

# The IntraLift™: A new minimal invasive ultrasonic technique for sinus grafting procedures

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This case report reveals a new technology in sinus grafting with an ultrasonic device and special tips designed for the atraumatic lifting and augmentation of the sinus floor.

**The need of secure implantology** in the maxillary molar region has urged dentists and surgeons to find evidence-based methods for operation protocols of the sinus. The lateral window technique Tatum described is one of the most secure and predictable ways to guarantee a new bone formation in maxillary edentulous areas with increased pneumatized sinus related to atrophic reaction caused by a loss of bone function. This technique requires a full flap for a good visibility of the operation field, mostly created with a crestal or paracrestal incision, and the cut of a window of the lateral sinus wall.

Done with rotative burs or diamonds, the threat of an iatrogenous rupture of the Schneiderian Membrane is one of the challenges the surgeon is facing. Once the window has been cut, the next challenge is to reflect the sinus mucosa from the bone floor and walls without the injury of the sinus mucosa. Even though for the experienced surgeon the lateral sinus lift technique is not that pretentious and the potentially ruptured membrane can easily be covered with a resorbable membrane, the search for a less traumatic way was negotiated by the Summers Technique and its modifications.

This technique is less invasive due to the crestal approach that makes an extended flap unnecessary. Nevertheless, disadvantageous is the threat of an uncontrolled rupture caused by the osteotomes and, in addition to that, the area of submucosal augmentation is restricted. Done with surgical hammers, the operation itself is for most of the patients described as more uncomfortable compared to the lateral technique, but the postoperative complaints are significantly reduced compared to the lateral technique with visible hematoma and edema.

The intention of the inventors of this technique was to combine the benefits of the lateral window technique—regarding to safe augmentation of bigger areas—and the reduced invasive postoperative patient complaints with the Summers Technique. Since ultrasonic surgery has become a secure method in bone surgery, the idea was to develop a technique that reduces the risk of traumatization of the Schneiderian membrane tremendously, and to graft the sinus to any extent desired with a hydrodynamic cavitation effect.

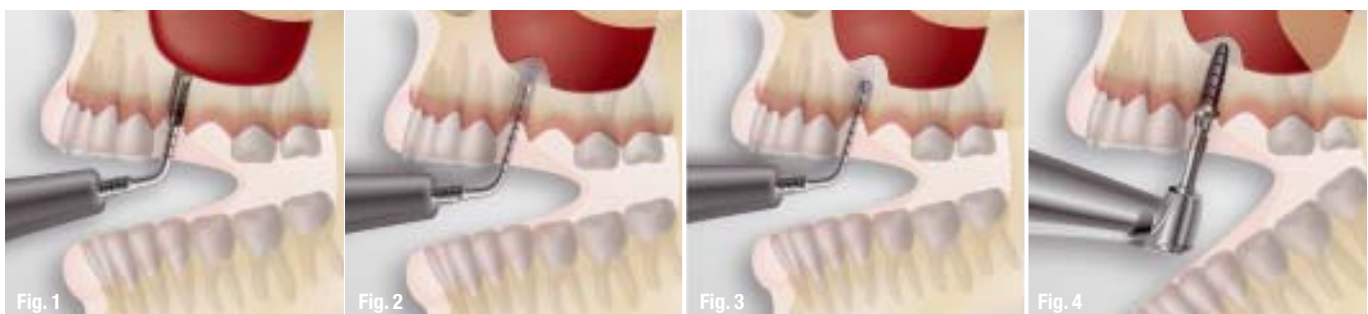
In preliminary studies on lamb skulls, the scientific group of Troedhan, Kurrek, Wainwright (TKW) and the Acteon Group in France developed a technique with the ultrasonic Piezotome® named as the IntraLift™.

**Fig. 1**\_TKW3 in use, preparing the osteotomy site with water irrigation (NaCl) and a high level setting.

**Fig. 2**\_TKW4 (trumpet) with the piezoelectric and microcavitation effect lifting the Schneiderian membrane from its floor.

**Fig. 3**\_TKW4 (trumpet) in use as a plugger with alternating use of water irrigation in low level (4).

**Fig. 4**\_ Implant placement if primary stability is achieved (+20 Ncm)



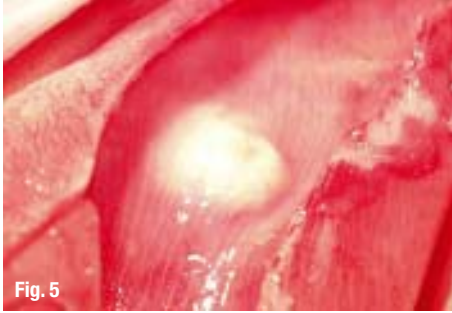


Fig. 5



Fig. 6



Fig. 7

**Fig. 5**\_In preliminary studies with sheep skulls, the technique was tested successfully. This picture shows the lifted membrane and the grafting material (Cerasorb M) shining through.

**Fig. 6**\_Biopsy punch in use after infiltration anesthesia.

**Fig. 7**\_Dissected gingiva before bedded in sterile NaCl.

### The IntraLift™ Protocol

The technique of the IntraLift is shown in Figures 1–4. If no lateral augmentation is required and the bone width is sufficient, the use of a biopsy punch is recommended. The punched gingiva is bedded in sterile sodium chloride and finally resutured after surgery. The protocol recommends an initial pilot drill osteotomy with a 2 mm twist drill when the crest is higher than 3 mm, and to stop 2 mm before the sinus floor. If less than 3 mm, like in this case, it's sufficient enough and more secure to start directly with the diamond coated and laser marked TKW 1. The piezotome technique allows the surgeon to prepare a safe and efficient implant site without the threat of a perforation of the Schneiderian Membrane, as compared to drilling devices. Nevertheless, the ultrasonic tip doesn't cut any soft tissue it might encounter so that too much pressure would result in an iatrogenic perforation; and an intraoperative x-ray might be helpful to determine the residual bone height. The water irrigation should be 80 ml/min in mode 1 (highest mode, depending on bone quality).

After TKW1 has reached the Schneiderian membrane, TKW2 and TKW3 (Fig. 1) follow with increasing diameter to widen the osteotomy for TKW4, named trumpet (Fig. 2). This is the most important step and instrument. With the combination of the piezoelectric and the hydrodynamic microcavitation effect resulting in a symmetrical distribution of the sterile sodium chloride, the Schneiderian membrane is lifted efficiently and quickly from the sinus floor.

The trumpet is used at level 2 or 3, and increasing irrigation starting with 40 ml/min going up to 60 ml/min—direct contact with the Schneiderian membrane should be avoided. A perforation can be

almost excluded, and even if it might not be bigger than 2.8 mm in diameter, it can be covered as the protocol recommends with a collagenous sponge or a resorbable membrane; even if there is no perforation just as a buffer prior to filling procedure with alloplastic or autogenous augmentation material.

The trumpet is used as a plugger to fill, through the osteotomy, the new subantral cavity with the grafting material (Fig. 3). For a homogenous distribution of the augmentation material the trumpet (TKW4) is used in low level mode (level 4) and irrigation 40–50 ml/min, alternating, for 3 seconds. If primary stability is achieved (above 20 Ncm), the placement of an implant is feasible. The punched gingiva is sutured back with atraumatic suture material 5/0 or 6/0. The first steps for the surgical protocol and technique were evaluated in preliminary studies on sheep skulls (Fig 5).

### Case Report

A 37-year-old male patient, heavy smoker (30 cigarettes/day) with missing teeth in the molar region and an insufficient restored oral cavity came with the desire for a full mouth treatment and a restitutio ad integrum. Tooth 13 was missing and the patient agreed with an implant treatment plan. The residual height of the alveolar crest was 2.5 millimeters at its lowest point.

It was planned to graft the sinus via the IntraLift technique and, if primarily stability above 25 Ncm was achieved, the placement of a 3iPrevail™ Implant. The implant design with a wider platform than the screw's diameter results in a high primary stability. After infiltration anesthesia with Ultracain forte™, the osteotomy site was revealed with a conventional biopsy

**Fig. 8**\_TKW3 in use.

**Fig. 9**\_A collagenous sponge is plugged into the osteotomy prior to the filling of the subantral room. This avoids an iatrogenous perforation and has the function of a buffer.

**Fig. 10**\_Cerasorb M mixed with blood from the osteotomy. This facilitate the grafting process and enhances the grafting material with a high osteoinductive autologous material.



Fig. 8



Fig. 9



Fig. 10



**Fig. 11\_** The trumpet (TKW4) used as a plugger for the grafting material.

**Fig. 12\_** Placement of a 3i Prevail Implant of 4 x 11.5 cm.

**Fig. 13\_** The gingival punch is sutured back with 6/0 atraumatic suture.

punch (Figs. 6, 7), and the tissue was bedded in sterile sodium chloride until it was sutured back after implant placement.

Figure 8 shows diamond coated and laser marked TKW 4 in action. The complete absence of drilling sounds and sensibility is connected with a high patient acceptance, especially compared to the use of a surgical hammer.

After final preparation with TKW4 (trumpet) and elevation of the Schneiderian membrane, a collagenous sponge is plugged into the cavity as a buffer to avoid any traumatization of the membrane (Fig. 9). The grafting material was, in this case, Cerasorb® M (2 x 0.5 cc 500–1,000 µm) mixed with blood from the osteotomy site containing a high amount of mesenchymal blast cells and progenitor cells with a high osteoinductive potency (Fig. 10).

The trumpet (TKW4) is used as a plugger as described in the protocol with alternate water irrigation use (Fig. 11). After reaching the desired grafting height—that can be easily controlled by a periodontal or an implant socket probe—a 3i Certain Prevail Implant of 4 x 11.5 mm was placed, and a primary stability of 25 Ncm was achieved (Fig. 12). The mucosa punch was sutured back with 6/0 atraumatic Supramid™ and the postoperative X-ray shows a clear peri-implant augmentation area with no rupture of the membrane and augmentation material in the sinus. The patient came back the following day with no swelling, bleeding and zero consumption of painkillers.

**\_Summary**

The IntraLift is an alternative to conventional sinus grafting techniques with dramatically reduced

trauma and a high patient acceptance. The aim to minimize operation techniques was the drive for the authors to invent this protocol based on the piezo-electric and the microcavitation effect. Regarding the protocol, a traumatization of the Schneiderian membrane is extremely reduced, and even if there is a perforation, the protocol describes the plugging of a collagenous sponge to close the perforation and to continue with the operation protocol. Small areas like single tooth implants or huge edentulous areas (Fig. 15 with regards to Dr Troedhan, Vienna) can be grafted with an osteotomy from the crestal aspect and, if no lateral augmentation is necessary, only with the atraumatic punch technique.

Patients today desire more and more a minimalization of operation techniques combined with a high predictability. This technique is an opportunity to increase the number of patients with compromised maxillary bone situation. New trabecular bone formation was partially visible only after 6 weeks, and in 98%, the treated patients didn't use any analgetics. Hence, an enlarged database and additional studies are necessary to underline the effectiveness of this technique.

*The literature list is available from Dr Wainwright.*

**Fig. 14\_** The postop X-ray reveals a clear visible augmented sinus floor with no perforation.

**Fig. 15\_** Even huge areas can be augmented with this minimal invasive technique, as shown in the case from Dr Troedhan (Austria). From each implant site, the augmentation of the sinus was achieved with the punch technique resulting in no pain and swelling for the patient.



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