



Small-Diameter Implants

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This month's *Implants Today* topic is "Small-Diameter Implants," or SDIs. Much has changed during the past 10 years with respect to this topic. Years ago, SDIs would have only referred to mini one-piece implants to support an overdenture. Now SDIs include one- and 2-piece implants, offering choices for both removable and fixed prosthetic options. SDIs can be broken up into 2 categories: the mini dental implants (MDIs) that range from 1.8 mm to 2.5 mm in width and 10 mm to 18 mm in length, and the SDIs ranging from 2.5 mm to less than 3.5 mm in width and 12.0 mm to 18.0 mm in length.

The US Food and Drug Administration (FDA) gave 510(k) approval for MDIs, and approval for certain brands can be found on fda.gov. The FDA approval of certain MDI brands is "for use as a self-tapping titanium screw for transitional or intrabony long-term applications." The MDIs are also indicated, according to the FDA website, for "long-term maxillary and mandibular tissue-supported denture stabilization."

SDIs also have FDA 510(k) approval. According to the FDA website, the 510(k) clearance for 3.0 mm-diameter-sized implants is stated as the following:

1. *An artificial root structure for single-tooth replacement of mandibular central and lateral incisors and maxillary lateral incisors.* The SDI may be immediately restored with a temporary prosthesis that is not in functional occlusion.
2. *When splinted together as an artificial root structure for multiple-tooth replacement of mandibular incisors.* The SDI may be restored after a period of time or placed in immediate function.
3. *For denture stabilization using multiple implants in the anterior mandible and maxilla.* The SDIs may be restored after a period of time or placed in immediate function.

It is apparent that there are approved indicated uses for dental implants in this size range. These FDA statements are only *guidelines* for the dental practitioner, and a clinician must make the final decision for his or her patient. Under the appropriate clinical conditions, both MDIs and SDIs have a definitive place in dental implant treatment planning.

When a clinician is formulating a treatment plan to replace missing teeth, spacing of dental implants is a high priority consideration. Implant spacing impacts issues such as number of implants and the proximal bone vascularity. If implants are closer than 2.0 to 3.0 mm, the propensity for bone loss increases, which in turn can create aesthetic issues through soft-tissue loss. Spacing implants too close together can even affect their survival rate. Previously, when the multitude of SDIs was not available, spacing issues were not as easily or adequately resolved by the clinician. Having the option of *smaller* diameter implants allows for more treatment planning choices as far as spacing issues. The option of different sizes also allows for *creativity* in treatment planning, with clinicians often combining traditional-sized implants with SDIs.

For the last 5 years or so, SDIs have been available as a 2-piece option. This has completely changed the scope of treatment planning options in a positive manner. There are advantages and disadvantages to one-piece implants. One advantage is the fact that there is not a microgap between the implant and the abutment, which (according to Dr. Carl Misch) allows for a closer proximity between implants and teeth. The disadvantages of one-piece implants, in general, are related to provisionalization and the need for more exact implant placement with respect to angles. If provisionalizing one-piece implants for less than a full-arch case, the implants should be out of occlusion during the healing period. If one-piece implants are used for a full-arch case, then the implants need to be splinted. The angulation of the implant is an issue for every one-piece implant, as angle correction abutments are not available. When a one-piece implant is used to support an overdenture, the patient is committing to the overdenture option. This long-term commitment is one that must be emphasized to the patient.

The surface area of the implant that contacts bone is a consideration of SDIs. With less surface area contacting the bone, the clinician should consider the loading forces on the implants with regard to the patient's occlusal forces. The patient's existing height or width of bone also relates to the forces on a dental implant. If there is an increased cantilever due to a lower bone height, this should be taken into consideration. A clinician's choice to use longer implants, more implants, and implants with increased surface texture are all ways to reduce the forces on implants.

The emergence profile must be considered when treatment planning, especially in the aesthetic zone. If the diameter of an implant is too narrow, then the emergence profile will be too extreme, creating the possibility of hygiene and aesthetic issues. This is especially evident with one-piece dental implants. The multitude of width options from manufacturers and the use of a custom abutment help to negate this issue. It is important for a clinician to be knowledgeable of the manufacturers' offered options for the various implant systems, as this directly pertains to ideal treatment for a patient. For instance, some manufacturers don't make multiunit angle-correcting abutments for certain SDIs, which could be an issue for certain implant cases. The ramifications of a manufacturer's inclusion of parts could also affect issues such as whether digital scans can be taken, if angled abutments are available, or if various healing cap sizes are available for the treatment planned SDI. Gaining in-depth knowledge of a manufacturer's available parts is an important pretreatment step, especially with SDIs, as there are less parts made for this segment of the market, in general.

In this month's issue, *Implants Today* presents 2 excellent articles that discuss the strategies of treatment planning with SDI and MDI options.

Implants Today advisory board member Dr. Steven Cutbirth has contributed a **very informative article** on using MDIs for full-arch tooth replacement. I especially like this case, as it was done with full reflection and not a flapless technique. This allowed Dr. Cutbirth to do the appropriate alveoloplasty, to see the surgical site, and to place grafting material and membranes. This article shows the utilization of the MDI option to support a denture with an adequate number of implant fixtures.

Dr. Charles Schlesinger has authored an **enlightening overview** on immediately loading dental implants. This article covers the principles of timing, surface area of an implant, and the appropriate length and width needed for immediate loading. These principles are appropriate for all sizes of dental implants, from MDIs to standard-size implants.

SDIs are another option we can offer our patients. As with every area of implant dentistry, it must be applied with the appropriate knowledge and put in context to both the treatment plan and all other available options. SDIs are holding a strong place in treatment options in implant dentistry.

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