# Bone Reconstruction of an Atrophic Fully Edentulous Maxilla Associated With Platelet Rich Fibrin and Leukocyte: A Case Report

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## Abstract

Atrophic maxilla rehabilitation is a complex treatment procedure and the treatment involves bone reconstruction with bone grafts, dental implants placement and restorative phase to require function and esthetics to the patient. The aim of this case report was demonstrate the effectiveness of the combination of bone reconstruction techniques with a tent-pole grafting and sinus floor elevation as treatment of an atrophic maxilla, both techniques were performed with Leukocytes Platelet-Rich Fibrin (L-PRF) and implant placement association. A 51-year-old female patient with chief complains associated with removable dental prosthesis in maxilla and the planning were based in bone reconstruction for anterior and posterior maxilla. For anterior maxilla, screws of titanium were positioned following the tent-pole technique and for posterior maxilla were performed sinus augmentation bilaterally, both techniques for bone reconstruction were associated with a xenograft (BioOss®, Geitslich, Switzerland) in conjunction with L-PRF membranes and six dental implants were installed. After 6 months, the second-stage was performed to change the abutment for prosthesis confection, and L-RPF was over again inserted in the surgical area to increase the soft tissue. After 90 days the patient received the final restoration made with ceramic and coated with zirconium (e-Max ceram). The patient showed thorough of 9 months of follow-up since baseline, good overcomes in implant stability, and bone augmentation demonstrated that reconstruction techniques performed in this case can be an alternative to patient with atrophic maxilla when associated with L-PRF.

**Keywords:** Atrophic maxilla • Dental implants • Bone regeneration • L-PRF

## Background

Rehabilitation of patients with edentulous area presents some limitations for dental implant placement [1]. Several therapies are described in the literature and indicated to increase bone quality and quantity in height and thickness parameters, procedures such as, guided bone regeneration, alveolar crest preservation and elevation of the maxillary sinus [1].

The association of techniques aimed for Implant Dentistry field, more focused on bone regeneration, identified that L-PRF reduces the width alveolar resorption and improves the stability of the implant during the initial phase of osseointegration [1], demonstrating as advantage for indication for surgeries.

There is a classification of autogenous platelets concentrate due the presence of growth factors, known as platelet-rich plasma or platelet-rich fibrin with different protocols in the literature [2]. Platelet and Leukocyte-Rich Fibrin (L-PRF) demonstrates the effectiveness advantage of being a great healing factor for tissue and bone regeneration, without inflammatory reactions [3].

The L-PRF has growth factors in its structure, which are essential to maintain activity for a long period and promote faster tissue regeneration [4]. However, some advanced treatments are available to minimize the risks for the patient and reduce the stages of surgery, according to the literature there are several advantages of L-PRF for Implant Dentistry field, the present case report aimed to describe the possibility of rehabilitation of an atrophic maxilla with bone reconstruction associated with xenograft biomaterial and L-PRF to improve a better tissue healing.

## Case report

### Patient information

A 51-year-old female patient presented with main complains a discomfort of a removable dental prosthesis in function by 30 years. The initial radiographic and clinical evaluation showed an atrophic fully edentulous maxilla (Figure 1). A planning (DentalSlice®, Software) was performed to aim to bone reconstruction for atrophic maxilla through tissue augmentation of anterior and posterior maxilla, both associated with dental implant placement (Figure 2).

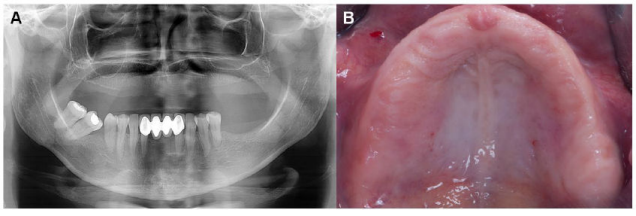


**Figure 1.** Initial condition of the patient A: Panoramic radiograph; B: Clinical condition of maxilla at baseline.

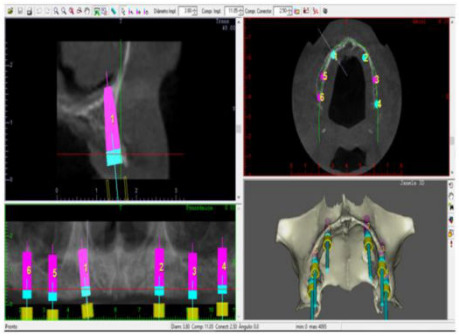

**Figure 2.** Planning of implant placement Digital implant software (DentalSlice®) was used to planning the adequate position of dental implants at atrophic maxilla.

## Surgical procedure

The surgery were performed under local anesthesia and crestal incision was made with vertical releases and the surgery for reconstruction of atrophic maxilla was initially performed by the access sinus with a piezoelectric device (CVDentus, Brazil) to create the lateral window (Figure 3). To obtain the membranes of L-PRF the fibrin protocol following the Choukrouns protocol [5] (standard protocol with 3000 rpm per 10 minutes), therefore, the membrane were associated with BioOss®, Geistlich and the sticky-bone were created (Figure 4). The sticky-bone was positioned inside of the sinus to fill the defect.

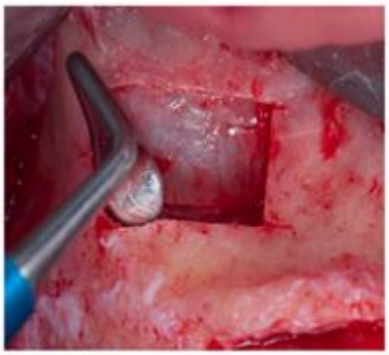

**Figure 3.** Lateral wall sinus augmentation technique. The window to access the sinus was performed with a piezoelectric device.

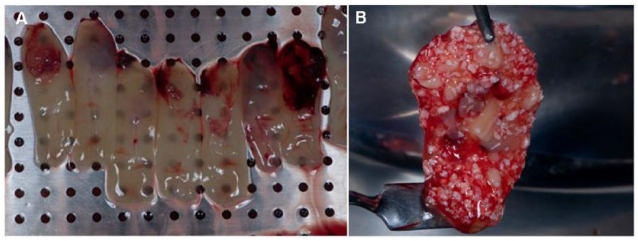


**Figure 4.** L-PRF membranes A: L-PRF membranes; B: sticky-bone created (BioOss® + L-PRF).

Surgery approach for region of anterior maxilla atrophic was performed by tent pole technique to bone augmentation of large vertical and horizontal defect. Initially, the anterior maxilla received a bone decorticalization of the receptor bed to improve vascularization of the area through blood tissue with a piezoelectric device (CVDentus®, Brazil), as following, six titanium screws of 8 mm length and 1.5 mm diameter (Neodent®, Brazil) were positioned in the bone defect to confection of tent pole technique with the head between 3-4 mm above the bone level (Figure 5-A). Six dental implants of titanium (Figure 5-A) with cone morse connection (Bioconect system, Itapira, São Paulo, Brasil) and 3.5 diameter and 11.5 mm length were installed (Figure 5-A).

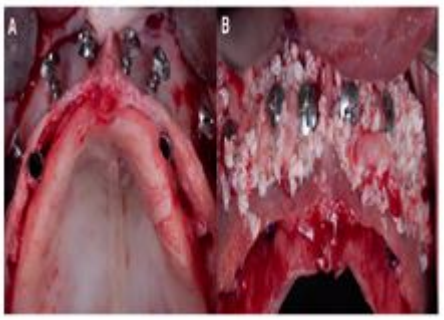


**Figure 5.** Tent-pole technique A: Titanium screws of 8 mm length and 1.5 mm diameter were positioned and dental implants (Bioconect, Itapira, São Paulo, Brasil) were installed;

The bone guide regeneration was performed with xenograft (BioOss, Geistlich®, Switzerland) associated with particulate membrane of L-PRF, where the sticky-bone was positioned directly to fill the defect (Figure 5-B) and covered with more than four membranes of L-PRF to obtain a sealing of xenograft, to aim to increase the augmentation tissue and to better wound healing (Figure 6). Sutures non-absorbable composited with polypropylene 5-0 (Techsuture, Brazil) were performed (Figure 7). Patient received post operatory recommendation with systemic medication (Amoxicilin 500 mg and Nimesulide 100 mg). The patient received the removable provisional prosthesis until the second-stage of procedure.

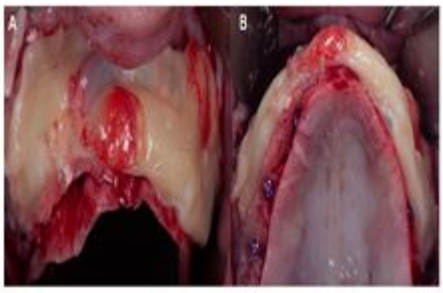


**Figure 6.** L-PRF Membranes A: Frontal view of membranes positioned; B: Occlusal view of membranes positioned to increase the augmentation tissue.

**Figure 7.** Sutures non-absorbable (Polypropylene 5-0, Techsuture, Brazil)

## Second-stage of procedure

After 6 months, before the second stage of surgery a radiograph examination was performed (Figure 8). The second-stage was performed to prosthesis phase, initially the incision was respecting the keratinized mucosa that was positioned to buccally, the screw were removed and the flap and the area associated with membranes of L-PRF to soft tissue conditioning to patient has a great healing with the provisional prosthesis (Figure 9-A and B). The membranes of L-PRF were positioned inside to obtain the tissue increase and the prosthetic phase was performed through off change of abutments and castings. A suture was performed to stabilization of tissue and membranes of L-PRF to increase and stability the soft tissue during the wound healing (Figure 9-C and D).

**Figure 8.** A radiograph panoramic of 6 months post-operative.

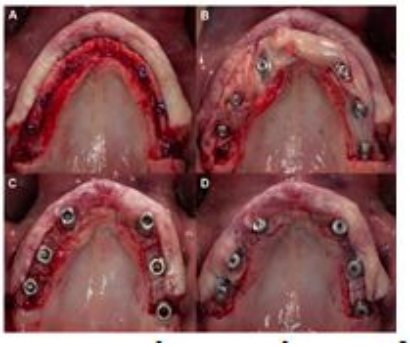

**Figure 9.** The second-stage of surgery A: Incision and keratinized tissue positioned to bucally position; B: Membranes of L-PRF was inserted in the surgical area; C: Prosthesis components positioned to casting phase; D: Suture and membranes inserted.

### Final restoration

Completed 90 days of follow-up and to aim to install the definitive prosthesis with ceramic structure and coated with zirconia (e-Max, ceram, detin), the healing and gain of hard and soft tissue was observed (Figure 10), and the prosthesis was installed (Figure 11). A radiograph panoramic final was performed to evaluation of complete case report (Figure 12), demonstrating as well as the satisfaction of the patient, with esthetics and function conditions.

**Figure 10.** 90 days after second-stage surgery.

**Figure 11.** Definitive prosthesis installed at 90 days of follow-up. A: Occlusal view; B: Frontal view.

**Figure 12.** Final follow-up with 9 months.

## Discussion

Bone reconstruction associated with implant placement is a challenge in Implant Dentistry field and the clinical case reported showed a patient with a large atrophic maxilla and bone augmentation techniques were performed demonstrating satisfactory outcomes

Autogenous bone is considered the gold standard for bone regeneration and it has been well documented and stabilized in the literature, however, the technique to obtain the graft has some disadvantages, such as, necessity of a second surgery, increase morbidity to patient and some resorption of bone, demonstrating that biomaterials, *i.e.,* derived with xenograft properties can be a satisfactory choice due osteoconductive and osteoinductive properties [6].

The surgical approach nominated tent pole in a possibility to bone reconstruction where the combination with bone graft and titanium screws were described in 2002 [7] and the strategy of this technique is allow and maintain the volume through of space created with support of titanium screws, in other words for maintenance of space and minimize the bone resorption through of defect reconstruction [7,8].

The use of L-PRF associated with graft materials demonstrates a good choice to augmentation tissue and an attempt to increase the process healing and bone formation [9], when associated with bone for regeneration surgeries, the results are demonstrated with greater values by improving tissue repair and regeneration [5].

The composition of L-PRF contains red and white cells that are necessary and important for healing process, the cells have the composition of neutrophilis and macrophages [10]. The presence of nitric oxide, a small radical, is important for biological functions, and during the healing and regeneration phases, its peak of activation is greater during the inflammation and decreased after the fifth day, its phenomenon, well known how healing phase, however, cells derived from fibroblasts and lymphocytes increase after tenth day of cell formation showing the phase of cell proliferation [11].

L-PRF can increase the thickness of soft tissue around implants, as well, has shown a shorter surgical time without second area of surgery, with less postoperative discomfort and pain for patients when compared to the gold standard, the autonegnous connective tissue graft [12].

It can be considered that L-PRF with growth factors interferes in surgical areas for a period of 5 to 7 days favoring bone regeneration after a surgical procedure [13]. For bone regeneration, the release of growth factor thought platelets and theirs products in association can improve hard and soft tissue healing [2].

The L-PRF can be associated with several procedures in Implant Dentistry, to aim improve a good effect for bone regeneration and osseointegration of dental implants9. The association of L-PRF with xenograft for sinus augmentation shows more percentage of new bone formation when compared with surgical areas without L-PRF [14], as well

as when L-PRF was associated with implant placement surgery; implant stability analysis showed greater values [15].

## Conclusion

This case report presented showed a great overcomes with prosthesis implant-supported rehabilitation for a female patient with atrophic maxilla. The surgical approaches performed with bone reconstruction by tent-pole technique, sinus augmentation, dental implants and L-PRF demonstrated satisfactory bone gain showing an alternative and how to treat patient with large vertical and horizontal defects.

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