Rehabilitation of the Edentulous Maxilla after the Failure of an Implant-Supported Bar

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Dental implants provide patients with multiple restorative options for the complete edentulous maxilla. This article describes a technique for restoration of the edentulous maxilla with a tissue-implant-supported overdenture after the mechanical failure of an implant-supported bar. This technique allows the clinician to use the existing restoration with better distribution of the occlusal load between the implants and the supporting tissues.

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INDEX WORDS: implant-supported overdenture, mechanical failure, denture repair

SEVERAL PROSTHETIC designs have been suggested for the restoration of the complete edentulous maxilla with dental implants,[1,2] but the implant-supported fixed restoration and implant-supported overdenture are the main prosthetic options.[1-5] The clinician should consider several factors, such as the patient's arch size and shape, the ability to perform oral hygiene procedures, the opposing dentition, the lip line position and the need for facial and lip support, when designing the implant-supported restoration.[3] Moreover, Heydecke et al[6] suggested that maxillary removable overdentures on multiple implants may provide patients with better function than fixed prostheses. In this crossover study, the same group of patients wore implant-supported fixed prostheses and implant-supported removable overdentures for different trial intervals. The removable overdentures received significantly higher satisfaction ratings than the fixed prostheses.[6]

The number and location of implants may dictate the use of one of the aforementioned prosthetic options; however, studies have not yet determined the precise number for a particular option, and recommendations thus far are more a matter of opinion and not based on solid scientific basis. Most authors recommend a minimum of six to eight implants for a prosthesis that is solely implant-supported.[3,7] The connecting bar design in an implant-supported overdenture prosthesis allows no movement of the overdenture; however, when four or fewer implants are placed, the prosthesis should be designed as a combined implant-retained and tissue-supported overdenture with a bar designed to allow overdenture movement around the fulcrum.[7] Zitzmann and Marinello[3] suggested that the palate be used for support to decrease implant loading if four or fewer implants are placed. Accordingly, the palatal coverage may be reduced with the gain of more support from the implants; however, contrary to common belief, no difference in patient satisfaction was found between implant-supported overdenture patients restored with and without palatal coverage when these were opposed by mandibular fixed prostheses.[8] Palmqvist et al[9] suggested that the absence of palatal coverage was a risk for future implant failure when other risk factors, such as poor bone quality and quantity, were present.

Implant-supported overdentures in the maxilla require a considerable degree of postinsertion prosthetic maintenance compared with fixed prostheses or mandibular overdentures.[9,10] Most mechanical complications were found to occur soon after denture insertion and were easily resolved.[11,12] Kiener et al[13] reported the

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effectiveness of maxillary implant-supported overdentures. During an average period of 3.2 years, the most frequent mechanical complications were loosening of the bar screws and the need to reactivate the retentive clips; during the first year, mucosal irritation and the need for occlusal adjustment were the most frequent findings. Watson et al[11] reported that bar fracture was very uncommon. This mechanical complication may be due to inadequate soldering or casting at the junction between the cylinder and bar.

This article describes a technique to resolve a clinically significant prosthetic complication that involves a fractured implant-supported bar. This technique offers the advantages of using the same restoration over the implant-supported bar with more favorable load distribution between the implants and the supporting tissues.

Background

A 47-year-old woman presented to the Department of Prosthodontics at the Louisiana State University School of Dentistry in New Orleans for maintenance. Clinical and radiographic evaluation revealed a horseshoe design, all-acrylic maxillary overdenture supported by four successfully integrated endosseous implants (Calcitek, Zimmer, Carlsbad, CA) opposing a natural mandibular dentition, extended from second premolar to second premolar. The implants had been placed after a bone augmentation procedure approximately 3 years earlier, and a Type III Gold (Firmalay®: 74.5% Au, 3.5% Pd, 11.0% Ag, 10.5% Cu; Jelenko, Heraeus Kulzer, Inc., Armonk, NY) bar had been fabricated to incorporate two ERA retentive housings at the bar distal aspects (APM-Sterngold, Attleboro, MA). Examination revealed a fracture of the bar at the junction between the cylinder and the bar (Fig 1A and B). The fracture appeared to be related to an inadequate soldering procedure.

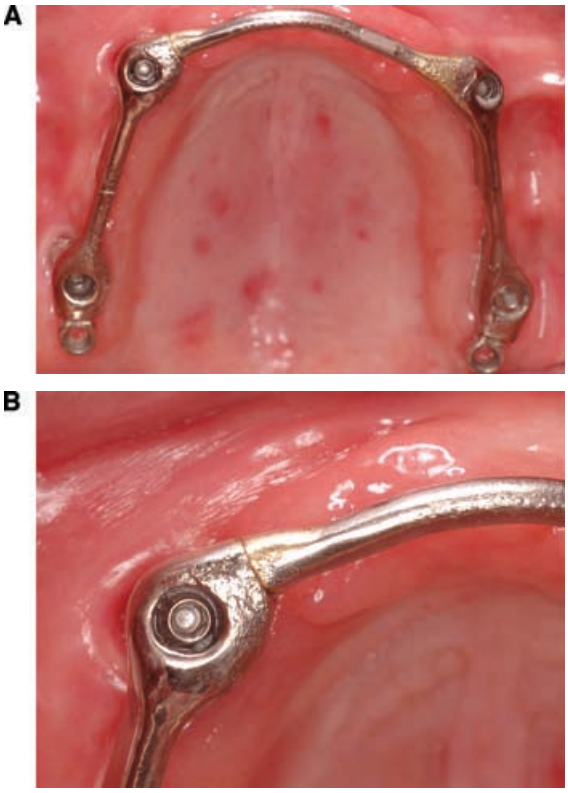

Figure 1. *(A)* Implant-supported bar on four implants. *(B)* Fractured solder area at the cylinder-bar junction.

Technique

1. Make an irreversible hydrocolloid (Jeltrate, Dentsply Caulk, Milford, DE) pick-up impression of the overdenture (Fig 2). Block-out the retentive elements and all undercuts in the intaglio surface of the overdenture with wax (Utility wax, Heraeus Kulzer). Pour Type III stone to obtain the working cast (Yellow Stone, Whip Mix Corp., Louisville, KY).
2. Apply a layer of Triad (Dentsply International, York, PA) denture base material directly on the cast to cover the palatal surface to the denture posterior border. Finger press the material to a uniform thickness of up to 2 mm (Fig 3) and cure for 10 minutes in the Triad processing unit (Dentsply International).
3. Remove the bar, section the broken segment, and polish the edges. Return the two independent sectioned bars to the mouth, confirm a passive seating, and secure to the implants (Fig 4).
4. Remove the metal clips from the intaglio surface of the overdenture with a No. 4 round acrylic bur.
5. Border mold the overdenture intraorally with modeling plastic impression compound (green modeling plastic impression compound, Kerr, Romulus, MI). Place wax under the bars to prevent locking the definitive impression

Figure 2. Pick-up impression.

material. Use polyether impression material (Permadyne Penta H/ Garant, 3M ESPE, Minneapolis, MN) to make a definitive impression of the maxillary arch (Fig 5). Pour Type III stone to obtain the definitive cast (Yellow Stone).

6. In the dental laboratory, rebase the denture with autopolymerizing resin (Lucitone 199, Dentsply), process, and finish.
7. Try the overdenture in the mouth and adjust for final fit using pressure-indicating paste (Mizzy Inc., Cherry Hill, NJ).
8. Place the retentive clips on the bars (Fig 6). Incorporate the clips to the overdenture intaglio surface in a closed-mouth procedure with autopolymerizing resin (Dentsply Repair material, Dentsply International) (Fig 7).

Figure 3. Added baseplate material over the palatal surface.

Figure 4. Bar configuration after sectioning.

9. Finish, polish, and sterilize the prosthesis (Fig 8A and B).
10. Provide home care instructions and schedule the post-insertion visits.

Discussion

When designing an implant-supported restoration for the edentulous arch, the clinician must consider the forces applied by the opposing dentition on the implant bar and the number of implants supporting the restoration. An implant-supported overdenture on four bar-splinted implants without palatal coverage opposing a natural dentition may overload the implants and the bar. The result might be a bar fracture, which is one of the more clinically significant mechanical

Figure 5. Closed-mouth procedure used for definitive maxillary impression fabrication. Note fractured left premolars.

Figure 6. Retentive elements before pick-up into the denture.

complications associated with implant overdentures. The described technique offers the following advantages: (1) the implants and supporting tissue better distribute the load; (2) the lack of need for new denture fabrication is cost-effective; (3) the denture stability and retention is improved; (4) the implants remain connected by bars to avoid stress concentration that might risk the implants; and (5) the patient is without the denture for a short period of time since this is an overnight laboratory procedure.

This technique does have a disadvantage—some patients might find it difficult to adjust to full palatal coverage after wearing an open palate denture.

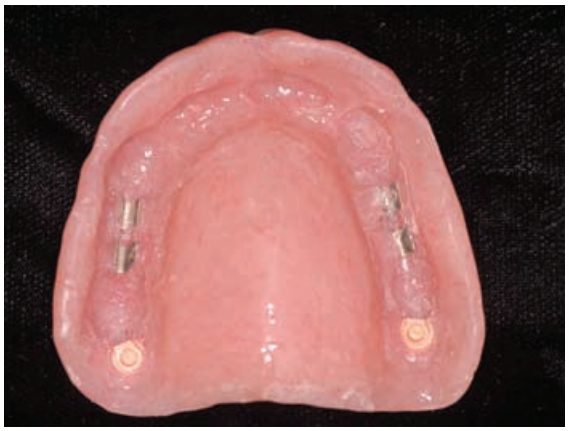

Figure 7. Intaglio view of full palatal coverage overdenture.

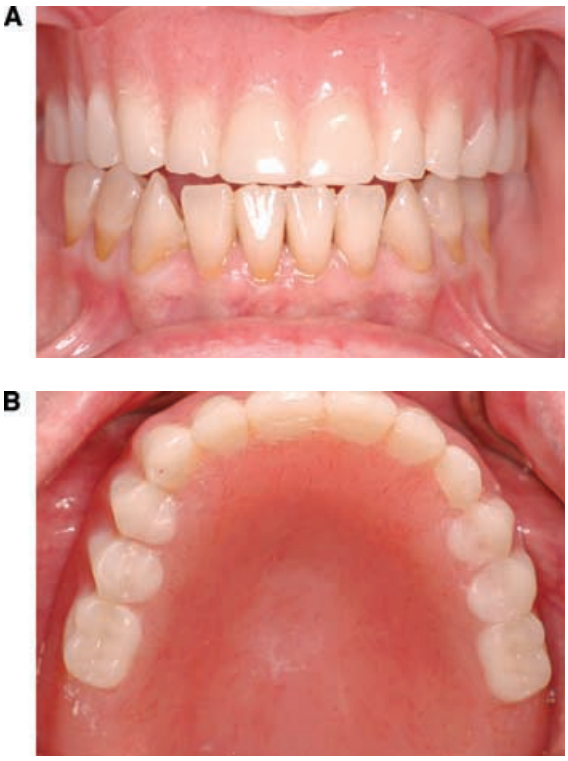

Figure 8. *(A)* Frontal view of definitive result. Note that the left premolars were replaced. *(B)* Occlusal view.

Summary

This article describes an alternative technique for the transformation of an implant-supported overdenture to a tissue-implant-supported overdenture after a mechanical failure of a bar. The same overdenture supported by four implants with the addition of full palatal coverage restores the edentulous maxillary arch. This technique offers a better distribution of the load between the implants and the supporting tissue, which might contribute to the restoration longevity.

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