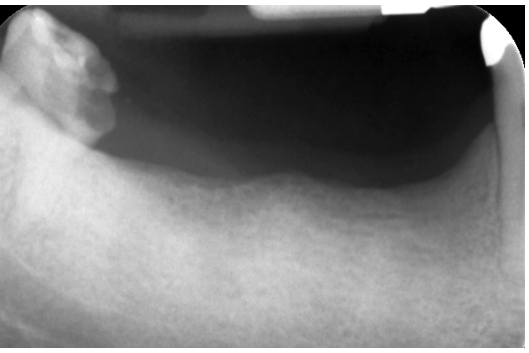

Fig. 1: The radiograph shows the reossification of the alveoli and an appropriately high jaw bone.

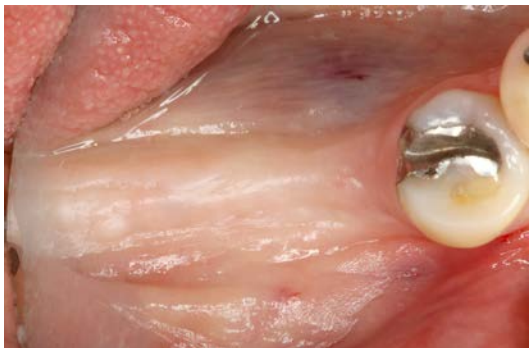

Fig. 2: The surgical site in regio 46, 47 reveals adequate keratinized gingiva.

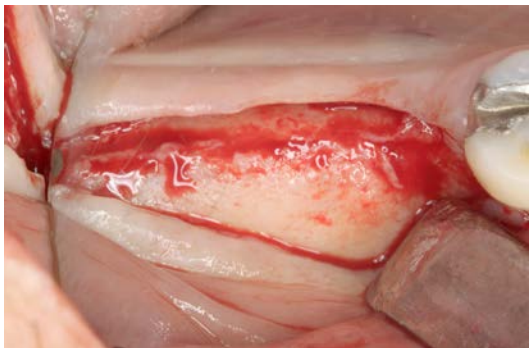

Fig. 3: A crestal incision line and a mesial releasing incision are used to expose the jaw bone.

FUNCTIONAL TREATMENT METHODS

STANDARDIZED IMPLANT PROSTHETICS BASED ON THE ISY CONCEPT

Dr. Steffen Kistler, Landsberg/Lech (Germany) and MDT Ricarda Eiterer, Marktoberdorf (Germany)

Trends in dental implant therapy are not heading towards standardized, functional, and cost-effective treatment methods in the esthetic area. With the advances that have been made in recent years in implant therapy, both dentists and patients are increasingly demanding options for a functional and esthetic prosthetic restoration. Because of improved oral health, the number of single-tooth restorations has increased across all age groups. The trend is moving from the preparation of healthy tooth substance for bridge restorations to single-tooth implants. A good dental restoration is very important to our patients. They are increasingly opting for fixed implant therapy. The extensive experience we have gained and the resulting successes provide us with many opportunities to make implementing standardized procedures significantly easier and quicker. New implant concepts or short or thinner implant versions allow implantation for specific indications without elaborate surgical procedures such as bone augmentation. In the following article we describe a straightforward and gentle treatment concept in the lower posterior region using the iSy Implant System from CAMLOG.

Part of the therapeutic concept of our practice is to keep the number of surgical procedures during implant treatment as low as possible. This concept is both gentler and requires less time, which also makes the treatment more cost-effective for everybody involved. Transmucosal healing of implants in the non-esthetic zone in accordance with the necessary criteria is state of the art in our practice [1,2]. The stable peri-implant soft-tissue cuff acts as a barrier to the underlying structures during open healing and reduces the risk of microbial contamination, which the implant healing would be affected by immediately after the surgical procedure. Transmucosal attachment is an essential prerequisite for a successful implant restoration. The iSy Implant Concept helps us to achieve this. Adherence to the concept means that the implant base remains in the mouth until the attachment of the final prosthetic restoration. The healing cap and the multifunction cap – for scanning or impression taking – are attached to the implant base. This avoids frequent changes of the abutment and the adhesion of the collagen fiber network is only minimally disrupted when the restoration is attached [3].

Findings and planning

A 59-year-old patient presented because of a root fracture of the first molar in the fourth quadrant. The general medical and dental findings were otherwise normal. Following extraction of tooth 46 and the previous loss of the second molar 47, the chewing function had to be restored. The patient wanted a fixed restoration on implants. He declined the alternative of removable dentures because he had already had implants inserted at another site and is very pleased with them. The option of a shortened dental arch was not considered due to the issue of elongation of the adjacent teeth. About one year after the extraction of 46, we evaluated the bone height and width at the surgical site using a DVT image. We had our dental technician prepare a guide template to ensure correct prosthetic positioning of the implant. Two iSy Implants were planned, one in regio 46 with 11 millimeters in length and 3.8 millimeters in diameter and one in regio 47 (9 millimeters in length, 4.4 millimeters in diameter). The inner configuration of the implant has

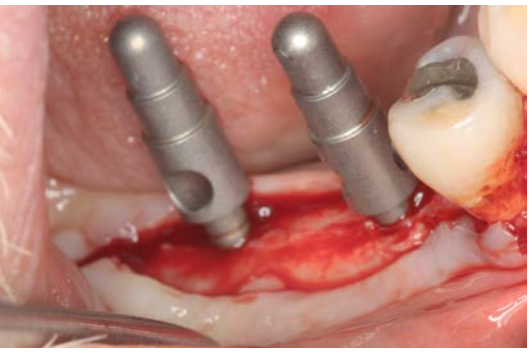

Fig. 4: The implant positions and angulation were checked after drilling the pilot drill hole using the direction indicators.

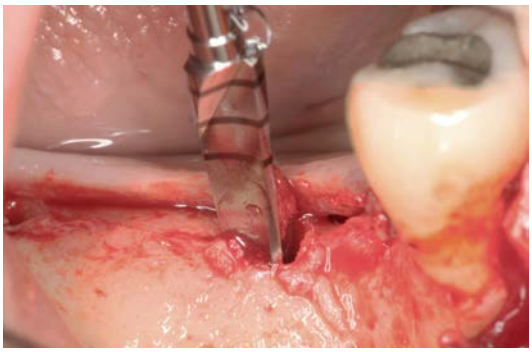

Fig. 5: After the pilot drill hole was made, the implant bed was processed to the desired depth of 11 millimeters with the single-use form drill.

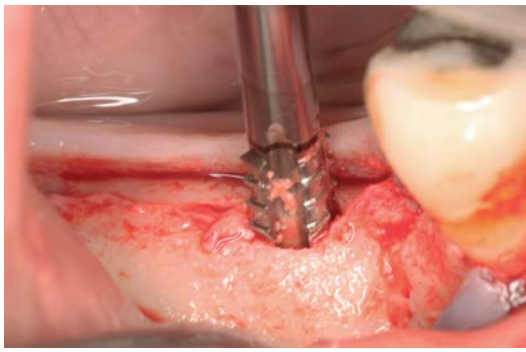

Fig. 6: The tap was used to reduce the insertion resistance in dense bone.

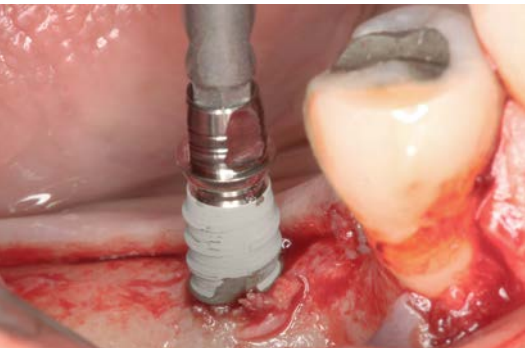

Fig. 7: The iSy Implant, pre-mounted on the implant base, was inserted with the help of the driver.

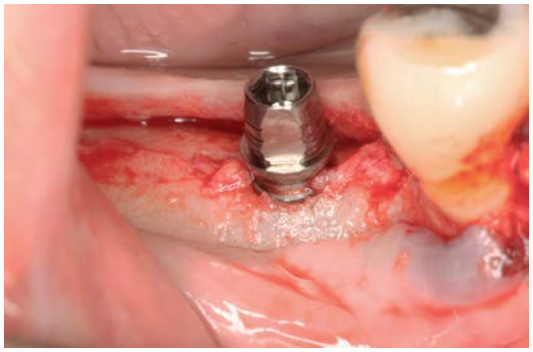

Fig. 8: The implant was positioned equicrestally on the vestibular side and aligned to one face of the implant base buccally.

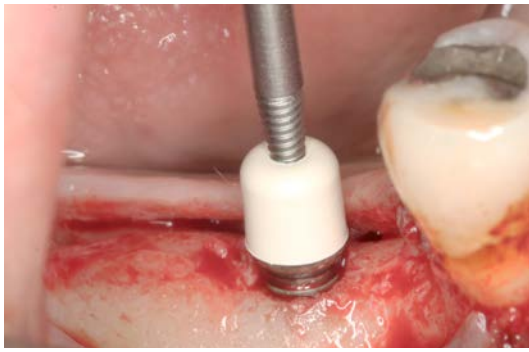

Fig. 9: The healing cap was taken out of the packaging and snapped onto the implant base.

a taper of 7.5° and an internal hexagon to prevent rotation. The restoration with the iSy Implant System uses Platform-Switching abutments [5].

Implantation

More sparing incision lines and smaller incisions are superior to a flapless implant insertion because the bone is well exposed and controlled working is assured. At the time of the surgery, there was a class III defect as defined by Cawood and Howell [6]. The height and width of the bony ridge was adequate, the alveoli were reossified, and the alveolar ridge was slightly rounded **(Fig. 1 and 2)**. Using a crestal incision, the attached gingiva at the surgical site was slit in the middle so that there was at least one millimeter of fixed mucosa present lingual and vestibular. This is necessary both for subsequent close wound closure and for a long-term stable reconstruction and ease of maintaining hygiene. After a mesial releasing incision around tooth 45, we prepared a mucoperiosteal flap in vestibular and lingual directions to expose the jaw bone **(Fig. 3)**. The guide template was stably fixed over the remaining dentition in the lower jaw and the pilot drill hole was made with the 2.8-millimeter iSy Pilot drill to the desired implant depth, eleven millimeters in regio 46 and nine millimeters in regio 47. We removed the template and checked the prosthetically oriented position of the implant bed with the depth and direction indicators **(Fig. 4)**.

Implant insertion

The iSy Implant set includes the implant and the single-use form drill. The drilling protocol for the iSy System has deliberately been reduced. Thanks to the special drill configuration, the form drill for the particular implant diameter is used immediately after drilling the 2.8 millimeter pilot drill hole. The sterile packed drills were taken out of the holder using the angled hand piece without touching them and the implant bed in regio 46 was then expanded to 3.8 millimeters and in regio 47 to 4.4 millimeters **(Fig. 5)**. Because the cortical bone in this case had a bone density of 2, we used a tap to reduce the insertion resistance and thus to counteract any necrosis **(Fig. 6)**. The iSy Implant is supplied pre-mounted on the implant base. The implant was transferred to the surgical site and inserted using the driver, which snaps into the implant base using light pressure and removes it from the sterile packaging **(Fig. 7)**. Due to the pre-tapped thread it is important to ensure that the positions of the thread ends in the cortical bone and on the implant match. The implant shoulder was positioned epicrestally and one face of the hexagon was aligned in the buccal direction. For visual inspection of the correct alignment, one face on the implant base should correspond to that of the face of the hexagon **(Fig. 8)**. The cylindrical healing cap made of PEEK that is included in the implant set was snapped onto the implant base using the handpiece for healing caps **(Fig. 9)**.

The implant was then inserted in the same manner in regio 47 and the healing cap was attached **(Fig. 10 and 11)**. We used the bone chips harvested in the spirals of the form drill **(Fig. 12)** for lateral bone augmentation **(Fig. 13)**. Using non-resorbable simple interrupted sutures (Resorba 5.0), we closed the surgical site and allowed the implants, in accordance with the iSy Concept, to heal open **(Fig. 14)**.

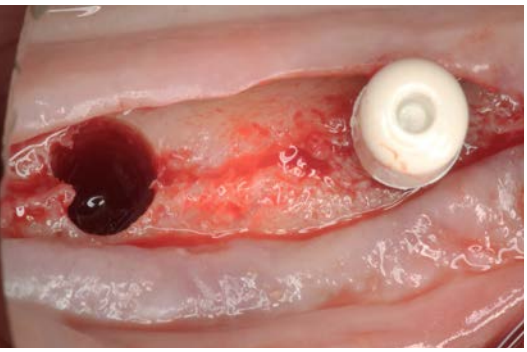

Fig. 10: The image shows the implant bed in regio 47 prepared to 4.4 millimeters.

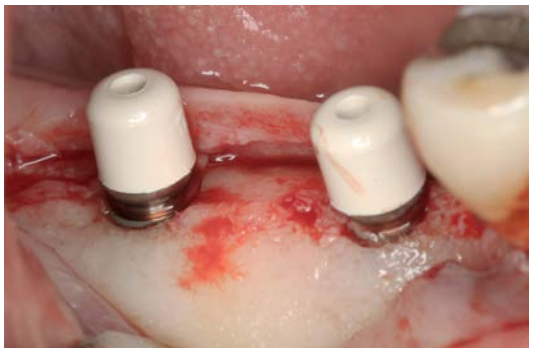

Fig. 11: The Platform Switching of the epicrestally positioned implants can be easily seen.

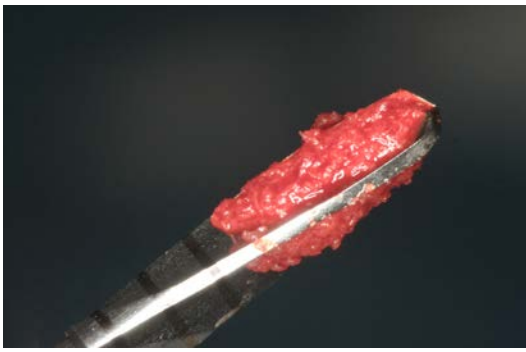

Fig. 12: The bone chips collected during preparation of the implant bed in the spirals of the form drill…

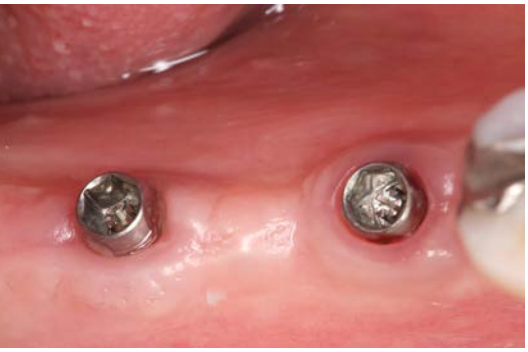

Fig. 16: To take the impression, the healing caps were removed from the implant bases …

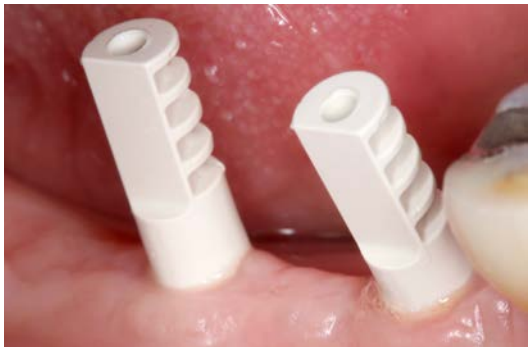

Fig. 17: … and the multifunction caps were attached.

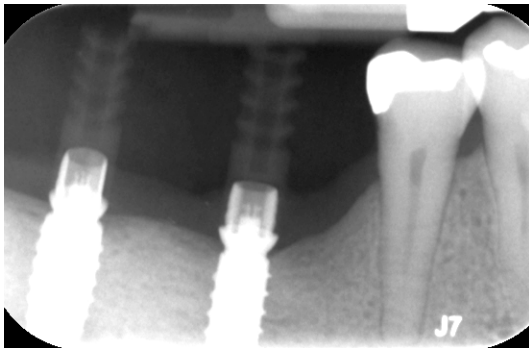

Fig. 18: The precise position was checked with the help of a X-ray.

Impression taking and prosthetic restoration

Because the patient did not want a temporary restoration, we started with the final prosthetic restoration ten weeks after the surgical procedure. There was sufficient stable attached gingiva when the impression was taken **(Fig. 15)**. We removed the PEEK healing caps from the implant base and attached multifunction caps, which are included in the implant set, onto the base **(Fig. 16 to 18)**. Using a polyether impression material (Impregnum™ plus ESPE) and a closed tray, we took an impression of the implant situation. The retention of the multifunction caps is optimally designed to ensure that they are held in the impression material precisely and without distortion **(Fig. 19)**. We used the two other multifunction caps in the implant set as bite registration aids. They were shortened in accordance with the opposing jaw dentition, attached, and then a bite registration was recorded in static occlusion **(Fig. 20 and 21)**. This support prevents the model sinking with articulation. In the laboratory the dental technician screwed the iSy Lab analogs to the lab implant bases, repositioned these in the multifunction caps in the impression, fabricated the master model, and mounted the model in an articulator **(Fig. 22 to 24)**. Until the restoration is ready the healing caps were reattached.

Using CAD/CAM, the anatomically reduced hybrid abutment crowns were constructed in the laboratory, milled out of zirconia (Zirkonzahn), and then individually veneered, always ensuring that the screw access channels were contained in the zirconia to avoid chipping or fractures. The marginal area of the hybrid abutment is shaped concave down to the gingival margin. The crown emergence profiles correspond to the emergence of natural teeth and blend harmoniously into the dental arch. The interdental spaces are designed so that they are easy to clean. The hybrid abutment crowns were bonded with the help of the bonding aid to the iSy Titanium base CAD/CAM. The abutment was silanized, the adhesion area of the zirconia crown activated to the base, and then both were bonded to one another **(Fig. 25 and 26)**. The excess bonding material was removed and the transitions to the base were polished. After a final check of the occlusion in the laboratory **(Fig. 27)**, the hybrid abutment crowns were sterilized and delivered to the practice **(Fig. 28)**.

Fig. 25: To bond the hybrid abutment crowns, the iSy Titanium base CAD/CAM were screwed to a lab analog and silanized.

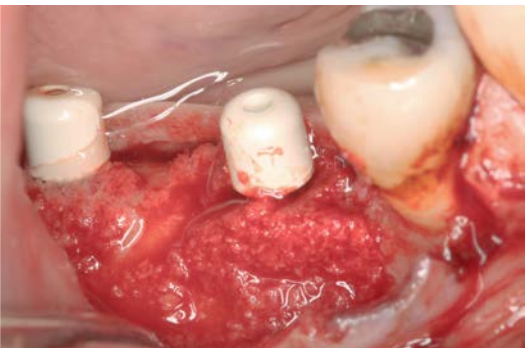

Fig. 13: …were used for lateral augmentation.

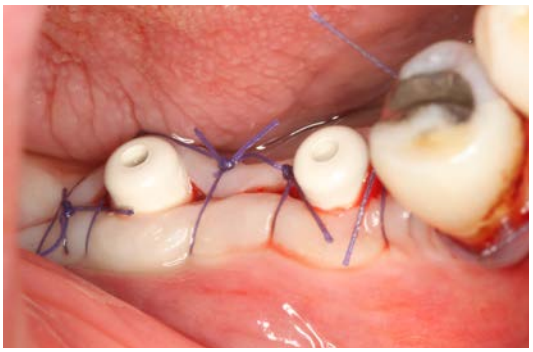

Fig. 14: Using simple interrupted sutures, the soft tissue was tightly closed around the healing caps.

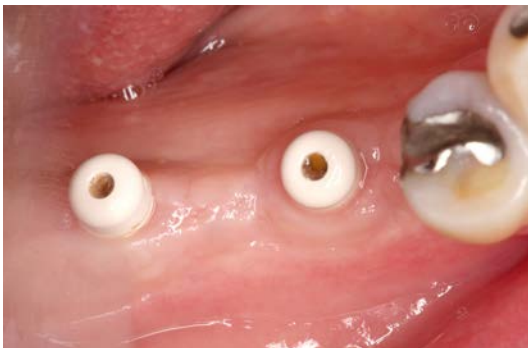

Fig. 15: Ten weeks after surgery the soft tissue situation was healthy and stable.

Fig. 19: The multifunction caps from the basal direction after closed impression taking with polyether.

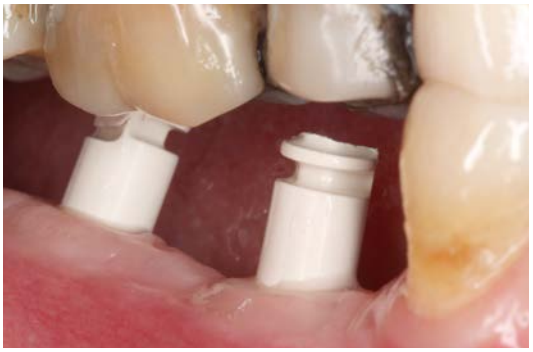

Fig. 20: The additional multifunction caps included in the implant set were shortened in accordance with the occlusion.

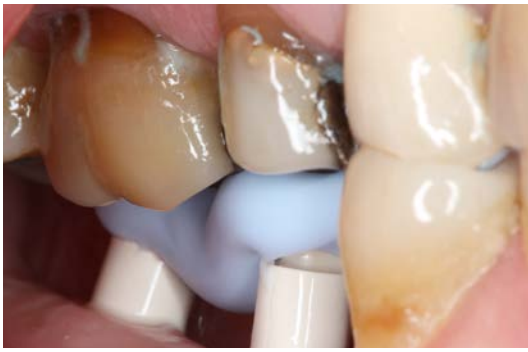

Fig. 21: The shortened multifunction caps are used to support the free-end situation during the bite registration.

Fig. 22: The iSy Lab components were screwed together (lower picture detail)…

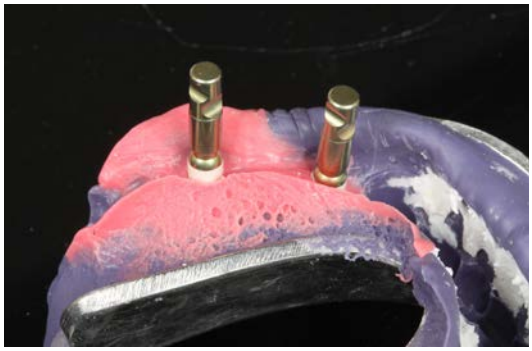

Fig. 23: …and repositioned in the multifunction caps in the impression.

Fig. 24: After fabrication of the master model, the crown emergence profiles were created and grooves were milled for visual inspection.

Fig. 26: The bonded hybrid abutment crowns were removed, the excess material was removed, and the transitions polished.

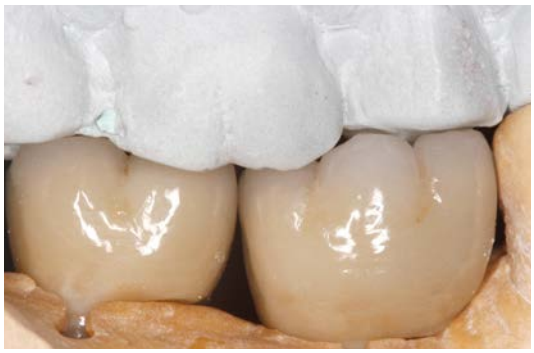

Fig. 27: After bonding the crowns the final occlusion was checked.

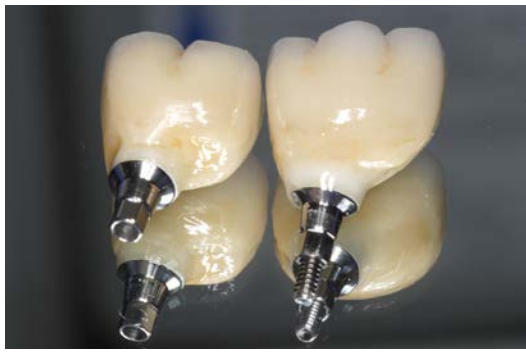

Fig. 28: The sterilized hybrid abutment crowns were delivered to the practice with new abutment screws.

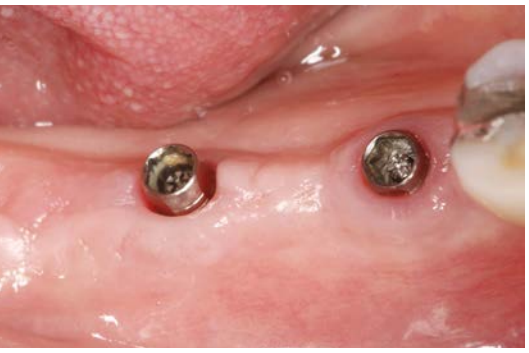

Fig. 29: To fit the hybrid abutment crowns, the healing caps were removed.

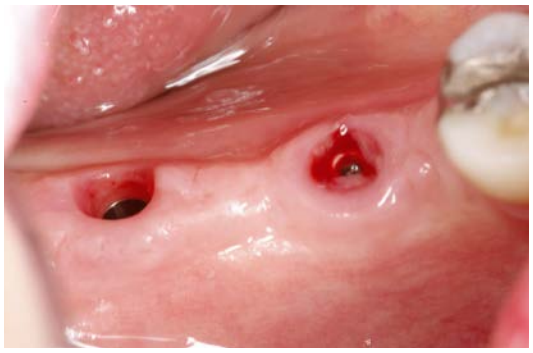

Fig. 30: For the first time after the surgical procedure the implant bases were removed. The loosening of the bonded collagen for fibers caused slight bleeding.

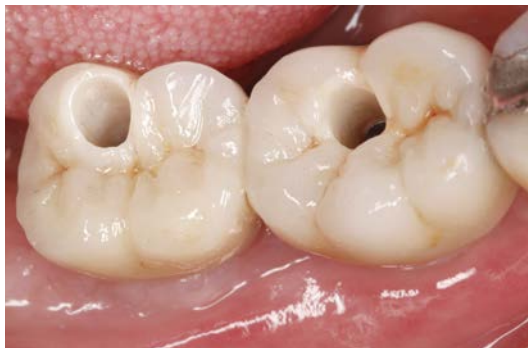

Fig. 31: The hybrid abutment crowns were inserted and the screws were tightened with 20 Ncm. The screw access channels contained in the zirconia can be easily seen.

Fitting the final restoration

Before fitting the hybrid abutment crowns, the healing caps were removed **(Fig. 29)** and the implant bases were detached for the first time [3]. **Figure 30** shows the slight bleeding in the soft tissues, caused by the loosening of the collagen fibres attached to the abutment. This image reveals the good seal to the peri-implant hard and soft tissues by the stable gingival cuff and the adhesion of the fibres to the abutment [5]. We rinsed the implant interface with a chlorhexidine solution, inserted the hybrid abutment crowns, and screwed them into the implant with 20 Ncm **(Fig. 31)**. We prefer directly screw-retained constructions. They are easily and quickly inserted and there is no need to remove cement excess from the sulcus. Cement residue that is not removed may trigger peri-implant disease [7, 8]. We checked the occlusion and re-tightened the abutment screws with 20 Ncm after another five minutes. We sealed the screw access channels first with temporary plastic, took a X-ray to check the exact fit of the reconstruction, and then checked the lateral occlusion **(Fig. 32 and 33)**. Four months after fitting the two hybrid abutment crowns, the peri-implant conditions were stable for the standardized implant restoration in the lower jaw **(Fig. 34)**.

CONCLUSION

The demographic shift will continue to change the requirements for dental care. Implant-supported restorations are one of the common and trusted treatment options. Their high stability and good bone integration means that implants enable the application of fixed therapeutic concepts that usually result in a better quality of life for patients. However, patients cannot or do not want to invest so much money the care of their teeth. It is up to the treating dentist to select a suitable therapy on the basis of discussions with the patient, the findings, and the diagnoses, taking into consideration the appropriate procedure, time, and cost/benefit factors. For this reason, we offer simple standardized implant concepts for the non-esthetic zone.

The standardized iSy Treatment Concept reduces both the surgical effort and the number of sittings with the patient. The components included in the implant set, such as the healing caps, multifunction caps, and the form drill, mean that the management of orders and parts that would otherwise be necessary is omitted. The concentration on a few work steps, the reduced drilling protocol, and the transgingival healing reduce the costs. With the help of this elegant, transgingival implant concept, we leave the implant base in situ until the final abutment is fitted. This appears to favor the preservation of soft and hard tissues and to make our results more predictable and more stable than was previously possible. New and cost-effective biocompatible materials that can be precisely prepared using CAD/CAM technology are gaining in importance. The hybrid abutment crowns are screwed on in the mouth immediately after removal of the implant bases. This means that otherwise necessary measures to cement the crowns to the abutments with subsequent removal of any excess cement from the sulcus are no longer required. If the restora-tion is extended, the abutment crowns can be simply removed and the implant can be easily integrated into a bridge restoration.

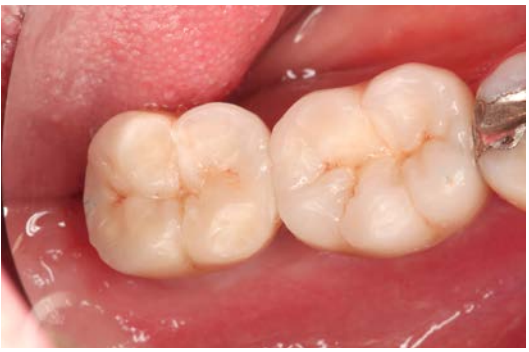

Fig. 32: The screw access channels were sealed with composite.

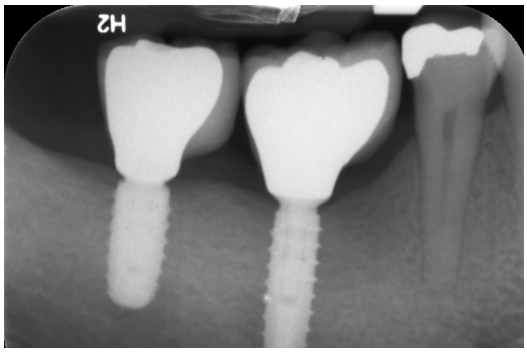

Fig. 33: At the checkup four months after fitting the final restoration, stable peri-implant bone can be seen in the X-ray image.

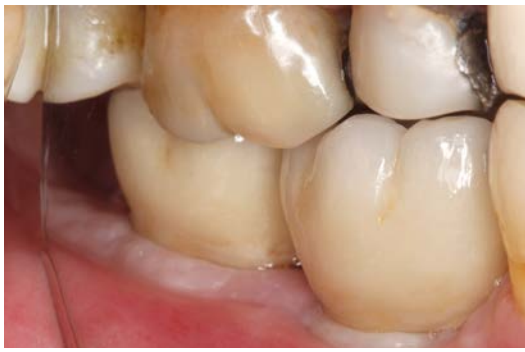

Fig. 34: The functional, standardized reconstruction of the free-end situation four months after the fitting.

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Dr. Steffen Kistler completed his dental studies between 1990 and 1995 at the Freie Universität Berlin and Ludwig-Maximilians-Universität Munich. He graduated in 1996 during his assistantship from 1995 to 1997 in the Clinic for Dental and Oral Medicine at the Ludwig-Maximilians-Universität Munich. For the next two years Steffen Kistler worked as a senior clinician in the discipline of prosthetics in the Clinic for Dental and Oral Medicine at the Ludwig-Maximilians-Universität Munich. From 1999 to 2001 he worked with Dr. Wolfgang Braun in a joint practice for oral surgery in Nördlingen (Germany) until he moved to the joint dentistry clinic in Landsberg/Lech (Germany) in 2001. Since then he has run the practice jointly with Dr. G. Bayer, his brother Dr. F. Kistler, and Dr. A. Elbertzhagen. The focus of his work is implantology and prosthetics. He is a specialist in implantology certified by the DGOI, BDIZ, and EDA as well as a diplomat of the ICOI since 2004.

Ms. Ricarda Eiterer completed her training as a dental technician with her apprenticeship examination in 1986. In the following years she worked in various dental laboratories as well as a practice laboratory where she became experienced in the fabrication of esthetic and functional reconstructions and refined her techniques. From 1996 to 1997 Ricarda Eiterer attended the school for master dental technicians in Munich where she earned her master title for dentistry. In the following years she worked as department head and laboratory manager. After a short period of parental leave, she became self-employed in 2001 and established a dental laboratory in Marktoberdorf.