Intrabony Defect Treated with Platelet-Rich Fibrin: A Case Report

ABSTRACT

Platelet-rich fibrin (PRF) has gained recommendable importance for predictably obtaining periodontal regeneration. The purpose of this case report is to present clinical and radiographic results of an intrabony periodontal defect treated with PRF. A 36-year-old Indian male presented with an intrabony periodontal defect in relation to 41. The probing pocket depth (PPD) on mesial proximal aspect was 9 mm and clinical attachment level (CAL) was 12 mm. On surgical treatment with bone graft and autologous PRF, one-year follow up revealed a significant reduction in PPD and CAL gain as well as radiographic bone formation, supporting the role of various growth factors present in the PRF in accelerating the soft and hard tissue healing. From the presented case, it can be concluded that PRF is clinically and radiographically efficacious regenerative material in the treatment of a periodontal intrabony defect.

KEYWORDS: intrabony defect, PRF, growth factors

INTRODUCTION

The primary aim of periodontal treatment is the maintenance of the natural dentition in health and comfortable function. Regeneration in periodontics, has been understood as the reconstruction of the lost tissue with the formation of new cementum, new alveolar bone, and a functional periodontal ligament.1,2 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 restoration. Various biomaterials, have been proposed to obtain regeneration of periodontal tissues employing bone grafts, alloplastic materials, guided tissue regeneration, growth factors, etc. but not a single graft material is considered as a gold standard in the treatment of intrabony defects. Growth factors are the vital mediators during this process that can induce the migration, attachment, proliferation and differentiation of periodontal progenitor cells. Platelet-rich fibrin (PRF) may be considered as a second generation platelet concentrate, because the natural concentrate is produced without any anticoagulants or gelifying agents. Caroll et al. (2008) in vitro study demonstrated that the viable platelets released six growth factors like PDGF, VEGF, TGF, IGF, EGF and bFGF in about the same concentration for 7-day duration of their study.

First biochemical analysis of the PRF composition indicated that this biomaterial consists of an intimate assembly of cytokines, glycanic chains, and structural glycoproteins enmeshed within a slowly polymerized fibrin network. PRF described by Choukran et al. allows one to obtain fibrin mesh enriched with platelets and growth factors, from an anti-coagulant-free blood harvest without any artificial biochemical modification. The PRF clot forms a strong natural fibrin matrix which concentrates almost all the platelets and growth factors of the blood harvest, and shows a complex architecture as a healing matrix, including mechanical properties, which no other platelet concentrate can offer. It has been recently demonstrated to stimulate cell proliferation of the osteoblasts, gingival fibroblasts, and periodontal ligament cells but suppress oral epithelial cell growth. Lekovic et al. in 2011 demonstrated that PRF in combination with bovine porous bone mineral had ability to increase the regenerative effects in intrabony defects. PRF in various surgical procedures like, degree II furcation, sinus floor
augmentation during implant\textsuperscript{11} placement, with coro-
nally displaced flap in multiple gingival recessions\textsuperscript{12} and
in facial plastic surgery procedures\textsuperscript{13} have been shown to
provide promising results.

Here, we present a one-year follow-up report of an
intrabony defect, treated by means of an autologous PRF
by assessing clinical and radiological parameters.

Case report

A 36-year-old Indian male complaining of pain and
food lodgement in the lower front tooth region reported
to the Department of Periodontology, Saraswati Dental
College, Lucknow. Patient did not give any contributory
medical history or presence of any systemic condition
that could interfere with physiological wound healing.
There was no history of dental trauma or orthodontic
treatment, and no injurious habit was reported by the
patient. On clinical examination, bleeding on probing
with pus exudation accompanied with mild swelling on
the labial surface of 41 was noted. The probing pocket
depth (PPD) on the mesial proximal surface was 9 mm,
and the clinical attachment level (CAL) was 12 mm,
Grade II mobility was detected in relation to 41 and
fremitus was found to be positive precluding the possi-
bility of trauma from occlusion (Fig. 1).

A periapical radiograph was taken using the stan-
dardized techniques, which revealed the presence of
interproximal intrabony defects (IBD) i.r.t 41 (Figs. 2–4).

A comprehensive treatment plan was formulated
based on the clinical examination with the following
sequential steps:

1. Oral hygiene instructions and motivation of
   the patient in performing effective oral hygiene
   measures.
2. Non-surgical periodontal therapy after a period
   of 2 weeks by means of conventional scaling
   and root planning, using curettes and ultrasonic
   instruments, with coronoplasty to remove
   trauma from occlusion.
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 CAL were measured every week
   for 6 weeks after the non-surgical periodontal
   therapy, and they were still found to be 8 mm
   and 12 mm, respectively. The mobility was
   assessed to be Grade I after Phase I therapy.
4. Surgical periodontal therapy was done 2 weeks
   after the re-examination of the patient after the
   completion of healing following non-surgical
   periodontal therapy.

Before planning for the periodontal surgical proce-
dure, patient’s Haematological examination including

Fig. 1 Clinical examination of 36-year-old male patient.

Fig. 2 Examination of probing depth i.r.t 41.

Fig. 3 Periapical radiograph revealing interproximal intrabony
defect i.r.t 41.
platelet count (3.5 lac/mm$^3$), Haemoglobin (13.5 gm/dl), Bleeding time (2.5 min) and Clotting time (4.5 min) were assessed and found to be within normal limits.

**PRF preparation**

The PRF was prepared in accordance with the protocol developed by Choukroun et al. Just prior to surgery, intravenous blood (by venipuncturing of the antecubital vein) was collected in a 10-ml sterile tube without anticoagulant and immediately centrifuged in centrifugation machine at 3,000 revolutions (Approximately 400 g) per minute for 10 minutes. Blood centrifugation immediately after collection allows the composition of a structured fibrin clot in the middle of the tube, just between the red corpuscles at the bottom and acellular plasma (Platelet-poor plasma) at the top. PRF was easily separated from red corpuscles base [preserving a small red blood cell (RBC) layer] using a sterile tweezers and scissors just after the removal of PPP and then transferred onto a sterile dappen dish (Figs. 5 and 6).

**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, buccal and lingual sulcular incisions were made and mucoperiosteal flaps were reflected. Care was taken to preserve as much inter-proximal soft tissue as possible. Meticulous defect debridement and root planing were carried out using ultrasonic instruments and area-specific curettes. No osseous recontouring was carried out. Minced PRF mixed with the ossify graft material was filled into the intrabony defect and was used to cover the defect. The mucoperiosteal flaps were repositioned and secured in place using 3–0 non-absorbable black silk surgical suture. The sling sutures were placed. The surgical area was protected and covered with periodontal dressing (Figs. 7 and 8).
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, 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 the 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 3 and 6 months. No subgingival instrumentation was attempted at any of these appointments. Re-examination at 1 year after the periodontal surgery revealed reduction in PPD (from 8 mm to 5 mm) and CAL (from 11 mm to 10 mm) with no sign of bleeding on probing and significant radiographic bone formation in the periodontal intrabony defect (Fig. 9).

DISCUSSION

The present case report evaluated the clinical efficacy of PRF in the treatment of intrabony defect. Reduction in PPD, IBD and gain in CAL are the major clinical outcomes measured to determine the success of any periodontal treatment. In the present case report, a significant reduction in PPD and CAL gain was found. The present case report also reflected the significant radiographic bone formation in the periodontal intrabony defect, supporting the role of various growth factors present in the PRF in accelerating the soft and hard tissue healing. Also as it was a 1-wall IBD, it provided the best spatial relationship for defect bridging by vascular and cellular elements from the periodontal ligament and adjacent osseous wall.

In this case report, the decision to utilize minced PRF as defect fillers in combination with alloplasts was made because of its ease of manipulation and delivery to surgical site. The intended role of the minced PRF in the intrabony defect was to deliver the growth factors in the early phase of healing. Despite of the fact that PRF is a denser and firmer agent than other biological preparations, such as PRP and EMD, it is still non-rigid to a degree that its space maintaining the ability in periodontal defects is non ideal. It has been reported in a study, that PRF in combination in with bone mineral had ability in increasing the regenerative effects in intrabony defects. For that reason, we chose alloplast (OSSIFI), hypothesizing that it could enhance the effect of PRF by maintaining the space for tissue regeneration to occur.

The reason why PRF could improve periodontal osseous defects healing may be explained as follows. PRF can upregulate phosphorylated extracellular signal-regulated protein kinase expression and suppress osteoclastogenesis by promoting the secretion of osteoprotegerin in osteoblasts cultures. PRF was also demonstrated to stimulate osteogenic differentiation of human dental pulp cells by upregulating osteoprotegerin and alkaline phosphatase expression. Furthermore, many growth factors such as platelet-derived growth factor and transforming growth factor are released from PRF. Recently, studies have demonstrated that the PRF membrane has a very significant slow-sustained release of key growth factors for at least 7 days and up to 28 days, which means that the PRF membrane stimulates its environment for a significant time during remodeling. The properties of this natural fibrin biomaterial thus offer great potential during wound healing. It has been clearly demonstrated that fibrin matrix leads directly to angiogenesis. Fibrin constitutes a natural support to immunity and reduce the inflammatory process. PRF itself can be recognized as an autologous biomaterial. PRF, as membrane and grafting material, offers an improved space making effect of the barrier, which is conductive to cell events leading to periodontal regeneration, and facilitation of mineralized tissue formation due to osteoconductive and/or osteoinductive properties possibly inherent in PRF.

Simplified, easy, fast and cost effective processing of PRF preparation without the 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.

CONCLUSION

From the presented case, it can be concluded that PRF is efficacious clinically and radiographically in the treatment of a periodontal intrabony defect. 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.

REFERENCES