

Evaluating the Effectiveness of Platelet-Rich Plasma (Prp) In Facial Scar Treatment: A Comprehensive Review

Abstract

Platelet-rich plasma (PRP) therapy has emerged as a versatile treatment modality across various dermatological applications including the management of atrophic acne scars. The unique composition of PRP, rich in growth factors and cytokines, facilitates tissue repair and regeneration, making it a promising option for improving skin texture and reducing scar visibility. This review synthesises current evidence on the efficacy of PRP in treating acne scars, comparing its effectiveness when used alone or in combination with other treatment modalities such as microneedling, fractional carbon dioxide laser, and subcision. Recent studies indicate that the combination of PRP with microneedling or laser treatments often results in superior clinical outcomes compared to monotherapy. These combinations enhance collagen production, accelerate wound healing, and modulate inflammatory responses, leading to more significant scar improvement and patient satisfaction. Additionally, newer techniques like the PSP (dot peeling, subcision, and PRP injection) have shown promising results in reducing scar depth and improving skin texture with minimal side effects. While PRP's efficacy in acne scar treatment is supported by numerous clinical trials and meta-analyses, there remains a need for standardisation in PRP preparation and application protocols to optimise outcomes. Furthermore, patient selection, scar type, and the timing of treatments are critical factors that influence the success of PRP therapy. This review underscores the potential of PRP as a valuable tool in dermatology, particularly for patients seeking minimally invasive treatment options with minimal downtime. Future research should focus on refining PRP protocols, exploring its role in combination therapies, and conducting

Case Report

¹Kristian Bugeja, ²Kirill Micallef Stafrace

¹Mater Dei Hospital, Msida, Malta, Europe

²Triagon Academy, Malta, Europe

***Correspondence:** Kristian Bugeja, Mater Dei Hospital, Msida, Malta, Europe.

Received: 28 Nov 2024; **Accepted:** 6 Dec 2024;

Published: 04 Dec 2023

Copyright: © Kristian B. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

large-scale randomised controlled trials to establish clear guidelines for its use in clinical practice. As the understanding of PRP's mechanisms of action continues to evolve, its application in dermatology is likely to expand, offering new hope for patients with challenging dermatological conditions such as atrophic acne scars.

Keywords

Platelet-Rich Plasma (PRP); Facial scar treatment; Acne scar therapy; PRP combination therapies; Skin texture improvement

Introduction

Platelet-rich plasma (PRP) therapy has rapidly emerged as a cutting-edge treatment in dermatology, including managing atrophic acne scars. PRP is an autologous serum, meaning it is derived from

the patient's own blood, which is processed to concentrate the platelets. These platelets are rich in growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β), and vascular endothelial growth factor (VEGF), all of which play crucial roles in tissue regeneration, wound healing, and collagen production. The process of PRP preparation involves drawing a small volume of the patient's blood, followed by centrifugation to separate the plasma from other blood components. The resulting platelet-rich concentrate is then re-injected into the targeted areas of the skin. PRP can be applied alone or in conjunction with other treatments like micro needling or fractional laser therapy, enhancing the penetration of growth factors into deeper skin layers and promoting more effective skin repair. In the treatment of atrophic acne scars, PRP's role is particularly valuable. These scars, which result from the loss of collagen and underlying tissue, are notoriously challenging to treat with conventional methods. PRP offers a minimally invasive alternative that leverages the body's natural healing processes to improve skin texture and reduce scar depth. Its use in combination therapies, such as with micro needling or fractional CO₂ laser, has been shown to significantly enhance clinical outcomes, making it a versatile and promising tool in dermatological practice.

Methodology

This review analyses data from clinical trials, comparative studies, and meta-analyses published between 1st January 2018 and 1st October 2024. It focuses on the outcomes of PRP therapy when used alone or alongside other modalities, including micro needling, fractional CO₂ lasers, and novel treatments such as PRF and PLT. The studies were selected based on their relevance to treating atrophic acne scars, with outcomes measured in terms of scar severity, patient satisfaction, and side effects.

Results

Efficacy of Prp In Acne Scar Treatment: Standalone Applications

Platelet-Rich Plasma (PRP) therapy has garnered significant interest for treating atrophic acne scars due to its high concentration of growth factors and cytokines, which promote skin repair, collagen synthesis, and tissue regeneration. This minimally invasive treatment harnesses the body's own healing mechanisms, offering patients a safer alternative to more aggressive procedures with fewer risks of adverse reactions and side effects. PRP's appeal lies in its autologous nature, meaning it is derived from the patient's own blood, thereby reducing the potential for allergic reactions and ensuring biocompatibility. Many studies demonstrate PRP's effectiveness in enhancing skin texture and reducing scar visibility, making it a valuable option for patients seeking a non-invasive approach. Despite these benefits, PRP protocols remain varied, and a lack of standardization continues to pose challenges. Current research indicates a pressing need for optimized protocols regarding PRP preparation, concentration, and application techniques to fully realize its therapeutic potential for acne scars.

Combination Approaches: Enhancing Prp With Micro needling And Fractional Co2 Laser Therapy

The efficacy of PRP is often amplified when combined with complementary treatment modalities, such as micro needling and fractional CO₂ laser therapy. Evidence suggests that combining PRP with micro needling can significantly enhance scar improvement and patient satisfaction over micro needling alone¹. PRP works synergistically by accelerating collagen production and enhancing skin repair processes. In tandem with fractional CO₂ lasers—well-regarded for their efficacy in addressing acne scars—PRP has shown to further improve outcomes. Studies by [6], found that adding PRP to fractional CO₂ laser treatments led to better scar reduction, heightened patient satisfaction, and accelerated recovery compared to laser therapy alone. Similarly [16]. split-

face study demonstrated that PRP not only increased scar improvement but also reduced post-treatment erythema and edema, facilitating a quicker recovery and improving overall patient experience.

Comparative Efficacy of Prp Versus Prf In Acne Scar Treatment

An alternative treatment, Platelet-Rich Fibrin (PRF), has recently gained attention and may present a viable alternative to PRP in specific cases [4]. PRF is produced through a slower centrifugation process without additives, resulting in a fibrin matrix that naturally traps platelets and white blood cells. This structural difference enables PRF to release growth factors gradually over an extended period, thereby supporting sustained tissue regeneration. In acne scar treatment, PRF has demonstrated considerable efficacy both as a standalone treatment and in combination with micro needling. Research suggests that PRF offers improved outcomes over PRP in enhancing skin texture and scar visibility, particularly when used with micro needling [4]. The continuous release of bioactive molecules by PRF supports ongoing collagen synthesis, wound healing, and anti-inflammatory effects, making it especially beneficial for patients with challenging, stubborn scars. As the underlying mechanisms of PRP and PRF are increasingly understood, these therapies may expand their role in dermatology, offering minimally invasive solutions with lasting results.

Innovative Techniques in Scar Treatment: Emerging Therapies

In pursuit of enhanced scar treatment outcomes, new methodologies continue to emerge, combining multiple therapeutic approaches for a more comprehensive effect. The PSP (Peeling, Submission, PRP) Technique integrates dot peeling, submission, and PRP injections, providing a multifaceted approach that targets various layers of skin damage in atrophic acne scars [14]. This innovative method has shown marked improvements across different scar types with minimal side effects, underscoring PSP's

potential as an advanced, layered treatment strategy. Another recent advancement, Platelet-Lyophilized Treatment (PLT) addresses some of PRP's limitations by enabling a long-term, standardized preparation of platelets [15]. PLT not only supports faster recovery and enhances skin texture but also offers a practical solution for clinical settings with its stability in storage and consistency in outcomes. Additionally, the combination of Autologous Fat, Stromal Vascular Fraction (SVF) Cells, and PRP has shown promise. Studies found that this combination significantly improved skin elasticity, reduced pore size, and enhanced skin texture, with SVF cells contributing stem cell-like properties that stimulate collagen production, fibroblast activity, and angiogenesis, offering a robust method for comprehensive tissue regeneration [5].

Safety and Patient Satisfaction in Prp And Combination Treatments

PRP treatments have consistently demonstrated a favorable safety profile, with minimal side effects reported, such as mild erythema, edema, and temporary discomfort at the application site. This high level of safety is particularly appealing to patients who prefer minimally invasive treatments that offer rapid recovery and low risk. PRP is well-tolerated by patients and generally yields high satisfaction levels, especially when used as part of a combination therapy [18]. Patient satisfaction is a key consideration in scar treatment, as the psychological impact of acne scars on self-esteem and quality of life can be profound. Studies have demonstrated that patients receiving PRP in combination with other treatments, such as submission or fractional CO2 laser therapy, report significantly higher satisfaction compared to those receiving monotherapy [14,18]. These findings reinforce the importance of combination treatments in enhancing not only the clinical outcomes but also the subjective satisfaction and overall experience for patients undergoing acne scar treatments.

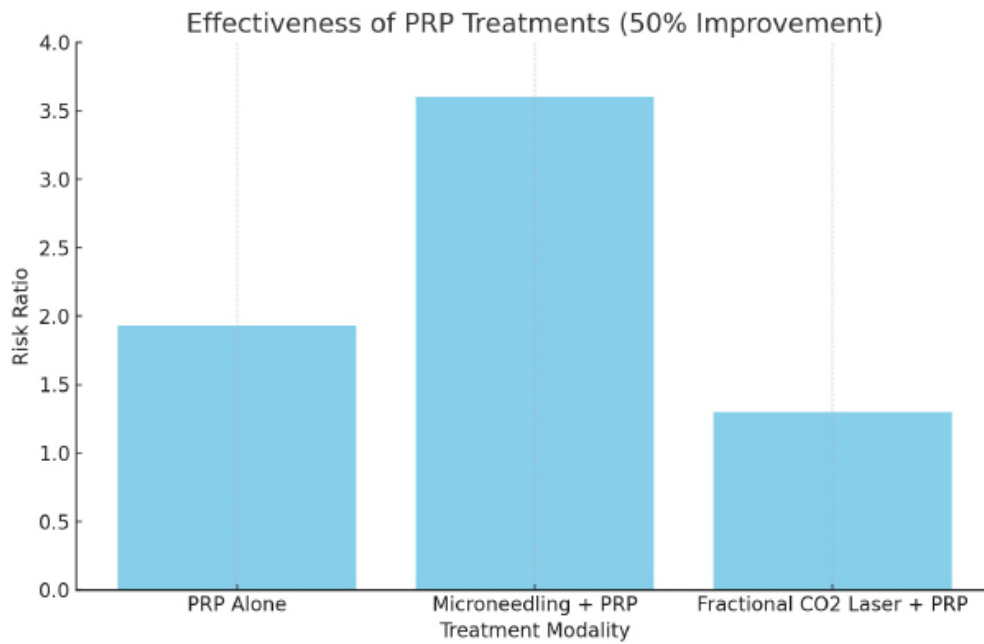


Figure 1: Effectiveness of PRP Treatments (50% Improvement) adopted from Huang et al., Aesthetic Plastic Surgery, 2019

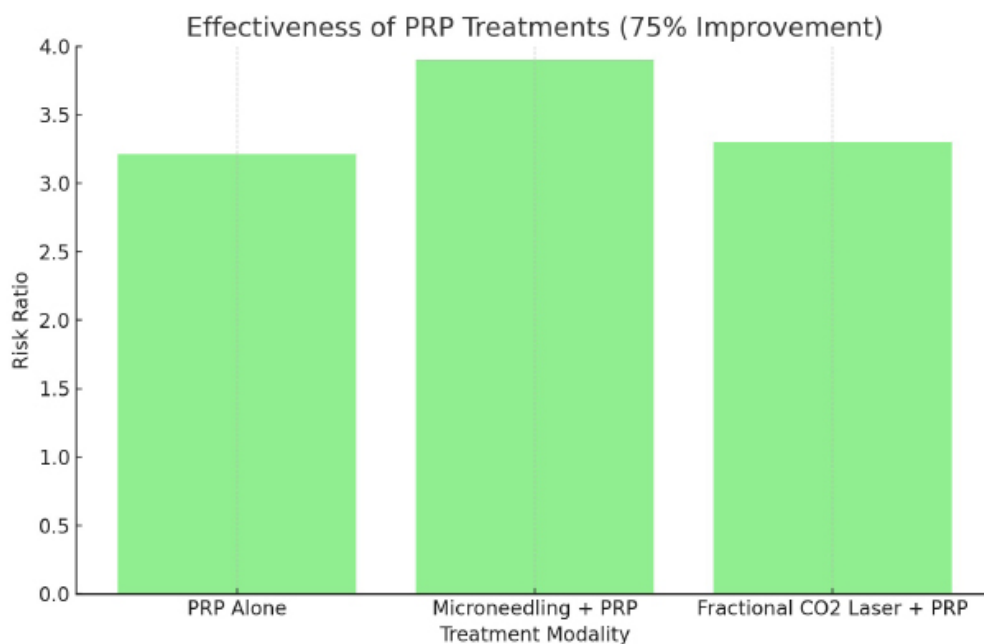


Figure 2: Effectiveness of PRP Treatments (75% Improvement) adopted from Huang et al., Aesthetic Plastic Surgery, 2019

Discussion

The findings from the reviewed studies underscore the significant potential of platelet-rich plasma (PRP) in the treatment of atrophic acne scars. PRP, which is rich in growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β), and vascular endothelial growth factor (VEGF), plays a critical role in tissue regeneration, wound healing, and collagen synthesis. These properties make PRP particularly effective in addressing the complex pathology of atrophic acne scars, which involve the loss of dermal collagen and subcutaneous tissue [1-3]

One of the most notable advantages of PRP therapy is its ability to enhance the efficacy of other treatments, such as micro needling and fractional CO₂ laser therapy. The combination of PRP with these modalities not only improves scar texture and depth but also accelerates the healing process, reduces downtime, and minimizes the risk of adverse effects such as prolonged erythema and hyperpigmentation. This is particularly important for patients with darker skin types, who are more prone to post-inflammatory hyperpigmentation following aggressive dermatological treatments [9,15,16].

The results of split-face studies, where one side of the face was treated with PRP in combination with another modality while the other side served as a control, consistently demonstrate superior outcomes on the PRP-treated side. These studies reveal that patients treated with PRP in combination with micro needling or laser therapy often experience a 20-30% greater improvement in scar severity and skin texture compared to those receiving monotherapy. Moreover, patient satisfaction scores are significantly higher for the PRP-treated areas, with many studies reporting over 90% satisfaction rates [14,18].

The PSP technique, which combines dot peeling, submission, and intradermal PRP injection, has also shown promise as a comprehensive approach to treating atrophic acne scars. The technique's ability to target different layers of the skin through a combination of mechanical and biochemical

mechanisms results in a holistic improvement in scar appearance. The statistically significant improvements reported in these studies ($p \leq 0.001$) suggest that the PSP technique could be a valuable addition to the dermatologist's toolkit, particularly for patients with severe scarring [13].

Despite these promising results, there are still several challenges and areas for further research. One of the key issues is the lack of standardization in PRP preparation and application protocols. Variability in PRP concentration, the volume of blood used for preparation, the use of activators, and the frequency and timing of treatments can all influence the outcomes. Establishing standardized protocols would help ensure consistency and reliability in clinical results, making it easier for clinicians to predict and optimize patient outcomes [11].

Another important consideration is patient selection. While PRP has been shown to be effective in a wide range of patients, certain factors such as skin type, scar age, and the underlying cause of acne may influence the efficacy of the treatment. Future studies should aim to identify the patient populations that are most likely to benefit from PRP therapy, as well as those who may require alternative or adjunctive treatments [7].

Furthermore, while the reviewed studies provide valuable insights, many of them have limitations, such as small sample sizes, short follow-up periods, and a lack of long-term data. Larger, well-designed randomized controlled trials with longer follow-up periods are needed to confirm the long-term efficacy and safety of PRP in the treatment of acne scars. Additionally, exploring the molecular mechanisms underlying PRP's effects on scar tissue could provide a deeper understanding of its therapeutic potential and lead to the development of even more targeted treatments [19].

In conclusion, PRP represents a powerful tool in the management of atrophic acne scars, offering significant benefits both as a standalone treatment and in combination with other modalities. Its ability to enhance tissue regeneration, improve skin texture,

and reduce downtime makes it an attractive option for patients seeking effective, minimally invasive treatment options. However, to fully realize the potential of PRP, further research is needed to standardize protocols, refine patient selection criteria, and explore its long-term effects. As the field of dermatology continues to evolve, PRP is likely to play an increasingly important role in the comprehensive management of acne scars and other dermatological conditions [8].

Conclusion

PRP is a valuable tool in managing facial scarring, particularly atrophic acne scars. It offers significant improvements in scar texture and patient satisfaction, especially when combined with other modalities such as micro needling, fractional CO2 lasers, and autologous fat grafting. Emerging therapies like PRF and PLT are poised to further enhance the efficacy of PRP treatments, offering new opportunities to

optimise patient outcomes. Future research should focus on standardising PRP protocols and exploring the full potential of these innovative therapies in scar management.

Abbreviations

- PRP: Platelet-Rich Plasma
- PRF: Platelet-Rich Fibrin
- PLT: Platelet-Lyophilized Treatment
- SVF: Stromal Vascular Fraction
- RR: Risk Ratio
- PSP: Peeling, Subcision, PRP
- CO2: Carbon Dioxide

References

1. Pindborg, Jens J., and Satyavati M. Sirsat. "Oral s1. Hesseler, Michael J., and Nikhil Shyam. "Platelet-rich plasma and its utility in the treatment of acne scars: A systematic review." *J Am Acad Dermatol.* 6 (2019): 1730-1745.
2. Huang YC, Chang CC, Tsai YR, Wang CH. Meta-analysis of the effectiveness of platelet-rich plasma in treating acne scars. *Aesthetic Plast Surg.* 2019;43(4):1101-1110.
3. Emer, Jason. "Platelet-rich plasma (PRP): current applications in dermatology." *Skin therapy letter.* 5 (2019): 1-6.
4. Diab, Nagwa Ali Fahmy, Al-shimaa M. Ibrahim, and Aya Mohamed Abdallah. "Fluid platelet-rich fibrin (PRF) versus platelet-rich plasma (PRP) in the treatment of atrophic acne scars: a comparative study." *Arch. Dermatol. Res.* 5 (2023): 1249-1255.
5. Nilforoushzadeh, Mohammad Ali, Maryam Heidari Kharaji, Shiva Alavi and Maryam Nouri et al. "Transplantation of autologous fat, stromal vascular fraction (SVF) cell, and platelet-rich plasma (PRP) for cell therapy of atrophic acne scars: Clinical evaluation and biometric assessment." *J. Cosmet. Dermatol.* 5 (2022): 2089-2098.
6. Zhao, Zixiao, Tao Wang, Wei Li and Qi Liang et al. "To evaluate the efficacy and safety of laser interventions for facial acne scars: a systematic review and Bayesian network meta-analysis." *Ann. Transl. Med.* 24 (2022).
7. Ismail, Sahar A., Nanis AH Khella, and Doaa AE Abou Taleb. "Which is more effective in atrophic acne scars treatment microneedling alone or platelet rich plasma alone or combined both therapeutic modalities" *Dermatol. Ther.* 12 (2022): e15925.
8. Zhang, Meijie, Gajin Park, Bingrong Zhou, and Dan Luo. "Applications and efficacy of platelet-rich plasma in dermatology: A clinical review." *J. Cosmet. Dermatol.* 5 (2018): 660-665.
9. Min, Seonguk, Ji Young Yoon, Seon Yong Park and

- Jungyoon Moon et al. "Combination of platelet rich plasma in fractional carbon dioxide laser treatment increased clinical efficacy of for acne scar by enhancement of collagen production and modulation of laser-induced inflammation." *Lasers Surg Med.* 4 (2018): 302-310.
10. Manishaa, V. "Evaluation of the Efficacy of Platelet-Rich Plasma Injections with and Without Microneedling for Managing Atrophic Facial Acne Scars: A Prospective Comparative Study." *Cureus.* 5 (2024).
 11. Cruciani, Mario, Francesca Masiello, Ilaria Pati and Simonetta Pupella, et al. "Platelet rich plasma use for treatment of acne scars: an overview of systematic reviews." *Blood Transfusion* 22, no. 3 (2024): 226.
 12. Kang, Cheng, and Dakai Lu. "Combined effect of microneedling and platelet-rich plasma for the treatment of acne scars: a meta-analysis." *Front. Med.* 8 (2022): 788754.
 13. Ibrahim, Zeinab A., and Lamia H. Elgarhy. "Evaluation of PSP technique including dot peeling, subcision and intradermal injection of PRP in the treatment of atrophic post-acne scars." *Dermatol. Ther.* 5 (2019): e13067.
 14. Nandini A. S, Sana M. Sankey, C. S. Sowmya, BC Sharath Kumar. "Split-face comparative study of efficacy of platelet-rich plasma combined with microneedling versus microneedling alone in treatment of post-acne scars." *J Cutan Aesthet Surg.* 1 (2021): 26-31.
 15. Huang, Chieh-Chen, and Haw-Yueh Thong. "Rapid wound healing and acne scar improvement after ablative fractional carbon dioxide laser treatment combined with the application of platelet-lyophilized treatment (PLT)." *Clinical, Clin. Cosmet. Investig. Dermatol.* (2021): 715-721.
 16. Sharma, Saurabh, Jasleen Kaur, Tanreet Kaur, and Roopam Bassi. "Fractional carbon dioxide laser versus combined fractional carbon dioxide laser with platelet-rich plasma in the treatment of atrophic post-acne scars: a split-face comparative study." *J Cutan Aesthet Surg.* 1 (2021): 41-46.
 17. Nassar A, El-Shaarawy W, Salah E. Autologous plasma gel injection combined with scar subcision is a successful technique for atrophic post-acne scars: a split-face study. *J Dermatol Treat.* 2022;33(2):829-835
 18. Gandhi, Riddhi N., and Meena Bhaskar Makhecha. "A split face study to compare the efficacy of platelet rich plasma versus normal saline injections in acne scars and to assess the utility of ultrabiomicroscopic sonography in evaluation of treatment response." *J Cutan Aesthet Surg.* 4 (2022): 375-380.
 19. Long T, Gupta A, Ma S, Hsu S. Platelet-rich plasma in noninvasive procedures for atrophic acne scars: a systematic review and meta-analysis. *J Cosmet Dermatol.* 2020;19(4):836-844
 20. Ibrahim, Zainab A., Shereen F. Gheida, Amira R. El-Halaby and Ghada FR Hassan et al. "Platelet rich plasma injection versus topical erythromycin 2% in treatment of acne vulgaris." *Dermatol. Treat.* 2 (2022): 946-953.
 21. Tian, Ju, Xiao Xuan Lei, Li Xuan and Jian Bing et al. "Application of plasma-combined regeneration technology in managing facial acne scars." *J. Cosmet. Laser Ther.* 3 (2019): 138-144.
 22. Gawdat, Heba I., Rehab A. Hegazy, Marwa M. Fawzy, and Marwa Fathy. "Autologous platelet rich plasma: topical versus intradermal after fractional ablative carbon dioxide laser treatment of atrophic acne scars." *Dermatol. Surg.* 2 (2014): 152-161.

Citation: Bugeja Kristian, Micallef Stafrace Kirill. "Evaluating the Effectiveness of Platelet-Rich Plasma (PRP) in Facial Scar Treatment: A Comprehensive Review." *J Aesthetic Surg Med* (2023): 103. DOI: [10.59462/JASM.1.1.103](https://doi.org/10.59462/JASM.1.1.103)