CLINICAL REPORT

Restoration of divergent implants with a 2-piece screw-retained fixed, complete dental implant prostheses

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Rehabilitating a completely edentulous maxilla with an implant-retained prosthesis is challenging. The resorptive pattern of the alveolar crest leads to hard and soft tissue defects that cannot always be addressed with augmentation procedures.1-3 Deficiencies in the horizontal plane and a prosthetically unfavorable implant position may compromise esthetics, phonetics, and function.1,4 Lip support is usually achieved with pink ceramic or acrylic resin.2

An edentulous maxilla can be restored with an implant overdenture or a fixed implant prosthesis.2,5 Maxillary implant overdentures are associated with more technical complications and biological problems than a fixed implant-supported prosthesis. A higher incidence of post-insertion maintenance (clip or attachment replacement/reactivation) and mucosal inflammation has been reported.1,4,6-8 Fixed implant-supported maxillary prostheses give greater patient satisfaction and a lower incidence of prosthetic complications.1,4 An implant-supported fixed prosthesis with metal superstructure and acrylic resin gingiva has been extensively used in the treatment of the edentulous mandible.2,5 Although long-term survival rates are well documented, technical complications are prosthetic screw loosening and/or fractures, abutment fractures, and fracture or wear of acrylic resin teeth.2,9-11

Fabrication is more demanding in the maxilla. Large interabutment spaces can disrupt speech and oral hygiene under flange extensions and around abutments is difficult.5,10,11 Ease of oral hygiene and retrievability of the prosthesis during the maintenance phase are essential for long-term success. This report describes the clinical and laboratory stages in fabricating a 2-piece screw-retained prosthesis on multiple divergent implants in a resorbed maxilla.

ABSTRACT

Restoring a severely resorbed maxilla is challenging because of poor bone quality and the resorptive pattern that follows tooth loss. When bone augmentation is not possible, implants are placed in suboptimal positions, making the prosthetic rehabilitation more complex. This report presents the steps used to rehabilitate a severely resorbed maxilla with divergent implants, using an implant-supported 2-piece screw-retained prosthesis. (J Prosthet Dent 2016;115:389-392)

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A 40-year-old woman with high esthetic expectations wished to “have her teeth restored.” Clinical and radiographic evaluation showed a severely resorbed maxilla with 6 osseointegrated implants (Bego Semados S implants; Bego GmbH & Co) with no signs of pathology (Fig. 1). The patient had a fixed metal-reinforced tooth implant- and tissue-supported (“tripod”) interim prosthesis in the maxilla. The maxillary left canine and implant corresponding to the right lateral incisor were used as abutments while 2 flanges extending on to the tuberosities provided additional support.12 All implants were suboptimally placed, emerging bucally from the alveolar crest on divergent axes (Figs. 2, 3). Despite a poor prognosis, the left maxillary canine was used to support the interim restoration.

Asymmetry in the levels of the periimplant mucosal margins and extensive bone resorption of the maxilla
in combination with the amount of mucosa seen on smiling required the use of artificial gingiva (Fig. 2). A diagnostic artificial tooth arrangement was set up (SR Vivodent; Ivoclar Vivadent AG). A clinical evaluation verified the correct position and alignment of the teeth, centric relation, vertical dimension, mandibular movements, and pink and white esthetics (Fig. 4).

The prosthesis needed to compensate for the deficiencies in both the hard and soft tissues. The prosthesis was screw-retained because of the patient’s esthetic demands. At the time of treatment, prefabricated, angled abutments for screw type prostheses (Sub-tech Multiplus abutments; Bego GmbH & Co) were not available. To compensate for the implants’ divergent axes, a 2-piece prosthesis was fabricated.13,14 It consisted of a cast metal Co-Cr substructure (Dentaurum GmbH & Co) attached to the implants with abutment screws. The substructure was designed to retain individual metal ceramic crowns to replace the maxillary teeth. All individual crowns were cemented, with the exception of the left and right first molars, right canine, right lateral incisor, and left first premolar. In order to ensure retrievability, these 5 crowns were retained with friction splints (Friction Splint FS1; Bredent GmbH & Co) (Figs. 5-7). The neck of the implant corresponding to the right lateral incisor was higher than that of the other implants, so this individual crown was cemented (Figs. 2, 5). This design allowed adequate lip support without increasing structural bulk.

An acrylic resin replica of the diagnostic waxing was fabricated on the definitive cast, which was then cut back with standard chamfer preparations (Fig. 5). The waxing, casting, and ceramic layering (IPS d.SIGN; Ivoclar Vivadent AG) of the crowns followed a standard protocol (Figs. 6, 7).

A clinical evaluation of the prosthesis verified passive fit and accessibility for oral hygiene (Fig. 8). The natural gingival contour and lip support of the definitive treatment (Figs. 9, 10) fulfilled the patient’s esthetic criteria. Figure 11 shows the anterior guidance during all eccentric movements (video, available online). After insertion of the definitive prosthesis, the patient was scheduled for a 4-monthly recall.
DISCUSSION

The patient’s high esthetic demands necessitated a fixed prosthesis despite the need for extensive lip support due to bone resorption. Apart from the promising success rates of fixed prostheses, the present screw-retention design offers the advantage of precluding the use of cement and therefore minimizes the risk of peri-implantitis due to residual cement. In addition, while technically demanding, fabricating the prosthesis in 2 pieces meant that the primary structure, which had an increased volume of metal, was not exposed to any further thermal procedures after casting and the polymer materials could be modified. Individual teeth could be characterized independently of the material replicating the soft tissues.

A possible drawback is that the pink resin gingiva that compensated for the resorption covers the labial part of the residual ridge, therefore necessitating meticulous oral hygiene. The use of friction splints ensures easy access to the fixation screws. Thus, during follow-up the prosthodontist could easily remove the prosthesis. Ease of repair was also ensured. In case of complications, the individual crowns could be removed without disturbing the other components. Another possibility would be the use of angled abutments for screw-retained prostheses used to redirect screw access in situations with prosthetically unfavorable implant angulations. At the time of treatment, however, these were not yet available.
The fabrication of the primary structure using computer-aided design and computer-aided manufacturing (CAD/CAM) techniques might improve the fit.12,13 Those techniques may be limited by a variety of factors, including the implant company, the type of CAD/CAM system, the implant-abutment connection, and the implant angulation. At the time of treatment however, the available systems could not accommodate the angulation of the implants.

Rehabilitating the resorbed maxilla with 2-piece reconstructions has been reported.13,14 It is a technically demanding approach associated with higher cost and complicated laboratory procedures.20 It does, however, offer a clinical solution where an implant-supported fixed prosthesis is indicated for a patient with a resorbed maxilla and high esthetic demands.

SUMMARY

A 2-piece, screw-retained implant-supported prosthesis was fabricated to restore 6 divergent implants on a resorbed maxilla. A primary cast metal framework mimicking the soft tissues was fitted to the implants with screw retention. The secondary prosthesis consisted of independent metal ceramic crowns fitted to the implant-supported framework. The prosthesis satisfied the patient’s esthetic demands. The use of pink acrylic resin corrected the asymmetrical gingival margin and provided adequate lip support without impeding speech or oral hygiene. Retrievability and ease of repair were also addressed.

REFERENCES


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