



Alveolar ridge preservation for further rehabilitation with implants: case report.

Maria de Fátima Batista Medeiros Alves Teixeira ¹, Ana Helena Gonçalves de Alencar ¹, Hugo Alexandre Souza ¹, Marcel da Silva Garrote ¹, Robson Rodrigues Garcia ¹

CASE REPORT

ABSTRACT

SUB-HEADING: Alveolar ridge preservation is done when immediate or early implant placement is not indicated. **PURPOSE:** Report a case of extraction of the maxillary premolar, followed by alveolar preservation and later rehabilitation with implants. **CASE REPORT:** A 52-year-old male patient sought care for the rehabilitation of upper left second premolar tooth, which had a longitudinal fracture. The radiographic examination revealed the proximity of the root apex to the floor of the maxillary sinus and alveolar preservation was chosen. **CONCLUSION:** The clinical decision-making process for preservation starts before extraction.

Keywords: dental implants, alveolar bone grafting, tooth extraction.

Preservação alveolar para futura reabilitação com implantes: relato de caso.

RESUMO

INTRODUÇÃO: Preservação alveolar é realizada quando a instalação de implante imediata ou precoce não é indicada. **OBJETIVO:** Relatar um caso de extração de um pré-molar superior, seguido pela preservação alveolar e posterior reabilitação com implante. **RELATO DE CASO:** Paciente do sexo masculino, 52 anos, necessitando da reabilitação do segundo pré-molar superior esquerdo, que possuía uma fratura longitudinal. O exame radiográfico, revelou proximidade do ápice radicular com o assoalho do seio maxilar e a preservação alveolar foi o tratamento de escolha. **CONCLUSÕES:** O processo de decisão clínica para a preservação alveolar deve iniciar antes da extração.

Palavras-chave: Implantes dentais, enxerto ósseo alveolar, extração dentária.

Instituição afiliada – ¹Dental School of Federal University of Goiás, Goiânia, Brazil.

Dados da publicação: Artigo recebido em 01 de Junho, aceito para publicação em 05 de Julho e publicado em 26 de Julho de 2023.

DOI: <https://doi.org/10.36557/2674-8169.2023v5n3p1347-1358>

Autor correspondente: *Maria de Fátima Batista Medeiros Alves Teixeira*
University Avenue, East University sector, 74605-020, Goiânia, Goiás, Brazil

Telephone number: +55 62 98105-8793.

E-mail: mfbmat@hotmail.com

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).



INTRODUCTION

The alveolar ridge is a tooth-dependent structure that develops in conjunction with tooth eruption and undergoes volume and morphologic alteration subsequent to tooth loss [1]. Alveolar ridge preservation (ARP) is “a procedure to preserve the ridge volume within the envelope existing at the time of extraction” [2]. It involves the use of bone graft material, a membrane, and biological products either alone or in combination with one another [1]. ARP delays implant placement [3, 4] by at least three to six months after extraction [3].

Ideally, the therapeutic plan starts before tooth extraction and offers three therapeutic options: spontaneous healing of the extraction socket; immediate implant placement; and techniques for preserve the alveolar ridge at the site of tooth removal [4]. From a clinical point of view, the decision to perform a certain ARP technique depends mainly on: (I) the time-point chosen and the ability to place a dental implant; (ii) the quality and quantity of soft tissue in the region of the extraction socket; (iii) the remaining height of the buccal bone plate; and (iv) the expected implant survival and success rates [4].

One indication of ARP is when patients are not available for immediate or early implant placement and another one is reducing the need for elevation of the sinus floor [3]. Immediate implant placement by itself may not prevent the remodeling of the alveolar ridge after extraction [1]. Careful selection criteria for immediate implant cases should be followed to avoid unfavorable outcomes [1]. It's known that ARP procedures may decrease the need for further ridge augmentation during implant placement in comparison to unassisted socket healing [1, 3, 4]. The presence of infection, root fracture, or decay are limitations of this technique [1].

In the dental field, platelet rich fibrin (PRF) has been utilized for the treatment of extraction sockets, gingival recessions, palatal wound closure, regeneration of periodontal defects, and hyperplastic gingival tissues [5]. Reported advantages include faster wound healing, faster angiogenesis, low costs, and complete immune-biocompatibility [5]. The development of an injectable formulation of PRF (iPRF) has been pursued with the aim of delivering to clinicians an easy to use platelet concentrate, in liquid formulation, that can be either utilized alone, or combined easily with various biomaterials. Taking

advantage of slower and shorter centrifugation speeds, a higher presence of regenerative cells with higher concentrations of growth factors can be observed, when compared to other formulations of PRF utilizing higher centrifugation speeds [5].

CASE REPORT

A 52-year-old male patient sought care for the rehabilitation of upper left second premolar tooth, which had a longitudinal coronal-radicular fracture. The proposed treatment was extraction and rehabilitation with implant. The radiographic examination revealed the proximity of the root apex to the floor of the maxillary sinus, evidencing the difficulty of an immediate implant ([Figure 1](#)).



Figure 1: Periapical radiograph showing radiolucency in the medial bone crest, suggestive of fracture. In addition, the root apex is close to the floor of the maxillary sinus.

Atraumatic, flapless extraction was performed ([Figure 2](#)). In the trans-surgical procedure, it was observed that the implant would not have locking on the side walls ([Figure 3](#)), so alveolar preservation was chosen. It was found that all the walls remained

intact. The socket was filled with xenograft (Endobon®, Zimmer, Sao Paulo, Brazil) bonded with i-PRF (Figure 4). For iPRF preparation, tubes of 10mL of whole blood without anticoagulant were centrifuged at 2100 rpm for 6 minutes at room temperature by a Duo Centrifuge (KASV K14 Bivolt). The liquid layer below the poor plasma was collected as iPRF. An autologous fibrin membrane was placed to close the socket (Figure 5).



Figure 2: Atraumatic flapless extraction.



Figure 3: Drill of 4.3 diameter loose in the socket, evidencing in the trans-surgical that the implant would not have locking, being indicative for the accomplishment of the alveolar ridge preservation.



Figure 4a) Liquid phase platelet rich fibrin (PRF) incorporated into the xenograft (Endobon®, Zimmer, Sao Paulo, Brazil).



Figure 4b) Socket filled with Endobon bonded with injectable platelet rich fibrin (iPRF).



Figure 5: Socket close with an autologous fibrin membrane.

After 15 days, complete soft tissue closure was observed, with satisfactory volumetric filling. The implant was installed after 6 months, with 30N locking and after 3 months of healing, the final crown was installed on the implant (Figure 6).



Figure 6: Follow-up radiograph 4 years after the installation of the crown on the implant, showing bone margins maintained satisfactorily.

DISCUSSION

The potential advantages of ARP include: maintenance of the existing soft and hard tissue envelope, a stable ridge volume for optimising functional and aesthetic outcomes, and simplification of subsequent treatment procedures such as generation of good soft and hard tissue volume for the time of implant placement [3, 4].

In spontaneous healing following tooth extraction, a 50% reduction in the bucco-lingual width of bone has been estimated, in addition to a decrease in bone height at 12 months after extraction. Two-thirds of this reduction happens within three months [1, 3, 4]. On the other hand, immediate implant placement in a fresh extraction socket, without additional guided bone-regeneration procedures, fails to prevent bone resorption, and therefore seems not to be beneficial when compared with spontaneous healing. However, less horizontal bone resorption can be expected by addition of a grafting material and by combining immediate implant placement with a guided bone-regeneration procedure [4].

Histologically, the inner part of the socket wall contains lamellar bone, the so-called bundle bone. The thickness of this bundle bone is reported to be 0,2-0,4mm. Similarly to the root cementum and to the periodontal ligament, its existence is strictly tooth-dependent [4]. It was found that the buccal bone plate, in most locations in the anterior maxilla, is less than 1 mm in thickness. In addition, nearly 50% of the sites investigated had a bone plate, which was (at maximum) 0.5 mm thick. It means that the bundle bone and the buccal bone plate commonly have a similar thickness in the anterior maxillary region. Therefore, one might assume that, after tooth extraction in the esthetic area, the buccal bone plate will be resorbed predominantly in the more crystal region [4].

Studies showed ARP will decrease the amount of residual ridge resorption, however some bone loss will still occur [1, 3, 4]. Complete preservation of the alveolar ridge after extraction is unlikely to be achieved, even if ARP techniques are used [3]. A need for further bone augmentation at implant placement, ranging between 0% and 15% for ARP and between 0% and 100% for spontaneous healing [4]. ARP is beneficial more in ridges with damaged extraction sockets compared with ridges with intact socket walls [1].

In addition, the proximity of the maxillary sinus often is a problem for the placement of implants in the posterior region of the maxilla. This is especially evident with sinus pneumatization which sometimes reaches just a few millimeters above the crest of the alveolar ridge. Placing immediate implants in the posterior maxilla can create unexpected problems due to possible undetected communication with the maxillary sinus and bone poor quality that can lead to displacement of the implant into the sinus [6].

Various materials were used for these procedures, but none of the material or techniques demonstrated were more favorable than others [1, 4]. Calcium sulfate and B-tricalcium phosphate show the fastest resorption rate. Xenografts shows lower resorption rate and might be better in preserving bone size overtime than allograft [1].

There are three options for alveolar ridge preservation: the use of soft tissue grafts; the use of hard-tissue graft materials; and a combination of soft-tissue and hard-tissue biomaterials [4]. The preservation of soft tissue have been described to enhance the quality, and/or regenerate the quantity, of the soft tissues that demonstrate deficiency before, or who will worsen after tooth extraction. As the healing period for such an intervention is kept to 6-8 weeks, only minimal new-bone formation can be expected within the socket, but complete soft-tissue closure [4]. Preservation of hard tissue and soft tissue is indicated for deficits in both hard and soft tissue, with a longer-term healing period (4-6 months), applying a minimally invasive, non flapped approach [4]. If there is severe loss (> 50%) of the buccal bone plate, preservation of hard tissue with a prolonged healing time biomaterial before implant placement has been suggested [4].

Flap elevation and soft tissue primary closure seem to have little effect on dimensional changes [1]. However, the use of membranes requires soft tissue coverage [1].

Studies support the use of ARP to preserve ridge volume, particularly at the hard tissue level. However, ARP doesn't provide clinical benefits in terms of implant-related success when compared to the conventional technique. Besides that it needs a long healing period (>6 months).

PRF forms a three-dimensional fibrin matrix that may further serve as a support for tissue regeneration. It has the characteristic of acting as a barrier membrane in guided bone and tissue regeneration (GBR, GTR) procedures while simultaneously holding a number of growth factors responsible for wound healing [5]. Miron *et al*, 2017 showed that both PRP and iPRF were capable of influencing cell activity of gingival fibroblasts despite showing various different properties. PRP was shown to induce higher levels of cell proliferation whereas iPRF was capable of inducing higher cell migration and mRNA expression of TGF-beta, PDGF, and COL 1 a 2 [5].

CONCLUSION

In conclusion, the clinical decision-making process for ARP starts before tooth extraction. The use of this technique associating the materials allowed the installation of the implant in a second phase and seems to be a good resource for cases in which the immediate installation of the implant incurs risks such as the loss of the implant plus the possibility of buccosinus communication..

REFERENCES

- 1 - Yafi FA, Alchawaf B, Nelson K (2019). What is the optimum for alveolar ridge preservation? *Dent Clin N Am* 63 (3), 399 - 418.
- 2 - Hammerle CHJ, Araújo MG, Simion M, Osteology Consensus Group (2011). Evidence-based knowledge on the biology and treatment of extraction sockets. *Clin Oral Implants Res* 23 (5): 80 - 2.
- 3 – Kalsi AS, Kalsi JS, Bassi S (2019) Alveolar ridge preservation: why, when and how. *British Dental Journal* 227 (4), 265 – 274.



4 - Jung RE, Ioannidis A, Hammerle CHF, Thoma DS (2018). Alveolar ridge preservation in the esthetic zone. *Periodontology* 2000 77, 165 - 175.

5 - Miron RJ, Fujioka-Kobayashi M, Hernandez M, Kandalam U, Zhang Y, Ghanaati S, Choukroun J (2017). Injectable platelet rich fibrin (i-PRF): opportunities in regenerative dentistry? *Clin Oral Invest* 21 (8): 2619-2627.

6 - El Charkawi HG, El Askary AS, Ragab A (2005). Endoscopic removal of an implant from the maxillary sinus: a case report. *Implant dent* 14 (1): 30 - 5.