Clinical Perspectives

Inside This Issue: Revised Drilling Guidelines For Parallel Walled Implants

Case Presentation By:
Pär-Olov Östman, DDS, PhD, MD

Volume 8, Issue 1
Emerging techniques in dental implant surgery are trending towards one-stage procedures and immediate loading. Unlike a two-stage approach, these procedures may be more challenging and aggressive; and therefore may require a high level of initial primary stability of the implant. To this end, new drilling guidelines have been recommended by BIOMET 3i for parallel walled implants, to increase initial primary stability.

Anatomy Of An Implant

In order to implement the most appropriate drilling protocol based on bone quality, it is important to understand the critical dimensions of an implant. These dimensions include the apical diameter of the implant, the major and minor diameter of the implant body and the diameter of the implant collar (Figure 1).

Based on these dimensions and clinician assessment of bone quality, BIOMET 3i has established drilling guidelines to increase bone-to-implant contact.

Surgical Protocol Selection Based On Bone Quality

Once a clinician has determined bone quality at each implant site, the recommended drilling protocol should be selected based on the diameter of the chosen implant. For example, in softer bone types, the final diameter twist drill should be selected so that the osteotomy is slightly undersized (smaller than the minor diameter of the implant) thus allowing for bone compression upon insertion of the implant. Insertional torque should also be considered when selecting the final twist drill. However, the insertional torque that is achieved may not be constant among all bone densities. Therefore, it may be necessary to modify the drilling protocol to achieve both adequate compression and insertional torque.

The clinical case presentation to follow demonstrates placement of a 5mm diameter parallel walled NanoTite™ Certain® Implant in soft (Type IV) bone. A single-stage protocol was followed.
INITIAL PATIENT PRESENTATION

A 70-year-old male patient presented with a partially edentulous posterior right mandible (Figure 1). A failed fixed partial denture previously supported by teeth Nos. 27, 29 and 31 [43, 45 and 47] had been removed six months prior due to root fracture of tooth No. 27 [43] and severe periodontitis of tooth No. 31 [47]. The patient was referred to the dental clinic seeking implant treatment to restore his ability to masticate properly. The patient desired a fixed restoration for his missing dentition. The treatment plan accepted by the patient included extraction of the remainder of tooth No. 29 [45] and placement of three dental implants to support fixed restorations.

DIAGNOSIS

- Partially edentulous mandibular right posterior quadrant
- Retained pier abutment for preexisting PFD, tooth No. 29
- Adequate bone quantity for implant placement without the need for grafting
- Adequate keratinized soft tissue in the edentulous area for implant placement
- Adequate interocclusal clearance with the opposing dentition

TREATMENT PLAN

- Extraction of the retained tooth No. 29 [45]
- Placement of three implants into tooth sites Nos. 27, 28 and 30 [43, 44 and 46] in a single-stage protocol
- Placement of Encode® Healing Abutments in lieu of cover screws
- Soft-tissue closure with intermittent sutures around the healing abutments
- Impressions of the Encode Healing Abutments in three months for fabrication of definitive Encode Abutments and PFM restorations
IMPLANT PLACEMENT

On the day of surgery, the patient received local anesthesia by infiltration in the mandibular right posterior quadrant. The remainder of tooth No. 29 [45], the mandibular right second bicuspid, was extracted. A full thickness mucoperiosteal flap with vertical releasing incisions was reflected to the buccal and lingual aspects of the ridge to allow visual inspection of the position of the mental foramen and the terminal branch of the mental nerve (Figure 2). Measurements were taken to determine the height of bone from the mental foramen to the top of the crest (Figure 3).

With the implant drilling unit set at 1500rpm, preparation of the osteotomy for tooth site No. 30 [46] began with an ACT® Pointed Starter Drill (ACTPSD) to mark the ideal location for placement of the first implant and to pierce the cortical bone (Figure 4). Copious irrigation was used during high speed drilling. Initial drilling was also performed in tooth sites 27 and 28 [43 and 44]. Preparation of the osteotomy in tooth site No. 30 continued (Figure 5) with a 2mm Twist Drill (ACT2015). During initial drilling, the bone quality was deemed to be soft (Type IV). Therefore, a clinical decision was made to undersize the osteotomies based on newer drilling guidelines aimed at ensuring a high level of initial primary stability for the implant.

CLINICAL TIP: The accumulation of bone debris in the cutting flutes of the 2mm Twist Drill provides a good indication of bone quality during initial preparation of the osteotomy. For example, less accumulation of bone debris may be indicative of the presence of soft bone (Type IV) in the site.

To verify the direction and position of the implant osteotomies, Direction Indicators (DI100) were placed into the three sites (Figure 6). The 2mm Twist Drill was used again to the full predetermined implant depth for each site. A Pilot Drill (PD100) was placed into the osteotomy created by the 2mm Twist Drill (Figure 7) and advanced to the depth marked with a laser line to shape the coronal aspect of the implant site. Preparation of the osteotomy in tooth site No. 30 continued with a 3.25mm Twist Drill (ACT3215) to the desired depth (Figure 8) for placement of a 5mm diameter x 10mm length NanoTite™ Certain® Implant.

NOTE: The osteotomies for tooth sites 27 and 28 [43 and 44] were prepared following the guidelines for placement of 4mm diameter implants in soft bone.

Next, a 5mm Countersink/Pilot Drill (CD500) was placed into the coronal aspect of the osteotomy (Figure 9) and
advanced to the first laser line (for crestal placement) to shape the coronal aspect of the implant site. The drill was used at 1200rpm. Based on the newer drilling guidelines for placement of parallel walled implants in soft bone, this was the last drill used prior to placement of the implant.

A 5mm diameter NanoTite™ Certain® Implant was picked up from the sterile package using a Certain Implant Placement Driver Tip (IIPDTS). The implant was carried to the mouth (Figure 10) and placed into the prepared site at approximately 15-20rpm at a torque of 40Ncm (Figure 11). Following the recommended protocol for placement of NanoTite Implants, irrigation was not used during implant placement allowing the blood to contact the implant surface and thus, maximizing fibrin concentration at the site. Final implant positioning was accomplished with the hand ratchet to ensure primary stability of the implant. The implants for the two other sites were then placed (Figure 12).

**CLINICAL TIP:** When using the hand ratchet for final implant positioning in the osteotomy, use light downward pressure with the thumb or forefinger to maintain engagement and alignment of the driver tip and the internal interface of the implant.

Encode® Healing Abutments consistent with the size of the implants placed and the tooth anatomy/soft-tissue depth at each implant site, were placed into the internal interfaces of the implants and visually inspected to ensure full seating (Figure 13). The soft-tissue flaps were closed around the healing abutments with 4.0 Vicryl (Ethicon, Inc.) interrupted sutures (Figure 14). A periapical radiograph was taken to ensure complete seating of the healing abutments. The patient was prescribed 2g V-PC (Kåvepenin) Ibuprofen as needed and was instructed to rinse with chlorhexidine gluconate (CHX) rinse three times per day.

The patient was seen for a post-operative visit 10 days later (Figure 15). Healing was progressing as planned. Due to the poor bone quality, a clinical decision was made to wait three months before seeing the patient for impressions of the Encode Healing Abutments, fabrication of definitive Encode Abutments and fabrication of the PFM restorations.

†Dr. Östman received his dental degree from the University of Umeå, Sweden. He received his PhD and MD degrees at the Department of Biomaterials, Institute for Surgical Sciences, Sahlgrenska Academy, Göteborg University, Göteborg, Sweden. He is head of “Team Holmgatan” private practice clinic in Falun, Sweden and Assistant Professor at the Department of Biomaterials, Institute for Surgical Sciences, Sahlgrenska Academy, Göteborg University, Göteborg, Sweden.
# Recommended Final Twist Drills Based On Bone Quality

## 3.25mm Implant Body

<table>
<thead>
<tr>
<th>BONE DENSITY</th>
<th>SOFT</th>
<th>MEDIUM</th>
<th>DENSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D = Diameter</td>
<td><img src="DiameterDiagram3.25mmSOFT.png" alt="Diameter Diagram" /></td>
<td><img src="DiameterDiagram3.25mmMEDIUM.png" alt="Diameter Diagram" /></td>
<td><img src="DiameterDiagram3.25mmDENSE.png" alt="Diameter Diagram" /></td>
</tr>
</tbody>
</table>

- Apical 2.44mm(D)
- Implant Minor 3.0mm(D)
- Implant Major 3.25mm(D)

## 4.0mm Implant Body

<table>
<thead>
<tr>
<th>BONE DENSITY</th>
<th>SOFT</th>
<th>MEDIUM</th>
<th>DENSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D = Diameter</td>
<td><img src="DiameterDiagram4.0mmSOFT.png" alt="Diameter Diagram" /></td>
<td><img src="DiameterDiagram4.0mmMEDIUM.png" alt="Diameter Diagram" /></td>
<td><img src="DiameterDiagram4.0mmDENSE.png" alt="Diameter Diagram" /></td>
</tr>
</tbody>
</table>

- Apical 2.60mm(D)
- Implant Minor 3.30mm(D)
- Implant Major 3.94mm(D)
### Recommended Final Twist Drills Based On Bone Quality (continued)

#### 5.0mm Implant Body

<table>
<thead>
<tr>
<th>BONE DENSITY</th>
<th>SOFT</th>
<th>MEDIUM</th>
<th>DENSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D = Diameter</td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
</tbody>
</table>

- Apical: 3.05mm(D)
- Implant Minor: 4.06mm(D)
- Implant Major: 4.98mm(D)

#### 6.0mm Implant Body

<table>
<thead>
<tr>
<th>BONE DENSITY</th>
<th>SOFT</th>
<th>MEDIUM</th>
<th>DENSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D = Diameter</td>
<td><img src="image4" alt="Diagram" /></td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
</tbody>
</table>

- Apical: 4.06mm(D)
- Implant Minor: 5.08mm(D)
- Implant Major: 5.99mm(D)
Certain® PREVAIL® 5/4mm, Certain Internal Connection 5mm And External Connection 5mm Diameter Implants

Subcrestal Placement

D = Diameter
P = Platform
L = Length

5mm Cover Screw (4.3mm) x 11.5mm(L) Implant
5mm Cover Screw (6.5mm) x 11.5mm(L) Implant

*The guideline shown above is representative of the clinical case demonstrated in this Clinical Perspective. To review the guidelines for all BIOMET 3i Implants, please refer to the Surgical Manual (CATSM).

Global Headquarters
4555 Riverside Drive
Palm Beach Gardens, FL 33410
1-800-342-6545
Outside The U.S.: +1-561-776-6700
Fax: +1-561-776-1272
www.biomet3i.com

SUBSIDIARIES
AUSTRALIA
Phone: +61-3-9855-4444
Fax: +61-3-8588-9500
AUSTRIA
Phone: +43-(0)-2251-200-40
Fax: +43-(0)-2251-200-45-9
BELGIUM
Phone: +32-2-5410900
Fax: +32-2-5410991
BRAZIL
Phone: +55-11-5081-4405
Fax: +55-11-5081-2484
CANADA
Phone: +1-416-988-9842
Fax: +1-416-988-9844
FRANCE
Phone: +33-1-40-04-94-35
Fax: +33-1-40-04-94-04
GERMANY
Phone: +49-721-243177-10
Fax: +49-721-243177-75
IRELAND
Phone: +353-1-800-550-750
Fax: +353-1-800-320-182
THE NETHERLANDS
Phone: +31-(0)-90-892-200
Fax: +31-(0)-90-892-200
NEW ZEALAND
Phone: +64-9-308-2221
Fax: +64-9-308-1231
NORDIC REGION
Phone: +46-41-17-6600
Fax: +46-41-17-6500
PORTUGAL
Phone: +351-21-220-1675
Fax: +351-21-220-1675
SPAIN
Phone: +34-90-421-59-90
Fax: +34-90-372-11-25
SWITZERLAND
Phone: +41-(0)-44-200-19-00
Fax: +41-(0)-44-200-19-01
TURKEY
Phone: +90-212-685-76-96
Fax: +90-212-685-76-95
U.K.
Phone: +44-800-455-1233
Fax: +44-1828-820132

DISTRIBUTORS
ARGENTINA
Cheimco, SA
Phone: +54-1-492-7700
Fax: +54-1-492-7701
CHILE
Cheimco, SA
Phone: +56-2-731-1883
Fax: +56-2-731-1883
FRANCE
Aloe Inc.
Phone: +33-1-6329-1205
Fax: +33-1-6329-1209
ITALY
Celtra, srl
Phone: +39-0444-913149
Fax: +39-0444-913148
NORWAY
Celtra, srl
Phone: +39-0444-913149
Fax: +39-0444-913148
PORTUGAL
Celtra, srl
Phone: +39-0444-913149
Fax: +39-0444-913148
SPAIN
Celtra, srl
Phone: +39-0444-913149
Fax: +39-0444-913148
SWITZERLAND
Celtra, srl
Phone: +39-0444-913149
Fax: +39-0444-913148
TURKEY
Celtra, srl
Phone: +39-0444-913149
Fax: +39-0444-913148
UNITED KINGDOM
Celtra, srl
Phone: +39-0444-913149
Fax: +39-0444-913148

SOUTH AFRICA
Selectcare Surgical CC
Phone: +27-11-997-7007
Fax: +27-11-972-1207
THAILAND
Thai (Thailand) Co., Ltd.
Phone: +66-2-2295-1170
Fax: +66-2-2295-1170
UKRAINE
Camil Dental
Phone: +38-066-580-3290
Fax: +38-066-580-3291
VIETNAM
S.O.I.
Phone: +84-99-53-37-03
Fax: +84-99-53-37-03

ACT, Certain and Implant are registered trademarks and Nanoflex is a trademark of BIOMET 3i LLC. BIOMET 3i is a registered trademark and BIOMET 3i and design are trademarks of BIOMET 3i, Inc. ©2009 BIOMET 3i LLC. All rights reserved.