



A Comparative Study on Efficacy of Fractional CO₂ Laser, And Platelet Rich Plasma (PRP) for Treatment of Striae Distensae in Tertiary Health Care Centre, Uttar Pradesh

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Abstract

Introduction: Striae distensae, commonly known as stretch marks, are a prevalent dermatological condition characterized by linear scars that result from the overstretching of the skin. They often appear during periods of rapid growth or hormonal changes, such as pregnancy, puberty, or obesity. These marks are not only a cosmetic concern but can also have psychological

impacts on affected individuals, leading to a substantial demand for effective treatment options.

Traditional treatments for striae distensae have included topical agents, microdermabrasion, and laser therapies, among others. Among these, Fractional CO₂ Laser and Platelet Rich Plasma (PRP) have emerged as promising modalities with distinct mechanisms of action.

Fractional CO₂ Laser therapy utilizes a laser beam to deliver high-intensity energy to the skin in a fractional manner, creating microthermal zones that stimulate collagen production and skin remodelling. This technique has shown potential in improving the appearance of striae distensae by enhancing dermal regeneration and elasticity.

Platelet Rich Plasma (PRP) therapy, on the other hand, involves the extraction and concentration of platelets from the patient's own blood, which are then reintroduced into the skin. The growth factors present in PRP are believed to accelerate tissue repair and collagen synthesis, potentially leading to significant improvements in the texture and appearance of stretch marks.

Despite the growing use of these treatments, there remains a lack of comprehensive, comparative studies evaluating their efficacy for striae distensae. This study aims to bridge this gap by systematically comparing the effectiveness of Fractional CO₂ Laser and PRP therapy in the treatment of striae distensae. By evaluating the outcomes in a tertiary health care centre in Uttar Pradesh, this research seeks to provide valuable insights into the relative benefits of these modalities and guide clinical decision-making in managing this common dermatological condition.

Aim and Objective

Aim: A Comparative study on efficacy of fractional CO₂ laser, and platelet rich plasma (PRP) for treatment of striae distensae in Tertiary health care centre, Uttar Pradesh.

Objectives of the Study

1. To compare efficacy of autologous Platelet Rich Plasma Injection and Fractional Carbon Dioxide Laser in treatment of stretch marks (SD)

2. To establish a cost effective, safe method for treatment of stretch marks (SD)

Materials and Methods

Ethics: Approved by the ethical committee; informed consent obtained. Site: Saraswathi Institute of Medical Sciences, Uttar Pradesh.

Duration: 24 months (June 2022 - July 2024). Design: Prospective comparative study.

Sample Size: 100 patients (50 each in PRP and CO₂ laser groups).

Inclusion Criteria: Patients above 18 with stretch marks on limbs/trunk, 2-30 cm in length.

Exclusion Criteria: Bleeding/clotting, disorders, chronic skin conditions, Cushing's disease, local infection.

PROCEDURE Group 1 (PRP): • Blood collected, centrifuged, and PRP extracted. • PRP injected intradermally along striae. • Treatment repeated every four weeks for five sessions.

Group 2 (Fractional CO₂ Laser): • Local anaesthesia applied. • Laser treatment performed with set parameters. • Single pass over lesions.

Assessment Objective: Quartile grading scale for width reduction (>50% as improvement). **Patient Satisfaction:** Scaled 0-10; scores ≥ 5 considered satisfied.

Results: The study compared 100 patients treated with PRP or fractional CO₂ laser for stretch marks. Patients undergone PRP showed greater improvement (>50% reduction) and higher patient satisfaction. Age, sex, striae type, site, family history, and drug history showed no significant differences between groups.

PRP demonstrated statistically significant better outcomes in improvement and Manchester scar scale.

Conclusion: PRP therapy shows superior efficacy and higher patient satisfaction for treating striae distensae

compared to CO₂ laser, highlighting the need for personalized and potentially combined treatment approaches.

Keywords: Striae distensae, Growth factor, Plasma, Stretch marks, Anorexia nervosa.

Introduction

Stretch marks, also referred to as striae distensae (SD), are prevalent skin marks that can lead to considerable psychological distress and cosmetic alteration. They often occur during pregnancy or when there is rapid weight fluctuation, also occurs at a young age, Cushing's disease, anorexia nervosa, and even drug use. Clinically, they appear as red, raised lines called striae rubra (SR) or white, sunken atrophic bands called striae alba (SA). They were first described histopathologically in 1889. In addition, many treatment methods are used to achieve maximum benefit and minimum side effects. Histologically, In the early stages, lesions mostly consist of small fibres. However, as the lesion ages, the epidermis flattens, atrophy occurs and reticular protrusions disappear. In addition, the dermis becomes thinner and collagen in the skin decreases. [1,2] Centella asiatica extract, almond oil [3] , olive oil [4] , cocoa butter [5] , hyaluronic acid, tretinoin [6] and 20% Topical cream containing a combination of glycolic acid and 10% ascorbic acid [7] , 1540 nm non-ablative fractional laser [8] , non-ablative erbium (Er): Glass [9] , ablative carbon dioxide (CO₂) laser [10] , excimer laser, pulsed dye laser, neodymium doped yttrium aluminium garnet (Nd: YAG) [11,12] , copper bromide and diode laser [13] . Light treatments such as intense pulsed light (IPL) [14] , ultraviolet (UV) [15] , and infrared are also used. Microdermabrasion [16] , Bipolar and Tripolar Radiofrequency are the various other treatment modalities used. Despite these many methods, the results

of SD treatment are often disappointing, frustrating for doctors and patients. Although it is not possible to completely eliminate SD, it is possible to improve its appearance and reduce physical symptoms. Platelet Rich Plasma is a new modality for the treatment of striae distensae. It is an autologous platelet concentrate in a small volume of plasma. This platelet concentrate is rich in bioactive proteins and cytokines, including epidermal growth factor, platelet-derived growth factor, transforming growth factor, vascular endothelial growth factor and other growth factors. These factors work together to initiate and accelerate tissue repair and regeneration. This process often requires expensive equipment and labour. In this study, we attempted to deliver PRP intradermally along the length of the striae using the linear threading technique commonly used for dermal fillers. Laser resurfacing is one of the favourite treatment modalities for striae. It seems that effect of laser in treatment of striae is via collagen increase in extracellular matrix. It has been found that fractional CO₂ laser improved texture and appearance of the mature, white striae in skin type I – IV. Fractional photothermolysis stimulates epidermal turn over and dermal collagen remodelling, which leads to significant improvement in several types of scars and has been approved by FDA for treatment of different kinds of scars. According to histological similarities of striae alba and scar, recently researchers have shown special interest towards the utilization of fractional photothermolysis in treating stretch marks, particularly striae alba, is noteworthy.

Aim and Objectives

Aim

A Comparative study on efficacy of fractional CO₂ laser, and platelet rich plasma (PRP) for treatment of

striae distensae in Tertiary health care centre, Uttar Pradesh.

Objectives of the Study

1. To compare efficacy of autologous Platelet Rich Plasma Injection and Fractional Carbon Dioxide Laser in treatment of stretch marks (SD)
2. To establish a cost effective, safe method for treatment of stretch marks (SD)

Materials and Method

Ethical Clearance

The study was approved by the Thesis and Ethical Committee of Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh. Written informed consent was obtained from all participants.

Study Site

Department of Dermatology, Venereology, and Leprology, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh

Study Duration:

July 2022 - June 2024 (24 months)

Study Design:

Prospective comparative study

Sample Size Calculation

Sample size (N)

$$N = \frac{4pq}{d^2}$$

p – prevalence = 90%

q = 1-p = 10%

d= (Margin of error) = 6%

N (Population size) = 100

Sample Size:

100 patients, divided into two groups of 50 each.

Study Groups:

- Group A: Autologous Platelet-Rich Plasma (PRP) Therapy.

- Group B: Fractional CO2 Laser Therapy.

Inclusion Criteria

- Adults ≥ 18 years.
- Stretch marks on limbs and trunk (2 cm to 30 cm in length).
- Willingness to participate.

Exclusion Criteria

- Bleeding/clotting disorders or anticoagulant therapy.
- Chronic skin disorders (e.g., psoriasis, vitiligo).
- Cushing's disease.
- Local infection at the treatment site.

Methodology

Patients were randomly assigned to groups based on the date and time of their initial OPD visit. Initial evaluations included blood tests and liver/renal function tests, and HIV and HBsAg screenings.

Procedures

- Group A (PRP Therapy): Local anaesthesia was applied, 40 ml of blood was collected, processed to obtain PRP, and injected intradermally into striae. Treatment was repeated every 4 weeks for 5 sessions. Post-treatment, local antibiotics were administered.
- Group B (Fractional CO2 Laser Therapy): Local anaesthesia was applied, and fractional CO2 laser treatment was administered with fixed settings (wavelength: 10,600 nm; duration: 1.0 ms; distance: 1.0 mm). A single pass over each lesion was performed.

Striae width and improvement scores were recorded at each visit.

Result

It was a hospital based prospective observational study conducted in Department of Dermatology of Saraswathi institute of medical sciences, Hapur, enrolling a total of

100 patients divided in to two equal groups of patients. Group A were treated with Autologous PRP Therapy Group B were treated with Carbon Dioxide Fractional laser therapy

Table 1: Association between Improvement (>50% reduction)

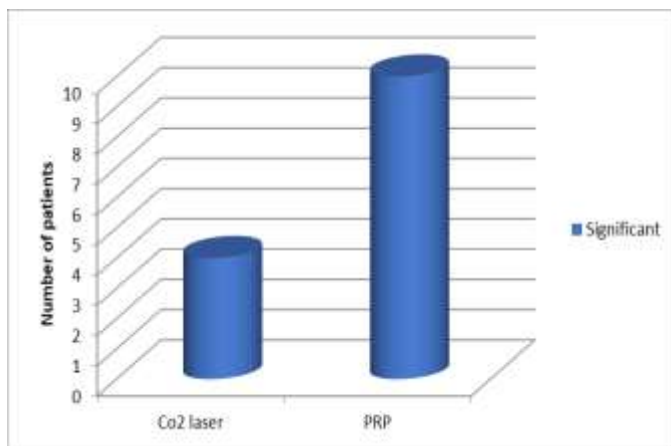
Group			
Improvement (>50% reduction)	Co2 laser	PRP	Total
Significant	4	10	14
Row%	21.4	78.6	100.0
Col %	100.0	100.0	100.0
Total	4	10	14
Row%	21.4	78.6	100.0
Col %	100.0	100.0	100.0

Chi-square value: 4.5714; df: 1; p-value: 0.0325

In CO2 Laser, 4 (8%) patients had Improvement (>50% reduction) Significant.

In PRP, 10 (20%) patients had Improvement (>50% reduction) Significant.

Association of Improvement (>50% reduction) was statistically significant (p=0.0325).



Graph 1: showing association between improvement (>50%)

Table 2: Association between non-improvement (<50% reduction)

Group			
Non-improvement (<50% reduction)	Co2 laser	PRP	Total
Mild	27	16	43
Row %	61.9	38.1	100.0
Col %	60.5	38.1	49.4
Moderate	19	24	43
Row %	39.5	60.5	100.0
Col %	39.5	61.9	50.6
Total	46	40	86
Row %	50.6	49.4	100.0
Col %	100.0	100.0	100.0

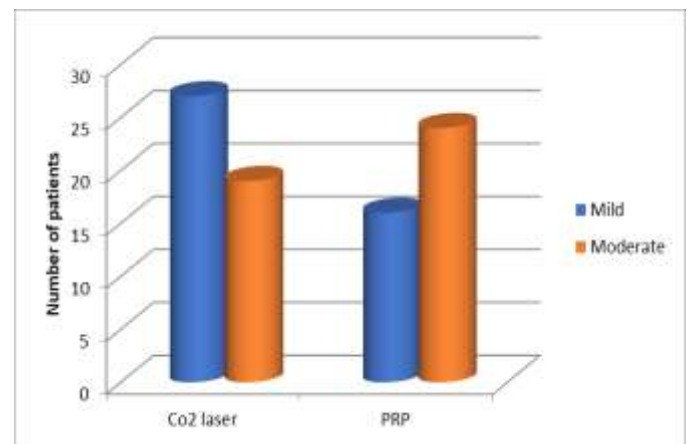
Chi-square value: 4.2535; p-value: 0.0391

Odds Ratio: 2.4853 (1.0384, 5.9481)

In CO2 Laser, 27 (54%) patients had Mild and 19 (38%) patients had Moderate Non-improvement (<50% reduction).

In PRP, 16 (32%) patients had Mild and 24 (48%) patients had Moderate Non-improvement (<50% reduction).

Association of non-improvement (<50% reduction) was statistically significant (p=0.0391).



Graph 2: showing association between non-improvement (<50%)

Table 3: Association between Patient Satisfaction Score

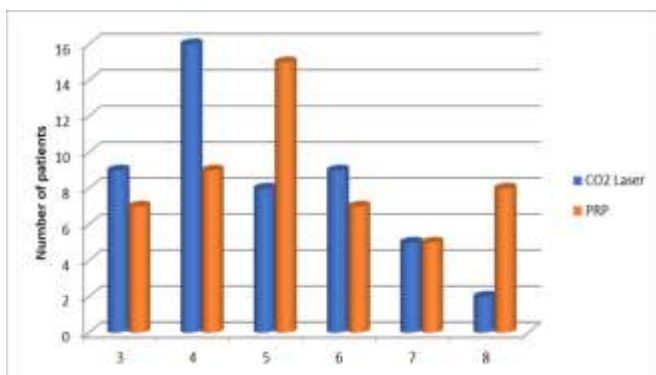
Group			
Patient Satisfaction Score	CO2 Laser	PRP	Total
3	9	7	16
Row %	56.3	43.8	100.0
Col %	18.4	13.7	16.0
4	16	9	25
Row %	64.0	36.0	100.0
Col %	32.7	17.6	25.0
5	8	15	23
Row %	34.8	65.2	100.0
Col %	16.3	29.4	23.0
6	9	7	16
Row %	56.3	43.8	100.0
Col %	18.4	13.7	16.0
7	5	5	10
Row %	50.0	50.0	100.0
Col %	10.2	9.8	10.0
8	2	8	10
Row %	20.0	80.0	100.0
Col %	4.1	15.7	10.0
Total	49	51	100
Row %	49.0	51.0	100.0
Col %	100.0	100.0	100.0

Chi-square value: 8.1537; p-value: 0.1480

In CO2 Laser, 9 (18.4%) patients had 3, 16 (32.7%) patients had 4, 8 (16.3%) patients had 5, 9 (18.4%) patients had 6, 5 (10.2%) patients had 7 and 2 (4.1%) patients had 8 Patient Satisfaction Score.

In PRP, 7 (13.7%) patients had 3, 9 (17.6%) patients had 4, 15 (29.4%) patients had 5, 7 (13.7%) patients had 6, 5 (9.8%) patients had 7 and 8 (15.7%) patients had 8 Patient Satisfaction Score.

Association of Patient Satisfaction Score with each Group was not statistically significant (p=0.1480).



Graph 3: showing association between patient satisfaction score.

Discussion

This study aims to compare the effectiveness and safety of fractional carbon dioxide laser and platelet rich plasma in the treatment of striae distensae.

The findings from this study highlight the differential efficacy of Fractional CO2 Laser and PRP in treating striae distensae. The results indicate a significant association between the treatment type and the level of improvement observed in patients.

Efficacy of Fractional CO2 Laser

Fractional CO2 Laser therapy utilizes focused laser beams to create micro-injuries in the skin, promoting collagen production and remodeling. This process helps to improve skin texture and reduce the visibility of striae.

In our study, out of 50 patients, 4 patients (8%) showed significant improvement (>50%) while 27 patients (54%) had mild improvement (<50%) and 19 patients (38%) showed moderate improvement (<50%).

Madegowda SB et al. conducted a comparative study in 2023 to assess the effectiveness of Fractional Carbon Dioxide Laser alone versus Fractional Carbon Dioxide Laser combined with Platelet-Rich Plasma for the treatment of Striae Distensae. All patients exhibited improvement on both sides. Among patients treated with CO2 laser alone, 25% showed moderate responses, 56% showed good responses, and 16.6% showed excellent responses. In patients treated with both CO2 laser and PRP, 20.8% showed moderate responses, 45.8% showed good responses, and 33.3% showed excellent responses. These findings indicate that ablative CO2 fractional laser therapy is an effective and safe treatment for striae, although slightly better efficacy was observed with the addition of PRP.

The mean Size of striae distensae (CM) (mean± s.d.) of patients undergoing Carbon dioxide fractional laser was 12.3200±6.4790. Distribution of mean Size (CM) with Group was not statistically significant (p=0.0055).

In Carbon Dioxide fractional Laser group, 10 (20.0%) patients were <20 years of age, 23 (46.0%) patients were 21-30 years of age, 16 (32.0%) patients were 31-40 years of age and 1 (2.0%) patient was >41 years of age. Association of Age with group was not statistically significant (p=0.2631)

Patients undergoing Carbon Dioxide Fractional Laser as treatment modality, 28 (56.0%) patients had S. alba and 22 (44.0%) patients had S. rubra. It was not statistically significant (p=0.2631).

In the present study patients who underwent Fractional carbon dioxide Laser response to the treatment was assessed by a subjective scoring scale i.e Patient Satisfaction Score. The mean patient satisfactory score was as follow, nine patients (18.4%) had 3, sixteen patients (32.7%) had 4, Eight patients (16.3%) had 5, Nine patients (18.4%) had 6, Five patients (10.2%) had 7 and only two patients (4.1%) had 8 Patient Satisfaction Score. In CO2 Laser, the mean Patient satisfaction score (mean± s.d.) of patients was 4.8800±1.4797. In this present study Association of Improvement (>50% reduction) with Group was statistically significant (p=0.0325) and association of non-improvement (<50% reduction) with Group was statistically significant (p=0.0391).

Patients' response was graded as per to the Manchester scale score which is a visual analogue scale considering various parameters such as colour, matte, contour, distortion, texture. In CO2 Laser, the mean Manchester Scar Scale (mean± s.d.) of patients was 7.9000±2.4682.

Distribution of mean Patient satisfaction score with Group was statistically significant (p=0.0080).

In our study, the PRP group showed a higher rate of significant improvement

(>50%) in 10 patients (20%) while in non-improvement category (<50%) mild results with PRP were seen in 16 patients (32%) and moderate results were seen in 24 patients (48%) stating PRP may be more effective than CO2 Laser in the context of our patient population.

Hausauer et al in 2020 emphasized that Platelet-rich plasma (PRP) has become increasingly popular as a treatment option for various dermatological conditions. They reported favourable outcomes associated with PRP, with the strongest evidence supporting its efficacy in treating androgenetic alopecia. Following this, PRP has shown promising results in wound healing after procedures, scar revision, treatment of striae, skin rejuvenation, and dermal filling.

In PRP group, five patients (10.0%) were <20 years of age, thirty-one patients (62.0%) were 21-30 years of age and fourteen patients (28.0%) were 31-40 years of age. Association of Age in Group with Group was not statistically significant (p=0.2631).

In PRP, twenty-eight patients (56.0%) had S. alba and twenty-two patients (44.0%) had S. rubra, which was not statistically significant (p=0.2631).

In PRP, the mean Size (CM) (mean± s.d.) of patients was 8.9600±5.2991. Distribution of mean Size (CM) with Group was not statistically significant (p=0.0055).

In PRP group the patient satisfaction score for Seven patients (13.7%) was 3, Nine patients (17.6%) was 4, 15 (29.4%) patients was 5, seven patients (13.7%) was 6, five patients (9.8%) was 7 and eight patients (15.7%) was 8.

Patient Satisfaction Score association in PRP Group was not statistically significant ($p=0.1480$).

Fractional Carbon Dioxide Laser Vs Platelet Rich Plasma

The chi-square analysis showed that the difference in improvement rates between the two groups undergoing Carbon dioxide laser and PRP was statistically significant ($p=0.0325$) indicating PRP showed significant improvement ($>50\%$) in patients. This indicates the potential superiority of PRP in achieving significant improvement in striae distensae.

In non-improvement category ($<50\%$) which was further divided into mild and moderate rates showed that a significant portion of patients in both groups experienced mild to moderate non-improvement. The chi-square value (4.2535) and p-value (0.0391) indicated a statistically significant difference between the groups, patients undergoing PRP shows a higher likelihood of moderate non-improvement (odds ratio 2.4853). This suggests that PRP lead to significant improvement in a higher proportion of patients.

Manole CG et al described that the use of Platelet-Rich Plasma (PRP) is widely acknowledged for its aesthetic and functional advantages for the skin. However, the praise for PRP's benefits sometimes leans towards being overly unquestioning, with its effectiveness often attributed solely to the activation of fibroblasts by the elements found within platelet granules. PRP therapy is fundamental to regenerative medicine, entailing the autologous delivery of conditioned plasma enriched with platelets.

The choice of treatment modality should consider the likelihood of significant improvement versus the risk of non-improvement. For patients seeking noticeable

improvement, PRP appears to offer a higher chance of success.

Additionally, the results highlight the importance of personalized treatment plans based on patient-specific factors, including the severity of striae, skin type, and individual response to treatments. Further research should explore the underlying mechanisms that contribute to the varying efficacy of these treatments and identify predictors of positive outcome.

Limitations

Lack of Blinding: The study did not mention any blinding mechanisms for either participants or evaluators, which could lead to potential biases in outcome assessment and interpretation.

Short-term Follow-up: The results were assessed relatively soon after treatment completion. Longer follow-up periods would be necessary to understand the long-term efficacy and safety of the treatments.

Single-Centre Study: Since the study was conducted in a single tertiary healthcare centre, the findings might not be generalizable to different settings or populations with different demographic characteristics.

No Control Group: The study compared two active treatment modalities but did not include a control group receiving no treatment or a standard care treatment, which could have provided a baseline for comparing treatment effectiveness.

Subjective Assessment Bias: Although subjective assessments were used, there might be inherent biases in how patients perceive and report improvements, particularly if they are aware of the treatment they received.

Conclusion

PRP Therapy

- **Efficacy:** PRP demonstrated superior efficacy in both significant improvement rates and scar appearance. It is a promising treatment for striae distensae, particularly for patients seeking less invasive options with faster recovery.
- **Patient Satisfaction:** Higher satisfaction rates, although not statistically significant, indicate a favourable patient perception of PRP. This aspect is crucial for adherence to treatment protocols and overall patient experience.
- **Safety and Tolerability:** PRP is generally well-tolerated with minimal side effects, making it suitable for a wide range of patients, including those with larger treatment areas.

CO2 Laser Therapy

- **Efficacy:** While CO2 Laser is effective, its efficacy appears lower compared to PRP, especially for larger striae. The higher non-improvement rates suggest a need for adjunctive treatments or combined approaches to enhance outcomes.
- **Patient Satisfaction:** CO2 Laser's lower satisfaction scores may reflect the more invasive nature of the treatment and associated discomfort. Ensuring adequate pain management and setting realistic expectations can improve patient satisfaction.
- **Clinical Use:** CO2 Laser remains a valuable tool, especially for patients with smaller, well-defined striae or those who prefer a treatment with a longer track record in dermatological procedures.

PRP therapy exhibits greater effectiveness in treating striae distensae, notably in achieving substantial reduction and enhancing scar appearance, when

compared to CO2 Laser therapy. Although CO2 Laser remains efficacious, its relatively lower rates of improvement and patient satisfaction underscore the necessity for customized approaches and potentially combined treatments to maximize results. Further research and longitudinal studies will be crucial in refining these therapies and improving patient outcomes in the management of striae distensae.

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