MDI Mini Dental Implants

Denture stabilization in the mandible

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Even though modern concepts of prevention and conservative dentistry lead to longer preservation of the patient's teeth, the treatment of edentulous patients will remain a central issue in dentistry. Many of those people desire fixed dentures, since tissue-borne prostheses offer limited stability and functionality – especially in patients with atrophic mandibular ridges. An adequate cost-effective solution to this problem is the use of small-diameter implants for denture stabilization. This option is more comfortable for the patient than conventional implant placement, since a minimally invasive, flapless surgical protocol is possible in most cases.

The placement of mini dental implants is particularly suited for medically or anatomically compromised patients who cannot be treated with conventional implants. Moreover, mini implants are a solution often preferred by patients with financial limitations. The implants are usually inserted in a 90-minute treatment procedure. Augmentation prior to implant placement is usually not required and, due to the minimally invasive treatment protocol, complications as well as soft tissue trauma are less likely to occur compared to conventional implants.

Under the umbrella of the product family of MDI Mini Dental Implants, 3M ESPE offers a whole range of implants suited for denture stabilization. They combine implant and abutment in one piece and are available in diameters between 1.8 mm and 2.9 mm (Fig. 1). Implants with diameters of 1.8 mm and 2.1 mm are predominantly used in the mandible, the 2.4 mm option is recommended for insertion in the maxilla and the implants with the largest diameter (2.9 mm) are used mainly for soft bone in the upper jaw and are also suited for long-term fixation of single crowns. Collared and Classic O-Ball as well as Collared Square Head Implants are available. The lengths of the threaded portion of the implant vary between 10 mm and 18 mm (Fig. 2).

Figure 1: The MDI Mini Dental Implants are available in four different diameters …

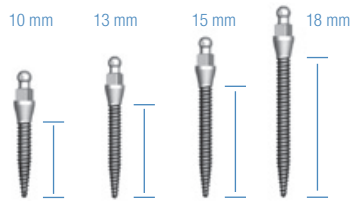

Figure 2: … and four lengths.

In the following, a patient case is used to illustrate the procedure for the insertion of MDI Mini Dental Implants.

Initial situation

An edentulous male patient in his mid 40s came to our dental practice in Berlin since he had problems with his mandibular denture. He reported that he used denture adhesives for fixation. Nevertheless, functionality and stability of this prosthesis were insufficient – it was so loose that he even had difficulty chewing. Since he was not able to carry the financial burden of a conventional implant treatment and desired a quick, comfortable solution, it was decided to place four MDI Mini Dental Implants in the anterior mandible for denture stabilization. Since the old prosthesis was in poor condition, the dentist, dental technician and patient agreed that a new denture should be fabricated in the dental laboratory.

Preparations

After having evaluated the anatomy of the jaw, local anaesthesia was delivered and the mucosal thickness determined with a periodontal probe (Fig. 3). Since a soft tissue depth of less than 2.5 mm was determined, implants with classic design were selected. Due to the small width of the patient's alveolar ridge, the implants of choice had a diameter of 1.8 mm. The length of 15 mm was chosen on the basis of the bone height visible in the initial X-ray.

After implant selection, the distal implant positions were planned extraorally and a labside guide was used to transfer the desired positions into the patient's mouth (Fig. 4). At this, care should be taken to plan the implant locations in safe distance – at least 7 mm mesially – from the mental foramina and neurovascular bundle. Between the implants, a minimum space of 5 mm is required due to the size of the metal housings used to fix the denture base. The planned locations of the distal mini implants were marked with the probe and became visible through slight bleeding (Fig. 5).

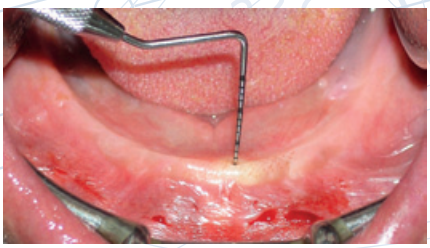

Figure 3: Determination of the soft tissue depth using a periodontal probe.

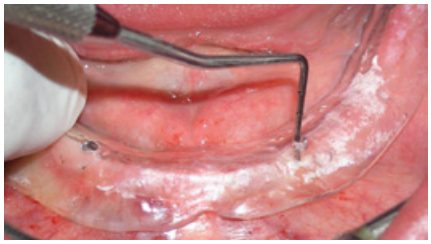

Figure 4: Marking of the implant positions in the mouth using a template.

Figure 5: Blood indicates the desired implant locations.

Subsequently, transgingival placement for the four single-piece implants followed in accordance with the surgical protocol for MDI recommended by 3M ESPE: with a pilot drill, the entry point for the first distal implant was prepared (Fig. 6). The depth of the pilot hole should be one third to one half of the implant length and the diameter of the drill should always be smaller than that of the implant (in this case, 1.1 mm). This is because the primary stability of the mini dental implants is established through bone condensation and bone compression. This self-tapping insertion technique makes immediate loading possible.

After after transgingival perforation of the cortical bone and preparation of the pilot hole, the single-piece implant was removed from the sterile packaging and placed into the pilot opening with the silicone cap (Fig. 7). It was inserted until sufficient friction was felt and the silicone cap was removed. Using a finger driver, the mini implant with self-tapping design was screwed further into the bone under slight downward pressure and clockwise rotation (Fig. 8). When resistance was felt, the process was continued with a winged thumb driver that offers mechanical advantages over the finger driver, because force transmission is improved (Fig. 9). Again, it became difficult to turn the implant and the instrument was replaced by a torque wrench. This tool is used to insert the MDI carefully into its final position (Fig. 10). When a force of 35 to 45 Ncm is reached, the implant is stable enough to be loaded immediately. The other implants were placed in the same manner. In this case, a parallelization aid was used for correct angulation of the implants (Fig. 11). Figure 12 shows the four mini implants in place.

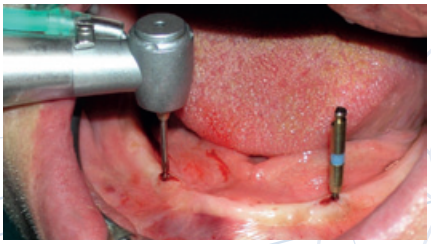

Figure 6: Drilling a pilot hole to a depth of one third to one half of the selected mini implant.

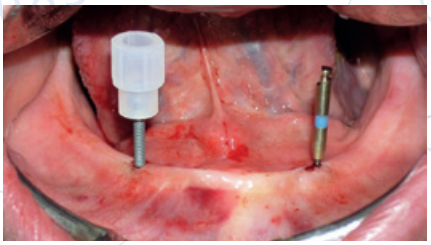

Figure 7: Placement of the first mini dental implant.

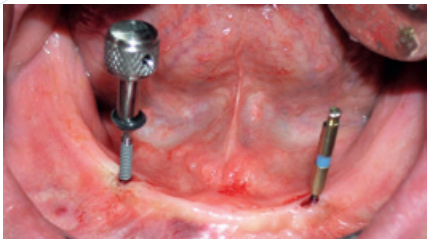

Figure 8: Implant insertion using a finger driver.

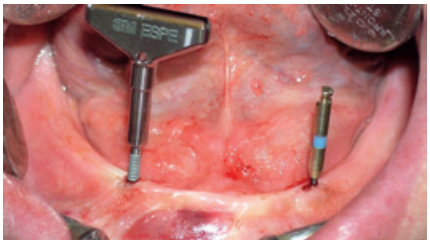

Figure 9: Implant insertion using a winged thumb driver.

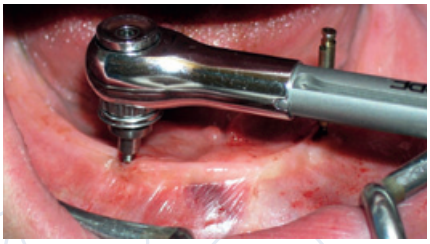

Figure 10: Putting the implant into its final position with a torque wrench at a torque of 35 to 45 Ncm.

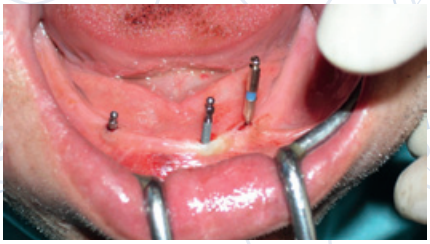

Figure 11: Inserting the implants in the desired orientation.

Figure 12: The four implants in correct positions.

When all implants were inserted, the implant positions were indexed on the denture base (Fig. 13) using a thin layer of SECURE Soft Reline Material and openings of the size needed for the metal housings drilled into it (Fig. 14). Metal housings were placed on the implants to check their

position and size. Then, blockout shims – used in order to prevent the acrylic resin from flowing unterneath the metal housing – were trimmed according to the space between the metal housing and the gingiva and placed over the O-ball head. The metal housings were then placed on the O-balls, pushing the shims in contact to the gingiva (Figs. 15 and 16).

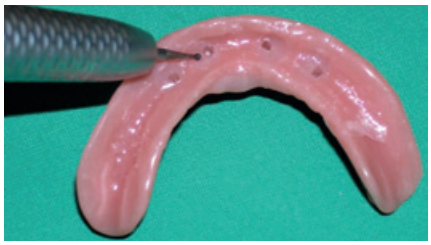

Figure 13: Marking of the implant positions on the denture base.

Figure 14: Base prepared for polymerization.

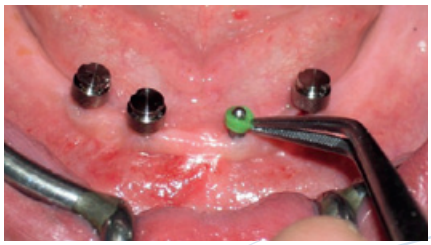

Figure 15: Placing the blockout shim on one of the implants.

In the following step, SECURE Hard Pick-Up Material was applied into the openings of the denture base as well as onto the metal housings and the prosthesis was seated in the patient's mouth (Fig. 17). The patient was asked to bite down and remain in occlusion under regular pressure for six to eight minutes (Fig. 18). This time is sufficient for the acrylic material to polymerize. Afterwards, the denture was removed and the fit of the metal housings checked (Fig. 19). Then, the denture was finalized, polished and tried in again.

Figure 16: The trimmed blockout shim in its ideal position.

Figure 17: Placing the prosthesis in the patient's mouth.

Figure 18: The acrylic sets intraorally under occlusion with normal pressure.

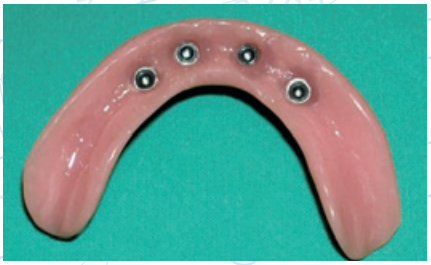

Figure 19: Metal housings fixed in the openings of the denture base.

Chewing function was immediately improved. Since the denture is now supported by the soft tissue as well as stabilized through the rubber O-rings (Fig. 20), the stability of the whole denture is ensured right from the beginning. At the same time there is no immediate contact between the metal housing and the O-ball, which prevents an overload of the implant body. The patient is still highly satisfied with the functionality of his new mandibular denture (Fig. 21).

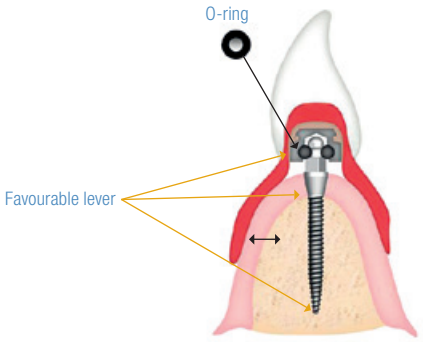

Figure 20: The mechanical load is not carried by the implants alone.

Figure 21: Final situation: the mandibular denture is stable and the chewing function is restored.

Conclusion

The present case shows that MDI Mini Dental Implants present a favourable option for denture stabilization, even if financial capacity is limited. The minimally invasive protocol and reduced treatment time lead to improved patient comfort – during as well as after the surgery.