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 2mm after one-year loading time and 0.2mm 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 periosteum preserving MIMI® procedure with implants that have an integrated Platform-Switching design and that can achieve primary stability has a high 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-matched implant-abutment connection (Bulman 1990). 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-gaps
The micro-gap is located between the implant body and abutment. It has been considered as a disadvantage of two-piece implants. If the micro-gap is too big, as is the case with many conventional two-piece implant systems and due to loading of the implant-abutment connection, there is a high risk of bacterial contamination of the micro-gap and implant body. This can lead to bone loss.

X-ray images of some two-piece implant systems (eg ITI), which are connected to the oral cavity, have shown that the biological vertical distance between the micro-gap and the implant-bone contact area is 2mm, regardless of how deeply the implant is inserted in bone (Herrmann 1997, 2000 and 2001). Tarnow2-4 has demonstrated in his studies 2000 and 2005 that the micro-gap expands horizontally by about 1.4mm, which is similar to the effect in case of a periodontal defect. Tarnow recommends that the minimum distance between two implants should be 5mm to protect bone and inter-implant papillae.

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 not platform-matched. Dental implant systems such as the Champions® (K)Evolution®, Ankylos® and Astra Tech® have an integrated Platform-Switching design and an internal cone that is long enough and that has an optimal angle. In addition, the geometry of the implant-abutment connection is the same for all implant diameters, so there is a prosthetic line for all implant diameters. With the Platform Switching function, the central position of 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® (K)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 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 implantation. 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 design. 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 N. 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 implantation. 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 design. 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 N. 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 implantation), the biological width can be formed and is not disturbed because of a second planned session.
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 periosteum\textsuperscript{18-23}. In this way, the su-
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invasive implantation method shall be ensured. The minimally
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During surgery, the periosteum, which nourishes peri-implant bone on
the outer fibrous layer (Stratum fibrosum) is connective tissue, which is not cell-
rich but rich in collagen fibers. 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

Apical deviations of 500 µm have been observed\textsuperscript{19}. Implants for at least four implants/teeth that will be splinted (including fixed, pre-
pared teeth that are positioned mesially from the implant) can be immediately loaded with a
final implant-supported restora-
tion within the first 14 days post surgery. Current studies have demonstrated good treatment outcome with regard to stable soft and hard tissue conditions af-
After 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 implantation\textsuperscript{28}. In addition, im-
edicate restored/loaded and delayed loaded implants showed similar bone-implant interface contact rates\textsuperscript{41}. In addition, a
biologically optimised surface enhances bone cell regenera-
tion\textsuperscript{28,41}

With these techniques, the
The peri-implant bone is almost completely nourished
by the histological, double-layered bone membrane

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Implant Tribune 13
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 preparing the soft 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 Cham-pions (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 BNC, and it is available in 6 combinations of heights and dimensions. 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® 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 like in this case.

View of the implant in Tooth site 14: when the Shuttle was removed from the implant, the inner thread and the exterior wall of the Champions® remained intact and was not contaminated with bleeding, saliva and bacteria.

After removing the Shuttles, the Abutments for Ball-Head are screwed with the Insertion Aid that is also used for one-piece Champions®.

The Shuttles are removed from the implants (without local anesthesia because the treatment, including the impression, is performed supragingivally).
12) Zappiere H (Universität Frankfurt am Main): Überprüfung der klinischen Implantat/Abutmentverbindung des Champion (Bi) Evolution® Systems mit 3,4mm, 4,0mm und 4,5mm Durchmessern auf Bautenfestigkeit auf Belastung mit 4N, 171N und 200 N auch im Vergleich mit anderen Implantat-Systemen. Mai-November 2012, noch nicht veröffentlicht


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Shuttle and screw the metal impression posts in the Insert/Shuttle. In this case, we prepared Tooth 45, which was then provided with Gingiva-Clix, which are made from biocompatible WIN! serve as transgingival healing caps.

At the time of surgery, the patient was treated under anesthesia (UDS forte). He was given 600 mg of beta blocker, and was instructed to take them with her implants and did not experience any pain. Two years later, she was still satisfied with her implants.