Maxillary sinus lift with crestal access using the Magnetic Mallet technique and bio-material placement: case report

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Abstract

Aim: The objective of this paper was to show a case report of maxillary sinus lift with crestal access using the Magnetic Mallet technique and bio-material placement.

Keywords: Magnetic Mallet, bone condensation, residual bone height, dental implant.

Materials and Methods

A 46-year-old woman, required the replacement of a prosthetic bridge on natural teeth (from 2.4 to 2.7), which caused her pain when chewing and thermal input. The elements supporting the rehabilitation needed endodontic treatment.
In addition to conservative treatment of the residual tooth abutments, it was decided to restore tooth 26 by implant placement.

Results

According to the insufficient residual bone height for the insertion of the fixture, the osteotome sinus floor elevation technique was performed.
Subsequently, since the elevation is greater than 30% of the basal bone, homologous bone is placed in addition to a small amount of autologous bone in the upper part of the elevation supported by collagen. After 4 months from surgery with a bone height of 9 mm, a 3.8x11 mm implant fixture (Winsix, Biosafin, Ancona, Italy) was placed and then prosthetically restored by deferred load method.

Conclusion

The Magnetic Mallet could be a valuable aid to support implant procedures in the absence of adequate residual bone height.

Introduction

With the increase in average age, the placement of dental implants to replace missing teeth could be a successful practice in all categories of patients (1-3).
The loss of teeth, in addition to other factors (4,5), causes bone resorption which, in posterior maxilla, increases due to pneumatization of maxillary sinus (6,7).
When residual bone height is too reduced for traditional axial implants placement, maxillary sinus elevation procedures could be indicated in rehabilitation of edentulous posterior atrophic maxilla, proving excellent long-term (≥5 years) implants survival rate (8-10).
The main approaches are lateral window technique and osteotome mediated technique (OSFE).
The first can be employ when residual bone height is less then 5 mm, the second, requires a minimum of 5 mm to be applied (11-13).
Lateral window approach was introduced for the first time by Tatum in 1977 (14) and then was described by Boyne and James in 1980 (15).
The surgical procedure provided the creation of a bony window on lateral sinus wall to allow sinus membrane elevation and biomaterials insertion. Implants placement could be performed at the same time of surgery or after bone healing (approximately 4 months later) (16).
The Osteotome mediated technique (OSFE) was introduced by Summers in 1994 as less invasive alternative: osteotomes of progressive diameter concurrently allowed Schneider's membrane elevation and bone compaction, allowing an immediate insertion of the implants (17).
According with several complications associated with traditional maxillary sinus augmentation procedures (18,19), the aim of this paper was to show a case report of maxillary sinus lift with crestal access using the Magnetic Mallet technique and bio-material placement.

Case report

The patient, a 46-year-old woman, required the replacement of a prosthetic bridge on natural teeth, which caused her pain when chewing and thermal input, and in fact the elements supporting the rehabilitation needed endodontic treatment.

At the first visit, the patient already expressed her specific request for a prosthetic restoration with single elements. Objective and radiological examination showed the presence of prosthetic bridges from 2.4 to 2.7 and a scarce amount of basal bone in the area to be rehabilitated with implant fixtures in site 2.6. (Fig. 1-4)

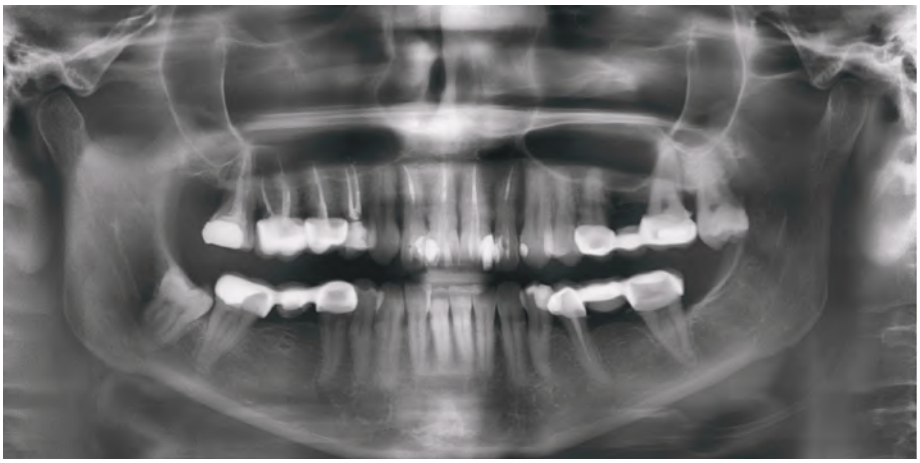
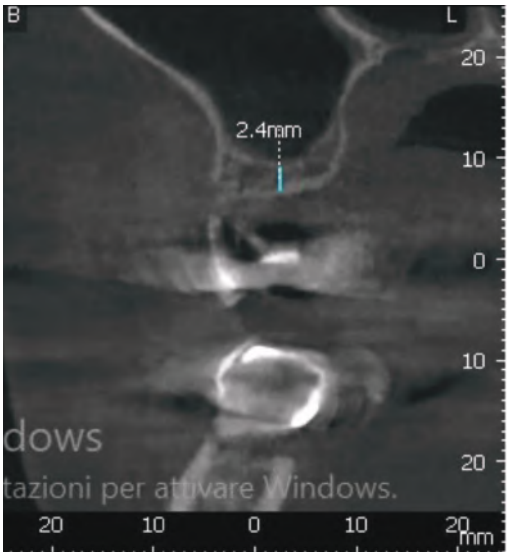


Figure 1.



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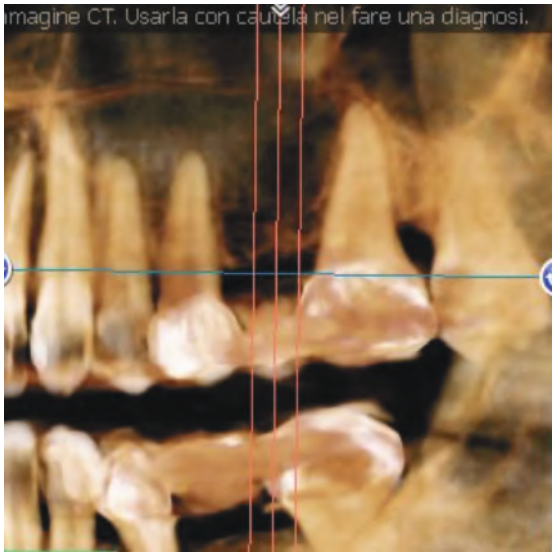
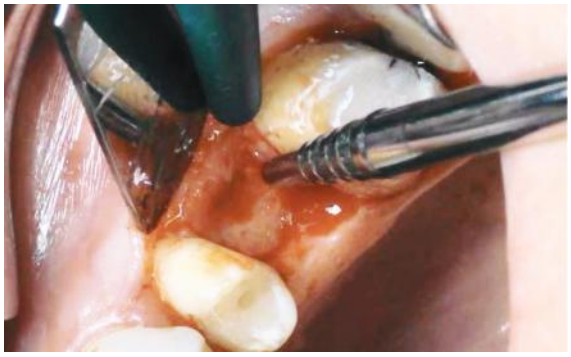


Figure 3.

Figure 4.

In agreement with the clinical and radiographical diagnosis it was decided to perform a sinus lift with crestal access using a minimally invasive biphasic technique.
Before surgery, diagnostic tests are performed to choose the technique to be performed and the amount of biomaterial to be placed.
Under local anaesthesia, a full-thickness access flap is performed to expose the cortical bone.
Once the cortical bone is exposed, preparation begins through compaction with a 300 flat osteotome. The cortical bone is fractured and displaced apically using the concave osteotome 200 until the sinus floor is broken. The compacted bone is invaginated during the simultaneous elevation of the Schneiderian membrane. The osteotome in the photo was the angled prototype of the new easy-in kit bent to simplify the procedures in posterior sectors.
Once the sinus cortical is broken, the membrane is detached to assess its correct mobility and avoid any injury during the insertion of biomaterial.
Once mobilized, the collagen is placed in direct contact with the displaced bone. It allows blood to be drawn in and stabilize the clot. It has been shown that the creation of a space between the sinus membrane and the residual bone promotes the migration of stem and mesenchymal cells within the blood clot; the differentiation of these cells into osteoblasts and the formation of new bone then occurs.
Subsequently, since the elevation is greater than 30% of the basal bone, homologous bone is placed in addition to a small amount of autologous bone in the upper part of the elevation supported by collagen.
In this case, since a rise of at least another 6 mm was required, 4.5 cc of osteoconductive material was placed according to the estimate described above 0.6x6= 3.6+30%=4.68. (Figure 5-15)

Figure 5.



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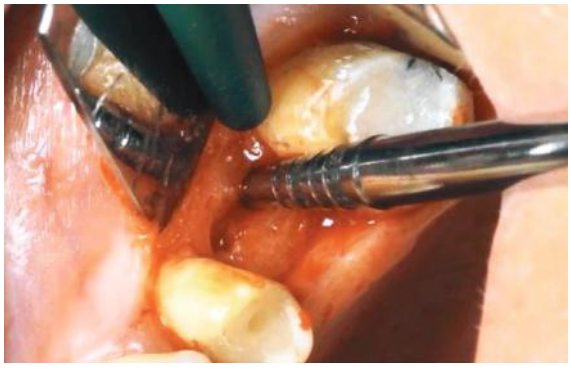

Figure 8.

Figure 9.

Figure 10.

Figure 11.

Figure 12.

Figure 13.

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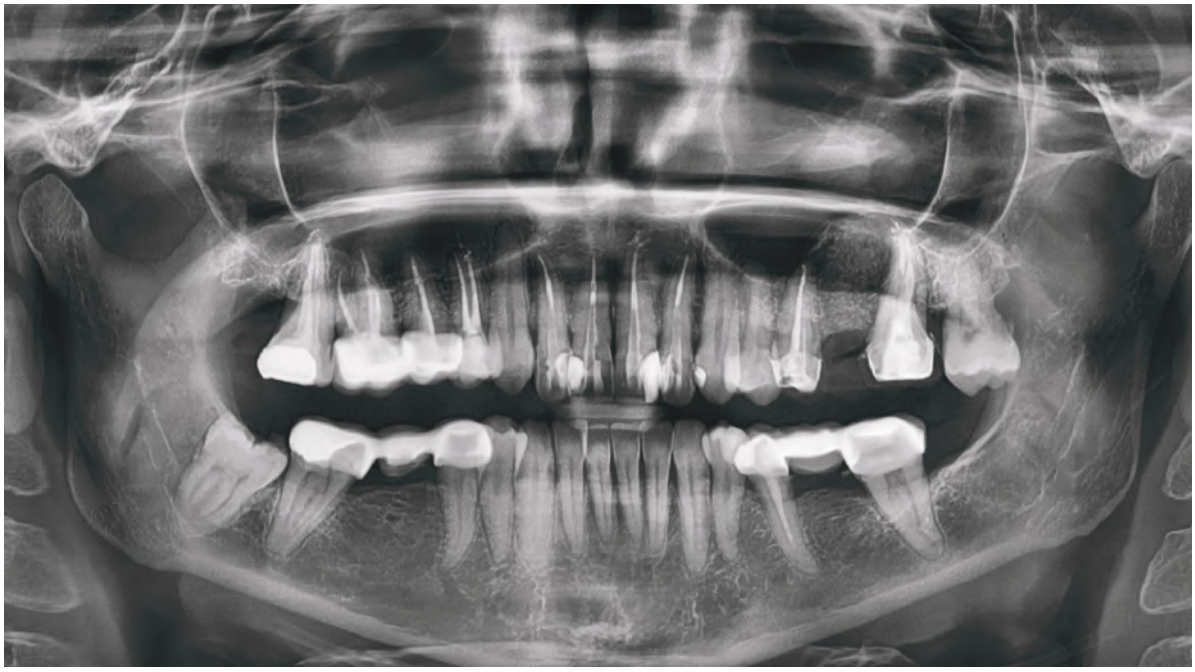
Figure 15.

After 4 months from surgery a radiological control is performed to evaluate the extent of the elevation obtained. With a bone height of 9 mm, it was decided to place a 3.8x11 mm implant fixture (Winsix, Biosafin, Ancona, Italy). (Fig. 16-17)

Once the bone had matured and stabilized through compaction, the implant site was prepared. (Fig. 18-26)
The operative sequence of the sharp concave tip osteotomes of the AZ easy-in kit was:
100-160-200. The step with the first osteotome 100P



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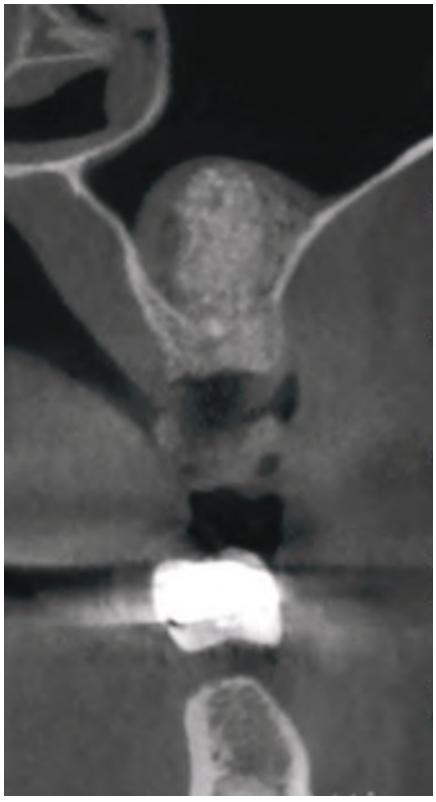
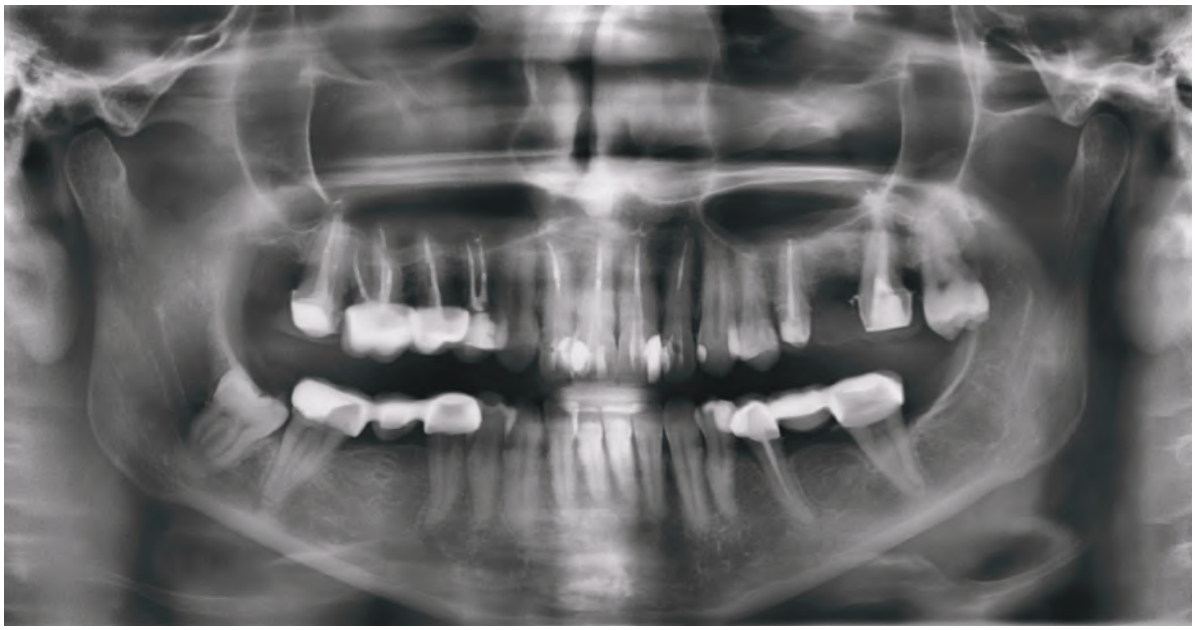


Figure 17.

was omitted due to the lack of mature cortical bone being newly angiogenic bone. The site preparation was taken up to a length of 11 mm thus proceeding with a new mini sinus lift.
Follow-up visits were performed one week after surgery, at 3 and 6 months and then once a year for the next years (5 years follow-up - Fig. 29-31). The patient was inserted in a professional oral hygiene program to avoid possible complications (20, 21) and monitoring dental implant.
The final prosthesis was performed, according with the healing time of the upper jaw, about four months after surgery.

Discussion

As reported by several Authors, both Sinus Floor Elevation Techniques could have many complications as Schneider membrane perforation (22), bone graft infections (23), acute or chronic sinus infection (24), vascular lesions (25), paroxysmal positional benign vertigo (PPBV) (26), wound dehiscence, bone graft and implants loss (27).
Membrane perforation represents the most common issue both for lateral and transcrestal approach, with a prevalence of 3.6% to 56% and 23.6 to 44% respectively (28, 29).
If this complication occur, bone graft migration into the sinus antrum could cause an acute or chronic sinus infection (23).



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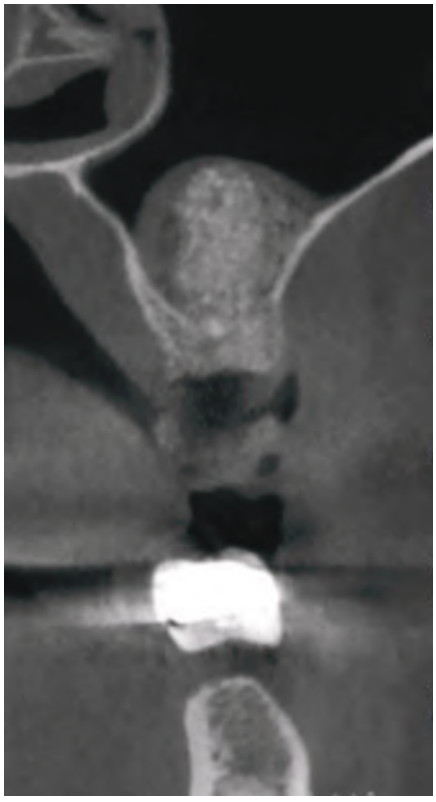

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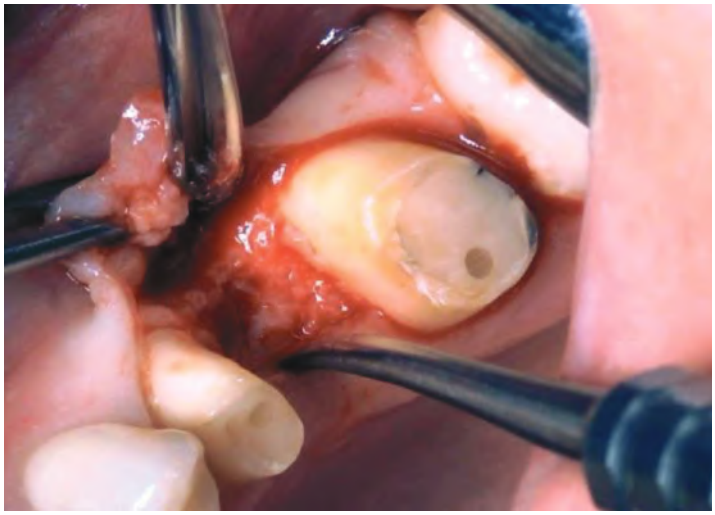

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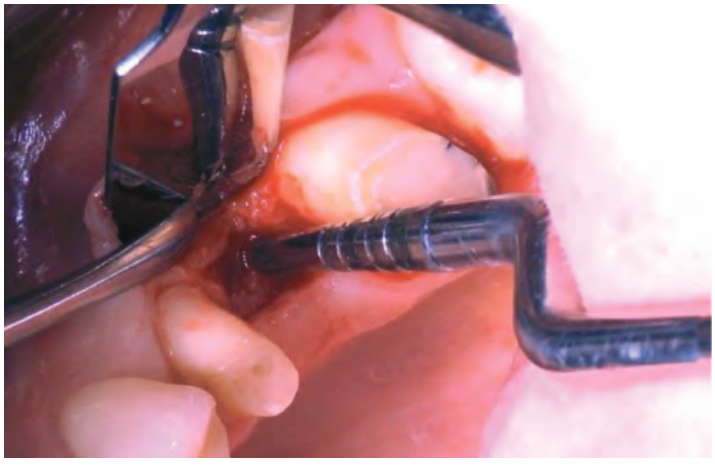

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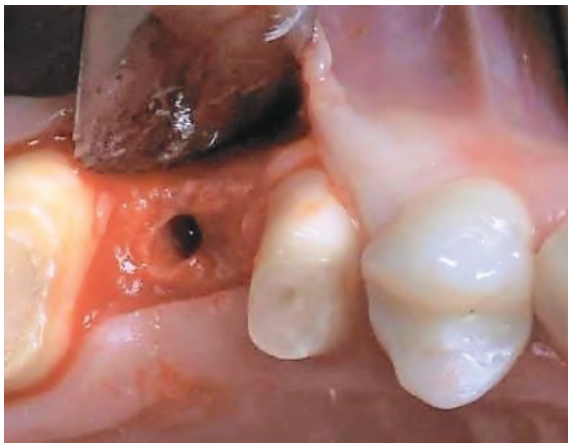

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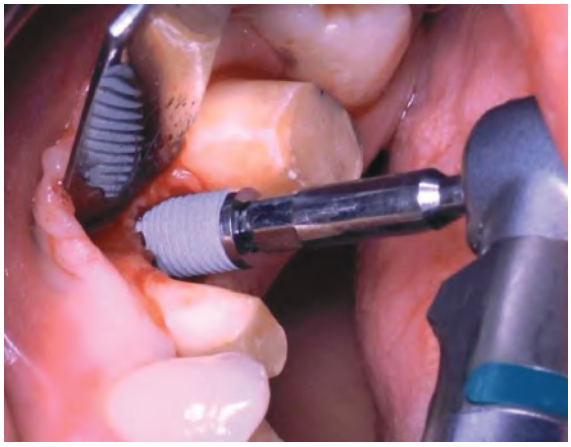

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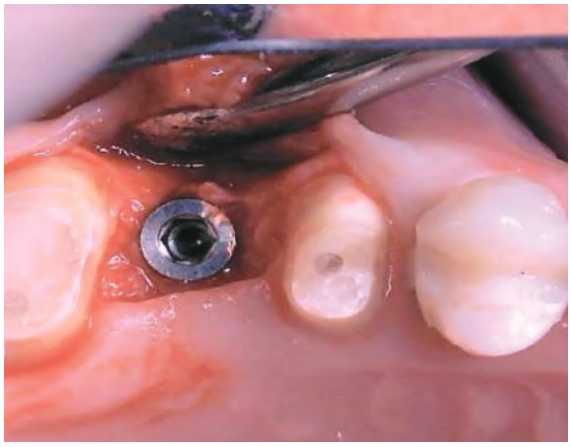

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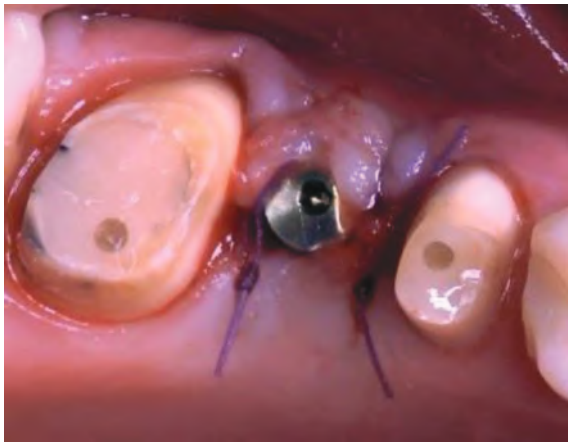

Figure 26.

Al-Dajani et Al. in a Meta-Analysis concerning incidence, risk factors, and complications of Schneiderian membrane perforation in sinus lift surgery, also described the role of membrane thickness and sinus septa on this issue. (30) According with Ardekian et Al. (31), there was a significant correlation between membrane perforation and sinus membrane <1 mm thick, with a higher prevalence in presence of bony septa.

Another possible complication of sinus floor elevation' procedures could be the injury of alveolar antral artery (AAA), which could have either an intraosseous or intrasinusal course (as minority) (32).

The consequence could be a several bleeding, which could increase according to vessel diameter (33).

To reduce these possible issues, as suggested by Torella et Al. (34) and Vercellotti et Al. (35), piezoelectric instruments should be preferred: during the creation of bony window on lateral sinus wall they could prevent both Schneider's membrane perforation and AAA lesion. Moreover, a Cone-Beam Computed Tomography performed before surgery is necessary to evaluate position and features of these anatomical structures (36).

Another possible complication of sinus floor elevation is

Figure 27.

Figure 28.

a postoperative maxillary sinusitis, with an incidence rate of up to 20% (37).

The possible consequence is a partial or complete obstruction of the ostium-meatal unit, altering the physiological activity of the mucosal airway system (38).

Concerning benign paroxysmal positional vertigo (BPPV), it was related only with transcrestal sinus floor elevation. BPPV can be described as a vestibular end organ disorder often characterized by episodes of vertigo. (39)

Although the symptoms involved within about a month, if not identified properly and managed correctly they could be enough severe to hinder patients from carrying out normal daily activities (13).

To reduce the incidence of complications, which is much higher in lateral approach breast augmentation, in the last few years we have tried to extend the indications for transcrestal augmentation also in case of residual bone height below 5 mm (40, 41).

With the new minimally invasive transcrestal elevation techniques, the frequency of perforation has decreased to an average of 3.8% for transalveolar elevation (42), whereas it is about 5 times more frequent for lateral elevation (43).

Membrane integrity is a key determinant of bone graft and implant survival: perforation is associated with a higher incidence of postoperative complications, such as graft failure and infection; furthermore, the size of the perforation is inversely proportional to implant survival (44).

Sinus lift performed with magneto-dynamic osteotomes could be performed in total safety, with a survival rate of 98.9%, as confirmed by the present clinical case (45,46).

Figure 29.

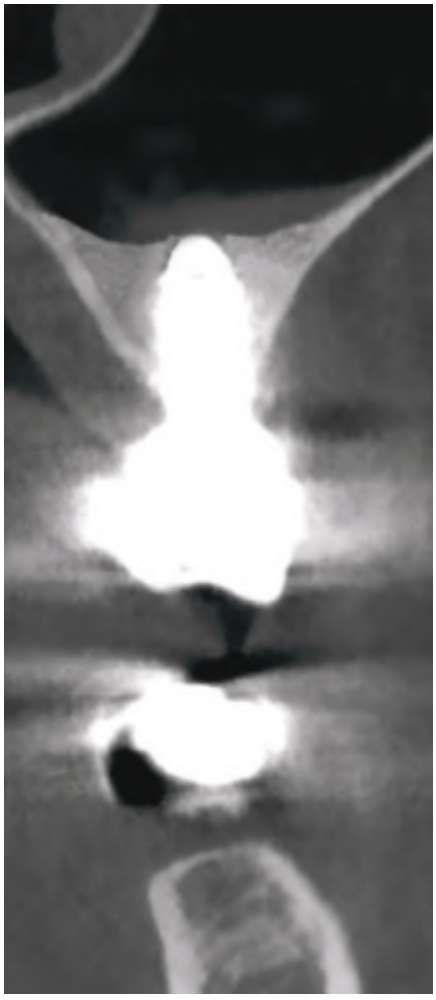

Figure 30.

Figure 31.

Conclusion

Within the limitations of this study, this case report could represent significant evidence of the efficacy of maxillary sinus lift with crestal access using the Magnetic Mallet technique and bio-material placement.

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