Use of Guide Planes and Implant Supported Bar Overdentures: A Case Report

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Implant-retained overdentures are a restorative option for certain patients with edentulous maxillae or mandibles. In this case, the patient is a 67-year-old male with an edentulous maxilla and Kennedy Class I mandibular arches (Fig. 1). It was decided to restore the patient’s occlusion with bilateral, implant-supported fixed partial dentures in the mandible and a maxillary implant-retained overdenture. A stable occlusal plane was established in centric relation using the fixed lower restorations and implant-supported bars with ERA™ (Sterngold-Implamed, Attleboro, MA) dental attachments, securing a maxillary overdenture. The overdenture was made very stable and retentive, yet easy for the patient to insert and seat properly to place, by using milled bar surfaces as guiding planes. The result was a secure removable prosthesis with accurate occlusal relations, and the patient restored to excellent function and esthetics.

TREATMENT SEQUENCE

Surgery and Provisionalization

Four (two per quadrant) titanium screw implants and healing abutments were placed using a two-stage surgical protocol (Figs. 2,3). The patient’s existing maxillary denture was adapted for use as an interim prosthesis by relining it (Fig. 4) with Perma Soft™ (Austenal/Myerson, Chicago, IL) soft denture liner. The soft liner conforms to the uncut areas of the healing abutments, permitting the overdenture to snap into position and be resiliently retained.

Impressioning and Master Cast Verification

Impressions were made using a closed-tray technique with Kerr Extrude™ (Kerr Corp., Orange, CA) vinyl polysiloxane putty and wash. Passive fit of the bar castings on the implant abutments is absolutely essential for restorative success. Therefore, it is also essential that the master cast be checked for accuracy by using a model verification appliance. This requires an extra patient appointment but is a necessary step in treatment that prevents later problems.

Technique

1. Place open tray type impression copings on the cast’s abutment analogs.
2. Wrap several turns of dental floss around and between the copings to serve as an armature.
3. Adapt Triad™ (Dentsply International, York, PA) acrylic material to the copings and dental floss armature. Use sufficient acrylic to create a rigid connection between the impression copings.
4. Cure the acrylic in the Triad™ unit.
5. The result is a testing jig or verification appliance that records the relative positions of the abutment analogs in the master cast. When the jig is tried in the mouth against the actual abutments, any inaccuracy in the master cast will be apparent (Figs 5, 6).

Bar Castings with Guide Planes and Dental Attachments

Two bars, with an anterior open segment, were used because of space limitations. This design allowed the anterior denture teeth to be set close to the ridge for natural lip support as well as correct phonetics and incisal function.

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The bars were milled to a 5-degree taper, and the denture base acrylic resin was processed to the milled bar surfaces (Figs. 9-11). The resulting guide planes give the restoration cross-arch stabilization, provide resistance to dislodging forces, and ensure distribution of occlusal loading among all four implants. The 5-degree taper is adequate parallelism to yield these advantages yet still allow easy guided patient insertion and removal of the overdenture (Figs. 7-10).

The guide plane surfaces begin to contact well before the dental attachment male and female components connect. Thus the four precisely parallel attachments are correctly positioned on their common path of connection. Patient misalignment of the overdenture and damage to the dental attachment during insertion is prevented.

In this case, four ERA™ partial denture attachments were cast at the ends of the two bars. The ERAeyelet is provided as a plastic pattern. It is incorporated into the wax pattern of the bar, using a paralleling mandrel in a dental surveyor, and then cast (Figs. 11, 12).

The alloy used must be hard to prevent excessive wear of the attachment. The attachment manufacturer recommends a minimum Vickers hardness of 200 and an ultimate tensile strength of 85,000 psi. Gold alloys of this class (ADAClass IV) usually have the capacity to exist in either a soft (solid solution) or a hardened (ordered metallic crystal lattice) state. Therefore, the dental technician must heat treat the finished casting to achieve proper physical properties in the bar and attachment.

The nylon ERA male is mechanically anchored in the denture base acrylic and is easily replaced as a chair side procedure. Because it is nylon, most attachment wear occurs in the male, provided the attachment female eyelets are set parallel to each other and to the overdenture’s path of insertion. Four color-coded males give four increasing levels of retention. Use the lowest level of retention that gives the patient satisfactory retention and masticatory performance. Replacing a worn male attachment with a new one of the same color restores retention.

There is also a fabrication (laboratory) male, which is black in color. It is used when processing the overdenture and when relining it. The fabrication male has a built-in spacer that gives the attachment 0.4 mm of vertical resiliency when it is replaced by any one of the color-coded retention males. This feature is intended for the resilient
functioning of a distal extension partial denture. When used with a tapered bar and guide planes, the attachment is nonresilient.

There is an optimal metal housing (Sterngold-ImplaMed, Attleboro, MA) for the ERA males. It serves as a permanent holding socket in the denture base. Metal housings assist in providing a stable environment for changing attachments, attachment stability in processed acrylic resin appliances, and durable centric stops when placed in cases with limited interarch clearance.

SUMMARY
Use of attachment-retained overdentures is one of the most effective treatments for patients with extensive tooth loss and markedly reduced periodontal support of remaining abutment teeth. The overdenture concept is also applicable to edentulous patients who are acceptable candidates for dental implants.

The optimal implant overdenture design is stabilized by milled bars and retained by dental attachments. The guide planes created on the bar surfaces provide lateral stability to the prosthesis, distribute occlusal forces among all the implants, guide the overdenture into proper alignment of the attachment components before seating, and protect the attachments from breaking.

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