Allogeneic Platelet-Rich Plasma: Is It Safe and Effective for Wound Repair?

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Keywords

Platelet-rich plasma · Allogenic · Ulcers · Chronic wounds

Abstract

Background: Platelet-rich plasma (PRP) and its derivatives are an emerging biotechnology whereby concentrated platelets provide damaged tissue with growth factors, cytokines, and other mediators to improve healing outcomes. Although there is strong evidence in the benefits of autologous PRP for both acute and chronic wounds, allogeneic PRP has been studied far less in comparison. **Summary:** In this mini-review, we discuss critical steps of allogenic PRP (and its derivatives) preparation. We performed a non-systematic review of the literature to identify animal and human subject studies testing allogenic PRP for wound treatment. We searched OVID Medline and PubMed for articles using the keywords “wound, ulcer, lesion, skin, and cutaneous” and “PRP, or platelet-rich plasma, or platelet-rich fibrin, or PRF, or platelet releasate” and “homologous, allogeneic or allogenic,” which were limited to non-review articles and English language. Two studies in animal models and 8 studies in patients were reviewed. There were inconsistencies in preparation methods, treatment regimens, and some lacked a control group in their studies. Despite these variations, none of the studies identified any major side effects or adverse

events. The treatment resulted in a reduced time to heal and/or reduced wound size in most cases. **Key Messages:** In situations where autologous PRP is not available or suitable, allogeneic PRP appears to provide a safe alternative. Its efficacy, however, requires larger-scale studies with appropriate controls. Standardization in PRP preparation and treatment regime are also needed to be able to interpret allogenic PRP efficacy.

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Introduction

Platelet-rich derivatives including platelet-rich plasma (PRP), most commonly used as autologous, are an emerging technology in regenerative medicine, whereby concentrated preparations of platelets are used to enhance the body's natural healing process [1]. Contained inside cytoplasmic granules within platelets, various classes of bioactive mediators, including adhesive proteins, growth factors, chemokines, clotting factors, and integral membrane proteins, as well as immune mediators, are stored and ready to respond to tissue injury. The bioactive mediators increase angiogenesis and mitogenesis, as well as regulating the endogenous inflammatory process, positively influencing cellular growth, proliferation, differen-

Fig. 1. A schematic diagram of allogenic PRP and PRF treatment. **a** The commonly used PRP preparation method. Whole blood (WB) is collected by venepuncture into an acid citrate dextrose (ACD) tube and spun down. The blood is separated into 3 layers of plasma, buffy coat, and red blood cells (RBC). Plasma has a gradient of platelet concentration with platelet-poor on top and platelet-rich (PRP) near the buffy coat. The plasma layer and the buffy coat (in the case of L-PRP) are transferred into a fresh tube with

no anticoagulant and re-centrifuged. The top two-thirds of the plasma that is poor in platelets (PPP) is discarded. The bottom third, which is rich in platelets (PRP) with a small amount of red blood cell contamination, is tested for virology and frozen for later application. **b** PRF, second-generation PRP preparation. Blood is collected in a tube with no anticoagulant and immediately (≤ 2 min) centrifuged. The fibrin matrix containing leukocytes and platelets is isolated. (Diagram created by BioRender.com.)

tiation, and re-epidermisation in wounds treated with PRP [1].

Although PRP has proven safe and effective for treating various wounds and soft tissue [2–4], its autologous application may be limited in a subset of the population in which harvesting or administration of derivatives is difficult and/or dangerous, such as the elderly, neonates, and those unable to donate large quantities of whole blood [5]. In this review, the growing bodies of evidence from animal models and in patients are presented to support the use of allogeneic platelet-rich derivatives as off-the-shelf therapy for wound repair and musculoskeletal injuries. Evidence-based gaps that have resulted in difficulties replicating and comparing clinical studies for allogenic application of PRP are identified as variations in: (1) source, (2) preparation meth-

od, (3) activation protocol, (4) concentrations of bioactive mediators, including growth factors and immune cells, and (5) frequency of treatment. These protocol variations will be discussed.

In addition to inconsistencies or the lack of reporting the constituency of the platelet-rich material, the absence of a universal nomenclature of its origin (source) in the literature has added ambiguity when interpreting the clinical outcomes. Recommendations have been made to refer to interindividual material donation as allogeneic, as opposed to homologous, which has been occasionally used in the past. Similarly, xenogeneic (materials derived from a different species) should be used to refer to human-derived material used in animal studies, which has been referred to as heterologous in the past [6, 7].

PRP Source

Autologous PRP has been recognised as a safe and effective treatment in both animal models and human studies, specifically in orthopaedic surgery, ophthalmology, dentistry, and skin wound repair [8–14]. Allogeneic PRP is not as extensively studied as its autologous counterpart, in part due to concerns regarding potential immunogenicity, but it has since been demonstrated not to be a significant risk [15]. Allogeneic PRP provides benefit in that collection can be done from voluntary blood donors, and its derivatives can be ready to use without clinicians needing to collect a sample from the patient. This may be useful in some clinical situations: for example, in acute burns, when patients may be fluid deplete and thrombocytopenic [16, 17]. Other contraindications to PRP preparation include haematological disorders, sepsis, or infection, with relative contraindications being the use of non-steroidal anti-inflammatory drugs or corticosteroids, tobacco use, malignancies, and anaemia [18].

PRP Preparation

PRP is a generic term often used in studies to describe preparation of blood-derived material with above normal platelet counts that applies to both allogenic and autologous preparations. There are various protocols describing speed, time, temperature of centrifugation, and the type of anticoagulant used when preparing PRP. Such variations influence the yield of bioactive material and confound comparative assessment of efficacy [19]. The most common PRP preparation method involves taking a whole blood sample through venepuncture into a container coated with citrate anticoagulant (Fig. 1). Thirty millilitres of blood yields approximately 3–5 mL of PRP, indicating approximately a 10% vol/vol yield. The first spin of the sample separates the tube into 3 layers: the upper layer containing mostly plasma and platelets, the intermediate buffy coat containing leukocytes, and the bottom layer containing red blood cells. Depending on whether the preparation is leukocyte-rich PRP or leukocyte-poor PRP, the upper layer is taken with either the whole buffy coat or with only the superficial buffy coat, respectively. A second spin is then performed to separate the upper platelet-poor plasma, from the pellet containing platelets. Platelets are resuspended in the lower third of the plasma solution (approx. 5 mL) to obtain PRP [20]. Studies have shown that varying centrifuge settings can impact the concentration of platelets, which continues to

be widely variable in clinical studies, without a clear consensus on an optimal regime for maximising platelet yield [20]. In addition to many studies using in-house centrifuging techniques, there are also commercially available PRP preparation kits, which allow for ease of PRP generation at additional cost. Regardless of whether studies used in house centrifuge preparation or a commercially available PRP generation kit, many studies evaluating the efficacy of PRP do not measure or report the platelet concentration in PRP, contributing to heterogenic methodologies and preventing proper analysis of its efficacy.

The beneficiary or inhibitory role of leukocytes in PRP-mediated wound repair is unknown [21]. The inclusion of leukocytes in PRP may provide additional advantages in tissue regeneration through activation of the innate immune system by neutrophils, monocytes, and macrophages, providing an additional defence mechanism against infection. Moreover, inflammatory growth factors and serine proteinases released from leukocytes can enhance platelet function through either the activation of growth factors (by cleavage of inactive precursors), or through degradation of the fibrin matrix, which releases stored growth factors [22]. Conversely, it has been argued that high levels of leukocytes may be responsible for delayed wound healing. High levels of serine proteases and reactive oxygen species in neutrophils aimed to damage pathogens may collaterally damage fresh tissues [23]. Hence, it has been suggested an acute increase in the number of neutrophils should be avoided. The presence of macrophages, however, can induce neutrophil apoptosis, a likely protective effect in addition to macrophage's role in healing by phagocytosing pathogens and promoting neovascularisation [24, 25]. Controlled animal studies are needed to support or reject the benefit of leukocyte inclusion in PRP, particularly in allogenic form in each specific application [26]. Fibrin concentration is also different in preparations, depending on the plasma content. Fibrin concentration is classified as low in PRP and high in platelet-rich fibrin (PRF).

Considering the variability between classes of PRP, a multi-disciplinary consensus conference published 4 main families of preparations: pure PRP (P-PRP), leukocyte and PRP (L-PRP), pure PRF (P-PRF), or leukocyte and PRF (L-PRF), depending on their leukocyte and fibrin content [27, 28]. This classification is still widely used throughout the literature. An improved classification system (PLRA system) has also been suggested by Mautner et al. [29], taking into account concentrations of platelets, and the presence or absence of leukocytes, red blood cells, and an activating agent in order to facilitate

the comparison of clinical studies and promote further progression in its application in the regenerative medicine field.

Platelet Activation

Platelets undergo 3 main changes in response to local prothrombotic factors (or exogenous derivative when platelets are activated *ex vivo*). These changes include: (1) upregulating integrin adhesion receptors to recruit further platelets, (2) undergoing a conformational change to become a more flattened, dendritic phenotype, and (3) initiating degranulation of both cytoplasmic α - and dense granules. The degranulation occurs when granules fuse with the cell membrane, releasing their content. The granules contain mostly growth factors, chemokines, and adhesion molecules that promote coagulation, angiogenesis, cellular adhesion as well as an immune response to tissue injury [30].

Multiple pathways can lead to platelet activation in wounds. Commonly, exposed collagen in a wound binds and activates glycoprotein VI, exclusively expressed on platelets and megakaryocytes membrane. A second pathway is through G-protein-coupled receptors (GPCRs), activated by agents such as adenosine 5'-diphosphate, thromboxane A₂, and thrombin. Other factors that activate platelets through GPCRs include epinephrine, prostaglandin E₂, and serotonin. In addition, thrombin activates protease-activated receptors (PAR): PAR1 is activated at low concentrations of thrombin exposure in situations of minor tissue damage, whereas PAR4 is active at higher concentrations of thrombin, such as in trauma where it acts as a protective mechanism to decrease bleeding [30]. Regardless of the activating pathway, a resulting increased intracellular calcium concentration initiates signalling cascades prompting cellular shape changes and dense granular release. Thrombin is also responsible for converting fibrinogen to fibrin, stabilising a platelet plug.

When using PRP therapy, platelets should be activated prior to administration to target tissues, as this has been shown to significantly increase concentrations and the availability of growth factors by triggering degranulation [30]. A number of chemical and physical methods of activating platelets are used clinically and experimentally, and it is important to note that different methods of platelet activation have varying effects on the rate and concentrations of bioactive factors released. Exogenous activators such as calcium, thrombin and type-1 collagen are used in isolation or in combination, depending on protocols and commercial preparations [31]. Generally, it is

observed that calcium and thrombin at higher concentrations can cause a rapid influx of growth factors, as opposed to a lower concentration which favours a slower, more gradual growth factor release [30]. Batroboxin (a snake venom-based defibrinogenating haemostatic enzyme) entraps platelets in a fibrin network and causes a slower release of growth factors [32].

One study reviewed the concentrations of platelet-derived growth factor, vascular endothelial growth factor, and transforming growth factor- β in PRP following activation with various agents at regular time points over 24 h [31]. Calcium chloride activation showed a gradual time-dependent increase over 24 h, compared to thrombin and thrombin + CaCl₂, which showed a more immediate release. Moreover, clotting was fastest in the thrombin-activated group, compared to a slower clotting profile in the CaCl₂-activated group. The preferred method of clotting depends on the type of application. A more rapid-acting gel may be used for cutaneous uses, and slower gel-forming agents may be chosen for liquid injections to then solidify in soft tissue injuries. For either intravenous or intra-articular uses, where a liquid is preferred, an agent less likely to form a clot may be selected. PRP activation can also be achieved by manipulating the temperature during preparation, without a need for exogenous activating materials [33]. Whole blood can be centrifuged at 4 °C to separate PRP, followed by a second centrifugation at 37 °C in a glass tube with no anticoagulant to trigger activation. It remains to be seen whether temperature-induced PRP activation has an advantage over the chemical-induced methods in terms of physical characteristics, granular release kinetics, and practical considerations in a clinical situation.

Summary of Animal and Human Subject Studies Testing Allogenic PRP for Wound Treatment.

To evaluate allogenic PRP for wound treatment, we searched OVID Medline and PubMed for articles using the keywords “wound, ulcer, lesion, skin, and cutaneous” and “PRP, or platelet-rich plasma, or platelet-rich fibrin, or PRF, or platelet releasate” and “homologous, allogeneic or allogenic,” which were limited to non-review articles and English language. Two studies in animal models and 8 studies in patients were reviewed. The 2 studies in rabbits did not show any risks associated with the application of allogenic PRP or PRF and reported evidence of a small improvement in wound repair that did not reach a significant level. In the 8 studies performed on

Table 1. Summary of studies evaluating the efficacy of allogeneic PRP as an intervention for wound healing

Author, year	Study design	Population/wound	Intervention	Outcomes
Liao et al. [44], 2020	Randomized controlled trial	60 patients with wounds refractory to 6 months of treatment ($n = 60$)	<p>Source: immediate family member blood donation</p> <p>Centrifuge 1: 400 g for 10 min</p> <p>Centrifuge 2: 1,200 g for 20 min</p> <p>Platelet concentration: $1,200 \pm 10^9/L$</p> <p>Activator: calcium gluconate</p> <p>Treatment regime:</p> <ol style="list-style-type: none"> 1. Wound debridement + saline dressing 2. Dressed in PRP 3. Covered with skin graft following appearance of fresh wound granulation <p>Control: conventional skin grafting</p>	<p>Significantly improved rate of healing at week 1 and week 3 time points ($p < 0.05$)</p> <p>No adverse reactions</p> <p>Clinically, necrotic tissue and pus had mostly resolved, with bright granulation tissue present</p>
Oliveira et al. [45], 2017	Randomized controlled trial	16 patients with venous ulcers ($n = 21$ ulcers)	<p>Source: pooled concentrated platelets</p> <p>Centrifugation: not reported</p> <p>Platelet concentration: not reported</p> <p>Activator: thrombin + calcium gluconate</p> <p>Treatment regime:</p> <ol style="list-style-type: none"> 1. Dressings cleaned and covered with PRP gel 2. Dressings changed every 4 days <p>Control: hydrocolloid dressing</p>	<p>Ulcers reduced by 64% in size when compared to 70% wound closure in the control arm ($p < 0.01$) at day 90</p> <p>Ulcer biopsies revealed no difference in histochemical signs of neovascularisation between groups</p>
Semenič et al. [46], 2018	Randomized controlled trial	60 patients with ulcers of various aetiologies ($n = 30$ treatment, $n = 30$ control)	<p>Source: ABO matched donor buffy coat</p> <p>Centrifuge 1: 1,500 g for 8 min</p> <p>Platelet concentration: Not reported</p> <p>Activator: thrombin + aprotinin + fibrinogen + coagulation factor XIII</p> <p>Treatment regime:</p> <ol style="list-style-type: none"> 1. Wound irrigated with antiseptic 2. Gel applied, covered with dressing 3. Treatment repeated weekly for a total of 3 weeks <p>Control: placebo hydrogel</p>	<p>Wound size decreased to 35.01% compared to 89.95% in controls ($p < 0.001$) at 6 months</p> <p>Laboratory blood values + inflammatory markers did not significantly differ</p> <p>No anti-platelet antibodies formed</p> <p>No changes to bacterial growth of wound swabs</p> <p>0% of treated patients showed wound maceration compared to 75% of controls</p> <p>No adverse reactions observed</p>
Shan et al. [47], 2013	Case Series	21 patients with diabetic lower limb ulcers refractory to >3 weeks of conventional treatment ($n = 21$)	<p>Source: ABO matched leukocyte-depleted single donor platelet concentrates</p> <p>Incubated for 5 min at 37°C</p> <p>Centrifuge 1: 153 g for 10 min</p> <p>Platelet concentration: not reported</p> <p>Activator: calcium gluconate</p> <p>Treatment regime:</p> <ol style="list-style-type: none"> 1. Wound cleaned 2. Platelet gel applied twice weekly covered with occlusive dressing 	<p>86% of wounds healed completely, with most marked improvement in first 2 weeks</p> <p>Remaining 14% of ulcers were non-responsive</p> <p>No side effects observed</p> <p>No infection observed</p> <p>No anti-platelet antibodies formed</p>

Table 1 (continued)

Author, year	Study design	Population/wound	Intervention	Outcomes
Greppi et al. [41], 2011	Case series	11 hypomobile elderly patients ($n = 14$ ulcers)	Source: platelet concentrate from blood bank Centrifuge 1: 570 g for 9 min Centrifuge 2: 3,000 g for 18 min Platelet concentration: $1,924 \pm 111 \times 10^9/L$ Activator: allogeneic thrombin or commercial Plateletex® Regime: 1–2 topical applications/week	79% of ulcers were reduced in size by $91 \pm 14\%$ at 12 weeks (median size 3.2 cm^2) 21% showed no ulcer improvement (median size 27 cm^3)
Chen et al. [43], 2010	Case series	15 patients with >3 months treatment-resistant lower extremity ulcers ($n = 17$ ulcers)	Source: PRP from blood bank Centrifugation: not reported Platelet concentration: not reported Activator: thrombin Treatment regime: 1. Wound debridement + saline dressing 2. Days 3–14: platelet gel to wound base + split-thickness skin graft + fibrin glue spray with splint immobilisation	76% of skin grafts took well Remaining 24% had <5% loss, which spontaneously healed Complete healing from 3 weeks to 2 months, without recurrence after 3–18 months of follow-up No adverse reactions noted
Jeong et al. [42], 2010	Randomised controlled trial	100 patients with diabetic lower limb ulcers ($n = 52$ treatment, $n = 48$ control)	Source: platelet concentrate from blood bank Centrifuge 1: 3,000 g for 30 min Platelet concentration: mean $1.1 \times 10^{10} \pm 3.9 \times 10^9$ platelets transplanted Activator: thrombin and fibrinogen Treatment regime: 1. Wounds debridement 2. Topical application of 12.5 or 25 mL of concentrate plus fibronogen, 2 doses 3–4 days apart 3. Thrombin added to wounds Control: topical fibrinogen and thrombin	79% complete healing at 12 weeks, compared to 46% in controls Mean healing time 7.0 ± 1.9 weeks, compared to 9.1 ± 2.2 weeks in controls ($p < 0.05$) No adverse effects in each of the groups, nor changes in vital signs, biochemistry, haematology, and urinalysis
Scevola et al. [49], 2010	Randomized controlled trial	13 patients with pressure sores ($n = 16$ ulcers)	Source: platelet concentrate from hospital Centrifugation: not reported Platelet concentration: $>2 \times 10^{10}$ platelets transplanted Activator: calcium chloride Treatment regime: 1. Gel applied to clean wound bed 2. Repeated twice weekly for 18 weeks Control: no platelet gel applied	Improved granulation tissue proliferation in first 2 weeks of treatment ($p = 0.025$) Longer treatment did not significantly improve wound repair ($p = 0.76$) No changes in ulcer bacteria contents, nor serum signs of infection

patients with difficult to heal wounds, including chronic leg ulcers and diabetic foot ulcers, there was an overall ulcer size and time to heal reduction in response to treatment and no serious adverse reaction reported (Table 1). However, the lack of standards in most patient studies makes it difficult to draw evidence-based treatment recommendations, as discussed in more details below.

Allogenic PRP for Wound Repair in Animal Models

Both immunogenicity and efficacy of allogenic PRP for tissue repair have been investigated in animal models. Allogenic PRP was injected intramuscularly into rabbits to measure immunogenicity [15]. Rabbit blood was analysed for CD4+ and CD8+ abundance using flow cytometry before and up to 12 weeks postoperatively. A non-significant increase in CD4+ lymphocytes at week 1 was observed, which decreased throughout testing and was restored to normal baseline values by week 8 ($p > 0.05$). Analysis of the local injection site showed little to no histological change with the exception of subtle inflammation of the skin in the first week.

Autologous, allogeneic, or xenogeneic PRP (PRP activated by calcium gluconate to form a gel) were compared for treating experimentally induced wounds monitored over 17 days in rabbits [34]. Full-thickness 8-mm wounds were created bilaterally, with the left side treated with saline and compared to the treatment arm. All PRP sources resulted in more wound contraction and complete reepithelialisation with no significant immunogenicity observed. Although wound healing rates in the presence of all types of PRP appear to be faster when compared to the control arm, particularly at earlier time points, the improved healing rate did not reach a significant level. Collagen deposition was slightly increased in autologous and allogenic PRF-treated wounds ($p > 0.05$).

Allogeneic PRP in Chronic Wounds and Difficult to Heal Ulcers

Spontaneous wound healing involves the sequential and overlapping phases of: (1) homeostasis by formation of a platelet plug; (2) acute inflammation; (3) proliferation including angiogenesis and extracellular matrix (ECM) formation, and (4) remodelling (reviewed in Gurtner et al. [35]). It has been shown in chronic wounds, with different aetiology, that inflammation does not subside and the wound contains a significantly higher con-

centration of ECM proteins and MMPs, which remove ECM, compared to a healing wound [36–39]. In such cases allogenic PRP has been considered as a treatment option. Although the molecular basis of how PRP changes the wound to move towards healing is not fully understood, there is some clinical evidence to suggest this strategy resets the wound to repair [40].

In a case series, 11 hypomobile elderly patients with chronic skin ulcers were treated with allogenic PRF (PRP pooled from blood banking procedures and activated by thrombin or batroboxin; Table 1). The gels were applied topically 1 or 2 times a week to ulcers within 2 h of activation. Eight out of 11 patients showed their wound size reduced by $91 \pm 14\%$ after a median of 12 weeks. Although promising results, a lack of placebo or standard care control group limits the interpretation of the results [41]. In another study, 52 patients with diabetic foot ulcers were treated with PRF (blood bank platelet concentrate activated by thrombin) applied immediately and once 3–4 days postoperatively. This was compared to a group of 48 patients in a control group treated with surgical debridement and topical fibrinogen and thrombin alone. The time to complete wound repair was 7.0 ± 1.9 and 9.2 ± 2.2 weeks in the blood bank platelet concentrate-treated and control groups, respectively ($p < 0.05$) [42].

A single donor PRF, sprayed, in combination with a split-thickness skin graft was shown to be effective in the repair of ulcers of various aetiologies among 15 patients. Complete healing was achieved in 3 weeks to 2 months with no adverse reaction or recurrence reported. However, it is difficult to interpret the efficacy of PRF as there was no control arm in this study [43]. A randomized trial of 60 patients with chronic wounds treated with either allogeneic single-donor PRP (activated by calcium gluconate prior to gelation) as a single dose injection prior to skin grafting or standard skin grafting showed significantly faster healing in the allogeneic cohort at the first- and third-week time points. On examination of the wounds, increased granulation and decreased inflammatory exudate was noted among the PRP group and no ulcers had recurred in the treatment group in periods of 6 months to 4 years of follow-up [44]. In contrast, a randomised trial allocated 16 participants with venous ulcers into either allogeneic PRF-treated (pooled from volunteers) or a hydrocolloid dressing-treated group for the treatment of venous ulcers. Results after 90 days favoured the hydrocolloid dressing treatment with ulcer size reduction of 70 vs. 64% ($p < 0.01$) [45].

Allogeneic PRF was also evaluated in a randomised, double blinded, placebo-controlled trial in a cohort of 60

patients with chronic leg ulcers. PRP from a single donor was activated with a combination of thrombin, calcium chloride, and fibrinogen to form a gel and the control group were treated with a hydrogel. Treatment was repeated once a week for 3 consecutive weeks. After 6 months, the mean ulcer area had decreased to 35.01% of the original size in the PRF arm compared to 89.95% in the control group ($p < 0.001$). This study also measured blood inflammatory markers and platelet antibody levels, which remained similar between the groups with no adverse reactions observed [46].

Single-donor allogenic PRP activated by thrombin and calcium gluconate was applied to 21 patients with type II diabetic lower limb ulcers refractory to conventional treatments for at least 3 weeks. Clinical responses to allogenic PRP showed a marked reduction in pain and ulcer size in the initial 2 weeks. Overall, 18 individuals had healed wounds completely, while 3 individuals did not respond to PRP treatment [47]. Similarly, a larger randomised trial involving 100 diabetic patients with lower limb ulcers showed the mean healing time was reduced by 2 days in the treated group compared to non-treated controls ($p < 0.05$) [43].

It is important to note that while most these studies show improvement in difficult to heal wounds when treated with allogenic platelet-rich derivatives, it is impossible to establish a consensus on what works. There are differences in PRP preparation. In particular, a range of platelet concentrations, leukocyte and fibrin concentrations, activation procedures, and times of application after platelet activation were used. In addition, treatment regimens, including the method of application and frequency, were not standardised. Development of standard protocols and randomised clinical trials are needed to establish the efficacy of allogenic PRP for the treatment of difficult to heal wounds [48].

Conclusion

Autologous PRP improves wound repair but may be inappropriate for various patients. Allogeneic PRP has potential to be produced on a large scale from blood bank pooled platelets, which are often a discarded derivative of blood donation services. Immunological and serological testing in the studies showed allogeneic PRP to be safe from adverse immune reactions.

The studies evaluated in this review show mixed results, with a likely positive effect on wound repair in chronic and difficult to heal wounds, similar to autolo-

gous PRP. However, neither autologous nor allogenic PRP have been tested in a sufficient quantity or quality of randomized controlled trials to warrant making firm evidence-based recommendations. The high degree of heterogeneity of PRP preparations must be addressed, as well as the need for standardised comparators and outcomes with universal protocols for clinical trials.

Key Message

Allogenic platelet-rich plasma appears safe for wound treatment, but its efficacy requires further investigation.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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