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COMPARISON OF BIOFILLER IN ATROPHIC ACNE SCAR MARKS WITH AND WITHOUT MICRO-NEEDLING (SPLIT FACE ANALYSIS)

Sehar Ikram*[1], Bushra Muneeb[2], Safoora Aamir[3]

*[1,2,3]*Department of Dermatology, Shaikh Zayed Hospital, Lahore*

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Corresponding Author: *
Sehar Ikram

Abstract

Background:
Atrophic acne scars pose both cosmetic and psychological challenges for affected individuals. Biofillers and microneedling have emerged as promising, minimally invasive treatment options to improve scar appearance and promote dermal regeneration.

Objective:
To evaluate and compare the efficacy of biofiller alone versus a combination of biofiller and microneedling in treating atrophic acne scars using a split-face analysis.

Methodology:
A prospective, split-face clinical study was conducted on 38 patients aged 18–45 with moderate to severe atrophic acne scars. The right side of each participant's face received microneedling followed by PRP-based biofiller, while the left received only the biofiller. Treatments were performed monthly for three sessions, and outcomes were assessed one month after the final session. The primary outcome measure was the Goodman and Baron Scar (GBS) score, and secondary outcomes included patient satisfaction and adverse effects. Two blinded dermatologists performed assessments.

Results:
Baseline GBS scores were statistically similar between the two sides (right: 24.95, left: 25.11, $p = 0.273$). Post-treatment, the right side (combination therapy) showed a significantly greater reduction in GBS score (mean: 12.71) compared to the left side (mean: 18.47) ($p < 0.001$). Patient satisfaction scores were also higher on the combination side (mean: 4.5) than on the monotherapy side (mean: 2.5) ($p < 0.001$). Side effects were mild, with slightly more edema on the microneedling side and slightly more post-inflammatory hyperpigmentation on the monotherapy side.

Conclusion:
Combining microneedling with biofiller is more effective than using biofiller alone to improve atrophic acne scars. The approach enhances scar remodeling and patient satisfaction, indicating a synergistic therapeutic benefit. Further studies with larger sample sizes and extended follow-up are recommended to validate these findings.

INTRODUCTION

Acne vulgaris produces atrophic acne scars, which create substantial cosmetic and psychological burdens for affected individuals. The impact of these scars on quality of life can be substantial, with estimates indicating a high prevalence of scarring among post-acne patients.[1] Historically, treatment modalities have ranged from topical agents to advanced surgical techniques; however, recent advancements in minimally invasive methods, particularly microneedling and biofillers, have garnered considerable interest from practitioners and patients alike. [2,3] Every year, around 40% of adults suffering from acne scarring explore various treatment options, seeking effective solutions that improve skin texture and overall appearance.[4]

With fine needles, microneedling generates tiny skin wounds that trigger wound healing responses, leading to enhanced collagen production for skin rejuvenation. Medical research demonstrates that microneedling treatment can boost the effectiveness of additional therapies, including platelet-rich plasma (PRP) and biofillers. The study by Ismail et al. demonstrated that using microneedling with PRP enhanced improvement scores that exceeded those obtained from microneedling.5 Other clinical trials support this combination effect of these therapeutic approaches over single-treatment methods.[6,7]

Biofillers composed of autologous platelet-rich plasma (PRP) and micronized acellular dermal matrix (mADM) exist to restore volume while improving atrophic scar contour. The study by Bhatt et al.[8] showed that injectable PRP gel works effectively as a biofiller for treating atrophic acne scars by preserving skin volume and strengthening the dermal matrix. Biofillers demonstrate unique advantages because they enhance scar visibility while creating conditions supporting healing and tissue regeneration. [9] Contemporary research shows that split-face analysis enables comparison of monotherapy and combination therapy effects to find the best treatment strategy for atrophic acne scars.[10,11]

The combination of microneedling and biofillers provides essential treatment because they effectively deal with the diverse factors causing atrophic acne scars. Recent studies demonstrate how treatment methods that strengthen skin tissue structure and boost elastin and collagen formation can minimize inflammation and collagen remodeling in atrophic scarring. Abnormal collagen formation occurs because of inflammatory mediators in acne lesions, disrupting transforming growth factor β1 signaling pathways. The combination of microneedling with biofillers shows promise as a treatment to reduce pathological changes in scarring, which leads to enhanced scar appearance.[12]

Obtaining superior outcomes from combination therapy in atrophic acne scar treatment requires continuous research efforts. Recent systematic reviews have highlighted the variabilities in efficacy based on individual patient characteristics, including skin type and scarring, suggesting the need for personalized treatment plans.[3,9] The comparative analysis of biofillers with and without microneedling advances our understanding of these therapies and paves the way for enhanced treatment protocols to optimize patient outcomes in atrophic acne scar management. This study aims to evaluate and compare the clinical efficacy of biofiller treatment alone versus a combination of biofiller and microneedling in the management of atrophic acne scars using a split-face analysis. This research investigates whether combining biofiller treatment with microneedling leads to better scar appearance and more favorable texture and satisfaction results compared to biofiller administration independently. This research evaluates treatment outcomes throughout a standardized three-month period to determine if the combined biofiller and microneedling therapy offers additional healing benefits for scar tissue restoration.

Materials and Methods

This study employed a prospective, split-face, comparative clinical design to evaluate the efficacy of biofiller treatment alone versus the combined use of biofiller and microneedling in managing atrophic acne scars. The study was conducted at a dermatology outpatient clinic between [insert study start and end dates]. Each participant received monthly treatments over three months, with a follow-up conducted one month after the final session to assess clinical outcomes. Before study initiation, ethical clearance was obtained from the Institutional Review Board (IRB) of [Insert Institution Name]. All participants provided written informed consent after being

informed in detail about the nature, benefits, and potential risks associated with the procedures. The study was conducted in compliance with the ethical standards of the Declaration of Helsinki. The sample size was calculated using a proportion-based formula to ensure adequate statistical power. Using a 95% confidence level, 5% margin of error, and an estimated population proportion of very good reduction in GBS scores of 16.66%,[8] the minimum required sample size was determined to be 38 patients. Inclusion criteria were: adults aged 18–45 years with clinically diagnosed moderate to severe atrophic acne scars (Goodman and Baron's quantitative scar grade >15), and no prior acne scar treatment within the past six months. Exclusion criteria included active acne, history of hypertrophic or keloid scarring, use of systemic retinoids within the past six months, coagulation disorders, active skin infections, and hypersensitivity to PRP or microneedling.

Technique

A split-face intervention was implemented for each participant. On the right side of the face, participants received microneedling followed by autologous PRP-based biofiller injections (combination therapy). On the left side, only biofiller injections were administered (monotherapy). Microneedling was conducted using a dermapen device with 1.5 mm depth sterile needles. The autologous biofiller was prepared using double-spin centrifugation from the participant's venous blood and activated with calcium gluconate before injection. Each participant underwent three treatment sessions, spaced one month apart. Figure 1a shows plasma drawn in 10 cc and 1 cc syringes. The preparation of the biofiller in hot water is illustrated in Figure 1b, resulting in a final product with gel-like consistency as seen in Figure 1c. For administration, a 23-gauge cannula attached to a 10 cc syringe was used during subcision, while individual scars were injected using a 1 cc syringe (Figure 1d).Both sides of the face received equal quantities of the biofiller for standardization. Post-procedure care included using non-comedogenic moisturizers, broad-spectrum sunscreens, and avoiding sun exposure or chemical irritants. The primary outcome was the degree of scar improvement measured using the Goodman and Baron quantitative acne scar grading system (GBS). Assessments were made at baseline and four weeks after the final treatment session. Secondary outcomes included patient satisfaction (measured using a 5-point Likert scale) and the incidence of side effects such as erythema, edema, post-inflammatory hyperpigmentation, and infection. All participants were photographed under standardized lighting and positioning conditions at baseline and during follow-ups. Two dermatologists, blinded to the treatment allocation on each side of the face, independently evaluated clinical photographs and in-person assessments to ensure objectivity and reduce observer bias. Data were analyzed using SPSS software 27. Quantitative variables were reported as means ± standard deviations, while frequency and percentage were calculated for qualitative variables. Differences in scar scores between the two facial sides were compared using the Wilcoxon signed-rank test, as the assumption of normality was not met in this dataset. The p-value <0.05 was considered statistically significant.

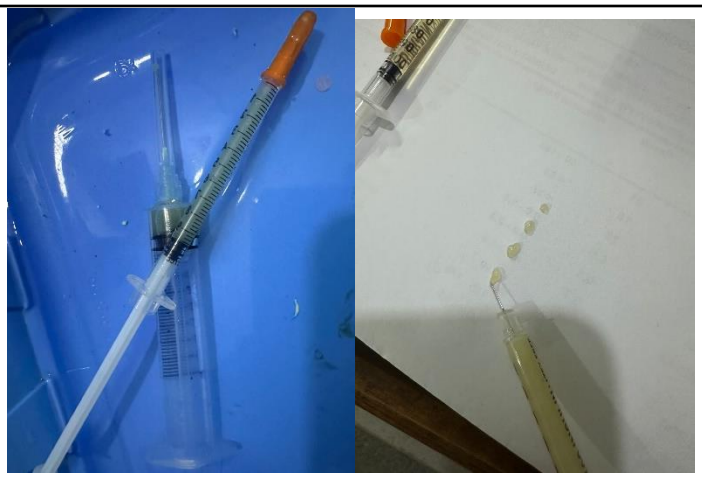


Figure 1a. Plasma taken in 10 cc and 1 cc syringe Figure 1b. Preparation of bio filler in hot water, Figure 1c.. Bio filler made , gel like consistency, Figure 1d. 23 gauge cannula on 10 cc syringe to inject while doing subcission and in the end injected individual scars with one 1cc

Table 1. Goodman and Baron quantitative acne scar grading system (GBS)[8]

Grade		Clinical features
1	Macular	Macular erythematous, hyperpigmented or hypopigmented flat marks
2	Mild	Mild atrophic or hypertrophic scarring that may not be obvious at social distances of 50 cm or greater and easily covered by makeup or beard hair in men
3	Moderate	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50 cm or greater and is not covered easily by makeup or beard hair in men, but is still able to be flattened by manual stretching of the skin
4	Severe	Severe atrophic or hypertrophic scarring not flattened by manual stretching of the skin

Results

Demographic profile of patients

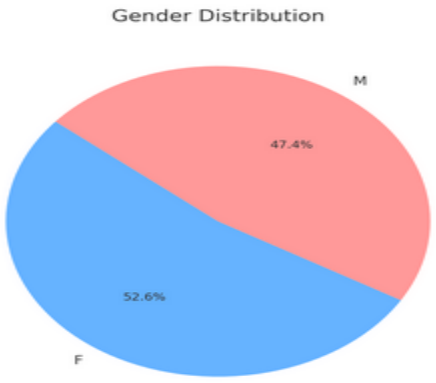


Figure 2

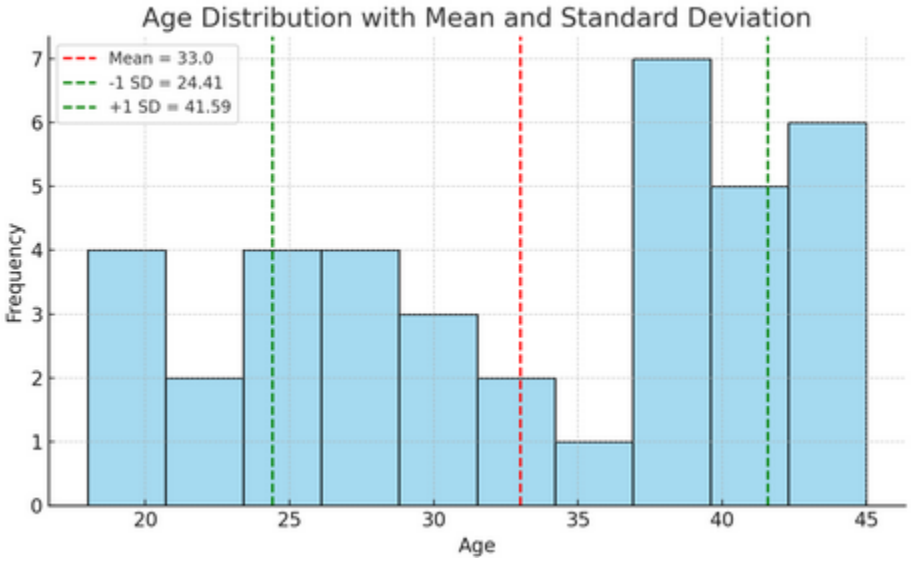
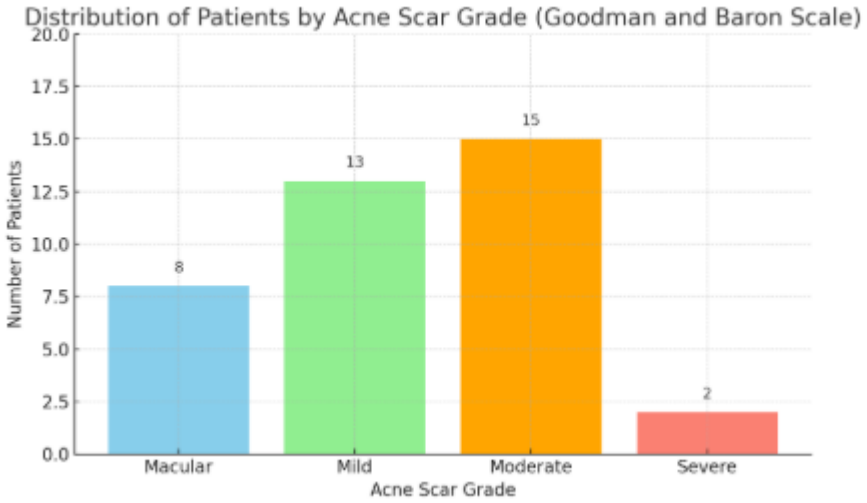


Figure 3

Table 3. GBS & Satisfaction Scores Before and After Treatment

GBS Score Type	N	Mean	Std. Deviation	Min	Max	p-value
Baseline GBS Score (Right)	38	24.95	3	20	29	
Baseline GBS Score (Left)	38	25.11	3.15	19	30	0.273
Post-Treatment GBS Score (Left)	38	18.47	3.55	10	25	
Post-Treatment GBS Score (Right)	38	12.71	3.42	7	18	<.001
Satisfaction score (left)	38	2.5	0.51	2	3	
Satisfaction score (right)	38	4.5	0.51	4	5	<.001



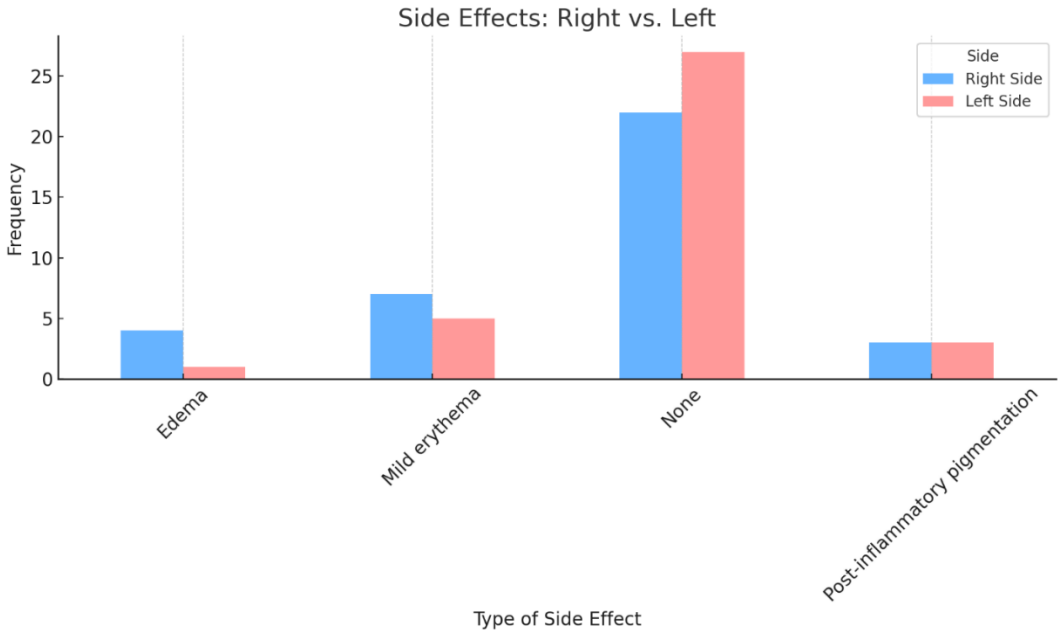


Figure 4

The study included 38 participants, revealing a slightly female-majority group (52.6% female, 47.4% male) with a mean age of 33 years (SD = 8.59, range 18–45), indicating a young adult cohort with moderate age variability. (Figures 2 & 3)

At baseline, the Goodman and Baron Scar (GBS) scores were statistically similar between both sides—24.95 on the right and 25.11 on the left ($p = 0.273$)—indicating a balanced starting point for evaluating treatment efficacy. Following the three-month intervention, a significant reduction in GBS scores was observed on both sides; however, the improvement was markedly greater on the combination therapy side. The post-treatment GBS score for the right side was 12.71, compared to 18.47 on the left, with this difference reaching statistical significance ($p < 0.001$). These results demonstrate a more substantial therapeutic effect when microneedling is added to biofiller treatment. Regarding patient satisfaction, participants reported a mean score of 4.5 on the right side and 2.5 on the left, further supporting the clinical findings ($p < 0.001$). (Table 2)

The right side, which received microneedling plus biofiller, had a slightly higher incidence of edema (4 vs. 1), likely due to the mechanical trauma from microneedling. However, the left side, treated with biofiller alone, showed a slightly higher frequency of post-inflammatory pigmentation (4 vs. 3). Mild erythema was comparably observed on both sides (7 on the right and 6 on the left). (Figure 4)

Discussion

The comparison of atrophic acne scar treatment via a split-face study yields significant observations on the effectiveness of biofiller therapies, especially when augmented by microneedling procedures. Our investigation illustrated a statistically significant decrease in the Goodman and Baron Scar (GBS) scores for the combined therapy versus the monotherapy side, which agrees with prevailing literature indicating greater results for combined treatment regimens.

Our findings have demonstrated the synergistic effects of microneedling combined with biofillers for treating atrophic acne scars, which match previous research. The research by Ismail et al. (2020) demonstrated that microneedling treatment with PRP led to better results than microneedling alone (GBS score reduction from 26.4 ± 4.1 to 15.8 ± 3.9 compared to 26.7 ± 4.3 to 20.1 ± 4.0, $p < 0.05$). [5] Their study used PRP without mADM but their findings matched our results. Bhatt et al. (2021) studied PRP-based biofillers and their subjects experienced a mean GBS score decrease from 28 ± 3.3 to 19.7 ± 3.2 across three treatment sessions. This outcome closely parallels our

left-side GBS score reduction from 25.11 ± 3.15 to 18.47 ± 3.55. Our combination therapy outmatched their previous results, which indicates that microneedling increases the therapeutic effectiveness of biofillers, according to the study. They concluded that biofillers (platelet-poor plasma gel) provide an efficient treatment option for atrophic acne scars because they are simple to use, minimally invasive, and cost-effective[8].

A clinical study demonstrated that scars treated with both PRP and microneedling procedures showed a substantial 62.20% improvement, while the control side achieved only 45.84% healing. This research evidence suggests that combining microneedling with suitable therapies produces better outcomes for atrophic acne scars.[13]

The study findings mirror the clinical observations reported by Faghihi et al. which showed improved scar grading results in patients who received fractional microneedled radiofrequency treatment with subcision therapy instead of monotherapy alone.[14] These clinical investigations indicate that joint procedures stimulating collagen formation and tissue reconstruction deliver superior therapeutic outcomes to atrophic scar patients. Patient treatment plans must be individualized because systematic reviews confirm that responses differ according to unique variables such as skin type and scar features.[15]

The scores from patient surveys match our numerical analysis results. The patient satisfaction ratings showed a significant difference between 4.5 for microneedling with biofiller treatment and 2.5 for biofiller-only treatment ($p < 0.001$). (Figure 5) Multiple studies conclude that patients rate their outcomes better when combination therapies are used.[16] Such satisfaction reports demonstrate clinical success alongside psychological and social dimensions of treatment responses which move treatment focus from purely aesthetic outcomes to comprehensive patient well-being.

Nevertheless, our research is not without its limitations. The sample size, statistically powered in preliminary calculation, is nevertheless relatively small, placing constraints on the generalizability of findings. The observational design of the study also has no randomized allocation of interventions for the evaluation of long-term efficacy beyond the three-month follow-up. Larger, multicentric trials in future research can inform more in-depth elucidation of the mechanisms by which microneedling increases biofiller efficacy alongside exploration of potential variables such as variations in skin healing kinetics.

Figure 5
1st session

2nd session

3rd session

Conclusion

our results prove the synergistic effect of the combination of microneedling with biofiller therapy for improving aesthetic results in atrophic acne scars. The improved GBS scores and much higher patient satisfaction support the need for integrated treatment modalities to manage the complex challenges posed by acne scarring. This research calls for further investigation into optimized treatment protocols based on individual patient profiles to develop more effective and personalized interventions for the management of acne scars.

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