Research Article

Role of Autologous Platelet-Rich Plasma in Wound Healing in Obese Patients Undergoing Elective Caesarean Delivery (Prospective study).

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Introduction

Skin is the largest organ in vertebrates, comprising 10% of the total body mass and covers the entire surface area. It has a crucial role in defense and survival thanks to its self-repairing and self-renewing capacity, acting as an important barrier from the outer environment to the inner environment. A disturbance of the normal anatomic structure and functional integrity of the skin can be described as a wound. Wound healing is a coordinated dynamic tissue repair process, which involves the interaction of multiple cell types, growth factors, cytokines, and chemokine's .If this mechanism is interrupted, chronic, non-healing wounds or excessive granulation tissue formation can appear, leading to arresting in the chronic inflammatory phase. (Hassan W.U., 2014). Obesity is a severe pathologic situation that causes both morphological and functional disorders in the human body and is associated with a high risk of morbidity and mortality. Obesity affects every aspect of an individual's life and has deleterious effects, not only on health and self-esteem but also on the socio-economic status of the patient. At the same time, each government spends a huge amount of money for the treatment of the different diseases caused by obesity. (Ogden CL., 2006). Seeking medical help is an essential step because it helps to reduce morbidity and mortality rates among obese individuals. Wound healing is a natural response to tissue injury, which involves a complex cascade of overlapped cellular events. However, in order to simplify the process, it has been traditionally explained as a series of four phases: hemostasis, inflammation, proliferation, and maturation. These stages may vary in length, due to different pathologic factors, such as infection, malnutrition, venous insufficiency, ischemia, and exogenous factors. Consensus has been reached such that a wound may be defined as chronic if complete healing has not been achieved in 6 weeks or no positive response to a treatment change is observed.(Schreml S, 2010). Platelet-rich plasma (PRP) can be defined as an autologous blood product containing a platelet concentration higher than the baseline level of 150,000--350,000platelets/mL (mean¼250,000) within whole blood Platelets play a central role in tissue regeneration. They function in hemo-stasis, construction of new connective tissue, and revascularization. (Pufe T, 2005). PRP is derived from whole blood through the process of gradient density centrifugation, there by concentrating a large number of platelets in a small volume of plasma. Platelets play a major role in the process of hemostasis and later wound healing in any wound. During the process of injury platelets gets initially accumulated and form plug producing hemo-stasis. later by the action of thrombin, platelet membrane gets depolamarised and release of platelet granules which are rich in various growth factors like PDGF, PGR, FGF, interleukins. (Kahle 8, Hermanns HJ, 2011). Platelets in PRP also play a role in host defense mechanism at the wound site by producing signaling proteins that attract macrophages. PRP also may contain a small number of leukocytes. That synthesizes interleukins as part of a non-specific immune response. Previous studies of PRP have demonstrated antimicrobial activity against Escherichia coli, Staphylo-coccus aureus, including methicillin-resistant Staphylococcus aureus, Candida albicans, and Cryptococcus neoformans. (Lindeboom JA, 2007). These growth factors aid in the process of wound healing by laying collagen matrix, fibroblast proliferation and early maturation of collagen. Based on this background autolo-gous platelet growth factors in the form of platelet rich plasma started in wound healing

after caesarian section in obese patients, with variable but encouraging results necessitating the need to continued use and further studies into its effectiveness.

Aim of the work

To assess the effect of platelets-rich plasma in enhancing wound healing in obese patients undergoing caesarean section and to prevent complications of wound healing.

Patients and Methods

Setting: This study will be performed on 140 cases for cesarean delivery who will be admitted to minia university hospital.

2- Funding.

3- Ethical issue: The protocol of the study was approved by ethical committee of gynecology and obstetrics department Minia University On 7\1\2019**.**

4- Study Design: This will be a balanced, randomized, prospective study that will be performed on 140 cases for cesarean delivery who will be admitted to Minia university hospital.

5- Plan of study: A research protocol including methods, considered outcomes, sample size calculation, and ethical considerations was produced prior to the initiation of the study. Informed consent was obtained from all participants and the study was registered to have a number.

patients were divided into two treatment groups:

(a) Study group (PRP group): wounds were cleaned with normal saline, and PRP solution was injected in subcutaneous tissue of wound after closure of the sheath.

(b) Control group: the wounds were cleaned with normal saline

6- Participants: All cesarean sections was carried out in Minia university hospital and under the supervision of the supervisors, and all of the patients was received the same pre-operative intravenous antibiotic.

The inclusion criteria was
.Age (18 y: 45 y)
.Elective delivery
.Obese patients (any type of obesity)
.Single pregnancy
.The same hospital
.The same operator
.non previous scar

The exclusion criteria was
.Younger ages below 18y
.Older ages above 45y
.Multiple pregnancies
.Other medical problems
.Emergency caesarian delivery
.Associated other diseases
.Previous caesarian section

7. Equipment (Interventions):

In the operating room before the start of each procedure,. PRP will be 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 during 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 during 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.

All of the procedures were conducted in an operation room with the purpose of safe guarding sterilization.

After closure of the fascia and prior to skin closure, PRP was directly applied to the subcutaneous tissue of the wound site by using a sterile syringe. In the control group (group B), the patients was received no topical treatment and the subcutaneous tissue will be cleaned with normal saline before skin closure.

For all participants, no drains were used and the skin was closed with brolene-1 according to the procedures of routine care. After skin closure, a wound dressing with a compressed bandage was applied. The patients were examined on day 1, 1 week, 2 weeks, and 4 weeks after the procedure. The wound healing will be evaluated by using the Vancouver scar scale (VSS) and the edema ecchymosed discharge approximation (REEDA) scale.

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

Between January of 2019 and august of 2019, 140 patients were enrolled in the study, 70 patients were assigned to the treatment group and 70 to the control group. In both groups, almost half of the patients were primigravida, and there was no difference between the two groups in terms of the gravidity. Also there was no significant difference between the two groups regarding their hemodynamic indices or blood groups. The groups were well matched at the baseline and the characteristics of the patients did not differ dramatically. The baseline demographic and clinical characteristics are summarized in Table 1.

Table (1):

parameter	Group 1	Group 2	p-value
Age	27±2.51	27±2.37	1
Parity	3±2.21	4±3.25	0.009
BMI	29±1.44	30±1.42	0.089
C.S INDICATIONS			
PG breech	26	28	0.708
Fetal macrosomia	31	32	0.848
History of traumatic pp. hge	8	5	0.717
Patient request	5	5	1

Discussion

Cesarean delivery, one of the most common surgical procedures performed worldwide. Its rate is about 20% of births around the world and is increasing in frequency.

There are common risk factors that lead to complications related to cesarean sections especially wound complications (infections and gapped wound up to burst abdomen) is obesity which related to poor tissue perfusion and subsequent tissue hypoxia that render wound healing.

Although prophylactic antibiotics is the only way guarding against postoperative infection, but some studies have shown significant reduction of total postoperative maternal infectious febrile morbidity rate after CS by the use of prophylactic antibiotics, while others did not find such association.

Platelet Rich Plasma (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 the infection.

PRP which a new intervention admitted to surgical activities few years ago in 1980 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.

This study is a prospective randomized study conducted at the department of obstetrics and gynecology, faculty of medicine, Minya University, Egypt during the period between January 2019 to august 2019 where 100 obese 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, after 1 week,2 weeks and 4 weeks postoperatively also pain response post operatively was assessed by VAS system at the same period of post-operative days 1, 1 week,2 weeks and 4 weeks follow up of the scar formation by VSS system was also assessed at days 1, 1 week, 2 weeks and 4 weeks 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 1 week, 2 weeks and 4 weeks, 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 8 cases of gabbed wound in control group, 8 of them were managed conservatively while other 4 cases needed secondary sutures.

However there was no cases of gabbing in active group (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., 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 obese patients only also our results are matched with those of Marwa et al., 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 in contrast to our results some authors deny any positive effect of PRP use in different surgical procedure like muscle or tendon repair 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.

Also some laboratory errors have been encountered as frequency and duration of centrifugation which might result in different activated PRP.

Conclusion & Recommendation

The present study is the first prospective, randomized, and controlled trial evaluating the efficacy of autologous PRP in prevention of gapped wound and infections in cesarean section surgery in obese patients, and it has demonstrated that PRP has positive effects on wound healing and pain reduction in obese patients undergoing cesarean section.

We recommend using this new technique in all women obese and non-obese undergoing caesarian section as can as possible to improve wound healing process and to prevent wound complications after caesarian section.

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