

The Effectiveness Of Platelet Rich Fibrin Compared With Bone Graft For The Treatment Of Chronic Periodontitis

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ABSTRACT

The treatment to obtain periodontal tissue regeneration is the application of bone graft during flap surgery, but for most patients the price of bone graft is still not affordable. Platelet rich fibrin (PRF) is an autologous matrix that also contains large amounts of platelets, leukocyte, cytokines, and platelet derived growth factor (PDGF) that can increase periodontal regeneration. The aim of this study was to analyze the healing of the periodontal status, repair of gingival bleeding and silting of the pocket by comparing the use of PRF and bone graft in flap surgery. The research design was a pre-test and post-test control group design. The data taken were in the form of pocket depth and gingival bleeding. Observation time was carried out at week 4, week 6 and week 8 by comparing the time before treatment and after treatment and compared between the two groups. Data processing uses the Shapiro Wilk Test. Significance for bleeding parameters using a different test for 2 independent samples with a significance level of 95%. The results of this study, proven that the treatment of periodontal disorders with the addition of PRF has the same results as the addition of bone graft.

KEY WORDS: periodontal regeneration, flap surgery, bone graft, platelet rich fibrin

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I. INTRODUCTION

One of the diseases of the periodontal tissues is periodontitis. Periodontitis is generally characterized by gingival bleeding, gingival discoloration, pocket formation and loss of soft tissue attachment. In addition, tooth mobility can occur and radiographic examination shows bone damage (Carranza, 2022). Patients with periodontitis with advanced conditions require flap surgery to treat this disorder. In flap surgery, a bone graft is needed to fill the defect and the pericard membrane as a barrier so that the bone graft remains in its position, so that within a certain time the bone will grow (Newman, 2012). The problem faced in flap surgery is that bone graft material is still relatively expensive. From the point of view of health service providers, this situation is a burden. Likewise, from the point of view of public hospital patients who seek private treatment, they have to buy materials at a relatively burdensome price,

Platelet rich fibrin (PRF) is an autologous matrix, containing many platelets and leukocyte cytokines. PRF is the second generation of platelet concentrate, has several advantages, namely it is cheaper due to faster and easier production compared to platelet rich plasma (PRP), and does not contain a mixture of chemicals so that it is purely autologous without added thrombin or coagulants (Fioravanti C, 2016). PRF has the ability to increase periodontal regeneration because PRF releases growth factors such as platelet derived growth factor (PDGF). In vitro studies stated that PRF has the ability to modulate the proliferation of periodontal tissue cells, namely gingival fibroblast cells, periodontal ligament cells, oral epithelial cells and osteoblast cells (Clark D, 2018, Miron RJ et al, 2017).

Based on the background and problems mentioned above, a study will be carried out on the effectiveness of PRF for periodontitis treatment by comparing healing after flap surgery and plus PRF with flap surgery plus bone graft. The results of this study are expected to add scientific information in the field of periodontology regarding the ability of PRF as an alternative to bone graft in cases of periodontitis that require flap surgery. This research has fulfilled the feasibility study because the data and results of this study can be used as a clinical practice guide for periodontitis cases that require flap surgery. The formulation of the problem is whether there is a difference in the effectiveness of PRF compared to bone graft for the treatment of periodontitis which requires flap surgery.

The specific objective of this study was to determine whether there is a difference in the effectiveness of PRF compared to bone graft for the treatment of periodontitis requiring flap surgery. The importance or urgency of conducting this research is so that there are alternative choices of materials for periodontitis cases that require flap surgery. Thus it can reduce the budget for flap surgery costs, both from the hospital and the patient side.

Treatment of periodontal disease that has a pocket depth of more than 5 mm is carried out surgically, namely by opening the gingiva until the bone underneath is visible (full thickness flap). This action is often called flap surgery. After the bone has been cleaned of granulation tissue and necrotic tissue, a bone graft is then applied to stimulate new bone growth (Newman MG, 2012, Al Mahdi et al, 2021)). Currently, tissue regeneration techniques have been developed, by adding growth factors obtained from the patient's blood in flap surgery procedures with the aim of maximizing tissue regeneration.

Bone graft is a material used in the operative process in patients with damaged bone tissue. In damaged bone tissue, a scaffold is needed that will function as a substitute for the microenvironment lost during the process of damage of bone tissue. The purpose of using bone grafts is as a bone substitute material to maintain space, by replacing the lost extracellular matrix because the contents of the bone graft are identical to the missing extracellular matrix in the damaged bone, also as a bone substitute material by stimulating and inducing the growth of new bone. With the function of providing a microenvironment that is suitable for the lost tissue, the right type of bone graft will help cell recruitment occur and become a liaison for gaps that occur in damaged tissue so that it can help transport nutrients, blood circulation, and other substances needed to accelerate regeneration network (Fatih K, 2019, Maria V, 2022).

Platelet Rich Fibrin (PRF) is a container or framework that contains growth factors because PRF is in the form of a tough fibrin matrix. PRF is an autologous matrix, containing platelets, cytokines and leukocytes (Damzas, 2020). PRF is obtained from the patient's blood which has been centrifuged at a certain speed. PRF releases growth factors slowly. PRF is a second generations platelet concentrate that can accelerate the healing of soft and hard tissues (Cheng Y, 2023). PRF was first developed by Chouckron for use in the field of oral surgery (Atalay B. 2018, Blinstein B. 2018). PRF has a dense fibrin network with leukocytes, cytokines, glycoproteins, thrombospondin-1 which lasts for about 7 days. PRF contains thrombin which is produced physiologically from the slow polymerization process of fibrinogen into fibrin, resulting in a physiological form that is beneficial for the wound healing process. Cytokines have an important role biologically, the fibrin matrix helps in determining components that have the potential to have a therapeutic effect on PRF (Clark D, 2018). The three-dimensional shape of fibrin makes this material resistant to pulling so that it is not easily torn and easy to use and at the same time functions as a barrier for surgical treatment (Faot F, 2017). PRF can also be used in the form of a membrane, namely by removing the fluid in the fibrin clot (Miron, 2017, Fioravanti, 2016).

II. RESEARCH METHODS

This study is a quasi-experimental study, by comparing the use of PRF and bone graft in flap surgery. The research design was a pre-test and post-test control group design. The data taken were in the form of pocket depth and gingival bleeding. Observation time was carried out at week 4, week 6 and week 8 by comparing the time before treatment and after treatment and compared between the two groups. Data processing uses the Shapiro Wilk Test. Significance for bleeding parameters using a different test for 2 independent samples with a significance level of 95%.

Make flap surgery

After asepsis of the operating area and anesthesia, a horizontal incision is made along the base of the pocket in the area to be operated on. Then a full-thickness flap is made with a raspatorium. Once the bones are visible, the granulation tissue and necrotic tissue are scraped clean, then irrigated with Pz solution. Then PRF or bone graft is applied. Lastly, flap suturing and closure of the postoperative area was performed with a periodontal pack. The pack was opened 1 week later, while the stitches were removed 2 weeks after the flap surgery.

Make and apply PRF

The preparation procedure for making PRF is by taking 10 ml of the patient's blood and placing it into a tube without anticoagulants. Then centrifuge for 10 minutes at 3000 rpm (Djais AI, 2020). The fibrin clot or PRF is obtained after the centrifugation results are removed from the tube and the attached RBCs are separated. PRF is used by cutting with scissors into small pieces and placed in the operating area. In addition, PRF is used as a substitute for the pericard membrane. The way to form PRF into a membrane is to remove the liquid in the fibrin clot, which is to squeeze the PRF with gauze to form a plate or membrane. Furthermore, the PRF membrane is affixed to the operating area to hold the PRF piece in place so that it remains in the expected position

Check bleeding on probing and pocket depth

Examination of bleeding and pocket depth was carried out at 4, 6, and 8 weeks after flap surgery. A new examination is carried out from week 4 to prevent disruption of the process of forming new epithelium, because the new epithelium at the bottom of the pocket will be completely formed in week 4. The way to measure it is that the probe is inserted into the pocket parallel to the tooth axis and the distance is measured from the bottom of the pocket to the edge gingiva. At the same time immediately see if there is bleeding in the area. If bleeding

occurs before 10 seconds after probing, then it is given a score of 1. If bleeding occurs after 10 seconds, then it is given a score of 0 (Carranza, 2022).

III. RESEARCH RESULT

Patients who participated in this study were 16 people aged between 21-65 years, and pockets more than 5 mm. There were 16 treated tooth regions with details of 8 regions underwent flap surgery and added PRF, while the other 8 underwent flap surgery and added bone grafts and closed the pericardial membrane. Based on the research data and the results of statistical tests using the Kolmogorof Smirnov test, the reduction in bleeding on probing and reduced pocket depth after treatment were normally distributed. The results showed that there was no significant difference between flap surgery plus bone graft and flap surgery plus PRF. The statistical test results can be seen in Table 1 and Table 2 below.

Table 1. Bleeding in group I (bone graft) and group II (PRF) before and after flap surgery and PRF at weeks 4, 6, and 8

Time	Group	N	Bleeding on Probing	P
Weeks - 4	I	8	6	0,143
	II	8	2	
Weeks - 6	I	8	4	0,626
	II	8	3	
Weeks - 8	I	8	2	0,143
	II	8	0	

The results of the Mann-Whitney hypothesis test showed that the α value at weeks-4 (0.143), weeks-6 (0.626) and weeks-8 (0.143) was > 0.05 so there was no significant difference in BOP in the group given bone graft and PRF.

Table 2. Difference in pocket depth between group I (bone graft) and group II (PRF) before and after being given treatment at week 4, 6, and 8

Time	Group	N	Mean difference	P
Beginning - weeks 4	I	8	2,875	0,484
	II	8	3,5	
Beginning - weeks-6	I	8	3,5	0,521
	II	8	3,87	
Beginning - weeks-8	I	8	3,5	0,908
	II	8	3,87	

The results of the Mann-Whitney hypothesis test showed that the value of α at weeks-4 (0.484), weeks-6 (0.521) and weeks-8 (0.908) was > 0.05 so there was no significant difference in the pocket depth of the group given bone graft and PRF

IV. DISCUSSION

Currently, the destruction of the periodontal tissue in periodontitis cases requiring regenerative periodontal surgery is added with bone graft material and pericardial membrane to stimulate alveolar bone growth. The costs required are quite large and not affordable for most patients. On the one hand, there are natural ingredients that come from the patient's own blood, namely platelet rich fibrin which has been proven to stimulate tissue growth.

In this study, there was no statistically significant difference in tissue regeneration in the two treatment groups, namely the group that was added to PRF and the group that was given bone graft. The results of this study support the statement that the use of PRF is beneficial for tissue healing (Dhoiphode, 2016, Faot, 2017, Atalay, 2018, Damsaz, 2020, Farshidar, 2022).

The results of the study in the group that added bone graft showed that there was an improvement in the periodontal tissue, namely the absence of bleeding and reduced pocket depth. This is in accordance with research conducted by Djais (2020) which states that the use of bone grafts in surgical procedures can stimulate the formation of new bone and repair of advanced bone defects which, if not repaired, can cause more severe periodontitis.

The results of the study in the group that added PRF showed that there was an improvement in the periodontal tissue, namely the absence of bleeding and reduced pocket depth. This is in accordance with

Gollapudi's study (2022), which stated that there was a reduction in pocket depth after PRF application in flap surgery. The results of this study support the research which states that PRF stimulates soft tissue healing and bone regeneration in various surgical procedures (Nani MVB, 2022).

The results of the statistical test for variable pocket depth at the 4th and 8th weeks showed no significant difference between the PRF-treated and bone graft-treated groups. A different thing happened in the observation at week 6 where there was a significant difference between the two treatment groups ($p < 0.05$), where the group that was given the bone graft had better results. The results of the significance test for the bleeding variable in the PRF and bone graft groups at week 4, week 6 and week 8 showed no significant difference. This study was conducted by observing the differences in the two treatment groups only up to the 8th week, so that the growth of the alveolar bone as a part of the periodontal tissue could not be evaluated.

Research on PRF application after tooth extraction compared to bone graft and PRF application showed no significant difference (Clark D, 2018). In cases that require growth of soft tissue and bone tissue, PRF application alone, or PRF application and bone graft have the same results. In contrast to the results of Thakkar's study (2020) which stated that the combination of bone graft and PRF is more effective for reducing pocket depth in cases of infrabony defects. Likewise, according to Karayurek (2019) who stated that the combination of PRF and bone graft resulted in the formation of new bone which was superior to PRF alone.

From the results of this study, it is proven that the treatment of periodontal disorders with the addition of PRF has the same results as the addition of bone grafts, so that PRF can be used as a substitute material. With the availability of alternative bone graft replacement materials, patients can choose materials according to their financial capabilities as well as the general condition and health of the patient.

The advantage of using PRF is that it costs less, and you can be sure that there will be no rejection reactions because PRF comes from the patient's blood, and the costs required are cheaper. The disadvantage of using PRF is that the patient's blood collection is not done in the dental clinic but in the clinical pathology laboratory, so that the patient takes longer to undergo treatment. When using bone grafts and membranes, all materials have been prepared beforehand, thus saving treatment time. The advantage of PRF is that there will be no rejection reaction and the material will be accepted by the patient's body, because it comes from the patient's own blood. In addition, if you use PRF, the costs required are cheaper, but the patient must have his blood drawn.

V. CONCLUSIONS AND RECOMMENDATIONS

In this study it can be concluded that PRF can be used to treat periodontitis which requires flap surgery, as a substitute for bone graft. PRF application has been shown to reduce pocket entry and reduce gingival bleeding as well as bone graft application. The limitation of this study is the lack of research time so that it cannot observe the growth of new bone. It is necessary to do a similar study by adding new bone growth parameters by means of radiographic examination.

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