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Assessment of Alveolar Bone Augmentation in Intrabony Defects Employing Platelet-Rich Fibrin (PRF) Membrane and Sticky Bone (Injectable-PRF & Demineralized Freeze-Dried Bone Graft). A Case Report

Dr. Harini Kulkarni
Postgraduate: Dept of Periodontology and Implantology
Navodaya Dental College and Hospital
Raichur, India

Dr. ASIF K
HOD: Dept of Periodontology and Implantology
Navodaya Dental College and Hospital
Raichur, India

Dr. SINDHURA H
Reader: Dept of Periodontology and Implantology
Navodaya Dental College and Hospital
Raichur, India

Dr. SWAPNA EDIGA
Sr. Lecturer: Dept of Periodontology and Implantology
Navodaya Dental College and Hospital
Raichur, India

Abstract:- The primary goal of periodontal therapy has always been the regeneration or restoration of damaged supporting tissue. The process of periodontal regeneration is multidimensional and necessitates a complex chain of biological processes, including cell adhesion, migration, proliferation, and differentiation. The current case report presents the management of an intrabony defect in a 23-year-old male patient, using Sticky bone made of injectable Platelet Rich Fibrin (iPRF) & Demineralized Freeze-Dried Bone Allo (DFDBA) graft along with a PRF membrane to cover the defect. The clinical & Radiographic parameters assessed were Periodontal Probing Depth (PPD), Clinical Attachment Loss (CAL) & amount of bone fill respectively. Follow-up was done after 6 months.

Keywords:- *PRF; iPRF; Stickybone; Intrabony Defect.*

I. INTRODUCTION

Periodontitis is a chronic inflammatory condition that is brought on by periodontopathic bacteria and is characterized by inflammation and the gradual breakdown of tissues that support the teeth [1]. According to a nationwide assessment carried out in the USA, 38.5% of the population had moderate or severe cases (stage III or stage IV) affecting almost 47% of the adult population [2]. Controlling disease activity and promoting the regeneration of periodontal structures are the prime goals of periodontal treatment. Regeneration in the periodontium entails the formation of newer alveolar bone, cement, and periodontal ligament [3]. It is a multifactorial procedure that calls for a coordinated series of biological phenomena, such as cell adhesion, migration, proliferation, and differentiation [4]. Guided tissue regeneration and bone grafting have been used to obtain the most successful results from periodontal regenerative treatments in infra bony defects and furcations [5,6] . Many controlled clinical trials have shown that several of the grafting techniques may promote periodontal regeneration in intrabony deformities. Nevertheless, complete and efficient regeneration of periodontal tissues is still challenging to achieve [7]. Recently, studies have additionally focused on polypeptide growth factors, which are biological agents capable of controlling the proliferation, chemotaxis, and differentiation of cells. By using immunohistochemistry and in situ hybridization, many polypeptide growth factors have been discovered in human periodontal tissue as early evidence for their potential use in periodontal wound healing [4]. Growth factors are prime mediators which induce a cascade of events during periodontal regeneration that result in the proliferation and differentiation of periodontal progenitor cells. One of the second-generation platelet concentrates called platelet-rich fibrin (PRF), which was first described by Choukroun et al. enables one to obtain fibrin membranes that are enriched with platelets and growth factors after beginning with an anticoagulant-free blood harvest without any artificial biochemical modification. Recent research has shown that it inhibits the development of oral epithelial cells while stimulating the proliferation of osteoblasts, gingival fibroblasts, and periodontal ligament cells [7]. Injectable platelet-rich fibrin (I-PRF) is the most recent and successful advancement in PRF since it is injected (autologous PRF) into afflicted soft tissues, mucous membranes, or skin. It was created in 2001 by Choukroun et al. [8] by slowing down the liquid-based centrifugation approach and omitting the formation of a PRF membrane. In the current case report, we presented the clinical and radiographic changes of intrabony defects in a patient treated using PRF membrane and iPRF with DFDBA as grafting material (Sticky bone).

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II. CASE REPORT

The current report presents the case of a 24 yrs. old male patient who has been referred to the department of periodontics, Navodaya Dental College, Karnataka India, with a complaint of pain in the left lower tooth. On examination, the patient was found to be in overall good health condition and had not been on any antibiotics or long-term anti-inflammatory drugs.

On clinical examination and radiographic evaluation, periodontal probing depth was 8mm measured on Williams periodontal probe (Figure 1) and intrabody defect respectively in relation to the mesial root of #36 (Figure 6). When put through a thermal with a heated gutta percha point, there was a persistent form of discomfort. The diagnosis was made to be primary chronic periodontitis.

Following scaling and root planning, instructions on proper oral hygiene were the focus of the patient's primary treatment, which was continued until the patient's O'Leary plaque score was 20% or below [9].

One month following phase 1 therapy re-evaluation was performed in relation to #36 to confirm the suitability of the periodontal surgical procedure. PPD was done using William's periodontal probe.

III. CLINICAL PROCEDURE

- *Preparation of Sticky Bone*

6 ml Patients blood sample was collected in a glass test tube without anticoagulant and promptly centrifuged at 700 RPM (60g RCF) for 3 min [10], yellow fluid, the topmost layer which is rich in growth factors and platelets was carefully separated and mixed with DFDBA & left undisturbed for 5-10 min to form sticky bone of moldable consistency (Figure 3).

- *Preparation of PRF Membrane*

On the day of the procedure, blood was drawn using a REMI 3000 centrifuge and collection kits by the PRF protocol.

In a nutshell, a 6 ml Patients blood sample was collected in a glass test tube without anticoagulant and promptly centrifuged at 3000 rpm for 12 minutes. The center of the tube developed a fibrin clot, acellular plasma, and with red corpuscles at the top and bottom, respectively. The fibrin clot was separated from the lower part of the centrifuged blood and gently pressed between two sterile dry gauges placed on two glass slabs to obtain a membrane (Figure 4).

An intracrevicular incision was made on the buccal and lingual aspect of the tooth of left mandibular teeth (#35, 36, and 37). A full-thickness flap was raised and the inner surface of the flap was curetted to remove the granulation tissue (Figure 2). Root surfaces were thoroughly planned using hand instruments and ultrasonic scalers. The left mandibular first molar demonstrated an intrabony defect. Pre-suturing was done sticky bone prepared was placed (Figure 5a) in the intrabony defect with a PRF membrane around the defect (Figure 5 b). Both the flaps were approximated and secured by figure 8 suture.

Post-surgical instructions were given and the patient was kept under antibiotic coverage (Amox 500 mg tid 3 days) non-steroidal anti-inflammatory drug (Zerodol P Bd, 3 days), and 0.12% chlorhexidine rinse (twice a day for 4 weeks). Sutures were removed after 15 days. Clinically healing was normal without any signs of inflammation or infection. The patient was recalled in 2nd week, 1st month, 6th month. Periapical intraoral radiographs were obtained from the periodontal defect site at baseline, and 6 months post-surgery.

IV. RESULTS

In this current case report, a 6-month follow-up revealed a higher reduction in pocket depth and an increase in clinical attachment level. These are the key clinical results for any periodontal regeneration treatment. Compared to observations at baseline, radiographs of the intrabony defect showed considerable bone fill (Table 1).

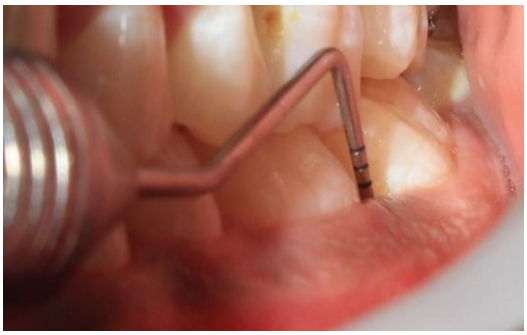

Fig 1: 8mm periodontal pocket depth (at the baseline)

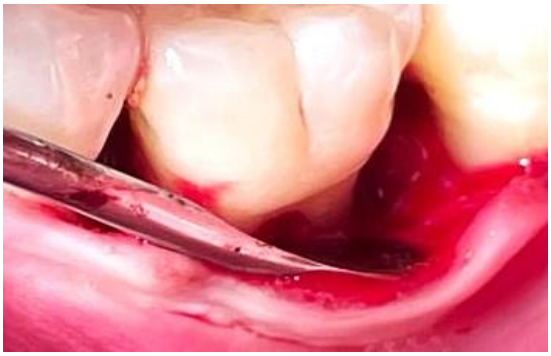

Fig 2: Kirkland flap raised and debridement done.

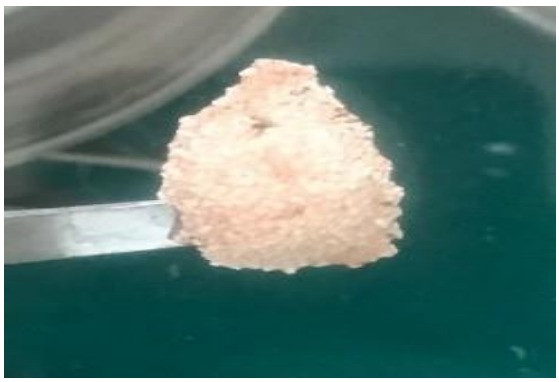

Fig 3: Sticky bone

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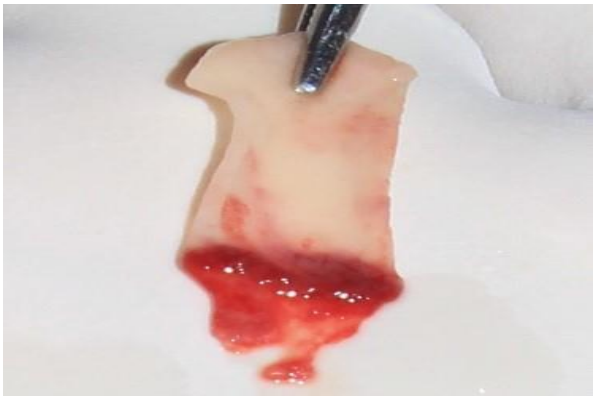

Fig 4: PRF membrane

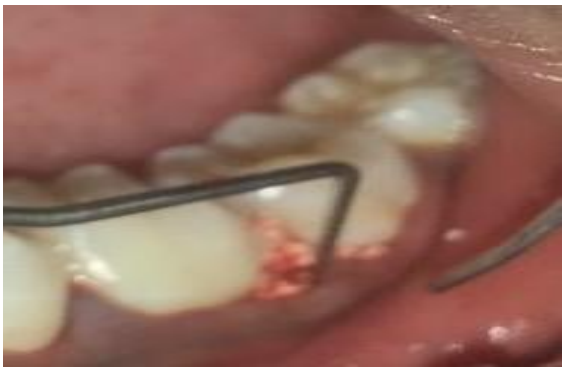

Fig 5a: Sticky bone in intrabony defect

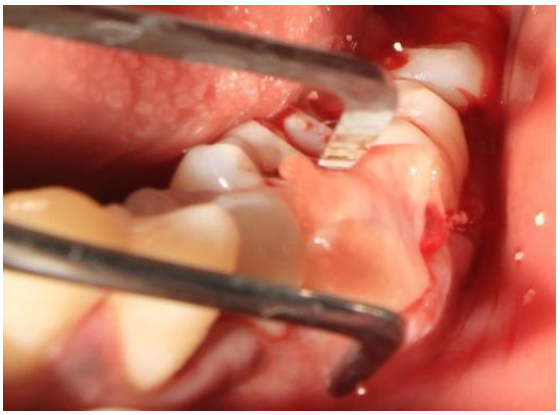

Fig 5b: PRF membrane positioning at the defect

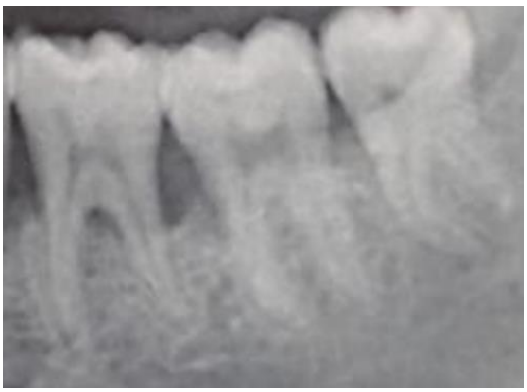

Fig 6: Pre-ope radiograph with bone defect # 36

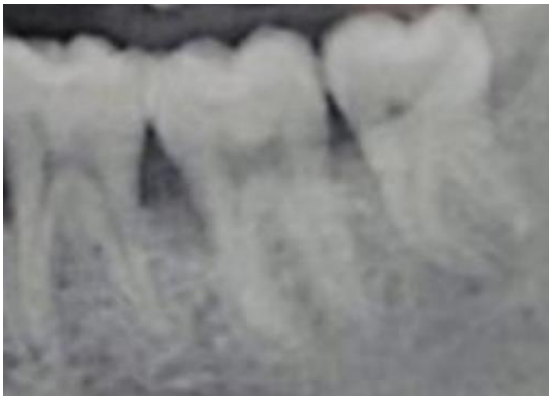

Fig 7: Post ope radiograph with bone fill #36 after 6 months.

Table 1 Comparison of Clinical Parameters

PARAMETERS	***BASELINE***	***AT 6 MONTHS***
Probing pocket depth	8mm	3mm
Clinical attachment loss	10mm	4mm
Clinical attachment gain	10mm	4mm

DISCUSSION

PRF is made naturally without the use of thrombin employing Choukroun's approach, and it is theorized that PRF has a natural fibrin structure and can protect growth factors from proteolysis [11]. As a result, growth factors (platelet-derived growth factor (PDGF), transforming growth factor (TGF), vascular endothelial growth factor (VEGF), etc. that have the potential to modulate and up-regulate tissue healing) can remain active for a longer period and efficiently induce tissue regeneration. The key difference between PRF and other platelet concentrates, such as platelet-rich plasma (PRP), is that it does not require an anticlotting agent. The spontaneously developing PRF clot has a thick and complex 3D architecture and concentrates both platelets and leukocytes [12]. Since PRF has a thick fibrin matrix, it gets resorbed more slowly by the host, sustaining the release of platelet- and leukocyte-derived growth factors into the wound site [13]. Ever since the focus was drawn toward the use of autogenous platelet concentrates, several advancements were made of which iPRF proposed by Choukroun was one of them.

In our current case report the combined impact of sticky bone (iPRF + DFDBA) and PRF membrane, which maximizes the results of regenerating processes, is responsible for the optimistic outcome which was presented by the reduction in pocket depth and gain in the clinical attachment at the 6 months follow up. These are the important clinical outcomes for any periodontal regenerative procedures. Radiographs demonstrated significant bone fill in the intrabony defect compared to measurements at baseline.

Packing the intrabony defect with sticky bone accelerates the osteoconductive and osteoinductive properties of osteoblasts. It undergoes resorption and gets replaced by bone that is rich in collagen type I, which is the major organic component of bone [14]. Besides PRF can decrease

osteoclastogenesis by enhancing the release of osteoprotegerin in osteoblast cell cultures and upregulate the expression of phosphorylated extracellular signal-regulated protein kinase [4].

V. CONCLUSION

Based on the results obtained in this case report, it could be concluded that the positive clinical impact of the additional application of sticky bone and PRF membrane in the treatment of periodontal intrabony defect is based on, Reduction in PPD, Gain in CAL, Significant radiographic defect bone fill, Improved patient comfort, Early wound healing process.

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