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Original Article

Comparing the effectiveness of microneedling along with Platelet Rich Plasma versus microneedling alone in treatment of acne scars

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Abstract

Objective To study the difference in results when microneedling is administered with platelet rich plasma as opposed to microneedling alone.

Methods This randomized controlled trial was conducted in the Dermatology Department of Shaikh Zayed Hospital, Federal Postgraduate Medical Institute, Lahore. 182 patients participated in the study. Two groups were formed and patients were with acne scars fulfilling the qualitative global scarring (Goodman and Baron) grade II- IV criteria, were divide equally. Patients from Group A received only the microneedling treatment, while patients from Group B received a combination of microneedling with PRP.

Results The largest age group comprised of patients between 18-25 years of age, followed by patients between 18-35 years of age. The mean age of the patients was Mean±SD 25.44±4.57 for Group A and 24.92±3.45years in Group B. In our study, there were 22(24%) male patients and 69 (76%) females in Group A, and 40 (44%) male patients and 51 (56%) females in Group B. In the current study at the final follow up visit, 45 (49.5%) patients improved in group A while 73 (80%) patients improved in group B. At the completion of follow up, change of one grade was noted in Group A in 13 (52%) patients who had grade 3 and 4 scarring, while no change was noted in 12 (48%) patients. In Group B, at the completion of 4 months, improvement of one grade was noted in 18 (72%) patients with grade 3 and 4 scarring, and no improvement was noted in 7 (28%) patients. Statistically significant difference ($p<0.05$) was noted in the results of the two groups.

Conclusion Microneedling is an easy, safe and economical treatment for the cure of facial atrophic scars. Combination of microneedling and autologous PRP gives overall better clinical results. It is concluded that combination of PRP and microneedling offers better clinical outcomes as opposed to microneedling alone.

Key words
Acne vulgaris; Microneedling; Platelet Rich Plasma; PRP.

Introduction

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous unit. It is a multifactorial process having characteristics of polymorphic lesions consisting of comedones, papules, pustules, nodules and sometimes cysts.[1] It is one of the most common skin diseases, prevalent in up to 80% of teenagers and in 5% of the adults.

In some patients, there is a change in texture in the superficial and deep dermis due to the extreme inflammatory response, resulting in post-acne scars.[2] Unfortunately, acne scarring is the commonest cause of facial scarring and

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occurs early in the disease process. Dermatologists find it challenging yet therapeutic to treat acne scars.[3]

Acne scars can be emotionally and psychologically disturbing for patients.[4]

Facial post-acne scars have been categorized into many morphological types and the appropriate option for treatment depends upon the manner of scarring.[5] Post-acne scars were categorized into two categories: one is atrophic scars and the second one is hypertrophic scars. Atrophic scars are further divided by Europeans acne group (ECCA) as ice pick (V-shaped), rolling (W-shaped) and box scar (U-shaped).

Varying treatment modalities have been used to treat acne scars from simple topical preparations to more invasive procedures.[6]

PRP combined with microneedling will facilitate and augment the cycle of wound healing and act synergistically to improve post acne scarring.

In a study, it was concluded that PRP along with microneedling was more efficacious in acne scars treatment than microneedling alone.[7]

In another study, Nofal *et al*. concluded that PRP with micro-needling treatment showed substantial improvement in the degree of scars. Therapeutic response according to quartile grading scale showed that, 33.3% had poor response, while 20%, 26.7%, 20% had good, very good and excellent responses respectively.[8]

Materials and Methods

Randomized controlled clinical trial was conducted in the Dermatology Department of Shaikh Zayed Hospital, Federal Postgraduate Medical Institute, Lahore from December 2018 to December 2019. After consent from the departmental ethics committee, a total number of 182 patients were enrolled in the study. Informed written consent was taken from each patient and was divided randomly into 2 groups: A and B, with 91 patients in each group. Patients from Group A received treatment of microneedling alone. Patients of group B received a combination of microneedling with PRP. A viral profile and platelet count were done for patients subjected to combined PRP and microneedling. Color facial photographs were taken. A dense layer of topical anesthetic cream (lidocaine 10%) was applied on the concerned facial area for about 30-45 minutes prior to the procedure. Platelet rich plasma was obtained through the double spin method. For PRP, 10ml of patients' whole blood was drawn and taken into sterile tubes containing acid citrate dextrose (ACD). 1st centrifugation was performed at low speed and time at 3000 RPM for 3 minutes separating PRP from RBCs. The supernatant plasma containing platelets was shifted to another sterile tube. Then, the centrifugation was performed at 4000 RPM for 15 minutes at room temperature in order to attain a platelet count higher than the base in PRP. It was then activated by adding 1ml calcium gluconate per 9ml of plasma. Derma-pen with microneedles of 1-1.5mm length was used. The skin was stretched and dermapen was rolled on affected areas four to five times all directions (vertically, horizontally and diagonal right and left). PRP was applied on the face. Topical antibiotic was given for 3 days after treatment. The subjects were advised to follow strict sun-protection. The patients were followed for any side effects. Four sessions were performed in total. Each session was performed after a 4-week interval. Patients were advised to follow up after 3 months. After the last session, the facial scars were graded using the global grading system and serial photographs. Photographic documentation was obtained using identical lighting and camera settings. Pre and

post treatment images will be compared.

Grading of the atrophic scars was done according to the Goodman and Baron scale. At the end of four sessions, the results were assessed on a scale from 1 to 4 using global scarring grading system. In addition, acne scars were further graded as poor, good and excellent based on the change in the grade of acne scars. Improvement by 2 grades (more than 50%) was translated as excellent. Improvement of 1 grade was graded as good and no improvement was graded as poor.

All the data was entered into the SPSS 23.0 software. Qualitative data like gender, effectiveness and grading of improvement were calculated as frequencies and percentages in both groups and quantitative data like age was determined by using Mean±SD for both groups. The significance of improvement in terms of grades was assessed by using McNemar's test in each group. Improvement in terms of one grade improvement was assessed by using binary logistic regression taking age, gender and treatment as confounding and independent variables. A p-value of ≤0.05 was deemed statistically significant.

Female and male patients with acne scars fulfilling the qualitative global scarring grade (Goodman and Baron) II, III and IV criteria with age ranging 18-35 years.

Patients with active acne lesions, systemic retinoids intake in the previous 6 months, history of bleeding disorder and anticoagulant therapy, pregnancy or lactation, history of keloidal scarring or immunosuppressive patient.

Results

A sum of 182 patients were enrolled. The largest age group comprised patients in 18-25 years of age group followed by 18-35 years. Mean±SD age of the patients was 25.44±4.57 years for group A and that of group B was 24.92±3.45 years with p value >0.05. This can be seen in **Table 1**.

In our study, there were 22 (24%) male patients and 69 (76%) females in group A and 40 (44%) male patients and 51 (56%) were females in group B **(Table 2)**.

According to baseline visit, the largest number of patients were in grade 4 i.e. 32 (35%) in Group A while Group B had 45 (50%). At grade 2, we had 28 (31%) patients in Group A and 12 (13%) in group B. Lastly, at grade 3, we had 31 (34%) in Group A and 34 (37%) patients in Group B which is statistically significant (p value 0.01) **(Table 3)**.

Table 1 Distribution of age of patients in group A and group B (n=182).

Age in years	*Group A (n=91) Microneedling alone*		*Group B (n=91) Microneedling with PRP*	
	No	*%*	*No*	*%*
18-25	57	63.0	51	56.0
26-33	29	32.0	37	41.0
>33	5	5.0	3	3.0
Total	91	100.0	91	100.0
Mean±SD	25.44±4.57		24.92±3.45	

Table 2 Sex distribution of patients in group A and group B

Sex	*Group A (n=91) Microneedling alone*		*Group B (n=91) Microneedling with PRP*	
	No	*%*	*No.*	*%*
Male	22	24.0	40	44.0
Female	69	76.0	51	56.0
Female to male ratio	3.13: 1		1.27: 1	

Table 3 Effectiveness of two treatments in the treatment of acne scar of baseline visit

Grade	*Group A (n=91) Microneedling alone*		*Group B (n=91) Microneedling with PRP*	
	No.	*%*	*No.*	*%*
2	28	31.0	12	13.0
3	31	34.0	34	37.0
4	32	35.0	45	50.0

Table 4 Effectiveness of two treatment at week 4 visit.

Grade	*Group A (n=91) Microneedling alone*		*Group B (n=91) Microneedling with PRP*	
	No.	*%*	*No.*	*%*
1	14	15.0	0	0.0
2	25	28.0	28	31.0
3	22	24.0	36	39.0
4	30	33.0	27	30.0

Table 5 Effectiveness of two treatments at week 8.

Grade	*Group A (n=91) Microneedling alone*		*Group B (n=91) Microneedling with PRP*	
	No.	*%*	*No.*	*%*
1	22	24.0	6	7.0
2	24	26.0	34	37.0
3	16	18.0	30	33.0
4	29	32.0	21	23.0

According to the first visit, the most number of patients were 30 (33%) in grade 4 Group A and 27 (30%) patients were in Group B. In grade 1, we had 14 (15%) patients in Group A and no patients in Group B. In grade 2, we had 25 (28%) patients in Group A while 28 (31%) were in Group B. Lastly, at grade 3 we had 22 (24%) patients in Group A and 36 (39%) in Group B which is statistically significant (p 0.001) **(Table 4)**.

In **Table 5** at grade 4, most patients were 29 (32%) in Group A and 21 (23%) patients were in Group B. At grade 1, we had 22 (24%) patients in Group A and 6 (7%) patients in Group B. At grade 2, we had 24 (26%) in Group A and 34 (37%) in Group B. Lastly, at grade 3, we had 16 (18%) patients in group A and 30 (33%) in Group B which is statistically significant (p 0.001) **(Table 5)**.

Table 6 shows the effectiveness of both treatments on third visit. At grade 1, there were 27 (30%) patients in Group A and 12 (13%) patients in Group B. In grade 2, 25 (27%) patients in Group A and 34 (37%) in Group B. At grade 3, we had 10 (11%) patients in Group A and 27 (30%) patients in Group B. Lastly, a majority of patients were at grade 4 with 29 (32%) in Group A and 18 (20%) patients in Group B which is statistically significant (p 0.001).

Table 7 depicts the comparison of improvement in both groups. In Group A, 45 (49.5%) patients saw an improvement of acne scars after the treatment of microneedling alone, while 73 (80%) patients saw an improvement in acne scars in Group B which is statistically significant with p value 0.000.

Discussion

Acne is a multifactorial inflammatory condition with post acne scarring occurring as sequelae to chronic inflammatory process. Facial post-acne scars have been categorized into many morphological types and the appropriate option for treatment depends upon the manner of scarring. In general, acne scarring is divided into atrophic, hypertrophic and keloidal scars. Most common type of acne scars are atrophic, these are further divided into rolling, ice pick and box scar. It is not uncommon for a person to have two or more type of scars.[4]

Table 6 Effectiveness of two treatments week 12.

Grade	*Group A (n=91) Microneedling alone*		*Group B (n=91) Microneedling with PRP*	
	No.	*%*	*No.*	*%*
1	27	30.0	12	13.0
2	25	27.0	34	37.0
3	10	11.0	27	30.0
4	29	32.0	18	20.0

Table 7 Comparison of improvement in both groups.

	Group A (n=91) Microneedling alone		*Group B (n=91) Microneedling with PRP*	
	No.	*%*	*No.*	*%*
Improvement	45	49.5	73	80.0
No improvement	46	50.5	18	20.0

Figure 1 Pre and post treatment photographs of patients treated with microneedling alone.

Figure 2 Pre and post treatment photographs of patients treated with microneedling and PRP.

Varying treatment modalities have been used to mitigate acne scars from simple topical preparations to more invasive procedures.[6] Dermabrasion, laser resurfacing, chemical peeling, subcision, and augmentation by fillers, punch excision as well as fat transplantation, stem cell therapy, CROSS treatment with trichloroacetic acid, and skin microneedling have been used to treat post-acne scars via enhancement of dermal extracellular matrix.[9]

Microneedling therapy, also called CIT or collagen induction therapy is one of the newer modalities for the treatment of acne scars. The use of microneedling is based on the concept of initiation of new collagen synthesis. This is accomplished by using microneedles that create minute punctures at the level of mid dermis. Tissue damage is insignificant as the needles are very fine.[10]

PRP or platelet rich plasma, as the name signifies, is a small proportion of autologous plasma in which there is increase of up to 3-5 times of platelets than normally found.[11] In Dermatology, it has been used in androgenic alopecia, skin rejuvenation and wound healing. Platelet-rich plasma contains multiple autologous growth factors, especially epidermal, platelet-derived, transforming growth factor-b, and vascular endothelial growth factor.[1] All of these growth factors are secreted from α-granules of the platelets by platelet activation, and are associated with tissue regeneration by stimulating cell differentiation and cell proliferation.

These growth factors also significantly stimulate and regulate proliferation of dermal fibroblasts and human adipose-derived stem cells,[12] thereby diminishing the healing time and improving wound healing.

As depth and extent of inflammatory response varies, different morphological acne scars can be found in a single patient. Such multiple types of scars propose the need for combined therapies to facilitate better results. PRP combined with microneedling will facilitate and augment the cycle of wound healing and act synergistically to improve post acne scarring. Developing countries like Pakistan still lack published data on this treatment modality. It has been difficult to assess the efficacy of such treatment modalities in our region because of a lack of controlled, comparative studies of the effectiveness of various treatments in facial scars. This study, therefore aims to generate local data with a large sample size so that a treatment protocol can be recommended to manage acne scars in our skin type.

A total of 182 patients were included in our study. This study was aimed at comparing the effectiveness of micro needling with or without platelet-rich plasma in patients with various types of acne scars. Patients were divided into two groups; A and B, with 91 patients in each group.

The largest age group comprises patients of 18-25 years of age followed by 18-35 years. Mean age of the patients was Mean±SD 25.44±4.57 for Group A and 24.92±3.45years in Group B, which is statistically not significant with p value >0.05. In a study carried out by Goodman and Yadav the mean age of the patients in Group A was 22.48±7.87 years and age recorded in other Group was 21.96±6.78 years (Mean±SD), similar to our study.[13,6] A similar study reported by Yaseen *et al*. with age group of patients from 18-39 years; mean age of 25.6±5.2 years is similar to our study.[14]

The current study showed that there were 22 (24%) male patients and 69 (76%) females in Group A and 40 (44%) male patients and 51 (56%) were females in Group B. In a study reported by Yentzer *et al*., the gender differences were apparent in the ratio of office visits for the treatment of acne with nearly two-thirds by females which is comparable with our study.[15] A study by Yaseen *et al*. found that, out of 35 patients, there were 25 (71.4%) females and 10 (28.5%) males which is comparable with our study.[14]

In our study, on the baseline visit the greatest number of patients were 32 (35%) in grade 4 in group A, while there were 45 (50%) patient in Group B, 28 (31%) patients in grade 2 and 31 (34%) in grade 3 in Group A while 12 (13%) in Group B and 34 (37%) patients were in Group B. In a similar study by Goodman and Baron`s, in Group A, the acne scar scoring (qualitative) at baseline was 6 (24%) and 19 (76%) patients in grade 3 and 4 respectively. In the current study at the final follow up visit, 45 (49.5%) patients were improved in group A while 73 (80%) patients showed improvement in group B. In a similar study the results at final follow up showed 2 (8%) in grade 2, 14 (56%) in grade 3 and 9 (36%) patients in grade 4 respectively. In the last follow up, only one grade change was noted in 13(52%) patients with grade 3 and 4 scarring in Group A, while 12 (48%) patients showed no change. In this study, 9 (36%) and 16 (64%) patients were in grade 3 and 4 respectively at baseline in Group B. There were 8 (32%), 11 (44%) and 6 (24%) patients in grade 2, 3 and 4 respectively at the final visit. In 18 (72%) patients In Group B, at the last visit change of only one grade was noted with grade 3 and 4 scarring while no no change was observed in 7 (28%) patients; which are similar with our study.

Majid *et al*. also conducted a study and included 36 patients to record the effect of microneedling in acne scars. This study reports 16.67%, 58.33%, 25% patients were in grade 4, 3 and 2 respectively. It noted two grades change in 72.2% patients with one grade change in 16.7% patients while 11.1% patients remained unaffected in this study. This difference of the results in both studies can be explained by the fact that we noticed 76% of patients in grade 4 while they reported only 16% patients in the same grade. This can be attributed to limitation of micro-needling treatment which shows that Grade 2 and Grade 3 scars respond well to this modality as compared to Grade 4 scars that do not respond so well, which are comparable with the current study.[5,16]

In our study, a greater improvement was found after the treatment of acne scars with microneedling with platelet-rich plasma which is observed 28% more as compared to the treatment with microneedling alone. A similar

study carried out by Fabbrocini *et al*. showed more improvement with a combination of microneedling and PRP, which was statistically significant and comparable with our study. In this study, excellent improvement was noted in 8%, while fair and good improvement was observed in 36% and 56% respectively; which is comparable with our study.[7] A similar study carried out by Sharma S *et al*. conducted a split-face trial comparing microneedling with PRP and microneedling alone, concluded that the combination therapy of microneedling along with PRP improved the scar grading significantly, with the decrease of the mean of Goodman and Baron's grade from 3.20±0.40 at baseline, to 2.13±0.56 at the final treatment, whereas on the left half of the patient's face, mean acne scar grade reduced from 3.20±0.40 to 2.36±0.56 at final treatment.[17]

Our findings demonstrate that microneedling combined with PRP for acne scars has not been studied much in our region. In comparison to previous studies, differences can be observed in method of PRP preparation, the total platelet counts and the final results. Variation is also noted, thus, more research is required for the standardization of PRP preparation and its uses.

Conclusion

Microneedling is a safe, cost-effective and easy procedure for atrophic acne scars. In combined with platelet-rich plasma, microneedling gives better results. It is concluded that combination of PRP and microneedling augments the final clinical results as compared to microneedling alone.

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