sity can affect the overall length of the starter site. The penetration through the gingival tissue must have attached gingiva surrounding the site.

After extensive research, developers of the MDI concluded that the optimum diameter for the implant to allow for auto advancing in both types I and II bone should be 1.8 mm. More importantly, the standard proprietary thread design is used for implants placed in type I bone, and the MDA MAX thread is designed to effect a deeper bite into the host site (Figure 2). The mini dental implants are provided in a sterile vial inside a sterile pouch. The implant is suspended from the stylet to allow for easy removal and attachment to the finger driver.

The finger driver is used to carry the mini implant to the premarked starter site (Figure 3). There is a small black "O"-ring that retains the implant in the driver and allows for transport to the mouth without accidental mishandling. The finger driver provides optimum control and tactile feedback, allowing the surgeon to engage and start the auto advancement process of insertion into the bone. Controlled advancement is accomplished with the finger driver until auto advancement takes over.

The finger driver is then removed, and a winged thumb driver is deployed to advance the implant further into the bone (Figure 4). Angulation of applied forces to the implant determines the final alignment position of the implant.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Implant Name</th>
<th>Material</th>
<th>Diameter</th>
<th>Length</th>
<th>Package Size</th>
<th>Package Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devices, Inc.</td>
<td>MDI 3.0</td>
<td>Titanium</td>
<td>3.0 mm</td>
<td>8 m</td>
<td>10 pack</td>
<td>Immediate Load IMI</td>
</tr>
<tr>
<td>Dentsply</td>
<td>Implant System</td>
<td>Zirconia</td>
<td>3.5 mm</td>
<td>10 m</td>
<td>10 pack</td>
<td>Immediate Load IMI</td>
</tr>
<tr>
<td>IMTEC Corp</td>
<td>MDI 3.5</td>
<td>Titanium</td>
<td>3.5 mm</td>
<td>12 m</td>
<td>10 pack</td>
<td>Immediate Load IMI</td>
</tr>
</tbody>
</table>

RESTORATIVE OPTIONS

There are many restorative options for mini dental implants. They have applications in the following cases:

1. (Transitional)
2. (Ongoing)
   - fixed (Figures 6 through 9)
   - removable (Figures 10 through 14)
3. (Salvage) (Figures 15 through 20)

CONCLUSION

The most significant demand for mini dental implants, in my experience, has been for the application of immediate and ongoing stabilization of a fixed or removable prosthesis. Mini dental implants are an excellent and profitable addition to every dental practice. As a clinician, I can readily see from my personal experiences that the addition of mini dental implants opens a great deal of treatment modalities for the implantologist and patient to consider.

Mini Dental Implants: Enhancing Patient Satisfaction and Practice Income

By Ronald A. Bulard, DDS

In the 15 years I have been practicing implant dentistry, one of the most significant advances in my practice has been the addition of mini dental implants. Having placed thousands of root form implants, I found that my ability to predict the outcomes for surgical and final prosthetic restorations improved over the years when treating the ideal patient. However, I quickly learned there were still a great number of patients who were not receiving treatment with traditional implants because of medical, anatomical, and/or financial reasons.

In 1996 I expanded my implant practice and opened the Dental Implant Center in New York City. One of the first clinicians to welcome me to Manhattan was Dr. Victor J. Sendax. He outlined an innovative mini dental implant treatment procedure he was providing his patients. He was placing these implants into his patients’ jaws utilizing a minimally invasive nonsurgical technique that allowed for immediate loading. Many of his patients had ridges too narrow for conventional root form implants, but needed stabilization for their dentures and support for final crown and bridge restorations.

He was also salvaging failing implant cases and restoring conventional crown and bridge cases that had failing abutments. All of these implant treatments were provided to the patient in one clinic visit.

Admittedly, I listened with some degree of skepticism. Dr. Sendax’s rationale was, that if mini dental implants were placed using a minimally invasive nonsurgical protocol, they would work not only for immediate but also for ongoing stabilization. Although Dr. Sendax’s theory seemed sound, it was not until I had actually implemented this technique into my practice and completed several cases that I saw the impressive difference in results. After utilizing the Sendax technique and noting the enhanced patient acceptance and corresponding clinic income, I quickly found that the addition of mini dental implants to my practice regimen was a significant professional advancement.

Historically, my first experience with mini implants was with the Modular Transitional Implant (MTI), a transitional use system, now offered by...

Figure 1. "Starter Pilot" opening drilled directly through crestal attached gingiva and cortical bone.

Figure 2. Left: MDA MAX thread design. Right: MDA standard thread design.
Dentatus USA Ltd. Like most clinicians, I used those implants only for temporary cases in the interim, during which standard two-stage implants are integrated. Dentatus’ implants are removable, non-erupted, integrated to maintain their shape. Some patients cannot afford the cost for long-term traditional implants, and most opt to use their option of transitional implantation. For a comparison of these systems, see the accompanying Table.

**CURRENT MINI IMPLANT SYSTEMS ON THE MARKET**

Currently, four mini implant systems comprise the entire market in the United States. They are the MTI, marketed by Dentatus USA Ltd.; the Bone Screw/Temporizer Implant, marketed by Bionet Inc.; the IMTEC Sendax MDI marketed by IMTEC Corporation; and the Immediate Provisional Implant (API), marketed by Nobel Biocare. All have been approved for marketing by the Food and Drug Administration (FDA) for transitional use. However, only the IMTEC Sendax MDI system has an additional FDA approval for marketing by the FDA for immediate stabilization. As such, the MDI can be utilized for transitional and extended treatment modalities. For a comparison of these systems, see the accompanying Table.

**THE MDI PROTOCOL**

The minimally invasive non-surgical protocol is one of the key elements that makes the IMTEC Sendax MDI system unique, and enables it to work for ongoing and long-term treatment.

The insertion protocol involves a five-step technique compared with customary 30-step procedures for conventional root form implants. These steps are as follows:

1. Anesthesia is obtained without giving a mandibular nerve block. Only buccal and lingual infiltration is given below the peristome. Since no block is given, the surgeon can obtain feedback from the patient if placement is impinging on the nerve bundle. No incision is necessary to place the MDI implant. In fact, a non-surgical approach is the recommended protocol. This allows for a quicker recovery time, as well as minimal blood loss during the procedure. The lack of incision also allows for immediate adaptation of the final prosthesis to the implant abutment at the same appointment.

2. There is no full osteotomy prior to implant insertion. The overall length of the implant to be placed should be determined from clinical and radiographic examinations. A 1.1-mm externally irrigated titanium drill is used to penetrate the cortical plate of bone. This drill is used for approximately one-third of the final depth of the implant (Figure 1). Significantly, the optimum depth is the minimum penetration into the bone that still allows for engagement of the mini implant to allow for "auto advancement." There are many clinical and anatomical factors that will affect this depth. Factors such as crestal width, cortical thickness, and bone den-
Dentatus USA Ltd. Like most clinicians, I used those implants only for temporary cases in the interim, during which standard two-stage implants ossesintegrated. Dentatus’s implants are provided nonsuture with a machine commercially pure titanium surface, and must be sterilized prior to insertion. Their protocol involves reflecting a full-thickness flap and drilling a standard ostectomy site the length of the implant. The implants are then placed, and bent if needed prior to correct alignment. The final prosthesis involves a process metal infrastructure and attachment system. MTIs are placed in function for a 3- to 6-month temporary use period, then removed.

The placement of transitional implants may be of benefit to patients who not only can afford conventional dental implants, but who will also accept an extra fee, since transitional implants generally add an additional 20% to 30% to the overall treatment costs for a case. Although transitional in nature, they allow the clinician to offer patients immediate stabilization during the healing phase of their implant treatment. Personally, I have experienced considerable success with this type of treatment modality, and still do. However, I have found in my geographical area that many patients can barely afford the cost for long-term traditional implants, and most opt to pass on the transitional implant option and resultant expense. On the other hand, I have found considerable patient acceptance when presented with mini dental implants that are to be placed and used in function for ongoing applications.

**CURRENT MINI IMPLANT SYSTEMS ON THE MARKET**

Currently, four mini implant systems comprise the entire market in the United States. They are the MTI, marketed by Dentatus USA Ltd; the Bone Screw Temporary Implant, marketed by Biocom, Inc.; the IMTEC Sendax (MDI) marketed by IMTEC Corporation; and the Immediate Prosthetic Implant (IPI), marketed by Nobel Biocare. All have been approved for marketing by the Food and Drug Administration (FDA) for transitional use. However, only the IMTEC Sendax MDI system has additional FDA approval to be marketed for ongoing stabilization. At such, the MDI can be utilized for transitional and extended treatment modalities. For a comparison of these systems, see the accompanying Table.

The Dentatus MTI system was one of the first transitional systems to be marketed in the United States. Early on in their marketing efforts, Dentatus credited Dr. Sendax with the origination of the concept, and its descriptive name, “transitional mini implants.” Dr. Sendax felt that the applications for temporary transitional implants were not the only, or even optimum, applications for mini dental implants. Armed with that concept, he developed the minimal-invasive nonsurgical insertion protocol that would allow mini implants to remain in function for extended and indefinite periods of time. He worked for many years to secure marketing approval from the FDA, not only for transitional purposes, but specifically for ongoing applications.

Of the four mini systems, the IMTEC Sendax MDI is the only system that does not require insertion in a standard depth “implant length” ostectomy site. Moreover, the MTI, the Bone Screw/Temporary Implant, and the IPI all have been approved for marketing by the FDA for “temporary stabilization” only. The insertion protocol is therefore one of the critical differences between the systems.

**THE MDI PROTOCOL**

The minimally invasive nonsurgical protocol is one of the key elements that makes the IMTEC Sendax MDI system unique, and enables it to work for ongoing treatment.

The insertion protocol involves a five-step technique compared with customary 30-step procedures for conventional root form implants. Those steps are as follows:

1. Anesthesia is obtained without giving a mandibular nerve block. Only buccal and lingual infiltration is given below the perioseum. Since no block is given, the surgeon can obtain feedback from the patient if placement is impinging on the nerve bundle. No incision is necessary to place the MDI implant. In fact, a nonsurgical approach is the recommended protocol. This allows for a quicker recovery time, as well as minimal blood loss during the procedure. The lack of incision also allows for immediate adaptation of the final prosthesis to the implant abutment at the same appointment.

2. There is no full ostectomy prior to implant insertion. The overall length of the implant to be placed should be determined from clinical and radiographic examinations. A 1.1-mm externally iri-gated titanium drill is used to penetrate the cortical plate of bone.

This drill is used for approximately one third of the final depth of the implant (Figure 1). Significantly, the optimal depth is the minimum penetration into the bone that still allows for engagement of the mini implant to allow for “auto advancement.” There are many clinical and anatomical factors that will affect this depth. Factors such as crestal width, cortical thickness, and bone den-
sity can affect the overall length of the starter site. The penetration through the gingival tissue must have attached gingiva surrounding the free gingival.

After extensive research, developers of the MDI concluded that the optimum diameter for the implant to allow for auto advancing in both types I and II bone should be 1.8 mm. More importantly, the standard proprietary thread design is used for implants placed in type I bone, and the MDA MAX thread is designed to effect a deeper bite into the host site (Figure 2). The mini dental implants are placed in a sterile vial inside a sterile pouch. The implant is suspended from the stylet and allows for easy removal and attachment to the driver.

The finger driver is used to carry the mini implant to the premarked starter site (Figure 3). There is a small black “O-ring” that retains the implant in the driver and allows for transport to the mouth without accidental mishandling. The finger driver provides optimum control and tactile feedback, allowing the surgeon to engage and start the auto advancement process of insertion into the bone. Controlled advancement is accomplished with the finger driver until auto advancement takes over.

(4) The finger driver is then removed, and a winged thumb driver is deployed to advance the implant further into the bone (Figure 4). Angulation of applied forces to the implant determines the final alignment position of the implant.

<table>
<thead>
<tr>
<th>Table. Guide to Mini Implants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company Name</strong></td>
</tr>
<tr>
<td><strong>Product Name</strong></td>
</tr>
<tr>
<td><strong>Material</strong></td>
</tr>
<tr>
<td><strong>Diameter</strong></td>
</tr>
<tr>
<td><strong>Length</strong></td>
</tr>
<tr>
<td><strong>Wedge</strong></td>
</tr>
<tr>
<td><strong>Height</strong></td>
</tr>
<tr>
<td><strong>Dental Grade</strong></td>
</tr>
</tbody>
</table>

**SURGICAL OPTIONS**

- **Surgical Protocol:**
  - Optional: Mesial and Distal Exposure
  - Optional: Vertical Resection

**RESTORATIVE OPTIONS**

Restorative options for mini dental implants are available in the following categories:

1. **Transitional**
2. **Ongoing**
3. **Salvage**

**CONCLUSION**

The most significant demand for mini dental implants, in my experience, has been for application of immediate and ongoing stabilization of a fixed or removable prosthesis. Mini dental implants are an excellent and profitable addition to every dental practice. As a clinician can readily see from my personal experiences, the addition of mini dental implants opens wide opening of dealing with rehabilitation modalities for the implantologist and patient to consider.

**Mini Dental Implants: Enhancing Patient Satisfaction and Practice Income**

By Ronald A. Bulard, DDS

In the 15 years I have been practicing implant dentistry, one of the most significant advances in my practice has been the addition of mini dental implants. Having placed thousands of root form implants, I found that my ability to predict the outcomes for surgical and final prosthetic restorations improved over the years when treating the ideal patient. However, I quickly realized there were still a great number of patients who were not receiving treatment with traditional implants because of medical, anatomic, and/or financial reasons.

In 1996 I expanded my implant practice and opened the Dental Implant Center in New York City. One of the first clinicians to welcome me to New York was Dr. Victor I. Sendek. He outlined an innovative mini dental implant treatment protocol he was providing his patients. He was placing these implants into his patients’ jaws utilizing a minimally invasive nonsurgical technique that allowed for immediate loading. Many of his patients had ridges too narrow for conventional root form implants, but needed stabilization of their dentures and support for final crown and bridge restorations. He was also salvaging failing implant cases and restoring conventional crown and bridge cases that had failing abutments. All of these implant treatments were provided to the patient in one clinic visit.

Admittedly, I listened with some degree of skepticism. Dr. Sendek’s rationale was that if mini dental implants were placed utilizing a minimally invasive nonsurgical protocol, they would work not only for immediate but also for ongoing stabilization. Although Dr. Sendek’s theory seemed sound, it was not until I had actually implemented this technique into my practice and completed several cases that I saw the impressive difference in results. After utilizing the Sendek technique and noting the enhanced patient acceptance and corresponding clinical income, I quickly found that the addition of mini dental implants to my practice regimen was a significant professional advance.

Historically, my first experience with mini implants was with the Modular Transitional Implant (MTI), a transitional use system then offered by Dr. Bulard practices implant dentistry at the Dental Implant Center in Anchorage, Ohio, and New York. He is a diplomate of The American Board of Oral Implantology and a diplomate of the International Congress of Oral Implantologists. He can be reached at (508) 206-0410 or bulard@mdinternet.com.

Disclosure: Dr. Bulard is chairman of IMTEC Corporation.

Figure 1. "Starter Pilot" opening drilled directly through attached gingiva and cortical bone.

Figure 2. Left: MDI MAX thread design. Right: MDA standard thread design.