



RESEARCH ARTICLE

Efficacy of Autologous Platelet-Rich Plasma (PRP) on Perineal Wound Healing: A Controlled Non-Randomized Clinical Trial.

Muhammad Fadli^{1,*}, Bobby Indra Utama², Hirowati Ali³

¹ Department of Obstetrics and Gynecology, Faculty of Medicine, Andalas University/Dr. M. Djamil Padang General Hospital, Padang, West Sumatra, Indonesia

² Division of Reconstructive Urogynecology, Department of Obstetrics and Gynecology, Faculty of Medicine, Andalas University/Dr. M. Djamil Padang General Hospital, Padang, West Sumatra, Indonesia

³ Biomedical Laboratory, Faculty of Medicine, Andalas University, Padang, West Sumatra, Indonesia

Corresponding Author: Muhammad Fadli, dr.fadli12@gmail.com

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Abstract

Introduction: Perineal wounds are a very common complication of vaginal birth. Perineal trauma associated with childbirth is defined as damage to the skin, perineal muscles, as well as the sphincter and anal epithelium complex. This study aims to determine the effect of PRP use on perineal wounds.

Method: A single-center, controlled, non-randomized, non-blinded clinical trial was designed in patients with perineal wounds after vaginal delivery. PRP was taken from each patient's serum (autologous). Perineal wound healing after intervention was assessed using the Redness, Oedema, Ecchymosis, Discharge, Approximation (REEDA) scale. Perineal wound pain was assessed using the Visual Analog Scale (VAS).

Result: The current study involved 56 samples, 28 people per group. The average age of the patients was 28.38 ± 6.280 years. The highest education was high school, 42.9%, while the lowest was elementary school (21.4%). The highest VAS scale was 3 (42.9%) and the lowest was 1 (5.4%). The prevalence of the highest degree of perineal wounds in general was degree 2 (98.2%). The highest score was in the moderately healed group on PRP administration (92.9%). In contrast to the control group, the mildly healed category was 21.4% and not healed 14.4%.

Conclusion: There is a significant relationship between the PRP to healing perineal wounds in vaginal delivery patients at the Seberang Padang Health

Keywords: Perineal wound, PRP, REEDA scale

INTRODUCTION

Vaginal delivery is the process of giving birth to a fetus through the mother's birth canal that occurs naturally. Perineal wounds are a very common complication of vaginal birth. Perineal trauma associated with childbirth is defined as damage to the skin, perineal muscles, as well as the sphincter and anal epithelium complex. More than 85% of women who undergo vaginal delivery will experience some degree of perineal tear and one-third of them are spontaneous perineal lacerations.^{1,2} In Indonesia, the highest cause of maternal mortality in 2020 was postpartum hemorrhage. One of them can be caused by perineal rupture. Research by Triyani et al. (2021) at the Serui Regional General Hospital (RSUD), Papua, the incidence of perineal rupture was 41.9% with most of them being degree 2 (34.6%).^{3,4}

Based on the health profile of Padang City in 2022, 80% of deliveries are carried out in health service facilities (fasyankes). Of the 23 health centers in Padang City, the Seberang Padang Health Center is one of the health centers with the most inpatient facilities that handle vaginal childbirth with a total of 262 people. Childbirth has always been associated with trauma to the uterus, cervix, vagina, and perineum. Injuries range from minor mucosal tears to lacerations that cause bleeding or threatening hematomas. According to *the American College Obstetricians and Gynecologists* (ACOG, 2020), more than 80% of women experience some type of laceration during vaginal delivery.^{5,6}

The rationale for utilizing Platelet-Rich Plasma (PRP) as an adjuvant therapy is driven by the significant incidence of perineal wound complications. Epidemiological data indicates that perineal trauma affects approximately 85% of women undergoing vaginal delivery globally. In Indonesia, data from the Indonesian Demographic and Health Survey (SDKI) shows that 57% of women delivering spontaneously require perineal suturing. However, primary repair often faces healing failures, with the incidence of perineal wound dehiscence reported to range from 0.21% to as high as 24.6% in various clinical settings.⁷

The clinical significance of wound dehiscence cannot be overlooked, as it often leads to severe morbidity, including persistent pain, dyspareunia, psychological distress, and an increased risk of postpartum sepsis. When dehiscence occurs, wounds may require up to 16 weeks to heal by secondary intention, which significantly impacts the mother's quality of life. PRP offers a biological solution by providing a high concentration of autologous growth factors, such as Platelet-Derived Growth Factor (PDGF) and Transforming Growth Factor-beta (TGF- β). These factors are crucial in accelerating the inflammatory and proliferative phases of wound healing, thereby potentially reducing the high rate of dehiscence and promoting faster tissue regeneration in the perineal area.⁸⁻

10

Platelet Rich Plasma (PRP) is an autologous preparation of human plasma that contains high platelet levels and is rich in growth factors and hemostatic mediators and tissue healing, anti-inflammatory, and antimicrobial. Alpha platelet granules contain more than 300 bioactive substances that play a fundamental role in hemostasis and/or tissue healing through stimulation of cellular chemotaxis, proliferation, and differentiation, clearance of tissue debris, angiogenesis, and

deposition of extracellular matrix. Growth factors that are important in the healing process such as *transforming growth factor beta* (TGF- β), *vascular endothelial growth factor* (VEGF), *platelet-derived growth factor* (PDGF), *epithelial growth factor* (EGF), *basic fibroblast growth factor* (bFGF), *keratinocyte growth factor* (KGF), *connective tissue growth factor* (CTGF), and *insulin-like growth factors* (IGF). Platelets also release histamine and serotonin which increase the permeability of local capillaries to increase the additional access of inflammatory cells to initiate the reparative process.⁷ Topical applications of PRP have been performed in cases of chronic immunosuppressive complexes, wound infections, and after *vacuum-assisted closure therapy* with positive results. PRP has improved reepithelialization in acute wounds such as acute ulcers, postoperative decidual wounds, and burns. Epitheliation reaches 80-100% with a time of 4-20 days.⁸

Research on the use of PRP in obstetrics and gynecology cases is still limited, especially in cases of perineal lacerations. Despite its easy access, relatively simple preparation and known satisfactory working mechanisms, PRP is still of limited use in this field. A 2021 *randomized controlled trial* (RCT) on 200 *sectio caesarean* (SC) patients and PRP was given to wounds after surgery, it was found that there was a positive effect of PRP in wound healing and pain reduction in high-risk patients.¹¹ However, research conducted by Moegni et al. (2022) found that the use of PRP in the management of postpartum levator muscular trauma showed no significant difference in the wound healing process.¹²

Akhoundova et al. (2022) administered PRP to patients with Postpartum Perineal Repair Failure and found that PRP can be an option to accelerate and improve conservative management of dehiscent wounds after vaginal delivery. Outpatient use, as well as no anesthesia required, and no major side effects make this therapy a promising option.⁸ Limited research on the use of PRP in perineal wound management and the lack of this research in Indonesia, researchers are interested in conducting research on "The Use of Platelet Rich Plasma (PRP) in Perineal Wounds".

METHODS

Study Design and Setting

This study employs a non-randomized controlled clinical trial design to evaluate the efficacy of Platelet-Rich Plasma (PRP) in accelerating perineal wound healing. The research was conducted at the Seberang Padang Community Health Center in Padang, Indonesia, covering a period from September 2023 to August 2024. The primary objective was to determine the relationship between PRP administration and the healing process of perineal wounds in patients following vaginal delivery.

Population and Sampling

The study population comprised all patients who underwent perineal repair at the health center. A total of 62 participants were selected using a consecutive sampling technique, divided into a treatment group (n=31) receiving PRP and a control group (n=31) receiving standard care. Inclusion criteria focused on women with Grade I or II perineal tears who provided informed consent. Exclusion criteria were rigorously applied to ensure data integrity, ruling out patients with

hematological disorders (anemia Hb <10 g/dl, thrombocytopenia), systemic infections, diabetes, chronic liver disease, or those on anticoagulant and anti-inflammatory therapies.

PRP Preparation and Intervention

The independent variable in this study is the application of PRP, prepared via a double centrifugation method to optimize platelet concentration. Venous blood (15–50 mL) was collected using ACD-A as an anticoagulant and large-bore needles to prevent platelet trauma. The first centrifugation cycle separated erythrocytes, while the second cycle concentrated the platelets into a final volume of 2–4 mL. During processing, temperatures were maintained at 12–16°C to prevent premature platelet activation. The PRP was administered 24 hours post-repair via intralesional injection for Grade I tears and submucosal injection for Grade II tears under local anesthesia.

Clinical Assessment

Clinical assessment of wound healing was performed using the REEDA (Redness, Edema, Ecchymosis, Discharge, and Approximation) scale. Data underwent a systematic processing workflow, including editing, coding, entry, and cleaning to ensure accuracy before analysis.

Statistical Analysis

Data were analyzed using both univariate and bivariate methods. Univariate analysis described the frequency distribution and proportions of the variables based on the REEDA scores. Bivariate analysis was performed using the Chi-square test to determine the significance of the association between PRP administration and wound healing. A p-value of $p \leq 0.05$ was established as the threshold for statistical significance.

Ethical Considerations

This research adhered to ethical standards and received formal clearance from the Health Research Ethics Committee of RSUP Dr. M. Djamil Padang with approval number DP.04.03/D.XVI.XI/47/2024.

RESULTS

Study Overview and Sample Characteristics

This study was conducted using a single-center, controlled, non-randomized, non-blinded clinical trial design at the Seberang Padang Health Center and the Biomedical Laboratory of the Faculty of Medicine, Andalas University, from September 2023 to August 2024. Primary data were collected regarding the administration of Platelet-Rich Plasma (PRP) for the healing of perineal wounds following vaginal delivery. The total sample size consisted of 56 participants, analyzed through both univariate and bivariate methods.

The baseline characteristics of the samples showed a mean age of 28.38 ± 6.28 years. Regarding educational background, the majority of participants were high school graduates (42.9%), while the lowest percentage had a primary school education (21.4%). The mean height of the

participants was 155.07 ± 5.19 cm. In terms of Body Mass Index (BMI), most participants fell into the normoweight category (80.3%), followed by overweight (16.1%). For the Visual Analogue Scale (VAS) pain assessment, the highest frequency recorded was a score of 3 (42.9%), while the lowest was 1 (5.3%). Notably, BMI and VAS scores showed significant differences between the two study groups ($p < 0.05$).

Prevalence of Perineal Rupture

The distribution of perineal rupture based on the degree of injury among patients undergoing vaginal delivery at Seberang Padang Health Center revealed that Grade 2 ruptures were the most prevalent, accounting for 98.2% of the total cases. This included 100% (28) of the intervention (case) group and 96.4% (27) of the control group. Grade 1 perineal wounds were minimal, representing only 1.8% of the total sample, all of which were within the control group.

Comparison of Perineal Wound Healing

Wound healing progress was monitored on the 7th day postpartum using the REEDA scale (Redness, Edema, Ecchymosis, Discharge, and Approximation).

- Redness: The worst score (3) was found exclusively in the control group (32.1%). In contrast, the majority of the case group achieved a score of 1 (50.0%).
- Ecchymosis and Edema: The control group exhibited poorer outcomes, with 14.3% scoring a 2 in ecchymosis and 28.5% scoring a 3 in edema. The case group showed superior results, with 92.9% scoring 0 for ecchymosis and 96.4% scoring 0 for edema.
- Discharge and Approximation: The control group faced significant issues with discharge, with 64.4% receiving the worst score (3). In the case group, 60.7% achieved a score of 0. Regarding approximation, 32.2% of the control group remained at the worst score (2).

On Day 7 post-intervention, the PRP group demonstrated superior REEDA outcomes. 7.1% of the PRP group were categorized as "healed," while the remaining 92.9% were "moderately healed." Notably, no patients in the PRP group fell into the "mildly healed" or "not healed" categories. Conversely, the control group showed much slower progression, with 14.4% remaining "not healed" and 21.4% "mildly healed."

Statistical Influence of PRP on Wound Healing

To determine the effect of PRP on healing, a Fisher's Exact Test was performed. This was done by merging categories into "healed–moderately healed" and "mildly healed–not healed" to meet the statistical assumptions, as the initial 4 x 2 chi-square table yielded expected counts > 5 in 75% of cells.

The bivariate analysis using Fisher's Exact Test resulted in a p-value of 0.001 ($p < 0.05$). These findings indicate a significant statistical correlation between the administration of Platelet-Rich Plasma and the acceleration of perineal wound healing among patients following vaginal delivery at the Seberang Padang Health Center.

DISCUSSION

This analytical study, involving 56 samples analyzed through univariate and bivariate methods, provides insights into sample characteristics, prevalence, healing patterns, and the impact of Platelet-Rich Plasma (PRP) on perineal wound healing following vaginal delivery.

Sample Characteristics

Parity is a significant determinant of perineal rupture. Our findings indicate a higher prevalence among multiparous women. While the number of fetuses impacts perineal integrity, previous literature suggests that primiparous women aged 26-35 are at a higher risk for significant rupture, whereas multiparity generally presents a lower risk compared to first-time mothers.¹³ Jansson et al. observed that 53.9% of perineal rupture patients were primiparous women aged 26-30.¹⁴ Furthermore, extensive ruptures are more frequent in nulliparous patients (average age 28) than in multiparous patients (average age 30).¹⁵ Statistically, nulliparity carries a 2.4 times higher risk of perineal rupture.¹⁶

The high frequency of tears in primiparous women is often attributed to a lack of experience regarding protective measures during labor. Unlike multiparous women, who have developed better control and a sense of effective pushing techniques often assisted by nursing staff-primiparous women may lack the biomechanical adaptation that comes with previous deliveries.⁵⁰ As Mahgoub et al. concluded, the biomechanical stress of labor, which causes micro-ruptures, tends to decrease as parity increases.¹⁷

Demographic factors such as age, education, and marital status also influence wound healing knowledge.¹⁸ The average age in our study was 28.38 ± 6.280 years. Increased maternal age and Asian ethnicity are associated with higher risks of perineal trauma. This is likely due to the age-related decline in connective tissue elasticity and the anatomical tendency for Asian women to have shorter perineal bodies. Interestingly, higher educational attainment (university graduates) was also linked to higher risk in our findings, though the exact causal mechanism remains unclear.¹⁹

Regarding nutritional status, most patients in this study had a normal BMI. Paradoxically, multivariate analysis indicates lower rates of Obstetric Anal anal Sphincter Injuries (OASIS) in obese (OR 0.2, 95% CI 0.04-0.9) and overweight women (OR 0.3, 95% CI 0.1-0.99) compared to those with normal weight.²⁰ This protective effect may be multifactorial: obese patients may possess softer, more elastic perineal tissue, and their uterine contractions are often less frequent or forceful, potentially shielding them from severe lacerations. Additionally, birthing positions chosen by or for obese patients may inadvertently lower the risk of rupture.²¹

Perineal pain is a significant postpartum morbidity. In Japan, a cross-sectional study of primiparous women reported a median Visual Analog Scale (VAS) pain score of 54/100 on the first postpartum day. Our study mirrored high pain levels, with a frequent score of 3/5.⁵⁹ Notably, PRP treatment has been shown to reduce VAS scores by 93% at the end of follow-up, compared to only 79% in control groups ($P < 0.001$).²² Our data confirmed significantly lower pain scores in the PRP

group (3.22 ± 0.78 vs. 3.09 ± 1.06 ; 2.18 ± 0.49 vs. 2.45 ± 0.66 ; and 0.73 ± 0.42 vs. 1.5 ± 0.64 , respectively, $P = 0.001$).²³

Prevalence of Perineal Rupture by Degree

Perineal tears are classified into four degrees, ranging from superficial mucosal lesions (First Degree) to those involving the rectal mucosa (Fourth Degree).²⁴ In our study, second-degree tears were the most common. This aligns with existing research where second-degree tears accounted for 40.6% of cases, with risk factors including post-term delivery, vacuum extraction, and fetal weight > 4000 g.¹⁴ Research in Tangerang and Karawang hospitals found that 83.3% of primigravida patients experienced first or second-degree ruptures. A perineal body length of ≤ 3.0 cm was identified as a significant predictor for more severe (third and fourth-degree) tears ($p < 0.001$).²⁵

While our findings emphasize second-degree tears, some studies report a higher prevalence of first-degree tears (64.3%).¹³ However, the consensus remains that first and second-degree ruptures dominate the clinical landscape, with third and fourth-degree incidents remaining relatively rare.

Perineal Wound Healing Profile

We utilized the REEDA scale (Redness, Edema, Ecchymosis, Discharge, and Approximation) to assess healing. A score of 0 indicates total healing, while 11-15 indicates poor outcomes.²⁶ A randomized controlled trial at Menoufia University Hospital showed that PRP groups had significantly greater reductions in REEDA scores by Day 7 compared to controls (1.51 ± 0.90 vs. 2.49 ± 1.12 , $p < 0.001$). Our results corroborate this, showing overall lower REEDA scores in the PRP group by the seventh day. Similar outcomes have been reported internationally, with PRP facilitating up to an 85.5% reduction in REEDA scores compared to 72% in standard care.^{23,27}

The Impact of PRP on Perineal Healing

The efficacy of PRP is well-documented in various case reports. For instance, a 31-year-old patient with chronic pain ten years post-episiotomy showed an 80% reduction in pain and 66.67% wound improvement after three PRP treatments.²⁸ Similarly, Akhoundova et al. (2022) demonstrated that autologous PRP (A-PRP) successfully treated episiotomy dehiscence within three weeks.⁸

PRP's biological potency stems from a platelet concentration 3 to 4 times higher than baseline plasma, releasing growth factors like PDGF, TGF- β , VEGF, and EGF.²⁹ These factors stimulate matrix metalloproteinase (MMP) synthesis and fibroblast proliferation, which are essential for collagen and elastin production.³⁰ In gynecology, PRP has proven effective for pelvic organ prolapse, fistulas, and even improving pregnancy potential in patients with implantation failure.³¹ It acts as an autologous, low-risk modality that accelerates angiogenesis and tissue regeneration.^{32,33}

Research Limitations

This study has several limitations. Despite strict inclusion/exclusion criteria, we could not fully control for external factors such as nutritional intake, smoking habits, or postpartum hygiene—one control patient did experience an infection likely due to these variables. Additionally, we did not differentiate between spontaneous tears and episiotomies, which may introduce bias as episiotomies typically yield higher REEDA scores. Our pain assessment was limited to a single VAS measurement, preventing a pre- and post-treatment comparison. Finally, the Day 7 follow-up for the REEDA scale may be too early to capture the total duration of healing, and the specific molecular composition of the PRP for each sample was not analyzed.

CONCLUSION

The results of this controlled non-randomized clinical trial demonstrate that the administration of autologous Platelet-Rich Plasma (PRP) is a highly effective adjuvant therapy for accelerating perineal wound healing after vaginal delivery. The study confirms that PRP significantly enhances the physiological recovery process, particularly for Grade II perineal ruptures, which constituted the majority of cases.

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