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Role of Autologous Platelet Rich Plasma in Management of Chronic Wounds

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ABSTRACT

Background and Aim: Globally, the incidence of chronic wounds rose (1.9% to 13.1%) with age, with an estimated 10% of the population developing chronic wounds, resulting in a 2.5% mortality rate. The purpose of the present study was to assess the role of autologous platelet rich plasma (PRP) in management of chronic wounds.

Materials and Methods: A randomized control trial was conducted on 46 chronic wounds patients in General Surgery Unit of Mardan Medical Complex, Mardan Pakistan from 6th August 2022 to 5th February 2023. All the chronic wounds patients with traumatic wounds and diabetes were enrolled. PRP was used as a saturated dressing "non-absorbable dressing with paraffin gauze" or as a local injection in the wound margins. Reduction in the size of ulcers in terms of volume and area was assessed after first, second, third, and fourth week.

Results: The overall mean age was 42.8 ± 4.6 years. There were 32 (69.6%) male and 12 (30.4%) females. The incidence of diabetes wounds, venous ulcers wounds, and traumatic wound was 82.6% (n=38), 13% (n=6), and 4.4% (n=2) respectively. The pre-treatment and after 6th injection session area of wound was 4.4±5.7 and 1±2.2 respectively revealing the 77.8% reduction in wound area that is considered as statistically significant (P-value <0.001).

Conclusion: The different etiologies of chronic wounds can be effectively managed by PRP. Additionally, PRP is a safe, economical, biocompatible, and straightforward treatment for chronic or non-healing wounds.

Keywords: *Chronic wounds, Plasma rich platelet, Non-healing wounds*

INTRODUCTION

Chronic wounds are a frequent disorder significantly influencing the individual quality of life [1]. A huge burden on health care system is mainly due to dressing materials higher cost, protracted and amputation-related expenditures [2]. Microangiopathy, venous insufficiency and neuropathy are various causes for ulceration [3]. Platelet-rich plasma (PRP) is consist of tissue re-modelling, growth factors, stem cell regeneration, cytokines, and platelet of higher concentration centrifuged serum [4-6]. PRP, as an alternative therapy option, might reduce the healthcare burden of wound maintenance by potentially decreasing the healing period of ulcers and improve patients' quality of life. The chemical signals interaction mediating the cellular activities and mediator leads to wound healing. The scar formation occurs due to extracellular matrix creation, recruitment of mesenchymal cell, and proliferation [7, 8]. Several investigations have shown that chronic wounds may lack GFs in some circumstances due to diminished synthesis, limited release, entrapment, excess degeneration, or a combination of these processes [9, 10].

Platelet rich plasma (PRP) is a new therapy technique that has gained widespread acceptance. Platelets perform two critical functions in wound healing: hemostasis and wound initiation. GFs are released from granules in the thrombocyte cell membrane upon platelet activation and clot formation. By interacting to certain cell surface receptors, GFs operate as physiologic mediators to enhance cellular activity [11]. The whole blood centrifuge separating the PRP based on their density. It may utilized the chronic wound treatment variety and difficult healing of cutaneous lesions, specifically in cases where conventional treatment is inefficient and ineffective. PRP might reduce the hospital stay duration and cost. The purpose of the present study was to assess the role of autologous platelet rich plasma (PRP) in management of chronic wounds.

METHODOLOGY

A randomized control trial was conducted on 46 chronic wounds patients in General Surgery Unit of Mardan Medical Complex, Mardan Pakistan from 6th August 2022 to 5th February 2023. All the chronic wounds patients with traumatic wounds and diabetes were enrolled. PRP was used as a saturated dressing "non-absorbable dressing with paraffin gauze" or as a local injection in the wound margins. Reduction in the size of ulcers in terms of volume and area was assessed after first, second, third, and fourth week. A proven malignancy caused by chronic wounds, acute or chronic ischemia patients, positive AIDS serologically, and osteomyelitis were excluded. PRP was used as a saturated dressing "non-absorbable dressing with paraffin gauze" or as a local injection in the wound margins. Acid citrate dextrose was used to anticoagulated 10-60 ml of venous blood. PRP was created using the twofold centrifugation technique. The first spin was a strong spin (3000 rpm for 15 minutes) that separated the plasma, buffy coat, and red blood cells into three layers. A sterile test tube was used for aspiration of buffy coat and plasma without an anticoagulant and centrifuged for 5 minutes at 2000 rpm to separate platelet poor plasma (PPP) in the top portion and platelet rich plasma (PRP) in the lower half. Gel dressing and PRP injection were repeated until complete healing and all the individual was follow-up for 24 weeks after therapy. Data analysis was done using SPSS version 27.

RESULTS

The overall mean age was 42.8 ± 4.6 years. There were 32 (69.6%) male and 12 (30.4%) females. The incidence of diabetes wounds, venous ulcers wounds, and traumatic wound was 82.6% (n=38), 13% (n=6), and 4.4% (n=2) respectively. The pre-treatment and after 6th injection session, area of wound was 4.4±5.7 and 1±2.2 respectively revealing the 77.8% reduction in wound area that is statistically significant (P-value <0.001). The duration of the ulcers varied from 1 month to 12 months, with a mean ± SD of 3.12 ± 2.64 months. The healing duration was 48.76 ± 8.24 days. The demographic details and baseline characteristics are shown in Table-I. The chronic wound caused by various causes such as diabetic foot, traumatic, pressure ulcer, and venous ulcer was found in 17.4%, 43.5%, 26.1%, and 13% respectively as shown in Table-II.

TABLE 1: Baseline characteristics

Parameters	Value (Mean ± SD)	P-value
Age (years)	42.8 ± 4.6	<0.001
Gender N (%) Male Female	 32 (69.6) 12 (30.4)	0.546
Duration of ulcers (months)	3.12 ± 2.64	<0.001
Healing duration (days)	48.76 ± 8.24	<0.001
Change in area Pre-treatment After 6th session of injection	 4.4±5.7 1±2.2	<0.001

TABLE 2: various causes of ulcers

Parameters	Percentage (%)
Diabetic foot	17.4%
Traumatic	43.5%
Pressure ulcer	26.1%
Venous ulcer	13%

DISCUSSION

The present study mainly investigated the role of autologous platelet rich plasma in management of chronic wounds and found that Plasma rich platelets appear to be effective in the treatment of several chronic wound etiologies. PRP is a simple, safe, and cost-effective therapy for chronic or non-healing wounds. Chronic wounds/ulcers have a significant expense and morbidity for patients as well as society as a whole. The primary objective of any treatment approach is to achieve wound closure as soon as possible. The standard therapy comprises proper debridement, infection management, excess pressure avoidance on the lesion, and ischemic tissue revascularization [13]. In terms of ulcer etiology, whereas PRP was superior to conventional treatment in terms of full closure and wound area reduction in both venous ulcers and diabetic, the venous ulcer group had better outcomes. This phenomena might be explained by the healing difficulty in diabetic ulcers; yet, superior outcomes have been reported in cases where PRP was frequently used for venous ulcers. PRP was beneficial in terms of full closure after follow-up durations.

The growth factor (GFs) higher variation, tissue healing at vascular injury sites, and the important role of cytokines in inflammation are involved in platelets. Due to the platelet features, researchers have proposed employing PRP as an alternate treatment option for enhancing the wound healing [14]. Because of the abundance of leukocytes, which are abundant in PRP, the anti-inflammatory substances in PRP also play a role in wound healing. In addition to GFs, platelets produce a variety of additional chemicals that aid in wound healing (for example, fibronectin, vitronectin, and sphingosine 1phosphate). The release of several GFs and differentiation of factors upon platelet activation is an advantage of PRP over single recombinant human GF administration [15].

Patients who received topical autologous PRP showed significant reductions in pain, hypertrophic scar formation, and keloids as well as improved wound healing. None of the patients experienced any adverse effects. Other research, similar to ours, has indicated that PRP enhances wound healing [16, 17]. In contrast, few studies reported PRP ineffectiveness in wound healing [18, 19].

The number of clinical investigations on the function of PRP in chronic wound healing is growing. Cardenosa et al, [20] investigated the 32 patients for PRP gel effectiveness and found that the healing rate was significantly higher 96.2% as compared to control group patients 59.4%.

Chandanwale et al. [21] investigated chronic wound healing based on autologous PRP. The average duration of therapy was 12 weeks. Autologous PRP may improve the healing of diabetic foot ulcers compared to normal treatment. Fewer trials found that wound infections or dermatitis has insignificant association of adverse outcome between PRP treatment and patients underwent normal care.

Another study investigated diabetic foot ulcers among 35 patients who underwent PRP or saline gel and found that wounds healing in PRP gel was significantly higher than control gel treated patients [22].

Goda et al, [23] conducted their study on diabetes mellitus patients effectively treated with vacuum assisted closure VACPRP and found that on the fifteenth day after primary VAC dressing, all were identified as non-healing wounds due to the absence of visible granulation tissue. Gude et al [24] studied 40 patients who underwent platelet leukocyte gel and found that pain measured using VAS was significantly reduced. The analgesic usage and recovery time significantly reduced after 6-weeks follow-up. These findings were comparable to a previous study [25].

CONCLUSION

The different etiologies of chronic wounds can be effectively managed by PRP. Additionally, PRP is a safe, economical, biocompatible, and straightforward treatment for chronic or non-healing wounds.

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