Masterclass in Clinical Practice

Dental Implants

with

Dr Andre W. van Zyl[1]
Dr Vladimir S. Todorovic[2]

Hydraulic lift Sinus Floor Elevation revisited

Scan the QR code to view the video

[1] Andre W. van Zyl
(BChD) (Stell) MChD (OMP) (Stell)
Private Practice, Hermanus, South Africa

[2] Vladimir S Todorovic, PhD
Research Associate, School of Dental Medicine, University of Belgrade, Serbia
Private practice, Belgrade, Serbia

Introduction

Sinus Floor Elevation (SFE) is out of the scope of most general dentists and belongs for the most part in the domain of dental specialists. There is however no law prohibiting dentists from performing the SFE procedure.

Over the past few years it has become clear that there are safer and easier techniques than lateral window approach SFE or the transcrestal osteotome technique.

The technique described here uses hydraulic pressure with saline in a very low trauma approach. This is a procedure within the domain of any clinician who is comfortable performing implant surgery.

The video shows the instrumentation and technique on a skull and the images below illustrate most of the instrumentation and a case study.

With the transcrestal osteotome technique, a limited SFE is possible and to achieve more than 3mm vertical lift is risky as the membrane may tear. With the hydraulic lift SFE described a 10mm lift is achievable in a low trauma low risk technique with no sharp instruments or sharp bony splinters as can happen with the osteotomes.

There are many of these hydraulic sinus kits available, and the one shown here is the Hiossen®.

Clinical procedure

1. A CBCT scan is mandatory to study the sinus floor anatomy. The following should be done pre-operatively:

- Measure the available bone below sinus as this will determine what stopper will be used to approach to within 1mm of the sinus floor
- Study the angle of the sinus floor in the edentulous area as well as the adjacent teeth and the buccal and medial walls of the area. This will indicate what lift can be achieved and is illustrated below with the CBCT images. As for implant surgery, one can use a classification of straightforward, advanced or complex (based

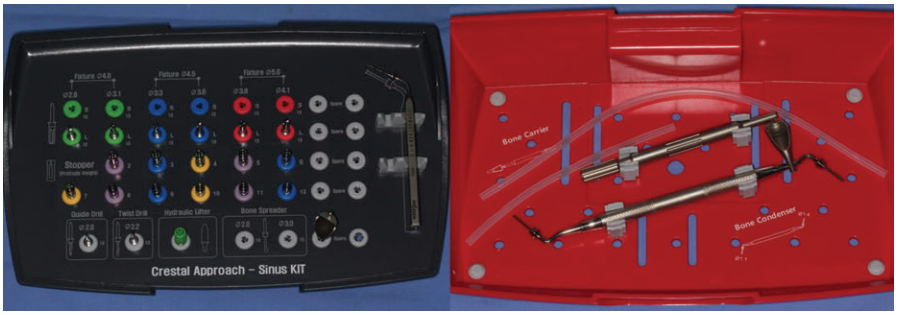

Figure 1: The Hiossen® crestal approach sinus kit showing on the left the drills, hydraulic lift and stoppers, and the red lower deck showing bone condenser and bone carrier with the silicone tubing

on ITI SAC classification). Dentists who are experienced in dental implant surgery should be comfortable with straightforward cases and in time progress to advanced cases.

- Try to study the Schneiderian membrane- a slightly thickened membrane is safer to lift than one which is not visible on CBCT- as these membranes can be extremely thin and fragile.
- Identify any sinus septa by scrolling through the complete surgical site on the CBCT. Any septum in area of SFE will place it in the complex category of SFE.
- Infection in the sinus would be a contra-indication and can usually be identified on the CBCT imaging.

2. When performing a one stage procedure, at least 3-5 mm of bone is required for implant stability. The geometry of the implant used is important as an implant with a smooth 2-3mm neck, will not provide any mechanical stability in such limited bone. The implant length that we feel comfortable with to support a maxillary molar would be at least 8mm. As it is an accepted fact that some shrinkage will occur during the maturation of the bone graft, one should aim to lift the Schneiderian membrane at least 2mm above the apical aspect of implant to protect the implant.

3. Particulate bone graft material is used and this may be mixed with blood or saline. Particles wet with saline will spread more uniformly when pushed into sinus, whereas blood may cause a coagulum that will not disperse into the sinus void in a uniform manner. The more loose the particles, the better it will spread as it is introduced into the sinus. Inside the sinus the blood will infiltrate the particles very quickly, so there is no real benefit to use blood beforehand to wet particles.

4. With a SFE one should allow for longer healing as most of the implant surface will have no bone contact and this takes time to heal. 4-6 months should be the range when a fast resorbable graft is used. Whether a lateral window or transcrestal hydraulic technique is used, the healing time should be equal for both if the residual bone is the same.

5. The safe way to approach the implant osteotomy preparation is to use a stopper of 1mm less than what the bone was measured on the CBCT. Confirm this with an intra-oral radiograph as shown below. Proceed in 1mm increments till the hard bone of the sinus floor is sensed. Recommended speed for this is 300-400rpm to minimise heat build-up. Remove the drill every few seconds to clean the flutes of bone which may reduce the cutting power of drill and increase heat. When the drill goes through the floor one should be ready to immediately pull back and if used

Figure 2: The stoppers fit on all the instrumentation and the depth is shown on the stopper (in this case 4mm limiting the drilling depth to 4mm)

Figure 3: On the left the drills can be seen without any stoppers and on the right the stoppers from left to right increasing the drilling depth in 1mm increments from 2mm to 7mm.

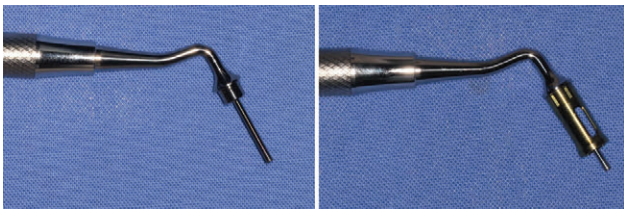

Figure 4: The bone condenser with the 4mm stopper placed on the right

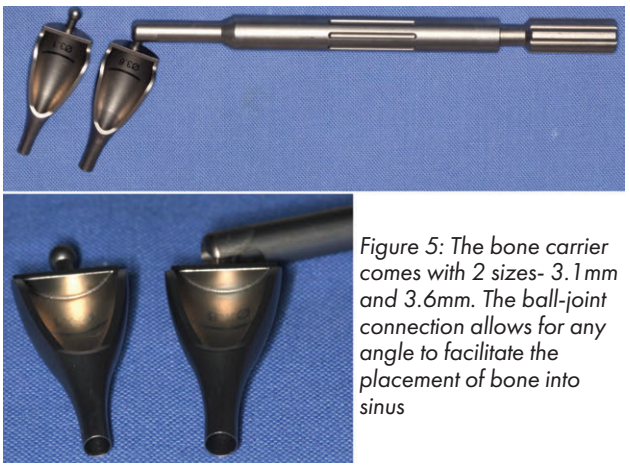

Figure 5: The bone carrier comes with 2 sizes- 3.1mm and 3.6mm. The ball-joint connection allows for any angle to facilitate the placement of bone into sinus

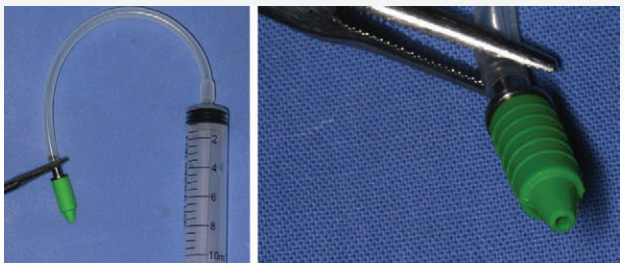

Figure 6: The hydraulic lifter is a silicone device designed to seal the osteotomy site for lifting the Schneiderian membrane using a standard syringe. The silicone lifter is held tight in the osteotomy opening using an artery forceps for easier control.

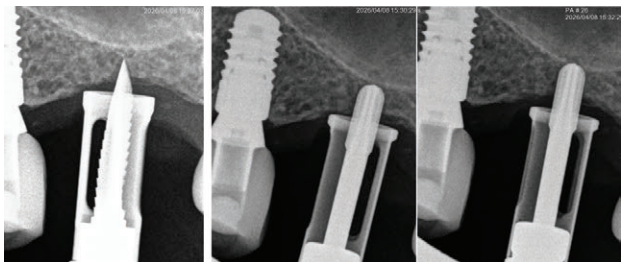

Figure 7: On the left the lance/guide drill is shown at 2mm to start the process of measuring during drilling. The CBCT showed 3mm of bone below the sinus and the 2mm sharp drill was safe enough to use, whereafter the 3mm drill (middle) takes the process to the sinus floor and the 4mm drill (on the right) starts perforating the sinus floor in a controlled manner with drills not cutting at the tip.

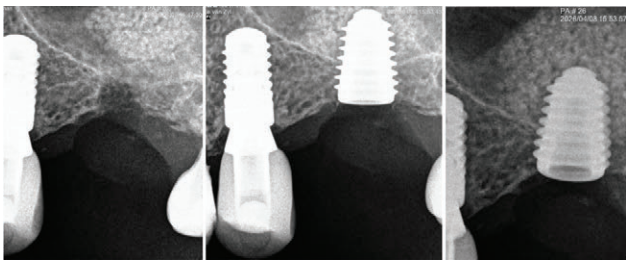

Figure 8: On the left the osteotomy site can be seen and the bone is introduced into the sinus through this using the bone carrier (shown in video). Radiographs show the egg shaped graft indicating a successful lift of the sinus Schneiderian membrane.

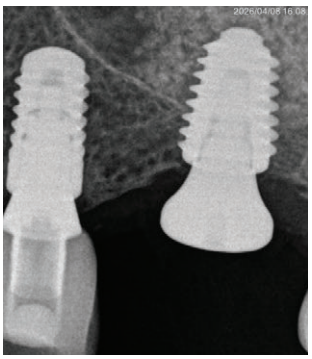

Figure 9: The implant in this case achieved 45Ncm stability allowing a one-stage surgery with healing abutment placed.

correctly as described, the maximum "fall-through" effect will be less than 1mm and with a slightly thickened membrane this will not perforate the Schneiderian membrane.

6. At this point it is indicated to use the hydraulic lifter even though the opening will be 2.2mm only. The Schneiderian membrane should lift which will immediately remove the risk of tearing membrane with the next drills going through the sinus floor bone as you increase the drill sizes. All of the drilling is then done with maximum 1mm penetration beyond the sinus floor and this can be verified with intra-oral radiography. The hydraulic lifter can be used again if you need to control the volume of the SFE.

7. Keep in mind that you may want to introduce the bone with the bone carrier before reaching your final size drill. Once the membrane is lifted and bone is introduced into the sinus, the egg-shaped dome can be verified with an intra-oral radiograph which indicates that the membrane is intact and the SFE successful.

8. Once the bone is in, the dedicated drills of implant kit may be used to reach the final diameter. Keep in mind that you may want to underprepare to maximise the primary stability of implant.

9. Should the primary stability be sufficient for a one-stage surgery- the implant may be placed. The implant should be placed with a low 15rpm, as the implant will increase the pressure on the particulate graft as it enters into the sinus and you do not want to overexert pressure on the Schneiderian membrane at the very end which may cause a tear.

10. Standard post-operative instructions are to use Chlorhexidine (Chx) 0.2% twice daily for 1minute. Chx rinse should not be used within 10minutes of brushing teeth with toothpaste as remnants of the toothpaste will neutralise the Chx, and patients should be nil per mouth after rinsing for at least 15minutes. 5-7 days after surgery, patients should attempt to brush the healing abutment with a very soft tooth brush, dipped in the Chx. This will improve the compliance from rinsing which is unpleasant and can be used for 4-6 weeks post-operatively to minimise infection risk. Patients often do not use the Chx rinse due to staining and taste. Brushing it on does not have those negatives.

11. Antibiotic cover starting day before the surgery for 5 days will lower risk of infection.

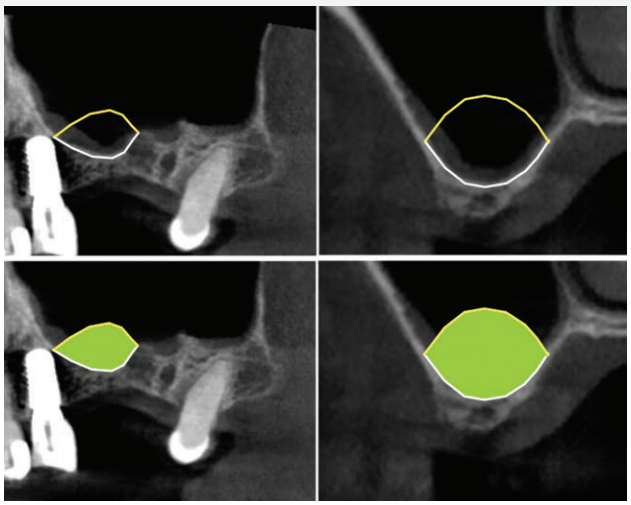

Figure 10: When assessing the anatomy for a sinus floor elevation, it should be classified like implants as straightforward, advanced or complex. This case would be straightforward as the anatomy allows for a lift of at least 10mm without putting strain on the Schneiderian membrane. This planned lift is shown lower right- with the white line the pre-op sinus floor and the yellow line indicating planned lift- the yellow and white lines are identical in dimension and due to the pronounced dip, allowing a large lift without the danger of strain on membrane that may lead to a tear and failure.

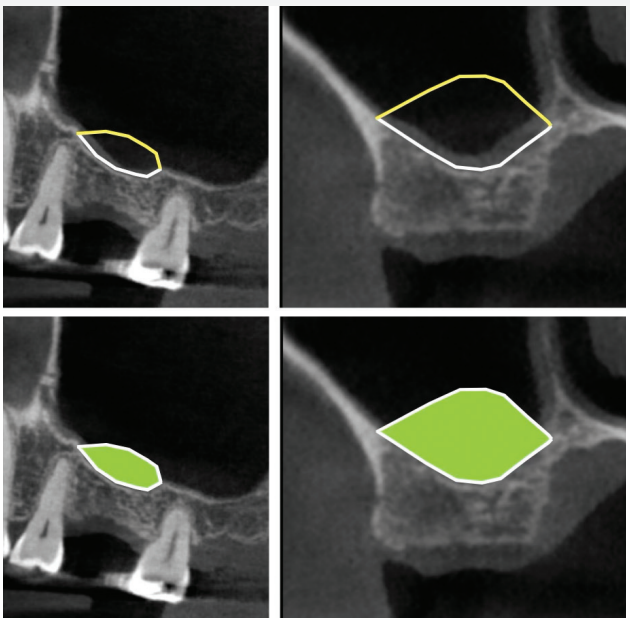

Figure 11: This planned lift has a favourable anatomy in the cross section but the buccal view shows no real dip, which means the membrane will be stretched tight if lifted too much- possible tearing the membrane in the process. This may allow for 3-4mm lift maximum and as the existing bone volume is 5.5mm, it will be enough for placement of an 8mm length implant.

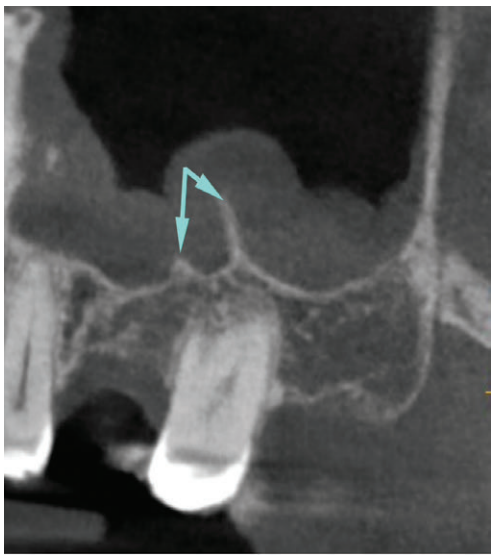

Figure 12: This sinus has a short septum (Underwood septum) as well as a longer one just behind above tooth 27. The septum will complicate the sinus floor elevation process and should not be attempted by an inexperienced surgeon. Fig 13 shows the planning in this case.

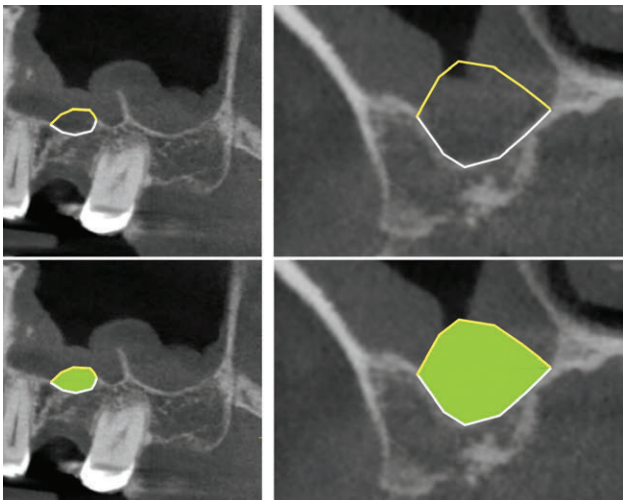

Figure 13: The buccal view shows a limited lift which is safely possible, even though the cross section indicates a larger lift which is possible. This would be a complex SFE.

Conclusion

The hydraulic lift SFE using saline is a viable alternative to lateral window SFE, with much lower morbidity and in our opinion also lower risk of failure due to the fact that no sharp metal instruments are used to lift the Schneiderian membrane. The surgical access is the same as for placement of the dental implant.