Prosthetic Solution for Unfavorably Inclined Maxillary Implants: A Case Report

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Misaligned implants may affect the esthetic, phonetic, and functional results and challenge the restorative dentist. Proper attachment selection is important considering the patient-related circumstances. This article presents a case where a change in prosthetic attachments was required because implant inclination diminished overdenture retention and stability. The treatment involved an alternative implant and soft-tissue impression technique.

Key Words: misaligned implants; precision attachments; case report

INTRODUCTION

In completely edentulous patients, implants can be used in conjunction with attachments to enhance the retention and stability of overdentures. Many clinicians have reported clinical observations of various connecting structures, including the Dolder bar, Hader bar, magnets, and O-ring and ball attachments.

Overdenture attachments should have adequate retentive properties to enhance the stability of the prosthesis, while allowing the patient to easily place and remove the prosthesis. Other important considerations in treatment planning and selecting the appropriate attachments for an implant-retained overdenture include their cost-effectiveness, amount of retention needed, expected level of oral hygiene, patient expectations, maxillomandibular relationship, status of antagonistic jaw, and interimplant distance.

The maxilla presents specific challenges to implant placement because of the anatomic shape of the bone. Often the crest sits laterally to the base, necessitating that implant placement be tipped buccally. This is more common in the anterior aspect than in the posterior of some patients because of the flare of the premaxilla. Clinically, this condition may result within the misaligned placement of implants. In the literature, prosthetic solutions of unfavorably positioned implants have been reported.

The number of implants supporting a maxillary overdenture may vary according to such anatomic constrains as alveolar ridge height and width and sinus proximity. Placement of 4 implants in the anterior maxilla is not often confined by the maxillary sinus locations.

The difference between the displacement of the soft tissue relative to the implant must be considered when selecting attachments for the implant-retained overdentures. Two basic impression techniques are used for transferring implant positions from the mouth to working casts, namely, direct and indirect impression techniques. A functional impression technique may also be used for transferring implant positions.

This article describes a case where a change of prosthetic attachments was necessitated because implant inclination diminished overdenture retention and stability. A functional impression was used to transfer the implant position and soft tissues.

CASE REPORT

A 65-year-old woman suffering from unretentive maxillary denture was referred to the Ankara University Department of Prosthodontics by her private dentist. Intraoral and radiologic examinations revealed...
that 3 maxillary and 3 mandibular implants (3.3 × 10 mm; Tapered Screw-Vent, Zimmer Dental Inc, Carlsbad, Calif) had been placed. The private dentist conveyed information about the manufacturer and the dimensions of the implants. The patient had maxillary and mandibular overdentures retained by ball attachments. The maxillary overdenture was unstable and unretentive because of the divergence of the implants. The center maxillary implant had not been used as a support because of a sagittal inclination, and the overdenture had been retained by only 2 terminal implants (Figure 1).

One treatment option would have been to replace the ball attachments with bar or stud attachments to adjust for the problem of inclined implants, but the bar attachment was removed from the treatment considerations because the facial contour would be changed unfavorably. Stud attachments (Locator, Zimmer Dental Inc) were selected and placed on the implants to adjust for their inclination. The tissue cuff heights of the attachments were 0 mm, except for the right maxillary implant attachment, which had 1-mm tissue cuff height.

A preliminary maxillary impression was made with irreversible hydrocolloid (CA 37, Cavex Holland BV, Haarlem, Netherlands). An acrylic custom tray (Meliodent, Heraus Kulzer, Dormagen, Germany) was prepared with an open area in the implant region and positive notches were prepared only on the palatal anterior region of the tray to retain the elastomeric impression material. Occlusion rims were placed on the tray to achieve the optimum vertical dimension of occlusion (Figure 2). Impression copings of Locator attachments were placed on the attachments. After
border molding with plastic impression compound (Impression Compound, Kerr Italia S.p.A., Salerno, Italy), the impression of the alveolar mucosa was made with a zinc oxide eugenol impression paste (SS White; Prima Dental Group, Gloucester, UK) using a closed-mouth technique (Figure 3). The tray was removed from the mouth, excessive impression material was cleaned to the tray border, and the tray was replaced carefully into the mouth. Light-body elastomeric impression material (Speedex, Coltene/Whaledent Inc, Cuyahoga Falls, Ohio) was injected around the impression copings and supported with heavy-body elastomeric impression material (Speedex, Coltene/Whaledent Inc), which was placed above the light-body material. A smooth transition between the impression materials was achieved. Locator attachment analogs (Zimmer Dental Inc) were inserted into the impression (Figure 4) before pouring with Type IV stone (BEGO, Bremen, Germany).

Locator parallel posts were attached to the analogs on the model to determine the degree of implant divergence. The angles were measured \(31^\circ\) on the model with a compass (Rotring, Sanford GmbH, Hamburg, Germany) and goniometer (Hatas, Bursa, Turkey) to select the proper plastic resilient elements (Figures 5 and 6). Red Locator extended-range plastic resilient elements were selected.

Centric and vertical relation records were obtained with record bases and occlusion rims. The casts were transferred to semiajustable articulator (Denar Advantage, Teledyne Waterpik, Ft Collins, Colo) using face-bow. Teeth (Vitapan, VITA Zahnfabrik, Bad Sackingen, Germany) were selected and arranged on the record bases for a trial denture setup. The denture

Figures 5-8. Figure 5. Measurement of angles between implants with a compass. Figure 6. The angle between terminal implants indicates the use of extended-range plastic resilient elements. Figure 7. Tissue-side view of final prosthesis with red plastic resilient elements. Figure 8. Intraoral view of definitive prosthesis.
wax-up was evaluated intraorally for esthetics, phonetics, vertical dimension of occlusion, and centric relation. The protrusive record was taken, and balanced occlusion was obtained on the articulator.

The undercuts were blocked out beneath the housing assemblies with an appropriate silicone material (Speedex, Coltene/Whaledent Inc). The denture was processed with a conventional heat-processing technique; finished and polished. The processing plastic male components were replaced with extended range red plastic resilient elements (Figure 7). The denture was delivered to the patient (Figure 8). The patient returned for follow-up visits every 2 months over a 10-month follow-up period.

**Discussion**

One of the treatment options to correct severe implant misalignment is to splint the implant abutments for a bar-supported implant overdenture. However, in the patient described in this case study, bar attachment was omitted from the options because of its unfavorable effect on the patient’s facial contour.

Compared with the bar/clip attachment overdenture, stud attachments may be less costly, less technique-sensitive, less dependent on implant position, easier to clean and replace, and easier to adjust and control the amount of retention; they may also require less interarch space and are better able to distribute functional forces.

The attachment used in the present case can accommodate up to 40° of divergence between implants. The reduced height of the attachment component also provided easy accommodation for misaligned implants. Therefore, this attachment was suitable for the patient. However, long-term prospective studies are required to evaluate the clinical performance of the attachment.

The impression technique used in this article decreased the chair time for postinsertion maintenance, but is technique-sensitive, which requires experience and time during the impression-making phase.

**Summary**

Lack of implant parallelism can challenge a dentist when selecting the proper overdenture attachment system. This article describes the change of the prosthetic attachments because of inclination of implants, which has caused loss of retention and stability of the denture.

**References**