GUIDED BONE LEVELING FOR OPTIMUM IMPLANT RESULTS

by Ara Nazarian, DDS, DICOI

Dental implants have been successfully used to restore edentulous mandibles with implant-supported fixed bridges, hybrid prosthetic dentures and removable overdenture prosthetics. However, many completely edentulous patients desire a fixed restoration rather than a removable prosthesis. A fixed restoration provides the psychological advantage of acting and feeling similar to natural teeth, whereas an overdenture, even if fully implant supported, remains a removable prosthesis.[1] This article focuses on the techniques implemented when restoring a patient with a fixed lower bridge supported by implants.

A female patient presented to the office with an existing set of dentures that were about 23 years old. Her chief complaint was that her mandibular denture was very loose and painful, even though it had been relined multiple times over several years.

The patient was evaluated preoperatively with respect to jaw size, bone quality and volume, jaw relations, maxilla-mandibular distance and occlusion. Preoperative analysis of the anatomic conditions was performed with a CT scan (i-CAT). Upon clinical examination and radiographic interpretation, the anterior mandibular ridge had severe undercuts (Fig. 1) as well as posterior bone loss that would prevent dental implant placement without extensive block grafting. She had already consulted with other dentists and specialists about dental implant options prior to presenting to my office, but was not satisfied with the treatment duration and prognosis regarding block grafting. Although block grafts (and other non-block grafts) represent the accepted treatment standard for fortifying or augmenting bone tissue, there is another method for creating a foundation of adequate width and contour that many

1. Contemporary Implant Dentistry, Third Edition. Carl E. Misch. Mosby. Pages 327-364. 2008.

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Fig. 1

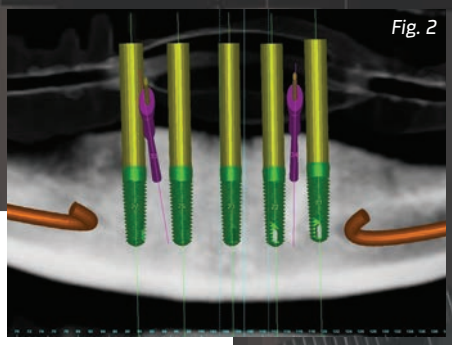
Fig. 2

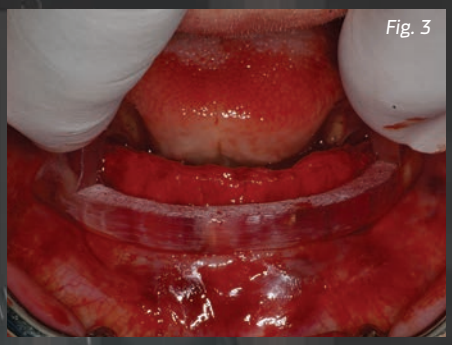
Fig. 3

Fig. 1: Pre-operative view depicting irregular ridge
Fig. 2: Virtual 3D treatment plan and CBCT sccan
Fig. 3: Bone level guide inserted

dentists may not be completely aware of yet that is taught in some of today's popular post-graduate training programs.

My consultation with the patient focused on the advantages of having the ability to restore the lower arch with implants and a fixed cantilever bridge after bone leveling. Some of the advantages included less extensive surgery, shortened treatment time and reduced cost. Once the patient was educated about these advantages, she quickly agreed to the proposed treatment plan, which included fabrication of a new upper complete denture, alveoplasty of the mandibular ridge, and placement of five dental implants with a cantilevered fixed bridge.

The arch form and the position of the mental foraminae are important criteria when placing implants in the anterior segment to replace the entire mandibular arch. The anterior arch form and foraminae position affects the position of the distalmost implants and the anterior arch form (square, oval or tapering) is relative to the anteriomost implant position. The distance from the center of the most anterior implant to a line joining the distal aspect of the two most distal implants on each side is called the "A-P Distance" or the "A-P Spread." The greater the A-P Spread, the further the distal cantilever may be extended to replace the missing posterior teeth.[1]

The most common number of implants used today in the Branemark treatment option is five. This number allows as great an A-P Spread as six implants, with greater inter-implant distance, so that if bone loss occurs on one implant, the loss would not automatically affect the adjacent implant site."[1] As a general rule, when five implants are placed in the anterior mandible between the foramina, the cantilever should not exceed 2.5 times the A-P Spread with all other force factors being low.

Before the surgical appointment, a CBCT scan (Fig. 2) was taken to accurately treatment plan this case to make certain no complications would arise from doing the guided bone leveling procedure and dental implant placement at the same time. SimPlant software (Materialise Dental) was used through 3D Diagnostix virtual assistance to precisely plan the placement of five Engage (OCO Biomedical) dental implants in the mandibular arch after bone leveling. A bone leveling guide as well as a pilot implant guide were fabricated from Materialise in developing the most stable configuration of implants possible and, as demonstrated in this case, define the amount of and location of, leveling to create a uniform modified ridge.

Engage dental implants were selected because I have personally experienced their high implant stability at placement, which is a critical success factor during the early healing process of osseointegration with these types of cases. The Engage implant body creates a tapping pattern when threaded for an enhanced mechanical lock in the bone. Other dental implant systems with aggressive threading may include but are not limited to: Nobel Active (Nobel Biocare), Seven (MIS), ETIII (Hiossen), I5 (AB Dental USA) and Any Ridge (Megagen).

The patient was anesthetized and a full thickness flap reflected using a mucoperiosteal elevator. Soon afterwards, the floor of the mouth was temporarily sutured to ensure it would not be traumatized by the bone-leveling bur during reduction. The bone level guide was inserted onto the mandible and inspected to insure complete seating (Fig. 3). Once stable, bone was reduced through the bone leveling guide using a surgical handpiece and bur with the Aseptico surgical motor (AEU 7000) at a speed of 1,200rpm with copious amounts of sterile saline (Fig. 4).


Fig. 4 Bone reduced to level of guide

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Fig. 5

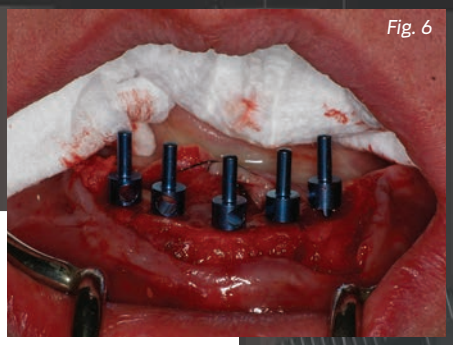
Fig. 6


Fig. 7

Fig. 5: Bone reduced to level of guide
Fig. 6: Paralleling pins
Fig. 7: Engage dental implant

Once the bone level guide established an optimal level of bone, the pilot implant guide was seated and secured with retention pins (Fig. 5). Using the pilot surgical guide provided by 3D Diagnostix, the sites for the implants were begun with a 1.95mm longstop pilot drill.

Paralleling pins were placed in the sites of the osteotomies to confirm the accuracy of the surgical guide (Fig. 6) and X-rays were taken to check the angulations of the pins within the mandible. Once the osteotomies were complete, an implant finger driver was used to place the dental implants, until increased torque was necessary (Fig. 7). The ratchet wrench was then connected to the adapter and the implants torqued to final depths reaching a torque level of about 40-50Ncm.

Extended healing caps were hand-tightened to the implants. A post-operative radiograph was made of the implants and the healing caps to ensure complete seating (Fig. 8). The lower denture was soft relined with a silicone based soft denture relining material Ufi Gel Soft (VOCO America). By using the extended healing caps with the soft reline, the immediate dentures were much more retentive. The soft tissue and implants were evaluated clinically after one week. The patient stated she had very little post-operative discomfort or swelling.

Approximately nine weeks after the initial placement of the dental implants, the patient returned for the definitive porcelain fused to metal restoration impressions. Adequate implant osseointegration was verified using an Osstell ISQ implant stability meter (Osstell), which uses resonance frequency analysis (RFA) as a method of measurement (Fig. 9). Several studies have been conducted based on RFA measurements and the implant stability quotient scale. They provide valid indications that the acceptable stability range lays above 55 ISQ.

Using impression posts, full arch impressions were taken using Instant Custom C&B Trays (Goodfit). These custom trays can be adapted and fitted in minutes, eliminating the need for models, light cure materials, monomers and extra laboratory time in custom impression tray fabrication, because they are made of a material (PMMA) that becomes adjustable when heated and maintains its shape while cooling. Once molded for the patient, an access window was created to take an open tray impression (Fig. 10) and full arch impressions were taken using a polyvinylsiloxane impression material (Take 1 Advance by Kerr). Bite relations as well as instructions for size, shape and color for the full arch fixed restoration was forwarded to the dental laboratory.

Fig. 8: Post-operative panorex

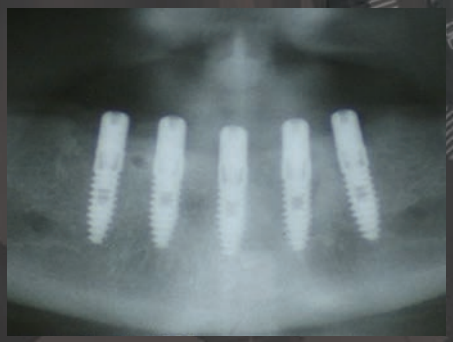

Fig. 9: Osstell recording of implant

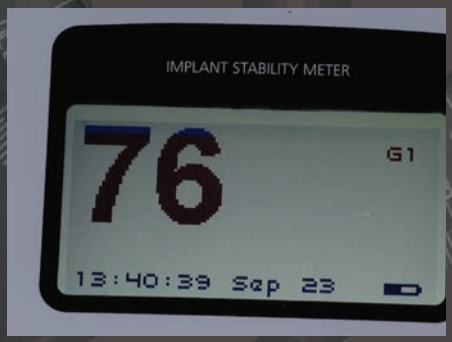

Fig. 10: Goodfit custom tray

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Within a couple weeks, the custom abutments and final bridgework were forwarded to the dental office. The custom abutments were inserted and torqued to 25Ncm (Fig. 11). The access openings were sealed with some cotton and Temposil cement (Coltene Whaldent).

The patient was very satisfied with the look of her fixed bridge restoration and approved them for final cementation. The crown restorations were seated with Premier Implant Cement. Premier Implant Cement is a non-eugenol resin cement that features a unique, two-stage cure that makes seating the restoration and removing excess cement a quick and simple process. The rigid final set and low solubility in oral fluids provide an excellent marignal seal and superior retention. The overall health and structure of the soft tissue and restoration was very good (Fig. 12). The patient was very pleased with the restorations and her new enhanced smile.

The advent of cone CT scans and 3D treatment planning software has not only improved yesterday's dentistry, it is responsible now for the development of treatment plans that would not otherwise be available today. Time-honored concepts of trial and error and wait and see dentistry is rapidly becoming a historical event within the dental profession. More importantly, virtual planning is within the reach of nearly any dentist or specialist. In addition, 3D dentistry does not automatically determine that treatment costs will be higher. As in this case, it was used to create a mandibular reconstruction treatment plan that cut costs by 30 percent and made it immediately affordable for the patient. ■

Fig. 11: Custom abutments

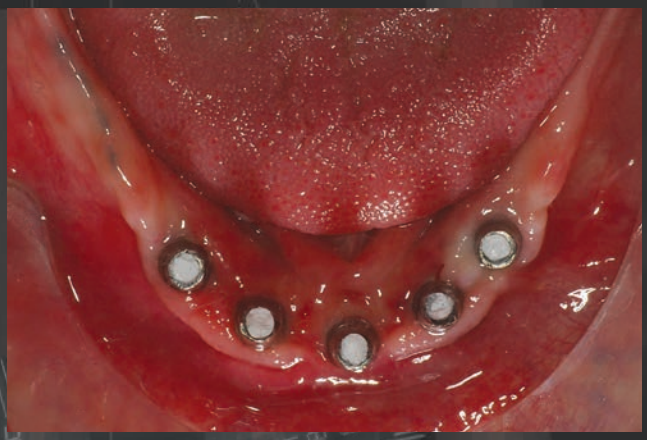

Fig. 12: Fixed full arch restoration

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Do you have any questions for Dr. Nazarian? Visit Dentaltown.com/magazine.aspx and let him know.

Author's Bio

Dr. Nazarian maintains a private practice in Troy, Michigan, with an emphasis on comprehensive and restorative care. He is a Diplomate in the International Congress of Oral Implantologists (ICOI). His articles have been published in many of today's popular dental publications. Nazarian is the director of the Reconstructive Dentistry Institute. He has conducted lectures and hands-on workshops on aesthetic materials and dental implants throughout the United States, Europe, New Zealand and Australia. Nazarian is also the creator of the DemoDent patient education model system. He can be reached at 248-457-0500 or at www.aranazariandds.com.