

Autologous Platelet Rich Plasma (PRP) - Regeneration to Repair in Post Operated Caesarean Wounds

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INTRODUCTION

Autologous Platelet-Rich Plasma (PRP) therapy is a treatment based on high concentrations of growth factors released by platelets, having potential to improve the healing by stimulating regeneration of epithelium. In this report, we describe three patients with non-healing wounds after major surgeries (post caesarean) at our institution who were efficiently & contentedly treated with PRP with positive results. Also we reviewed the literature of PRP's mechanisms, benefits & limitations.

Wound healing is an intricate process characterized by stages of inflammation, proliferation, repair, and remodelling.^(1,2) The stage of inflammation is commenced partly by platelet degranulation.⁽¹⁾ Platelets have a minimum of five growth factors which will lead to tissue development and epithelialization: Platelet factor 4, Platelet-Derived Growth Factor (PDGF), platelet-derived angiogenesis factor, transforming growth factors and platelet derived epidermal growth factor. These factors are important in wound healing because they stimulate and modulate multiple biological processes on their release.^(1,2,3,4) Chronic wounds may lack growth factors in some cases.⁽²⁾ Reduced growth factor availability may be due to reduced production, reduced release, excess degradation, trapping or a combination of these processes.⁽²⁾

Caesarean delivery rate has continued to increase & caesarean deliveries are being employed for about 15 % of the births worldwide.⁽⁵⁾ Surgical site problems like infection, haematoma, dehiscence, pain & seroma can occur within the postpartum period. The postpartum period may be challenging time & difficult for mothers especially due to the needs of caring for a new-born baby, these complications are related to prolonged hospital stay, increased cost & substantial morbidity and mortality. Maternal and neonatal care can be improved by reducing the extent of these morbidities, therefore scaling down on medical expenses.⁽⁶⁾ The risk factors affecting the wound repair process in caesarean delivery includes: (1) chronic systemic illness (diabetes, hypertension, and immune deficiencies), (2) Anaemia, (3) Time Span of Surgery > 90 minutes, (4) Obesity, (5) Previous Incision, (6) Corticosteroid Treatment, (7) Immunosuppression Treatment, and (8) Twin Births.^(7,8)

PRP is an autologous product extracted from whole blood there by concentrating a large number of platelets in a small proportion of plasma through the process of gradient density centrifugation. Platelets play major role in the process of haemostasis and later wound healing in any wound. Platelets initially get accumulated and form plug producing haemostasis during the process of injury. Platelet membrane gets depolarised by the action of thrombin & release platelet granules which are rich in various growth factors like PDGF (Platelet-Derived Growth Factor), FGF (Fibroblast Growth Factor), and interleukins.^(9,10) 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, autologous platelet growth factors in the form of plasma rich platelet started in the management of chronic wounds.

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PREPARATION OF PRP & APPLICATION

After explaining the treatment protocol and other options, informed valid written consent was taken from all patients. Autologous PRP was prepared by centrifugation of the patient’s blood for 15 min at 3500 rpm in a tabletop centrifuge after aseptic collection from the ante cubital vein employing a 16 G needle, which is then transferred to a sterile vacutainer. Anti-coagulant was not used in this study. After fractionation of components the middle buffy layer of PRP was collected; applied over wound & dressed in sterile Vaseline gauze. The first look dressing is on 5th day which is then followed by alternate saline dressing. Based on the response of wound to the first procedure / application decision is taken to repeat the procedure of subsequent applications. As autologous platelets are used there was no chance of spread of infectious diseases and allergic reactions. The wound was followed up under the following parameters like size of wound [with tape], quality of granulation tissue, no of times of application, skin grafting, and time taken for complete healing.

RESULTS

Case 1



Figure 1. 1ST Sitting of PRP Therapy after Resuturing Failure



Figure 2. 3rd Sitting of PRP on Day 7, Red Granulation Seen

Patient 1 was a 29 yrs. G2A1 with 37 weeks 4 days of gestation who had caesarean in May 2019 at our institution with indication of cephalopelvic disproportion in labour. Postoperatively she had indurated suture site, later on had infection at suture site & fluid collection in subcutaneous

planes (on ultrasonography), she was taken up for incision & drainage. After the infection was treated with Inj. Amikacin 500 mg bd for 7 days & debridement of necrotic tissue, patient was taken for resuturing & wound did not heal after resuturing. After resuturing failure, patient undertook complete 6 PRP treatments over 6 weeks. The wound became smaller & gradually healed completely with time with subsequent PRP treatments.



Figure 3. Complete Approximation on Wound on Day 24

Case 2



Figure 4. Post Caesarean Wound Gap, 1st Sitting of PRP



Figure 5. Subsequent 4th Sitting of PRP Therapy

Patient 2 was a 31 yrs. old female who underwent caesarean in July, 2019 & presented on day 15 post caesarean with complaints of pain over suture site & wound discharge. After investigations she was found to be anaemic with haemoglobin of 8 gm %. Ultrasonography of local site over suture line was done suggestive of gross oedema & collection with thick echoes within along the suture line in subcutaneous plane. Wound swab report was suggestive of clindamycin resistant MRSA (Methicillin-Resistant *Staphylococcus aureus*) coagulase positive *staphylococci* sensitive to amikacin. Treatment with

antibiotics completed & wound debridement was done. In place of resuturing, PRP treatment was introduced after anaemia correction & wound improved gradually after 5 PRP treatments.



Figure 6. 5th Sitting of PRP on Day 30 Shows Approximation

Case 3



Figure 7. Wound Gap Post Caesarean, 1st Sitting of PRP Therapy

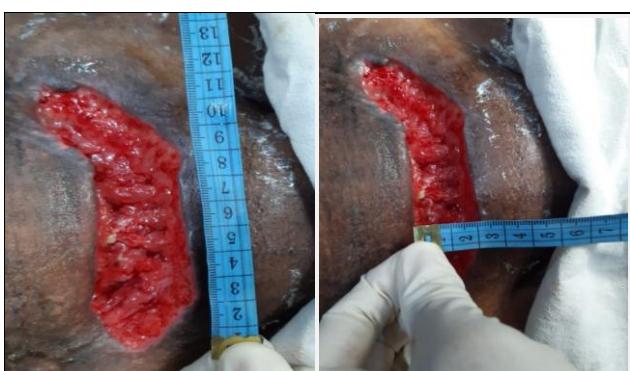


Figure 8. Healthy Granulation Seen, Subsequent 4th Sitting of PRP on Day 16



Figure 9. 6th Sitting on PRP on Day 27, Approximating Wound Seen with Gradual PRP Therapies

Patient 3, was a 20 yrs. primigravida with 40 weeks of gestation who came to our hospital in September 2019 & underwent caesarean in view of cephalopelvic disproportion & had wound discharge in postoperative period. Proper antibiotic coverage was given according to wound swab report with inj Amikacin 500 mg bd for 7 days. Despite proper daily dressing the wound did not show any improvement & patient had wound gap. Therefore, we decided to introduce PRP treatment & total of 13 PRP sessions were given resulting in wound healing. The wound gap was gradually filled with red granulation tissue with the wound very close to being epithelialized with gradual PRP treatment.

DISCUSSION

Chronic non-healing wounds represent a forbidding challenge and need specialized therapy to give the best advantage to each patient for wound closure. Delayed wound healing is a result of interplay of various factors. Strong association is seen between physical factors like diabetes, physical pressure, aging, vasculitis syndrome & delayed healing of wound. Also, local influences like bacterial colonization, high levels of inflammatory cytokines, low density of beneficial cytokines & imbalance in matrix metalloproteinase also play a role in delayed wound healing.^(11,12) These factors create a vicious circle for the wound to heal, thus are the reason & consequence of delayed wound repair. Therefore, it's essential to treat both physical & regional influences that cause delayed wound repair. Now a variety of novel therapies are accessible to support wound healing including growth factor products, hyperbaric oxygen therapy.⁽¹³⁾ Amongst those promising therapies is autologous platelet concentrated plasma. In this case series, we have enumerated longstanding bad wounds in post caesarean patients which fruitfully healed with PRP.

Blood platelets also play role in promoting wound healing. Platelets have abundant cytokines & mend tissue injury by neoangiogenesis & stimulating multiplication, immigration & differentiation of dermal fibroblasts.^(14,15,16) Alpha-granules within platelets attach with platelet cytoplasmic membrane & liberate it's constituents into the surrounding after tissue injury. Principal cytokines like VEGF (Vascular Endothelial Growth Factor), PDGF (Platelet-Derived Growth Factor), TGF-Beta (Transforming Growth Factor), epidermal growth factor & basic fibroblast growth factor are liberated during wound healing. These growth factors not just trigger the targeted cells, but further team up with one another & boost their functions. There are two other important roles of platelet in wound repair, first they function as a meshwork of fibrin that forms a biological scaffold. The scaffold helps mesenchymal cells to immigrate from the base & margins of the wound, finally evolving into granulation tissue. Second they help to reduce bacterial colonization as they have antibacterial proteins.⁽¹⁷⁾

PRP therapy is easy to apply, painless & more tolerated in patients.⁽¹⁸⁾ One more advantage of PRP is safety. As an autologous preparation, PRP is safer to use than allogenic or homologous preparations & is free from concerns over transmissible diseases like hepatitis, human immunodeficiency virus, West Nile Fever & Creutzfeldt Jacob Disease. The risk of graft vs host disease is prevented,⁽¹⁹⁾ as PRP requires no specific considerations regarding antibody

formation & leading to better allowance by patients. As only small volume of blood is taken from the patient each time, PRP is minimally invasive & relatively economic modality that requires multiple venesections. Each preparation of PRP should have a minimum of 1 million platelets per microlitre.

Nevertheless, there are certain restraints regarding PRP treatment. The foremost limitation could be that hardly a small count of doctors are presently able to utilize PRP therapy in their practice due to lack of uniform protocol & limitation of facilities.⁽²⁰⁾ Also, there can be variation in the characteristic of autologous PRP in comparison to allogenic or homologous products drawn from healthy patient's blood following systematized working methods of blood establishments. In certain patients, especially those with diabetes, PRP therapy may not be as efficacious as expected as viability & proportion of cytokines in platelets are reported to decline.⁽¹³⁾

CONCLUSIONS

Platelet rich concentrate supplements deficient & faulty wound environment by innately balancing growth factors in wound. PRP helps to restore the natural healing process. If further evidence on its productiveness is gathered & a concrete protocol & policy is established, PRP treatment may become one the most definitive treatments.

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Disclosure forms provided by the authors are available with the full text of this article at jemds.com

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