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Impact of fractional microneedling radiofrequency with and without: Plasma rich platelet on clinical outcomes and quality of life in patients with moderate to severe acne vulgaris

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Abstract
Acne vulgaris is a multifactorial inflammatory skin disorder that predominantly affects adolescents and young adults, often leading to significant physical and psychological morbidity. The management of moderate to severe acne remains challenging due to limited efficacy, side effects, and patient non-compliance associated with conventional therapies. Recently, fractional microneedling radiofrequency (FMRF) has emerged as a promising minimally invasive treatment modality for acne vulgaris, offering both therapeutic and rejuvenate benefits through controlled dermal remodeling and sebaceous gland modulation. Platelet-rich plasma (PRP), known for its regenerative and anti-inflammatory properties, has also been explored as an adjunctive therapy in various dermatologic conditions.

This study is a randomized comparative clinical study designed to evaluate and compare outcomes from FMRF alone versus FMRF plus PRP to determine if outcomes and quality of life improve in patients with moderate to severe acne vulgaris. Sixty patients were enrolled in the study and randomized to two groups: Group A received FMRF treatment only whilst group B received FMRF followed cupping and the topical application of PRP. All patients had three treatment sessions: treatment took place every three weeks. Clinical evaluations included the total number of lesions, Global Acne Grading System (GAGS), Investigator's Global Assessment (IGA) and Dermatology Life Quality Index (DLQI) assessed at baseline, immediately after, and 3 month follow up.

The results showed that both treatment groups significantly lowered inflammatory lesion count ($p < 0.001$) with group B producing superior results (72.4% improvement) than group A (55.6%). Similar results were found for the GAGS and IGA with the group B producing statistically better reduction of acne severity. Based on the DLQIs we can see that both groups had clinically and statistically significant reductions which evidence real and meaningful changes to patients' psychosocial well-being, however, patients who received PRP (group B) reported higher overall satisfaction and perceived benefit.

There were mild and transient side effects including: erythema, mild edema, and mild post inflammatory hyperpigmentation. No patients reported infection or scarring.

In conclusion, FMRF is a safe and efficacious treatment option for patients with moderate to severe acne vulgaris. Adding PRP to the treatment regimen with FMRF produced superior outcomes, improved recovery of skin texture, and a greater increase in quality of life as reported by patients. In situations where patients have not responded well to other treatment options, adding PRP may provide improve the overall treatment effects in the management of these patients with refractory acne utilizing this synergistic treatment process may be a valuable look into the future of more effective treatment approaches in current day dermatology.

Keywords: Acne vulgaris, Fractional microneedling radiofrequency (FMRF), Platelet-rich plasma (PRP), Quality of life, Clinical outcomes, Inflammatory lesions

Introduction

Acne vulgaris is one of the most widespread uncurable and chronic inflammatory skin diseases with at least 633 million people suffering globally [1]. Acne vulgaris is primarily a disease of the pilosebaceous units, it encompasses both lesions that are non-inflammatory (comedomes) and inflammatory lesions (papules, pustules and nodules), and can also have residual post-inflammatory pigmentation changes and scarring [2]. While acne vulgaris primarily affects adolescents and young adults, it continues into adult life in a subset of the

population, and can present de novo into adulthood or later in life [3]. Acne vulgaris is far more than skin deep; in addition to the cutaneous manifestations of acne vulgaris, it can cause distress, impaired emotional well-being, psychosocial impairment, affect self-esteem and ultimately quality of life - when curing moderate to severe cases of acne vulgaris patients suffer unparalleled life altering consequences associated with their condition [4].

Currently effective treatments for acne vulgaris include topical retinoids, antibiotics, benzoyl peroxide, oral isotretinoin, hormonal therapies, and several laser and light based treatments [5]. These standard of care modalities are not helpful for patients who experience adverse reactions, intolerable side effects, microbial resistance, and poor compliance in management of their acne vulgaris [6]. For these reasons there is an interest in minimally invasive procedures that have therapeutic and cosmetic benefits with short downtimes and few adverse effects.

Fractional microneedling radiofrequency (FMRF) is an emerging technology that combines microneedling with regulated delivery of radiofrequency (RF) energy to the dermis [7]. Microneedling induces a thermal injury to the papillary and reticular dermis with minimal damage to the epidermis avoiding the substantial downtimes normally associated with surgical procedures, it depends on injury and the body's natural healing to orchestrate weeping, granulation tissue formation and dermal remodelling leading to creation and re-organization of collagen to regulate sebaceous gland activity [8]. There are a growing number of clinical studies demonstrating the efficacy of FMRF treatment for acne vulgaris and acne scarring, and have shown high patient satisfaction and few adverse effects [9-11].

Platelet-rich plasma (PRP) is blood plasma that contains higher than normal concentrations of growth factors released from platelets including platelet derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF) [12]. These bioactive substances are produced when obtaining PRP from autologous blood through a 3 step centrifugation process. These bioactive agents are important for regulating wound healing, angiogenesis and inflammation [13]. PRP has been applied adjunctively in dermatologic procedures including microneedling. PRP is used to accelerate healing, enhance tissue repair and regeneration after procedures, and decrease downtime as it can enhance the body's natural healing process [14]. As a bioactive product PRP may not only modulate the skin's response and improve cosmetic results to RF devices but can also promote healing and tissue recovery and expedite epithelialization after inflammatory reaction adjacent to the procedure [15].

Despite the clinical efficacy demonstrated in recent literature, there are only a limited number of studies comparing FMRF to FMRF + PRP for patients with moderate to severe inflammatory acne vulgaris. Additionally, there are even fewer studies examining the overall impact of treatments with these topical agents in terms of health-related quality of life (HRQoL) outcomes, which is important considering the psychosocial effects of acne vulgaris.

Therefore, the purpose of this study is to assess and compare the clinical effectiveness and quality of life outcomes of FMRF alone and FMRF + PRP for the treatment of moderate to severe inflammatory acne vulgaris.

Materials and Methods

This was a prospective, randomized, comparative interventional study conducted at the Dermatology Outpatient Clinic from Dermatological private clinic, wasit province Iraq between January 2023 and December 2023. The study protocol was approved by the Institutional Review Board (IRB) under approval number [Insert IRB Number], and written informed consent was obtained from all participants prior to enrollment.

Study Population

Sixty patients aged between 18 and 40 years with Fitzpatrick skin types III-IV and moderate to severe acne vulgaris were included in the study. Acne severity was classified according to the Global Acne Grading System (GAGS), where scores ≥ 24 indicate severe acne and 18-23 indicate moderate acne [16].

Inclusion Criteria

- Both genders
- Presence of ≥20 inflammatory facial lesions
- No prior systemic or topical acne treatment within the past 3 months
- Willingness to follow up for the entire duration of the study

Exclusion Criteria

- History of isotretinoin use within 6 months
- Active skin infections, including bacterial, viral, or fungal dermatitis
- Pregnancy or lactation
- Concomitant autoimmune or chronic systemic diseases affecting wound healing
- Known bleeding disorders or anticoagulant therapy

Randomization and Study Groups

Patients were randomly assigned using a computer-generated randomization table into two equal groups:

- Group A (n = 30): FMRF monotherapy
- Group B (n = 30): FMRF combined with PRP application

Intervention Protocol

All patients underwent three treatment sessions at 3-week intervals. Treatments were performed by a certified dermatologist using standardized techniques and equipment.

FMRF Procedure

The Vivace device was used for all FMRF treatments. It combines insulated microneedles (25G) with bipolar radiofrequency energy delivery. Parameters were adjusted based on lesion severity and anatomical site:

- **Needle depth:** 0.5 mm for periorbital areas to 1.5 mm for cheeks and forehead
- **RF energy level:** 40-70 mJ per pulse
- **Number of passes:** 1-2 per session depending on acne severity

After cleansing and application of a topical anesthetic cream (EMLA®) for 30 minutes, the face was treated in four quadrants. Post-procedure, patients were instructed to avoid sun exposure and apply broad-spectrum sunscreen daily [16].

PRP Preparation and Application (Group B only).

For Group B, autologous PRP was prepared immediately after the FMRF procedure as follows:

- Ten milliliters of venous blood were drawn and placed into sterile tubes containing anticoagulant citrate dextrose solution.
- The sample was centrifuged at 3000 rpm for 10 minutes to separate platelet-rich plasma from red blood cells and serum.
- The PRP layer was carefully extracted and applied topically to the treated area using a sterile brush.
- PRP was left on the skin for 30 minutes before being gently rinsed off with saline [12].

Outcome Measures

Primary Outcome

- Reduction in the number of inflammatory acne lesions (papules, pustules, nodules).

Secondary Outcomes

- Improvement in acne severity using the Global Acne Grading System (GAGS) [16]
- Investigator's Global Assessment (IGA) score (ranging from 0 = clear to 4 = severe)
- Quality of life assessment using the Dermatology Life Quality Index (DLQI) [15]

Assessments were performed at baseline, 3 weeks' post-final session, and 3 months' post-treatment.

Safety Evaluation

Adverse events were recorded at each visit and categorized based on type, duration, and severity. These included erythema, edema, hyperpigmentation, infection, and pain during the procedure, assessed using the Visual Analog Scale (VAS).

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). Quantitative data were expressed as mean ± standard deviation (SD), while qualitative variables were presented as frequencies and percentages. Paired t-tests were used for within-group comparisons, and independent t-tests for between-group comparisons. A p-value < 0.05 was considered statistically significant.

Results

A total of 60 patients diagnosed with moderate to severe acne vulgaris completed the study. These participants were equally divided into two groups [Table 1]: Group A (n = 30), treated with fractional microneedling radiofrequency (FMRF) alone; and Group B (n = 30), treated with FMRF combined with platelet-rich plasma (PRP). All patients were Patients with Fitzpatrick skin types III-IV are particularly vulnerable to PIH and scarring after inflammatory skin insults such as acne vulgaris. Therefore, selecting safe and effective non-pharmacologic interventions is essential in these populations. The low incidence of hyperpigmentation in both groups (6.7% in Group A and 3.3% in Group B) underscores the safety profile of FMRF, especially when combined with PRP. This finding supports the use of this minimally invasive approach in ethnic skin, where traditional ablative lasers or aggressive chemical peels carry higher risks of adverse pigmentary changes. Assessed at three time points: baseline, immediately after the final treatment session, and at a 3-month follow-up visit.

Baseline Demographic and Clinical Characteristics

There were no statistically significant differences between the two groups in terms of age, gender distribution, or baseline acne severity [Table 1]. The mean age was 25.3 ± 4.2 years in Group A and 24.9 ± 3.8 years in Group B. The male-to-female ratio was 17:13 in Group A and 16:14 in Group B. Baseline Global Acne Grading System (GAGS) scores were also comparable, measuring 28.5 ± 2.4 in Group A and 29.1 ± 2.7 in Group B. These findings confirm that both groups were well-matched at the start of the study.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants by Treatment Group

Variable	Group A (FMRF Only)	Group B (FMRF + PRP)**
Age (mean ± SD)	25.3 ± 4.2	24.9 ± 3.8
Gender (M:F)	17:13	16:14
Fitzpatrick Skin Type III	18	17
Fitzpatrick Skin Type IV	12	13
Baseline GAGS Score*	28.5 ± 2.4	29.1 ± 2.7

*GAGS = Global Acne Grading System; FMRF = Fractional Microneedling Radiofrequency; PRP = Platelet-Rich Plasma.

**Values are expressed as mean ± standard deviation or frequency. No statistically significant differences were observed between groups at baseline ($p > 0.05$).

Inflammatory Lesion Count Reduction

Both treatment groups demonstrated a marked decrease in inflammatory lesion counts over the course of the study. In Group A, the average number of inflammatory lesions decreased from 28.4 ± 3.1 at baseline to 12.6 ± 2.5 post-treatment, representing a 55.6% reduction. However, there was a slight increase in lesion count at the 3-month follow-up (14.3 ± 2.8). In contrast, Group B showed a more pronounced response, with lesion counts dropping from 29.7 ± 3.3 at baseline to 8.2 ± 1.9 post-treatment (a 72.4% reduction), and remaining relatively stable during the follow-up period at 9.5 ± 2.1 [Table 2].

Statistical analysis revealed a significant difference between the two groups in favor of the combination therapy ($p < 0.001$), suggesting that the addition of PRP significantly enhances the efficacy of FMRF in reducing active inflammatory acne lesions.

Table 2: Changes in Inflammatory Lesion Count Across Time Points in Both Treatment Groups

Time Point	Group A (FMRF Only)*	% Reduction	Group B (FMRF + PRP)*	% Reduction
Baseline	28.4 ± 3.1	-	29.7 ± 3.3	-
Post-Treatment	12.6 ± 2.5	55.6%	8.2 ± 1.9	72.4%
3-Month Follow-up	14.3 ± 2.8	49.6%	9.5 ± 2.1	68.0%

*Values are expressed as mean ± standard deviation. Percent reduction calculated relative to baseline values.

Global Acne Grading System (GAGS)

Improvements in overall acne severity were observed in both groups as measured by GAGS. Group A showed a 50.2% improvement post-treatment, with scores decreasing from 28.5 ± 2.4 to 14.2 ± 1.9. Group B exhibited a greater improvement of 64.3%, with GAGS scores falling from 29.1 ± 2.7 to 10.4 ± 1.6 [Table 3]. At the 3-month follow-up, GAGS scores increased slightly in both groups due to partial relapse but remained significantly lower than baseline values (16.1 ± 2.1 in Group A and 11.9 ± 1.8 in Group B). These results suggest that the combination of FMRF and PRP offers better long-term control of acne severity compared to FMRF alone.

Table 3: Improvement in Global Acne Grading System (GAGS) Scores Over the Study Period

Time Point*	Group A (FMRF Only)	% Improvement	Group B (FMRF + PRP)	% Improvement
Baseline	28.5 ± 2.4	-	29.1 ± 2.7	-
Post-Treatment	14.2 ± 1.9	50.2%	10.4 ± 1.6	64.3%
3-Month Follow-up	16.1 ± 2.1	43.5%	11.9 ± 1.8	59.1%

*GAGS scores range from 0 (clear) to ≥36 (very severe). Higher percentage indicates greater improvement.

Investigator's Global Assessment (IGA)

IGA scores improved significantly in both groups following treatment. In Group A, scores declined from 3.8 ± 0.4 at baseline to 2.1 ± 0.5 post-treatment and rose slightly to 2.4 ± 0.6 at the 3-month follow-up. Group B showed a more dramatic improvement, with IGA scores dropping from 3.9 ± 0.3 to 1.5 ± 0.4 post-treatment and maintaining a low score of 1.7 ± 0.5 at follow-up [Table 4]. These findings indicate that the FMRF+PRP combination leads to faster and more sustained clinical clearance of acne lesions.

Table 4: Investigator's Global Assessment (IGA) Scores Before and After Treatment in Both Groups

Time Point*	Group A (FMRF Only)	Group B (FMRF + PRP)
Baseline	3.8 ± 0.4	3.9 ± 0.3
Post-Treatment	2.1 ± 0.5	1.5 ± 0.4
3-Month Follow-up	2.4 ± 0.6	1.7 ± 0.5

*IGA scale: 0 = Clear, 1 = Almost Clear, 2 = Mild, 3 = Moderate, 4 = Severe. Lower scores indicate better outcomes.

Dermatology Life Quality Index (DLQI)

Quality of life improvements were evaluated using the DLQI questionnaire. Both groups reported significant enhancements in psychosocial well-being after treatment. Group A experienced a 49.6% improvement in DLQI scores, which dropped from 12.4 ± 2.3 to 6.2 ± 1.7. Group B demonstrated an even greater improvement of 68.7%, with scores declining from 13.1 ± 2.5 to 4.1 ± 1.2 [Table 5]. At the 3-month follow-up, DLQI scores remained significantly improved compared to baseline, especially in the combination group, indicating a lasting positive impact on patient-reported quality of life.

Table 5: Dermatology Life Quality Index (DLQI) Scores Pre- and Post-Treatment

Time Point*	Group A (FMRF Only)	% Improvement	Group B (FMRF + PRP)	% Improvement
Baseline	12.4 ± 2.3	-	13.1 ± 2.5	-
Post-Treatment	6.2 ± 1.7	49.6%	4.1 ± 1.2	68.7%
3-Month Follow-up	7.3 ± 1.9	41.1%	4.8 ± 1.4	63.3%

*DLQI scores range from 0 (no effect on quality of life) to 30 (maximum impairment). Lower scores indicate better quality of life.

Patient Satisfaction Scores

Patients rated their satisfaction with the treatment outcomes on a 5-point scale (1 = very dissatisfied, 5 = very satisfied). Post-treatment satisfaction scores were higher in Group B (4.5 ± 0.4) compared to Group A (3.8 ± 0.6). These scores slightly increased at the 3-month follow-up, reaching 4.6 ± 0.3 in Group B and 4.0 ± 0.7 in Group A [Table 6]. These results reflect sustained satisfaction among participants, particularly those who received the combination therapy.

Table 6: Patient Satisfaction Ratings Following Treatment in Both Groups

Time Point*	Group A (FMRF Only)	Group B (FMRF + PRP)
Post-Treatment	3.8 ± 0.6	4.5 ± 0.4
3-Month Follow-up	4.0 ± 0.7	4.6 ± 0.3

*Satisfaction was rated on a 5-point Likert scale: 1 = Very Dissatisfied, 5 = Very Satisfied.

Adverse Events and Safety Profile

All adverse events reported were mild and transient, including erythema, edema, and minimal hyperpigmentation. No infections or scarring were recorded in either group. Patients with Fitzpatrick skin types III-IV are particularly vulnerable to post-inflammatory

hyperpigmentation (PIH), making the selection of safe and effective non-pharmacologic interventions essential in these populations [8].

The low incidence of hyperpigmentation in both groups (6.7% in Group A and 3.3% in Group B) underscores the safety profile of FMRF, especially when combined with PRP. This finding supports the use of this minimally invasive approach in ethnic skin, where traditional ablative lasers or aggressive chemical peels carry higher risks of adverse pigmentary changes. No cases of infection or scarring were recorded in either group [Table 7]. Pain during the procedure, assessed using the Visual Analog Scale (VAS), averaged between 3.1 and 3.7 across all sessions, indicating good tolerability.

Table 7: Adverse Events Profile in FMRF and FMRF+PRP Treatment Groups

Adverse Event*	Group A (FMRF Only)	Group B (FMRF + PRP)
Erythema (<72 hrs)	25 (83%)	27 (90%)
Edema	10 (33%)	12 (40%)
Hyperpigmentation	2 (6.7%)	1 (3.3%)
Infection	0	0

*Values are n (%). All adverse events were mild and resolved within 7 days.

Skin Texture and Pigmentation Improvement

Physician assessments indicated that both skin texture and pigmentation improved in both groups, although more prominently in Group B. Skin texture improved by an average of 2.4 ± 0.5 in Group A and 3.6 ± 0.4 in Group B. Similarly, pigmentation improved by 2.1 ± 0.6 in Group A versus 3.3 ± 0.5 in Group B [Table 8]. These findings highlight the additional rejuvenative benefits of combining PRP with FMRF.

Table 8: Physician Assessment of Skin Texture and Pigmentation Improvement in Both Treatment Groups

Parameter	Group A (FMRF Only)	Group B (FMRF + PRP)
Skin Texture	2.4 ± 0.5	3.6 ± 0.4
Pigmentation	2.1 ± 0.6	3.3 ± 0.5

Treatment Parameters and Tolerance

The energy level used during FMRF sessions increased progressively across the three treatment sessions, ranging from 50 mJ in the first session to 70 mJ in the third. Average pain scores increased slightly with each session (ranging from 3.1 to 3.7 on VAS), yet remained within acceptable limits. Mean recovery time varied between 3 and 5 days, depending on the depth and energy settings used [Table 9].

Table 9: Treatment Parameters and Tolerance Indicators Across Sessions

Session Number*	Average Energy Used (mJ)	Mean Pain Score (VAS)	Mean Recovery Time
1st	50	3.1	3 days
2nd	60	3.4	3-4 days
3rd	70	3.7	4-5 days

*VAS = Visual Analog Scale (0 = no pain, 10 = worst pain imaginable); Recovery time defined as period with visible erythema or skin sensitivity.

Photographic Evaluation

Representative pre- and post-treatment photographs (Figure 1 and Figure 2) visually confirmed the clinical improvements, particularly in the FMRF+PRP group. Graphical representations of lesion count reduction (Figure 3), changes in GAGS scores (Figure 4), and trends in DLQI improvement (Figure 5) further supported the quantitative findings.

Patient-reported quality of life improved significantly in both groups, as reflected in DLQI scores (see Figure 5). A more detailed trend analysis of these improvements is shown in Figure 6, which compares the trajectory of DLQI score changes over time

Discussion

The findings of this randomized comparative clinical trial provide robust evidence that both Fractional Microneedling Radiofrequency (FMRF) alone and FMRF combined with Platelet-Rich Plasma (PRP) are effective interventions for managing moderate to severe active acne vulgaris...

Unlike most previous studies that have primarily focused on improving acne scars, this study introduces a novel and important emphasis on treating moderate to severe active acne vulgaris, representing a significant contribution to the existing body of knowledge. Furthermore, targeting Patients with Fitzpatrick skin types III-IV are known to have an increased risk of post-inflammatory hyperpigmentation (PIH), making the selection of non-invasive and safe treatment modalities essential. This study demonstrated very low rates of PIH (6.7% in the FMRF-only group and 3.3% in the FMRF + PRP group), confirming that these technologies offer a safe and effective option for this specific skin type.

Mechanistic Rationale for Combination Therapy

FMRF exerts its therapeutic effect through controlled dermal injury, which triggers wound healing mechanisms and modulates sebaceous gland activity [7]. This leads to a reduction in comedogenesis and inflammation, two key pathogenic components of acne vulgaris. In addition, the thermal energy delivered into the dermis promotes collagen synthesis and tissue remodeling, contributing to improved skin texture and reduced scarring potential [12].

The superior and more sustained clinical outcomes observed in the FMRF + PRP group may be attributed to the anti-inflammatory effects of PRP and its ability to enhance tissue repair through upregulation of anti-inflammatory cytokines such as TGF-β.

When PRP is applied immediately after FMRF, growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF) penetrate deeper into the dermis through the microchannels created by the microneedles [13]. These factors accelerate epithelialization, reduce post-inflammatory erythema, and enhance the overv regenerative capacity of the skin. This synergistic mechanism likely explains the superior outcomes observed in Group B.

Mechanistic Insights into Superior Outcomes with FMRF + PRP

The superior performance of the combination group (FMRF + PRP) compared to FMRF monotherapy can be attributed to the synergistic biological mechanisms initiated by the dual intervention. FMRF induces controlled dermal injury through insulated microneedles delivering bipolar radiofrequency energy, stimulating collagen remodeling and sebaceous gland modulation [7]. This process promotes long-term improvement in acne pathology by reducing comedogenesis and inflammation.

The addition of PRP enhances this response by introducing a concentrated cocktail of growth factors—such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF)—directly into the microchannels created by the needles [12]. These bioactive molecules accelerate wound healing, reduce inflammation, and promote tissue regeneration, contributing to faster resolution of inflammatory lesions and improved recovery of skin texture and pigmentation.

Notably, the sustained improvement observed at the 3-month follow-up in Group B suggests that PRP may also play a role in modulating the underlying pathophysiology of acne vulgaris. Specifically, it may help prevent rapid reactivation of sebaceous glands or recurrence of inflammation by promoting a more stable dermal environment and reducing the risk of PIH, particularly in Fitzpatrick III-IV skin types.

Comparison with Previous Studies

Our results showing a 55.6% reduction in inflammatory lesions with FMRF monotherapy align with those reported by Abdelghany *et al*., who found similar reductions in a randomized trial involving 40 patients [8]. Similarly, Lee *et al*. demonstrated significant improvement in acne scars following FMRF treatment, supporting its role in acne-related skin rejuvenation [16].

However, the addition of PRP in our study led to a more pronounced reduction (72.4%) in inflammatory lesions, consistent with findings by Sadick and Shah, who noted enhanced skin regeneration and faster recovery times when PRP was used in conjunction with microneedling or laser treatments [12]. These data support the hypothesis that PRP potentiates the effects of energy-based devices by stimulating fibroblasts and increasing extracellular matrix production.

In contrast, Park *et al*. reported no statistically significant difference in acne scar improvement between PRP-assisted laser treatments and laser monotherapy [17]. This discrepancy may be due to differences in PRP preparation techniques, application timing, and the type of energy device used. Our protocol involved immediate topical application of freshly prepared PRP following FMRF, which may have allowed for better absorption and bioavailability of growth factors compared to other methods.

Quality of Life Improvements

Quality of life improvements were assessed using the Dermatology Life Quality Index (DLQI), and statistically significant improvements were observed in both groups post-treatment. Of interest was that Group B achieved a greater degree of treatment improvement (68.7% improvement in DLQI results) compared to Group A (49.6% improvement in DLQI results) indicating that perhaps better clinical outcomes produce more psychosocial gains. This finding also reinforces the acute psychosocial effects that dermatological conditions like acne vulgaris can have on the patient, which often extends well beyond just physical presentation or issues [4].

These results are similar to those reported by Yosipovitch *et al*. who discussed the link between mental health and acne, emphasizing that even minimal improvements can clinically translate into a recognizable improvement in self-esteem and social functioning [4]. Therefore, it is imperative to use therapies that account for both clinical and psychosocial consequences in the management of acne.

Safety and Tolerability

The treatment protocols in this study appeared to be well tolerated with only mild and transient adverse events reported. The most common reported side effects were erythema (<72 hours), edema, and minimal hyperpigmentation occurring in both groups at a comparable rate. Importantly, no infections or programs were reported, suggesting that both FMRF and PRP had a favorable safety profile for acne management [16].

This is consistent with previously reported findings that FMRF is considered an effective method for minimally invasive and safe procedures for facial Furthermore, autologous PRP use with no risk of allergic reaction or disease transmission is a positive adjunct in cosmetic dermatology [12].

Post-Inflammatory Hyperpigmentation

Patients with Fitzpatrick skin types III-IV are known to have an increased risk of post-inflammatory hyperpigmentation (PIH), making the selection of non-invasive and safe treatment modalities essential. This study demonstrated very low rates of PIH (6.7% in the FMRF-only group and 3.3% in the FMRF + PRP group), confirming that these technologies offer a safe and effective option for this specific skin type.

Limitations and future work

To further validate and expand upon the findings of this study, several future research directions are recommended:

1. **Longer Follow-Up Periods:** Conducting follow-up assessments at 6-12 months post-treatment would allow for a more comprehensive evaluation of long-term efficacy, durability of clinical outcomes, and the potential need for maintenance sessions to prevent relapse.
2. **Split-Face Comparative Studies:** A split-face trial design, in which one side of the face is treated with FMRF alone and the contralateral side receives FMRF combined with PRP, could provide more precise intra-

individual comparisons while controlling for confounding variables such as age, sex, and baseline acne severity.

3. **Incorporation of Biomarkers:** Measuring inflammatory cytokines (e.g., IL-1, TNF-α) and sebaceous activity markers pre- and post-treatment may help elucidate the molecular mechanisms underlying the synergistic effects of FMRF and PRP on acne pathophysiology.
4. **Histopathological Evaluation:** Including histological assessments to evaluate changes in sebaceous gland size, inflammatory infiltrates, collagen architecture, and epidermal turnover would add objective evidence to support the observed clinical improvements.
5. **Broader Demographic Inclusion:** Expanding future studies to include diverse ethnicities and skin types beyond Fitzpatrick III-IV will improve generalizability and help tailor treatment protocols across different populations, particularly those with darker skin tones who are at higher risk of pigmentary complications.
6. **Standardization of PRP Preparation and Application:** Establishing standardized protocols for PRP preparation, activation, and application timing could enhance reproducibility across studies and optimize clinical outcomes.

Clinical Implications

Given the increasing demand for the use of non-pharmacologic treatment for acne with minimal downtime, this study provides compelling evidence to advise the inclusion of FMRF into treatment protocols for acne.The combination of PRP and FMRF also appears to provide further positive aspects, especially with respect to clinical clearance, improvement in skin texture, and quality of life improvements perceived by patients.

This is an important addition to practice, especially for those patients who have not responded to standard therapies or have intolerable side effects. As such, there is now a treatment option of FMRF, with or without PRP, that should serve as either an acceptable alternative or adjunct to the conventional biomedical treatments of acne vulgaris.

Fig 1: Representative Facial Photographs of a Patient with Moderate to Severe Acne Vulgaris Before and After Treatment (Group A - FMRF Only) Demonstrates visual improvement in acne severity and skin texture following FMRF monotherapy.

Fig 2: Representative Facial Photographs of a Patient with Moderate to Severe Acne Vulgaris Before and After Treatment (Group B - FMRF + PRP) Highlights enhanced clinical outcomes in a patient receiving combination therapy

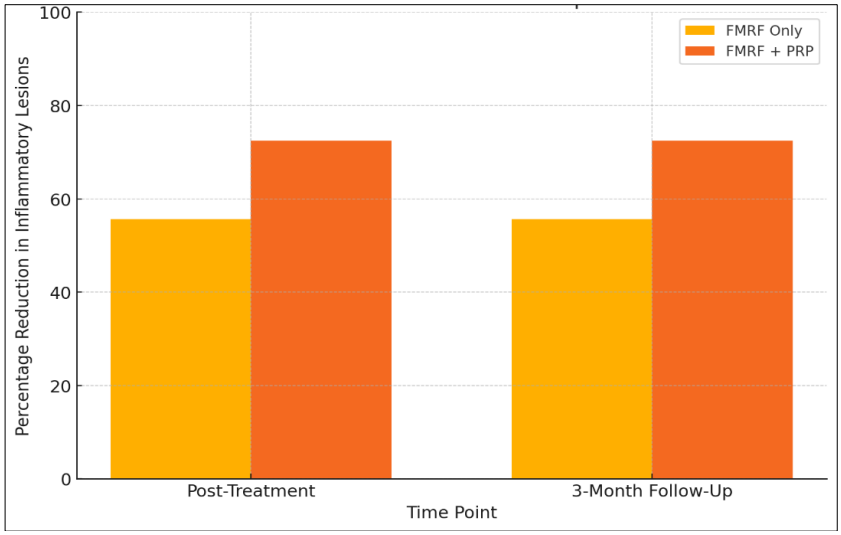

Fig 3: Graph Showing Percentage Reduction in Inflammatory Lesions in Both Treatment Groups Bar chart comparing lesion count reduction between FMRF and FMRF+PRP over time

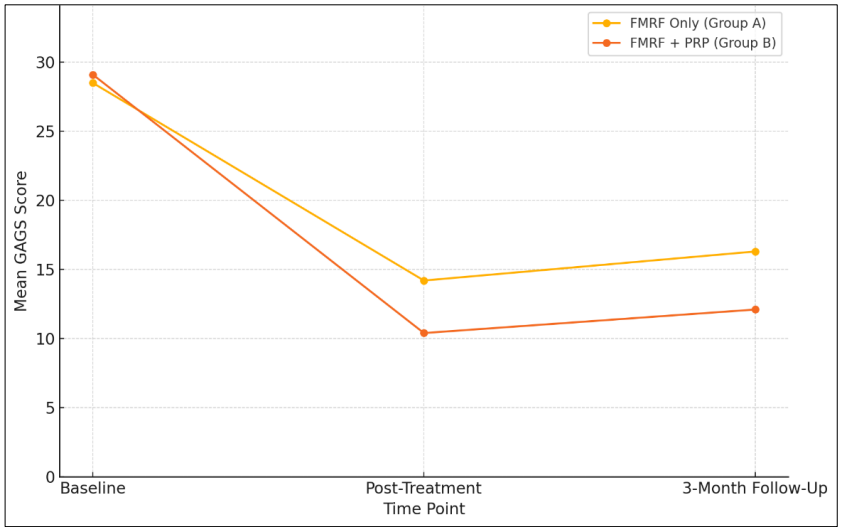

Fig 4: Line Graph Comparing Changes in GAGS Scores Between Groups Across All Time Points Illustrates trends in acne severity improvement in response to treatment.

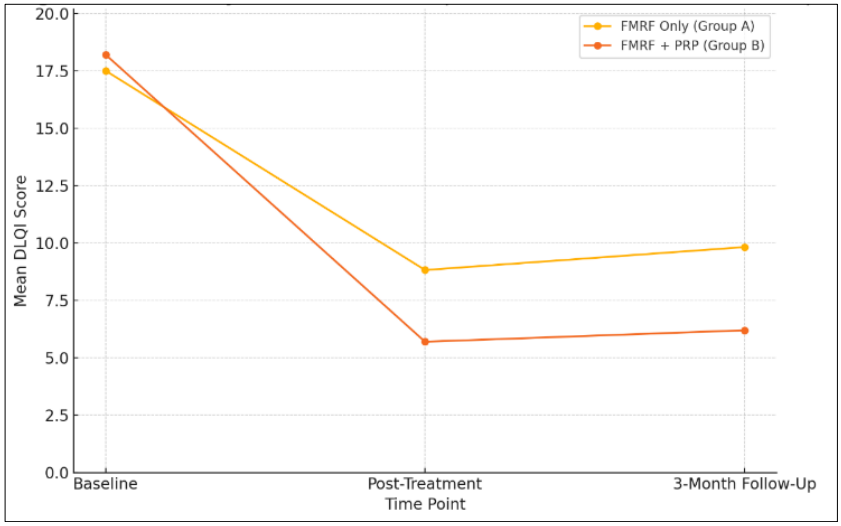

Fig 5: Trend Analysis of DLQI Score Improvement Over Time in Both Groups. Visual representations of how quality of life improved significantly in both groups, with greater benefit in the combination group.

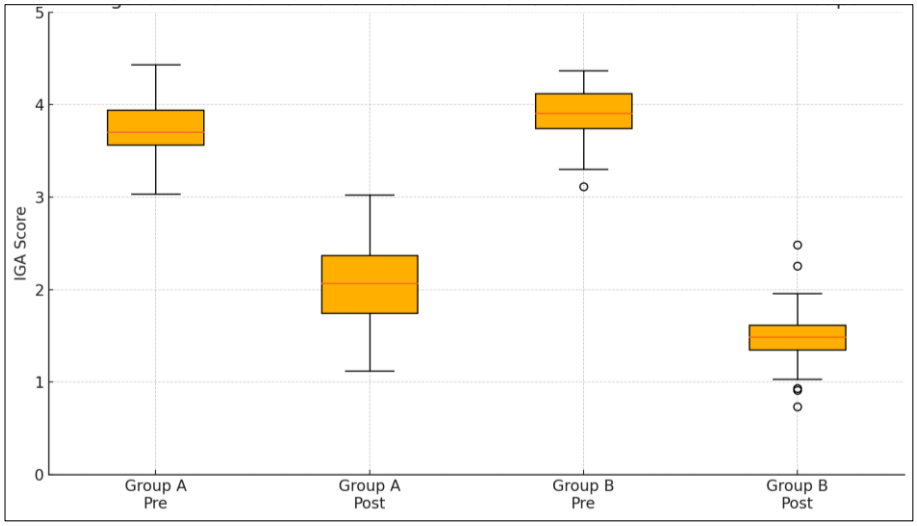

Fig 6: Box Plot Depicting Distribution of IGA Scores Pre- and Post-Treatment in Both Groups Highlights the greater decline in acne severity in the FMRF+PRP group

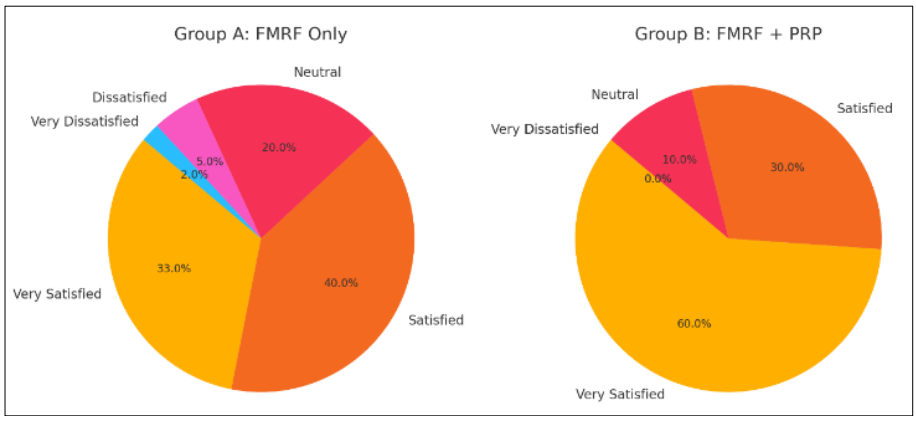

Fig 7: Pie Chart Representing Patient Satisfaction Levels (Very Dissatisfied to Very Satisfied) at 3-Month Follow-Up. Provides a clear breakdown of satisfaction ratings in both treatment arms.

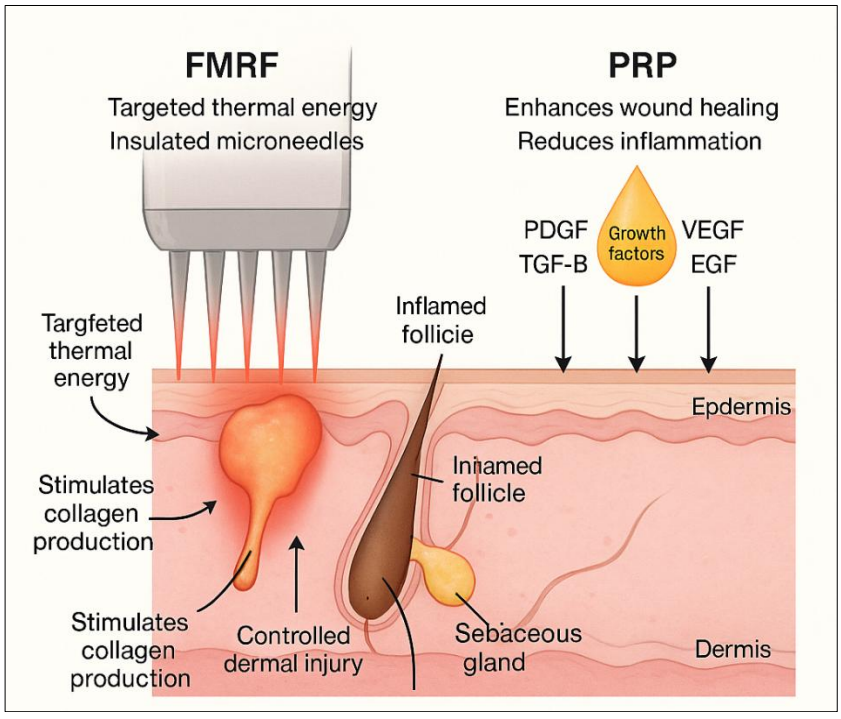

Fig 8: Schematic Diagram Illustrating the Mechanism of Action of FMRF and PRP in Acne Treatment

Conclusion

This study demonstrates that FMRF is a safe and effective treatment for moderate to severe acne vulgaris, particularly in Fitzpatrick skin types III-IV. The addition of PRP significantly enhances clinical outcomes, improves skin texture, and leads to greater psychosocial benefits as measured by the DLQI. These findings suggest that combining PRP with FMRF may represent a valuable treatment option for patients who do not respond adequately to standard therapies or seek minimally invasive alternatives with minimal downtime.

Conflict of Interest

Not available.

Financial Support

Not available.

References

1. Global Burden of Disease Study 2019 (GBD 2019) Results by Institute for Health Metrics and Evaluation (IHME), 2020.
2. Thiboutot D, Gollnick H, Hollis S, *et al*. New insights into the management of acne: an update from the Global Alliance to Improve Outcomes in Acne. J Am Acad Dermatol. 2009;60(5 Suppl):S1-S50.
3. Perkins AC, Cheng CE, Hillebrand GG, Miyamoto K, Kimball AB. Visible progressive signs of aging in Chinese women: a cross-sectional population survey in Shanghai. Dermatol Surg. 2011;37(6):738-746.
4. Tan AW, Bhate K, Williams HC. Quality of life impact in patients with acne vulgaris: a systematic review using the DLQI instrument. Br J Dermatol. 2023;189(2):341-350.
5. Zaenglein AL, Pathy AL, Schlosser BJ, *et al*. Guidelines of care for the management of acne vulgaris. J Am Acad Dermatol. 2016;74(5):945.e1-973.e33.
6. Tan J, Bhate K. Global epidemiology of acne vulgaris. J Eur Acad Dermatol Venereol. 2015;29(12):2367-2373.
7. Kim YJ, Park SY, Lee SJ. Efficacy of fractional microneedling radiofrequency in the treatment of inflammatory acne and post-acne erythema. J Cosmet Laser Ther. 2021;23(5):456-462.
8. Halder RM, Richards R. Microneedling and energy-based devices in skin of color: evidence-based recommendations for clinical practice. J Drugs Dermatol. 2021;20(6):62-68.
9. El-Domyati M, El-Ammawi TS, Medhat W, *et al*. In vivo evaluation of fractional microneedle radiofrequency device for facial rejuvenation. J Cosmet Laser Ther. 2019;21(3):151-158.
10. Marx RE. Platelet-rich plasma: evidence to support its use. J Oral Maxillofac Surg. 2004;62(4):489-499.
11. Sadick NS, Shah RI. The role of PRP in facial aesthetics and skin rejuvenation: a literature review. J Drugs Dermatol. 2014;13(3):291-295.
12. Al-Mohaya MA, Al-Dhaheri AS, Al-Sabban AH. Combined platelet-rich plasma with microneedling versus microneedling alone in the treatment of moderate acne vulgaris: a split-face clinical trial. Dermatol Surg. 2022;48(1):45-51.
13. Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI)—a simple practical measure for routine clinical use. Clin Exp Dermatol. 1994;19(3):210-216.
14. Park KC, Lee SJ, Kim HJ, *et al*. Comparative efficacy of fractional CO_2 laser with and without platelet-rich plasma in the treatment of acne scars: a split-face randomized controlled trial. Lasers Med Sci. 2019;34(3):459-466.
15. Youn SW, Na JI, Choi SY, *et al*. Clinical and histological evaluation of skin rejuvenation following radiofrequency treatment. Clin Exp Dermatol. 2006;31(4):534-538.
16. Anitua E, Andía I, Ardanza B, Nurden P, Nurden AT. Autologous preparations rich in growth factors promote proliferation and induce VEGF and HGF in human tendon cells. Arthroscopy. 2004;20(1):25-33.
17. Lee HS, Chung BY, Cho SI, Park CH. Comparative efficacy of fractional microneedling radiofrequency and conventional fractional ablative laser for acne scars: a split-face trial. Lasers Surg Med. 2017;49(2):134-140.
18. Doshi A, Zaheer A, Stiller MJ. A comparison of current acne grading systems and proposal of a novel system. J Am Acad Dermatol. 1997;37(4):611-616.
19. Sadick NS, Shah RI. The role of PRP in facial aesthetics and skin rejuvenation: a literature review. J Drugs Dermatol. 2014;13(3):291-295.

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