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Original Research Paper

Treatment of Periodontal Intrabony Defect with Platelet Rich Fibrin and Bone Replacement Graft: A Case Report

Dental Science

KEYWORDS : Demineralised Bone Matrix, Probing Pocket Depth, Regeneration, PRF, Bone graft

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ABSTRACT

The goal of periodontal therapy has always been the regeneration of the lost attachment apparatus. Regeneration is thought to partially mimic developmental mechanisms, which requires a coordinated orchestration of cellular events such as proliferation, migration and differentiation. Regeneration has been defined as the reproduction or reconstitution of a lost or injured part to restore the architecture and function of the periodontium. Regenerative potential of platelets was introduced in 1974 and found that growth factors are released after activation from the platelets trapped within fibrin matrix, and have been shown to stimulate the mitogenic response in the periosteum for bone repair during normal wound healing. Choukroun's platelet rich fibrin (PRF) is a fibrin matrix in which platelet cytokines and cells are trapped which are released after a certain time, and that can serve as a resorbable membrane. In the present case combination of PRF and Bone graft [Demineralised Bone Matrix (DMBM)] was used to treat the periodontal intra bony defect.

Introduction

Periodontal disease is defined as a complex, multifactorial disease characterized by the loss of connective tissue attachment with destruction of periodontal tissues. The aim of periodontal therapy is to eliminate inflammatory process, prevent the progression of periodontal disease and also to regenerate the lost periodontal tissues. Periodontal regeneration is a complex multifactorial process involving biologic events like cell adhesion,

migration,proliferation, and differentiation in an orchestrated sequence [1]. Periodontal regenerative procedures include Soft tissue grafts, bone grafts, Root biomodifications, Guided tissue regeneration, and combinations of these procedures. The current perspective is that regenerative periodontal therapies to date can only restore a fraction of the original tissue volume and have a limited potential in attaining complete periodontal restoration [2]. Various biomaterials have been used for periodontal tissue regeneration in addition to autogeneous and allogenic bone grafts but not a single graft material is considered as gold standard for the treatment of intrabony defects [3].Materials like Hydroxyapatite, Freeze dried bone graft, Tricalcium phosphate, bioactive glass etc. have been widely used and tested for their contribution in healing and regeneration of soft and hard tissues. Platelet Rich Fibrin was first described by Dr. Joseph Choukroun in 2001in France to promote wound healing in implants. Currently, the studies have been focused on the use of an autogenous material called Platelet Rich Fibrin that provides an osteoconductive scaffold along with growth factors to stimulate patient's own cells towards a regenerative response [4,5, 6]. Platelet-rich fibrin (PRF) described by Dr. Choukroun et al is a second-generation platelet concentrate which contains platelets and growth factors in the form of fibrin membranes prepared from the patient's own blood free of any anticoagulant or other artificial biochemical modifications. 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 with unique mechanical properties which makes it distinct from other platelet concentrates [1]. PRF enhances wound healing and regeneration and several studies show rapid and accelerated wound healing with the use of PRF than without it. PRF is superior to other platelet concentrates like PRP due to its ease and inexpensive method of preparation and also it does not need any addition of exogenous compounds like bovine thrombin and calcium chloride. It is advantageous than autogenous graft also because an autograft requires a second surgical site and procedure [7]. Thus PRF has emerged as one of the promising regenerative materials in the field of periodontics.

PRF in various surgical procedures like, degree II furcation,sinus floor augmentation during implant placement, with coronally displaced flap in multiple gingival recessions and in facial plastic surgery Procedures have been shown to provide promising results [7,8,9]. Here, we present a case in which autologous PRF and osseograft was used as a biomaterial for achieving bone fill. The patient visited the Department of Periodontics, Sree Mookambika Institute of Dental Sciences, Kanyakumari (Dist), Tamil Nadu, India, and was otherwise medically fit. There were no contraindications for performing periodontal surgery. All standard pre- and post-surgical protocols were followed, and the patient is on periodontal maintenance care.

CASE REPORT

A 43 years old male patient came with the chief complaint of deposits on teeth. Patient did not give any relevant medical history and there was no 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 intraoral examination, the color of the gingiva was pale pink with mild physiologic pigmentation and there was loss of scalloping with rolled out margin and Blunt interdental papillae. There was generalized bleeding on probing present but no swelling and no pus exudation was noticed. The probing pocket depth of teeth # 25 and # 26 and # 45 and 46

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was 5mm.There was Grade II mobility and Grade II furcation involvement in relation to # 26.

A periapical radiograph was taken using the standardized techniques, which revealed presence of interproximal intrabony defects (IBD) with relation to teeth # 45 and # 46 and # 25 and # 26. Keeping all the findings in the mind, a thorough treatment plan was decided, including a series of therapeutic procedures,

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.
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 5 mm.
4. After obtaining Informed consent, surgical periodontal therapy with PRF and osseograft was done 2 weeks after the re-examination of the patient after completion of healing following non-surgical periodontal therapy.

Before planning for the periodontal surgical procedure, patient's blood parameters were assessed and found to be within normal limits [Total WBC count (11,900 cells /mm3), Haemaglobin (15.7 gm/dl), bleeding time (2 mins) and Clotting time (4 mins 30 sec)].

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 with #15 B.P blade (Fig- 1a,1b) and mucoperiosteal flaps were reflected here was presence of granulation tissues (Fig- 2a, 2b). Care was taken to preserve as much inter-proximal soft tissue as possible. Meticulous defect debridement and root planning were carried out using ultrasonic instruments and area specific curettes Fig-3a, 3b) .No osseous recontouring was carried out.

PRF Preparation

The PRF was prepared in accordance with the protocol developed by Choukroun et al in 2001 [5, 10, 11, 12, 14]. Followed by open flap debridement, 5 ml 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 3000 RPM (Approximately 400g) 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 [6]. PRF was easily separated from red corpuscules base [preserving a small red blood cell (RBC) layer] using a sterile tweezers and scissors just after removal of PPP and then transferred onto a sterile gauze (Fig-4). PRF membrane of the required size was obtained from PRF Clot by removal of fluid by squeezing the clot and along with osseograft (Fig-5) was filled into the intrabony defect in relation to #45 and #46 and in #25 and #26. Figure of eight sutures were placed using 3-0 non-resorbable black silk surgical suture (Fig 6a, 6b). The surgical area was protected and covered with periodontal dressing. Suitable antibiotics (Tab. Amoxicillin 500mg thrice daily for 5 days, Tab. Flagyl 400mg thrice daily for 5 days, Tab. Fenac plus ,thrice daily for three days and Capsule, Becosules once daily for 10 days) was prescribed. The patient was advised to brush gently over the surgical area and rinses his mouth with 0.2% chlorhexidine twice daily for one week.

Postoperative Care

Periodontal dressing and sutures were removed two weeks after the surgical procedure. The surgical wound was cleaned with 0.2% chlorhexidine gluconate with a sterile cotton swab. The patient was examined weekly for 1 month and then after 4th and 7th month. No probing or any subgingival instrumentation was done in the treated area in between the visits.

Discussion

The mechanism of periodontal regeneration till date remains a complex and elusive phenomenon. To understand it further, the present case report evaluated the clinical and radiographic efficacy of autologous PRF and bovine derived bone matrix in the treatment of an intrabony defect. Demineralized bone matrix (DMBM; osseograft TM) containing Type-I collagen obtained from bovine cortical bone samples, is commercially available as nonimmunogenic, resorbable and flowable particles of approximately 250µm. It is deemed to be osteoconductive as well as oseoinductive in nature [12]. The various advantages of DMBM include its ability to act as a space maintainer, easy handling and its cost effectiveness. The only concern regarding DMBM is for its nature of origin that is obtained from a donor of different species and may result in cross species antigenicity. However, the histological evaluation by Sogal et al **confirmed good tolerance and good tissue acceptance of xenografts, with almost completely free of risk of disease transmission [7]. Platelet rich fibrin, the latest platelet concentrate developed by** Choukroun et al *in 2001 in France, concentrates 97% of platelets and greater than 50% of leukocytes in a specific three dimensional distribution. It consists of intimate assembly of cytokines, glycanic chains and structural glycoproteins enmeshed within a slowly polymerized fibrin network.*

The scientific rationale behind the use of platelet preparations lies in the fact that the platelet granules are a reservoir of many growth factors that are known to play a crucial role in hard and soft tissue repair mechanism. These include platelet-derived growth factors (PDGFs), transforming growth factor beta (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF), insulin like growth factor-1 (IGF-1) [13, 14, 15]. 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 [16]. In the present clinical case we have seen a gain in the clinical attachment level and a decrease in Probing pocket depth along with an increase in the radiographic bone fill at the end of 7 months [Fig 7a, 7b, 8a, 8b]. The three walled component of the defect provided the best spatial relationship for bridging of the graft materials with the vascular and cellular elements from the periodontal ligament and adjacent osseous wall. Also, space maintenance as provided by the defect walls helped to keep the PRF membrane in stable position thus providing protection and retention to the grafted material.

Choukroun et al in his histological evaluation on effect of PRF on bone allograft in sinus lift procedure, reported a reduced healing time to 4 months with the addition of

PRF. The comparative histological maturation with FDBA alone was observed at 8 months post-operative period only. Thus, suggesting rapid healing and osteogenic ability of PRF [7]. Simple, easy, fast and cost effective process of PRF preparation without any biochemical involvements hold the major advantage over other derivatives. Also the physiologic functional fibrin matrix has the ability to sustain and progressively release growth factors, cytokines and leukocytes in the surrounding tissues as the matrix degrades over time. All these factors help make Platelet Rich Fibrin the most significant in fibrin technology and endogenous regenerative therapy.

Conclusion

Among the available grafting modalities, Platelet Rich Fibrin appears to be the most advantageous. Its properties of being the completely natural, physiologic, and economical source of autologous growth factors and cytokines makes it the most sought after treatment option currently available. From the above report, it can be concluded that the combination of PRF and bone graft can be efficaciously used in the treatment of a periodontal intrabony defects with significantly improved clinical parameters. The use of combination technique also promises additional benefit of rapid and early bone formation. However, clinical trials with larger sample size and confirmatory histological evaluations are required to better assess the clinical benefits of combination approach using PRF with bone grafts.

Figure-1a & 1b: Crevicular incisions given in 4th and 2nd Quadrants respectively

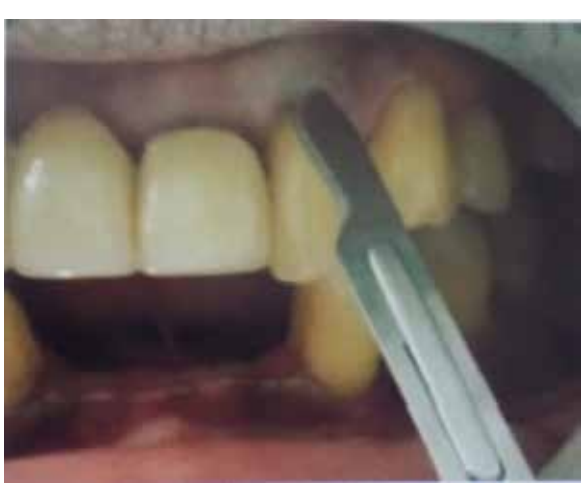
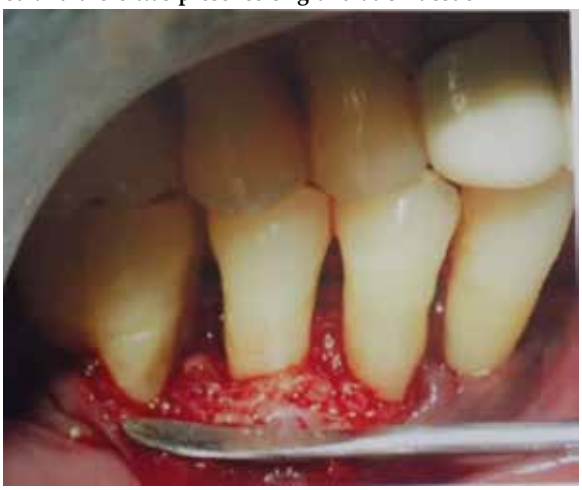


Figure-2a & 2b: Full thickness mucoperiosteal flap reflected and there was presence of granulation tissue



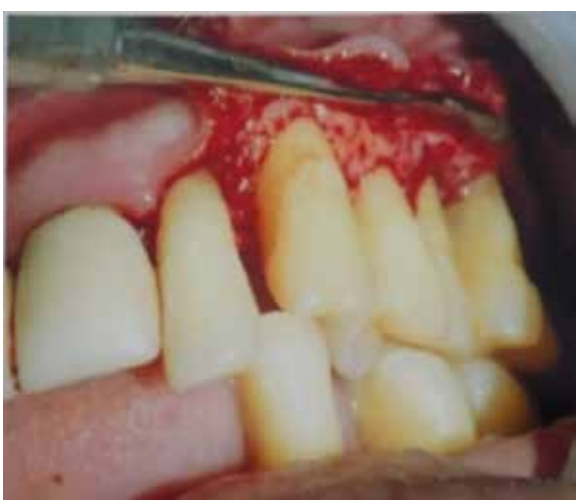


Figure-3a & 3b: Defect in 45-46, 25-26 teeth region respectively

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Figure-4&5: PRF transferred to sterile gauze and mixed with osseograft

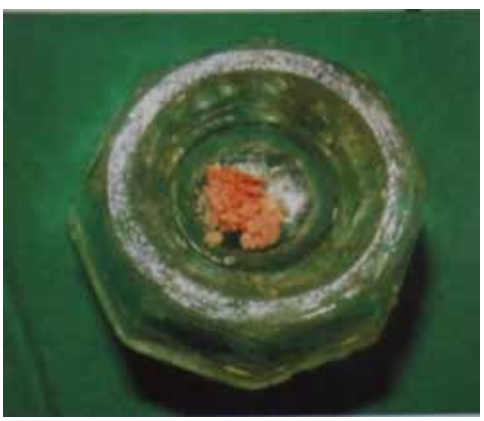


Figure-6a&6b: Flap is repositioned using Figure of eight sutures after placing osseograft and PRF in # 45 & # 46 and # 25 & # 26 region respectively

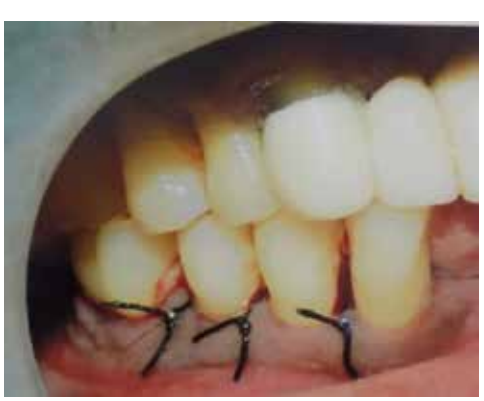
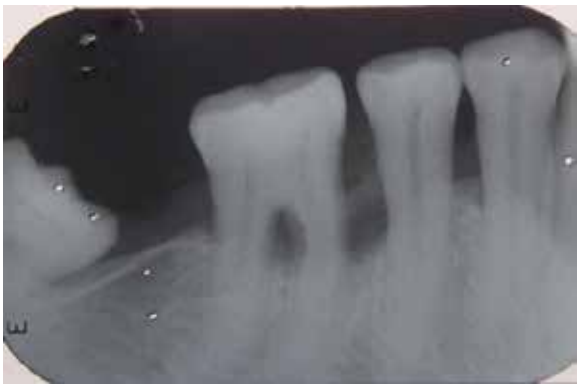


Figure-7a&7b: Immediate post operative and 7 months post operative IOPA in 45 & 46 region



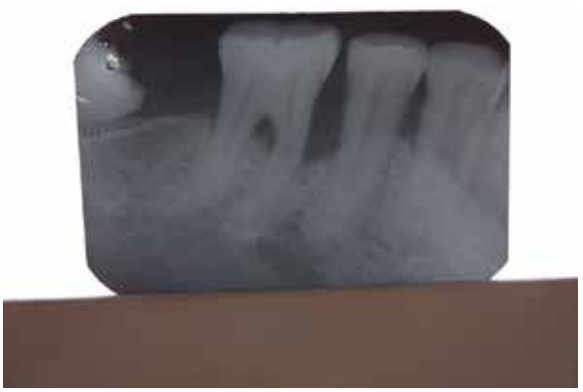
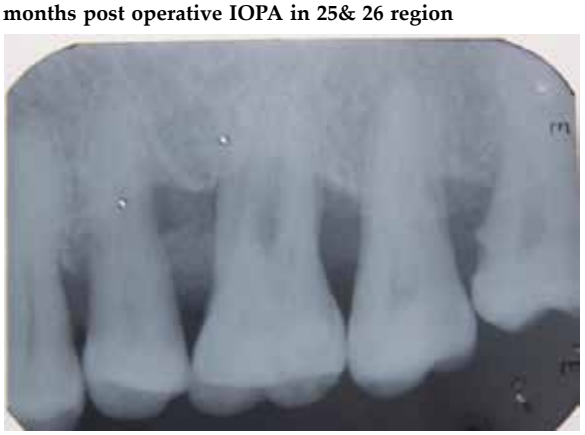


Figure-8a&8b: Immediate post operative and after 7 months post operative IOPA in 25& 26 region



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