Small Diameter Implants: Drilling Protocol for Achieving Primary Stability

Inclusive Magazine: Volume 3, Issue 1

Choosing the appropriate sized drill in combination with the correct drilling depth is key to ensuring good primary stability when placing small-diameter implants (Fig. 1). Dense mandibular bone may require site preparation to the full length, particularly when using wider diameters, which comprise a larger overall surface area. Conversely, site preparation in the maxillary arch might necessitate the use of an undersized osteotomy drill as well as decreased drilling depth, depending on the density of cortical bone.

INCLUSIVE® MINI IMPLANT DIAMETERS	CORRESPONDING CORTICAL BONE DRILL DIAMETERS*
Ø 2.2 mm	Ø 1.5 mm
Ø 2.5 mm	Ø 1.7 mm
Ø 3.0 mm	Ø 2.4 mm

*Dependent on bone density

Figure 1

Mandibular Arch

Before beginning the procedure, determine the density of the bone (Fig. 2). It is not important to over-prepare or over-drill the initial osteotomy. It is best to drill halfway first (Fig. 3), and then assess the underlying bone. Try using the blunt end of an endodontic explorer to push on the bone and determine the level of resistance. If no trabecular bone is found and you feel ample resistance, then D1 bone is present. At that point, it may be prudent to increase the osteotomy to the full length of the small-diameter implant. If you encounter D2 or D3 bone, allow the self-tapping design of the small-diameter implant to thread its way to full seating depth.

Figure 2: Endodontic probe being used to feel density of the mandibular cortical bone.

Figure 3: Pilot drill taken to one-half the length of the small-diameter implant.

Maxillary Arch

To achieve good primary stability, assess the bone before starting. Try sounding the bone with the sharp end of an endodontic explorer, even before using the drill bit, to determine how much of a cortical plate there is to work with. If it's a nice one and thick, you will get a lot of resistance. If it is thin, you may find your endodontic explorer has pierced the outer cortical plate and you are now in the soft trabecular bone. If the latter is the case, use the pilot drill to perforate the cortical plate only. Then, thread the implant through, allowing it to condense and compress the bone. Another way to achieve additional primary stability in the maxillary arch is to use the smaller diameter drill.

For example, if you were going to place a 3.0 mm implant in the maxillary arch and the bone happened to be very soft (D3- or D4-type bone), instead of using a 2.4 mm pilot bit as suggested in the placement protocol, a 1.5 mm or 1.7 mm pilot drill may be used to remove less bone. In essence, this gives the implant more bone to act upon as an osteotome.

Bone Types

D1: Almost the entire jaw is composed of homogenous compact/cortical bone.

D2: A thick layer of cortical bone surrounds a core of dense trabecular bone.

D3: A thin layer of cortical bone surrounds a core of dense trabecular bone of favorable strength.

D4: A thin layer of cortical bone surrounds a core of low-density trabecular bone.

Adapted from the Lekholm-Zarb bone quality classification

Inclusive Magazine: Volume 3, Issue 2

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