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Comparative Efficacy of Microneedling with and without Autologous Platelet-Rich Plasma in the Treatment of Striae Distensae: A Prospective, Observer-Blinded Study

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ABSTRACT

Literature on efficacy of microneedling with or without autologous platelet rich plasma (PRP) in striae distensae (SD) is limited. To compare the efficacy of microneedling versus microneedling with autologous platelet rich plasma in striae distensae. In this prospective, observer-blinded comparison trial, a total of 36 patients with SD were included. Each patient received microneedling with autologous PRP on one side and microneedling alone on the other side. The treatments were provided every 4 weeks for a duration of 16 weeks. A follow-up assessment was conducted at the 20th week after the completion of the treatment period. The evaluation of the clinical response to treatment involved the comparison of clinical images taken before and after treatment as well as the assessment of patient satisfaction levels. The assessment of treatment efficacy was conducted with a visual analogue score. The study saw a significant improvement in 51.38% of patients in the microneedling group with a moderate improvement seen in 47.22% of patients. Additionally, one patient in this group showed exceptional improvement. In contrast, the microneedling combined PRP group demonstrated noteworthy improvement in 68.06% of patients (n = 24), while 31.94% of patients (n = 12) in this group experienced good improvement. Significant improvements in striae distensae were observed on each side of the body. Nevertheless, the outcomes shown superior efficacy when microneedling was combined with autologous platelet-rich plasma (PRP) compared to microneedling performed in isolation, with a statistically significant distinction observed between the two approaches. The utilization of microneedling with or without autologous platelet-rich plasma (PRP) has been identified as a viable and effective therapeutic approach for the management of striae distensae, ensuring both safety and efficiency. The combination of microneedling and platelet-rich plasma (PRP) confers additional benefits compared to microneedling as a standalone treatment.

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Key Words
Striae distensae, platelet rich plasma, microneedling

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INTRODUCTION

Striae distensae (stretch marks) is a common skin condition characterized by atrophic linear dermal scars with overlying epidermal atrophy, commonly seen in adolescents and young adults with a prevalence of ranging from 11-88%[1,2,3]. Though asymptomatic in most patients SD poses a significant psychological burden for patients with a considerable challenge in terms of its treatment[3]. Various treatment modalities are available but unfortunately, none of these are curative or preventive. Therefore, a safer effective and affordable treatment modality is needed for patients of SD.

Platelet-rich plasma (PRP) has been used as an effective treatment in various surgical and medical fields. It has been employed with varying degrees of success in a diverse array of dermatological diseases, including as ulcers, acne scars, contour abnormalities, androgenetic alopecia and skin rejuvenation, including the treatment of striae distensae[4-7]. The substance in question is a concentrated form of platelets, along with a variety of growth factors derived from platelets and other sources. These components have been demonstrated to be beneficial in the process of wound healing. Micro-needling is a percutaneous collagen induction treatment that initiates a series of growth factors which directly stimulate the maturation phase of wound healing, hence, initiating the healing process and enhancing skin repair mechanisms[8,9]. It has been demonstrated to be efficacious in the treatment of SD[10-13].

While there is existing evidence supporting the beneficial effects of microneedling and platelet-rich plasma (PRP) independently in the treatment of striae distensae(SD), no research have yet investigated the combined use of the two procedures. Therefore, we undertook a prospective trial with left or right controlled design where the observers were blinded to evaluate the effectiveness with microneedling in combination with autologous platelet-rich plasma (PRP) as opposed to microneedling alone over the care of striae distensae (SD).

MATERIALS AND METHODS

A left/right controlled, prospective, observer blinded comparative study conducted in a tertiary care centre. All consequetive patients with striae distensae, attending the dermatology outpatient department of our institute from December 2021-2022 were screened (n = 156). A sample size of 40 patients was arbitrarily decided and consenting patients who fulfilled the inclusion and exclusion criteria were recruited (Excluded: steroid-induced striae n = 44, SD not fulfilling other inclusion criteria n = 33, declined to participate n = 39). The study was approved by the ethics committee of the, Navodaya Medical College Hospital and research centre.

Previously untreated patients of striae distensae of duration more than 6 months were included in the study. Patients with striae rubra, tendency for keloid formation, collagen or elastin disorders, usage of topical steroids, pregnancy and lactation, HIV I and HIV II, HBsAg positive, active or recurrent herpes simplex infection, other active dermatoses/eczematous conditions, active bacterial infections, diabetes, unrealistic expectations and those on anticoagulant therapy and bleeding disorders were excluded. Baseline evaluation of complete hemogram, clotting time and bleeding time, random blood sugar, HIV 1 and HIV 2, HBsAg were done.

Platelet rich plasma preparation: A two-stage (separation and concentration) centrifuging process was employed in the preparation of platelet-rich plasma. Centrifuge machine was pre-cooled for 10 mins. About 8.5 mL of whole blood was drawn from the patient and transferred into vacutainer containing 1.5 mL of ACD-A (acid citrate dextrose-A) anticoagulant. The vaccutainer was labelled and centrifuged at 2500 rpms for 7 mins. After the centrifugation, the plasma and buffy coat was collected into a plain vacutainer (not having anti-coagulant) using 2 mL syringe. The RBCs was discarded (separation). The collected concentrate of plasma in the above step was again centrifuged (in a plain vacutainer not having anti-coagulant) at 3000 rpms for 6 mins (concentration). After the centrifugation, upper 2/3rd of platelet poor plasma is discarded and the concentrated PRP at the lower 1/3rd was obtained in a sterile insulin syringe. For each patient 1-1.5 mL PRP was prepared.

Procedure: Topical anesthetic cream (eutectic mixture of local anesthetics) was applied to the treatment area under occlusion for 45-60 mins and then completely removed using saline-soaked gauze before treatment. Treatment area will be disinfected by povidone iodine solution. A total of 4 treatments were given at an interval of 4 weeks. Striae on the left were treated with microneedling with PRP. Intradermal injections of autologous PRP 0.05 mL (2 units in insulin syringe) each at a gap of 1 cm along the length of SD were given and then needling using dermaroller (rolling barrel 10 mm wide, equipped with 24 needles (1.5 mm long and 0.25 mm in diameter) in 8 rows) was performed immediately. Needling was done 10 times each in horizontal, vertical and oblique (right and left) directions to achieve pin point bleeding. While on right side microneedling was done without PRP injections. Following the conclusion of the surgery, surplus blood was purged by means of cotton soaked in saline solution. The patients were provided with instructions to apply topical fusidic acid cream twice daily for a duration of 4-5 days, along with the application of moisturizer containing Glycerin also liquid paraffin three to four times daily for a period of 2 weeks

following the therapy. This regimen was recommended in order to facilitate wound healing and mitigate the occurrence of dryness. The aforementioned processes were replicated at each visit. A series of four treatment sessions were undertaken with a four-week break between each session, resulting in an average time frame of 16 weeks. The patients were provided with instructions to refrain from engaging in any form of self-medication throughout the course of their treatment.

Assessment: Photographic documentation was conducted prior to and subsequent to each appointment as well as one month following the final therapy session. The images were assessed and compared by two dermatologists who worked independently. They utilized an quartile grading system to determine the level of improvement observed in the photographs. The grading system consisted of five categories: 0 indicating no improvement (0%), 1 indicating minor improvement (<25%), 2 indicating moderate improvement (26-50%), 3 indicating remarkable improvement (51-75%) and 4 indicating excellent improvement (76-100%). The evaluation of the reduction in the magnitude of striae distensae was conducted by comparing the visual analog scale (VAS) scores between the side subjected to needling alone and the side subjected to needling in combination with platelet-rich plasma (PRP) treatment. Furthermore, the participants were requested to assess their level of satisfaction about the observed improvement by utilizing a numerical scale ranging from 0-100. The responses were then categorized into four distinct (levels: 1) not satisfied (<25%) 2 slightly satisfied (25-<50%), 3 satisfied (50-<75%) and 4 very satisfied (75% or above). All negative consequences observed over the duration of the trial were documented. The data underwent verification, input and subsequent statistical analysis utilizing the ANOVA (analysis of variance) test.

RESULTS

Table 1 the study findings can be succinctly described by analyzing the VAS ratings which compare the impacts of microneedling as a standalone treatment against microneedling in conjunction with PRP for both sides of the body, respectively. During the fourth week of treatment, it was discovered that the VAS ratings were rather low, suggesting limited to no change on both sides. By the 20th week of the study, notable distinctions became apparent. On the side where microneedling was administered as a standalone treatment (right side), a significant improvement was observed in 23 patients while moderate improvement was observed in 12 patients and only 1 patient reported great improvement. In contrast when microneedling was paired with PRP on the left side, 26 patients reported significant improvement, 13 patients claimed good improvement and none reported moderate improvement. This implies that the combination of microneedling with PRP provides a higher level of effectiveness for the management of striae distensae. These findings, illustrated in Fig. 1, demonstrate that a combination of microneedling and PRP seems to be more effective over time, compared to just microneedling (Table 1 and 2).

An assessment of patient satisfaction was conducted after the completion of the treatment sessions. In the group where microneedling was used as a standalone treatment, 1 patient expressed dissatisfaction, while 21 patients reported being slightly content and 13 patients indicated satisfaction. In comparison for the group treated with microneedling combined with PRP, 2 patients expressed slight satisfaction, 26 reported satisfaction, and 8 reported a high level of satisfaction. These results highlight that patients were generally more satisfied with the outcome of the combined treatment.

Table 1: Comparison of Visual analogue score between needling and needling with PRP side regarding degree of improvement.

	VAS scoring of needling side-right				VAS scoring in needling+PRP side-left			
	VAS-1 (weeks)		VAS-2 (weeks)		VAS-1 (weeks)		VAS-2 (weeks)	
Degree of improvement-VAS	4th	20th	4th	20th	4th	20th	4th	20th
No-0	5	0	1	0	0	0	0	0
Minimal-1	31	0	34	0	32	0	30	0
Moderate-2	0	12	1	22	4	0	6	0
Marked-3	0	23	0	14	0	23	0	26
Excellant-4	0	1	0	0	0	13	0	10
Total	36	36	36	36	36	36	36	36

Table 2: Patient satisfaction score

	Needling alone		Needling with PRP		Mean PSS		
Patient satisfaction score (PSS)	No.	Percentage	No.	Percentage	Needling alone	Needling with PRP	p-value
1	1	02.78	0	00.00	2.3889±0.5989	3.1667±0.50709	<0.005
2	21	58.33	2	05.56			
3	13	36.11	26	72.22			
4	1	02.77	8	22.22			
Total	36	100.00	36	100.00			

Fig. 1: Marked response on the left side (needling) and excellent response on the right (Needling+PRP) side (pre-treatment photographs 1 and 2, post-treatment photograph 3 and 4)

Fig. 2: Mild improvement on the left side (needling) and marked improvement on the right side (needling+PRP) (pre-treatment photographs 5 and 6, post-treatment photograph 7 and 8)

Additionally, it was noted that about 36.11% of the participants did not experience any adverse effects from the treatments. For those who did the most common side effects included a burning sensation or discomfort (47.22%) followed by Secchymoses (33.33%) and erythema (11.11%). Only a small percentage (5.55%) of patients reported mild post-inflammatory pigmentation. Figure 2 and 3

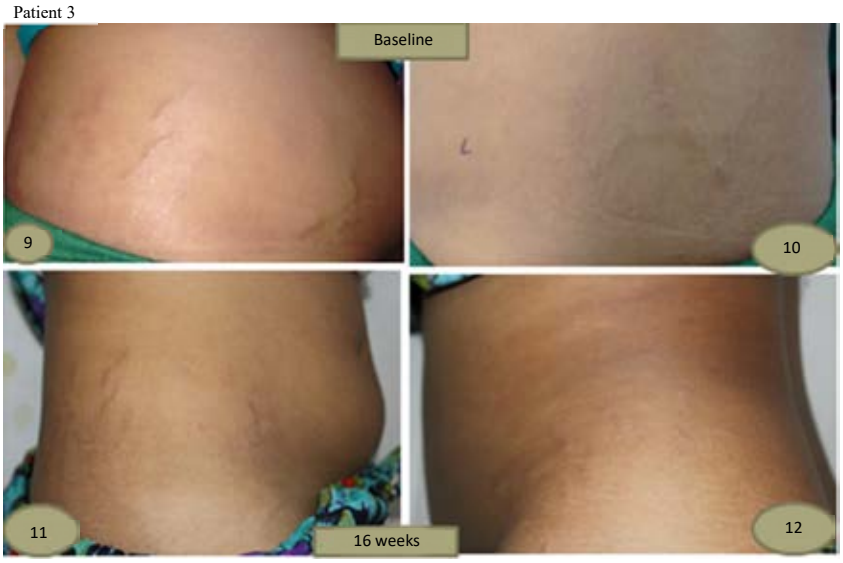

Fig. 3: Marked improvement on the left side (needling) and mild/moderate improvement on the right side (needling+PRP) (pre-treatment photographs 9 and 10, post-treatment photograph 11 and 12)

visually represent these comparisons, indicating a greater inclination of patient satisfaction towards the combined therapy.

DISCUSSIONS

Striae distensae represents a prevalent dermatological problem. Individuals diagnosed with striae are susceptible to experiencing substantial psychosocial impairment, which can also detrimentally affect their interpersonal interactions. Several therapy methods have been employed in the treatment of SD but regrettably, none of these approaches offer a straightforward and conclusive solution. A considerable proportion of pregnant women, estimated to be as high as 78%, utilize a range of topical treatments, resulting in notable financial costs. Various topical treatments have been utilized for the management of stretch marks, including tretinoin cream, Alphastria, Trofolastin containing centella asiatica, cocoa butter, olive oil, verum, silicone gel as well as chemical peeling agents such as glycolic acid (GA) and trichloroacetic acid (TCA). Additionally, procedures like Microdermabrasion, Non-ablative Laser (including the 585 nm pulsed dye laser (PDL), the 1,064 nm Neodymium-doped YAG (Nd-Yag)[6,7], the 308 nm xenon chloride (XeCl) excimer laser and the 577 nm copper bromide laser), ablative short-pulsed 10,600 nm CO2 laser, Intense pulsed light (IPL), radiofrequency, UV light therapy and fractional photothermolysis have been employed, yielding varying outcomes[3].

The regulated skin damage caused by needling therapy does not actually harm the epidermis. These micro-injuries cause just minor surface bleeding and initiate a cascade of wound healing elements[11]. Additionally, needling creates a clean pathway through the epidermis for topical substances like PRP to be absorbed more successfully. Though, the precise mechanism of PRP in SD is unknown, it appears to be helpful since, it contains concentrated platelets as well as the seven basic protein growth factors that have been shown to be actively released by platelets to start wound healing. These growth factors include transforming growth factors (TGF-b1), vascular endothelial growth factor and epithelial growth factor[8-10]. They also contain platelet-derived growth factors (PDGF-aa, bb and ab). Early wound healing has been demonstrated to benefit from PDGF, which also enhances the deposition of fibronectin and glycosaminoglycan. Additionally, it exhibits a dosage response relationship with the growth of fibroblasts, type I collagen and mesenchymal stem cells[7]. TGF-b1, however has been demonstrated to enhance in vitro collagen synthesis and deposition[6,7].

These might work in unison with growth factors brought on by skin needling to speed up the healing process. Theoretically, this provides support for the use of PRP in conjunction with skin needling[7,8].

Few studies have utilized PRP in addition to other treatments for SD thus far. For 7-9 our outcomes were marginally superior to those of Kim *et al*.[5] study, which used radiofrequency (RF) devices to inject PRP combined with higher energy fluencies directly into the dermis and Suh *et al*.[6] evaluation of the efficacy and safety of enhanced platelet rich plasma penetration with ultrasound following plasma fractional radiofrequency.

There was a statistically significant difference among the groups that were investigated with regard to the regression of striae as well as patient satisfaction in a study by Ibrahim *et al*.[7] that compared the effectiveness of microdermabrasion with and without PRP. The results showed that the group that received combined treatment with microdermabrasion and PRP had better outcomes. This was in line with our research, which supports the use of PRP in the treatment of SD. Although we were unable to confirm this in our study due to the small number of sessions that were fixed on both sides, their investigation also demonstrated that the group that received combination treatment required the fewest sessions. However, since the PRP side outcomes were better, we may infer that our study also showed that the PRP side results were better sooner.

The procedure was generally free of adverse effects and all patients tolerated it well. The patients could tolerate the burning and pain at the injection site, which lasted for about two to 3 hrs. The ecchymoses caused by the RBCs in the PRP faded away after a few days and the erythema appeared immediately and disappeared within three to four days. Except for the worsening of striae distensae in three individuals in Ibrahim *et al*.[7] trial none of our study's participants reported worsening all the side effects were modest and identical to those of their study.

Skin needling is a minimally invasive treatment that heals quickly and requires little recovery time. The most significant benefit is that a section of the epidermis is left intact because it is not destroyed, giving it clear advantages over other methods for treating striae distensae. This prevents the majority of potential side effects seen after chemical peeling or laser treatment.

Our study was the first of its kind to combine the effectiveness of PRP and microneedling as there had never been a study of its kind before. In our study, the side that received both needling and PRP improved more than the side that received only needling. Statistics showed that the difference was significant.

Our study's primary weakness was the tiny sample size. Since, many patients refused to have more than 8.5 mL of blood drawn and only a portion of it was sent for platelet counting, the amount of PRP obtained was insufficient for those with extensive striae. We were unable to remark on whether or not PRP activation affects the treatment outcome for striae distensae differently than PRP that has not been activated.

CONCLUSION

The findings of our study indicate that microneedling therapy, with or without platelet-rich plasma (PRP) is a viable and cost-effective therapeutic option that demonstrates both safety and efficacy. Using platelet-rich plasma in microneedling therapy yielded notable synergistic outcomes in managing striae distensae. Additional research is necessary to establish the effectiveness of autologous platelet-rich plasma (PRP) in treating striae distensae through the implementation of large-scale trials with a greater number of treatment sessions.

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