E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/15.01.125

Research Article

A Comparative Study of Safety and Efficacy of Platelet Rich Plasma and Fractional Co2 Laser in Treatment of Post Acne Scar

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Email: skinstudy@gmail.com
Received: 04.03.25, Revised: 23.04.25, Accepted: 21.05.25

INTRODUCTION

Acne is a very common occurrence among adolescents, which may sometimes persist into adulthood.

It is a prevalent and chronic skin disorder, affecting approximately 9.4% of the global population. In India, its prevalence is notably high among adolescents—50.60% in males and 38.13% in females aged 12 to 17 years. [1] Facial scarring caused by severe acne in adolescence and early adulthood is a common cosmetic problem. Acne scars may be atrophic or hypertrophic. It can place a significant psychosocial burden on patients, including lack of self-confidence, concerns over body image and adverse impact on quality of life. [1]

The main cause of scar formation is compromised collagen remodelling during the wound-healing process. [2] These scars are categorized into ice pick, rolling, and boxcar types, with ice pick scars being the most prevalent. Different procedures are being used to influence dermal remodelling which include surgical techniques (subcision, punch graft and punch excision), resurfacing techniques (dermabrasion, chemical peel, traditional ablative and non-ablative laser treatment) and tissue augmentation (autologous fat transfer and dermal fillers). In spite of it, treatment of acne scar remains a challenge. [3]

Facial resurfacing with fractional lasers is currently regarded as one of the most effective treatments for facial scars. Autologous platelet-rich plasma contains iatrogenically high platelet concentration. [4]

It has been used clinically in humans for its healing properties attributed to the increased concentrations of autologous growth factors particularly epithelial growth factors, platelet-derived growth factors, and vascular endothelial growth factors, and secretory proteins that may enhance the healing process on a cellular level which initiate cellular growth, morphogenesis, and accelerate natural healing. In dermatology, PRPs have been used for skin rejuvenation, ulcer management, and alopecia. [5] Monotherapy with intradermal PRP for acne scars has been reported to be beneficial.

Fractional CO2 laser (FCL) is also well established in scar management. This therapy is based on the principle of fractional photo thermolysis which generate thermal energy targeting the separated columns of skin at specific depths called the microthermal treatment zones. It creates homogeneous thermal damage at a particular depth within the skin. This method intrinsically spares the tissue around the treated columns from damage allowing for prompt epidermal regeneration of the treated zones. [6] In addition, the enormous heat generated during ablative fractional carbon dioxide laser treatment can remove dermal tissue and bring about tissue shrinkage in the adjacent dermal collagen accompanied by collagen remodelling and skin tightening. So compared to traditional ablative laser

treatment, the tissue surrounding each column is spared with this technique, resulting in rapid epidermal regeneration with less downtime and adverse reactions. The fractional carbon dioxide laser is thought to be highly effective for treating acne scars. A split-face study in Korean patients reported that the combination of FCL and PRP enhances recovery of laser-damaged skin and synergistically improves the clinical appearance of acne scars. [7]

There are very few studies available in the literature comparing efficacy and safety of PRP with Fractional CO2 LASER. Thus our study might prove to be useful and provide detail information regarding safety and efficacy of the two most frequently used modalities of the treatment of post acne scars. [8]

Aim And Objective:

To compare the efficacy and safety of PRP with fractional CO2 laser in the treatment of post acne scars.

MATERIAL AND METHOD:

The study was conducted at dermatology department of a tertiary care hospital from January 2023 to June 2023. The Sample size included total 40 patients of acne scars divided in two groups with 20 patients each.

Sampling Technique: Simple Random Sampling Technique

Inclusion Criteria: Consenting adult males and females between 18 and 40 years of age with post acne scars.

Exclusion criteria

Patients who deny to participate in the study.
Patients under the age of 18 and over the age of 40.
Women who are pregnant or nursing.
Patients who have received oral retinoid treatment in the last 6 months and oral antibiotics in the last 3 months.
Patients who have received topical anti-acne treatment within the last month, such as retinoids, antibiotics, or anti-inflammatory agents.
Patients who have had ablative or non-ablative laser treatment in the previous 12 months.
Patients who have a history of photosensitive disorders such as lupus erythematosus or dermatomyositis.
Patients who have a history of active infections such as Herpes type I or II.
Patients with keloid and vitiligo history.

- Patient assessments included demographic details, medical history, clinical examination, and baseline investigations.
- Acne scars were graded using Goodman and Baron's quantitative global scarring grading system.[3]
- Standardized baseline photographs of both sides of the face were taken for documentation.

Grade	Level Of Disease	Clinical Features	Example/Impact
Grade 1	**Macular disease**	Erythematous hyper- or hypopigmented flat marks visible to patient or observer irrespective of distance. No palpable scarring	Erythematous, hyper-or hypopigmented flat marks , makeup usually conceals them completely
Grade 2	**Mild disease**	Mild atrophy or hypertrophy that may not be obvious at social distances of 50 cm or greater and may be covered adequately by makeup or the normal shadow of shaved beard hair in males or normal body hair if extra facial.	Mild rolling, small soft papular
Grade 3	**Moderate disease**	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 30 cm or greater and is not covered easily by makeup or the normal shadow of shaved beard hair if extra facial, but is still able to be flattened by manual stretching of the skin.	More significant rolling, shallow "box car" mild to moderate hypertrophic or papular scars

Grade	Level Of Disease	Clinical Features	Example/Impact
Grade 4	**Severe disease**	Severe atrophic or hypertrophic scarring that is obvious at social distances of 50 cm or greater and is not covered easily by makeup or the normal shadow of shaved beard hair in males or normal body hair if extrafacial and is not able to be flattened by manual stretching of the skin.	Punched out atrophic (deep "box car"), "ice pick" , bridges and tunnels, gross atrophy, dystrophic scars significant hypertrophy or keloid

Group A-Patients with Autologous Platelet Rich Plasma

- Autologous platelet rich plasma was obtained by a two-stage centrifuging process. 20ml of patient's whole blood sample was drawn from the median cubital vein.
- The tubes were centrifuged at 1500 rotations per minute for 10 minutes in the centrifugal machine. The bottom layer consisting of RBCs, the middle layer consisting of platelets and WBCs and the top layer consisting of platelet-poor plasma was formed.
- Only the supernatant plasma containing platelets were transferred into another sterile tube without anticoagulant. This tube was subjected to a second spin at 3000 rotations per minute for 10 minutes.
- At the end of second spin, the lower 1/3rd was platelet rich plasma, upper 2/3rd was platelet poor plasma and platelet pellets were formed at the bottom of the tube. Platelet rich plasma was injected into the scar with insulin syringe. Patients were advised to apply broad spectrum sunscreen.
- The treatment was administered at four-week intervals for 3 months.

Group B-Fractional carbon dioxide laser and treatment protocol

- Patients with acne scars had three sequential fractional carbon dioxide laser (DERMA INDIA FUTURA RF30) treatments, with a four-week interval between each session.
- Prior to each treatment session, eutectic cream (lignocaine 2.5 percent & prilocaine 2.5 percent) was applied to the target areas of acne scars and left on for 40 minutes and eye shields were used to protect the eyes. Two passes were distributed during each session.
- The laser procedure was carried out with the following settings. Power: 50%, scanning size: 3mmx3mm to 10mmx10mm depending on the width of the lesion, distance: 1.1mm, duration: 2ms.
- Following the procedure, the site was gently wiped with cold water and an icepack was applied for 5 minutes and patients were advised to apply broad spectrum sunscreen.

RESULT

All 40 patients completed three sittings and were followed up for 3 months.

26 were males and 14 were females. The mean age of the subjects was 28.25 ± 4.18 years.

Assessment was done using using Goodman and Baron's qualitative scar scale. For group A patients, the mean baseline score was 3.3 ±0.28 and mean final score was 2.89± 0.46 showing a statistically significant difference (p=0.0312) between the baseline and final scores.

In group B patients the mean baseline score was 3.36 ±0.32 and mean final score was 2.84± 0.36 and the difference between the baseline and final scores was statistically significant (p=0.0284).

Pretreatment baseline scores for group A and B were almost similar (p=0.7678) and the final post treatment scores of both groups showed a significant better outcome in Group B (p=0.0812) [Table 1].

Table 1. Assessment of improvement based on goodman and Baron's qualitative global grading system after completing three sittings

	Baseline	2 month after 3 session

PRP	3.3±0.28	2.89±0.46
CO_2 Laser	3.36±0.32	2.84±0.36

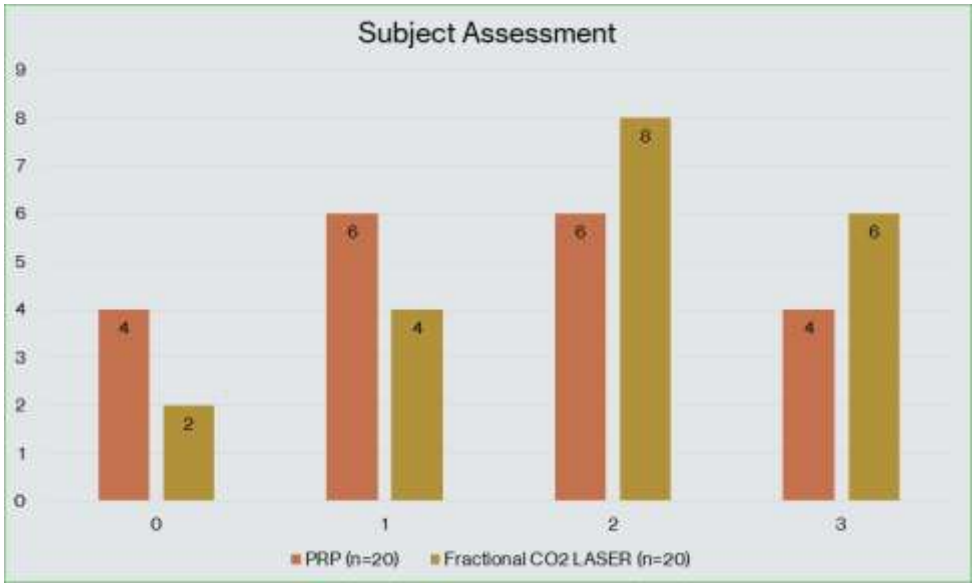
Figure 1. PRP at Baseline and After Three Sessions.

Figure 1. Fractional CO2 Laser At Baseline And After Three Sessions.

Table 2. Subjects Assessment (3 months after 3 sessions)

Score	PRP (n=20)	Fractional CO_2 laser (n=20)
0	4 (20%)	2 (10%)
1	6 (30%)	4 (20%)
2	6 (30%)	8 (40%)

3	4 (20%)	6 (60%)
Total	20	20



DISCUSSION

Acne Scar treatment is a challenge and many therapeutic options exist for the treating dermatologist. Among the treatment options available, literature reports successful use of lasers and non-ablative devices in the management of acne scars with or without the use of PRP as an alternative to surgical correction.

Ablative lasers such as Erbium YAG lasers and carbon dioxide lasers have improved the condition but have been associated with morbidity such as erythema, post-inflammatory hyperpigmentation, hypopigmentation, and scarring.

Historically the abrasive techniques have been commonly used to treat post-acne scarring with inconstant results. However, newer techniques like laser resurfacing and platelet rich plasma have gained popularity in recent years.

The male to female ratio in this study was 13:7 with a greater number of subjects in the age group of 18-30 years which could be attributed to subjects in the younger age group being more conscious about their appearance. This demographic pattern is consistent with a study by Kim et al. (2023), which found that 65% of patients undergoing acne scar treatment with PRP or fractional CO_2 laser were aged between 20 and 30 years. [8]

Studies by Shah et al. (2017) and Sharma et al. (2021) also reported a similar age group (early adulthood) as the most affected and treated demographic for acne scarring. This is likely due to the fact that psychological distress caused by acne scars, such as low self-esteem and body dissatisfaction, becomes particularly prominent during these socially formative years. [9,10]

Autologous PRP is the plasma portion of sourced blood with an iatrogenically high platelet concentration. The rationale for using autologous PRP lies in its biological composition—platelets rich in growth factors like PDGF, TGF-β, and VEGF—which stimulate dermal regeneration, angiogenesis, and collagen remodeling at the cellular level.

Fractional CO2 laser was developed to reduce the complications of conventional CO2laser resurfacing. The use of FCL in improving traumatic and burn scars is reportedly useful. FCL induces neocollagenesis through thermal damage, stimulating fibroblast migration and dermal matrix regeneration.

Our findings support these mechanisms, as evidenced by improved patient outcomes with both PRP and FCL. Findings by Kar et al.[11] have suggested that PRP can reduce inflammation, postoperative blood loss and infection, in addition to accelerating osteogenesis and wound as well as soft tissue healing. These results verify that PRP treatment may help promote the recovery of laser-damaged skin and decrease downtime. Specifically, platelet-derived growth factor may help to stimulate the production of other

growth factors important in tissue remodelling, promoting connective tissue healing by upregulating collagen and protein synthesis. Higher levels of transforming growth factor beta may also expedite tissue recovery through the up regulation of cellular migration and proliferation, as well as by directly stimulating cell replication and fibronectin binding interactions. Insulin-like growth factor may also assist in the proliferation and migration of fibroblasts and increase collagen production. Although the effects of epithelial growth factor are limited to the basal layer of the epidermis, it also promotes cell differentiation and re-epithelialization.

Our results also agree with those of Gawdat, et al., who randomized the patients into four groups. They compared intradermal PRP plus fractional CO, resurfacing versus fractional CO, alone. They also compared intradermal PRP with fractional CO, versus topical PRP plus fractional CO, the clinical improvement was excellent in 66.7% of the patients who received fractional CO, and intradermal PRP, 60% of the patients who received fractional CO, and topical PRP, and 26.7% of the patients who were only treated by fractional CO, laser, and there was a statistically significant improvement of the PRP-treated sides over the non-PRP-treated side. [10] the safety and efficacy of FCL in scar revision have been validated in studies, including those by Kar et al. and Gawdat et al., which report reduced scar depth, smoother skin texture, and high patient satisfaction. [11,12]

Kar et al. conducted a split-face study where FCL was used on one side and FCL + PRP on the other. Although the scar improvement was statistically similar, the PRP side showed reduced post-treatment discomfort and erythema—highlighting PRP's role in enhancing recovery. [11]

Zhu et al used erbium laser with PRP in 22 patients with acne scar and reported excellent clinical improvement and patient satisfaction. In our study, a statistically significant improvement in the qualitative scoring of acne scars was demonstrated in both groups after treatment. There was no statistical significance between the mean baseline and final scores between both groups at the start of and after treatment respectively. [13]

Shah et al. reported that FCL + PRP resulted in significantly better outcomes in acne scar reduction compared to FCL alone in Indian skin types, with fewer adverse effects and improved patient satisfaction. [9] They concluded, that the fractional carbon dioxide laser-platelet-rich plasma side was found to have a better response than the fractional carbon dioxide laser-control side and participants were more satisfied with the fractional carbon dioxide laser-platelet-rich plasma side than the fractional carbon dioxide laser-control side; however, the difference was not found to be statistically significant. [14]

Moreover, molecular-level investigations by Min et al. demonstrated that PRP enhances expression of wound-healing markers such as TGF-β1, TGF-β3, TIMPs, and collagen types I and III—suggesting a deeper regenerative effect beyond cosmetic improvement. [15]

A recent study by Neinaa et al, [16] reported significant clinical improvement of post-acne scars treated with AFCL combined with PRP, as evidenced by the significant reduction in both the Clinique des Cicatrices d'Acné and Goodman and Baron's qualitative scar scale scores with minimal adverse effects. In that study, they found that AFCL-assisted delivery of lyophilized growth factors, a new PRP preparation that is standardized in growth factor concentrations, reached a higher degree of clinical improvement and patient satisfaction. This is a huge technological advance that has great prospects for development.

Study Limitations

The limitations of our study include small sample size, absence of all skin phototypes and the lack of objective methods for clinical evaluation of acne scar improvement and side effects. We feel that further studies are required to investigate the mechanism, benefits and safety of autologous blood-derived platelet-rich plasma.

CONCLUSION

This study shows that PRP as well as fractional CO2 laser result in significant improvement in the qualitative scoring in post acne scars. The principle points of interest of CO2 LASER are that it is less time consuming and more convenient and can be used alone or in combination with other therapies.

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