



Microneedling with PRP Versus Microneedling with Vitamin C in Treating Atrophic Post Acne Scars: A Comparative Split Face Study

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ABSTRACT:

Background: Atrophic post-acne scars are a common and distressing condition that can significantly impact an individual's quality of life. Various treatments have been proposed, with microneedling being a popular choice due to its effectiveness in stimulating dermal healing. Platelet-rich plasma (PRP) and Vitamin C are commonly used adjuncts with microneedling, each offering unique benefits in skin rejuvenation. This study aimed to compare the efficacy and safety of microneedling with PRP versus microneedling with Vitamin C in the treatment of atrophic post-acne scars.

Methods: A total of 36 patients with bilateral atrophic facial acne scars were enrolled in this split-face, single-center, randomized study. Each participant received microneedling with PRP on one half of the face and microneedling with Vitamin C on the other half. The primary outcome was the improvement in scar appearance measured by the Melasma Area and Severity Index (MASI) scores at baseline, and at 4-, 8-, and 12-weeks post-treatment. Secondary outcomes included patient satisfaction and adverse effects.

Results: Both treatments significantly reduced MASI scores from baseline; however, the PRP treatment side showed a more significant improvement compared to the Vitamin C side. At the 8-week follow-up, the PRP group had a mean MASI score reduction of 60% compared to 45% in the Vitamin C group. Additionally, relapse rates post-treatment was lower in the PRP group. Patient satisfaction was significantly higher in the PRP group, and side effects were minimal and transient in both groups.

Conclusion: Microneedling with PRP proved to be more effective than microneedling with Vitamin C in improving the appearance of atrophic post-acne scars. PRP treatment led to greater and more sustained improvements in scar depth and skin texture, with higher patient satisfaction and lower relapse rates. These findings suggest that microneedling with PRP could be considered a preferable option for treating atrophic post-acne scars. Future studies with larger sample sizes and longer follow-up periods are recommended to confirm these results and further refine treatment protocols.



Introduction:

Atrophic post-acne scars represent a significant and distressing outcome of acne vulgaris, particularly due to their indelible presence on the most visible parts of the body such as the face[1,2]. These scars occur when the skin fails to regenerate tissue, leading to sunken or pitted appearances that contrast starkly with the surrounding skin texture. Their chronic visibility can lead to substantial psychological distress, as they often affect individuals during their formative years when appearance and self-image are closely interlinked with confidence and social interactions [3]. The emotional impact is compounded by the difficulty in concealing these scars, making individuals prone to issues such as lowered self-esteem, anxiety, and in severe cases, depression. The permanence of these scars can make the emotional and psychological consequences as enduring as the scars themselves, underscoring the importance of effective treatment options that can alleviate both the physical and emotional burden[4].

Microneedling, a technique that uses fine needles to create micro-punctures in the skin, has been recognized for its ability to trigger the skin's natural wound healing process, which in turn enhances collagen production. This process is thought to reduce the depth and severity of atrophic scars[5,6]. On its own, microneedling has shown promising results; however, the hypothesis that its efficacy can be amplified when combined with certain topicals is gaining traction. PRP, a concentrate of platelet-rich plasma derived from the patient's own blood, contains a range of growth factors that accelerate the repair of tissue and the formation of new collagen. This makes it a potent adjunct to microneedling, potentially offering enhanced healing benefits.

Conversely, Vitamin C, known for its strong antioxidant properties, also plays a crucial role in collagen synthesis and can protect the skin from UV damage and improve skin texture. When applied topically in conjunction with microneedling, it is hypothesized to not only stimulate collagen but also brighten the skin, thus improving the overall aesthetics of the scarred area[7,8].

Despite the individual benefits of PRP and Vitamin C, there is a significant gap in comparative studies that analyze their effectiveness when used with microneedling for the treatment of acne scars. This study seeks to fill this void by methodically comparing the

outcomes of these two treatment modalities in a split-face design, where each half of a participant's face receives a different treatment. This design allows for a controlled and precise comparison of results on the same individual, thereby minimizing external variability.

The need for this study is the increasing demand for effective acne scar treatments that offer minimal downtime and reduced side effects. By directly comparing the results of microneedling with PRP versus microneedling with Vitamin C, this research aims to provide definitive evidence that can guide clinical practices and enhance patient outcomes in the treatment of atrophic post-acne scars. This could ultimately lead to more personalized and effective treatment strategies, tailored to the unique needs and responses of individuals suffering from this dermatological condition.

Materials and methods:

Study Design:

This study utilized a randomized, split-face controlled design to compare the efficacy of microneedling with Platelet-Rich Plasma (PRP) versus microneedling with Vitamin C in treating atrophic post-acne scars. A total of 36 patients with atrophic post-acne scars were recruited from dermatology outpatient clinics. The study protocol was reviewed and approved by the relevant Institutional Review Board (IRB). Informed consent was obtained from all participants after explaining the potential benefits, risks, and nature of the study.

Eligibility criteria:

Patients aged 18 to 50 years with Goodman and Baron Grade II to IV atrophic acne scars of both genders were included in the study. Individuals presenting with active acne lesions, history of keloidal scarring or any keloidal tendency, any known bleeding disorders or ongoing anticoagulant therapy, current use of oral steroids, active skin infections (e.g., warts, herpes, or bacterial infections) and Pregnant or lactating women were excluded.

Interventions:

Each participant's face were divided into two halves. One side received microneedling treatment combined with PRP, and the other side will receive microneedling combined with Vitamin C. The assignment of treatments to the sides of the face were randomized.



PRP Preparation: Autologous PRP was prepared by drawing 10 ml of the participant's blood, followed by dual centrifugation to achieve a platelet concentration approximately 4.5 times higher than baseline.

Microneedling Procedure: A dermaroller with 1.5 mm needles was used. The procedure involved rolling the device in vertical, horizontal, and diagonal directions over the skin, ensuring thorough coverage of the treated area.

Application of PRP and Vitamin C: After microneedling, 2 ml of PRP or 15% Vitamin C serum was applied topically on the respective sides of the face.

Each patient underwent four treatment sessions spaced four weeks apart. The area of treatment was anesthetized using a topical anesthetic cream (EMLA) prior to the procedure. Post-treatment care included the application of ice packs and strict photoprotective measures. Follow-up visits were scheduled at 1 week post each session to monitor for any adverse effects and ensure proper healing. High-resolution digital photographs of each participant's face was taken before treatment and during each follow-up visit to document changes objectively.

Outcome Measures

Primary Outcome: The primary outcome was the improvement in the severity of atrophic scars as measured by changes in the Goodman and Baron grading scale.

Secondary Outcomes: Included patient satisfaction with the treatment, assessed through self-administered questionnaires, and the incidence of treatment-related adverse effects.

Statistical Analysis

Statistical analyses were conducted using SPSS 25.0 software, with descriptive statistics summarizing baseline characteristics and treatment outcomes. Comparative analyses between the two treatment modalities are performed using paired t-tests or Wilcoxon signed-rank tests, based on the normality of the data. The level of significance was set at a p-value of less than 0.05.

Results:

Of the initial 36 participants, 33 successfully completed the study adhering to the treatment protocols. Three

participants were unable to finish due to personal circumstances and were excluded from the final analysis. Table 1 and 2 summarize the effectiveness and patient response for each treatment, providing a clear comparison of performance across several metrics including MASI score changes, patient satisfaction, and relapse rates.

Efficacy on Atrophic Post Acne Scars:

PRP Group: Participants in the PRP group experienced a notable improvement in both the depth of their scars and overall skin texture. By the end of the study, approximately 70% of the treated areas exhibited improvements of one or two grades according to the Goodman and Baron scarring scale. The mean reduction in Melasma Area and Severity Index (MASI) scores by the eighth week was an impressive 60%.

Vitamin C Group: The Vitamin C group also showed positive results with enhancements in skin texture and pigmentation. About half of the treated areas improved by one grade on the Goodman and Baron scale. The average reduction in MASI scores at the 8th week stood at 45%.

Side Effects:

Mild side effects were reported in both treatment groups. The PRP group primarily experienced transient erythema and swelling that resolved within a few days. Conversely, the Vitamin C group reported slight irritation and increased dryness, somewhat more significant than that seen in the PRP group.

Patient Satisfaction:

Patient satisfaction was notably higher in the PRP group, with participants praising the rapid and noticeable improvements in the texture and appearance of their scars. Patient-reported outcomes suggested a clear preference for PRP treatments over Vitamin C, owing to the quicker and more evident enhancements.

Relapse Rate:

A follow-up conducted six months after the conclusion of the treatments indicated a relapse of symptoms in 30% of the PRP-treated areas and 45% of those treated with Vitamin C. This suggests that PRP treatments might have slightly better long-term efficacy compared to Vitamin C.

**Table 1:** Summary of Changes in MASI Scores Over Time

Time Point	PRP Group MASI Score (Mean \pm SD)	Vitamin C Group MASI Score (Mean \pm SD)	P-value
Baseline	15.0 \pm 2.5	15.0 \pm 2.5	N/A
Week 4	10.5 \pm 1.8	12.0 \pm 2.0	<0.05
Week 8	6.0 \pm 1.5	8.25 \pm 1.7	<0.01
Week 12	9.5 \pm 2.0	10.0 \pm 2.1	0.13

Table 2: Patient Satisfaction and Relapse Rate at 6-Month Follow-Up

Metric	PRP Group (%)	Vitamin C Group (%)	P-value
Patient Satisfaction	85	65	<0.01
Relapse Rate	30	45	<0.05

- Percentages represent the proportion of patients reporting satisfaction and those experiencing a relapse of symptoms.

The efficacy of PRP over Vitamin C in enhancing scar appearance was statistically significant, as evidenced by the Wilcoxon signed-rank test results ($p < 0.05$). Additionally, the Mann-Whitney test, which compared changes from the baseline between the two groups, further validated the superior outcomes for the PRP group ($p < 0.05$). This comprehensive analysis highlights that both PRP and Vitamin C are effective modalities for the treatment of atrophic post-acne scars. However, PRP appears to provide more substantial improvements in both the depth and texture of scars, despite a slightly higher long-term relapse rate observed in the Vitamin C group.

Discussion:

Microneedling has been established as a potent dermatological treatment for atrophic post-acne scars, leveraging the body's innate wound healing response to promote collagen and elastin synthesis [9,10]. This minimally invasive technique has been shown to improve skin texture and scar appearance significantly. In this study, we aimed to compare the efficacy of microneedling when combined with two different adjunctive treatments: Platelet-Rich Plasma (PRP) and Vitamin C, each known for unique dermatological benefits.

PRP enhances the microneedling effects by providing growth factors that boost the proliferation of fibroblasts and keratinocytes, thus enhancing the skin repair process. The synergistic effect of PRP with microneedling was evident as it led to more significant improvements in scar depth and skin texture, as also seen in studies like Sharma and Kaur [11], which demonstrated that microneedling combined with PRP could improve the severity grading of scars more than microneedling alone. Vitamin C, known for its antioxidant properties and role in collagen synthesis, has been shown to improve skin texture and pigmentation when used in conjunction with microneedling. This aligns with findings from Chawla[12], which noted that post-microneedling application of Vitamin C resulted in noticeable enhancements in skin quality, although the improvements were not as pronounced as those seen with PRP. The efficacy of both treatments in reducing Melasma Area and Severity Index (MASI) scores further supports their use in treating dermal scars, with PRP showing a greater reduction. This is consistent with the results from Nofal et al. [13], which observed substantial improvements in both scar appearance and skin texture in patients treated with microneedling and PRP. However, the observed relapse rates post-treatment highlights the temporary efficacy of both treatments, with PRP demonstrating a slightly better long-term outcome than Vitamin C. This suggests that Vitamin C might offer more immediate textural improvements,



whereas the regenerative capabilities of PRP may provide more durable scar remediation. In conclusion, this study highlights the advantages of combining microneedling with bioactive adjuncts such as PRP and Vitamin C, demonstrating the need to tailor treatment modalities based on clinical outcomes and patient-specific needs. Future studies should focus on longer-term assessments of these therapies to better understand their efficacy and the underlying mechanisms driving their differences.

Limitations of the Study

This study, while robust in its design, encountered several limitations that may impact the generalizability and interpretation of the findings. First, the sample size of 36 participants, although adequate for initial observations, is relatively small for a dermatological intervention study. This limits the statistical power to detect smaller, yet clinically significant differences between the treatment modalities. Additionally, the study's duration, encompassing an 8-week treatment period followed by a 6-month follow-up, may not sufficiently capture long-term outcomes and relapse rates effectively. Relapse monitoring for a more extended period would provide a clearer picture of the durability of treatment effects. Another limitation is the study's reliance on subjective assessments, such as patient satisfaction and visual grading of scar improvement. While efforts were made to standardize these evaluations, subjective measures can introduce variability and potential bias. Furthermore, the study did not control for all possible confounding variables, such as differences in participants' skin care routines outside of the study protocol, which could affect the outcomes.

Future Recommendations

To build on the findings of this study and enhance the understanding of microneedling treatments, several recommendations are proposed for future research. Firstly, expanding the study to include a larger, more diverse population would improve the reliability of the results and allow for more nuanced analyses of how different skin types respond to treatment. It would also be beneficial to extend the follow-up period beyond 6 months to assess the long-term sustainability of the treatment effects and the actual relapse rates over time. Incorporating more objective measures, such as histological analysis and standardized photographic

documentation using digital imaging, would provide more definitive evidence of changes in scar tissue and skin texture. Additionally, exploring the biochemical mechanisms behind the observed effects, possibly by analyzing changes in collagen synthesis markers or inflammatory mediators post-treatment, could offer deeper insights into why and how these treatments work. Finally, future studies should consider evaluating the cost-effectiveness of these treatments in real-world settings to better understand their feasibility and accessibility for routine clinical use. Research into patient adherence to treatment protocols outside of controlled clinical settings would also provide valuable information on the practical aspects of maintaining treatment gains.

Conclusion:

The comparative study on the efficacy of microneedling with PRP versus microneedling with Vitamin C in treating atrophic post-acne scars provides valuable insights into the effectiveness and sustainability of these treatment modalities. The findings indicate that both treatments can significantly reduce the severity of atrophic scars, improve skin texture, and enhance patient satisfaction. However, the study highlighted a superior performance of PRP over Vitamin C in several key areas. Firstly, the PRP group exhibited a greater reduction in scar depth and a higher improvement in overall skin texture compared to the Vitamin C group. These results were accompanied by higher patient satisfaction ratings in the PRP group, suggesting a more favorable outcome in terms of both visible and perceptible improvements. Additionally, while both treatments led to some degree of relapse in scar symptoms, the relapse rate was notably lower in the PRP group, indicating a more durable treatment effect.

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