

Improving Existing Dentures With Mini Implants

Idealizing a Knife-Edged Mandibular Ridge



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INTRODUCTION

Mandibular dentures have historically been one of the most unpredictable and unsatisfactory dental restorations. Regardless of the expertise of the dentist, patient anatomy and muscular function often work against the stability of a lower denture. The old dental saying that “the most important part of mandibular denture fabrication is that the denture fit the patient’s shirt pocket or purse” is not far from the truth. Quality-of-life issues such as difficulty chewing, fear of the denture falling out, and the resultant avoidance of social settings are all genuine concerns to denture wearers, and can result in the denture spending more time on a bathroom counter than in the patient’s mouth. When we also keep in mind the demographic of potential denture wearers—generally senior citizens and those of older age¹—the importance of a comfortable, well-fitting denture becomes apparent, not just in social contexts, but in giving patients the ability to confidently enjoy, and not avoid, the crunchier, nutritious foods essential to health.

Traditional implants can serve as a viable solution for patients presenting with den-



Figure 1. Patient with ill-fitting lower denture.



Figure 2. Knife-edged mandibular ridge with a “lip.”

are similar. Although tooth loss—and full edentulism—is on the decline in the United States,¹ more than 20% of Americans remain edentulous³ and may approach their dental providers seeking a solution.

Background

Some mandibular ridges do not require alteration to receive SDIs. It is the author’s experience, however, that a high percentage of lower ridges do require alteration to successfully accommodate even these smaller implants. Most of the alteration is needed because of a pre-existing “knife edge” ridge, as is the case with the patient shown in this article. SDIs can be placed in as little as 3 to 4 mm of facial-lingual bone width,^{4,5} and at least 1.0 mm of bone should surround the SDI for successful osseointegration. As such, a knife-edge ridge must be flattened and/or bone grafted at the time of placement. Note that traditional implants can be placed in approximately 6 mm of mandibular bone facial-lingually, and both SDIs and traditional implants generally need 10 mm of bone height in the coronal-apical direction.^{4,5}

Forthcoming will be the first in a series of articles detailing (1) idealizing a knife edge ridge, placing SDIs, and relining/retaining an existing denture; (2) idealizing a knife edge ridge, placing SDIs, bone grafting/membrane placement, then fabrication of a lower denture; (3) extraction of mandibular anterior teeth, modifying the interproximal bone,

then immediate placement of SDIs in the interproximal bone followed by bone grafting/membrane placement, then fabrication of a lower denture; (4) placement of SDIs in a mandibular ridge with minimum vertical bone height; (5) SDI denture stabilization in the maxillary arch; (6) technique for relining dentures that contain implant housings; and (7) SDI utilization for removable partial denture stabilization.

CASE REPORT

Diagnosis and Treatment Planning

A 70-year-old male in good health with an unremarkable medical history presented with pre-existing maxillary and mandibular full-arch dentures. He was a retired university professor and stated that he had retired earlier than he would have liked because of the instability of his lower denture (Figure 1). He reported that he was constantly fearful that the denture would “rise up” when he was speaking, and that he seldom laughed anymore because the lower denture had actually fallen out of his mouth once when he was laughing. He was generally pleased with the occlusion and aesthetics of the existing dentures, and vertical dimension with the dentures in place was acceptable.

The anterior mandibular arch had adequate bone height for SDIs but was knife-edged with a mesial lip (Figure 2). It was determined that SDIs could be placed in the lower

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ture instability and retention concerns; however, overall expense, fear of surgery, and expected healing time associated with this option may make the procedure unpalatable for many older patients.² Small-diameter implants (SDIs; also called mini-dental implants, or MDIs), however, are a reasonably simple, easily learned, predictable, and less expensive alternative to stabilize dentures and provide the comfort, functionality, and confidence patients are seeking. Notably, a recent literature review by Sohrabi et al² demonstrates that the survival rates for SDIs versus traditional, standard-width implants

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arch with ridge modification. The existing lower denture would be modified and relined to accept the SDIs. The patient was presented with this plan and eagerly consented to our suggested course of treatment.

Clinical Protocol

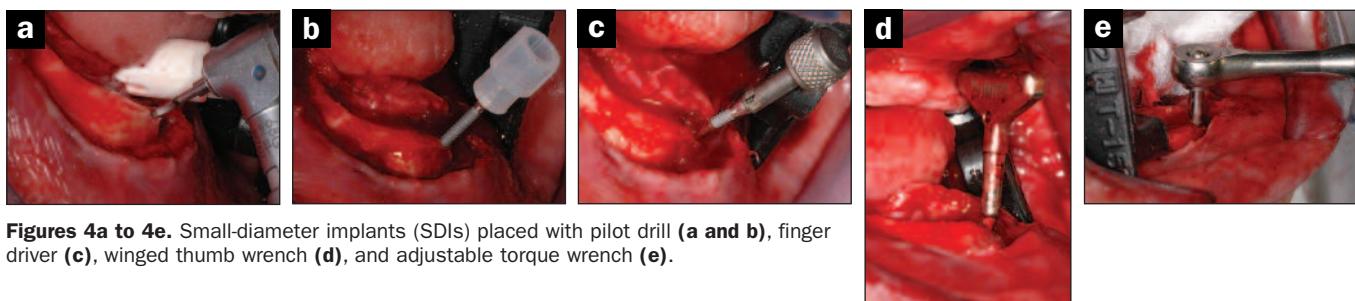
An incision was made with a 15 Bard-Parker blade along the crest of the mandibular anterior ridge from cuspid to cuspid. The incision was extended apically in the first bicuspid area. Care was taken to avoid the inferior alveolar nerve exiting the mental foramen. A full-thickness gingival flap was reflected apically along the entire anterior arch, exposing the underlying alveolar bone. The knife edge/alveolar lip of coronal alveolar bone was flattened with a coarse football diamond bur (No. 5379 023 [Brassler USA]) and rongiers, creating a flat surface for SDI placement (Figures 3a to 3c). Either high- or low-speed handpieces can be used with the football diamond. If a high-speed handpiece is used, high water volume and very light pressure should be applied. A vacuum-formed shim may be used to guide SDI placement, but it is not necessary if the clinician is comfortable visualizing implant alignment. It is sometimes difficult to utilize a prefabricated shim for implant placement following ridge modification. The SDIs do not have to align exactly with each other. SDIs and the corresponding housings are designed to allow up to 15° of alignment variation in each SDI.

Five 1.8 mm x 13 mm SDIs (MDI Mini Dental Implants [3M ESPE]) were placed in the flattened mandibular ridge anterior to the mental foramen. Current practice and dental literature indicate that it is acceptable to complete a mandibular denture stabilization procedure using 4 SDIs;^{5,6} however, we chose to utilize 5 implants in this patient for additional stability. The mental foramen may be located by palpation or radiographically with gutta-percha cones taped to a mandibular, 0.020-inch vacuum formed stent. The most posterior implant should be placed at least 7.0 mm anterior to the mental foramen. Up to 60% of mandibles have an "anterior loop" 1.0 to 5.0 mm to the mental foramen. Each implant should be placed at least 7 mm apart to make room for the housings.^{5,7}

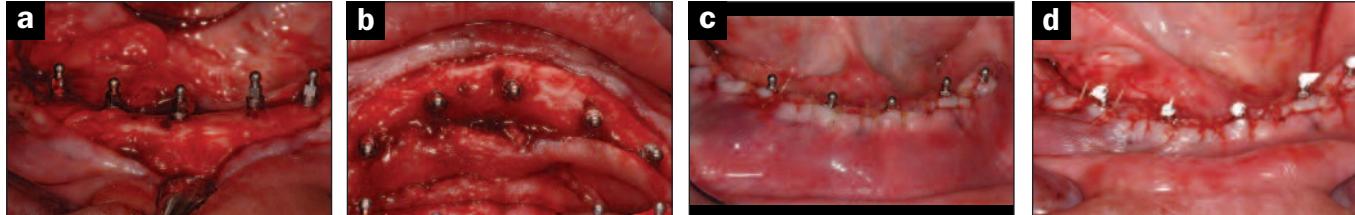
Once ideal implant sites are determined, small indentations are made



Figures 3a to 3c. Full-thickness gingival flap reflected (a); knife-edge ridge flattened and coronal-facial "lip" removed (b and c).



Figures 4a to 4e. Small-diameter implants (SDIs) placed with pilot drill (a and b), finger driver (c), winged thumb wrench (d), and adjustable torque wrench (e).



Figures 5a to 5d. Five SDIs (MDI Mini Dental Implants [3M ESPE]) in place and the soft tissue sutured.

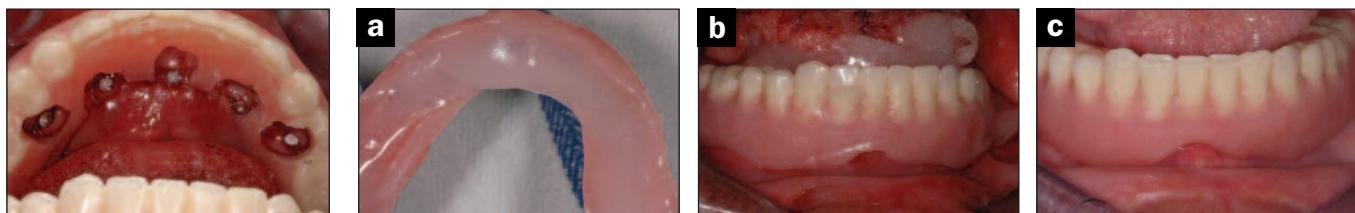


Figure 6. Existing denture marked and adjusted to passively receive SDIs.



Figures 7a to 7c. Denture then relined with soft liner.



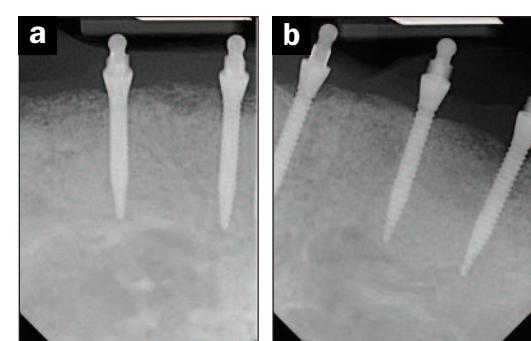
Figures 8a and 8b. Clinical view of SDIs after 3 months of passive osseointegration and soft-tissue healing.

in the cortical bone with a No. 4 round bur. These indentations prevent the pilot drill from sliding. Pilot holes are drilled through the cortical plate approximately one fourth to one third the length of the threaded implant (about 3 to 4 mm in this case). On a slow-speed contra angle handpiece, the pilot drill is moved up and down with high water flow to avoid burning the bone (Figure 4a).

The SDIs are initially inserted with the plastic lid of the implant, continuing with a finger driver, then a winged thumb wrench, and, finally, the torque wrench set at 30 Ncm (Figures 4b to

4e). It is important to note that the SDI should not be screwed completely to place with the finger driver. If that occurs, that implant should be removed and another implant site chosen. So long as the winged thumb screw is needed to screw the SDI to place, the implant success rate is very high.

The reflected periodontal flap is sutured passively with either 4-0 gut or 5-0 polypropylene (Prolene [ETHICON 360]) suture. Prolene is not absorbable or dissolvable; if used, it must be removed in 2 weeks. Figures 5a to 5d show the 5 implants in place,



Figures 9a and 9b. Radiographic views also shown.

with the soft tissue sutured.

The existing mandibular denture is marked and adjusted to passively receive the SDIs (Figure 6). The SDIs do not touch the acrylic denture while the gingival tissue is healing. The denture is lined with soft conditioner/reliner material (Lynal Tissue Conditioner and Temporary Reliner [DENTSTPLY Caulk]) (Figures 7a to 7c). The implant holes in the soft liner are opened with a No. 8 round bur so there is minimal pressure on the implants for the first 2 to 3

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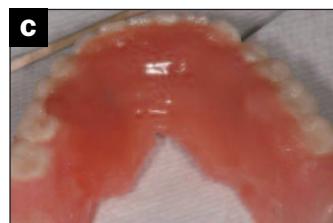
Figure 10. SDI housings with rubber separators in place.



Figure 11. Existing denture adjusted to passively receive SDIs with housings.



Figures 12a and 12b. IMTEC Secure Hard Pick Up Kit (3M ESPE) (a) with IMTEC Secure Dispensing Gun (3M ESPE) (b), which were used in this case.



Figures 13a to 13d. Existing denture relined and SDI housings “pulled” with hard liner pick-up material.



Figures 14a to 14c. Excess pick-up material is removed, and the denture is polished and securely seated.

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months of integration. The housings are not installed with hard reline material for 2 to 3 months. If 30 Ncm of torque is achieved upon implant seating, then the housings may be placed and the implants loaded immediately. In a case such as this one, soft-tissue healing of at least 6 weeks should be allowed prior to housing placement with hard reline material.

Following passive osseointegration and gingival healing in 2 to 3 months (Figures 8a to 9b), the soft liner material is removed and housings are placed in the lower denture to attach to the implants (Figures 10 and 11). IMTEC Secure Hard (3M ESPE) acrylic pick-up material is used to reline the lower denture and pick up the housings (Figures 12a and 12b). Once the pick-up material is set, the acrylic is trimmed and polished.

In the case presented here, the patient was completely satisfied with the implant procedure and reports excellent mandibular denture stability (Figures 13a to 13d). He stated that he probably would have continued teaching 5 to 10 more years if he had gotten SDIs placed initially.

DISCUSSION

We chose IMTEC Sendax MDI Implants for their reasonable cost and efficiency in placement; our experience also indicates that patients seem to tolerate them well and that they stand the test of time, making them ideal for denture stabilization. IMTEC Secure hard-pick up kit is free of methyl methacrylate and generates a smooth surface upon placement, allowing for additional layers if needed. Also, the reliner/tissue conditioner (Lynal) is an effective self-curing temporary liner that we have used successfully in our clinical practice.

As previously mentioned, SDIs can serve as an efficient and lower-cost solution for mandibular denture stabilization when compared to traditional implant procedures. While conventional implants generally require at least 6 mm of facial-lingual bone width for successful placement and osseointegration, their smaller diameter counterparts are ideal for narrower spaces. SDIs' ability to be placed in as little as 3.0-4.0 mm of facial-lingual bone width forgives the bone and ridge resorption commonly found in elderly patients as well as the fully edentulous population. Additionally, a minimally invasive procedure and the reduced healing time associated with

an SDI procedure appeal to those who are fearful of extensive surgeries or prolonged recoveries.

Further advantages include easy replacement of the implant if it is lost, and simple housing pick up and denture relining when needed. SDI placement is easier versus traditional implant procedures, as SDIs and the corresponding housings are designed to allow up to 15° of alignment variation. Finally, and importantly, there is a reduced chance of damage to the inferior alveolar nerve, as the procedure requires only 3 to 4 mm of drilling (through the cortical plate).

For all of their advantages, though, it is important to note that SDIs are contraindicated in certain patient populations, including smokers, severe bruxers, those with later stage diabetes, and those who are taking bisphosphonates for the treatment of osteoporosis, other bone-related diseases, as well as certain cancers. Of course, prior to the initiation of any treatment plans, patients should be fully evaluated and fully informed of the suggested course of treatment. A complete medical history should be taken to ensure that the patient is physically and psychologically able to understand and tolerate the procedures involved, and signed

consent forms should be kept on file.

CLOSING COMMENTS

For edentulous patients seeking a more stable denture and a better quality of life, SDIs can serve as a lower-cost, effective, minimally invasive solution. They allow denture stabilization with a reduced recovery time and reduced risk of nerve damage, and can serve as an ideal solution for an otherwise frustrated patient population. Through surgically flattening our patient's knife-edged ridge, and the use of SDIs, we were able to provide him not just a stable denture, but increased confidence and a better quality of life (Figures 14a to 14c).♦

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