SCIENTIFIC ARCHIVES OF DENTAL SCIENCES (ISSN: 2642-1623)

Volume 5 Issue 8 August 2022

Case Report

Transnasal and Pterygoid Implants as an Alternative to Quad Zygoma in Atrophic Total Maxilla: Case Report with Immediate Loading and 12 Months Follow-Up

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Received: June 20, 2022; **Published:** August 01, 2022

Abstract

The severely atrophic maxilla results from advanced bone resorption and becomes a limiting condition for patient rehabilitation. The dental surgeon requires extensive anatomical and technical knowledge to perform major surgical procedures, such as the use of bone grafts and the installation of zygomatic implants. These techniques are, most of the times, procedures that present high morbidity and risks and possible complications. In this perspective, the option for more conservative techniques can favor implantoprosthetic rehabilitation. The purpose of this article was to present the alternative technique of transnasal and pterygoid implantation to avoid the Quad Zygoma, using extralong implants as a new anchorage alternative in atrophic jaws, thus aiding immediate loading. The patient has been under follow-up for 12 months.

Keywords: *Atrophic Maxila; Transnasal Implant; Zygomatic Implant; Quad Zygoma; Oral Rehabilitation*

Introduction

Bone loss in the posterior region of the maxilla characterizes the occurrence of atrophic maxilla, generally caused by bone resorption, periodontal diseases or pneumatization of the maxillary sinus. Atrophic maxilla poses challenges for the installation of osseointegrated implants. In this perspective, the use of bone grafts to increase the volume is indicated for the adequate installation of osseointegrated implants [1].

Another possible surgical option is the zygomatic implant technique, with the installation of osseointegrated implants in areas of remaining bone, without the need for bone grafts. The technique makes the most of the available bone supply, such as the resorbed alveolar process, canine pillars, and pterygoid and zygomatic processes [2-5].

The prognosis and design of prostheses on implants in both techniques in atrophic maxillae - grafts or zygomatic implants - present similar characteristics and limitations. Additionally, they are traumatic procedures with high morbidity for patients [3,6].

Originally, the technique of installing zygomatic implants foresaw an intrasinusal implant path and the creation of a window in the anterior wall of the maxillary sinus to allow visualization of the zygomatic bone during implant insertion [7]. However, the technique was limited by the intra-sinusal access and prosthetic relationship. Thus, the original technique was modified, improving the prosthetic relationship, allowing the extra-sinusal path for zygomatic implants, and decreasing sinus pathologies [8]. The extramaxillary approach allows the integrity of the sinus membrane during the drilling phases, and for the zygomatic implant to be

installed in the space between the membrane and the internal surface of the maxillary bone. The surgical technique provides for the creation of a groove along the surface of the maxillary bone until the sinus membrane is exposed from below. The membrane will subsequently be mobilized into the sinus with hand instruments to create space for the drills [5].

In cases of severe maxillary atrophy, anchorage with zygomatic implants in the all-on-four technique becomes necessary due to the limited bone availability in the entire maxilla [9]. These associated techniques have a high rate of implant success and a low incidence of prosthetic complications [10]. However, considering anatomical alterations in some patients, there may be limitations in the width of the zygomatic bone for the installation of the second uppermost implant, with the infraorbital foramen being very close to the path of the second implant. This implant can, in most cases, be exteriorized and with many exposed spires [11]. Complications such as orbit perforation, implant malposition, perimplantation and sinusitis are not uncommon [8]. Additionally, the Quad Zygoma technique requires greater operator dexterity and understanding of anatomy to avoid complications [10].

Purpose of the Study

The purpose of this article was to present the alternative technique of transnasal and pterygoid implantation to avoid Quad Zygoma, using extralong implants as a new anchorage alternative in atrophic jaws, thus aiding immediate loading.

Case Report

A Caucasian female patient, 60 years-old, presented to the clinic complaining of the need for replacement of her upper total prosthesis.

Clinically, extensive resorption was observed in the maxillary bone tissue covered with fibromucosa, sometimes mobile, mainly in the anterior edentulous region (Figure 1). The patient reported dissatisfaction due to lack of stability of the upper total prosthesis.

Extraoral evaluation determined a great esthetic collapse, loss of vertical dimension and facial aging (Figure 2).

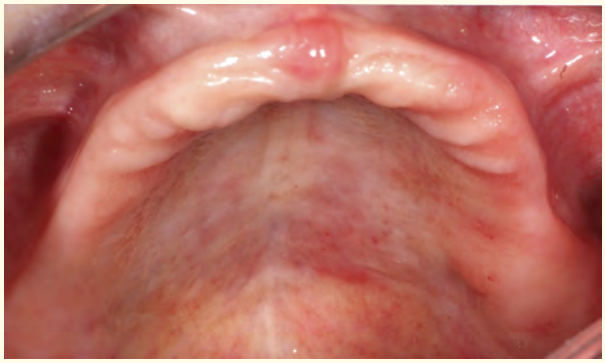


Figure 1: *Initial intraoral clinical aspect: patient presenting with atrophic maxilla.*

Figure 2: *Extraoral aspect with loss of vertical dimension and facial aging.*

Cone-Beam Computed Tomography (CBCT) confirmed the large bone resorption (Figure 3). Virtual planning using specific CBCT software and subsequent prototyping considered the possibility of anchorage in the regions of teeth 11, 13, 21 and 23 by means of transnasal and pterygoid implants (Figure 4), followed by rehabilitation with immediate loading.

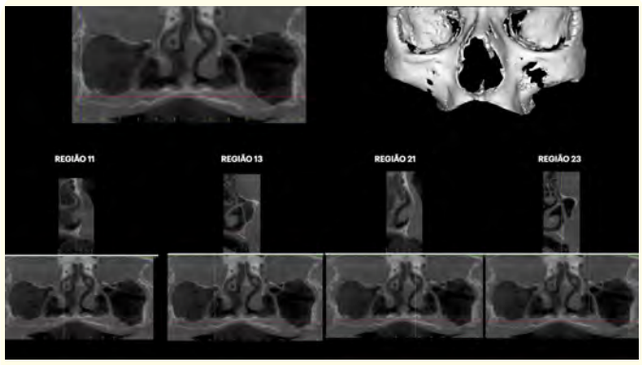


Figure 3: *Large bone resorption observed on cone beam computed tomography (CBCT).*

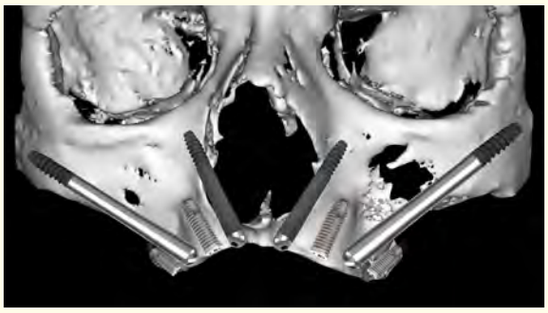


Figure 4: *Virtual planning using specific software on CBCT.*

After presentation of the technique and clarification, the patient consented to the proposed treatment.

Technique description

The anchorage technique with zygomatic implants and extra--long transnasal implants is a proposal to rehabilitate maxillae with immediate loading and without the need of grafts. Transnasal implants are fixations that anchor in the basal bone of the maxilla, cross the nasal cavity tangentially to the distal wall and are anchored apically to the frontal process of the maxilla [11], as can be seen in figure 5.

Figure 5: *Schematic drawing of the transnasal implant installation. 1: Conchal ridge. 2: Frontal process of the maxila (medial side).*

The procedure was performed in a hospital environment, under general anesthesia. Infiltrative anesthesia was used to promote local vasoconstriction and reduce local bleeding. Primary incision over the entire bone crest of the maxillary ridge followed by perpendicular relaxing incisions were performed, so that by detaching the palatine and buccal mucoperiosteal flap, it was possible to separate the flap, with a median palatal suture (Figure 6). Bone planing was performed to regularize the alveolar ridge (Figure 7).

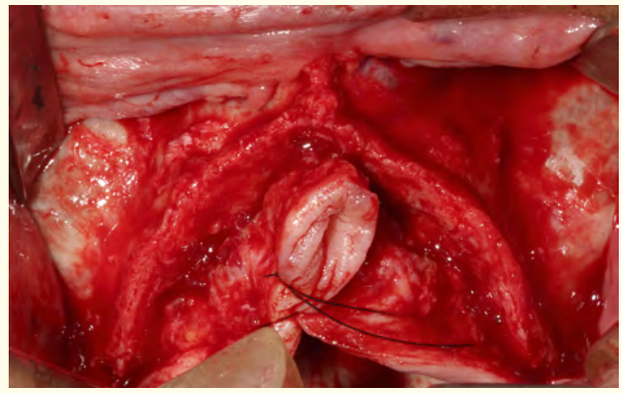
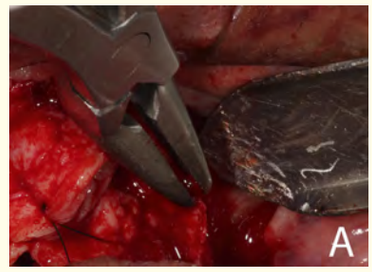


Figure 6: *Detachment of the palatal and buccal mucoperiosteal flap.*



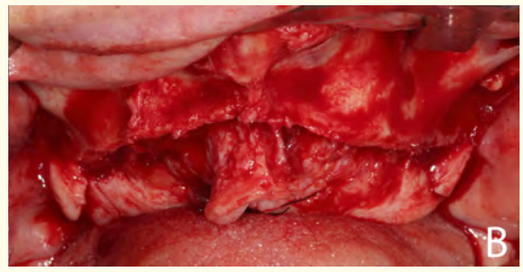


Figure 7: *Bone planing for regularization of the alveolar ridge. Use of the alveolotome (A); Regularized ridge (B).*

In the region of teeth 13 and 23, milling and installation of 4 X 9 mm Cone Morse implants (Dentoflex, São Paulo, Brazil) was performed (Figure 8).

Subsequently, the nasal floor and lateral wall of the frontonasal pillar were detached, accessing the internal conchal ridge and medial surface of the maxillary frontal process up to a height of 30 mm (Figure 9).

The previous virtual planning and the prototyped model is transferred to the surgical site, determining the milling and installation

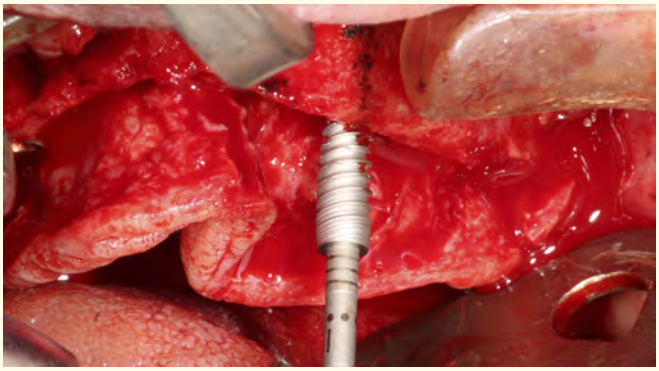
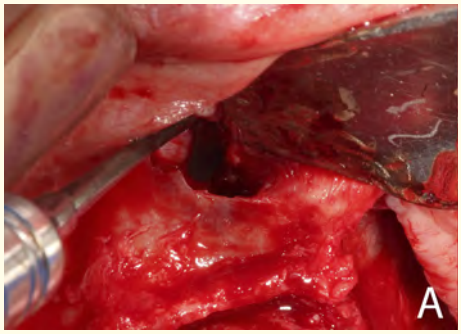


Figure 8: *Installation of the Cone Morse implant in the region of tooth 23.*



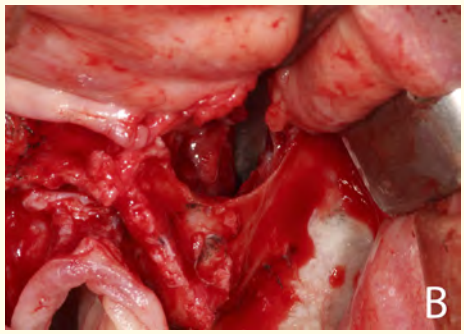
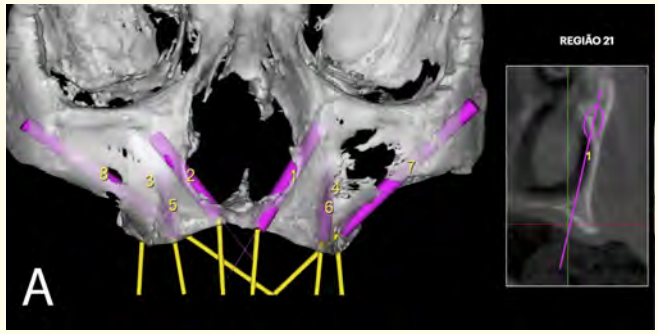


Figure 9: *Detachment of the nasal floor and the lateral wall of the frontonasal pillar. Right side (A); left side (B).*

of the transnasal implants, starting from the left side (Figure 10 and 11). The milling is started with the palatal approach technique until reaching the apical anchorage target, using the spear milling cutter (Figure 12 and 13). The surgical alveolus must be inspected (Figure 14), and subsequent long milling is performed with the 2.8 mm and 3.5 mm drills, towards the frontonasal pillar (Figure 15). A 4 X 30 mm external hexagon implant (Dentoflex, São Paulo, Brazil) was installed, angled at 45°, reaching a torque of 45N (Figure 16). A biomaterial graft was inserted in the nasal floor and lateral wall of the nasal cavity. The same sequence of procedures was performed on the right side.



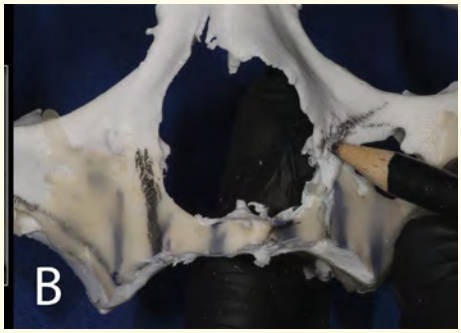
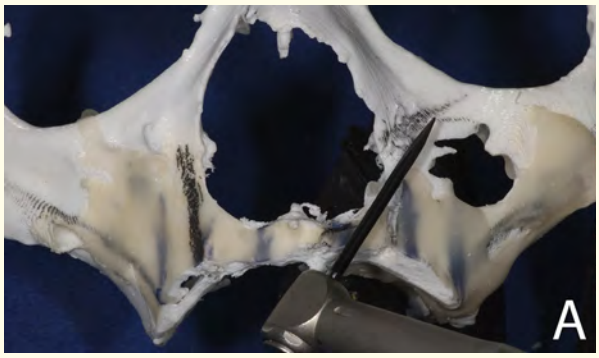


Figure 10: *Virtual planning (A); Planning on the prototyped model (B).*



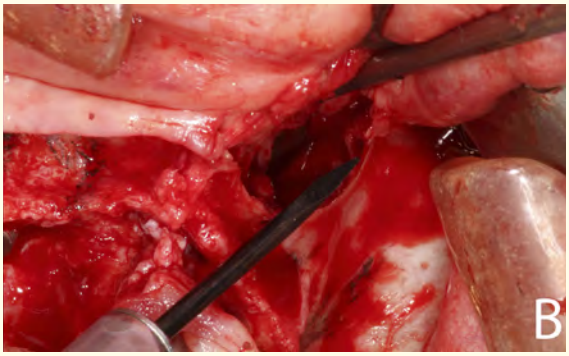


Figure 11: *Use of spear drill on prototyped model (A) and transferred to the oral cavity (B) of the transnasal implant.*

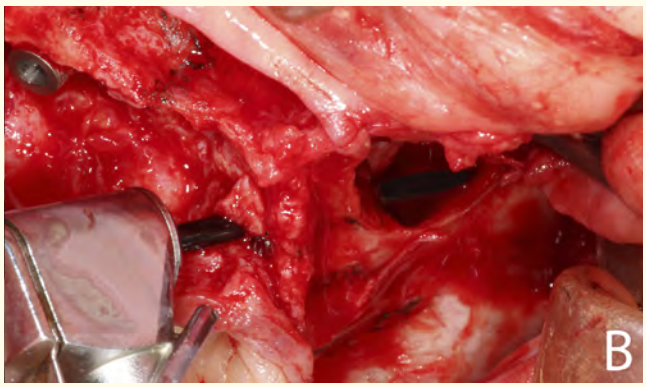


Figure 13: *Milling with spear drill in prototyped model (A) and transferred to the oral cavity (B) of the transnasal implant.*

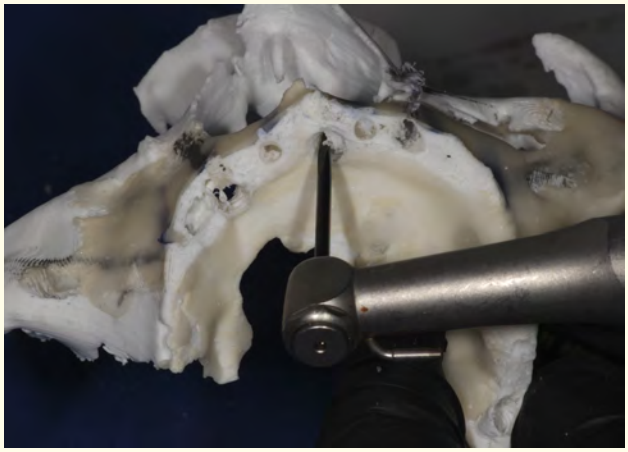


Figure 12: *Palatal approach.*

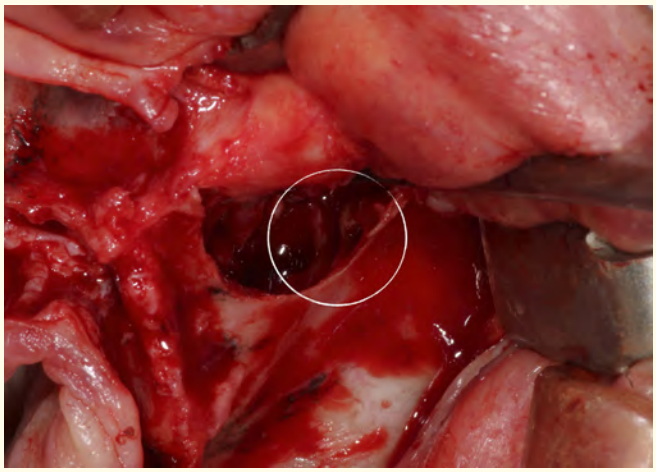
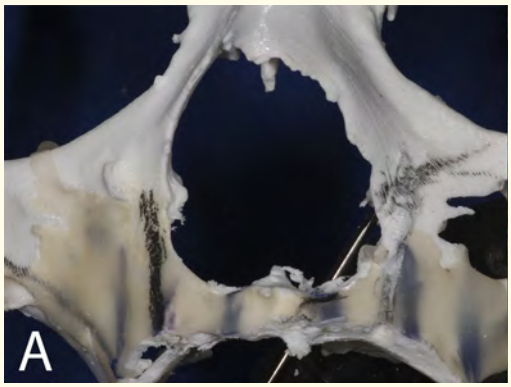
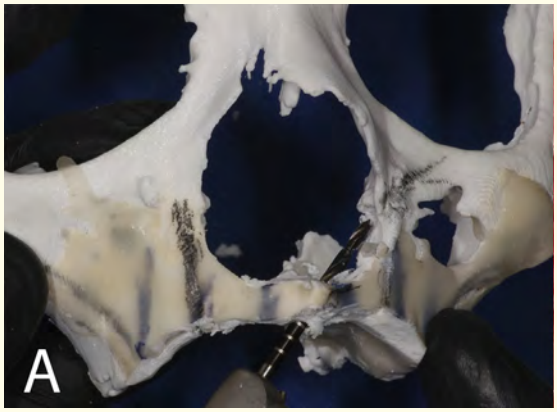


Figure 14: *Inspection of the surgical socket.*





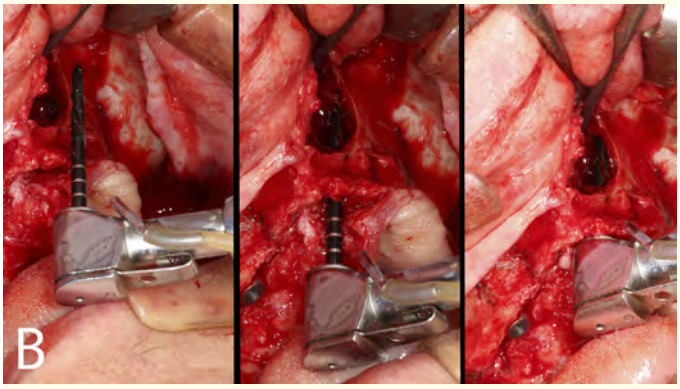
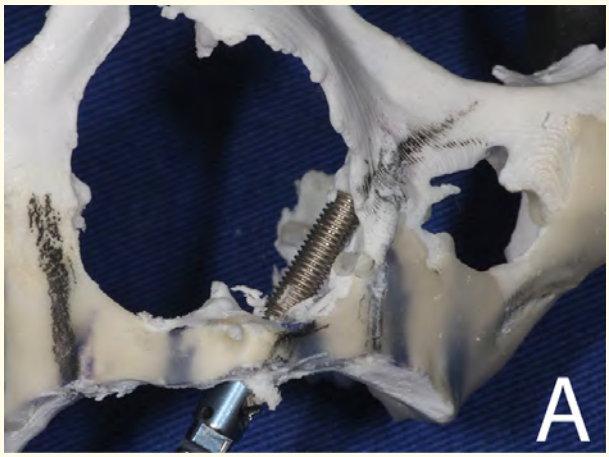
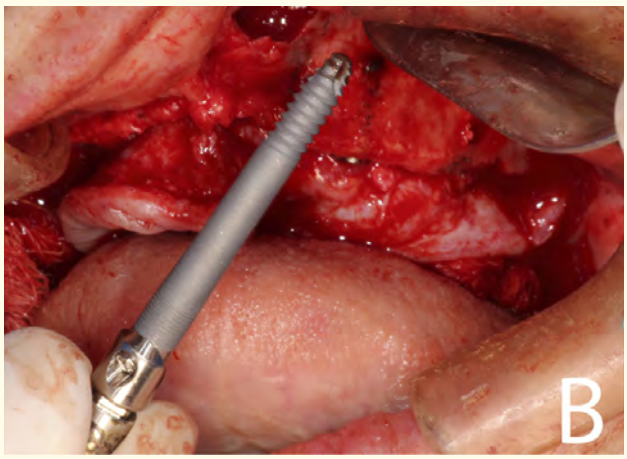


Figure 15: *Long milling with the 2.8 mm and 3.5 mm drills towards the frontonasal abutment: on prototyped model (A) and in the oral cavity (B).*





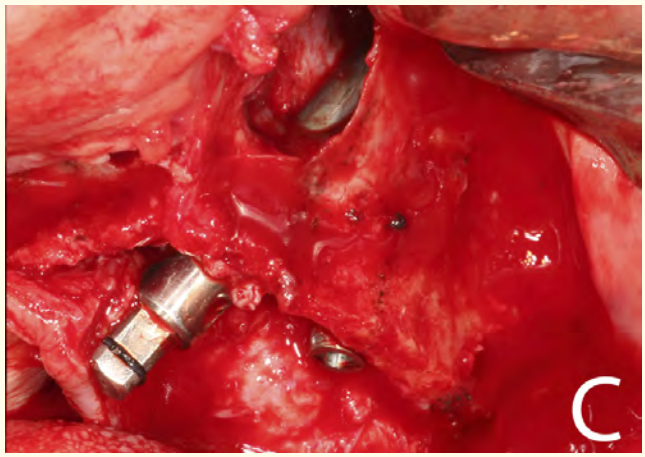


Figure 16: *Installation of the 45° angled external hexagon implant: on the prototyped model (A), in the oral cavity (B), followed by its installation (C).*

For the installation of the zygomatic implants, the access and exposure of the zygomatic bone and identification of anatomical structures, such as the frontozigomaticomaxillary junction and superficial fibers of the masseter muscle, representing the upper and lower limits, respectively, were improved. The region of choice for antrostomy was the total displacement of the sinus membrane below the zygomatic pillar, accessed bilaterally with the LSM Bur (Dentoflex, São Paulo, Brazil) (Figure 17). The milling was performed with a zygomatic canal drill (Dentoflex, São Paulo, Brazil) (Figure 18). Subsequently, a long lance drill from the zygomatic kit (Dentoflex, São Paulo, Brazil) was used, performing the milling until bicorticalization at 45 mm (Figure 19), followed by milling with a 3.5mm long drill (Figure 20). The 42 mm zygomatic implant (Dentoflex, São Paulo, Brazil) was installed with 60N torque (Figure 21). On the right side, the milling and implant installation followed the same sequence as on the left side (Figure 22 = 62). Additionally, a 4.3 X 16mm Cone Morse implant (Dentoflex, São Paulo, Brazil) was installed in the tooth 17 region, in order to promote anchorage in the pyramidal process of the sphenoid bone (Figure 23).

The region was sutured. The patient was discharged from the surgical procedure and was monitored during recovery from anesthesia. Analgesic, anti-inflammatory and antibiotic drugs were prescribed.

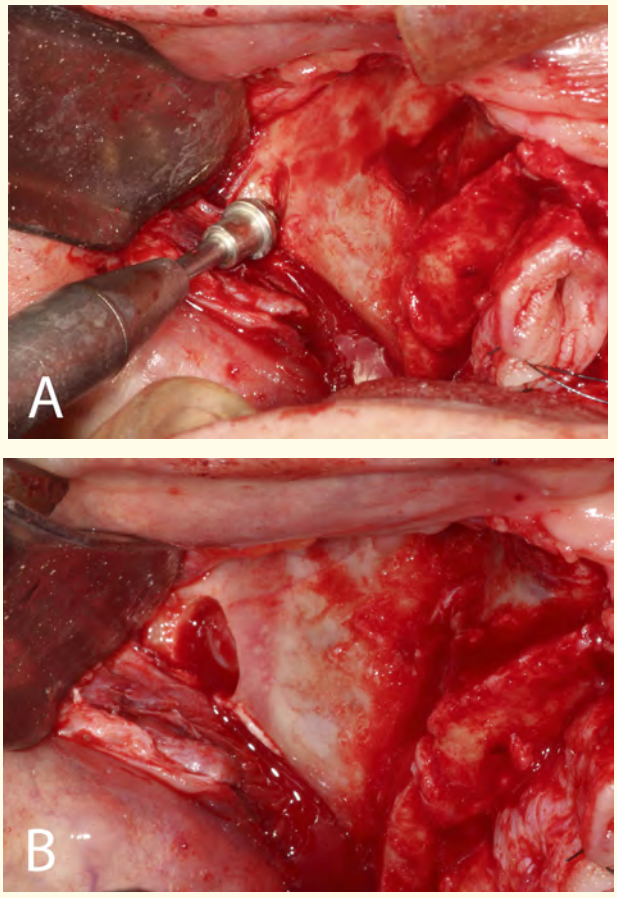


Figure 17: *Access with the LSM Drill (A) and making of the surgical bed (B).*

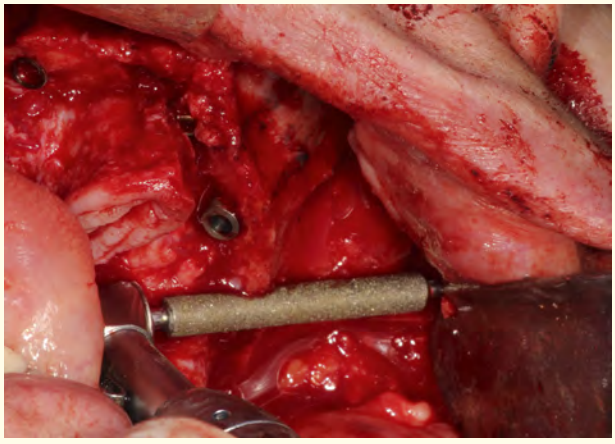


Figure 18: *Milling with zygomatic channel drill.*

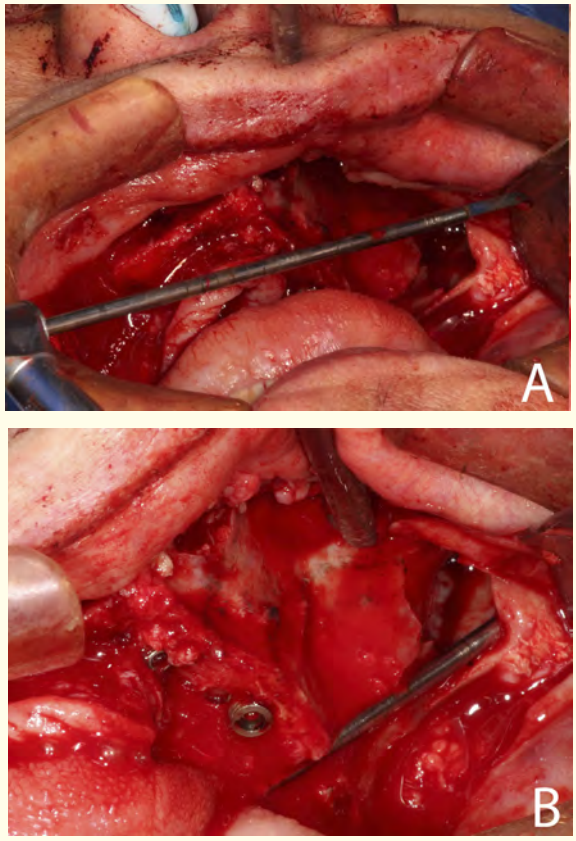
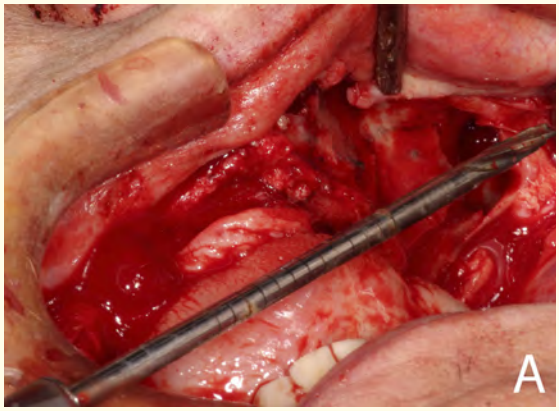


Figure 19: *Presentation (A) and milling (B) with long lance drill of the zygomatic kit.*



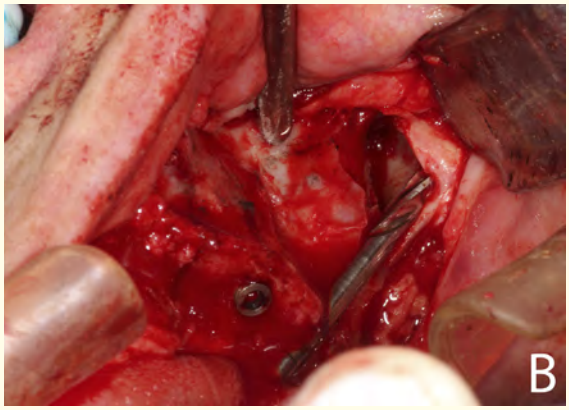
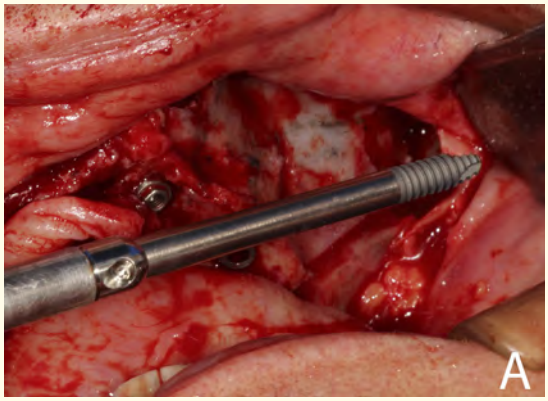


Figure 20: *Presentation (A) and milling (B) with long drill bit (3.5 mm) from zygomatic kit.*



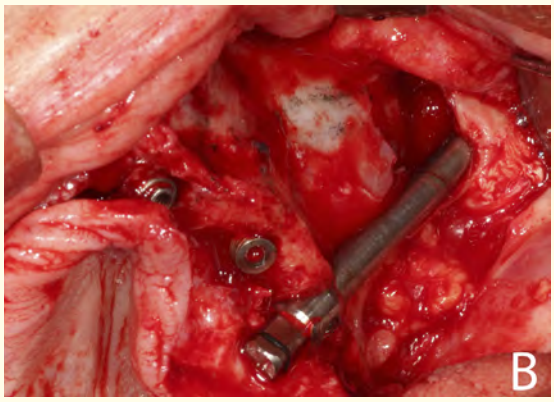


Figure 21: *Installation of the 42 mm zygomatic implant (A and B).*

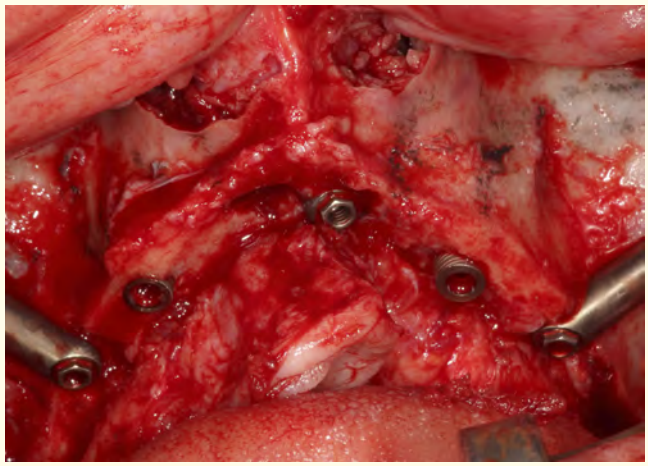


Figure 22: *Zygomatic implant installation on the right side.*

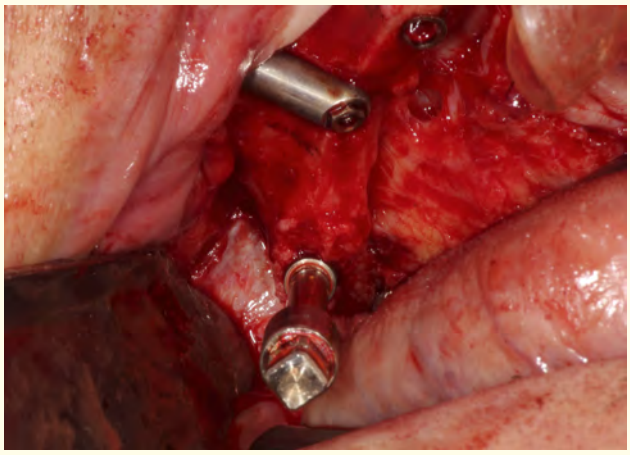


Figure 23: *Installation of a 4.3 X 16 mm Cone Morse implant in the pyramidal process of the sphenoid bone, to increase anchorage.*

Mini-pillars were installed and the components were captured for installation of the provisional fixed prosthesis in immediate load by molding with silicone (Figure 24).

After 24 hours, the installation of the provisional fixed prosthesis was performed (Figure 25) and panoramic radiographic evaluation (Figure 26).

After 40 days, the prosthesis was removed and tissue repair and gingival health were verified (Figure 27). The patient's esthetic and functional satisfaction with the fixed prosthesis was reported (Figure 28). The patient has been followed up for 12 months.

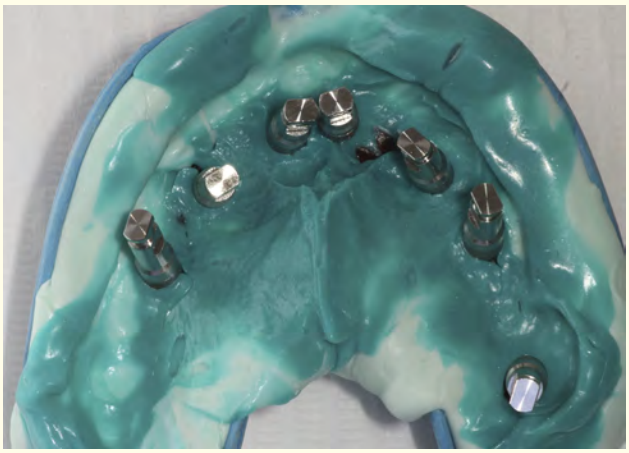


Figure 24: *Molding with capture of the minipillars for making the prosthesis with immediate load.*

Figure 25: *Fabrication of the provisional fixed prosthesis.*

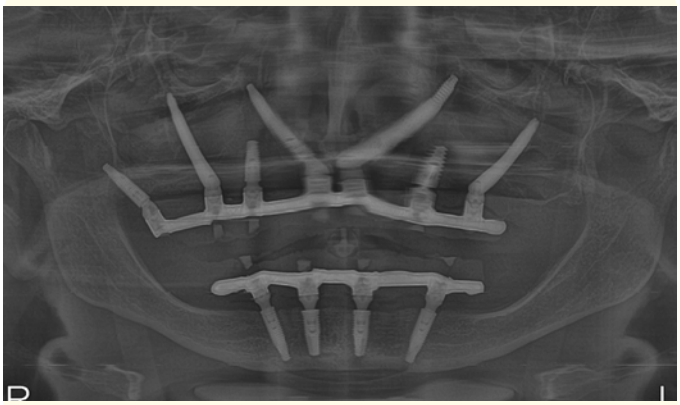


Figure 26: *Panoramic radiographic evaluation.*

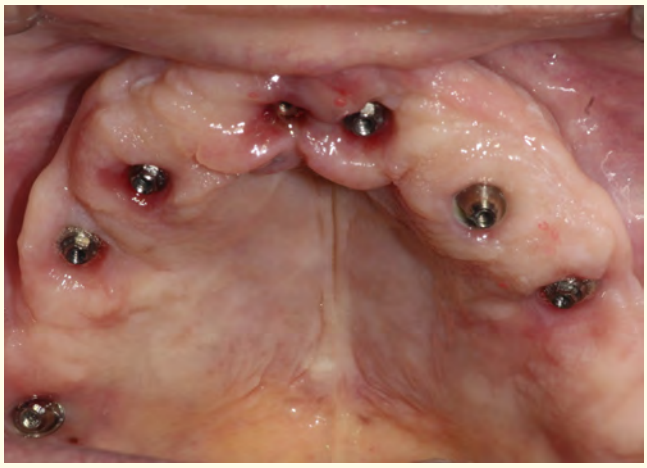


Figure 27: *Tissue repair and gingival health.*

Figure 28: *Esthetic and functional patient satisfaction with fixed prosthesis.*

Discussion

In cases of severely resorbed maxilla, the externalized technique can be considered one of the best surgical approaches because it has fewer surgical steps, is less invasive and reduces surgical time [8]. Simultaneously, immediate loading allows the patient to undergo rehabilitative treatment without the need to wait for the normal period of osseointegration, allowing masticatory function to be restored by means of a fixed implant-supported total prosthesis without grafts [13]. This treatment presents a high level of patient satisfaction, as was demonstrated in the present report, with a success rate of 100% of cases and zygomatic implants may be a viable treatment for the severely atrophic maxilla [5].

In cases of complete bone resorption of the maxilla, accurate planning is necessary. In these indications, the double zygomatic may become necessary [9]. The quad zygoma technique requires expertise, experience and learning curve necessary to achieve success, and avoid complications [8,11,14]. Invasion into the orbital cavity is one of the major complications and may also cause other more serious complications [13].

The installation of the zygomatic implant can be hindered by some factors, such as the lack of volume of the zygomatic bone in width or thickness, bone quality, or the position of the infraorbital foramen in relation to the implant path [15]. In these conditions, the installation of the transnasal implant in the premaxilla and the frontal process of the maxilla can enable anchorage and avoiding the double zygomatic [11]. In this technique, an auxiliary resource is the previous training by means of prototyping, as it was presented by us. This premise helps the complete visualization of anatomical structures in the operative act, increasing trans-surgical assertiveness. The installation of transnasal implant for severely atrophic maxilla is indicated in cases with bone height inferior to 4 mm between the maxillary ridge and the nasal cavity, and at least 3 mm of anchorage of the implant in the frontonasal process of the maxilla [11,16].

The present case demonstrated the possibility of obtaining immediate loading in severely atrophic maxilla. The anatomical knowledge and the anchorage techniques promote greater safety in the installation of implants in more conservative techniques, being an alternative and avoiding the Quad Zygoma technique.

It is important to emphasize that, regardless of the technique used, clinical and radiographic follow-up is imperative to ensure the longevity of the implantoprosthetic rehabilitation. In the present case, the follow-up has been performed for 12 months.

Conclusion

The association between zygomatic implants and transnasal implants allows the anchorage in remaining bone, even in cases of little bone availability in the anterior and posterior alveolar ridge. This association can avoid the need for large bone grafts, allows for the installation of the prosthesis with immediate loading and avoids the need for bilateral double zygoma (Quad Zygoma).

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Volume 5 Issue 8 August 2022

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