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Original Research Article

Autologous Platelet Rich Plasma Injection for Scar Rejuvenation – A Prospective Observational Study

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Conflict of interest: Nil

Abstract

Background: Platelet-rich plasma (PRP) is an autologous blood product enriched with platelets, growth factors and cytokines, concentrated in a small plasma volume. Since the 1970s, PRP has gained significant attention for its role in tissue repair and regeneration. The use of autologous PRP eliminates risks of cross-reactivity, immune reactions or disease transmission. This study aimed to evaluate the effectiveness of platelet-rich plasma (PRP) monotherapy for scar rejuvenation, as no prior clinical studies have objectively assessed its outcomes using a validated tool.

Objective: To study the effect of injection of autologous platelet rich plasma in the rejuvenation of scars among patients attending Plastic Surgery OPD in Government Medical College, Thiruvananthapuram, for a period of 1 year.

Methods: The study included 40 patients with scars who received PRP injections. Patient and Observer Scar Assessment Scale (POSAS) score was marked on the proforma after obtaining consent and the patients were reassessed at regular intervals. The decrease in POSAS score was statistically analysed using SPSS version 27.

Results: There was a statistically significant decrease in POSAS score on both the patient and observer sides after PRP injection. Among 40 patients, mean age was 30.7 years (range: 18–46), 65% female. Scars were located on the head/neck (57%), upper limbs (20%), trunk (18%), and lower limbs (5%). Causes included road traffic accidents (70%), post-surgical scars (17.5%), and burns (12.5%). The mean pre-procedure POSAS patient score was 28.97 (SD: 2.09), decreasing to 26 post-procedures (SD: 2.12). Pain and itch showed no significant changes ($p > 0.05$), while other variables improved significantly ($p < 0.05$). Similarly, the mean POSAS observer score decreased from 28.4 (SD: 2.023) to 25 (SD: 2.36) post-procedure.

Conclusion: Injection of PRP seems to be a promising and effective therapeutic approach for scars with different origins such as trauma, burns, and post-surgery. Treated areas regain characteristics similar to normal skin, leading not only to aesthetic but also functional results.

Keywords: Scar, Platelet rich plasma, Autologous, Intralesional, POSAS, Scar rejuvenation.

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Introduction

Wound healing is a complex biological process involving hemostasis, inflammation, proliferation and remodelling phases. In ideal circumstances, a surgical incision heals as a fine, barely visible line. However, abnormal healing responses can lead to hypertrophic scars or keloids — fibroproliferative disorders characterised by excessive tissue formation. These lesions may carry a significant psychosocial burden, affecting patients' quality of life and self-esteem.[1,2]

Various scar revision techniques exist, including non-surgical approaches (topical agents, intralesional corticosteroids, cryotherapy, laser therapy, pressure therapy) and surgical methods (fusiform excision, Z-plasty, tissue expansion, flaps and grafts). While these modalities offer varying degrees of improvement, there remains a need for

minimally invasive, cost-effective treatments that promote true tissue regeneration rather than mere scar camouflage.[3,4]

Platelet-rich plasma (PRP) is an autologous blood product prepared by concentrating platelets from the patient's own blood. Platelets contain numerous growth factors including platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF), which play crucial roles in tissue repair and regeneration. PRP has been widely used in orthopaedics, dentistry, and dermatology for its regenerative properties.[5,6,7] The use of autologous PRP eliminates risks of cross-reactivity, immune reactions or disease transmission, making it an attractive therapeutic option. While several studies have evaluated PRP in combination with other modalities for scar treatment, there is a paucity of literature on PRP monotherapy for scar rejuvenation using validated objective assessment tools.[8,9] The Patient and Observer Scar Assessment Scale (POSAS) is a comprehensive, validated scar assessment tool that evaluates scars from both the patient's and observer's perspective, offering a more holistic evaluation compared to other scales. This study aimed to evaluate the effectiveness of autologous PRP monotherapy for scar rejuvenation using POSAS as the primary outcome measure.[10]

Materials and Methods

Study Design: This was a prospective observational study conducted at the Department of Plastic and Reconstructive Surgery, Government Medical College, Thiruvananthapuram, over a period of one year after obtaining Human Ethics Committee clearance (HEC No: 03/03/2023/MCT, dated 07.02.2023).

Ethical Approval: The study was approved by the Human Ethics Committee (HEC)/Institutional Review Board (IRB) of Government Medical College, Thiruvananthapuram. Written informed consent was obtained from all participants.

The ethical standards were in accordance with the guidelines provided by ICMR. All records were coded and patient identity was kept confidential. No financial liability was incurred by the patients.

Study Population: A total of 40 patients with scars attending the Plastic Surgery OPD were enrolled using consecutive sampling. The minimum sample size was justified based on the study by Bhooshan LS et al.[11]

Inclusion Criteria: Male and female patients aged 18–80 years, presenting with scars of various causes such as traumatic injuries, surgical procedures, and burns.

Exclusion Criteria: Patients unwilling to provide consent; those with unstable scars, scars older than 5 years, malignancies, active skin infections, keloidal tendencies, or those undergoing treatment with oral steroids, isotretinoin, or anticoagulant therapy; pregnant individuals; patients with contractures; those with severe cardiovascular disorders, systemic diseases such as systemic lupus erythematosus (SLE), porphyrias, or other metabolic conditions; and patients diagnosed with any bleeding disorder.

PRP Preparation: Venous blood was drawn into a blood collecting vacutainer with acid citrate dextrose in a ratio of 9:1 (blood: acid citrate dextrose) after confirming normal PT and APTT values. Closed bag centrifugation was performed using EPPENDORF Model No: 5810R at 3000 rpm for 3 minutes (Department of Transfusion Medicine, Government Medical College, Thiruvananthapuram). After separation of the erythrocyte mass, the bottom one-third (PRP) and top two-thirds (platelet-poor plasma/PPP) were separated.

PPP was removed, and platelet pellets were suspended in a small plasma volume by shaking the tube. PRP was carefully aspirated into a separate PRP bag. Platelet count and pH of the obtained PRP were estimated.

Activator Solution: PRP was activated by combining with 1% Calcium Chloride ($CaCl_2$) and applied immediately after activation.

Procedure: Treatment areas were cleaned and anaesthetised with topical EMLA cream. After approximately 45 minutes, the area was cleaned with spirit. Activated PRP was loaded in an insulin syringe and injected in and around scars through multiple punctures.

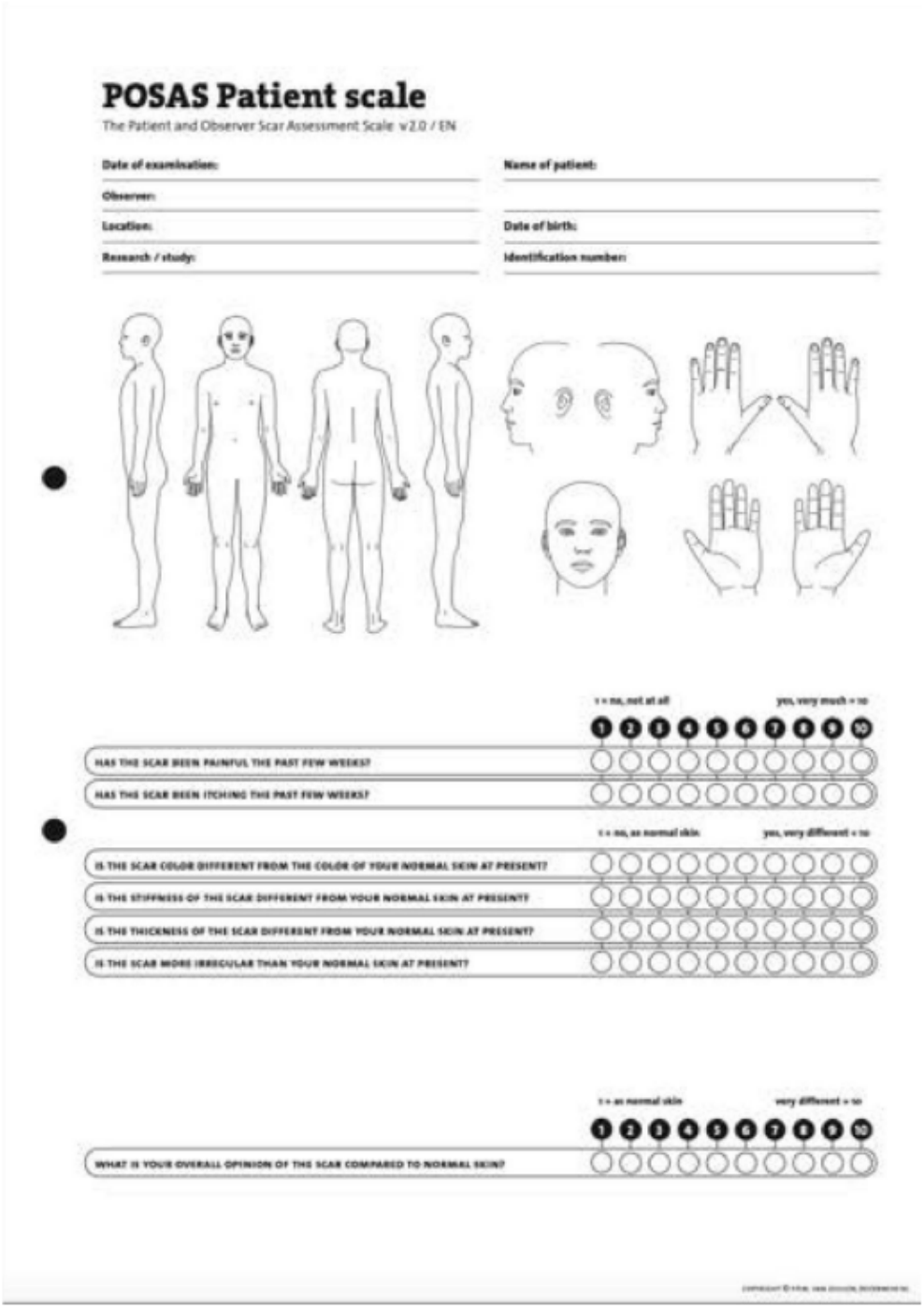
Blanching and elevation of the scar was taken as the endpoint. Based on the number of scars, 1–3 ml of PRP was injected per session. The process was repeated every 4 weeks over the course of 3 months.

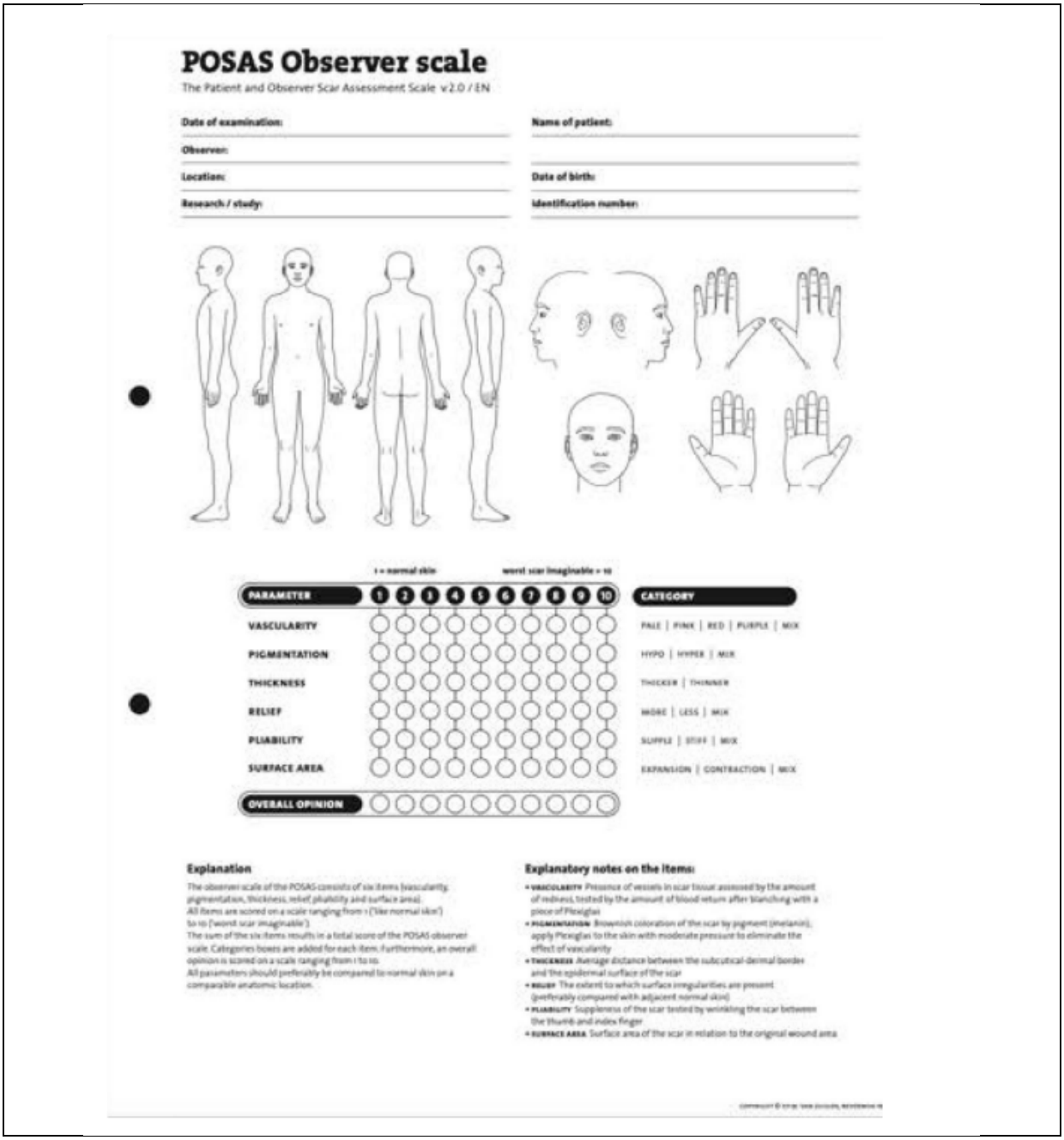
Outcome Assessment: The primary outcome was the change in POSAS score (both observer and patient scales). The POSAS observer scale evaluates six parameters — vascularity, pigmentation, thickness, relief, pliability, and surface area — each scored from 1 (normal skin) to 10 (worst imaginable scar), with a total score range of 6–60.

The POSAS patient scale evaluates pain, itching, colour, thickness, stiffness, and irregularity with similar scoring. Scar assessment was performed pre-procedure, at 3 months, and at 6 months. Clinical photographs were taken at each visit.

Statistical Analysis: Data were recorded in Microsoft Excel and analysed using SPSS version 27. Categorical variables were expressed as

frequency and percentage; quantitative variables as mean ± SD. Paired t-test was used for comparison of quantitative parameters before and after intervention. A p-value < 0.05 was considered statistically significant.





Results

A total of 40 patients with scars were enrolled in the study. The demographic and clinical characteristics of the study population are summarised below.

Table 1: Age distribution of study population

Variable	Minimum	Maximum	Mean	SD
Age (years)	18	46	30.7	8.007

Table 2: Gender distribution

Gender	Number	Percentage (%)
Female	26	65
Male	14	35

Table 3: Distribution based on location of scars

Location of Scars	Frequency	Percentage (%)
Head and Neck	23	57
Upper Limb	8	20
Trunk	7	18
Lower Limb	2	5

Table 4: Distribution based on duration of scars

Duration of Scar	Frequency	Percentage (%)
<12 Months	5	12
12–24 Months	8	20
24–36 Months	5	13
36–48 Months	10	25
48–60 Months	12	30

Table 5: Distribution based on mechanism of injury

Mechanism of Injury	Frequency	Percentage (%)
Road Traffic Accident	28	70
Post-surgical	7	17.5
Burns	5	12.5

Table 6: Contamination and healing pattern

Parameter	Category	Frequency	Percentage (%)
Contamination	Yes	28	70
	No	12	30
Healing	Secondary Intention	27	68
	Primary Intention	13	32

Table 7: Distribution based on number of PRP injections

Number of PRP Injections	Frequency	Percentage (%)
1 injection	7	17
2 injections	20	50
3 injections	13	33

Table 8: Comparison of POSAS patient scale scores before and after PRP injection

POSAS Patient Scale	Pre-procedure	Post-procedure	p-value
Mean ± SD	28.97 ± 2.09	26 ± 2.12	<0.05
Range	25–35	24–32	

The mean pre-procedure POSAS patient score was 28.97 (range: 25–35, SD: 2.09), which decreased to 26 post-procedure (range: 24–32, SD: 2.12). Statistical analysis revealed no significant differences in pain and itch ($p > 0.05$), while all other POSAS patient scale variables (colour, thickness, stiffness and irregularity) showed statistically significant improvements ($p < 0.05$).

Table 9: Comparison of POSAS observer scale scores before and after PRP injection

POSAS Observer Scale	Pre-procedure	Post-procedure	p-value
Mean ± SD	28.4 ± 2.023	25 ± 2.36	<0.05
Range	25–35	24–32	

Similarly, the mean POSAS observer score decreased from 28.4 (range: 25–35; SD: 2.023) to 25 post-procedure (range: 24–32; SD: 2.36). All observer scale parameters including vascularity, pigmentation, thickness, relief, pliability and surface area showed statistically significant improvement ($p < 0.05$).

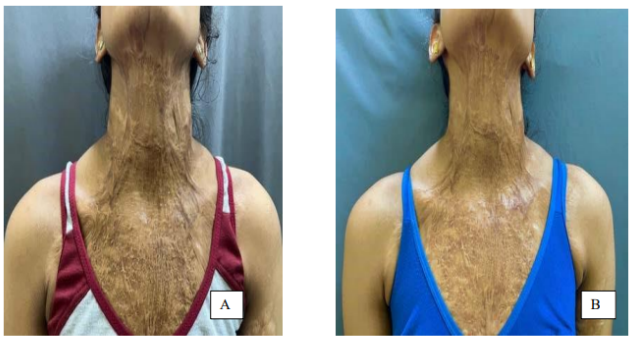


Figure 1: 28 years old female came with post burn scar over neck and upper chest. (A) Before PRP injection. (B) After 3 doses of PRP injection

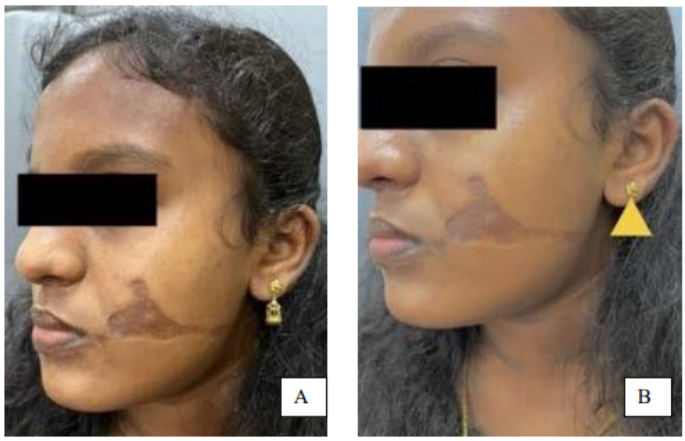


Figure 2: 25 years old female came with scar over left cheek post RTA 60 months back.(A) Before PRP injection. (B) After 1 dose of PRP

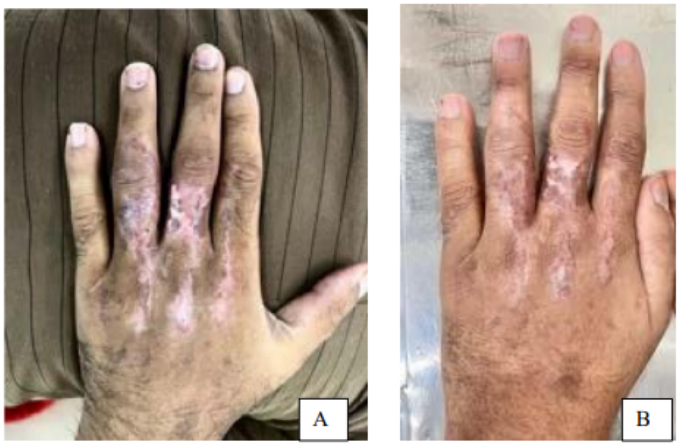


Figure 3: 37 years old male with history of trauma 2 years back came with a scar over his left leg. (A) Before PRP injection. (B) After 2 doses of PRP

Discussion

The present study demonstrates that autologous PRP monotherapy is a promising therapeutic approach for scar rejuvenation. The study included 40 patients with scars of varying aetiologies and utilised the POSAS as the primary outcome measure to objectively assess improvements in scar characteristics including texture, pigmentation, and overall appearance through both patient-reported and clinician-observed evaluations.

The results showed statistically significant improvement in both patient and observer POSAS scores following PRP injection. While pain and itch parameters did not show significant changes ($p > 0.05$), all other parameters — including colour, thickness, stiffness, irregularity (patient scale) and vascularity, pigmentation, thickness, relief, pliability, surface area (observer scale) — demonstrated significant improvement ($p < 0.05$). These findings suggest that PRP primarily improves the structural and visual aspects of scars rather than symptomatic parameters. Our findings are consistent

with several previous studies. Alessio Redaelli et al. (2010) assessed the outcomes and benefits of standardised PRP injection over a 3-month period in 23 patients and concluded it as a promising technique for facial rejuvenation and scar reduction, supporting the outcomes of our study.12 Pietro Gentile et al. (2014) demonstrated 69% maintenance of contour restoration after one year in patients treated with fat grafting combined with PRP, validating the efficacy of PRP in tissue restoration.[13] Ozlem KA et al. (2016) conducted a prospective controlled clinical study in Turkey on 20 women and demonstrated enhancement of dermal collagen levels through growth factors and skin needling, supporting that PRP application, even as a single treatment, is effective and safe for skin rejuvenation.[14] Aftab et al. (2017) confirmed PRP therapy as a simple outpatient procedure effective for treating acne scars with minimal side effects.[15] Aniruddha et al. (2019) studied PRP's efficacy as a single modality for acne scars on 30 patients and concluded it as a cost-effective and well-tolerated treatment offering significant results.[16] Deshmukh and colleagues (2019) showed that PRP combined with subcision yielded significantly greater improvement compared to subcision alone.[17] Elmarakby et al. (2024) compared nanofat and PRP injections for recent scars, noting that while nanofat showed greater improvement in height, pigmentation, and vascularity, scar pliability showed comparable improvement in both groups.[18] The advantage of PRP lies in its autologous nature, eliminating risks of cross-reactivity, immune reactions, or disease transmission. The growth factors released by activated platelets — including PDGF, TGF-β, VEGF, and IGF — promote collagen synthesis, angiogenesis, and tissue regeneration, which are crucial mechanisms underlying scar improvement.[5,6]

Limitations

1. Small sample size (n=40), which may limit the generalisability of findings.
2. Lack of a control or placebo group, making it difficult to determine the true isolated efficacy of PRP.
3. Short follow-up period of 6 months, which may not capture the durability or potential late adverse effects of PRP treatment.
4. Variability in PRP preparation methods (centrifugation protocols, activation techniques) can lead to inconsistent results across studies.
5. Reliance on subjective measures in the patient scale of POSAS, though the validated tool minimises this limitation.
6. Heterogeneity of scars in type, age, size, and location among participants.
7. Non-blinded study design, which may introduce bias in both patient-reported and clinician assessments.
8. Limited understanding of the exact mechanisms by which PRP improves scar appearance.

Conclusion

Injection of autologous platelet-rich plasma is a promising and effective therapeutic approach for scars of different origins such as trauma, burns, and post-surgery. The study demonstrated statistically significant improvement in POSAS scores on both the patient and observer scales. Treated areas regain characteristics similar to normal skin, which are clinically perceptible, leading not only to aesthetic but also functional improvement. PRP monotherapy offers a safe, cost-effective, and minimally invasive option for scar rejuvenation that deserves further investigation through larger randomised controlled trials with longer follow-up periods.

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