Inadequate vertical bone dimension managed by indirect sinus grafting technique and simultaneous implant placement

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ABSTRACT

Implant placement into the posterior maxilla often creates a challenge due to inadequate bone height because of close sinus proximity. This article presents a case report of indirect sinus lift technique involving hydraulic pressure to elevate the floor of the maxillary sinus.

Key words: Bone graft, hydraulic pressure, implant, sinus lift

INTRODUCTION

Once the loss of the natural dentition occurs, the lack of occlusal forces transferred to the alveolar bone activates a series of bone remodeling processes that cause pressure threshold-regulated bone atrophy. Apart from the resorption of the buccal plate of the residual ridge after tooth extraction, increased osteoclastic activity of the periosteum of the maxillary sinus floor leads to the enlargement of the sinus. This pneumatization occurs at the expense of alveolar ridge height beneath the maxillary sinus. Inadequate height, width, and density of the alveolar process are considered some of the common limiting factors for dental implant placements in the posterior maxillary regions. Compromised quality and quantity of bone in the posterior edentulous maxilla can adversely affect the clinical outcomes of dental implant treatments with higher incidences of implant failure rates and complications.

Various intra-crestal sinus lift techniques include the use of osteotomes (summers – and its multiple variations), balloon lift, hydraulic sinus condensing technique (Chen and Cha) and motor-driven drilling systems.

The surgical approach, known as sinus floor elevation (SFE), can dramatically increase the height of bone available for implant placement. In general, two main SFE approaches for dental implant placement can be used – indirect and direct.

Indirect sinus grafting technique a transalveolar approach can be utilized to condense bone grafting materials beneath the Schneiderian membrane in the presence of at least 5 mm of residual bone, this approach can gain approximately 3–5.0 mm in height within the sinus with a simultaneous implant placement option.

Direct sinus grafting technique, sinus lifting through a lateral window approach, is recommended as the treatment of choice where the height of residual bone is <5.0 mm. This approach provides clinical outcomes of increased height of bone >5.0 mm but usually requires...
a 6–9 months delayed staged approach of implant placement.\cite{6}

This article presents a case report of indirect sinus lift technique involving hydraulic pressure to elevate the floor of the maxillary sinus.

**Case Report**

A 35-year-old male patient reported to the Department of Prosthodontics, Post Graduate Institute of Dental Sciences, Rohtak for the replacement of his missing tooth [Figure 1]. After a thorough history taking, clinical and radiographic examination, the treatment options were explained to the patient, and it was decided to place an implant with respect to missing 16. Since the available bone height in this region was only 5 mm, hence, it was decided to perform an indirect sinus lift and bone grafting with simultaneous implant placement.

**Procedure**

- The crestal approach sinus kit (CAS-KIT, Hiossen) was used in this case to provide a convenient sinus grafting surgery and to enhance maximum safety while easily providing the lift of the membrane in a controlled manner for the maxillary sinus [Figure 2].
- After anesthetizing the patient, the crestal incision was given [Figure 3] and flap was reflected.
- The CAS-drills were used in a sequential manner to prepare the osteotomy site. Due to the inverse conical drill design of the CAS-KIT, the conical bone chips in between the cutting blades create an auto-lifting function to elevate the membrane safely. The atraumatic design of the drill tip allows the user to perform sinus surgery even if the sinus floor is flat, incline, or septum. The unique stopper system also prevents membrane perforation and excessive drill penetration [Figure 4]. Thus, progression of 1.0 mm increments could be accomplished until penetration was achieved in a controlled manner.
- The hydraulic lift system was used to elevate the sinus membrane by hydraulic pressure of saline injected through a syringe [Figures 5 and 6].
- The bone carrier was used to deliver bone graft material (Ostofom) [Figure 7] into the space created by sinus lift [Figures 8 and 9]. Graft material required is in direct proportion to the amount of fluid used to inflate the balloon: 1cc of fluid will require 1cc of graft material.
- After delivering the bone graft material in the osteotomy site, the bone condenser [Figure 10] was used to compact the bone material. Using a slow speed (50 rpm), the bone spreader was used to evenly spread the material within the cavity. This step was repeated until the desired height and volume of the sinus cavity was filled and was ready for implant insertion. This was followed by placement of Implant (3.75 mm × 10 mm, Osstem) and the site was sutured [Figure 11].

**Discussion**

Sotirakis and Gonshor\cite{7} proposed an elevation of the maxillary sinus floor with hydraulic pressure. This technique involves elevation of the sinus floor by injecting normal saline solution under hydraulic pressure.
beneath the Schneiderian membrane with a suitably fitted syringe. This procedure achieves simultaneous detachment and elevation of the sinus membrane.

The indirect sinus elevation technique is less invasive, less time consuming with decreased postoperative patient morbidity, and discomfort. Lack of direct visualization of the membrane and the use of osteotomes may lead to a risk of membrane perforation as high as 26%. [8]

Hiossen’s CAS-KIT makes the sinus lift procedure easy and predictable, combining the advantage of high volume bone placement of the lateral window approach, with the simplicity of the crestal approach without any fear of membrane perforation. Use of non-invasive technique minimizes the crestal bone loss, which is otherwise inevitable and is upto 0.5 mm in first 6 months of implant surgery[9,10] and hence ensuring the long term implant success.[11]
Conclusions

This article presents a novel technique for indirect sinus elevation using the CAS-KIT followed by bone graft and simultaneous implant placement.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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