Flapless MIMI® implantation using the two-piece implant shuttle preventing physiological bone loss

Armin Nedjay discusses Flapless implants

According to valid scientific criteria for a successful implant treatment, bone loss after one-year loading is considered as inevitable. Thus, the implantation is defined as successful when crestal bone loss does not exceed 2 mm after one-year loading time and 0.2 mm annually thereafter.

With more than 22,000 successful implantations with immediately restored and loaded implant systems, the author describes solutions that have been successful in preventing physiological bone loss. With respect to Tarnow’s findings concerning bone loss, the author has suggested that the peri-implant preservative MIMI® procedure with implants that have an integrated Platform-Switching design and that can achieve primary stability has a potential to prevent physiological bone loss. Since bone loss can be evidenced if an implant is uncovered, it is also recommended to avoid implant exposure.

Implant Design & Physiological Bone Loss

Most traditional implant systems have a conventional platform-matched implant-abutment connection. External and internal connections can have an impact on the hard and soft tissue interface. Long-term studies have shown that the peri-implant bone level is established apically from this platform-switched implant-abutment connection (Bisson 1999). If the implant, surrounded by bone, heals with its cap screw in bone until its exposure and if the cap screw is removed by means of osteotomy and replaced with a healing cap, a bone remodeling process starts after exposure. This can lead to a peri-implant bone defect (Fig. 1, implant on the right).

Micro-gap

The micro-gap is located between the implant body and abutment. It has been considered a disadvantage of two-piece implants. If the micro-gap is too big, it might risk being contaminated with bacteria, from the peri-implant bone tissue in the implant shoulder area, the biological width is shifted away from bone.

Platform Switching

Implants with a Platform-Switching concept have a proper potential to prevent bone loss. The diameter of the healing abutment is narrower than the diameter of the implant platform/shoulder. In this way, the implant-abutment connection is different from the biological structures around natural teeth. The micro-gap is moved to the implant axis. Through the separation of the micro-gap, which might risk being contaminated with bacteria, from the peri-implant bone tissue in the implant shoulder area, the biological width is shifted away from bone.

As a rule, an exposure of the Champions® Evolution® implant and a reopening/ injury of the sensitive biological width are not necessary. In this way, biological bone loss can be avoided, and the issue according to Tarnow remains to be discussed, also with respect to one-piece implants.

Conclusion

Conventional implantation methods have been increasingly questioned. MIMI® is the abbreviation for the Minimally Invasive Method of Dental Implantation. One-piece implants and also two-piece implant systems will be ideal for MIMI® if they can remain bacteria-resistant even if they are loaded with strong forces.
The Shuttle: The two-piece Champions (R)Evolution® implant system consists of an integrated bacteria-proof “Shuttle”/Insert, which remains in the implant for at least eight weeks post surgery until the final prosthetic restoration is fit. During the healing phase in the first weeks, the implant internal thread will not be contaminated with bacteria. During implantation, the Shuttle and micro-close connection protect the internal thread from contamination with bacteria, blood or saliva. With these two-piece implant systems and also one-piece implants, there is very little risk of bone loss. Sufficient primary stability at a torque of at least 35Ncm is a prerequisite for a successful implantation17. The implant with the Shuttle can be inserted at a torque of up to 70/80Ncm and achieve sufficient primary stability without deforming or breaking the outer part and inner thread and without loosening the abutment during the prosthetic phase.

Platform Switching & Optimised Cone Connection: It has been found that crestal bone loss can be prevented with implants with an integrated Platform-Switching design15,16. In addition, internal cone connections should have an angle of 5° to 10°, and the cone should be long enough in order to prevent bacterial migration even if, for example, a 3.5mm-diameter two-piece implant is loaded with a force of 200 N12. Since one-piece implant systems have no micro-gap at all, they are bacteria-proof as well. The one-piece implant system is particularly indicated for the rehabilitation of four or more implants/teeth. In order to compensate insertion divergences, Prep-Caps (zircon or titanium) can be cemented. The impression can be cast with super hard plaster (no Laboratory Analogs!) in the dental laboratory. If done correctly, the cement will not be pressed subgingivally so that there is no risk of periimplantitis because of cement remains in these one-piece implant Prep-Caps (“abutments”).

1) The Shuttle: The two-piece Champions (R)Evolution® implant system consists of an integrated bacteria-proof “Shuttle/Insert, which remains in the implant for at least eight weeks post surgery until the final prosthetic restoration is fit. During the healing phase in the first weeks, the implant internal thread will not be contaminated with bacteria. During implantation, the Shuttle and micro-close connection protects the internal thread from contamination with bacteria, blood or saliva. With these two-piece implant systems and also one-piece implants, there is very little risk of bone loss. Sufficient primary stability at a torque of at least 35Ncm is a prerequisite for a successful implantation17. The implant with the Shuttle can be inserted at a torque of up to 70/80Ncm and achieve sufficient primary stability without deforming or breaking the outer part and inner thread and without loosening the abutment during the prosthetic phase.

2) Platform Switching & Optimised Cone Connection: It has been found that crestal bone loss can be prevented with implants with an integrated Platform-Switching design15,16. In addition, internal cone connections should have an angle of 5° to 10°, and the cone should be long enough in order to prevent bacterial migration even if, for example, a 3.5mm-diameter two-piece implant is loaded with a force of 200 N12. Since one-piece implant systems have no micro-gap at all, they are bacteria-proof as well. The one-piece implant system is particularly indicated for the rehabilitation of four or more implants/teeth. In order to compensate insertion divergences, Prep-Caps (zircon or titanium) can be cemented. The impression can be cast with super hard plaster (no Laboratory Analogs!) in the dental laboratory. If done correctly, the cement will not be pressed subgingivally so that there is no risk of periimplantitis because of cement remains in these one-piece implant Prep-Caps (“abutments”).

3) Due to the flapless MIMI® procedure and the fact that a second or third session is not necessary (implant exposure, subgingival impression), the biological width can be formed and is not disturbed because of a second
intervention (exposure). During surgery, the periosteum, which nourishes peri-implant bone on the long-term, can be preserved. Peri-implant bone nourishment shall be ensured. The minimally invasive implantation method has proven beneficial to the periosteum18-23. In this way, the su-

sequently, an iatrogenic mucoperi-

ity of nerves and blood vessels. The Sharpey’s fibers, which pass from the outer layer through the inner layer, are embedded in the Substantia compacta of the bone and secure the periosteum to the bone. The iatrogenic detac-

ment of the periosteum can lead to poorly nourished bone after weeks, months or years. Conse-

quently, an iatrogenic mucoperi-

osteal flap is not recommended. However, if the gingival thickness is 4 mm or more, crestal incisions (also flapless) can be performed.

The peri-implant, gingival structures and the periosteum, which nourishes bone, remain intact. Physiological bone loss is very unlikely to occur. Current studies and clinical findings over 16 years have shown that the periosteum preserving flapless MIMI® method is very benefi-

cially18-20.

Drilling templates have not always shown to be particularly accurate. On the one hand, the diameter of the Champion® implant is not congruent with the diameter of the conical triangular drills.

On the other hand, studies have compared virtually planned implant positions using current DVT-based navigation-guided templates with achieved implant positions, also involving the use of drills with diameters congruent with the implant diameters. Apical deviations of 500 μm have been observed19. Implants for at least four implants/teeth that will be splinted (including fixed, pre-

pared teeth that are positioned mesially from the implants) can be immediately loaded with a final implant-supported restor-

ation within the first 14 days post surgery. Current studies have demonstrated good treatment outcome with regard to stable soft and hard tissue conditions af-

ter immediate restoration – also in conjunction with immediate implantation. This success rate is comparable to the one obtained in conventionally loaded im-

plants three to six months after implantation25,26. In addition, im-

mediately restored/loaded and delayed loaded implants showed similar bone-implant interface contact rates6. In addition, a biologically optimised surface enhances bone cell regenera-

tion18-20.

With these techniques, the risk of physiological bone loss can be reduced or even elimi-
nated. Currently, Tarnows theory that there should be a distance between the implants of at least 5 mm is controversial.

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When inserting the implants using the flapless and periosteum preserving MIMI® method, we drill the bone cavity transgingivally at a rotation speed ranging from 50 – 250 rpm with the conical triangular drills, depending on the bone density. In most cases, this is done without water-cooling. The cylindrical drills are additionally used to prepare the D1 and D2 bone. For prepared the softer D3/D4 bone, it is sufficient to use the conical triangular yellow drill and special bone condensers. After each step, the bone cavity must be checked with the thin BCC (Bone Cavity Check) probe. While avoiding bone overheating, a two-piece Chamions (R)Evolution®, which is equipped with an Insert/Shuttle, can be inserted at a torque ranging from 40-60 Ncm without deforming or breaking the inner thread and the thin titanium part (for instance, a 3.5 mm-diameter implant has an approx. 0.4 mm-thick outer part). Sufficient primary stability can be achieved.

The bacteria-proof platform-switched Shuttle (see Fig. 11 and "2"), which is set in the implant cone, is restored with a Gingiva-Clix. The Gingiva-Clix is made from white bio-compatible RBC, and it is available in 6 combinations of heights and diameters. During the bone remodeling phase within 8 weeks following surgery, the Gingiva-Clix stays on the Shuttle. After 8 weeks, the Gingiva-Clix is removed, and with this particular Clix type, the gingiva is shaped irritation-free. An impression post is transgingivally set in the Shuttle and manually screwed...

The Impression Coping is set. After making the impression and the supraconstruction, the Shuttle, which is connected to the implant, is removed with the Shuttle Extractor. The Shuttle is removed for the first time, while the screw remains uncontaminated. After removing the Shuttle, the Abutment (ICA zircon abutment) is screwed seal-tight, preventing bacterial migration. Finally, the crown is cemented and fit.

After removing the small implant/Shuttle connecting screw, you can easily remove the Shuttle from the Champions (R)Evolution® with the Shuttle Extractor. This procedure is performed either about 8 weeks after implantation (transition between Primary Osseointegration Stability and Secondary Osseointegration Stability) in many cases or immediately after the insertion of the implants in this case.


Fig. 44 - 46: The patient was treated under anesthesia (UDS forte). He was given 600 mg Ibuprofen. With the yellow, black, white and blue drills, we drilled in the D1/D2 bone at a maximum rotation speed of 250 rpm. Then, we checked the bone cavity quality with the BCC cone and screw them at a torque of 30 Ncm. With a Pattern Resin key, you can set the abutments in the 9.5° Champions inner cone and screw them at a torque of 30 Ncm.

Fig. 47 - 49: After eight weeks, when the independent extractions were completed, the screws were removed, the Gingiva-Clix and the small screw from the Insert/Shuttle were removed, and the implants were immediately restored with Ball-Head cones and step. The bone cavity was checked in all dimensions. After taking X-rays, the Insert/Shuttle was removed, and the implants were immediately restored with Ball-Head cones and step. The bone cavity was checked in all dimensions.

Fig. 50 - 52: After taking X-rays, we fixed the white impression cap on the metal impression posts and made a closed impression.

Fig. 53 - 55: The abutments are chosen. Then, the final prosthetic restoration is fabricated. When fitting the prosthetic restoration, the Gingiva-Clix are removed, and the Insert/Shuttle are removed from the implant for the first time. With a Pattern Resin key, you can set the abutments in the 9.5° Champions inner cone and screw them at a torque of 30 Ncm.

Fig. 56 - 58: After closing the abutment screws with Cavit, the crowns can be fixed with ImplantLink semi (company Detax, Champions-Liga).

Fig. 59 - 60: This figure shows a placed 3.5 mm-diameter and 10 mm-diameter Champions (R)Evolution® implants, which were inserted transgingivally using the Appelo MMR® method. The bone cavity depth corresponded to the implant length. After each drilling step, the bone cavity was checked, and the Gingiva-Clix was removed. If the Insert/Shuttle was removed, and the implants were immediately restored with Ball-Head treatment in the mastication zone. Because of the gentle, patient-friendly and invasive-free treatment, we consider the MMR® method to be the method of choice in many cases. However, even if this technique might be quite easy to learn, it is not always suitable for beginners in Implantology. In order to apply the MMR® method successfully, it is necessary that the dentist has enough experience in Implantology and that she/he has considerable manual dexterity.

Fig. 61: This 99-year-old patient from Munich (patient at risk) was the oldest patient worldwide who was treated with implants using the flapless MIMI® method. In June 2011, this lady was provided with four implants to support a full prosthesis in the mandible. Under local anesthesia, surgery lasted about 20 minutes, and the preparation of the restoration and matrices in the dental laboratory took about 2 hours. Two hours following surgery, she was able to eat an apple strudel. Two years later, she was still satisfied with her implants and did not experience any pain.