants represents a major challenge for the clinician. The standard clinical protocols include fixed restorations with a minimum of five to six implants or removable overdentures with two to four implants.<sup>1,2</sup>

In some cases, however, the treatment plan has to be adapted to the patient's demands.

Certain patients demand a fixed restoration in the anterior area, although willing to accept a removable prosthesis for the posterior region. The insertion of implants in the posterior areas often requires extensive surgical procedures because of excessive bone loss.<sup>3-5</sup> In addition, the need for more implants increases the total treatment cost.

Patients who have been using a removable partial denture (RPD) are accustomed to removable appliances but may be unwilling to convert to an implant supported overdenture if anterior teeth are lost. Their major demand is a restoration resembling the preexisting one.

The use of RPDs in conjunction with implants has been previously reported.<sup>6-8</sup> However, there are

very few studies on the use of RPDs connected to fixed implant-supported restorations.<sup>7,8</sup>

## PURPOSE

The purpose of this case report is to present a case where bilateral distal extension RPDs were used in combination with anterior fixed implant prostheses with semi-precision attachments.

## CASE PRESENTATION

A 65-year-old Caucasian female patient presented for treatment. The initial clinical and radiological examination revealed that the patient suffered from severe periodontitis. All maxillary and mandibular teeth showed poor prognosis and were considered hopeless (Figure 1). The treatment plans presented to the patient included fixed implant supported restorations for both arches, implant supported overdentures, and conventional complete dentures. The patient preferred a fixed restoration but could not afford a great number of implants. Additionally, she did not consent to extensive surgical procedures for implant placement in the posterior areas (i.e., bone augmentation, sinus lift). The treatment plan that was decided upon included implant-retained, bar-supported overdentures on four implants in each arch.

Four maxillary (16, 13, 23, 26) and three mandibular (38, 33, 43) teeth were maintained until the second stage surgery to support provisional fixed restorations (Figures 2 and 3). The remaining teeth were selected according to their distribution in the dental arch and their position in relation to prospective implant placement sites. The patient followed a periodontal recall program to ensure inflammation control during the healing period (5 months).

Four implants (Osseotite External Hex; 3i Biomet Co., Palm Beach, FL, USA) were placed in the maxilla in the areas of the lateral incisors and first premolars (#14, 12, 22, 24). In the mandible, four similar implants were inserted in the equivalent areas (#34, 32, 44, 42). The implant in the area of the left lateral mandibular incisor (#32) failed during osseointegration, but the patient refused a new surgery to replace it.

After second stage surgery a set of immediate complete dentures were fabricated to serve as interim restorations and as a guide for the final restorations. Additional support and retention were achieved using healing screws (EP Healing Screws; 3i Biomet Co.) with increased height over the implants. Vertical dimension, soft tissue support, esthetics, and phonetics were evaluated and adjusted



Figure 1. Initial panoramic X-ray.



Figure 2. Panoramic X-ray after preparation of the abutment teeth for the provisional restorations and prior to implantation.



Figure 3. The provisional restorations.



Figure 4. Impression copings for open-tray technique on four maxillary implants.

during the fabrication of the interim dentures.

The final impressions were made using the open-tray technique (Figures 4 and 5). The final working casts were fabricated using ISO Type-4 dental stone (Silky-Rock; WhipMix Co., Louisville, KY, USA) with a soft tissue replica (Gingiva Mask; GC Co., Tokyo, Japan). Screw-retained

baseplates were used for the registration of centric relation. The set-up from denture teeth was completed using the interim restorations as a guide (Figures 6 and 7). The set-up was tried clinically for verification of esthetics, occlusion, and phonetics (Figure 8). The casts were mounted to a semi-adjustable articulator (Hanau Wide View; Teledyne Hanau, Buffalo, NY, USA) (Figure 9).

Silicon indexes were obtained from each set-up to allow space evaluation for the supporting bar and metal framework (Figures 10 and 11). Because of the labial inclination of the implants, the space available in both arches was minimal. This could lead to serious maintenance problems, such as frequent replacement of retentive elements or acrylic teeth and/or base fractures, causing patient



Figure 5. Impression copings for open-tray technique on three mandibular implants.



Figure 6. Diagnostic set-up for maxillary intermediate complete dentures on screw-retained base plates.



Figure 7. Diagnostic set-up for mandibular intermediate complete dentures on screw-retained base plates.



Figure 8. Try-in of the teeth set-up.

complaints and increased cost. Moreover, the patient was strongly concerned with the appearance of the metal bar when removing the overdentures for oral hygiene purposes. Because of these problems, an alternative treatment plan was proposed, including the fabrication of a fixed implant-supported fixed partial denture (FPD) in both arches, with semi-precision attachments retaining a bilateral distal

extension RPD. The patient consented to the increase in the overall cost because of the anterior fixed restorations.

For the fabrication of the cement-retained restorations, two prefabricated titanium (Prep Tite Post; 3i Biomet Co.) and two custom-made abutments were used in the maxilla (Figure 12). In the mandible, two prefabricated titanium and one

custom-made abutment were used (Figure 13). The custom-made abutments were fabricated by over-casting UCLA abutment cylinders (Gold Standard ZR hexed; 3i Biomet Co.) using a high gold alloy (V-Delta Metalor Co., Neuchatel, Switzerland). Both prefabricated and cast abutments were individualized using the silicon index from the set-up. Fixed ceramometal cemented implant

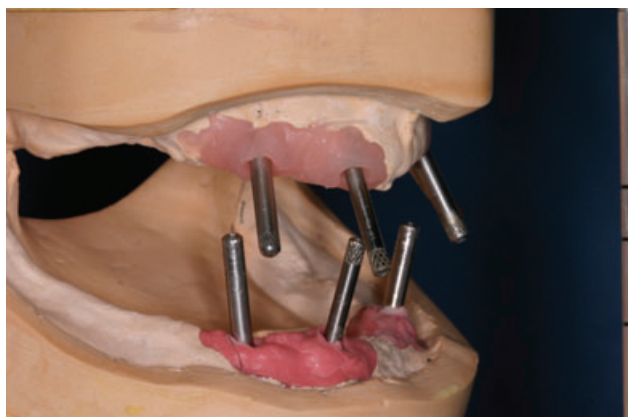


Figure 9. Unfavorable maxillary and mandibular implant inclination.



Figure 10. Evaluation of the available space in the maxilla using silicone index from the set-up.

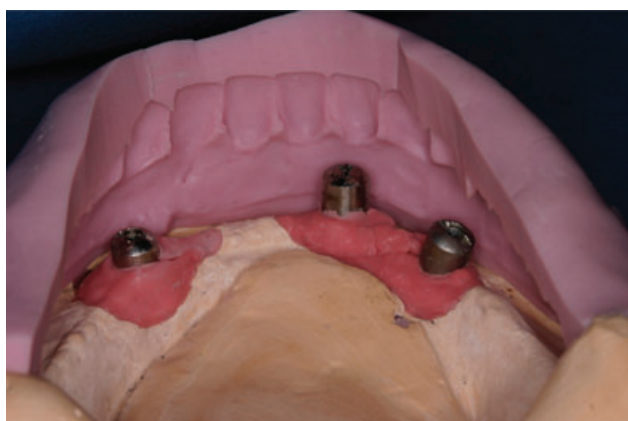


Figure 11. Evaluation of the available space in the mandible using silicone index from the set-up.

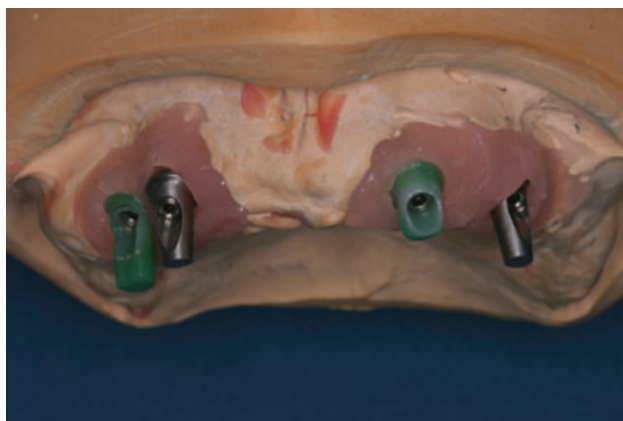


Figure 12. Individualized prefabricated and custom-made abutments before overcasting in the maxillary cast.

restorations with semi-precision attachments (ERA; Sterngold Co., MA, Attleboro, USA) adjacent to the distal abutments were fabricated (Figures 14 and 15).

The metal frameworks were tried clinically to verify passive fit (Figure 16). Veneering of the implant-supported FPDs was carried out in the conventional

way (Figures 17 and 18). Gingiva-colored porcelain was added at the cervical areas to compensate for the preexisting bone resorption.

The framework design for the RPDs followed the classical principles. Indirect retention for the framework was achieved through lingual cingulum rests. The substantial bone loss caused by the

removal of the teeth, resulted in limited space available for a lingual bar-type major connector. A modified lingual bar was designed at the height of the cingulum rests (Figures 19 and 20).

The patient was satisfied with the final result and the clinical condition remained stable at the 1-year recall (Figures 21 and 22).

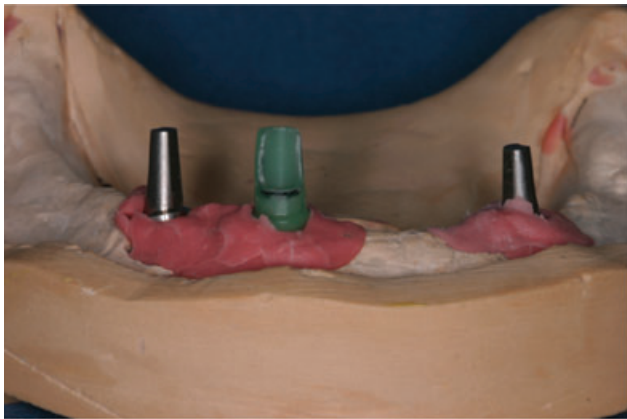


Figure 13. Individualized prefabricated and custom-made abutments before overcasting in the mandibular cast.



Figure 14. Metal framework for fixed, implant-supported, cement-retained restorations with ERA attachments in the maxilla.



Figure 15. Metal framework for fixed, implant-supported, cement-retained restorations with ERA attachments in the mandible.



Figure 16. Metal framework try-in.

#### DISCUSSION

The use of dental implants with overdentures has been extensively documented in the literature.<sup>9-11</sup> Dental implants as retentive and/or supportive elements of RPDs have been reported.<sup>6-8</sup> Extensive clinical studies concerning their clinical use have been

sporadically published. According to a literature review<sup>6</sup> there are a few case reports and one short-term and one longitudinal clinical study.

Mitrani and colleagues published a retrospective study of 10 partially edentulous patients unsatisfied

with their RPDs (Kennedy Class I and II). Posterior osseointegrated implants were placed, providing stability and/or retention of the removable prostheses and eliminating the need for clasps when possible. The authors reported patient satisfaction, minimal component wear, stable tissue condition, and

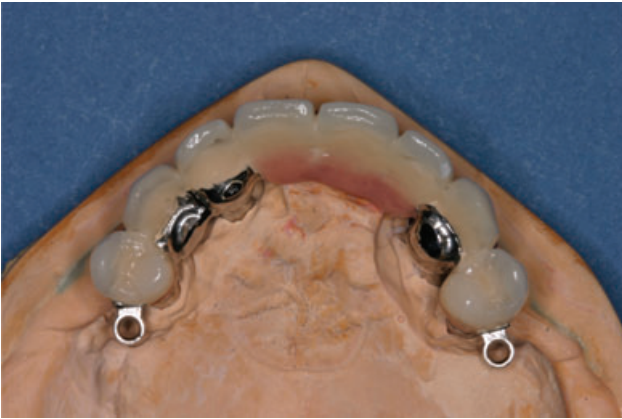


Figure 17. Maxillary anterior restorations after veneering.



Figure 18. Mandibular anterior restorations after veneering.



Figure 19. Maxillary restorations.



Figure 20. Mandibular restorations. Note the major connector modification.



Figure 21. Final clinical result.

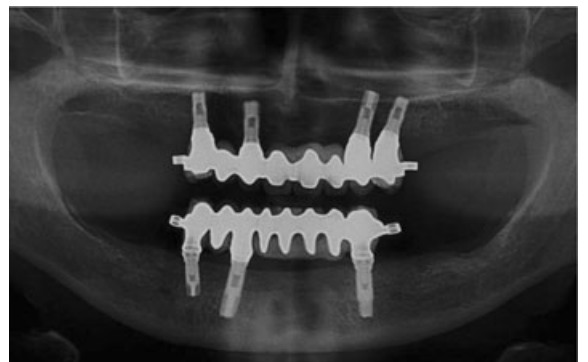


Figure 22. Panoramic X-ray of final fixed implant-supported restorations at 1-year recall.

no radiographic evidence of bone loss with a follow-up of 1 to 4 years.<sup>12</sup>

Mijiritsky and colleagues published a longitudinal study investigating the use of implants in conjunction with teeth-supported RPDs. Fifteen patients were treated with a follow-up of 2 to 7 years. This clinical approach was considered a viable and cost-effective treatment modality, leading to improved chewing efficiency with only minor prosthetic complications.<sup>13</sup>

In numerous case reports<sup>14–19</sup> one or two implants were placed in the molar areas to contribute to the support and/or retention of distal extension RPDs. Jang and colleagues<sup>20</sup> reported the use of an implant metal-ceramic crown as an RPD abutment. Multiple implants have been used by various authors for RPD retention.<sup>21–23</sup>

Implants connected to natural teeth have been used as RPD abutments in some clinical reports.<sup>24–28</sup> In the majority of the studies mentioned earlier, the complexity of design and the connection of implants to natural teeth increased the overall difficulty of the treatment. Additionally, treatment time and cost were significantly increased. Anterior fixed implant-supported restorations connected to posterior distal extension RPDs have been

reported by Starr<sup>7</sup> and Pellechia and colleagues.<sup>8</sup>

In the treatment option proposed in the present article, the classic principles of fixed–removable prostheses were followed, leading to a simplified clinical and laboratory procedure. The patient's benefits were increased comfort, superior esthetics in the anterior area, improved phonetics, and masticatory function. Patient satisfaction was further enhanced by the fact that the anterior teeth did not need to be removed either for oral hygiene or during sleep. Normal emergence profiles, phonetics, lip support, and anterior guidance were established with the implant-supported FPD. Vertical dimension was successfully restored with the incorporation of first premolars in the FPDs.

The patient was completely satisfied with the treatment result. The need for the replacement of the retaining components of the precision attachments was similar to conventional RPDs. Patient self-confidence was increased by the use of an anterior fixed restoration instead of an unesthetic bar.

The non-axial loading of the distal implants by the precision attachments may be considered a mechanical risk factor.<sup>28</sup> This was minimized by the proper

design of the RPD, according to the classic prosthodontic principles. Pellechia and colleagues<sup>8</sup> observed normal bone levels around implants supporting RPDs after a period of 3 years and concluded that stress-breakers probably reduced the masticatory load on the supporting implants. Additionally, the use of cantilevers in implant restorations is a common and documented clinical procedure, with satisfactory long-term results.<sup>28</sup> The role of implant length and diameter associated with distal extension RPDs can still be considered under investigation.<sup>29</sup> Bars supporting overdentures provide splinting of the implants, but vertical and horizontal space required for their use is not always available, as shown in the presented case.

Alternative treatment plans in the presented case would be implant-supported overdentures and fixed restorations with cantilevers. Implant overdentures are not always well accepted by patients, whereas prosthetic complications (i.e., acrylic teeth and/or base fractures) and maintenance requirements (i.e., replacement of retentive elements, rebasing, or relining) may increase chair-time and cost.<sup>30,31</sup> Additionally, the patients have to accept the presence of a metal bar or ball attachment when the overdenture

is removed. This option is rejected by a number of patients. The restoration of the patient presented in this case with cantilever prosthesis would limit the distal extension to the second premolar. This would lead to a shortened dental arch with reduced chewing performance<sup>32</sup> and possibly esthetic problems caused by the lack of posterior buccal support. In every case the patient's demands have to be carefully evaluated during treatment planning.

From the surgical and prosthetic standpoint, an ideal treatment plan would include bone augmentation in both arches and placement of six to eight implants in the maxilla and six implants in the mandible to support a fixed implant restoration. The final decision was reached after evaluation of the time and cost involved, the demands of the patient, and her objection to multiple surgical procedures.

Within the limitations of the present case report (lack of long-term clinical results), the use of implant-supported fixed restorations in combination with RPDs may be proposed as an effective and viable clinical solution in selected cases. Extensive clinical longitudinal studies are needed to establish the long-term success of this treatment modality.

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