

Novel technique for esthetic root coverage with titanium prepared platelet-rich fibrin

ABSTRACT

Leukocyte- and platelet-rich fibrin (L-PRF) can be defined as an autologous leukocyte and platelet-rich biomaterial. Unlike other platelet-rich products, this technique does not require an anticoagulant or bovine thrombin. However, it is simply centrifuged blood without any additives, which makes it possible to avoid all of the legal restrictions related to the reimplantation of blood-derived products. L-PRF is composed of a fibrin matrix polymerized in a tetramolecular structure and is involved in the joining of platelets, leukocytes, cytokines, and circulating stem cells. The use of silica-coated test tubes is arising a lot of queries about the safety of L-PRF prepared within these test tubes. So, to avoid the use of silicacoated test tubes, titanium prepared PRF has come in practice now, as titanium is biocompatible metal and has property of histoconduction. The present case report is about successful esthetic root coverage around mandibular anterior teeth with clinical attachment loss of 4–5 mm at baseline. The patient had reduced sensitivity, CAL was 1 mm, and attached gingiva covered denuded root surface after 15 days and after 3-month recall appointment.

Keywords: Esthetic root coverage, leukocyte- and platelet-rich fibrin, platelet concentrates, titanium platelet-rich fibrin

INTRODUCTION

Platelet-rich fibrin (PRF) was first developed as an autologous leukocyte-and PRF (L-PRF) biomaterial in 2001.^[1] Unlike other platelet-rich products, this technique requires neither anticoagulant nor bovine thrombin. Thus, this PRF is considered as a second-generation platelet concentrate.^[2-7] Without an anticoagulant, most platelets are activated a few minutes after contacting the tube walls, which initiates the coagulation cascade. Fibrinogen is initially concentrated in the upper part of the tube, before the circulating thrombin which transforms it into fibrin. A fibrin clot is then formed in the middle of the tube, just between the red corpuscles at the bottom and the acellular plasma at the top.^[4] The success of this technique entirely depends on the speed of blood collection and transfer to the centrifuge. Indeed, without the anticoagulant, the blood samples start to coagulate almost immediately upon contact with the tube glass, and it takes only a few minutes of centrifugation to concentrate the fibrinogen in the middle and upper part of the tube.^[4]

Quick handling is the only way to obtain a clinically usable L-PRF clot. If the time required to collect the blood and is overly long, failure will occur. The fibrin will diffusely polymerize in the tube, and only a small blood clot without consistency will be obtained.^[8] Successful clinical results have been reported with L-PRF,^[9-12] but some physicians^[13] worry about a possible health hazard with glass-evacuated blood collection tubes with silica activators. O'Connell^[13] described the unavoidable silica contact. The silica particles in the tube, although dense enough to sediment with the red blood

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cells, are small enough for a fraction to remain colloiddally suspended in the buffy coat, fibrin, and platelet-poor plasma layers; therefore, these particles might reach the patient when the product is used for treatment.

T-PRF is a modification of the initial method by changing the structure of the tubes with a more biocompatible titanium material.^[14] The fibrin in the T-PRF samples seemed thicker and better organized than L-PRF samples. As a result, there is degradation of fibrin and release of growth factors for a longer time period.^[15]

CLINICOPATHOLOGIC CASE REPORT

A case of gingival recession was referred to Department of Periodontology with a chief complaint of sensitivity of teeth due to cervical lesions in left mandibular arch [Figure 1a]. There was clinical attachment loss of 4–5 mm on left lower side with lateral incisor, canine, first and second premolars. After clinical and radiographical evaluation, the nonsurgical periodontal therapy was performed which included scaling root planing, and cervical lesions were restored with Glass ionomer cement (GIC) restorative material [Figure 1b]. The patient was recalled for root coverage after 3–4 weeks so that inflammation subsides and margins become firm for incisions.

The blood investigations were done; complete blood count and glucose levels were evaluated and were found within normal limits. The patient's informed consent was taken prior to surgery. Adequate anesthesia was obtained using 2% Xylocaine (lidocaine) with adrenaline 1:80,000 with infiltration in left mandibular arch to achieve rapid onset of action within 2–3 min. The conventional split thickness

flap was reflected with sulcular incisions extending from left mandibular lateral incisor to second premolar.

The T-PRF was prepared according to the L-PRF protocol but in titanium-coated test tubes. 20 mL of blood was quickly drawn from the antecubital vein of each patient's right/left arm and was transferred to the specially designed Grade IV titanium sterile tubes without any anticoagulant. The tubes were immediately centrifuged at 2,700 rpm for 12 min using a table centrifuge (Hettich Universal 320, Hettich Zentrifugen, Germany) at room temperature.^[16] After centrifugation, the T-PRF clot (in the middle part of the tube) was removed with sterile tweezers and separated from the red blood cell base without using scissors [Figure 2]. Then, the clot was compressed in gauze to create a constant thickness of the T-PRF membrane.

The T-PRF was prepared and membrane was placed over the defects on teeth #32, #33, #34, and #35 [Figure 1c]. The graft width was measured to cover 1 mm beyond the root surface defects coronally in the recipient area, and graft was sutured with 4-0 absorbable poly (glycolide-co-lactide) synthetic sutures (Pegalak, Doğan, Turkey). The width of attached gingiva was compromised on tooth #35 so as to increase the width of keratinized gingiva, the free gingival graft was procured from the donor site in palate of dimensions as length 7 mm, breadth 4 mm, and thickness 1.5 mm using two horizontal and 2 vertical incisions. The rectangular free graft was procured and secured with 4-0 absorbable poly (glycolide-co-lactide) synthetic sutures (Pegalak, Doğan, Turkey) over the T-PRF membrane to give adequate thickness and enhance the attached gingiva. The recipient site was covered with noneugenol periodontal dressing (Coe Pak) after gingival augmentation done with help of T-PRF and free gingival graft.



Figure 1: (a) Preoperative view with 4–5 mm attachment loss over teeth # 32, #33, #34, and #35. (b) Preoperative view of GIC restoration. (c) Surgical view after grafting T-PRF membrane with tooth # 32, #33, #34 and free gingival graft with tooth #35. (d) Postoperative 3-month view



Figure 2: Titanium platelet-rich fibrin preparation in centrifuge using Grade IV titanium test tubes

The patients were given a cold compression extraorally for the first 24 h to minimize bleeding and swelling. All patients were given an appropriate nonsteroidal anti-inflammatory drug. The results were evaluated at 3 months and showed clinical attachment loss of 1 mm [Figure 1d]. The sensitivity was reduced after the esthetic root coverage.

DISCUSSION

The present case for root coverage was done with T-PRF along with restoration of cervical lesions with GIC. The T-PRF was three dimensionally more stable on visual analog scale in comparison with L-PRF. In this study, although 6-month follow-up period, similar results were obtained with previous studies, it was shown that T-PRF was better than L-PRF in strength and handling. In a recent study, the clinical effects of T-PRF on human palatal mucosal wound healing were evaluated. Because of the positive results, the researchers concluded that T-PRF is a promising autogenous material for histoconduction, and it may also be preferred as an alternative to CTG in the treatment of gingival recessions.^[17]

Although this issue is still debated, the cell composition and three-dimensional organization of L-PRF were evaluated by the influence of different collection tubes (dry glass or glass-coated plastic tubes) and compression procedures (forcible or soft) on the final L-PRF-membrane architecture. It was shown that the type of tested tube (dry glass or glass-coated plastic tubes) and the compression process of the clot (forcible or soft) did not influence the architecture of this second-generation platelet concentrate. Following these discussions, several research groups published studies concerning L-PRF;^[11,12,15-19] however, none of these studies reported a clinically significant drawback with the glass tubes. Despite these findings and the successful results in clinical studies, the initial L-PRF method was changed with the structure of the tubes and used a more biocompatible material, titanium.^[20] This material was tried to eliminate the speculations about the potential negative effects of silica from dry glass or glass-coated plastic tubes.

CONCLUSION

Within the limits of this study, the results demonstrated that T-PRF is a safe, effective method in treating class I and II Miller gingival recessions. In addition, this procedure can be recommended to treat localized or multiple-adjacent gingival recessions without additional surgery. However, future randomized clinical trials with a split-mouth design and larger sample size are essential for evaluating the T-PRF efficiency in gingival recession treatment modalities.

Declaration of patient consent

The authors declare that they have obtained consent from patients. Patients have given their consent for their images and other clinical information to be reported in the journal. Patients understand that their names will not be published and due efforts will be made to conceal their identity but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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