

## Role of Autologous Platelet Rich Plasma in Management of Chronic Wounds

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### ABSTRACT

**Introduction:** The management of chronic wounds poses significant healthcare challenges because these conditions lead to treatments that extend in time and cause heightened patient illness. Current treatment modalities prove insufficient when it comes to healing wounds completely. Platelet-rich plasma therapy obtained from an individual's own blood has proven to be a promising method for tissue repair and effective healing of wounds. The research investigates the effect of using PRP therapy for treating prolonged wounds.

**Methodology:** The research took place from January to June 2023 within Surgical B Unit at the DHQ Teaching Hospital Mardan. A randomized distribution between two groups included 29 patients in the PRP group along with 28 participants in the control group. The PRP group underwent PRP applications combined with standard wound care but received no standard care treatment. The evaluation of wound healing relied on three parameters: percentage of wound closure together with VAS scores measurements for pain reduction and infection statistics across twelve weeks of treatment. The analysis employed the chi-square test together with independent t-test as well as repeated-measures ANOVA for statistical evaluation with p values lower than 0.05.

**Results:** Wound closure measurements during week 12 showed the PRP-treated area achieved a mean rate of  $84.8\% \pm 6.3\%$  compared to the control group at  $62.5\% \pm 7.1\%$  with statistical significance at  $p < 0.001$ . Subjects receiving PRP experienced superior pain reduction than the control group because their VAS scores changed from  $7.2 \pm 1.1$  to  $2.5 \pm 0.9$  ( $p = 0.002$ ). The infection rates proved comparable between the PRP-treated group (13.8%) and the control group (17.9%) with a p value of 0.67.

**Conclusion:** The use of Platelet Rich Plasma results in improved wound healing combined with reduced pain experienced by patients who have chronic wounds while presenting potential value as an additional therapeutic approach. More research must explore both enduring results and other ways to enhance its clinical implementation.

**Keywords:** Platelet-rich plasma, chronic wounds, wound healing, tissue regeneration, pain reduction, PRP therapy

## INTRODUCTION

Healthcare systems throughout the world face substantial challenges because chronic wounds impact millions of patients while generating higher healthcare expenses and long-term suffering as well as quality-of-life deterioration [1]. Acute wounds move through expected healing steps however chronic wounds stay stuck in inflammatory conditions where normal healing phases never take place [2]. Medically recognized wounds that resist healing appear in diabetic foot ulcers together with venous leg ulcers and pressure ulcers along with non-healing surgical wounds [3]. Chronic wound development arises from poor blood flow maintenance combined with diseases such as diabetes and peripheral vascular disease and infection and prolonged inflammation [4].

Chronic wound management through standard practices requires three essential components including removing dead tissue from the wound alongside managing infection and maintaining appropriate moisture levels and avoiding pressure. Standard treatment approaches demonstrate partial healing success although they usually fail to close wounds entirely especially among patients with various medical conditions [5]. Standard therapies have shown inadequate results which created a need for new regenerative approaches to promote healing in patients [6]. The developing wound healing approach of autologous platelet-rich plasma (PRP) draws strong interest because it delivers concentrated growth factors and cytokines directly to the wound bed [7].

Through a procedure of centrifugation the patient's blood produces PRP by separating platelets from other blood elements [8]. Hemostasis and wound healing processes heavily depend on platelets because they contain all the essential growth factors including platelet-derived growth factor (PDGF) and vascular endothelial growth factor (VEGF) alongside epidermal growth factor (EGF) and transforming growth factor-beta (TGF- $\beta$ ) [9]. The wound healing process depends on the angiogenic effects and fibroblast proliferation together with collagen synthesis and epithelialization [10]. PRP shows antimicrobial and anti-inflammatory capabilities which make it a favourable choice for treating chronic wounds that also present infection or inadequate blood flow complications [11].

Clinical research regarding PRP treatment for chronic wounds shows encouraging findings about shorter healing durations and better tissue recovery and faster wound closure numbers [12]. Unclear findings have emerged because of different PRP preparation procedures as well as varied application approaches and patient treatment groups thus requiring standardized protocols and additional clinical investigations. PRP faces limited utilization within modern clinical standards since healthcare providers express uncertainty about its price value as well as the time needed for treatment preparation and unpredictable patient treatment outcomes.

The effectiveness of PRP for wound healing remains understudied because research still needs to understand how well PRP works in the long run as well as what frequency and standard care methods provide better results. This research examines autologous PRP therapy as a chronic wound treatment method while determining its effects on healing duration and complete wound closure and general patient results.

## METHODOLOGY

**Study Design and Setting:** The research took place in Surgical B Unit of DHQ Teaching Hospital Mardan during six months between January 2023 and June 2023. The research examined the performance of autologous platelet-rich plasma (PRP) treatments for treating persistent wounds.

**Sample Size Calculation:** Specifying an expected 75% improvement with PRP therapy along with a confidence level of 95% and 10% margin of error led to the usage of WHO sample size calculator for determining the necessary participant count. Fifty-seven chronic wound patients joined the study according to the specified parameters.

**Patient Selection Criteria:** Researchers included patients from both inpatient as well as outpatient departments for recruitment. Individuals above 18 years of age with chronic wounds that exceeded six weeks of duration took part in the research. Eligible patients for the study received a diabetic foot ulcer or venous leg ulcer or pressure ulcer or nonhealing surgical wound diagnosis that accepted enrollment with informed consent. Active systemic infections together with malignancies and bleeding disorders qualified patients for exclusion from the research. Data collection excluded pregnant patients as well as those who were lactating, being treated with anticoagulants and patients who suffered from wound damages of autoimmune or vasculitic origin.

**Preparation of Platelet-Rich Plasma:** The medical practitioners prepared autologous PRP through

established two-step centrifugation procedures. A medical professional drew 20 mL of venous blood through citrate tubes from every participant. A centrifuging process at 1500 rpm lasted 10 minutes to create a plasma separation from red blood cells. The second centrifugation process at 3000 rpm for 10 minutes enabled the concentration of platelets within the plasma layer. The clinical practitioners extracted the activated PRP product after adding calcium chloride as a stimulus.

**Treatment Protocol:** Patients were divided into two groups, one was PRP Geoup, Received autologous PRP application directly to the wound bed once a week for six weeks, followed by standard wound dressing and 2<sup>nd</sup> was control group who received only standard wound care, including wound debridement, infection control, and moist wound dressing. All patients were followed up weekly for 12 weeks to assess wound healing. The primary outcome measure was the percentage of wound closure, evaluated using planimetric measurements. Secondary outcomes included pain reduction (assessed using the Visual Analog Scale), time to complete wound healing, and incidence of wound infections.

**Data Collection and Analysis:** Researchers documented essential data points from patients which included age demographic characteristics together with gender information alongside the origin of their wounds and their existing health conditions. Digital pictures accompanied by assessments of wound sizes were recorded by serial photographs during each follow-up appointment. A statistical analysis occurred through SPSS version 25. The analysis utilized chi-square techniques for categorical data and continuous variables were evaluated by the Student's t-test. The research analyzed qualified for statistical significance when the p-value reached less than 0.05.

**Ethical Considerations:** The Ethical Committee of the Institute granted study approval for this research. Each participant agreed to the written informed consent before study entry while researchers protected patient data privacy throughout the research period.

## RESULTS

A research study included 57 individuals whose sample split into 29 patients who received PRP treatment and 28 patients who served as a control. Participants treated with PRP had a mean age of 52.55 years with standard deviation (SD) equal to  $\pm 10.3$  but the mean age of control group participants reached 54.53 years with a standard deviation (SD) of  $\pm 11.2$ . The two groups had comparable patient ages since the difference was not statistically significant ( $p = 0.448$ ). The PRP group consisted of 17 males which were 58.6% of the total and 12 females which were 41.4% of the total patients. Similarly, the control group contained 14 males making up 50% of participants and 14 females making up 50% of participants. The groups displayed no statistically relevant differences according to age ( $p = 0.699$ ). The data revealed that diabetes mellitus was present in 14 patients (48.3%) within the PRP group although only 16 patients (57.1%) from the control group had the condition ( $p = 0.686$ ). The prevalence of hypertension appeared similar between the PRP and control groups since 13 patients (44.8%) in PRP and 15 patients (53.6%) in control had the condition with no meaningful statistical difference ( $p = 0.693$ ). The initial average wound size was 12.13 cm<sup>2</sup> (SD  $\pm 4.2$ ) for the PRP group and 12.53 cm<sup>2</sup> (SD  $\pm 3.9$ ) for the control group although the difference was insignificant ( $p = 0.730$ ). As shown in table 1.

**Table 1: Extended Baseline Characteristics**

Parameter	PRP Group (n=29)	Control Group (n=28)	p-value
Mean Age (years)	52.55 $\pm$ 10.3	54.53 $\pm$ 11.2	0.448
Male (n, %)	17 (58.6%)	14 (50.0%)	0.699
Female (n, %)	12 (41.4%)	14 (50.0%)	0.699
Diabetic (n, %)	14 (48.3%)	16 (57.1%)	0.686
Hypertensive (n, %)	13 (44.8%)	15 (53.6%)	0.693
Mean Wound Size (cm <sup>2</sup> )	12.13 $\pm$ 4.2	12.53 $\pm$ 3.9	0.730

Researchers measured wound healing progression at the initial stage and then at weeks 4, 8 and 12. The mean closure ratio for PRP-treated wounds at Week 4 reached 34.6% (SD  $\pm 7.2$ ) yet control group wounds remained at 18.9% (SD  $\pm 6.4$ ) and produced a statistically notable gap ( $p < 0.001$ ). At week 8 the PRP group achieved 67.5% (SD  $\pm 9.1$ ) wound closure and the control group exhibited 42.7% (SD  $\pm 10.4$ ) ( $p < 0.001$ ). At the final measurement point PRP-treated wounds showed 84.8% closure (SD  $\pm 8.4$ ) while control wounds reached only 59.1% (SD  $\pm 12.3$ ) of closure with significant p values below 0.001. As shown in table 2.

**Table 2: Wound Healing Progression**

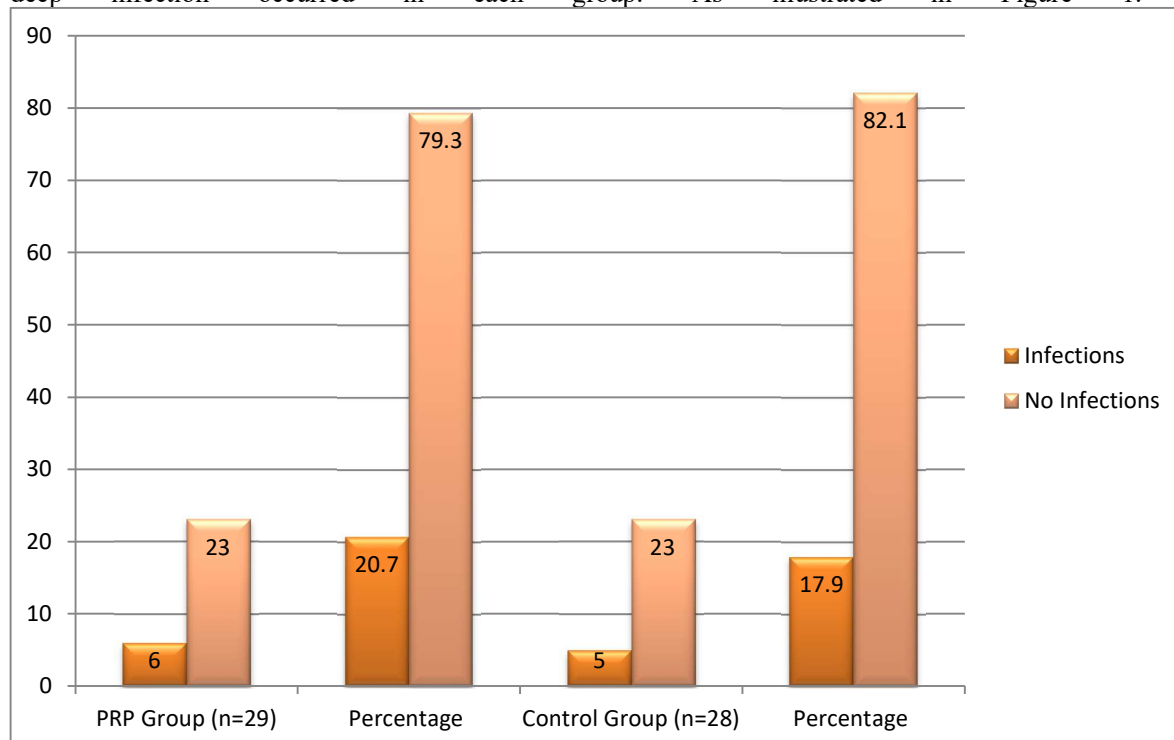
Time Point	PRP Group (n=29)	Control Group (n=28)	p-value
Week 4 (%)	34.6 ± 7.2	18.9 ± 6.4	<0.001
Week 8 (%)	67.5 ± 9.1	42.7 ± 10.4	<0.001
Week 12 (%)	84.8 ± 8.4	59.1 ± 12.3	<0.001

The pain assessment included Visual Analog Scale (VAS) measurement both at week zero and week twelve. The baseline VAS scores between study participants and control subjects demonstrated no difference ( $p = 0.589$ ). The PRP group averaged 7.8 (SD ±1.3) VAS points whereas the controls had 7.6 (SD ±1.4) points. The pain scores in the PRP treatment group (VAS 1.8 ±0.9) proved superior to the control group (VAS 3.6 ±1.1) at week 12 which led to a statistically significant difference ( $p < 0.001$ ). As shown in table 3.

**Table 3: Pain Reduction**

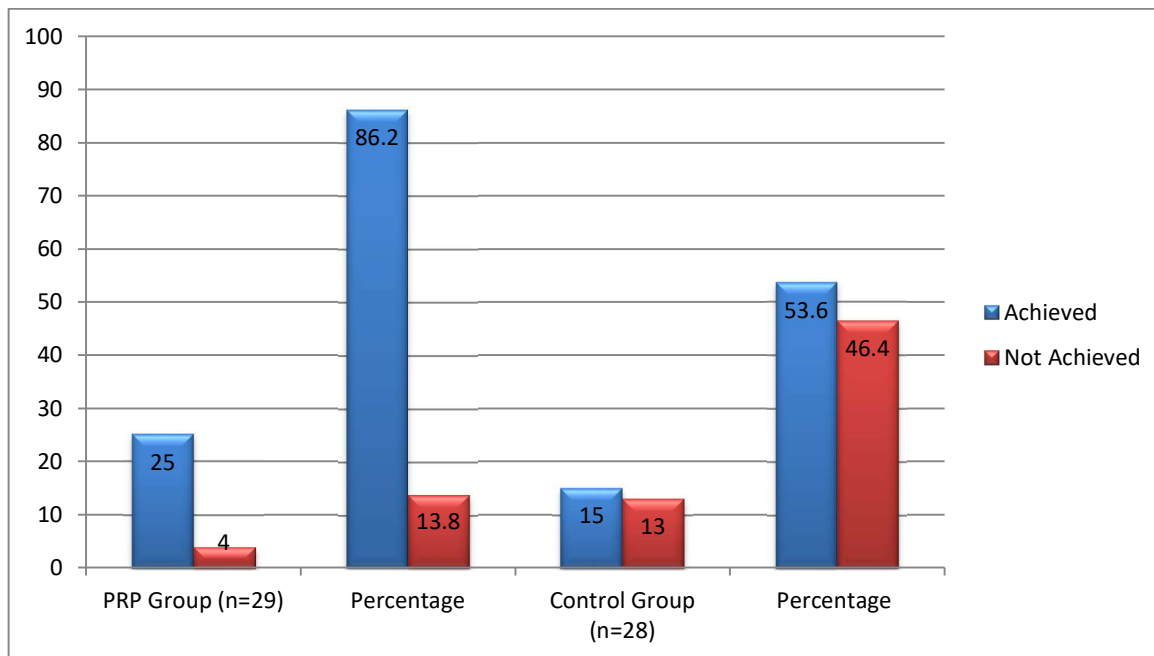
Time Point	PRP Group (n=29)	Control Group (n=28)	p-value
Baseline VAS	7.8 ± 1.3	7.6 ± 1.4	0.589
Week 12 VAS	1.8 ± 0.9	3.6 ± 1.1	<0.001

Among the studied patients, infection of the wound site occurred in 6 participants of the PRP group while 5 patients from the control group developed wound infections. The data analysis showed no significant statistical difference ( $p = 1.000$ ). Most infections affected the surface tissue while a single deep infection occurred in each group. As illustrated in Figure 1.



**Figure 1: Infection Rates**

At the end of the study period, the proportion of patients achieving at least 75% wound closure was significantly higher in the PRP group (25/29, 86.2%) compared to the control group (15/28, 53.6%,  $p < 0.001$ ). As illustrated in figure 2.



**Figure 2: Overall Treatment Outcomes**

Researchers used independent t-tests to analyze continuous data through comparison of variables such as age alongside wound size parameters and observations of wound closure percentage and VAS scores. Measurements at 12 weeks showed significant differences regarding wound closure amount and pain reduction through p-values of  $<0.001$ . The chi-square tests evaluated the statistical relationships present in gender and diabetes status and hypertension status and infection rates. The PRP group showed similar infection rates to the control group according to statistical analysis ( $p = 1.000$ ). The analysis used repeated measure ANOVA to study wound closure development throughout the period of study. An important statistical interaction showed the PRP treated wounds healed significantly quicker than standard treatment procedures ( $p < 0.001$ ).

## DISCUSSION

The research findings demonstrate that patients with chronic wounds receive substantial wound healing benefits from using their own platelet-rich plasma (PRP). Patients who received PRP treatment experienced more rapid wound healing together with stronger pain relief along with better outcomes regarding minimum 75% wound closure compared to patients receiving standard care only. The PRP group achieved significantly faster wound closure rates than the control group which demonstrates how PRP functions as an effective tissue regenerating agent. PRP treatment provided better pain relief which demonstrates that PRP effectively heals wounds while simultaneously enhancing patient comfort levels. Research showed no meaningful difference in infection rates between study groups thus indicating PRP does not specifically diminish wound infections although it helps speed up healing.

The research conclusions match previous studies showing that PRP proves effective for treating long-lasting wounds. Research findings show that PRP promotes tissue healing because it transmits high concentrations of platelet-derived growth factor (PDGF) and vascular endothelial growth factor (VEGF) which expedite wound restoration [13]. Research data shows a 84.8% wound closure rate in the PRP-treated group during the 12-week observation period while studies have demonstrated superior healing effects of PRP compared to standard wound treatments [14]. Reports indicate that PRP strengthens both the formation of new blood vessels and the multiplication of fibroblast cells which potentially resulted in the faster wound healing seen in this investigation.

The research findings about pain reduction match previous studies where scientists established that PRP regulates inflammation while helping wounds heal while reducing inflammatory response molecules [15]. Research data has shown that pain relief speeds up in patients treated with PRP symptoms as measured through VAS scores [16]. A range of outcomes related to infection rates emerged from previously conducted research. The infection rate evaluation between PRP-treated and control subjects

showed no statistical variations in research findings according to [17]. Simultaneously some experts note that PRP harnesses antimicrobial effects from its leukocyte content [17]. The infection rates between treatment groups matched in the current research. This evidence demonstrates that PRP prevents neither infection properly but also fails to raise infection risks for patients.

The literature demonstrates that patients with diabetic chronic wounds respond best to treatment with PRP [18]. The significant sample of diabetic patients in this study indicates PRP may serve as a promising healing treatment for wound care within this patient group. The researchers need to conduct separate analyses on diabetic and non-diabetic patient groups to establish clear findings.

**Limitations and Future Recommendations:** This study has several limitations. There were restrictions in generalizing study findings because the number of participants remained low. A bigger multi-center study with larger numbers would improve the research reliability of conclusions. The research duration of 12 weeks was insufficient to measure extended PRP treatment outcomes. A future research study needs to investigate if PRP treatment persists as a valuable medical solution when followed beyond the 12-week mark. The research failed to assess various PRP preparations along with differing dosage levels that might affect treatment results. Standard PRP preparation and application procedures should be adopted since they will enhance the repeatability of research findings. Research needs to implement bigger randomized trials that combine prolonged follow-up evaluations to determine long-term wound healing results. The evaluation of PRP therapy cost-effectiveness rates in regular clinical care would enable better understanding of how widespread implementation of this approach would be feasible.

## CONCLUSION

The research proves autologous platelet-rich plasma (PRP) works effectively as a medical solution for chronic wounds because it speeded up healing time and reduced pain symptoms better than standard therapeutic methods. PRP shows effectiveness for tissue healing however the evidence about its ability to prevent infections remains uncertain. The potential therapeutic advantages of PRP make it a promising supplement for chronic wound treatment especially when used on diabetic and non-healing wound patients. Additional extensive studies which run longer than the existing follow-up periods must demonstrate these results in order to create established clinical PRP application protocols.

## REFERENCES

1. Everts PA. Autologous platelet-rich plasma and mesenchymal stem cells for the treatment of chronic wounds. *Wound healing-current perspectives*. 2018 Nov 5:149-79.
2. Qu W, Wang Z, Hunt C, Morrow AS, Urtecho M, Amin M, Shah S, Hasan B, Abd-Rabu R, Ashmore Z, Kubrova E. The effectiveness and safety of platelet-rich plasma for chronic wounds: A systematic review and meta-analysis. *In Mayo Clinic Proceedings* 2021 Sep 1 (Vol. 96, No. 9, pp. 2407-2417). Elsevier.
3. Tsai HC, Lehman CW, Chen CM. Use of platelet-rich plasma and platelet-derived patches to treat chronic wounds. *Journal of Wound Care*. 2019 Jan 2;28(1):15-21.
4. Weller CD, Gardiner EE, Arthur JF, Southey M, Andrews RK. Autologous platelet-rich plasma for healing chronic venous leg ulcers: Clinical efficacy and potential mechanisms. *International Wound Journal*. 2019 Jun;16(3):788-92.
5. Meznerics FA, Fehervari P, Dembrovszky F, Kovacs KD, Kemeny LV, Csupor D, Hegyi P, Bánvölgyi A. Platelet-rich plasma in chronic wound management: a systematic review and meta-analysis of randomized clinical trials. *Journal of Clinical Medicine*. 2022 Dec 19;11(24):7532.
6. Rainys D, Cepas A, Dambrauskaite K, Nedzelskiene I, Rimdeika R. Effectiveness of autologous platelet-rich plasma gel in the treatment of hard-to-heal leg ulcers: a randomised control trial. *Journal of Wound Care*. 2019 Oct 2;28(10):658-67.
7. Miłek T, Nagraba Ł, Miłek T, Woźniak W, Młosek K, Olszewski W, Ciostek P, Deszczyński J, Kuchar E, Stolarczyk A. Autologous platelet-rich plasma reduces healing time of chronic venous leg ulcers: a prospective observational study. *Advances in Biomedicine*. 2019:109-17.
8. Elbarbary AH, Hassan HA, Elbendak EA. Autologous platelet-rich plasma injection enhances healing of chronic venous leg ulcer: a prospective randomised study. *International Wound Journal*. 2020 Aug;17(4):992-1001.

9. Moneib HA, Youssef SS, Aly DG, Rizk MA, Abdelhakeem YI. Autologous platelet-rich plasma versus conventional therapy for the treatment of chronic venous leg ulcers: a comparative study. *Journal of cosmetic dermatology*. 2018 Jun;17(3):495-501.
10. Alserr AH, Antonopoulos CN, Zaki A, Eldaly W. Autologous platelet rich plasma promotes the healing of non-ischemic diabetic foot ulcers. A randomized controlled trial. *Annals of Vascular Surgery*. 2022 May 1;82:165-71.
11. Liao X, Liang JX, Li SH, Huang S, Yan JX, Xiao LL, Song JX, Liu HW. Allogeneic platelet-rich plasma therapy as an effective and safe adjuvant method for chronic wounds. *Journal of Surgical Research*. 2020 Feb 1;246:284-91.
12. Chicharro-Alcántara D, Rubio-Zaragoza M, Damiá-Giménez E, Carrillo-Poveda JM, Cuervo-Serrato B, Peláez-Gorrea P, Sopena-Juncosa JJ. Platelet rich plasma: new insights for cutaneous wound healing management. *Journal of functional biomaterials*. 2018 Jan 18;9(1):10.
13. Nassar AT, Megahed MA, Abdel Razek ME, Rageh TM. The role of autologous platelet-rich plasma in healing of gaping and chronic wounds. *Menoufia Medical Journal*. 2019;32(2):723-8.
14. He M, Guo X, Li T, Jiang X, Chen Y, Yuan Y, Chen B, Yang G, Fan Y, Liang Z, Armstrong DG. Comparison of allogeneic platelet-rich plasma with autologous platelet-rich plasma for the treatment of diabetic lower extremity ulcers. *Cell Transplantation*. 2020 Jun 5;29:0963689720931428.
15. Burgos-Alonso N, Lobato I, Hernández I, Sebastian KS, Rodríguez B, March AG, Perez-Salvador A, Arce V, Garcia-Alvarez A, Gomez-Fernandez MC, Grandes G. Autologous platelet-rich plasma in the treatment of venous leg ulcers in primary care: a randomised controlled, pilot study. *Journal of wound care*. 2018 Jun 1;27(Sup6):S20-4.
16. Liu Q, Zhang N, Li Z, He H. Efficacy of autologous platelet-rich plasma gel in the treatment of refractory pressure injuries and its effect on wound healing time and patient quality of life. *Clinics*. 2021 Feb 5;76:e2355.
17. Rainys D, Cepas A, Dambrauskaite K, Nedzelskiene I, Rimdeika R. Effectiveness of autologous platelet-rich plasma gel in the treatment of hard-to-heal leg ulcers: a randomised control trial. *Journal of Prescribing Practice*. 2020 Aug 1;2(Sup8):32-42.
18. Elgarhy LH, El-Ashmawy AA, Bedeer AE, Al-bahnasy AM. Evaluation of safety and efficacy of autologous topical platelet gel vs platelet rich plasma injection in the treatment of venous leg ulcers: A randomized case control study. *Dermatologic Therapy*. 2020 Nov;33(6):e13897.