Short Implants: A Viable Treatment Option in the “Anatomically Challenged” Patient

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Patients with fully or partially edentulous alveolar ridges comprised of markedly reduced bone volume must accept the higher risk of complication, extended treatment duration, and heavier financial burden associated with their implant-supported rehabilitation. The clinical challenge is exacerbated by post-extraction ridge resorption and increased pneumatization of the maxillary sinus often creating proximity to both the inferior alveolar nerve and antral floor. This reduced residual bone volume frequently prohibits the placement of implants 10 mm in length or longer without frequently requiring the use of autogenous bone grafts that lead to prolonged healing times. As a less invasive alternative, osteotome-mediated sinus floor elevation (OMSFE) procedures procure antral bone for primary stabilization of implants, osteotome-mediated sinus floor elevation (OMSFE) procedures procure 2 mm to 7 mm of localized sinus floor elevation, usually permitting the simultaneous placement of implants 10 mm in length. Studies by Toffler and Rosen et al found a significantly reduced survival rate of 73.3% and 85.7%, respectively, when the residual subantral bone height (RSBH) was 4 mm or less. Based on these studies, it would seem that in the more severely resorbed posterior maxilla (< 5 mm RSBH), minimally invasive OMSFE with simultaneous implant placement is not the treatment of choice and a staged approach using a lateral window technique or crestal core approach would be preferred. However, the recently reported success with short implants with a variety of roughened surfaces may transcend these boundaries, requiring less RSBH as well as minimal sinus floor elevation to achieve successful long-term results. Similarly, the inherent risk of nerve lateralization and the extreme challenge of vertical ridge augmentation may be avoided by using short implants in the atrophic posterior mandible.

The following case reports clearly demonstrate the clinical and practical benefits of using short implants in the deficient alveolus where the residual bone volume is significantly diminished, resulting in proximity to the nasal floor, sinus floor, or inferior alveolar nerve (IAN).

CLINICAL REPORTS

Case 1

An 88-year-old man who was taking warfarin, doxazosin, digoxin, hydrochlorothiazide, and metoprolol to control atrial fibrillation and high blood pressure presented with a failing maxillary right posterior prosthesis and missing posterior teeth in the left maxilla. He desperately wanted to avoid wearing a removable prosthesis and was anxious to expedite implant treatment, avoiding more invasive staged procedures as these would prolong treatment, impose a greater risk for complication, and would likely require modification of his warfarin intake. The morning of the first surgical appointment, the patient’s international normalized ratio (for anticoagulant monitoring) was 2.2, low enough for the author to proceed with the intended treatment. At site Nos. 13 and 14, 4 mm to 6 mm of subantral bone was present. OMSFE allowed for the placement of 8-mm long, single-stage implants at site Nos. 13 and 14 and a 10-mm long single-stage implant at site No. 12 (Figure 3). Four weeks later, in the upper right quadrant, tooth Nos. 2 and 4 were extracted. A 10-mm implant was placed immediately at site No. 4 in combination with OMSFE, along with a 12-mm implant at site No. 5. Using OMSFE, a 6-mm long, wide-diameter implant was placed in 3 mm of RSBH at site No. 3 (Figure 4). After 3.5 and 4.5 months of healing, splinted implant-supported restorations were cemented in place in

*An osteotome-mediated approach offers the advantages of a more conservative surgical entry...*
A 48-year-old woman had lost fourth premolar with an implant-supported restoration (Figure 4). A 4.5-mm x 7-mm implant was placed at site No. 19. The implants were uncovered 3 months later and three attachments were placed to aid in partial denture retention (Figure 19 through Figure 21). This less invasive treatment alternative not only reduced treatment time, morbidity, and cost, but also stabilized the mandibular prosthesis. The patient achieved improved function and reduced stress and discomfort associated with the anterior teeth.

Case 5
A 54-year-old woman presented with missing teeth Nos. 5 through 12, complaining of instability of her maxillary RPD. She had lost the anterior teeth in a motor vehicle accident 15 years earlier, and the remaining ridge was severely atrophic. An advanced degree of bone loss was also noted around tooth Nos. 2, 3, and 15 (Figure 22). She sought a second opinion after being advised that she required iliac grafts in the anterior maxilla, extraction of teeth Nos. 2 and 3, and sinus augmentation to stabilize the RPD or allow for placement of a fixed implant-supported prosthesis. The dental scan revealed a small “island” of bone at site Nos. 8 and 9 (Figure 23) where 3.3-mm x 8-mm implants were placed with a minor nasal floor lift (Figure 24 and Figure 25). Six months after placement, abutments were attached to the implants (Figure 26), stabilizing the prosthesis (Figure 27 and Figure 28) and reducing stress on the remaining teeth. This minimally invasive approach, using strategically placed short implants, adequately addressed the patient’s chief complaint and avoided hospitalization and a prolonged staged treatment.

DISCUSSION
Ideally, implant treatment must be cost-effective, short in duration, simple in procedure, and highly predictable.22 The ability to achieve long-term success with all implants is intrinsically related to the amount of surface area of the implant contacted to bone.30 The quality of the bone–implant interface encompasses multiple factors, including bone quality and the length, diameter, surface properties, shape, and design of the implant.31 The addition of a roughened surface texture to machined threads is known to enhance overall clinical performance, especially in areas of reduced bone density such as that found in the posterior maxilla.32 It is believed that the surface irregularities ensure a firm contact with the blood clot allowing primitive cells to migrate to the interface, differentiate to osteoblasts, and form bone directly on the surface.33 Modifications of the implant surface features, such as etching, blasting, and increasing porosity, improve the retention between the implant and the bone by enlarging the contact surface area, thus increasing the biomechanical interlocking between implant and bone.32,34 These enhanced osseointegrative surfaces increase the bone-to-implant contact, effectively reducing the length of the implant previously necessary to successfully function under occlusal load generated in the posterior alveolus. The improved bone-to-implant contact in the minimal residual bone along with preser-
mentation procedures where necessary would make great strides toward the achievement of this lofty goal. This approach has been eagerly accepted and successfully applied in the author’s clinical practice, broadening the referral base and increasing implant availability for even the most reluctant dentists and patients.

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REFERENCES


