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Rehabilitation Of Severe Atrophic Maxila with Zygomatic and Pterygoid Implants: Case Report

Marcelo Gabriel de Oliveira
Universidade Estadual Paulista Júlio de Mesquita Filho
São Paulo, São Paulo, Brasil

Anna Ligia
Universidade Estadual Paulista Júlio de Mesquita Filho
São Paulo, São Paulo, Brasil

Thiago Borges Mattos
Centro Universitário UNINCOR Três Corações, Minas Gerais, Brasil

Lídia Batista Conrado Martins
Universidade Federal de Juiz de Fora Juiz de Fora, MInas Gerais, Brasil
Departament: oral rehabilitation

Francisco Cerdeira Filho
Universidade UNINGRANRIO
Duque de Caxias, Rio de Janeiro, Brasil

João Marcos Mattos
Centro Universitário UNINCOR
Três Corações, Minas Gerais, Brasil

Ive Couto
Centro Universitário UNINCOR
Três Corações, Minas Gerais, Brasil

Paola Ferreira Galito
Centro Universitário UNINCOR
Três Corações, Minas Gerais, Brasil

Corresponding Author-Lídia Batista Conrado Martins

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Abstract

Background: The absence of dental elements results in progressive bone resorption of the maxilla, leading to vertical bone loss with a gradual decrease in medullary bone, thereby hindering the rehabilitative process using

osseointegrated implants. Zygomatic fixation protocols combined with pterygoid implants have proven to be viable alternatives for maxillary bones with severe bone resorption.

Objective: describe, through a case report, the treatment protocol for atrophic maxilla using zygomatic fixation implants, complemented by pterygomaxillary implants through an immediate loading system over a twelve-month follow-up period.

Results: All implants showed clinical and radiographic signs of osseointegration, and no pathology was detected.

Conclusions: The technique appears to be effective without requiring, in this specific case, any prior procedures for reconstruction of the atrophic maxilla.

Keywords

Dentistry, Dental Implants, Zygoma, Mouth Rehabilitation.

Introduction

Edentulism is responsible for numerous deleterious consequences for systemic health. This condition may result not only in the physiological process of bone resorption but also in a predisposition to various systemic diseases and an increased mortality rate[1]. Supporting this perspective, studies such as those by Albrektsson (1986) have suggested significant difficulties in the rehabilitation process of the posterior maxillary region, primarily due to its anatomical complexity, poor bone quality, and gradual decrease in bone volume[3].

To overcome these challenges, surgical procedures such as bone grafting and maxillary sinus lift have been proposed by Sjöström (2013) and Aparicio (2014) as alternatives to enable the viability of osseointegrated treatment approaches. However, these procedures are not free from complications [6,7]. It is also important to note that the use of extraoral grafts presents an unpredictable pattern of resorption and may even result in the loss of nearly all graft material, particularly in extensively edentulous areas[8] (PEÑARROCHA-DIAGO et al., 2019).

Therefore, aiming to simplify treatment protocols and increase the predictability of outcomes while reducing risks, economic and biological costs, and morbidity, Brånemark proposed in 1989 the application of zygomatic anchorage and fixation techniques without the need for prior bone grafting procedures[10]. Initially, this technique was used in rehabilitative procedures involving discontinuous maxillary bone to anchor the prosthetic device. However, today it is considered a relevant alternative for implant anchorage in anatomical structures adjacent to the maxilla.

The literature describes various techniques for the placement of zygomatic implants, including combinations of zygomatic implants with one to three conventional anterior implants. In cases of insufficient bone availability, the placement of two implants anchored in the pterygoid region is also regarded as an excellent option[9]. This updated protocol also allows for implant placement in the most posterior area of the maxilla, near the maxillary tuberosity and behind the maxillary sinus. The placement of implants through the maxillary tuberosity and into the pterygoid plate is referred to as a pterygoid or pterygomaxillary implant[3].

The literature highlights the mechanical capability of the aforementioned implant to overcome the need for structural enhancement procedures, such as sinus lifting and bone grafting. In specific cases, it may even serve as an alternative to more invasive zygomatic implants. Findings by Nag (2019) report a 94% success rate for inclined and pterygoid implants in maxillary rehabilitation, underscoring their high predictability. This success is attributed to the high degree of mineralization at the implant site, which allows for bicortical bone engagement. Bicortical implant engagement has been shown to provide better stabilization with reduced stress on the crestal bone and implants. The use of a flapless approach in this technique enables faster implant placement, minimizes tissue trauma, and reduces postoperative discomfort.

Thus, the aim of this study is to describe, through a clinical case, the clinical protocol for rehabilitation using an implant-supported prosthesis with zygomatic fixation combined with the placement of a pterygomaxillary implant.

Case Report

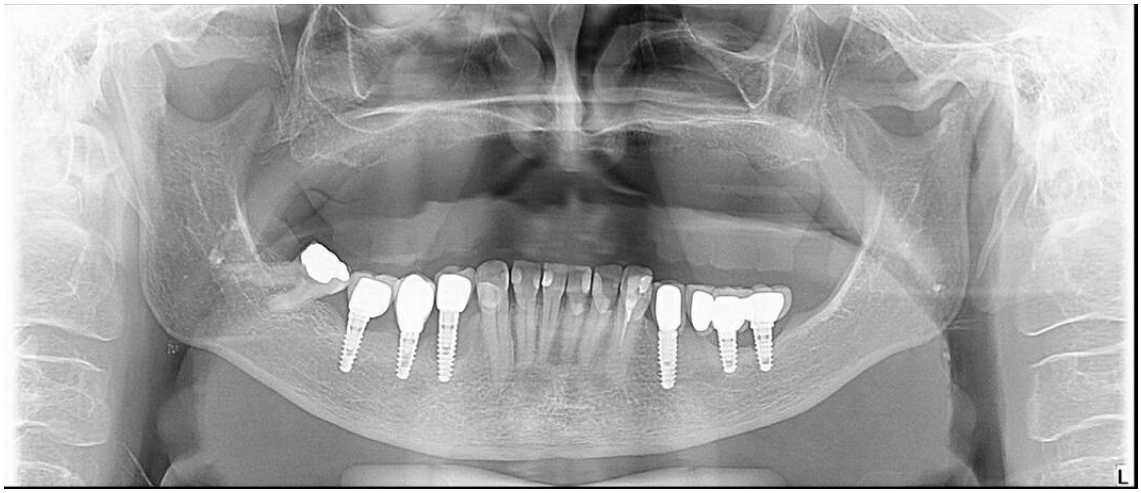
A 50-year-old female patient with fair skin presented to a private dental clinic, reporting dissatisfaction due to the lack of functionality and discomfort caused by her upper complete denture. To enable a detailed analysis and better understanding for the development of a treatment plan, a clinical examination was initiated.

Regarding her medical history, the patient denied any allergies, blood disorders, cardiovascular, gastrointestinal, hepatic, endocrine, or renal diseases, as well as temporomandibular joint dysfunction (TMD). She also reported no regular use of controlled medication. As a complementary step, the patient was referred for radiographic and tomographic imaging, which helped to supplement the primary diagnostic information.

Clinical and imaging evaluations revealed a loss of labial support, a low smile line, and severe atrophy of the alveolar bone, resulting in poor retention of the conventional complete denture. Radiographic assessment confirmed severe maxillary bone atrophy, with loss in both height and width, as well as pneumatization of both the right and left maxillary sinuses (Figure 1).

Taking into consideration the patient's desire for a short-term, definitive rehabilitation solution, and her reluctance to undergo intraoral grafting procedures to gain the necessary structure for conventional osseointegrated implants, the treatment plan chosen was rehabilitation using zygomatic and pterygoid implants. The absence of acute sinusitis, maxillary or zygomatic pathology, and uncontrolled or malignant systemic diseases further supported the safety and appropriateness of the selected technique.

Figure 1: Initial imaging exam



The treatment plan was explained, understood, and approved by the patient, who signed the informed consent form, allowing the proposed treatment to proceed.

Prior to the surgical procedure, the patient underwent laboratory tests to ensure safety for the intervention to be performed. The procedure followed all biosafety protocols, with aseptic measures including the application of 2% Chlorhexidine Digluconate (Riohex, Rioquímica, São José do Rio Preto, SP) on the extraoral region and 0.12% solution intraorally.

The surgical procedure was performed in a private dental office, following an anesthetic protocol that included infraorbital nerve block, middle superior alveolar nerve block, greater palatine nerve block, and nasopalatine nerve block, using 4% articaine with 1:200,000 epinephrine (Articaine®, DFL, Brazil).

After waiting for adequate anesthetic onset, a crestal incision was made using a 15C scalpel blade attached to a scalpel handle (MAXIMUS, Contagem, Minas Gerais, Brazil), with divergent releasing incisions behind the zygomatic-maxillary buttresses, allowing access to the sinus and elevation of soft tissues. To guide implant positioning, an osteotomy was performed in the area of the zygomatic plateau, followed by the elevation of the Schneiderian membrane to better visualize the vector for implant placement.

Immediately following the exposure of the bone tissue, osteotomies were carried out following the drilling

protocol recommended by the manufacturer. Two low-speed zygomatic implants with a CM (conical Morse) platform, Z-Force (Dentoflex, São Paulo, SP, Brazil), measuring 42.5 mm x 3.5 mm, were installed with a torque of 60 N on both sides, achieving firm fixation in the body of the zygomatic bone (Figure 2, Figure 3).

Due to the presence of 4 mm of bone between the maxillary ridge and the nasal cavity—without affecting respiratory function (Camargo, 2019)—the installation of two pterygoid implants was then performed (Figure 4). These were also CM platform implants (SEARCH, Dentoflex, São Paulo, SP, Brazil), anchored in the basal bone of the maxilla. The implant on the right side measured 22.5 mm in length, while the left measured 20 mm, both placed with a torque of 60 N.

Finally, the mucoperiosteal flap was repositioned and sutured with 3.0 nylon using simple interrupted stitches.

Figure 2: Zygomatic implant in position.

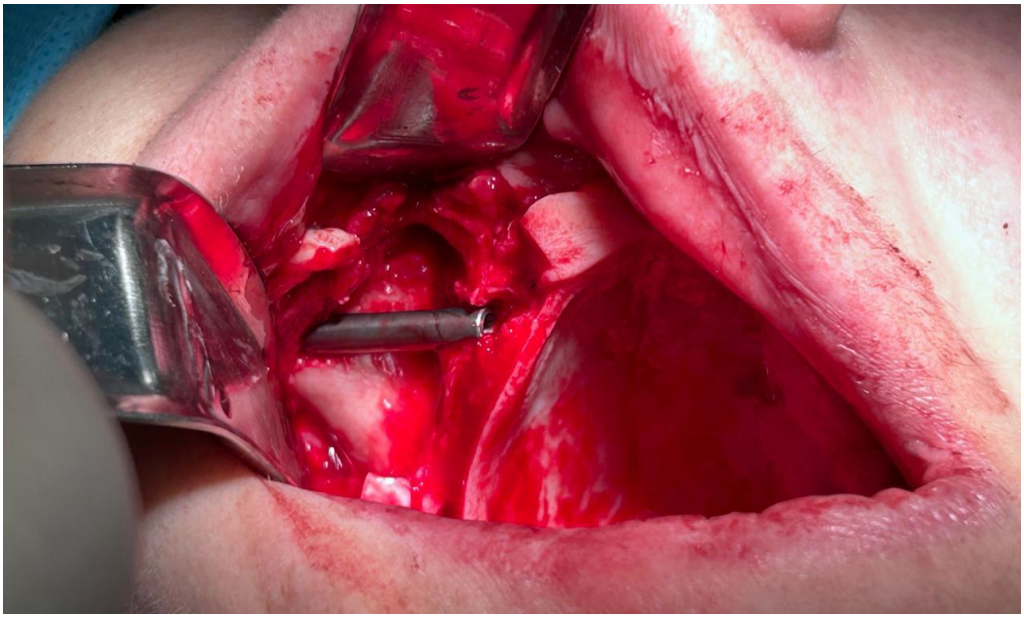
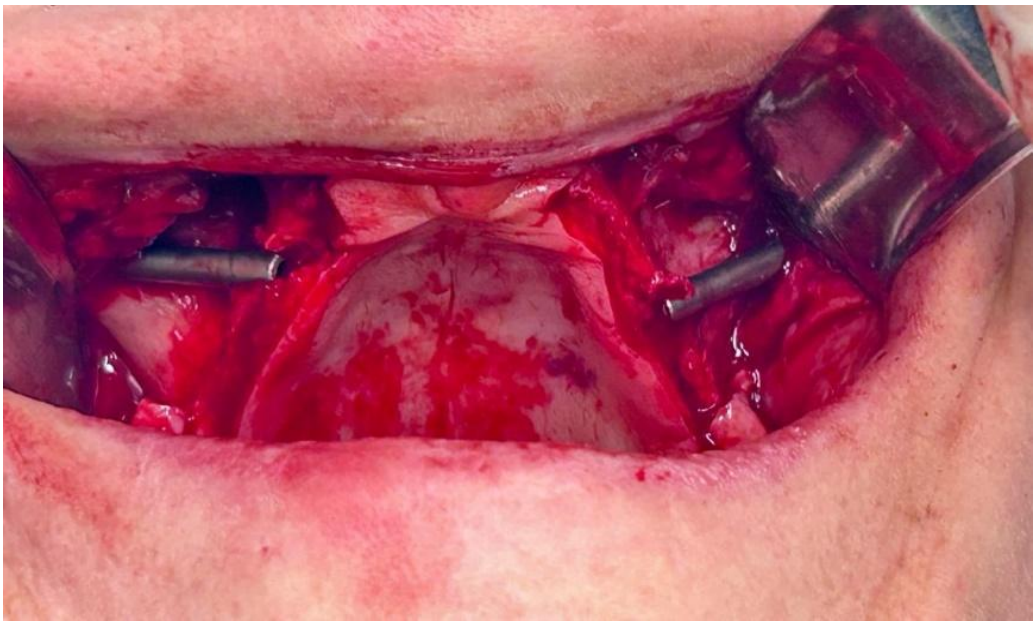


Figure 3: Bimaxillary zygomatic implant



For the zygomatic fixations, the classic technique proposed by Brånemark in 1998 was used. During the prosthetic phase, angled abutments (mini pillars) were installed — 17 degrees for the pterygomaxillary implants

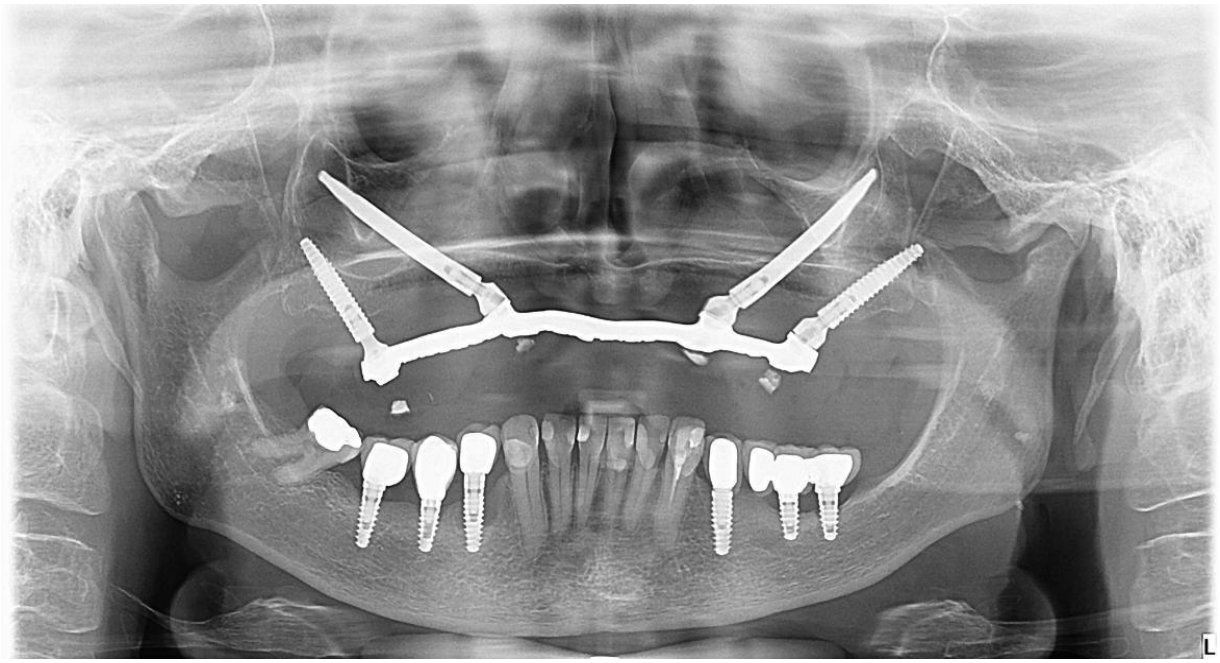
and 30 degrees for the zygomatic implants — all with a final torque of 20 N. The procedure was completed with simple interrupted sutures using nylon thread, followed by the installation of an immediate loading prosthesis (Figure 4).

Figure 4: Finalization of the rehabilitation process.

In the postoperative phase, the patient was prescribed Amoxicillin 500 mg (Prati – Donaduz, CIA LTDA – Nilton Arruda Toledo, PR, Brazil) for 7 days at eight-hour intervals, Dexamethasone 4 mg for 4 days at twelve-hour intervals, and Spidufen (Janssen, São Paulo, SP, Brazil) 600 mg for 2 days at eight-hour intervals.

During a 6-month follow-up period, updated imaging examinations qualitatively demonstrated bone integration of the implants, with no radiolucency observed, indicating the absence of surrounding pathological tissue. A comparison with clinical records showed no pain symptoms upon palpation, percussion, or function, and no presence of exudate, suggesting proper bone healing dynamics consistent with anatomical and physiological union. Additionally, the prosthetic connection remained stable between the remodeled bone and the titanium surface (Figure 5).

Figure 5: Imaging exam after twelve months of follow-up.



Discussion

The rehabilitative process with implant-supported prostheses in patients with atrophic maxillae has become a compelling topic in dentistry[12]. This is primarily due to the lack of predictability associated with conventional implants in areas of bone deficiency, often necessitating additional procedures to restore the proper bone architecture[13].

To address this, procedures such as maxillary sinus lift and bone grafting have been reported in the literature as methods that increase the feasibility of implant placement in resorbed sites[14]. However, these procedures involve multiple surgical interventions, increased risk of complications, longer treatment times, higher costs, and greater biological burden for the patient[13,14]. In this context, the use of zygomatic implants represents an alternative to extensive bone reconstruction procedures[14].

Zygomatic implants were first described by Brånemark in 1998, with the goal of reconstructing maxillary bones that could not be treated with conventional implants. In the original surgical technique, the zygomatic implant passes through the maxillary sinus and achieves apical stabilization in the zygomatic bone [14]. As the technique evolved, in order to minimize the risk of maxillary sinus contamination, Migliorança (2012) and Aparicio (2010) described an extra-sinus approach in which the body of the implant follows the outer wall of the maxillary sinus and anchors in the zygomatic bone[16], this technique was used in the case described here.

Brida (2011) suggests that implant-retained prostheses using zygomatic fixation in atrophic maxillae show promising results based on current robust scientific guidelines. Additionally, the authors highlight several benefits of rehabilitation based on zygomatic implant-supported prostheses, including immediate loading, restoration of function, and reduced prosthetic failure rates. This study supports and provides scientific backing to the clinical case presented.

Grachu (2023) and Heboyan (2022) describe this technique as less invasive and more predictable; however, the literature reports significant complications and their respective prevalence rates, such as sinusitis (5.86%), peri-implant mucositis (2.96%), nerve injury (1.26%), oroantral fistula (1.20%), and even orbital perforation or invasion of the infratemporal fossa (1.33%). None of these complications were observed in the present case.

In addition to the options mentioned, another treatment alternative is the combination of zygomatic and pterygoid implants[12]. In a study conducted by Curi (2015), implant stability was evaluated at the time of abutment connection using a mobility test, as well as after prosthesis placement. Measurements were based on marginal bone maintenance, as seen in panoramic radiographs, and the absence of pain or infection. The 3-year cumulative survival rate for pterygoid implants in this study was 99%.

Similar results were found in a systematic review by Araújo (2019), which analyzed the clinical outcomes of pterygoid implants in the treatment of patients with posterior atrophic maxillae. Based on retrospective studies, the authors concluded that, in addition to a high durability rate, most implant failures occurred within 6 months after implant placement and before loading. Once osseointegrated, the pterygoid implants remained stable and functional beyond the first year—an outcome that aligns with the present case, in which a 12-month follow-up showed no signs of implant rejection or biomechanical failure.

Conclusion:

The present study revealed that the rehabilitation of severely atrophic maxillae using zygomatic implants and pterygomaxillary-anchored implants is both favorable and reliable in terms of biomechanics, supporting the findings described in the literature.

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