The Baby Boomer population is aging, and because tooth loss and age are closely related, the number of edentulous patients is also increasing. Patients are presenting to practices all over North America with their teeth already extracted (due to neglect, caries, medications, or other systemic reasons), wearing some type of removable prosthetic device(s). Patients who have been wearing removable prosthetics for several years may soon discover the common denture problems of instability, sores, and pain that are associated with resorption. Their dentures may no longer fit very well, unless they incorporate some type of implants into the treatment plan. Implants, whether small or traditional, allow patients with dentures to eat and function like they once did when they had teeth.

However, there are some patients who are not good candidates for traditional or small-sized dental implants due to deficiencies in the remaining bone. These patients may need to undergo major surgery to graft these areas with particulate grafts, block grafts, and sinus lifts, usually taking several months of healing and recovery. In addition, the costs associated with these types of grafts may be too costly for the patients to endure. More importantly, there are concerns with reports of infection or failure.

When bone in the maxilla (upper jaw) is atrophied so much that standard and small-diameter dental implants cannot be placed without major grafting, I will recommend a subperiosteal dental implant embedded in bone as an alternative option.

**Subperiosteal Implants**

Subperiosteal implants have actually been around since the early 1940s. They were invented by a Swedish dentist, Dr. Gustav Dahl, and then brought to the United States by Drs. Aaron Gershkoff and Norman Goldberg. These implants were made of a lightweight and inorganic metal that the body accepted. The usual material was Vitallium, a cobalt chrome alloy that is completely inert in human tissue. The subperiosteal implant was designed to rest on top of the bone and beneath the periosteum. Its design was created to distribute stress from the prosthesis to large areas of supporting bone. Retention was obtained by the mucoperiosteum; when it became reattached, it would stabilize the infrastructure casting. However, throughout time, these subperiosteal implants became sources of infection because tissue would grow into the grooves of the framework. When these complications arose, treatment or intervention was necessary, including curettage and irrigation of struts or abutments, pocket elimination, addition of grafting material, or sectioning of any portion of the subperiosteal struts.

**Modified Subperiosteal Implant Design and Technique**

Throughout the years, many clinicians have modified the technique and design of this implant primarily in the United States. Coating of the subperiosteal implant with hydroxyapatite (HA) was introduced by Rivera in the 1980s to improve the likelihood of direct implant to bone contact. Several authors reported very successful data on the use of HA-coated subperiosteal implants during that time period (1980 to 1990s). Today, it has been observed and reported that HA-coating improves the chance of direct bone-to-implant interface, to decrease strut dehiscence and to improve the soft-tissue environment. A consensus report of the American Academy of Implant Dentistry presented by clinicians Weiss, Linkow, Clark, and Nathan concluded that both maxillary and mandible, full and unilateral, HA-coated subperiosteal implants were viable and recommended techniques for both fixed and removable prostheses.

The technique of placing generous amounts of nonresorbable artificial bone (HA) around the HA-coated subperiosteal implant to create an implant embedded in bone (also called custom endosteal implant or custom embedded implant) was introduced by W. D. Nordquist and D. Naisbitt. This technique helps eliminate any open areas for bacteria to develop and allows the subpe...
Placement of a Modified...
continued from page 00

The primary purpose of embedding the HA-coated subperiosteal implant is to prevent soft-tissue migration....

Dental Laboratory Work

A duplicate of this model was poured up in stone by our dental laboratory (Dutton Dental Concepts) for designing the subperiosteal framework. The dental lab team designed the subperiosteal implant so that the framework would tightly fit the supporting areas of the maxilla including the area directly under the nose, areas on either side of the dental arch extending up the zygomatic arches, the roof of the mouth, and the pterygohamular complexes. Once completely reflected, any residual connective tissue on the bony ridge was removed so that the subperiosteal frame would only be in contact with bone.

The subperiosteal implant was inserted into the surgical site with careful attention not to allow saliva to contaminate the framework (Figure 5). Once inserted, the framework was inspected to confirm there was no space between it and the underlying bone. Each strut and component was checked to confirm that the subperiosteal implant was firmly and accurately seated. Two bone fixation screws (Salvin Dental) were placed into the appropriate recessed areas of the zygomatic portion of the framework to further enhance the stability of the subperiosteal implant onto the underlying bone.

The use of dense HA (Osteogen [Impladent]) was then placed over the entire framework to completely cover and fill any voids between the framework and the underlying bone (Figures 6 and 7). This would aid in the prevention of tissue growing into the openings of the framework, resulting in healing without infection.
Placement of a Modified... continued from page 00

in a possible infection. Once the subperiosteal implant was completely covered in HA, the tissue flaps were coapted without tension and sutured together using 4.0 black silk sutures. The area was inspected to confirm that it was properly closed; otherwise, more sutures would be added.

A provisional restoration had already been fabricated in 2 parts by our dental laboratory team. One part resembled a palate-free record base that already had Hader Clips (PREAT) in it, while the other segment was an arch of denture teeth set in a base of pink acrylic. The record base portion was snapped onto the prosthetic bar of the subperiosteal implant. Immediately after, the arch of denture teeth was connected to the record base with pink Triad (DENTSPLY Prosthetics) material. The patient was instructed to bite together in centric occlusion. Once it was confirmed that all the teeth in the provisional were in contact with the opposing dentition, a curing light (Demetron [Kerr]) was used to polymerize the pink Triad material [DENTSPLY Trubyte, DENTSPLY International] to join the 2 portions of the provisional. Any voids in the provisional were filled with a pink, light-cured composite (Quick Up LC [VOCO America]) material.

Postoperative instructions were reviewed with the patient in regard to biting and function as well as foods to eat. The patient was primarily instructed to eat a soft diet for the next 2 months. She was given a prescription for antibiotics (Amoxicillin, 500 mg, 28 tabs QID) and for pain medication (Vicodin ES, 15 tabs, one tab every 6 hours for pain). Oral hygiene instructions using a mouth rinse were also reviewed.

The patient returned 72 hours later for her postoperative visit. Although she had some swelling, she complained of very little discomfort at this time. She mentioned when she did have pain that the medication was sufficient in keeping her comfortable. The area was inspected to ensure that there were no signs of infection, edema, or suture line opening. Since everything looked within normal limits, the patient was instructed to return in 10 days for suture removal.

Using topical anesthetic, we removed the sutures 10 days after her first postoperative appointment. The patient was very pleased with her palate-free provisional restoration and commented how excited she was for the definitive restoration.

After 4 to 5 months of healing (Figure 8), the patient returned to the dental office for impressions to fabricate her final restoration: a palate-free overdenture utilizing Hader Clips for retention. Now that the tissue had healed, an accurate impression of the bar and surrounding tissues could be taken. In order to block out any undercuts in the bar of the framework, a silicone material (Fit Test C & B [VOCO America]) was injected under the bar and allowed to set. Once set, a customized tray (Goodfit) was used with a vinyl polysiloxane impression material (Take 1 Advanced [Kerr]) to take a full-arch impression. From this impression, our dental lab team fabricated the final restoration (Figure 9).

Within 2 weeks of the impression, the palate-free overdenture with Hader Clips and Blue Line (Ivoclar Vivadent) denture teeth was delivered to the patient (Figure 10). The patient was so pleased that she could smile and function without the embarrassment of her teeth falling out, thanks to the integrated subperiosteal implant (Figure 11).

CLOSING COMMENTS

Having the ability to provide an HA-coated subperiosteal implant embedded in bone for patients who have otherwise been told they cannot have implants is very rewarding to not only the patient, but also the provider. Professionally, it is a great accomplishment to be able to deliver an implant-retained restoration that allows patients the ability to speak and function regularly without discomfort or embarrassment when others previously told them there was no solution but complete dentures.

Acknowledgment:
The author would like to thank Ryan Dutton, CDT, and the lab team at Dutton Dental Concepts Laboratory, Ohio, for the fabrication of the subperiosteal implant and overdenture.

References

Further Study/Resources
For detailed step-by-step instructions on the protocol for a one-stage subperiosteal implants and accompanying prosthetics, please visit the Web sites located at aranazariandds.com and dutton dental.com.

Dr. Nazarian maintains a private practice in Troy, Mich, with an emphasis on comprehensive and restorative care. He has earned a Fellowship and Mastersthip in the International Congress of Oral Implantologists. His articles have been published in many of today’s popular dental publications. Dr. Nazarian is the director of the Reconstructive Dentistry Institute and has conducted lectures and hands-on workshops on aesthetic materials and dental implants throughout the United States, Europe, New Zealand, and Australia. Dr. Nazarian is also the creator of the Demand patient education model system. He can be reached by calling (248) 457-0500 or via the Web site reconstructivedentistryinstitute.com.

Disclosure: Dr. Nazarian reports no disclosures.

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