

## CASE REPORT

# Platelet-Rich Fibrin in the Treatment of Periodontal Bone Defects

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## ABSTRACT

**Background:** Periodontitis is characterized by the formation of true pockets, bone loss and attachment loss. Various techniques have been attempted in the past to truly regenerate the lost periodontal structures, albeit with variable outcome. In this evolution, the technique being tried out widely is the use of platelet rich concentrates, namely platelet-rich fibrin (PRF).

**Case description:** In this report, we present a case of surgical treatment of osseous bone defects namely two walled crater and dehiscence treated in posterior teeth with autologously prepared platelet rich fibrin mixed with hydroxy apatite bone graft and PRF in the form of a membrane.

**Conclusion:** Our results showed clinical improvements in all the clinical parameters postoperatively namely the pocket depth reduction and gain in attachment level and hence, PRF can be used alone or in combination with the bone graft to yield successful clinical results in treating periodontal osseous defects.

**Clinical significance:** Platelet-rich fibrin is an effective alternative to platelet-rich plasma (PRP) in reconstructing bone defects.

**Keywords:** Bone, Hydroxyapatite, Periodontitis, Platelet substitutes, Regeneration.

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**Conflict of interest:** None declared

## INTRODUCTION

Periodontitis is an infectious disease that affects the tooth supporting structures of teeth with progressive attachment loss and bone loss. Clinically it presents itself as a lesion involving both hard and soft tissues of the periodontium namely bone, cementum, gingiva and periodontal ligament. Thus the aim of periodontal therapy will not only be directed

in functionally restoring the diseased periodontal tissues to health, but also to regenerate the tissues histologically.

In early 1980s, a series of experiment was conducted on a procedure to regenerate lost attachment apparatus using a membrane to exclude the epithelium and to provide a space for allowing periodontal cells to repopulate the wound as they have the potential to regenerate.<sup>1</sup> In spite of satisfactory clinical outcomes, complete regeneration was not achieved, and if achieved, was not consistent.<sup>1</sup> In this evolutionary process, another novel technique was adopted from the field of regenerative medicine, which involves the morphogenesis of new tissue using three components namely cells, scaffold and signaling molecules. This can be applied to periodontal regeneration too, if by any means the above said factors are placed simultaneously inside the periodontal tissues, which eventually led to the use of platelet concentrates as a tool for regeneration of periodontal defects.<sup>2</sup>

Platelet-rich plasma (PRP), a first generation platelet concentrate, works on the premise that platelets, when sequestered as in PRP release larger quantities of polypeptide growth factors which influence differentiation and proliferation of various cells in periodontal milieu.<sup>2</sup> Success with the use of PRP led to the search of a material, a second generation platelet concentrate, platelet-rich fibrin (PRF) retaining the beneficial aspects of PRP lacks the disadvantage of PRP like manipulation of chemicals, long preparation time and risk of immunogenicity.<sup>3</sup> From its time of advent, PRF has been used in treating various treatment procedure like sinus elevation.<sup>4</sup> But the efficacy of PRF in treating periodontal defects is not ascertained, despite its ability to stimulate bone formation, proved in *in vitro* studies.<sup>5</sup> Hence, we tried using PRF in treating vertical bone defects in two different forms, namely as a gel and membrane in a patient with chronic periodontitis.

## CASE REPORT

A female patient aged 44 years came to a private dental clinic, Chennai with the chief complaint of bleeding gums for the past 6 months with non-contributing medical history. On clinical examination, probing depth of 8, 6 and 7 mm with clinical attachment level (CAL) of 10, 8 and 8 mm seen in relation to mesiobuccal aspect of lower right first molar (46), second molar (47) and third molar (47) respectively.

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**Fig. 1:** Prepared PRF



**Fig. 2:** PRF made as membrane



**Fig. 3:** PRF mixed with bone graft in place

There were no pockets and/or attachment loss in other areas of the dentition. Radiographs (periapical) were taken with grid in place, which revealed bone loss in relation to the above said areas. Based on these findings a diagnosis of chronic localized periodontitis was made.

Anesthesia was achieved with 2% Lignocaine with 1:2,00,000 nor-epinephrine, an intra sulcular incision was placed in the proposed surgical site and full thickness mucoperiosteal flap was reflected in the mentioned area. Root planing was done and thorough debridement of osseous defects performed. Clinically, transgingival probing was done and a two walled defect was found between 47 and 48 and dehiscence of 6 mm in relation to mesial root of 46 found. PRF was prepared as per the guidelines.<sup>3</sup> In short, required amount of blood was drawn in 10 ml tubes without an anticoagulant and immediately centrifuged using a table top centrifuge (REMY Laboratories) for 12 minutes at 2,700 rpm. PRF was separated from top most platelet poor plasma and bottom most RBC layers (Fig. 1). PRF was used in the

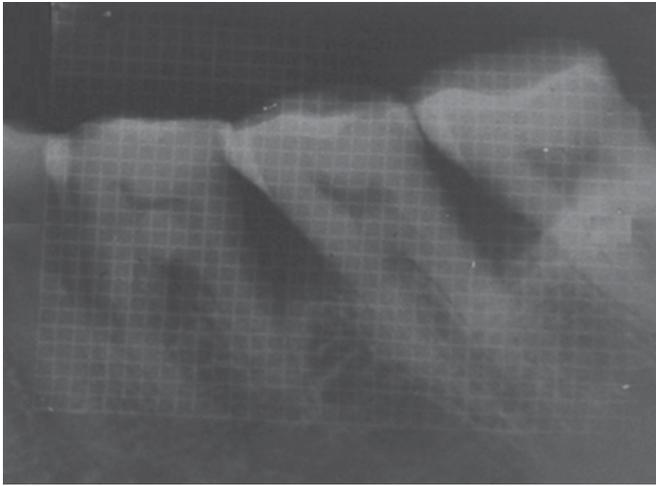
form of a gel by mixing with bone grafts or manipulated by squeezing between wet gauzes to form a membrane (Fig. 2).

To fill the bone defect, PRF was mixed with hydroxy apatite bone graft material (G-Bone, Surgicare Pharmaceuticals) and placed inside the two walled defect (Fig. 3). To cover the dehiscence, PRF was made into a membrane and placed over the mesial root of 46. Flaps were coadapted with 3-0 black silk suture material. Patient was instructed to follow the postoperative instructions given to them in a printed sheet. Postoperative antibiotics, Amoxicillin (Ranbaxy Pvt Ltd) 500 mg three times daily for a period of 3 days and analgesics, Ibuprofen (Abbott India Pvt Ltd) 400 mg 6 hourly for a period of 3 days were prescribed and the patient was instructed to use chlorhexidine mouth wash 0.2% (ICPA Pvt Ltd), twice daily for a period of 15 days. The patient was reviewed immediately on the next postoperative day, after 1 week, 15 days, 1, 3, 6 and 9 months after surgery.

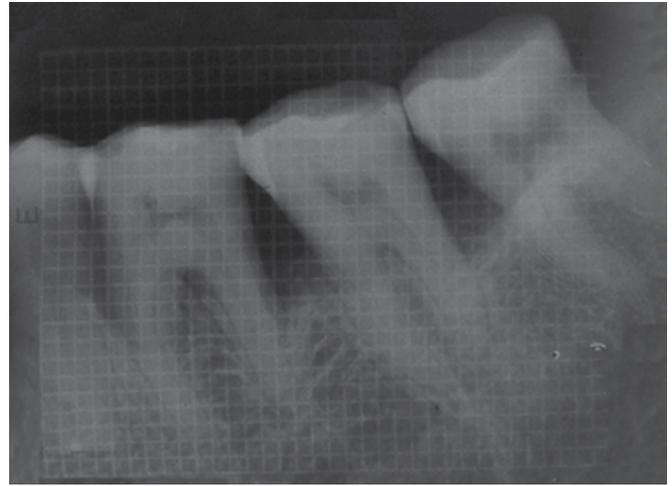
## DISCUSSION

At 3 months there was a reduction in probing depth from 8, 6 and 7 mm to less than 2 mm in relation to 46, 47, 48 respectively and CAL of 4 mm in 46, 3 mm in 47 and 48 were recorded. At the end of 9 months' period, there was no reduction or increase in the probing depth or CAL levels. Radiographs were taken at the end of 9 months demonstrated radiographic presence of bone filling the defect between 47 and 48 (Figs 4 and 5).

The ultimate goal of periodontal therapy is not only to prevent the tooth mortality but also to regenerate the lost periodontal structures. Many procedures were attempted with varying success in the past, one among them being the platelet concentrates. Even though, PRP, the first generation platelet concentrate is found to be successful in achieving periodontal regeneration, due to its inferior properties like



**Fig. 4:** Preoperative radiograph



**Fig. 5:** Nine months' postoperative radiograph

poor handling characteristics, immunogenicity, etc. PRF, a second generation platelet concentrate found its place in periodontal therapy.<sup>3</sup> Not only PRF lacks the disadvantages of PRP, it was also proven that PRF is equivalent to PRP or superior to PRP in releasing the growth factors.<sup>6</sup> Further, it was also shown that PRF, when made as a membrane gently, found to be effective in releasing polypeptide growth factors.<sup>7</sup> The basic rationale of using PRF is its ability to cause accelerated cicatrization of wounds, accelerated wound clotting with fast remodeling and increased availability of platelets to the site which are the ultimate store house of growth factors and are essential for wound healing.<sup>8</sup>

In our case, we treated a patient of chronic localized periodontitis with two walled defect and root dehiscence in molars using PRF, in conjunction with a bone graft. The success of hydroxy apatite bone graft for treating periodontal defects either alone or in conjunction with PRP is well proven.<sup>9,10</sup> Likewise, the efficiency of PRF was also proved when used in conjunction with other type of bone graft materials.<sup>11</sup> But, studies or reports combining both PRF and hydroxy apatite crystals are lacking. Since, hydroxy apatite is easily available and also cost effective; we used hydroxy apatite crystals in our study. Similarly, the studies were done using PRF along with other bone grafts for either sinus lift or some other prosthetic rehabilitation,<sup>8</sup> but not for treating periodontal defects. In one study, PRF, when used alone, found to be superior to PRF mixed with DFDBA in inducing bone formation in extraction sockets.<sup>12</sup> These results show that PRF when either used alone, or in combination with other bone graft can give better results which are either comparable to or superior to those obtained by using PRP. This was also supported by a series of clinical trials conducted by Dohan and Diss,<sup>5</sup> wherein the capability of PRF in accelerating bone repair, by modulating osteoprotegerin expression *in vitro*, in addition to its ability to promote fibroblast proliferation and collagen formation

was demonstrated. The efficacy of hydroxy apatite along with PRF was also demonstrated in our report as evidenced by radiographic bone formation. The quality of bone formed, however, must be evaluated in further trials.

Barrier membranes were introduced in late 1980s and from then on found wide application in regenerative periodontal surgery. In addition to its inherent disadvantages like membrane exposure, other drawbacks like technical difficulties in placing the membrane over the defect, variations in defect morphology, varied results obtained through various studies and case reports, with respect to its regenerative potential, preclude the use of these membranes in all the cases with periodontal defects.<sup>1</sup> In this context, it is to be noted that PRF can be used in the form of membrane, and when used properly, found to release same or increased amount of growth factors than gel form.<sup>7</sup> Moreover, when compared to barrier membranes, this is autologous, easy to prepare and there is no risk of infection when exposed to oral cavity and till now we do not find any isolated case reports or other well designed studies where in PRF was tried to cover dehiscence or to treat periodontal defects excluding few animal studies where PRF was mixed with bone grafts in artificially induced defects.<sup>12</sup> Since PRF has the ability to stimulate bone formation as mentioned above,<sup>5</sup> PRF was tried to place it over the periodontal defects in our case.

In our case we tried both the membrane form and the gel form combined with hydroxyapatite bone graft (mixed with PRF) to fill the periodontal defects. We attained clinical improvement in all the clinical parameters at 3 months postoperatively which was maintained at the end of 9 months also. Radiographs taken at 9 months period also show marked improvements in bone level. But, histological outcome of our therapy is not known. So, this case report outlines one more area where PRF can be used effectively and further longitudinal, controlled trials which also evaluate the healed sites histologically is required to know the true

regenerative potential of PRF. In conclusion, clinical results show that when PRF, used in conjunction with a bone graft, either in gel form or as a membrane, result in improvement of all the clinical parameters with appreciable radiographic bone fill.

## CONCLUSION

Our case report shows PRF is a useful alternative to PRP in the treatment of vertical bone defects caused due to periodontitis, either in the form of a membrane or a gel in conjunction with alloplastic materials.

## CLINICAL SIGNIFICANCE

Platelet-rich fibrin, in contrast to PRP is easy to prepare, easy to handle and can be molded to form a membrane. Hence, it is an effective and efficient alternative to PRP, especially in a private set up.

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