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 peristeme preserving 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 (Bosshardt 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, 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 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.

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 (B)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, the exposure of the soft tissues in the sulcus might risk being contaminated by bacteria, from the peri-implant bone tissue in the implant shoulder area, 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.
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 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 prosthodontic 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. 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”).

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 post surgery until the final prosthodontic restoration is fit.
Apical deviations of 500 μm have been observed. 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 restoration within the first 14 days post surgery. Current studies have demonstrated good treatment outcome with regard to stable soft and hard tissue conditions after immediate restoration – also in conjunction with immediate implantation. This success rate is comparable to the one obtained in conventionally loaded implants three to six months after implantation. In addition, immediately restored/loaded and delayed loaded implants showed similar bone-implant interface contact rates. In addition, a biologically optimised surface enhances bone cell regeneration.

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

Bibliography

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

The periosteum preserves flapless surgery, the periosteum, which is richly supplied with blood vessels and nerve fibres; the inner cambial layer is rich in cells. 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 intrageneric detachment of the periosteum can lead to poorly nourished bone after weeks, months or years. Consequently, an intrageneric mucoperiosteal 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 beneficial.

Drilling templates have not always been shown to be particularly accurate. Nevertheless, on the one hand, the diameter of the Champions® 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.

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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 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 Champion® (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 BINC® 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 Champion® (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 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 Champion® (R)Evolution® 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 Champion®.

The Shuttles are removed from the implants (without local anesthesia because the treatment, including the impression, is performed supraanatomically).
Soardi E, Pistilli R, Piattelli M, Dec;24(6):1106-12


Soardi E, Pistilli R, Piattelli M, Dec;24(6):1106-12


12) Zapperich H (Universitét Frankfurt am Main): Überprü- fung der konischen Implantat/ Abutmentverbindung des Cham- pion (B)Evolution® Systems mit 3,5mm, 4,0 und 4,5mm Durchmes- sern auf Baktierientwickligkeit und Belastung mit 6N und 200 N in einem Vergleich mit anderen Implantat-Systemen, Mai-Novem- ber 2012, noch nicht veröffentlicht


17) Esposito M, Causinuzzi G, Sordi E, Piotto R, Panetti M,

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 270 rpm. Then, we checked the bone cavity quality with the BCC (Bone Cavity Check) probe. Then, we inserted the Champions (R)Evolution® implant with the Insert/Shuttle, which had been fixed on the implant at a torque of only 10 Ncm Ex Works, using a flapless technique. In this case, we prepared Tooth 45, which was then provided with a crown. The impression can be made without removing the Insert/Shuttle from the implant and without contaminating the prosthodontic restoration, the Gingiva-Clix are removed, and the Inserts/Shuttles 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. Abutments are available in a combination of six widths and heights.

Fig. 47 - 49: After eight weeks, when the independent abutment type to the transition of all Champions® from Primary Osteointegration Stability to Secondary Osteointegration Stability can be assured, we remove the Gingiva-Clix and the small screw from the Insert/Shuttle and screw the metal impression posts in the Insert/Shuttle. In this case, we prepared Tooth 45, which was then provided with a crown. The impression can be made without removing the Insert/Shuttle from the implant and without contaminating the implant with saliva. The impression of this two-piece implant system is made transgingivally or supragingivally. Implant exposure and anesthesia are usually not necessary.

Fig. 50 - 52: After taking X-rays, we fixed the white impression copings 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 provisional restoration, the Gingiva-Clix are removed, and the Inserts/Shuttles 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 Dentsply, Champions- Liga).