

# A Split Face Comparative Interventional Study to Evaluate the Efficacy of Fractional Carbon Dioxide Laser against Combined use of Fractional Carbon Dioxide Laser and Platelet-Rich Plasma in the Treatment of Acne Scars

## Abstract

**Background:** Fractional carbon dioxide laser (FCL) is an established treatment option for acne scars, but use of platelet-rich plasma (PRP) as an adjuvant still requires elaborate studies. **Aim:** To compare the efficacy and safety of FCL alone and combined use of FCL with PRP in the treatment of acne scars. **Materials and Methods:** This was a split-face (right-left) comparative study including 32 patients with moderate to severe acne scars. The patients underwent three sessions of FCL along with PRP and FCL alone on right and left sides of the face, respectively, at an interval of 6 weeks. Goodman and Baron qualitative and quantitative scores were used for the evaluation of results along with visual analog scale (VAS) for patient satisfaction and physician assessment of scars. Adverse effects following the procedure were also evaluated and compared. **Results:** There was significant improvement of scars over both sides of the face, but the difference between right and left sides was not statistically significant according to Goodman and Baron qualitative (p 0.9115) and quantitative score (p 0.6957). On assessing VAS score, patients were more satisfied with the right side, but the values were not statistically significant (p 0.8571). Physician assessment grading showed comparable results over both the sides (p 1). There was no difference in adverse effects between both sides of the face. **Conclusions:** Inclusion of intradermal PRP to FCL did not produce any statistically significant synergistic effects in the treatment of acne scars.

**Keywords:** Acne scars, fractional carbon dioxide laser, platelet-rich plasma

**Devi Priya,  
Shivakumar Patil**

Department of Dermatology,  
Venereology and Leprosy,  
J. N. Medical College, KAHER,  
Belagavi, Karnataka, India

## Introduction

Acne is a chronic inflammatory disease of pilosebaceous unit in skin. 15–20% of patients suffer from moderate to severe types of acne scars.<sup>[1]</sup> Scarring develops in 95% of patients with acne.<sup>[2]</sup>

The different types of acne scars are atrophic, hypertrophic, and keloidal.<sup>[3]</sup> Atrophic acne scars are divided into three types: icepick, rolling, and boxcar scars (further divided into shallow (0.1–0.5 mm) and deep ( $\geq 0.5$  mm)).<sup>[4]</sup>

The severity of acne scars depends on the time delayed for the initiation of treatment from the onset of acne lesions, thereby further highlighting the need for early and aggressive treatment.<sup>[2]</sup> Various treatment methods of atrophic acne scars include subcision, needling, dermabrasion, chemical peels, punch techniques, non-ablative lasers, fillers, and autologous fat transfer.<sup>[5]</sup>

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Fractional laser re-surfacing technique is gaining more popularity because of its good clinical outcome, less side effects, and a decrease in the time taken for recovery.<sup>[6]</sup>

The carbon dioxide laser emits an infrared beam (10,600 nm) which is invisible and targets extra-cellular and intra-cellular water. Vaporization of skin happens when water-containing tissue absorbs this energy.<sup>[7]</sup> Fractional re-surfacing technique results in thermal ablation of microscopic epidermal columns and dermal tissue in a regularly spaced manner. Therefore, in fractional photothermolysis, there will be thermal damage to a portion of skin, leaving the intervening areas unaffected.<sup>[8,9]</sup> Re-epithelialization is stimulated, which is mediated by adjacent normal tissue, and collagen fiber production is initiated.<sup>[6]</sup>

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## Address for correspondence:

Dr. Devi Priya,  
Department of Dermatology,  
Venereology and Leprosy,  
J. N. Medical College, KAHER,  
Belagavi - 590010, Karnataka,  
India.  
E-mail: devipriyadk@gmail.com

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Platelet-rich plasma (PRP) contains a platelet concentration about 4 to 7 times the baseline concentration of human platelets, and contains alpha and dense granules.<sup>[10]</sup> Activation of platelets cause degranulation, followed by activation of secretory proteins.<sup>[11]</sup> Platelets secrete growth factors within 10 minutes of activation.<sup>[12]</sup>

In this split-face study, we compare the efficacy and safety of FCL alone against the combined use of FCL and PRP. The efficacy of PRP along with FCL still remains a controversy because of difference in the findings of various studies, and the literature lacking studies with statistically significant results.

## Materials and Methods

This prospective, comparative split-face study was conducted over a period of 1 year in the Dermatology department of a tertiary health care hospital. The study was initiated after obtaining institutional ethical committee clearance.

Thirty-two patients out of 40 completed the study. All adult males and females in the age group of 18–40 years with moderate to severe atrophic scars according to Goodman and Baron qualitative scoring were included. Those patients with active acne, herpes infection, bleeding disorders, keloidal tendencies, and connective tissue disorders; pregnant and lactating mothers; and patients with unrealistic expectations were excluded from the study.

High-resolution photographs were taken with the help of a digital camera and with constant camera settings at baseline and 6 weeks after each session. A written informed consent was taken prior to the start of treatment.

In this split-face study, the right side of the face was treated with FCL and PRP and the left side was treated with FCL alone. A total of 3 sessions were performed with an interval of 6 weeks between every session.

FCL was set at a power of 15 W, with a distance and duration of 0.5 mm and 0.5 ms, respectively. One to two passes were delivered.

PRP was centrifuged with a first spin of 1000 rpm for 10 min and a second spin of 2000 rpm for 5 min. The anti-coagulant used was citrate phosphate dextrose.

Patients were advised topical antibiotics, emollients, and sunscreens post procedure and were asked to follow up on the third day for the assessment and documentation of side effects.

Assessment of scar improvement was analyzed with the help of

1. Goodman and Baron's qualitative and quantitative score
2. Visual Analog Scale (VAS)
3. Physician assessment.

Data were analyzed using software R Version 4.0.2. The association between categorical variables was calculated by

Chi square test. The mean between groups was calculated with the help of two-sample t-test. Paired t-test was used to compare means over time points. A *P* value  $\leq 0.05$  was considered statistically significant.

## Results

Of the 40 patients enrolled in the study, 32 patients completed the study. There were 18 females and 14 males.

On assessing Goodman and Baron qualitative scores, 68.75% patients had moderate scars, and 31.25% had severe scars at baseline over both sides of the face. At the end of the study, on the right side, there were 68.75% with mild scars, 25% had moderate scars, and 6.25% had severe scars. Over the left side of the face, 62.5% had mild scars, 31.25% had moderate scars, and 6.15% had severe scars. However, two patients (6.15%) remained to be severe over both the sides. The majority of patients found significant improvement over both sides, but there was no statistically significant improvement in the quality of scars over the right side of the face as compared to the left side.

The mean of quantitative score was calculated at baseline and at the end of the study. There was a statistically significant improvement in scars, but the results were comparable over both sides [Table 1].

On analyzing VAS score for patient satisfaction, the majority of patients were very satisfied over both sides. Even though patients were more satisfied over the right side of the face, the values were not statistically significant [Figure 1].

In physician assessment grading, the majority of the patients had 26–50% (Grade 2) improvement [Figures 2 and 3]. However, there was no statistically significant improvement over the PRP-treated side (right) as compared to the left side of the face.

Erythema, burning sensation, edema, scabbing, and post-inflammatory pigmentation were the side effects observed. Immediate side effects such as erythema, burning sensation, and scabbing were seen in almost all patients. Side effects resolved with a downtime of 4–5 days except post-inflammatory pigmentation, which took 4–6 weeks to subside. There was no difference in adverse effects between both sides of the face.

**Table 1: Comparison of Goodman and Baron quantitative scores between both the sides of the face at baseline and at the end of the study**

Time point	Goodman and Baron quantitative scores		<i>P</i>
	Right side	Left side	
Before	11.38±2.17	11.12±1.98	0.6316
After	7.94±1.85	7.75±1.97	0.6957
<i>P</i>	<0.00001	<0.00001	-
Change in score	3.44±1.13	3.38±1.07	0.8214

## Discussion

The treatment of acne scars has always posed a challenge to the dermatologist, and requires a multimodality approach. The current study analyzed the efficacy of PRP as an adjuvant to the time-tested modality of FCL for acne scars.

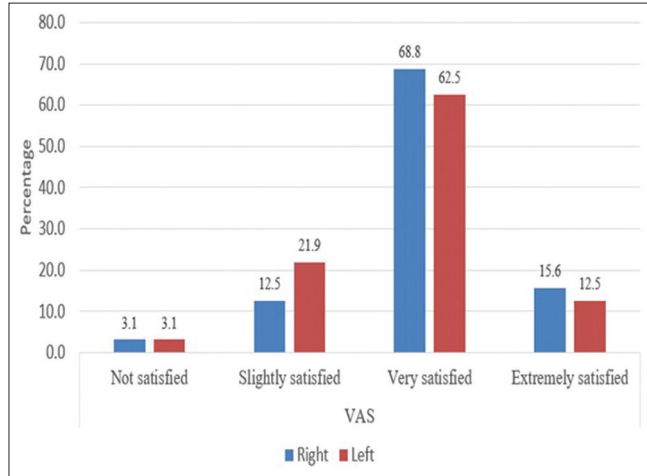


Figure 1: Comparison of VAS of patient satisfaction between both the sides of the face at the end of the study

There was a female predominance observed in our study which was in contrast to the study conducted by Kar *et al.*,<sup>[13]</sup> where the majority of patients in the study belonged to male gender. This was likely to be because of the irregular follow-up by men in our study as compared to women who completed the study with regular follow-up visits.

The majority of patients in our study (72%) had mixed type of scars which included rolling, boxcar, and icepick scars. Assessment of the type of scars is relevant as FCL laser and PRP treatment modalities have shown to be more efficacious for rolling and superficial boxcar scars.<sup>[14]</sup> On the basis of subjective analysis, the rolling type of scars found better improvement.

On comparison of Goodman and Baron quantitative scores, there was no statistically significant improvement over the right side of the face as compared to the left side (P value 0.82). The VAS score for patient satisfaction showed score 2 (very satisfied) with the treatment over both sides of the face, and no statistically significant difference was observed by the patient between both sides of the face (P value 0.86). However, Galal *et al.*<sup>[15]</sup> reported



Figure 2: (A) Clinical photographs of the right side of the patients' face (patient 1) at (a) baseline and (b) after three sessions. (B) Clinical photographs of the left side of the patient's face (patient 1) at (a) baseline and (b) after three sessions



Figure 3: (A) Clinical photographs of the right side of the patient's face (patient 2) at (a) baseline and (b) after three sessions. (B) Clinical photographs of the left side of the patient's face (patient 2) at (a) baseline and (b) after three sessions



a higher patient satisfaction over the side treated with a combination of PRP with FCL.

Faghihi *et al.*<sup>[16]</sup> used fractional carbon dioxide laser with PRP in 16 patients with acne scars in a split-face study and observed no significant difference in treatment response over both the sides with patients being more satisfied over the side treated by combination with PRP with an insignificant statistical difference over both the sides of the face.

On side effect analysis, hyper-pigmentation was seen in nine patients (28.1%), observed more in patients belonging to Fitzpatrick IV and V skin types. Even though edema was more over the right side of the face, the values were not statistically significant (P value 0.2265). A study by Godara *et al.*<sup>[17]</sup> conducted over post-traumatic scars and post-burn scars observed that the adverse effects were more over the side treated with a combination of FCL and PRP.

The variation in our study findings with other studies can be attributed to the difference in duration of study and interval between every session. The possible explanation would be the longer time taken by the scars to show improvement after the treatment. Moreover, results were assessed with the help of subjective modalities, and the methods used for assessment of improvement differed between studies.

### Study limitations

1. Small sample size
2. Short follow-up period
3. Lack of objective methods for result assessment.

### Conclusion

The addition of PRP did not provide any synergistic effects in the treatment outcome. There was no improvement or worsening of side effects, and there was no decrease or increase in the duration of side effects following the inclusion of intradermal PRP. Therefore, by avoiding PRP, we can cut down on an extra interventional therapy, thereby reducing the cost and increasing patient compliance.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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