Case Presentation: Full Mouth Implant Treatment Via a Trio of Modalities

By Seth A. Shapiro, DDS, Private Practice, West Palm Beach, FL

Mr. P is a 69-year-old male who presents with a chief complaint of, “I have neglected my teeth for 20 years and I’d like to have them fixed.” He is a lifelong nonsmoker, in good health, with no known drug allergies and no significant past medical history. Dental findings are notable for significant edentulousness: teeth numbers 1, 2, 3, 5, 7, 10, 13, 16, 17, 18, 19, 20, 30, 31, 32 are not present. Fixed acrylic/gold restoration supported by teeth numbers 4, 6, 8, 9, 11, 12, 14, 15 at the maxilla; no mandibular restorations are present. Oral examination of the hard tissue reveals failure of maxillary restoration due to recurrent root decay of all supporting abutments and lack of posterior occlusion. Mandibular premolars exhibit excessive occlusal wear. Lower anteriors exhibit incisal wear and class I mobility. The soft-tissue exam is significant for generalized inflammation and plaque buildup. Lower anteriors exhibit hard and soft-tissue loss, more likely secondary to traumatic occlusion than active periodontal disease.

Based on the above findings, a treatment plan was discussed with the patient and included the following:

1. Extraction of maxillary teeth with socket preservation and placement of transitional full denture;
2. Periodontal treatment of remaining mandibular teeth;
3. Restoration of mandibular premolars;
4. Replacement of mandibular posterior teeth with implants and fixed restorations;
5. Replacement of maxillary teeth with implants and fixed restorations;
6. Occlusal guard.

Phase I of Treatment

A full mouth series of radiographs, Panorex, and intra-oral photos was obtained prior to any intervention; preliminary impressions and study models were fabricated. Refer to figures 1-6 for these images. An immediate transitional denture was constructed for placement at the time of extraction and grafting.
Periodontal/Endodontive/Restorative Considerations

Scaling and root planing of the remaining mandibular teeth were performed. The patient was given oral hygiene instructions and placed on a three-month recall system. Endodontic treatment was completed on tooth numbers 29, as well as teeth numbers 21, 28, and 29 were restored with full coverage restorations for treatment of excessive occlusal wear and to level the occlusal plane. For each surgery, the patient was premedicated with 2 grams of amoxicillin clavulanic acid 500 mg.

Surgery 1 – Extraction and Grafting of Maxillary Teeth (Figure 7)

The patient was anesthetized with Septocaine 4% with 1:100,000 epinephrine. The maxillary bridge was removed and all remaining teeth were extractedatraumatically. The residual sockets were debrided and cleaned. Mineralized, freeze-dried bone allograft (OsteoLife Biomedical, Miami, FL) mixed with autogenous bone from the surgical site and calcium sulfate powder was condensed into the residual sockets to the level of the alveolar crest. Collagen plugs were placed as dressings over grafted sockets and were secured using 4.0 resorbable sutures (Demtech, Miami, FL). After adequate hemostasis, 1 mL dexamethasone was administered and the transitional denture was delivered with a soft reline. The patient healed uneventfully and was followed postoperatively until full wound closure and denture comfort were achieved.

Phase II of Treatment

After 6 weeks of healing, new impression and bite registrations were obtained in a manner consistent with complete/partial denture fabrication. A diagnostic wax-up of the maxillary and mandibular posterior dentition was generated that would serve as the functional and aesthetic blueprint for the final restorations. In this case, in order to maintain the existing vertical dimension, the patient’s existing transitional denture was duplicated in clear acrylic resin and used as a custom tray for the maxillary final impression. The wax-ups were tried and the occlusion verified.

Implant Treatment Planning

A flapless computed tomography (CT)-guided surgical protocol was utilized to place the maxillary implants;
“conventional” surgical protocol was implemented for the mandibular implants. The dual scan protocol was employed, as directed by Simplant software by Materialise Dental (Leuven, Belgium). The maxillary wax-up was duplicated in clear acrylic resin to which radiographic markers were bonded (see Figure 8). This “scan prosthesis” was then captured alone via cone beam (CB) computerized tomography (CBCT) and then again via CBCT while the patient was wearing it (Figures 9 and 10). The two images were then uploaded to Simplant software and converted into the treatment planning rendering. A CB scan was obtained of the mandible as well to assess the posterior ridge width, height, and distance to the inferior alveolar canal and mental foramen from the alveolar crest (Figure 11).

Evaluation of the maxillary CB scan revealed insufficient ridge width in the upper anterior segment for flapless surgery, so a ridge-splitting procedure was planned for the upper anterior ridge. Evaluation of the mandibular CB scan revealed an area of dense sclerotic bone in the area of tooth number 19 (Figures 12, 13, and 14).

**Definitive Treatment Plan**

**Maxilla:**
1. Implants numbers 3, 4, 6, 11, 13, 14, 15 via CT-guided surgery
2. Implants numbers 7 and 10 in conjunction with a ridge split procedure
3. Fixed restorations for number 3 single unit. Numbers 4-5-6, a three-unit bridge; numbers 7-8-9-10, a four-unit bridge; numbers 11-12-13, a three-unit bridge; numbers 14 and 15 single units

**Mandible:**
1. Implants number 18, 20, 30
2. Fixed restorations number 30 single unit, numbers 18-19-20, three-unit bridge

**Surgery 2 – Mandibular Implants (Figure 15)**

Two grams of amoxicillin was administered within one hour of surgery. The patient was anesthetized with Septocaine 4% with 1:100,000 epinephrine. Bilateral, full-thickness flaps were reflected, exposing the alveolar crest. A 5x11.5 tapered implant (Biomet 3i, Palm Beach Gardens, FL) was placed in the #18 site, a 4x11.5 tapered implant (Biomet 3i, Palm Beach Gardens, FL) was placed in the
Figure 8: Clear acrylic scan prosthesis with radiographic markers made from duplicate of diagnostic wax-up.

Figure 9: CBCT of scan prosthesis

Surgery 3 – Maxillary Implants – 6 Months Post Extraction and Grafting

1. Guided Surgery (Figures 16–20)

A surgical placement guide was constructed from the Simplant (Materialise Dental, Leuven, Belgium) rendering. The guide comes with a “menu” outlining the drilling sequence necessary to place implants using your particular guided-surgery system. In this case, the Navigator system from Biomet 3i (Palm Beach Gardens, FL) was employed. The patient was anesthetized with Septocaine 4% with 1:100,000 epinephrine. The surgical guide was held in place while a tissue punch was used to access the proposed osteotomy sites (numbers 3, 4, 6, 11, 13, 14, 15). The soft-tissue plugs were removed with a curette and placed in sterile saline. The surgical guide was replaced and the prescribed drilling sequence was initiated. The 5x13 parallel-walled implants (Biomet 3i, Palm Beach Gardens, FL) were placed in the #3 and number #15 sites, 4x15 parallel-walled implants (Biomet 3i, Palm Beach Gardens, FL) were placed in the number 5, 6, 11, 13, 14 sites. After all fixtures were torqued, the surgical guide was removed and the tissue plugs were replaced and sutured in place with 4.0 resorbable sutures (Demetech, Miami, FL).

2. Anterior Ridge Split with Immediate Implant Placement (Figures 21–32)

As previously discussed, the width of the anterior ridge was insufficient for implant placement without augmentation. Ridge splitting is a procedure whereby the buccal plate is separated from the lingual plate and slowly spread apart in a series of controlled movements until adequate buccolingual width is available for implant placement. In this case, the same procedure was carried out for both the #7 and

#20 site, and a 6x13 tapered implant (Biomet 3i, Palm Beach Gardens, FL) was placed in the #30 site. All implants torqued in with excellent primary stability (> 50 Ncm), so healing abutments were placed and the tissue was sutured around them as a single stage surgical procedure. Hemostasis was obtained and 1.0 mL dexamethasone was administered to the site. The patient was given a week-long course of amoxicillin clavulanic acid (500 mg twice daily). The patient was followed postoperatively until sufficient healing was evident, with full wound closure, and no swelling, pain, or bleeding.
#10 implant sites. Crestal and vertical incisions were made in the proposed areas. Obtaining passive, primary closure is crucial to the success of this procedure. Therefore, a split-thickness flap was elevated with careful dissection of the periosteum from the overlying mucosa. Once full periosteal release is obtained and it has been determined that the flap is mobile enough to close the wound fully at the end of the procedure, the remaining periosteum may be elevated or “pushed” off the bone in preparation for the ridge split. A piezo surgical unit (Osada, Inc., Los Angeles, CA) was used with a saw blade and copious irrigation to make a crestal incision in the alveolar crest, through the cortex and into the cancellous bone.

Vertical cuts were extended apically from the crest to a point where the ridge measures at least 8 mm in width, also through the cortex and into the cancellous bone. This will allow for maximum flexibility of the bony flap and reduce the likelihood of a buccal plate fracture. It is important to ensure that the vertical and crestal bone cuts intersect completely at the corners so that full release and subsequent spreading of the buccal plate segment is possible. Next, expansion screws (G. Hartzell and Son, Concord, CA) of increasing diameter and taper were slowly inserted into the prepared bone to the desired length, in this case 13 mm. Once the first screw is placed to length, it is important to allow time (3–5 minutes) for the bone to expand before moving on to the next size screw. Switching too quickly to the next size expansion screw will likely result in a green stick fracture of the bony segment. Once the ridge is spread apart to a sufficient diameter,
the final osteotomy is prepared to length and the implants are torqued into place (3.25x15 tapered implant by Biomet 3i). After the implants are placed, mineralized, freeze-dried bone allograft (OsteoLife Biomedical, Miami, FL) of slurry consistency was used to “fill in gaps” and concavities. A pericardium membrane (OsteoLife Biomedical, Miami, FL) was placed to contain the graft and allow for bone maturation without soft-tissue ingrowth from the overlying flap. The tissue was then sutured with 4.0 resorbable sutures with complete primary passive closure.

The goal was immediate load fixed temporary restoration. Although primary stability of the implants was achieved, the torque values were not high enough to risk a fixed temporary at this time. Instead, the labial flanges of the upper denture were removed and a soft reline was placed; 1 mL dexamethasone was administered, and the patient was followed postoperatively until sufficient soft-tissue healing was evident.

To date, the patient’s lower implants have been restored and he is healing uneventfully in the maxilla. Six months postoperatively, the final restoration of the maxillary arch will be initiated. ■
Figure 20: Simplant treatment planning rendering from which the surgical guide is constructed

Figure 21: Vertical and crestal incisions

Figure 22: Split thickness flap with periosteal release

Figure 23: Flap advancement confirming adequate periosteal release necessary for primary, passive closure

Figure 24: Crestal bone cut with piezo surgical unit

Figure 25: Vertical bone cuts with piezo surgical unit

Figure 26: Expansion screw introduced into “osteotomy”

Figure 27: Completed ridge split

Figure 28: Implant placed with bone graft
Figure 29: Pericardium membrane placed over surgical site

Figure 30: Primary closure

Figure 31: Ridge-expansion instrumentation

Figure 32: Final Panorex with all implants in place