

Comparison of Fractional CO₂ Laser Versus Combined Platelet Rich Plasma and Fractional CO₂ Laser in Treatment of Post Acne Scars

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Abstract

Background: Acne scars are a common disfiguring sequela of acne, significantly impacting patients' psychosocial well-being. A comprehensive approach tailored to individual needs is essential to treat this complex condition. Fractional carbon dioxide laser induces controlled injury to the skin promoting scar remodeling. PRP is rich in growth factors and cytokines that accelerate wound healing. Combining the two modalities may yield synergistic benefits.

Objective: To compare the results of fractional CO₂ laser treatment versus a combination of platelet-rich plasma and fractional CO₂ laser treatment for post-acne scars.

Methods: This randomized control trial was conducted at Department of Dermatology, Mayo Hospital, Lahore from 16th August 2021 to 15th February 2022. A total of 178 patients were enrolled and divided into 2 groups, group-A and group-B. Group-A was treated with fractional CO₂ laser alone while group-B patients were treated using fractional CO₂ laser followed by intradermal platelet rich plasma (PRP) injection. The outcome of patients was compared in terms of Goodman and Baron's acne scar grading scale at baseline and 3 months follow up. Data was analyzed statistically and was expressed as mean \pm SD or frequency (%).

Results: The mean 3 months post-treatment Goodman and Baron's score of group B (2.15 ± 0.66) was significantly reduced than that of group A (2.43 ± 0.65) with p-value= 0.04.

Conclusion: Our study demonstrated that fractional CO₂ laser treatment combined with PRP showed more favorable results in treatment of post-acne scars at 3 months compared to fractional CO₂ alone.

Keywords: Fractional CO₂ laser, platelet-rich plasma, post-acne scars.

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Introduction

Acne vulgaris is among the most prevalent skin disorders, primarily affecting the pilosebaceous unit. This condition typically begins in adolescence and predominantly impacts areas with a high density of sebaceous glands, such as the face, chest, shoulders, and back.¹ Its prevalence is remarkably high, affecting up to 95–100% of adolescents.^{1,2} Acne scars, which affect approximately 14% of women and 11% of men, are a disfiguring consequence that can significantly impact

a patient's quality of life by causing psychosocial challenges.^{3,4,5}

Scarring occurs when the acne lesions become inflamed, causing the surrounding skin to break down. The body responds by producing new collagen to repair the damaged tissue, but this repair process can result in abnormal skin texture and appearance.^{3,4} Acne scars generally manifest in two forms: atrophic scars, where there is tissue loss causing skin indentations, and hypertrophic scars, where excess tissue forms raised areas on

the skin.^{5,6} Acne scarring is a widespread issue, affecting up to 95% of individuals with acne, and the duration of treatment depends largely on the severity of the condition.^{7,8} Scarring can develop in all types of acne, from mild papulopustular to severe nodulocystic cases, making early intervention crucial.^{3,9}

A variety of treatment options for acne scarring have been developed, ranging from chemical peels and microdermabrasion to more advanced techniques like punch excision and laser therapies.⁸ One of the most commonly used methods is fractional CO₂ laser resurfacing. The laser works by creating microscopic wounds in the skin, stimulating collagen production and tissue remodeling.^{9,10} However, fractional CO₂ laser therapy often requires multiple sessions and can be associated with side effects such as erythema, pain, edema, post-inflammatory hyperpigmentation and infections limiting its use in some patients.^{11,12} Lately, the use of autologous platelet-rich plasma (PRP) as an adjunct to laser therapy has gained attraction. PRP, derived from the patient's own blood, is rich in platelets, growth factors, and cytokines, which have regenerative and tissue remodeling properties.^{13,14,15}

Combining PRP with fractional CO₂ laser therapy has been proposed as a way to reduce the number of laser sessions required, minimize side effects, and enhance overall treatment outcomes. While there is growing evidence supporting the combined use of fractional CO₂ laser and PRP for the treatment of acne scars, most studies have been conducted in international settings.^{16,17,18} Given the limited availability of local data on this topic, our study aims to fill this gap by comparing the effectiveness of fractional CO₂ laser therapy alone versus its combination with PRP in treating post-acne scars. By generating local evidence, we hope to provide dermatologists with more reliable treatment guidelines for acne scars.

Methods

A randomized clinical trial was conducted at the Department of Dermatology, Mayo Hospital Lahore, from August 16, 2021, to February 15, 2022. This study was approved by Research Evaluation

Unit of CPSP vide Ref NO. CPSP/ REU/ DER/ - 2019-066-1103. A total of 178 patients were recruited using a non-probability consecutive sampling technique, with 89 patients in each group, based on the mean global good score at three months (FCL: 3.3 ± 2.8 ; FCL + PRP: 2.2 ± 2.4). The study aimed for 80% power and a 95% confidence level, including patients aged 18 to 40 years of either gender, with a global good score > 3 per Goodman and Baron's acne scar grading scale.⁶

Patients having active acne, or history of recent use of isotretinoin or any previous treatment for acne scars were not included in the study. Patients with diabetes, collagen vascular disease, history of recurrent herpes or any bleeding disorders were excluded. Pregnant or lactating females were also excluded.

Informed consent was obtained from 178 patients who met the criteria. Demographic data were collected, and participants were randomly allocated to Group A or Group B using a lottery method, with high-resolution photographs taken prior to treatment.

Group A received three sessions of fractional CO₂ laser treatment at four-week intervals, The treatment utilized a smart stack scanning method at a power of 15 W, with DOT spacing of 800 μ m, a dwell time of 600 μ s, and stack 2. Topical anaesthetic was applied under occlusion for 45 minutes before treatment.

Group B underwent the same fractional CO₂ laser treatment followed by platelet-rich plasma (PRP) injected intradermally. PRP was prepared via a double-spin centrifugation process. Autologous whole blood (20 ml) was drawn under strict aseptic conditions and placed in a sterile vacutainer containing citrate anticoagulant. The blood was first centrifuged at 1500 RPM for 10 minutes. The lower cellular part was discarded, and the supernatant was centrifuged again at 4000 RPM for 10 minutes. The resulting platelet-rich plasma was aspirated, and 0.1 ml of calcium chloride was added per 1 ml of PRP prior to injection. Intradermal injections were administered using a nappage technique at designated points, with excess drops rubbed into the skin. Cold compressors were

applied post-injection to reduce inflammation. Instructions were given for using moisturizers and sunscreen.

Outcomes were assessed at three months. Data were analyzed using SPSS version 24, calculating means and standard deviations for quantitative variables and frequencies for categorical variables. Independent sample t-tests compared acne scar scores at three months, with chi-square tests for categorical variables. Stratified analyses considered age, gender, side involved, and baseline scores, with $p < 0.05$ deemed significant.

Results

A total of 178 subjects were enrolled in the study, 89 participants and each group. Out of the total, 101 were females and 77 were males. The mean age of total number of participants was 26.58 ± 6.28 , and that of group A was 27.06 ± 6.24

and that of group B was 26.09 ± 6.32 years. The difference of the sides involved between the two groups was not significant (Table 1).

Of the overall number of participants, the Goodman and Baron’s baseline score of 3.29 ± 0.45 was significantly improved to 2.29 ± 0.67 at 3 months after treatment, with p value = 0.04. To assess the efficacy of both treatment modalities, the baseline and 3-month post treatment mean scores of group A were further compared to that of group B (Table 2). The mean 3 months post-treatment score of group B (2.15 ± 0.66) was significantly reduced than that of group A (2.43 ± 0.65).

3-month Goodman and Baron’s qualitative score of group B was statistically significantly lower in patients of age ≥ 25 years (p value= 0.68).

Upon considering the patients of both genders, the 3-month Goodman and Baron’s qualitative score was statistically significantly lower for group B (FCL + PRP). However, upon stratification of gender male patients in group B showed a statistically significantly lower score (p -value = 0.02) whereas

Table 1: Demographic and baseline characteristics of subjects.

Variable	Group A (FCL) n = 89	Group B (FCL + PRP) n = 89	p-value
Gender			
Male	37 (41.6 %)	40 (44.9 %)	0.65
Female	52 (58.4 %)	49 (55 %)	
Age (years)			
<25	39 (43.8 %)	46 (51.7 %)	0.29
≥ 25	50 (56.2 %)	43 (48.3 %)	
Involved side			
Right	21 (25.6 %)	23 (25.8 %)	0.89
Left	28 (31.4 %)	29 (32.5 %)	
Both sides	40 (44.9 %)	37 (41.5 %)	

Table 2: Mean values of Goodman and Baron’s qualitative score at baseline and 3-month follow-up.

Variable	Group A (FCL) n = 89	Group B (FCL + PRP) n = 89	p-value
Goodman and Baron’s qualitative score			
Baseline	3.27 ± 0.44	3.30 ± 0.46	0.62
At 3 months	2.45 ± 0.56	2.21 ± 0.59	0.007*

*Statistically significant

female patients of group B showed lower 3-month Goodman and Baron’s qualitative score but statistically, it was not significant. ($p = 0.09$).

Upon stratification of baseline Goodman and Baron’s qualitative score, patient with baseline

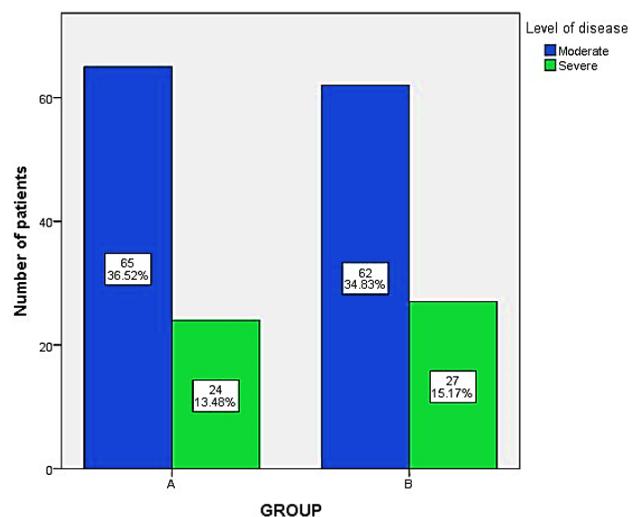


Figure 1: Patient's stratification based on the level of disease (Goodman and Baron’s score) at baseline.

score of 3 in group B showed a statistically significantly lower 3-month Goodman and Baron's qualitative score (p -value = 0.0008) however this trend was not observed for patients with baseline score of 4 (p = 0.36).

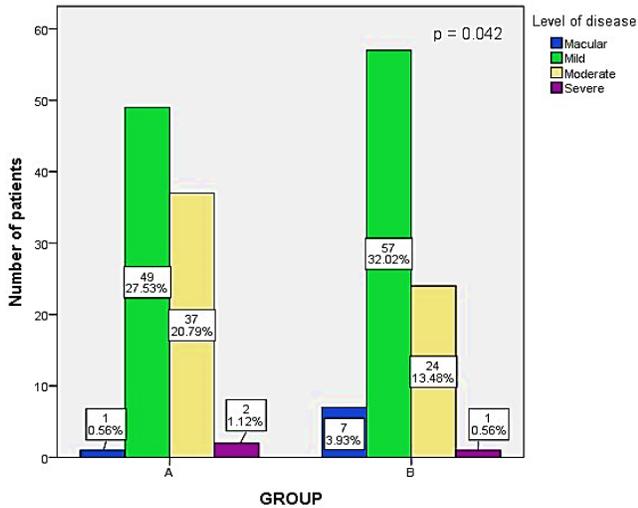


Figure 2: Patient's stratification based on the level of disease (Goodman and Baron's score) at 3 months follow up.



Figure 3: Patient treated for acne scars with CO₂ fractional laser alone, pictures taken at baseline and at 3 months followup.

At baseline, 65 patients of group A had moderate level of acne scars and 24 patients were observed with severe acne scars, whereas, in group B, 62 patients had moderate acne and 27 had severe acne (Figure 1).

After 3 months, significant improvement was demonstrated in almost all the cases. Only 1 patient of group B and 2 patients of group A were observed with severe level of acne scars. 37 and 24 patients of group A and B, respectively, were observed with moderate acne scars. Most of the pat-

ients (49 in group A and 57 in group B) lied in the category of mild acne scars and some (1 in group A and 7 in group B) were observed with macular acne scar (Figure 2).



Figure 4: Patient treated with combined CO₂ fractional laser and PRP, pictures taken at baseline and at 3 months followup.

Discussion

Scarring is a potential complication of acne and can occur if treatment is delayed or inadequate. Our study demonstrated that the combination of fractional CO₂ laser (FCL) and platelet-rich plasma (PRP) resulted in a more favorable response and shorter recovery time compared to laser treatment alone.

In this study, we compared two groups: patients receiving FCL alone and those receiving FCL followed by PRP. Both groups showed a significant reduction in acne scar scores (p = 0.04), but the combination group exhibited a greater reduction in scars after three months (p = 0.005). Numerous studies have reported the efficacy of PRP in conjunction with fractional CO₂ laser in treating atrophic acne scars, noting reduced adverse effects in the form of edema and erythema.^{16,17,23}

Although upon stratification, group B did not show statistically significant differences for age under 25, female gender, right side, and baseline score of 4, still all groups demonstrated a reduction in scores. This lack of statistical significance may be attributed to the smaller sample size.

Previous studies, such as Lee et al, involved two FCL sessions on each side of the face with one side receiving intradermal PRP and the other saline, reporting better improvement on the PRP-treated

side.¹⁷ Similarly, Shah and Mehta conducted a split-face study that revealed both sides improved, but the PRP side showed greater enhancement.²¹ Zhu and Xuan study on 22 patients using erbium fractional laser with topical PRP also highlighted significant clinical improvement and patient satisfaction.²²

In line with our findings, Abdel Aal and Ibrahim's study found that PRP injections on one side post-CO2 laser treatment led to notable improvement in 13.3% of patients compared to the untreated side.²³ Gala and Tawfik's randomized study confirmed better outcomes when combining fractional CO2 laser with PRP, as evidenced by objective assessments using a skin analysis camera.¹⁸

However, our results contradicted some studies where the addition of PRP did not significantly modify scars after four months.^{24,25} This may be due to the prolonged healing time required for scars, difference in technique applied for PRP injection as well as potential side effects such as edema and pain noted in other research.^{24,25}

Notably, one patient in group B and two in group A remained classified as severe despite reporting subjective improvement and showing changes in superficial scars. Overall, most patients progressed to lower scar grades, with complete clearance seen in only two participants by the end of the study. Extended treatment could lead to improved outcomes, as complete scar resolution is often gradual.

Our findings suggest that PRP may enhance recovery from laser damage and reduce downtime, possibly due to the growth factors present in PRP. These factors may stimulate tissue remodeling, collagen upregulation, and healing processes, while also promoting cell proliferation and migration.

Follow-up assessments three days post-procedure revealed milder symptoms of redness, swelling, and pain in the FCL + PRP group, with statistically significant differences. This aligns with existing literature supporting the use of PRP after laser treatments. While Faghihi et al, reported better scar correction on the PRP side, it was not statistically significant, and more local side effects were

noted.²⁴ Our study's use of topical PRP instead of injections may have reduced trauma to the laser-treated areas.

Our study was limited in terms of shorter follow-up duration, as judgement of improvement in the scar is better made after 6 months following the treatment. Also, it was a single-center based study. Multicenter study and long follow up can be beneficial to further evaluate the effectiveness of the aforementioned modalities. Based on the results of this study, FCL combined with PRP is recommended to be therapy of choice for the treatment of acne.

Conclusion

The present study demonstrates that fractional CO2 laser (FCL) treatment combined with platelet-rich plasma (PRP) has superior efficacy over FCL treatment alone. At three months, the combination therapy notably reduced Goodman and Baron's qualitative score, underscoring its enhanced effectiveness. The regenerative properties of PRP contribute directly to favorable outcomes in post-acne scar management.

Ethical Approval: The Research Evaluation Unit of CPSP approved this study vide Ref NO. CPSP/REU/ DER/ -2019-066-1103.

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Author's Contribution

IA: Acquisition of data, conception & design of study, analysis & interpretation of data, drafting of article.

AG: Acquisition of data, conception & design of study, analysis & interpretation of data, drafting of article, critical review of the article for important intellectual content, final approval of the version to be published.

ZA: Acquisition of data, analysis & interpretation of data, drafting of article, critical review of the article for important intellectual content, final approval of the version to be published.

WS: Drafting of article, critical review of the article for important intellectual content, final approval of the version to be published.

References

1. Stathakis V, Kilkenny M, Marks R. Descriptive epidemiology of acne vulgaris in the community. *Australas J Dermatol.* 1997;38(3):115-23.
2. Clark AK, Saric S, Sivamani RK. Acne scars: how do we grade them? *Am J Clin Dermatol.* 2018;19(2):139-44.
3. Fabbrocini G, Annunziata M, D'arco V, De Vita V, Lodi G, Mauriello M, et al. Acne scars: pathogenesis, classification and treatment. *Dermatol Res Pract.* 2010;2010(1):893080.
4. Goodman GJ. PERSONAL REVIEW Post-acne scarring: A short review of its pathophysiology. *Australas J Dermatol.* 2001;42(2):84-90.
5. Boen M, Jacob C. A review and update of treatment options using the acne scar classification system. *Dermatol Surg.* 2019;45(3):411-22.
6. Goodman GJ, Baron JA. Postacne scarring: a qualitative global scarring grading system. *Dermatol Surg.* 2006;32(12):1458-66.
7. Soliman YS, Horowitz R, Hashim PW, Nia JK, Farberg AS, Goldenberg G. Update on acne scar treatment. *Cutis.* 2018;102(1):21.
8. Bhargava S, Cunha PR, Lee J, Kroumpouzou G. Acne scarring management: systematic review and evaluation of the evidence. *Am J Clin Dermatol.* 2018;19(4):459-77.
9. Petrov A. Efficiency of carbon dioxide fractional laser in skin resurfacing. *Open access Maced J Med Sci.* 2016;4(2):271.
10. Bjørn M, Stausbøl-Grøn B, Braae Olesen A, Hedelund L. Treatment of acne scars with fractional CO2 laser at 1-month versus 3-month intervals: an intra-individual randomized controlled trial. *Lasers Surg Med.* 2014;46(2):89-93.
11. Neaman KC, Baca ME, Piazza III RC, Vander Woude DL, Renucci JD. Outcomes of fractional CO2 laser application in aesthetic surgery: a retrospective review. *Aesthet J Surg.* 2010;30(6):845-52.
12. Omi T, Kawana S, Sato S, Bonan P, Naito Z. Fractional CO2 laser for the treatment of acne scars. *J Cosmet Dermatol.* 2011;10(4):294-300.
13. Alser OH, Goutos I. The evidence behind the use of platelet-rich plasma (PRP) in scar management: a literature review. *Scars Burn Heal.* 2018;4:2059513118808773.
14. Long T, Gupta A, Ma S, Hsu S. Platelet-rich plasma in noninvasive procedures for atrophic acne scars: A systematic review and meta-analysis. *J Cosmet Dermatol.* 2020;19(4):836-44.
15. Hesselner MJ, Shyam N. Platelet-rich plasma and its utility in the treatment of acne scars: a systematic review. *J Am Acad Dermatol.* 2019;80(6):1730-45.
16. Min S, Yoon JY, Park SY, Moon J, Kwon HH, Suh DH. Combination of platelet rich plasma in fractional carbon dioxide laser treatment increased clinical efficacy of for acne scar by enhancement of collagen production and modulation of laser-induced inflammation. *Lasers Surg Med.* 2018;50(4):302-10.
17. Lee JW, Kim BJ, Kim MN, Mun SK. The efficacy of autologous platelet rich plasma combined with ablative carbon dioxide fractional resurfacing for acne scars: a simultaneous split-face trial. *Dermatol Surg.* 2011;37(7):931-8.
18. Galal O, Tawfik AA, Abdalla N, Soliman M. Fractional CO2 laser versus combined platelet-rich plasma and fractional CO2 laser in treatment of acne scars: Image analysis system evaluation. *J Cosmet Dermatol.* 2019;18(6):1665-71.
19. Jordan R, Cummins C, Burls A. Laser resurfacing of the skin for the improvement of facial acne scarring: a systematic review of the evidence. *Br J Dermatol. Original Articles.* 2000;142(3):413-23.
20. Gawdat HI, Hegazy RA, Fawzy MM, Fathy M. Autologous platelet rich plasma: topical versus intradermal after fractional ablative carbon dioxide Page | 82 laser treatment of atrophic acne scars. *Dermatol Surg.* 2014;40(2):152-61.
21. Shah SD, Mehta BD, Borkar MA, Aswani RC. Study of safety and efficacy of autologous platelet rich plasma combined with fractional CO2 laser in the treatment of post acne scars: a comparative simultaneous split-face study. *Int J Res Med Sci.* 2017;5(4):1344-51.
22. Zhu J-T, Xuan M, Zhang Y-N, Liu H-W, Cai J-H, Wu YH, et al. The efficacy of autologous platelet-rich plasma combined with erbium fractional laser therapy for facial acne scars or acne. *Mol Med Rep.* 2013;8(1):233-7.
23. Abdel Aal AM, Ibrahim IM, Sami NA, Abdel Kareem IM. Evaluation of autologous platelet-rich plasma plus ablative carbon dioxide fractional laser in the treatment of acne scars. *J Cosmet Laser Ther.* 2018;20(2):106-13.
24. Faghihi G, Keyvan S, Asilian A, Nouraei S, Behfar S, Nilforoushzadeh M. Efficacy of autologous platelet-rich plasma combined with fractional ablative carbon dioxide resurfacing laser in treatment of facial atrophic acne scars: a split-face randomized clinical trial. *Indian J Dermatol Venerol Leprol.* 2016;82(2).
25. Kar BR, Raj C. Fractional CO(2) Laser vs Fractional CO(2) with Topical Platelet-rich Plasma in the Treatment of Acne Scars: A Split-face Comparison Trial. *J Cutan Aesthet Surg.* 2017;10(3):136-44.