Predictable Dental Implant Placement into Grafted Sinuses

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Introduction
In many patients, the edentulous posterior maxilla does not have enough vertical height to allow for implants to be placed without intruding the maxillary sinus. This scenario often creates a challenge to the clinician performing implant tooth replacement. Various techniques to treat the posterior sinus have been described.1

The classic lateral antrostomy pioneered by Tatum appears to be the most commonly utilized sinus lift procedure for the severely deficient posterior maxilla.1 The procedure consists of making a window or door-hinge osteotomy in the lateral maxillary sinus wall. With careful manipulation the window is luxated or fractured inward and upward to form the "new" sinus floor, although some clinicians favor removal.1 Meticulous separation of the Schneiderian membrane from the inner wall of the sinus to avoid perforation is essential and can be accomplished with specific instruments. The newly formed space is then filled with a graft material and the surgical site is closed.

Implant placement can be performed at the time of sinus grafting. Ostéotomies for an existing bone height for primary stability of the implants (usu- ally 4-5 mm) or delayed for several months (4-9 months) to allow for adequate graft maturation. The sinus graft procedure has become one of the most predictable methods to grow bone height with results of up to 20 mm of bone height and an implant survival rate greater than 98%.2

Bone Grafting Materials
Bone substitute materials have played an important role in dentistry for many years. Today there exists a wide array of graft materials used either alone or in combination that can fill the elevated sinus.16 Bone graft materials such as autogenous bone, allografts, xenografts or alloplasts have all been advocated for this procedure.4

Of the various bone augmentation materials available, allografts provide easily procured graft materials.6 Unlike autogenous bone, allografts do not contain live bone cells, but they do provide type I collagen, which is composed mostly of the organic component of bone.

Allografts contain BMPs, which help stimulate bone growth. These proteins, 13 of which have been identified so far (BMP1–BMP13), are considered osteoinductive compounds.7 Osteoinductive materials encourage new bone formation by acting as a signaling agent in initiating and regulating specific tissue formation. This activity leads to a series of developmental processes that result in the differentiation of mesenchymal cells into osteoblasts.4

Materials & Methods
A total of 42 patients under went sinus grafting procedures. Patients were treated if determined to have no contraindication for minor oral surgery with local anesthesia and/or conscious sedation. Both smokers and non-smokers were included in this study. A total of 56 sinuses were tabulated for these patients.

Each patient was given a complete hard and soft tissue exam, periodontal evaluation and oral examination as indicated. The sinus area was evaluated carefully for mucosal thickening, polyp formation and the presence on any septum (Fig. 1). Diagnostic study models and photographs were obtained pre-operatively as required.

Patients were administered pre-operative surgical antibi otic prophylaxis (amoxicillin 2 g by mouth 1 hour pre-op, or clindamycin 600 mg by mouth 1 hour pre-op, followed by 1 week postoperative three times per day coverage) and corticosteroid therapy pre-operatively (Medrol® Dose Pack, dispense one pack and follow pack instructions) begun on the morning of surgery.

Patients were scheduled for sinus grafting with local anesthesia or without conscious sedation. 0.5% bupivicaine or 2% lidocaine with epinephrine 1:200,000 (Cook-Waite, Abbott Labs North Chicago, Ill.) was administered via infiltration and greater palatine nerve blocks.

A full thickness mucoperiosteal flap was elevated with an incision over the crest of the ridge and vertical releasing incisions were made anterior and posterior to the sinus cavity. The sinus area was located and a lateral window osteotomy was outlined with an 8-round surgical bur and irrigation. The bony plate was fractured and the sinus mucosa was carefully elevated (Fig. 2).

The sinuses were then carefully filled with cancellous mineralized bone allograft material 1–2 mm particle size (Puros®Tutogen) (Fig. 3). Larger sinus cavities were grafted with a mixture of Puros and resorbable HA (Osteogen® Impiant or Osteogen® N-300 Ceramed). A collagen membrane (Bio mend®, Zimmer Dental, Inc.) was placed over the lateral window prior to closure to produce a "caging effect" (ref105). Closure was made with 3-0 or 4-0 silk, chromic gut, or Vicryl® (Ethicon, Inc. Piscataway, NJ) sutures.

The patients were given postoperative instructions. Prescriptions for 500 mg amoxicillin 3-times daily for 5 days (clindamycin 150 mg for those allergic to amoxicillin) and analgesics for 3 days (oxycodone 5 mg/325 acetaminophen every 4 hours as necessary)

Carlsbad, CA) was placed over the lateral osteotomy to allow sinus elevations. The lateral osteotomy was filled with particulate mineralized human allograft in a particulate or particulate and hydroxyapatite (HA) over a 2-year period to allow sinus elevation. A total of 136 loaded implants were placed and 136 dental implants were placed into the grafted sites after 4-6-month healing period. All re-entries revealed a bony hard structure acceptable for osteotomy preparation. 124 of these implants have been restored with fixed prosthesis and 12 with removable overdentures for a total of 136 loaded implants. A total of 1 implants required removal (failure) resulting in a 97.7% implant success rate (2.3% failure rate). A conclusion was made that sinus elevations is a clinically predictable method acceptable for implant placement and restoration.