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Efficacy of Platelet-Rich Plasma (PRP) in wound Healing in Superficial Partial Thickness Burn Wounds

Saqib Shakoor[1], Bushra Akram Mughal[1], Shumaila Yousaf[2], Muhammad Behram Abbas[1], Hadiya Maqsood[1], Zahida Younas[1]

[1]Department of Plastic Surgery, Allied Burn and Reconstructive Surgery Centre, Faisalabad Medical University, Faisalabad, Punjab, Pakistan.
[2]Allied Burn and Reconstructive Surgery Centre, Faisalabad / Faisalabad Medical University, Punjab, Pakistan.

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Correspondence to: Saqib Shakoor
Department of Plastic Surgery, Allied Burn and Reconstructive Surgery Centre, Faisalabad Medical University, Faisalabad, Punjab, Pakistan.
Email: shazzzsaqib@gmail.com

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ABSTRACT

Objectives: To determine the efficacy of Platelet-Rich Plasma (PRP) and conventional dressing among patients with Superficial Partial Thickness Burns. **Study Design:** Randomized controlled trial. **Study Duration:** March 2025 to May 2025. **Place of Study:** Allied Burn and Reconstructive Surgery Centre, Allied Hospital, Faisalabad. **Materials & Methods:** Total 60 patients between the ages of 16 and 65 years with superficial partial thickness burn area of 35% were included. People with full-thickness burns, which damage the entire dermis, chemical, electrical, or friction burns, a history of bleeding disorders, those currently on anticoagulant therapy, or those who are hypersensitive to PRP components, uncontrolled diabetes with a hbA1c level greater than 6, other injuries, or who are already anemic were not allowed to participate. People in group A had PRP done. Thirty patients in Group B were chosen to get treated with standard dressing therapy. We also looked for evidence of epithelialization on the wound surface, such the presence of fresh, pink epithelial tissue, and on the borders of the incision, like the creation of an epithelial "lip. **Results:** Patients in group A were 37.10 ± 7.81 years old on average, while those in the group B were 37.37 ± 7.63 years old. With a male to female ratio of 2.2:1, 41 (68.33%) of the 60 patients were men and 19 (31.67%) were women. At the end of 9 days of treatment, 18 patients (60.0%) in group A (Platelet-Rich Plasma (PRP)) and 01 patients (3.33%) in group B (conventional dressing) showed efficacy. 0.0001 is the statistically significant p-value. **Conclusion:** Our research shows that autologous platelet-rich plasma (PRP) is substantially better at healing wounds than standard dressings.

INTRODUCTION

Burn injuries are a big problem in healthcare, killing an estimated 180,000 people every year around the world. This means that treatment methods need to keep getting better to help patients recover more quickly. Platelet-Rich Plasma (PRP) is one of the new treatments that has shown promise for treating burn wounds.[1] Burn wounds are a complicated medical situation that often needs careful treatment to avoid problems and get the best healing results. Wound debridement, topical therapies, and grafting are some of the traditional ways to care for wounds. But the search for faster and more effective recovery has led to the discovery of new treatments, and PRP is one of the more interesting ones.[2,3]

Several studies have shown that PRP works well, with faster healing times, higher healing rates, and better graft take in different types of wounds. However, the specific use of PRP on burn wounds needs more attention since burn injuries are different from other types of injuries in that they cause a lot of tissue damage, make the blood vessels less effective, and make the person more likely to get infections.

Previous studies have talked about the possible benefits of PRP for healing wounds[4], but a full review of all the information is needed to fully appreciate its effects. A meta-analysis of 13 research from 2009 to 2023 that looked at the effectiveness of Platelet-Rich Plasma (PRP) in treating burn wounds with 808 people showed that PRP worked better than usual therapy. PRP had a much quicker healing time, a higher healing rate, and a bigger healed area %. Also, PRP had a greater percentage of graft take areas.[4]

A close look at the current research shows that there is an increasing interest in using PRP to repair wounds, especially burns.[5] Researchers have looked into its biological basis in the past, focusing on the high levels of growth factors and cytokines in platelets that help repair and regrow tissue. These things are very important for controlling inflammation, encouraging angiogenesis, and

getting cells to divide, all of which are important steps in healing a wound.[6,7]

A study looked at how well Platelet Rich Plasma worked compared to regular dressing therapy for partial thickness burn wounds. We randomly split the patients into two groups. Platelet Rich Plasma (PRP) was applied to group "A" with a three-day break between applications until the wound was completely healed. In group "B," however, they used regular dressing therapy until the wound healed completely. The results showed that 16 out of 30 (53.4%) had epithelization after three administrations, each with a three-day break in between, for a total of nine days of therapy. No patient in group B demonstrated epithelization after three applications.[8]

There are still important gaps in the existing research, such as differences in study designs, patient demographics, and outcome measures among previous studies. This shows why this observational study is needed. This work is new because it brings together facts in a systematic way, which helps us better understand how PRP affects the healing of burn wounds. We want to find out what the effects of PRP therapy are on healing rate, early epithelialization, and length of hospital stay by doing this study.

MATERIALS AND METHODS

The Allied Burn and Reconstructive Surgery Centre, Allied Hospital, Faisalabad, conducted this randomized controlled study from March 2025 to May 2025. Following ethics review board permission, patients aged 16–65 who demonstrated a 35% Superficial Partial Thickness Burn area and were verified by clinical evaluation (TBSA score). The surface area of the body is divided into percentages using this procedure. For instance, 9% of the body's surface area is made up of the front and back of each arm and hand. About 9% of the body's surface is made up of the stomach and chest. Nine percent of the body's surface area is made up of the upper and lower backs.. The front and rear of each leg and foot make up 18% of the body's surface area. This grading system was used to figure out the total burn %, which includes all burns that happened in the last 72 hours. We used the WHO sample size calculator for two proportions to figure out the sample size. The confidence interval was 95%, the power of the test was 80%, the expected proportion in Group A was 53.3%, the expected proportion in Group B was 0%, and the sample size was 60 (30 in each group). People with full-thickness burns, which damage the entire dermis, chemical, electrical, or friction burns, a history of bleeding disorders, those currently on anticoagulant therapy, or those who are hypersensitive to PRP components, uncontrolled diabetes with a hbA1c level greater than 6, other injuries, or who are already anemic were not allowed to participate.

The patient or guardian gave their written consent after being fully informed. For follow-ups, we wrote down demographic information including name, age, weight (and BMI), gender, and address. All patient information was kept private. For the study, subjects had to have had Superficial Partial Thickness Burns within the last 72 hours and had to have a history of medical, surgical, and drug use. There were two groups of patients. People in group A had PRP done. We got platelet concentration by taking platelets out of one pint of whole blood. The donor was healthy, didn't have any blood-borne diseases that may be passed on, and was ABO compatible. Their entire blood picture test results should have been normal. The CRYOFUGE (centrifuge machine) produced by JOVAN (France) took out the platelets. The platelets that were taken out were put into a transfusion bag with 50–100 ml of plasma. The concentration of this plasma was three to five times that of whole blood. The patient in Group A was transferred to the operating room before to each PRP application. After closely examining the wound, any dead or sloughed tissue was removed using debridement or desloughing techniques. Every process was carried out in a very hygienic setting. If there was no slough or dead tissue, the incision was cleaned with NaCl. Before use, the blood bank gives you a transfusion bag with platelet extract and a separate syringe with CaCl2 in it. You mix the two together before using them. This mixing causes the platelets to break down and start releasing growth factors. Then, the activated PRP is put over the wound, and within 10 minutes, a sterile dressing is put over it. It stays for three days because that's when the platelet-borne factors are intended to be most active. We prepared the following application for three days later. Thirty patients in Group B were chosen to get treated with standard dressing therapy. Dressing is done in the operating room, where everything is clean. They looked at the wound and cleansed it with regular saline. The dead and damaged tissues are taken out, and then a non-adhesive dressing is put on with 1% silver sulphadiazine. At first, the dressing change depends on how much the wound has soaked, how bad it is, and how long the topical antibacterial cream lasts. These steps were followed until the wound was completely healed. We also looked for evidence of epithelialization on the wound surface, such the presence of fresh, pink epithelial tissue, and on the borders of the incision, like the creation of an epithelial "lip."

We put the data we collected into SPSS 25.0 and looked at it. Mean ± S.D. showed the quantitative data, such as age, weight, height, BMI, wound size (cm), volume of PRP applied (ml), and TBSA score. We showed the qualitative characteristics, such as gender, education level, comorbidities, and efficacy, as frequencies and percentages. We used the chi-square test to see how effective both groups were. Stratification adjusted for effect modifiers as age, gender, BMI, TBSA score, and co-morbidities. We used a post-stratification chi-square test, and a p-value of 0.05 or less was considered significant.

RESULTS

The study's age range was 16 to 60 years old, with a mean age of 37.18 ± 7.68 years. Patients in group A were 37.10 ± 7.81 years old on average, while those in the group B were 37.37 ± 7.63 years old. With a male to female ratio of 2.2:1, 41 (68.33%) of the 60 patients were men and 19 (31.67%) were women. Mean TBSA was 30.19 ± 4.82%. Mean BMI was 28.75 ± 3.59 kg/m2. Distribution of patients according to different variables is shown in Table I.

At the end of 9 days of treatment, 18 patients (60.0%) in group A (Platelet-Rich Plasma (PRP)) and 01 patients (3.33%) in group B (conventional dressing) showed efficacy. 0.0001 is the statistically significant p-value. (Table II).

Stratification of efficacy with respect to age, gender, BMI, TBSA score and co-morbidities is shown in Table III.

Table I

Distribution of different variables (n=60).

		Group A (n=30)	Group B (n=30)
		Number (%)	Number (%)
Age (years)	16-35	11 (36.67%)	12 (40.0%)
	36-60	19 (63.33%)	18 (60.0%)
Gender	Male	21 (70.0%)	20 (66.67%)
	Female	09 (30.0%)	10 (33.33%)
BMI (kg/m²)	≤27	11 (36.67%)	12 (40.0%)
	>27	19 (63.33%)	18 (60.0%)
TBSA	≤30	13 (43.33%)	10 (33.33%)
	>30	17 (56.67%)	20 (66.67%)
HTN	Yes	08 (26.67%)	10 (33.33%)
	No	22 (73.33%)	20 (66.67%)
DM	Yes	13 (43.33%)	14 (46.67%)
	No	17 (56.67%)	16 (53.33%)
Education status	Uneducated	12 (40.0%)	10 (33.33%)
	Educated	18 (60.0%)	20 (66.67%)

Table II

Comparison of efficacy (n=60).

	Group A (n=30)		Group B (n=30)		P-value
	Yes	No	Yes	No	
EFFICACY	18 (60.0%)	12 (40.0%)	1 (3.33%)	29 (97.67%)	0.0001

Table III

Stratification of efficacy with respect to age, gender, BMI, TBSA score and co-morbidities.

		Group A (n=30) Efficacy		Group B (n=30) Efficacy		P-value
		Yes	No	Yes	No	
Age (years)	16-35	07 (63.64%)	04 (36.36%)	00 (0.0%)	12 (100.0%)	0.0009
	36-60	11 (57.89%)	08 (42.11%)	01 (5.56%)	17 (94.44%)	0.0007
Gender	Male	14 (66.67%)	07 (33.33%)	00 (0.0%)	20 (100.0%)	0.0001
	Female	04 (44.44%)	05 (55.56%)	01 (10.0%)	09 (90.0%)	0.0887
BMI (kg/m²)	≤27	08 (72.73%)	03 (27.27%)	01 (8.33%)	11 (91.67%)	0.0016
	>27	10 (52.63%)	09 (47.37%)	00 (0.0%)	18 (100.0%)	0.0003
TBSA	≤30	03 (23.08%)	10 (76.92%)	01 (10.0%)	09 (90.0%)	0.412
	>30	15 (88.24%)	02 (11.76%)	00 (0.0%)	20 (100.0%)	0.0001
HTN	Yes	04 (50.0%)	04 (50.0%)	00 (0.0%)	10 (100.0%)	0.0112
	No	14 (63.64%)	08 (36.36%)	01 (5.0%)	19 (95.0%)	0.0001
DM	Yes	09 (69.23%)	04 (30.77%)	00 (0.0%)	14 (100.0%)	0.0001
	No	09 (52.94%)	08 (47.06%)	01 (6.25%)	15 (93.75%)	0.0035

Figure 1 to 6

DISCUSSION

We found that wounds treated with autologous PRP healed far faster, made better granulation tissue, and made the patient more comfortable than wounds treated with paraffin gauze dressing. Numerous growth factors, including platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), and transforming growth factor-beta (TGF-β), are present in PRP. These support angiogenesis, chemotaxis, matrix formation, and other phases of wound healing. These bioactive proteins may be to blame for the PRP group's faster recovery since they lower inflammation and speed up the growth of new tissue.[9,10] The paraffin gauze dressing, on the other hand, keeps things from drying out and protects them, but it doesn't have the natural bioactive components that PRP has. The paraffin gauze group's healing process, which probably only relied on the body's natural healing processes[11], may have caused the slower healing rates.

Carter MJ et al. and Yammine K. did a systematic review and meta-analysis that showed that platelet-rich plasma treatment is highly recommended for full recovery from chronic wounds. According to a meta-analysis of research on acute wounds with primary closure, wounds treated with platelet-rich plasma were less likely to get infected. This is in line with what we found in our study.[12,13]

Suthar M et al. did a similar study and found that the patients who got treatment were an average of 62.5±13.53 years old, were watched for 24 weeks, and all of them showed signs of healing, such as a smaller wound size. The average time it took for an ulcer to heal was 8.2 weeks. In our study, the average age was 48±18 years, and by day 14, 72.2% of the patients with PRP had healed. When we compared this to the patients in the Non-PRP group, we found a significant difference (0.043).[14]

Another study by Rajendran S et al. reported that 66.7% of the patients in the PRP Group had their ulcers heal, which is close to the 72.25% we found in our study. The ulcer in the PRP group was substantially less than in the group that got routine dressings.[15] This was true in both the prior trial and our study.

Another study by Elsaid A et al. found that the patients in the PRP group had a much larger percentage of reduction in the length and width of the diabetic foot ulcer than the patients in the traditional dressing group. The time it took to get the best recovery was much shorter than with regular dressing.[16] Xu P et al and Lacci KM et al said that PRP's capacity to speed up wound healing could lead to fewer sick days for patients, shorter hospital stays, and an earlier return to normal activities. This is in line with our findings.[17,18]

When 20 consecutive leg ulcer patients got topical platelet-rich fibrin treatment once, there were no statistically significant changes in macroscopic epithelialization between treated and control wounds in a randomized clinical trial (RCT).[19] This was the case for both donor sites and autografts. In another case study, it was shown that giving the split-thickness skin transplant donor location PRP treatments over and over again helped dermal angiogenesis and epithelialization. Changing the gauze less often was connected to less pain in each of these cases.[20] The differences identified in the earlier cases are likely due to many sessions of PRP therapy, since the current study only looked at PRP therapy once. Our research shows that PRP therapy improved the quality of scars. Also, in a study of 38 people with mature scars who had been burned, PRP worked better than silicone-based therapies for pigmentation, pliability, and itching. Silicone-based management, on the other hand, did a better job of making scars thinner than PRP.[21] For six months, a patient with a scar from BWs received monthly injections of autologous PRP, according to Ruiz et al. Particularly after 180 days of treatment, they noticed significant changes in pliability, vascularity, discomfort, irregularity, and color. In vitro research indicates that 7 PRP exhibits antibacterial activity against certain bacterial strains, but not all of them.[22-26] PRP and control wounds did not vary in terms of bacterial infection or discomfort in a randomized controlled trial including 20 patients with leg ulcers who received a single topical platelet-rich fibrin therapy.[19]

This study had a lot of problems, but it did show that PRP could be a safe way to treat burns and keep cosmetics and get their texture back rather rapidly. This also means that there are fewer side effects, including infections or allergic responses, which is in line with the results of many trials and experiments.[27-29] A small sample size, lack of multicenter regional support, and sometimes patients refusing to take part in the new study are some of the problems that can be found. In the future, these problems

can be fixed by using careful design, a big sample size, histological investigation, and a long follow-up period.

CONCLUSION

Our research shows that autologous platelet-rich plasma (PRP) is substantially better at healing wounds than standard dressings. PRP-treated wounds had better granulation tissue growth, faster epithelialization, and made the patients feel better. Because its physiologically active components help tissue regenerate, PRP is a helpful addition to wound treatment. More study should be done to standardize the usage of PRP and see how helpful and cost-effective it is over the long run in different groups of patients.

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