Sinus lift without scalpel

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_Owing to the loss of vertical bone volumes in the maxillary sinus area, an implantation with sufficient primary stability is often not possible. In many cases a therapeutical consequence is introduction of a bone augmentation in the sinus area (sinus lift). Fear of this procedure and higher costs are often the causes of why patients resist having this operation done. Because of these reasons, our development moved to the next step. With the JEDER®-System it is possible to perform a sinus lift without the use of a scalpel. In comparison to the conventional lateral fenestration of the buccal sinus bone, in our procedure all one needs is a small opening on the crestal alveolar ridge. Over this opening it is possible to place the augmentation material and the implant itself. The risk of a rupture in the Schneiderian membrane can also be reduced through this innovative technique.

_Virtually bloodless procedure

In order to place implants, maxillary bone substance with sufficient height and diameter is required. Owing to atrophic processes it becomes increasingly difficult to place implants after tooth loss. Under such atrophic conditions it is not possible to place implants with sufficient primary stability, especially when the maxillary bone height falls below 4 mm. In these cases an augmentation is unavoidable. Hence it is necessary to place augmentation material between the sinus floor and the Schneiderian membrane: the sinus lift.

With this innovative surgical technique it is possible to simply lift the Schneiderian membrane in a gentle and safe manner through a 3.5 mm opening in the crestal bone with the use of the JEDER®-System (Fig. 1 A-C) (Patent AT 507208 & Patent AT 504552). After the membrane has been lifted with the aid of a pressurized, oscillating saline solution depicted graphically on the display (Fig. 2), the bone augmentation material can be inserted into the newly formed cavity above the hole of the initial drilling. A successive implantation immediately after augmentation poses no problem. This surgical technique drastically reduces postoperative pain and ensures the surgeon simultaneous feedback-control during the procedure itself. At the same time, the classical risks of swelling and membrane rupture are reduced. The surgical procedure is explained in the following three simple steps.

1.) A.T.P-Punch (Atraumatic Transginigival Perforation)

After application of the local anaesthesia, the A.T.P-Punch (Fig. 3), developed by Prof Dr Wolfgang Jesch (sales: DENTSPLY Friadent) is used to punch through the mucoperiosteum. Simultaneously the punch makes a small incrementation in the crestal bone in which the primary drill for implantation can gain purchase. The advantages in perforating of the soft tissue in this manner are: a clean access to the alveolar ridge and a minimal invasive procedure that makes a smaller wound, resulting in fewer traumas and less pain for the patient. After the A.T.P-Punch is

Fig.1_The JEDER®-System.
Fig. 2_Pressure-, Frequency-, and Volume-Monitor.

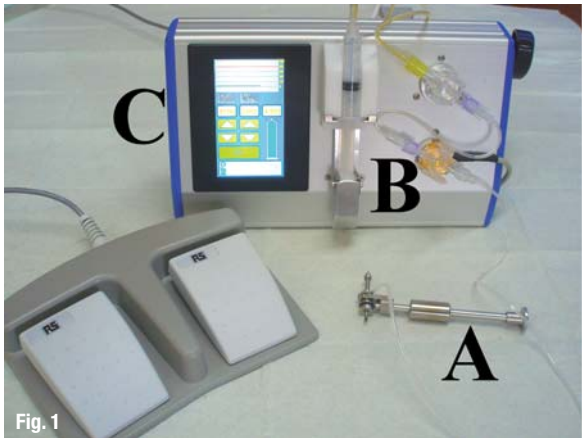


Fig. 1

Fig. 2

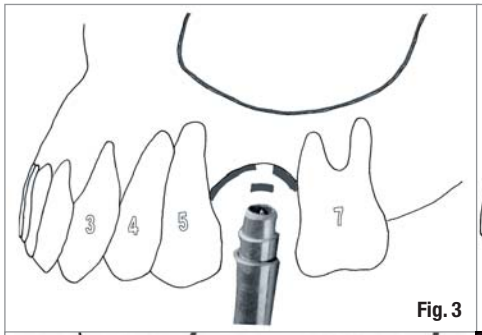


Fig. 3

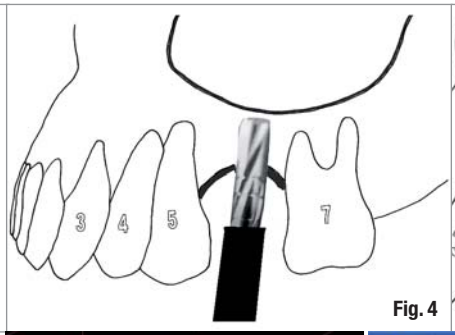
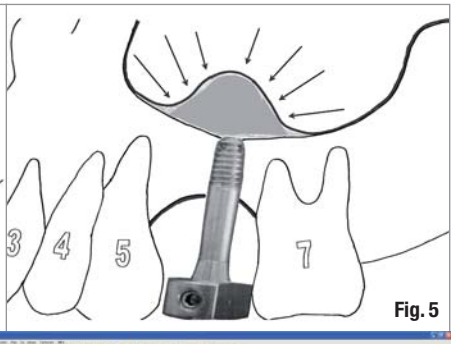


Fig. 4



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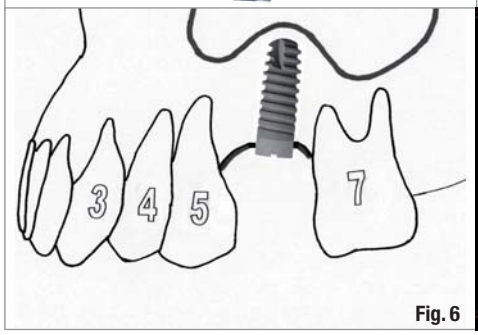
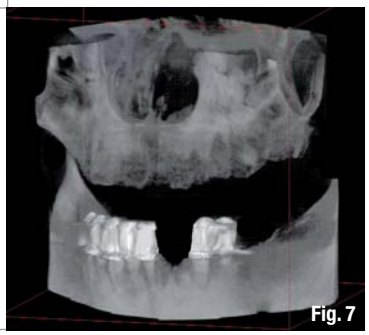


Fig. 6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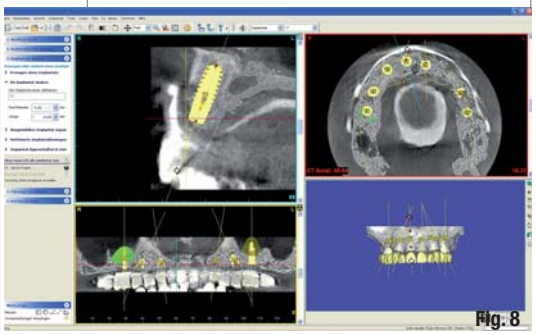


Fig. 8

used, the JEDER®-System is applied. This system is comprised of two components: The Pressure Bone Drill (P.B.D) and the Sinus Vibration Pump (S.V.P).

2.) The Pressure Bone Drill (P.B.D)

The drilling is continued until just below the sinus floor (Fig. 4). If necessary a panoramic X-ray can be done in order to examine the exact position of drill depth. After fixing the tight fitting P.B.D (Fig. 1A) measurable pressure is created using saline solution. In the inside of the P.B.D a drill moves forward at a rate of one tenths of a millimetre in the direction of the sinus floor. A soon as the slightest perforation is made through the remaining bone, the saline solution (which is under pressure) forces the schneiderian membrane upward and away from the pursuing drill that could damage the membrane. Since a resulting loss in pressure can be measured using the JEDER®-System, the forward-moving drill is abruptly stopped by the surgeon.

3.) Sinus Vibration Pump (S.V.P)

After successful "penetration" of the remaining bone volume a panoramic X-ray can be made to ensure that a bubble was made with the aid of the pressurized saline solution. After this step, the saline solution is brought into oscillation with the aid of the S.V.P (Fig. 1B). At the same time the volume of the solution can be increased precisely (Fig. 1C). Through this method the Schneiderian membrane can be lifted more easily from the sinus floor (Fig. 5). After pumping the saline solution out of the cavity, this newly formed cavity can be filled with the bone augmentation material. According to our protocol we place the implants immediately after augmentation (Fig. 6).

The surveillance of the operation is monitored in its entirety through constant pressure and volume measurements. A simple technique to determine if a membrane rupture has taken place is the conventional valsalva test commonly practiced after wisdom tooth removal in the maxilla. An advanced way of checking a rupture was with the aid of an endoscope, which we used in the preliminary examinations. Setting the implants always went according to the guidelines of the implant manufacturer. The healing phase was set at three months in each case. Similar technology uses a balloon to lift the membrane. The difference in the Jeder®-System is the comparative reduction of fric-

Fig. 3_A.T.P-Punch fort he minimal invasive approach.
Fig. 4_Drill until slightly below the sinus floor.
Fig. 5_Schneiderian membrane being lifted through the saline solution.
Fig. 6_Implantat in place.
Fig. 7_Preoperative volume tomography.
Fig. 8_Digital planning of the implant positions.

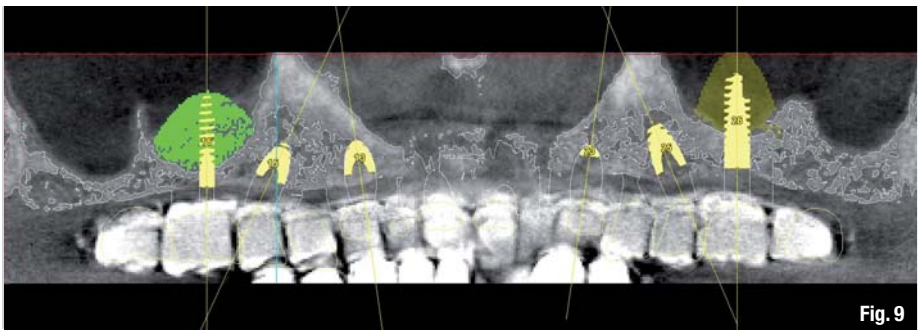


Fig. 9

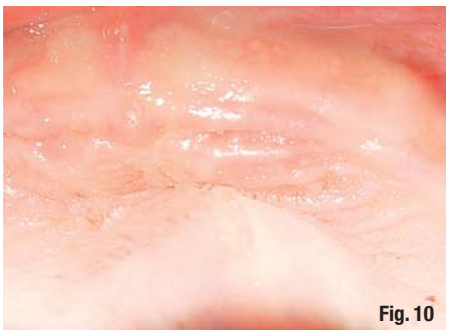
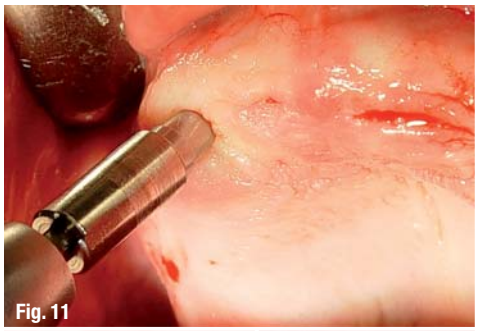


Fig. 10

Fig. 9_Virtual measurement of sinus lift volume.
Fig.10_Maxilla before operation.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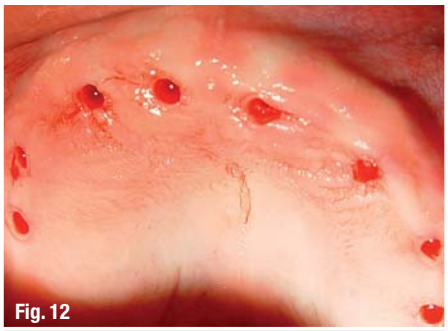
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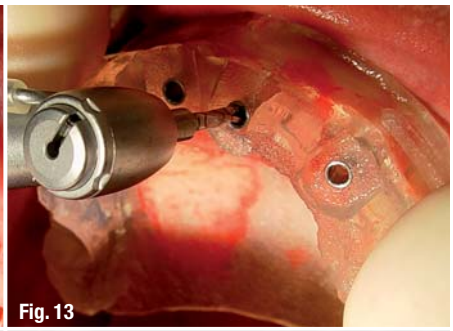
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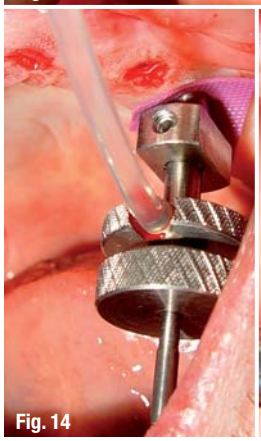
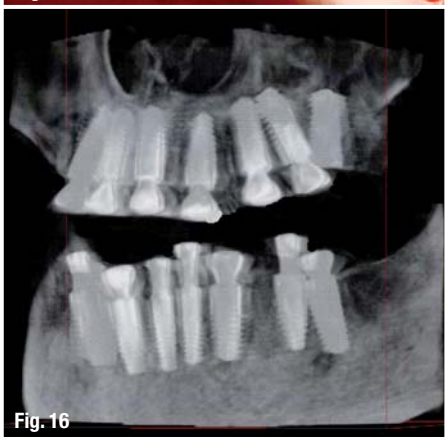


Fig. 14


Fig. 15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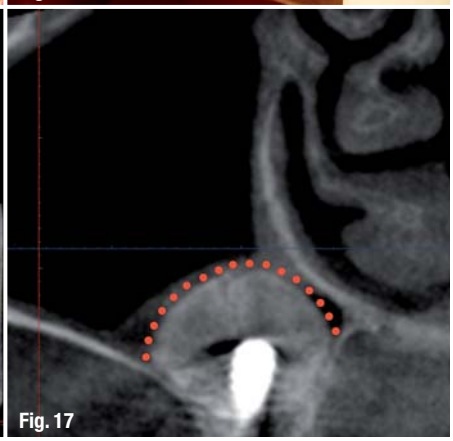
Fig. 17

Fig.11_Use of the A.T.P-Punch.
Fig.12_All eight implant positions.
Fig.13_Navigation splint in use.
Fig.14_P.B.D in use.
Fig.15_Placement of the implant after sinuslift.
Fig.16_Postoperative volume tomography.
Fig.17_Coronal view of the sinuslift.

Fig.18_Emergence profiles.
Fig.19_Individual zirkonia abutments.
Fig. 20_Final restauration.

tion that is placed upon the membrane: since only water creates the pressure, the risk of a rupture is reduced considerably. At the same time, the amount of saline solution volume is monitored, thus ensuring a very precise knowledge of how much bone augmentation material should be applied (Fig. 2). In 2009 alone, 30 patients with a total of 35 sinus lifts were successfully treated with the JEDER®-System.

_Case report

A 64-year-old edentulous patient who was wearing a full denture for almost two years wished a fixed prosthetic solution. The bone volume assessment showed an inner-antral bone height of 14–18 mm. The bone height in the sinus area was between 3–5 mm. Preoperative planning is essential for success. In order to accommodate the high aesthetic demands of the patient a detailed surgical and prosthetic plan was prepared. It was determined that wax-up and navigated implantation were essential for a positive outcome of this case.

The surgical procedure was divided into two parts: the implantation and the sinus augmentation. In order to assess the available bone volume a preoperative volume tomography was made (Planmeca; ProMax®, Helsinki; Fig. 7). Digital planning of the implant positions was made possible with the navigating software Materialise® (DENTSPLY Friadent). A further important tool in this software is the virtual measurement of the expected volume of the sinuslift. In so doing, a volume amount was calculated before the procedure itself, thus providing important knowledge of the saline solution volume and bone augmentation material required and how much of both will be required during the operation itself. In this case 0.88 ml for the right sinus, and 0.66 ml for the left sinus were calculated virtually (Fig. 8 and 9).

For the minimal invasive sinus lift the described components P.B.D and S.V.P (Fig. 1A and B) were applied. Because of the small crestal opening (3.5 mm diameter x 5 mm in height) only a paste-like bone augmentation material could be used. In our cases we used Ostim® (Heraeus Kulzer). The intraoperative drill-splint from Materialise® made an exact positioning of the implants possible (Fig. 10 to 15). A postoperative

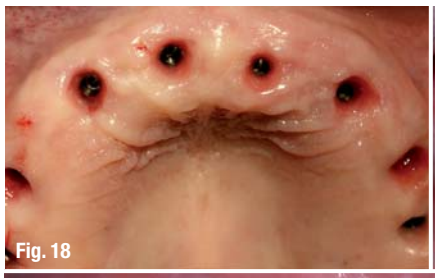
Fig. 18


Fig. 19

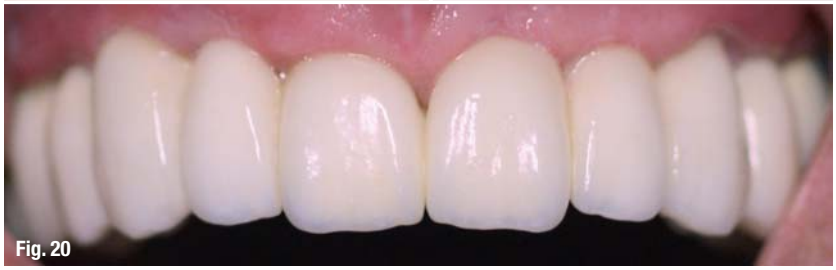
Fig. 20

volume tomography documents the implant positions as well as the minimal invasive sinus lift (Figs. 16 &17). In order to mange the soft tissue for an optimal aesthetic result, following aids were used:

_The use of the A.T.P-Punch to avoid a mucoperiosteal flap and to reduce soft tissue trauma.
_The use of very large healing abutments (diam. 7 mm) to make space for the individual zirconium prosthetic abutments (Fig. 18).
_An optimal provisional bridge that contours the soft tissue as well.
_Using a fine burr to model the keratinized gingiva in the papilla areas.

Owing to the high primary stability of the eight implants (incl. sinuslift) an immediate loading of all implants was decided upon. Full ceramic individual abutments, zirconium framework and a ceramic finish (Dental Design Koczy, Figs. 19 & 20) made this bridge perfect in all aspects of the patient's aesthetic demands. The manufacturing of the bridge took three weeks and was cemented permanently using iCem® (Heraeus Kulzer).

_Conclusion

In summary and according to our concept, the following is needed for an optimal management of soft and hard tissue.

_Flapless implantation (A.T.P)
_Flapless sinus lift (JEDER®-System)
_Navigated implantation (Materialise®)
_Individual abutments/Zirconium Framework
_Individual provisional solution

Advantages using the JEDER®-System
_Minimal invasive technique
_No suture, no swelling
_No discolouration (haematoma)
_Short operation
_Almost no pain or discomfort after operation
_Large reduction of risk (membrane rupture)
_Simplified surgical procedure

_contact implants

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