# **Oral Health & Dental Science**

# All-On-Four Protocol in Atrophic Mandible Matheus dos Santos Bonfim<sup>1\*</sup>, Tiago Diomar Claudino<sup>1</sup>, Catherine Leticia Costa Rodrigues<sup>1</sup>, Vinicius Felix Valim<sup>1</sup>, André Luiz Reyes da Silva Alves<sup>1</sup>, Murilo Jacinto Santiago<sup>1</sup>, Ruthe Souza de Oliveira Nasareth<sup>1</sup>, Leandro Henrique da Silva<sup>2</sup>, Marcus Vinicius Alves Fonseca<sup>3</sup>, Marcelo Benedito Ruffini Penteado<sup>4</sup> and Rafael Alves de Camargo<sup>5</sup> <sup>1</sup>Postgraduate Program in Implantology at Senac University Center, São Paulo, Brazil. <sup>2</sup>Coordinador of the Digital Dentistry Program at Senac University \*Correspondence: Center, São Paulo, Brazil. Matheus dos Santos Bonfim, Postgraduate Program in

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# ABSTRACT

The evolution of treatments for edentulous ridges in Implantology is driven by the pursuit of suitable solutions aimed at improving patients' quality of life. Scholars have built on this premise to develop the All-on-Four technique, a goldstandard method for complete arch rehabilitation using only four implants to support a fixed prosthesis. This work explores the application of this technique in the mandible, examining the surgical procedures, clinical outcomes, and possible complications associated with the aforementioned technique.

This review discusses the theoretical principles and indications for the All-on-Four technique, emphasizing its suitability for patients with total tooth loss and atrophic bone structures. The technique involves maximizing bone utilization so that prosthetic rehabilitation adheres to the biomechanical principle of the "Roy's Polygon."

The patient in question was carefully evaluated, considering her main complaint and clinical conditions. Therefore, this clinical case report details the surgical protocol, implant selection, planning, and execution of the procedure. The work presents the diagnostic criteria of three- dimensional images (computed tomography) for case planning, and the stages of the surgical procedure, from bone bed preparation to implant insertion and the fixation of a temporary prosthesis.

#### **Keywords**

All-on-Four protocol, Implants, Clinical case report.

# Introduction

Total tooth loss is a condition that significantly affects patients' quality of life, impacting not only masticatory function and aesthetics but also overall health and emotional well-being. Traditional approaches to total oral rehabilitation often involve the use of multiple implants and bone grafts, procedures that can be invasive, costly, and time-consuming. In this context, the Allon-Four surgical technique emerges as an innovative solution, offering an effective and less complex alternative for complete dental arch rehabilitation.

Developed by Paulo Malo and collaborators, the All-on-Four technique aims at oral rehabilitation using only four implants

to support a fixed dental prosthesis. This method has gained popularity due to its ability to reduce the number of implants needed, minimize the need for bone grafts, and provide satisfactory functional and aesthetic results more quickly and predictably. The technique is particularly relevant for patients with reduced bone density or significant bone loss, who often face challenges with traditional surgical approaches.

The application of the All-on-Four technique in the mandible has been the subject of increasing interest in dental and surgical literature. The mandible, with its unique anatomical characteristics and specific challenges, offers a unique scenario for the implementation of this method. The technique involves the placement of two posterior angled implants and two anterior implants, allowing for optimized distribution of masticatory forces and effective stabilization of the prosthesis. This method has shown promising efficacy in providing a long- lasting and functional solution for oral rehabilitation.

The objective of this monograph is to provide a comprehensive analysis of the All-on-Four technique applied to the mandible, exploring its theoretical foundations, surgical protocol, clinical outcomes, and possible associated complications. Fundamental aspects such as patient selection, surgical planning, execution of the technique, and long-term outcome evaluation will be addressed. Additionally, the monograph will examine the main complications and challenges faced in clinical practice, offering evidence-based recommendations to optimize results and minimize risks.

This study aims to contribute to the understanding and improvement of the All-on-Four technique, providing valuable information for professionals in dentistry and oral surgery who seek to offer effective and innovative solutions for total dental rehabilitation.

#### **Clinical Case Report**

A 77-year-old female patient presented at the SENAC dental clinic with the main complaint that her lower prosthesis no longer stayed in place, consequently causing difficulty in speech and mastication. Upon clinical examination, an edentulous mandibular alveolar ridge with severe gingival resorption was observed. The patient reported using a full lower prosthesis for over 40 years. A computed tomography scan was requested, which revealed an acceptable bone level for an All-on-Four protocol. Therefore, this treatment was proposed and accepted by the patient.

Through planning with computed tomography, ideal areas for the installation of dental implants using the All-on-Four technique were observed. The patient's lower prosthesis was then cloned in colorless acrylic resin for the use of a surgical guide (Figures 1, 2, 3, 4, 5, 6, 7, and 8).

The surgery was performed with a mucoperiosteal flap, initially with infiltrative anesthesia in the mental region, both vestibular and lingual, and infiltrative anesthesia in the crest, leaving the entire area ischemic. The surgical guide was then adapted to the ridge for better implant perforation, and after 4 months, we captured it with bisacrylic resin and used the patient's own prosthesis as a provisional screw-retained prosthesis (Figures 23, 24, 25, 26, 27, 28, and 29).

Subsequently, perforations were made with spherical drills, helical drill  $\emptyset$  2.2 mm, helical drill  $\emptyset$  2.8 mm, and helical drill  $\emptyset$  3.5 mm. For the installation of 02 Straumann BLT SLActive® implants of 4.1 x 10mm in the anterior region, both vertical and parallel to each other, and another 02 Straumann BLT SLActive® implants of 4.1 x 12mm installed in the lower premolar region, both inclined at 45° (Figure 17).

After implant installation, healing caps were inserted for better ridge adaptation, and suturing was performed in the operated region (Figure 18).

After 4 months of surgery, it was confirmed that all implants were osseointegrated (Figures 19 and 20). Upon the patient's return, Straumann NC SRA abutments were installed, with the posterior ones at 30° and 2 straight anterior abutments, and sequentially, the patient's prosthesis was captured and inserted (Figure 29). The patient was then referred to the SENAC postgraduate program in Prosthetics on Implants for the fabrication of her definitive lower prosthesis.

















Figure 16. Crystal incision in the lower alveolar ridge









Figure 20. Initial appearance 4 months after surgery



(Straumann NC SRA 30° posterior abutments and 2 straight anterior abutments)





Figure 23. Perforated prosthesis for adaptation of the hoods.



Figure 24. Application of <u>DryCoat</u>. (adhesive agent) and photopolymerization for insertion of <u>Bisacovlic</u> Resin



Figure 25. Testing the prosthesis in the mouth



Figure 26. Insertion of the bisacrylic, resin into the prosthesis. (Capture of the prosthesis)





Figure 28. Finishing and polishing the prosthesis





#### Discussion

The All-on-Four technique represents a significant advancement in total oral rehabilitation, offering an efficient and less invasive alternative to traditional methods. This section summarizes the main points discussed in the text, supported by references to key authors:

#### **Efficacy and Advantages**

The All-on-Four technique has proven highly effective in mandibular rehabilitation, providing excellent functional and aesthetic stability with high implant success rates and patient satisfaction [1].

The use of only four implants reduces the complexity of treatment, resulting in shorter surgery time and faster recovery [2].

The technique maximizes bone utilization, adhering to the biomechanical principle of the "Roy's Polygon," which optimizes force distribution and prosthesis stability [3].

# **Challenges and Complications**

Despite its advantages, the All-on-Four technique is not without complications, including infections, failures in osseointegration, and prosthetic issues [4]. Proper patient selection, detailed preoperative planning, and careful evaluation of bone density are crucial to minimize risks [5].

The inclination of posterior implants, while beneficial for reducing cantilever length, can increase stress on marginal bone, though studies show this effect is manageable [6].

#### **Comparison with Traditional Methods**

Compared to traditional methods, the All-on-Four technique reduces the need for bone grafts and multiple implants, making it less invasive and more cost-effective [7].

Traditional methods may still be preferred in cases with adequate bone density or when greater flexibility in implant placement is required [8].

## **Clinical Implications**

The All-on-Four technique is a viable option for patients with total tooth loss, offering a solution that combines efficacy, efficiency, and comfort [9].

The adoption of this technique requires rigorous patient evaluation and careful surgical planning to ensure optimal outcomes [10].

## **Future Directions**

Continued research and clinical data collection are essential to refine the technique and improve long-term outcomes [11].

Technological advancements, such as the use of monolithic zirconia prostheses, show promise in reducing prosthetic complications and improving success rates [12].

In conclusion, the All-on-Four technique is a reliable and innovative solution for mandibular rehabilitation, offering significant benefits in terms of functionality, aesthetics, and patient satisfaction. However, its success depends on careful patient selection, meticulous planning, and ongoing research to address potential complications and improve long-term outcomes.

#### **Final Considerations**

The All-on-Four surgical technique has emerged as an effective and innovative solution for complete dental arch rehabilitation, especially in the mandible. By allowing the placement of a fixed prosthesis on just four implants, this approach offers a viable alternative to traditional techniques, which often require multiple implants and additional procedures, such as bone grafts. The analysis of the theoretical foundations and surgical protocol reveals that the All-on- Four technique is based on solid principles of biomechanics and strategic planning. The placement of implants at specific angles allows for optimized distribution of masticatory forces and improves prosthesis stability, minimizing the need for additional interventions and accelerating the rehabilitation process.

The clinical results obtained so far indicate that the technique is highly effective in restoring masticatory function and dental aesthetics. Studies and clinical data demonstrate favorable implant success rates and high levels of patient satisfaction. The technique has proven particularly beneficial for patients with reduced bone density, who may face significant challenges with traditional approaches. However, like any surgical procedure, the All-onFour technique is not without complications. Complications such as infections, failures in osseointegration, and problems with the prosthesis are possible but can be mitigated with careful planning, rigorous patient selection, and strict postoperative monitoring. The strategies for managing these complications, as discussed, are crucial to ensuring the best possible outcomes.

This monograph confirms that the All-on-Four technique offers an effective and predictable solution for mandibular rehabilitation, with significant benefits in terms of functionality and aesthetics. The approach is particularly valuable for patients seeking a quick and less invasive solution for total tooth loss.

In the future, continued research and additional data collection are essential to refine the protocols and outcomes of the All-on-Four technique. Continuous innovation and evidence- based clinical practice will contribute to the advancement of implant dentistry and the improvement of patients' quality of life.

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