# Application of Platelet Rich Fibrin and Osseomold Bone Graft in Different Intrabony Defects – 2 Case Reports

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## Abstract

Aims & objectives: The motto behind any periodontal treatment is arrest of periodontal disease and regeneration of lost periodontium. Various treatment strategies have been employed in treatment of intrabony defects, but the best way to obtain regeneration is probably by mimicking the actual occurring events that takes place in the formation of the periodontal tissues at embryonic stage. Conventional open flap debridement falls short of regenerating tissues destroyed by the disease and current regenerative procedures offer a limited potential towards attaining complete periodontal regeneration. Platelet rich fibrin (PRF), a second generation platelet concentrate is widely used in osseous regeneration.
Case description: The present study aimed to explore the clinical and radiographical effectiveness of autologous PRF along with the osseomold bone graft in treatment of 2 different cases of intrabony defects in chronic periodontitis subjects.
Conclusion: Among the 2 subjects, case-1 had 2-wall defect and case-2 patient had 3-wall defect. Both the subjects reported to the department with a complaint of food impaction and with clinically accessible >7-8mm pocket. Pocket depth was assessed at 3 months, 6months and 9months respectively and radio graphically bone gain was accessed at 3 month and 6 months.

**Key words:** Fibrin; platelets; chronic periodontitis; wound healing.

## Introduction

Reconstructive dental surgeons are constantly looking for an "edge" that jump starts the healing process to maximize predictability as well as the volume of regenerated bone. Is it bone morphogenetic protein-2 (BMP-2), recombinant platelet derived growth factor-BB (rhPDGF-BB), platelet rich plasma (PRP), plasma rich in growth factors (PRGF), or a combination of all? The question serves to introduce a second generation platelet concentrate, platelet-rich fibrin (PRF).

PRF is easy to obtain, less costly, and a possibly very beneficial ingredient to add to the "regenerative mix." Regardless of the choice of graft material (autograft, allograft, xenograft or alloplast) or membrane selection (bioresorbable or nonresorbable), predictable bone regeneration is dependent upon 4 major biologic principles: primary wound closure, blood supply, space maintenance, and wound stability. [1]Blood supply provides the necessary cells, growth factors, and inhibitors to initiate the osteogenic biomineralization cascade. [2]

Injury to blood vessels during oral surgical procedures causes blood extravasation, subsequent platelet aggregation, and fibrin clot formation. The major role of fibrin in wound repair is hemostasis, but fibrin also provides a matrix for the migration of fibroblasts and endothelial cells that are involved in angiogenesis and

responsible for remodeling of new tissue. Platelet activation in response to tissue damage and vascular exposure results in the formation of a platelet plug and blood clot as well as the secretion of biologically active protein. [3] Platelet-rich fibrin (PRF) represents a new step in the platelet gel therapeutic concept with simplified processing minus artificial biochemical modification. [4] Unlike other platelet concentrates, [5-8] this technique requires neither anticoagulants nor bovine thrombin (nor any other gelifying agent), making it no more than centrifuged natural blood without additives.

Developed in France by Choukroun et al in 2001, [9] the PRF production protocol attempts to accumulate platelets and released cytokines in a fibrin clot. Though platelets and leukocyte cytokines play an important part in the biology of this biomaterial, the fibrin matrix supporting them certainly constitutes the determining element responsible for the real therapeutic potential of PRF. [10-11]

PRF is in the form of a platelet gel and can be used in conjunction with bone grafts, which offers several advantages including promoting wound healing, bone growth and maturation, graft stabilization, wound sealing and hemostasis, and improving the handling properties of graft materials. PRF can also be used as a membrane. Clinical trials suggest that the combination of bone grafts and growth factors contained in PRP and PRF may be suitable to enhance bone density.

With the support of literature in hand, the present modality for treating intrabony defects using the combination of bone graft and autologous PRF was carried out to see its effectiveness clinically and radiographically through the follow up data till 9 months.

**Case Reports**

**Case 1:** A 28-year-old female complaining of food lodgement and pain in the upper right maxillary region reported to the Department of Periodontics, PMNM Dental College and Hospital, Bagalkot, Karnataka, India. There was neither reported history of dental trauma, orthodontic treatment nor any adverse habits. Intraoral examination revealed generalized bleeding on probing with no noticeable swelling or pus exudation. The probing pocket depth (PPD) on distobuccal aspect of tooth #26 was 9mm with the periodontal attachment level (PAL) of 8mm, with negative results for mobility and fremitus test, precluding the possibility of trauma from occlusion. (Fig 1) A periapical radiograph was taken using the standardized techniques, which along with clinical evaluation revealed presence of 2 walled interproximal intrabony defects (IBD) (Fig 2)

**Case 2**: A 35-year-old male reported to the same institution complaining of pain and food lodgement in the lower left posterior region of mandible and mobility in relation with the last molar. In case of case 2, PPD on the distal aspect of tooth #37 was 8mm and PAL was 7mm, along with grade III mobile #38, which was extracted followed by antibiotic prophylaxis. (Fig 3)Further examination by periapical radiographs helped to appreciate the 3 walled intrabony defect in realation to distal aspect of tooth #37. (Fig 4)

Both the subjects did not give any relevant history of systemic condition which could interfere with physiological wound healing. Keeping all the findings in the mind, a thorough treatment plan was decided, including a series of therapeutic procedures,

1. Oral hygiene instructions, education & motivation regarding the oral hygiene maintenance.
2. Non-surgical periodontal therapy after a period of 2 weeks by means of conventional scaling and root planing, using curettes and ultrasonic instruments.
3. Recall after every week and re-examination of the patient after the completion of healing after 6 weeks following non-surgical periodontal therapy. PPD and PAL were measured every week for six weeks after the non surgical periodontal therapy and they were still found to be 8 mm and 7 mm respectively in case 1 subject but PPD & PAL was reduced by 1mm in case 2 subject.
4. Surgical periodontal therapy was done 2 weeks after the re-examination of the patient after completion of healing following non-surgical periodontal therapy.

Both the subjects, complete blood examination was assessed and values were before planning for the periodontal surgical procedure.

**PRF preparation:**

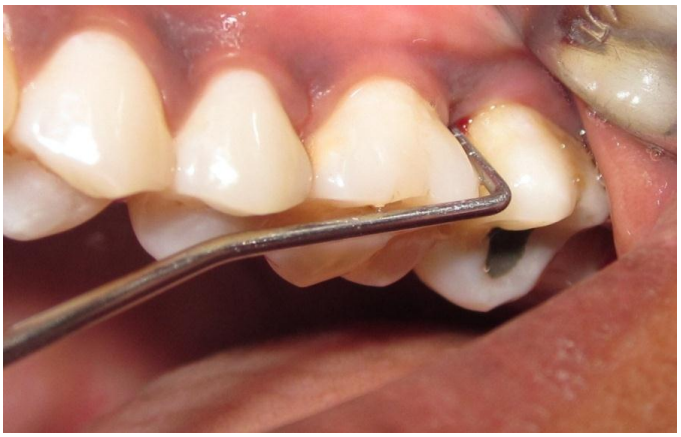
The PRF was prepared in accordance with the protocol developed by Choukroun et al. [9] just prior to surgery; the required quantity of intravenous blood was drawn & collected into 10ml sterile test tubes without an anticoagulant and centrifuged immediately for 12 min at 2700 rpm. The resultant product consisted of following 3 layers- topmost layer consisted of acellular platelet poor plasma (PPP), PRF clot in the middle and RBC's at the bottom. PRF was easily separated from red corpuscles base [preserving a small red blood cell (RBC) layer] using a sterile tweezers and scissors just after removal of PRF and then transferred onto a sterile dapen dish. (Fig 5)

Surgical procedure:

Intra-oral antisepsis was performed with 0.2% chlorhexidine digluconate rinse and Iodine solution was used to carry out extraoral antisepsis. Following administration of local anaesthesia, sulcular incisions were made and mucoperiosteal flaps were reflected. (Fig 6). Meticulous defect debridement and root planing were carried out. PRF of the required size mixed with osseomold was filled into the intrabony defect. (Fig 7) The mucoperiosteal flaps were repositioned and sutured followed by periodontal dressing.

**Postoperative Care:**

The Suitable antibiotics and analgesics (amoxicillin 500 mg four times per day for 5 days and ibuprofen 800 mg three times per day) were prescribed,



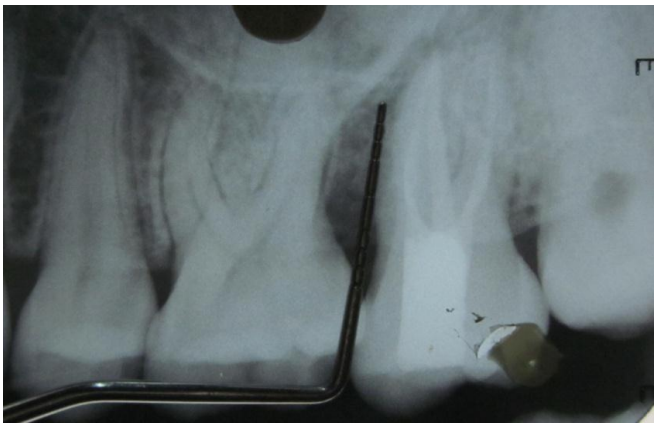
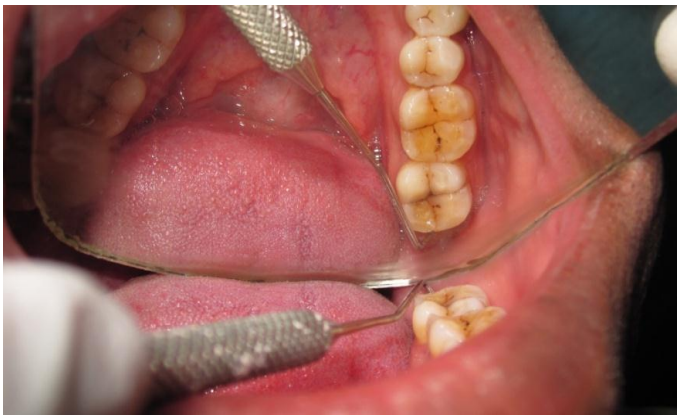


**Fig 1. Case 1: pre-operative probing depth**

**Fig 2. Case 1: IOPA showing the bone loss**



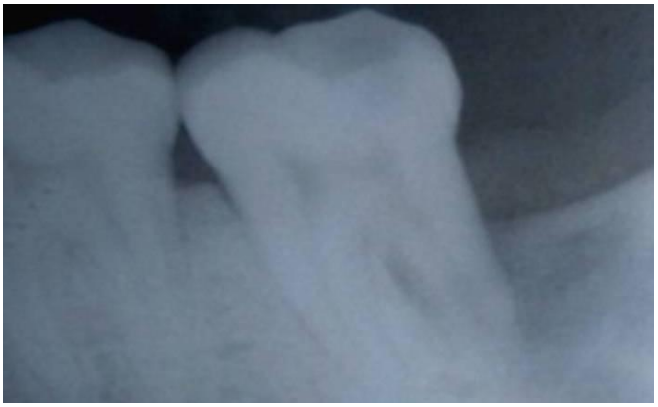
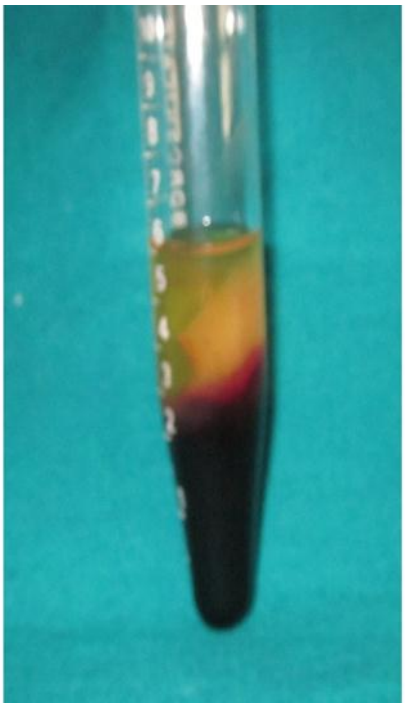
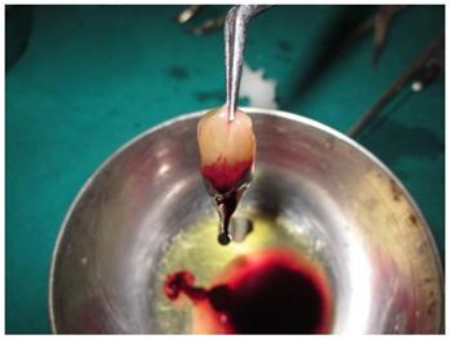
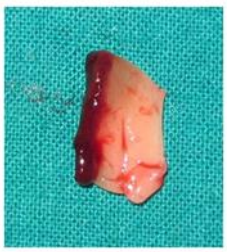


**Fig 3. Case 2: pre-operative probing depth**

**Fig 4. Case 2: IOPA showing the bone loss**







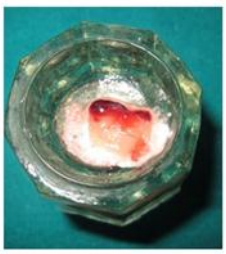


**Fig 5. Preparation of PRF & Bone graft mixture**

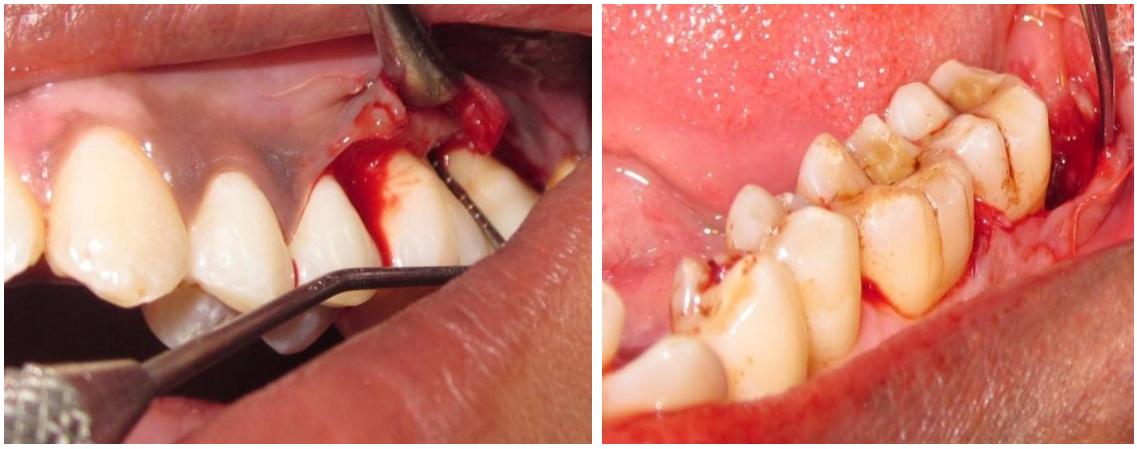


**Fig 6. After flap reflection**

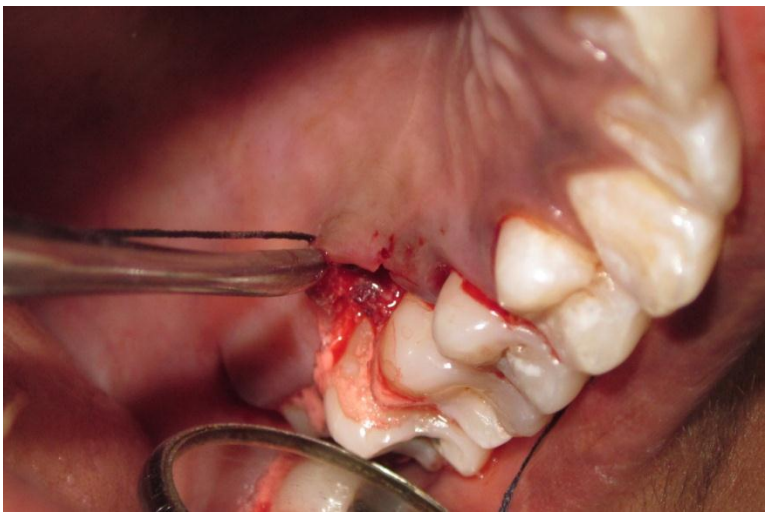


**Fig 7. Placement of PRF & Bone graft**

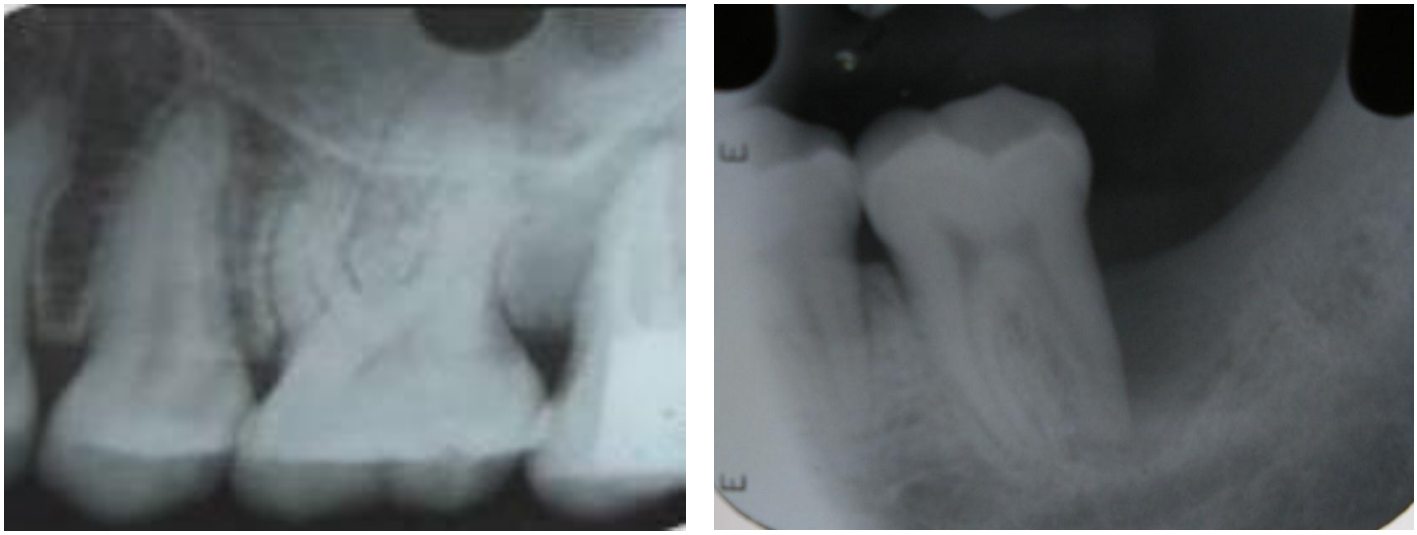


**Fig 8,9 - IOPA showing bone fill after 9 months**

along with chlorhexidine digluconate rinses (0.2%) twice daily for 2 weeks. Periodontal dressing and sutures were removed 2 weeks post-operatively. Surgical wounds were gently cleansed with 0.2% of chlorhexidine digluconate and patient was instructed for gentle brushing with a soft toothbrush. Patient was re-instructed for proper oral hygiene measures postoperatively and examined weekly up to 1 month after surgery and then 6 and 9 months. No subgingival instrumentation was attempted at any of these appointments. Re-examination at 9 months after the periodontal surgery revealed reduction in PPD (from 9 mm to 6 mm) and PAL (from 8 mm to 5 mm) in case 1(Fig 8) and in case 2 PPD (8mm to 5mm) and PAL (7mm-4mm) (Fig 9) respectively, with appreciable radiographic bone formation in the periodontal intrabony defect.

## DISCUSSION

The present case reports have shown the clinical efficacy of PRF and OSSEOMOLD in the treatment of IBD suggesting a significant reduction in PPD and PAL gain. Radiographically, significant radiographic bone formation in the intrabony defect, supporting the role of various growth factors present in the PRF in accelerating the soft and hard tissue healing was appreciated. Presence of a 3-wall IBD provided the best spatial relationship for defect bridging by vascular and cellular elements from the periodontal ligament and adjacent osseous wall.[12] Space maintenance is provided by the defect walls to minimize membrane collapse and/ or provides protection and retention of the grafts.[12] Osteoblasts cultured with PRF showed a intiation in mineralization process by using light and scanning electron microscopy and PRF leucocytes shown proliferation and interaction with osteoblasts. Preparation of PRF is quite easy, fast and simplified processing without any additional artificial biochemical modifiers as in PRP, which takes more time. [13] The PRF preparation process creates a gel like fibrin matrix polymerized in a tetramolecular structure that incorporates platelets, leukocyte, and cytokines, and circulating stem cells. [14] PRF would be able to progressively release cytokines during fibrin matrix remodeling; such a mechanism might explain the clinically observed healing properties of PRF. [15] It is also found that PRF organized as a dense fibrin scaffold with a high number of leukocytes concentrated in one part of the clot, [16] with a specific slow release of growth factors (such as transforming growth factor-1β, PDGF, and vascular endothelial growth factor) and glycoproteins (such as thrombospondin-1) during ≥7 days. [17] Simplified, easy, fast and cost effective processing of PRF preparation without use of any anticoagulant, along with functional, intact platelet in fibrin matrix and sustained release of growth factors, all these help to make PRF first in fibrin technology. [15]

## CONCLUSIONS

In the present case reports, clinical and radiographic findings reveal the amount of bone formation achieved with the combination of Osseomold +PRF in the treatment of a periodontal intrabony defects. PRF is an autologous preparation and found to be clinically effective and economical than any other available regenerative materials including PRP. However, long term, multicenter randomized, controlled clinical trial will be required to know its clinical and radiographic effect over bone regeneration.

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