International Journal of Obstetrics and Gynaecology

ISSN Print: 2664-8334
ISSN Online: 2664-8342
IJOG 2025; 7(1): 52-56
www.obstetricsjournals.com
Received: 10-07-2025
Accepted: 16-08-2025

Tana Khazal Ahmed
Azadi Teaching Hospital, MOH, Kirkuk, Iraq

Yogsel M Zenalabeden
Azadi Teaching Hospital, MOH, Kirkuk, Iraq

Sunbul N Abdulqader
Azadi Teaching Hospital, MOH, Kirkuk, Iraq

Corresponding Author:
Tana Khazal Ahmed
Azadi Teaching Hospital, MOH, Kirkuk, Iraq

Platelet-rich plasma for improving post-cesarean wound outcomes: A randomized interventional study

Tana Khazal Ahmed, Yogsel M Zenalabeden and Sunbul N Abdulqader

DOI: https://doi.org/10.33545/26648334.2025.v7.i1a.42

Abstract
Background: Chronic wounds are a major issue in women's health, and many of these wounds are the result of caesarean sections. The healing process of many different kinds of tissues makes extensive use of platelet-rich plasma.
Aim of study: To determine how autologous PRP affects pain perception and wound healing after a caesarean section in high-risk patients.
Methods: An interventional study was carried out in Azadi Teaching Hospital in Kirkuk, Iraq for a period between March 2024 and May 2025. It included 150 pregnant women who delivered by elective C/S and divided randomly into two groups: PRP group following fascia closure but before skin closure, 75 pregnant women got 4-5 ml of PRP injected into their veins and control group included 75 pregnant women who didn't receive any topical treatment.
Results: Total REEDA scale demonstrated reduction in PRP group achieving a significant decrease (P= 0.001) unlike control group which remained constant. There was a statistically significant reduction in pain VAS scores between the pre- and post-treatment periods in both groups. The PRP group showed a considerable improvement in scar severity compared to the control group.
Conclusion: When applied to wounds, PRP speeds up the healing process significantly. Patients can rest assured that it is both cost-effective and safe because it is autologous, meaning it has healing properties without any side effects.

Keywords: Cesarean, platelet rich plasma, wound, healing, infection

Introduction

The World Health Organization (WHO) considers a caesarean section (C/S) rate of 10%-15% to be optimal, however the current global rate of 21% far exceeds this threshold. The C/S rate in 1990 was approximately 7% [1]. This sharp increase in CS rates has a number of identified causes that have nothing to do with medicine. Several factors contribute to the higher caesarean section rates in private hospitals compared to public ones. These include mothers' desires to have a baby on a specific day, doctors' preferences or convenience, and financial incentives for doctors or hospitals that perform more caesarean sections than those that perform vaginal deliveries (VDs) [2, 3]. Many cuts and scrapes end up being chronic wounds, which is a major issue for world health. Depending on their level of contamination, they are grouped into four classes: clean, clean-contaminated, contaminated, and dirty-infected [4, 5]. One of the body's normal responses to damage to tissues is the healing process. Nevertheless, the vascular system, cytokines, mediators, and other cell types all interact in intricate ways, making it far from a simple phenomenon [6]. Inflammation, proliferation, maturation, and proliferation are the four stages that overlap with one another. Abnormal wound healing results from any disturbance [7]. Systemic variables such as age, body type, chronic disease, immunosuppression, radiation therapy, laboratory values, nutritional state, vascular insufficiency, and so on might impede wound healing even when the wound site is relatively unrelated to these factors [8]. Platelet-Rich Plasma (PRP) is a protein concentrate made from whole blood that has been centrifuged to remove red blood cells (RBCs). It is also called autologous conditioned plasma [9]. Acute trauma, cosmetic surgery, dermatology, dentistry, and veterinary medicine are among its well-established areas of application [10]. One possible explanation for the broad use of PRP in tissue healing is that platelets contain a variety of signaling molecules, including fibrinogen and leukocyte-derived catabolic cytokines, which can control and direct the process of tissue repair [11]. Researchers have

shown that PRP enhances mesenchymal stem cell (MSC) proliferation and differentiation *in vitro*, indicating that PRP has a great deal of restorative potential [12]. Several studies have shown that PRP accelerates the regeneration of both hard and soft tissues, including skin, fat, and mucosa, and it has been utilized in injectable and gel form for over 10 years [13]. This study aimed to determine how autologous PRP affects pain perception and wound healing after a caesarean section in high-risk patients.

Materials and Methods

This was an interventional study was carried out in the Department of Obstetrics and Gynecology, Azadi Teaching Hospital in Kirkuk, Iraq for a period between March 2024 and May 2025.

The study included 150 pregnant women with body mass index (BMI) ≥ 25 kg/m^2, diabetic or developed GDM, or twin pregnancy who delivered by elective C/S. They were divided randomly into two groups after matching done in age and BMI level:

- **PRP group:** Following fascia closure but before skin closure, 75 pregnant women got 4-5 ml of PRP injected into their veins. A sterile syringe was used to directly apply PRP to the subcutaneous tissue of the wound site.
- **Control group:** It included 75 pregnant women who were not given any topical medication. Prior to skin closure, the subcutaneous tissue was cleansed using normal saline.

Exclusion criteria for this trial were a body mass index (BMI) below 25 kg/m^2, a history of chronic pain, hepatitis, anemia (defined as a hemoglobin level below 9 mmol/L), problems related to coagulation or low platelet count, and females who declined to participate.

Ethical issue: Following the guidelines established by the 1964 Declaration of Helsinki and its subsequent revisions or equivalent ethical norms, the research was carried out. After a thorough explanation of the operation was given to each patient, their informed permission was obtained. Instead of names, identification codes were used. All sensitive material is stored on a laptop that requires a password and is used only for research.

Data collection

Data was collected from a questionnaire that covered a wide range of topics, including demographics (age, residency, etc.), obstetrics (parity, gravidity, abortion history, number of previous C/S), and medical history (chronic diseases, diabetes, hypertension, cancer, heart disease, liver disease, etc.). Participants were classified according to BMI as overweight (25 - 29.99 kg/m²) and obese (≥ 30 kg/m²).

All patients included in the study had standard diagnostic procedures, including full blood counts and abdominal exams, as well as vital signs and general physical examinations.

Procedure of PRP injection

Using a five-milliliter syringe, remove four cc of the PRP from the kit once the fascia and skin are closed. The next step is to inject it into the patient after briefly activating it through a specialized conduit. PRP was administered to the wound site's subcutaneous tissue using a sterile syringe.

Follow up

The patients were evaluated on three separate occasions following C/S: the first, fifth days, and second months. The parameters that were assessed are:

1. **REEDA scale:** Used to evaluate wound healing. It has five major assessment areas (Table 1) [14]:

Table 1: REEDA Scale

Redness	Edema	Ecchymosis / bruising	Discharge	Approximation
0 (None)	0 (None)	0 (None)	0 (None)	0 (Closed)
1 (Within 0.25 cm of wound)	1 (Less than 1 cm)	1 (Within 0.25 cm bilaterally or 0.5 unilaterally)	1 (Serum)	1 (Skin separation 3 mm or less)
2 (Within 0.5 cm)	2 (Between 1-2 cm)	2 (Between 0.25 cm and 1 cm bilaterally or between 0.5 and 2 cm unilaterally)	2 (Serosanguinous)	2 (Skin and subcutaneous fat separation)
3 (Beyond 0.5 cm)	3 (More than 2 cm)	3 (Greater than 1 cm bilaterally or 2 cm unilaterally)	3 (Bloody - Purulent)	3 (Skin, subcutaneous and facial layer separation)

From 0 to 3, a score is assigned to each region. Fifteen is the final score. The severity of the infection is graded from 0 (no infection), 1-5, 6-10, and 11-15.

2. **Vancouver scar scale (VSS):** So that hypertrophic scars or keloids can be identified. The overall score can be anywhere from zero to fourteen points, and it takes into account four subjective variables: vascularity, height/thickness, pliability, and pigmentation [15].

3. **Visual analog scale (VAS) for pain:** Which is a 10-point unidimensional scale where 0 means no pain and 10 is the worst pain you've ever felt [16].

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 28 was used to analyses the data. We used a two-tailed independent t-test to compare the continuous variables. The continuous data was examined using a paired t-test before and after therapy. Statistical significance was determined by a p-value lower than 0.05.

Results

The study included 150 women with mean age 26.38±8.9 years (range 19 - 43 years). Baseline characteristics were well-balanced between groups with no significant differences in all of them (Table 2).

Table 2: Difference in study groups by clinical characteristics

Variable	Study group		P - Value
	PRP Mean ± SD	Control Mean ± SD	
Age (Year)	27.49±7.1	25.29±9.8	0.3
BMI (kg/m^2)	29.85±3.9	30.45±4.1	0.122
Parity	1.77±1.1	1.42±1.0	0.098
No. (%) No. (%)			
Residence (Urban / Rural)	52 (69.3) / 23 (30.7)	59 (78.7) / 16 (21.3)	0.192
Abortion	13 (17.3)	16 (21.3)	0.535
Previous C/S	44 (58.7)	49 (65.3)	0.4

Total REEDA scale demonstrated reduction in PRP group achieving a significant decrease (P= 0.001) unlike control group which remained constant. VAS score of pain was significantly decreased after treatment compared to that before treatment in both groups (Table 3)

Table 3: Difference between pre and post treatment in total REEDA scale and in VAS score for pain among study groups

Study group	Before Treatment Mean ± SD	After Treatment Mean ± SD	P - Value
Total REEDA Scale			
PRP	2.14±1.2	1.14±0.92	0.001
Control	2.64±1.4	2.54±1.2	0.831
VAS score for pain			
PRP	6.4±1.2	4.16±1.1	0.001
Control	7.35±1.3	5.96±1.1	0.001

As shown in table (4), PRP group showed significantly lower VSS compared to control group (0.8 versus 2.13, P= 0.001).

Table 4: VSS difference among study groups

VSS	PRP Group Mean ± SD	Control Group Mean ± SD	P - Value
	0.8±0.9	2.13±1.3	0.001

Discussion

One of the most prevalent types of surgical procedures carried out on a global scale is the caesarean section. It is becoming more common and accounts for around 20% of births worldwide [17]. Complications from C/S can arise from a variety of sources, but one of the most common is inadequate tissue perfusion and hypoxia, which impedes wound healing and increases the likelihood of infections and gapped wounds that can even burst the abdomen [18]. PRP has been utilized in various gynecological and obstetric procedures due to its endogenous platelet activities, which improve wound healing, speed up tissue regeneration through the release of various growth factors, and simultaneously boost local immunity, which fights infections. This, in turn, allows for better scar formation, which heals the wound more effectively and more cosmetically [19].

This study showed that total REEDA scale reduced significantly in PRP group (P= 0.001) unlike control group which remained constant. Similar results noticed in studies conducted by Elkhouly NI *et al* [20], Abd-Allah HE *et al* [21], and Wanas M *et al* [22] when they found that PRP made a greater reduction in the REEDA score compared to the control group. PRP is a relatively new surgical intervention that has been used in various gynecological and obstetric procedures. It is believed to have endogenous platelet activities that improve wound healing, speed up tissue regeneration through the release of various growth factors, and boost local immunity to fight infections. Additionally, it allows for better scar formation, which heals the wound more effectively and has a better cosmetic appearance [23]. Hemostasis and subsequent wound healing in any wound are facilitated by platelets. Platelets initially concentrate and form a clog, which causes hemostasis, throughout the process of damage. The release of platelet granules, which contain several growth factors such as platelet-derived growth factor (PDGF), plant growth regulators (PGR), fibroblast growth factor (FGF), and interleukins occur later on as a result of thrombin's impact on the platelet membrane [24].

In this study, VSS was significantly lower in PRP group than that in control group which was agreed with results obtained by Roohaninasab M *et al* study when they concluded that PRP is very effective in treating burn scars [25]. The increased concentration of platelets in the plasma may be the reason why PRP injection can make scars seem better. Many growth factors, including PDGF and transforming growth factor beta (TGF-β), are released by platelet α granules. A decrease in the expression of connective tissue growth factor (CTGF) could be caused by a feedback loop in it signaling pathway, which could be activated by the increased levels of TGF-β. In the long run, this process helps scars heal [26].

Conclusion

When applied to wounds, PRP speeds up the healing process significantly. Because it is autologous, it has healing properties and is both safe and effective for patients financially. PRP should be a part of C/S wound care routines. To evaluate its efficacy in more complex situations, a larger sample size, and a longer research duration are required.

Strength and Limitations

Clear, clinically relevant question focusing on an important and common procedure (C/S) in a high-risk population. It is simple, low-cost intervention that could be translated to clinical practice if effects are reproducible. Despite these,

this study showed limitations as: First: Two-month follow-up may be too short to capture mature scar formation and late wound complications. Second: No microbiological confirmation of infection or objective measures of wound infection severity; reliance on REEDA and clinical assessment. Third: Conducted at one hospital in Kirkuk; results may not generalize to different settings, surgical techniques, or PRP systems.

Acknowledgments

The employees at Azadi Teaching Hospital have our deepest appreciation for all that they have done to support our study. It is really appreciated that people are ready to share their data and experiences with us. Without them, we couldn't have conducted this study. Regarding the disclosure of any personal or financial ties that might have impacted the outcomes of this research, no writers have any substantial conflict of interest.

References

1. Angolile CM, Max BL, Mushemba J, Mashauri HL. Global increased cesarean section rates and public health implications: A call to action. Health Sci Rep. 2023;6(5): e1274.
2. Rai SD, van Teijlingen E, Regmi PR, Wood J, Dangal G, Dhakal KB. Caesarean section for non-medical reasons: a rising public health issue. J Karnali Acad Health Sci. 2021;4(2):45-52.
3. Nantume S, Baluku EM, Kwesiga D, Waiswa P. Factors associated with high rates of caesarean deliveries: a cross-sectional study classifying deliveries according to Robson in Mengo Hospital Kampala. Risk Manag Healthc Policy. 2023; 16:2339-56.
4. Cho E, House H, Marten A, Feffer M, Agel J, Scolaro J, *et al*. Does the CDC Surgical Wound Classification adequately predict postoperative infection in lower extremity fracture surgery? OTA Int. 2025;8(1): e357.
5. Yin V, Cobb JP, Wightman SC, Atay SM, Harano T, Kim AW. Centers for Disease Control (CDC) Wound Classification is prognostic of 30-day readmission following surgery. World J Surg. 2023;47(10):2392-400.
6. Wallace HA, Basehore BM, Zito PM. Wound Healing Phases. StatPearls. Treasure Island (FL): StatPearls Publishing; 2025.
7. Fernandez-Guarino M, Naharro-Rodriguez J, Bacci S. Aberrances of the wound healing process: a review. Cosmetics. 2024;11(6):209-18.
8. Raziyeva K, Kim Y, Zharkinbekov Z, Kassymbek K, Jimi S, Saparov A. Immunology of acute and chronic wound healing. Biomolecules. 2021;11(5):700-12.
9. Odložilová Š, Paral J, Sirovy M, Zajak J, Fibír A. Platelet-rich plasma: characteristics and current review of its use in surgery. Pol J Surg. 2024;96(5):59-67.
10. Zhang Z, Liu P, Xue X, Zhang Z, Wang L, Jiang Y, *et al*. The role of platelet-rich plasma in biomedicine: a comprehensive overview. iScience. 2025;28(2):111705.
11. Sharma S, Kamarthi N, Goel S, Malik S, Gupta S, Sharma A. Comparative evaluation of autologous platelet-rich plasma and triamcinolone acetonide injection in the management of erosive *Lichen planus* and oral submucous fibrosis: a clinical study. Int J Basic Clin Pharmacol. 2023;12(3):439-45.
12. Sun Y, Zhu M, Qiu L. Efficacy of mesenchymal stem cells and platelet-rich plasma therapies on wound healing: a systematic review and meta-analysis. Regen Ther. 2025; 30:75-91.
13. Manole CG, Soare C, Ceafalan LC, Voiculescu VM. Platelet-rich plasma in dermatology: new insights on the cellular mechanism of skin repair and regeneration. Life. 2024;14(1):40-8.
14. Adlia A, Sumartono C. Comparison of post-caesarean section wound healing methods based on REEDA scale and platelet lymphocyte ratio. Syst Rev Pharm. 2020;11(7):314-8.
15. Garg SP, Williams T, Taritsa IC, Wan R, Goel C, Harris R, *et al*. Evaluating skin colour diversity in the validation of scar assessment tools. Wound Repair Regen. 2023;31(6):731-7.
16. Delgado DA, Lambert BS, Boutris N, McCulloch PC, Robbins AB, Moreno MR, *et al*. Validation of digital visual analog scale pain scoring with a traditional paper-based visual analog scale in adults. J Am Acad Orthop Surg Glob Res Rev. 2018;2(3): e088.
17. Yaghmaei M, Ajori L, Mokhtari M. Repeat cesarean sections: maternal and neonatal outcomes and complications. J Obstet Gynecol Cancer Res. 2024;9(1):95-101.
18. Gillespie BM, Ellwood D, Thalib L, Kumar S, Mahomed K, Kang E, *et al*. Incidence and risk factors for surgical wound complications in women with body mass index >30 kg/m² following cesarean delivery: a secondary analysis. AJOG Glob Rep. 2022;2(3):100069.
19. Willison N, Behnia-Willison F, Aryan P, Padhani ZA, Mirzaei Damabi N, Nguyen T, *et al*. Application of platelet-rich plasma in gynaecologic disorders: a scoping review. J Clin Med. 2025;14(16):5832.
20. Elkhouly NI, Elkilani OA, Kolaib HA, Elkhouly RM, Morsi DI. Retracted paper—does autologous platelet-rich plasma improve wound healing and pain perception after cesarean section in high-risk patients? Gynecol Obstet Invest. 2021;86(4):336-42.
21. Abd-Allah HE-DS, Kamel HH, Mohamed MAA, Saied MIM. Role of autologous platelet-rich plasma in wound healing in obese patients undergoing elective caesarean delivery (prospective study). Minia J Med Res. 2020;31(2):31-5.
22. Wanas M, Khalaf W, Elmandooh M. Effect of autologous fibrin gel and platelet-rich plasma activated by ozone versus those activated by calcium chloride on wound healing and prevention of infection in high-risk cesarean sections: randomized controlled study. Egypt J Hosp Med. 2017;68(2):1155-61.
23. Belal S, Ahmed AM, Elhossary H. The effect of platelet-rich plasma (PRP) on wound healing in high-risk patients undergoing abdominal hysterectomy. Egypt J Hosp Med. 2025;100(1):2458-66.
24. Scridon A. Platelets and their role in hemostasis and thrombosis—from physiology to pathophysiology and therapeutic implications. Int J Mol Sci. 2022;23(21):12795-812.
25. Roohaninasab M, Jafarzadeh A, Sadeghzadeh-Bazargan A, Zare S, Nouri M, Nilforoushzadeh MA, *et al*. Evaluation of the efficacy, safety and satisfaction rates of platelet-rich plasma, non-cross-linked hyaluronic acid and their combination in patients with burn scars

treated with fractional CO_2 laser: a randomized controlled clinical trial. Int Wound J. 2024;21(10): e70065.
26. Jafarzadeh A, PourMohammad A, Goodarzi A. A systematic review of the efficacy, safety and satisfaction of regenerative medicine treatments, including platelet-rich plasma, stromal vascular fraction and stem cell-conditioned medium for hypertrophic scars and keloids. Int Wound J. 2024;21(4): e14557.