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A Comparison of Efficacy of Platelet-Rich Plasma (PRP) and Platelet-Rich Fibrin (PRF) in the treatment of Post-Acne Scars

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ABSTRACT

Objective: To compare the efficacy of Platelet-Rich Plasma (PRP) and Platelet-Rich Fibrin (PRF), in the treatment of post-acne scars. **Study design:** Prospective, split-face, randomized controlled trial. **Place and duration of study:** Department of Dermatology, KRL Hospital, Islamabad, from April 2024 to September 2024. **Methods:** A total of 50 patients aging between 18-45 years, reporting with post-acne scars of varying severities were included in this study. Left sides of faces of all study participants were selected as PRP side where intradermal injections of platelet-rich plasma (PRP) at 0.1 mL per injection were injected into atrophic scars, while right sides of faces were selected as PRF side where intradermal injections of platelet-rich fibrin (PRF) at 0.1 mL per injection were injected into atrophic scars (1.5 to 2 cm apart). Subsequently, all the patients were treated with a dermapen (micro-needling) in four directions. Assessment of severity of acne scars was done by employing the Goodman and Baron's Global Scarring Grading System. The primary outcome was the improvement in post-acne scars assessed by this grading system four weeks after the last session. **Results:** Mean age of study participants was 27.68±4.93 years with age ranging from 19 to37 years. Male gender was 58% of total study population while female gender was 42%. The results of the primary outcomes of the study showed that PRF was significantly more effective than PRP in the treatment of post-acne scars, as evaluated by Global Scarring Grading System scores (p=0.001) and quartile grading (p=0.007). **Conclusion:** The method of PRF is significantly more effective than PRP is the treatment of acne scars. The two treatments are equally acceptable regarding the incidence of adverse events.

INTRODUCTION

Acne Vulgaris is a frequently reported dermatological condition and is particularly reported during the age of adolescence and early adulthood, in all ethnicities around the globe.[1] The prevalence is estimated from 35% to 90% in different surveys conducted in different regions and countries, with potential onset during the preadolescent period, at the ages of 7-12 years.[2]

Acne is in fact a disorder of the pilosebaceous unit, and predominantly manifest on face, back, and chest. The condition results in post-inflammatory sequelae, including macules, pigmentary alterations, and potential scarring. These permanent changes on the skin not only compromise aesthetic appearance but also impact patients' psychological well-being, including self-esteem and social interactions.[3]

While the active phase of acne often subsides, many individuals are left with disfiguring post-acne scars which result from disrupted inflammatory processes and abnormal wound healing, causing irregular collagen deposition. These scars are present in diverse morphologies including icepick, boxcar, and rolling and offers a potential therapeutic challenge to the dermatologists. Effective treatment of acne scars is not only a cosmetic concern but also a crucial aspect of enhancing the quality of life for affected individuals.[4]

The studies done with conventional post-acne scar therapies like chemical peels, microdermabrasion, and laser resurfacing have shown limited efficacy, along with the risks of tissue damage. These disadvantages have always led the researchers to work on innovative treatment options that can target the underlying pathological processes involved in scar formation.[5]

With the advancement of regenerative medicine techniques, body's natural healing processes are utilized to promote regeneration. Platelet-derived therapies (PDT), specifically Platelet-Rich Plasma (PRP) and Platelet-Rich Fibrin (PRF), are among the biological interventions that have proven their benefits in dermatological rehabilitation processes.[6]

PRP, involves concentrated autologous platelets that release multiple growth factors, including Platelet-Derived Growth Factor (PDGF), Transforming Growth Factor-β (TGF-β), and Vascular Endothelial Growth Factor (VEGF),

which support collagen synthesis, improve tissue regeneration and regulate inflammatory responses. Studies have shared desirable efficacy in the management of post-acne scars, however, some limitations such as need for anticoagulants and rapid release of growth factors are reported with these techniques.[7,8]

PRF, is a recent advancement, and considered as a second-generation platelet concentrate. PRF doesn't need anticoagulants and provides a three-dimensional fibrin matrix, enabling a more controlled and sustained release of these growth factors. This architectural configuration offers a comprehensive and prolonged tissue regeneration.[9,10]

Studies have shared satisfactory results with these PDTs, however, investigations on comparative efficacy of these methods are limited. Specifically, our local data lacks the work focused on the efficacy of these techniques in post-acne scars.

This study was, therefore, planned to compare the efficacy of PRP and PRF, in the treatment of post-acne scars in patients presenting to our tertiary care hospital in Islamabad. The results of our study will help our dermatologists to optimize their therapeutic strategies while dealing with cases of post-acne scars.

Methods

This prospective, split-face, randomized controlled trial was conducted at the Department of Dermatology, KRL Hospital, Islamabad, from April 2024 to September 2024, over a period of 6 months. The approval of conducting the study was received from the ethical committee of the KRL Hospital (Ref ERC: KRL-HI-PUB-ERC/Oct23/32).

Sample size was calculated using WHO calculator as per following details:

alpha = 5% (two sided), Power= 80%.

p1 (Excellent response with PRP) = 20%, p2 (Excellent response with PRF) = 46.7%.[11]

Hence the estimated sample size: n1= 48, n2 = 48.

A total of 50 patients aging between 18-45 years, reporting with any type of post-acne scars of varying severities, and no recent history of chemical peeling, laser therapy, or topical treatment within the last three months, were included in this study through consecutive sampling.

Exclusion criteria was set as patients with coexisting active skin diseases like chronic eczema, melasma, chronic urticaria, systemic diseases, bleeding disorders, those on anticoagulants, and individuals with psychiatric problems.

Informed written consent was received from all the study participants after explaining the purpose, procedures and risks involved in the procedure.

To minimize the chances of bias in the outcomes caused by endogenous factors of the study participants, both treatments were applied to each individual in a way that left sides of the faces of all study participants was selected as PRP side while right sides of the faces of all study participants was selected as PRF side.

A dermatological assessment was conducted, involving medical history and detailed clinical examination to categorize and classify acne scarring specifically identifying and differentiating between icepick, boxcar, and rolling scar types. A topical anesthetic cream composed of lidocaine and prilocaine was applied 45 minutes prior to the treatment session, to the entire facial area to provide optimal numbing. The facial surface was thoroughly disinfected using alcohol before starting the procedure to ensure a sterile treatment environment.

In PRP side , intradermal injections of PRP (at 0.1 mL per injection) were injected into atrophic scars, spaced 1.5 to 2 cm apart, subsequently treated with a dermapen (micro-needling) in four directions; vertical, horizontal, and diagonal.

On PRF side, intradermal injections of PRF (at 0.1 mL per injection) were injected into atrophic scars, spaced 1.5 to 2 cm apart, subsequently treated with a dermapen (micro-needling) in four directions; vertical, horizontal, and diagonal.

Each treatment was performed in 3 sessions with 4 week interval. Assessment was done at the follow up visit planned after 4 weeks of completion of treatment.

For the preparation of PRP, standardized blood collection protocol was used which involved 10 mL venipuncture with EDTA anticoagulation. There was two-stage centrifugation at 900 rpm (5 minutes) and 2,000 rpm (15 minutes) which effectively separated cellular components, and provided 2 mL of platelet-rich plasma. Calcium chloride (10%) was added to help in activation of platelets, triggering growth factor release and thereby initiating the regenerative healing process. For the preparation of PRF, a single-spin centrifugation of 10 mL venous blood in a plain glass tube without anticoagulant was spun at 700 rpm for 3 minutes. This yielded yellow to orange-colored upper layer, fluid PRF, providing approximately 1 mL concentrated platelet-rich preparation.

Severity and improvement of acne scars were evaluated by employing the Goodman and Baron's Global Scarring Grading System (GSGS).[12] Quartile grading scale was utilized to grade the improvement (>75% meant excellent, 50-74% meant very good, 25-49% meant good and <25% meant as poor improvement).

Patients rated their level of satisfaction using the following categories as poor, good, very good, and excellent. All the patients also rated their pain on a scale of 0 to 10, where 0 meant no pain and 10 meant the worst pain.

The primary outcome of the study was the improvement in post-acne scars assessed by GSGS, four weeks after the last session. The secondary outcomes was patient satisfaction level for the treatment results, as excellent, very good, good or poor. Adverse events, were also recorded during or after the treatment in both the sides.

The data was analyzed using SPSS version 25. Quantitative variables were presented as Mean ±SD while qualitative variables were expressed as frequency and percentages. The significance of difference between the two sides was assessed by applying chi-square test and independent t-test taking a p-value of<0.05 as significant.

RESULTS

The age of patients in this study was 27.68±4.93 years with

an age range of 19-37 years. Male gender was 58% of total study population while female gender was 42%. The demographics and clinical findings related to the type of acne scars are shown in Table-I.

Table I

Demographics and the type of acne scars (n=50)

Demographics		
Age (Mean±SD) years		27.68±4.93
Gender	Male n (%)	29 (58)
	Female n (%)	21 (42)
Type of acne scars		
Ice pick n (%)		25 (50)
Boxar n (%)		15 (30)
Rolling n (%)		10 (20)

The results of primary outcomes showed that PRF was significantly more effective than PRP in the treatment of post-acne scars as assessed by therapeutic response evaluated by post treatment GSGS scores (p=0.001) and quartile grading (p=0.007). Patients satisfaction score was also significantly higher on PRF side compared to PRP side (p=0.045) as shown in Table-II.

Table II

Comparison of treatment responses among the two sides (n=50)

Treatment responses		**PRP side (n=50)**	**PRF side (n=50)**	**p-value**
Pre-treatment GSGS score (Mean±SD)		8.44±1.59	8.1±1.49	0.27
Post-treatment GSGS score (Mean±SD)		3.58±1.93	2.24±1.14	0.001
Quartile grading	Excellent n (%)	1 (2)	8 (16)	0.007
	Very good n (%)	21 (42)	29 (58)	
	Good n (%)	26 (52)	12 (24)	
	Poor n (%)	2 (4)	1 (2)	
Patients satisfaction	Excellent n (%)	2 (4)	6 (12)	0.045
	Very good n (%)	12 (24)	21 (42)	
	Good n (%)	30 (60)	21 (42)	
	Poor n (%)	6 (12)	2 (4)	

The two treatment strategies were equally tolerable and there was no statistically significant difference between the 2 sides regarding pain, hyperpigmentation, transient erythema, swelling and redness as shown in Table-III.

Table III

Pain score and adverse events (n=50)

Adverse events	**PRP side (n=50)**	**PRF side (n=50)**	**p-value**
Pain score (Mean±SD)	2.54±1.27	2.96±1.29	0.10
Hyperpigmentation n (%)	9 (18)	7 (14)	0.59
Transient erythema n (%)	19 (38)	18 (36)	0.84
Swelling n (%)	18 (36)	21 (42)	0.54
Redness n (%)	21 (42)	23 (46)	0.69

Figure 1

Treatment with PRF

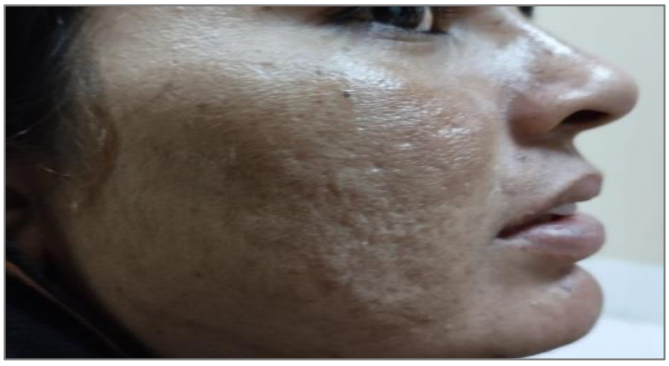


Figure II

Treatment with PRP

Figure III

Treatment with PRF

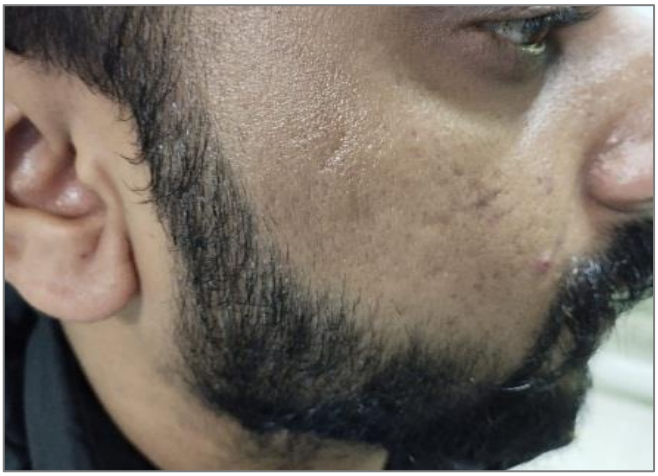
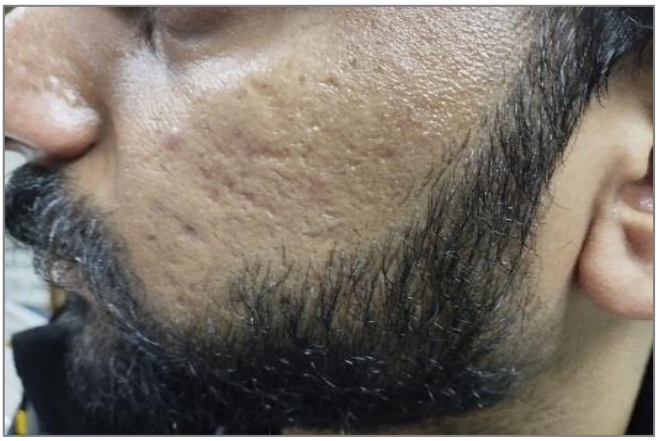


Figure IV

Treatment with PRP



DISCUSSION

Treatment of post-acne scars has been discussed in a number of research works by using different therapeutic strategies including PDTs with various levels of success.

In a review conducted by Kaushik and Kumaran to determine the efficacy of PRP on acne scars, showed a promising potential of the method for acne scar treatment through its growth factor-rich composition. Studies included in this review indicated its ability to enhance

tissue healing, improve scar appearance, and modulate inflammatory responses. Despite observed benefits in facial scar remodeling and collagen production, review suggested more research work on the utilization of PRP for this medical need.[13] Priyadharsini R studied the treatment response of topical PRP with microneedle in the treatment of post-acne scars. Overall, 40% of these patients had significant reduction in their acne scars and a good safety profile was reported for PRP treatment in this study.[14] A study conducted in Pakistan by Mumtaz M, compared the efficacy of intra-dermal PRP and 50% trichloracetic acid using chemical reconstruction technique in treating acne scars. The results shared significantly better efficacy with PRP compared to chemical reconstruction method at the completion of 12 and 24 weeks of treatment as evaluated by global acne scars grading (14.15 ± 3.05 *vs*. 17.57 ± 4.51 p<0.001 and 7.09 ± 1.46 *vs*. 10.09 ± 3.58,p = <0.001, respectively).[15]

In a comparative research study by Atsu N, a marginal superiority of PRF over PRP was observed in facial skin rejuvenation, specifically in the canthal region. PRF demonstrated statistically significant improvements in smoothness and wrinkle reduction at completion of three-month treatment. The overall outcomes on cosmetic parameters were comparable, however, PRF showed potential advantages due to its simpler preparation method, absence of anticoagulants, and possibility of sustained therapeutic effect.[16]

Pandey K et al compared the efficacy of PRF alone or in combination with micro-needling in the treatment of facial acne scars. The study showed that PRF with micro-needling significantly reduced the SGSG quantitative score from 23 to 14. PRF alone was also effective in reducing this quantitative score from 16 to 11.5 (p=0.005), however, injectable PRF combined with micro-needling was significantly more effective in reducing acne scar count, improving the GSGS score, and enhancing overall scar appearance.[17]

In a clinical case presented by Murlistyarini and kusumaningsih, a 21 years old male patient underwent a comparative treatment using PRP (on the right side) and PRF (on the left side). The outcomes of this study underscored the regenerative capabilities of PDTs in dermatological scar management and reported a better efficacy of PRF in the management of post-acne scarring compared to PRP. This was explained to be linked with its favorable action on inflammatory reactions, fibroblast activation, advanced growth factor release and collagen production.[18]

In a detailed research work by Diab NAF et al, superior efficacy of PRF over PRP in treating atrophic acne scars was established. Evaluating 30 patients, the research revealed that PRF intradermal injections, both alone and combined with needling, produced significantly better outcomes compared to PRP treatments. Both these groups showed improvement, but PRF consistently outperformed PRP as evaluated by GSGS scores, quartile grading scale and assessment of patient satisfaction. Fluid PRF, thereby, emerged as a highly effective, safe, and straightforward procedure, alternative to PRP for managing acne scarring.[11]

The mean age of patients in our study was 27.68±4.93 years with an age range of 19-37 years. Male gender was 58% of total study population while female gender was 42%. The results of the primary outcomes of the study showed that PRF was significantly more effective than PRP in the treatment of post-acne scars, as evaluated by GSGS scores at the completion of treatment (2.24±1.14 vs 3.58±1.93,p=0.001). Improvement assessed by quartile grading showed that significantly more number of patients achieved better response in PRF side compared to PRP side (p=0.007). Patients satisfaction score was also significantly better on PRF side compared to PRP (p=0.045) .We also compared the incidence of adverse events recorded in both treatment strategies which showed equal levels of safety and acceptability between the two sides. These results are in line with the results of studies discussed above and establish superiority of PRF over PRP in the management of post-acne scars.[11,16,17,18]

This was a single center study which is the major limitation of this research, and its results can't be generalized. Future studies with multicenter protocols will add up in this use full data for the treatment of post-acne scars.

CONCLUSION

PRF demonstrate superior efficacy compared to PRP in the treatment of post-acne scars and offers higher patient satisfaction. Both treatments were equally tolerable with comparable safety profiles.

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