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Placement of a Modified Subperiosteal Implant:

A Clinical Solution to Help Those With No Bone

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Placement of a Modified Subperiosteal Implant:

A Clinical Solution to Help Those With No Bone

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ABOUT THE AUTHOR

Dr. Nazarian maintains a private practice in Troy, Mich, with an emphasis on comprehensive and restorative care. He has earned a Fellowship and Mastership in the International Congress of Oral Implantologists. His articles have been published in many of today's popular dental publications. He 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. He is also the creator of the DemoDent patient education model system. He can be reached by calling (248) 457-0500 or by visiting the Web site located at reconstructivedentistryinstitute.com.

Disclosure: *Dr. Nazarian reports no disclosures.*

INTRODUCTION

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[1] in the 1980s to improve the likelihood of direct implant to bone contact. Several authors

reported[2-4] 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.[5] 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.[6]

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.[7] This technique helps eliminate any open areas for bacteria to develop and allows the subperiosteal dental implant to restore function and stay in use without developing general infection in the jawbone. The primary purpose of embedding the HA-coated subperiosteal implant is to prevent soft-tissue migration under the casting before osseointegration between the implant and natural bone is complete. Any further osseointegration that takes place is considered secondary. Some of the examples of benefits of this technique include elimination of soft-tissue sequestration between implants and bone, functional forces are distributed more evenly throughout the jaw, and alternative solution when there is no bone available due to extensive resorption.

CASE REPORT

Diagnosis and Treatment Planning

A woman in her late 60s presented to our office frustrated with her upper complete denture of 27 years that opposed her natural dentition from teeth Nos. 19 to 29. She complained that her upper denture was currently nonretentive, and always moving around during eating and speaking.

Palpation and radiographic examination revealed a moderately narrowed maxillary ridge that would not allow adequate width for traditional-sized or small-sized dental implants (Figure 1). Because of this, a CT scan was obtained to accurately detect the amount and quality of bone remaining in the maxilla. Using a dual-scan technique, the patient's denture was scanned individually as well as in the patient's mouth. It is important to note the denture had radiographic markers (gutta-percha points) placed on the facial and palatal aspects of her existing denture held by sticky wax.

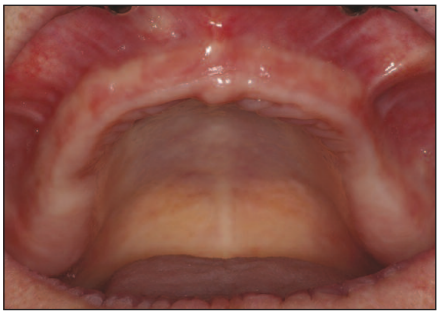

Figure 1. Edentulous maxillary ridge with excessive resorption.

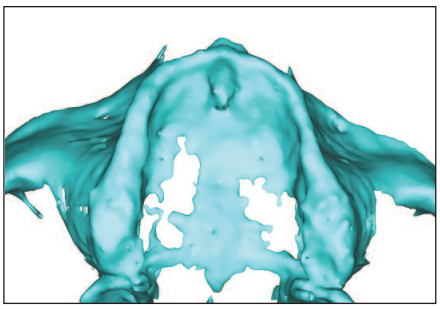

Figure 2. A 3-D image of the maxillary ridge.

Figure 3. A 3-D model of the maxillary ridge.

The DICOM file was then seamlessly uploaded to 3ddx.com (3D Diagnostics) for a custom conversion and a treatment planning session using SimPlant (Materialise)—this was done so we could rotate the image and evaluate it 3-dimensionally (Figure 2). With the assistance of the doctor on staff, we identified that this patient indeed did have extensive bone loss in the maxilla. Major grafting utilizing block grafts, particulate grafts, and sinus lifts would be required in order to have root form implants into the maxillary arch.

When the patient returned for review of the CT scan, all

risks, benefits, and alternatives to the various treatment options were discussed. The patient decided that she did not want to undergo extensive grafting. Instead, she opted for the HA-coated subperiosteal implant procedure with corresponding palate-free maxillary overdenture.

Once informed consent was obtained from the patient, a 3-D model was fabricated from 3D Diagnostics (Figure 3) and forwarded to the dental laboratory team.

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 processes. The framework consisted of permucosal extensions with a connecting bar and struts. Additionally, the subperiosteal framework had 2 *countersunk screw holes for rigid fixation using bone screws*.

Clinical Protocol

Utilizing intravenous sedation, the jawbone was exposed by making an incision at the crest of the ridge, from the distal incline of one tuberosity around the arch to the contralateral side. A sharp periosteal elevator was used to reflect the palatal tissue cleanly from the bone (Figure 4). The incisive neurovascular bundle is always severed when performing this procedure; however, with no significant harm. Once complete, the palatal tissue was temporarily sutured together to assist in clearly visualizing the ridge for implant placement. On the labiobuccal aspects, the muco-periosteum was elevated starting from the anterior section and proceeding posteriorly on both sides. The structures that needed to be exposed included the anterior nasal spine, canine fossa (up to the lower rim of the infraorbital foramina), zygomatic buttresses, and the entire bony tuberosities extending toward 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

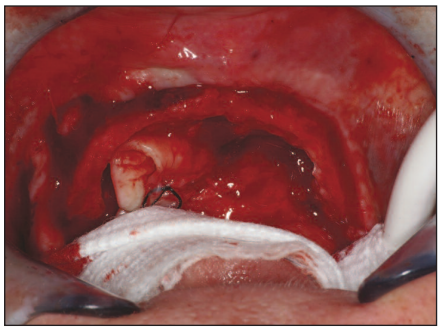

Figure 4. Reflection of the periodontal tissue.

Figure 5. Subperiosteal implant.

Figure 6. The hydroxyapatite (HA) bone grafting material.

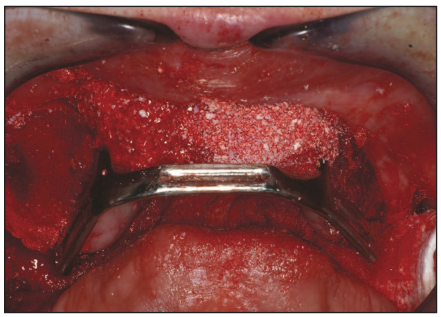

Figure 7. The HA bone grafting placed over subperiosteal implant.

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 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 mouthrinse 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.

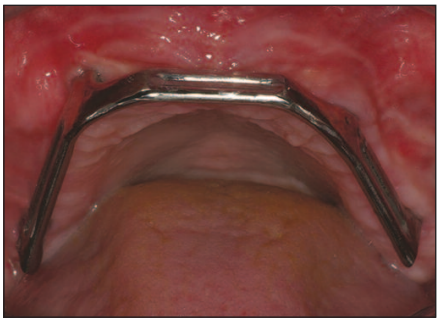

Figure 8. Bar extension of the subperiosteal implant after healing.

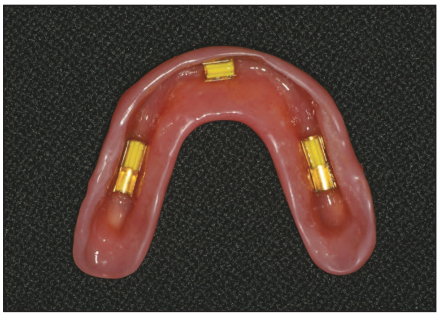

Figure 9. Internal connection of the denture.

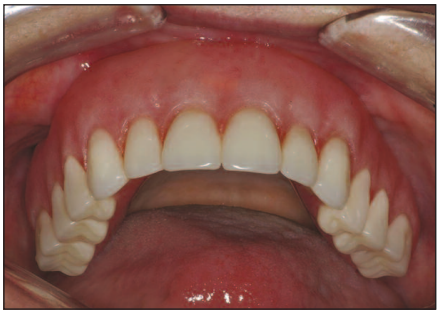

Figure 10. Palate-free overdenture seated intraorally.

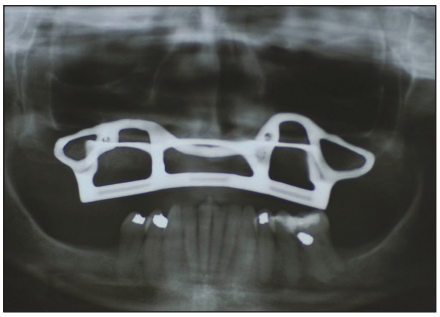

Figure 11. Panoramic radiograph (Panorex) of the subperiosteal implant.

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 BlueLine denture teeth (Ivoclar Vivadent) was delivered to the patient (Figure 10). The patient was very 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.

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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 at duttondental.com.

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1. **There are some patients who are not good candidates for traditional or small sized dental implants due to deficiencies in the remaining bone.**

   a. True **b.** False

2. **The subperiosteal implant was designed to rest on top of the bone and beneath the periosteum.**

   a. True **b.** False

3. **Subperiosteal implants rarely become sources of infection due to tissue growth into the grooves of the framework.**

   a. True **b.** False

4. **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. True **b.** False

5. **In the clinical procedure, as described by the author, the incisive neurovascular bundle is never severed when performing this procedure, to prevent significant harm.**

   a. True **b.** False

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ANSWER FORM: VOLUME 33 NO. 7 PAGE 134

Please check the correct box for each question below.

1. ❑ a. True ❑ b. False
2. ❑ a. True ❑ b. False
3. ❑ a. True ❑ b. False
4. ❑ a. True ❑ b. False
5. ❑ a. True ❑ b. False

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