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Complex Maxillary Prosthetic Restoration with Titanium Bar and Small Diameter Implants

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Abstract

Small diameter implants (SDIs), initially introduced to stabilize temporary dentures, were soon found to have several other clinical applications due to their high versatility [1,2]. Significant findings have been reported in the literature about the long-term survival of small diameter implants [3,4]. Minimally invasive surgical techniques are becoming more and more discussed and practiced; accurate planning and case evaluation are imperative for a success.

Keywords: Small diameter implants; Implantology; Prosthetic Restoration

Introduction

Small diameter implants (SDIs), initially introduced to stabilize temporary dentures, were soon found to have several other clinical applications due to their high versatility [1,2]. Significant findings have been reported in the literature about the long-term survival of small diameter implants [3,4]. Minimally invasive surgical techniques are becoming more and more discussed and practiced; accurate planning and case evaluation are imperative for a success. The versatility of the SDI offers the opportunity to propose an implant treatment to patients of wider ranges. The clinical case proposes a minimally invasive alternative to complex maxillary treatment.

Clinical Case

The patient, 58 years woman, with an extremely compromised situation, namely loose upper-arch teeth and mastication difficulties (Figure 1), came to the Department of Implantology (AOU Cagliari, EIMS H.E.I.) requesting an upper prosthetic restoration on implants. The initial clinical and radiological evaluation was taken resulting that upper arch teeth were all extremely loose and could not be saved.

Figure 1: *Face and upper arch before treatment.*

A relevant registered in the anamnesis is that the patient, carrying an artificial cardiac prosthesis, took anti-coagulant treatment; in this case, dental surgical treatment can be performed only in the presence of adequate rates (INR 1.5-2.5), and on the same day in which such values are observed. We started from the extraction of the most compromised teeth and left one single tooth (the less periodontal compromised), which would serve as a support for a

removable temporary prosthesis. The coagulation rates were brought to the pre-surgical ones in the following days. After some months, we performed a new 3D radiographic examination (CBCT), which showed us scarce bone volume in a vestibule-palatal direction, and barely sufficient bone height (Figures 2 and 3).

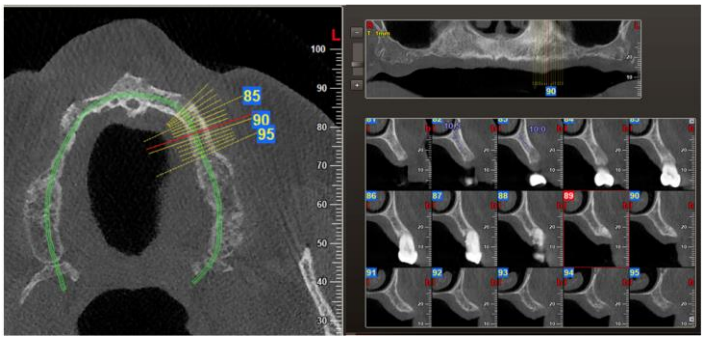

Figure 2: *CBCT: sections of the second quadrant.*

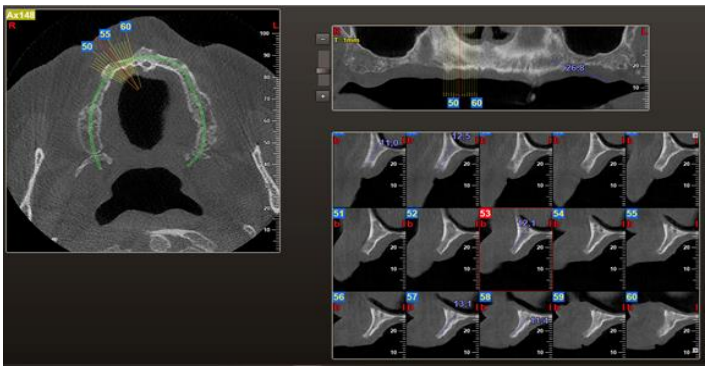

Figure 3: *CBCT: sections of the first quadrant.*

The clinical treatment planned, provided small-diameter implants (SDIs), and contextual split-crest on upper arch, although we knew that this small-diameter implants (Exacome 2.9 diameter, Leone, Firenze, Italy) is best employed for the substitution of a single tooth, particularly in patients who have lateral incisors agenesis, and with scarce bone availability in mesial-distal direction [5].

In the upper left arch, after local anesthesia, was performed a full thickness flap, which allowed us to evaluate the bone crest thickness (Figure 4).

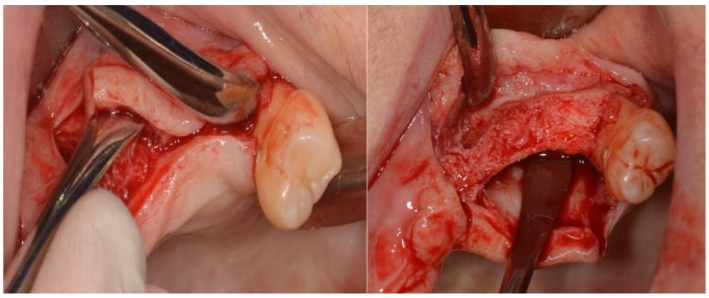

Figure 4: *Full-thickness flap.*

The bone was slightly thicker in the canine area as compared to the premolar region. We used a pilot bur diameter 2.2 mm, for a depth of 13 mm in the canine area, after having performed a corticotomy with a flame bur. It was not possible to use burs in the premolar regions, due to the thickness of the bone crest. Therefore, we decided to perform a horizontal corticotomy, up to a depth of 8 mm, with piezoelectric instruments, and then to complete the expansion with manual scalpels (Figure 5), reaching a depth of 11 mm.

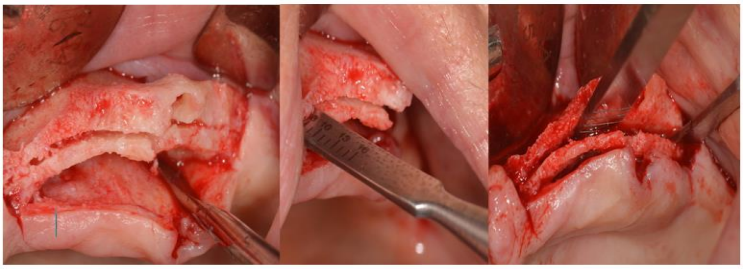

Figure 5: *Initial cut using piezo surgery and scalpels to start the Split Crest phase.*

After having obtained the expansion of the two cortical bones, we inserted two SDI implants (Exacome, Leone Firenze Italy): one 3.3 mm diameter, length 12 mm for the II Upper left premolar area (Figure 6), and the second in 2.9 mm diameter, length 14 mm (Figures 7 and 8) in the upper left canine area; both implants were positioned 1 mm below the bone crest.

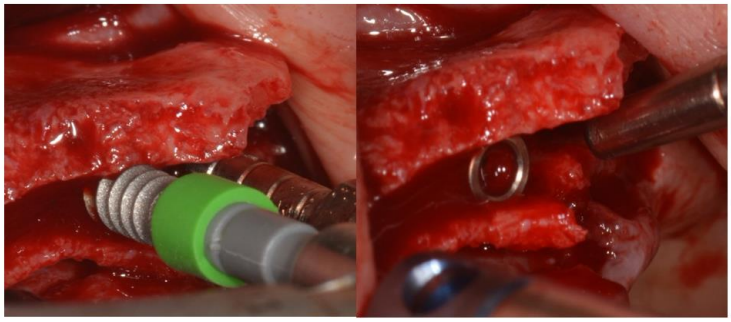

Figure 6: *The various steps of the first implant insertion (Leone 3.3 x 12mm).*

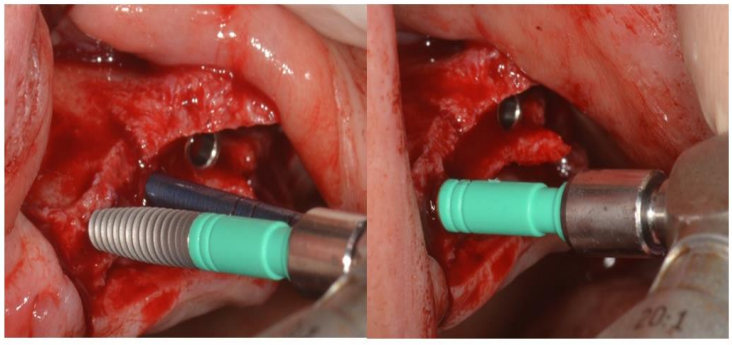

Figure 7: *The various steps of the second implant insertion (Leone 2.9 x 14mm).*

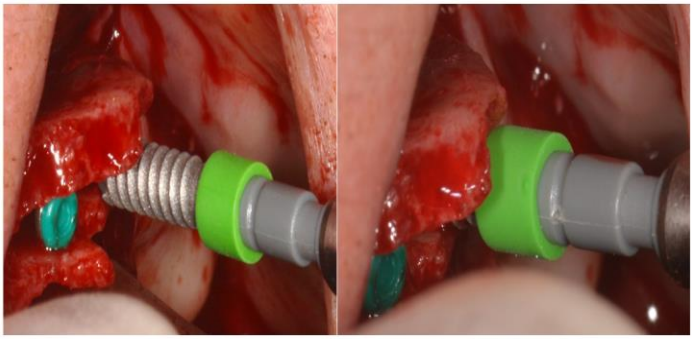

Figure 8: *Various steps of the third implant insertion (Leone 3.3 x 12mm).*

This was done by using an implant contra-angle, and the positioning was completed by using a manual ratchet. The surgical protocol applied was the standard protocol suggested by the Implant Company (Leone, Firenze, Italy) [6]. The procedure was completed inserting biomaterial in order to fill the gap that was created between the two implants due to bone expansion, and we performed releasing incisions on the periosteum, so as to make the flap passive and tensionless (Figure 9).

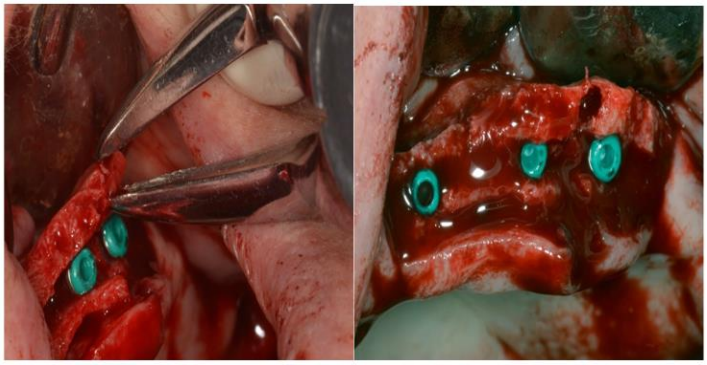

Figure 9: *Healing caps. Sampling the patient's autologous bone with a rongeur.*

In the upper right arch, prepared a surgical flap with the same characteristics as the previous ones (Figure 10), we realized that the crest was evenly thin.

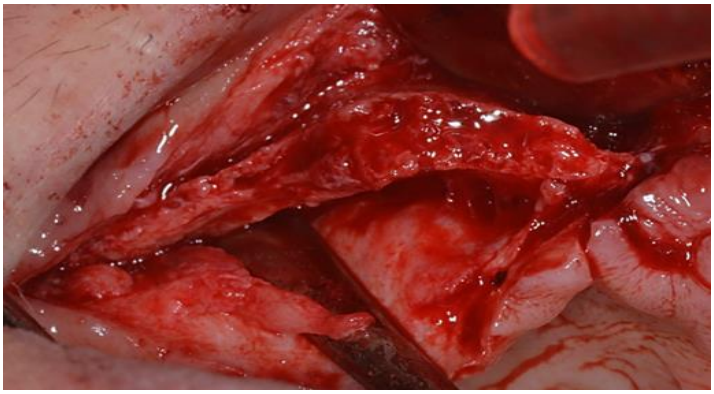

Figure 10: *Tissue unsticking.*

After using two sonic instruments; the expansion was completed with manual scalpels and osteotomes, making sure to keep the two cortical bones dilated mesially, using a depth gauge for the purpose, while we expanded the distal area. Were inserted 2 SDIs 2.9 mm diameter, length 10 mm (Exacone, Leone, Firenze Italy), in the canine and first premolar area (Figures 11 and 12). We noticed that, thanks to the conic shape of these SDIs, we had obtained a greater expansion of the cortical bones in oral region 15, so as to be able to use a 2.8 mm bur, reaching a depth of 8 mm.

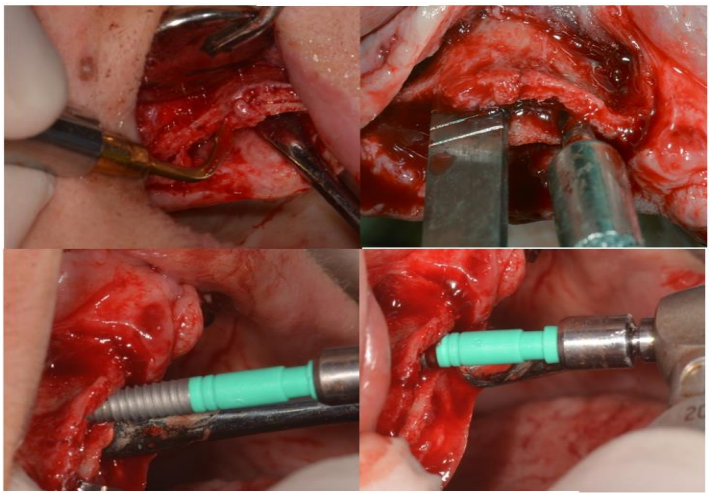

Figure 11: *Surgical phase and insertion of the first implant (2.9x10mm)*

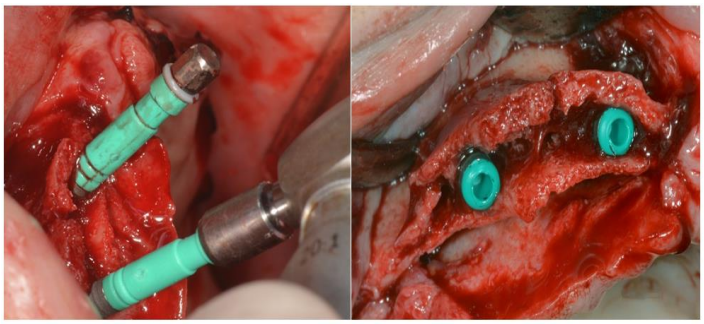

Figure 12: *Insertion of the second implant (Leone 2.9 x 10mm).*

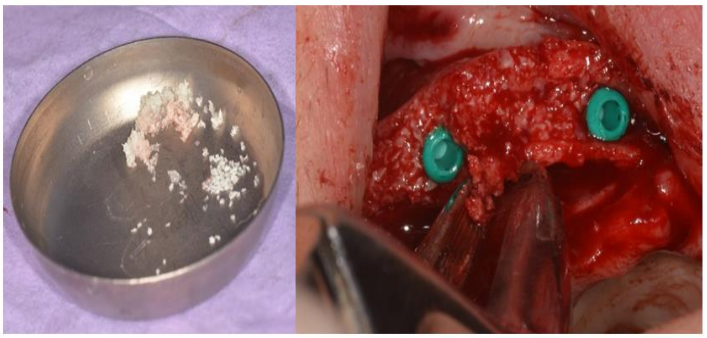

Figure 13: *Insertion of the second implant (Leone 2,9 x 10mm). Filling of the bone defect with cortical-spongious bone chips and autologous bone collected from the bone crest with the aid of a rongeur.*

This was done using a small speed (50 rpm) without irrigation to recuperate bone chips. The treatment was completed closing the gap created between the two cortical bones, using the bone chips we previously recuperated, and by collecting bone tissue with a rongeur, so as to obtain a good ratio between synthetic bone and the patient's bone (Figures 13 and 14). Afterwards, we made the flap passive before suturing (Figure 15).

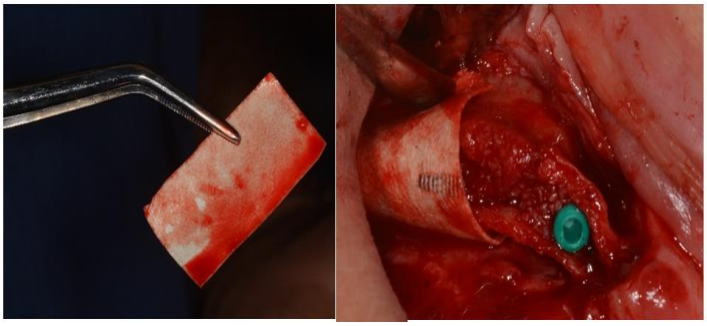

Figure 14: *Releasing incisions in the periosteum and adapting the pericardium membrane so as to completely cover the area to regenerate.*

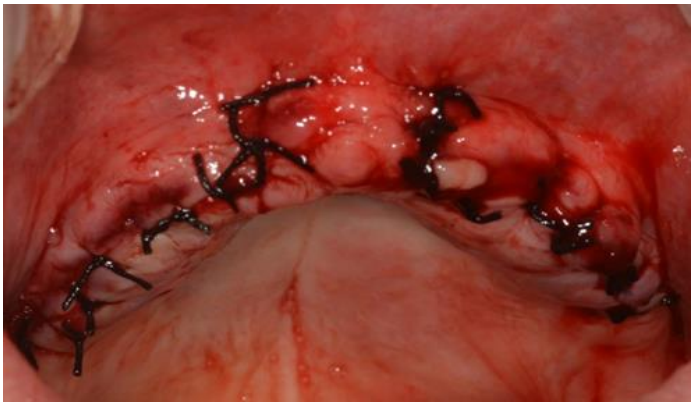

Figure 15: *Final surgical suture in both quadrants.*

Discussion

Six months after the surgical treatment, since the patient had a complicated anamnesis, was performed a small flap (so as to avoid abundant bleeding) in both quadrants to verify whether hard tissues had healed well, and to position the healing caps on the implants, therefore substituting the closure screws (Figure 16). In the upper right quadrant, apart from newly formed bone, we noticed the presence of heterologous bone chips, which had not been completely resorbed; in upper left quadrant, where we had used homologous bone, we only noticed native bone. In both sites we observed that implants were perfectly integrated, as well as the presence of bone tissue that filled the gap that had previously created because of the split. After having opened the implants, and after having obtained the maturation of soft tissues with the aid of standard healing caps, a dental impression was taken registering the implants position by using transfers, so as to create a first model and to proceed to the prosthetic phases, which would then lead to the creation of a titanium bar for removable prosthesis anchorage (Figures 17-19).

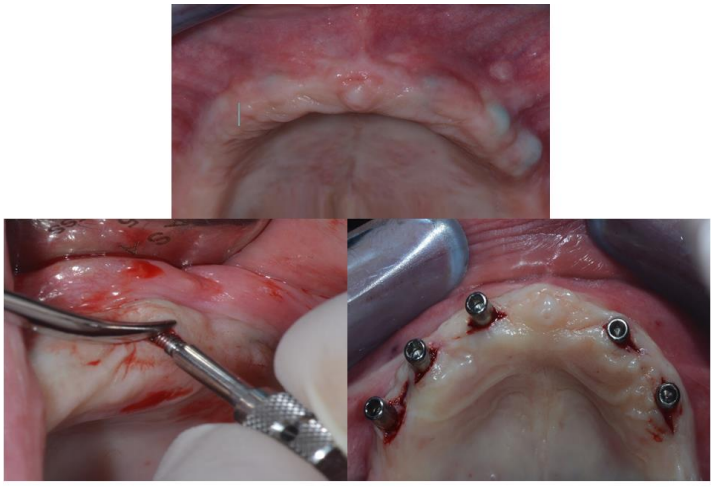

Figure 16: *Reopening.*

Figure 17: *Dental impression.*

Figure 18: *Positioning of the plate and of the removable prosthesis.*

Figure 19: *Face after treatment.*

Clinical evaluation after 2 years shows that the soft tissues have optimal trophism (Figure 20), while the radiographic examination shows that the hard tissues surrounding the implants are stable (Figure 21).

Figure 20: *Clinical evaluation after two years.*

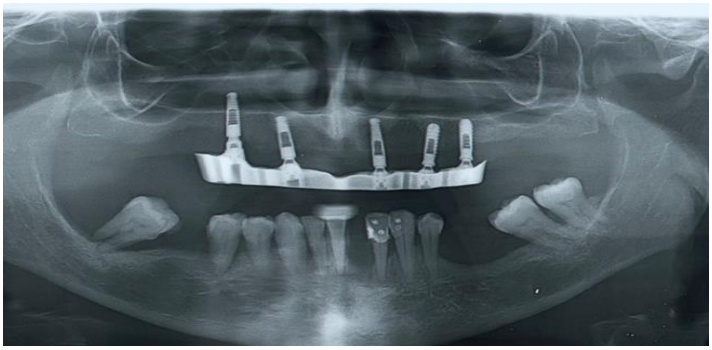

Figure 21: *Radiographic examination after two years.*

Conclusion

We can conclude that, despite the Dental Company's indications suggest the use of these SDIs (Exacone Leone Firenze Italy) for management of small areas in mesial-distal and vestibule-palatal/lingual directions, thus typically of inferior incisors or upper lateral incisors [7,8], our clinical experience, proposed with this case example, has allowed us to register high performance of these SDIs in unconventional situations; this could be a stimulus for investigating in more fields of application also considering the most recent evidences that show Narrow diameter implants with diameters of 2.5 mm and more demonstrated no difference in implant survival rates compared to standard diameter implants.

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