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A Comparative Study to Evaluate the Efficacy of Skin Microneedling and Platelet Rich Plasma (PRP) Combination Versus Skin Micro Needling Alone for the Treatment of Atrophic Facial Acne Scars using Goodman and Baron's Grading

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ABSTRACT

Background: One unfortunate and permanent effect of acne vulgaris is atrophic scarring. The ailment is rather common and greatly affects the quality of life of the person. Tests of micro needling have been conducted both as a stand-alone therapy and in combination with chemical peeling, platelet-rich plasma, radiofrequency, subcision, and lasers. **Objective:** To assess the effectiveness of a combined treatment using skin micro needling and platelet rich plasma (PRP) compared to skin micro needling alone in treating atrophic facial acne scars. **Methodology:** Randomized control trial (RCT) and comparative study were conducted in department of Dermatology, MTI/Lady Reading Hospital, Peshawar, for the duration of one year. Out of 100 patients 50 were included in each group in the study. Group-A was treated with skin micro needling and PRP while Group-B with skin micro needling alone for the treatment of atrophic facial acne scars. **Results:** Mean age of the patients of group-A was 28.0±6.2 and group-B was 29.4±5.2 years. Females were predominant in both groups. Mean duration of symptoms in group-A was 9.0±8.5 month and in group-B 10.9±8.5 months. Combined therapy with micro needling and PRP reported 82% efficacy while skin micro needling alone showed 62% efficacy for the management of atrophic scars from face acne (p=0.026). **Conclusion:** In conclusion, combination of skin micro needling and platelet rich plasma (PRP) is more effective than needling alone for the treatment of atrophic facial acne scars.

INTRODUCTION

Acne vulgaris is a persistent skin condition characterized by the obstruction and irritation of pilosebaceous units, which consist of hair follicles and sebaceous glands. [1]. The main causes that contribute significantly to the development of acne include excessive keratinization of hair follicles, colonization of bacteria called Propionibacterium acnes, increased production of sebum, and a complicated inflammatory response including both innate and acquired immunity [2]. Facial scarring is equally prevalent in both males and females and is observed in 75% of acne patients [3].

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Post acne scars resulting from highly inflammatory papulopustular and nodulocystic lesions are associated with reduced self-esteem and significant psychological distress, necessitating appropriate treatment [4]. Acne scars fall into three different types: keloidal, hypertrophic, and atrophic. The most prevalent kind of acne scars are atrophic ones, which fall into three primary categories: boxcar, rolling, and pick scars. Patients frequently have a variety of scar types. [5].

Various techniques such as topical applications, dermabrasion, laser resurfacing, punch excision, punch elevation, subcutaneous incision, chemical peels, dermal grafting, fillers, fat transfer, autologous collagen implantation, cultured and expanded autologous fibroblasts implantation, trichloroacetic acid focal treatment, skin micro needling (automated or derma roller), and platelet rich plasma (PRP) have been employed for the treatment of post-acne scars [6,7].

Micro needling is a highly effective process that stimulates the production of new collagen without removing the top layer of skin, resulting in minimal downtime after the procedure. By creating tiny channels, this process improves the absorption of topical medications like platelet-derived plasma (PRP), which includes autologous growth factors including transforming growth factor beta, platelet-derived growth factor, epidermal growth factor, and vascular endothelial growth factor. Together with the growth factors brought about by skin needling, they enhance collagen remodeling and the healing of wounds. [8].

Skin texture improved noticeably and atrophy decreased in research by Gulanikar AD et al. [8]. Skin needling was shown in a different study by Fernandes and Signorini to increase skin thickness and significantly deposition of collagen. Scars from atrophic acne improved noticeably as a result. Asif MD et al. found that micro needling combined with platelet rich plasma (PRP) was 62.20% effective, while micro needling alone was 45.84% successful [10].

Multiple therapies are available for acne scars, however none have been conclusively demonstrated to be the most efficacious. Combination therapy is essential to provide improved results and minimize negative effects in treating acne scars, particularly when a patient has various types of scars with varying forms. Autologous platelet-rich plasma (PRP) therapy is a novel technique that enhances and accelerates the healing process of soft tissues. The procedural safety of this treatment is widely recognized due to its autologous nature. Hence, the objective of this study is to assess the effectiveness of combining micro needling with PRP (platelet-rich plasma) in comparison to using micro needling alone for the treatment of post-acne scars.

METHODS AND MATERIALS

Trial Design

A randomized control trial (RCT) and comparative study.

Eligibility Criteria

Inclusion Criteria

1. Patients with grade 2 to grade 4 acne scars, classified on the basis of Goodman's Qualitative classification.
2. Patient with equal Goodman's Quantitative and Qualitative scores on both halves of the face.
3. No active acne
4. Adult males and females between 18 and 45 years of age.

Exclusion Criteria

1. Positive history of keloidal tendency
2. Positive history of bleeding or platelet disorder or platelet count less than 1 lakh/cm3.
3. Positive history of major surgery in past 6 months
4. Presence of any acute infection on face like, herpes, folliculitis
5. Patients of HIV. HBsAg, or any chronic illness
6. Pregnancy
7. Patients with active acne
8. Hb less than 10mg/dl

Setting

Department of Dermatology, MTI/ Lady Reading Hospital, Peshawar.

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Duration of Study with Dates
Study was carried out over a period of one year from 25-07-2021 to 24-07-2022.

Data Collection Procedure
After approval from research and ethical review committee, patients with grade 2 to 4 post acne scaring according to Goodman and Baron qualitative grading system presenting to outpatient department of dermatology unit, LRH was enrolled for the study-based inclusion and exclusion criteria. History was taken and clinical examination was performed. Informed written consent was taken and demographic data was obtained.

Intervention
The study population were divided into two groups on basis of intervention they were applied. Patients were allocated randomly in two groups A and B using blocked randomization.

Group A
Patients in Group A received treatment combining micro needling and PRP. To give local anesthesia, a solution of prilocaine 2.5% and lignocaine 2.5% was administered topically and coated around 45 minutes previous to the procedure. 192 needles in all were used, grouped using a derma roller into 24 rows of 8 needles each. Each needle was 1.5 mm deep and arranged in a circular pattern. Four rotations of the object at a right angle to the one before it were made over the scars until minute blood drops were evident. PRP was made using the twofold spin technique. An intradermal needle of 30G was used for the injections. Enough was injected to raise and lighten the scar. Two centimeters separated the injection sites for the 0.2 milliliters of normal saline or platelet-rich plasma. Depending on the amount of scars, one or two cc were injected in total.

Group B
Group B patients had micro needling only, following the previously described method. All told, both groups had four therapy sessions, spaced four weeks apart. Six months later, there was one last follow-up meeting. It was advised to employ strong photo-protection and to apply topical sunscreen therapy on occasion. [11].

Outcomes
To assess the treatment response clinical photograph was taken at each visit and by evaluating Goodman and Baron's qualitative acne scar grading scale by a single observer. Reductions of two grades were deemed extraordinary, reductions of one grade as satisfactory, and reductions of zero or none at all as unsatisfactory. Patients were also given the opportunity to complete an additional questionnaire during their final appointment, which allowed them to articulate their personal assessment of the improvement in their scars. Patients assessed the degree of improvement as either very good (50-75% improvement), good (25-49% improvement), or bad (0-24% improvement). Significant improvement of 76-100%.

Sample Size
Calculated sample size was 280 (140 in each group) on the basis of following assumptions and is calculated on the basis of hypothesis testing for 2 population proportion using WHO sample size estimation software.

- Confidence level 95%
- Anticipated efficacy of skin micro-needling in combination with PRP in the treatment of atrophic facial acne scars is 62.20%. Anticipated efficacy of skin micro needling alone in the treatment of atrophic facial acne scars is 45.84%.

Considering the COVID-19 situation, a sample size of 100 patients was taken that is 50 patients in each group.

Randomization
Simple randomization were considered patients having odd serial number on sequence of coming to OPD were indulge in Group A, while those have even serial number were considered in Group B. These groups were followed throughout session keeping their medical record numbers.

Blinding
Blinding was not applicable to our study and informed consent were taken from all the participant before including them in study.

RESULTS
Out of 100 patients 50 were randomly included in each group in the study. Group-A was treated with skin micro needling and PRP while Group-B with skin micro needling alone for the treatment of

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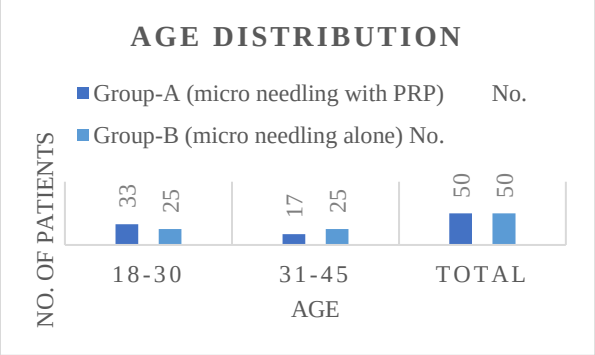
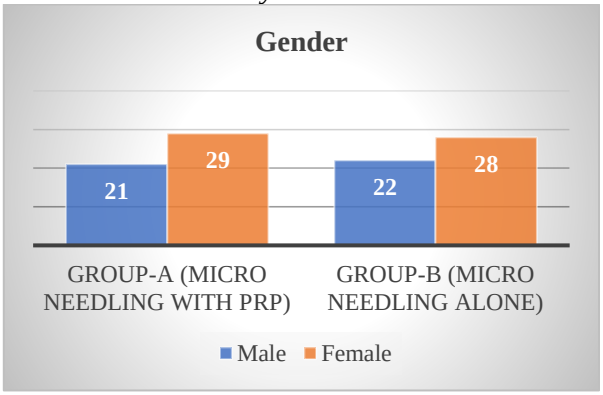
atrophic facial acne scars.
Mean age of the patients of group-A, 28.0±6.2 and in group-B 29.4±5.2 years, (Table-1).

Graph 1
Distribution of patients by age



Females were predominant in both groups Graph 2

Graph 2
Patient Distribution by Gender.



Mean duration of symptoms in group-A was 9.0±8.5 month and in group-B 10.9±8.5 months (Table-1).

Table 1
Distribution of patients on basis of symptoms duration

Duration(month)	Group-A (Micro needling with PRP)		Group-B (Micro needling alone)	
	No.	%	No.	%
≤ 12	42	84.0	36	72
≥ 13	08	16.0	14	28
Total	50	100.0	50	100.0
Mean ± SD	9.0 ± 8.5		10.9 ± 8.5	

Goodman and Baron's gradeat baseline mean values were 2.8±0.8 and 2.6±0.8 in group-A and B, respectively (Table 2).

Table 2
Distribution of patients by Goodman and Baron's grade at baseline

Goodman and Baron's grade	Group-A (Micro needling with PRP)		Group-B (Micro needling alone)	
	No.	%	No.	%
1-2	18	36.0	25	50.0
3-4	32	64.0	25	50.0
Total	50	100.0	50	100.0
Mean ± SD	2.8 ± 0.8		2.6 ± 0.8	

Graph 2 revealed that combined therapy with micro needling and PRP reported 82% efficacy while skin micro needling alone showed 62% efficacy for the management of atrophic scars from face acne (p=0.026).

Graph 3
Distribution of patients by efficacy

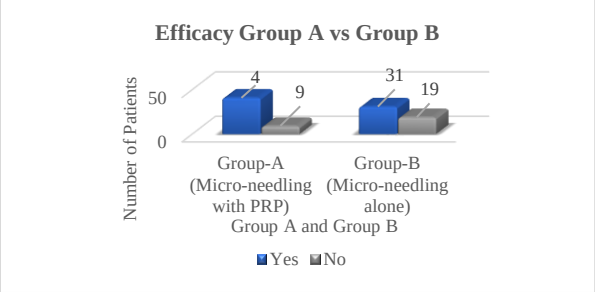


Table 3

Chi square	=	4.960
P value	=	0.026

Figure 1
Group A Micro needling plus PRP (BEFORE THERAPY)

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Figure 2
Group A Micro needling plus PRP (AFTER THERAPY)

Figure 3
Group B Micro needling Alone (BEFORE THERAPY)

Stratification of efficacy on the basis of gender is shown in table 4 which shows higher efficacy for females as compare to their male counterpart.

Figure 4

Table 4
Stratification for gender with regard to efficacy

Gender	Group	EFFICACY		Total	P value
		Yes	No		
Male	Group-A	16(76.2%)	5(23.8%)	21(100%)	0.232
	Group-B	13(59.1%)	9(40.9%)	22(100%)	
Total		29(67.4%)	14(32.6%)	43(100%)	
Female	Group-A	25(86.2%)	4(13.8%)	29(100%)	0.055
	Group-B	18(64.3%)	10(35.7%)	28(100%)	
Total		43(75.4%)	14(24.6%)	57(100%)	

Table 5 shows huge impact on efficacy of early intervention and shows that early intervention has better outcome for both groups A and B.

Table 5
Stratification for duration of symptoms (month)with regard to efficacy

Duration ofsymptoms	Group	EFFICACY		Total	P value
		Yes	No		
	Group-A	41(97.6%)	1(2.4%)	42(100%)	

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≤ 12 month	Group-B	27(75.0%)	9(25.0%)	36(100%)	0.003
Total		68(87.2%)	10(12.8%)	78(100%)	
	Group-A	0(0%)	8(100%)	8(100%)	
≥ 13 month	Group-B	4(28.6%)	10(71.4%)	14(100%)	0.095
Total		4(18.2%)	18(81.8%)	22(100%)	

The table 6 results shows that the efficacy of both group were more in high grades according to Goodman and Baron's grade classification as shown for Grade 3-4 the P value is less than 0.001 which is highly significant.

Table 6

Stratification for Goodman and Baron's grade at baseline with regard to efficacy

Goodman and Baron's grade	Group	EFFICACY		Total	P value
		Yes	No		
	Group-A	11(61.1%)	7(38.9%)	18(100%)	
1-2	Group-B	19(76.0%)	6(24.0%)	25(100%)	0.294
Total		30(69.8%)	13(30.2%)	43(100%)	
	Group-A	30(93.8%)	2(6.3%)	32(100%)	
3-4	Group-B	12(48.0%)	13(52.0%)	25(100%)	<0.001
Total		42(73.7%)	15(26.3%)	57(100%)	

DISCUSSION

Acne scars, a permanent effect 0f acne vulgaris occur in about 49% of those who suffer from it [13]. While they can result from any type of acne, nodulocystic acne is particularly likely to cause them [12].

Acne scars predominantly manifest on the face (95%), followed by the trunk (12%) [12]. Factors that increase the likelihood of acne scarring include a familial history of acne scarring, acne affecting the trunk, delayed initiation of acne scar treatment, severe inflammatory acne, and repeated relapses. [14].

Treating acne scars involves using several therapeutic methods, which can be either invasive or non-invasive. However, these treatments are often either highly risky or not very effective. Energy-based therapies encompass fractional radiofrequency, intense pulsed light, ablative and non-ablative lasers, and plasma skin regeneration. Non-energy-based therapies consist of chemical peels, micro needling, dermal fillers, and subcision.

Micro needling, also known as needle derma-abrasion, intradermabrasion, percutaneous collagen induction (PCI), or collagen induction treatment (CIT), is the practice of repeatedly puncturing the skin with sterile microneedles to stimulate percutaneous collagen induction. [15, 16].

Micro-punctures about the diameter of four cells, are created in the epidermis. The needle, with a density of 250-300 pricks per square centimeter, seems to separate the cells rather than simply puncturing them. When we pierce the dermis, we aim for the intermediate reticular layer, which has the most stem cells and hence has the highest degree of collagen formation. The micro-injuries initiate a sequence of processes referred to as the wound healing cascade, resulting in the secretion of several growth factors (GFs). These GFs include connective tissue activating protein, connective tissue growth factor, fibroblast growth factor, transforming growth factor-alpha, and transforming growth factor-beta [17]. Neovascularization and neocollagenesis are triggered by the accumulation of intercellular matrix and the movement and rapid growth of fibroblasts. [17].

The platelet-rich plasma (PRP) contains approximately twenty growth factors, some of which are interleukin-8, matrix metalloprotein-2, matrix metalloprotein-9, and vascular endothelial growth factor. Others include fibroblast growth factor and endothelial growth factor. Cell division is stimulated in smooth muscle cells and fibroblasts by a number of different growth factors (GFs). In addition to this, they promote the development of new fibrous tissue, the expansion of blood vessels, and the multiplication of fibroblasts [18].

There have been several research studies that have investigated the use of micro needling as a treatment for atrophic acne scars. After receiving two sessions of micro needling, Fabbrocini et al.

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[17] found that the severity of rolling scars was significantly reduced following the treatment. Similarly the results of a study that was carried out by Dogra and colleagues [19] demonstrated that after attending five sessions, there was an average improvement of fifty to seventy-five percent in acne scars. The effectiveness of micro needling was evaluated by Majid [20] in 36 patients, and the results showed that eighty percent of the patients experienced an extraordinary response. There was a comparison made by Sharad between the effectiveness of micro needling on its own and the effectiveness of a combination of micro needling and 35% glycolic acid peels in the treatment of acne scars. The study was conducted on thirty participants. Following a total of five sessions, the results demonstrated that the group that received the combination therapy saw a sixty percent improvement, whereas the group that received micro needling alone achieved a thirty one percent improvement.

PRP has been tested to see whether or not it is effective in treating acne scars. After receiving fractional carbon dioxide laser treatment for acne scars, a study that was carried out on a split face basis discovered that there were no statistically significant differences between the intradermal and topical L-PRP treatments [22]. There is a limited amount of research that has directly compared the effectiveness of platelet-rich plasma (PRP) with micro-needling. In addition to this, the majority of these trials have made use of PRP injections that were administered intradermal.

The current study found that using only skin micro needling resulted in a 62% success rate in treating atrophic facial acne scars. However, when paired with platelet rich plasma (PRP), the success rate increased to 82%. Therefore, there is a statistically significant difference in efficacy between Groups A and B, with a p-value of 0.026. The results of our study align with the research conducted by Asif et al. [10], which examined the efficacy of micro-needling for treating acne scars and intra-lesional PRP. They observed a 62% improvement for micro-needling and a 45.8% improvement for intra-lesional PRP.

Higher response in patients receiving intradermal PRP and micro needling was shown by Ibrahim et al. [23].
After topical PRP administration, two sessions of skin needling were reported by Fabbrocini et al. [24] to ameliorate acne scarring. More effective microneedling with topical PRP was demonstrated by Chawla et al. than with vitamin C. Nevertheless, unlike the current trial, micro needling was carried out following topical PRP treatment, which could account for the higher effects.

After three sessions, Porwal et al. [25] reported 42.67% and 58.47% improvement in the Dermatology Life Quality Index of patients treated with micro needling alone and micro needling with PRP in acne scars, respectively.
In their study, Kang and Lu asserted that patients with acne scars benefit more from combined treatment with micro needling and PRP than from micro needling alone; our findings are consistent with theirs [26].

Similar findings were obtained by Fabbrocini et al. [27], who discovered that PRP with micro needling worked better for acne scars than micro needling alone. They demonstrated that after just four treatments spaced eight weeks apart, the severity of the acne scars in every patient was significantly decreased, with no adverse effects other than redness and swelling that subsided in two to three days. According to Fernandes et al. [28], PRP has benefits over skin needling. The most significant one is that the epidermis heals more quickly because it encourages the skin to make more collagen. By reducing most of the risks and adverse effects of skin needling, the new collagen helps to enhance skin texture and acne scars.
In the present study, women outnumbered men in both study groups. Majid (2009) found comparable findings in a research [29]. The identical results, that females predominated in their investigation, were also shown by Gupta et al. (2021) [30].

For men, 16 out of 21 (76.2%) individuals in Group-A reported efficacy, whereas 5 (23.8%) did not.
Of the 22 participants in Group-B, 13 (59.1%) indicated efficacy and 9 (40.9%) did not. In all, 29 (67.4%) of the 43 male participants reported efficacy, while 14 (32.6%) did not. The p-value, which is not statistically significant at the traditional level of 0.05, for the comparison of efficacy between Groups A and B for males is 0.232.

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Like with females, 25 out of 29 (86.2%) participants in Group-A reported efficacy, while 4 (13.8%) did not. Out of 28 participants in Group-B, 18 (64.3%) indicated efficacy and 10 (35.7%) did not. In Group-B, 10 (35.7%) participants did not declare efficacy, while 18 out of 28 (64.3%) did so. The p-value, which is marginally significant at the traditional level of 0.05, for the comparison of efficacy between Groups A and B for females is 0.055. Overall, the results imply that, for both sexes, efficacy is greater in Group-A than in Group-B, however for men this difference is not statistically significant. Females show a little larger difference, with Group-A reporting more efficacy. In the present study, the mean age of the patients was 29.4±5.2 years in the micro needling alone group and 28.0±6.2 years in the micro needling with PRP group. All things considered, the results point to a statistically significant difference in efficacy between Group-A and Group-B for participants between the ages of 18 and 30. There is no statistically significant difference in efficacy between Groups A and B for people between the ages of 31 and 45, however. Few research have compared PRP and micro-needling using the qualitative grading system developed by Goodman and Baron. Since PRP is a recent development in the arsenal of acne scar treatments.

CONCLUSION

In conclusion, combining skin micro needling with platelet rich plasma (PRP) is more effective than using needling alone for treating atrophic face acne scars. It is also shown that these techniques were more efficacious at high grades of Goodman and Baron's grade classification. Further research is required to investigate the additional or supplementary effect of combining PRP with micro-needling for treating atrophic acne scars on the face.

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