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Autologous Platelet-poor Plasma (PPP) Gel – A Cost-effective Treatment for Post-Acne Atrophic Scars

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ABSTRACT

OBJECTIVE: To assess the clinical effectiveness and safety of biofiller of autologous platelet-poor plasma (PPP) in treating post-acne atrophic scars.

METHODOLOGY: The interventional study was conducted at the Department of Dermatology, PNS Shifa Hospital, Karachi between August 2024 and January 2025. The patients were selected consecutively and numbered 50, with post-acne atrophic scars aged 18-45 years. Using a standard heating/cooling method, autologous PPP gel was successfully prepared and injected intradermally every month under the scars. Baseline and follow-up scar severity assessments were completed using the Goodman and Baron qualitative and quantitative scales, Physician Global Assessment (PGA), and patient satisfaction using the Visual Analogue Scale (VAS). Three-month follow-up was performed for adverse effects. Data were analyzed using SPSS version 26, and a p-value of <0.05 was deemed statistically significant.

RESULTS: The mean Goodman and Baron quantitative score significantly reduced from 28.0±3.3 to 8.2±3.1 ($p < 0.001$) after treatment. Qualitative assessment revealed improvement (13 patients (26%) developed Grade 1 scars; severe scars were significantly reduced). Of the 17 patients who achieved almost clear skin, 27(54%) improved to mild scarring, according to the research from PGA. 43(86%) patients reported high patient satisfaction, with 5(10%) patients reporting excellent satisfaction. The side effects were mild and short-lived and most frequently were erythema 37(73%), discomfort 27(54%) and edema 23(47%).

CONCLUSION: Autologous PPP gel is a safe, effective, and economically viable treatment option for post-acne atrophic scars, with high patient satisfaction and minimal side effects.

KEYWORDS: Acne Vulgaris, Atrophic Scars, Platelet Poor Plasma, Biofiller, Intradermal Injection.

INTRODUCTION

Acne vulgaris is among the most common dermatological diseases in the world and has persisted in patients into their adult age, with many developing long-term sequelae in the form of post-acne atrophic scars[1]. These scars, which are categorized into ice-pick, rolling, and boxcar scars, distort normal skin structure and, in most cases, have heavy psychosocial consequences such as low self-esteem, withdrawal, and dissatisfaction with cosmetics[2]. Often, skin depressions that appear as a result of active acne are permanent and require no further curative methods to be reunited with another factor that led this paper to the quest to discover viable and convenient treatment measures, even with properly handled acne. Several modalities have been utilized in atrophic scar management, including microneedling, fractional lasers, subcision, chemical peels, and synthetic dermal fillers that provide different levels of benefits at the cost of limitations regarding price, patient downtime, safety, and patient acceptance[3,4]. Over the past years, autologous biofiller therapies have gained interest because of their safety and regenerative capacity. Platelet-poor plasma (PPP) gel is one of these. It has proved to be an effective intervention, as it is volumizing and has biological activity but does not have the side effects of synthetic fillers[5]. PPP gel is generated by heating and cooling of autologous plasma under controlled conditions, which produces a rich fibrin scaffold which would have a role of natural filler and also helps in collagen generation and remodeling of the dermis as time passes[6]. Early clinical trials showed significant and beneficial results in scar depth, surface contour deformities, and overall skin texture in response to PPP gel treatment, and patients were very pleased, with few adverse effects observed[7]. Although an increasing amount of evidence supports the idea, data on PPP gel results in South Asian populations are scarce. Since PPP gel has a cost-effective and advantageous safety profile, it is necessary to assess it further in that demographic. Hence, this research paper will evaluate the clinical effectiveness and safety of autologous PPP gel as a treatment of post-acne atrophic scars using validated scoring models.

METHODOLOGY

The interventional study was conducted at the Department of Dermatology, PNS Shifa Hospital, Karachi between August 2024 and January 2025, after the approval of the institutional review board. In this study, 50 patients were selected based on a formal request. Written informed consent was obtained from all participants. The sample size of 50 patients was calculated using the WHO sample size calculator, with a 95% level of confidence and a 5% margin of error. For this study, we used a non-probability consecutive sampling technique.

This study included patients aged 18–45. All patients were clinically diagnosed with post-acne atrophic scars. Patients excluded from this study were those with active acne, bleeding disorders, keloidal tendency, autoimmune diseases, active skin infections, and those with a history of the use of systemic retinoids in the last 6 months.

Autologous platelet-poor plasma (PPP) gel was prepared from venous blood using a double centrifugation method (1500 rpm for 10 minutes followed by 3000 rpm for 10 minutes). Plasma was heated to 80°C for 5 minutes and then cooled to 4°C, according to the described protocols[9,10]. Before the procedure, a topical anesthetic cream was applied. Intradermal PPP gel injections were administered beneath each scar using a 26½-gauge needle in a linear threading technique, and each patient had six treatment sessions spaced one month apart.

The clinical outcomes were assessed at the baseline and follow-up appointments using the Goodman and Baron qualitative and quantitative scar grading scales, Physician Global Assessment (PGA), Visual Analogue Scale (VAS) to assess patient satisfaction, and serial digital photography.

For three months after treatment, patients were watched for side effects, which included erythema, edema, pain, infection, post-inflammatory hyperpigmentation, nodularity, and allergic reactions.

Data were collected on a structured proforma and analyzed using IBM SPSS version 26: paired t-test and repeated measures ANOVA were used for assessment of quantitative variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The sample population for this study included 50 patients with post-acne atrophic scars, including 28 males (56%) and 22 females (44%), with a mean age of 26 years. After the study, the Goodman and Baron quantitative score decreased, with a mean score of 28.0±3.3 at baseline and 8.2±3.1 at the final follow-up, demonstrating an overall decrease of 70.7% ($p < 0.001$).

In the Goodman and Baron qualitative grading scale, severe scarring (Grade 4) decreased from 13 patients (26%) at baseline to 5 patients (10%) after treatment. In addition, 13 patients (26%) improved to Grade 1 (macular scars).

The participants of the study also exhibited significant improvement in the Physician Global Assessment (PGA); at baseline, 22 participants (44%) exhibited severe scars and 20 participants (40%) exhibited moderate scars. At the conclusion of the study, no participants exhibited severe scars, 27 participants (54%) exhibited mild scars, and 17 participants (34%) exhibited almost clear skin.

Patient satisfaction was evaluated using the Visual Analogue Scale (VAS) and, of the participants, 43 patients (86%) reported a high level of satisfaction, including 5 patients (10%) who reported excellent satisfaction.

The only side effects reported were mild, temporary, and self-limiting within 24 hrs. Of the participants, 37 patients (73%) reported erythema, 27 patients (54%) reported discomfort, and 23 patients (47%) reported edema. The total side effects reported by the participants exceeded 100% because some participants reported more than one side effect. There were no reports of fibrosis, nodules, infection, or pigmentary changes.

Table I provides results of the clinical improvement after PPP gel application.

Table I: Comprehensive Assessment of Scar Severity and Clinical Outcomes (n = 50)

Assessment Tool	Parameter / Grade	Baseline (n=50)	Final Visit (n=50)	Change / Improvement	p-value
Goodman & Baron (Quantitative)	Score	28.0±3.3	8.2±3.1	↓ 19.8 points (≈70.7% reduction)	$p < 0.001$
Goodman & Baron (Qualitative)	Grade 4 (Severe)	13(26%)	5(10%)	Reduction in severe cases	$p < 0.001$
	Grade 3 (Moderate)	22(44%)	13(26%)	Improvement in many patients	$p < 0.001$
	Grade 2 (Mild)	15(30%)	15(30%)	Stable/minor shift	$p < 0.001$
	Grade 1 (Macular)	0(0%)	13(26%)	Marked improvement	$p < 0.001$
Physician Global Assessment (PGA)	Grade 4 (Severe)	22(44%)	0(0%)	Complete resolution of severe cases	$p < 0.001$
	Grade 3 (Moderate)	20(40%)	6(12%)	Major reduction	$p < 0.001$
	Grade 2 (Mild)	8(16%)	27(54%)	Majority shifted to mild scars	$p < 0.001$
	Grade 1 (Clear)	0(0%)	17(34%)	Nearly clear skin achieved	$p < 0.001$
Visual Analogue Scale (VAS)	High satisfaction	-	43(86%)	Strong patient satisfaction	$p < 0.001$
Adverse Effects	Erythema	-	37(73%)	Mild and transient	-
	Edema	-	23(47%)	Mild and transient	-
	Discomfort	-	27(54%)	Mild and transient	-

Abbreviation: PGA = Physician Global Assessment; VAS = Visual Analogue Scale

Figure 1 shows study participants' adverse effect reporting frequency. The change in scar severity scores was statistically significant ($p < 0.001$).

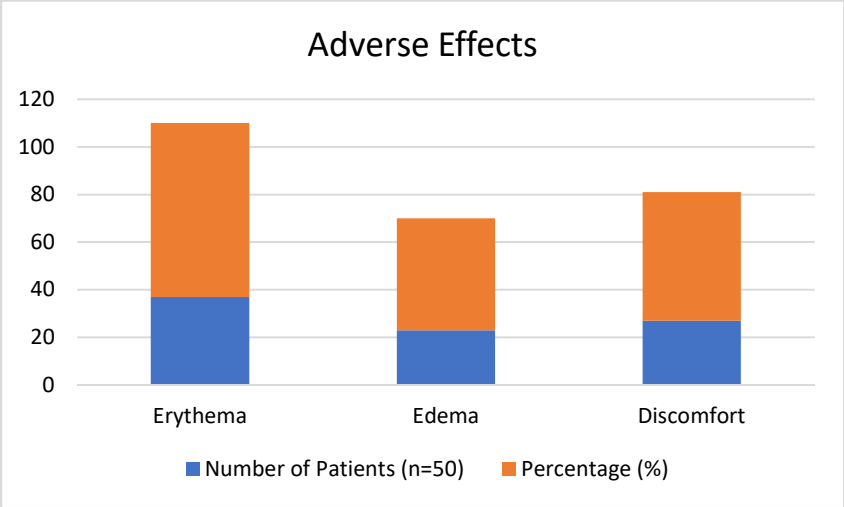

Figure 1: Adverse effects in 50 patients after PPP gel injections: erythema 73%, discomfort 54%, edema 47%. Some patients had multiple side effects; all were mild and resolved within 24 hours.

Picture 1: Before treatment, the patient had both boxcar and rolling scars, combined with noticeable moderate and severe surface defects.

Picture 2: The scar depth and skin texture show noticeable improvement

DISCUSSION

The findings of this research indicate that an autologous platelet-poor plasma (PPP) gel can be highly effective in clinical terms in post-acne atrophic scars because the substantial decrease in the Goodman and Baron scale score and the steady high level of patient satisfaction support it. These results are consistent with recent data that argue in favour of the regenerative capabilities of plasma-derived bio fillers, which can support structure and induce dermal remodelling at the same time [8]. A significant percentage of our patients have crossed over to less severe scar grades, and almost one-third of our patients have almost-clear skin based on the Physician Global Assessment, which supports the therapeutic flexibility of PPP gel. The working principle behind the PPP gel is the mode of conversion to a fibrin-based structure by the regulated heating and cooling process. This procedure increases viscosity and forms a stable scaffold that has the potential to trigger collagen synthesis, angiogenesis and deposition of the extracellular matrix [9].

In comparison to platelet-rich plasma (PRP), which mainly uses platelet-derived growth factors, PPP gel is richer in fibrinogen. It has better volumizing/contouring effects, which are appropriate for larger atrophic scars of atrophic nature[10]. Recent histological evidence demonstrates that fibrin-based matrices promote fibroblast growth and enhance dermal thickness, which correlates with the textural enhancement seen in our patients[11]. We concur with studies conducted in clinical trials that yielded a significant enhancement in the depth of the scar, the skin smoothness, and the general aesthetic effects of using PPP gel. Indicatively, Kim J 2022[12] exhibited significant improvements following monthly PPP gel sessions, and the intervention was well-tolerated and showed few side effects. Aesthetic outcomes with PPP gel have also been comparatively studied, indicating that it has outcomes similar to hyaluronic acid fillers, with a lower risk of complications including vascular occlusion, granulomas, or hypersensitivity reactions due to its autologous nature[13]. This safety benefit was observed in our study, in which the negative events of erythema, edema, and discomfort were acute and self-limiting. This study is especially relevant to the South Asian populations because there is limited information on the efficacy of PPP gel. Differences in pigmentation patterns, scars, and skin type require specific study in these regions. Our results are in line with previous studies in the region that show positive results when using plasma-based fillers in Fitzpatrick skin types III-V [14]. Moreover, PPP gel is cost-effective and, therefore, particularly useful in resource-denied clinical settings, which improves accessibility to patients in need of scar revision procedures.

Nevertheless, some shortcomings should be acknowledged. The lack of a control group limits the direct comparison with proven therapies like micro-needling or the use of fractional lasers. Follow-up was quite brief, and it was impossible to comment on long-term durability. Moreover, personal differences in scar morphology could also affect treatment response, and further analysis should be stratified[15]. On the whole, the present research supports the existing literature that autologous PPP gel is a cost-effective, safe, and efficient modality to deal with post-acne atrophic scarring. PPP gel may be a valuable addition to modern dermatologic practice due to its biocompatibility, minimal downtime, and high level of patient satisfaction. More randomized controlled trials with extended follow-up are required to substantiate and support these findings in the future.

CONCLUSION

In this group of fifty patients, autologous platelet-poor plasma (PPP) gel was a safe, effective, and cheap way to treat post-acne atrophic scars. The Goodman and Baron scale showed that scars became much less severe, and the Physician Global Assessment and patient satisfaction levels were both quite high. Adverse events, while prevalent, were moderate, brief, and self-limiting, hence affirming the positive safety profile of PPP gel. These results suggest that PPP gel is a viable biofiller that works well in the clinic and is well-liked by patients. More controlled trials are needed to confirm its long-term use in dermatology.

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AUTHOR CONTRIBUTION

Maheshwari J: Study design, acquisition, analysis, interpretation of data, final approval
Junaid S: Drafting, revision, final approval
Kumari S: Interpretation of data and results
Rao A: Contributed to abstract writing and references
Saghir N: Provided resources for research work
Shafquat S: Provided patient data whose follow-up was done
All authors approve the final version of the manuscript to be published

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