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Rehabilitation Of An Atrophic Mandible With Dental Implants Under Immediate Loading: A Case Report

Luiz Heyctor Alves Nascimento
Specialist in Oral and Maxillofacial Surgery and Traumatology from the State University of Amazonas-UEA, Brasil.

José da Silva Júnior
Specialist in Oral and Maxillofacial Surgery and Traumatology and Implantology from Faculdade do Amazonas - IAES, specialist in Orthodontics from UniversidadeUningaMaringá, Master in implantology from Faculdade São Leopoldo Mandic, Brasil.

Raphael Carvalho e Silva
Specialist in Oral and Maxillofacial Surgery and Traumatology from the University of Franca/SP, PhD in Dental Sciences from the Faculty of Dentistry of RibeirãoPreto, Brasil

Renata Carvalho e Silva
Specialist in Implantology from ABO-AM, Master in Implantology from Faculdade São Leopoldo Mandic, Brasil.

Eric Barbosa de Camargo
Specialist in Implantology and Dental Prosthesis from the Faculty of Amazonas-IAES, Master in Dental Sciences in the area of Implantology from the University Center in Barretos UNIFEB/SP, Brasil.

Abstract:
One current approach for rehabilitating patients with total or partial tooth loss involves the immediate loading of implants. Recent advancements in surgical techniques, a deeper understanding of tissue biology, and improvements in implant quality have led to the growing acceptance of immediate loading as a viable rehabilitative option in both clinical practice and literature. While some concerns about potential compromises to osseointegration with immediate loading have been initially expressed, submerged healing of implants is not crucial for successful osseointegration. The key lies in controlling micro-movements at the bone-implant interface instead. This report presents a clinical case involving immediate functional loading in a completely edentulous patient, providing insights into its indications and necessary precautions.

Key Word:*Implants; prostheses; rehabilitation.*

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I. Introduction

Edentulism is a prevalent condition that notably impacts a substantial portion of the global population, particularly the elderly. Mandibular atrophy, which is marked by significant bone loss, is linked with edentulism. The traditional treatment approach for this condition has involved the utilization of full or partial dentures. However, this method frequently gives rise to a myriad of issues, including gum irritation, challenges in eating, nutritional deficiencies, pain, temporomandibular disorders, psychological alterations, and bone resorption1.

Rehabilitating patients with atrophic jaws represents one of the most intricate procedures in reconstructive surgery. The literature outlines various treatment options for this purpose, such as employing short implants, executing bone grafts either before or during implant placement, and lateralizing the vascular-nervous bundle, among other approaches2.

The protocol outlined by Brånemark recommends a two-stage surgical process for dental implant placement. In the initial stage, implants are placed in the bone and allowed to undergo osseointegration over a healing period ranging from 3 to 4 months for the mandible and 5 to 6 months for the maxilla. Throughout this duration, functional loading on the implant must be avoided to facilitate the osseointegration process. Following the designated healing period, a subsequent surgical procedure involves affixing the prosthesis to the implant.

Numerous experts currently endorse the adoption of immediate loading in dental implants. This entails the placement of a prosthesis either during the same surgical procedure as the implant or within 72 h thereafter, rendering it a feasible option for patients with total or partial tooth loss3. This report presents a clinical case involving the rehabilitation of an atrophic mandible with four implants under immediate loading, employing the capture technique and discussing its advantages and considerations.

II. Case Report

A 62-year-old male patient, who presented with leukoderma, normotension, and afebrility, and all other systemic health indicators within normal ranges, sought assistance at the implant dentistry clinic due to issues with a loose lower complete denture. Upon clinical examination, the patient was observed to be entirely edentulous in both the upper and lower arches. The mucosal condition in the area appeared normal, but local palpation revealed bone loss in the buccal-lingual and apical-coronal directions. A panoramic radiograph indicated adequate height for the placement of dental implants in the mandible (Figure 1). The proposed treatment plan involves the placement of four implants and creation of an immediate provisional prosthesis using the existing lower complete denture through the pick-up impression technique.

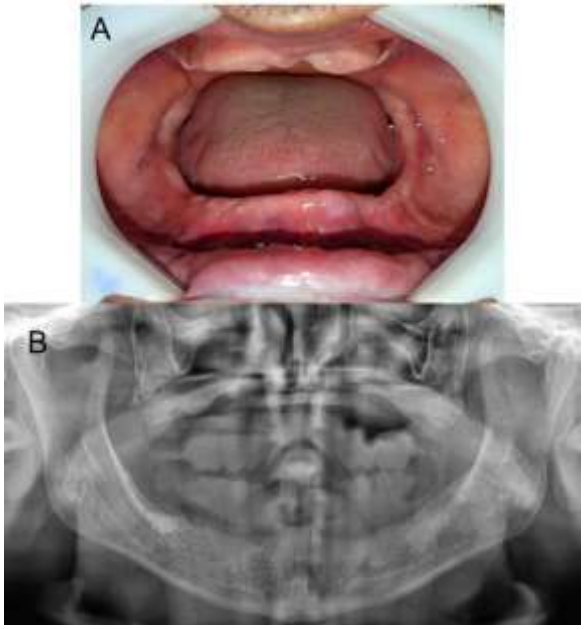

Figure 1. (a) Clinical presentation of the patient's oral mucosa. (B) Panoramic radiograph depicting significant maxillary and mandibular bone resorption.

Following the administration of local anaesthesia to block the bilateral mental nerve, a linear incision was made in the alveolar crest, extending 1.5 cm beyond the bilateral mental foramen. This was followed by mucoperiosteal detachment of the flap and localisation of the mental foramen. Subsequently, the lingual tissues were scraped. An osteoplasty was then performed in the interforaminal region using a straight handpiece and a Maxicut bur, with copious irrigation, to level the alveolar ridge and create a plateau. The milling process commenced, with ongoing verification of the three-dimensional positioning of the perforations. Subsequently, four Morse taper implants, each measuring 3.5 mm in diameter and 11.5 mm in length, were placed and secured with a torque of 60 Ncm. Additionally, four mini-implants were inserted, and the mucosa in the area was sutured. The processing cylinders were strategically positioned to capture the complete prosthesis with acrylic resin, ensuring proper occlusion. The prosthesis underwent final finishing and polishing before placement (Figure 2).

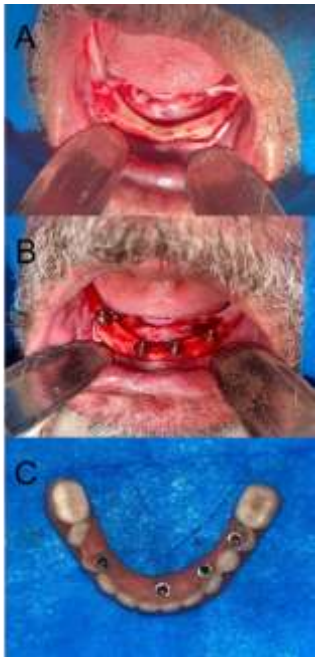

Figure 2. (A) Clinical presentation after osteoplasty of the interforaminal region. (B) Clinical image displaying the placement of implants along with the mini-pillars. (C) Clinical presentation of the lower complete denture subsequent to the placement of the provisional abutments, followed by finishing and polishing.

Following a 3-month interval, the final prosthetic protocol was initiated, characterized by favourable peri-implant tissue conditioning achieved through osteoplasty. This process was complemented by tissue conditioning facilitated by the provisional prosthesis, as illustrated in Figures 3 and 4.

Figure 3. (A) Clinical appearance of the region three months post-surgery. (B) Definitive prosthesis protocol placed three months post-surgery.

Figure 4. Image depicting the control panoramic radiograph following the placement of the definitive prosthetic protocol.

III. Discussion

The literature extensively covers the surgical procedure for dental implant and placement and subsequent rehabilitation following the osseointegration period. Nevertheless, advancements in techniques and technologies have led to the adoption of early rehabilitation in the clinical practice, thereby reducing waiting times for patients and improving their acceptance and adaptation4. Prior to recommending immediate implant loading, certain prerequisites must be met, including the placement of implants in areas with sufficient primary stability, preferably in the anterior region of the mandible. However, with the development of implants designed to achieve robust primary stability and the understanding of osseointegration, immediate loading can now be applied in virtually any area of the jaws5.

The application of minimal load stability when loading implants can induce micromovements. Once these micromovements surpass 150 µm, they are deemed detrimental, potentially causing the development of fibrous tissue between the bone and implant, consequently leading to implant failure3. However, research indicates that immediate loading of the implant can promote bone integration when micromovement is effectively controlled6. Although there is no unanimous consensus in the literature regarding the minimum torque needed for safe implant loading, implants should be loaded with a torque of 30 Ncm or higher7. In the presented case, the implants were strategically positioned between the mental foramina to ensure robust primary stability, enabling their immediate loading. The patient's existing lower complete denture was adjusted to craft the provisional prosthesis. The design was altered to minimise posterior cantilevers, promoting a favourable distribution of occlusal forces. This modification not only sustained functional occlusion but also shaped the healing tissues around the implants, culminating in a smooth, keratinised, and uniform tissue foundation for the final prosthesis.

The quantity of implants inserted in the mandible may vary based on the surgical plan, contingent upon the available bone in the specific case. Some authors have proposed the use of three implants to support a full-arch prosthesis, but this approach necessitates a minimum bone volume, including a bone height of 15–16 mm and sufficient width to accommodate implant platforms of at least 7 mm. However, such measurements are infrequently encountered; more commonly, cases involve jaws with limited bone volume, similar to that in the reported case. Despite the commendable survival rates of prosthetic protocols supported by three implants, a higher incidence of failures compared to protocols involving four to six implants are observed8.

According to a systematic review and meta-analysis, employing fewer than five implants per arch for supporting a fixed prosthesis in a completely edentulous maxilla or mandible yields comparable survival rates to using five or more implants per arch, with no statistically significant difference observed9. In a separate comparative study involving 20 clinical cases, a lower protocol with four implants was followed. The study compared the parallel implant installation technique to the distally inclined posterior implant technique. The results revealed high success rates for both techniques in the long term, with neither technique demonstrating superiority over the other. To employ the inclination technique for distal implants, specific anatomical criteria must be met. In the maxilla, a minimum bone width of 5 mm and a bone height of 10 mm from canine to canine are necessary, while in the mandible, a bone height of 8 mm is required. These implants can be angled up to 45°. Additionally, a minimum height of 6 mm is essential in the interforaminal crest region. Caution is particularly crucial in proximity to the mental vascular-nervous bundle, where a minimum distance of 5 mm in front of the foramen must be maintained. This precaution arises from the fact that the inferior alveolar nerve forms a loop of up to 2 mm in front of the foramen before emerging in the chin, necessitating an additional 3 mm as a safety margin10,11,12.

In the presented case, we chose to utilize the parallel implant technique, adhering to the recommended posterior cantilever distance in the prosthetic phase. This distance was set at a maximum of 14 mm from the distal end of the last implant, aiming to promote implant longevity and ensure a favourable distribution of chewing force13.

IV. Conclusion

The immediate loading of implants is intended to expedite the treatment process, allowing for prompt rehabilitation immediately after implant placement. However, surgeons must exercise discretion in making appropriate indications and adhere to all necessary criteria to prevent treatment failures. This procedure should not be viewed as a replacement for the conventional technique but rather as a complementary approach. Moreover, the risk-benefit ratio should be carefully assessed and customized for each patient to determine the viability of this technique as an alternative option.

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