Maximizing Aesthetics in the Deficient Alveolar Ridge

A long-standing challenge to the restorative dentist is single tooth replacement in an atrophic ridge crest. The loss of bone volume after tooth loss has received considerable attention in the literature. Different rates and patterns of alveolar loss have been observed, depending on where and how the tooth was lost. A 25% decrease in facial palatal width occurs in the first 12 months, and can be as great as 40% within 3 years. This article will present a predictable method for replacing the lost bone prior to implant placement through the ramus block graft technique.

CASE REPORT
Diagnosis and Treatment Planning
A 42-year-old female presented to our office in March 2006. She expressed a desire to discuss alternatives for tooth replacement of her missing right maxillary cuspid (Figure 1). The patient had worn a maxillary removable partial denture for 26 years. A comprehensive oral exam, panoramic radiograph, bite-wings, and models mounted in the centric relation position were done. The patient's medical history had no contraindications to treatment, and her dental exam was unremarkable. Tooth No. 6 had been lost at age 16 due to extensive caries. Although conventional crown and bridge was discussed as a treatment option, it was discouraged because of (1) the lack of any restorations on the potential abutment teeth Nos. 5 and 7, and (2) the unfavorable morphology of tooth No. 7 as an abutment in a 3 unit bridge.

A root form implant with prior bone augmentation was the recommended treatment. Specifically, an autogenous block graft from the ramus buccal shelf was the suggested donor site. It is common in the maxillary incisor region to have significant bone width compromise due to the thinness of the overlying labial plate (Figure 2). The utilization of the ramus area as opposed to the mandibular symphysis is dictated by clinical access and anatomy. Although the position of the inferior alveolar canal, the external oblique ridge, and anterior posterior dimensions of the ramus can be evaluated with a panoramic radiograph, it is noteworthy that many studies show it to be the least accurate, with distortions ranging from 3.0 to 7.0 mm. Cone beam computer tomography (CT scanning) exhibits uninterrupted continuity with the least distortion, ranging from 0.2 mm to 0.5 mm. As such, the anterior posterior width of the ramus can best be evaluated with a CT analysis.

The range of harvestable bone from the ramus is a rectangular piece 3 to 4 mm in thickness, 1 to 3.5 cm in length, and usually about 1.0 cm in height. The preoperative clinical evaluation indicated a desired graft of approximately 3.0 mm in thickness, 8 mm in height, and 12 mm in length.

SURGERY: PHASE I
The preoperative medications were as follows: premedication (oral sedation) using Triazolam 25 mg, Atarax 50 mg, and Benadryl 25 mg, all taken 30 minutes prior to appointment. Amoxicillin 500 mg, Ibuprofen 600 mg, Dexamethasone 9.0 mg, Viscodin ES-prn. Chlorhexidine Gluconate 0.12% oral rinse (Peridex [OMNI Preventive Care, a 3M ESPE Company]) was also prescribed. (Rinse with one capful for 30 seconds twice a day starting one day after surgery.) Vitals were taken and recorded every 10 minutes with a pulse oximeter.

The Recipient Site
The recipient site was anesthetized with local infiltration using 1.8 ml 2% lidocaine, along with palatal anesthesia. The donor site was anesthetized with an inferior alveolar nerve block using the same anesthesia along with 1.0 m of 0.5% Marcaine (1:200,000 epi- nephrine) (Cook Waite Novocain Pharmaceuticals of Canada). In the recipient area, a sulcular incision, with two vertical releasing incisions on the distal aspect of teeth Nos. 4 and 7, was made. On the underlying bone, a rectangular shape is subtly outlined with No. 6 (Brasseler USA) diamond round bur, and the entire area to receive the block was decorticated approximately 1.0 mm in depth. The decortication sets up a regional acceleratory phenomenon (RAP). This involves platelet release from damaged blood vessels, increased osteogenesis, cell availability and overall a better graft union to the host bone.

The Donor Site
A distal oblique releasing incision was made at the buccinator muscle, at the distal aspect of the retromolar pad. Sulcular incisions both buccal and lingual were made up to the mandibular cuspid with a vertical releasing incision mesial to the cuspid. A full-thickness mucoperiosteal flap was made allowing direct view of buccal the shelf and the mental neurovascular bundle.

In this procedure, 3 basic bone cuts were utilized. First the superior osteotomy was made with a 702 L (Brasseler USA) bur. This

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was made 4.0 mm medial to the buccal shelf, and continued anteriorly up to the first molar site as needed. In this case, we stopped at about 1.4 cm from the inferior portion of the graft was made with the 701 L (Figures 3 to 5).

Finally, the inferior osteotomy was made with a No. 8 (Brasseler USA) round bur. This was more of a “scoring” than a cut, and the graft was outfractured from the superior portion with a Tatum bone spreader (Sun Coast Dental) (Figure 6). It is not necessary to place anything in the remaining defect, although a membrane of rich plasma protein was used in this case. Much has been written about the use of platelet rich plasma (PRP) and other growth factors in conjunction with autogenous bone grafts. The patient’s blood is drawn, centrifuged and fractionated into 3 components by gradient dentistry (Harvest Technologies) (Figures 7 and 8). 6

The platelet concentration obtained is one million platelets/ml versus the normal average of 200,000 platelets/ml. By itself, PRP cannot induce bone formation. However, it can be used as a “spark” that ignites a process that ultimately enhances bone maturation as well as soft-tissue closure. 7

The graft is then contoured and placed in the recipient site. The block is fixated with 2-point screw fixation (Osteomed screws [Osteomed Corp] 1.6 mm x 10 mm length (Figures 9 and 10). Any voids around the periphery of the graft are filled with a combination of 0.5 cc of Mineros (BioHorizons) rich plasma protein (Figure 11). Both areas are sutured tension-free, utilizing 4.0 and 3.0 Vicryl suture (Ethicon [Johnson & Johnson]). The

patients existing partial denture was then refined and utilized as the provisional on the day of surgery.

Typically, intraoral block grafts are allowed to heal for a minimum of 4 months for maxillary sites. 5 The higher vascular maxillary cortex allows for a more rapid angiogenesis of the graft then in mandibular sites. 9

SURGERY PHASE II: IMPLANT PLACEMENT

At 5 months from the first surgery, the patient returned for implant placement. The same pre-op medication and anesthesia protocol for the maxillary recipient site were utilized. The incision line from the first surgery was followed. The graft had become fully fixated, and the 2 Osteomed screws were removed (Figures 12 and 13).

The goals of ideal anterior implant placement include the following:
The center of the implant should be located directly under the incisal edge of the crown. This portion improves the angle of force to the implant, and lends itself to excellent aesthetics. 10

Furthermore, we would strive to position the top of the implant platform 2.0 mm below the adjacent facial cementoenamel junction. This will provide 3.0 mm of soft-tissue drape in a healthy periodontium leading to ideal aesthetics. 11

Both of these goals were easily accomplished since the ramus graft yielded abundant bone in our recipient site. Ramus grafts exhibit minimal resorption rates at 0 to 20%. 12 A 4.3 x 12 mm Replace Select (Nobel Biocare) implant was utilized. A healing cap was placed, and closure was achieved using 4.0 vicryl sutures. The patient continued to wear the original maxillary partial denture (further
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relined for the healing cap. At this point in the uncovering, it was decided that the aesthetic outcome of the final restoration would be enhanced if we “plumped out” the overlying tissue. A de-epithelialized connective tissue pedicle graft was utilized. There is abundant attention to this procedure in the literature (Figures 14 to 16). 13

Final impressions were taken at 12 weeks post-op (Figure 17). A direct implant impression protocol was followed. The dental laboratory prescription called for the custom fabrication of a zirconium abutment with a Lava (3M ESPE) all-ceramic crown. The final restoration was cemented 8 months after the original office visit to the patient’s satisfaction (Figures 18 to 20).

SUMMARY

This article has demonstrated a predictable and aesthetic method for replacing the lost bone prior to implant placement through the ramus block graft technique. ✓

REFERENCES


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