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Platelet-rich Fibrin and Coronally Advanced Flap Technique: A Novel Approach for the Treatment of Gingival Recession

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ABSTRACT

Platelet-rich fibrin (PRF), referred to as a second generation platelet-concentrate has been shown to promote soft--tissue healing because it contains autologous growth factors. Coronally advanced flap (CAF) technique has been shown to the effectively treat gingival recession. Therefore, the purpose of this case report was to evaluate effect of PRF with CAF technique for the treatment of gingival recession. A patient with Miller Class I gingival recession of 5.0 mm was treated by PRF and CAF technique. PRF was prepared from whole blood according to the protocol developed by Choukroun *et al.* in 2001 and applied to the root surface. After 6 months, 100% root coverage was obtained. PRF and CAF technique is predictably used for the achievement of complete root coverage. The long-term follow-up with histologic studies will be required to obtained more information about PRF and CAF technique for the treatment of gingival recession.

Keywords: Coronally advanced flap, gingival recession, platelet-rich fibrin.

INTRODUCTION

Gingival recession is defined as the exposure of root surface in the oral cavity, resulting from the detachment and migration of junctional epithelium toward the apex of the root [1]. The goal of periodontal therapy is to protect and maintain the patient's natural dentition over his or her lifetime for optimal comfort, function, and esthetic appearance [2]. Different techniques have been developed to cover exposed root surface. They can be classified as pedicle grafts, free soft--tissue grafts or a combination of both. Free soft--tissue grafts as epithelialized gingival graft, subepithelial connective tissue graft, subpedicle connective tissue graft and pedicle grafts as rotational flap, coronally advanced flap (CAF), and semilunar flap have been advocated. CAF is less technique sensitive than rotational flaps and also eliminates the need to harvest donor tissue as require in free--soft tissue grafts.

CAF resulted in epithelial and connective tissue attachment with the minimal bone repair. Therefore, various adjunctive agents like enamel matrix derivative, recombinant human bone morphogenetic protein, recombinant human growth factors and platelet concentrates as platelet-rich plasma or platelet-rich fibrin(PRF) has been applied to promote healing and periodontal regeneration. PRF is a leucocyte- and PRF matrix, first developed by Choukroun *et al.* in 2001 in France [3]. Platelets in PRF release high amount of growth factors and matrix glycoproteins [4]. Thus, PRF presents a specific biology for repair and regeneration. The aim of this case report was to evaluate the impact of PRF

with CAF technique for the treatment of gingival recession.

CASE REPORT:

A 19-year-old female patient had a complaint of receding gum in lower front tooth region. At intra-oral clinical examination, an isolated Miller Class I gingival recession at the labial surface of the lower right central incisor (#41) was present [Figure 1] due to trauma from occlusion. The recession depth was 5 mm recorded by using UNC-15 periodontal probe-measured from the cementoenamel junction (CEJ) to the gingival margin. Gingival height was 2.0 mm when measured from the apical portion of gingival margin to mucogingival line and probing depth was 2.0 mm as the distance from the bottom of the sulcus to the most apical portion of the gingival margin.

The patient underwent phase I therapy including scaling, root planing, and instructions for proper oral hygiene measures. Occlusal therapy including occlusal adjustment or coronoplasty was done for the treatment of trauma from occlusion. A coronally directed "roll" technique was advised for tooth with the gingival recession to minimize toothbrushing trauma of the gingival margin. Surgical treatment of gingival recession was not schedule until the patient could able to maintain full mouth bleeding score [5] of ≤ 20 % and full mouth plaque score [6] of ≤ 20 % along with absence of plaque, that is, "plaque-free" (area where plaque could not be removed with a manual probe) and bleeding on probing at the surgical tooth site.

The PRF was procured according to Choukroun *et al.* [3]. PRF was prepared without biochemical manipulation of blood and requires neither anticoagulant nor bovine thrombin. Prior to surgery, 10 ml of venous blood was drawn from patient by venipuncture of the antecubital vein into a sterile glass test tube (vacutainer) of 10 ml without any anti-coagulant and centrifuged immediately at 3000 rpm (approximately 400 g) for 10 min using a tabletop centrifuge. Because of the absence of an anticoagulant, blood begins to coagulate as soon as it comes in contact with the glass surface. Therefore, for successful preparation of PRF, speedy blood collection and immediate centrifugation before the clotting cascade is initiated are absolutely essential. Due to differential densities, centrifugation resulted in the separation of three basic layers in the tube: Red blood cells (RBCs) layer at the bottom, acellular platelet-poor plasma (PPP) as a supernatant at the topmost layer and PRF clot in the middle between the two layers. A total of 2-3 ml of the top layer was pipetted out with the sterile dropper; the middle layer PRF clot was removed and placed in a sterile dappen dish. The PRF clot was then transformed into a membrane by compression between two sterile gauzes.

Patient was instructed to do presurgical rinse by 0.2 % chlorhexidine solution. The facial skin all around the oral cavity was cleaned with spirit and scrubbed by 7.5 % povidone iodine solution. Intra-oral surgical site was painted with 5 % povidone iodine solution [7].

After proper part preparation, 2 % lignocaine HCL with 1: 80,000 adrenaline was administered to anaesthetize lingual, labial, and inferior alveolar nerves. The CAF was prepared according to Pini-Prato *et al.* [8]. After local anesthesia, a marginal incision was given all along the soft--tissue margin of the recession defect. Two vertical incisions were given at the line angles of two teeth adjacent to the operating tooth extending beyond the mucogingival junction. Sulcular incision was given which connects the two vertical incisions. Full thickness mucoperiosteal flap [Figure 2] was elevated beyond the mucogingival junction and at least 5 mm apical to the most apical margin of the bony dehiscence. The flap was further released by sharp dissection. The PRF membrane was placed over the denuded root [Figure 3] and stabilized with a horizontal mattress suture in the intended position. The flap was then coronally advanced to completely cover the membrane and secured in place by using sling suture [Figure 4].

Antibiotic (amoxicillin 500 mg, 1 tablet every 8 h, for 7 days) and analgesic (nimesulide 100 mg, 1 tablet every 12 h, for 3 days) were prescribed. Patient was instructed to be extremely cautious during mastication at meals and not to brush the teeth in the treated area for 2 weeks but to use 0.2 % chlorhexidine mouthwash twice daily for 1 min. After this period, patient was advised to mechanical cleaning of treated tooth region using an extra soft toothbrush by coronally directed "roll" technique, together with 0.2 % chlorhexidine mouthwash twice daily, 1 min for more 4 weeks. After this period,

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routine oral hygiene procedures could be reintroduced.

Clinical follow-up was performed once a week in the first postoperative month, every 2 weeks in the second postoperative months and once a month after that up to 6 months. At each visit, recall programs including professional tooth cleaning and reinforcement of daily oral hygiene measures were done. Healing was uneventful. Patient was satisfied with the treatment outcome. As the post-operative time increased, the progressive adaptation and morphologic resemblance were observed. After 6 months, 5 mm, that is, 100 % root coverage, 7 mm of gingival height, and 1 mm of probing depth were obtained [Figure 5].

DISCUSSION:

The ultimate goal of any therapeutic intervention aimed at root coverage should be to restore the tissue margin at the CEJ and to achieve an attachment of the tissues to the root surface so that a normal healthy gingival sulcus with no bleeding on probing and a minimal probing depth is present [9].

Various surgical procedures have been described to treat gingival recessions, but these have been demonstrated to heal with a long junctional epithelium, and regeneration has been observed only in the most apical portion of the lesion. Although the bilaminar technique using subepithelial connective tissue grafts [10] still holds the most promising results in root coverage, histological studies show unpredictable healing. The use of PRF membrane in our case report to attain root coverage may alleviate the need for donor site procurement of connective tissue graft.

The evaluation period used in this case report was 6 months from last surgical treatment because this period is considered adequate to provide soft--tissue maturity and stability as reported in systematic review dealing with root coverage procedures [11] In this case report of PRF and CAF technique 5 mm, that is, 100 % root coverage was obtained after 6 months, this was similar to subepithelial connective tissue graft [10] in which 2--6 mm of root coverage was reported, but this technique surpassed the result of the subpedicle connective tissue graft [12] in which 88 % root coverage was reported.

Platelet-rich fibrin is a second generation platelet concentrate and is defined as an autologous leucocyte- and PRF biomaterial. PRF membrane consists of a fibrin three dimensional polymerized matrix in a specific structure, with the incorporation of almost all the platelets and more than half of leucocytes along with growth factors and the presence of circulating stem cells [13]. Platelets are merged within fibrin meshes like cement, but enmeshed leucocytes are alive and functional. During PRF processing by centrifugation, platelets are activated resulting into degranulation and release of high quantities of growth factors. Due to the specific fibrin polymerization mode in PRF, it provides a stable composition, quantities, and increased life span for these growth factors for at least 7 days, which is especially encouraging for the healing process by increasing angiogenesis and matrix biosynthesis during wound healing [4]. The extremely high densities of fibrin fibers (x100 normal) detected in the PRF membrane which provides additional stability of the wound and promotes rapid neoangiogenesis [14]. Regardless of the fact that growth factors trapped in PRF mesh are slowly released and able to accelerate the regenerative potential, the structure of the fibrin network is the key element of the improved PRF healing process [13]. As PRF is an autologous preparation from patient own blood, it decreases the cost of the regeneration therapy and also less time--consuming, both for surgeon and patient. Placement of PRF does not require a skill and it is less technique sensitive than guided tissue regeneration and bone graft placement for the periodontal therapy.

CONCLUSION:

Soft--tissue maintenance is the primary line of defense in protecting the tissue from bacterial infection. Although the growth factors and the mechanisms involved are still poorly understood, the ease of applying PRF in the dental clinic and its beneficial outcomes, including reduction of bleeding and rapid healing, holds promise for further procedures. More well--designed and properly controlled studies will be needed to provide solid evidence of PRF's capacity for and impact on wound healing, soft--tissue reconstruction and augmentation procedures, especially in periodontal therapy.

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FIGURES:

Figure 1: Preoperative clinical situation.

Figure 2: Mucoperiosteal flap was elevated

Figure 3: PRF membrane placed on recession site

Figure 4: CAF sutured over the PRF membrane

Figure 5: Six months postoperative.

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