

THE COMPLETE MAXILLARY SUBPERIOSTEAL IMPLANT: AN OVERVIEW OF ITS EVOLUTION

Edmond Demirdjan, DDS

The subperiosteal implant has been used with varying degrees of success since the 1940s. In 1942, Dahl, a Swedish dentist, inserted the first subperiosteal implant.¹ Later that decade, Goldberg and Gershkoff reported the first subperiosteal implant placed in the United States.² The subperiosteal implant was conceived out of the need to improve the retention and stability of full dentures in severely atrophied ridges. Today, its use is still limited to the severely atrophied ridge of either the mandible or the maxilla. However, the implant is used less commonly in the maxilla because it has a lower success rate there; in addition, qualities of the maxilla allow for more retentive and stable prostheses. Lower success rates in the maxilla can be attributed to the poorer quality of bone. Subperiosteal implants are more successful in the basal bone-rich mandible than in the maxilla, which is primarily cancellous bone. This article will focus on the evolution of the maxillary subperiosteal implant.

DESIGN

Early versions of the maxillary subperiosteal implant used the hard palate for support, with crossover struts. However, it quickly became clear that the palatal soft tissues would not rest on anything other than palatal bone. As a result, the early design was quickly abandoned. Later designs of the maxillary subperiosteal implant encountered complications resulting from the expanding maxillary sinus. The struts of the implant would even-

tually settle and perforate the porous alveolar bone beneath or buccal to the sinuses. Eliminating alveolar struts and responding to the realization that dense, stable bone should support the subperiosteal implant were the next logical steps in the evolution of the implant. Areas of dense, stable bone in the maxilla can be found in the anterior nasal spine, the canine fossas, and the palatal surface of the alveolar ridge. However, none of these anatomic sites offer a distal support, so in 1970, Linkow extended his subperiosteal design to include the pterygomaxillary suture.³ In 1985, Cranin *et al* took Linkow's idea a step further by designing the maxillary pterygomaxillary subperiosteal implant, which used the pterygoid plates as buttresses.⁴

IMPRESSIONS

Both Dahl¹ and Goldberg and Gershkoff² designed their subperiosteal implants with soft-tissue impressions. Their models were altered to approximate the bony anatomy by estimating soft-tissue thickness from radiographic examination.³ Berman introduced the two-surgery technique in the 1950s. The first surgical procedure incises and reflects the gingival tissues; then the surgeon takes a direct bone impression using a custom tray fabricated from soft-tissue impressions.⁵ In the second surgical procedure, the surgeon inserts the implant that is fabricated directly from the bone impression. This technique dramatically improved the adaptation of the implant to the maxilla, yielding a more successful result.

In the 1980s, computerized tomog-

raphy scanning and CAD-CAM technology allowed the practitioner to have a replica of the maxilla without a direct bone impression.⁶ Although this technology offers the advantage of eliminating a surgical procedure, it is costlier, it exposes the patient to ionizing radiation, and it is less accurate than a direct bone impression.⁷

DISCUSSION

The use of the maxillary subperiosteal implant appears to have decreased as success rates of ridge augmentation, sinus lifts, and root form implants have increased. The subperiosteal implant still does offer some advantages for the patient with a severely atrophied maxilla. One advantage is that ridge augmentation, sinus lifts, their associated complications, and graft donor site morbidity are avoided. A less significant advantage is the shorter time period required to have the final prosthesis. Frequently, finances dictate a patient's ability to undergo oral rehabilitation; when this is the case, the complete maxillary subperiosteal implant is a more viable option than root form implants in combination with host site preparation.

REFERENCES

1. Dahl GSA. Om möjligheten for implantation i kaken av metallskelet som bas eller retention for fasta eller avtagbara proteser. *Odont T*. 1943;51:440-446.
2. Goldberg NI, Gershkoff A. Implant lower dentures. *Dent Digest*. 1949; 55:490-494.
3. Linkow LI. *Implant Dentistry Today: A Multidisciplinary Approach*. Italy: Piccin; 1990.

4. Cranin AN, Satler N, Shpuntoff R. The unilateral pterygohamular subperiosteal implant: evolution of a technique. *J Am Dent Assoc.* 1985;110:496–500.
5. Berman N. An implant technique for full lower denture. *Denture Digest.* 1951;57:438.
6. Golec TS. CAD-CAM multiplanar diagnostic imaging for subperiosteal implants. *Dent Clin North Am.* 1986;30:85–95.
7. Cranin AN, Klein M, Ley J, Andrews J, DiGregorio R. An in vitro comparison of the computerized tomography/CAD-CAM and direct bone impression techniques for subperiosteal implant model generation. *J Oral Implant.* 1998;24:74–79.

Edmond Demirdjan, DDS
Junior Fellow, Dental
Implants and Biomaterials
Brookdale University
Hospital and Medical Center
The Dental Implant Group
Department of Dental and
Oral Surgery
Brookdale, NY 11212 ■