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Enhancing palatal wound healing by using platelet rich fibrin membrane as fibrin bandage

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Abstract
Aim: Free gingival graft procedure is a frequently used mucogingival procedure for gingival augmentation. One of the major drawback associated with technique is healing of donor site by secondary intention which takes more time to heal and causes patient discomfort. PRF is a novel biomaterial which has shown to accelerate wound healing process. The article describes the healing of donor site with and without placement of PRF membrane in 2 patients.
Case presentation: Two patients requiring gingival augmentation were enrolled for the study. The palatal donor site of one patient was covered with PRF membrane as palatal bandage. The donor site of the other patient was allowed to heal in a conventional way without PRF membrane to evaluate the difference in healing. The healing was evaluated visually by using healing index and by hydrogen peroxide test at 12th, 13th, 18th, 19th, 24th, 25th, 30th and 31st days. Palatal donor site covered with PRF membrane demonstrated considerably faster healing and higher healing score compared to site not covered by PRF membrane.
Conclusion: The superior healing observed at the PRF membrane site supports its use in accelerating the soft tissue healing. PRF membrane as a bandage is an efficacious approach to protect the open wound in palate to reduce healing time and patient discomfort.

Keywords: Enhancing palatal, fibrin membrane, fibrin bandage

1. Introduction
Free gingival grafts are used to create a widened zone of attached gingiva. The autogenous free gingival graft (FGG) with the aim of increasing the width of keratinised gingiva was introduced by Björn (1963) and Nabers (1966). The palate is the usual donor site.
The disadvantages include the need of second surgical site which creates open wound that is prone to bleeding, pain, and slow healing [1]. Studies on the donor sites of FGG, have shown that palatal wound requires 2-4 weeks to heal with secondary intention [2] and patients experience more pain in comparison to connective tissue grafts [3]. In spite of these limitations, little has been mentioned about their management in literature.
Platelet rich fibrin (PRF) has long been used as a wound healing therapy in skin wounds and recent evidence has suggested its applications in oral cavity for different treatment modalities. At the site of injury, platelets release an array of potent inflammatory and mitogenic factors that are involved in cascade of wound healing process. Also, Platelet-rich fibrin (PRF) is the simplest and inexpensive procedure to use autologous glues [3]. He blood is collected without any anticoagulant and immediately centrifuged. The natural coagulation process allows for the easy collection of a leucocyte- and platelet-rich fibrin (L-PRF) clot. Biochemical activation of PRF is not required. The PRF clot forms a strong fibrin matrix and can be compressed to form a strong membrane. The fibrin matrix is remodelled in a way comparable to a natural clot and does not dissolve rapidly after application [4]. Studies have supported that PRF is involved in 3 key mechanisms of wound healing i.e angiogenesis, immunity and epithelial proliferation. It is also utilised in management of non-healing wounds [5].
Thus keeping in mind the advantages provide by PRF, the aim of this article is to explore the use of PRF membrane as a palatal bandage and clinically comparing the conventional healing of donor site without PRF and with PRF membrane.

2. Case Presentation

Two systemically healthy patients, one female and one male with mean age of 25 years came to the department of periodontology, Dr. Syamala Reddy Dental College, Hospital and Research Centre Bangalore in January, 2014. On clinical examination, inadequate keratinized tissue was present with respect to lower central incisors. The surgical procedure i.e gingival augmentation was explained to the patients and the informed consent obtained.

2.1. Surgical Procedure: Gingival augmentation procedure was done by harvesting FGG from palate. The palatal donor sites of first patient was covered with PRF membrane as palatal bandage. The donor site of the second patient was allowed to heal in a conventional way without PRF membrane to assess the difference in healing.

3. Preparation of PRF membrane

10ml of intravenous blood from antecubital vein was collected in test tube without an anticoagulant and centrifuged immediately using a tabletop centrifuge for 10 minutes at 3,000 rpm. The resultant product consists of the following three layers: Top most layer consisting of acellular platelet poor plasma (PPP), PRF clot in the middle, RBCs were present at the bottom. The fibrin clot was easily separated from the lower part of the centrifuged blood and spread on a sterile gauze and converted into a membrane.

4. Application of membrane at donor site

After preparing PRF membrane, it is cut and resized according to donor size. PPP being good adhesive was used at donor site. Membrane is sutured by using 4-0 non resorbable mersilk suture (Ethicon^{R}).

5. Result

The healing was evaluated clinically at 12th/ 13th, 18th/ 19th, 24th/25th and 29th/30th day by using healing index (Landry *et al.* 1988) and H_2O_2 test. Healing index showed higher scores and hence superior healing for donor site where PRF was placed. The negative peroxide test for two consecutive days indicated complete healing. An uneventful comprehensive healing was observed at the site with PRF by 18 days. The H_2O_2 test was negative on 18th/19th day and afterwards showing epithelialisation at PRF site. The demarcation of membranes integrated at the donor sites was visible at 18 days. The donor site without PRF membrane healed completely at 4 weeks and showed positive H_2O_2 test till 24th/25th days but negative on 30th/31st days showing epithelialisation. The considerably lesser time required for healing by PRF membrane sites resulted in lesser post-operative discomfort to the patients.

6. Discussion

PRF was first developed in France by Choukroun *et al.* for specific use in oral and maxillofacial surgery. This technique requires neither anticoagulant nor bovine thrombin (nor any other gelling agent). PRF membrane acts much like a fibrin bandage, serving as a matrix to accelerate the healing of wound edges [6]. It also provides a significant postoperative protection of the surgical site and seems to accelerate the integration and remodelling of the surgical site [7].

The published data till date validate that PRF membrane can be considered as an effective healing biomaterial. It features all the essential parameters permitting optimal healing. PRF membrane consists of a fibrin 3D mesh polymerized in a specific structure; the incorporation of platelets, leukocytes, and growth factors; and the presence of circulating stem cells. The PRF membrane influences the factors that affect healing and soft tissue maturation. PRF encourages angiogenesis, immunity and epithelialization [8]. The angiogenesis property of fibrin matrix can be attributed to angiogenesis soluble factors such as vascular endothelial growth factor, platelet-derived growth factor (PDGF) and fibroblast growth factor-basic. The platelets and leukocyte cytokines play an important role in the biology of the PRF, the fibrin matrix supporting them certainly constitutes the determining element responsible for the real therapeutic potential of PRF [9].

Principle of using H_2O_2 test in present study is based on fact that an intact epithelial barrier prevents the diffusion of H_2O_2 into the connective tissue, thus resulting in liberation of little or no oxygen. This test measures the quality of epithelial barrier. Also the healing index used in study showed better result using PRF membrane. (Table 1)

Table 1

1 Very poor	tissue colour: ≥ 50% of gingiva red • response to palpation: bleeding • granulation tissue: present • incision margin: not epithelialised, with loss of epithelium beyond incision margin • suppuration present
2 Poor	tissue colour: ≥ 50% of gingiva red • response to palpation: bleeding • granulation tissue: present • incision margin: not epithelialised, with connective tissue exposed
3 Good	tissue colour: ≥ 25% and < 50% of gingiva red • response to palpation: no bleeding • granulation tissue: none • incision margin: no connective tissue exposed
4 Very good	tissue colour: < 25% of gingiva red • response to palpation: no bleeding • granulation tissue: none • incision margin: no connective tissue exposed
5 Excellent	tissue colour: all tissues pink • response to palpation: no bleeding • granulation tissue: none • incision margin: no connective tissue exposed

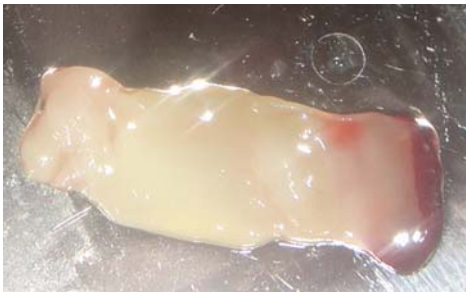

Fig 1: Prf Membrane

Fig 2: After Prf Placement At Donor Site

Fig 3: Donor Site with Prf Placement 18 Days Post-Operative

A

B

Fig 4: Donor Site Comparison: With Prf (A) And Without Prf Placement (B) (18 Days Post-Operative)

7. Conclusion

This technique of using PRF membrane as palatal bandage allows the clinician to reduce longer healing period associated with donor sites by accelerating the healing process.

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