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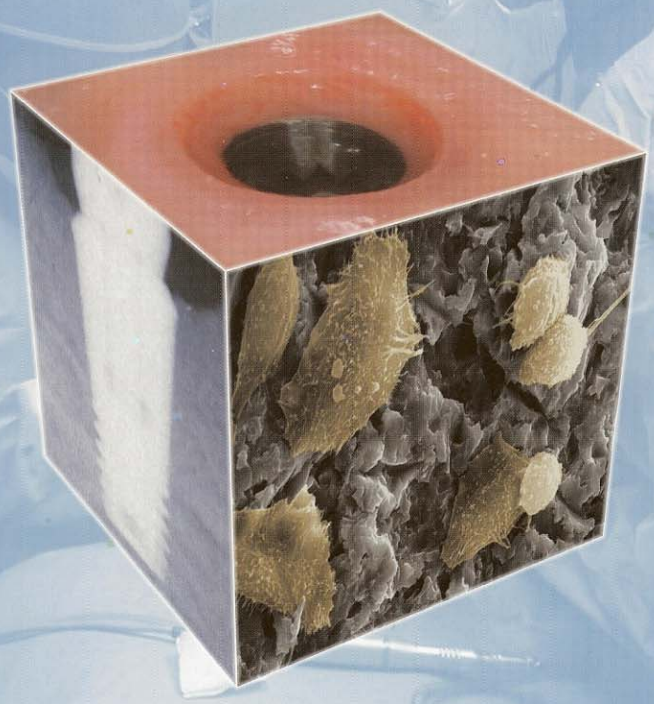
THINKING OUTSIDE THE BOX



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Localized Internal Sinus Floor Elevati Implant Placement Using Osteotome

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Implant placement in the posterior maxilla is often compromised by reduced bone quality and limited bone height beneath the sinus floor. Osteotome techniques have been developed to improve localized bone density through osteocompression and provide for additional implant length through apical alveolar displacement.[1,2] The osteotomes represent an alternative to rotary instrumentation in type III or IV bone, preserving bone that would be spilled during the drilling process. When used to prepare the osteotomy in the maxilla, osteotomes will improve bone-implant-contact and assist in localized internal sinus floor elevation.[3,4]

This less invasive approach for sinus floor elevation using osteotomes with concurrent grafting and implant placement was introduced by Summers in 1994.[2] The bone added osteotome sinus floor elevation technique (BAOSFE) uses osteotomes and graft materials to reposition the pre-existing bone beneath the sinus, elevating the sinus floor allowing for the placement of longer implants. The procedure is recommended for patients who have at least 5.0 to 6.0 mm of bone remaining between the crest and sinus floor (Fig. 1). The use of drills is minimized except in initial preparation or expanding the osteotomy in existing cortical bone. The osteotomy is initiated with a round bur to perforate the cortex and then a 2.3 mm twist drill is taken to a depth of 3.0 to 5.0 mm. The position and angulation of the early preparation is evaluated with a surgical template. After ideal prosthetic positioning has been verefied, Astra Tech osteotome #1 is pushed or malleted to the working depth which is 1.0 mm shy of the sinus floor. The osteotomy is then gradually expanded with wider osteotomes (Astra Tech osteotomes

Fig. 1: Radiograph prior to osteotome sinus floor elevation revealing 6.0 mm of sub-sinus bone present at site #13.

Fig. 2: Site preparation has been initiated with a 2.0 mm osteotome malleted to a depth of 5.0 mm (working depth).

Fig. 3: Using wider osteotomes inserted to the working depth, the osteotomy has been expanded to 3.0 mm.

on With Simultaneous Techniques

#s 2 & 3 for the 4.5 mm ST or #s 2, 3, 5 & 6 for the 4.0 and 5.0 mm ST) inserted to the working depth (Fig. 2–4). The final apical diameter will be 3.2 to 3.7 mm depending on localized bone quality. The softer the bone, the more the osteotomy may be underprepared to maximize primary stabilization. The final 5.0 mm of crestal expansion for the 4.5 ST and 5.0 ST fixtures is performed after localized sinus elevation.

To initiate sinus floor elevation, a graft mixture consisting of autogenous and bovine bone (Bio-Oss, Osteohealth, Shirley, NY) in a 1:1 ratio is then placed to almost fill the osteotomy (Fig. 5). The author uses as much autogenous graft material as possible harvested from the surgical site. Particulate bone may be gathered via rongeurs, trephination or during any drilling procedures with a specially designed suction device such as the BoneTrap. The osteotome used to prepare to the final apical diameter is then malleted to working depth (Fig.6). The added graft material (autogenous bone and bovine bone mineral) and the bone that has been apically condensed immediately below the sinus floor will infracture the floor, elevating the mucosal lining of the sinus. For every 3.0 to 5.0 mm high plug of bone mix, the clinician should anticipate 1.0 mm of localized sinus elevation. The osteotomes which are used to apically condense the bone mix are never inserted past the

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Fig. 4: Radiograph confirms proximity to sinus floor and ideal working depth 0.5 to 1.0 mm shy of sinus floor.

Fig. 5: After osteotomy has been completed for 4.5 mm ST fixture, bone graft mixture is used to fill the osteotomy.

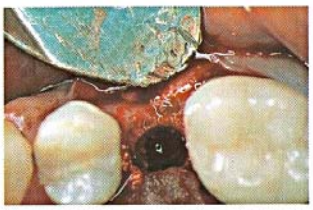

Fig. 6: Final osteotome has been malleted to working depth to apically displace the graft infracturing sinus floor and initiating elevation.

Fig. 7: Specially designed short tapered-tip MT osteotomes #s 1,2&3 for the 5.0 mm of crestal expansion necessary for ST fixtures placed in areas of limited sub-sinus native bone.

Fig. 8: A 4.5 mm x 11.0 mm ST fixture has been successfully placed at site #13 with excellent primary stability.

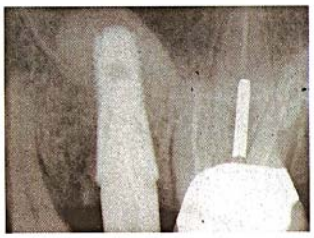

Fig. 9: Radiograph immediately after placement of a 4.5 x 11.0 mm ST fixture reveals 5.0 to 6.0 mm of controlled localized sinus floor elevation. A single-stage protocol was used with a 4.5 mm high zebra healing abutments.

Continued

original sinus boundary to avoid membrane perforation. After the localized internal sinus elevation is completed, additional crestal expansion to 4.3 mm for the 4.5 ST and to 4.8 mm for the 5.0 ST is achieved with specially designed tapered osteotomes (MT#s 1, 2&3, Fig. 7). The implants are placed with their apical end in the tented space with the initial fixation provided by the pre-existing bone (Fig. 8–10). In the author's experience the BAOSFE procedure has consistently produced a localized sinus elevation of 2.0 to 7.0 mm with minimal complications. The author has placed over 300 implants using this technique with an overall success rate of 94% and average loading time of 28 months.[5]

Fig. 10: Radiograph of implant-supported restoration after one year in function. Restoration by Dr. Alan Winner, NY, NY.

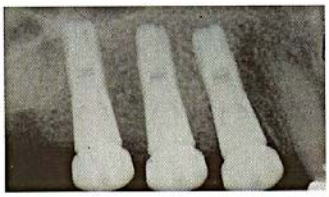

Fig. 12: Radiograph immediately after the insertion of three 4.5 x 11.0 mm ST fixtures. Note: immediate fixture at site #5 and localized osteotome sinus floor elevation at site #3.

Implant Selection for the Osteotome Technique

The author has found that a tapered implant with a roughened surface such as the Astra Tech Fixture 4.5/5.0 ST, when used in combination with osteocompressive techniques and localized sinus elevation, can improve initial stabilization in areas of reduced bone quality and limited available bone height. The tapered ST design assures a stable bone-implant interface at the time of insertion and aids in stabilization in poorer quality bone. This self-tapping threaded implant is placed with no cortical countersinking thus preserving the valuable cortical bone. Increased primary stabilization due to implant design and osteotome techniques as well as improved and more rapid osseointegration due to surface modification should translate into greater success as well as reduced healing times. This theory is presently being tested so that we may offer more predictable treatment in less time in areas of reduced bone quality often encountered in the posterior maxilla (Fig. 11–13). ■

Fig. 11: Preoperative radiograph of site #s 3,4 and 5 immediately after the extraction of #5.

Fig. 13: Final implant-supported splinted prosthesis at time of insertion – 8 weeks! Restoration by Dr. Bruce Valauri, NY, NY.

The author's use of osteotomes has:

- *allowed implant placement in areas of limited bone height and width;*
- *improved initial implant stability;*
- *improved implant success in the maxilla;*
- *simplified sinus elevation; and*
- *increased case acceptance.*

References

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