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JOIS

CASE REPORT

Management of the atrophic maxilla using remote anchorage with zygomatic and short Implants: a 4-year follow-up case report

RELATO DE CASO

Tratamento da maxila atrófica usando ancoragem remota com implantes zigomáticos e curtos: relato de caso de acompanhamento de 4 anos

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Abstract

This case report presents a rehabilitation of atrophic maxilla employing remote anchorage with zygomatic and short implants in the premaxilla, including a nasopalatine approach. A 47-year-old female patient presented with advanced posterior bone resorption and bilateral sinus pneumatization. Two zygomatic implants were placed for posterior support, and three short implants were positioned in the premaxilla, achieving sufficient primary stability to allow immediate prosthetic loading. The patient was followed at 1, 6, and 12 months postoperatively, with annual monitoring. Satisfactory function and preservation of peri-implant mucosal health were observed throughout the observation period. Radiographic evaluation revealed stable bone levels. No mechanical or biological complications occurred during the 4-year follow-up period. Remote anchorage using zygomatic implants combined with short implants in the premaxilla represents a reliable and graftless approach for the rehabilitation of atrophic maxilla, optimizing anterior–posterior spread, reducing cantilever extension, and promoting biomechanical stability.

Keywords: : Bone Resorption; Immediate Dental Implant Loading; Zygoma; Case Report

Resumo

Este relato de caso apresenta a reabilitação de uma maxila atrófica utilizando ancoragem remota com implantes zigomáticos e implantes curtos na região de pré-maxila, incluindo a abordagem do canal nasopalatino. A paciente de 47 anos apresentava reabsorção óssea posterior avançada e pneumatização sinusal bilateral. Dois implantes zigomáticos foram instalados para suporte posterior, e três implantes curtos foram posicionados na pré-maxila, obtendo estabilidade primária suficiente para permitir a carga protética imediata. A paciente foi reavaliada em 1, 6 e 12 meses após a cirurgia, com acompanhamento anual. Observou-se função satisfatória e preservação da saúde da mucosa peri-implantar durante todo o período de observação. Foi observado na avaliação radiográfica níveis ósseos peri-implantes estáveis. Não foram observadas complicações mecânicas ou biológicas durante o período de 4 anos de acompanhamento. A ancoragem remota com implantes zigomáticos, combinada ao uso de implantes curtos em região de pré-maxila, representa uma abordagem confiável e sem a necessidade de enxertos para a reabilitação de maxilas atróficas. A técnica otimiza a distância anteroposterior, reduzindo a extensão do cantiléver e promovendo estabilidade biomecânica.

Palavras- chave: Reabsorção Óssea; Carga Imediata em Implante Dentário; Zigoma; Relato de Caso.

Introduction

The rehabilitation of atrophic maxilla remains challenging in contemporary implantology. The loss of posterior maxillary alveolar bone often results in a significant reduction of the residual ridge, while the anterior maxillary region typically presents limited bone height and low bone density[1]. Although well-documented bone grafting procedures such as maxillary sinus floor elevation have a high treatment survival rate, they are associated with increased surgical morbidity, prolonged treatment time, and the need for multiple interventions[1-4]. Consequently, patients with moderate-to-severe maxillary atrophy frequently require alternative treatment approaches that optimize the use of the remaining bone or minimize the need for augmentation procedures[5].

Remote anchorage through pterygoid, zygomatic, and nasal implants has expanded treatment possibilities for patients with severe maxillary atrophy[6]. These approaches provide predictable solutions for the rehabilitation of both fully and partially edentulous atrophic maxilla. Among these options, zygomatic implants have gained relevance, offering stable posterior support when conventional implants cannot be placed[7,8]. Introduced by Brånemark, zygomatic implants were developed to enable fixed implant-supported prostheses in patients with advanced maxillary resorption [9,10]. Since then, the use of zygomatic implants has shown survival rates upper to 95% and favorable long-term outcomes [9,11-14].

Another viable alternative treatment for the atrophic maxilla is the use of short dental implants. The use of short implants provides benefits such as less invasive technique compared to bone augmentation procedures, reduced surgical morbidity, treatment cost, and patient discomfort[1,15,16]. Clinical studies have demonstrated high predictability of short implants, with survival rates exceeding 94% in mid- to long-term follow-ups [15,17,18]. Available clinical data indicate that short implants achieve comparable outcomes to standard-length implants placed with maxillary sinus floor elevation [2,19].

Particularly for patients with severe maxillary atrophy, the combination of zygomatic implants in the posterior region with conventional or short implants in the anterior region has been proposed as an alternative treatment [20,21]. This hybrid treatment simplifies surgical procedures, reduces treatment time and cost, and provides favorable functional outcomes in full-arch maxillary rehabilitation.

This case report describes the implant-supported rehabilitation of a patient with maxillary atrophy using zygomatic implants in combination with short implants in premaxilla, with a 4-year follow up period.

Case Report

This clinical case report follows the CARE guidelines (supporting information file 01) and was approved by the Institutional Review Board of ILAPEO College (7.583.973).

Case description

A 47-year-old female patient, classified as ASA I, presented to the ILAPEO College in 2021 with chief complaints of poor esthetics and difficulty in mastication due to discomfort caused by removable prosthesis. The patient also presented missing teeth in the posterior mandible (Figure 1).

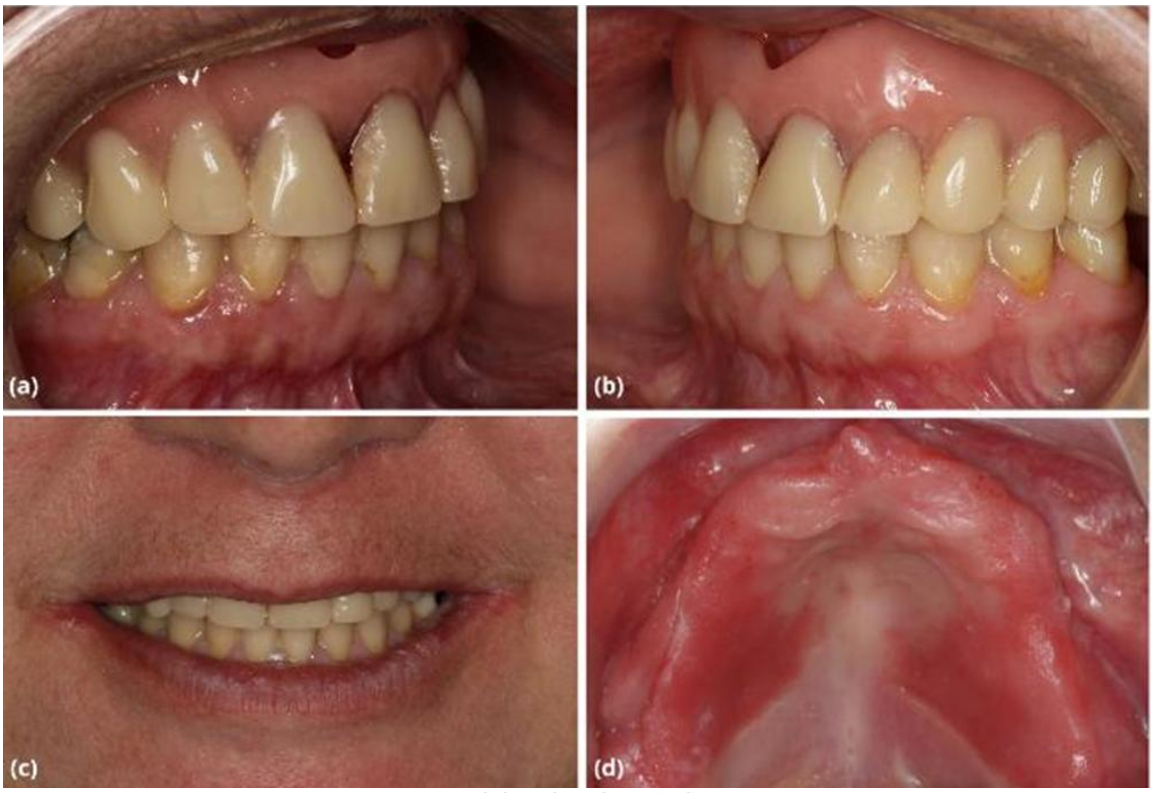

Figure 1 - Initial clinical condition (a-d)

Clinical and radiographic findings

Clinical and radiographic evaluation, including panoramic and cone-beam computed tomography (CBCT) imaging, revealed maxillary bone atrophy. The treatment plan for maxillary rehabilitation with dental implants consisted of the placement of two zygomatic implants and three anterior implants (Figure 2). For the posterior mandible, the proposed treatment included the placement of one implant on each side.

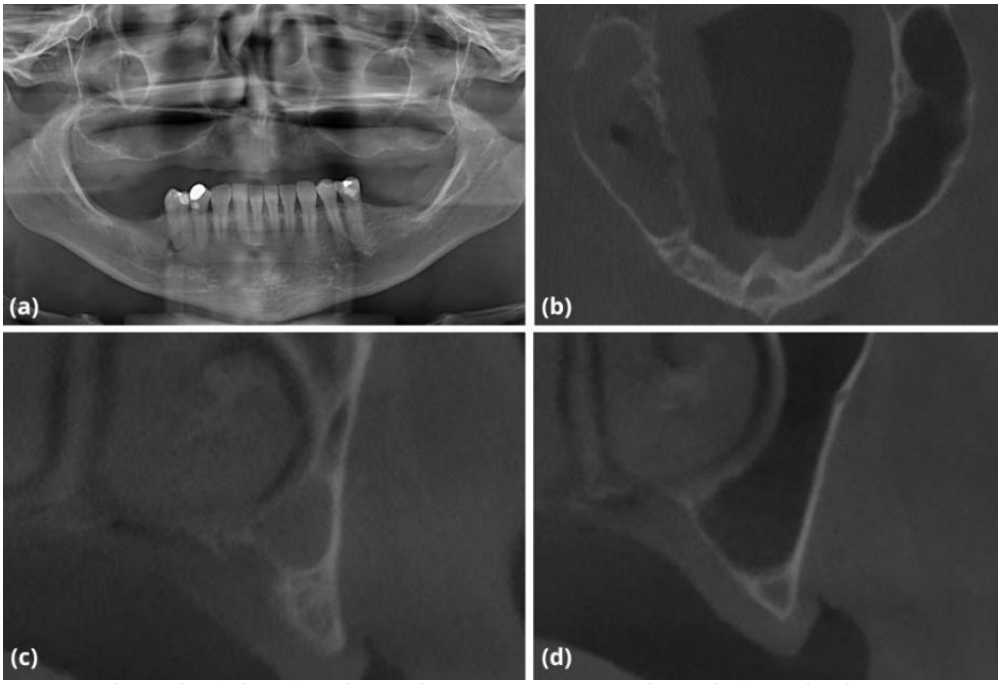

Figure 2. Radiographic findings from the initial situation. Panoramic radiograph (a). Axial and cross-section from the CBCT of maxilla (b-d).

Surgical Procedure

Before the surgical procedure, a multifunctional surgical guide was planned to allow ideal implant positioning and to enable immediate impression taking.

Preoperative medication included diazepam and 4 mg of betamethasone administered one hour before surgery. Local anesthesia with 4% articaine with epinephrine (1:100,000) was administered. After crestal incision and flap elevation, osteotomies were performed according to the manufacturer's recommendations. Two Zygoma-S GM implants (Neodent®, Curitiba, Brazil) measuring 3.75 × 37.5 mm were inserted in the zygomatic bone (Figure 3), and three Helix Short implants (Neodent®, Curitiba, Brazil) were placed in the anterior atrophic maxilla: two implants measuring 3.75 × 8.5 mm (regions #13 and #23), and one 5.0 × 8.5 mm implant placed in the nasopalatine foramen after resection of the nasopalatine canal (Figure 4). Osteotomies were carried out under continuous double irrigation, in accordance with the manufacturer's drilling protocol and recommended rotational speeds. The insertion torque for all implants was 60 N.cm. Bone quality was classified as type II.

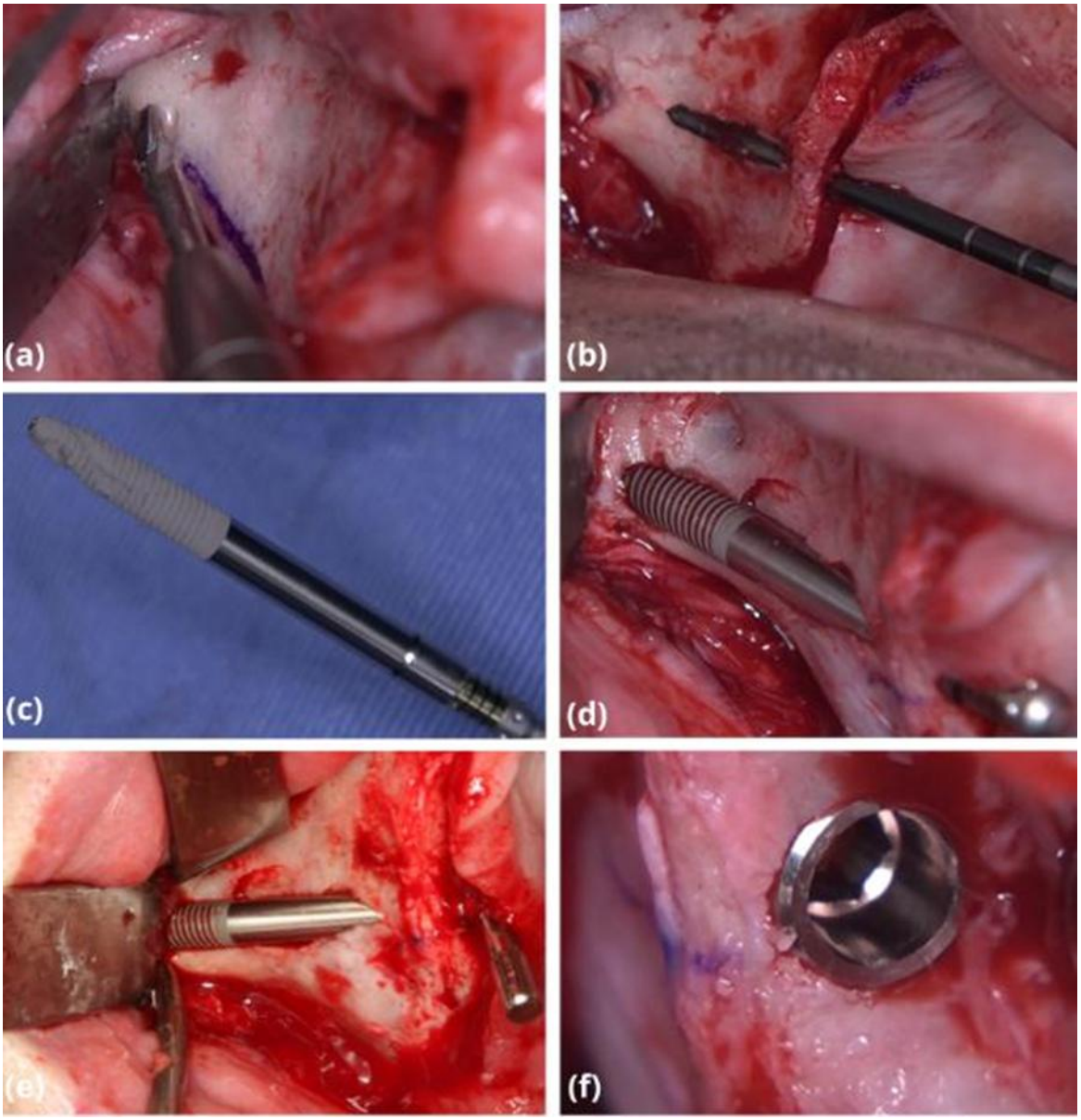

Figure 3 - Surgical procedure -Initial drilling of Zygoma-S implant (a-b). Macrogeometry of the Zygoma-S implant (c). Zygoma-S implant anchored in the zygomatic bone (d-f).

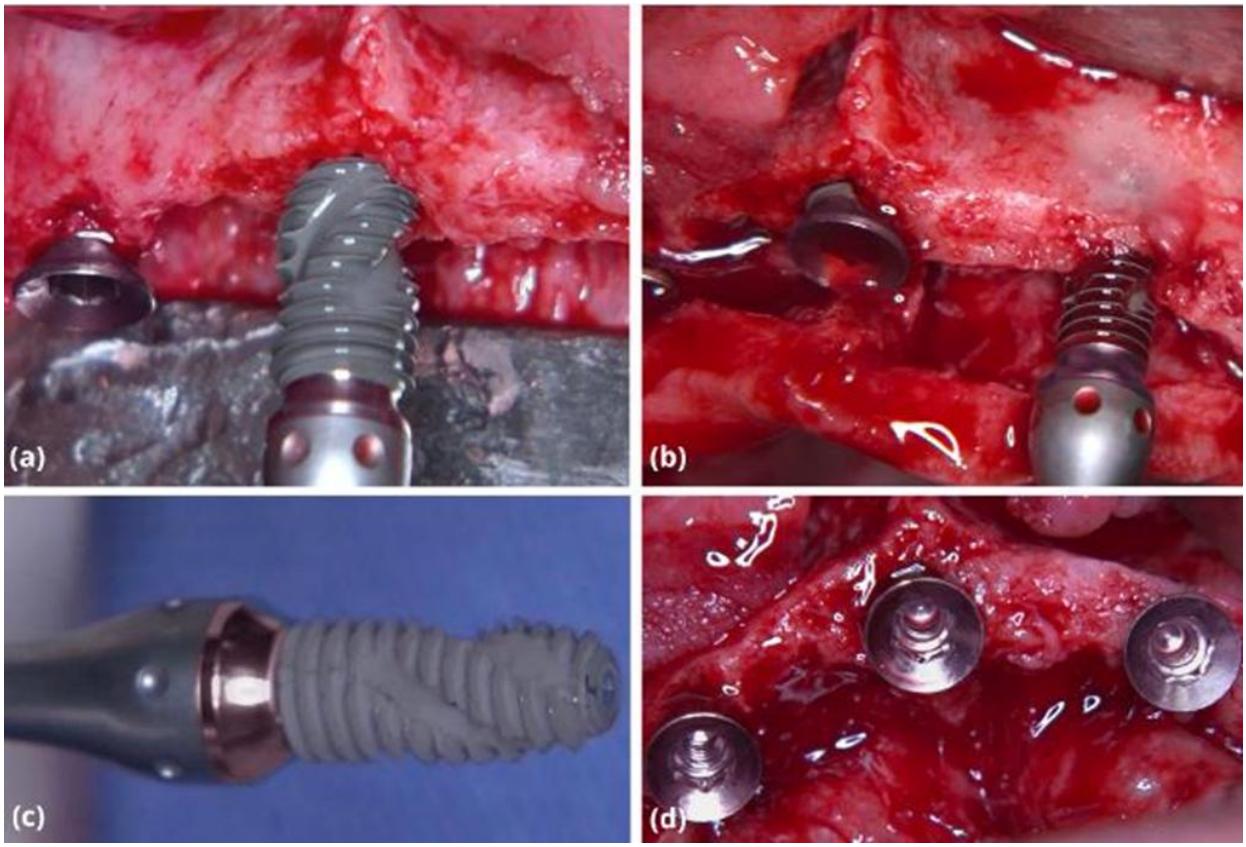

Figure 4 - Surgical procedure - Helix Short implants positioned (a–b). Macrogeometry of the Helix Short implant (c). Occlusal view of the short implants in place (d).

Following the achievement of primary stability for all implants, mini conical abutments were installed. For the zygomatic implants, GM Mini Conical Abutments 60° (Neodent®, Curitiba, Brazil) with 2.5 mm gingival height were used. For the Helix Short implants, HS Mini Conical Abutments (Neodent®, Curitiba, Brazil) with 2.5 mm (region #13), 2.5 mm (nasopalatine region), and 1.5 mm (region #23) gingival height were selected. All abutments were torqued according to the manufacturer's instructions.

Wound closure was achieved using simple sutures. The impression copings for the mini conical abutments were connected to the multifunctional guide using self-curing acrylic resin (Pattern Resin, GC America, IL, USA). The interocclusal record was refined using three reference points of self-curing acrylic resin. After confirming the vertical dimension of occlusion established by the multifunctional guide, the impression material was injected both the interocclusal record and the impression were sent to the dental laboratory to fabricate a full-arch, implant-supported fixed prosthesis. The definitive prosthesis was delivered 48 hours after surgery (Figure 5A-5B). Sutures were removed for seven days postoperatively.

Postoperative Care

Postoperative medication included amoxicillin 875 mg and Spidufem® 600mg. No adverse events were observed during or after surgery.

Follow-Up

The patient was followed up at 1, 6 and 12 months postoperatively, with annual monitoring. Satisfactory function and preservation of peri-implant mucosal health were observed throughout the observation period. Also, radiographic evaluation revealed satisfactory bone stability (Figure 5C-5I).

No mechanical or biological complications were observed during the 4-year follow-up period. All implants and the implant-supported prosthesis remained in function.

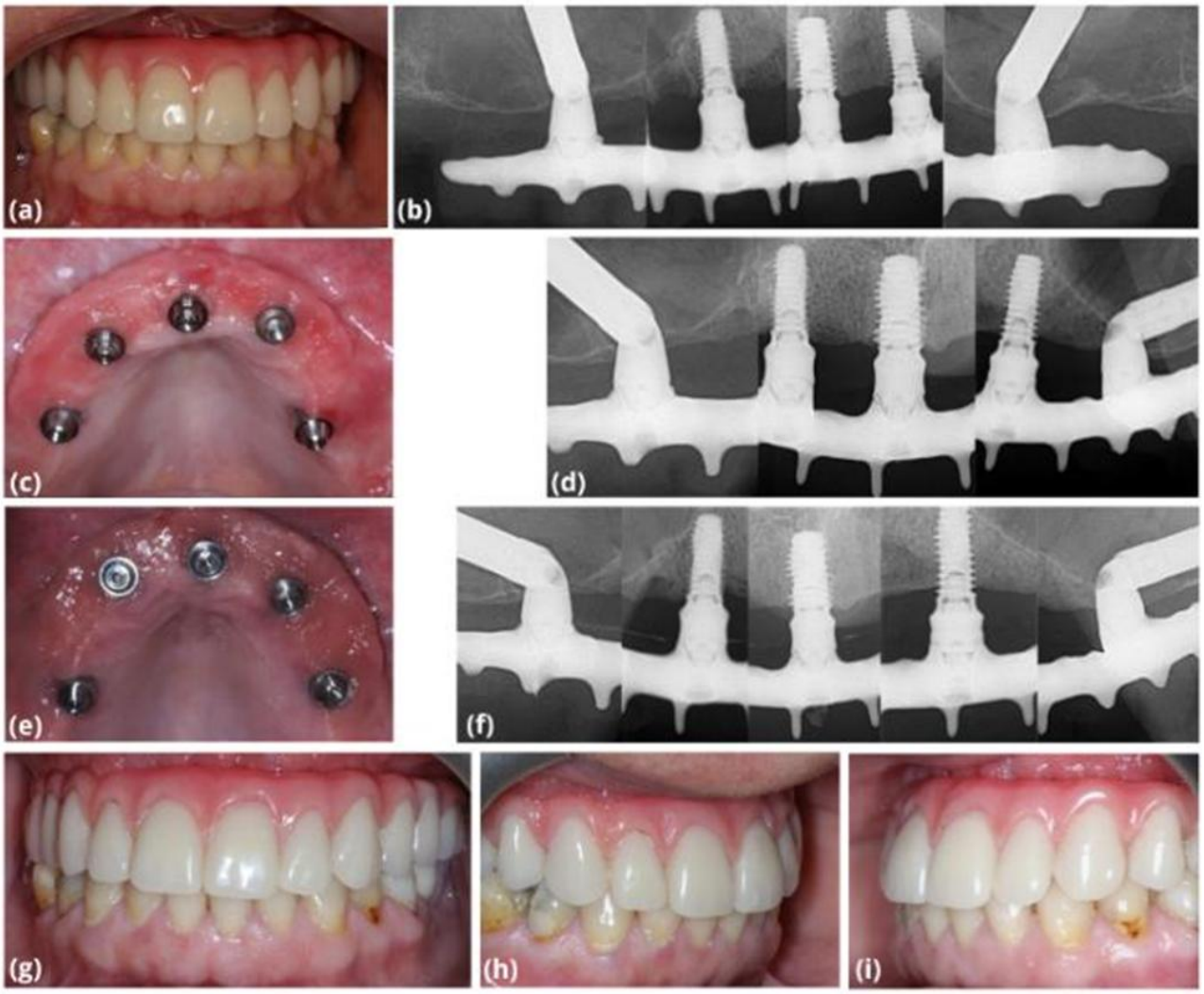

Figure 5 - Clinical and radiographic conditions: Final definitive prosthesis delivered at 48 hours postoperatively. (a–b); 1-year follow-up (c–d); 4-year follow-up (e–i).

Discussion

This case report describes the rehabilitation of atrophic maxilla using remote anchorage with zygomatic implants combined with short implants in the premaxilla. Immediate loading was performed. After a 4-year follow-up period, all implants remained stable and functional, with preservation of peri-implant bone levels. No mechanical or biological complications were observed during the mid-term follow-up. This case report describes the rehabilitation of atrophic maxilla using remote anchorage with zygomatic implants combined with short implants in the premaxilla. Immediate loading was performed. After a 4-year follow-up period, all implants remained stable and functional, with preservation of peri-implant bone levels. No mechanical or biological complications were observed during the mid-term follow-up.

Maxillary atrophy typically requires alternative rehabilitation strategies[20]. Conventional implant placement with sinus floor elevation or bone grafting is a standard approach[22]. However, from a patient perspective, this approach demonstrates increased morbidity and longer recovery time [23]. As a result, techniques that minimize or eliminate the need for bone grafting have gained relevance in the management of severe maxillary atrophy. In this context, alternative strategies such as remote anchorage using zygomatic implants have been proposed[8,24,25].

Remote anchorage provides a predictable treatment option for challenging maxillary defects, particularly in cases where severe bone resorption and extensive sinus pneumatization limit the feasibility of conventional implant placement[24]. This technique

consists of engaging distant cortical bone to enhance primary stability and optimize load distribution, particularly in severely atrophic jaws[26]. In addition to surgical advantages, remote anchorage also offers prosthetic benefits, including cantilever reduction and improved anterior–posterior distribution, which contribute to enhanced load transfer and long-term prosthetic stability[26]. These biomechanical characteristics may also support the feasibility of immediate loading protocols, as in addition to primary stability, implant distribution and cross-arch splinting are recognized as important factors for maintaining stability during the early healing phase.

The decision to use zygomatic anchorage in this clinical case was based on the presence of severe posterior maxillary atrophy and bilateral pneumatization of the maxillary sinus[8]. Zygomatic implants have demonstrated high survival rates, exceeding 95%[9,11-14]. In this case report, no implant loss occurred during the mid-term follow-up period. Postoperative sinusitis has been reported as the most common complication associated with zygomatic implants, while soft tissue dehiscence has also been identified as a potential adverse event[11,27,28]. No surgical or prosthetic complications were observed throughout the follow-up period.

Short implants are indicated in the anterior region when atrophic maxilla provides sufficient residual bone for stable placement[20,25]. In the present case, three straight short implants were placed in the premaxilla, including one positioned through a nasopalatine approach. The use of nasopalatine deflation associated with implant placement may be considered in cases of atrophic maxilla, as this anatomical structure may serve as an additional site for implant anchorage and enhance anterior implant support[29,30]. Careful anatomical assessment using CBCT is essential for proper treatment planning, since this region presents anatomical variation in size, morphology, and configuration across individuals and populations[31,32]. Because the nasopalatine canal contains neurovascular structures, implant placement in this region may result in neurosensory disturbances, including transient or permanent sensory alterations[33]. In full-arch rehabilitation, wide-platform implants are indicated in order to improve primary stability and allow immediate loading[34]. A retrospective study examined fifteen edentulous patients who were rehabilitated using zygomatic implants in conjunction with implants placed in the nasopalatine foramen. All patients underwent immediate loading and were followed for 8 years. In this case report, no implant failures or sensory disturbances in the nasopalatine region were observed during the follow-up period[29].

Several studies have demonstrated predictable outcomes when two zygomatic implants are combined with anterior maxillary implants, supporting this configuration as a reliable alternative for the rehabilitation of the atrophic maxilla[9,35,36]. Alternative full-arch rehabilitation protocols have also been proposed for the treatment of atrophic maxilla, such as the All-on-4 concept, which relies on two anterior implants and two posterior tilted. Both treatment approaches have shown favorable surgical and prosthetic outcomes[37]. However, other factors such as patient satisfaction and the incidence of biological complications may differ between treatment modalities [37]. Therefore, the choice between these approaches may depend on clinical experience and patient preference factors.

Zygomatic implant placement is considered technique-sensitive and requires thorough anatomical knowledge and surgical expertise, proper execution is essential to minimize complications and achieve predictable outcomes[38-40]. Similarly, short implants have also been proposed as a less invasive alternative in cases with limited bone height, as they avoid grafting procedures and are associated with fewer biological complications and reduced morbidity compared to standard-length implants placed with sinus floor elevation[2,17].

In this case report, the strategic use of posterior zygomatic implants with short implants in the premaxilla enhanced the anterior–posterior spread and reduced cantilever length, resulting in favorable load distribution and improved prosthetic stability. These findings are supported by literature, which found that higher cantilever/anterior–posterior spread (CL/AP) ratios were associated with an increased frequency of screw loosening and prosthetic complications[41,42].

Conclusion

This clinical case report demonstrates that treatment with remote anchorage using zygomatic implants in combination with short implants in premaxilla represents a strategic approach for the rehabilitation of atrophic maxilla. This protocol allows for a reduction in the number of surgical stages and ensures a mechanically stable prosthetic outcome. After a 4-year follow-up period, all implants demonstrated stability of peri-implant bone level and preservation of peri-implant mucosal health. As this report describes a single clinical case, the findings should be interpreted with caution and cannot be generalized. Further long-

term studies are needed to confirm the predictability of this approach for the rehabilitation of atrophic maxilla.

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