

THE EFFICACY OF PLATELET-RICH FIBRIN (PRF) THERAPY: A CASE STUDY

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Summary

Chronic venous insufficiency (CVI) is a progressive condition often associated with recurrent, non-healing leg ulcers that significantly impact a patient's quality of life. Conventional therapies often provide suboptimal results, leading to the exploration of regenerative approaches such as platelet-rich fibrin (PRF). This article presents the case of a 75-year-old female patient suffering from a right leg ulcer for over 30 years, who underwent five sessions of PRF therapy, with documented dramatic improvement over the course of treatment. This study highlights the potential of PRF as an effective therapeutic option for chronic venous ulcers.

Keywords: chronic venous insufficiency, Platelet-Rich Fibrin (PRF), venous leg ulcers, tissue regenerative therapy, wound healing, fibrin matrix, growth factors, autologous treatment.

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Introduction

Chronic venous insufficiency (CVI) is a widespread vascular disorder affecting approximately 40% of individuals over the age of 70. It is characterized by venous hypertension, valvular incompetence, and impaired microcirculation, ultimately leading to skin changes, pain, and venous leg ulcers (VLUs). VLUs represent the severe end of CVI and are notoriously challenging to treat, particularly in elderly patients with longstanding ulcers. [1-4]

Standard treatment modalities include compression therapy, wound debridement, dressings, and pharmacological agents; however, many patients experience recurrent or non-healing wounds due to chronic inflammation and impaired tissue regeneration. Recently, platelet-rich fibrin (PRF), an autologous, platelet-concentrate

biomaterial, has gained attention for its wound healing properties, as it releases growth factors (PDGF, VEGF, TGF- β) that promote angiogenesis, fibroblast proliferation, and tissue remodeling. [5-7]

This study presents the successful healing of a 30-year-old chronic venous ulcer in a 75-year-old female patient, who underwent five PRF therapy sessions, demonstrating significant clinical improvement.

Material and Methods

1. Patient Profile

A 75-year-old female patient presented with a non-healing venous leg ulcer located on the right lower leg, with an onset of approximately 30 years. The patient had a history of chronic venous

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insufficiency (CVI) and recurrent ulceration, with previous conventional treatments providing only temporary relief.

Clinical Characteristics at Baseline:

- Ulcer size: ~6 cm × 4 cm.
- Ulcer depth: Partial-thickness with exposed granulation tissue.
- Periwound skin: Hyperpigmentation, lipodermatosclerosis, moderate edema
- Pain level (VAS scale 0-10): 7/10.
- Previous treatments: Compression therapy, topical dressings, and systemic antibiotics.

2. PRF Treatment Protocol

The patient underwent five sessions of PRF therapy, one per month, with photographic documentation before each session.

PRF Preparation and Application

Blood Collection: 10 mL of autologous blood was drawn from the antecubital vein into I-PRF and L-PRF (solid PRF) tubes without anticoagulants.

Centrifugation the blood:

- I-PRF - the blood was centrifuged at a lower speed to separate the i-PRF layer while preserving leukocytes, platelets and growth factors.
- L-PRF - the blood was centrifuged at a higher speed for a longer period of time, allowing platelets and fibrin to separate into a fibrin clot containing a high concentration of growth factors.

PRF Application: The upper layer of the I-PRF was collected using a syringe before it coagulated. I-PRF was injected subdermally or intradermally using fine needles (27-30G) around the margins of the venous ulcer every 5 mm.

The upper layer of the the L-PRF membrane was extracted and applied directly to the ulcer bed, ensuring full coverage of the affected area. A non-adherent dressing was placed over the PRF membrane (Grassolind). Compression therapy was continued post-application (Figure 1).

Types of PRF: injectable PRF and PRF in the form of a fibrin clot

1. Injectable PRF (i-PRF):

- *Composition:* injectable PRF is a liquid form of platelet-rich fibrin derived from the centrifugation of whole blood without anticoagulants. It contains a high concentration of platelets, leukocytes, growth factors, and fibrinogen.
- *Preparation:* prepared using a low-speed centrifugation protocol to preserve cell viability and fibrinogen in a liquid state.
- *Application:* i-PRF is injected directly into the affected area, such as chronic wounds, to stimulate tissue repair and regeneration. The liquid consistency allows it to penetrate deep into the wound bed, enhancing angiogenesis and promoting granulation tissue formation.
- *Advantages:* provides targeted delivery of bioactive factors, is minimally invasive, and supports cell migration and proliferation.

2. PRF in the Form of a Fibrin Clot:

- *Composition:* this solid form of PRF is created by centrifuging whole blood at specific speeds and durations, leading to the formation of a fibrin matrix enriched with platelets, leukocytes, and growth factors.
- *Preparation:* after centrifugation, the fibrin clot is separated from the red blood cell layer and trimmed to a manageable size for application. This matrix provides a sustained release of growth factors over time.
- *Application:* the fibrin clot is placed directly on chronic wounds, surgical sites, or areas requiring tissue regeneration. It acts as a scaffold, supporting cell adhesion and migration while maintaining a moist wound environment.
- *Advantages:* offers a sustained release of bioactive molecules, supports tissue integration, and is particularly useful in covering larger wound areas or stabilizing healing sites.

Comparative Insights:

- *Flexibility:* injectable PRF offers the advantage of adaptability for diverse anatomical locations, including deep or irregular wounds. Fibrin clots are more suited for

surface applications or as a scaffold for tissue regeneration.

- *Release of Growth Factors:* Both forms provide growth factors, but fibrin clots release them over an extended period, whereas i-PRF ensures an immediate and uniform distribution.
- *Clinical Use:* the choice between i-PRF and fibrin clot depends on the wound type, location, and the desired therapeutic outcome. In chronic venous ulcers, combining both forms may offer synergistic effects.

Follow-Up and Documentation: monthly clinical assessments were performed, including ulcer measurement, pain evaluation, and photographic documentation before each session.

Results

The patient, a 75-year-old female diagnosed with chronic venous insufficiency and long-standing venous ulcers (30 years), underwent five sessions of platelet-rich fibrin (PRF) therapy, spaced at one-month intervals, with systematic photographic documentation before each session. Her condition, exacerbated by years of prolonged standing, improved significantly following treatment. Before PRF treatment, the ulcers on the patient's right leg presented with irregular, undermined edges and were surrounded by erythematous, hyperpigmented skin consistent with chronic venous stasis. Her systemic management included Detralex 1000 mg/day, Pentoxifylline R 2 tablets/day, Vessel Due F 250 2 tablets/day, Hyalo 4 skin cream applied to the adjacent skin alternately with Sorbalgon and Atrauman Ag dressings, with changes performed at intervals of 2-3 days from each other. The wounds exhibited fibrinous exudate, with areas of exposed subcutaneous tissue and moderate inflammation. A significant and gradual improvement was observed, with notable reductions in ulcer size, wound exudate, periwound inflammation, and pain levels.

Sessional Improvements

1. *First Session:* initial debridement removed necrotic tissue, and PRF was applied directly to the wound bed. Perilesional I-PRF was also performed. One week post-

session, the wound showed early signs of epithelialization with reduced inflammation and exudate.

2. *Second Session:* progressive wound contraction was observed, with granulation tissue becoming prominent. Hyperemia surrounding the ulcer decreased significantly.
3. *Third Session:* the wound bed exhibited robust granulation tissue, and the epithelial margins advanced further. Skin pigmentation around the ulcer started normalizing, and adjacent skin appeared less irritated. The pain in the leg was significantly reduced.
4. *Fourth Session:* most of the ulcer's surface was covered with new epithelial tissue. Granulation tissue decreased as re-epithelialization dominated the healing process. The patient experienced minimal pain in the right calf.
5. *Fifth Session:* at the conclusion of treatment, the wound had nearly closed, with residual hyperpigmentation and minimal scarring. The adjacent skin was intact, and no secondary infections occurred.

1. Ulcer size reduction

Over the five-month period, progressive re-epithelialization and granulation tissue formation were observed.

By the final PRF session, the ulcer showed progressive healing and contracted by more than 90%. The patient reported minimal pain and discomfort, with only residual hyperpigmentation remaining.

2. Pain reduction

- Significant pain relief, from 7/10 at baseline to 1/10 after five months.
- Improved mobility and reduced need for analgesics.

3. Wound Healing Progress

Photographic evidence confirmed consistent improvement across all sessions.

Impact of systemic and local treatment

Systemic Treatment Contribution

The patient followed a comprehensive systemic therapy regimen, which likely contributed

Table 1

Session	Ulcer Size (cm)	Pain Score (VAS 0-10)	Observations
Baseline	6 × 4 cm	7/10	Deep ulcer with granulation tissue, hyperpigmented periwound skin, lipodermatosclerosis, and moderate edema.
Session 1	5 × 3.5 cm	6/10	Mild re-epithelialization, decreased exudate, reduced erythema.
Session 2	4 × 3 cm	5/10	Improved granulation tissue, shallower ulcer bed, periwound skin less inflamed.
Session 3	3 × 2 cm	3/10	Increased epithelial coverage, further reduction in exudate and hyperpigmentation.
Session 4	2 × 1 cm	2/10	Significant wound contraction, re-epithelialization nearly complete.
Session 5	0.5 × 0.5 cm	1/10	Ulcer almost closed, minimal residual pigmentation and mild periwound atrophy.

to the improved microcirculation, reduced inflammation, and enhanced venous return:

- Detralex 1000 mg/day: improved venous tone, microvascular function, and reduced capillary hyperpermeability.
- Pentoxifylline R 2 tablets/day: increased blood flow by reducing erythrocyte aggregation and improving microvascular perfusion.
- Vessel Due F 250 2 tablets/day: reduces blood clot formation by inhibiting platelet aggregation and enhancing fibrinolysis, protects the endothelium and also improves capillary function decreasing edema.

Topical Treatment Contribution:

Hyalo 4 Skin Cream applied to the adjacent skin helped: maintain hydration and barrier integrity, reduce keratinocyte hyperplasia and fibrosis, promote reepithelialization in combination with PRF.

Sorbagon dressing – absorbs and removes the excess exudate, inflammatory mediators and bacterial toxins from the ulcer bed. By managing wound exudate effectively, Sorbagon helps maintain an optimal level of moisture at the wound site.

Atrauman Ag dressing – has an antibacterial action due to the impregnation of the product

with silver ions. By controlling microbial contamination and reducing infection-related inflammation, the dressing indirectly contributes to a decrease in local inflammatory responses, which can accelerate the healing process.

Functional and Quality of Life Improvements

The patient's lifestyle adjustments also contributed to improved outcomes:

- previous standing habits: the patient used to spend long hours standing, exacerbating venous congestion
- current lifestyle (retirement and position alternation): able to alternate between sitting, standing, and resting, reduced venous stasis, leading to better lower limb circulation and ulcer healing, enhanced leg elevation further assisted in reducing venous hypertension and edema.
- wearing compression stockings improved venous circulation by enhancing venous return from the lower extremities, reducing venous stasis and decreasing edema.

Photographic documentation of healing

The progressive reduction of ulcer size and depth was clearly evident in the serial monthly photographs, demonstrating:

1. Initial condition: large ulcer and 4 other smaller wounds, with edema, periwound

- hyperpigmentation, and inflammation (Figure 2).
2. After PRF session 1: mild contraction of ulcer size, early granulation tissue formation (Figure 3).
 3. After PRF session 2: increased epithelialization, reduced exudate, and improved periwound skin condition (Figure 4).
 4. After PRF session 3-4: noticeable wound contraction, complete closure of the small ulcers, pain significantly reduced (Figure 5, Figure 6).
 5. After PRF session 5: nearly complete closure, with only minor residual pigmentation (Figure 7).

No infection or adverse effects were noted throughout the treatment.

The combination of PRF with systemic therapy facilitated rapid wound healing. Notable improvements included a reduction in wound size, complete cessation of exudate, and reconstitution of skin integrity. The patient's compliance with systemic medication and position management (alternating standing and sitting post-retirement) further enhanced healing outcomes.

These outcomes underscore the effectiveness of PRF in promoting wound healing in chronic venous ulcers, emphasizing its potential as a pivotal treatment modality. Visual documentation provided monthly highlights the progressive stages of wound closure, demonstrating the treatment's clinical success.

Summary of Key Outcomes

1. *Rapid wound healing*: significant reduction in wound size and closure achieved after five PRF sessions.
2. *Enhanced epithelialization*: progressive advancement of epithelial tissue covering the ulcer bed.
3. *Robust granulation tissue formation*: PRF promoted the development of healthy granulation tissue.
4. *Reduction in inflammation*: surrounding erythema and hyperemia diminished significantly during treatment.
5. *Improved skin integrity*: adjacent skin showed reduced irritation and signs of normalization.
6. *No secondary infections*: the treatment course was free from complications such as infections.
7. *Adherence to systemic therapy*: compliance with Detralex, Vessel Due F and Pentoxifylline contributed to therapeutic success.
8. *Sustained progression across sessions*: monthly photographs documented steady and measurable improvements.
9. *Minimized scarring*: the wound closed with minimal residual scarring and hyperpigmentation.
10. *Holistic improvement*: the combination of local PRF application and systemic treatment optimized clinical outcomes.

Discussion

This case highlights the potential of PRF therapy as an adjunctive treatment for chronic venous ulcers, particularly in elderly patients with longstanding wounds. The dramatic improvement observed over five sessions suggests several key mechanisms by which PRF contributes to wound healing:

1. PRF as a Bioactive Scaffold

PRF provides a natural fibrin matrix, which acts as a biological scaffold supporting cell migration and proliferation. This structure prolongs the release of growth factors, facilitating tissue regeneration.[8-10]

2. Enhanced Angiogenesis and Tissue Remodeling

The release of vascular endothelial growth factor (VEGF) promotes capillary formation, improving oxygen and nutrient delivery to the ulcer bed. Fibroblast stimulation by platelet-derived growth factor (PDGF) accelerates collagen deposition and epithelialization.[11-15]

3. Anti-Inflammatory and Antimicrobial Properties

PRF contains leukocytes, which contribute to localized immune modulation, reducing chronic inflammation. Studies suggest PRF exhibits antimicrobial effects, lowering the risk of secondary infections.[16-20]

4. Clinical Implications

The successful outcome in this case supports the use of PRF therapy in patients with refractory venous ulcers, especially when conventional therapies fail. Given its autologous nature, cost-



Figure 1: PRF technique.



Figure 2: CVI with chronic leg ulcers before treatment



Figure 3: IVC with chronic leg ulcers 1 month after the first PRF session



Figure 4: IVC with chronic leg ulcers 1 month after the second PRF session



Figure 5: IVC with chronic leg ulcers 1 month after the third PRF session



Figure 6: IVC with chronic leg ulcers 1 month after the fourth PRF session

Figure 7: IVC with chronic leg ulcers 1 month after the fifth PRF session



effectiveness, and safety, PRF represents a promising alternative to expensive growth factor therapies.

Further randomized controlled trials (RCTs) are warranted to establish standardized PRF protocols, compare efficacy with existing treatments, and explore its potential for broader vascular wound management.

The management of chronic venous insufficiency (CVI) and associated venous leg ulcers (VLUs) remains a significant challenge in clinical practice, particularly in patients with longstanding conditions and recurrent ulcerations. The use of platelet-rich fibrin (PRF) in this case represents an innovative and regenerative approach that capitalizes on the patient's own biological resources to enhance wound healing. This discussion focuses on the mechanisms, outcomes, and broader implications of PRF therapy, based on the presented case and supporting literature.

Mechanisms of PRF in wound healing

PRF is a second-generation platelet concentrate that differs from traditional platelet-rich plasma (PRP) due to its three-dimensional fibrin matrix, which serves as a scaffold for the sustained release of growth factors and cytokines. These bioactive molecules, including vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), and transforming growth factor-beta (TGF- β), are pivotal in promoting angiogenesis, tissue regeneration, and cellular proliferation. Unlike PRP, which requires anticoagulants, PRF forms a natural clot, providing a sustained delivery system for these factors over an extended period.[21-23]

In this case, both injectable PRF and PRF fibrin clots were used, allowing for targeted application to the ulcer bed and surrounding tissue. Injectable PRF facilitated the delivery of growth factors to deeper tissue layers, enhancing neovascularization and collagen synthesis, while the fibrin clot provided a physical barrier and further stimulated epithelialization. This dual approach underscores the versatility of PRF as a therapeutic agent in managing chronic wounds.

Clinical Outcomes

The patient exhibited remarkable improvement over the course of five PRF sessions, with

evident reduction in ulcer size and depth, resolution of infection, and restoration of skin integrity. Serial photographs demonstrated progressive granulation tissue formation and re-epithelialization, suggesting that PRF not only accelerates healing but also contributes to the quality of the regenerated tissue. The reduction in inflammatory markers and pain, as reported by the patient, aligns with PRF's known anti-inflammatory properties mediated by interleukin-4 (IL-4) and interleukin-10 (IL-10).[24,25]

The patient's systemic treatment with Detralex, Tarosin, and Pentoxifylline likely complemented the localized PRF therapy. These agents improve venous tone, reduce blood viscosity, and enhance microcirculatory perfusion, creating an optimal physiological environment for wound healing. The adjunctive use of Hyalo 4 cream on adjacent skin further supported epithelial repair and barrier restoration, highlighting the importance of a multimodal approach in CVI management.

Comparison with conventional treatments

Traditional treatments for CVI and VLUs, such as compression therapy, debridement, and topical agents, often yield variable outcomes, particularly in recalcitrant cases. Advanced modalities, including skin grafting and negative pressure wound therapy, carry additional risks and are not always feasible in elderly patients. PRF offers a safer, cost-effective alternative with minimal risk of immunological reactions or adverse events, as it utilizes autologous blood products. This case reinforces PRF's potential to fill a critical gap in the therapeutic arsenal for chronic wounds.[26-29]

Limitations and Challenges

While the outcomes of PRF in this case are promising, several limitations must be considered. The success of PRF therapy depends on standardized preparation techniques, including centrifugation parameters, which influence the composition and efficacy of the fibrin matrix. Moreover, the variability in patient response underscores the need for individualized treatment plans based on wound characteristics and systemic health factors.[30-34]

The absence of randomized controlled trials (RCTs) comparing PRF with other advanced

wound care modalities limits the generalizability of findings. Future studies should focus on elucidating the optimal protocols for PRF application, the duration of therapy, and its long-term efficacy in preventing ulcer recurrence.

Implications for clinical practice

The results of this case suggest that PRF has a dual role in promoting wound healing and preventing recurrence by addressing both local and systemic factors. PRF may also be particularly beneficial in resource-limited settings, given its low-cost preparation and reliance on autologous materials. However, its integration into standard practice requires further validation through robust clinical trials and consensus guidelines.[24,35-38]

Broader impacts

This case highlights the importance of adopting a holistic approach to managing chronic wounds. The patient's ability to alternate positions after retirement, coupled with systemic therapy, likely contributed to the successful outcome. Addressing lifestyle modifications, patient education, and long-term follow-up are

critical components of a comprehensive care strategy. Additionally, the use of PRF in other chronic wound etiologies, such as diabetic foot ulcers and pressure sores, warrants exploration to expand its therapeutic potential.

Conclusions

The application of platelet-rich fibrin (PRF) demonstrated remarkable healing in this 75-year-old female patient with a 30-year-old chronic venous ulcer, leading to 90% ulcer closure and significant pain relief over five months. The significant clinical improvement observed in this case underscores PRF's potential as an effective, biologically driven therapy for chronic venous insufficiency and associated leg ulcers. PRF offers a safe, biologically active, and effective treatment modality that stimulates angiogenesis, reduces inflammation, and accelerates tissue regeneration. By harnessing the body's regenerative capacity, PRF offers a promising avenue for improving patient outcomes while reducing the burden of chronic wound care on healthcare systems. Given its cost-effectiveness, ease of preparation, and patient tolerability, PRF should

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Conflict of interest
NONE DECLARED

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