



**ORIGINAL RESEARCH PAPER**

**Dermatology**

**A PROSPECTIVE INTERVENTIONAL STUDY  
COMPARING THE EFFICACY OF FRACTIONAL  
CO<sub>2</sub> LASER AND MICRONEEDLING COMBINED  
WITH AUTOLOGOUS PLATELET RICH PLASMA IN  
MANAGEMENT OF STRIAE DISTENSÆ**

**KEY WORDS:** Striae Distensae, Platelet Rich Plasma (PRP), Fractional CO<sub>2</sub>, Microneedling

<b>Dr. Sanjay Meena</b>	Assistant Professor, Department Of Dermatology, Geetanjali Medical College & Hospital, Udaipur.
<b>Dr. Ashok Meherda</b>	Senior Professor, Department Of Dermatology, J.L.N. Medical College, Ajmer
<b>Dr. Rajkumar Kothiwala*</b>	Professor & H.O.D., Department Of Dermatology, J.L.N. Medical College, Ajmer. *Corresponding Author
<b>Dr. Kapil Vyas</b>	Assistant Professor, Department Of Dermatology, Geetanjali Medical College & Hospital, Udaipur.

**ABSTRACT**

**Background:** Striae distensae is a very common condition with irregularly linear, several centimetres long. There are numerous therapeutic modalities available with variable efficacy but none are proven treatment. **Aim and objectives:** A comparative study of Fractional CO<sub>2</sub> Laser Versus Microneedling With Autologous platelet Rich Plasma in striae distensae. **Methods:** This study was conducted from november 2016–2017 and included 52 patients of striae distensae where Group-1 of striae treated by microneedling with autologous PRP and Group-2 treated with Fractional CO<sub>2</sub> laser. Randomized prospective study was conducted for a period of 16 weeks. Clinical photographs were taken immediately before and 4 weeks after fourth treatment and VAS score and patient satisfaction score was obtained at the baseline and at the end of 20 weeks to see treatment response. **Results:** As per the VAS system, mean VAS in the patients Group-1 treated by microneedling with prp was 0.8462± 0.3397 at 4 weeks, which later increased to 2.577± 0.6737 at 20th week i.e. 4 weeks after the last sitting. Mean VAS in patients Group-2 treated by Fractional co<sub>2</sub> laser was 1.077±0.3374 at 4 weeks, which later increased to 3.077±0.7706 at 20th week i.e. 4 weeks after the last sitting. The difference in mean VAS at 4th week between two groups was statistically significant with a p-value of <0.05(0.0110). The difference in mean VAS at 20th week between two groups was statistically significant with a p-value of <0.05(0.0100). Both groups of the patients showed statistically significant improvement in striae distensae at the end of 20th weeks however Fractional CO<sub>2</sub> laser versus microneedling with autologous PRP was more efficacious in decreasing the extent of striae distensae. **Conclusion:** Study concluded microneedling with Autologous PRP, and Fractional CO<sub>2</sub> Laser both can serve as a safe and efficient treatment in cases of striae distensae but fractional CO<sub>2</sub> laser more efficacious.

**INTRODUCTION :**

Striae Distensae (SD) isa common dermatological condition that frequently affect adolescent, pregnant and obese.<sup>1,2</sup>The reported prevalence is variable in different population ranging from 43-88% in pregnant women and adolescents.<sup>1</sup>Striae distensae (SD)are predominantly a dermal disorder with superimposed flattening and atrophy of the epidermis.It frequently affects sites such as abdomen, breasts, thighs and buttocks.<sup>3,4</sup>Theories of genesis of SD have been postulated as mechanical stretching of the skin, hormonal changes and an innate structural disturbance of the integument.<sup>5,6</sup>Histopathology reveals inflammatory changes in early stage and epidermal atrophy or alteration of dermal collagen in later course of the disease.<sup>7</sup>Although SD is not a cause of significant morbidity as most of the patients are asymptomatic. It can be cosmetically worrisome problem leading to emotional and psychological distress in affected individuals.<sup>6</sup> Treatment of striae distensae has always been challenging with several treatment modalities with varying outcome. Unfortunately, none of these modalities are gold standard.<sup>6,8</sup> Amongst the myriad treatment, topical retinoids, superficial to medium depth peels, mechanical debridement techniques, laser and light therapy and radiofrequency devices are prevalent in routine cosmetic practices. Recently, PRP has been emerged as a treatment modality for various dermatoses. Platelet rich plasma contain various growth factors derived from platelets and it is plausible that PRP can reduce the dermal and epidermal atrophy and produce collagen modulation in SD.<sup>9</sup> In the recent past there are reports of successful use of ablative CO<sub>2</sub> laser in SD.<sup>10</sup> Although several studies from the past are available which compare efficacy of different modalities of treatment in SD. This study was designed to compare the treatment efficacy and adverse effect profile of fractional CO<sub>2</sub> laser and PRP with

microneedling.

**METHOD & MATERIAL:-**

This was a randomized active controlled prospective interventional study comparing the two known modalities for SD i.e. laser and PRP. The study comprises 56 subjects with SD of different etiology and demographic profiles. The subjects were randomly allocated into two groups using computer generated random number table. Group -1 patients were treated by microneedling with platelet rich plasma and group 2 with fractional CO<sub>2</sub> laser for 4 session with interval of 4 weeks. The procedures were performed at every visits. In total, 4 such treatment sittings were conducted during a total course of 16 weeks. After designing appropriate inclusion and exclusion criteria. Following patients were excluded from the study i.e. patients with keloidal tendency, collagen or elastin disorders, any usage of topical or oral retinoids in past 3 months and having unrealistic expectation about the outcome. Subjects with pregnancy, immunosuppression, active infective, neoplastic and inflammatory dermatoses, hematological disorders and photosensitivity were also excluded. The patient recruited to the study were subjected to meticulous examination and battery of routine investigations such as complete blood count, liver and kidney function tests, blood sugar, coagulation profile and thyroid profile was done. History regarding precipitating factors and comorbidities were enquired in detail. All patients of both groups disinfected by povidone iodine solution and after cleaning topical anesthetic cream i.e EMLA (Lidocaine 2.5% + Prilocaine 2.5%) was applied 45 mins prior to the procedure. In Group -1 patients, prp was prepared using standard protocol. The first spin was hard with centrifugation at 2500rpm for 7 minutes at 20C (soft spin) subsequently collected plasma and buffy coat was again centrifuged at

3000 rpm for 6 mins (hard spin). Approximately 20ml of whole blood yield a PRP of 3-4ml with platelet concentrate of 3 to 4 fold.<sup>11</sup> After preparation of prp, microneedling with autologous prp, was done with strict asepsis. Skin needling was carried out using a dermaroller with rolling barrel 10 mm wide, equipped with 24 needles (1.5mm long and 0.25mm in diameter) in 8 rows. Microneedling with PRP was done 10 times in horizontal, vertical, and oblique (right and left) directions to achieve pin point bleeding. The entire procedure lasted for 15 to 20 minutes, depending on the extent of the area to be treated and was well tolerated by most of them without any immediate side effects. In group-2, patients were treated with Fractional CO<sub>2</sub> laser resurfacing with following parameters, at a pulse energy of 30~60 mJ and a spot density of 75~100 spots/cm<sup>2</sup> using a scan area and setting of laser was kept flexible according to size of SD. Photographic documentation were performed at baseline and intermittently at every follow up. Two independent dermatologists evaluated and compared the photographs using a visual analogue score. Scores, judged by them were labelled as VAS-1 and VAS-2. Decrease in extent of striae distensae was assessed comparing the VAS in Group-1 patients treated by microneedling plus PRP versus Group-2 patients treated by Fractional CO<sub>2</sub> laser. Objective and subjective improvement was evaluated using VAS and patient satisfaction score in both group for comparing the efficacy.<sup>8,12,13</sup> (table-1)

The outcome parameters were compared between the two groups using appropriate statistical tools. Qualitative data were expressed as percentage, ratio and proportion. Quantitative data were presented as mean and standard deviation. Groups were compared using Mann whitney U test. P value <0.05 was considered statistically significant.

**Table-1. Objective (VAS) and Subjective (PSS) scoring used for comparing results between two groups.**

Improvement	VAS	Level of satisfaction	Score of satisfaction
Excellent improvement (76-100%)	4	Extremely satisfied	4
Marked improvement (51-75%)	3	Very satisfied	3
Moderately improvement (26-50%)	2	Satisfied	2
Minimal improvement (1-25%)	1	Slightly Satisfied	1
No improvement	0	Not satisfied	0

**RESULTS:**

Demographic details of study population are given in table (table-2). As per the visual analogue scoring system, mean VAS in the patients (GROUP-1) treated by microneedling with prp was (0.8462± 0.3397) at 4 weeks, which later on increased to (2.577± 0.6737) at 20<sup>th</sup> week i.e. 4 weeks after the last sitting. Mean VAS in patients (GROUP-2) treated by Fractional CO<sub>2</sub> laser was (1.077±0.3374) at 4 weeks, which later increased to 3.077±0.7706 at 20<sup>th</sup> week i.e. 4 weeks after the last sitting.(table 3)

**Table 2- Demographic variables of both groups.**

	Group 1	Group-2	Group-1 Mean±sd	Group-2 Mean±sd	P value
Age	18-36years	18-35years	25.35±4.534	24.62±4.224	0.5504
Gender	Male-30.76% Female-69.23%	Male-34.61% Female-65.38%			0.7675
Duration of disease	1-8years	1-9years	3.308±1.975	3.192±2.263	0.8455

Marital status	Married-61.53% Unmarried-38.46%	Married-65.38% Unmarried-34.61%	
Family history	Yes-26.92% No -73.07%	Yes-30.76% No -69.23%	0.7595
Common Affected site	Abdomen-38.46%	Abdomen-34.61%	
Associated of obesity	Yes-30.76% No-69.23%	Yes-23.07% No -76.92%	

**Table-3 Comparison of Visual analogue score between microneedling with PRP Group-1 versus fractional CO<sub>2</sub> laser Group-2 regarding degree of improvement**

Degree of improvement - VAS.	No. of patients in GROUP-1 PRP with microneedling				No. of patients in GROUP-2 fractional co2 laser			
	VAS-1		VAS-2		VAS-1		VAS-2	
	4 <sup>th</sup> week	20 <sup>th</sup> week	4 <sup>th</sup> week	20 <sup>th</sup> week	4 <sup>th</sup> week	20 <sup>th</sup> week	4 <sup>th</sup> week	20 <sup>th</sup> week
No improvement -0	06	00	03	00	01	00	01	00
Minimal improvement -1	20	01	22	02	21	02	22	01
Moderately improvement -2	00	10	01	10	04	03	03	02
Marked improvement -3	00	14	00	12	00	14	00	15
Excellent improvement -4	00	01	00	02	00	07	00	08
Total	26	26	26	26	26	26	26	26

The difference in mean VAS at 4<sup>th</sup> week between two groups was statistically significant with a p-value of <0.05(0.0110) and z score is 2.541. The difference in mean VAS at 20<sup>th</sup> week between two groups was statistically significant with a p-value of <0.05(0.0100) and z score is 2.574. (table 4) Patients satisfaction regarding outcome in both groups was judged using patient's satisfaction score with the self administered questionnaire at the end of the study period (i.e. 20 weeks). Scoring was assessed on a scale of 0-4. In Group-1, 7.69% patients were slightly satisfied, 13(50%) were satisfied, 38.46% very satisfied and 3.84% was extremely satisfied. In Group-2, 3.84% was slightly satisfied, 19.23% were satisfied, 53.84% were very satisfied and 23.07% were extremely satisfied. The difference in mean satisfactory score at 20<sup>th</sup> week between two groups was statistically significant with a p-value of <0.05(0.0068) and z score is 2.706. (table-5)

Both groups of the patients showed statistically significant improvement in striae distensae at the end of 20th weeks however Fractional CO<sub>2</sub> laser was more efficacious than microneedling with autologous PRP in decreasing the extent of striae distensae. In our study 23.07% patients in group 1 and 53.84% patients in group-2 didn't have any post procedure side effect. No significant difference was observed according to mean of the side effect p value >0.05(0.0736). Out of the rest, in group-1 most common side effect was pain(38.46%, 10) during procedure. Next common side effect were ecchymoses, erythema, post inflammatory pigmentation, which started to develop, On the other hand in group 2 most common side effect was pain(23.07%), during procedure,

followed by erythema, edema which persisted for few days. These side effects were temporary and resolved in 5-7 days. (table-6)

**Table-4 Comparison of Visual analogue score between microneedling with PRP Group-1 versus fractional CO<sub>2</sub> laser Group-2 regarding difference of mean.**

Group	At 4th week	Follow up at 20th week
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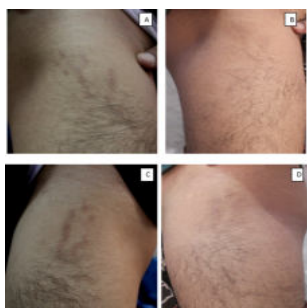
Group 1 (N=26)	Mean	0.8462	2.5769
	Std. Deviation	0.3397	0.6737
Group 2 (N=26)	Mean	1.0769	3.0769
	Std. Deviation	0.3374	0.7706
Mann-whitney U		227.00	202.50
Z score		2.541	2.574
p value		0.0110	0.0100

**TABLE 5. Difference of mean satisfactory score between both groups.**

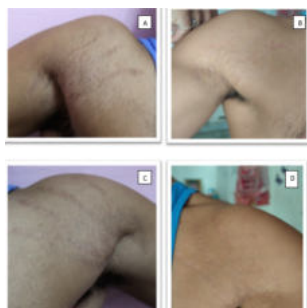
Patient satisfaction score (PSS) At 20th week	MicroNeedling +Autologous PRP GROUP-1		FRACTIONAL CO <sub>2</sub> LASER GROUP-2		Mean PSS		Difference in PSS of two GROUPS ( p-value)	Mann-whitney U	Z SCORE
	No. Of patients	%	No. Of patients	%	GROUP-1	GROUP-2			
0	0	0	0	0	2.385±0.6972	2.962±0.7736	0.0068	199.50	2.706
1	02	7.69%	01	3.84%					
2	13	50%	05	19.23%					
3	10	38.46%	14	53.84%					
4	01	3.84%	6	23.07%					
Total	26	100	26	100					

**Table-6 Comparison of side effects between both groups.**

Side effects Group-1 PRP with microneedling	No. of patients	%	Side effects Group-2 Fractional CO <sub>2</sub> laser	No. of patients	%	P value
BURNING/ PAIN	10	38.46%	BURNING/ PAIN	06	23.07%	0.0736
NONE	06	23.07%	NONE	14	53.84%	
ECCHYMOSES	04	15.38%	ECCHYMOSES	0	0	
ERYTHEMA	3	11.53%	ERYTHEMA	04	15.38%	
HYPERPIGMENTATION	3	11.53%	HYPERPIGMENTATION	02	7.69%	
TOTAL	26		TOTAL	26		



**Figure-1** Striae distensae on the both lateral side of thigh of a representative patient. Show significant excellent improvement treated by Fractional CO<sub>2</sub> laser at 20th weeks post-treatment, (A) at lateral side of right thigh baseline; (B) lateral side of right thigh after 20th week. (C) atlateral side of left thigh baseline (D) at lateral side of left thigh at 20<sup>th</sup> week.



**Figure-2** Moderate improvement on both side of anterior surface of shoulder treated by prp with microneedling . (A) before treatment baseline right side (B) after treatment at 20<sup>th</sup> week right side (C) before treatment baseline left side (D) after treatment at 20<sup>th</sup> week left side.

**DISCUSSION:**

Striae distensae (SD), also known as stretch marks, are common permanent dermal lesions that can be symptomatic and are considered aesthetically undesirable; thus, they pose a significant psychosocial and therapeutic challenge. SD arise in areas of dermal stretching and most commonly occur on the abdomen, breasts, buttocks, and thighs.<sup>2</sup> Fractional CO<sub>2</sub> Laser has recently emerged as one of the treatment modality for scars including striae distense.<sup>14</sup>

In our study, family history for Striae distensae was positive in 26.92% patients in group 1 whereas in group 2 family history was seen in 30.76% patients. These data shows both groups have similar inheritance pattern and there is no bias regarding genetic inheritance of SD.

In a study of 131 Korean adolescents by Cho et al. 26.5% of patients did not know, 11.5% were positive and 61.8% were negative for family history, which was different from our study which may be attributed to awareness in our study patients of SD in family as most of them were educated adults. Also, our study has a advantage of eliminating the bias due to genetic factors.<sup>1</sup>

In both groups abdomen was the most common site affected in patients followed by shoulder, thigh, breast, waist, breast, calf, lower back and arms, which was comparable to a study by Ibrahim *et al.* in which abdomen was the most common site affected followed by arm, groin and thigh, shoulder, leg and back. These data point to the fact that less compliant sites are more prone to develop SD.<sup>15</sup>

In our study, mean VAS in the microneedling+ PRP group was (0.8462±0.3397) at 4 weeks, which later on increased to (2.577±0.6737) at 20<sup>th</sup> week i.e. 4 weeks after the last sitting. Mean VAS in the fractional CO<sub>2</sub> laser group was (1.077±0.3374) at 4 weeks, which later increased to

(3.077±0.7706) at 20<sup>th</sup> week i.e. 4 weeks after the last sitting. The difference in mean VAS between two groups was statistically significant with a p-value of <0.05. There was also improvement in laxity texture and tightness in skin. The results could be explained by appropriate dermal collagen induction by laser as compared to microneedling because of the advantage in CO<sub>2</sub> laser as well as fractional mode increase the effect whereas decrease the depth downtime by creating multiple microthermal zones (MTZ).

In Group-1, 7.69% was slightly satisfied, 50% were satisfied, 38.46% were very satisfied and 3.84% was extremely satisfied. In Group-2, 3.84% was slightly satisfied, 19.23% were satisfied, 53.84% were very satisfied and 23.07% were extremely satisfied. The difference in mean satisfactory score at 20<sup>th</sup> week between two groups was statistically significant with a p-value of <0.05(0.0068). These data showed that the downtime and collagen induction are more favourable in fractional CO<sub>2</sub> group as compared to microneedling.

No significant difference was observed according to mean of the side effect p value>0.05(0.0736), minimal post procedure side effects were observed in our study in both groups and the findings were similar to a study done by Metelitsa AI et al.<sup>16</sup>

In a study done by Lee SE, Kim JH, et al where they demonstrated that the use of CO<sub>2</sub> FS can have a positive therapeutic effect on late-stage striae distensae. They found that it could be an effective method in treating striae distensae similar to our study.<sup>17</sup>

**CONCLUSION:**

Study concluded microneedling with Autologous PRP, and Fractional CO<sub>2</sub> Laser both can serve as a safe and efficient treatment in cases of striae distensae but fractional CO<sub>2</sub> laser is cosmetically more efficacious and also less time consuming with lesser downtime. Our study recommend superiority of fractional CO<sub>2</sub> laser as a efficacious modality for SD as compared to microneedling with autologous PRP.

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