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Case Report

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Maxillary Sinus Elevation through Side Window Using Piezoelectric and Immediate Placement of Implant

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Abstract

The loss of a dental organ generates bony phenomena that decreases the height and thickness of the residual bone. The bone height that exists between the alveolar ridge and the floor of the maxillary sinus plays a fundamental role in the surgical planning of an implant, the use of bone grafts by different techniques of approach allows to increase the bone height favoring the placement of implants and consequently the oral rehabilitation of the patient, the use of the electric piezo offers benefits for the approach of the maxillary sinus.

We present a clinical case of a 48-year-old male patient who came for rehabilitation of the edentulous area between teeth 25 and 27 with a deficient bone height of 4.27mm in relation to the maxillary sinus. Maxillary sinus lift is performed through a side window using a piezoelectric device with immediate with immediate implant placement and bone graft.

Keywords: Piezosurgery, Maxillary sinus floor elevation, Dental implants

Introduction

The maxillary sinus (MS), also known as Highmore's antrum, is related to the anatomist Nathaniel Highmore who was believed to have been the first to describe it and draw, it until 1901, when Leonardo da Vinci's anatomical drawings were discovered [1]. George Caldwell and Henry Luc in 1893 separately described the technique that today bears his name to approach the maxillary sinus Tatum in 1970 published the technique of lifting the maxillary sinus floor with bone graft placement Boyne and James in 1980 published the first report of case on autologous grafts for the augmentation with placement of deferred implants, Vercellotti in 2001 was the first to use low frequency ultrasonic vibration to create the lateral window and elevate the sinus membrane [2-5].

The MS has a capacity of 12 to 15ml of air, its irrigation is mainly carried out by the arteries: posterior superior alveolar, lower orbital, palatine major and sphenopalatine. It is innervated by the nerves: superior posterior, middle alveolar and by the greater palatine nerve [5,6]. It has a pyramidal shape with an internal base and external vertex, the sinus floor extends from the canine to the maxillary tuberosity, it is at the level of the nasal floor, its lowest part is located at the level of the first molar, in edentulous patients it is 1 cm below the nasal floor [5,6]. The distance may vary according to gender, men have shorter distances between the sinus floor and the roots of the dental organs, in patients with a marked gonial angle less height was found [7]. The mesiobuccal root of the first upper molar is the closest to the SM floor with an average of 0.83mm [8].

The Schneiderian membrane (SM) covers the entire surface of the MS, it´s composed of 3 layers. The first layer is periosteum, which covers the bone of the antrum. A layer of highly vascular connective tissue covers the periosteum. The last layer is pseudostratified columnar epithelium and is exposed to the sinus cavity and continues with the nasal membrane [6]. The force required to detach the membrane from the bone surface is 0.05 N, however, to drill it requires a force greater than 7.3 N, it has a resistance to 32.6% in one direction and 24.7% in two directions [9].

The side window technique can be performed using osteotomes, rotation systems or ultrasonic systems, it´s indicated for residual processes of 5mm or less, with the immediate placement of implants in heights between 4 and 5mm and the deferred placement in ridges with a smaller size at 4mm, the main complication of this technique is perforation of the sinus membrane that ranges from 20 to 44%, followed by infections, bleeding, sinusitis, pain, facial inflammation, facial paraesthesia, facial asymmetry, oroantral fistula, dehiscence of the gingival-labial wound and damage of dental organs. The perforation of the membrane can be attributed to an inadequate surgical technique, thin sinus mucosa, previous sinus surgery, absence of bone between the sinus mucosa and the oral mucosa, MS floor irregularities, chronic maxillary sinusitis and allergies [3,6].

The ultrasonic insertion allows soft sectioning of bone without damaging to the sinus membrane, the risk of SM perforation decreases with this technique, the inconvenience is the increase of operative time, it does not generate heat unlike rotating instruments that can generate areas of necrosis when it exceeds 47° C [10,11]. The

histologicall evidence shows of better wound healing and better bone formation the whit use of piezoelectric inserts allows preparation without damage to the vessels in the lateral wall, reduced membrane perforation rate, improved intraoperative visibility intraoperative bleeding reduced surgical trauma [12].

Clinical Case

This is a 48-year-old male patient with no history of relevance to the case, who comes to the consultation referred by the service of prosthesis and oral implantology for presenting an edentulous area between teeth 25 and 27, in computerized axial tomography in a sagittal reconstruction, a deficient height of 4.27mm Figure 1 is observed between the floor of the maxillary sinus and the bony rim, elevation of the maxillary sinus is proposed through a lateral window with immediate placement of the implant and bone graft.

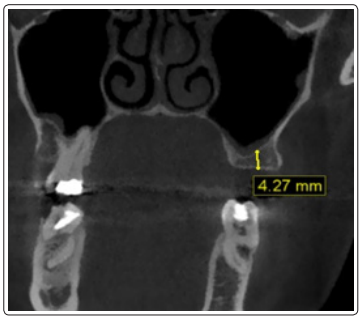

Figure 1: Frontal slice on tomography showing flange height of 4.27mm-

Under local anaesthesia, Newman flap of total thickness is made, the osteotomy is formed using piezoelectric with micro vibrations between 20-60nm, a 7mm from the residual ridge, a bone island of 12 mm long by 8mm high is formed Figure 2.

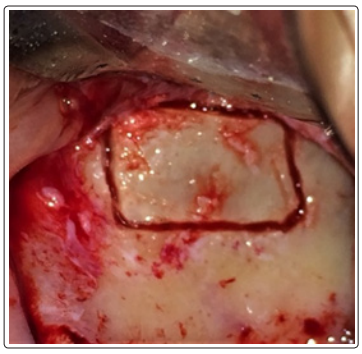

Figure 2: Full-thickness flap and osteotomy

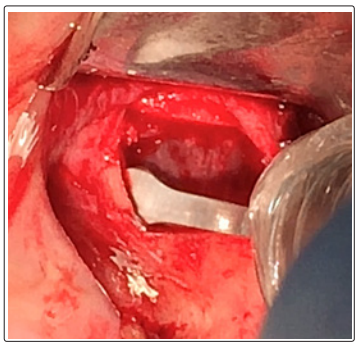

Figure 3: Survey of MS m, Piezoelectric

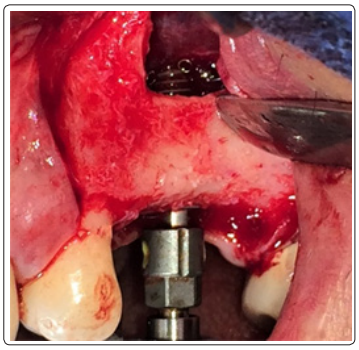

Figure 4: Implant placement

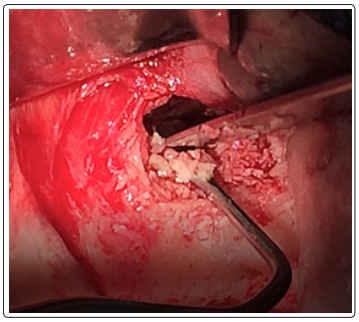

Figure 5: Placement of bone graft

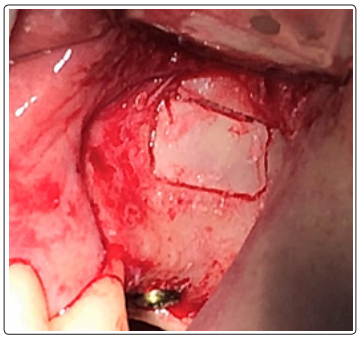

Figure 6: Bone island replacement

The bone island is extracted exposing the SM, by piezoelectric abutment the sinus membrane is lifted gently, moving it upwards Figure 3, implant milling protocol is performed which is positioned with care to not lacerate the sinus mucosa Figure 4, xenograft is placed, suture using simple points of 4: 0 vicryl Control is done tomographic and adequate position of bone graft and dental implant is observed Figure 7.

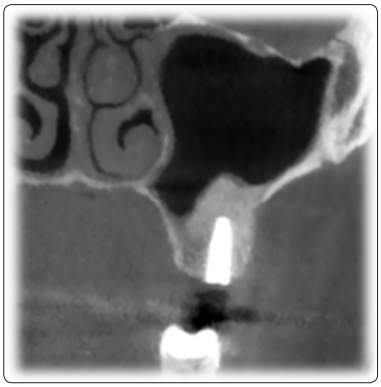

Figure 7: Control tomographic

Discussion

Alveolar bone resorption post-extraction and pneumatization of the maxillary sinus frequently compromise the quantity and quality of available bone in the edentulous posterior maxilla [9]. SM floor elevation is a safe treatment Lateral window approach is recommended for bone cases residual less than 6mm and immediate placement of implants for ridges greater than 4mm, with a high rate of success [3,6]. The main complication associated with this treatment is perforation of the sinus membrane, the incidence of perforation of the sinus membrane was found to vary between 3.4% reaching up to 40%, perforation of the membrane was associated with graft failure, being proportional to the size of the perforation and its location, in addition to the additional cost for the patient [3,6,11,13,14]. Several authors refer that the piezoelectric decreases the rate of perforations the technique eliminates the "drag" created by the rotating instrumentation and therefore, it is less likely to damage the blood vessels or Schneider membrane. Atieh, et al. found no significant difference in sinus membrane perforations comparing the piezoelectric and rotary systems, however if it found a difference in the size of the perforation, also attributed to the lack of training of the surgeon in this system [5,13].

The replenishment of the bony island acts as a physical barrier favouring the support of the graft, decreasing the use of membranes, some authors suggest the coverage of the window with a membrane after the placement of the graft materials. However, bone formation is not seen affected by the presence of a membrane on the bone window [6]. Survival of the implants is similar with the different types of bone graft either alone or in combination, bone formation has been demonstrated by elevation of the sinus membrane without using any bone graft, only with the placement of a membrane in the form of a barrier, even though there is still a lack of long-term research [3,11,15].

Another complication described in the rotary systems is the transoperative bleeding that can occur by the anastomosis between the superior infraorbital and alveolar arteries, the same that can be avoided with a good tomographic diagnosis, the piezoelectric offers greater security in this aspect [13,15]. Histologically, the piezoelectric system offers better healing than the conventional system, although clinically there is no significant difference. Surgical time is significantly higher with the piezoelectric system, especially with thick walls of the SM, it is recommended to use a technique initial rotary at surface level and then use the piezoelectric [12].

Conclusion

Currently, maxillary sinus lift and immediate placement of implants can be performed at heights equal to or greater than 4mm taking into account the distance between the floor of the maxillary sinus and the residual ridge.

The piezoelectric is a useful alternative for the elevation of the floor of the maxillary sinus, allows better control in the osteotomy and elevation of the sinus membrane, reduces the risk of haemorrhage, does not cause damage to the soft tissues, but lengthens the surgical times.

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