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ORIGINAL STUDY

Stromal Vascular Fraction and Plasma-Jet: A Synergistic Approach to Enhance Acne Scar Treatment Outcomes

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Abstract

Background: Acne scars represent a significant dermatological concern, manifesting as marks and indentations on the skin surface following severe or prolonged acne. Both Plasma-Jet and Stromal Vascular Fraction (SVF) have been used in a synergistic approach to treat moderate to very severe types of acne scars.

Objectives: The aim of this study is to evaluate the efficacy and safety of combining SVF and Plasma-Jet in the management of acne scars.

Materials and Methods: This prospective single-arm clinical trial was conducted from September 2024 to September 2025 at Rizgary Teaching Hospital and Zheen International Hospital in Erbil, Iraq. Twenty patients aged 20–45 with moderate to very severe facial acne scars were treated with SVF and Plasma-Jet. The scar severity, improvement, and satisfaction were the outcomes of the study.

Results: The mean age of the patients was 31.4 years (SD: 6.52, range: 20–45 years), predominantly male (80%). Most scars were bilateral cheek lesions (90%), classified as type II (55%), III (20%), or IV (25%), with moderate severity being the most common (55%). The baseline mean Goodman and Baron score was 16.1, significantly reduced to 8.05 post-treatment ($p < 0.0001$). Patient satisfaction was high, with 85% satisfied (50% very satisfied, 25% satisfied, and 10% satisfied but wanting more sessions), while 15% were not satisfied. All patients showed improvement: 50% significant, 35% moderate, and 15% mild. Improvement was consistent across age, gender, Fitzpatrick skin type, and initial severity ($p > 0.05$ for all), indicating the treatment's effectiveness regardless of demographic or clinical factors. The combination therapy demonstrates promising results for diverse acne scar types and severities.

Conclusion: Combined SVF and plasma-Jet treatment significantly improves acne scars, with high patient satisfaction and consistent results across age, gender, skin type, and severity, demonstrating safe and effective outcomes for diverse scar types.

Keywords: Stromal vascular fraction (SVF), Plasma-jet therapy, Acne scar

1. Introduction

Acne scars represent a significant dermatological concern, manifesting as marks and indentations on the skin surface following severe or prolonged acne. They form due to abnormal wound healing and inflammation, often involving the skin producing too much or too little collagen, excessive manipulation

like picking pimples, and genetic predisposition [1]. These scars are categorized into several types, including atrophic Scars, which result from tissue loss and appear as deep pits or wide shallow depressions; hypertrophic Scars, characterized by thick raised tissue that remains within the original acne area; and keloid Scars, which are more severe than hypertrophic scars as they extend beyond the original acne margin.

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Understanding their shapes and appearance is crucial for accurate classification [2].

Beyond their physical manifestations, acne scars impose substantial social and psychological burdens, leading to low self-esteem, social withdrawal, anxiety, and even clinical depression [3]. These psychosocial impacts can be particularly aggressive among adolescents and young patients, where physical appearance plays a vital role in personality and social development. Despite the availability of numerous medical and cosmetic treatments, many patients continue to struggle with the emotional and social consequences of their condition [4, 5]. Therefore, a comprehensive understanding of the causes, types, and impacts of acne scars is essential, not only for successful clinical treatment but also for supporting the patient's overall well-being [2].

Current therapeutic strategies for acne scars commonly involve physical approaches like CO₂ laser, pulsed dye laser, or cryotherapy; surgical methods such as dermabrasion; or topical applications of chemical peels and medical creams [6]. However, many of these procedures have yielded unsatisfactory results, and a universally accepted guideline treatment for acne scars has yet to be established [6]. Treating acne scars remains one of the most challenging areas for dermatological professionals [6, 7].

Stromal Vascular Fraction (SVF) has recently become a widely accepted repair method because research shows its effectiveness for skin restoration and the renewal of skin tissue [6]. The subcutaneous adipose tissue provides the source of SVF, which contains abundant adipose-derived stem cells. The mixed population of cells within SVF contains endothelial progenitor cells together with adipose-derived adherent stromal/stem cells, along with blood-derived cells and pericytes. SVF demonstrates an exceptional ability to generate collagen while functioning as a filler substance. The repair capabilities of SVF cells stem from stem cells which form connections and interact with growth factors. Research evidence shows that SVF treatment effectively helps patients reduce acne scars. The process of creating SVF gel eliminates extra cells and lipids, which produces fewer lipid droplets than traditional fat grafting, thus leading to reduced swelling and short-term redness that fades after three days [6, 7].

In parallel, plasma-Jet therapy offers a non-surgical, minimally invasive, or non-invasive procedure for skin rejuvenation [8]. It operates by heating the superficial surface of the skin, intentionally creating small injuries [7]. The mechanism involves the passage of an electric current in the space between the plasma-Jet device's emitting tip and the targeted skin surface. This high-voltage exposure to atmospheric air trig-

gers an electric current that forms reactive oxygen species, reactive nitrogen species, and other gases (OH, NO, and O₃), which provide protective and antibacterial effects on tissues. This process ultimately produces managed thermal lesions on the skin's superficial surface, leading to skin rejuvenation [8].

Despite the existence of numerous tactics and methods for treating acne scars and extensive research aiming for admirable results, there is little research on using Plasma-Jet in conjunction with SVF to treat this complaint [9]. To our knowledge, this important research has not been performed in this locality, highlighting a significant research gap. Therefore, the aim of this study was to assess the efficacy and safety of combining SVF and Plasma-Jet in the management of moderate to very severe acne scars. Therefore, the aim of this study was to evaluate the efficacy and safety of combining SVF and Plasma-Jet in the management of moderate to very severe acne scars.

2. Materials and methods

2.1. Study design and sampling

This study was designed as a prospective single-arm clinical trial conducted over a period of one year, from September 2024 to September 2025, as mentioned previously. The procedures were performed at Rizgary Teaching Hospital and Zheen International Hospital, both in Erbil, Iraq, to ensure better follow-up and correct instrumental use during the trials.

2.2. Participants

The prospective clinical trial study included twenty patients purposively who were initially recruited for the research. Twenty patients between 20 and 45 years of age showed moderate to very severe acne scars on their facial areas. Each patient received a clinical diagnosis of facial acne scars, which ranged from mild to severe severity. All participants provided both verbal and written consent to join the study and to share their follow-up facial photographs for research purposes.

2.3. Inclusion criteria

- Individuals aged 18–50 years.
- Patients with moderate to very severe acne scars.
- All types of acne scars (depressed, hypertrophic, keloid, and pigmentary).
- Patients with scars who had failed previous treatments.
- Patients who had not undergone prior scar treatment in the past 3 months.

- Patients who had not used isotretinoin in the past 3 months.
- Patients with psychological stability and realistic expectations.

2.4. Exclusion criteria

- Active acne with large pustules.
- Infected acne mixed with scars.
- Pregnancy or breastfeeding.
- Cancer.
- Bleeding disorders.
- Skin disorders that might interfere with healing.
- Psychological instability or unrealistic expectations.
- Failure to follow the post-procedure protocol or attend follow-up schedules for photography.

Prior to the procedures, a history was taken to confirm that patients met the inclusion and exclusion criteria. Eight cases were excluded at this stage: six refused SVF injection after Plasma-Jet, and two refused Plasma-Jet sessions. There was also a loss of 5 cases who received 2 sessions of Plasma-Jet treatment but did not return for SVF injection.

2.5. Assessment tools for efficacy and safety

Several objective and subjective measurement tools were used to assess the severity of acne scars and treatment outcomes, as well as patient satisfaction and safety. These included:

- **Clinical grading scale:** The Goodman and Baron quantitative scaling schedule was used for visual assessment of scar severity [10].
- **Patient-reported outcome questionnaire:** This assessed how acne scarring affected the patient's quality of life and self-esteem.
- **Satisfaction survey:** A summary of questions was used to assess patient satisfaction with the results after the procedure compared to before.
- **Standardized imaging (before and after photography):** A series of follow-up photos were taken to evaluate the recorded results by the surgeon and could be shared with the audience and patient.

2.6. Treatment procedure

Combination of Plasma-Jet and SVF Patients exhibiting moderate to severe acne scars were randomly assigned to receive a combination therapy, starting with Plasma-Jet sessions followed by SVF gel injection.

2.6.1. Plasma-jet treatment

Patients underwent two sessions of Plasma-Jet treatment and SVF on their cheeks, performed in an outpatient clinical setting. Prior to the procedure, lidocaine cream (Amla cream) was applied to the treatment areas and left in place for 40 minutes to ensure adequate topical anesthesia. During the treatment, the cream was gradually removed as needed to maintain effective numbing while allowing optimal device contact with the skin. While the procedure was generally well-tolerated, patients might experience mild burning sensations. In some cases, minor oozing of blood occurred, particularly in areas with greater skin thickness or vascularity; when this happened, pinpoint pressure was applied to control bleeding, and the procedure was continued without interruption. Immediately after treatment, patients often reported mild residual burning, which was effectively managed with ice packs or, if requested, topical applications of Arnica cream or Aloe vera cream. The face was gently cleansed with normal saline post-procedure, and no antibiotic ointments were required. Patients were given detailed aftercare instructions, including the use of SPF 50 sunscreen every two hours during the first two weeks, strict avoidance of sun exposure, heat, and hot water, and delaying facial washing for 24 hours using only chemical-free soap. The second Plasma-Jet session was scheduled no sooner than three weeks after the first, allowing sufficient time for healing and tissue recovery.

2.6.2. SVF gel injection

Following the completion of two Plasma-Jet sessions and a minimum interval of three weeks, patients received SVF gel injections to further improve acne scar appearance. The SVF gel was derived from subcutaneous fat harvested from donor sites such as the thigh, abdomen, or flanks—areas selected based on fat availability, with female patients typically offering more favorable donor tissue. The preparation of SVF gel was performed mechanically in the operating room under sterile conditions. After site sterilization, a tumescent solution containing lidocaine and epinephrine was infiltrated into the donor area and allowed to take effect for 5–10 minutes. Fat was then harvested using Coleman's liposuction technique with a 3 mm cannula, yielding approximately 75 mL of adipose tissue. The collected fat was transferred into sterile syringes, allowed to stand upright for 5–10 minutes to facilitate layer separation, and rinsed with saline if significant blood content was present. The cleaned fat was centrifuged at 1,200 rpm for 3 minutes, after which the supernatant fluid was discarded to obtain purified adipose tissue. This purified fat was emulsified by passing it back and forth

between two syringes via a 3-way stopcock for one minute. The emulsified fat was then subjected to a second centrifugation at 2,000 rpm for 3 minutes, resulting in three distinct layers: an upper oily layer, a lower aqueous layer, and a middle gel-like layer rich in SVF gel. The top and bottom layers were discarded, and the middle SVF gel—typically yielding 5–8 mL from an initial 60–80 mL of harvested fat—was collected into sterile syringes for injection.

The SVF gel was administered subcutaneously into acne-scarred regions of the face using 18G × 70 mm blunt cannulas. The injections were performed in multiple planes and directions to ensure even distribution and optimal volumetric correction. Post-procedure, patients experienced mild swelling and redness, though these effects were notably less severe compared to traditional fat grafting techniques. Swelling usually resolved within 2–3 days, and any discomfort typically subsided within 48 hours. After the injection, the face was cleansed with saline to remove any residual blood from cannula entry points, and no facial dressing was necessary. Patients were advised to avoid heat exposure—including saunas, steam rooms, hot water, and heat-based cosmetic procedures—for two weeks, as heat could compromise SVF cell viability. They were also instructed to refrain from strenuous physical activity and to avoid sleeping on the treated areas to protect the grafted material and enhance treatment outcomes. Donor sites were covered with gauze dressings, and patients were informed that minor drainage from these sites could persist for up to three days, which was considered a normal part of the healing process.

2.7. Statistical analysis

The general and medical characteristics of patients with acne scars are presented as mean (SD) or no. (%) as appropriate. Scar severity was reported as mean (SD), and scar types were described as no. (%). Changes in treatment scores before and after intervention among patients with acne scars were summarized using mean and standard deviation and visualized using box plots. The association between general/medical characteristics and the level of clinical improvement was assessed using Pearson's chi-squared test. Statistical significance was defined as $p < 0.05$. All statistical analyses were performed using IBM SPSS Statistics for Windows (Version 27.0) [Computer software], IBM Corp. (2020).

2.8. Ethical approval

This study was approved and reviewed by the Research Ethics Committee of Hawler Medical Uni-

versity, College of Medicine (reference number 21 of meeting code 11 on August 6, 2025).

3. Results

The mean age of patients with acne scars who received the combined treatment of SVF and plasma-Jet was 31.4 years, ranging from 20 to 45 years. The majority of patients were male (80.0%), followed by female (20.0%). In most cases, scars were located bilaterally on the cheeks (90.0%), with the remaining patients exhibiting scars on the cheeks and chin (10.0%). Scar types were classified as type II (55.0%), type III (20.0%), and type IV (25.0%). Based on the Goodman and Baron grading system, most patients had moderate scar severity (55.0%), followed by severe (25.0%) and very severe (20.0%). The mean severity score was 16.1, ranging from 10 to 36. Scar morphology varied, with the most common combinations being icepick, rolling, and boxcar (36.84%); hypertrophic/keloid, boxcar, and rolling (21.05%); boxcar and rolling (15.79%); and boxcar, rolling, and pinprick (15.79%). Less common patterns included icepick, rolling, and hypertrophic (2.26%) and rolling with boxcar (5.26%) (Table 1).

The study showed that the post-treatment score of the acne scar was significantly decreased from 16.1 to 8.05 ($p < 0.0001$; Table 2, Fig. 1).

The study showed that 85.0% of patients with acne scars were satisfied with the treatment, with varying degrees of satisfaction: 50.0% were very satisfied, 25.0% were satisfied, and 10.0% were satisfied but expressed a desire for additional sessions. The remaining 15.0% of patients were not satisfied with the treatment outcome. All patients showed some degree of clinical improvement, which was categorized as significant improvement in 50.0%, moderate improvement in 35.0%, and mild improvement in 15.0% (Table 3; Fig. 2).

The study showed that the level of improvement after treatment in patients with acne scars did not differ significantly across age groups ($p = 0.5144$), gender ($p = 0.5274$), Fitzpatrick skin type ($p = 0.8162$), or baseline disease severity ($p = 0.3525$) (Table 4).

A series of follow-up pre and post-procedural photos of the patient were recorded; some of the results are shown in Figs. 3 to 5.

Performing a combination of both Plasma-Jet treatment and SVF gel injection was well-tolerated by patients. Although there were some transient and mild adverse effects observed, the most common side effects were localized erythema at the surface of the skin which was treated with laser, and the area where SVF injections were done, slight edema which usually resolved in less than 7 days, and mild discomfort at

Table 1. General and medical characteristics of the patients with acne scars.

Characteristics (n = 20)	Frequency distribution	
	Number	Percent
Age (20–45 years)	Mean: 31.4	SD: 6.52
Std Err Mean: 1.46		
Gender		
Male	16	80.00
Female	4	20.00
Scar Location		
Cheeks (bilateral)	18	90.00
Cheeks and Chin	2	10.00
Fitzpatrick Type		
Type II	11	55.00
Type III	4	20.00
Type IV	5	25.00
Severity (G&B)		
Moderate	11	55.00
Severe	5	25.00
Very Severe	4	20.00
Goodman & Baron Score (10–36)	Mean: 16.1	SD: 9.89
Scar Description		
Icepick, rolling, boxcar	7	36.84
Hypertrophic/keloid, boxcar, rolling	4	21.05
Boxcar, rolling	3	15.79
Boxcar, rolling, pinprick	3	15.79
Icepick, rolling, hypertrophic	1	5.26
rolling, boxcar	1	5.26

Table 2. Changes in the treatment score before and after treatment in patients with acne scars.

	Treatment score times			
	Pre-Treatment Score	Post-Treatment Score	p	Mean diff (95% CI)
Mean (SD)	16.1 (9.89)	8.05 (4.39)	<0.0001	–8.05 (–10.86 to –5.24)
Min-max	10.00–36.00	4.00–18.00		

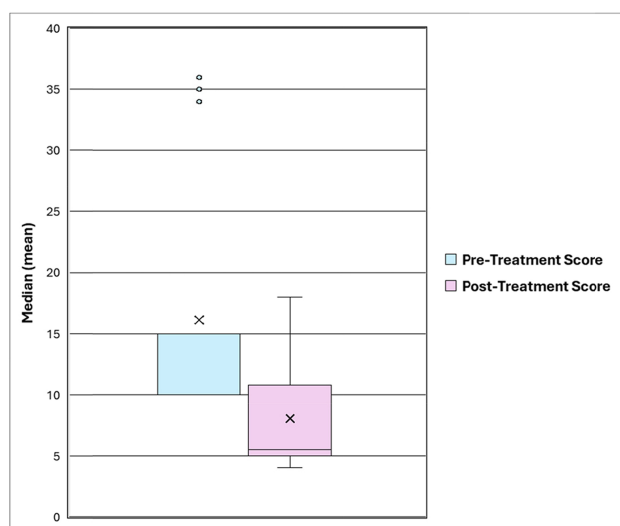


Fig. 1. Pre- and post-Treatment Scores of patients with acne scars.

the treated sites. A few patients mentioned temporary hyperpigmentation that started in the 3rd week post-plasma-Jet treatment, especially those with Fitz-

patrick skin types III and IV, but it resolved gradually with appropriate skin care and sun protection. No records of infection, worsening of the scars, or prolonged pigmentary changes were made.

4. Discussion

This research evaluated the effectiveness of the combination treatment of Plasma-Jet and SVF treatment for acne scar improvement. There have been many studies on SVF alone as the treatment for acne scars or SVF, or combined with CO₂ laser treatment, derma pen combined with SVF, or dermabrasion combined with SVF, but very few on Plasma-Jet combined with SVF. Within the group, according to the Goodman and Baron quantitative scar scale classification, 11 patients had moderate acne scars, whereas 5 patients complained of severe acne scars, and 4 patients had very severe acne scars. Following the treatment sessions, clinical examination of the cases showed that the treatment guidelines resulted in considerable and prominent improvements, especially for the cases

Table 3. Satisfaction of the patients with acne scars and treatment improvement after treatment.

Outcomes (n = 20)	Frequency distribution	
	Number	Percent
Post-Treatment Satisfaction		
Not fully satisfied, noted changes	1	5.00
Not fully satisfied, noted improvement	1	5.00
Not fully satisfied, wants further sessions	1	5.00
Satisfied	5	25.00
Satisfied, may need more sessions	2	10.00
Very satisfied	10	50.00
Improvement Level		
Mild Improvement	3	15.00
Moderate Improvement	7	35.00
Significant Improvement	10	50.00

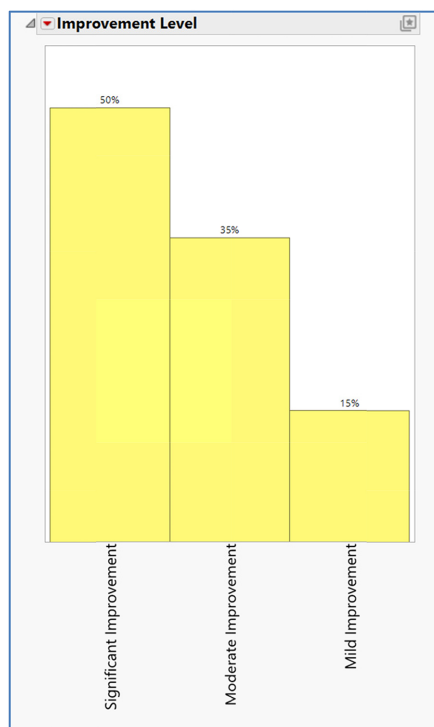


Fig. 2. Improvement of acne scar after treatment.

that suffered from moderate acne scars. Among the patients with moderate acne scars, all experienced positive results, showing significant improvements in skin texture, a decrease in scar depth, a more uniform skin tone, revitalization of the skin, and an overall increase in smoothness and viability. These findings suggest that the synergistic use of plasma jet and stromal vascular fraction (SVF) exerts more pronounced beneficial effects on less aggressive and less advanced acne scars, likely due to the greater remodeling capacity of less-damaged skin. As well as in the 5 cases that had severe scars, they noticed visible improvements in scar depth and number, with a satisfied attitude to-

ward the treatment. On the other hand, the 4 patients who complained of very severe acne scars showed improvement, but not as good as those with moderate scars. Their results demonstrated an acceptable level of improvement.

This variation was most probably due to the chronic fibrotic composition and the extra depth of the very severe scars, which had higher resistance to the treatment. However, sensible and reasonable improvements were observed, which made this minimally invasive procedure an acceptable approach as a treatment for such challenging scar types.

Overall, the findings suggested that the synergistic method of Plasma-Jet and SVF treatment stimulated collagen remodeling and production in conjunction with remodeled skin and rejuvenation, especially in less aggressive cases with scars. The effect of Plasma-Jet had come from stimulating more collagen and fibroblast production, which caused shrinkage of the scar size and depth reduction. In addition to this size shrinkage, the subsequent SVF injection resulted in further collagen production, skin rejuvenation, and remodeling from the effect of all the regenerative cells and growth factors that were present in it [1].

Tao Zhao et al. evaluated CO₂ fractional laser and SVF using separate treatments in 10 patients with moderate to severe acne scars. Each patient received a single CO₂ laser session on one side of the face and an SVF injection on the other side. The SVF-treated side showed no post-inflammatory hyperpigmentation or hematoma. It also demonstrated better clinical outcomes compared with the CO₂-treated side [6].

In agreement with the literature, multiple methods of treatment for atrophic acne scars, including the injection of SVF combined with fat grafting and PRP, were used. The results showed significant improvement in skin pores, spots, skin lightness, melanin content of skin, and skin elasticity with denser skin layers. A percentage of 66.6% of patients showed good

Table 4. Effects of the general and medical characteristics on the improvement level in patients with acne scars.

Characteristics (n = 20)	Improvement Level			p
	Mild Improvement	Moderate Improvement	Significant Improvement	
Age groups				
<30 yrs.	2 (25.00)	3 (37.50)	3 (37.50)	0.5144
≥30 yrs.	1 (8.33)	4 (33.33)	7 (58.33)	
Gender				
Male	2 (12.50)	5 (31.25)	9 (56.25)	0.5274
Female	1 (25.00)	2 (50.00)	1 (25.00)	
Fitzpatrick Type				
Type II	2 (18.18)	4 (36.36)	5 (45.45)	0.8162
Type III	0 (0.00)	1 (25.00)	3 (75.00)	
Type IV	1 (20.00)	2 (40.00)	2 (40.00)	
Severity (G&B)				
Moderate	2 (18.18)	5 (45.45)	4 (36.36)	0.3525
Severe	1 (20.00)	0 (0.00)	4 (80.00)	
Very Severe	0 (0.00)	2 (50.00)	2 (50.00)	

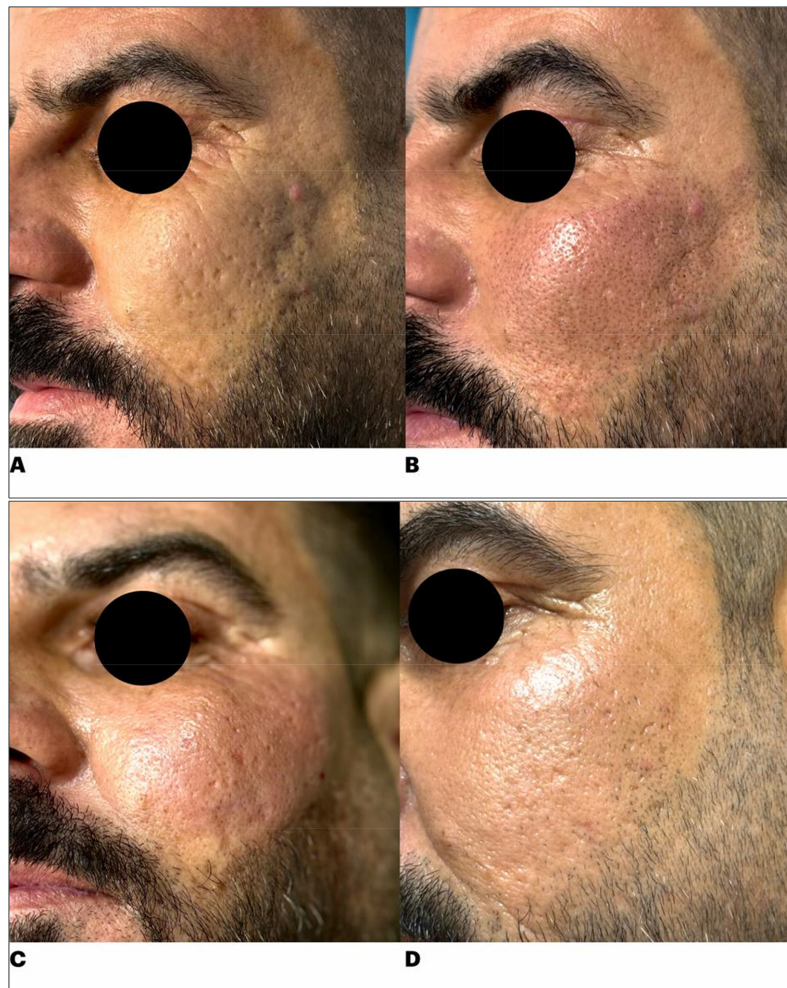


Fig. 3. The follow-up sequence of a patient presented with severe acne scars, starting with Goodman and Baron score 15 (A), improved to a score of 8 (D) after the treatment. A and B show the pre and immediately post 1st session of Plasma-Jet, C immediately after SVF injection, D 6 weeks after the complete combination of the treatment.

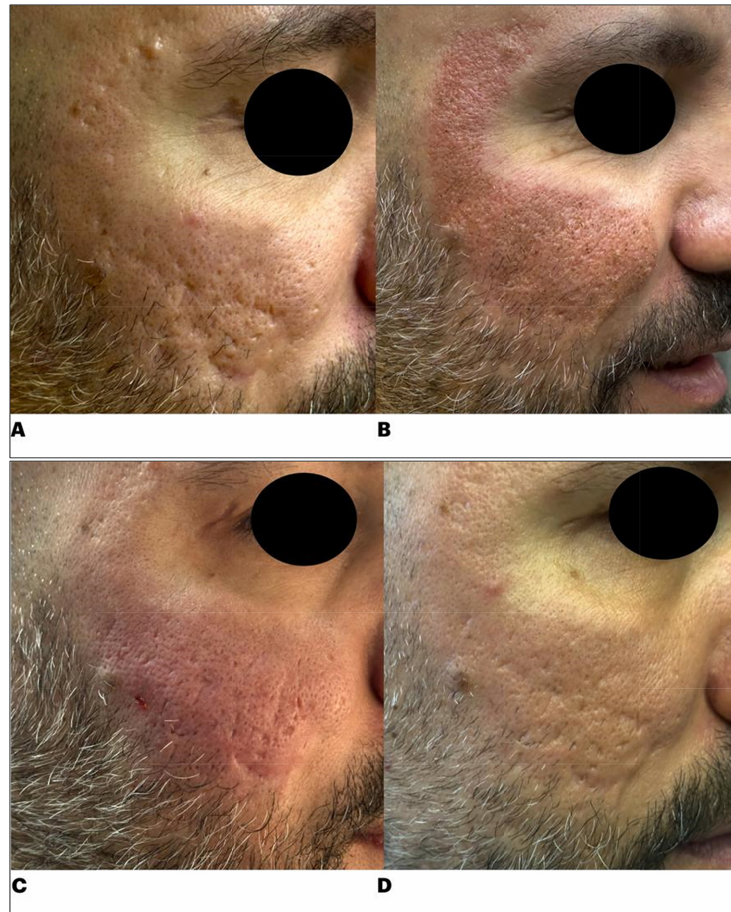


Fig. 4. The follow-up sequence of a patient presented with very severe acne scars, starting with Goodman and Baron score 34 (A), improved to score 18 (D) after the treatment. A and B showing the pre and immediately post 1st session of Plasma-Jet, C immediately after SVF injection, D 6 weeks after the complete combination of the treatment.

satisfaction after the treatment, while in this research, we had 85% of very satisfied feedback from the cases [11]

Similarly, a study carried out a comparison of 4 types of laser therapies on acne scars: CO₂ fractional laser, erbium-doped yttrium aluminum garnet (Er:YAG), non-ablative fractional laser (NAFL), and ablative fractional laser (AFL). A greater number of sessions of the fractional lasers (NAFL, AFL) were applied to achieve a result close to the resurfacing ablative lasers (CO₂, Er:YAG). However, the downtime of the resurfacing ablative lasers (CO₂, Er:YAG) was longer than the fractional lasers. Hence, the elongation of the recovery period resulted in a higher risk of complications like erythema and pigmentation. All three, CO₂, Er:YAG, and AFL, revealed satisfactory results and improved the acne scars, while NAFL showed significant unsatisfaction, although in the synergistic approach of Plasma-Jet and SVF, we had less downtime and fewer complications in compari-

son to the ablative laser therapy, but they both had good results on acne scars [12].

A study combined subcision and SVF treatment; significant recovery and improvement of the scars were observed. Hence, subcision is an invasive and mechanical approach that has released the dermal and subdermal dense fibers and fibrotic bands, resulting in notable improvement of the severe and depressed scars. While Plasma-Jet is a noninvasive and superficial treatment depending on the effects of thermal and plasma energy on the surface of the skin, it has stimulated fibroblasts and collagen, as well as softened the skin for better effect of the followed SVF injection, which showed very good results and satisfaction for moderate and severe scars but not so for the very severe scars [13]. In accordance with Neil S. Sadick et al., there was a review of the various types of lasers that were used for the treatment of atrophic acne scars. They admitted their efficacy in general but also mentioned that they differed in having side

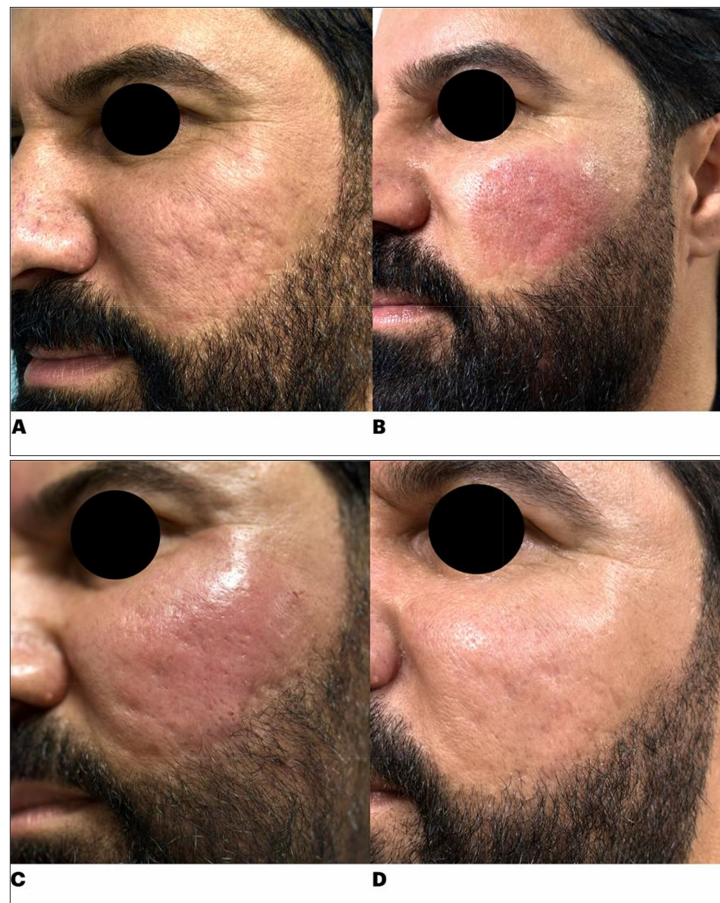


Fig. 5. The follow-up sequence of a patient presented with severe acne scars, starting with Goodman and Baron score 13 (A), improved to score 7 (B) after the treatment. A and B show the pre and immediately post 1st session of Plasma-Jet, C immediately after SVF injection, D is 6 weeks after the complete combination of the treatment.

effects and outcomes as a result of some patients' factors like skin and severity of scar [14].

In addition, Abeer Attia Tawfik et al. reviewed the numerous trials on treating acne scars with different shapes of fat grafts and mentioned the filling properties with the addition of nanofat and stromal vascular fraction if injected alone or if other treatments like laser or PRP were added to it. Ultimately the expression of satisfaction with all the results was concluded [15]. Compared to Fatemeh Mokhtari et al., each patient among her total of 30 participants received fractional CO₂ on the right side of the face and fractional Er:YAG lasers on the left side of the face. A total of 3 sessions of laser therapy, with a 1-month interval as the waiting time in between the sessions, were performed on each side of the face. She noticed that the fractional CO₂ laser was markedly superior to the Erbium:YAG laser. However, side effects in both were mild and temporary [16].

On the other hand, Ding-Ding Zhang et al. used a variety of techniques to treat acne scars and found

that fractional CO₂ laser treatment did not significantly differ from or outperform other non-CO₂ laser therapies [17]. Fractional radiofrequency laser was the gold standard treatment for acne scars of all kinds, according to Lucija Kroepfl et al. Patients with darker or more sensitive skin types, as well as those receiving isotretinoin, had a lower chance of developing scarring or hyperpigmentation. Numerous clinical findings from an active laser practice that treated a large number of patients with acne scars served as the basis for the research. It was mentioned that fractional radiofrequency can be used in addition to any other treatment options to expedite the patient's perceived clinical improvement [18].

Treatment with SVF and Plasma-Jet for acne scars was excluded in patients on medications like isotretinoin due to safety concerns, especially in darker skin types where strict post-procedure care is required to prevent hypopigmentation. Conversely, Jihee Kim et al. found that combining fractional microneedle radiofrequency with traditional ablative

fractional laser was safe and effective for patients with inflammatory acne and scars, even those on low-dose isotretinoin (43 out of 71). These patients showed significant reductions in acne and scar scores, with no persistent side effects, such as prolonged inflammation or scarring documented [19].

5. Conclusion

In this study, marked improvement was achieved among patients with moderate and severe acne scars associated with high satisfaction expression; however, those with very severe acne scars were less satisfied with the outcome because of the partial improvement of the scars. Furthermore, this was the reason behind their requests for additional sessions to enhance the results. Overall, this method of approaching acne-scarred cases with the combination of Plasma-Jet and SVF injection seems to be a safe and effective choice of treatment, specifically among moderate cases. However, in patients with very severe scars, multiple sessions of this combination treatment might be necessary to achieve optimal outcomes.

6. Limitations of the study

This study had a few limitations. First, the one-year follow-up period, which is too short to be able to fully record the long-term results of the treatment. Second, patients were noncompliant; some patients were not strict with the follow-up schedule, which affected the regularity of the evaluations, and some other patients intentionally missed their next session and did not complete the procedure, which made me exclude them from the research and resulted in a waste of money, time, and effort. If the duration of the study had been longer and there had been better patient cooperation, it would have been easier to conduct more follow-up sessions, if not extra sessions, and a better insight and more accurate results of the treatment would be expected.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Hawler Medical University, College of Medicine (reference number of 21 of meeting code 11 in 6/8/2025).

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