The restoration of an appropriate implant base following tooth loss depends on a multitude of important factors. As the initial focus was placed on complete osseous reconstruction of the bone defect with a view to ensuring sufficient bone quality and volume, essential secondary factors such as a harmonious soft tissue profile with a thick morphotype, vital blood supply and a low-scar and tension-free wound closure in the aesthetic zone have often been underestimated, and in fact still are.

Onlay plasties using bone blocks have become a proven method nowadays that has established itself as an important standard technique for reconstructing bone defects. Nonetheless, this indication should be used with considerable discrimination:

- The use of bone grafts always demands a second surgical site, with all the potential adverse consequences such as pain, morbidity, risk of infection and scar formation.

Dr. Gerhard Iglhaut (Dentist)/Memmingen, Germany

The Minimally Invasive Shell Technique for Bone Augmentation

For pre-implantologic bone augmentation, the ultrasound-based SonicWeld-technology—introduced by Dr. Iglhaut—represents a method of choice. The high strength of the resorbable PDLLA membranes has proved to be highly useful for three-dimensional alveolar ridge augmentation. The primary objective of this method, which consists in avoiding the use of bone block grafts, has already been successfully achieved by the author in more than 40 cases.

Dr. Gerhard Iglhaut (Dentist)/Memmingen, Germany

Fig. 1–5: Osteosynthesis with SonicWeld Rx®. – Fig. 1: Heat and adapt the plate/mesh. – Fig. 2: Pre-drill the hole. – Fig. 3: Put SonicPin Rx in place.
– The operation poses the risk of wound dehiscence with loss of the graft.
– Hypocellular cortical blocks cannot achieve full osseous integration.
– Consequently, there is a risk of the graft coming off its bone base when preparing the implant bed.
– Cancellous bone block grafts from the hip region tend to be subject to excessive resorption.

To prevent all this, Khoury developed a special technique of horizontal and vertical bone augmentation using cortical bone slices created from block grafts harvested from the retromolar region next to the linea obliqua. This allows building a three-dimensional, positionally stable space for reconstruction of the alveolar ridge. In this way, it is possible to achieve low-resorption bone regeneration of stable volume while keeping the bone requirements considerably lower.

The greatest disadvantage, though, must be seen in the high technical demands that this technically sensitive method places on surgeons. Besides, traumatic graft harvesting from a second surgical site cannot be avoided.

The SonicWeld Rx® technology enabled surgeons for the first time to perform a stable 3-D reconstruction by using shapeable and resorbable shells. What has proved to be particularly advantageous for patients and surgeons alike is the fact that a second intervention is no longer required. With this novel technique, an ultrasound generator provides pulses of an exactly defined frequency focused by way of a sonotrode. Upon putting a resorbable pin in place on the pre-drilled hole and activating the sonotrode, the ultrasonic vibrations cause the pin surfaces to liquefy at the edges, thus enabling the pin to glide into the hole and, thanks to the change effected in its state of aggregation, penetrate into the bony cavities to anchor itself in a way that would never be possible for conventional bone screws. This explains the previously unknown initial strength of these pins. Moreover, the pin head bonds with the implant carrier—the membrane or plate—during the melting-in process to create a blocking mechanism that results in a three-dimensional construction of impressive stability.

Quite in contrast to previous resorbable pins, inserting (or rather, melting in) the SonicPins Rx is technically a very simple process and pin fracture is virtually pre-
vented. Special angled sonotrodes are available to ensure that the pins can be easily inserted even in anatomical regions that are difficult to access. Smoothing sonotrodes, in turn, allow one to smoothen away any excess or overlapping material by welding it to the local bone.

What impresses the clinical practitioner even more than the strength of the resorbable pins is the rigidity of the SonicWeld membranes. These membranes can be very well preshaped and adapted as required after heating them up. Once they have cooled down again, they reliably retain their new shape and never “relapse”. The three-dimensional stability is an essential feature that sets these membranes apart from any conventional membrane available on the market. Therefore, it was a rather obvious idea to utilize the rigid, dimensionally stable, synthetic membranes made from pure, amorphous PDLLA (poly-D-L-lactic acid) instead of small cortical bone slices as previously used for the shell technique. The augmentation itself consists of a roughly 50/50 mixture of particulated autologous bone and deproteinized, bovine bone matrix (BioOss®). This benefits the patient in that the harvesting intervention can be limited to a minimum, while the surgeon is spared the time-consuming task of preparing bone slices in a technically intensive process. Another positive effect results from the fact that it is possible for the surgeon to insert the SonicPins Rx in the augmentation region in a first step, and with a perfect view of the site, before the resorbable membrane is welded in place on the SonicPins in a second step.

Regarding the critical coverage of the alveolar ridge, the author uses either diffusion-open collagen membranes or small collagen sponges, as these materials ensure the best possible blood supply to the incision region and especially the wound flap. Should wound healing problems or dehiscences occur nonetheless, the collagen-covered wound region will always tend to close itself by secondary wound healing. Loss of the augmentate can thus be avoided.

Primary wound closure can usually be achieved by minimally invasive soft tissue management. The most important point here is a tension-free tissue flap that provides static, motionless coverage of the augmentation region. Careful and tissue-sparing preparation of this flap represents a key factor for the success of the operation. The objective must be to secure a postoperative soft tissue situation that is comparable, both in color and form, to the preoperative state. Only when this is guaranteed can the surgeon be really satisfied with his work and expect the best possible outcome for the patient.

As regards the suture techniques used, the author distinguishes between retaining sutures and coapting sutures. Retaining sutures consist of PTFE and are placed near the mucogingival border within the fixed mucosa. They are intended to hold the flap in a stable position and take up the muscular tensile forces. Crestally, very fine Seralene, coapting sutures size 6-0 to 7-0 are used for perfectly adapting the wound edges to ensure a complication-free and closed healing process. Courses are continuously offered throughout Germany to train dental surgeons in these details and give them an opportunity for hands-on experience using animal jaws (for more information, please visit the following website: www.adsystems.de).

My thoughts are already directed at preventing bone loss in the first place. For if I realize as a clinician that horizontal bone loss of about 50% occurs within just one year, with two thirds of this loss concentrated in the first three months, I always have to think of my follow-up concept whenever I am extracting a tooth. The objective should be to prevent atrophies altogether by immediately creating stable spatial conditions with a resorbable substitute structure and fill the alveole with bony material.

■ CONTACT

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Innovative augmentation without harvesting of autologous bone blocks

- Shell technique according to Dr. G. Iglhaut
- Horizontal and/or vertical alveolar ridge augmentation
- Reduced bone harvesting – a minimally invasive procedure
- Easy handling and best rigidity based on 100% biologic resorbable material
- Surgical approach, incision, suturing and soft tissue management – a reliable master-plan