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RESEARCH ARTICLE
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# COMPARISON OF THE OUTCOME OF TREATMENT OF MICRONEEDLING WITH AUTOLOGOUS PLATELET-RICH PLASMA VERSUS MICRONEEDLING WITH TOPICAL INSULIN IN THE TREATMENT OF POSTACNE ATROPHIC SCARS AT TERTIARY CARE HOSPITAL, KARACHI

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**Abstract**

**Objective:** To compare the outcome of treatment of microneedling with autologous platelet-rich plasma versus microneedling with topical insulin in the treatment of postacne atrophic scars at Tertiary Care Hospital, Karachi.

**Study design:** Randomized controlled trial.

**Place and duration of study:** This study was conducted at Department of Dermatology, JPMC, Karachi from August 2022 to January 2023.

Material and methods: Total 50 patients were selected. After taking proper consent, post acne scars patient were included in this study, 25 patients in each group. Random allocation was determined through sealed opaque envelopes labeled as MP (Microneedling with autologous platelet-rich plasma group) and MI (Microneedling with topical insulin group). Data was analysed on SPSS (version 23.0).

**Results:** The study included participants aged 20 to 50 years, with a mean age of 34.51±10.78 years in Group MI and 35.36±9.78 years in Group MP. Predominantly, patients in both groups were within the 20-35 years age range, and the majority were male. Posttreatment, the SQGS grade distribution indicated that patients in Group MI achieved grades 0, 1, 2, 3, and 4 in 4%, 4%, 8%, 24%, and 60%, respectively, compared to Group MP which achieved 4%, 12%, 28%, 36%, and 20%, respectively.

Conclusion: It can be concluded from this study that microneedling with insulin can improve postacne atrophic scars treatment and is a superior option to microneedling with PRP.

**Keywords:** Acne vulgaris; Micro-needling; Platelet Rich Plasma; Insulin, Post-acne atrophic scar

## INTRODUCTION:

Acne vulgaris, a persistent inflammatory skin condition involving hair follicles and sebaceous glands, is highly prevalent, affecting up to 80% of adolescents.[1-2] One common consequence of acne is the formation of scars, seen in about half of individuals with acne, particularly in noticeable areas like the face and cheeks. Atrophic acne scars, the most widespread type, significantly impact patients' aesthetic appeal and, in some cases, their overall quality of life. [3-4] The intricate pathogenesis of atrophic acne scars encompasses the breakdown of inflammatory mediators, collagen fibers, and subcutaneous fat, ultimately resulting in changes to subcutaneous collagen deposition. [5-6] To address these concerns, multiple treatment strategies have been developed for the clinical management of acne scars. [7]

Microneedling serves as a straightforward and efficient method for stimulating the generation of the body's new collagen layers, providing a viable alternative to more invasive techniques like lasers and peels. [8] The skin reacts to precise punctures by releasing growth factors. This procedure is safe, can be conveniently conducted in an office setting without complications, and offers a favorable cost-benefit ratio, as it is economically viable and does not disrupt the patient's daily activities. [9] Moreover, platelet-rich plasma (PRP), enriched with diverse growth factors and bioactive cytokines, is utilized as an additional therapeutic approach for addressing acne scars. [10] Several limited-scale clinical investigations have explored the efficacy of a combined approach involving microneedling and PRP in individuals with atrophic acne scars. [11] Sharma et al evaluated outcome of treatment of microneedling with autologous platelet-rich plasma versus microneedling with topical insulin and found that patients in grade 0 (2.5% vs 7.5%), grade I (25% vs 35%), grade II (52.5% vs 45%), grade III (12.5% vs 7.5%) and grade IV (7.5% vs 5%) respectively. [12]

Though many treatment options like subcision, microneedling, peels, platelet rich plasma (PRP), tissue augmentation techniques, ablative and non ablative lasers are available for treating post acne scars but optimized treatment still does not exist. The varying morphologies of acne scars, especially when multiple types of scars are found in the same patient, suggest the need for combination therapy to provide better outcome. Thus the present study was conducted with an aim to evaluate the efficacy of microneedling in combination with PRP versus microneedling with insulin in the management of post acne scars. Data from this would help in establishing it as a treatment of choice thereby lead to reduction in cost and benefit the patient both financially and psychologically.

## MATERIAL AND METHODS:

There were 50 patients between 20 to 50 years of age, both genders, who had presented to the Department of Dermatology, JPMC, Karachi, were included in our randomized control trial. Patients who presented with postacne atrophic scars ≥ 2 on Goodman and Baron's acne scar-grading system were included in the study. Patients were assessed for outcome in either group using scar quartile grading scale (SQGS) - degree of improvement was evaluated by pre and post procedural digital photographs and was graded on the basis of the percentage improvement as follows: Grade 0- no improvement, Grade 1: Less than 25% improvement; Grade 2: 26-50% improvement; Grade 3: 51-75% improvement; Grade 4: More than 75% improvement.

Patients having a history of photosensitivity and diseases such as systemic lupus erythematosus and xeroderma pigmentosum, history or presence of post-inflammatory hyperpigmentation (HPI), drugs used that induce hyperpigmentation such as amiodarone, clofazimine, minocycline, chloroquine. Presence of ice-pick scarring, pregnancy or lactation, oral isotretinoin used in the past six months, history of laser facial treatment or surgical treatment past three months. Patients with a history of herpes infection, warts or any other active infection, presence of cutaneous cancer or actinic keratoses on the skin, coagulopathies or use of anticoagulant therapy, personal history or

hypertrophic scars or keloids, being treated with chemotherapy, radiotherapy or high-dose corticosteroids, diabetes mellitus were excluded from the study subjects were excluded.

Patients were assessed by a dermatologist with over 10 years of experience, in the presence of a researcher, who were assigned grades. Random allocation was determined through sealed opaque envelopes labeled as MP (Microneedling with autologous platelet-rich plasma group) and MI (Microneedling with topical insulin group). The microneedling with platelet-rich plasma (PRP) procedure was performed under topical anesthesia (a combination of prilocaine 2.5% and lignocaine 2.5%), applied under occlusion for about 45 minutes before the procedure.

Microneedling was executed using a dermaroller (1.5mm depth), arranged in 24 circular rows of 8 needles each, totaling 192 needles. The dermaroller was rolled over the scars in four different directions, each perpendicular to the other, until pinpoint bleeding is observed. PRP was prepared using the double spin method .Microneedling was done with 1-2 ml of platelet-rich plasma or insulin (Regular insulin was used) .Patients were advised on intermittent treatment, including topical sunscreen and strict photoprotection. A total of four treatment sessions were provided at 4-week intervals, with the final follow-up scheduled one month after the last session.

Statistical analysis was performed using SPSS (version 23.0). Relevant demographic information such as age, gender, and baseline characteristics of the participants were recorded. Descriptive statistics were employed to summarize the demographic characteristics of the participants. Continuous variables, such as age, were presented as mean ± standard deviation. Categorical variables, including gender and treatment outcomes, were expressed as frequencies and percentages. The primary outcome measure was the Scar Quality Grading System (SQGS) grade distribution post-treatment. The distribution of grades (0 to 4) was compared between the two treatment groups using chi-square test. Effect modifiers were controlled through stratification of age, gender and duration of acne vulgaris. Post stratification chi-square was applied and p-value of $\leq 0.05$ was considered significant.

## RESULTS

Age range in this study was from 20 to 50 years with mean age of 34.51± 10.78 years in Group MI while 35.36±9.78 years in Group MP. In both groups majority of patients belonged to 20-35 years age group. In both groups majority of patients belonged to male gender (Table 1).

**Table 1:** Demographic Characteristics of the Two Groups

| Variables | Group MI n = 25 | Group MP n= 25 |
|---|---|---|
| Age (years) | 34.51 ± 10.78 | 35.36 ± 9.78 |
| Age | | |
| 20-35 Years | 18 (72%) | 19 (76%) |
| 35-50 Years | 07 (28%) | 06 (24%) |
| Gender | | |
| Male | 14 (56%) | 13 (52%) |
| Female | 11 (44%) | 12 (48%) |

Table 2 presents the posttreatment Scar Quality Grading System (SQGS) grade distribution for the two study groups, Group MI (Microneedling with topical insulin) and Group MP (Microneedling with autologous platelet-rich plasma). In Group MI, out of the 25 participants, 4% achieved Grade 0, 4% Grade 1, 8% Grade 2, 24% Grade 3, and 60% Grade 4 posttreatment. Comparatively, in Group MP, also consisting of 25 participants, the posttreatment distribution was 4% for Grade 0, 12% for Grade 1, 28% for Grade 2, 36% for Grade 3, and 20% for Grade 4. These values illustrate the varying degrees of improvement in postacne atrophic scars in each group. Notably, Group MI had a higher proportion of participants achieving Grade 4, indicating a more substantial improvement in scar appearance compared to Group MP. The statistical analysis, including the chi-

square test with a p-value of 0.003, further supports the conclusion that microneedling with insulin yields superior outcomes in treating postacne atrophic scars when compared to microneedling with autologous platelet-rich plasma.

**Table 2 :** Posttreatment SQGS Grade

| Clinical Variables | Group MI n = 25 | Group MP n= 25 | $\chi^2$ | Df | P-value |
|---|---|---|---|---|---|
| Grade 0 | 01 (04%) | 01 (04%) | | | |
| Grade 1 | 01 (04%) | 03 (12%) | | | |
| Grade 2 | 02 (08%) | 07 (28%) | 15.84 | 4 | 0.003 |
| Grade 3 | 06 (24%) | 09 (36%) | | | |
| Grade 4 | 15 (60%) | 05 (20%) | | | |

## DISCUSSION

Acne vulgaris is a condition characterized by inflammation or obstruction of pilosebaceous units. Post-acne scars typically develop after severe and nodulocystic acne episodes.[12] The predominant form of acne scars is atrophic, further categorized based on the extent and size of tissue damage, with classifications including ice pick, boxcar, and rolling scars according to the depth and dimensions of the scars. Understanding the nature of post-acne scarring involves delving into the diverse types, with atrophic scars emerging as the most common and consequential. [13]

The formation of these atrophic scars represents a dynamic process involving the remodeling of collagen and the reorganization of skin tissue. In instances of severe and prolonged inflammation, the natural healing mechanisms of the skin may be compromised, leading to aberrant collagen production and distribution. This imbalance in collagen synthesis and degradation results in the altered texture and appearance characteristic of atrophic scars. The post-inflammatory changes in the dermal layer, coupled with the destruction of sebaceous follicles, contribute to the distinct nature of these scars. [14-15]

It is essential to recognize that post-acne scars extend beyond their physical manifestation, impacting the psychological well-being and quality of life of individuals. The visibility of these scars can lead to self-esteem issues, social anxiety, and a reluctance to engage in interpersonal relationships. The emotional toll of post-acne scarring underscores the importance of developing effective strategies for prevention and treatment. [16-17]

Preventing or mitigating post-acne scarring involves addressing the underlying causes of severe acne and implementing appropriate skincare practices. Early intervention with dermatological treatments, such as topical retinoids, antibiotics, or oral contraceptives, can help control acne inflammation and reduce the risk of scarring. Moreover, avoiding the temptation to manipulate or pick at acne lesions is crucial in preventing further tissue damage and scarring. [18]

Numerous studies in the literature substantiate the efficacy of microneedling in stimulating collagen production for the treatment of acne scars. Aust et al. demonstrated a substantial 40% augmentation in epidermal thickness along with significant collagen deposition one year after microneedling therapy.[19] Likewise, Fernandes and Signorini also endorsed the enhancement of thicker collagen deposition, particularly benefiting atrophic acne scars. [20]

Posttreatment, the SQGS grade distribution indicated that patients in Group MI achieved grades 0, 1, 2, 3, and 4 in 4%, 4%, 8%, 24%, and 60%, respectively, compared to Group MP, which achieved 4%, 12%, 28%, 36%, and 20%, respectively in our study. Another study compared micro-needling with a derma roller, topical applications of 2ml of human actrapid insulin was done in group-A and 2ml of PRP in group-B and that found In Group-A, consisting of 40 participants, 25% were males and 75% were females, with a mean age of 23.68±5.03 years. Group-B, comprising 40 individuals,

had 32.5% males and 67.5% females, with a slightly higher mean age of 24.48±4.75 years. The average duration of scars was 4.5±2.1 years in Group-A and 4.9±2.3 years in Group-B. The mean sunlight exposure was 4.9±2.3 hours in Group-A and 4.7±2.1 hours in Group-B. Notably, Group-A exhibited a significant mean percentage reduction of scar grades at 55.42±12.74%, while Group-B showed a lower reduction at 23.33±16.79%.[21]

Various therapeutic modalities are available for treating established post-acne scars, with the choice of intervention depending on the type and severity of the scars. Laser therapy, including fractional laser and ablative lasers, has shown promise in improving the appearance of atrophic scars by promoting collagen remodeling and resurfacing the skin. Chemical peels, microdermabrasion, and microneedling are additional procedures that aim to enhance skin texture and reduce the visibility of scars through controlled exfoliation and collagen stimulation. [22-23]
In the field of dermatology, micro-needling therapy is now widely utilized for treating various skin conditions, including post-acne scars, wrinkles, and dyschromia. This minimally invasive technique enables the targeted delivery of therapeutic substances to the skin. [24] Specifically addressing post-acne scars, where there is a predominance of type 1 collagen over type III collagen, micro-needling stimulates the production of type III collagen within the natural skin framework, effectively reducing scar severity. Notably, this procedure is considered safe for individuals with darker skin tones and is often complemented with platelet-rich plasma (PRP) for enhanced treatment. [25] In recent times, platelet-rich plasma (PRP) has become increasingly significant in the field of dermatology. PRP is rich in autologous growth factors, including platelet-derived growth factor (PDGF), transforming growth factor (TGF), and vascular endothelial growth factor (VEGF). These components work to enhance acne scars by boosting collagen synthesis and promoting tissue growth. [26]

The process of controlled epithelial injury during skin needling triggers the release of potassium ions and proteins from epithelial cells. This event subsequently modifies the electrical potential and conductivity of the interstitium, leading to the migration of fibroblasts and the generation of neocollagen at the site of the epithelial injury. [27]

Post-acne scars, particularly atrophic scars, represent a significant concern for individuals who have experienced severe and nodulocystic acne. Understanding the diverse types of atrophic scars and their underlying pathophysiology is crucial for developing effective prevention and treatment strategies. Beyond the physical impact, post-acne scarring carries psychological implications, emphasizing the importance of holistic approaches that address both the visible and emotional aspects of this dermatological condition. Advances in dermatological research and therapeutic modalities offer hope for individuals seeking to improve the appearance of post-acne scars and enhance their overall well-being.

## CONCLUSION:

The combination therapy of microneedling with insulin demonstrates higher efficacy compared to the use of microneedling with platelet-rich plasma in addressing acne scarring. This combined approach of microneedling with insulin is not only cost-effective but also well-suited for all skin types, minimizing the risk of post-inflammatory hyperpigmentation. Additionally, this novel combination procedure also offers convenience for both medical practitioners and patients, as it requires no advanced skills, eliminates the need for an intravenous line, and is easily administered.

## LIMITATION:

This was a single center study with a smaller sample size. More studies are needed in future.

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