

Research Article

Role of Autologous Platelet-Rich Plasma Solution in healing of episiotomy after normal vaginal delivery

(Prospective Randomized controlled trial)



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DOI: 10.21608/mjmr.2023.187753.1305

Abstract

Background: Episiotomy is the procedure that help to promote difficult vaginal deliveries to control and decrease dangerous perineal lacerations during normal labour. The aim of this study was to evaluate the effect of local injection of Autologous Platelet-Rich Plasma (PRP) Solution in healing of episiotomy wounds. **Methods:** Randomized controlled trial included 200 patients undergoing their first childbirth at Minia Maternity University Hospital and El-Fashn General Hospital between May 2021 and December 2021 randomized into either PRP (study) or control groups. In the study group, PRP solution was injected in subcutaneous tissue of wound while wounds were only cleaned with saline in the control group .Wound healing and pain were assessed using REEDA, VAS and VSS scores. **Results:** REEDA score was significantly lower in the PRP group compared to the control group at one, two and four weeks (1.5 ± 0.49 vs. 1.85 ± 0.7 , 1.19 ± 0.46 Vs. 1.65 ± 0.5 and 1.65 ± 0.5 vs. 1.65 ± 0.5 , respectively $P=0.0001$). Similar results were shown regarding VSS score in favour of PRP (1.13 ± 0.57 vs. 1.62 ± 0.75 , 1.1 ± 0.52 vs. 1.48 ± 0.65 and 0.5 ± 0.34 vs. 1.1 ± 0.58 , respectively, $P = 0.0001$). Lower pain scores were achieved in the PRP group as compared to the control group; as evidenced by Vas scores (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, $P = 0.001$). **Conclusion:** PRP injection in episiotomy wounds is safe and may have a beneficial effect on wound healing and pain after vaginal delivery.

Keywords: episiotomy, PRP, REEDA, VAS, VSS.

Introduction

Episiotomy is a surgical controlled incision through the perineum (the muscular area between the vaginal opening and the anus) during vaginal delivery to give sufficient area to labour ,help to augment difficult vaginal deliveries and decrease pressure on perineum so decrease incidence of severe perineal tears during delivery^[1]. Complications of Wound site such as infection, hematoma, prolonged wound healing, dehiscence, and pain may occur in the puerperal period. These complications are associated with substantial morbidity, prolonged hospital stay, and increased cost. So, reduction in the incidence of these morbidities would decrease medical expenses and promote maternal and neonatal care^[2].

Wound healing is a complex system which consist of many phases of haemostasis (minutes to hours after injury), immune response, inflammatory phase (days 1–3), regulated cellular perforation and repair (days 4–21) and matrix remodelling(days 21–365).^[3,4] Usually, in wound healing studies focused on immune and inflammatory cellular phases (e.g. neutrophils and monocyte/ macrophages). nowadays, there is more focusing on the initial haemostatic and sustained secretory role of platelets which modulate the various mechanistic stages of wound healing by promotion of clots, stabilization and retraction, different growth factors release and cytokines

from active platelet granules, and release of matrix remodelling enzymes.^[5]

The blood component responsible for haemostasis and thrombosis is the platelets, nowadays there are many experimental and clinical researches which show that its main physiological role is to augment primary haemostasis and defence mechanism through decreasing loss of blood in case of interrupted continuity of vasculature, and may help the regulation of immune response and inflammatory process through (adhesion, activation, secretion, aggregation).^[6]

After injury platelet plaque formed by Platelets and fibrin, granules of growth factors and thromboxane A2 released from platelets help in vasoconstriction .and Transforming growth factor beta (TGF- β) which is the main growth factor that has a central role in wound healing .release of growth factors, cytokines and their complex contents from platelets help in proliferation of Mesenchymal stem cells (MSC)^[7]. In vitro studies on PRP and its effect on proliferation of (MSC) confirm a great regenerative potential of PRP^[8].

PRP is an autologous substance derived from the patient's own blood, by centrifugation a plasma fraction is obtained with a platelet in higher concentration than that in circulating blood, so augment its role in process of wound healing.^[9] There are several growth factors involved in the wound healing process, such as platelet-derived growth factor (PDGF), epidermal growth factor (EGF), fibroblast growth factor (FGF), insulin-like growth factor (IGF₁, IGF₂), vascular endothelial growth factor (VEGF), transforming growth factor (TGF- β), and keratinocyte growth factor (KGF).^[10,11,12]

Since the 1940s, the use of growth factors to help cutaneous wound healing had begun,^[13] and now many successful trials for PRP clinical applications have been reported for chronic skin ulcers^[14], acute cutaneous wounds^[15], burns^[16], and plastic and cosmetic surgery^[17].

The aim of the current study was to evaluate the effect of local injection of PRP on healing of episiotomy wounds after normal vaginal delivery.

Patients and Methods

The current study was a RCT included 200 women recruited from Minia University Maternity Hospital and El-Fashn General hospital during the period from May 2021 to December 2021. Ethical approval was obtained from the local ethical committee of the department of Obstetrics and Gynaecology, Faculty of Medicine, Minia University. All patients signed written informed consent before enrolment in the study.

We included women undergoing their first childbirth and were expected to have episiotomy doing labour. We excluded women that had any factor that might affect healing (DM, immunological disorders, morbid obesity). Women that managed to deliver without episiotomy were excluded from the final analysis.

Randomization:

Patients was randomly assigned into two groups using a random number sequence generated by statistical software and stratified with a 1: 1 allocation using random block sizes of 6. A randomization list was prepared by an epidemiologist and was inserted into a set of numbered sealed envelopes. Whenever a patient fulfilled the inclusion criteria and consented to participate in the trial, the numbered envelope was opened to determine the study group.

Patient allocation into study groups:

The patients were divided into two groups; study group (PRP group) in whom wounds were cleaned with normal saline, and PRP solution was injected in subcutaneous tissue of wound or control group in whom wounds were cleaned with normal saline.

Study procedure:

All cases of episiotomies were conducted at the delivery room. In the study (PRP) group, PRP was directly applied to the subcutaneous tissue of the wound site after closure of the underlying layers and prior to skin closure by using a sterile syringe. In the control group (group B), the patients received no topical treatment and the subcutaneous tissue was cleaned with normal saline before skin closure. Skin was closed with vicryl-2/0 according to the hospital

protocol. All patients received the same oral antibiotic for 5 days after delivery. Patients were examined on day one, one week, two weeks, and four weeks after delivery. The wound healing was evaluated by using the Vancouver scar scale, visual analogue scale and the edema ecchymosed discharge approximation scale. Data were recorded in data collection forms for analysis.

PRP was prepared from the patient own blood (autologous PRP). Under complete aseptic conditions, 10 ml of venous Blood sample was drawn from the antecubital vein, Sample was added to sterile tubes containing 3.2% sodium citrate as anticoagulant. Blood was centrifuged at 300xg for 5 minutes at 18°C to separate the red blood cells (bottom layer), the white blood cell layer-buffy coat-(middle layer), The upper fraction (plasma and platelets) was isolated, without disturbing the buffy coat, and was transferred into another sterile tube then centrifuged again at 700xg for 17 minutes at 18°C. The bottom layer (platelet pellet) obtained from centrifuged plasma was 3-4ml. Platelet activation was performed immediately by adding 0.3ml 10% calcium chloride for every ml of PRP to achieve platelet degranulation.

Study Outcomes:

The study outcomes were assessed using REEDA and VSS scores for wound healing and VAS score for pain.

- 1- The REEDA: Is a tool that assesses the inflammatory process and tissue healing in the perineal trauma, through the evaluation of five items of healing: redness (hyperaemia), oedema, ecchymosis, discharge and approximation of the wound edges (coaptation). Each item is rated on a scale of 0 to 3, and total scores may range from 0 to 15. A lower score indicates better healing.
- 2- The Vancouver Scar Scale (VSS): was used to detect formation of keloids or hypertrophic scars. It assesses 4 subjective Variables: vascularity, height/thickness, pliability, and pigmentation within a possible range of 0 -14 for the total score.
- 3- VAS assesses pain via a continuous measurement instrument that is operationally comprised of a horizontal line, anchored at each end by verbal descriptors such as no pain and the worst pain

imaginable. The subject is asked to indicate a spot on the scale that best represents her degree of pain. The score is determined by measuring the distance (mm) between the no pain anchor to the point that the patient marks, providing a range of scores from 0 - 10. A higher score indicates greater pain intensity.10.

Statistical analysis:

Data analysis was carried out using the IBM SPSS version 26.0 statistical package software (IBM; Armonk, New York, USA). Normality of the data was tested using the Kolmogorov-Smirnov test. Data was expressed as mean \pm SD for parametric quantitative data, numbers and percentages for qualitative data. Independent samples t-test was used for parametric quantitative data for comparison between two independent groups, while Paired samples t-test for comparison of parametric quantitative data variables. A P-value less than 0.05 was considered significant.

Results

The study included 200 patients allocated to either study group or control group Twenty sixth patients were lost during follow up and 176 patients were included in the final analysis (88 cases and 86 controls). The demographic characteristics of the study population were summarized in table 1.

Wound healing was assessed using REEDA and VSS scores. REEDA score was significantly lower in the PRP group compared to the control group at one, two and four weeks (1.5 ± 0.49 vs. 1.85 ± 0.7 , 1.19 ± 0.46 vs. 1.65 ± 0.5 and 1.65 ± 0.5 vs. 1.65 ± 0.5 , respectively $P=0.0001$). Similar results were shown regarding VSS score in favour of PRP (1.13 ± 0.57 vs. 1.62 ± 0.75 , 1.1 ± 0.52 vs. 1.48 ± 0.65 and 0.5 ± 0.34 vs. 1.1 ± 0.58 , respectively, $P = 0.0001$) (table 2).

Local pain at the episiotomy scan site was assessed using VAS score. Lower pain scores were achieved in the PRP group as compared to the control group; as evidenced by Vas scores (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, $P = 0.001$) (table 2).

There were seven cases of gapped wound in control group; five of them were managed

conservatively while other two cases needed Secondary sutures. However there was no cases of gabbing in PRP group (P value, = 0.0001) (table 2).The same findings of VAS and VSS scoring systems showing higher significant Difference between both group with more fine

and clean wound in PRP group than control group and better pain tolerability in PRP group than the control group except for the 1st day of assessment as there was more inflammatory reactions in PRP group than the control group with more need for analgesia at that day

Table (I): Demographic characteristics of the study population

	PRP group N= 88	Control group N= 86	p value
Age (Mean ± SD)	26.94 ±4.91	26.67± 5.06	0.722
BMI	30±1.42	29±1.44	0.089
Residence: (N%)			
Rural	44(50%)	43 (50%)	>0.99
Urban	44 (50%)	43 (50%)	
Occupation: (N %)			
Housewife	26 (29.5%)	23 (26.7%)	0.918
Worker	44 (50%)	45 (52.4%)	
Employee	18 (20.5%)	18 (20.9%)	
Social level: (N %)			
Low	26 (29.5%)	23 (26.7%)	0.918
Moderate	44 (50%)	45 (52.4%)	
High	18 (20.5%)	18 (20.9%)	

Table (2): REEDA, VSS, and VAS scores in the study population

Groups	Day1	Week1	Week2	Week4	P-value
•REEDA score	2.56±0.57	1.5±0.49	1.19±0.46	1.65±0.5	0.0001
PRP group					
Control group	2.36±0.67	1.85±0.7	1.65±0.5	1.65±0.5	
•VSS score	1.79±0.68	1.13±0.57	1.1±0.52	0.5±0.34	0.0001
PRP group					
Control group	2.44±0.8	1.62±0.75	1.48±0.65	1.1±0.58	
•VAS score	5.69±0.99	3.22±0.78	2.18±0.49	0.73±0.42	0.0001
PRP group					
Control group	4.91±1.13	3.09±1.06	2.45±0.66	1.5±0.64	
•Wound gapping	0	0	7/88 (7.6%)	0	0.0001
PRP group			0/86 (0%)		
Control group	0	0		0	

Discussion

Episiotomy is considered as one of the most common surgical procedures performed in obstetric practice^[18]. Episiotomy wound usually cause discomfort and local pain as perineum is a vascular and extremely tender area, and perineal muscles involved in many activities as sitting, walking etc. There are many complications related to episiotomy wound

such as bleeding, oedema, infection, gapped wound^[19].

PRP is a volume of blood having high concentration of platelets that markedly improves the adhesive properties and the process of wound healing. After application of PRP, the tissue-healing substances are released. The high concentration of platelets at the wound site accelerates the healing process and

protects the wound against infection^[20,21]. Due to its simple preparation, high content of growth factor and low immunogenicity, PRP has been widely used in many surgical operations and clinical treatments and has shown promising experimental and clinical effects in wound healing, especially in chronic wounds^[22]. The main role of PRP in wound healing and tissue regeneration has been confirmed by many studies. Some researchers' findings suggest that PRP has a good effect on revascularization. PRP has a higher content of VEGF to promote the vascularization of deep partial-thickness burns, which is beneficial to the prognosis of burn wounds^[23].

PRP can give an appropriate microenvironment for bone marrow stromal cells (BMSCs) and cooperate with BMSCs to enhance diabetic wound healing by promoting angiogenesis and cell proliferation, and by inducing TGF- β 1 expression^[24] and enhance formation of new capillaries so accelerate local vascularization of the wound^[25]. It also has been reported that PRP can give a series of antibacterial substances, reduce local inflammation and prevent wound infection^[26].

Due to its physiological role in wound healing, nowadays PRP is used more often in variable of clinical applications, and it became now popular to apply it as a part of routine wound management. However, it still remains uncertain whether the impact of topical application of PRP is a fact or a fiction^[27].

To our knowledge, the current study is the first RCT evaluated the use of PRP injection in episiotomy wound. The study was conducted at El-Fashn General hospital and Minia Maternity University Hospital in Egypt including 200 patients undergoing normal vaginal delivery with episiotomy during the period between May 2021 to December 2021. Wound healing and postoperative pain were assessed using REEDA, VSS and VAS scores respectively. The study demonstrated a significant improvement of wound healing and significant reduction in pain scores after one week in PRP group as compared to the control group. This significant difference was maintained after two and four weeks.

Similar findings to our study were demonstrated by Tehranian and colleagues who evaluated the effect of PRP injection on caesarean section scars in high risk population. REEDA scoring was lower in PRP group than control group but there was not documentation of wound changes in PRP group in day one which may be due to mixed patients' types⁽²⁸⁾.

The findings of the current study are matched with those demonstrated by of Wanas et al., 2017; who studied different activators of PRP on REEDA, VAS, VSS scoring. In that study, PRP has been shown to be associated with better results in form of less scar formation and lower incidence of infection^[29]. Similar studies used PRP in different non obstetric surgical procedures and found significant difference when PRP used in comparison with control. In contrast to our results, some researchers deny any positive effect of PRP use in different surgical procedure like muscle or tendon repair. These contradicting results may be attributed to different patients selection criteria, and different field of surgical procedure as most of the studied population were in an emergency traumatic situation, while in current study the patient selected at an elective clean situation⁽³⁰⁾. Animal studies has shown good results in favour of use of PRP in full thickness cutaneous wounds^(31,32).

Strengths and limitations:

This study has points of strengths and limitations. The strength of the study is in its design as a RCT and being the first study to evaluate the efficacy of autologous PRP in prevention of gapped wound and infections in episiotomy wounds. The limitations are the relatively few number in relation to such a common procedure and performing the surgical cut and repair by different clinicians with difficult clinical experience.

The study has implications on both clinical and research sides. On the clinical side, PRP can be safely used for local injection in episiotomy wounds and it may have a potentially beneficial effect on both healing and pain reduction, On the research side, larger RCTs are urged to be conducted to allow the implementation of the study results on wider scale.

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