

Predictable Sinus Tenting with Implant Placement

by Timothy Kosinski, DDS, MAGD

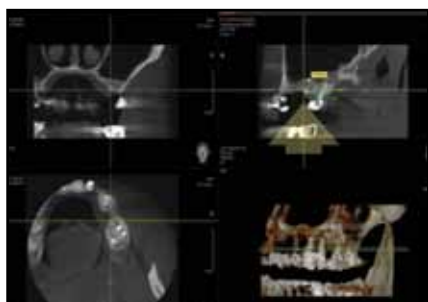


Figure 1

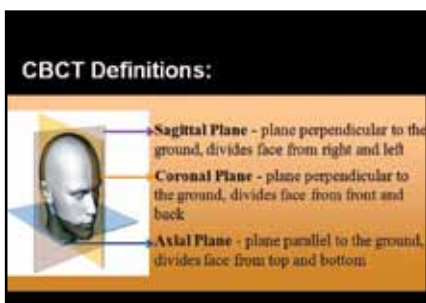


Figure 2

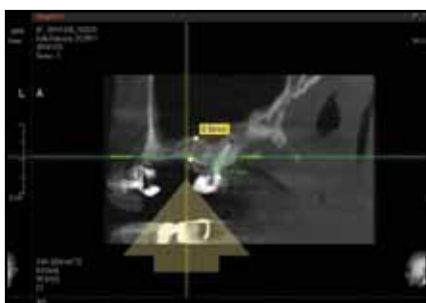


Figure 3



Figure 4

When evaluating edentulous spaces in the posterior maxilla for dental implant therapy, practitioners are often concerned with the compromised bone quantity and quality. The maxillary sinus sits below the eyes, above the roots of teeth on either side of the cheek area of the face. When teeth are present, the roots help elevate the sinus membrane like a tent pole holds up a circus tent. When teeth and roots are removed, the bone may shrink apically and palatally, but also the sinus floor may collapse, as happens to the circus tent if the tent poles are removed.

Most often, the maxillary bone in the posterior part of the arch is relatively soft, or Type IV trabecular in nature. (1) The nature of the bone allows the skull to be lighter to be kept on the shoulders. In conjunction with the softer bone is the fact that occlusal forces placed on teeth in the posterior of the jaw are the greatest. In summary, the bone is the weakest yet the chewing forces are the greatest.

Our 51 year old female with controlled hypertension and a sulfa allergy presented with an edentulous space in the maxillary left second bicuspid area. The tooth had been extracted about 12 months previously. She developed an infection at the extraction site and was thus hospitalized to get the infection under control. The extraction site was reportedly allowed to heal without grafting, thus enlarging the sinus cavity

and minimizing the amount of available bone. No other details were provided by the patient,

and CBCT scan analysis using the PaX-i3D Green Machine Imaging system in Figure 1 (Vatech America Inc., Fort Lee, NJ) shows the axial, sagittal and coronal planes. The axial plane is the plane parallel to the ground, thus dividing the face from top to bottom. The sagittal plane is one perpendicular to the ground, dividing the face from right to left. Finally, the coronal plane, shows the plane perpendicular to the ground, dividing the face from front to back. (Figure 2.)

The sagittal view of our preoperative CT illustrates that there is 6.6mm of available bone height from the crest of the edentulous ridge to the floor of the sinus. (Figure 3)

When considering implant placement to replace a missing maxillary second bicuspid tooth where the sinus cavity is large and the available bone minimized several options for treatment can be considered. An invasive Caldwell Luc procedure would create a window on the buccal aspect of the missing tooth and the sinus filled with bone grafting material of the surgeon's choice.(2) After an appropriate healing time, the grafted area would convert to bone allowing implant placement. Since there are crowns on the anterior and posterior teeth to the edentulous space, a conventional three unit bridge would

not be inappropriate as an adequate treatment option. Our patient requested consideration for a single dental implant which would allow easy maintenance and flossing. A sinus tenting procedure would allow elevation of the sinus floor enough to place an implant and restore with an implant retained crown.

The maxillary Schneiderian membrane can be elevated or stretched without complication. This membrane is bilaminar in design with ciliated columnar epithelial cells on the internal side and periosteum on the osseous side.(3) Tearing of this membrane may result in sinus trauma and could affect the osseointegration of the implant.

We only had 6.6mm of available height of bone preoperatively. In my experience I am able to predictably tent the sinus membrane about 3mm in preparation to place an immediate implant. Since tenting 3mm would not allow me to predictably place at least a 10mm long implant, it was decided that I would not place an implant immediately after tenting. Rather I would attempt to lift the sinus floor first and prepare the site for an eventual implant. (4) A tenting procedure was completed lifting the sinus floor significantly. The allograft was allowed to integrate for approximately 5 months before implant placement.

Figure 4 illustrates a digital radiograph of the perceived success of the initial sinus grafting.after 5 months of healing. A 5mm ball bearing is radiographed and calibrated. The new vertical height of available bone is measured to be 11.5mm. Thus I was able to gain nearly 5mm of vertical height.

The Implant Direct Legacy 3 dental implant (Implant Direct, Thousand Oaks,

CA) was chosen as the implant of choice in this situation. The tapered design and macro and micro threads of the system will allow for nice initial stability and allow for integration of bone to the body of the implant. Figure 5 shows the 2.2mm diameter pilot drill positioned between the first bicuspid and first molar teeth. The intent is to visualize the emergence of the final implant retained crown prior to any surgical intervention. Once the pilot drill is shown to be ideally angled mesial-distally, the epithelium is punched and the tissue depth measured with a periodontal probe (Figure 6) Next the 2.2mm diameter drill is slowly positioned to approximately 1-2mm below the sinus floor. This can be accomplished by moving the bur in 2mm or so increments.

Next a 2.8mm diameter bur is used to widen the osteotomy to the desired depth short of the sinus floor. (Figure 7) From this point on flat tipped osteotomes are used to widen the osteotomy and compress the porous bone along the walls to help stabilize the implant. The osteotome is marked so that the proper depth in bone can be determined at the soft tissue level. We chose to place the implant 11.5mm into bone and the tissue depth was 2mm, therefore the osteotome is set at 13.5 mm to soft tissue (Figure 8). The digital radiograph indicated that the osteotome has created a space for the implant 11.5 mm into bone. Figure 9 shows the preliminary osteotomy intraorally. A resorbable membrane (Cytoplast , Implant Direct, Thousand Oaks, CA) is positioned into the prepared osteotomy site (Figure 11) and allograft material (Direct Gen Min Blend Allograft, Implant Direct, Thousand Oaks, CA) is carefully placed into the socket. A larger osteotome is used to push the



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9

membrane and allograft to the desired position (Figure 13). This technique serves to protect the schneiderian membrane from perforation. The Implant Direct Legacy 3 is torqued to proper position to the crest of the ridge at 35Ncm. Radiographically the implant is positioned to the floor of the sinus at 11.5mm. Because the implant is properly torqued to at least 35Ncm, a 2mm tall healing abutment is placed and torqued to 25Ncm (Figure 15) The flapless procedure is atraumatic with little or no bleeding around the healing abutment (Figure 16)

After approximately 4 months of integration the healing abutment

is removed showing a healthy pink gingival cuff of epithelial tissue (Figure 17) An impression transfer assembly is inserted into the hex designed implant body. I place a small piece of cotton to prevent the impression material from going into the screw hole (Figure 18) Panasil tray soft and Panasil initial contact vinyl polysiloxane material provides for clean, crisp impression (Kettenbach, Huntington Beach, CA) and the transfer assembly is unthreaded from the implant and placed into a lab analogue which is used to fabricate the master cast. (Figure 19) Our Lab (Glidewell Lab, Newport Beach, CA) fabricates a custom titanium abutment with

margins at the gingiva and a Bruxzir zirconia CAD/CAM designed implant retained crown (Figure 20) The titanium abutment is torqued to 30Ncm. Note the margins created at the gingival line (Figure 21)

The Bruxzir crown is cemented with Improv implant cement (Salvin Dental, Charlotte, NC) and a final radiograph made to insure a complete seat of both the abutment and implant retained crown (Figures 22 and 23).

The clinical procedure completed here was done in stages. First the sinus was elevated using a tenting technique, increasing the vertical height of bone from 6.6mm to 11.5 mm or nearly 5mm.



Figure 10



Figure 11



Figure 12

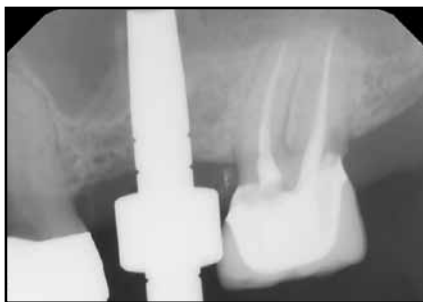


Figure 13



Figure 14



Figure 15



Figure 16



Figure 17



Figure 18

Following integration, an implant was placed ideally to the floor of the sinus. The surgical protocol involved using osteotomes to compress the available bone and increase initial stability of the dental implant. The legitimate concerns about placing an implant in the maxillary sinus are addressed by creating a controlled platform for implant placement.

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Figure 19



Figure 20



Figure 21



Figure 22

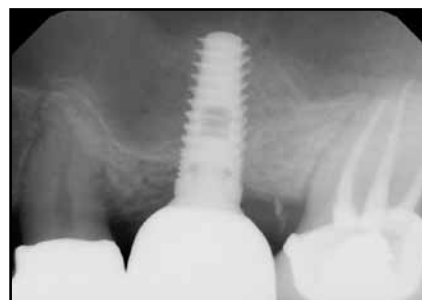


Figure 23