Rehabilitation Of Hopeless Dentition In The Mandible With The Tapered Navigator® System For CT Guided Surgery

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Computed Tomography (CT) guidance technology has transformed dental implant treatment planning, surgery, provisionalization and definitive restorations to allow for more consistent and predictable prosthetic outcomes. The utilization of planning software allows clinicians to better understand realistic three-dimensional, patient-specific anatomy and relate it to a desired prosthetic outcome before surgical intervention. This technology allows all team members to understand surgical performance standards which must be met and are based on the desired prosthetic outcome. This paradigm shift in implant therapy is true "collaborative accountability" for all treating team members and, perhaps most importantly, provides an atmosphere of complete disclosure for the patient prior to commencing with treatment. CT guided technology has revolutionized implant dentistry and may be considered the emerging standard of care.

The BIOMET 3i™ Tapered Navigator® System for Guided Surgery is the latest technology within the "totally guided" CT surgical arena in which osteotomy-site preparation and implant delivery are controlled through a single surgical guide. The system also provides users open architecture planning-software compatibility to allow clinicians to work with their preferred software program and surgical guides. The Tapered Navigator® System is designed for accuracy and precision of CT guided therapy when placing BIOMET ***3i*** Tapered Implants. In many instances, the Navigator® Surgical Guide also provides the opportunity to fabricate a master cast presurgically and subsequently, an aesthetic, functional, laboratory-processed provisional restoration for immediate seating at the time of implant placement with minimal chairside adjustment.

The following clinical presentation demonstrates the treatment of a 62 year old Caucasian male patient who presented with generalized advanced chronic periodontitis as well as multiple biological, biomechanical and structural dental compromises (Figs. 1-3). Several treatment plans were developed. Facing an imminent total joint replacement, the patient opted for extraction of all remaining natural mandibular teeth with simultaneous placement of five interforaminal implants to support an immediate provisional prosthesis. The major advantage of this treatment plan, was that it allowed the patient to avoid wearing a removable appliance, resolved oral infection, and positioned him for proper nutrition before, during, and after orthopedic surgery. The existing tooth positions allowed for a prosthetically satisfactory final outcome, and therefore, no scanning appliance was needed. CT scan imaging of the mandible was performed and was formatted to computer software for three-dimensional implant-treatment planning. 3D imaging confirmed the presence of adequate bone volume for placement of dental implants in optimal prosthetic positions.

The treatment plan included extraction of all mandibular teeth, followed by the placement of five interforaminal implants and delivery of an immediately loaded prosthesis. The surgery was carried out using a bone-supported Tapered Navigator® Surgical Guide.

After acquiring the CT scan, DICOM data was formatted to SimPlant® 3D dental planning software and 3D case planning was performed. Virtual implant positioning was carried out to position implants to optimize the ability for immediate function and in prosthetically desirable positions (Figs. 4 and 5). Medical modeling and a Tapered Navigator® Surgical Guide were ordered from Materialise Dental, Inc. (Glen Burnie, MD) for CT guided implant therapy.

At the surgical appointment, the patient received IV conscious sedation and profound infiltration-based local anesthesia. The natural teeth were atraumatically extracted with the exception of #30 [46] (Fig. 6), which was temporarily retained to orient the bone-supported Surgical Guide within the mandibular anatomy without teeth. Sulcular and midcrestal incisions were made from the right to left retromolar pads and soft-tissue reflection was performed carefully (Figs. 7 and 8).

The Surgical Guide was placed on the post-extraction (and pre-osteoplastied) bone, oriented by the retained molar (Fig. 9). The Surgical Guide was fixated using 2mm diameter bone screws (BIOMET Microfixation, Jacksonville, FL, USA) (Fig. 10).

The Tapered Navigator® Surgical Plan, provided by Materialise Dental, specified the instrumentation and drilling protocol to prepare the osteotomy sites and enable precise placement of five Full OSSEOTITE® (FOSS) Tapered Implants. Preparation of the osteotomies was done through the Master Tubes using the appropriate Tapered Navigator® Twist Drills and Shaping Drills with definitive depth stops (Fig. 11). The proper diameter and length Implant Mounts were selected from the kit, according to the Surgical Plan received. The implants were delivered through the Tapered Navigator® Surgical Guide (Figs. 12 and 13). All implants required hand tightening, which measured roughly 70Ncm per implant. Such insertion torque values as objectively measured by a High Torque Ratchet Wrench ensured primary stability. In addition, an Osstell SmartPeg was placed into each implant (Fig. 14) to measure the ISQ (implant stability quotient) value, using an Osstell ISQ device (Osstell AB, Gothenburg, Sweden). The device uses RFA (Resonance Frequency Analysis) as the method of measurement. All ISQ readings were recorded at 80 or higher, thus providing greater confidence and validation to proceed with immediate function.

The Implant Mounts were removed, followed by removal of the fixation screws and Surgical Guide. The axial and subcrestal outcome positions of the implants were precisely as planned (Fig. 15). A periodontal probe was used to assess vertical implant positioning relative to crestal bone (Fig. 16). Following delivery of the implants and removal of the Surgical Guide, tooth #30 [46] was then extracted. Gross osteoplasty was then performed manually and a Bone Profiler was used at each implant site to allow for full seating of the abutments (Fig. 17). IOL® Abutments were seated into the implants and tightened to 20Ncm, followed by placement of Temporary Cylinders, which were secured with screws (Fig. 18). Prior to surgery, an immediate temporary denture was fabricated and prepared for an immediate load conversion prosthesis. This was facilitated by medical modeling. The screw-access openings were blocked out and acrylic resin was applied to lute the cylinders to the denture, following the DIEM® Protocol (Fig. 19). The provisional prosthesis was removed and the voids were filled around the temporary cylinders. The cylinders and flanges on the denture were trimmed and polished.

Next, the maxillary posterior teeth were extracted and the remaining anterior teeth were treated with non-surgical periodontal therapy (scaling/root planing). Lastly, platelet-rich fibrin was placed in the remaining extraction sockets (Fig. 20). The soft-tissue flaps were closed with interrupted 6.0 Monocryl Sutures (Ethicon, Inc., A Johnson & Johnson Company) (Fig. 21). The modified denture was placed and secured with retaining screws tightened to 10Ncm. A stable, balanced occlusion was verified against the remaining maxillary anterior dentition and an immediate removable posterior partial denture. Final post-treatment periapical radiographs are noted in Fig. 22 demonstrating the accuracy and precision in carrying out the original plan. Postoperative healing was uneventful. Four-month post-treatment clinical photographs (Figs. 23 and 24) and radiographs (Fig. 25) demonstrate the favorable bone response to immediate function.

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Figure 1

Figure 2

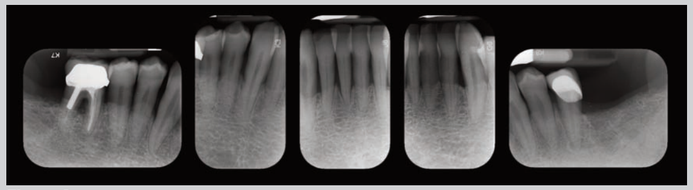
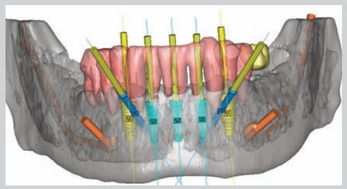


Figure 3



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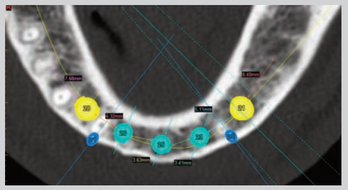


Figure 5

Figure 6

Figure 7

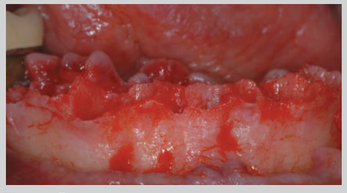


Figure 8

Figure 9

Figure 10

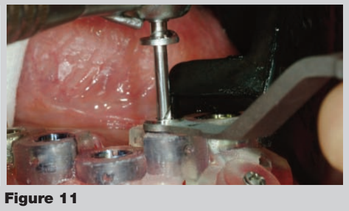
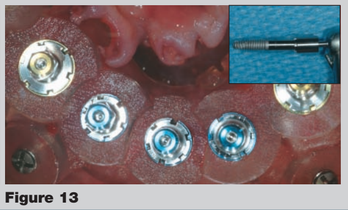


Figure 11

Figure 12



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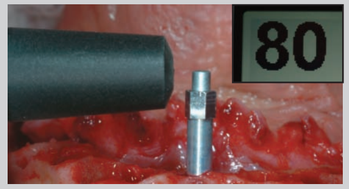
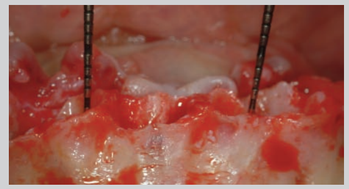


Figure 14

Figure 15



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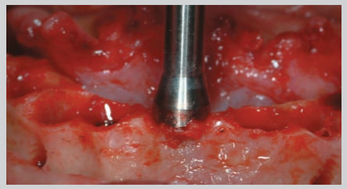

Figure 17

Figure 18

Figure 19

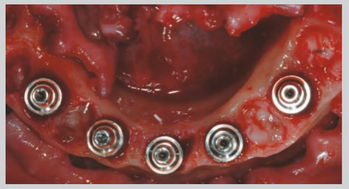

Figure 20

Figure 21

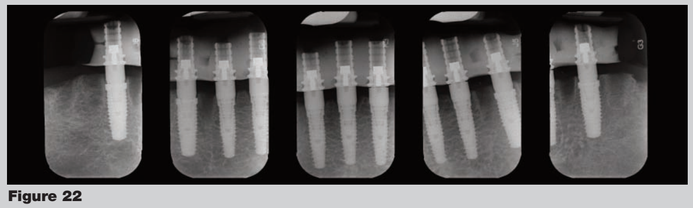

Figure 22

Figure 23

Figure 24

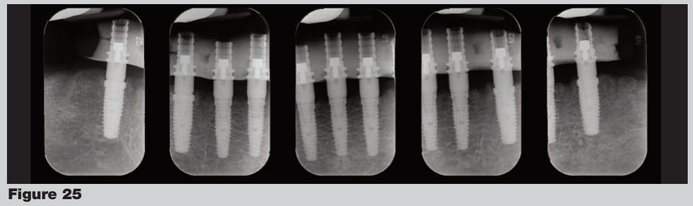

Figure 25

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