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Management of Periodontal Intrabony Defect Using Sticky Bone and GTR Membrane: A Case Report

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Abstract: ***Background: Periodontal regeneration in particular represents regain of lost periodontal tissues either by regenerative techniques to be used alone or in combination with an adjunct. Platelet-rich Fibrin (PRF) is an autologous product that is derived from whole blood by applying the process of gradient density centrifugation. Use of platelet concentrates is promising due to its autologous nature, release of multiple growth factors, low cost, ease of procurement and comfortable handling. Injectable PRF (i-PRF) can be combined with bone grafts to form sticky bone with superior handling and healing properties. Hereby, we report a case with intra bony defects treated with sticky bone and barrier membrane with a 1-year follow-up. Methodology: 10 ml of the patient's venous blood was collected and i-PRF was obtained by low centrifugation protocol. Sticky bone was prepared by mixing i-PRF with alloplast and was placed in intrabony defect. A bioresorbable collagen membrane was placed over the sticky bone followed by periodontal flap closure. Results: A reduction in the Probing pocket depth (PPD) from 7mm (Pre-operative) to 3mm, Clinical attachment loss (CAL) from 8mm to 4mm. Conclusion: Significant improvement in clinical parameters such as PPD, CAL and radiographic bone fill indicates success of regenerative therapy using i-PRF with bone grafts.***

Keywords: Bone loss, Intrabony defects, Periodontitis, Periodontal regeneration, PRF, Bone grafts

1. Introduction

Periodontitis is an inflammatory disease with varied levels of periodontal attachment loss and bone destruction.[1] Periodontal regeneration has been defined as "the reproduction or reconstitution of a lost or injured part to restore the architecture and function of the periodontium."[2] Predictable regeneration of periodontium is a challenge faced worldwide because this process requires an organized succession of complicated biological events.[3]The biological mechanisms which provide a rationale for bone grafting are osteogenesis, osteoinduction and osteoconduction.[4] Platelets contain various growth factors in abundance entrapped in the alpha granules. These growth factors promote the regeneration irrespective of being utilized alone or in combination with other materials.[5-7] Platelet-rich fibrin (PRF) was first described by Choukroun et al. in 2001 in France as a second-generation platelet concentrate because the natural concentrate is produced without any anticoagulants or gelifying agents.[8]In the past decade, so called injectable-PRF (i-PRF) has been developed using lower centrifugation protocols. i-PRF remains liquid for approximately 15 mins.[9] The Bone graft is mixed with i-PRF to form bone graft matrix called "Sticky bone" which makes it a manipulative mass.[10]

2. Case Report

A 58-year-old male patient reported to the Department of Periodontology, Govt. College of Dentistry, Indore, with a chief complaint of food impaction in the lower right back tooth region since1year. The patient was systemically healthy. Periodontal examination revealed periodontal pockets in relation to #43 and #44.There was no mobility noted. Probing pocket depth (PPD) was recorded with a UNC-15 probe (Hu-Friedy, USA). #43 on the distal surface had a PPD of 7mm [Fig.1]. The Clinical attachment loss (CAL) was 8mm on distal surface of #43. Intra-oral periapical radiograph (IOPA)revealed vertical bone loss in relation to #43 and #44 upto apical third of root[Fig.2]. Vitality test using electric pulp tester revealed #43 as vital. Routine hematological investigations revealed a normal blood picture. The treatment plan consisted of scaling and root planning followed by regenerative therapy for intrabony defects. The patient was advised 0.2% chlorhexidine mouth rinse twice daily.

The patient was recalled 6 weeks after phase-I therapy and the clinical parameters were re-evaluated. Thereby, surgical intervention was necessary. Periodontal regenerative therapy using sticky bone and barrier membrane was planned in relation to #43 and #44. The procedure, advantages and associated risks were explained to the patient.

Surgical Phase

After obtaining patient's consent, local anaesthesia was administered. Sulcular and interdental incision were placed followed

Figure 1: Pre-operative pocket probing depth

Figure 2: Pre-operative intraoral periapical view radiograph

by elevation of full-thickness flap in relation to #42, #43 and #44 [Fig.3]. The area was debrided to remove subgingival calculus and granulation tissue. The width and depth of the intra bony defect was measured using UNC-15 periodontal probe.

Figure 1: Bone defect exposed

i-PRF was prepared as follows: 10 ml of patient's venous blood was collected from the median cephalic vein (antecubital fossa) into a plastic test tube without anti-coagulants. [Fig.4a]. The collected blood was subjected to centrifugation (Remi R-8C, Remi Electotechnik LTD, India) at 700 rpm for 3 mins. The obtained i-PRF was collected with a syringe (Fig.4b) and mixed with an alloplast (SYBOGRAF-T, Eucare Pharmaceuticals, Chennai, India). A cohesive mass termed sticky bone was formed which can be manipulated according to defect morphology (Fig.4c).

Pre-suturing was done using 5-0 polypropylene sutures (Prolene Ethicon, Puerto Rico, USA). Sticky bone was placed at the defect area [Fig. 5a] followed by the placement of a GTR membrane (Periocol, Eucare pharmaceuticals, Chennai, India) cut into a dumbbell-shape [Fig. 5b]. The facial and lingual flaps were approximated using a horizontal mattress suture [Fig. 5c]. Non eugenol periodontal dressing (COEpak, GC, USA) was placed for 14 days. Patient was advised to restrain from mechanical cleaning aids at the operated area for 1 month.

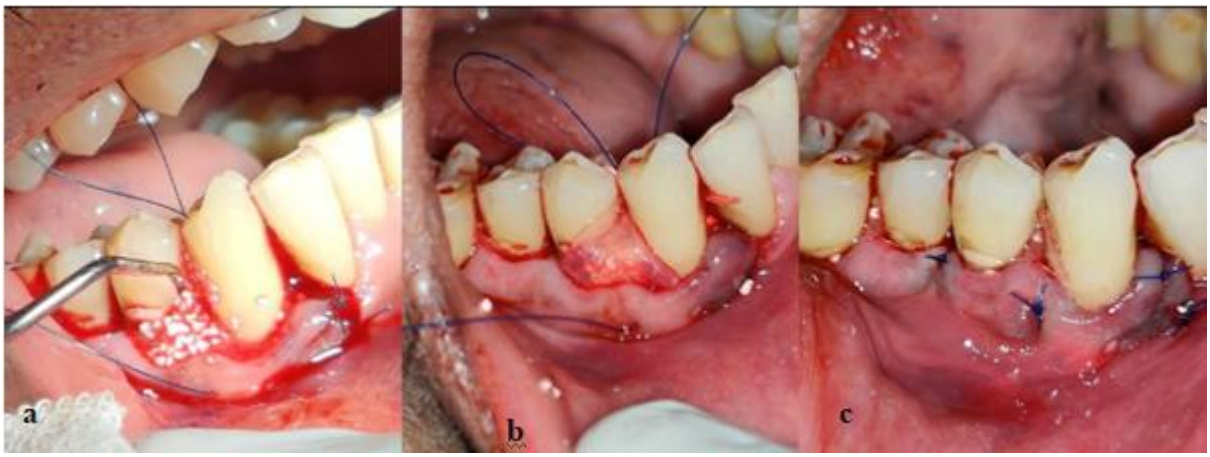

Figure 2: a) Aspiration of blood from greater cephalic vein, b) Prepared i-PRF collected in sterile syringe, c) Sticky bone made by mixing bone graft with i-PRF

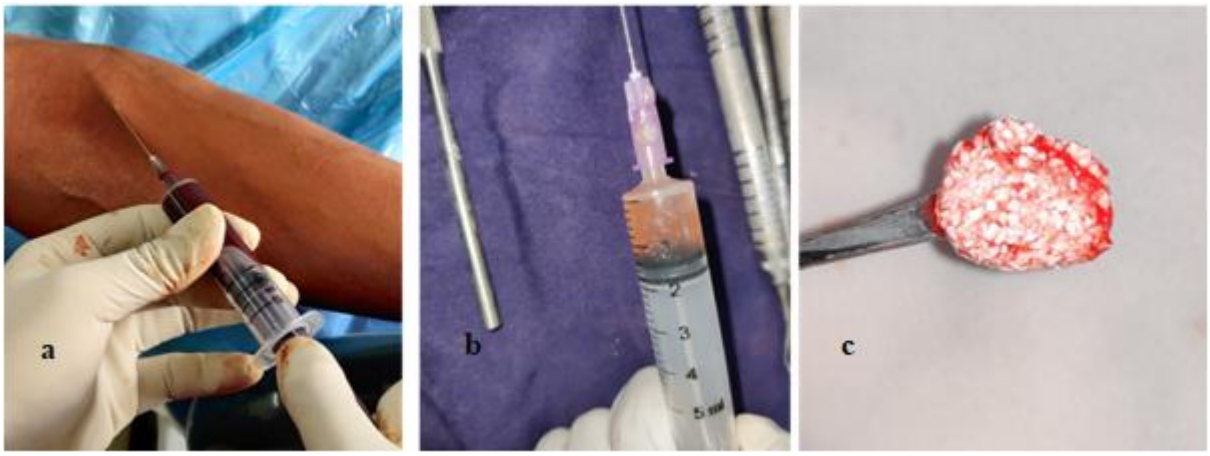

Figure 3: a) Placement of sticky bone in defect, b) Placement of GTR membrane, c) Sutures placed

Amoxicillin + clavulanic acid (500 mg + 125mg) 1 tds, Analgesic –Ibuprofen (400mg) 1 tds and Chlorhexidine 0.2% rinse thrice a day, were prescribed.

Following surgery, patient was re-evaluated at regular intervals of 3months for 1year. Necessary de-plaquing was done and patient was reinforced for plaque control at recall visits. There was a reduction in the PPD and CAL from 7mm and 8mm (pre-operative) to 3mm and 4mm (1-year post-operative) respectively. There was no mobility noted at any of the follow-up visits. Radiographically, a partial defect fill was achieved [Fig.6].

Figure 4: 1-year follow-up intraoral periapical view radiograph

3. Discussion

The ideal goal for regerative periodontal therapy is the reconstitution of connective tissue attachment and alveolar bone which has been destroyed by the periodontal disease.[11]Complete periodontal regeneration after various treatment modalities is difficult to achieve because of differential healing abilities of periodontal tissues. The events range from cell migration to differentiation and incorporation of numerous cytokines and growth factors for regulation.[3]

The most favourable outcome for regenerative periodontal therapy is the regain of lost supporting tissues. Some of the regenerative therapies advocated include, open flap debridement; open flap debridement with bone grafts/bone substitutes, and guided tissue regeneration (GTR).

Dental research industry has been progressively concerned over the past two decades with placement biologically inert, synthetic and autologous materials into periodontal intrabony defect.

In our case report, intrabony defects of the patient in relation to #43 and #44 was treated with i-PRF in combination with alloplastas sticky bone and GTR membrane to attempt periodontal regeneration.

PRF contains numerous growth factors like platelet-derived growth factor (PDGF), transforming growth factor (TGF), vascular endothelial growth factor (VEGF) etc. that has the potential to modulate and up-regulate tissue healing.[12]

Injectable PRF (i-PRF) is formed at low centrifugation settings of 700rpm for 3 minutes. It can be injected in liquid form or mixed with bone graft to give a well agglutinated growth factors-enriched bone graft “steak” for bone grafting i.e., sticky bone.

After application, i-PRF immediately coagulates into a clot rich with growth factors, which has been reported to be constantly released over a period of 10–14 days. Presence of higher number of leukocytes in i-PRF has advantage as it favours more growth factor release and local antimicrobial action and thus promotes tissue wound healing. Sticky bone aids in better handling and stabilization of bone graft mass which helps in acceleration of tissue healing, providing bulk and also minimizing bone loss during healing phase.[10]Sohn et al. demonstrated that i-PRF has excellent biocompatibility, induces a significant number of cell migration and proliferation and when compared to PRP, better osteogenic differentiation has been documented.[13]

Bone grafts in combination with a barrier membrane have been shown in literature to enhance the regenerative outcomes. Filling the defect with sticky bone and covering it with a barrier membrane have shown to accelerate the bone formation and wound healing with superior periodontal regeneration. i-PRF with bone graft (sticky bone) can be easily moulded into the desired and required shape, aiding in its easy handling and also in preventing dispersion.[14] Studies have shown that following 10 days, an additional release of growth factors could be expected from i-PRF.[15] Hence, in

this study i-PRF with bone graft and sterile barrier membrane was decided to be used for regeneration.

As described by Sculean et al.[16] in the systematic review, that most studies have demonstrated superior histologic healing following the combination of barrier membranes and grafting materials than following open flap debridement, hence in this case with the use of sticky bone, GTR membrane was also placed for better outcome. Other bone graft materials like bovine bone, allografts, etc have also been studied extensively for placement in intraosseous bone defects. Some authors evaluated the effect of PRF and bioactive glass and found significant results in terms of clinical and radiographic outcomes at 1 year follow-up.[17]

Preoperatively, a PPD and CAL value in our patient was recorded as 7mm and 8mm respectively. At 1 year post-operatively, the values reduced to 3mm and 4 mm respectively. The results of this report shows that with the use of i-PRF and bone graft material (sticky bone) along with a barrier membrane, it was possible to regenerate wide intrabony defect.

4. Conclusion

According to the results obtained in this case report, it could be concluded that the positive clinical impact of additional application of PRF with alloplastic graft material in treatment of periodontal intrabony defect is based on reduction in probing pocket depth, gain in clinical attachment level, significant radiographic defect bone fill, improved patient comfort and early wound healing.

However, long-term, multicentre randomized, controlled clinical trial will be required to substantiate the observations of the present case report.

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