

Maxillary Sinus Bypass: An Alternative to Sinus Lift Procedures

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Abstract

An adequate quality and quantity of bone is essential for successful placement of implants. Posterior maxilla presents many challenges to an implantologist because of its anatomical limitations. Alveolar bone resorption and pneumatization of the maxillary sinus reduces the available amount of bone both in height and width for the placement of dental implants. It is therefore, common to find the sinus floor close to the alveolar crest. This condition may be treated with an elevation of the maxillary sinus floor, which is usually accomplished by lateral or transcrestal approach to the antrum. As an alternative to these augmentation procedures, a more conservative treatment option would be to either place short implants or to bypass the sinus floor. This paper focuses on maxillary sinus by pass with tilted implants in close proximity to the sinus wall, thus, avoiding sinus floor elevation & bone grafting procedures.

Keywords: Sinus bypass, tapered screw bone expanders, pterygoid implants, tilted implants.

Introduction

The maxillary sinus is the main anatomical limitation in the upper jaw. Alveolar bone resorption and pneumatization of the maxillary sinus reduce the available amount of bone both in height & width for the placement of dental implants in the edentulous posterior maxilla (1, 2).

Another problem that usually occurs in this area is the quality of the bone, which is often less dense and more medullar & thinner than in the mandible (1-3). In the last decades the problem of pneumatization of the maxillary sinus combined with the reduced thickness of the residual bone in the area was solved using both lateral and crestal sinus lift procedures

Carl Misch subcategorized the implant treatment planning into **four** approaches based on bone height in the posterior area:⁴

Subantral Option 1 (SA1)

Conventional implant placement when bone height is greater than 12mm. No sinus lift is required and bone graft may be used only to augment the bone width.

Subantral Option 2 (SA2)

10-12mm of bone height is available. Sinus lift with osteotomy technique and simultaneous implant placement is done. This technique was developed by Tatum in mid 1970s. Osteotomy is tapped to produce a green stick fracture on the sinus floor. Bone graft can be added.

Subantral Option 3 (SA3)

At least 5mm bone height of sufficient width is present. A Tatum lateral wall approach is performed just superior to the residual alveolar bone. A Green stick fracture is introduced in the access window as it is rotating inward and upward and serves as the floor of the implant. Autogenous bone and/or allograft material is placed with simultaneous or delayed implant placement

Subantral Option 4 (SA4)

5mm or less of bone height is available. In this case, Tatum lateral wall approach is performed. Autogenous bone and/or allograft material is placed. Delayed implant placement at 8 to 12 months so as to allow the new bone to migrate, differentiate, and mature.

Discussion

The problem of pneumatization of the sinus together with the reduced thickness of the residual bone in the sub-antral area is usually solved using either lateral or crestal sinus lift procedures.

Disadvantages of Sinus Lift Surgery-

1. One of the biggest problems in sinus lift procedures is the time factor, the time required for the integration of the graft is quite long (6-9 months) depending on the nature of the graft.
2. Any surgical procedure involves risk, including damage to the sinus membrane, infection to the bone graft and sometimes non-integration of the bone graft with the natural bone.

An **alternative** to these augmentation procedures would be to place short implants to avoid entering the sinus cavity, or **to by-pass the sinus** in order to overcome the inadequate bone.⁵ In 2003, **Malò** proposed the use of tilted implant in full arch rehabilitations, in order to by-pass the principal anatomical limitations (i.e. maxillary sinus and mental nerve), thus, avoiding bone grafting procedures.⁶

Sinus Bypass

It can be achieved by using either tubero pterygoid implants or tilted implants.

Tubero Pterygoid Implants

Tubero pterygoid implants are placed under local anaesthesia using minimally invasive flapless procedure through the tuberosity bone into the pterygoid plates. One implant is placed with a distal tilt anterior to sinus and another implant is placed posterior to the sinus with a mesial tilt.⁷ Occlusal forces go to the pterygomaxillary bone which is more stable and cortical thus allowing immediate loading of the implants

Advantages

1. As the pterygoid bone is always present so these implants can be used for everyone irrespective of the available residual bone.
2. Tubero pterygoid implants are placed in the most distal part of the maxilla and all the 14 teeth can be replaced without cantilevers.
3. No screw loosening and implant breakage

as these are single piece implants.

4. All molars can be replaced resulting in improved chewing efficiency
5. Can avoid sinus lifts and bone augmentation procedures
6. Immediate loading is allowed.

Sinus Bypass With Tilted Implants

Tilted Implant Expansion Osteotomy (tieo):

Here the use of tapered-screw bone expanders (TSBEs) in combination with the tilted implant placement in close proximity to the sinus wall is proposed.⁵

TSBEs were introduced in the last decade for bone splitting techniques of edentulous ridges with mainly horizontal atrophy, in order to achieve a more predictable, progressive and safe bone expansion, rather than osteotomic splitting techniques.⁸ The use of TSBEs was also proposed to increase the bone density of implant tunnel in D4 bone, as an alternative to the ridge expansion osteotomy technique.⁹ These tools revolutionized the surgical approach to expansive techniques, eliminating the percussive trauma caused by the hammering of osteotomes, thus reducing the patient discomfort and simplifying the instrumental access in the posterior region of the jaws.¹⁰ TSBEs can be advantageously for implant tunnel preparation, to by-pass the maxillary sinus. The TSBEs are comparable to chisels able to expand the bone. (Fig 1)

Implant tunnel is first prepared by bone burs of small diameter (up to 2.3 mm), in close proximity to the cortical bone, delimiting the anterior portion of the sinus, and subsequently followed by the use of TSEs.

The implant tunnel is gradually expanded by means of the TSBEs and where needed the inclination of the tunnel can be improved, deforming the anterior wall of the sinus, in order to allow the use of a standard titanium abutment, with a maximum inclination of 25°. (Fig 2)

In cases where there is edentulous area anterior to the sinus, we can place straight implant anteriorly followed by tilted implant in the proximity of the sinus. (fig 3-6)

Usually with TSBEs, n. 3.5, n. 4 and n. 4.5, implants with diameters of 3.8 mm, 4.2 mm and

4.8 mm are positioned respectively.

Although the TSBEs have been designed to ideally match tapered implants (with similar conicity), cylindrical implants can be placed in order to maximize the primary implant stability in the apical portion of the implant tunnel.⁵ Implant lengths and diameters are selected according to the largest dimensions allowed by patient's anatomy, in order to reduce the risk of fracture of the implant as well as the screw.

Advantages of TIEO

1. Increases bone density by condensing the surrounding bone thus increasing the primary stability of the implant.
2. Short surgery time
3. Cheaper than other techniques
4. Relatively atraumatic procedure than the conventional osteotomy preparation with burs and/or chisels
5. Improves patient comfort and acceptance as no chiseling is done
6. Faster healing than conventional sinus lift procedures.

Conclusion

The maxillary sinus is the main anatomical limitation in the upper jaw. In the last decades the problem of pneumatization of the sinus together with the reduced thickness of the residual bone in the sub-antral area was solved

using both lateral and crestal sinus lift procedures. Many bone augmentation procedures are proposed in the sub-antral space, and in case of two-stage surgery procedures the time required for the integration of the graft is quite long (6-9 months) depending on the nature of the graft.

An alternative to these augmentation procedures would be to place short implants or to by-pass the sinus by use of pterygoid or tilted implants in order to overcome the inadequate bone. In 2003, Malò proposed the use of tilted implant in full arch rehabilitations, in order to by-pass the principal anatomical limitations (i.e. maxillary sinus and mental nerve), thus avoiding bone grafting procedures. TIEO proposed by Bassi MA IN 2016 is a promising surgical procedure for oral rehabilitation of posterior maxillary edentulous sites and represents a therapeutic alternative to sinus lift techniques. In such technique, TSBEs can be advantageously used in order to optimize the inclination of the implant tunnel, condense the surrounding bone and thus increasing the primary implant stability.

References

1. Watzek, G, Weber, R, Bernhart, T, Ulm, C and Haas, R. Treatment of patients with extreme maxillary atrophy using sinus floor augmentation and implants: preliminary results. *Int J Oral Maxillofac Surg* 1998;

- 27(6):428-34.
2. Ferrigno, N, Laureti, M and Fanali, S. Dental implants placement in conjunction with osteotome sinus floor elevation: a 12-year life-table analysis from a prospective study on 588 ITI implants. *Clin Oral Implants Res* 2006; 17(2):194-205.
3. Calvo-Guirado, JL, Saez-Yuguero, R and Pardo-Zamora, G. Compressive osteotomes for expansion and maxilla sinus floor lifting. *Med Oral Patol Oral Cir Bucal* 2006; 11(1):E52-5.
4. Mish CE, Rensik RR, Misch F. Maxillary sinus anatomy, pathology, & graft surgery. In: Carl E Misch (editor) *Contemporary Implant Dentistry*. 3rd Ed. Elsevier. P.930-9.
5. Bassi MA, Andrisani C, Lopez MA, Gaudio RM, Lombardo L and Lauritano D. Maxillary sinus by-pass with tilted implants via tapered-screw bone expanders in low density bone *JBRHA* 2016;30(2):13-20
6. Malo, P, Rangert, B and Nobre, M. "All-on-Four" immediate-function concept with Branemark System implants for completely edentulous mandibles: a retrospective clinical study. *Clin Implant Dent Relat Res* 2003; 5(1):2-9.
7. www.lbrdentalimplants.com/implant-services/tubero-ptyergoid-implants
8. Lee, EA and Anitua, E. Atraumatic ridge expansion and implant site preparation with motorized bone expanders. *Pract Proced Aesthet Dent* 2006; 18(1):17-22.
9. Khaimar, MS, Khaimar, D and Bakshi, K. Modified ridge splitting and bone expansion osteotomy for placement of dental implant in esthetic zone. *Contemp Clin Dent* 2014; 5(1):110-4.
10. Scipioni, A, Bruschi, GB and Calesini, G. The edentulous ridge expansion technique: a five-year study. *Int J Periodontics Restorative Dent* 1994; 14(5):451-9.



Fig 1 Tapered screw bone expanders

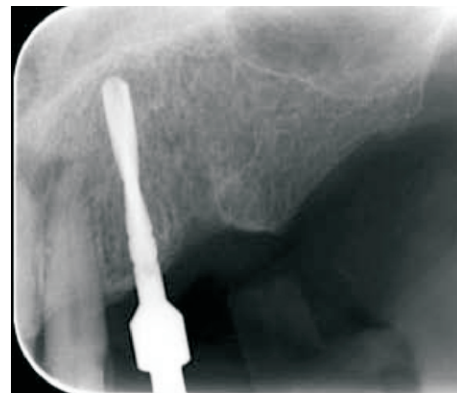


Fig 2

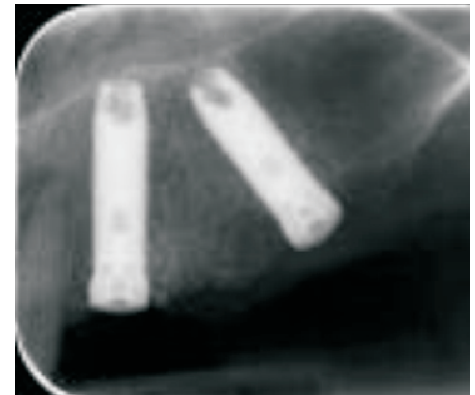


Fig 3

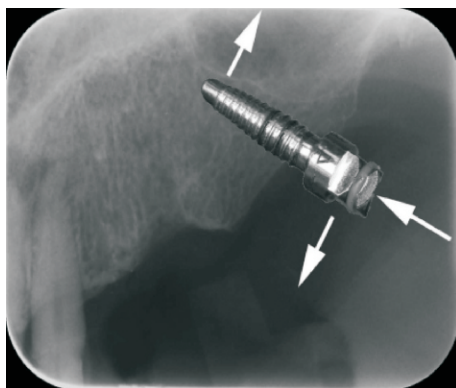


Fig 4

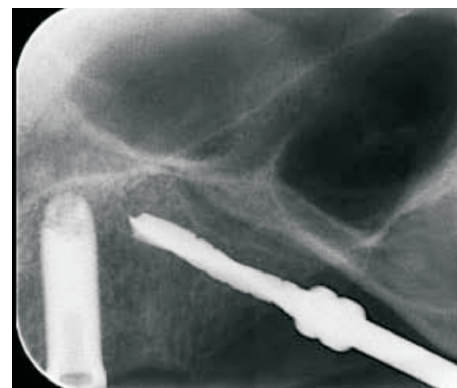


Fig 5



Fig 6