IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 10 Ver. X (Oct. 2017), PP 72-76
www.iosrjournals.org

Socket preservation with PRF as a sole grafting material – clinical and histological evaluation. Case report

Ivan Chenchev[1],Vasilena Ivanova[1], Svitlana Bachurska[2]
[1](*Department of Oral Surgery, Faculty of Dental Medicine, Medical University – Plovdiv, Bulgaria)*
[2](*Department of General and Clinical Pathology, Faculty of Medicine, Medical University – Plovdiv, Bulgaria)*

Abstract:
Introduction:*Bone resorption is a physiological process, which occurs after tooth extraction. Reduction of the bone in horizontal and vertical dimension leads to difficulties in the following treatment plan, including implant placement and prosthetic treatment. Recently PRF has been successfully used as a soft and hard tissue regenerativematerial.*
Case Report: *A 37-year old female with a non-restorable molar tooth was treated with tooth extraction and socket preservation with PRF as a sole grafting material. Clinical and histological results were reviewed 4 months after tooth extraction and a dental implant was placed.*
Conclusions:*The clinical and histological results of the case revealed that socket preservation with PRF, as a sole grafting material, is beneficial for preserving the volume of the alveolar ridge, before implant placement.*

Keywords: *advanced- platelet rich fibrin, platelet-rich fibrin, socket preservation, regeneration*

I. INTRODUCTION

After tooth loss, the alveolar bone undergoes dimensional changes in horizontal and vertical direction. [1]Bone resorption is most pronounced during the first year after tooth extraction and the peak period is within the first three months. [2,3] Expected loss in terms of height and width of the alveolar bone is respectively 40 percent and 60 percent. [4,5] Reduction of the bone width is in the range of 2.6 – 4.6 mm and in bone height is between 0.4-3.9 mm.(6) Severe bone loss often leads to difficulties in the fabrication of an implant-supported restoration or a conventional prosthesis.[2] In some cases placing a dental implant without injuring adjacent anatomical structures becomes a challenge.In order to reduce the alveolar bone resorption in horizontal and vertical dimension and the soft tissue collapse after tooth extraction, various materials and methods are used for socket preservation. The selection of graft material depends on the rate and extent of its absorption, and on the type of surgical procedure.[1,7] Recently many authors have been using PRF as a sole grafting material with promising results in procedures for socket preservation. [8–11] PRF is a second -generation autologous leucocyte- and platelet-rich fibrin biomaterial described by Choukroun et al.[12,13] It is able to form natural fibrin matrix composed of growth factors, cytokines, platelets and stem cells.[14] The qualities of PRF are considered bothsuitable for soft and hard tissue regeneration.[15]

II. CASE REPORT

A 37 – year old healthy non-smoking female patient was referredfor treatment at the Department of Oral surgery at FDM, MU – Plovdiv. On clinical examination fracture of the crown with mobile part of it was observed. A panoramic film examination revealed unsuccessful endodontic treatment, a radiolucent shadow over the apex and caries lesion reaching the furcation area. (Fig.1) Treatment plan which involved socket preservation with PRF as a sole grafting material with following dental implantation after wound healing was suggested.

Fig. 1- Panoramic radiograph reveals unsuccessful endodontic treatment and a radiolucent shadow over the apex of tooth 37

Preparation of A-PRF: Venous blood without an anticoagulant was taken from the patient in 10 ml test- tubes and immediately centrifuged for 8 minutes at 1300 rpm. The A-PRF membrane, in our methodology,[16] is formed out of two A-PRF clots by putting them on top of one another - the areas bordering with the red part are put at the opposite ends and it is then dried in a special for this case box - A-PRF Box®.

Fig.2- The fibrin clot, separated from the lower part of the centrifuged blood and placed in the A-PRF Box.

Surgical treatment: Under inferior alveolar nerve block anesthesia, an intrasulcular incision was made and tooth 36 was atraumatically extracted with forceps. The socket was curetted for granulation tissues and rinsed with saline solution. PRF was packed in layers until the socket was filled to the gingival margin. The edges of the wound were sutured with eight likenesses non-resorbable thread 000.

A **B**

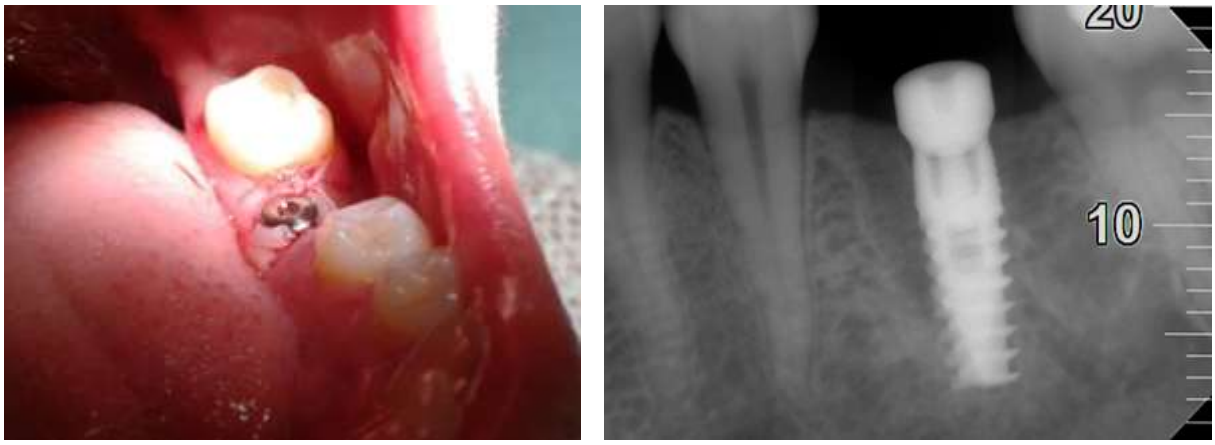
Fig.3 *A – Clinical photograph of the extracted tooth 36. B – Clinical photograph of the sutured extraction socket.*

Postoperatively the patient was prescribednon-steroidal anti-inflammatory drugs for three days and 0.12% chlorhexidine rinse twice a day for 2 weeks. After 10 days sutures were removed. During the postoperative period, no infection or inflammation was observed. After 4 months a second surgery was performed in order to place the dental implant. On panoramic radiography bone-like density at the extraction site was observed. During the second surgical re-entry, the pilot drilling was made with a trephine bur with an external diameter of 3.5 mm in apical-coronal direction.

A **B**

Fig.4*- A – Panoramic radiograph four months after tooth extraction and socket preservation procedure. B – Clinical photograph of bone biopsy.*

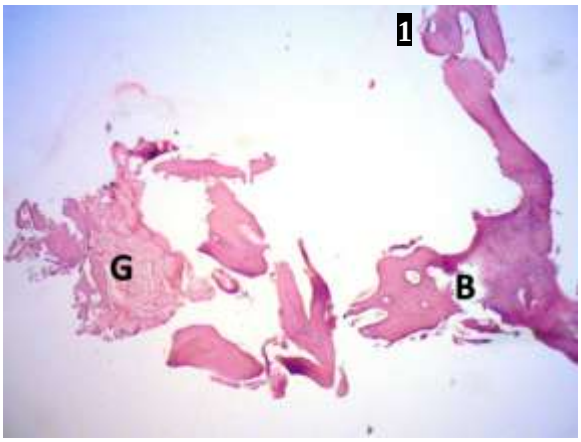
A dental implant with diameter 4.2mm and length 11.5 mm was placed according to the recommendations of the manufacturer.



A **B**

Fig.3*- A - Clinical photograph after implant placement. B – Intraoral radiograph after implant placement.*

Histology:A histological evaluation of the bone cores, taken from the extraction site four months after the extraction revealed new bone formation. The sections of bone were examined under light microscopy to identify the bone content using100x magnification. Bone cores were stained with haemotoxylin and eosin. (Figure 4)



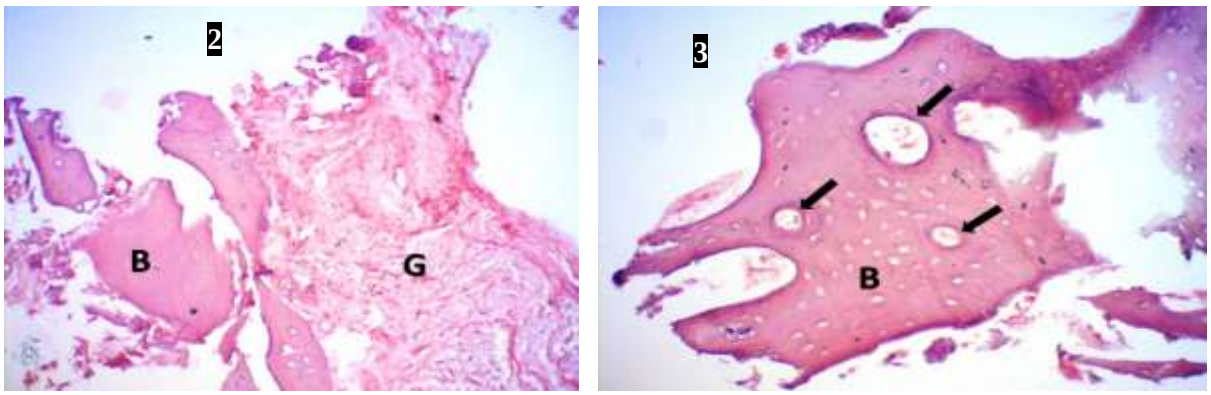


Fig.4*-1–Overall histological appearance of the material demonstrating newly formed bone (B) and granulation and maturing connective tissue (G)(magnification x25 HE) 2 - A fragment of the material demonstrating mature connective tissue (G) between bone fragments (B) (magnification x100, HE.)3 - A piece of material demonstrating the newly formed bone (B) with the presence of capillaries (black arrows) in it (magnification x100, HE)*

III. DISCUSSION

Recently, autologous platelet concentrates have been successfully implemented in maxillofacial surgery.[17] Initially, PRP was first introduced in the oral surgery practice, but because of its disadvantages such as the content of synthetic or anticoagulant materials and shorter releasing period, it was substituted by PRF.[18] On the contrary PRF contains more growth factors and releases them gradually.(19)PRFalso delivers platelet-derived factors and transforming growth factors.[20]PRF is implemented in the dental practice not only as a source of growth factors but as a fibrin-based living biomaterial.[12]

Intriguingly, PRF was found to stimulate cell proliferation of osteoblasts and periodontal ligament cells and to inhibit epithelial cell production.[21,22]Zhao et al.[9]reported a clinical case report of filling of a post-extraction socket with PRF as a sole grafting material. Results revealed no infectious episodes or purulent complications during the healing period. Indeed PRF also reduced alveolar bone resorption.As reported by Chang et al.[23] PRF stimulates the expression of phosphorylated extracellular signal-regulated protein kinase (p-ERK) and activates osteoprogerin (OPG) production, which leads to new bone formation. Mazor et al.[24] in a study with sinus floor augmentation with PRF as a sole filling material reported a high volume of natural regenerated bone in the subsinus cavity 6 months after surgery.

The results of our clinical case show that PRF is able to stimulate rapid formation of new bone in the alveolar socket after tooth extraction.These results are confirmed with clinical and histological evaluation.

IV. CONCLUSION

In this case report, PRF was found to be beneficial for the uncomplicated healing of the extraction socket. In addition, PRF also enhances the bone regeneration process. More clinical cases and additional research is needed to confirm the achieved results.

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