Research article

Efficacy of Platelet-Rich Fibrin as Regenerative Periodontal Tissue in Chronic Periodontitis: A Case Report

Dian Eka Satya[1*], Hasanuddin Thahir[2], Sri Oktawati[2], Nuraini Puspita Sari[1], and Jennifer Tjokro[1]

[1]Periodontology Specialist Educational Program, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia
[2]Periodontology Department, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia

ORCID
Dian Eka Satya: https://orcid.org/0000-0001-9446-5228

Abstract.

Background: One of the pertinent challenges the periodontists face today is the regeneration of periodontal tissue because of its complex structure. Periodontal tissue damage is characterized by bone and soft tissue loss. At present, one of the recommended materials for regeneration is PRF or platelet-rich fibrin. It is a regeneration material containing growth factors, prepared from the patient's own blood, that can be used as a membrane.

Objective: To see the efficacy of healing periodontal tissue using the addition of PRF.

Method: A 31-year-old woman presented to the Department of Periodontology of Hasanuddin University Dental and Oral Hospital with the chief complaint of elongated teeth that often bled. Intraoral examination showed pocket depths of 6 mm and 5 mm in teeth 32 and 42, respectively. Radiographs showed radiolucent features in lower anterior teeth with horizontal bone loss. Chronic periodontitis of 32 and 42. Therapeutic intervention included initial therapy by scaling and root planning, followed by flap operation and regenerative therapy with PRF, membrane and bone graft.

Results: One week post regenerative therapy with PRF, the clinical appearance seemed better and there was no complaint from the patient.

Conclusion: The addition of PRF to periodontal surgery as a regenerative therapy can accelerate healing in the treatment of chronic periodontitis.

Keywords: flap operation, platelet rich-fibrin, tissue regeneration

Corresponding Author: Dian Eka Satya; email: dian03djie@gmail.com

Published: 25 April 2022

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the NaSSiP 6 Conference Committee.

1. Introduction

Periodontitis is an infectious disease of periodontal tissue caused by bacteria that results in damage to the supporting tissues of the teeth, characterized by loss of supporting tissues of the teeth and periodontitis has a high prevalence rate worldwide according to WHO (2013). Periodontal regenerative therapy has ultimate goal which is to prevent the development of periodontal disease, regeneration the periodontal supporting tissues, which are loss due to periodontitis or trauma. Periodontal regeneration is a complete

recovery of lost tissue to its original form and function in accelerated bone healing. [1,2,3,4,5]

Healing is a complex process, which involves cellular organization, chemical signals, and extracellular matrix for tissue repair. An understanding of the healing process is still incomplete, but it is known that platelets play an important role in the process of hemostasis and wound healing. Platelet Rich Fibrin (PRF) is a new generation of concentrated platelets that can regenerate tissue, especially soft tissue and as a medium in the healing process. The simpler processing does not require bovine anticoagulant thrombin as in platelet-rich plasma (PRP), so this preparation is truly autologous.[6]

Choukroun et al. have developed PRF in France in 2001 which is the second generation of platelet concentrates. PRF is an autologous growth factor reservoir containing platelets, leukocytes, cytokines, and adhesive proteins including fibrinogen, fibronectin, vitronectin, and thrombospondin-1. The PRF clot concentrates 97% platelets and> 50% leukocytes in a particular three-dimensional distribution. It consists of cytokines, chain glycates, and structural glycoproteins that are entwined in fibrin tissue that is slowly polymerized. PRF is successfully used in various fields of dentistry and medicine and has shown successful results when used as a single agent in the treatment of periodontal intrabony defects. [7,8,9]

Some of the ideal roles for platelet concentrates are: [1]

1. Tissue healing augmentation: By increasing the proliferation of connective tissue progenitors which stimulate the activity of fibroblasts and osteoblasts and increases osteogenesis.
2. Anti-microbial activity: Against bacterial species involved in oral infections.
3. Modification of host defense mechanisms: By sending peptide signaling which attracts macrophage cells.
4. Modification of immune reactions: By releasing leukocytes that synthesize interleukin.

Also, several benefits are reported in the literature related to the use of PRF, such as the following:[6]

1. Preparation is a simple and efficient technique, with centrifugation in one step, free and openly accessible for all doctors.
2. This is obtained from an autologous blood sample.
3. Little blood manipulation.

4. Does not require the addition of external thrombin, without the risk of an immunologic reaction.
5. There is a natural fibrin framework with growth factors that can maintain its activity for a relatively long time and stimulate effective tissue regeneration
6. Can be used combination or alone with bone graft, depending on its purpose.
7. Increase the rate of healing of grafted bones.
8. Economical and fast choice compared to recombinant growth factors when used together with bone graft.
9. Avoids surgical procedures at the donor site and reduces patient discomfort during the initial wound healing period to use a membrane
10. PRF studies are more efficient and with less controversy in the final clinical outcome when compared to PRP.

Method and Treatment Result

2. Case Report

A 31-year-old female patient came to the department of periodontology Hasanuddin University Dental and Oral Hospital with the chief complaint that teeth were elongated and often bled, patients had no history of systemic diseases and a history of allergies. On intraoral examination there were pocket depths of 6 mm and 5 mm of teeth 32 and 42; on radiographic images appeared radiolucent (Figure 1) in lower anterior teeth with horizontal bone loss. Chronic Periodontitis of 32 and 42. Therapeutic intervention: initial therapy by Scaling and Root Planning, followed by flap operation and regenerative therapy with platelet-rich fibrin (PRF), membrane and bone graft.

Treatment started after the operator explain the treatment procedure, checks the patient's vital signs with normal results, then the patient signed an informed consent. Before performing the action, the operator prepared the tools and the materials in the form of diagnostic sets: mouth retractors, cytoject and anesthetics, blade no. 15c and handles, clamps, network scissors, tissue tweezers, 6-0 nylon threads, and needle holders. In the surgical procedure, the initial procedure was to administer 2% povidone-iodine disinfection (Figure 2), then infiltrate local anesthetic using lidocaine HCL anesthesia and 1: 80,000 epinephrine (Figure 3). Sulcular and vertical incisions with full-thickness flap designs performed using blade no. 15, then the flap was opened using a laboratory to expand the alveolar chemistry (Figure 4)

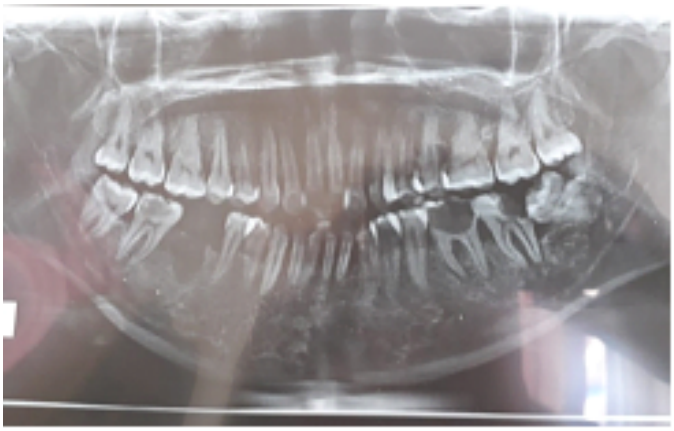

Figure 1: radiographic x-ray of patient before treatment.

Figure 2: Disinfection the treated area (Source: Authors own work).

Figure 3: infiltration anaesthesia the labial aspect of treated area (Source: Authors own work).

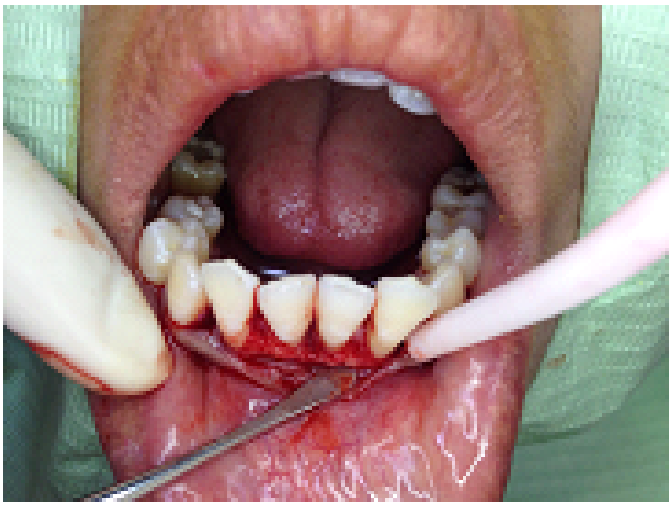

Figure 4: releasing full thickness flap with rasparatorium (Source: Authors own work).

3. PRF Preparation

PRF preparation with intravenous blood was then stored in a sterile tube without anticoagulation and immediately centrifuged at 2,700 rpm for 12 minutes at room temperature, the tube was removed, after that the PRF clot was inserted into the PRF preparation kit and compressed to get the PRF membrane. After that, continued the surgical procedures by debriding the 4 lower anterior teeth using a Gracey curette and ultrasonic scaler. Furthermore, the area was condensed with DFDBX and PRF then covered with a bioresorbable GTR membrane (Figure 9,10,11). The flap was then repositioned and then sewn. And finally giving periodontal dressing (Figure 14).

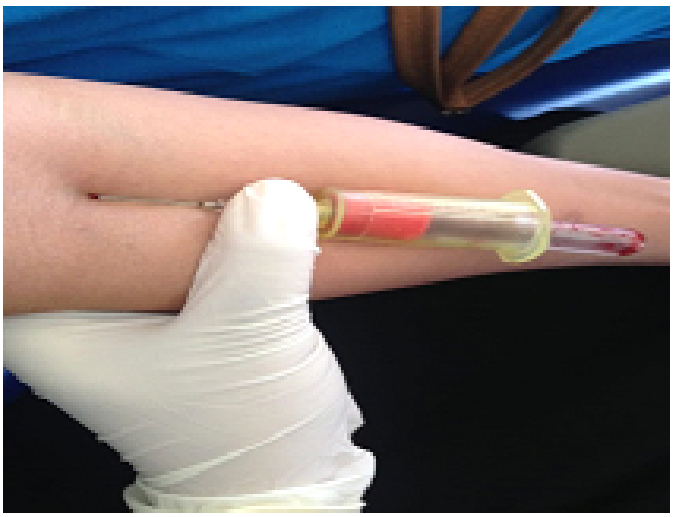

Figure 5: Intravenous blood was taken (Source: Authors own work).

Figure 6: Proccesing of PrF,centrifuged at a speed of 2700 rpm for 12 minutes (Source: Authors own work).

Figure 7: tube in centrifuge machine (Source: Authors own work).

Antibiotics and analgesics were prescribed for 1 week and inform the patient of postoperative instructions. Patients were instructed to come for control 1 week after treatment to open the sewing thread.

Figure 8: Layers formed after centrifugation (Source: Authors own work).

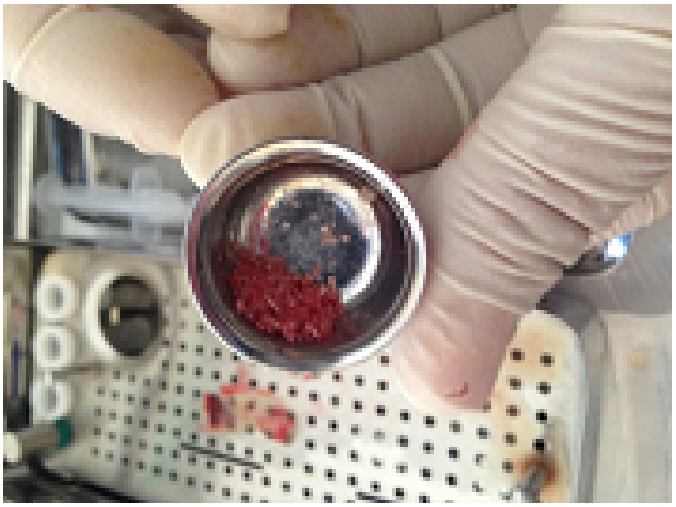

Figure 9: bone graft + PRF (Source: Authors own work).

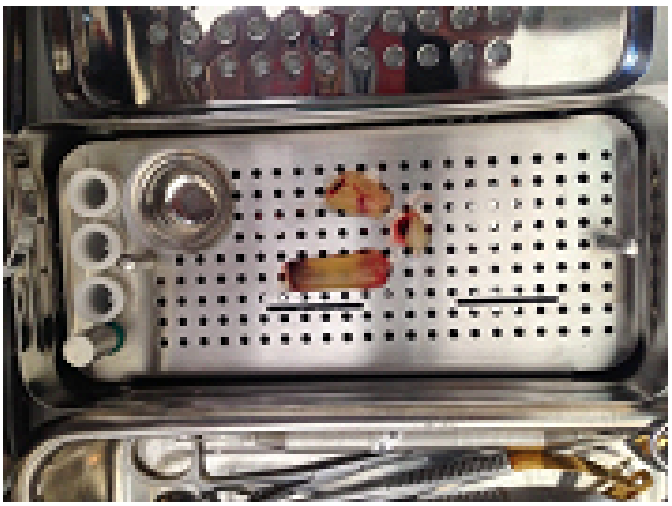

Figure 10: PRF (Source: Authors own work).

Figure 11: Membrane bioresorbable (Source: Authors own work).

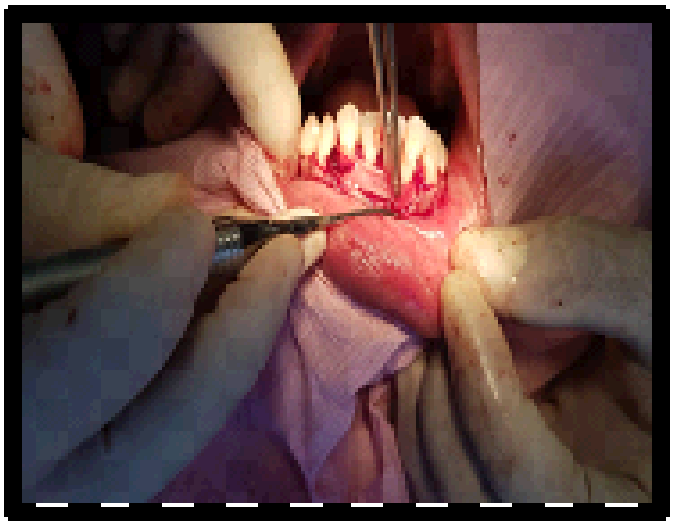

Figure 12: Bonegraft+PRF+membrane placed by GTR membrane (Source: Authors own work).

Figure 13: Flaps were then repositioned and sutured (Source: Authors own work).

Figure 14: Periodontal dressing (Source: Authors own work).

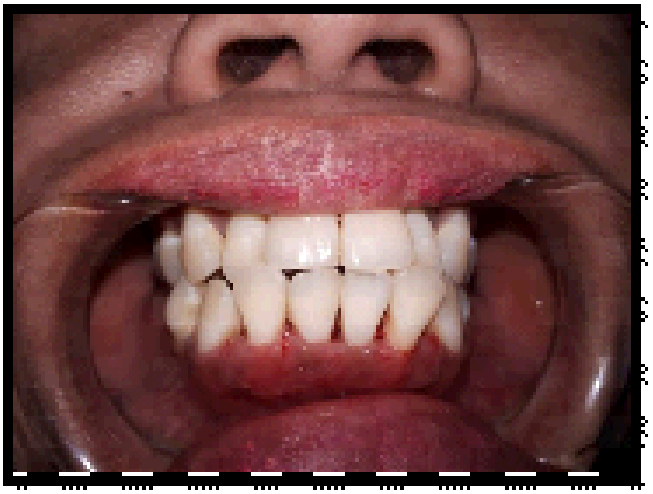

Figure 15: 1 week after surgery (Source: Authors own work).

3.1. Treatment result

Soft tissue healing was good, although there was still a slight degree of inflammation at the gingival margins of the treated area. Periodontal pocket depth decreased and the patient felt more comfortable after the treatment.

.

4. Discussion

Periodontitis is an inflammatory reaction of periodontal tissue to bacterial invasion. Clinically, periodontitis can cause loss of attachment and the formation of periodontal pockets, the resorption of bone which ultimately loses teeth. Periodontal regeneration treatment aims to regenerate periodontal tissue that may be damaged due to pathological disease. There are six periodontal structures that must be considered before performing regenerative treatments, including gingival epithelium, gingival connective

tissue, periodontal ligament, cementum root surface surfaces, alveolar bone, and gingival vascularity. [10]

PRF is used to enhance bone regeneration and soft tissue healing in periodontal plastic surgery procedures. The technique is simple, does not require a long time and is economical so it is often used as an alternative choice in the combination of regenerative treatments. PRF is usually applied in cases of regeneration of infrabony defects, recessions, socket preservation after tooth extraction, gingival care and sinus elevation. According to one study, treatment of defect infrabony combined with PRF gives better results. [11]

PRF is an autologous material that regulates the inflammatory process and appears to be in harmony with physiological wound healing, because in addition to being able to fuse with bone, it can also increase the formation of new bone. PRF is a platelet concentrate that is rich in growth factors, combined with bone graft in treating periodontal tissue defects. [12]

All of these components are mineralized and non-mineralized growth factors, must be repaired in their original shape and position for the regeneration of the periodontium. A growth factor is a class that naturally forms proteins in three cellular keys in tissue repair, namely mitogenesis, migration and matrix synthesis, and remodeling. The combination of growth factors may be more effective in stimulating mineral formation like normal tissue. Platelets are rich in which helps the process of tissue regeneration. [13]

In this case, the use of PRF in the pocket treatment process showed good periodontal tissue healing and reduced pocket depth. Su NY (2015) performed infrabony pocket treatment using PRF and after 6 months of treatment obtained a reduction in pocket depth, gingival attachment, increased gingival thickness, and increased periapical bone density. Cortese A et al. (2016) performed bone augmentation for implant placement in 10 patients using a combination of PRF and bone graft and obtained good osseointegration results between bone and implant. The PRF promotes wound healing and improves vascularization of the operative area so neoangiogenesis occurred. [13]

5. Conclussion

The addition of PRF to periodontal surgery as a regenerative therapy can accelerate healing in the treatment of chronic periodontitis.

6. Acknowledgements

I would like to thank all the lectures of Department Periodontology. Dentistry Faculty of Hasanuddin University, Makassar, Indonesia for the support in this manuscript.

References

[1] Arunachalam M, Pulikkotil SJ, Sonia N. Platelet rich fibrin in periodontal regeneration. The Open Dentistry Journal. 2016;10(1):174–81. http://dx.doi.org/10.2174/1874210601610010174

[2] Dharmawati IA, Manuaba IBP, Thahir H et al. Pocket measurement methods in wistar rats periodontitis induced by bacteria and the installation of silk ligature: An experimental studies. International Journal of Applied Pharmaceutics. 2019;11(4):71–4. http://dx.doi.org/10.22159/ijap.2019.v11s4.35296

[3] Thahir H, Setiawati D. Regenerative approach in the treatment of grade II furcation: A case report. Journal of Dentomaxillofacial Science. 2019;4(1):53-56.

[4] Kumar VR, Shubhashini N. Platelet rich fibrin: A new paradigm in periodontal regeneration. Cell Tissue Bank. 2013;14(3):453–63. https://doi.org/10.1007/s10561-012-9349-6

[5] Ajwani H, Shetty S, Gopalakrishnan D et al. Comparative evaluation of platelet-rich fibrin biomaterial and open flap debridement in the treatment of two and three wall intrabony defects. Journal of International Oral Health. 2015;7(4):32–7.

[6] Borie E, Oliví DG, Orsi IA et al. Platelet-rich fibrin application in dentistry: A literature review. International Journal of Clinical and Experimental Medicine. 2015;8(5):7922–9.

[7] Preeja C, Arun S. Platelet-rich fibrin: Its role in periodontal regeneration. Saudi Journal for Dental Research. 2014;5(2):117–22. http://dx.doi.org/10.1016/j.ksujds.2013.09.001

[8] Miron RJ, Bishara M, Choukroun J. Basics of platelet-rich fibrin therapy. Dentistry Today. 2017;36(4):74–746.

[9] Grecu AF, Reclaru L, Ardelean LC, Nica O, Ciucă EM, Ciurea ME. Platelet-rich fibrin and its emerging therapeutic benefits for musculoskeletal injury treatment. Medicina. 2019;55(5):1–12. https://doi:10.3390/medicina55050141

[10] Su NY, Chang YC. Clinical application of platelet-rich fibrin in perio-endo combined intrabony defect. Journal of Dental Sciences. 2015;10(4):462–3. https://doi:10.1016/j.jds.2015.03.005

[11] Agarwal A, Manjunath RGS, Sethi P, Shankar GS. Platelet-rich fibrin in combination with decalcified freeze-dried bone allograft for the management of mandibular degree II furcation defect: A randomised controlled clinical trial. Singapore Dental Journal. 2020;39(1):1–8. https://doi:10.1142/s2214607519500032

[12] Suwondo CI, Herawati D, Sudibyo S. Effect of advanced platelet-rich fibrin applications on periodontal regeneration in infrabony pocket treatment. Majalah Kedokteran Gigi Indonesia. 2019;4(3):154. https://doi:10.22146/majkedgiind.37414

[13] Cortese A, Pantaleo G, Borri A, Caggiano M, Amato M. Platelet-rich fibrin (PRF) in implant dentistry in combination with new bone regenerative technique in elderly patients. International Journal of Surgery Case Reports. 2016;28:52–6. https://doi:10.1016/j.ijscr.2016.09.022