Section: Miscellaneous

Original Research Article

COMPARATIVE STUDY OF SUBCISION WITH MICRONEEDLING VERSUS SUBCISION WITH PLATELET-RICH PLASMA IN THE TREATMENT OF ATROPHIC ACNE SCARS: A PROSPECTIVE INTERVENTIONAL STUDY

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ABSTRACT

Background: Acne scarring is a common and distressing sequela of acne vulgaris, with significant psychosocial impact. Various treatment modalities exist, but there is no consensus on the optimal approach. This study compares the efficacy and safety of two combination therapies for atrophic acne scars.
Objective: To compare the efficacy and safety of subcision combined with microneedling versus subcision combined with platelet-rich plasma (PRP) in the treatment of atrophic acne scars.
Materials and Methods: This prospective interventional study included 67 patients with atrophic acne scars, randomized into two groups. Group A (n=32) received subcision (2 sessions) plus microneedling (4 sessions), and Group B (n=35) received subcision (2 sessions) plus intradermal PRP (4 sessions). All sessions were performed at monthly intervals. Assessment was done using Goodman-Baron qualitative score, physician-assessed quartile improvement, patient satisfaction on Visual Analogue Scale (VAS), and photographic evaluation at baseline, 3 months, and 12 months. Statistical analysis was performed using SPSS version 20.
Results: Sixty patients completed the study (30 per group). Mean age was 26.4±3.97 years, with male predominance (78.3%). Fitzpatrick skin type IV was most common (93.3%). Ice-pick scars were the predominant type (73.3%), followed by boxcar (58.3%) and rolling scars (14.2%). Both groups showed significant improvement ($p<0.01$). Mean Goodman-Baron score reduction was greater in Group A (1.66 vs. 1.04, $p<0.01$). Physician-assessed excellent/good response was seen in 40% of Group A versus 6.6% of Group B. Patient satisfaction (VAS) was significantly higher in Group A (mean 5.9±1.94 vs. 4.2±1.92, $p<0.001$). Both modalities achieved 100% improvement in erythematous macular scars. Group A showed better results for ice-pick and boxcar scars, while Group B showed better response for rolling scars. Side effects were mild and transient.
Conclusion: Both combination therapies are effective and safe for atrophic acne scars. Subcision with microneedling demonstrates superior overall efficacy and patient satisfaction compared to subcision with PRP, particularly for ice-pick and boxcar scars. These combinations offer cost-effective treatment options, especially in resource-limited settings.
Keywords: Acne scars, subcision, microneedling, platelet-rich plasma, Goodman-Baron score.

INTRODUCTION

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous unit, clinically characterized by comedones, inflammatory papules, pustules, and occasionally nodules and cysts. It commonly arises during adolescence and can cause significant psychosocial distress.[1,2] While acne itself is often a transitory condition, the scarring that occurs as a sequelae can be permanently disfiguring, affecting patients both physically and psychologically. Acne scarring represents one of the most common causes of facial scarring worldwide.[3]

The pathogenesis of acne scarring involves damage to the dermis during the inflammatory phase of active acne, with subsequent abnormal collagen remodeling. The resultant scars are typically classified as atrophic (ice-pick, boxcar, or rolling), hypertrophic, or keloidal. Atrophic scars are the most common type and result from insufficient collagen deposition during healing.[4]

Given the high prevalence of acne scarring and its profound emotional impact on affected individuals, scar clearance is often the primary concern for patients presenting with acne sequelae. A multitude of therapeutic options exist, ranging from topical agents and chemical peels to energy-based devices and surgical interventions. However, no single modality achieves complete improvement without potential side effects, and even the most expensive treatments have limitations.[5,6]

Understanding the pathogenesis of acne scarring and the morphological characteristics of different scar types is essential for optimizing treatment outcomes. Since no ideal procedure exists, combination approaches are frequently employed to achieve synergistic results. However, a standardized algorithm for acne scar management remains elusive, with treatment selection often dependent on physician expertise, patient preference, financial considerations, and coexisting pathologies.[7]

Subcision, first described by Orentreich and Orentreich in 1995, is a surgical technique that involves inserting a needle beneath the scar to release fibrotic bands, allowing the depressed scar to elevate.[8] This procedure is particularly effective for rolling and some boxcar scars. Microneedling, also known as percutaneous collagen induction, creates controlled micro-injuries that stimulate neocollagenesis and elastin production, making it useful for all atrophic scar types.[9] Platelet-rich plasma (PRP) is an autologous preparation of concentrated platelets that releases growth factors promoting tissue regeneration and collagen remodeling.[10]

Despite the widespread use of these modalities, there is a paucity of comparative data evaluating combination approaches. This study was therefore undertaken to evaluate patients with atrophic acne scars and to compare the efficacy and safety of two combination treatment regimens: subcision with microneedling versus subcision with PRP.

Aims and Objectives

1. To observe and evaluate different types of atrophic acne scars and their response to treatment.
2. To observe and compare the efficacy and safety of subcision with microneedling versus subcision with platelet-rich plasma in the treatment of atrophic acne scars.
1. To perform objective and subjective evaluation based on clinical improvement and photographic evidence.
2. To observe any untoward events or side effects

MATERIALS AND METHODS

Study Design and Setting

This prospective, interventional, comparative study was conducted in the Department of Dermatology, Venereology, and Leprology at a tertiary care hospital over a period of one year. The study was initiated after obtaining approval from the Institutional Ethics Committee (Reference No. 91/2019). Written informed consent was obtained from all participants after thorough explanation of the treatment protocols, expected outcomes, and potential complications.

Sample Size Calculation

Sample size was calculated using Sigma software with a 90% confidence interval, standard deviation of 0.5, and margin of error of 1%. The calculated sample size was 58 patients. To account for potential dropouts, 67 patients were enrolled in the study.

Selection Criteria

Inclusion Criteria

- Patients with mild to severe atrophic acne scars
- Age group 18-40 years
- Willingness to undergo treatment and follow-up

Exclusion Criteria

- Unrealistic expectations
- Pregnancy and lactation
- Bleeding disorders or anticoagulant therapy
- History of herpes labialis or active bacterial/viral infection
- Oral isotretinoin use within the preceding 6 months
- History of keloidal tendency
- Facial surgery or dermal fillers within the preceding 6 months
- Photosensitivity
- Thyroid disorders, diabetes mellitus, hypertension, or asthma

Patient Allocation

Eligible patients were divided into two groups:

Group A (n=32): Subcision (2 sessions) + Microneedling (4 sessions)

Group B (n=35): Subcision (2 sessions) + Platelet-rich plasma (4 sessions)

All procedures were performed at monthly intervals. Each patient served as their own control for pre- and post-treatment comparisons.

Baseline Assessment

A detailed clinical history was obtained, including onset, duration, symptoms, and severity of acne scars. Past treatment history was recorded. Fitzpatrick skin type was assessed for each patient. Scarring was classified into the following types: rolling scars, boxcar scars, ice-pick scars, elevated scars, macular erythematous scars, and perifollicular elastolysis.

Pre-procedure workup included:

- Complete hemogram
- Serum virology (HIV, HBsAg, HCV)
- Coagulation profile (bleeding time, clotting time, prothrombin time, INR, APTT)

Photographic Documentation

Standardized photographs were taken using a Canon Ixus 510 HS camera at exposure setting '0' under fixed manual illumination at a fixed spot. Photographs were obtained at baseline, at the 3rd month, and 4 months after the last treatment session. Written consent for photography was obtained from all patients.

Treatment Protocols

Subcision (Both Groups)

Instruments Required:18-gauge hypodermic needle, gauze pieces, insulin syringe for local anesthesia, skin marker

Procedure

1. Facial skin was disinfected with antiseptic solution.
2. Scar areas were marked, and 2% lidocaine solution was infiltrated for local anesthesia.
3. An 18-gauge hypodermic needle was inserted at an angle of 25-45 degrees to the skin surface and advanced until positioned beneath the scar. The needle was swept to and fro horizontally through the scar until no resistance was felt. A snapping sound indicated release of fibrous bands. Forward and backward piston-like movements were also used to further release adhesions.
4. The needle was withdrawn, and the skin was squeezed circumferentially around the exit point to evacuate excess blood and prevent large hematoma formation. A small hematoma was allowed to form to support the released scar.
5. Hemostasis was achieved with pressure and ice application.

Post-procedure Care

- Oral and topical antibiotics for 5 days
- NSAIDs as needed for pain
- Sunscreen from the 2nd day post-procedure
- Two sessions were performed at monthly intervals

Microneedling (Group A)

Instruments Required: Dermaroller (1.5 mm needle length, 192 needles), gauze pieces, normal saline

Procedure:

1. Topical anesthetic cream (EMLA) was applied for 45-60 minutes.
2. Skin was disinfected with betadine and spirit solution.
3. The skin was stretched, and the dermaroller was moved in four directions (horizontal, vertical, and both diagonals) on the skin surface until pinpoint bleeding was achieved (approximately 5-6 passes).
4. The face was cleaned with normal saline-soaked gauze.

Post-procedure Care

- No face washing for 6 hours
- Topical antibiotics for 3 days
- Strict sun protection
- Four sessions were performed at monthly intervals

Platelet-Rich Plasma (Group B)

Instruments Required: Centrifuge machine, BD vacutainers containing acid citrate dextrose (ACD), gauze pieces, 1 ml insulin syringe, normal saline

Preparation of PRP:

1. Fifteen milliliters of venous blood was collected under aseptic precautions and immediately transferred into two 8.5 ml vacutainers containing ACD solution. The tubes were gently rotated to mix blood with anticoagulant.
2. First spin (soft spin): Centrifugation at 2000 rpm for 10 minutes.
3. The supernatant plasma and buffy coat were extracted from both vacutainers using an 18-gauge needle and transferred to empty vacutainers.
4. Second spin (hard spin): Centrifugation at 3000 rpm for 10 minutes.
5. Platelets were observed as a precipitate at the bottom. The upper three-fourths (platelet-poor plasma) was discarded.
6. The remaining plasma with precipitated platelets was gently shaken to prepare PRP (approximately 1-2 ml).

Injection Procedure

1. The affected area was anesthetized with topical EMLA cream and disinfected.
2. PRP was injected using a 1 ml insulin syringe with multiple small injections directly beneath the base of scars.
3. Total volume injected per session was 1-2 ml.

Post-procedure Care

- No vigorous face washing for 6 hours
- Avoid vigorous physical activity for 24 hours
- Avoid NSAIDs for 24 hours post-procedure
- Regular sun protection
- Four sessions were performed at monthly intervals

Follow-up Schedule

Patients were followed up on

- Day 3 post-procedure: to assess for immediate complications
- Every 2 weeks for the first 2 months
- Monthly thereafter
- Comprehensive assessment at 3rd month, 6th month, and 12th month after treatment initiation

Outcome Assessment

Objective Assessment

A single blinded dermatologist evaluated treatment outcomes using standardized photographs presented in randomized fashion (pre-treatment, during treatment, and post-treatment without labeling). Assessment was based on two parameters:

1. **Percentage Improvement (Quartile Scale):**

- Excellent: ≥75% improvement
- Good: 50-75% improvement
- Fair: 25-50% improvement
- Poor: <25% improvement

Improvement was discerned by reduction in scar depth, number, and resolution of scars.

2. **Goodman-Baron Qualitative Score.**[11]

The Goodman-Baron scale was applied at baseline and 12 months after treatment completion:

- Grade 1 (Macular): Scars may be erythematous, hypo- or hyperpigmented
- Grade 2 (Mild): Mild atrophy or hypertrophy not obvious at social distance (≥50 cm); may be covered by makeup or normal beard/body hair shadow
- Grade 3 (Moderate): Moderate atrophy or hypertrophy obvious at social distance; not easily covered by makeup or hair shadow but flattens with manual stretching
- Grade 4 (Severe): Severe atrophy or hypertrophy obvious at social distance; not covered by makeup or hair shadow; does not flatten with manual stretching

Treatment response based on grade change

- **Excellent:** Reduction by 2 grades from pre-treatment value
- **Good:** Reduction by 1 grade from pre-treatment value
- **Poor:** No change in grade

Subjective Assessment

Patients graded their satisfaction on a Visual Analogue Scale (VAS) from 0 to 10, where 0 represented no change and 10 represented maximum possible improvement. Responses were quantified as:

- Excellent: Score 7-10
- Good: Score 4-6
- Poor: Score 0-3

Statistical Analysis

Data were entered into Microsoft Excel 2013 and analyzed using IBM SPSS version 20 software. Descriptive statistics were expressed as mean ± standard deviation for continuous variables and as percentages for categorical variables. The Chi-square test was used to compare categorical variables between groups. The paired t-test was used to compare pre- and post-treatment scores within groups. A p-value <0.05 was considered statistically significant.

RESULTS

The mean age of study population was 26.40 ± 3.97 years. Mean age in Group A was 26.10 ± 3.35 and in Group B was 25.81 ± 3.40.

Majority of the patients 40% (24) were inage group 26-30 years.

Youngest patient was 19 years old, while oldest patient was 40 years of age.

78.3% (47) were Male, 21.70% (13) were Female with Male to female ratio of 3.6:1.

Majority of the patients 93.3% (56) had Fitzpatrick skin type IV. No patients had skin type I,II and VI

15% patients had taken treatment for their acne scar, of them, 8.3% had history of isotretinoin use and 5% were using topical retinoids on acne scars. 1.7% of the patient had history of chemical peel done for acne scars.

Table 1: Duration of scars

DURATION OF SCARS (YEARS)	TREATMENT GIVEN (A)	TREATMENT GIVEN (B)	TOTAL
1 to 2	16.7%(5)	23.3%(7)	13.3%(12)
3 to 5	60%(18)	50%(15)	55%(33)
>6	23.3%(7)	26.7%(8)	25%(15)

Maximum number of patients 55% (33) had acne scars for 3 to 5 years. And only 13.3% (12) patient had acne scars for duration< 2years.

Acne scars were predominantly seen on cheeks, all 100% patients had scars on both cheeks followed by involvement of cheeks and temple in 50% acne scar patients.

Majority of the patients had GRADE IV scars that is 48.3%, while only 10% patient had grade II scars at baseline.

Patient with Ice pick type constituted 73.3% of scars, boxcar scar was seen in 58.3%,least type of scar were, elevated (bridging and papular type) and erythematous with 3.3% each at baseline.

Table 2: Change in grade of qualitative goodman baron score

CHANGE IN GRADE BY	GROUP A	GROUP B
3	13.3%(4)	0
2	36.7%(11)	13.3%(4)
1	50%(15)	76.7%(23)
0	0	10%(3)

Majority of patients 76.7% (23) had their grade changed by one and belonged to group B. However, maximum change in grade was by three which was seen in 13.3% (4) in group A.

10% (3) patients of group B did not show any change in grade from baseline.

Table 3: POST TREATMENT GOODMAN BARON QUALITATIVE GRADES

ost treatment, majority of the patients got downgraded in grade II, grade I and grade III with 41.7% (25), 30% (18) and 23.3% (14) respectively.

No patients remained in same grade post treatment in group A. However, group B had 10% patients in same grade post treatment.

P value is 0.008 that is significant.

TABLE 4: POST TREATMENT CHANGE IN SCAR

Maximum improvement is seen in macular erythematous type (figure 4) which is 100% in either group, Icepick showed improvement by 10% only in group B while 23.47% in group A, Boxcar improved by 33% in group A, rolling scar improved by 30% in group B. No improvement was seen in elevatedscars.

Table 5: Assessment by goodman baron qualitative scale

TREATMENT GIVEN	POOR	GOOD	EXCELLENT	TOTAL
Group A	0.0% (0)	50% (15)	50% (15)	100% (30)
Group B	10% (3)	76.7% (23)	6.7% (4)	100% (30)

76.70% showed good improvement and they belonged in group B, 50% patients showed good to excellent response in group A. No patients showed poor response in group A

Table 6: Mean change in pre and post procedure goodman baron score

TREATMENT GIVEN	MEAN PRE PROCEDURE GBS	MEAN POST PROCEDURE GBS	P VALUE
GROUP A	3.36 ± 0.688	1.7 ± 0.7	0.0001 (<0.01)
GROUP B	3.4± 0.67	2.36 ± 0.89	0.0001 (<0.01)

In group A the mean pre procedure GBS was 3.36 while post procedure it was 1.70. In group B the mean pre procedure GBS was 3.4 and post procedure it was 2.36.

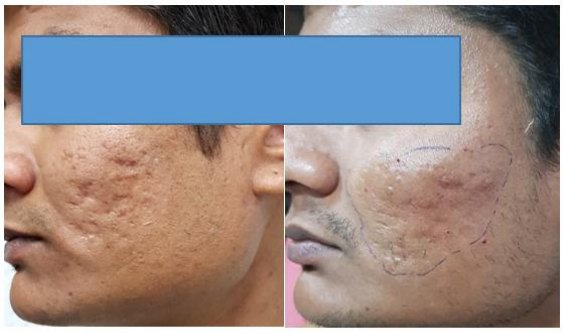
By Paired t-test, in both the groups, on comparing mean GBS, pre and post procedure, the p value is 0.0023($p < 0.01$), that is highly significant.

Degree of freedom for each group = 29

T value is 3.19

On comparing the improvement of mean GBS of both the groups with each other, p- value is 0.0023 for group A and p value is <0.0001 for group B, T value for group A is 9.39 and that of group B is 5.11 , that is highly significant

Degree of freedom = 58.



baseline after 12months

Figure 1: Showing excellent result, GROUP A

BASELINE AFTER 12MONTHS

Figure 2: Excellent Results by Group B Modailty

Table 7: Percentage of Improvement (Quartile Scale) As Recorded by Physician

	EXCELLENT RESPONSE (>76%)	GOOD RESPONSE (51-75%)	FAIR RESPONSE (26 – 50%)	POOR RESPONSE (0- 25%)
GROUP A	13.3% (4)	26.7% (8)	36.7% (11)	23.3% (7)
GROUP B	3.3% (1)	3.3% (1)	43.3% (13)	50% (15)

Excellent response was seen in 8.3% patients overall (13.3% in group A, 3.3% in group B)

Good response was seen in 15% patients (26.7% in group A,3.3 % in group B)

Poor response was found in 36.7% patients (23.3% in group A,50% in group B)

Maximum patients 40% showed fair improvement (36.7% group A, 43.3% in group B)

Table 8: Patient Response On Visual Analogue Scale

RESPONSE	TREATMENT		
	GROUP A	GROUP B	TOTAL
Poor	6.7% (2)	53.3% (16)	30.0% (18)
Good	46.7% (14)	26.7% (8)	36.7% (22)
Excellent	46.7% (14)	20.0% (6)	33.3% (20)

In Group A, 46.70% graded themselves as having good to excellent response. only 6.7% showed poor response to treatment

In Group B, majority of the patients 53.3%(16) were not satisfied with the treatment and graded as poor response, 20% (6) patients were highly satisfied.

Mean score in group A = 5.9 ± 1.94

Mean score in group B = 4.2 ± 1.92

On applying Pearson chi square with value 15.725[a]and df = 58, **p value was significant (0.000).**

Table 9: Effect of Duration of Scars on Response

DURATION OF ACNE SCARS(YEARS)	POOR RESPONSE	GOOD RESPONSE	EXCELLENT RESPONSE
1-2 (n=12)	8.3%(1)	66.7%(8)	25%(3)
3-5 (n=33)	3%(1)	63.63%(21)	33.3%(11)
> 6 (n=15)	6.7%(1)	60%(9)	33.3%(5)

Excellent response is seen in 33.3%patients each with scar duration 3 to 5 years and > 6years.

Good improvement is seen in all three age group range 66.7% (8), 63.7% (21), 60% (9) respectively).

Poor improvement was seen in acne scars < 2 years duration in 8.30% (1) patients.

Longest duration of acne scar observed in study was 11 years. Showed good response.

The p-value is 0.929 and is not significant. And hence, no dependence of duration of acne scars and treatment outcome is seen.

Table 10: Effect of grade of scars on response

PRE PROCEDURE GBS	GRADE OF ACNE SCARS		
	4(N=29)	3(N=25)	2(N=6)
Response (Poor)	10.4% (3)	0.0%	0.0%
Response (Good)	51.8% (15)	68% (17)	100% (6)
Response (Excellent)	38% (11)	32% (8)	0.0%

All patients i.e. 100% (6) patients with grade II achieved Good response to treatment.

Excellent response is seen in 38% (11) of grade 4.

Poor response is only seen in grade 4 acne scar patients 10.4% (3)

On applying chi- squared test, to the above data, p=0.57 which is not significant.

Table 11: Complications

SIDE EFFECTS	GROUP A	GROUP B
Pain lasting <1 to 24 h	43.3%(13)	86.7%(26)
Pain and erythema	46.7%(14)	6.7%(2)
Pain, erythema and swelling	10%(3)	3.3%(1)
Swelling with or without pain	0	3.3% (1)

In treatment group A, 46.7% (14) patients had erythema and pain that lasted <5 days.

In treatment group B, 86.7% (26) patients complained of pain that lasted less than 24hours post procedure.

No major complication were confronted during treatment period.

DISCUSSION

This prospective interventional study compared the efficacy and safety of two combination treatment regimens for atrophic acne scars: subcision with microneedling versus subcision with platelet-rich plasma. Our findings demonstrate that both combinations are effective, but subcision with microneedling yields superior overall outcomes.

Demographic Profile

The mean age of our study population (26.4 years) is consistent with previous studies on acne scar treatment. Dogra et al. reported a mean age of 25.47 years, Hassan et al. reported 25.07 years, and Bhargava et al. reported 24.2 years.[12-14] This age distribution reflects the typical presentation of patients seeking treatment for acne sequelae, usually several years after active acne has subsided.

The male predominance in our study (M:F = 3.6:1) differs from most previous reports where female patients predominated. Dogra et al. reported a sex ratio of 0.36, Hassan et al. reported 1.21, and Bhargava et al. reported 0.67.[12-14] This difference may be explained by cultural factors and greater willingness of males in our population to undergo invasive procedures, while many females preferred

less invasive options or were concerned about procedure-related downtime.

The predominance of Fitzpatrick skin type IV (93.3%) in our study is consistent with the regional population and similar to other Indian studies. Faghihi et al. reported 68.8% type IV, Bhargava et al. reported 77%, and Gulanikar et al. reported 80% type IV.[14-16] The absence of significant post-inflammatory hyperpigmentation in our patients, despite darker skin types, attests to the safety of these procedures when performed with proper technique and strict photoprotection.

Scar Characteristics

The majority of our patients (55%) had scar duration of 3-5 years, similar to previous studies. The cheeks were the most common site (100%), followed by temple involvement (50%). This distribution reflects the typical pattern of acne vulgaris, which predominantly affects the central face.

At presentation, 48.3% of patients had Grade IV (severe) scars, 41.7% had Grade III (moderate), and 10% had Grade II (mild) scars. This distribution is comparable to Bhargava et al., who reported 64.5% Grade IV, 26.7% Grade III, and 4.4% Grade II scars.[14] Hassan et al. reported a different distribution with 34.3% Grade IV, 22.9% Grade III, and 42.9% Grade II, possibly reflecting different referral patterns.[13]

Ice-pick scars were the most common type (73.3%), followed by boxcar (58.3%) and rolling scars (40%). This predominance of ice-pick scars is typical in Asian populations and poses a therapeutic challenge, as these deep, narrow scars are often resistant to treatment. The presence of mixed scar types in most patients underscores the need for combination approaches targeting different scar morphologies.

Treatment Efficacy

Both treatment combinations resulted in statistically significant improvement in Goodman-Baron scores ($p<0.0001$). However, the mean reduction in GBS was greater in Group A (1.66) compared to Group B (1.04), indicating superior efficacy of subcision with microneedling. This finding is consistent with the study by Bhargava et al., who reported significant improvement with subcision and microneedling in 95.6% of patients.[14]

The 100% response rate (≥1 grade improvement) in Group A compares favorably with Hassan et al., who reported 100% efficacy with subcision and microneedling, and Bhargava et al., who reported 95.6%.[13,14] In Group B, 90% of patients showed improvement, which is slightly lower than the 100% reported by Akmal et al. with subcision and PRP.[17] This difference may be attributed to variations in PRP preparation techniques and injection protocols.

Analysis by scar type revealed differential responses to the two treatment modalities:

Ice-pick scars showed 23.4% improvement in Group A versus 10% in Group B. This finding is consistent with Krishna Deb et al., who reported 18.25% improvement in ice-pick scars with microneedling.[18] The superior response in Group A likely reflects the ability of microneedling to stimulate collagen remodeling in the deep dermis, which is essential for elevating ice-pick scars.

Boxcar scars improved by 33.3% in Group A versus 26.7% in Group B. Both modalities were effective, but the combination with microneedling yielded better results. This aligns with the study by Deshmukh et al., who reported 33.8% improvement in boxcar scars with subcision and PRP.[19]

Rolling scars showed 26.7% improvement in Group A versus 30% in Group B. The slightly better response in Group B may be explained by the synergistic effect of subcision (which releases fibrotic bands tethering rolling scars) and PRP (which provides growth factors for collagen regeneration). Deshmukh et al. reported 39.27% improvement in rolling scars with subcision and PRP.[19]

Erythematous macular scars showed 100% improvement in both groups, likely due to the anti-inflammatory effects of needling and the growth factors in PRP promoting vascular normalization.

Elevated scars showed no improvement in either group, consistent with the known limited response of hypertrophic scars to these modalities.

Physician versus Patient Assessment

Physician-assessed improvement using the quartile scale showed that 40% of Group A patients achieved good to excellent (>50%) improvement compared to only 6.6% in Group B. This aligns with Bhargava et al., who reported 42.1% good to excellent improvement with subcision and microneedling.[14]

Patient satisfaction on VAS was significantly higher in Group A (mean 5.9) compared to Group B (mean 4.2). In Group A, 93.4% of patients reported good to excellent satisfaction, similar to Bhargava et al.'s finding of 97.8% satisfaction.[14] The lower satisfaction in Group B (46.7% good to excellent) may reflect the relatively modest improvement in ice-pick and boxcar scars, which were predominant in our population. Deshmukh et al. reported a mean satisfaction score of 45.28% with subcision and PRP, comparable to our findings.[19]

The discrepancy between physician-assessed and patient-assessed outcomes, particularly in Group B, highlights the importance of managing patient expectations and the subjective nature of cosmetic outcomes.

Factors Influencing Treatment Response

Age: Patients younger than 35 years showed excellent response rates (83.3-100%), while only 50% of patients above 36 years achieved good improvement. This age-related difference, though not statistically significant, may reflect decreased capacity for neocollagenesis with advancing age. Hassan et al. similarly reported better responses in younger patients (84.6-91.9% efficacy).[13]

Scar duration: No significant correlation was found between scar duration and treatment response ($p=0.929$). This suggests that even long-standing scars (up to 11 years in our study) can respond to treatment, supporting the intervention in patients with chronic scarring.

Baseline scar grade: Although all Grade II scars responded well and poor responses were confined to Grade IV scars, the difference was not statistically significant (p=0.57). This may be due to the relatively small sample size in subgroup analysis.

Safety Profile

Both treatment modalities were safe with no serious adverse events. The side effect profile differed between groups:

In Group A, pain and erythema lasting <5 days were most common (46.7%), consistent with the known effects of microneedling. Similar findings were reported by Bhargava et al., Hassan et al., and Fabbrocini et al.[13,14,20]

In Group B, transient pain lasting <24 hours was most frequent (86.7%), reflecting the pain of multiple injections. Deshmukh et al. reported similar findings.[19]

One patient in Group B developed a localized nodular swelling 7 days post-subcision, which resolved spontaneously within 2 months with massage. Similar hypertrophic lumps have been reported by Alam et al. and Balighi et al., attributed to aggressive subcision technique with excessive fibrous tissue formation.[21,22] This complication underscores the importance of proper technique and avoiding over-aggressive subcision.

The absence of post-inflammatory hyperpigmentation, despite predominantly dark skin types, highlights the safety of these procedures when combined with strict photoprotection.

Comparison of Techniques

Our subcision technique using an 18-gauge needle with 2 sessions at 4-week intervals is consistent with previous studies. Orentreich et al. used 18-gauge needles with 3-6 sessions, Alam et al. used Nokor needles with 1-3 sessions, and Al-Dhalimi et al. used 18-gauge needles with 1 session.[8,21,23] The standardization of this technique across studies supports its reliability.

For microneedling, we used a 1.5 mm, 192-needle dermaroller with 4 sessions at 4-week intervals, comparable to Majid et al. (1.5 mm, 3-4 sessions at 2-3 week intervals) and Hassan et al. (2.0 mm, 3 sessions at 4-week intervals).[12,13,24]

For PRP preparation, our double-spin method (2000 rpm × 10 minutes, then 3000 rpm × 10 minutes) yielded a 2.7-fold increase in platelet concentration (0.5-0.8 million/ml). This is comparable to Zhu et al. (0.7-1.0 million/ml) and Gulanikar et al. (0.8-1.0 million/ml).[15,25] Despite variations in centrifugation parameters across studies, final platelet yields were similar, suggesting that the specific RPM and duration may be less critical than achieving adequate platelet concentration.

Mechanism of Action

The superior efficacy of subcision with microneedling can be explained by their complementary mechanisms:

Subcision mechanically releases fibrotic bands that tether scars to underlying tissue, immediately elevating depressed scars and creating a controlled tissue injury that stimulates wound healing.[8]

Microneedling creates multiple micro-channels that trigger the release of growth factors (platelet-derived growth factor, transforming growth factor-α and -β, connective tissue growth factor, and fibroblast growth factor) from platelets and inflammatory cells. These factors stimulate fibroblast proliferation and neocollagenesis, with collagen remodeling continuing for up to 12 months post-treatment.[9,24]

PRP provides a concentrated source of autologous growth factors that theoretically enhance collagen regeneration. However, its efficacy may be limited by rapid diffusion from the injection site and the need for multiple treatments to achieve sustained effect.[10,17]

The combination of mechanical release (subcision) with sustained collagen stimulation (microneedling) appears more effective than adding growth factors (PRP) to mechanical release alone.

Study Limitations

1. Sample size: Although adequately powered, the sample size was relatively small for subgroup analyses.
2. Lack of blinding: The treating physician was not blinded to group allocation.
3. No histopathological correlation: Objective confirmation of collagen remodeling was not performed.
4. Short follow-up: While 12-month follow-up is adequate, longer follow-up would assess durability of results.
5. Single-center design: Results may not be generalizable to other populations.

Our findings have important clinical implications

1. Subcision with microneedling should be considered first-line combination therapy for mixed atrophic acne scars, particularly when ice-pick and boxcar scars predominate.
2. Subcision with PRP may be preferred when rolling scars are the primary concern.
3. Both combinations are safe in darker skin types with appropriate technique and photoprotection.
4. These cost-effective modalities offer viable alternatives to expensive laser treatments, particularly in resource-limited settings.
5. Patient education regarding realistic expectations is crucial, especially for severe (Grade IV) scars.

CONCLUSION

This prospective comparative study of 60 patients with atrophic acne scars leads to the following conclusions:

1. Both combination therapies—subcision with microneedling and subcision with platelet-rich plasma—are effective and safe for treating atrophic acne scars, with statistically significant improvement in Goodman-Baron scores ($p<0.0001$).

2. Subcision with microneedling demonstrates superior overall efficacy compared to subcision with PRP, with greater mean reduction in Goodman-Baron score (1.66 vs. 1.04), better physician-assessed improvement (40% vs. 6.6% achieving good to excellent response), and higher patient satisfaction (mean VAS 5.9 vs. 4.2, $p<0.001$).
3. Differential efficacy by scar type was observed:
- Subcision with microneedling is more effective for ice-pick (23.4% improvement) and boxcar scars (33.3% improvement)
- Subcision with PRP shows slightly better results for rolling scars (30% improvement)
- Both modalities achieve 100% improvement in erythematous macular scars
- Neither modality is effective for elevated/hypertrophic scars

4. Treatment response is not significantly influenced by scar duration or baseline scar grade, although all Grade II scars responded well and poor responses were confined to Grade IV scars.
5. Both treatments are well-tolerated with mild, transient side effects:
- Subcision with microneedling: pain and erythema lasting <5 days (46.7%)
- Subcision with PRP: transient pain <24 hours (86.7%)
- No major complications; rare nodular swelling (3.3% in Group B) resolves spontaneously

6. Age may influence treatment response, with patients >36 years showing poorer outcomes (50% improvement vs. 83-100% in younger age groups), though this was not statistically significant.
7. A minimum downtime of 12 months is required for optimal collagen remodeling, with maintained results on longitudinal follow-up.
8. Acne scars have significant psychosocial impact, and a patient-centered, multi-modality approach is essential for optimal outcomes.
9. Even in resource-limited settings, gratifying results can be achieved with these cost-effective combination therapies, offering viable alternatives to expensive laser treatments.

In conclusion, subcision with microneedling should be considered the preferred first-line combination therapy for mixed atrophic acne scars, particularly when ice-pick and boxcar scars predominate. Subcision with PRP remains a valuable option, especially for rolling scars. Further studies with larger sample sizes, longer follow-up, and histopathological correlation are warranted to validate these findings and optimize treatment protocols.

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