



A Peer-Reviewed Case Report

Improving Patients' Quality of Life

Implant-retained dentures with minimal bone volume

Robert C. Vogel, DDS



ABSTRACT

Implant-retained dentures offer significant functional, psychologic, biologic, and systemic health benefits when compared to conventional dentures. Factors that limit patients from obtaining this treatment include lack of adequate bone volume, general health, and finances. The use of a small-diameter implant designed specifically for this application can minimize the need for augmentation, decreasing invasiveness and cost, and resulting in an improved overall quality of life.

Implant-retained dentures offer significant functional, psychologic, biologic, and systemic health benefits when compared to conventional dentures.^{1,2} An evaluation of the current literature in implant dentistry reveals a heavy bias toward fixed restorations, biologic factors, grafting, and the use of new technologies and materials. However, sometimes a different set of factors can shift one's perspective, such as while treating a young, fully edentulous patient with limited horizontal bone as well as limited resources. These factors (as well documented in the McGill consensus)³⁻⁵ are improved emotional, psychologic, and systemic health resulting in an overall improved quality of life.⁶ This was achieved though providing an implant-retained denture to someone who was miserable due to an inability to obtain functional, esthetic teeth. This patient's emotional status and daily activities of life were significantly compromised due to edentulism.

The recent introduction of the Straumann® RidgeFit implant has greatly expanded the population of patients that can be provided with an improved quality of life by minimizing the need for bone augmentation while providing a significantly stronger small-diameter implant with

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high biocompatibility. This is achieved with a 2.4-mm diameter one-piece Tissue Level Roxolid SLA implant. Higher fatigue strength (approximately 22%) and level of biocompatibility is provided through the use of Straumann Roxolid material (a titanium zirconium alloy).^{7,8} The SLA (micro-roughened sand blasted large grit acid-etched) surface on the threaded portion of the implant provides well-documented high, consistent survival rates over the long term, along with low prevalence of peri-implantitis.⁹⁻¹⁵

Having used tissue-level implants since the late 1980s, clinicians have come to truly appreciate the biologic advantage of a highly polished transmucosal collar, especially in a fully edentulous ridge. Consistent findings include a snug adaptation of the mucosal tissue with a lower affinity of plaque accumulation, along with long-term soft tissue stability.¹⁶⁻¹⁷ A tapered apical tip allows

for under preparation of the osteotomy and higher primary stability.¹⁸ Further advantages of this design are the use of only 1 or 2 drills based on bone density and immediate removable fixation of the overdenture if primary stability is achieved, with a 35 Ncm insertion torque (ifu.straumann.com). Although allowing for less invasive procedures when patients present with minimal horizontal bone volume, the available lengths of 10, 12, and 14 mm maximize the advantage of available vertical bone.

Of course, all this would be academic without an ideal means of prosthetic retention. The restorative head of the RidgeFit implant is a titanium nitride-coated connection with PEEK inserts in a low-profile titanium housing. The "Optiloc" connection allows for low friction between the matrix and abutment, providing excellent wear resistance. Wear is further reduced by a split ring design of the PEEK inserts to minimize distortion as they flex over the height of contour of the abutment to engage an overcut.¹⁹ The ideal level of retention is achieved through the available six retentive strengths of the PEEK inserts, ranging from approximately 300 g to 2550 g. New restorative instrumentation is streamlined and allows for simple chair-side replacement of inserts in seconds. Reduced wear of abutments and inserts, along with simple chairside maintenance, helps to reduce long-term cost factors. The presence of dental implants is not only to provide retention of the prosthesis, but also to aid in preservation of bone and reduction of mucosal irritation.²⁰ The net result of these findings is a reduction in the need for prosthetic adjustments, relines, and remakes.²¹

The RidgeFit implant has expanded the level of care for patients who previously were not able to be treated with a definitive long-term option due to limited bone volume, health limitations restricting more aggressive surgical procedures, and financial concerns; it also allows for immediate function. Patient acceptance of treatment has increased by minimizing the need for augmentation procedures, allowing more patients an improved quality of life. Studies have



ROBERT C. VOGEL, DDS

Private Practice
Palm Beach Gardens, Florida

Fellow
The International Team
for Implantology

Fellow
International College
of Dentists

Fellow/Director
Academy of Osseointegration

also documented the cost effectiveness of implant overdentures when compared to traditional dentures.²²

Most authors have focused on publishing about implant-retained dentures in the elderly population. The overwhelming positive impact implant-retained dentures has on this population is well documented. Presenting a younger patient in this article demonstrates the profound impact this treatment had on her emotional, psychologic, and systemic health.

Case Report

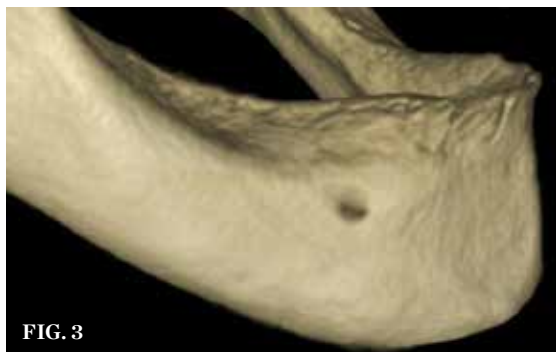
Danielle is a healthy 35-year-old female taking no medications who is fully edentulous due to extractions starting at age 16 secondary to advanced decay, sporadic dental care, and limited family finances (Figure 1 and Figure 2). Imaging of her mandible revealed a severe “knife edge” residual ridge with minimal horizontal bone volume (Figure 3 and Figure 4). While a significant advantage of a small-diameter implant is the ability to be placed without a flap, this was not the case due to Danielle’s resorptive

pattern. Recontouring of the ridge crest was necessary to place any implant due to the extreme “knife edge” (Figure 4). An alveoplasty was performed to obtain a more ideal ridge form and crestal contour (Figure 5). The vertical volume of bone allowed for placement of 12-mm implants. The benefit of this tissue-level implant with a highly polished emergence collar (transmucosal cuff) is the elimination of the need for second stage or uncovering surgery. A further advantage of this design is that it allows for ideal epithelialization to simplify home care, even with minimal keratinized tissue.^{16,17}

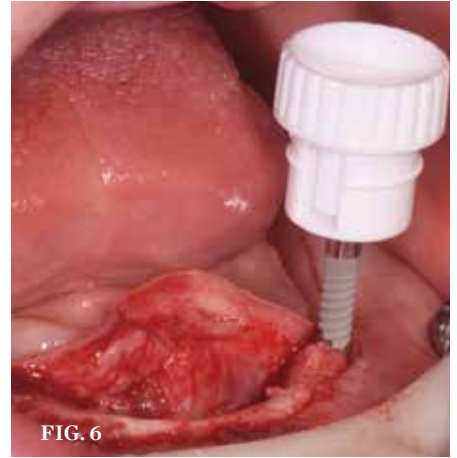
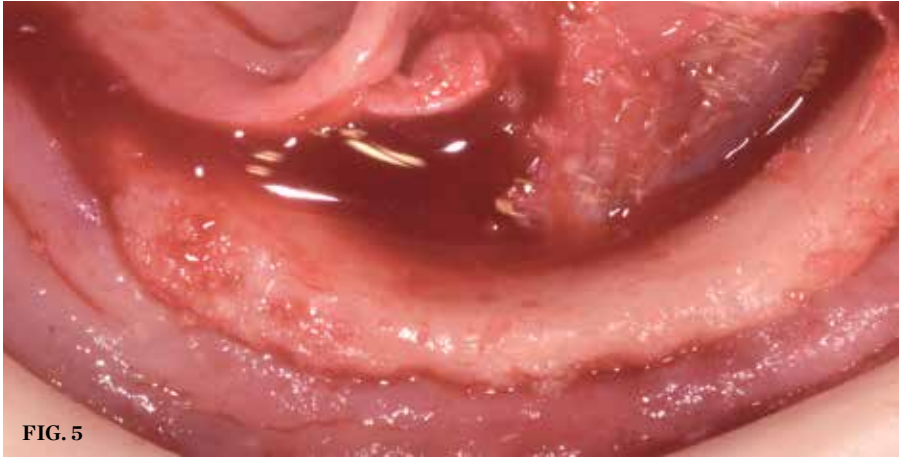
After recontouring the ridge crest, placement of the RidgeFit implant was accomplished manually with the attached insertion device and brought to the ideal position with the use of a torque control device so the rough SLA surface terminated at the crest of the bone (Figure 6 through Figure 8). There is also an instrument to place the implants with a handpiece if desired. Following primary closure with 3-0 chromic

gut interrupted sutures, the highly polished collar of this tissue-level design emerges through the soft tissue to allow for healing and emergence of the prosthetic platform (Figure 9 and Figure 10). This implant is approved for immediate function. However in Danielle’s case the decision was made to delay loading due to the alveoplasty and need to fabricate a new prosthesis.

During the 8-week healing period her existing prosthesis was hollowed out over the anterior ridge, and buccal borders were reduced to minimize uncontrolled loading. Impressions were made with a border molded custom tray (Easy-Tray) and PVS (V-Posil putty and light body wash, VOCO) (Figure 12). In overdenture fabrication, this author places a “processing spacer” on the abutment at the time of the impression to create a recess in the denture in the ideal position, allowing for chair-side curing of the housings (Figure 11 through Figure 13).²³ The importance of the recess having adequate dimension both vertically and circumferentially



(1. AND 2.) 35-year-old edentulous female at time of initial presentation. **(3.)** Imaging of mandible reveals minimal bone width at the crest. **(4.)** Surgical exposure of mandible at time of implant surgery prior to vertical reduction of “knife edge” ridge.

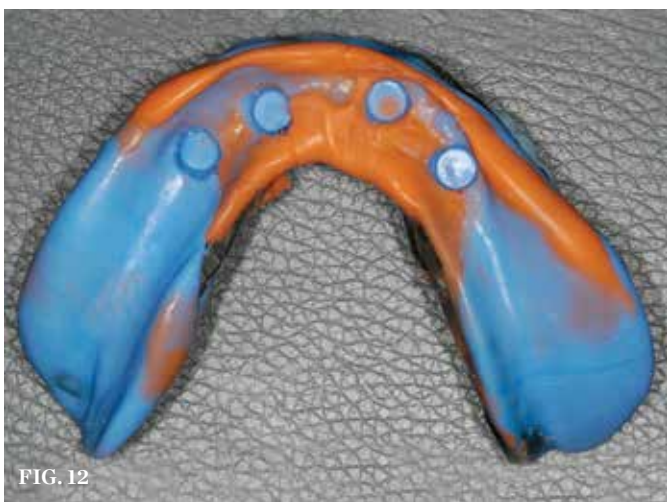
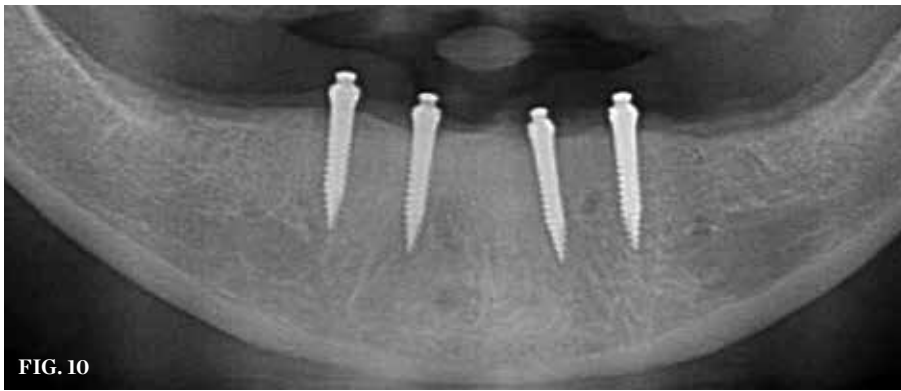


(5.) Alveolus after reduction and contouring. (6.) Initial insertion of RidgeFit Implant following osteotomy preparation. (7.) Continued placement of implant with torque driver adapter in place. (8.) Placement of rough surface at level of osseous crest. (9.) Soft tissue adapted to the highly polished transmucosal portion of the implant.

is to ensure that the final prosthesis is implant retained but tissue supported. A risk of inadequate space in the denture is that the appliance will rest on the implants and not the soft tissue. This situation will cause premature problems with the abutments. Curing the housings chairside allows the patient to bite in centric with “light to medium” force, creating some level of mucocompression and intimate contact between the residual ridge and intaglio surface of the denture. It is important to note that if a clinician is not comfortable curing overdenture housings into the prosthesis chairside,

there are impression matrix and laboratory analogs available for processing in the laboratory. Three housings are available for the RidgeFit system (Figure 14). One preference is to use a housing that allows the greatest amount of undercut for increased retention in the denture. The available elliptical design provides lateral wings for increased retentive area (Figure 15 and Figure 16). While acrylic (methyl methacrylate) has historically been used to cure housings into dentures, the introduction of several composite (bis methacrylate) materials offer the advantages of reduced exothermic

reaction, odor, dimensional change, and porosity. One of these materials (Quick Up, VOCO GmbH) was used to secure the Optiloc housing into the denture. With any overdenture procedure, it is important to eliminate peri-implant areas into which excess material can flow. This is accomplished through the use of the white mounting collar placed under the housing (Figure 17 and Figure 18). It is also the author’s preference to place small vent holes in the appliance prior to curing the housings chairside to allow for escape of excess material (Figure 19). Once cured, the appliance was removed,



(10.) Immediate postoperative image of four 2.4 mm x 12 mm RidgeFit implants. **(11.)** Processing caps placed on abutments in preparation for overdenture impression. **(12.)** Custom tray border molded PVS impression. **(13.)** Final prosthesis ready for chairside curing of Optiloc overdenture housings. **(14.)** Optiloc housings available.

and any voids were filled in (Figure 20). The patient was then instructed in insertion, removal, and hygiene of the appliance. If a different level of retention is desired, the Optiloc PEEK inserts are available in six levels of retention (Figure 21) and are quickly removed and replaced chairside with one compact instrument (Figure 22 and Figure 23) for most ideal function and comfort of the patient (Figure 24).

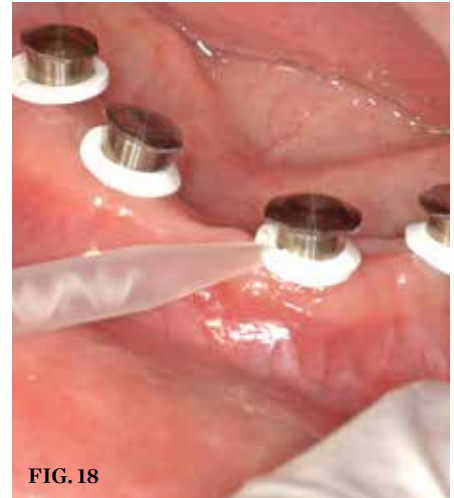
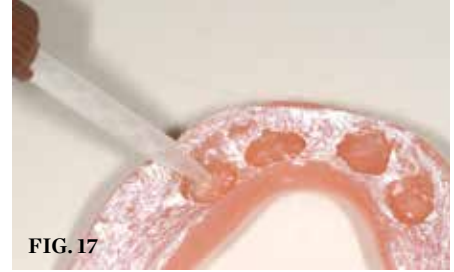
Conclusion

The multitude of functional, psychologic, and systemic health benefits realized from implant-retained dentures allows clinicians to improve patients' overall quality of life. The introduction of Straumann's RidgeFit 2.4-mm diameter implant expands the patient population that can obtain these benefits with reduced invasiveness (when augmentation was necessary in the past) while

offering a stronger, more biocompatible long-term solution. 🌟

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(15.) 8-week healing of RidgeFit implants with well epithelialized tissue free of inflammation. **(16.)** Optiloc elliptical housings in place with white mounting collars to eliminate potential undercuts and stabilize housing during intra-oral processing into denture. **(17.)** Composite material (Quick Up, VOCO GmbH) placed into pre-set recesses in denture. **(18.)** Composite being placed under the wings of elliptical housing to increase retention in the denture. **(19.)** Patient in full occlusion with light-to-medium bite force while composite cures Optiloc housings into denture. **(20.)** Housings cured into denture immediately upon removal from patient's mouth. **(21.)** Optiloc PEEK inserts ranging from extra light to extra strong. **(22.)** Instrument for insertion and removal of PEEK inserts. **(23.)** After a trial period, distal inserts were replaced with higher retentive value to minimize anteroposterior tripping when biting anteriorly into harder foods. **(24.)** Patient 3 months after initial presentation for treatment.

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FIG. 22



FIG. 23



FIG. 24

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