

## Utilization of Recombinant Human Bone Morphogenetic Protein on the Reconstruction of Critical Defect on Maxilla

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### Abstract

**Objective:** The aim of this study was to report a case of utilization of recombinant human bone morphogenetic protein-2 on bony regeneration of anterior maxilla.

**Case Report:** 39 years old female patient, non-smoker and without systemic complication was referred to dental evaluation because of dental esthetic dissatisfaction. After clinical and tomographic examination a defect class III of Seibert was observed six months after extraction of teeth 12 and 11. Because of defect's morphology augmentation by autogenous bone block was not allowed. Alveolar ridge augmentation was realized utilizing rhBMP-2. After 12 months a new tomography revealed bone augmentation that allowed implant installation.

**Discussion:** rhBMP-2 has been utilized for induction of bone formation for different critical defects including alveolar ridge defects.

**Conclusion:** The clinical results observed on this study allowed reconstruction of alveolar ridge and adequate tridimensional implant installation on anterior maxilla.

**Keywords:** maxilla; alveolar ridge augmentation; guided bone regeneration; recombinant human bone morphogenetic protein-2h

### INTRODUCTION

Critical ridge defects in the anterior maxilla region are one of the most challenging cases in Implantology. In spite of advances in biomaterials and the development of new techniques for bone reconstruction, the increase of bone volume for the appropriate three dimensional implant installation in these areas is of great complexity<sup>1,2</sup>.

As a gold standard the autogenous bone graft is considered the ideal material when compared to others since it presents osseointegrating, osseointegrating and osteogenic properties. However, obtaining autogenous bone involves the approach of another surgical site besides representing greater morbidity for the patient<sup>3</sup>.

The human recombinant morphogenetic protein 2 (rhBMP2) associated with absorbable collagen

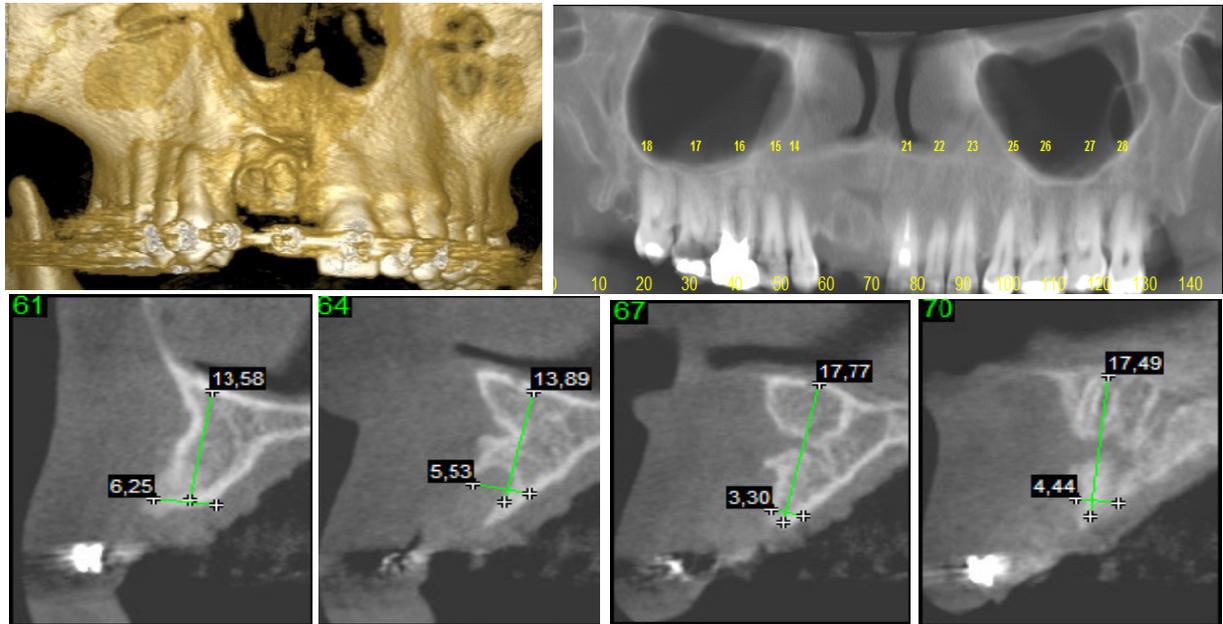
sponge (ACE) has been used since 2007 in procedures for maxillary sinus lift and alveolar preservation<sup>4</sup>. However, there is still a shortage in the literature on the reconstruction of critical defects in the anterior region of the maxilla using this biomaterial.

In this sense, the objective of the present study was to report a case of alveolar ridge reconstruction in the aesthetic area prior to implant installation with rhBMP2.

### CASE REPORT

Patient 39 years old, female, non-smoker and without systemic involvement was referred to the Specialization in Implant Dentistry course of the Brazilian Dental Association in the city Ipatinga, Minas Gerais, Brazil, due to her dissatisfaction with dental aesthetics. Teeth 11 and 12 were extracted six months before. A Class III defect of Seibert was observed in the region (Figure 1).

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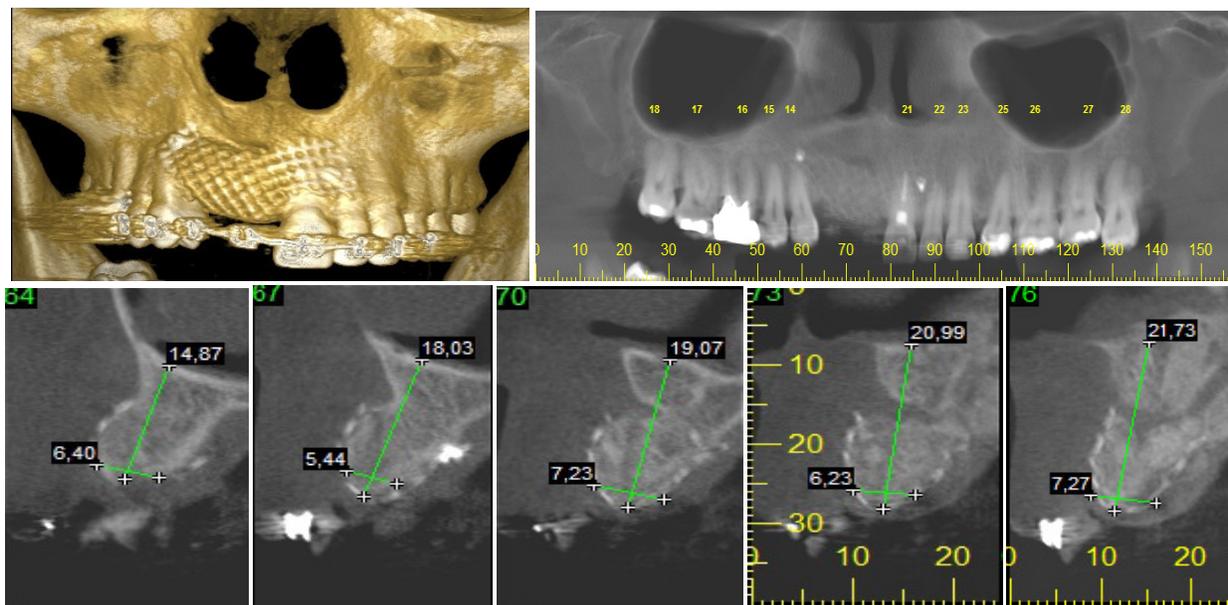


**Fig 1.** Tomographic images prior ridge augmentation

Due to the morphology of the defect that made autogenous block graft unfeasible, an alveolar ridge augmentation procedure was performed using rhBMP-2 (Infuse, Medtronic, USA) associated with ACE.

The procedure for placing the biomaterial was performed under local anesthesia (Alphacaine 1: 100000; DFL, Brazil). Two vertical incisions and a horizontal crest incision were performed and a total flap was folded. The defect was debrided in order to remove the granulation tissue and the rhBMP-2 preparation was made following the manufacturer's recommendations.

The stabilization of the material was done with titanium screen (Intra-Lock, USA) fixed with bone graft screws (Neodent, Curitiba, Paraná, Brazil). Gaps were filled with deproteinized bovine bone (Bio Oss, Geistlich Pharma, Switzerland) and the flap was repositioned and sutured. The patient was medicated with analgesic and oriented to perform oral hygiene with 0.12% chlorhexidine digluconate (Periogard, Colgate Palmolive, Brazil). The sutures were removed 20 days later. After 12 months of the reconstruction procedure, a new tomographic examination revealed an increase in bone volume, making implant placement possible (Figure 2).



**Fig 2.** Tomographic images after ridge augmentation

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A new total flap for titanium screen removal and placement of the implants in the areas corresponding to teeth 11 and 12,  $4.1 \times 12$  mm and  $3.4 \times 12$  mm, respectively was made (Figure 3).



**Fig 3.** Implants installed in the anterior area



**Fig 4.** Provisional acrylic crowns

### DISCUSSION

The loss of teeth is frequently associated with alveolar resorption and results in defects in the ridge that may make rehabilitation via implants unfeasible<sup>5</sup>. Especially in the anterior region of the maxilla this situation constitutes a challenge for surgical and prosthetic reconstructions.

As a gold standard, autogenous bone graft is considered the ideal material when compared to other materials since it has osseointegrative, osseointegrative and osteogenic properties. However, obtaining autogenous bone involves the approach of another surgical site and greater morbidity for the patient. As an alternative, bone substitutes such as rhBMP-2, hydroxyapatite and bioactive glasses have been employed in alveolar ridge augmentation procedures<sup>3</sup>.

Although rhBMP-2 has been released since 2007 for craniofacial reconstructions, few studies have evaluated its use in critical defects in the anterior region of the maxilla<sup>5-8</sup>.

The growth factors stimulate the migration of mesenchymal cells and angiogenesis around the bone

tissue promoting a path for osteoprogenitor cells and new bone formation. Thus, the morphology of a bone defect dictates the choice of material and technique to be employed. Sites with few bone walls and severe alveolar resorptions require materials with increased biological activity and regenerative capacity<sup>7</sup>. In the case presented here, the defect was of considerable extension with one bone wall and the anterior maxilla area. In view of the impossibility of autogenous block grafting, we chose to use rhBMP-2, which obtained excellent results.

In a randomized clinical study<sup>6</sup>, the authors observed that rhBMP-2 provided a significantly greater bone gain when compared to autogenous bone graft in the anterior maxilla. In the present case report, the use of rhBMP-2 for the reconstruction of a critical defect in the anterior region of the maxilla made possible the rehabilitation through implants.

The literature reports that the rehabilitation of the aesthetic area of the maxilla is a complex task since it also involves high expectations and demands on the part of patients, especially in women<sup>9</sup>. In the rehabilitation of the present case, the patient had a

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high aesthetic requirement and an excellent aesthetic harmony was achieved. However, it is important to note that, in order to obtain these results, it was necessary to reconstruct the defect in order to allow the appropriate three-dimensional implant installation<sup>10</sup>.

### CONCLUSIONS

The use of rhBMP-2 for bone augmentation in the anterior maxilla region was a viable alternative in the present case for the adequate installation of implants and subsequent prosthetic rehabilitation.

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