

Comparison of efficacy of micro-needling plus platelet-rich plasma and fractional CO₂ laser plus platelet-rich plasma in the treatment of post-acne scars

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Abstract

Objective To compare the efficacy of micro-needling plus PRP and fractional carbon dioxide laser plus PRP in treating post-acne scars.

Methods This randomized control trial (RCT) study was conducted in the Dermatology Department of CMH Hospital Peshawar from 20th August 2021 to 20th February 2022. Patients with all types of acne scars except hypertrophic scars aged 15 to 45 were included. They were subjected to detailed history and clinical examination followed by relevant investigations. These patients were divided into two groups after taking a written informed consent. Group I was managed with micro-needling with PRP, while group II was treated with Fractional carbon dioxide plus PRP.

Results A total number of 66 patients, the majority male patients (48.5% vs. 54.5%) in each group, were included with a mean age of 28.5 years with a standard deviation of 6.21. The efficacy in terms of good improvement was statistically greater in microneedling plus PRP groups compared to Fractional CO₂ plus PRP (91% VS 57.6 %; p<0.005). The efficacy of treatment was stratified based on the type of post-acne scars (ice pick scars: p<0.001; box scars: p= 0.44; and rolling scars: p= 0.56).

Conclusion The effectiveness of micro-needling with PRP is statistically more significant than fractional CO₂ with PRP in the treatment of acne scars. Microneedling with PRP is a comparatively simple approach that does not require a specialized setup and can give impressive results in the management of these scars.

Key words

Acne vulgaris; Micro-needling; Fractional CO₂; Platelet-rich plasma.

Introduction

Acne vulgaris affects 9.4% of the world population, most commonly the adolescent,

affects 90% males and 80% females in all ethnic groups. Data show that delaying treatment causes scarring and psychological disturbances.^{1,2}

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Acne scarring is an unfortunate complication that can affect up to 95% of acne vulgaris patients.³ Based on their shape and depth, Icepick or V shaped, boxcar or U shaped, rolling or M shaped, and hypertrophic scars are the four main subtypes of acne scars.⁴

Retinoids, dermabrasion, micro-needling, botulinum toxin injections, dermal fillers, and lasers have all been tested to reduce the presence of scars.⁵ The majority of the methods do not completely remove acne scars. However, there is a growing interest in combining these techniques to treat post-acne scars. Furthermore, platelet-rich plasma (PRP) can improve the appearance of atrophic post-acne scars treated with micro-needling and ablative fractional lasers.^{6,7} The addition of PRP to these techniques improves the scars quality in patients with microneedling and fractional CO2 lasers, and it decreases the duration of laser-related side effects like erythema and edema.

Locally, fractional CO2 lasers and microneedling have been used for the treatment of post-acne scars. But their combination with PRP has not been studied in this prospective. So, this comparative study was conducted to compare the results of these procedures in the treatment of post-acne scars in the local population of Khyber Pakhtunkhwa (KPK).

Methods

This six-month duration study was conducted in Combined military hospital (CMH) Peshawar from 20th August 2021 to 20th February 2022 after taking approval from the hospital's ethical and research committee. Patients (either gender) aged 15 to 45 years with all types of post-acne scars except hypertrophic scars were included in the study. Patients with active acne, keloid scarring, patients taking anticoagulants or with any bleeding disorder, any active skin diseases like herpes or facial warts, and lactating and pregnant women were excluded from the study. A sample size of 66 patients (33 patients in each group) was taken based on 100% effectiveness of micro-needling plus PRP and 83.3% effectiveness of fractional CO2 laser plus PRP using 80% power of the test and 5% margin of error according to the WHO calculator for

sample size determination from the previous study, conducted by El Refaei AM *et al.*⁷

These patients were divided into two groups based on blocked randomization. A written informed consent was taken from all the patients. Demographic information was taken from all the patients. Photographs were taken of all the patients before and after the procedure. A thick layer of local anesthetic was applied on the faces of all the patients after sterilization, and 10 ml of whole blood was taken into tubes containing acid citrate dextrose and centrifuged at 1500 rpm for ten minutes to get platelets-rich plasma at the top of the test tube. The PRP solution was further centrifuged at 4000 rpm for ten minutes in order to obtain the final PRP solution. Group (A) of patients was subjected to microneedling plus PRP, while group B patients were subjected to fractional CO2 laser plus PRP. The procedure was repeated after each month, and a total of three sessions were done. Pre and post-procedure photographs were taken. Strict exclusion criteria were used to avoid any bias in the study. Data were analyzed by SPSS version 23.0. The mean and standard deviation were calculated for numerical variables, while frequencies and percentages were calculated for categorical variables. The statistical significance level was marked as $p \leq 0.05$.

Results

In this study, a total of 66 patients were included. These patients were divided on the basis of treatment intervention into two groups (**Table 1**).

Table 1 Gender-wise distribution of patients (N=66).

Gender of Patients	Treatment Group	
	Micro-needling with RP (n=33)	Fractional CO2 with PRP (n=33)
Male	16(48.5%)	18(54.5%)
Female	17(51.5%)	15(45.5%)
Total	33(100%)	33(100%)

P value 0.62

Table 2 Characteristics of patients (N=66).

	Age of the patient	No of acne scars	Acne scars duration
Mean	28.69 years	26.21	15.43 months
Standard Deviation	6.21years	8.13	4.77 months

Group I included patients who were treated with micro-needling with PRP, in this group, among the total 33 patients, 16 patients (48.5%) were males and 17 patients (51.5%) were females.

Group II included patients who were treated with fractional CO2 with PRP, in this group a total of 33 patients included 18 patients (54.5%) were males and 15 patients (45.5%) were females.

Basic characteristics of patients i.e. age of the patients, number of post acne scars and duration of post-acne scars are given in **Table 2**.

The majority of patients in both groups (22 patients: 66.7% in group A, 25 patients: 75.8% in group B) were below 30 years.

The patients were further distributed on the basis of types of acne scars (**Table 3**). The majority of patients in group 1 were having box scars (14 patients: 42.5%), followed by rolling scars (10 patients: 30.2%) and ice pick scars (9 patients: 27.3%). Ice-pick types of acne scars were the most common scars in group II (14 patients: 42.5%), followed by box scars (11 patients: 33.4%), and rolling scars (8 patients: 24.1%).

Based on the global acne scarring classification system, the efficacy was graded as an excellent (improvement of >90% in acne scars improvement), good (improvement of 50% to 90% in post acne scars) and poor response (<50% improvement in the scar).

Group I (micro-needling with PRP): In this group, 1 patient (03%) had excellent

improvement and 30 patients (91%) had good improvement.

Group 2 (fractional CO2 with PRP): In this group, 1 patient (03%) reported excellent improvement, while 19 patients (57.6%) had good improvement.

By applying the Chi-square test, the difference in their efficacies was statistically significant ($p < 0.005$) (**Table 3**).

The efficacy of treatment was stratified based on the type of post acne scars (**Table 4**).

Ice pick scars: Among patients with these scars, 07 patients (77.8%) in group I had a good improvement compared to 1 patient (7.2%) in group II with a good improvement in the fractional CO2 laser group with a statistically significant difference ($p \text{ value} < 0.001$).

Box scars: Among the patients with box scars, 14 patients (100%) in group I reported with a good improvement compared to 10 patients (91%) in group II with good improvement. One patient (9%) in group II reported excellent improvement, however, no patient reported excellent improvement in group I, and the difference in efficacy was statistically insignificant ($p\text{-value} = 0.44$).

Rolling scars: Among the patients with these scars, 09 patients (90%) in group I reported with

Table 3 Efficacy of treatment (N=66).

Efficacy of Treatment	Treatment Group	
	Micro-needling with RP (n=33)	Fractional CO2 with PRP (n=33)
Excellent improvement	01 (3%)	01 (3%)
Good improvement	30 (91%)	19 (57.6%)
Poor response	02 (06%)	13 (39.4%)
Total	33 (100%)	33 (100%)
P-Value 0.005		

Table 4 Stratification of efficacy on the basis of types of post-acne scars (n=66).

Types of Scars/ Efficacy	Treatment Group		P value
	Group I (n=33)	Group II (n=33)	
Ice pick scars/			
Good	7 (77.8%)	1 (7.2%)	0.001
Poor	2 (22.2%)	13 (92.8%)	
Total	09 (100%)	14 (100%)	
Box scars/			
Excellent	0 (0%)	1 (9%)	0.44
Good	14 (100%)	10 (91%)	
Poor	0 (0%)	0 (0%)	
Total	14 (100%)	11 (100%)	
Rolling scars/			
Excellent	1 (10%)	0 (0%)	0.56
Good	9 (90%)	8 (100%)	
Poor	0 (0%)	0 (0%)	
Total	10 (100%)	8 (100%)	

Group I: Micro-needling with PRP.

Group II: Fractional CO2 with PRP.

a good improvement compared to 11 patients (100%) in group II. One patient (14.3%) in group I reported with excellent improvement. However, no patient reported with excellent improvement in group II. The difference in efficacy among this age group was statistically insignificant (p-value =0.56).

Discussion

Acne vulgaris is a chronic skin inflammatory disorder most commonly affecting young males and females worldwide.⁸ Even though it's a common condition and non-threatening ailment, acne has a comorbidity that has a substantial psychological as well as economic impact.⁹ Acne vulgaris can complicate in seborrhea, papules, pustules, nodules, and cysts, comedones, and occasionally scarring that persists throughout life.¹⁰

The prevalence of acne among teenagers ranges from 28.9% to 91.3%.¹¹ Acne vulgaris is subjected to be mild in 68.4% of individuals, 26.0% moderate acne, and 5.6% severe acne.¹² People who suffer from severe kinds of acne are more likely to get acne scars, which lowers their

quality of life.¹³ The prevalence of post-acne scar is not well documented in the literature however, the available data shows even mild cases of acne can be complicated with scarring in up to 46% of cases.¹⁴ Patients frequently experience social isolation, anxiety, and feelings of discomfort, which can cause melancholy and even suicidal thoughts.¹⁵

Various treatment modalities are in practice for the eradication of post-acne scars. Among them are micro-needling with growth factor, platelet-rich plasma (PRP), ablative laser resurfacing such as fractional CO2 laser, non-ablative lasers, trichloroacetic acid, fractional radiofrequency, subcision and punch techniques etc.^{7,16} A combination of some of these techniques such as fractional CO2 laser with PRP and microneedling with PRP is currently gaining the attention of dermatologists and aesthetic physicians.⁷ This study aimed to determine the comparison between the efficacy of fractional CO2 laser with PRP and microneedling with PRP.

In our study, a total of 66 patients were included. The mean age of patients was 28.69 years with a standard deviation of 6.21. The majority of patients in group I were females 51.5% and the majority of patients in group II were males 54.4%. The mean duration of acne scars is 15.43 months with a standard deviation of 4.77. While the number of acne scars is 26.21 with a standard deviation of 8.13. Micro-needling with PRP was more effective than fractional CO2 with PRP in the treatment of post-acne scars with a statistically significant difference (91% VS 57.6%, p<0.005).

In our study, micro-needling with PRP was more effective than fractional CO2 (91% VS 57.6%, p<0.005). El Refaei AM *et al.* conducted a study and concluded that clinical improvement after combination therapy was significantly higher than that after laser alone. They concluded that

micro-needling with PRP was more effective in comparison with fractional CO2 in the treatment of post-acne scars, which is consistent with the findings of our study.⁷

Chang HC *et al.* conducted a systematic review on the effectiveness of micro-needling with PRP and concluded that PRP with microneedling was superior to either PRP or micro-needling alone (RR=4.2, P<0.001), which is also consistent with the findings of our study.¹⁷ Alser OH *et al.* concluded in their review article that the combination of PRP with microneedling had superior results in the treatment of post-acne scars (60% VS 46.7%, P=0.89),¹⁸ which also signifies the results of this study.

Solanki AD *et al.* concluded in their split-face regimen-based study on the efficacy of micro-needling plus PRP and fractional CO2 laser plus PRP in post-acne scars and concluded that these modalities were effective with satisfactory responses from the patients.¹⁹

El Refaei AM *et al.* concluded in their study that excellent response was noted in 16% of their patients with box scars,⁷ while in our study, we noted excellent responses in 9%, and a good response was noted in 91% of cases with box scars treated with fractional CO2 plus PRP. Overall, they concluded that the results of micro-needling with PRP were more satisfactory compared with fractional CO2 plus PRP, which is also consistent with the results of our study.

This study provides the latest data on the comparison of the effectiveness of micro-needling with PRP versus fractional CO2 with PRP, proving the fact that micro-needling with PRP stands more effective treatment modality for the treatment of post-acne scars in the local population. The significant difference in efficacies (p<0.005) signifies that micro-needling with PRP is also a good treatment

modality in this direction and can be opted as a treatment option whenever feasible. This study also clarifies the fact that micro-needling with PRP does not need facilitated equipment as compared to fractional CO2 so it can be practiced comparatively with ease.

Conclusion

In our study, we conclude that micro-needling with PRP is a better treatment modality than fractional CO2 with PRP in the treatment of post-acne scarring. However, treatment with either of these modalities takes several sessions for significant outcomes. Before beginning any therapeutic intervention, patients should be carefully counseled regarding the length of treatment, injection site pain, and post-inflammatory hyperpigmentation following treatment. Multi-centered large-sample-sized RCT studies should be conducted in order to properly assess the efficacies of these procedures.

Recommendations Studies with higher sample size are recommended in future to strengthen and more elaborate these results further.

Declaration of patient consent The authors certify that they have obtained all appropriate patient consent.

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Conflict of interest Authors declared no conflict of interest.

Authors' contribution

SUR,ZKS: Contributed to the conception, design, data acquisition, and analysis and interpretation of data, manuscript writing and critical review, has given final approval of the version to be published.

TN,IUF: Contributed to the conception, design, and interpretation of data, critical review, has given final approval of the version to be published.

MAS: Contributed to the data acquisition, and analysis and interpretation of data, manuscript

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DK,MK: Contributed to the conception, design, manuscript writing, has given final approval of the version to be published.

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