

Conference Paper

Effectiveness of Platelet Rich Fibrin (PRF) Compared with Conventional Therapy Toward Wound Dehiscence of Post-Operative Laparotomy

Abdurahman Laqif, Nur Aini Fatah, and Supriyadi Hari Respati

Department of Obstetrics and Gynecology Faculty of Medicine of Universitas Sebelas Maret/ Dr. Moewardi General Hospital Surakarta

Abstract

Objective: To compare the effectiveness of Platelet Rich Fibrin (PRF) and conventional therapy toward wound dehiscence of post-operative laparotomy in the Department of Obstetrics and Gynecology at Moewardi hospital.

Methods: This was a cross-sectional study conducted from September to December 2017 on obstetrics and gynecology post-laparotomy patients undergoing subtotal wound dehiscence in the Department of Obstetrics and Gynecology at Moewardi hospital from 2013 to 2017. They were divided into 2 groups, group 1 consisted of patients with subtotal wound dehiscence after obstetric and gynecological operation receiving conventional non-operative therapy, and group 2 was those having subtotal wound dehiscence after obstetrics and the gynecological operation receiving non-operative treatment with PRF. The data were analyzed using the T-test, performed by SPSS (Software Package for Social Science).

Results: There were 15 subjects in each group meeting the inclusion and exclusion criteria for both case and control groups. The statistical test showed that the average duration of wound healing in control group (12.60 about 2.58) was longer than in PRF group (7.0 about 3.52) with the significance of value $p = 0.001$ ($p < 0.05$). The PRF group spent less cost (IDR 4.511.362 \pm 2.977.934) compared with the conventional therapy group (IDR 12.540.735 \pm 8.227.433) with $p = 0.001$ ($p < 0.05$).

Conclusions: Patients with PRF therapy had faster-wound healing duration, and the result was statistically significant with $p = 0.001$ ($p < 0.05$). PRF therapy also had more cost-effectiveness compared with conventional therapy with $p = 0.001$ ($p < 0.05$).

Keywords: Wound healing, Platelet-rich fibrin

Corresponding Author:

Abdurahman Laqif
a_laqif@yahoo.com

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1. Background

Wound dehiscence after laparotomy remains a severe surgical complication problem and includes 1-3% of patients undergoing abdominal surgery. The occurrence of post-laparotomy wound dehiscence is related to conditions such as anemia, hypoalbuminemia, malnutrition, malignancy, obesity, diabetes, geriatrics, as well as specific surgical

procedures such as obstetric and gynecological surgery (obstetrical and gynecological laparotomy) [1]. Current dehiscence management is divided into non-operative or conservative and operative management. Platelet Rich Fibrin (PRF) is a breakthrough for non-operative therapy in patients with surgical dehiscence. PRF contains many growth factors needed for wound healing [2]. PRF contains over 30 bioactive proteins, growth factors, various cytokines, and chemokines that play an essential role in wound healing, acute tissue response to trauma, and involves in some of the physiological processes of the cell, such as growth differentiation, and cell replication [3]. PRF is autologous, so it is relatively safe and does not pose a risk of allergic or infectious disease. This study aimed to determine the effectiveness of wound healing in wound dehiscence of obstetric and gynecologic laparotomy with PRF treatment compared to conventional non-operative methods.

2. Subject and Methods

This was a cross-sectional study conducted in patients who admitted to Obstetric and Gynecology clinic of Dr. Moewardi General Hospital from September to December 2017 and underwent subtotal wound dehiscence following obstetric and gynecological laparotomy in the last 5 years. Subjects were divided into two groups: the control group was given conventional non-operative method while the treatment group was using PRF treatment and all the subjects met inclusion and exclusion criteria. Inclusion criteria including post-obstetric and gynecologic laparotomy dehiscence with a minimum wound length of 3 cm with wound depth up to the fascia of musculus rectus abdominis, while exclusion criteria including post-obstetric and gynecologic, obstetric deformation complications with depth to peritoneum parietal, complications of laparoscopic dehiscence wounds were present such as infection, worsening of the patient's general condition, and also the patient's refusal to continue the study. The sample size was taken with fixed disease sampling method, and Patient has first assessed the condition of the wound then divided into two groups. In the control group using conventional methods, wound dressing was performed by cleaning the wound with 0.9% sterile saline (NaCl) followed by wound closure using sterile gauze. In the PRF therapy group, wound dressing was performed by cleaning the wound with 0.9% sterile saline (NaCl) followed by PRF gel and then wound closure by sterile gauze. Evaluation of wound conditions were 3 days after treatment for each group, followed by the retrieval and data processing and conducted statistical analysis. The difference among 2 groups was considered statistically significant if p value <0.05 .

3. Results

The subjects of the study were patients with subtotal wound dehiscence after obstetric and gynecologic laparotomy in Dr. Moewardi Hospital. Subjects were divided into 2 groups, each group consisted of 15 patients. Each group's characteristics is shown in Table 1 below:

TABLE 1: Description of Data Subject of the Study.

Variable	N	Min	Max	Mean	SD
Maternal Age (Year)					
Control group	15	26,00	43,00	36,06	5,22
PRF group	15	25,00	43,00	35,38	5,02
BMI					
Control group	15	20,00	36,50	22,36	4,13
PRF group	15	19,00	24,00	21,13	1,46
Hemoglobin					
Control group	15	9,30	12,00	11,47	3,03
PRF group	15	9,30	11,90	10,51	0,75
Albumin					
Control group	15	2,50	4,00	3,37	0,37
PRF group	15	3,00	4,10	3,56	0,35
Blood Glucose					
Control group	15	80,00	112,00	95,00	10,336
PRF group	15	68,00	120,00	95,00	13,824
Working status		Work	Do Not Work		
Control group	15	7		8	
PRF group	15	6		9	

Statistical analysis was done to determine the normality and the homogeneity of the data, continued with bivariate analysis of each characteristic above. We found that all the above variables were homogeneous and there were no significant differences.

The outcome of wound healing between the control group and PRF is seen in the average time of wound healing as shown in Table 2 below:

TABLE 2: Wound healing time between the control group and PRF group.

Variable	Group	N	Mean (days)	p
Wound healing time	Control group	15	12.60±2.58	0.001*
	PRF group	15	7.0±3.52	

* Significance value p < 0.05

Table 2 shows that the average length of wound healing in the control group was longer than PRF group (12.60±2.58 vs 7.0±3.52). Statistical analysis using the normality

data test by Saphiro-Wilk test on the duration of wound healing for the control group and the PRF group showed $p= 0.050$ and $p= 0.069$ ($p \text{ sig} > 0.05$), which means that data is normally distributed. The homogeneity test of Lavene showed $p= 0.23$ ($p \text{ sig} > 0.05$), meaning that the data is homogeneous. The statistical difference in wound healing time in both groups then analyzed using unpaired t-test. It showed that there was a very significant difference ($p= 0.001$) between two groups.

TABLE 3: Multivariate Dependent Regression independent Age, BMI, HB, Albumin, Blood Glucose Serum (BGs), and PRF toward dependent variable (Wound Healing Time).

Variable	Standardized Coefficient (β)	T	p	Note
Umur	10,169	-0,064	0,950	Not significant
Body mass index (BMI)	-0,010	0,274	0,786	Not significant
Hemoglobin (Hb)	0,058	1,461	0,157	Not significant
Albumin	0,462	0,102	0,920	Variable
Blood glucose	0,181	0,122	0,904	Variabele
PRF	0,008	-3,699	0,001	Signifiant
Value of F = 4,367 p Sig = 0,004 (Significant)				

F test on double linear regression which aimed to test independent variable (age, BMI, Hb, albumin, blood glucose, PRF) on regression model shows that all independent variables had a simultaneous effect on the dependent variable (wound healing time).

The costs of therapy on patients undergoing wound dehiscence after obstetric and gynecologic laparotomy in Dr. Moewardi Hospital over the past five years (2013-2017) were also analyzed in both control group and PRF group, the cost data obtained from the medical record, with an average cost as follows:

TABLE 4: Average Cost of therapy on the control group and PRF group.

Variable	Group	N	Average cost (days)	p
The average cost of therapy	Conventional	15	IDR 12.540.735±8.227.433	0.001*
	PRF	15	IDR 4.511.362±2.977.934	
* Significance value $p < 0.05$				

From Table 3 it was found that the average cost of therapy in conventional group patients was more expensive than the PRF group ($12.540.735 \pm 8.227.433$ vs $4.511.362 \pm 2.977.934$) and it is statistically significant ($p=0.001$). Thus PRF therapy can be used as a cheaper therapy.

Multivariate test by using confidence interval 95% and $\alpha=0.05$ showed that total wound healing cost between conventional and PRF group was not affected by external variables where $p=0.071$ ($p < 0,05$).

TABLE 5: A multivariate test of wound healing average cost between conventional and control group.

Variables	OR	Sexual Disorder		P
		CI 95 %		
Occupational status	.785	-4362335.260	9647326.682	.442
Age	.944	-345836.946	920818.425	.356
Wound healing time	.349	-718962.486	1008476.604	.731
Hb	-.265	-1542027.120	1193814.280	.794
BMI	1.408	-293029.694	1522950.983	.174
Albumin	.294	-6305767.124	8383344.365	.772
Blood Glucose serum	.202	-257044.011	312501.243	.841
Group	-1.809	-15944929.811	1107558.516	.085

* Significance $p < 0.05$

4. Discussion

From the result of the bivariate test conducted on the research variables in both groups of PRF, it showed that age, BMI, hemoglobin, albumin, and blood glucose are not statistically different (or homogeneous) with $p > 0.05$. The average duration of wound healing appears to be longer in the conventional group (12.60 ± 2.58 days), compared to PRF group (7.00 ± 3.52 days). The unpaired t-test analysis using a 95% confidence interval and $\alpha = 0.05$ proved that the difference in wound healing among the conventional group and the PRF group was statistically significant ($p = 0.001$).

The Mann Whitney's test analysis using 95% confidence interval and $\alpha = 0.05$ proved that there was a very significant difference ($p = 0.001$) in total cost of wound healing between the conventional group and PRF group. Multivariate test using 95% confidence interval and $\alpha = 0.05$ showed that the existing external variable did not affect total wound healing cost between conventional group and PRF group ($p = 0.071$; $p > 0.05$).

Plasma Rich Fibrinogen is a blood plasma contain rich of fibrin and thrombocyte concentration 3-5 times above normal value (platelet concentration in whole blood) [4]. Another literature mentioned that thrombocyte concentrations in PRF were 2-8 times higher compared with average values [5]. The high concentration of platelets and various growth factors in PRF has made this agent applicable in many branches of medicine, i.e., oral surgery, plastic surgery, craniofacial surgery, cardiac surgery, orthopedics, neurology, sports medicine, and dermatology [6].

Plasma Rich Fibrinogen has various growth factors that are needed in wound healing. When platelets in PRF are activated by thrombin, thrombocytes release growth factors

and other substances that serve to accelerate wound healing by increasing cell proliferation, matrix formation, osteoid production, tissue healing, angiogenesis, and collagen synthesis. Plasma Rich Fibrinogen works by degranulation of α -granules present in platelets containing growth factors [7].

These growth factors help wound healing by attracting cells in a newly formed matrix and trigger cell division. Plasma Rich Fibrinogen has several advantages such as simple, safe, low cost, and clinical effectiveness so that PRF can be an ideal therapy for the treatment of chronic wounds [8]. Plasma Rich Fibrinogen not only releases growth factors in high concentrations but also has antimicrobial properties that can prevent infection because it contains leukocytes [9].

Plasma Rich Fibrinogen has long been used in healing wounds and soft tissue underneath. The use of PRF in the field of skin surgery and cosmetic dermatology is also proliferating [10]. Wound healing is a complex event involving various cells, and biochemical mediators, one of the critical part were platelets. In response to tissue damage, activated platelets will form platelet plugs and release various growth factors [11]. These growth factors play an essential role in the various phases of wound healing (the inflammatory phase up to the remodeling phase) [12]. Platelets also store other bioactive proteins, such as the enzyme matrix metalloproteinase (MMP), coagulation factors, chemotactic factors, adhesion molecules, vasoactive substances, as well as some bactericidal and fungicidal proteins that also play an active role in the wound healing process. In vitro, there is a relationship between platelet concentration with mesenchymal stem cell proliferation, fibroblast proliferation, and type I collagen production. It supports the role of PRF to accelerate wound healing [13].

Platelet Derived Growth Factor (PDGF) functions in the stimulation of fibroblasts, chemotactic, TGF- β stimulation, collagen production, increased proteoglycan synthesis. Transforming Growth Factor Beta (TGF- β) functions to modulate the proliferation of fibroblasts, formation of extracellular matrix, increase collagen production by fibroblasts, neutrophil chemotactic factors, and macrophages, while Basic Fibroblast Growth Factor (bFGF) plays a role in collagen production, stimulation of angiogenesis, and myoblast proliferation [11].

In this study, besides healing wounds more quickly, PRF also has more affordable cost therapy than conventional therapy. Faster healing time affects hospitalization care time in the hospital, thus reducing cost therapy. Thus, PRF can be a practical and cost-effective treatment option.

5. Conclusion

There was a significant difference in wound healing time of wound dehiscence patients after obstetric and gynecological laparotomy using PRF therapy compared to conventional methods, where PRF group has shorter wound healing time than the control group. Also, PRF therapy is cheaper than conventional therapy.

6. Recommendation

Further study is needed by involving more subjects so it will strengthen the validity and the study could be used as a comparison.

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