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Combination therapy using subcision, needling, and platelet-rich plasma in the management of grade 4 atrophic acne scars: A pilot study

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Summary

Background: Multimodality therapies including minimally invasive modalities are increasingly used in atrophic scarring.

Objective: To evaluate the role of platelet-rich plasma (PRP) as adjunctive therapy to a combined subcision and needling treatment in severe (grade 4) atrophic acne scarring.

Methods: A total of 30 patients with grade 4 acne scars were randomly divided into two groups, 15 patients each: Group A underwent three sequential treatments of subcision and needling while Group B, three sequential treatments of subcision, needling, and topical application of PRP that were performed at 3-week intervals. Scar grading was assessed 3 months following the final session. Participant's assessment of treatment response was registered.

Results: Scar improvement $\geq 50\%$ was reported significantly more often by Group B than Group A patients ($P = 0.025$). Regarding physician-based assessment of scar grading post-therapy (number of patients with two grades improvement vs one grade or no improvement), there was a trend toward more improvement in Group B ($P = 0.195$). Physician's evaluation of acne scar improvement correlated with the patient's assessment of improvement: 60% of Group A and 66.6% of Group B patients appreciated an improvement of 25%-49% and 50%-74%, respectively. Mean duration of postprocedure erythema/edema was shorter among Group B than Group A patients (16.1 vs 32.9 hours, respectively). Overall, substantial improvement was noticed in rolling and boxcar scars with only a mild change in icepick scars.

Conclusion: Platelet-rich plasma appears to add to the improvement of grade 4 atrophic acne scars when combined with needling and subcision. These findings require further evaluation by future studies.

KEYWORDS

acne scarring, management, needling, platelet-rich plasma, subcision, therapy

1 | INTRODUCTION

Atrophic acne scars are categorized into icepick, rolling, and boxcar.¹ A plethora of modalities have been used for atrophic acne scarring including resurfacing, surgical, volume- and lifting-related procedures.¹ Whereas many modalities, such as the traditional ablative lasers, have shown high efficacy in treating atrophic acne scars, they can have adverse effects and downtime, and are quite costly. Hence, the interest has shifted over time to minimally invasive, less costly procedures that can be effective in combination regimens. Combination therapies are more effective than solo treatments because patients typically have different types of scars that require volume restoration, tightening, and/or tissue movement (eg, surgical modalities) along with resurfacing.¹

Subcision and needling are minimally invasive modalities that can be included in multimodality therapies.¹ In subcision, a needle is inserted under the atrophic scar to sever the fibrous tissue (tethers) which binds the atrophic scar down. The induced dermal trauma results in clot formation and neocollagenesis with subsequent filling of the space created; this enhances scar elevation. Needling percutaneous collagen induction (PCI) creates perforations in the papillary dermis, and this trauma results in platelet and fibroblast activation and collagen induction. Fibroblast migration is also enhanced by the electric potential of needles.² Additionally, needling ruptures fine blood vessels and breaks collagen strands in the superficial dermal layer resulting in removal of damaged and senile collagen.

Recently, platelet-rich plasma (PRP) came into the acne scar management picture after platelet-derived growth factor (PDGF) was shown to promote wound healing, angiogenesis, and tissue remodeling.³ Platelet-rich plasma is derived from autologous blood containing other factors, such as transforming growth factor, vascular endothelial growth factor, and insulin-like growth factor that upon activation lead to collagen induction which may ultimately enhance the remodeling of atrophic acne scars.

The aim of our study was to evaluate the efficacy of PRP when combined with needling and subcision in severe (grade 4) atrophic acne scars. To our knowledge, PRP has not been combined with subcision before. Also, there is a lack of minimally invasive multimodality studies in severe (grade 4) atrophic acne scarring.

2 | MATERIALS AND METHODS

2.1 | Study design

A written informed consent was signed by the patients. All patients were provided a detailed description of the study design, purpose, and possible outcomes. The study was conducted between February 2017 and February 2018.

2.2 | Subjects

Thirty patients with grade 4 atrophic acne scars were enrolled in this study. The acne scar severity grading system by Goodman and Baron defines grade 4 as severe scarring which is obvious from a social distance of 50 cm and can neither be covered by makeup nor be flattened by manual stretching (Table 1).⁴ Patients older than 18 years and with grade 4 acne scars were included in the study. Exclusion criteria were active herpes labialis, active acne, history of keloid scars, bleeding disorder, pregnancy or lactation, history of any facial surgery or procedure for scars, patients with HIV or hepatitis B and those with unrealistic expectations. Patients that received treatment for acne or acne scars within 6 months before entry to study were also excluded. The patients were divided randomly into two groups that received three treatments at 3-week intervals: Group A underwent treatment with subcision followed by needling, whereas Group B had topical PRP after the sequential subcision + needling treatment. Patient characteristics were similar in the groups (Table 2). Facial photographs were taken before initiation of and 3 months after completion of final treatment. At the initial clinical evaluation, the scar type(s) of each participant was/were recorded and documented via "before procedure" photos.⁵

2.3 | Intervention

Eutectic mixture of lignocaine 2% and prilocaine 2% cream was applied under occlusion over the affected areas for 1 hour before the procedure. Subcision was performed using an 18-gauge needle. We utilized a modified technique in which the needle is bent at 90° twice before the syringe is attached to it for better stability and ease to perform the procedure.⁶ Needling was then performed using a dermaroller (1.5-mm needle size, 192 needles) that was rolled on the affected skin in vertical, horizontal, and diagonal directions until the

Grade	Level of disease	Clinical features
1	Macular	Erythematous, hyper- or hypopigmented flat marks (color problem)
2	Mild	Mild atrophic or hypertrophic scars may not be obvious at social distances of ≥ 50 cm and may be covered adequately by makeup
3	Moderate	Moderate atrophic or hypertrophic scarring is obvious at social distances ≥ 50 cm, not easily covered easily by makeup, and can be flattened by manual stretching of the skin (if atrophic)
4	Severe	Severe atrophic or hypertrophic scars that are obvious at social distances > 50 cm, not covered easily by makeup, and cannot be flattened by manual stretching of the skin

TABLE 1 Acne scarring severity grading per Goodman and Baron.⁴

TABLE 2 Patient characteristics

	Group A (subcision + needling)	Group B (subcision + needling+PRP)
Male/females	6/9	5/10
Mean age (y)	27.1	28.2
Age range (y)	21-35	22-37
Fitzpatrick skin type		
III	2	2
IV	11	12
V	2	1

appearance of uniform, fine pinpoint bleeding points. Platelet-rich plasma was prepared under aseptic precautions using double-spin method in a laboratory centrifuge. Then, 2 mL of PRP was applied

topically over the treated area. Intraoperative pain was very low. Antiviral prophylaxis was prescribed in patients with history of herpes infection. Immediately after the procedure, cold compresses were applied for comfort and pain reduction. Patients were advised to apply a broad-spectrum sunscreen daily for several weeks after the procedure.

2.4 | Clinical assessment

Scar severity grading (Table 1) was evaluated by blinded dermatologist 3 months of treatment completion. The response to treatment was evaluated clinically and aided by “before and after” photographs. Patients were asked to judge their scars 3 months after treatment completion and provided their assessment of treatment outcome (rated “poor,” “good,” “very good,” or “excellent,” with 0%-24%, 25%-49%, 50%-74%, and 75%-100% improvement, respectively).

TABLE 3 Scar grading in groups A and B before and after therapy

Scar grading	Group A (subcision + needling)		Group B (subcision + needling+PRP)	
	No. of patients		No. of patients	
	Before treatment	After treatment	Before treatment	After treatment
Grade 4	15	1 (6.7%)	15	-
Grade 3	-	12 (80%)	-	10 (66.67%)
Grade 2	-	2 (13.3%)	-	5 (33.3%)

**FIGURE 1** Group B patient with grade 4 acne scars before treatment (A and B) that improved to grade 2 after treatment completion (C and D)



FIGURE 2 Group A patient with grade 4 acne scars before treatment (A and B) that improved to grade 3 after treatment completion (C and D)

Adverse effects were recorded at each treatment visit and at the 3-month follow-up. Assessment of duration of procedure-related erythema/edema in the days after the procedure was based on patient diary.

3 | RESULTS

The physician's assessment of response to treatment is summarized in Table 3. In Group B, there were 5 (33.3%) patients who showed improvement by two grades (Figure 1; excellent response) compared to only 2 (13.3%) patients in Group A. 80% patients in Group A improved by one grade (Figure 2) and showed good response compared to 66.7% in Group B. All patients improved by at least one grade in Group B, but in Group A, one patient did not show any improvement. A substantial improvement was noticed in rolling and boxcar scars with only a mild change in icepick scars. The mean duration of postprocedure erythema and edema was shorter in Group B (16.1 hours; range, 12-18 hours) than Group A (32.9 hours; range, 30-36 hours) patients. There were no worrisome adverse effects, such as bleeding, prolonged erythema, infection, scarring, and postinflammatory hyperpigmentation, and postprocedure daily activities were not affected by the treatment in either group.

Participants' assessment of response to treatment was documented. "Excellent to very good" response (50%-100% improvement)

was appreciated by 80% of patients in Group B compared to 33% of patients in Group A (Table 4). All patients in Group B were very much satisfied with the treatment, whereas there was one patient in Group A who was not contented ("poor" response) after completion of three sessions of subcision and needling.

3.1 | Statistical analysis

Scar improvement $\geq 50\%$ was reported significantly more often by Group B than Group A patients (Fisher's exact test) ($P = 0.025$). Regarding physician-based assessment of scar grading post-therapy (number of patients achieving two grades improvement vs one grade or no improvement), there was a trend toward more improvement in Group B ($P = 0.195$) (chi-square test).

TABLE 4 Patient-rated scar grading after treatment completion

Participant's response ^a	Group A (subcision + needling)	Group B (subcision + needling+PRP)
Poor (0%-24%)	1 (6.7%)	0
Good (25%-49%)	9 (60%)	3 (20%)
Very good (50%-74%)	4 (26.7%)	10 (66.67%)
Excellent (75%-100%)	1 (6.7%)	2 (13.33%)

^aPercentages of improvement are provided in parenthesis.

4 | DISCUSSION

Our treatment protocol that included a combination of subcision and needling as well as PRP as adjunct showed good results in patients with severe (grade 4) acne scars. Physician's assessment of improvement in acne scars correlated with the patient's assessment. The procedure was well tolerated by patients in both the groups. Procedure-related erythema and edema were mild and transient. Troublesome adverse effects, including postinflammatory hyperpigmentation, were not noted. Downtime was minimal, and there was no postprocedure loss of work days.

Subcision is an important procedure to include in minimally invasive multimodality regimens because it releases tethering of the epidermis to the dermis that is present in many atrophic scars, especially rolling scars, and enhances neocollagenesis. It has been combined successfully with needling, fractional CO₂ laser, and microneedling radiofrequency to enhance their efficacy in treating atrophic scars.⁷⁻⁹

Needling enhances neocollagenesis which continues for a few months after the procedure¹⁰; therefore, there is evidence that needling provides more than a transient benefit for acne scars.¹¹ The number of melanocytes is not affected as there is no epidermal damage, and hence, needling can be used safely in darker skinned individuals.¹² Needling stimulates production of tumor growth factor (TGF)- β 3 (TGF- β 3) that has anti-inflammatory effects and TGF- β 1 that restricts pigment production through downregulation of tyrosinase.¹³ These effects may explain why postinflammatory hyperpigmentation is not noted after needling if the patient follows postprocedure instructions such as sun protection and avoidance of photosensitizing drugs. The dermal injury induced by skin needling and platelet activation with subsequent release of cytokines and growth factors modifies the natural healing response from the beginning of inflammation to the initiation of collagen induction thus inducing remodeling of acne scars. In addition to inducing new collagen synthesis, needling aids in the absorption of PRP.¹⁴ Needling combined with PRP has yielded superior results compared to needling monotherapy in all^{10,15-19} but the study by Ibrahim et al.²⁰ This combination may accelerate wound healing because of the high concentration of patient's own growth factors, upregulated protein synthesis, and greater collagen remodeling.^{16,21}

Platelet-rich plasma works synergistically also with fractional carbon dioxide (CO₂) laser, erbium-doped yttrium aluminum garnet (Er:YAG) laser, and autologous fat injections.²²⁻²⁸ Adding PRP was shown to increase tolerability and decrease downtime of laser modalities which makes PRP an appropriate therapy to include in multimodality regimens.²³ A decrease of downtime of other procedures by PRP was also confirmed in the present study. As our study demonstrates, subcision + needling treatment can have a synergistic effect with PRP. This is possibly due to enhancement of PRP absorption by the action of needling.¹⁴ The growth factors generated by PRP optimize healing after subcision and needling, thus contributing to scar improvement and shorter duration of edema and erythema.

Subcision, needling and PRP are minimally invasive modalities and have the advantages of short downtime and low cost.^{16,29,30}

The combination treatment used in the present study is effective in severe (grade 4) acne scarring and well tolerated in Fitzpatrick skin types III to V. To our knowledge, this is the first study that has combined these minimally invasive modalities. However, studies with a larger sample size and longer follow-up are required to confirm the results of the present study. As there is a paucity of minimally invasive multimodality therapy studies in severe acne scarring, this present study may fuel an interest in a safer treatment of severe acne scarring with minimally invasive multimodality approaches.

5 | CONCLUSION

Our study suggests that combination of subcision, needling, and PRP can be an effective treatment for severe atrophic acne scars. This cost-effective multimodality therapy requires a relatively small number of sessions and is associated with high level of patient satisfaction and minimal downtime.

ETHICAL APPROVAL STATEMENT

This study was approved by the Institutional Review Board (Ethics Committee) of RD Gardi Medical College, Ujjain, India.

CONFLICT OF INTEREST

None declared.

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