ISSN: 0975-3583, 0976-2833 VOL15, ISSUE6, 2024

Original Research Article

Final Results of Split Thickness Skin with Platelet-Rich Plasma therapy

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Abstract

Background & Methods: The aim of the study is to assess Final Results of Split Thickness Skin with Platelet-Rich Plasma therapy. Under all aseptic precautions, 12ml of blood was drawn intravenously from the antecubital region into 2 bulbs containing CPDA (0.7ml) each. The bulbs were shaken thoroughly to ensure mixing of anticoagulant with drawn blood. The blood was centrifuged at 3000rpm for 5mins. The supernatant formed are Platelet Poor Plasma (PPP) and buffy coat. PPP and buffy coat were aspirated and collected in another vacutainer and again centrifuged at 1000rpm for 5mins. The upper half is discarded and the lower half yields concentrated platelet rich plasma.

Results: Subjects in both groups were compared with all objective assessment parameters. All PRP patient's grafts adhered well within seconds of application compared to 00% of control subjects. Graft edema with PRP group was present only in 4% of patients whereas in STSG group 22% of patients were observed with graft edema. 22% patients in STSG group showed discharge from STSGs site which was insignificant in PRP group. Only 3% patients from case group showed hematoma whereas in STSG group 23% patients showed hematoma.

Conclusion: PRP added topically to a DE epithelialized wound accelerates the early phase of wound healing, as well as a fibrin-rich base that provides an early revascularization a framework for epithelial migration. Clinically, these biological events gain an earlier epithelialization promoting faster healing and less pain reducing patients agony associated with STSG donor site. The use of PRP is safe and effective in the management of acute wounds. It is a cost-effective procedure, helps in early skin grafting and reduced hospital stay. It is found to be highly beneficial in many aspects both to the patient and surgeon based on our results. We recommend the use of autologous PRP routinely in all age groups and all types of wounds prior to resurfacing to ensure better and faster healing as suggested by our results.

Keywords: Split, Thickness, Skin, PRP & therapy.

Study Design: Observational Study.

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Introduction

The split-thickness skin grafting (STSG) is performed daily in plastic surgery and is an indispensable part of many plastic surgery procedures. It is required for the coverage of secondary defects during flap harvest, posttraumatic, and postburn raw area.

Donor sites are created by these transplants, usually on a smooth skin area like the thigh. In STSG, a paraffin gauze dressing is used to maintain the donor site. According to studies, patients frequently experience pain at the donor site, and up to half of all donor sites exhibit indications of infection.[1] Blood and fluid leakage issues are also commonly experienced at the donor srite. A hypertrophic scar with either hypo- or hyper-pigmentation might arise from infection, discomfort, and leakage, which can both complicate and slow the healing process. Smoking, being underweight or overweight, using steroids, and suffering from autoimmune illnesses are all factors that negatively impact wound healing.[2]

Due to its novelty and recent discovery, relatively little research has been done on the effectiveness of plasma-rich platelets in human subjects. Additionally, PRP was utilized as a control in certain non-control trials, with extremely positive outcomes in the host defense mechanism. Platelets containing PRP are essential for the production of protein at the wound site, which draws macrophages. PRP plays a key role in regeneration and vascularization [3].

The process of transferring cutaneous tissue from one area of the body to another is known as split-thickness skin grafting. A full epidermis and partial dermis are taken from a donor location and allowed to heal naturally in a split-thickness skin graft (STSG). Due to their donor sites' improved ability to mend, STSGs are most frequently employed to cover major deformities. After STSG is harvested, some dermis remains, which aids in the development of new skin at the donor site [4].

Grafts do not have their own blood supply, so the wound bed they are placed on must to be clean, healthy, and well-vascularized in order to maximize graft acceptance. According to a number of studies, the splitthickness graft requires between 70 and 90 percent. Numerous methods have been attempted to enhance the take, including autologous platelet-rich plasma (PRP), antimicrobial dressing in conjunction with negative pressure wound therapy, hypertonic glucose in conjunction with negative pressure wound therapy, and bolstering with the aid of negative pressure wound therapy [5].

Material and Methods

The efficacy of autologous platelet rich plasma in wound beds prior to resurfacing skin grafts instead of conventional methods like sutures, staplers or glue. The study was conducted at LN Medical College, Bhopal on 60 cases for 01 Year. The study was approved by the local ethical committee of our hospital. There are two groups, 30 cases was divided in each group An informed written consent was obtained from all patients. 60 were randomly chosen for study with autologous PRP and thirty cases received conventional methods like sutures, staplers or glue in wound bed for anchorage of skin grafts. Detailed history was taken in all cases regarding the duration, mode of onset, progression and associated symptoms. The etiological factor that might be responsible for chronicity was also elicited. Wound examination was done in all cases. All healing ulcer including traumatic, infective and post burn were included

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in study. Patients with co morbidities like DM, hypertension, and those on aspirin analogue were also included in this study.

Inclusion Criteria:

1. Age 18–50 years.

2. 03 to 20% total body surface area burns at deep second-degree and/ or second-degree thermal burns at 10–14 days post burns.

3. Granulating wound with post-burn raw areas.

4. Suitable for STSG between 2 and 3 weeks from the burn event, as close to day 14 as possible.

Exclusion Criteria: Patients with ulcers with evidence of malignancy, active infection with pus discharge, slough, immuno compromised patients, ulcer has exposed tendons, ligaments or bone, evidence of gangrene in the ulcer or on any other part of limb, patient is currently receiving or has received radiation or chemotherapy within the last 3 months, patient with active cancer, decompensated liver disease, or on renal dialysis and patient on steroids for another illness were excluded from the study.

Result

Table No. 1: Etiology

S. No.	Growth Factor	PRP Level		STSG Level		P Value
		No.	%	No.	%	
1	Abscess	03	03	00	00	
2	Amputation	03	03	00	00	
3	Burn	03	03	05	05	
4	Cellulites	31	31	32	32	.00047
5	Compartment syndrome	04	04	00	00	
6	Diabetic	11	11	26	26	
7	Necrotizing fasciitis	23	23	13	13	
8	Trauma	22	22	24	24	
1	Age	Mean	SD	Mean	SD	-
		48.93	12.57	53.66	9.49	

The chi-square statistic is 17.8594. The *p*-value is .00047. The result is significant at $p < .05$.

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Table No. 2: Co-morbidities

S. No.	Growth Factor	PRP Level		STSG Level		P Value
		No.	%	No.	%	
1	Diabetic	53	53	49	49	.720052
2	Hypertension	33	33	33	33	
3	Aspirin analogue	14	14	18	18	

The chi-square statistic is 0.6569. The *p*-value is .720052. The result is *not* significant at $p < .05$.

Table No. 3: Growth factors: levels of some growth factors PRP

S. No.	Growth Factor	PRP Level	STSG Level	P Value
1	PDGF	17±8ng/ml	5.3±2ng/ml	.049398
2	TGF	119±41ng/ml	37±1ng/ml	
3	VEGF	953±1017ng/ml	169±103ng/ml	
4	EGF	469±316ng/ml	132±52ng/ml	

The chi-square statistic is 5.0105. The *p*-value is .049398. The result is significant at $p < .05$.

Table No. 4: Outcome variables

S. No.	Growth Factor	Instant adhesion	Graft edema	Discharge from graft site	Hematoma
1	PRP Level	100%	08%	04%	03%
2	STSG Level	00%	61%	22%	23%

Subjects in both groups were compared with all objective assessment parameters. All PRP patient's grafts adhered well within seconds of application compared to 00% of control subjects. Graft edema with PRP group was present only in 4% of patients whereas in STSG group 22% of patients were observed with graft edema. 22% patients in STSG group showed discharge from STSGs site which was insignificant in PRP group. Only 3% patients from case group showed hematoma where as in STSG group 23% patients showed hematoma.

Discussion

Platelet-Rich Plasma (PRP) is also known as Platelet-rich Growth Factors (GFs), Platelet-Rich Fibrin (PRF) matrix, PRF, and platelet concentrate. The concept and description of PRP started in the field of hematology. Hematologists created the term PRP in order to describe the plasma with a platelet count above that of peripheral blood, which was initially used as a transfusion product to treat patients with thrombocytopenia[6]. Subsequently, PRP has been used predominantly in the musculoskeletal field for sports injuries.

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Numerous growth factors and cytokines found in platelets are important for inflammation and tissue repair, and they also aid in hemostasis at vascular injury sites.[7] Because of these properties, platelets have been proposed as therapeutic agents to aid in wound healing. The PRP used is autologous, and 3–5 ml of PRP is made by centrifuging 10 ml of blood. Due to the use of autologous blood, there is no chance of cross infection.

Any peripheral venous access is the first step in the PRP extraction process. Through plasmapheresis, platelet concentrate is extracted from patient blood and concentrated to 300% of normal blood levels. PRP's function in acute trauma wound healing has been demonstrated by Kazakos et al. Compared to traditional dressing techniques, PRP-dressed wounds healed noticeably more quickly.[8] Platelet-derived growth factor (PDGF)-AB, transforming growth factor beta-1 (TGF-β), and vascular endothelial growth factor are among the several growth factors found in PRP.[9-11] The observed accelerated rate of epithelialization and decreased pain at wound sites are believed to be caused by these growth factors. Graft donor sites are frequently the main cause of postoperative discomfort, particularly those of the dorsal thigh.

In line with our findings, Kakudo et al. demonstrated that PRP stimulates fibroblast proliferation and induces epithelialization and neovascularization in split-thickness skin graft donor sites [12]. It was proposed that the growth factor generated by the platelets in PRP encouraged cell proliferation and vascular regeneration, which in turn led to wound healing. In contrast to control wounds, donor sites dressed with PRP exhibited faster healing during all dressing changes in this investigation.

According to research by Kakudo et al., frequent PRP treatment is linked to less pain during gauze changes, which is in line with our findings. During a dressing change, patients reported decreased pain both at rest and when the dressing was opened.

According to Danielsen et al., platelet-rich fibrin therapy had no discernible effect on the interstices of autografts or the epithelialization of donor wounds.[13]

PRP may alleviate some of the pain at the STSG donor site, according to Miller et al. PRP may potentially lessen the need for postoperative analgesics and decrease hospital stays by easing donor site pain.[14]

Conclusion

PRP added topically to a DE epithelialized wound accelerates the early phase of wound healing, as well as a fibrin-rich base that provides an early revascularization and a framework for epithelial migration. Clinically, these biologic events gain an earlier epithelialization promoting faster healing and less pain reducing patients agony associated with STSG donor site. The use PRP is safe and effective in the management of acute wounds. It is a cost-effective procedure, helps in early skin grafting and reduced hospital stay. It is found to be highly beneficial in many aspects both to the patient and surgeon based on our results. We recommend the use of autologous PRP routinely in all age groups and all types of wounds prior to resurfacing to ensure better and faster healing as suggested by our results.

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