SPIDER ZYGOMA: A NEW IMPLANT REHABILITATION TECHNIQUE FOR ATROPHIC MAXILLA

M. ZANNA[1], M. MASCITTI[2], E. COCCIA[2], L. LO MUZIO[3] and A. SANTARELLI[2,4]

[1]"Casa di cura E. Montanari" Private Hospital, Morciano di Romagna, Italy; [2]Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; [3]Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy; [4]National Institute of Health and Science of Aging, INRCA, Ancona, Italy

Received June 18, 2018 – Accepted September 4, 2018

Atrophic maxilla is a challenge in dental implant surgery, and new strategies are needed. We present a new minimally-invasive approach, called "Spider Zygoma", consisting of implant-supported prosthesis with the addition of customized maxillofacial plates and screws on surface of zygomatic bone. A 3D-model of the edentulous upper jaw was used as preoperative model. Two customized bone plates were created and used as guide for placement of implants and zygomatic screws. Although this is only a pilot study, this new surgical technique seems to be safe and accurate, confirmed by the maintenance of good aesthetic and functional results after 5-year follow-up.

To the Editor,

Implant-based rehabilitation has shown high long-term success rate, but one of the current challenges remains the treatment of patients with atrophic maxilla. This condition is not unusual, due mainly to pneumatization of maxillary sinus and alveolar resorption (1).

To solve this problem, the use of several surgical procedures and materials for ridge augmentation have emerged (2). Despite maxillary sinus augmentation procedures have proven to be effective, a range of adverse events were reported. Furthermore, a major contraindication is the presence of pathological processes in maxillary sinuses (3). Regarding the use of specific implant strategies, zygomatic implants have provided a solution for treatment of extremely atrophied maxilla as an alternative to sinus augmentation or bone graft (4). Unfortunately, this procedure is significantly more invasive and is associated with several types of complications, such as maxillary sinus infection and ocular complications (5). The necessity for less invasive and, therefore, less risky surgical technique has led to the development of new implant strategies, such as tilted implants and mini-implants (2). These techniques have proven to have a good load distribution and a significative reduction of the stress level in immediate loading rehabilitation of edentulous jaw (6). The major limitation is the lack of long-term survival analysis and comparative studies between mini-implants and standard implants (2).

With the aim of continuing the path of minimally-invasive strategies and better distribution of occlusal forces, we have developed a new solution to provide further bone support. In this report we present a case of severely resorbed upper jaw, which was treated

Key words: dental implants, zygomatic implants, atrophic maxilla, bone plates, new technique

Mailing address:
Prof. Andrea Santarelli.
Via Tronto 10,
60126 Ancona, Italy
Tel.: +39 071 2206226
Fax: +39 071 2206221
e-mail: andrea.santarelli@staff.univpm.it

0393-974X (2018)
Copyright © by BIOLIFE, s.a.s.
This publication and/or article is for individual use only and may not be further reproduced without written permission from the copyright holder.
Unauthorized reproduction may result in financial and other penalties
DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

using a minimally-invasive approach, called "Spider Zygoma", consisting of implant-supported prosthesis with the addition of customized maxillofacial plates and screws on surface of zygomatic bone (Fig. 1, A-B).

Case report

A 56-year-old Caucasian female presented to "Casa di cura E. Montanari" Private Hospital with the desire "to solve her dental problem". Indeed, the patient was not satisfied with the dental function and appearance of her denture. Her medical history included the diagnosis of bilateral chronic hyperplastic sinusitis starting 3 years previously. She did not smoke or consume alcohol. On clinical examination, the patient showed maxillary total edentulism and a fixed complete denture in the mandible. The patient stated that she had been edentulous in the upper jaw for about 10 years. The removable maxillary denture showed lack of retention due to severe atrophy. Upon clinical and computed tomography (CT) evaluation, the maxilla was classified ACP PDI for Complete Edentulism Class III. The patient was informed about surgical alternatives and the "Spider Zygoma" procedure and provided written consent. A 3D model of the edentulous maxillary arch and the surrounding bone was made and used as the preoperative model. CAD/CAM technology was used to create two customized bone plates (Fig. 1, C-D). A total of 16 implants (GiEsse Technology srl, Cogoleto, Italy) were placed using the following protocol ("Spider Zygoma" protocol). After supra-crestal incision, four 2.9 x 8 mm implants and four 2.9 x 6 mm implants were placed in the maxilla and torqued to 40 Ncm (Fig. 2, A-B). Furthermore, six 2.9 x 6 mm implants and two 2.7 x 11 mm zygomatic screws were placed from the maxillary premolar area to the zygomatic surface, using the customized titanium bone plates (35 x 1 mm) as guides. The implants were torqued to 60 Ncm, and the connection between plates and implants was ensured by interference fit (Fig. 2C-D). After suturing the soft tissues, the maxillary denture was inserted and, after occlusal adjustment, was fixed with prosthetic retaining screws (Fig. 2, E-F).

The patient was given proper oral hygiene instructions and scheduled for follow-up every 3 months. At the follow-up appointments, there were no discernable clinical or radiographic changes

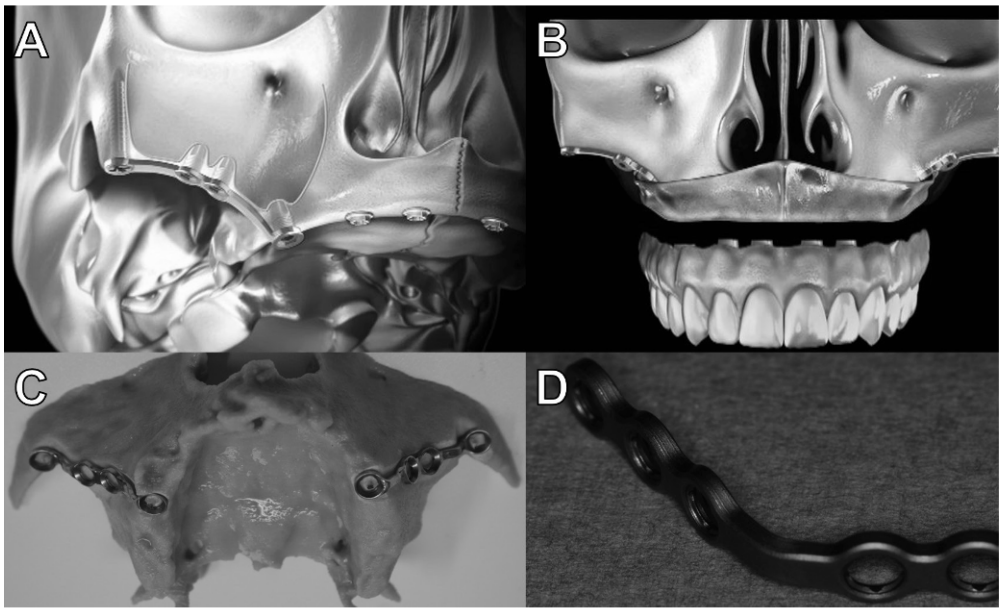


Fig. 1. ***A, B****) Spider Zygoma treatment concept, using customized titanium plates and screws on surface of zygomatic bone.* ***C****) 3D model of the edentulous maxillae and (****D****) customized titanium bone plates.*

around the dental implants. Furthermore, bone formation at the maxillary sinus floor following implants placement was observed, as highlighted by transparent 3D CT image protocol (Fig. 3, A-B). After a 5-year follow-up period, the patient maintained a good aesthetic and functional result.

DISCUSSION

To date, the major limitation in maxillary rehabilitation with dental implants is the lack of bone volume, due to the resorption of the alveolar process and the pneumatization of the maxillary sinuses (1). Furthermore, several reports demonstrate low bone density in maxilla (7, 8). Several surgical techniques have been proposed to overcome these limitations in severely atrophied upper jaws: elevation of the sinus floor, bone grafting, and zygomatic implants. Sinus lift surgery was avoided due to the presence of bilateral chronic sinusitis, considered a contraindication (3). The use of bone grafting was avoided as the patient was uncomfortable with the exploitation of extraoral sites. Regarding the use of zygomatic implants, several disadvantages were considered, such as the invasiveness of this approach and the risk of severe complications (5, 9). To increase the support surface area, thus providing a better distribution of occlusal forces, we developed the Spider Zygoma protocol, consisting of using two custom-made titanium plates, fixed on both zygomatic surfaces with screws. Spider Zygoma offers a series of advantages: i) a less invasive surgical procedure; ii) a lower risk of complications; and iii) the use of cortical screw anchorage of zygomatic bone (10).

In conclusion, this new surgical technique seems to be safe and accurate, confirmed by the

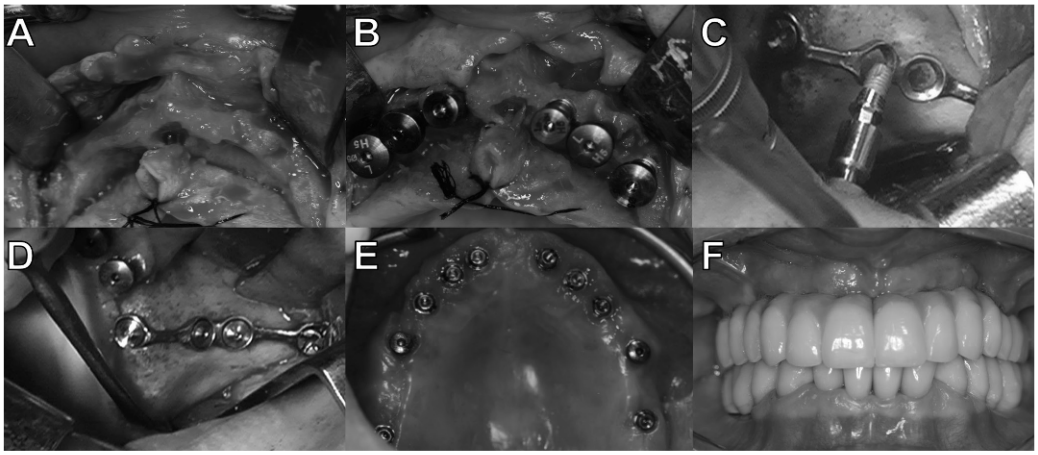


Fig. 2. *Surgical steps of Spider Zygoma protocol. **A**) Supra-crestal incision, (**B**) implant placement, (**C**, **D**) placement of implants, zygomatic screws, and bone plates from maxillary premolar area to zygomatic surface, (**E**, **F**) prosthodontic phases.*

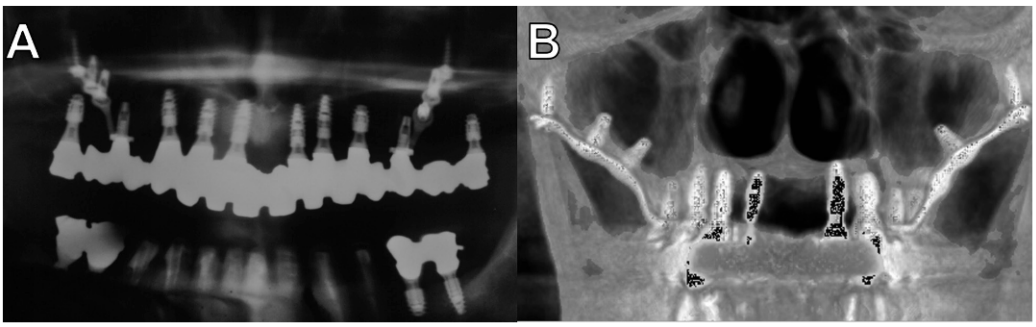


Fig. 3. *A) Panoramic radiograph after implant placement. **B**) Transparent 3D CT image protocol highlights bone formation at the maxillary sinus floor.*

absence of clinical or radiographic changes and the maintenance of good aesthetic and functional results after a 5-year follow-up. However, due to the novelty of this technique, we take a cautious approach, using a greater number of implants in the distal area. Future prospective studies are needed to compare this technique with other well-established implant strategies, especially with zygomatic implants. Indeed, recent development in zygomatic implant protocols makes this technique less susceptible to complications (11, 12). For these reasons, other spatial configurations of the Spider Zygoma system will need to be studied.

REFERENCES

1. Sorni M, Guarinos J, Garcia O, Penarrocha M. Implant rehabilitation of the atrophic upper jaw: a review of the literature since 1999. Med Oral Patol Oral Cir Bucal 2005; 10(Suppl 1):E45-56.
2. Ali SA, Karthigeyan S, Deivanai M, Kumar A. Implant rehabilitation for atrophic maxilla: a review. J Indian Prosthodont Soc 2014; 14:196-207.
3. Chiapasco M, Casentini P, Zaniboni M. Bone augmentation procedures in implant dentistry. Int J Oral Maxillofac Implants 2009; 24(Suppl):237-59.
4. Candel-Marti E, Carrillo-Garcia C, Penarrocha-Oltra D, Penarrocha-Diago M. Rehabilitation of atrophic posterior maxilla with zygomatic implants: review. J Oral Implantol 2012; 38:653-57.
5. Tran AQ, Reyes-Capo DP, Patel NA, Pasol J, Capo H, Wester ST. Zygomatic dental implant induced orbital fracture and inferior oblique trauma. Orbit 2018:1-4.
6. Menini M, Signori A, Tealdo T, et al. Tilted implants in the immediate loading rehabilitation of the maxilla: a systematic review. J Dent Res 2012; 91:821-27.
7. Wakimoto M, Matsumura T, Ueno T, Mizukawa N, Yanagi Y, Iida S. Bone quality and quantity of the anterior maxillary trabecular bone in dental implant sites. Clin Oral Implants Res 2012; 23:1314-19.
8. Santarelli A, Mascitti M, Orsini G, et al. Osteopontin, osteocalcin and OB-cadherin expression in Synthetic nanohydroxyapatite vs bovine hydroxyapatite cultured Osteoblastic-like cells. J Biol Regul Homeost Agents 2014; 28:523-29.
9. Sharma A, Rahul GR. Zygomatic implants/fixture: a systematic review. J Oral Implantol 2013; 39:215-24.
10. Nkenke E, Hahn M, Lell M, et al. Anatomic site evaluation of the zygomatic bone for dental implant placement. Clin Oral Implants Res 2003; 14:72-79.
11. Balan I, M DIG, Lauritano D, Carinci F. Treatment of severe atrophic maxilla with zygomatic implants: a case series. Oral Implantol (Rome) 2017; 10:317-24.
12. Grecchi F, Bianchi AE, Siervo S, Grecchi E, Lauritano D, Carinci F. A new surgical and technical approach in zygomatic implantology. Oral Implantol (Rome) 2017; 10:197-208.