

## Associated short and regular implants for complete denture retention in an atrophic mandible: clinical follow-up

### Implantes corto y regular asociados para retención de prótesis completa en mandíbula atrófica: seguimiento clínico

### Implantes curto e regular associados para retenção de prótese total em mandíbula atrófica: acompanhamento clínico

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#### ABSTRACT

**Objective:** to present the radiographic clinical follow-up of the prosthetic rehabilitation of a patient with an atrophic mandible, with the installation of short implants associated with an implant of regular length. **Method:** case report of a completely edentulous patient with an atrophic mandible and a 6-year radiographic clinical follow-up conducted at the dental clinic of the Federal University of Piauí, Teresina, from February 2011 to January 2020. After collecting sociodemographic data, health records, clinical radiographic examinations, and prosthetic surgical planning, four dental implants were installed between the mental foramina. After three months, mini-conical abutments and a fixed prosthesis screwed onto the implants were installed and monitored every six months for a period of six years. **Results:** the clinical evaluation revealed tissue stability without significant peri-implant changes

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after the follow-up period. Radiographically, bone resorption was not observed around the implant. Stability of the prosthesis and absence of prosthetic complications were observed during the follow-up period. **Conclusion:** short implants associated with regular-length implants can be placed in the anterior region of an atrophic mandible for rehabilitation with fixed complete dentures.

**Descriptors:** Dental Implants; Protheses and Implants; Jaw, Edentulous; Mouth Rehabilitation.

## **RESUMEN**

**Objetivo:** *presentar el seguimiento clínico radiográfico de la rehabilitación protésica de un paciente con mandíbula atrófica con la instalación de implantes cortos asociados a un implante de longitud regular. Método:* relato de caso de paciente totalmente edéntulo con mandíbula atrófica, y seguimiento clínico radiográfico de seis años, realizado en la clínica odontológica de la Universidad Federal de Piauí, Teresina, de febrero de 2011 a enero de 2020. Después de recolectar datos sociodemográficos y registros de salud, exámenes clínicos radiográficos y planificación quirúrgica protésica, se instalaron cuatro implantes dentales entre los forámenes mentonianos. Luego de un período de tres meses, se colocaron mini pilares cónicos y se atornilló una prótesis fija sobre los implantes, la cual fue monitoreada semestralmente durante un período de seis años. **Resultados:** las evaluaciones clínicas mostraron estabilidad tisular sin cambios periimplantarios significativos después del período de seguimiento. Radiográficamente se observó mantenimiento sin reabsorción ósea alrededor de los implantes. La estabilidad de la prótesis y la ausencia de complicaciones protésicas se observaron clínicamente durante el período de seguimiento. **Conclusión:** los implantes cortos asociados a implantes de longitud regular pueden ser colocados en la región anterior de la mandíbula atrófica para rehabilitación con prótesis fija completa.

**Descriptor:** *Implantes Dentales; Prótesis e Implants; Arcada Edéntula, Rehabilitación Bucal.*

## **RESUMO**

**Objetivo:** *apresentar o acompanhamento clínico radiográfico da reabilitação protética de um paciente com mandíbula atrófica com a instalação de implantes curtos associados a um implante de comprimento regular. Método:* relato de caso de uma paciente desdentada total com mandíbula atrófica, e acompanhamento clínico radiográfico de seis anos, realizado na clínica odontológica da Universidade Federal de Piauí, Teresina, no período de fevereiro de 2011 a janeiro de 2020. Após coleta de dados sociodemográficos e registro de saúde, exames clínicos radiográficos e planejamento cirúrgico protético, foram instalados quatro implantes dentários entre os forames mentonianos. Após o período de três meses foram instalados mini pilares cônicos e uma prótese fixa aparafusada sobre os implantes que foi acompanhada a cada seis meses por um período de seis anos. **Resultados:** as avaliações clínicas mostraram estabilidade tecidual sem alterações peri-implantares significativas após o período de acompanhamento. Radiograficamente foi observada a manutenção sem reabsorção óssea ao redor dos implantes. A estabilidade da prótese e a ausência de complicações

*protéticas foram observadas clinicamente durante o período de acompanhamento. Conclusão: os implantes curtos associados a implante de comprimento regular podem ser colocados na região anterior da mandíbula atrófica para reabilitação com prótese total fixa.*

**Descritores:** *Implantes Dentários; Próteses e Implantes; Arcada Edêntula, Reabilitação Bucal.*

## INTRODUCTION

Dental loss causes serious aesthetic problems and physiological changes in patients. The severity of damage due to chewing, phonation, and joint disorders depends on the number and location of the missing teeth<sup>1</sup>. Long-term use of removable dental prostheses leads to bone resorption and a decrease in keratinized mucosa, which impairs the retention and stability of the dental prosthesis. Constant mucosal trauma can lead to pain and functional limitations<sup>2</sup>.

Different treatment options for dental rehabilitation of patients with severe mandibular resorption have been reported, including bone grafting, alveolar osteogenic distraction, inferior alveolar nerve lateralization, and the use of short implants<sup>3,4</sup>. Anatomical factors should be considered when selecting the best treatment option<sup>5</sup>.

The use of short implants in edentulous patients with atrophic jaws may present fracture risk during the surgical procedure or in the immediate postoperative period<sup>6</sup>. This treatment has been proposed as an alternative to reconstructive surgery followed by prosthetic rehabilitation<sup>7</sup>]. Therefore, to obtain satisfactory results in such cases, surgical and prosthetic planning is essential. This study aimed to present the radiographic clinical follow-up of the prosthetic rehabilitation of a patient with an atrophic mandible with the installation of short implants associated with an implant of regular length.

## METHOD

A single case study of a patient, toothless, wearing a complete denture, and complaining of masticatory, aesthetic, and functional difficulties due to instability of the lower complete

denture was conducted, who visited the dental clinic of the Federal University of Piauí, Teresina, between February 2011 (patient's first dental visit) and January 2020 (patient's last visit for dental follow-up).

In the first dental visit, during the clinical examination, severe resorption of the residual alveolar ridges was observed.

Complete dentures were planned for the rehabilitation of the patient, and the lower one was implant-supported owing to difficulties in obtaining retention and stability. Because these are severely reabsorbed ridges, it is necessary to identify short implants.

For clinical follow-up of the patient, it was necessary to use a form with sociodemographic data, follow-up data on implant survival and prosthetic complications were collected, and a form for assessing clinical conditions. At follow-up examinations, peri-implant tissues and implant health were assessed using the following parameters: a) suppuration (presence/absence); b) plaque index (score of 0 to 3); c) probing depth and attachment

level; d) bleeding on probing (score of 0 to 3); e) percussion with evidence of metal (functional ankylosis) or dull sound (fibrous integration in the area of implant placement); f) persistent pain<sup>8</sup>.

All cases showing peri-implant inflammation were treated according to the guidelines of Mombelli and Lang<sup>8</sup>. Intraoral radiographs were taken using the parallel technique to control projection geometry.

A single experienced evaluator, a specialist in prosthesis and dental implants, was responsible for collecting data at each evaluation moment (intervals of six months during for six years). This same professional, at each evaluation, checked the gingival clinical situation with the removal of the prosthesis and requested an annual radiographic examination to control bone stability.

The present study was approved by the Ethics and Research Committee of Ceuma University (UNICEUMA) with CAEE n. 71011823.0.0000.5084 and opinion n. 6.159.658. Participants' names were coded to guarantee anonymity and secrecy. The patient

was informed of the risks and possible factors associated with treatment failure. An informed consent form was presented and signed.

treatments were not functional and their esthetics were unsatisfactory. Radiographic and clinical examinations revealed severe bone resorption in the maxilla and mandible (Figure 1 AB).

## CASE REPORT

An edentulous 59-year-old female resident of Teresina (PI) reported having lost her teeth many years ago; the previous

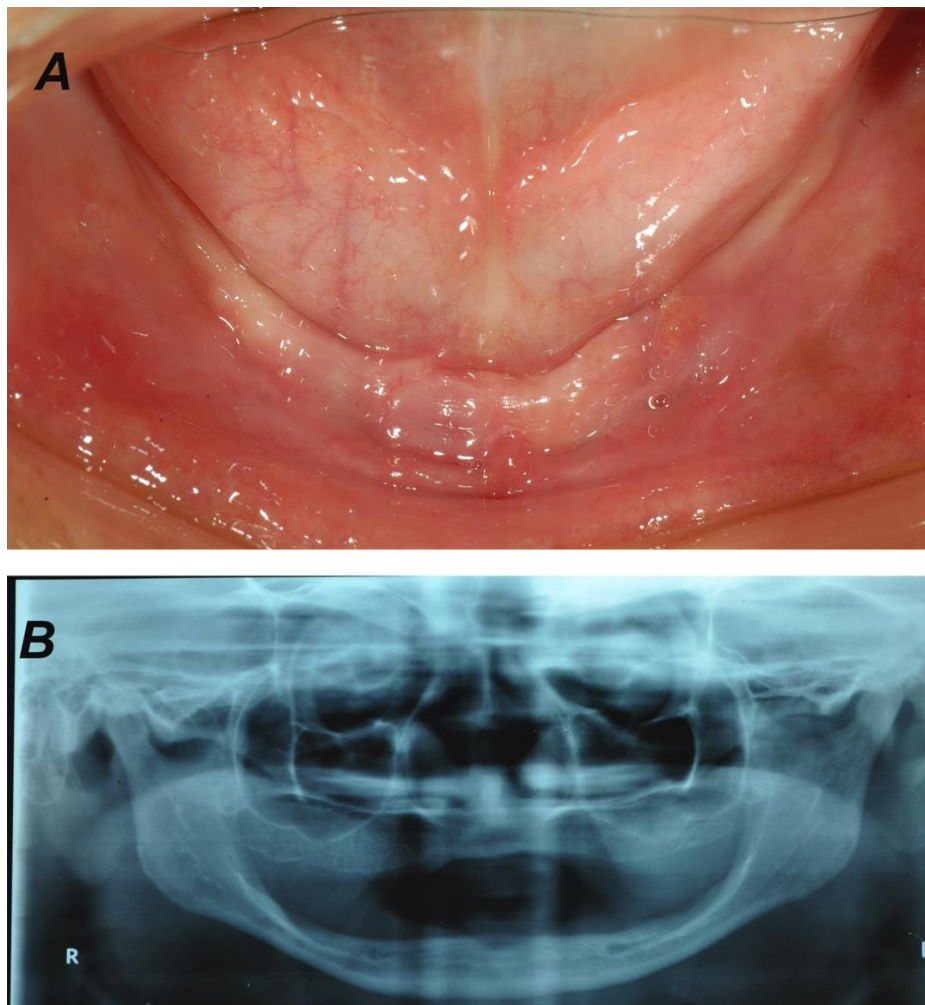


Figure 1 A and B: Initial clinical and panoramic X-ray evaluation. Patient with severe bone resorption in the mandible.

Different treatment options were discussed after anamnesis and clinical and radiographic examinations, considering mandibular atrophy risks and treatment costs. We chose rehabilitation with a superior conventional total prosthesis combined with an implanted fixed prosthesis for the mandible installed on four short implants between the mental foramina area.

Three implants with external hexagon connection with 3.75 mm × 8.5 mm and one 3.75 × 10 mm dimensions were used (Sistema de Implante Nacional [SIN], Sao Paulo, Brazil). The soft tissue flap was reduced during the surgical procedure to preserve muscle insertion and to avoid undesirable effects on the atrophic mandible. Care regarding the fracture risk was also considered (Figure 2).

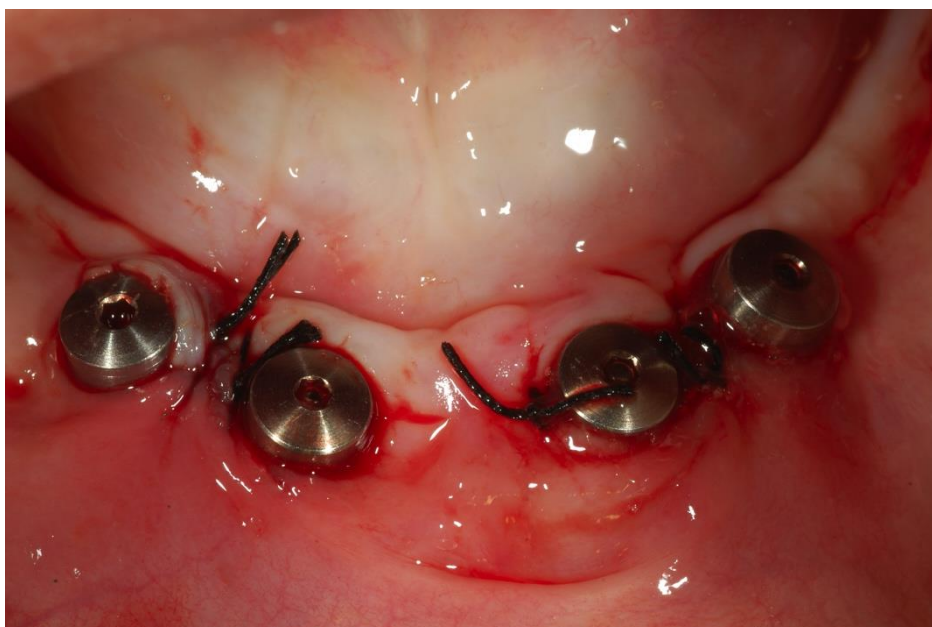


Figure 2 - Clinical characteristics after implant installation and healing caps.

A 3mm high healing cap (SIN, São Paulo, Brazil) (Figure 02) was installed, and a provisional temporary total denture was relined with soft resin (Soft Comfort-Dencril, São Paulo, Brazil) for a period of 4 months which is

necessary for osseointegration of the implants.

After the osseointegration period, mini-conical abutments (Figure 3 AB) were installed (Micro Unit, SIN, Sao Paulo, Brazil). Procedures for impressing and creating the preliminary and

definitive fixed implant-supported (Figure 4 and 5).  
total prostheses were conducted

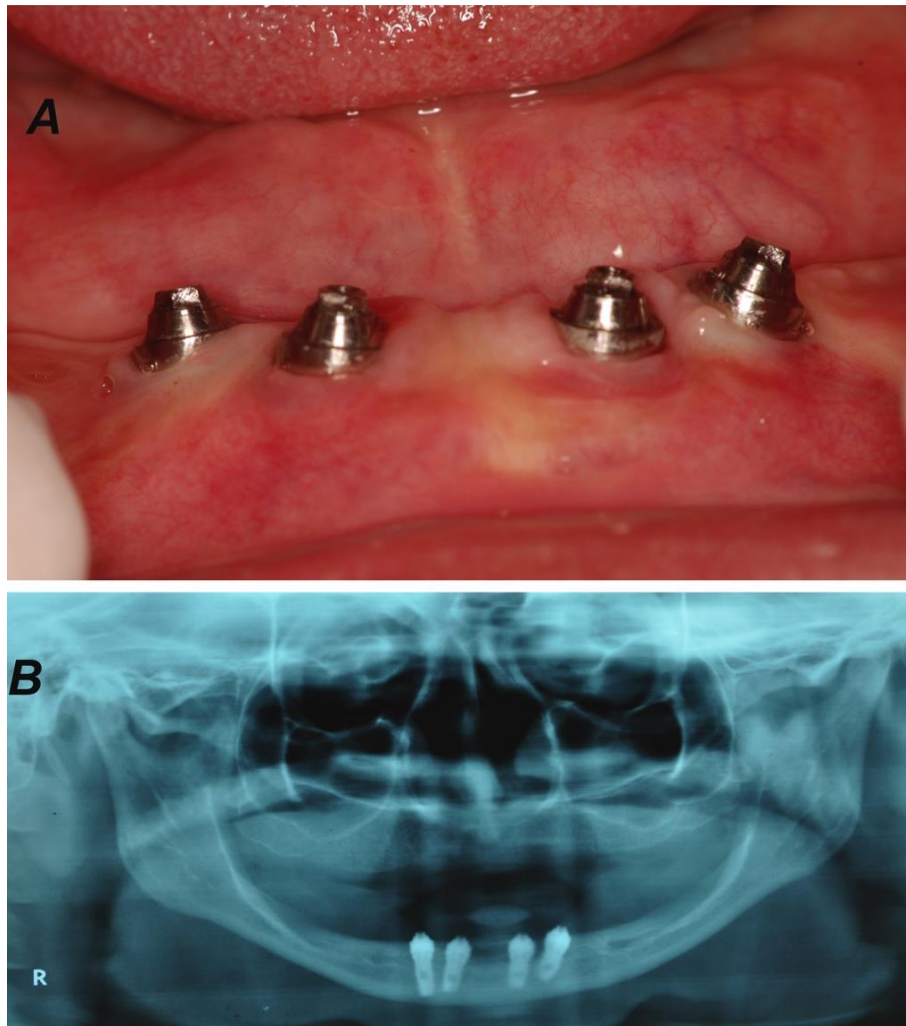


Figure 3 AB - Installation of the conical abutments and Panoramic X-ray.



Figure 4 - Static and functional evaluation of the superior conventional total prosthesis occluding with reduced arch implant supported prosthesis.

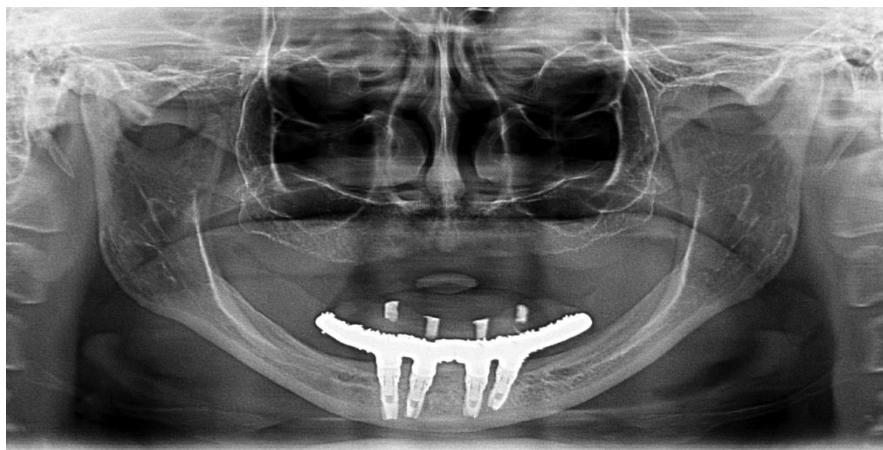


Figure 5 - Panoramic X-ray immediately after installation of the prosthesis.

Due to the atrophy and small mandible, we chose to make a denture with a reduced arch (only one premolar and one molar in each hemiarch). The antagonist arch was rehabilitated using an arch-reduced conventional prosthesis. Oral hygiene guidance and follow-up visits were provided to the patients.

The first maintenance return visit was scheduled six months after prosthesis placement, followed by clinical evaluations each year. All assessments followed the same assessment protocol established at the beginning of treatment<sup>8</sup>. Panoramic radiographs were obtained at three and six years. The hygiene guidelines were

explained at each visit, followed by professional tooth cleaning. Screw loosening or prosthetic complications were not observed during the 6-year follow-up period, and no changes were observed in the peri-implant region. The patient reported hygiene difficulties at the implant-prosthesis interface, and biofilm accumulation was observed in this area (Figure 6 AB). Considering the limitations of the panoramic radiographic image, minimal bone resorption was observed, after 6 years, when compared to the initial radiograph (Figure 7).





Figure 6 AB - Clinical aspect of the peri-implant region and biofilm accumulation on the prosthesis, after six years of follow-up.



Figure 7 - Panoramic X-ray evaluation of the implants, at six years of follow-up.

## DISCUSSION

The atrophic mandible reported in this case presented with factors that limited prosthetic rehabilitation with implants. The presence of the mandibular canal and submandibular gland fossa in the posterior region of the mandible is associated with low bone quality due to disuse atrophy, which compromises implant installation<sup>9</sup>.

Several treatment options have been reported, including bone grafting, osteogenic distraction, inferior alveolar nerve lateralization, and the use of short implants<sup>10</sup>. All treatment alternatives were discussed with respect to age, general health status, treatment duration, and surgical risk. Short implants in the

anterior region were selected based on these factors.

Bone grafting before rehabilitation with implants showed good results, with predictable and acceptable levels of resorption. One study showed that implants preserve the graft in the same way that natural teeth preserve alveolar bone<sup>11</sup>. However, reports have shown that bone grafts in the mandible have unpredictable results. In addition, many patients are unable to accept the treatment because of the high cost and need for additional surgical procedures or general health conditions<sup>12</sup>. These questions were fundamental to planning the reported case.

Atrophic bone ridges of at least 9 mm in height and adequate thickness can be rehabilitated with short implants<sup>8</sup>. This is a simple and

predictable alternative that reduces costs, procedural morbidity, and treatment time. In these cases, bone quality plays a key role in treatment success. Adequate bone height and thickness were observed during installation of the short implants.

Even without reconstructive surgical procedures, this mode of treatment for atrophic bone ridges has a significant success rate and is accepted as a reliable and predictable solution<sup>13</sup>. Short implants are defined as those with a length of  $\leq 10$  mm; others consider short implants with an extension of  $< 8$  mm<sup>10</sup>. Although there is no consensus on the length to be considered short, masticatory force and antagonist arch type are the determinants of implant selection. In this case report, three 8.5 mm and one 10 mm long implants were used.

Masticatory load, vertical dimension, and unsatisfactory bone density are associated with failure of atrophic jaw rehabilitation. Therefore, the load on a prosthesis must be reduced<sup>14</sup>. In this case, the antagonist was a conventional total prosthesis with a short arch (one

premolar and one molar), occluding the inferior prosthesis fixed to the implants.

The ideal minimum ratio between the size of the crown and the implant installed is 1 to 1. When the alveolar ridge is reabsorbed and an implant is installed in the remaining bone, the crown-to-implant ratio is altered. This is considered a biomechanical risk<sup>15</sup>. When prosthetic parameters of the crown-to-root ratio are altered, occlusal loads should be placed as close as possible to the long axis of the implant to promote better distribution of forces<sup>16</sup>. These parameters were considered in the planning of the case in question.

Some of these findings are important in cases of short implant placement. First, the diameter of the implant is more efficient than the length in the dissipation of tension because the region that receives the most effort is next to the bone crest. Short implants present success rates close to those of conventional implants, and splinting, elimination of horizontal occlusal contacts, and reduction of the arch increase the biomechanics

and predictability of the treatment<sup>17</sup>.

After 6 months of follow-up, the patient was highly satisfied with the treatment results. No complications were found clinically or radiographically, suggested procedure failure<sup>18</sup>.

A systematic review was performed of studies on clinical rehabilitation with implants of <10 mm in length in atrophic jaws<sup>19</sup>. The longevity of the implants, biological and biomechanical factors, and complications, such as peri-implantitis and marginal bone loss were evaluated. A high success rate (99.1%) and low incidence of biological and biomechanical complications have been observed in clinical studies<sup>19,20,21</sup>. After 6 years, no biological or biomechanical complications were observed in the presented clinical case.

Short implants are considered an alternative for the rehabilitation of atrophic mandibles. Repairing edentulous areas with reduced mandibular bone volume without reconstructive surgical protocols

has a reliable and predictable prognosis<sup>18</sup>.

## CONCLUSION

Clinical and radiographic follow-up after 6 years of function showed that it is possible to consider rehabilitation of the atrophic mandible using short implants and fixed prosthetic rehabilitation with good predictability and maintenance of tissue integrity.

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