

Original Research Article

Combination of platelet rich plasma and microneedling in the management of atrophic acne scars

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ABSTRACT

Background: Acne scars have a lot of psychosocial implications, they are difficult to treat and can cause depression in the affected patient. The objective of the study was to assess the efficacy of combination of platelet rich plasma (PRP) injections and microneedling in the management of acne scars.

Methods: Thirty-five patients with atrophic acne scars were enrolled and graded using Goodman and Baron qualitative grading. Platelet rich plasma injection and microneedling were done at 2-week interval alternatively for a total of 6 sessions of each. Acne scars were graded before and 6 months after starting the treatment. Patients own evaluation of improvement was also recorded.

Results: A total of 12 patients had grade 4 acne scars, 8 (66.6%) improved to grade 2 and 4 (33.3%) improved to grade 3 scars. Out of 15 grade 3 scars, 8(53.3%) improved to grade 1, 7 (46.6%) improved to grade 2. 8 (100%) grade 2 patients improved to grade 1. All patients were highly satisfied with the results.

Conclusions: This combination has shown good results in all grades of acne scars.

Keywords: Platelet rich plasma, Dermaroller, Atrophic acne scars

INTRODUCTION

Acne Vulgaris is an extremely common disorder. It is most common in adolescent age group with up to 95% adolescents being affected, persisting in up to 14% of adults where in it causes psychological and social implications.¹ Ninety-five percent of the patients having acne vulgaris report scarring after healing of their acne lesions. Acne scars are the end result of inflammatory process. The loss of tissue resulting in atrophic scars whereas increased tissue formation leads to hypertrophic scars and keloids.² Scars with loss or damage of tissue known as atrophic scars, can be classified as ice-pick,

rolling and boxcar scars.³ Treatment of acne scars is challenging for the physician, hence number of therapeutic approaches like topical retinoids, chemical peeling, subcision, dermabrasion, fillers, and lasers have been performed to improve acne scarring.⁴⁻⁸ Every treatment modality has its advantages and disadvantages. Lasers like carbon dioxide fractional laser and ER: YAG laser have been used with great success but are not affordable for all patients. Therefore, there is always a search for a treatment modality which is cheap and highly effective. Role of platelet rich plasma (PRP) came into vogue after the discovery of platelet-derived growth factor (PDGF) in promoting wound healing, angiogenesis

and tissue remodeling. The successful role of PRP in dentistry and surgery as shown by Marx and co-workers, have fuelled research on its role in other specialties like dermatology and aesthetics.^{9,10} Microneedling produces a controlled injury, thereby inducing platelet activation and collagen induction. The aim of our study was assessment of combination therapy using Platelet rich plasma injection and microneedling for the management of atrophic acne scars. Their additive action on acne scars is the basis of our study.

METHODS

Thirty-five patients with atrophic acne scars were enrolled in this study. Study was conducted for a period of 6 months from April 2016 till October 2017 which was considered as the end point of our study. Patients were followed for 6 months till April 2017 to observe the maintenance of the results.

Exclusion criteria

Exclusion criteria was active herpes labialis, active acne, patients on systemic retinoids, history of keloid scars, pregnancy or lactation, history of any facial surgery or procedure for scars, patients with unrealistic expectations.

Study was conducted in the outpatient department of Department of Dermatology Mubarak Hospital Srinagar. Proper informed consent was taken. Goodman and Baron Qualitative scar grading system was used to grade the scars by a physician who was not in the study (Table 1).¹¹

We started with injection of PRP on the first visit. PRP was prepared under aseptic precautions using double spin method in a simple lab centrifuge. Platelet count was done before and after preparing PRP and ensured that platelet count was above the baseline. Activation of PRP was done by adding calcium chloride to PRP. PRP was injected using insulin syringes into the scar area. Immediately after the procedure, cold compresses were done over the injected area to reduce the pain. Patient was asked to apply regular sunscreen from next day onwards. A total of six sessions of PRP were done. Two weeks later microneedling was done using dermaroller of 1.5mm needle size and having 192 needles. Treatment was performed by rolling the dermaroller in vertical, horizontal and diagonal directions in the affected area until appearance of uniform fine pinpoint bleeding points, followed again by PRP 2 weeks later. A total of six sessions of microneedling were done. This process was continued till 6 months. Eutectic mixture of lignocaine 2% and prilocaine 2% cream was applied under occlusion for 1 hour to the affected areas which was removed using gauze before all procedures. All patients were evaluated after 1, 2 and 6 months after beginning of treatment. Any adverse effects and interference in daily activities post-treatment were noted. Post-treatment scars were graded again by the same physician using Goodman and Baron Scale. Patient response was also graded as poor, good, very good or excellent with 0-24%, 25-49%, 50-74% and

75-100% improvement, respectively, in their acne scars. Digital color facial photographs were taken before treatment and during each visit of treatment.

Statistical analysis

Descriptive statistics such as mean and standard deviation are calculated. Data is presented in frequencies and their respective percentages. Data was entered and analysed using SPSS version.

RESULTS

All thirty-five patients completed the treatment. Out of 35 patients, there were 25 (71.4%) females and 10 (28.5%) males with age group between 18-39 years with mean age of 25.6 ± 5.2 yrs. 10 (28.5%) patients had Fitzpatrick Type II, 15 patients (42.8%) had Type III Fitzpatrick skin type and 10 (28.5%) patients had Fitzpatrick Type IV. Out of 35 patients who completed the treatment, 8 patients had Grade 4, 14 patients had Grade 3 and 5 patients had Grade 2 scars before treatment and 8 patients had Grade I scars. The physician's assessment of response to treatment based on Goodman and Baron Qualitative scar grading system is summarized in (Table 2). In patients with Grade 4 scars, 6 patients (75%) showed improvement by 2 grades i.e., their scars improved from Grade 4 to Grade 2 of Goodman Baron Scale. Two patients (25%) with Grade 4 scars showed improvement by 1 grade to grade 3. In 14 patients with Grade 3 scars, 9 patients (64.2%) (Figure 2 and 3) showed improvement by 2 grades to grade I (Figure 1a, 1b and Figure 2a, 2b). Five patients (35.7%) improved by 1 grade to grade 2. Five patients (100%) with Grade 2 scars before treatment showed improvement to grade 1 (Figure 1a and 1b). Eight (100%) patients with grade 1 scars were left with almost no scars at all (Table 3). Six months after starting the treatment almost all patients showed reduction in the grade with no failure rate. Patients own response to treatment was also documented. In patients with Grade 4 scars (Table 4), 7 patients (87.5%) graded their response to treatment as very good with 50-74% improvement in their acne scars after treatment and 1 patient (12.5%) had good improvement in their scars with 25-49% improvement. In patients with Grade 3 scars, 10 patients (71.4%) graded their response to treatment as excellent with 75-100% improvement in their scars and 4 patients (63.6%) reported the response as very good with improvement between 50 and 74%. All 5 patients (100%) with grade 2 scars graded their response after treatment as very good with improvement between 50 and 74%. Eight patients with grade 1 graded their response as excellent with an improvement of 75-100%. Poor response with 0-24% improvement in scars was reported by none of the patients. Follow up of all patients was done till 6 months after the last session. At the end of 1-year of follow-up, it was observed that all the 35 patients sustained the level of improvement in their grade of scars which was attained at the end of the last procedure. During this period, no shift in grade was noticed.



Figure 1: before and after pretreatment grade 2 to grade 1.

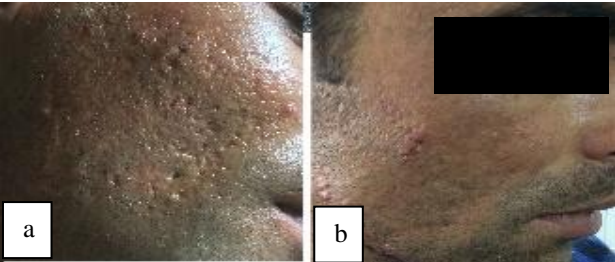


Figure 2: Before and after pretreatment grade 3 to grade 1.

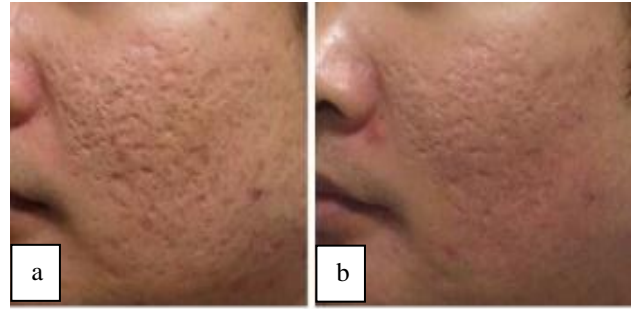


Figure 3: Before and after pretreatment grade 3 to grade 1.

Boxcar, rolling and linear tunnel type of scars showed excellent response to treatment with little improvement in ice pick scars. Side effects were mild and transient. After PRP session, mild erythema lasted for 2-3 days which subsided with no sequelae. Post-derma roller transient erythema and oedema lasted for 1-4 days and resolved completely with cold compresses. There was no interference in daily routine of our patients.

Table 1: Goodman and Baron qualitative grading of acne scars. Grades of post acne scarring level of disease clinical features.

Grade	Severity	Clinical features
1	Macular	These scars can be erythematous, hyper- or hypopigmented flat marks. They do not represent a problem of contour like other scar grades but of color.
2	Mild	Mild atrophy or hypertrophy scars that may not be obvious at social distances of 50 cm or greater and may be covered adequately by makeup or the normal shadow of shaved beard hair in men or normal body hair if extra facial.
3	Moderate	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50 cm or greater and is not covered easily by makeup or the normal shadow of shaved beard hair in men or body hair if extrafacial, but is still able to be flattened by manual stretching of the skin (if atrophic).
4	Severe	Severe atrophic or hypertrophic scarring that is evident at social distances greater than 50 cm and is not covered easily by makeup or the normal shadow of shaved beard hair in men or body hair if extrafacial and is not able to be flattened by manual stretching of the skin.

Table 2: Physician assessment of treatment results.

Result	Number of patients (%)
Very good	26 (74.2)
Good	6 (17.1)
Poor	3 (8.5)

Table 3: Results: Reduction by 2 grades and 1 grade is shown. 8 patients who had grade 1 scar before treatment were left with no scar at the end of the treatment.

Pre-treatment Grade	Number of patients	Post treatment improvement of 2 grades	Post Treatment improvement of 1 Grade	Post treatment no scarring
Grade 1	8			8 (100%)
Grade 2	5		5 (100%)	
Grade 3	14	9 (64.2%)	5 (35.7%)	
Grade 4	8	6 (75%)	2 (25%)	
Total	35			

Table 4: Patient's own grading of the result.

Pre-treatment Grade	Number of patients	Excellent result (75-100%) improvement	Very good result (50-74%) improvement	Good result (25-49%) improvement	Poor result (0-24%) improvement
Grade 4	8	-	7 (87.5%)	1 (12.5%)	-
Grade 3	14	10 (71.4%)	4 (63.6%)	-	-
Grade 2	5	-	5 (100%)	-	-
Grade 1	8	8 (100%)	-	-	-

DISCUSSION

Treatment of acne scars is most of the times a challenging task for the physician. There are various topical modalities like tretinoin 0.025% and 0.05% and silicone gels with limited efficacy and need to be applied for prolonged duration and is not effective in grade 3 and 4 acne scars. This study has shown good results in patients with severe grade 4 and 3 acne scars with 6 (75%) patients with grade 4 scars moving to grade 2 and 9 (64.2%) patients with grade 3 scars improving by 2 grades at the end of treatment. Five patients (35.7%) with grade 3 improved to grade 2 at the end of the treatment. In grade 2 scars all 5 patients (100%) showed improvement by 1 grade to grade 1. All 8 (100%) patients with grade 1 were left with no scars at the end of the treatment. Hence, all 35 (100%) patients showed improvement in their scars by some grade with no failure rate. The physician's analysis also correlated with the patient's assessment of improvement in scars with 7 (87.5%) patients with grade 4 scars reporting improvement as very good, 10 (71.4%) patients with grade 3 scars as excellent and 5 (100%) patients with grade 2 scars as very good, with poor response reported by none of the patients. The procedure was well tolerated by all the patients. Post-procedure there was no loss of work days and side effects were mild and transient. There was no PIH in any of our patients which is seen with many chemical peels. It has the advantage of being an office procedure and in being cost-effective. The improvement in the grade of scars was sustained in the follow-up period of 1 year. In a study conducted by Majid I et al, 36 out of 37 patients showed good response to microneedling treatment.¹² Fabbrocini et al conducted a study and found that PRP combined with microneedling was more effective in acne scars than microneedling alone.¹³

PRP (platelet rich plasma) is defined as a volume of the plasma fraction of autologous blood with an above baseline platelet concentration. It contains numerous growth factors like platelet-derived growth factor (PDGF), transforming growth factor (TGF), vascular endothelial growth factor (VEGF) and insulin-like growth factor (IGF) with their isoforms. Upon activation these growth factors lead to collagen induction and hence remodeling of acne scars. The mechanism hypothesized for action of percutaneous collagen induction using dermaroller is that it creates thousands of micro clefts through the epidermis into the papillary dermis. The

wounds thus produced activates the fibroblasts resulting in collagen deposition which continues for months together.¹⁴ In microneedling, there's localized damage and bleeding by rupturing fine blood vessels. The needles also break old collagen strands in the most superficial layer of the dermis that tether scars or wrinkles. This process promotes removal of damaged collagen and induces more collagen immediately under the epidermis.

The other skin needling mechanism has been postulated that needles have their own electrical potential which triggers the proliferation of fibroblasts. The body reacts to any epithelial injury with electrical signals that controls cascade of wound-healing mechanisms. Under normal conditions, the interior of skin cells has a resting electrical potential of -70 mV. The extra cellular space as well as the skin's surface is charged positively. If an epithelial injury occurs, the skin cells release potassium and proteins that in return change the conductivity of the interstitium. At the same time, the inner cellular potential increases dramatically to -120 and me the conductivity of the interstitium. At the same time, the inner cellular potential increases dramatically to -120 and more mV. This potential difference forces fibroblast to migrate to the point of injury and finally forces them to proliferate and transform into collagen fibrils. Revascularization and neocollagenesis fill up the atrophic scar tissue.¹⁵

Skin needling does not cause any damage to the stratum corneum, other layers of the epidermis or the basal membrane and there is no dermabrasive reduction of epidermal thickness evident 24 hours after the procedure. The number of melanocytes neither increased nor decreased in any of the groups. This explains why skin needling can be repeated safely in dark skin.¹⁶

The injury to the dermis by skin needling acts in synergy with activated platelets, which modify the natural healing response from the beginning of inflammation to the initiation of collagen induction by releasing cytokines and growth factors. All these factors induce remodeling of acne scars. Thus, the combination works well in treating the acne scars.

Although ablative laser resurfacing is generally considered to be the most effective option for scar resurfacing, it is associated with significant damage to the epidermis and basal membrane with associated inflammation which causes erythema, scarring and pigmentation problems. It also has a long downtime.^{17,18}

In comparison, percutaneous collagen induction does not induce post-operative dyspigmentation as the epidermis and basal membrane are left intact.¹⁹

CONCLUSION

As the demand for less invasive, highly effective cosmetic procedures is growing, this combination of treatment for acne scars has shown good results not only in Grade 2 but also in severe Grade 4 and 3 acne scars. The treatment is well tolerated in Fitzpatrick skin types III, IV and V with no failure rates or loss of days at work. There is a high level of patient satisfaction, minimal downtime and the treatment is cost-effective to the patient. To our knowledge, this is the first study using this combination of therapy in the management of atrophic acne scars.

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Ethical approval: The study was approved by the institutional ethics committee

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