



## EFFECT OF PLATELET RICH FIBRIN AND BIO-OSS FOR SOCKET PRESERVATION

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### ABSTRACT

**Objectives:** The aim of the present was to evaluate the effect of platelet rich fibrin and bio-oss for socket preservation. **Subjects and methods:** Thirty patients were divided randomly, into 3 groups: Group (A): include sockets which left to heal alone. Group (B): include sockets grafted with bio-oss. Group (C): include sockets grafted with bio-oss and PRF. Follow up: 1<sup>st</sup> and 7<sup>th</sup> day post operatively to evaluate patients clinically, and 1, 6 months for radiograph evaluation by CBCT. **Results:** There were a statistically significant reduction in boneheight, width and density in group C, B than group A (control group). Group C showed limited reduction and best results in length, width, density and volumetric changes than group B. **Conclusion:** Bio-oss bone either grafted with PRF or not is effective on healing process and decrease bone resorption than leaving socket to heal alone.

**KEYWORDS:** Bio-oss, PRF, bone length, bone width.

### INTRODUCTION

Alveolar ridge resorption, occurs after tooth extraction and can make implant placement difficult or affect the final aesthetic result. Several techniques for maintaining normal bone and soft tissue contours are of great interest to clinicians and patients as even resorption of the buccal plate after extraction can have significant clinical implications, particularly in the cosmetic field. Moreover Loss of ridge height and width also results in prosthetic instability and complicated esthetic tooth replacement with implants which may require extensive reconstructive surgery later on <sup>(1)</sup>.

Alveolar ridge preservation is a post-extraction procedure to reduce resorption of the alveolar ridge and increase bone formation within the socket. However, there are clinical cases when ridge preservation at the time of extraction is not recommended as it is in acute infections. In these cases, ridge preservation can be delayed for six to eight weeks after extraction <sup>(2,3)</sup>.

The rational behind ridge preservation is modulation of early stage ridge resorption, increasing bone density and facilitating future implant placement<sup>(4)</sup>. Several solutions have been proposed for preserving extraction socket; atraumatic extraction of the tooth, immediate

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implant placement<sup>(5,6)</sup>, grafting materials with or without barrier membrane<sup>(7,8)</sup>, and also barrier alone can be used without grafting materials<sup>(9)</sup>.

Different grafting materials have been used including; autogenous bone graft harvested from one site to another within the same individual. Allograft transferred between members of the same species, xenografts from different species as bovine bone graft and alloplasts which are synthetic in origin<sup>(10)</sup>. The use of autogenous bone has always been the gold standard, but at times, autogenous bone harvesting is not feasible, where now the alternatives are allografts, xenografts or alloplastic material<sup>(11)</sup>.

Platelet-rich fibrin (PRF) belongs to a new generation of platelet concentrates with simplified processing and without biochemical blood preparation. Although platelet rich fibrin (PRF) resembles an autologous fibrin gel with scarring properties, it is actually a new concept of platelet concentration. Its production protocol attempts to aggregate the platelets and cytokines released into the fibrin clot. These data have been documented for previous generations of platelet concentrations (e.g. different types of concentrated platelet rich plasma (cPRP)<sup>(12)</sup>.

## SUBJECTS AND METHODS

Thirty patients attended to extract teeth indicated for extraction as badly destructed teeth, failed root canal treatment and remaining roots from outpatient clinics at department of oral and maxillofacial surgery, dental medicine faculty, Cairo, boys, Al-Azhar University.

Inclusion criteria includes patients who have good general health, hopeless or badly decayed teeth indicated for extraction and free from any systemic condition that may alter the treatment.

Exclusion criteria include pregnancy, traumatic extraction, patients with systemic disease or taking medications affect bone metabolism, patients who received radio therapy to the head and neck area and heavy smokers.

Patients were divided randomly into three groups: Group (A): (control group) include sockets which left to heal alone, Group (B): include sockets grafted with bio-oss, Group (C): include sockets grafted with bio-oss and PRF.

The procedure was done with local anesthesia (Mepecaïne–L, Alexandria Co. for pharmaceuticals, Egypt), Ten ml. intravenous blood was obtained into a syringe and collected in a sterile tube without anti-coagulant and immediately centrifuged in centrifugation machine (Electric laboratory centrifuge, 4Yang, China). at 3,000 revolutions per minute (rpm) for 10 min<sup>(12)</sup> as shown in figure (1a). Atraumatically extraction was done, after extraction a proper socket curettage was done using bone curette under continuous irrigation of saline. Sharp periosteal elevator used for reflection of buccal and lingual mucosa, in group (B) bio-oss (Bio-oss bone xenograft, Geistlich pharma, Switzerland) was grafted alone as shown in figure (1b), while in group (C) bio-oss was grafted with PRF as shown in figure (1c), then suture was done, post surgical medications include antibiotic and analgesic. Follow up during first week to assess pain and suture removal then radiographically one and six months by CBCT as shown in figure (1d & e) (Cone beam computed tomography, Planmeca promax, Italy).

**Statistical analysis of the data:** Statistical analysis was carried out using Microsoft Excel 2010 program. While testing significance was performed using IBM® SPSS® Statistics Version 20 for Windows and Graph Pad Prism Version 8. Paired t test was performed to test the significance between the follow up periods within each group to detect the effect of time on bone length and width. In addition, One Way ANOVA test followed by Tukey's post hoc test for multiple comparisons were performed to test the significance between all groups at each follow up periods regarding bone length and width. Finally, Chi Square test was performed to test the significance between all groups at each follow up periods regarding bone type.

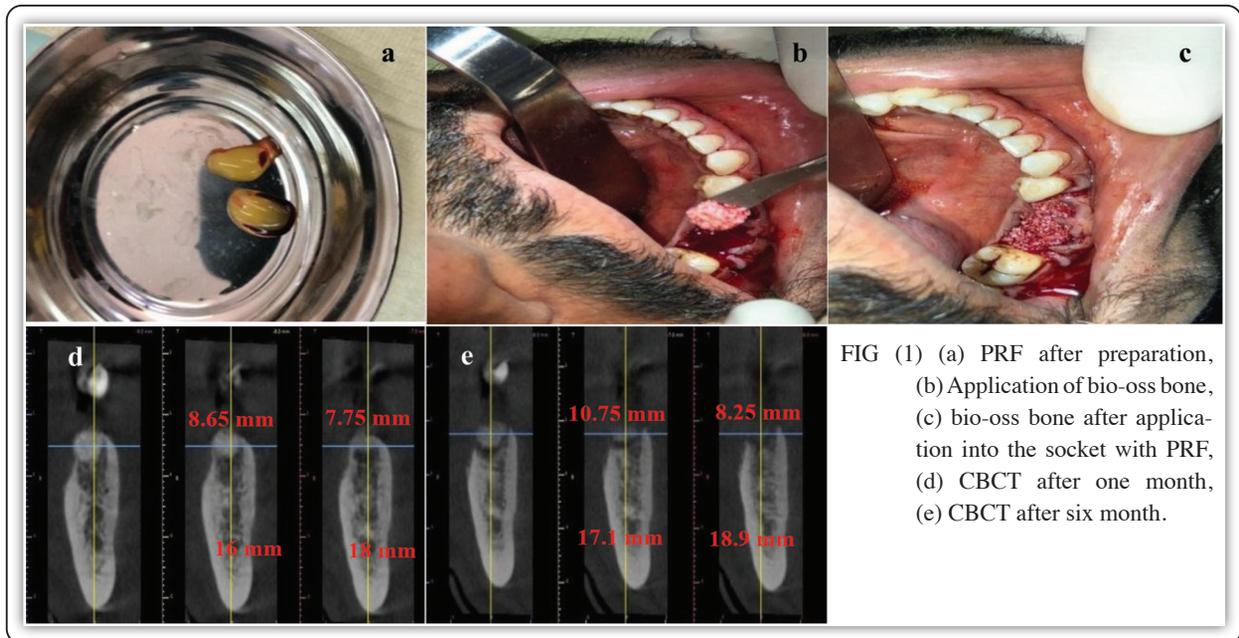


FIG (1) (a) PRF after preparation, (b) Application of bio-oss bone, (c) bio-oss bone after application into the socket with PRF, (d) CBCT after one month, (e) CBCT after six month.

**RESULTS**

At the present study as shown in table (1), it has been found that the reduction of bone height in the control group was about 11.11% and width was about

14.53, compared to the second group the reduction of the bone length was about 3.36% and width was about 3.18%, while the third group the reduction in height was 1.14% and width reduction was 86%. whereas bone height and width is preserved.

**TABLE (1)** Table showing Overall comparison between the three groups

	Group (A)	Group (B)	Group (C)	P-value
<b>Bone Length in mm</b>				
After one month	14.131±1.763 <sup>a</sup>	14.25±1.30 <sup>a</sup>	13.94±1.05 <sup>a</sup>	0.8834*
After six months	12.56±1.74	13.77±1.21	13.78±1.11	0.0944*
P-value	0.06*	0.404*	0.7444*	
Mean Difference	1.571±0.023 <sup>a</sup>	0.48±0.09 <sup>b</sup>	0.16±0.06 <sup>c</sup>	<0.0001**
% Reduction	-11.11%±1.32 <sup>a</sup>	-3.36%±1.48 <sup>b</sup>	-1.14%±0.16 <sup>c</sup>	<0.0001**
<b>Bone Width in mm</b>				
After one month	5.85±0.84	6.91±0.57	8.14±0.97	<0.0001**
After six months	5±0.82	6.69±0.46	8.07±0.97	<0.0001**
P-value	0.0343**	0.3548*	0.874*	
Mean Difference	0.85±0.02 <sup>a</sup>	0.22±0.11 <sup>b</sup>	0.07±0.001 <sup>c</sup>	<0.0001**
% Reduction	-14.53%±2.44 <sup>a</sup>	-3.18%±2.91 <sup>b</sup>	-0.86%±1.03 <sup>b</sup>	<0.0001**

## DISCUSSION

The resorption and remodeling of the alveolar ridge after tooth extraction is a normal healing phenomenon, which is physiologically undesirable and possibly inevitable and can impair implant placement.<sup>(13)</sup>

The aim of the present study was to evaluate the ridge preservation using Bio-oss bone graft with PRF after tooth extraction clinically and radiographically. The present study was carried out on thirty patients suffering from curious or badly decayed teeth indicated for extraction. Thirty patients were divided into 3 groups (10 of each): Group A (sockets were left to heal alone). Group B (sockets were grafted with Bio-Oss). Group C (sockets were grafted with Bio-Oss and PRF). Postoperative evaluation was done clinically and radiographically (CBCT postoperatively 1,6 months) to measure bone height, width, volumetric changes and relative bone density.

In this study, a non-traumatic extraction was performed because lifting and advancing a full thickness flap can cause postoperative bone resorption, marginal recession of adjacent teeth, defective papillae, and loss of keratinized mucosa. Bio-oss is a deproteinized bovine bone mineral that has been used to transplant bone defects and extraction sockets of dogs mandible, and the biomaterial served as a scaffold for new bone formation (14). The biocompatibility of the material is based on its manufacture with the aim of removing the protein and fat components from the original material and making it inorganic before it is sterilized by heat and radiation.<sup>(15-17)</sup>

In this study after extraction, Bio-oss powder was mixed with either saline or blood and inserted in the socket in group B, a mixture of Bio-oss and PRF preparation was inserted in the sockets of the C group. The PRF membrane was covered on the grafted material before suturing.

In the current study, obtaining a PRF was very simple. A blood sample without anticoagulant was

taken into 10 ml tubes which were immediately centrifuged for 10 minutes at 3000 rpm. The absence of anticoagulants means that most of the platelets in the blood sample are activated upon contact with the tube walls within a few minutes and triggering coagulation cascades. Fibrinogen first accumulates at the top of the tube before circulating thrombin converts it into fibrin. Then a fibrin clot forms in the middle of the tube, right between the red blood cells at the bottom and the acellular plasma at the top. Theoretically, platelets are largely trapped in the fibrinolytic network. The success of this technique depends entirely on the speed with which the blood is drawn and transferred to the centrifuge<sup>(12)</sup>.

Centrifugation of freshly drawn blood without the addition of anticoagulants or thrombin leads to the normal formation of a platelet-rich fibrin clot and leukocytes with entrapped bioactive proteins, representing a system for the slow release of growth factors. In addition, fibrin formation supports cell migration<sup>(12)</sup>.

Bone loss affect width and height of the socket, in this study it has been found that the reduction of bone height in the control group was about 11.11% and width was about 14.53, compared to the second group the reduction of the bone length was about 3.36% and width was about 3.18%, while the third group the reduction in height was 1.14% and width reduction was 0.86%. Whereas bone height and width is preserved when Bio-oss and PRF are used for grafting the socket after extraction. In this study postoperative evaluation of volumetric changes of 3 groups along the study period revealed that, The control group A showed a volume reduction (25.076%) while the study groups showed volume reduction (9.46%) in group B and (5.889%) in group C. The volumetric change of the extraction socket in the study groups differ significantly with the control group. This study provides clinical, volumetric and radiologic evidence to suggest that Bio-oss alone or in combination with PRF can be an inexpensive alternative to the traditional bone marrow used in ridge preservation technology.

There was a statistically significant difference between the three groups; control group showed reduction in bone density about (47.94%) while the study groups showed group B

(37.19%), and group C (37.48%), that mean bone density in group A was attributed to normal healing while group B, C density values were attributed to the socket grafting with bio-oss and PRF, The results of this prospective randomized study show that alveolar ridge resorption with Bio-oss and PRF reduces alveolar ridge resorption in all dimensions compared to other outcomes after tooth extraction without preservation of the alveolar edge.

## CONCLUSION

The following conclusions can be drawn from the current study: Application of bio-oss graft with PRF is very effective and promising on enhancing the healing process and decrease bone resorption. Increase of bone height, width and density indicate the use of bio-oss graft with PRF as a valid method in decreasing bone resorption and socket preservation to be ready for any procedure such as implant.

Although PRF belongs to a new generation of platelet concentrate, it is mainly a fibrinolytic technology. Indeed, the biological activity of the fibrin molecule by itself is sufficient to explain the large scar capacity of PRF.

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