

## Fabrication of a maxillary implant-supported removable partial denture: A clinical report

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Implant-supported removable partial denture treatment provides an esthetic and functional result that allows proper access for hygiene and maintenance. This article describes the treatment of a patient with a maxillary removable partial denture supported by 3 implants. The use of alignment-correction abutments enabled restoration of misaligned implants. (J Prosthet Dent 2006;95:19-21.)

There are several factors to consider when choosing between a fixed or removable implant-supported prosthesis.<sup>1</sup> A greater number of implants are generally required for the fixed prosthesis as compared to the removable prosthesis treatment option. The loss of tissue resulting from residual ridge resorption, trauma, or ablative surgery may be more easily restored by the acrylic base of an implant-supported removable partial denture. A removable prosthesis provides easier access for oral hygiene procedures and the ability to correct discrepancies in dental arch relationships.<sup>2,3</sup>

The design requirements for the maxillary and mandibular implant-supported overdenture prosthesis may vary due to differences in anatomy, dependence of retention, and palatal coverage. Intra-arch spacing and the alignment of multiple implants influence the prosthesis design for a particular patient.<sup>4</sup> The horizontal maxillomandibular relationship may also create difficulty in fabrication of the prosthesis.<sup>5</sup>

The degree of prosthesis retention and stability is based on attachment type, design, alignment, and position.<sup>4</sup> Various methods have been proposed for connecting overdentures to underlying implants. Independent connections to each implant abutment or continuous bar retainers are the most common approaches.<sup>6,7</sup> The use of direct abutments with attachments (ERA; Sterngold, Attleboro, Mass) has been reported to be successful in implant-supported prostheses.<sup>8</sup> This clinical report describes a treatment approach for oral rehabilitation of a patient with maxillary misaligned implants.

### CLINICAL REPORT

A 55-year-old man previously treated with implants in a private dental office presented to the Department of Prosthodontics at Ankara University, School of Dentistry, for an implant-supported prosthesis. The patient reported receiving 4 implants following bilateral sinus lift procedures in the maxilla. However, the patient

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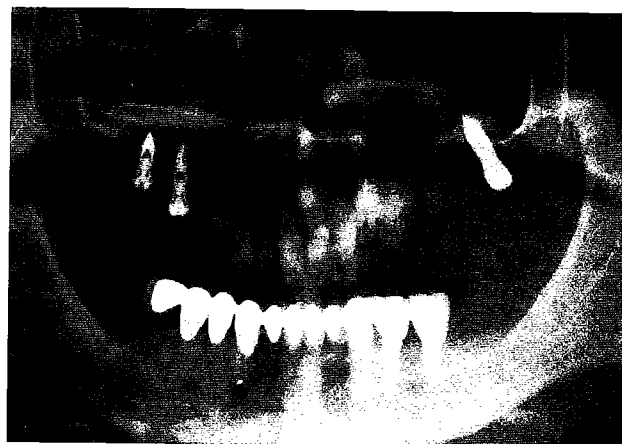


Fig. 1. Pretreatment panoramic radiograph.



Fig. 2. Parallelism of direct alignment-correction abutments on implants and guide planes on crowns.

stated that the implant in the position of the left premolar had failed.

Clinical examination revealed 8 remaining teeth, the maxillary right first premolar through the left first premolar. The maxillary left canine and first premolars had been previously prepared for complete coverage crowns, and interim acrylic resin crowns had been placed. There were 3 unrestored implants (Zimmer; Zimmer Dental

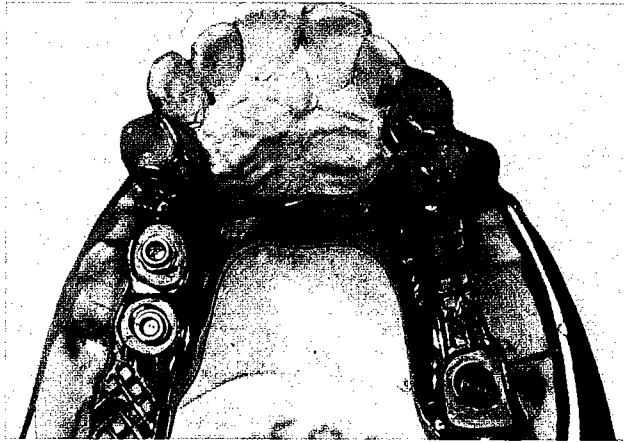


Fig. 3. Metal framework.

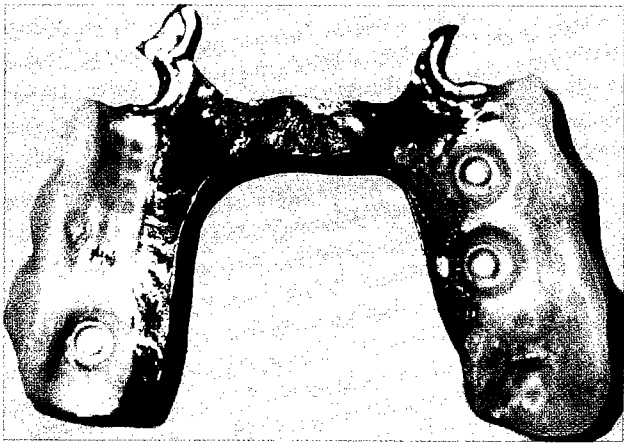


Fig. 5. Metal attachment housing and plastic retention element incorporated in prosthesis.

Inc, San Diego, Calif) in sites of the maxillary right second premolar, right first molar, and left second molar. The patient had an implant-supported fixed partial denture (FPD) replacing the left premolars and a single cantilevered FPD between the left canine and right second premolar in the mandible. The patient presented with highly resorbed maxillary posterior residual ridges.

A panoramic radiograph revealed misalignment of implants (Fig. 1). Implant placement in the site of the left second premolar, with a second surgical procedure followed by placement of an FPD, was not an option due to the severe residual ridge resorption in the posterior regions and the misalignment of implants. Thus, a treatment plan including an implant-supported removable partial denture (RPD) was presented and accepted by the patient. A closed-tray impression was made with a custom tray and elastomeric impression material (Speedex; Coltene/Whaledent Inc, Cuyohoga Falls, Ohio) for implants and 3 prepared teeth. The impressions were poured with Type IV stone (BEGO, Bremen, Germany). A



Fig. 4. Attachments on abutments prior to transfer. Pieces of glove material prevent acrylic resin from locking onto attachments.



Fig. 6. Definitive prosthesis.

centric relation record was obtained with record bases and occlusion rims using an interocclusal registration material (Virtual; Ivoclar Vivadent, Schaan, Liechtenstein). The casts were transferred into a semi-adjustable articulator (Dentatus ARH, Stockholm, Sweden) by the centric relation record.

Parallel guide planes, 2 to 4 mm in length, were prepared on the distal surfaces of the wax crowns for the right and left first premolars, using a surveyor (BEGO). The palatal surfaces of the wax patterns were milled (BEGO) to develop surfaces parallel to the guide planes. Crowns were cast with a base metal alloy (KeraN; Eisenbacher Dentalwaren GmbH, Woerth, Germany). After the fit of the cast crowns was verified intraorally, metal-ceramic restorations were completed (Omega 900; VITA Zahnfabrik, Bad Sackingen, Germany). Guide planes, path of insertion, and selected alignment correction abutments (ERA; Sterngold) used to align implants favorably to the path of insertion were verified (Fig. 2).

For the implant in the position of right premolar, a straight abutment (0 degrees) (ERA; Sterngold) with a 2-mm tissue cuff height was selected. For implants in the position of right and left molars, 17-degree alignment correction abutments with a 3-mm tissue cuff height (ERA; Sterngold) were selected. Two alignment correction abutments (ERA; Sterngold) were cemented with provisional cement (Provicol; VOCO, Cuxhaven, Germany) on implants in the sites of right first and left second molars. Each implant abutment was numbered so as not to confuse the selected alignment correction abutments. In the position in which guide planes and angled abutments were parallel to the path of insertion, a line was drawn and a notch was placed on the movable upper part and the base of the implant abutment to fix the position on the cast. The notches were prepared to transfer the determined position of the alignment-correction abutments intraorally. Then fabrication of the implant-supported RPD framework was initiated. The framework was made from chromium-cobalt metal alloy (Biosil-F; Degussa, Hanau, Germany). Considering the patient's desires, minimal support was derived from the palate, and a palatal strap major connector was used. Openings in the framework were placed to accommodate the implants (Fig. 3). Prosthetic teeth (Major; Major Prodotti Dentari, Torino, Italy) were arranged for trial insertion. The denture was processed and the area around the implants was relieved.

After the transfer of implant abutments intraorally, the movable pieces of the implant abutments were cemented to their bases with adhesive resin (Rely-X ARC; 3M ESPE, St. Paul, Minn) using the previously described notches. All crowns were cemented with a polycarboxylate cement (HY-Bond; Shofu Inc, Kyoto, Japan). Pieces of glove material were used to block out the undercuts of the attachments (Fig. 4).

The attachments, consisting of a metal housing and a plastic resilient element, were placed on the abutments and incorporated directly into the denture base with autopolymerizing acrylic resin (Meliodent; Heraeus Kulzer, Wehrheim, Germany) added from the openings of the denture (Fig. 5). After insertion of the denture, the patient was recalled for follow-up appointments (Fig. 6). Six months after insertion, the upper piece separated from the base of the direct implant abutment (ERA; Sterngold) in the site of the left second molar. The 2 abutment sections were cemented again with adhesive resin.

## DISCUSSION

The dental implants placed for this patient were poorly positioned. A direct implant abutment was

selected because of the simplicity of its fabrication and repair, durability, and variable degrees of retention. However, one of the disadvantages of using direct implant abutments for this patient was the difficulty of positioning the angled piece of attachment at the posterior zone intraorally. Another disadvantage was decementation of the upper part of the attachment.

Although it may have been possible to fabricate an implant-supported FPD with advanced surgical techniques and placement of additional implants, inadequate bone quantity and previously placed misaligned implants made this option unacceptable to the patient. The patient also declined the second surgery and the associated cost. For this situation, considering the interarch space and maxillomandibular relationship, an RPD appeared to be more appropriate.

## SUMMARY

This report describes a patient with a partially edentulous maxilla treated with an RPD supported by angled implant abutments on misaligned implants.

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