ORIGINAL ARTICLE

NATIONAL JOURNAL NJMR MEDICAL RESEARCH

Fractional CO2 Laser versus Microneedling with PRP in Striae Distensae Treatment: A Comparative Analysis on Asian Skin

Ayushi Tayal[1]*, Praveen Kumar Rathod[2]

[1,2]Dermatology, venereology and leprosy, Rohilkhand medical college and hospital, Bareilly, India

Keywords:
Stretch marks,
striae distensae,
Fractional CO2 laser,
microneedling, platelet-rich plasma,
dermatology

***Corresponding author**:
Dr. Ayushi Tayal
Dermatology, venereology and leprosy, Rohilkhand medical college and hospital, Bareilly, India
E-mail: ayushi.tayall@gmail.com

Date of Submission: 15-May-2024
Date of Acceptance: 23-Jun-2024
Date of Publication: 01-Jul-2024

DOI: 10.55489/njmr.140320241000

ABSTRACT

Background: Striae distensae (SD), are a common dermatological issue caused by skin stretching and subsequent dermal damage. Various treatments, including laser therapy and microneedling, have been explored for SD. This study evaluates and compares the effectiveness of Fractional CO2 laser and microneedling with platelet-rich plasma (PRP) for treating SD.

Method: Ninety-eight patients were randomly enrolled and divided into two groups: Group A (Fractional CO2 laser) and Group B (microneedling with PRP), each receiving four sessions at three-week intervals. The effectiveness of treatments was assessed using the Visual Analogue Score (VAS) and Patient Satisfaction Scale (PSS) at multiple follow-ups.

Result: Group A showed a significant reduction in striae width and length compared to Group B. By Week 12, 48.80% of Group A reported Excellent Improvement in VAS scores, compared to 12.80% in Group B. Patient satisfaction was significantly higher in Group A, with more patients reporting Very Satisfied and Extremely Satisfied outcomes. Side effects such as erythema and hyperpigmentation were more common in Group A.

Conclusion: Fractional CO2 laser therapy is more effective than microneedling with PRP in reducing the appearance of stretch marks, with higher patient satisfaction and significant improvements in VAS scores.

INTRODUCTION

Stretch marks, also known as striae distensae, have been recognized as a clinical condition for centuries, with the first detailed descriptions appearing in medical literature as early as 1889.[1] These marks present as linear bands of thinned skin,[2] often with a smooth texture, and typically develop in areas where the skin has been subjected to stretching and subsequent dermal damage.[3] They are associated with various physiological conditions, such as pregnancy, excessive adrenal gland activity, and rapid changes in body weight, and are considered a common and often distressing dermatological issue.

Due to their high prevalence and impact on patients' quality of life, effective treatment options are in demand. Various treatment modalities have been explored, including topicals,[4] acid peel treatments,[5] and laser therapy.[6] Laser therapy, particularly fractional photothermolysis, has become increasingly popular for treating

Publisher: Medsci Publications www.medscipublications.com ISSN: 2249 4995 Official website: www.njmr.in

stretch marks (SD),[7] especially striae albae, due to its histological similarities to scar tissue.[8–10] Fractional photothermolysis stimulates epidermal turnover and dermal collagen remodeling,[11] leading to significant improvement in various types of scars.[12] FDA approval for the treatment of different types of scars[12–14] further validates its effectiveness.[10]

Ablative Fractional CO2 10,064nm laser, based on the principle of fractional photothermolysis, stimulates fibroblast activity, inducing dermal tissue remodeling. However, multiple sessions may be required, and side effects such as erythema, crust formation, and hyperpigmentation, are possible. [15]

Microneedling with a dermaroller or dermapen has emerged as a treatment option for scars, including stretch marks, acne scars, wrinkles, and facial rejuvenation. It is a relatively simple and cost-effective modality that can also facilitate transdermal drug delivery.[16] Microneedling promotes the release of growth factors, stimulating the formation of new collagen and elastin in the papillary dermis, along with neovascularization, which contributes to the reduction of stretch marks.[17]

Skin needling, also known as microneedling, is believed to promote the removal of damaged collagen and stimulate the growth of new collagen beneath the skin's surface. By puncturing the skin multiple times, microneedling increases collagen and elastin deposition, making it potentially effective for treating conditions like stretch marks (SD), which are characterized by dermal scars with epidermal atrophy.[17]

Platelet-rich plasma (PRP) is a concentrated solution of plasma containing numerous growth factors and proteins. When injected intradermally, PRP supplements dermal elasticity by stimulating cell proliferation, migration, angiogenesis, and synthesis of new collagen. Combining PRP with microneedling, radiofrequency, or fractional CO2 laser therapy has shown enhanced efficacy in treating stretch marks.[18]

The purpose of the study is to evaluate and compare the effectiveness of Fractional CO2 laser and microneedling using Dermapen, along with autologous platelet-rich plasma, for treating stretch marks. The study aims to address this gap in research and determine which treatment modality offers better patient compliance, and fewer side effects while achieving the desired results.

METHODOLOGY

This study was designed as a randomized controlled trial conducted in the Department of Dermatology, Venereology, and Leprosy at Rohilkhand Medical College and Hospital in Bareilly, Uttar Pradesh, over a one-year period from November 1, 2022, to October 31, 2023.

A total of 98 patients who attended the outpatient department and met the inclusion criteria were enrolled. These patients were divided into two groups of 49 each: Group A was treated with fractional CO2 laser, while Group B underwent microneedling with PRP. Both treatment modalities consisted of four sessions at three-week intervals (Fig 1).

Inclusion criteria included patients seeking cosmetic treatment for striae distensae, aged between 18 and 40 years. Exclusion criteria comprised patients with keloidal tendencies, collagen or elastic disorders, recent use of topical or oral retinoids, unrealistic expectations, those below 18 or above 40 years, patients with blood dyscrasias, pregnant or lactating women, those on immunosuppressive drugs, and patients with active infections or conditions delaying wound healing like HIV and diabetes mellitus.

The study received approval from the Institutional Ethics Committee, and all patients provided written informed consent. Participants' histories were documented, including age, gender, smoking status, drug and disease history, pregnancy history, and weight gain. Comprehensive examinations and routine investigations, such as complete blood count, blood sugar levels, coagulation profiles, and viral markers, were conducted.

Patients were randomized into two groups using an odd-and-even method: odd-numbered patients were assigned to Group A and even-numbered patients to Group B. Striae distensae were evaluated based on size, shape, site, position, number, and type.

Fractional CO2 laser treatments in Group A and microneedling with PRP in Group B were performed in four sessions over 12 weeks. Photographic documentation was done at baseline and at each follow-up visit. The length and width of the largest striae were measured initially and at subsequent follow-ups for comparison.

Two dermatologists assessed the photographs using a visual analogue score (VAS), with the scores labeled as VAS-1 and VAS-2. The reduction in striae extent was determined by comparing these VAS scores between the two groups. Patient satisfaction was evaluated after the completion of the four sessions, and any side effects were recorded and compared between the groups.

Data analysis was conducted using SPSS version 23.0, with qualitative data expressed as percentages, ratios, and proportions, and quantitative data as mean and standard deviation. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 98 cases were enrolled, with Group A consisting of 49 patients treated with fractional CO2 laser and Group B comprising 49 patients treated with microneedling by derma pen with platelet-rich plasma. In Group A, there were 20 (40.8%) male and 29 (59.2%) female patients enrolled. Conversely, in Group B, there were 27 (55.1%) male and 22 (44.9%) female patients enrolled.

In Group A, 8.20% of participants were <=20 years old, 73.50% were in the 21-30 age range, and 18.40% fell within the 31-40 age category.

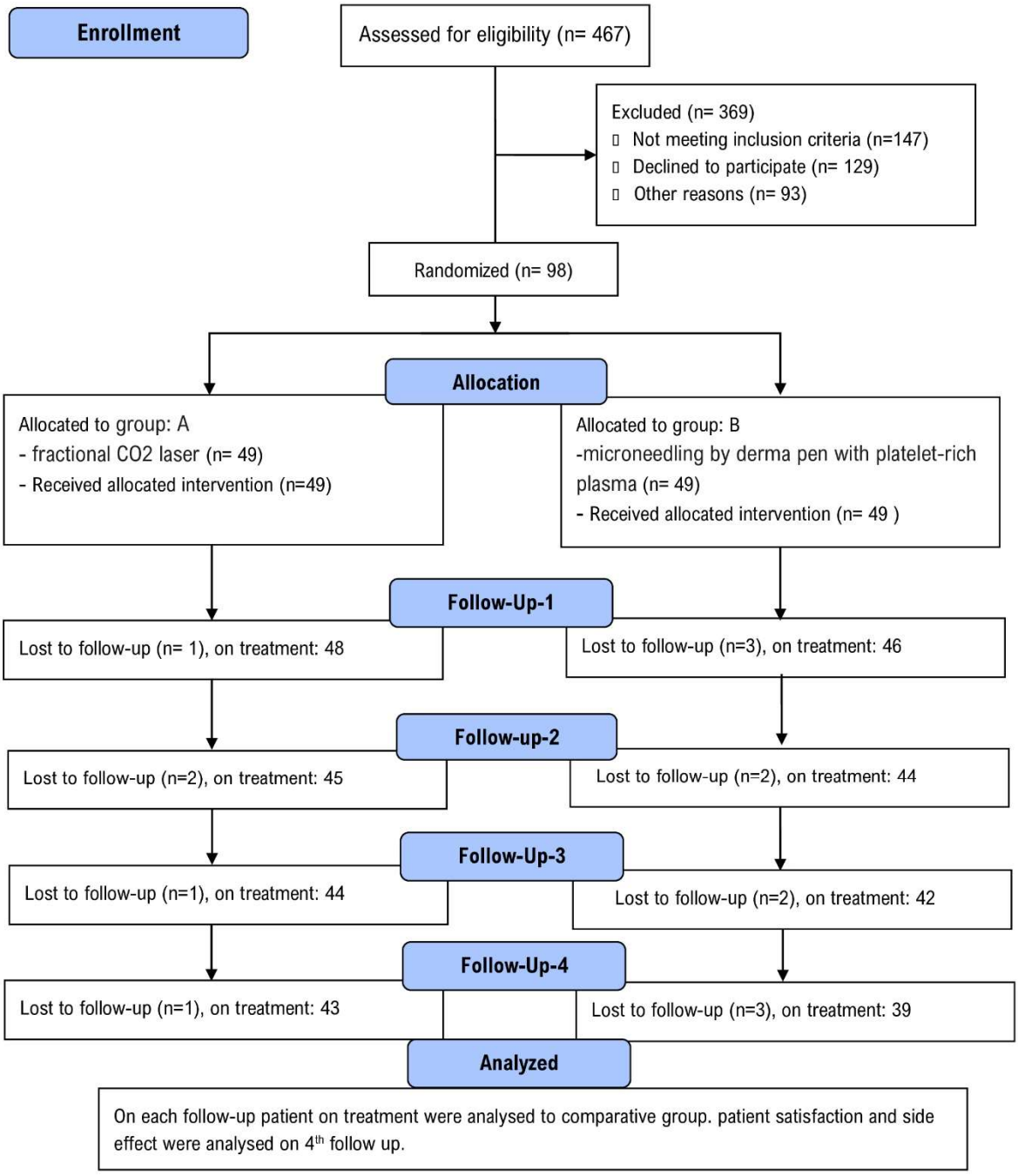

Fig 1: PRISMA flow chart

In Group B, 4.10%, 75.50%, and 20.40% belonged to the respective age groups. The mean age for Group A was 25.9±4.4, and for Group B, it was 26.4±4.1, with an overall mean of 26.2±4.2 for the study.

A higher occurrence of striae was found on the abdomen in Group A (32.70%) compared to Group B (28.60%), and a greater presence on the thigh in Group B (22.40%) compared to Group A (16.30%). Similarly, striae on the breast were more prevalent in Group B (10.20%) than in Group A (2.00%). Conversely, Group A had a higher percentage of striae on the arm (10.20%) compared to Group B (4.10%).

The mean BMI values for Group A (26.6±4.44) and Group B (27.4±5.1) are presented along with a standard deviation. The t-test resulted in a t-value of -1.04 and a p-value of 0.30. The non-significant p-value suggests that there is no statistically significant difference in mean BMI between both groups. This indicates that, based on BMI classification, the patient distribution is similar between Group A and Group B.

At Week 3, 16.70% of participants in Group A and 30.00% in Group B were lost to follow-up. By Week 6, Group A saw 33.30% attrition, while Group B had a lower percentage of 20.00%. At Week 9, 16.70% of Group A participants and 20.00% of Group B participants were no longer part of the study. At the final follow-up, Week 12, 33.30% of Group A and 30.00% of Group B were lost to follow-up. The total attrition over the entire study was accounting for 16 patients.

Table 1: Comparison of mean width of striae between the two groups

Group	Day 1 Width (mm)	Week 12 Width (mm)	Reduction in width
Group A	5.6+-2.5	2.1+-1	3.6+-2.5
Group B	6.2+-3	3.6+-2.2	2.6+-1.5
Total	6+-2.8	2.8+-1.9	3.1+-2.2
p value	0.29	<0.001*	0.02*

Table 2: Comparison of mean length of striae

Group	Day 1 Length (cm)	Week 12 Length (cm)	Reduction in Length
Group A	5.8+-2.4	2.3+-1.3	3.5+-2.3
Group B	6.2+-2.3	3.5+-1.6	2.6+-1.5
Total	6+-2.4	2.9+-1.6	3+-2
p value	0.42	<0.001*	0.05*

On Day 1, Group A exhibited a mean width of 5.6 mm, while Group B showed a slightly higher mean width of 6.2 mm. By Week 12, there was a noticeable reduction in striae width in both groups, with Group A decreasing to a mean of 2.1 mm and Group B to 3.6 mm. The computed differences in width highlighted a greater reduction in Group A (3.6 mm) compared to Group B (2.6 mm). Statistical analysis revealed a significant p-value of <0.001 for Group A, indicating a highly meaningful reduction in striae width over the 12-week period. However, Group A exhibited a non-significant p-value of 0.29. The overall study, with a p-value of 0.02, suggests a significant difference in the mean width of striae between Day 1 and Week 12, emphasizing the effectiveness of the treatment in Group A in achieving a reduction in striae width compared to Group B.

Initially, at Day 1, Group A exhibited a mean striae length of 5.8 cm, slightly less than Group B's 6.2 cm, the statistical analysis revealed a non-significant difference in length of striae on day 1 between two groups with p-value of 0.42. By Week 12, both groups experienced reductions in striae length, with Group A decreasing to 2.3 cm and Group B to 3.5 cm with p <0.001 indicating a substantial reduction in striae length in group A over the 12-week period.

The reduction in length was more pronounced in Group A (3.5 cm) compared to Group B (2.6 cm). The overall study, with a p-value of 0.05, signifies a significant difference in the mean length of striae between Day 1 and Week 12, highlighting the effectiveness of the treatment in Group A in achieving a substantial reduction in striae length compared to Group B.

The observation of VAS score was done by two observers. The findings of first observer were depicted as VAS_1 and findings of second observer was depicted as VAS_2. The scores are categorized into five levels of improvement: No Improvement, Minimal Improvement (1-25%), Moderate (26-50%), Marked (51-75%), and Excellent Improvement (76-100%).

VAS score at different follow-ups among group A.

At Week 3, a substantial proportion (22.90%) of participants reported No Improvement for both VAS_1 and VAS_2. The majority indicated improvement, with 35.40% experiencing Minimal for VAS_1 and 39.60% for VAS_2. Moderate Improvement was reported by 18.80% for VAS_1 and 20.80% for VAS_2. Additionally, 22.90% reported Marked Improvement for VAS_1, while 16.70% reported the same for VAS_2. None reported Excellent Improvement for either VAS_1 or VAS_2.

By Week 6, there was a notable shift, with only 6.50% reporting No Improvement for both VAS_1 and VAS_2. There was a significant increase in participants reporting Moderate Improvement, with 45.70% for VAS_1 and 54.30% for VAS_2. At Week 9, all participants reported some level of improvement for both VAS_1 and VAS_2. Specifically, 17.80% reported Excellent Improvement for both. By the final follow-up (Week 12), there were no reports of No Improvement for either VAS_1 or VAS_2. The distribution demonstrated ongoing improvement, with 48.80% reporting Excellent Improvement for both.

VAS score at different follow-ups among group B.

At Week 3, a substantial proportion (41.30%) of participants in Group B indicated No Improvement for both VAS_1 and VAS_2. Additionally, 45.70% reported Minimal Improvement for VAS_1, while 50.00% reported the same for VAS_2.

By Week 6, there was a noticeable shift in both VAS_1 and VAS_2 scores. For VAS_1, 18.20% reported No Improvement, 45.50% reported Minimal Improvement, and 29.50% reported Moderate Improvement. For VAS_2, 29.50% reported Moderate Improvement, and 9.10% showed Marked Improvement.

At Week 9, the trends continued to evolve. For VAS_1, 7.10% reported No Improvement, 23.80% reported Minimal Improvement, and 40.50% reported Moderate Improvement. For VAS_2, 52.40% reported Moderate Improvement, and 19.00% reported Marked Improvement.

By Week 12, improvements were observed in both VAS_1 and VAS_2 scores. For VAS_1, only 2.60% reported No Improvement, while 10.30% reported Minimal Improvement, 25.60% reported Moderate Improvement, 38.50% reported Marked Improvement, and 23.10% reported Excellent Improvement. For VAS_2, the majority experienced improvement, with 43.60% reporting Marked Improvement and 12.80% reporting Excellent Improvement.

In Group A, both VAS_1 and VAS_2 reported similar percentages for No Improvement (22.90%) and Minimal Improvement (35.40% and 39.60%, respectively). However, differences emerged in the categories of Moderate Improvement and Marked Improvement, where VAS_1 reported higher percentages than VAS_2. Conversely, in Group B, similar trends were observed, with comparable percentages between VAS_1 and VAS_2 for No Improvement (41.30%) and Minimal Improvement (45.70% and 50.00%, respectively).

Table 3: Comparison of VAS score of two observers among Group A and Group B on 3rd week follow-up

Improvement Category (3rd week)	Group A (n=48)		Group B (n=46)	
	VAS_1	VAS_2	VAS_1	VAS_2
No Improvement	11 (22.90%)	11 (22.90%)	19 (41.30%)	19 (41.30%)
Minimal Improvement	17 (35.40%)	19 (39.60%)	21 (45.70%)	23 (50.00%)
Moderate Improvement	9 (18.80%)	10 (20.80%)	6 (13.00%)	4 (8.70%)
Marked Improvement	11 (22.90%)	8 (16.70%)	0 (0.00%)	0 (0.00%)
Excellent Improvement	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Mean±SD	1.3+-1		0.65+-0.1	

P value: <0.001 (significant)

Table 4: Comparison of VAS score of two observers among Group A and Group B on 6th week follow-up

Improvement Category (6th week)	Group A (n=46)		Group B (n=44)	
	VAS_1	VAS_2	VAS_1	VAS_2
No Improvement	3 (6.50%)	3 (6.50%)	8 (18.20%)	8 (18.20%)
Minimal Improvement (1-25%)	7 (15.20%)	5 (10.90%)	20 (45.50%)	19 (43.20%)
Moderate Improvement (26-50%)	21 (45.70%)	25 (54.30%)	13 (29.50%)	13 (29.50%)
Marked Improvement (51-75%)	9 (19.60%)	10 (21.70%)	3 (6.80%)	4 (9.10%)
Excellent Improvement (76-100%)	6 (13.00%)	3 (6.50%)	0 (0.00%)	0 (0.00%)
Mean+-SD	2.07+-0.9		1.28+-0.8	

P value: <0.001 (significant)

Table 5: Comparison of VAS score of two observers among Group A and Group B on 9th week follow-up

Improvement Category (9th week)	Group A (n=45)		Group B (n=42)	
	VAS_1	VAS_2	VAS_1	VAS_2
No Improvement	0 (0.00%)	0 (0.00%)	3 (7.10%)	3 (7.10%)
Minimal Improvement (1-25%)	2 (4.40%)	0 (0.00%)	10 (23.80%)	8 (19.00%)
Moderate Improvement (26-50%)	15 (33.30%)	21 (46.70%)	17 (40.50%)	22 (52.40%)
Marked Improvement (51-75%)	20 (44.40%)	16 (35.60%)	11 (26.20%)	8 (19.00%)
Excellent Improvement (76-100%)	8 (17.80%)	8 (17.80%)	1 (2.40%)	1 (2.40%)
Mean+-SD	2.9+-0.5		1.88+-0.7	

P value: <0.001 (significant)

Table 6: Comparison of VAS score of two observers among Group A and Group B on 12th week follow-up

Improvement Category (12th week)	Group A (n=43)		Group B (n=39)	
	VAS_1	VAS_2	VAS_1	VAS_2
No Improvement	0 (0.00%)	0 (0.00%)	1 (2.60%)	1 (2.60%)
Minimal Improvement (1-25%)	1 (2.30%)	0 (0.00%)	4 (10.30%)	4 (10.30%)
Moderate Improvement (26-50%)	3 (7.00%)	3 (7.00%)	10 (25.60%)	12 (30.80%)
Marked Improvement (51-75%)	18 (41.90%)	19 (44.20%)	15 (38.50%)	17 (43.60%)
Excellent Improvement (76-100%)	21 (48.80%)	21 (48.80%)	9 (23.10%)	5 (12.80%)
Mean+-SD	3.52+-0.4		2.4+-0.65	

P value: <0.001 (significant)

Notably, the Mean+-SD values represent the average VAS scores for both Group A and Group B. The T value of 4.38, accompanied by a p-value of <0.001*, signifies a statistically significant difference in the average VAS scores between them.

At the 6th-week follow-up, In Group A, both VAS_1 and VAS_2 reported comparable percentages across the improvement categories, suggesting a consistent evaluation. Group B exhibited a similar pattern, with agreement between VAS_1 and VAS_2 in the reported percentages for each improvement category. The Mean+-SD values, indicating the average VAS scores for both groups, were 2.07+-0.9 for Group A and 1.28+-0.8 for Group B. The T value of 4.39, coupled with a p-value of <0.001*, signifies a statistically significant difference in the average VAS scores between the two groups at the 6th-week follow-up.

At the 9th-week follow-up, In Group A, the observers reported no instances of No Improvement, and there was a substantial alignment in the percentages across the remaining improvement categories. Similarly, in Group B, agreement was observed between VAS_1 and VAS_2 in the reported percentages for each improvement category. The Mean+-SD values, reflecting the av-

Table 7: PSS score at different follow-ups among group A.

Satisfaction Level	Week 3	Week 6	Week 9	Week 12
Group-A				
Not Satisfied	14 (29.20%)	2 (4.30%)	0 (0.00%)	0 (0.00%)
Slightly Satisfied	14 (29.20%)	12 (26.10%)	1 (2.20%)	0 (0.00%)
Satisfied	11 (22.90%)	14 (30.40%)	9 (20.00%)	2 (4.70%)
Very Satisfied	7 (14.60%)	13 (28.30%)	23 (51.10%)	12 (27.90%)
Extremely Satisfied	2 (4.20%)	5 (10.90%)	12 (26.70%)	29 (67.40%)
Group-B				
Not Satisfied	14 (29.20%)	2 (4.30%)	4 (9.50%)	2 (5.10%)
Slightly Satisfied	14 (29.20%)	12 (26.10%)	13 (31.00%)	9 (23.10%)
Satisfied	11 (22.90%)	14 (30.40%)	13 (31.00%)	11 (28.20%)
Very Satisfied	7 (14.60%)	13 (28.30%)	9 (21.40%)	12 (30.80%)
Extremely Satisfied	2 (4.20%)	5 (10.90%)	3 (7.10%)	5 (12.80%)

Table 8: Comparison of side-effects between the two study groups on 12th week of follow-up.

Side Effects	Group A	Group B	Total
Burnings/Pain	31 (63.30%)	26 (53.10%)	57 (58.20%)
Ecchymosis	19 (38.80%)	26 (53.10%)	45 (45.90%)
Erythema	22 (44.90%)	26 (53.10%)	48 (49.00%)
Hyperpigmentation	29 (59.20%)	23 (46.90%)	52 (53.10%)

erage VAS scores for both groups, were 2.9+-0.5 for Group A and 1.88+-0.7 for Group B. The T value of 7.8, coupled with a p-value of <0.001*, indicates a statistically significant difference in the average VAS scores between the two groups at the 9th-week follow-up. At the 12th week follow-up, across both groups, the majority of participants show improvements in their VAS scores from baseline, with varying degrees of improvement observed. Notably, marked improvement (51-75%) and excellent improvement (76-100%) categories exhibit the highest frequencies in both Group A and Group B. However, there are differences in the distribution of improvement levels between the two groups, as indicated by the highly significant P value of less than 0.001.

At the 3rd-week follow-up, a notable proportion of patients in both Group A and Group B reported being Not Satisfied (29.20% for both) and Slightly Satisfied (29.20% for both).

As the treatment progressed, there was a shift towards higher satisfaction levels in both groups. By the 6th week, the majority of patients in Group A fell into the categories of Very Satisfied (14.60%) and Slightly Satisfied (29.20%), while in Group B, the majority fell into the categories of Slightly Satisfied (26.10%) and Very Satisfied (28.30%).

This trend continued at the 9th and 12th weeks. In Group A, the majority of patients reported being Very Satisfied (51.10% and 27.90%, respectively) and Extremely Satisfied (26.70% and 67.40%, respectively). In Group B, the majority of patients reported being Slightly Satisfied (31.00% and 23.10%, respectively) and Very Satisfied (21.40% and 30.80%, respectively).

Patient Satisfaction Scale (PSS) scores at the 12th-week follow-up the overall comparison between the two groups, assessed using Pearson Chi-Square, revealed a statistically significant association between treatment groups and patient satisfaction at the 12th-week follow-up (p-value: <0.001*) comprising a substantial the highest level of satisfaction in Group A, Compared to Group B.

Table 8 illustrates a comparison of side effects reported by participants in Group A and Group B during the 12th-week follow-up. In Group A, 63.30% reported Burnings/Pain, 38.80% reported Ecchymosis, 44.90% reported Erythema, and 59.20% reported Hyperpigmentation. In contrast, Group B showed slightly lower percentages, with 53.10% reporting Burnings/Pain, 53.10% reporting Ecchymosis, 53.10% reporting Erythema, and 46.90% reporting Hyperpigmentation.

DISCUSSION

Overall, the present study suggested a significant difference in striae width between Day 1 and Week 12, highlighting the effectiveness of treatment in Group A over Group B.

In a manner similar to the results described above, following treatment, there was a notable decrease in the width of the biggest striae, along with a notable thickening of the epidermal cell layer and an increase in collagen fibres. The researchers hypothesise that this may be because collagen and elastic fibres have greater temperature stability because there was no discernible increase in the amount of elastic fibres throughout any of the periods.[19]

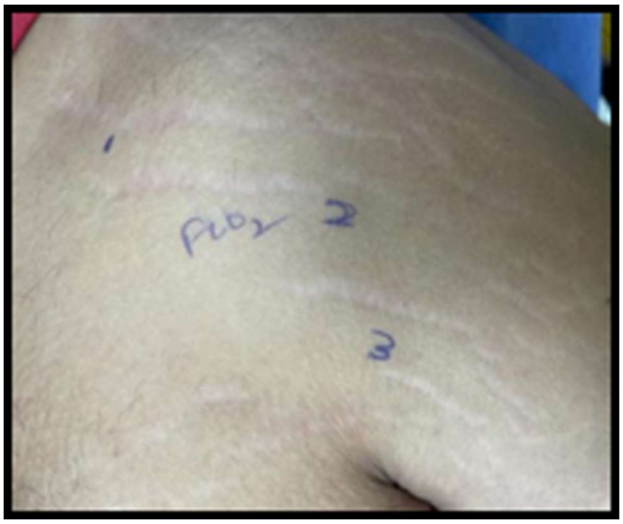

Image: 1.1 Multiple striae distance present on the left shoulder due to exercise in male patient Pre-procedure (FCO2 laser)

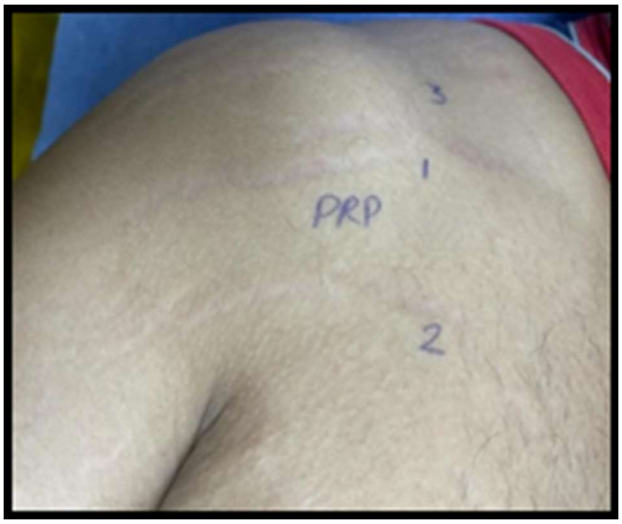

Image 2.1: Multiple striae distance present on the right shoulder due to exercise in male patient Pre-procedure

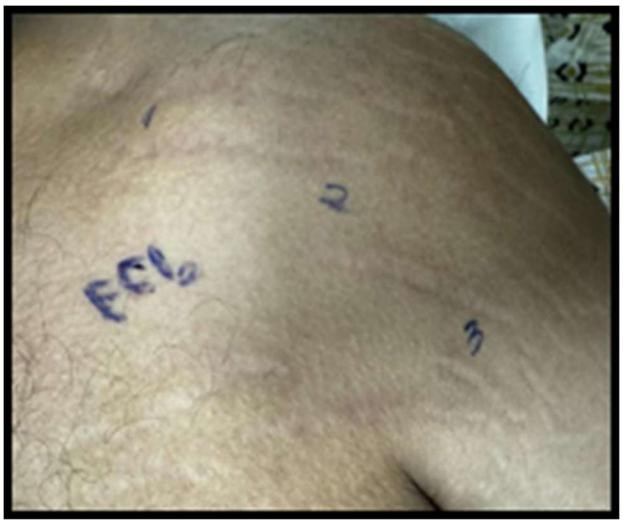

Image: 1.2: Improvement noted in length and width of individual stria with slight hyperpigmentation over the border after 2nd session of FCO2 laser

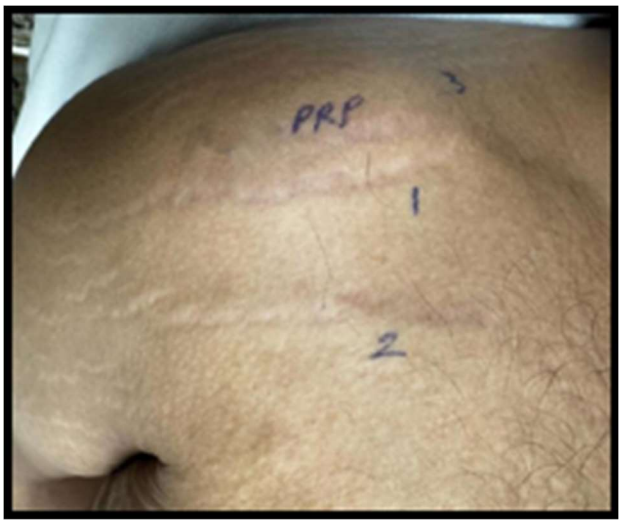

Image 2.2: Mild Improvement noted in length and width of individual stria after 2nd session of micro-needling with autologous PRP

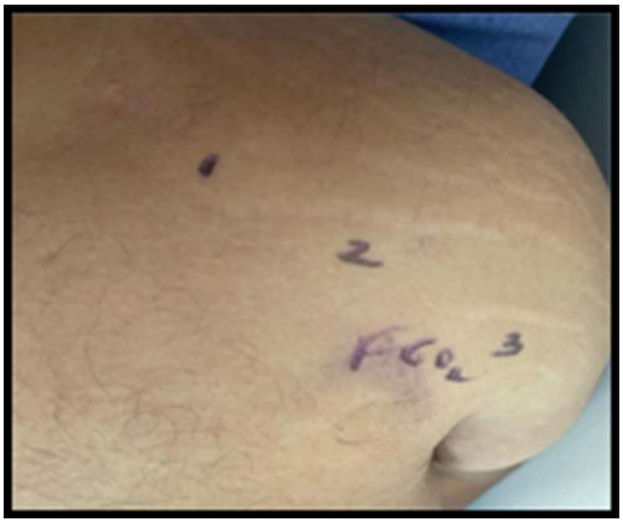

Image: 1.2: Reduction in length and width of striae after 4th session of FCO2 laser

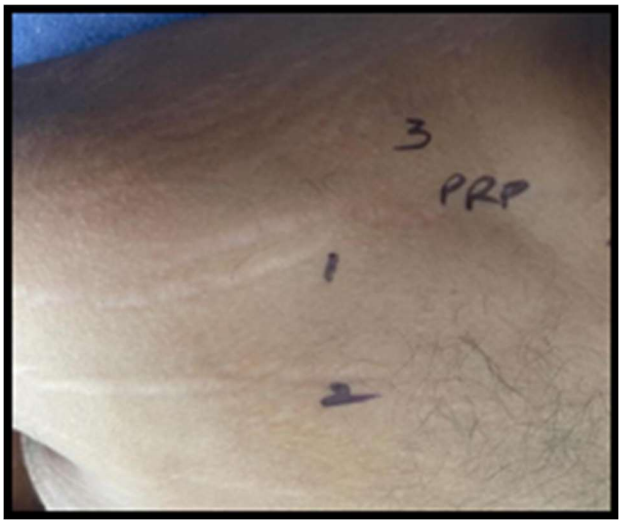

Image 2.3: Moderate Improvement noted in length and width of individual stria after 4th session of micro-needling with autologous PRP

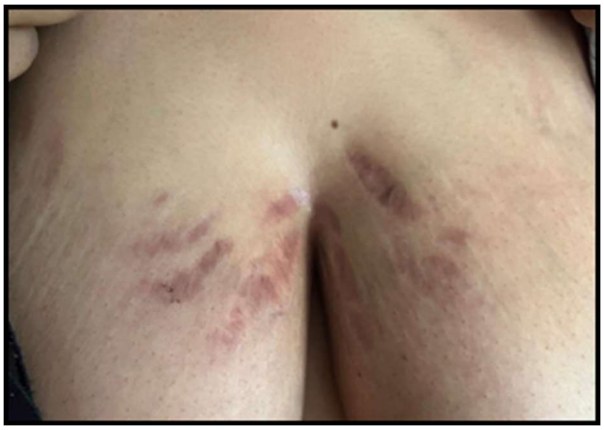

Image 3.1: Multiple striae rubra present over the breast of a female patient before the procedure (FCO2 laser)

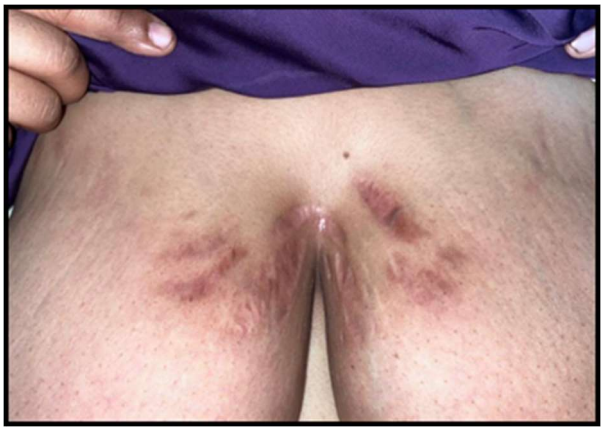

Image 3.2: Mild improvement noted in the appearance of striae along with erythema and hyperpigmentation after 4th session of FCO2 laser.

In Madegowda et al.'s study, after 8 weeks, 66.7% had a fair response with fractional CO2 laser alone, compared to 66.7% with fractional CO2 and PRP. At 12 weeks, 50% had good improvement with CO2 laser alone, versus 50% with CO2 and PRP, which showed significant improvement (P = 0.046). At 24 weeks, CO2 laser alone had 58.3% good response, while CO2 with PRP had 50% good and 33.3% excellent improvement (P = 0.389).[20]

In Sang Eun Lee et al. study 22.2% of participants reported being very satisfied, 51.9% were satisfied, 18.1% were slightly satisfied, and 7.4% were unsatisfied with the treatment outcomes. Overall, the study demonstrated favorable outcomes and high satisfaction rates among participants treated with ablative 10,600-nm carbon dioxide fractional laser for late-stage striae distensae.[21]

Similarly In research by Neinaa et al., after three treatment sessions spaced six weeks apart, 20% of participants reported acceptable improvement, 56.7 % showed remarkable improvement, and 23.3% reported outstanding improvement. These outcomes agree with the findings of our investigation.[22]

Mona Soliman et al. study concluded, fractional CO2 laser was found to be more effective in treating striae with acceptable side effects, although microneedling was also considered an effective, safe, and cost-efficient method for treating striae distensae.[23]

Comparative to the current study result, the Ghosh et al. study After the final four treatment sessions, at one month's end, 4 patients (26.66 %) had significantly improved striae, 5 patients (33.33 %) had moderately improved striae, and 6 patients (40 %) had minimally improved striae, as determined by the Global Improvement Score.[24]

Similarly, in the Nilforoushzadeh et al. study, Therapeutic efficacy was found to be 54.7 % for the combination approach and 43 % for the fractional CO2 laser method used alone, according to the data. The combined method's mean patient satisfaction score (VAS, or visual analogue scale) was 6.6, while the laser alone method's score was 5.2.[25]

The statistical analysis of the current study a significant difference in the reported levels of improvement between the two study groups, highlighting a potential divergence in treatment effectiveness.

Tehranchinia et al. treated 30 striae alba patients with fractional CO2 laser sessions using the following parameters: intensity 10 J/cm2, spot size 12, and 2 passes showed that during the 3-month follow-up, 80% of patients showed a poor or moderate improvement.[26]

The current study reveals a positive trend in patient satisfaction over the treatment duration, as evidenced by the Patient Satisfaction Scale (PSS) scores at different follow-up intervals for Group A.

According to Tehranchinia et al. study's findings, three out of the thirty participants (10%) were extremely satisfied, three (10%) were satisfied, one (3.3%) was somewhat satisfied, and twenty-one (76.7%) were not satisfied. In our study, the patient satisfaction score showed that two patients (20 %) were very satisfied, two patients (20 %) were satisfied, two patients (20 %) were slightly satisfied, and four patients (40 %) were not satisfied. Six patients (60 %) in group II had poor improvements, two patients (20 %) had good improvements, and two patients (20 %) had very good improvements.[26]

Furthermore, Patient Satisfaction Score: Upon completion of the last therapy sessions, at the end of one month, 5 patients (33.33 %) reported being very satisfied, 7 patients (46.6 %) reported being satisfied, and 3 patients (20 %) reported being mildly satisfied. Following therapy, Group B's mean Patient Satisfaction VAS Score was 2.1.[24]

The current study examines the overall comparison between the two groups for patient satisfaction at the 12th-week follow-up (p-value: <0.001*) comprising a substantial the highest level of satisfaction in Group A, compared to Group B.

In Yashwanth Reddy et al. study, after four sessions, one month later, 20% of patients in group B had a reduction of 3 grades, but only 13.3% of patients in group A showed the same reduction. 33% (2) of patients in Group A and 33.33 % (5) of patients in Group B expressed high levels of satisfaction with their therapy one month following the final session (4 sessions). Those in Group B had a higher patient satisfaction VAS score than patients in Group A. After four therapy sessions, Group B's mean Patient Satisfaction VAS Score was 2.1, while Group A's was 1.8 ($p<0.05$).[27]

In the present study, In Group A, 63.30% of participants reported Burnings/Pain, 38.80% reported Ecchymosis, 44.90% reported Erythema, and 59.20% reported Hyperpigmentation. Conversely, Group B exhibited slightly lower percentages, with 53.10% reporting Burnings/Pain, 53.10% reporting Ecchymosis, 53.10% reporting Erythema, and 46.90% reporting Hyperpigmentation.

Comparatively In research by Sobhi et al., fractional CO2 laser treatment caused hyperpigmentation in 52.2% of the patients. PRP did not cause any further negative effects to be observed. When using PRP in addition to a laser, more patients experienced discomfort than with only a laser. Compared to other studies, hyperpigmentation was revealed to be a highly frequent side effect in our investigation.[28]

When Aust et al. employed needling therapy to resolve striae, no unfavourable side effects were noted in the situations when the sides received microneedling, with the exception of moderate, temporary erythema, oedema, and in certain cases, pinpoint bleeding. Six months following dermaroller therapy, a follow-up examination revealed no pigmentary alterations in the skin.[29]

Eleven patients (36.7%) in yang et al. study experienced post-inflammatory hyperpigmentation as a side effect of fractional CO2 laser. Other anticipated adverse effects were temporary, moderate erythema, oedema, and pigmentation. Other than hypopigmentation, blistering, ulceration, or worsening of the stretch marks, there were no other complications. In the laser-treated patients, Yang and Lee found that 18 (81.8%) had post-inflammatory hyperpigmentation.[30]

CONCLUSION

Fractional CO2 laser therapy consistently demonstrated more significant improvements in striae width and length compared to microneedling with PRP across all follow-up intervals, indicating the superior efficacy of the intervention in Fractional CO2 laser therapy. Analysis of patient-reported outcomes revealed a notable increase in satisfaction levels over time in both groups, with a higher proportion of patients in Fractional CO2 laser therapy reporting the highest levels of satisfaction at the 12th-week follow-up. This divergence in satisfaction patterns between the groups was statistically significant, indicating potential disparities in treatment efficacy or patient experiences. The overall distribution of side effects was comparable between Fractional CO2 laser therapy and microneedling with PRP, suggesting similar tolerability of the treatments in both cohorts.

Funding agency: None
Conflict of interest: None

REFERENCES

1. García Hidalgo L. Dermatological complications of obesity. Am J Clin Dermatol 2002;3:497–506. https://doi.org/10.2165/00128071-200203070-00006.
2. Viennet C, Bride J, Cohen-Letessier A, Humbert P. Mechanical behavior of fibroblasts included in collagen lattices. J Soc Biol 2001; 195:427–30.
3. Burrows NP, Lovell CR. Disorders of Connective Tissue. Rook's Textbook of Dermatology 2004:2241–312. https://doi.org/10.1002/9780470750520.CH46.
4. Kang S. Topical tretinoin therapy for management of early striae. J Am Acad Dermatol 1998;39. https://doi.org/10.1016/S0190-9622(98)70453-0.
5. Mazzarello V, Farace F, Ena P, Fenu G, Mulas P, Piu L, et al. A superficial texture analysis of 70% glycolic acid topical therapy and striae distensae. Plast Reconstr Surg 2012;129. https://doi.org/10.1097/PRS.0B013E3182419C40.
6. Cho S Bin, Lee SJ, Lee JE, Kang JM, Kim YK, Oh SH. Treatment of striae alba using the 10,600-nm carbon dioxide fractional laser. J Cosmet Laser Ther 2010;12:118–9. https://doi.org/10.3109/14764171003706117.
7. Jiménez GP, Flores F, Berman B, Gunja-Smith Z. Treatment of striae rubra and striae alba with the 585-nm pulsed-dye laser. Dermatol Surg 2003;29:362–5. https://doi.org/10.1046/J.1524-4725.2003.29086.X.
8. Shin JU, Roh MR, Rah DK, Ae NK, Suh H, Chung KY. The effect of succinylated atelocollagen and ablative fractional resurfacing laser on striae distensae. J Dermatolog Treat 2011;22:113–21. https://doi.org/10.3109/09546630903476902.
9. Yang YJ, Lee GY. Treatment of Striae Distensae with Nonablative Fractional Laser versus Ablative CO(2) Fractional Laser: A Randomized Controlled Trial. Ann Dermatol 2011;23:481–9. https://doi.org/10.5021/AD.2011.23.4.481.
10. Elsaie ML, Baumann LS, Elsaaiee LT. Striae distensae (stretch marks) and different modalities of therapy: an update. Dermatol Surg 2009;35:563–73. https://doi.org/10.1111/J.1524-4725.2009.01094.X.
11. Bak H, Kim BJ, Lee WJ, Bang JS, Lee SY, Choi JH, et al. Treatment of striae distensae with fractional photothermolysis. Dermatol Surg 2009;35:1215–20. https://doi.org/10.1111/J.1524-4725.2009.01221.X.
12. Alster TS, Tanzi EL, Lazarus M. The use of fractional laser photothermolysis for the treatment of atrophic scars. Dermatol Surg 2007;33:295–9. DOI: 10.1111/J.1524-4725.2007.33059.X.
13. Behroozan DS, Goldberg LH, Dai T, Geronemus RG, Friedman PM. Fractional photothermolysis for the treatment of surgical scars: a case report. J Cosmet Laser Ther 2006;8:35–8. https://doi.org/10.1080/14764170600607251.
14. Hasegawa T, Matsukura T, Mizuno Y, Suga Y, Ogawa H, Ikeda S. Clinical trial of a laser device called fractional photothermolysis system for acne scars. J Dermatol 2006;33:623–7. https://doi.org/10.1111/J.1346-8138.2006.00143.X.

15. Tabaie SM, Nasr E, Naderi MS, Rezvan M. Treatment of striae distensae using fractional ablative CO2 laser in skin types II-IV: a retrospective case series study. J Cosmet Laser Ther 2018; 20:330–4. https://doi.org/10.1080/14764172.2018.1493512.

16. Doddaballapur S. Microneedling with Dermaroller. J Cutan Aesthet Surg 2009;2:110. https://doi.org/10.4103/0974-2077.58529.

17. Park KY, Kim HK, Kim SE, Kim BJ, Kim MN. Treatment of striae distensae using needling therapy: a pilot study. Dermatol Surg 2012;38:1823–8. DOI: 10.1111/J.1524-4725.2012.02552.X.

18. 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;37:931–8. https://doi.org/10.1111/J.1524-4725.2011.01999.X.

19. Guida S, Losi A, Greco M, Ciardo S, Pellacani G, Longo C. Reflectance confocal microscopy for striae distansae treatment monitoring after CO2 fractional laser. Dermatol Ther 2020;33:e14318. https://doi.org/10.1111/DTH.14318.

20. Madegowda SB, Rajegowda HM, Kalegowda D, Nagaraju PH, Naidu HM. Efficacy of Fractional Carbon Dioxide Laser versus Fractional Carbon Dioxide Laser with Platelet-Rich Plasma in Treatment of Striae Distensae in a Tertiary Care Center: A Comparative Study. J Cutan Aesthet Surg 2023;16:178. https://doi.org/10.4103/JCAS.JCAS_65_22.

21. Lee SE, Kim JH, Lee SJ, Lee JE, Kang JM, Kim YK, et al. Treatment of striae distensae using an ablative 10,600-nm carbon dioxide fractional laser: A retrospective review of 27 participants. Dermatologic Surgery 2010;36:1683–90. https://doi.org/10.1111/J.1524-4725.2010.01719.X.

22. Neinaa YMEH, Gheida SF, Mohamed DAEA. Synergistic effect of platelet-rich plasma in combination with fractional carbon dioxide laser versus its combination with pulsed dye laser in striae distensae: A comparative study. Photodermatol Photoimmunol Photomed 2021;37:214–23. https://doi.org/10.1111/PHPP.12636.

23. Soliman M, Mohsen Soliman M, El-Tawdy A, Shorbagy HS. Efficacy of fractional carbon dioxide laser versus microneedling in the treatment of striae distensae. Journal of Cosmetic and Laser Therapy 2019;21:270–7. https://doi.org/10.1080/14764172. 2018. 1525749.

24. Ghosh A, Swaroop MR, Ravindranath M, Mallya R. Comparative study of efficacy and safety of fractional CO2 laser and microneedling fractional radiofrequency (MnRF) in the treatment of striae distensae. IP Indian Journal of Clinical and Experimental Dermatology 2020;6:277–86. https://doi.org/10.18231/J.IJCED. 2020.056.

25. Nilforoushzadeh MA, Faghihi G, Jafari F, Haftbaradaran E, Hoseini SM, Mazaheri N. Comparison of Fractional Carbon Dioxide Laser Alone and in Combination with Subcision in Improving Atrophic Acne Scars. Journal of Isfahan Medical School 2013;31:131–7.

26. Tehranchinia Z, Mahboubianfar A, Rahimi H, Saedi N. Fractionated CO2 Laser in the Treatment of Striae Alba in Darker Skinned Patients - A Prospective Study. J Lasers Med Sci 2018;9:15. https://doi.org/10.15171/JLMS.2018.04.

27. Yashwanth Reddy K, Swaroop R, Mallaya RR, Ghosh A, Krishn ZS. A comparative study of efficacy of fractional carbondioxide laser and microneedling fractonal radiofrequency in the treatment of acne scars. IP Indian Journal of Clinical and Experimental Dermatology 2021;7:47–53. https://doi.org/10.18231/J.IJCED. 2021.009.

28. Sobhi RM, Mohamed IS, El Sharkawy DA, El Wahab MAEFA. Comparative study between the efficacy of fractional microneedle radiofrequency and fractional CO2 laser in the treatment of striae distensae. Lasers Med Sci 2019;34:1295–304. https://doi.org/10.1007/S10103-019-02792-7/METRICS.

29. Aust MC, Knobloch K, Vogt PM. Percutaneous collagen induction therapy as a novel therapeutic option for striae distensae. Plast Reconstr Surg 2010;126. https://doi.org/10.1097/PRS.0B013 E3181EA93DA.

30. Yang YJ, Lee GY. Treatment of Striae Distensae with Nonablative Fractional Laser versus Ablative CO2 Fractional Laser: A Randomized Controlled Trial. Ann Dermatol 2011;23:481–9. https://doi.org/10.5021/AD.2011.23.4.481.