Original Article

Comparison of Efficacy of Conventional Wound Care with and without Intralesional Autologous Platelet Rich Plasma Injection towards Healing of Superficial Wound Dehiscence after Pfannenstiel Incision Surgery

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Abstract

Objective: To compare the efficacy of conventional wound care with and without autologous PRP injection in healing superficial wound dehiscence after Pfannenstiel incision surgery.

Methodology: This prospective comparative study was conducted from March 2021 to February 2022 in the Gynae Department, Sir Ganga Ram Hospital, Lahore. Women 18-49 years of age presented with superficial wound dehiscence at the entire length of the Pfannenstiel incision were randomized into Group A (intralesional autologous PRP injection and conventional wound care) and Group B (conventional wound care alone). The wound was inspected for signs of infection, and the total wound area was calculated by multiplying both. Wound management was started by taking a swab for culture and sensitivity, and a single dose of intralesional autologous PRP was injected in a subcutaneous plane within half an hour of its preparation. Conventional wound care was continued during the hospital stay till the wound was clean and granulating. Secondary wound closure was done. The total duration of wound healing was noted for both groups.

Results: The mean age of study participants was 31.5 ±4.29 years. The minimum duration of complete wound healing was 13 days, and the maximum was 22 days, with a mean + standard deviation of 18.05 + 2.78 days. The mean duration of complete healing in the PRP group was 15.80 ± 1.83 days, while in the non-PRP group, it was 20.30 + 1.40 days, with a significant reduction(p=0.000).

Conclusion: The autologous PRP injection significantly shortened the healing duration of superficial wound dehiscence after Pfannenstiel incision surgery.

Keywords: Autologous, Gynaecological procedures, Obstetric, Pfannenstiel incision, Platelet Rich Plasma, Superficial wound, Surgical Site Infection.

Cite this article as: Tariq Z, Sultana R, Manzoor S, Akhter N. Comparison of Efficacy of Conventional Wound Care with and without Intralesional Autologous Platelet Rich Plasma Injection towards Healing of Superficial Wound Dehiscence after Pfannenstiel Incision Surgery. J Soc Obstet Gynaecol Pak. 2024; 14(4):377-380.doi. 10.71104/jsogp.v14i4.856

Introduction

Approximately 0.5% to 3% of patients who undergo surgery experience surgical site infections or related infections.[1] In abdominal surgeries, infections caused by “Staphylococcus aureus” and “Staphylococcus epidermidis” are the most common. Regarding surgical methods in gynecology, the rates of surgical site infections (SSI) are significantly lower in vaginal and laparoscopic hysterectomies, with a 50% reduction in SSI incidence compared to laparotomy, which has an SSI rate of 3.9% for open hysterectomies. Additionally, obstetric surgeries tend to have a lower incidence of SSI compared to gynecological surgeries, with rates of 1.2% and 10.3%, respectively.[2]

Platelets are essential for hemostasis, tissue regeneration, and the body's defense against infections. Platelet Rich Plasma (PRP) is “a biological product obtained as a part of the plasma fraction from the autologous blood in which concentration of platelets is above the baseline level before its centrifugation”.[3] As the name suggests, PRP comprises high concentrations of platelets and clotting factors in the normal physiological range. PRP contains numerous growth factors, peculiar chemokines, cytokines, and other plasma proteins.[4]

Authorship Contribution: [1]Conception, literature search, article drafting, Data collection, Article writing, statistical analysis, [2,3]critical review of final submission, Data collection, statistical analysis, [4]Article writing, Literature search, data collection

Funding Source: none
Conflict of Interest: none

Received: Aug 11, 2024
Accepted: Dec 07, 2024

Platelet-rich plasma extracted from autologous blood is considered an adjuvant treatment modality to promote wound healing. This autologous blood product is taken out through centrifugation from the patient's whole blood. Thus, producing a fraction with a supra-physiological concentration of platelets. It contains platelets concentration 3-5 times more than the whole blood, i.e., approximately 1 million Platelets/microliter.[5] Wound healing occurs in 4 steps: hemostasis, inflammation, proliferation, and tissue remodeling. It starts with clot formation.[6] Growth factors are released because of platelet degranulation, which is beneficial in wound healing. Platelet-derived growth factor (PGF) promotes wound healing by chemotaxis, cell proliferation, angiogenesis, extracellular matrix deposition, and tissue remodeling.[7]

Most of the research on the wound-healing potential of autologous PRP is in burn wounds, diabetic foot ulcers, chronic and non-healing ulcers, tendon repairs, etc. But its use in superficial wound dehiscence after surgeries through Pfannenstiel scars is not common.[8] The objective of this study is to determine the efficacy of intralesional injections of autologous platelet-rich plasma along with conventional wound care in reducing the duration of complete wound healing versus conventional wound care alone in superficial wound dehiscence after surgeries through Pfannenstiel incision.[9] The study's rationale is that, as in the literature, it is described that good results with PRP enhance wound healing and decrease the average period of wound closure after sub-total wound dehiscence among post-laparotomy patients.[10] However, no local data exists regarding this study, so we conducted this study to confirm the effectiveness of autologous PRP injection in superficial wound dehiscence. Thus, implementing its use in local settings improves the treatment outcome of infected open wounds. Moreover, the financial burden on the hospital and patient and the patient's duration of hospital stay can be reduced.

Methodology

This prospective comparative study was conducted over one year, from March 2021 to February 2022, in the Gynae Department of a tertiary care hospital after approval from the institutional Ethics Review Committee. A sample size of 80 cases, 40 in each group, has been calculated using the expected mean difference of healing time 3.9 days between the treatment group (16.8±5.7) and control group (20.7±6.6) among patients with deep grade 2 burns with 95.0% confidence level and 80.0% power of the test.[11] In the current study, patients who underwent hysterectomy, laparotomy, and cesarean section using Pfannenstiel incision were included.

Patients were allocated to either group using random sampling techniques and divided into groups A or B. Group allocation was done before the start of the study. All women 18-49 years of age, presented with superficial wound dehiscence at the entire length of the Pfannenstiel incision, were included in this study. Superficial wound dehiscence is defined as "when skin and subcutaneous tissue are separated open along the incision line while rectus sheath remains intact." Patients who have comorbidities such as diabetes, BMI >35, coagulation disorders, on antibiotics other than ceftriaxone**,** steroids, immunosuppressive drugs, sepsis, malignancy, platelets count <150 x 10^9/L, Hb <8 g/dl, HBsAg reactive and or anti-HCV reactive were excluded.

Patients who fulfilled the selection criteria were enrolled after obtaining written informed consent. The patients were randomly divided into two groups. Group A received intralesional autologous PRP injection and conventional wound care) while Group B only received conventional wound care. Conventional wound care included inspection for signs of infection, i.e. (erythema, induration, tenderness, discharge, pyrexia), taking wound swabs for culture and sensitivity, wound exploration and debridement, appropriate antibiotic cover and wound irrigation with 0.9% saline thrice daily.

Study variables, including age, parity, current surgical procedure, duration of surgery, and days since surgery, were taken from the discharge slip. At the same time, hemoglobin (Hb) and platelet counts from the hospital admission file were noted on the day of admission. The wound was inspected for signs of infection. Its length and depth were measured with the sterilized metal ruler in centimeters, and the total wound area was calculated by multiplying both. Wound management started with a swab for culture and sensitivity, wound debridement, wound irrigation with 0.9% saline thrice daily, and an ensuing antibiotic cover of injection ceftriaxone 1g 12 hourly. In the PRP group, according to the size of the wound, 30-40ml of the patient's venous blood was taken, and autologous PRP was prepared in the dermatology procedure room with an 80–1 Electronic Centrifuge by double centrifugation method. Within half an hour of its preparation, a single dose of intra-lesional

autologous PRP was injected in a subcutaneous plane at a ratio of 1cc PRP/4cm^2 wound area. The wound was covered with sterilized gauze. Conventional wound care was continued during the hospital stay until the wound was clean and granulating. Secondary wound closure was done in Gynaecology OT, and the date was noted. Secondary wound closure means suturing a previously open wound when the wound is clean, granulating, and has no devitalized or infected tissue.

Patients were followed up after 7 days for stitches removal and to observe for complete wound healing. The total duration of wound healing from the date of intervention till secondary wound closure was noted for both groups. All this information was recorded through a pre-designed proforma. Failures were admitted, and their management was continued according to the condition of their wound. Efficacy was assessed in terms of duration of wound healing from the day of intervention till the day of secondary wound closure.

Data was statistically analyzed using SPSS version 23. Quantitative variables like age, parity, BMI, duration of current surgical procedure, days since surgery, Hb, platelets count, and efficacy were presented as mean and standard deviation. To compare the mean duration of complete wound healing, an "independent sample t-test" was applied. A P-value of ≤0.05 was taken as statistically significant.

Results

The total number of study participants was 80. It included both gynaecological and obstetric procedures with Pfannenstiel scar. The mean age of women was 31.5 ±4.29 years. The minimum duration of a complete healing wound was 13 days, and the maximum was 22 days, with the mean ± standard deviation as 18.05 ± 2.78 days shown in Table I. The mean duration of complete healing in the PRP group was 15.80 ± 1.83 days, while in the non-PRP group, it was 20.30 ± 1.40 days, with a significant reduction(p=0.000).

Table II highlights the stratification of the mean duration of complete healing based on descriptive variables such as age, BMI, parity, hemoglobin levels, and platelet counts in both treatment groups (PRP and non-PRP).

Table I: Descriptive Statistics

Variables	Min	Max	Mean	SD
Age	21.00	40.00	31.50	4.28
Parity	2.00	5.00	3.13	1.11
BMI	23.00	32.00	27.76	2.13
Hb	8.60	11.30	10.01	.78
On presentation days since surgery	6	16	10.35	2.56
Platelet Count	256x10^3	455 x10^3	346.47 x10^3	72.49 x10^3
Duration of Complete Healing (Days)	13	22	18.05	2.78

Table II: Stratification for mean duration of complete healing for descriptive variables.

Variables		Treatment group	Duration of complete healing		P-value
			N	Mean ± SD	
Age (Years)	≤ 30	PRP	14	15.71 + 1.43	0.000
		Non-PRP	22	20.82 + 0.85	
	> 30	PRP	26	15.85 + 2.03	0.000
		Non-PRP	18	19.67 + 1.68	
BMI (Kg/m^2)	< 28	PRP	20	16.30 + 1.84	0.000
		Non-PRP	24	20.33 + 1.34	
	≥ 28	PRP	20	15.30 + 1.72	0.000
		Non-PRP	16	20.25 + 1.53	
Parity (N)	≤ 3	PRP	20	16.50 + 1.73	0.000
		Non-PRP	30	20.87 + 0.90	
	>3	PRP	20	15.10 + 1.68	0.000
		Non-PRP	10	18.60 + 1.27	
Hb (g/dL)	≤ 10	PRP	24	15.67 + 1.47	0.000
		Non-PRP	10	18.60 + 1.27	
	> 10	PRP	16	16.00 + 2.31	0.000
		Non-PRP	30	20.87 + 0.90	
Platelets (µL)	≤ 350x10^3	PRP	28	15.93 + 1.98	0.000
		Non-PRP	24	19.67 + 1.47	
	> 350x10^3	PRP	12	15.50 + 1.45	0.000
		Non-PRP	16	21.25 + 0.45	

Discussion

Surgical site infections are the most common type of nosocomial infections and a significant concern in post-operative patients.[12] PRP therapy promotes quicker wound healing than conventional measures. A meta-analysis reveals that PRP use in primary wound closure reduces the risk of infection.[13] In the current study, the mean age was 31.5 ± 4.29 years. The group that received PRP therapy had a shorter duration of wound healing. The minimum duration of a complete healing wound was found to be 13 days, and the maximum was 22 days, with mean ± standard deviation as 10.18 ± 2.80 days. Our study found a statistically significant difference in healing duration, age, parity, Hb, Platelet count, BMI, history of previous surgery, and mean duration of complete healing wound (p< 0.05). In another study, the effect of PRP therapy was evaluated in patients with severe burn wounds. Efficacy, rate of wound healing, inflammatory reaction, period of healing, scar index, visual simulation (VS) score, positive wound culture, number of layers of dressing, and number of times the gauze and dressing were changed. Results were statistically significant in patients who received PRP therapy.[14] PRP therapy has been proven beneficial in partial and complete wound

healing of cutaneous wounds as compared to conventional care.[15]

The literature revealed that in the control group, the wound healing period was significantly more extended (12.60, about 2.58) compared to the group who received Platelet Rich Fibrin (7.0, about 3.52) with a p-value equal to 0.001. The estimated cost spent by the PRF group was less (IDR 4.511.362 ± 2.977.934) compared to the control group with conventional measures (IDR 12.540.735 ± 8.227.433) with p = 0. 001.[16] According to Laqif A et al., the wound healing period was shorter in patients who received plasma-rich fibrin therapy with a significant difference (p=0.001) as shown in the current study. Moreover, it was more cost-effective than conventional measures (p=0.001).[14] In refractory pressure injuries, PRP gel has been shown to significantly accelerate wound healing, reduce wound pain, shorten the treatment cycle, decrease inflammation, and improve the quality of life. However, in this research, the mean age of the study population was higher, and PRP gel was administered by spraying.[17] There is little data on the role of PRP in post-operative wound dehiscence in obstetric and gynaecological patients. One case was reported on the healing of post-operative wound infection after an abdominal hysterectomy, which concluded improved wound healing with PRP therapy in a woman with comorbidities like obesity and diabetes.[18]

In the current study, statistically significant results in the group treated with PRP in post-operative wound dehiscence in Pfannenstiel scars in obstetric and gynecological procedures highlight its role in wound healing and add value to the existing literature. So, evidence augments our study supporting autologous PRP treatment for superficial wound dehiscence to reduce the duration of complete healing. Improvement in postoperative pain and cost-effectiveness are considerable aspects of PRP therapy.[19] The study's strengths lie in its sufficient sample size and comparative design. However, its limitation is that it is a single-centered study, which restricts the generalizability of the results. In the current study, only the duration of wound healing was compared. Further research is needed in the local population through large randomized controlled trials for PRP therapy considering different dimensions such as duration of wound healing, post-operative pain, cost-effectiveness in wound care, and comparing different types and indications of obstetric and gynae procedures.

Conclusion

The autologous platelet-rich plasma injection significantly shortens the healing duration of superficial wound dehiscence compared to the non-PRP group after Pfannenstiel incision surgery. This shows that autologous PRP injection can effectively improve wound healing.

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