

## The Use of Platelet Rich Fibrin and Demineralized Freeze Dried Bone Allograft in the Treatment of Intrabony Defect- A Case Report

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**Abstract:** Ideal graft material for regenerative procedures is autogenous bone graft but the major disadvantage with this graft is the need for a secondary surgical site to procure donor material and the frequent lack of intraoral donor site to obtain sufficient quantities of autogenous bone for multiple or deep osseous defects. So, to overcome these disadvantages, bone allografts were developed as an alternative source of graft material. Also the autologous platelet-rich fibrin clot (PRF) was used initially in implant surgery to improve bone healing. The homogeneous fibrin network that is obtained is considered by the promoters of the technique to be a healing biomaterial and is commonly used in implant and plastic periodontal surgery procedures to enhance bone regeneration and soft tissue wound healing. It contains platelets, growth factors, and cytokines that may enhance the healing potential of bone as well as soft tissues.

**Keywords:** autogenous, fibrin network, platelets, growth factors

### INTRODUCTION

Periodontitis is a chronic inflammatory disease that affects the investing and supporting tissue of the teeth. Periodontitis involves the annihilation of the gingival and periodontal ligament fibers, apical proliferation of junctional epithelium and resorption of the alveolar process, that leads to the formation of uneven defects in the interdental and marginal bone. Regenerative periodontal therapy comprises procedures which are specially designed to restore those parts of tooth-supporting apparatus which have been lost due to periodontitis. Regeneration is defined as a reproduction or reconstruction of a lost or injured part in such a way that the architecture and function of the lost or injured tissue are completely restored [1].

The ultimate goal of the periodontal therapy is not only to prevent periodontal disease progression but also to regenerate the dentition's lost supporting structures such as cementum, periodontal ligament and bone in the diseased root surfaces where appropriate. Various materials such as autogenous grafts, allografts, xenografts, alloplasts have been aimed in the treatment of intrabony defect [2].

Among the various bone grafts used in the regeneration therapy of intrabony defects, Demineralized Freeze Dried Bone Allograft (DFDBA) has osteoinductive potential that induce bone formation due to the influence of bone inductive proteins, a class of the transforming growth factor beta superfamily called bone morphogenic proteins (BMP's). Histological evidence suggests that the new attachment is achieved with the use of DFDBA.

In 1974 Platelet Regenerative Potentiality was introduced. Ross et al was the 1st to describe growth factor from platelets. The activation of platelets release growth factors which stimulate a mitogenic response in the bone periosteum during normal wound healing for the repair of bone [4]. Platelet Rich Plasma (PRP) was introduced to dentistry in 1998 by Marx et al. Marx stated that PRP should contain more than 1,000,000 platelets/ml to effectively enhance wound healing. Many studies have demonstrated that PRP is able to enhance early graft maturity, bone density and new bone formation in ridge preservation procedures, mandibular reconstruction, repair of peri-implant defects and sinus augmentation [5].

However Choukroun et al developed the Platelet Rich Fibrin (PRF) in 2001 at France and attempted to evaluate the potential of PRF with Freeze dried bone allograft (FDBA) to enhance bone regeneration in sinus floor. PRF is the second generation of platelet concentrate which can be used to promote wound healing, bone regeneration, graft stabilization and hemostasis. Release of growth factors from PRF and their good results led to optimize the clinical application of PRF. It has been extensively used in combination with bone graft materials for periodontal regeneration, ridge augmentation, sinus lift procedures and for coverage of recession defect in the form of membranes [6].

### CASE REPORT

A 45 year old male patient reported to OPD of Subharti Dental College And Hospital with the chief complaint of pain and food lodgement in lower right side since 3 months. Clinical examination revealed deep periodontal pockets on right side. The probing depth was found to be 9mm while the clinical attachment level was found to be 15mm between 46 and 47. The area of the intrabony defect was calculated as  $167.3\text{mm}^2$ .

Patient was systemically healthy and was not taking any medications. Routine blood investigations were found to be within normal limits. Radiological examination revealed evidence of angular bone loss on right side.

### Treatment

After phase I therapy, periodontal pockets and clinical attachment level were measured. The following recordings were made at baseline, 3 months and 6 months in the performa designed for study:

- Clinical parameters include:
  - Probing pocket defect (in mm) measured by UNC-15 periodontal probe using gingival margin as a reference.
  - Relative attachment level (in mm) was recorded using acrylic stent on study cast for each patient and trimmed to height of contour of the teeth and one vertical groove prepared to reproduce the probe angulation and position (Fig. 1).
- Digital Radiography to assess the area of the defect - Radiographs were recorded by using the RINN XCP system (Dentsly, U.S.A) by the standardized technique with the digital radiovisuography (R.V.G). In order to calibrate measurements digitally, the distance from the cusp tip to the cemento-enamel junction was calibrated to this scale. (Fig. 2). The intra bony component was assessed on the following parameters:
  - INFRA: An auxiliary line (AUX I) was drawn in the direction of the tooth axis. Then

a second auxiliary line (AUX II) perpendicular to the tooth axis drawn through the most coronal extension of the lateral wall of the infrabony defect. INFRA will be measured from the point where AUX II crossed the contour of the root to bony defect (BD).

- BDW: The width of bony defect was measured from the coronal most point of the lateral margin of the infrabony defect to the point where AUX II crossed the root surface.
- AB: The third side of the defect triangle was measured as the distance from the coronal most point of the lateral margin of the infrabony defect to BD [7].

AREA OF DEFECT:  $\text{INFRA} \times \text{BDW} \times \text{AB}$

All the parameters were recorded at baseline, 3 months and 6 months interval.

### Procedure for preparation of PRF

10 ml blood sample of the patient without anticoagulant was taken in the test tube and centrifuged immediately at 3000rpm for 10min. The resultant product consisted of the following 3 layers:

- Top layer- Acellular platelet poor plasma.
- PRF clot in the middle.
- RBC at the bottom.

The PRF clot was recovered, pressed between sterilized glass slab and a slide. It was cut in few mm fragments.

### Surgical Procedure

Under local anesthesia, crevicular incision was given and a mucoperiosteal flap was raised. The area was degranulated (Fig. 3) and pre suturing was done prior to the placement of the bone graft. Defect was isolated. The defect was filled with homogenous mass of DFDBA (Fig. 4) mixed with PRF (Fig. 5). After the complete condensation and filling of the defect, the suture was tightened over the defect site and also placed in the adjacent site so as to ensure complete approximation of the flap (Fig. 6). Following this a periodontal pack was applied over the site. The patient received postoperative instruction. At 10 days postoperatively, patient returned for suture removal and reinforcement of oral hygiene instructions.

The parameters were recorded at baseline, 3 months and 6 months.



**Fig. 1: Pre-operative RVG of the patient**



**Fig. 2: Clinical attachment level before surgery**



**Fig 3: Flap reflected and debrided, defect visible**



**Fig. 4: DFDBA placed in the defect**

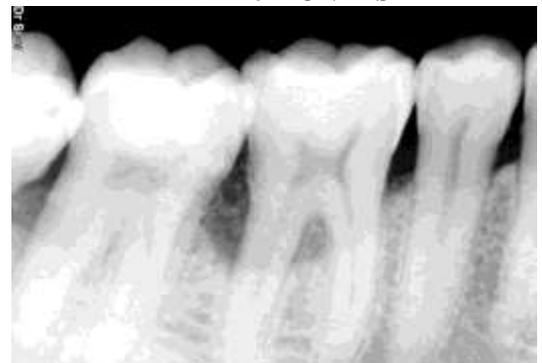


**Fig. 5: PRF membrane placed in the defect**



**Fig. 6: Sutures placed**

**AFTER 6 MONTHS**



**Fig. 7: Post-operative RVG of the patient**



**Fig. 8: Clinical attachment level after surgery**

## RESULTS

The clinical probing depth at Baseline was found to be 9mm. The clinical attachment level was found to be 15mm and the area of the intrabony defect was calculated as 167.3mm<sup>2</sup>.

The clinical probing depth after six months was found to be 5mm. The clinical attachment level was found to be 8mm and the area of the intrabony defect was calculated to be 16.7mm<sup>2</sup> (Fig. 7, Fig. 8).

## DISCUSSION

Bone grafting materials must possess attributes of biocompatibility (lacking an immunogenic response) and properties such as osteogenesis, osteoinduction and osteoconduction. Osteogenesis is the mechanism of forming bone directly from osteoblasts. Osteoinductive materials are capable of inducing the transformation of mesenchymal cells into osteoblasts, thereby enhancing bone growth. Osteoconduction is the process that permits bone apposition from existing bone and stimulates new attachment.

Bone allograft is the most frequently used alternative to autogenous bone. Allografts are grafts transferred between genetically dissimilar members of the same species. Three types of bone allografts are being used in periodontics: Fresh frozen iliac bone, FDBA, DFDBA.

DFDBA is used most often. Bone allografts come in different forms: particulate, gels, and putties. DFDBA is the allogenic bone that has undergone extensive demineralization and exhibits capacity to induce bone in nonorthotopic sites such as muscle. DFDBA provides an osteoconductive surface. In addition, it provides a source of osteoinductive factors. Therefore, it elicits mesenchymal cell migration, attachment, and osteogenesis when implanted in well-vascularized bone and it induces endochondral bone formation when implanted in tissues that would otherwise not form bone. Quintero *et al.* [8] did a six month clinical evaluation of Decalcified freeze dried allograft in periodontal osseous defect. Demineralization in cold, diluted hydrochloric acid exposes the components of bone matrix, closely associated with collagen fibrils that have been termed bone morphogenetic protein.

The scientific rationale behind the use of platelet preparations lies in the fact that the platelet  $\alpha$ -granules are a reservoir of many growth factors that are known to play a crucial role in hard and soft tissue repair mechanism [9, 10] These include platelet-derived growth factors (PDGFs), transforming growth factor beta (TGF- $\beta$ ), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF), insulin like growth factor-1 (IGF-1). Platelet growth factors

exhibit chemotactic and mitogenic properties that promote and modulate cellular functions involved in tissue healing and regeneration, and cell proliferation. It appears that the release of these growth factors is affected by a number of factors related to the preparation, handling and storage of the platelet preparation [11].

There are many advantages of using PRF, a second-generation platelet concentrate. PRF does not use bovine thrombin or other exogenous activators in the preparation process. It forms a gel-like matrix that contains high concentrations of non-activated, functional, intact platelets, contained within a fibrin matrix, that release, a relatively constant concentration of growth factors over a period of 7 days [12]. In the form of a membrane, it can be used as fibrin bandage serving as a matrix to accelerate the healing of wound edges [13, 14]. Being autologous in nature, it is relatively inexpensive as no additional cost for synthetic membranes is incurred to the patients. Furthermore, the chair side preparation of PRF is quite easy and processing is fast and simple [15].

Various studies have been done before regarding the use of DFDBA and PRF.

Mellonig *et al.* [16] carried out a study to evaluate DFDBA in human periodontal defects. 47 intraosseous defects were treated, 32 with DFDBA and 15 by open flap debridement. All defects were evaluated at least 6 months post surgery. Re-entry showed that there was 2.57mm of bone repair (64.7% fill of the defect) while in which no graft was placed there was 1.26mm of bone repair (37.8% fill of defect). They concluded that DFDBA has definite potential as a graft material in periodontal regenerative therapy.

Werbittl [7] presented several case reports where DFDBA was used to treat advanced infrabony defects and where new bone formation has occurred. A total of 20 defects were treated. At the 9 month evaluation, the 6 cases presented in this report had minimum probing depth and radiographic evidence of substantial bone fill. The amount of repair ranged from 75% to 90% of the original defect. Bone fill was achieved on both vital and non vital teeth. Thus they concluded that DFDBA plays a significant role in the treatment of intrabony defects.

Thorat *et al.* [15] studied the clinical effect of autologous PRF in the treatment of intrabony defects. 40 patients were selected. The control group was treated with conventional flap surgery whereas the test group was treated with conventional flap surgery with autologous PRF. Clinical parameters like plaque index, sulcus bleeding index, probing depth, CAL and gingival margin level were recorded at the baseline and 9 month

post operatively. They concluded that there was greater reduction in probing depth, more clinical attachment gain and greater intrabony defect fill at sites treated with PRF than the open flap debridement alone.

Bansal *et al.* [18] evaluated the efficacy of autologous PRF with the DFDBA in the treatment of periodontal intrabony defect. 10 patients having almost identical intrabony defects with clinical probing depth of atleast 6mm were selected for study. In group 1–DFDBA was placed and in group 2-PRF with DFDBA was placed. Clinical and radiographic parameters were recorded. They concluded that a combination of PRF and DFDBA demonstrated better results in probing depth reduction and clinical attachment gain as compared to DFDBA alone in the treatment of periodontal intrabony defect.

### CONCLUSION

It can be concluded that the use of DFDBA and PRF when used for the intrabony defect bring significant improvement in the clinical probing depth, Relative attachment level and Radiographically bone fill.

### REFERENCES

1. Karring T, Linde J, Cortellini P; Regenerative periodontal therapy. *Clinical Periodontology and Implant Dentistry*. 4<sup>th</sup> edition, Oxford: Blackwell Publishing Ltd., 2003.
2. Aspriello SD, Ferrante L, Rubini C, Piemontese M; Comparative study of DFDBA in combination with enamel Matrix derivative versus DFDBA alone for the treatment of periodontal intrabony defects at 12 months post-surgery. *Clin Oral Invest.*, 2011; 1: 225-232.
3. Agarwal A, Gupta ND; Comparative evaluation of decalcified freeze-dried bone allograft use alone and in combination with polylactic acid, polyglycolic acid membrane in the treatment of noncontained human periodontal intrabony defects. *Quintessence*, 2012; 4: 761-768.
4. Naik B, karunakar P; Role of platelet rich fibrin in wound healing: A critical review. *J Conserv Dent.*, 2013; 16: 284-293.
5. Huang LH, Neiva REF, Soehren SE, Giannobile WE, Wang H; They effect of Platelet-Rich Plasma on the Coronally Advanced Flap Root Coverage Procedure: A Pilot Human Trial *J Periodontol.*, 2005; 76: 1768-1775.
6. Tanya J, Thomas BS; Platelet rich fibrin membrane for recession coverage. *e-Journal of Dentistry*, 2012; 2: 223-226.
7. Quintero GF, Mellonig JT, Gambill VM, Pelleu GB; A six month clinical evaluation of decalcified freeze dried bone allograft in periodontal osseous defects. *J. Periodontol.*, 1982; 53:726-730.
8. Eickholz P, Horr T, Klein F, Hassfeld, Kim T; Radiographic parameters for Prognosis of Periodontal Healing of Intrabony Defects: Two Different Definitions of Defect Depth. *J Periodontol.*, 2004; 75: 399-407.
9. Marx RE, Carlson ER, Eichstaedt RM, Schimmele SR, Strauss JE, Georgeff KR; Platelet-rich plasma: growth factor enhancement for bone grafts. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.*, 1998; 85: 638-646.
10. Anitua E, Sanchez M, Orive G, Andia I; The potential impact of the preparation rich in growth factors (PRGF) in different medical fields. *Biomaterials* 2007; 28: 4551-60.
11. Schmidmaier G, Herrmann S, Green J. Quantitative assessment of growth factors in reaming aspirate, iliac crest, and platelet preparation. *Bone*, 2006; 39:1156-1163.
12. Carroll RJ, Amoczky SP, Graham S, O'Connell SM; characterization of autologous growth factors in cascade platelet rich fibrin matrix (PRFM). Edison NJ: Musculoskeletal Transplant Foundation, 2005.
13. Gabling V, Acil Y, Springer IN, Hubert N, Wiltfang J; Platelet-rich plasma and platelet-rich fibrin in human cell culture. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.*, 2009; 108(1): 48-55.
14. Vence BS, Mandelaris GA, Forbes DP; Management of dentoalveolar ridge defects for implant site development: an interdisciplinary approach. *Compend Contin Educ Dent.*, 2009; 30: 250–252.
15. Thorat MK, Pradeep AR, Pallavi B; Clinical effect of autologous platelet-rich fibrin in the treatment of intra-bony defects: a controlled clinical trial. *J Clin Periodontol.*, 2011; 38(10): 925-932.
16. Mellonig JT, Captain DC; Decalcified freeze-dried bone allograft as an implant material in human periodontal defects. *IntJ Periodontol Rest Dent.*, 1987; 6: 40-55.
17. Werbit M; Decalcified freeze-Dried bone allografts: A successful Procedure in the Reduction of intrabony defects. *Int J Periodontol Rest Dent.*, 1987; 5: 56-62.
18. Bansal C, Bharti V; Evaluation of autologous platelet rich fibrin with the demineralized freeze dried bone allograft in the treatment of periodontal intrabony defects. *J Indian Soc Periodontol.*, 2013; 17: 361-366.