Research Article

The value of using platelet rich plasma during caesarian section to enhance wound healing in diabetic women

Abstract

Introduction: Diabetes is an independent risk factor for bad wound healing during pregnancy. The bad wound healing among diabetic women may be related to high glucose level which lower the ability of immune response to fight organisms and associated tissue hypoxia due to vasculopathy especially in long standing diabetics and reduced immune response and improper wound healing. PRP is a volume of blood having a high concentration of platelets which improves the adhesive properties and the process of wound healing. the aim of this study is to evaluate the role of autologous PRP injection in wound healing in diabetic patients undergoing full term elective CS.

Patient and methods: This study is a randomized controlled study done at department of obstetric and gynecology , faculty of medicine, minia university Egypt. 120 diabetic women at full term planned for elective CS recruited and divided into 2 groups, one control group and one study group where PRP applied subcuranously to enhance wound healing and get better cosmetic results by means of scoring system as REEDA, VAS, VSS scoring systems of wound healing and pain assessment.

Results: this study show significant difference between wound healing in favor of PRP group with p- value <0.0001 in REEDA assessment scoring. Also the scar show better results with good healing and better cosmetic appearance together with better pain tolerability after day one postoperatively

Conclusion: autologous PRP solution could be used safely in diabetic women undergoing elective CS with further studies needed.

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Introduction

Patients with diabetes mellitus are at increased risk of bad outcome in pregnancy, including abortion, congenital anomalies, growth abnormalities, intrauterine fetal death, gestational hypertension, preeclampsia, birth injury, and operative delivery.[1] Diabetes is an independent risk factor for bad wound healing during pregnancy. Other risk factors involved in poor wound healing include, anemia, immunosuppressive medications, malnutrition, hypoxemia, chronic medical illness, prolonged surgery and obesity. The risks of wound infection and complications after cesarean section (CS) in diabetic women are not well studied.[2] The bad wound healing among diabetic women may be related to high glucose level which lower the ability of immune response to fight organisms and associated tissue hypoxia secondary to vasculopathy especially in long standing diabetics with associated tissue ischaemia and reduced immune response and improper wound healing.[3] The risk of wound infection and gapping is increased 4-5 times after elective and non elective CS.[4]

The healing process involve many physiological steps including hemostasis, inflammation, proliferation, epithelialization, fibroplasia, and maturation which triggered by tissue injury. During the biological events of healing, the platelets aggregated in a plaque with fibrin that release multiple growth factors allowing hemostasis and accelerate wound healing.[5] Platelet rich plasma, PRP is a volume of blood having a high concentration of platelets which improves the adhesive properties and the process of wound healing. After application of PRP stimulate healing by releasing of tissue healing substances with the high platelet concentration accelerate healing and guard against infection. PRP used in a gel form or as an injection with promising results in proper wound healing in both soft tissues (fat, skin, and mucosa) as well as the hard tissues (tendons and bones).[6] The aim of this study is to evaluate the role of autologous PRP injection in wound healing in diabetic patients undergoing full term elective CS

Methodology

This study is a randomized controlled study done at department of obstetric and gynecology, faculty of medicine, minya university Egypt, during the period between January 2017 to December 2017 after being approved by the department ethical committee 120 patients undergoing elective cesarean section for obstetric reasons with the following inclusion criteria, gestational or pre-gestational diabetics with proper glycemic control, full term, average body mass index(20-24.9kg/m²), no other associated medical condition, non scarred uterus, elective obstetric indication for cesarean section(CS).[7,8] Exclusion criteria involve, anaemic patients, medical disorders as cardiac patients, any immune disorders, placenta praevia, rupture membrane, in labor patients, and higher BMI above 24.[9] All patient were recruited from the attendees of outpatient obstetric clinic, department of obstetric and gynecology faculty of medicine, Minya university Egypt. All recruited patient gave an informed verbal consent to share in the study after full understanding and direct communication with the author to explain the study. For all patients the following done, proper history taking, general examination, abdominal examination, obstetric ultrasound evaluation to properly dating the pregnancy at 1st recruitment visit and before labor to confirm fetal wellbeing as well as proper indication for CS and estimation of fetal growth and weight.

Blood investigations as CBC, control of blood sugar, coagulation profile

The women divided randomly into two groups, 30 in each one, the control group and study group

For group 1(control group, n 60)):- the patient after being assessed by the anaethetic team were admitted to operative theatre (OT) where lower segment cesarean section done as usual with skin closure by continuous subcuticular proline 2/0 . the usual post-operative care given to the patients according to hospital protocol which involve using 1 gm of antibiotic, cefatrioxone 1g given at induction of anesthesia and repeated daily for 3 consecutive days while the patient in the hospital with no further antibiotics at home. For group 2(study group, n 60):- the patient after being assessed by the anesthetic team were admitted to OT where lower segment cesarean section done as usual Pre-prepared PRP solution was injected subcutaneously just before skin closure,the skin closed by continuous subcuticular proline 2/0 . the usual post-operative care given to the patients according to hospital protocol which involve using 1 gm of antibiotic, cefatrioxone 1g given at induction of anaesthesia and repeated daily for 3 consecutive days while the patient in the hospital with no further antibiotics at home. PRP preparation: the fresh autologous sample was prepared in the morning of the elective section and were ready on operative table at time of admission to operative theatre.

For preparation of PRP solution the following steps done:-

a. The following steps present a representative method of preparing PRP as follow :

b. venous blood (30mL) is drawn from the patient's arm in anticoagulant-containing tubes; *the recommended temperature during processing is 21□–24□ to prevent platelet activation during centrifugation of the blood;

c. The blood is centrifuged at 1,200 rpm for 12 minutes;

d. The blood separates into three layers: an upper layer that contains platelets and white blood cells, an intermediate thin layer (the buffy coat) that is rich in white blood cells, and a bottom layer that contains red blood cells;

e. The upper and intermediate buffy layers are transferred to an empty sterile tube. The plasma is centrifuged again at 3,300 rpm for 7 minutes to help with the formation of soft pellets (erythrocytes and platelets) at the bottom of the tube;

f. The upper two-thirds of the plasma is discarded because it is platelet-poor plasma

g. Pellets are homogenized in the lower third (5 mL) of the plasma to create the PRP; (8) the PRP is now ready for injection. Approximately 30 mL of venous blood yields 3–5 mL of PRP[7]

h. The prepared PRP solution is transferred within sterile syringe from the laboratory to the OT

i. Then applied and spread over the subcutaneous space before skin closure.

j. The patients were examined by the physician on day one, day seven and at day 30 after the procedure.

k. Pain was evaluated by the visual analog scoring system (VAS). The wound healing was

l. Evaluated by using the Vancouver scar scale (VSS) and the redness, edema ecchymosed discharge approximation (REEDA) scale.

The scores obtained were compared for both groups to evaluate the results of the study.

Outcomes

I. Primary Outcomes: They measured by the REEDA scale and VSS for assessing the changes in wound healing. REEDA as a descriptive scale has 4 points in a categorical score that measures 5 items of

healing: redness (hyperemia), edema, ecchymosis, discharge, and approximation of

the wound edges (cooptation). 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.[8]

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.[9]

II. Secondary Outcomes: Measured by VAS. 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

Sample size calculation was done using IBM SPSS Sample Power software, release 3.0.1 (IBM Corp., Armonk, NY, USA). the power set at 90%, alpha error at 0.05 and ratio of the two study groups at 1:1. Accordingly, 60 cases were needed in each group to detect 20% difference in healing process and scar formation Data were collected and tabulated using Excel Version 7 (Microsoft Corporation, NewYork, NY, USA), and analyzed using Statistical Package for the Social Sciences Version 16 (SPSS Inc.,Chicago, IL, USA).

Results

This study is a randomized controlled study done at department of obstetric and gynecology, faculty of medicine, Minya university Egypt, during the period between January 2017 to December 2017 where 120 diabetic patients undergoing elective CS were recruited and randomly divided into 2 groups, control group, and study group where PRP used subcutaneously before skin closure to enhance wound healing, lower incidence of wound infection and gapping and reduce the incidence of ugly scar formation. The socio-demographic data showing no significant difference between both groups (Table1). As regard indications of CS in both groups showing that fetal macrosomia, primegravidae breech, non vertex presentation of the 1st twin and patient request were the main indications for elective CS as regard wound healing based on REEDA Scoring, it shows that study group showing more inflammatory reactions on day 1 in the form of more redness, edema, discharge than the control group, but

at day 7 and 30 the study group showing better cosmetic appearance and proper wound coaptation than the control group (Table2) there were 12 cases of gabbed wound in group 1, 8 of them were managed conservatively while other 4 cases needed secondary sutures, however there was no cases of gabbing in group 2 (p.value 0.0001) as regard VSS which evaluate the shape and integrity of the scar, it shows better results in the study group tan control group with significant p value (0.001) (Table 3) as regard VAS there were more statistically difference in pain in day 1, and 7 in study group than control group but this difference disappeared afterwards at day 30 (Table 4).

Table 1 Sociodemographic criteria of both groups

Parameter	Group 1	Group 2	p- value
Age	26±2.52	26±2.36	1
Parity	4±3.25	3±2.21	0.0926
Rural residence	47	42	0.3011
Urban residence	13	18	0.2950
Economic standard			0.7786
Low	6	7	0.7996
Average	51	50	1
High	3	3	
Number of gestation			
Single	56	53	0.0897
Twins	4	7	0.3430
CS indications			
Pg breech	20	21	0.845
Fetal macrosomia	34	32	0.7175
Non vertex 1st twin	3	4	0.7089
Patient request	3	3	1

Table2 REEDA scoring system

	Group 1	Group 2	P value
Day 1	2.32±0.56	2.86±0.89	0.0001
Day 7	1.89±0.36	1.23±0.24	P < 0.0001
Day 30	1±0.28	0.86±0.12	0.0005

Table 3 VSS scoring system

	Group 1	Group 2	P value
Day 1	2.12±0.25	2.85±0.57	P < 0.0001
Day 7	2.26±0.54	1.85±0.13	P < 0.0001
Day 30	2.23±0.27	1±0.19	P < 0.0001

Table 4 VAS scoring

	Group 1	Group 2	P value
Day 1	3.25±1.23	5.2±0.35	P < 0.0001
Day 7	1.2±0.15	1.1±0.36	P < 0.0001
Day 30	0.56±0.2	0.23±0.1	P < 0.0001

Discussion

Cesarean section complications especially improper wound healing considered one of the most encountered puerperal problems which if neglected, it might progress to complete gapped wound up to burst abdomen. These morbid events are seen most commonly among high risk patients like diabetic women either gestational or pre-gestational and especially if uncontrolled glucose level which related to poor tissue perfusion, and subsequent tissue hypoxia that render wound healing[11] PRP which a new intervention admitted to surgical activities few years ago has been tried in different gynecological and obstetric procedures attributed to the endogenous platelet activities that enhance wound healing and accelerate tissue regeneration by releasing different growth factors and at the same time enhance local immunity that fight infection and allowing better scar formation that healed by primary intention with better cosmetic appearance of the wound [12,13] this study is a prospective randomized study conducted at the department of obstetric and gynecology, faculty of medicine, Minya University, Egypt during the period between January 2017 to December 2017 where 120 diabetic patients undergoing elective CS were recruited and randomly divided into 2 groups, control group, and study group where PRP used subcutaneously before skin closure to enhance wound healing, lower incidence of wound infection and gapping and reduce the incidence of ugly scar formation. Our assessment tools were REEDA scoring system to detect local wound changes as redness, edema, ecchymosis, discharge and approximation of the wound which used at day 1, 7, and 30 postoperatively also pain response post operatively was assessed by VAS system at the same period of post-operative days, 1, 7 and 30 follow up of the scar formation by VSS system was also assessed at days 1, 7 and 30 respectively as regard REEDA scoring between both groups, our results showing that there is significant difference between study and control group, but at 1st day the wound of PRP group showing more redness, edema and oozing discharge than the control group with p value 0.0001, however in the next following days 7 and 30, the PRP showing higher significant difference with more improvement of the wound REEDA scaling than the control group with p value less than 0.0001., there were 12 cases of gabbed wound in group 1, 8 of them were managed conservatively while other 4 cases needed secondary sutures, however there was no cases of gabbing in group 2 (p.value, 0.0001) 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 these findings are matched with that of Tehranian et al.,[14] who found better REEDA scoring in PRP group than control group but did not document any wound changes in PRP group in day one which may be due to mixed patients types in Tehranian study as they examined all high risk patients but our selection is restricted to diabetics only also our results are matched with those of Marwa et al.,[15] who studied different activators of PRP on REEDA, VAS, VSS scoring and found that PRP in general showing better results with less scar formation and lower incidence of infection similar studies used PRP in different non obstetric surgical procedures and found significant difference when PRP used in comparison with the control[16–18] in contrast to our results some authors deny any positive effect of PRP use in different surgical procedure like muscle or tendon repair[19] these antagonistic results may be due 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 this study the patient selected at an elective clean situation limitations of this study are lack of proper knowledge of the patients in our community to understand the procedure easily which limited the number of cases to be studied. Also, the principle of autologous PRP donation was not accepted by some patients, which related to cultural issues guarding against blood donation from those who are going to deliver. Another limitation is the amount of PRP solution as 30 ml of blood sometimes resulting in 5 ml of PRP and in some others giving 7, or 10 ml in other cases, but the author fixed the amount to be used to 5 ml only. Also some laboratory errors have been encountered as frequency and duration of centrifugation which might result in different activated PRP.

Conclusion

In conclusion, this study shows that use of PRP in diabetic women undergoing elective CS enhance wound healing with less scar formation and better cosmetic appearance. Further studies are needed to confirm these findings and more researches are needed to evaluate the use of PRP in emergency situation or other high risk patients other than diabetics women and the availability of use of Donor PRP in these situations.

Acknowledgments

Conflicts of interest

The author declare there is no conflict of interest.

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