

Figure 1 demonstrates the antral pneumatization of sinus and the lack of adequate quantity of bone. The remaining antral wall is covered by mucosa.

Introducing minimal invasive sinus elevation – the Balloon Lift approach

Prof. Liviu Steier and Gabriela Steier describe a new technique

The treatment of patients with pneumatization of the sinus and insufficient remaining bone to engage implant retained fixed restorations has become a standard treatment over the last 15 years.

Among the first, Hilt Tatum suggested in the late 1970s the alteration of the sinus cavity using a crestal procedure. The proposed treatment approach suggested the raising of the sinus floor and placement of bone grafts. In 1986 Tatum introduced his modification of the

Caldwell–Luc procedure. The technique included a lateral ostotomy with inward fracture, the elevation of the membrane and consecutive grafting.

The maxillary sinus is shaped like a pyramid measuring 2.5 cm width, 3.75 cm height and 3 cm in depth. The antral floor can measure between 5 mm but due to tooth loss and consecutive resorption it can turn to up to about 1 mm.

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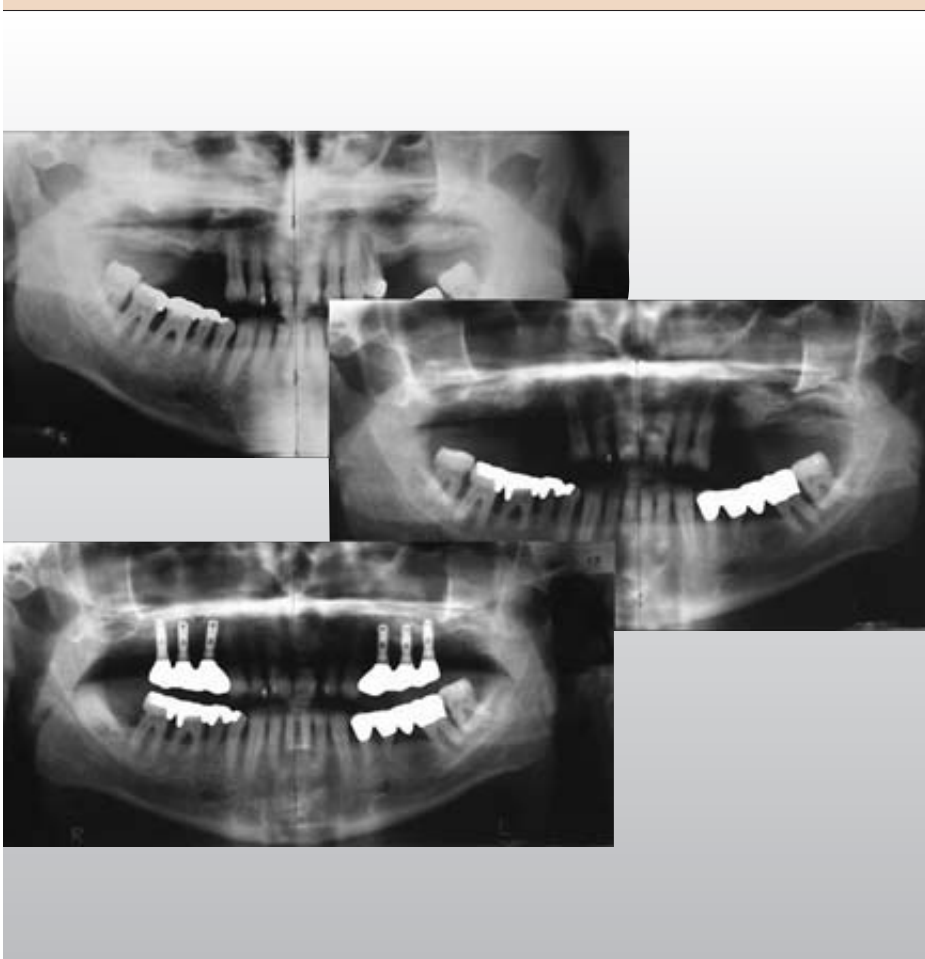


Figure 2 shows three panoramic views of the dentition after 18 years. First picture in the left shows both sides pneumatized sinuses. Picture in the middle shows the five months control after sinus augmentation before implant placement. Lower radiograph proves the quality of the performed oral rehabilitation 16 years later.

NUVIEW

The Balloon Lift approach to sinus elevation

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Figure 3 shows a case performed using the modified Tatum approach. A crestal and two vertical relaxing incisions (trapezoid design) were performed to expose the bony area. The bone cut was executed 3-4 mm away from the crestal ridge, a horizontal series of holes was performed parallel to the inferior bone cut almost penetrating the exterior cortex and exposing the Schneiderian membrane. The lateral wall was then carefully fractured and the relief of the membrane performed.



Risks associated with the classic sinus lift elevation procedure as described

The greatest danger was of course membrane perforation. In the early days this was considered an almost irreparable *fait accompli*. Later different attitudes were described in the literature, from closing down to membrane replacements.

If muscular insertion extended to the crestal ridge deficiency of the wound lips could occur leading to healing problems up to exposure of the graft. Worst case scenario lead to rejection of the graft and additional surgical attitudes. Of course patients with smoking habit were at even higher risk of incision line breakdown. Tension of the incision line resulted as well from deep muscular insertion and suture tension.

The Balloon Lift Control approach

To minimise the above mentioned risks a new approach has been introduced. So wherein do the differences lie?

- Starting with reliable measurements from the panoramic x-ray (after application of the 125 per cent rule) the remaining antral bone height is known. This information is used to preset the precise depth of drilling. Similar to the use of rubber stops in endodontic guidance shells are applied over the drills to limit the depth of penetration. The great benefit is seen in dramatically reduction of Schneiderian membrane perforation.
- The Tatum technique requires sharp instruments to relief the Schneiderian membrane from the bone. The Balloon Lift Control uses the balloon for the same purpose. This predictably avoids perforations.
- The surgeon can avoid raising a flap and use a punch to give give access to the bony plate. By this wound healing problems can be almost excluded.

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Figure 4 is a clinical image showing the use of a mucosa trephine and the access after penetration.

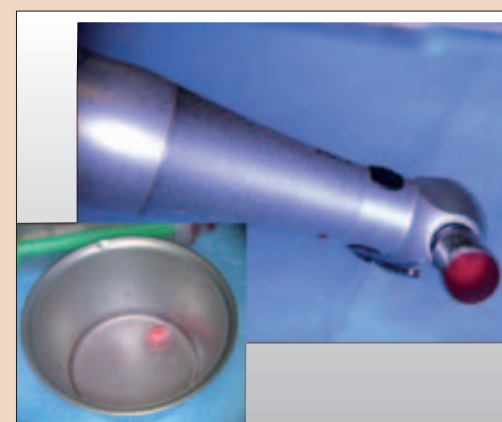


Figure 5 shows the rotary punch used to gain access to the bony plate. The removed mucosa can be kept to cover the access at the end of the procedure.

The Balloon Lift approach to sinus elevation

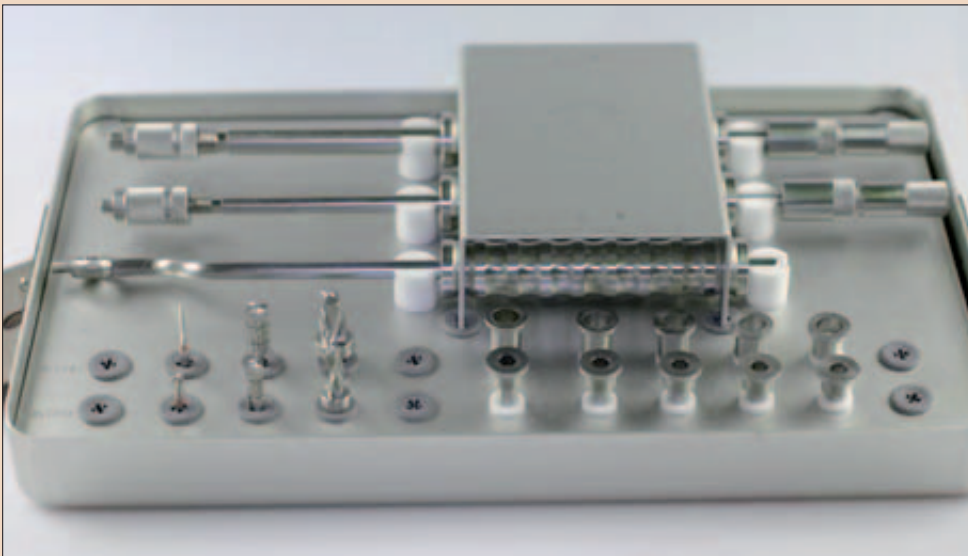


Figure 6 introduces the Balloon Lift Control (Hager and Meisinger). From top to bottom:
 – Two osteotomes with mandrin, guidance tool.
 – From left to right:
 – Initial bur, Ablative burs, special drill burs, the guidance shells for the osteotomes.



Figure 7 shows the special drill bur (3,0 mm drilling depth) introduced into the guidance shell, fixed in the guidance tool. The depth of the drill is adapted to the height of the antral bone ridge measured on the panoramic radiograph.

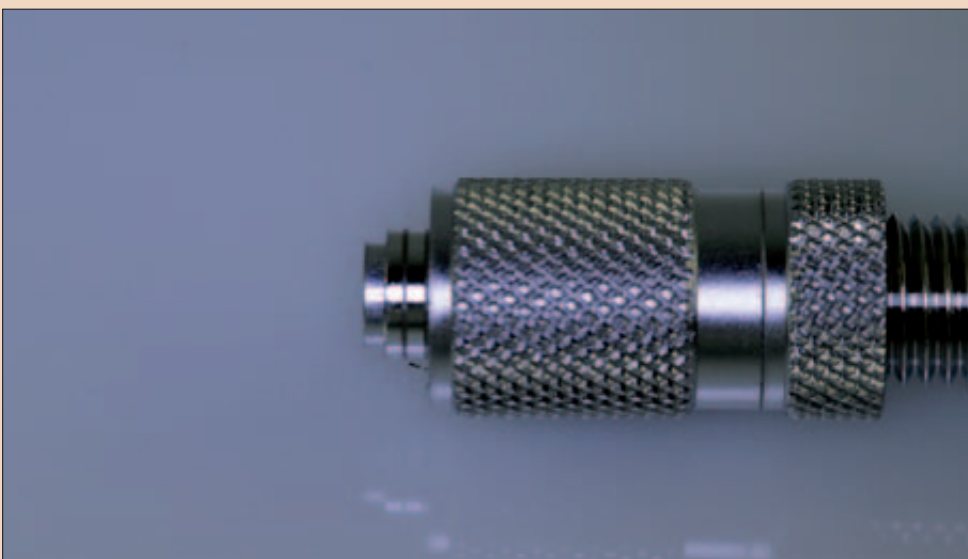


Figure 8 shows the Osteotome preset for a 3 mm bone thickness. This dimension can be explained as follows: 2 mm depth of drill penetration, 1 mm thickness of the remaining bone.

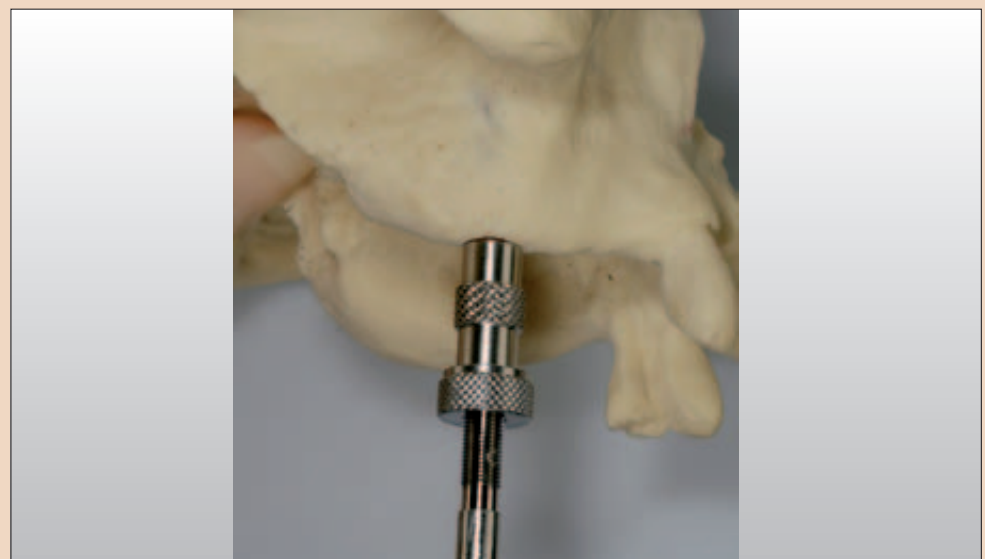


Figure 9: the Osteotome is fixed on the bony margins of drilled alveola. The length preset mandrin is pushed firmly through to infracture the remaining bone plate.



Figure 10 showing the osteotome with the balloon catheter in it. The balloon has to be previously prepared for action by evacuation of the air and filling with 0.9 per cent Sodium Chloride solution.



Figure 11 demonstrates the gained access on a model. The pink colored portion is the membrane exposed. Once the access to the antrum is gained the mandrin is removed from the osteotome and replaced by the balloon. The raising needs to be accomplished by gentle action. At least five strokes are required before inflating the balloon to its limits.

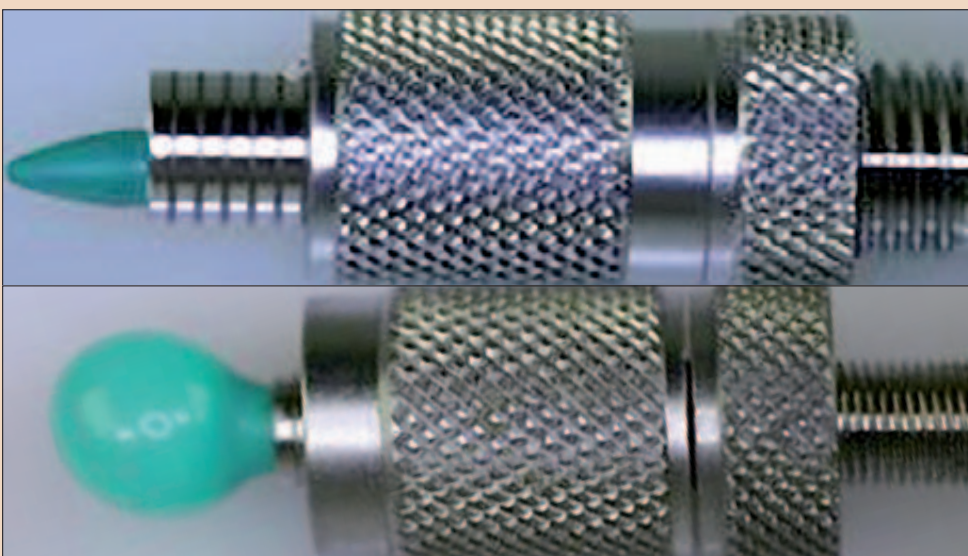


Figure 12 shows the position of the balloon and after inflation by Sodium Chloride solution.



Figure 13 shows the graft material (here BioOss—Geistlich) mixed with wound blood before being placed in the sinus.

The Balloon Lift approach to sinus elevation

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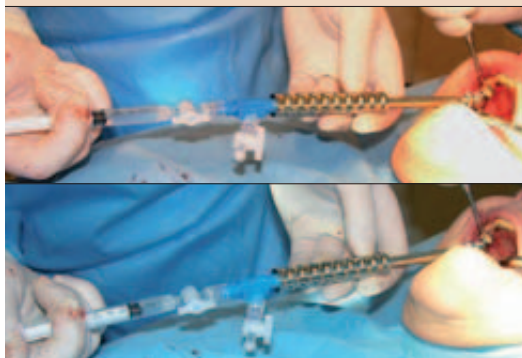


Figure 14 shows the use of the balloon to predictably raise the Schneiderian membrane.



Figure 15: Panoramic radiographs showing the preoperative situation. Tooth 16 needed to be removed due to extended infection. 10 weeks post extraction the defect healed. The remaining antral height not extending four mm. To place implants adequate bone height is required. The patient selected the Balloon Lift sinus elevation. The last radiograph was taken five months after grafting. A uniform length of 15 mm of height has been gained. At least three x 12 mm long implants can be inserted to anchor the future fixed restoration.

Conclusions

Coming a long way sinus grafting has become a unanimously accepted procedure. From its start until the present day several improvements have been performed to raise predictability and lower risks. The Balloon Lift is the latest improvement which has helped dramatically, lowering operative and postoperative risks. Acceptance for the treatment by patients could be raised impressively.

After more than 120 performed sinus elevations using the classic Tatum approach the author feels much more comfortable with this procedure. An other key-hole surgical approach has replaced invasive surgery. **DT**

For further information please call the Bone Management Centre at 20 Wimpole Street, London W1G 8GF on 0207 580 5011

References:

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- Misch C. Maxillary sinus augmentation for endosteal implants: Organized alternative treatment plans. *Intern J Oral Implantol* 1987;4:49-58.
- Chanavaz M. Maxillary sinus: Anatomy, physiology, surgery, and bone grafting related to implantology—Eleven years of surgical experience (1979-1990). *J Oral Implantol* 1990;16(3):199-209.

Courses

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