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**Original Research Article** 

# TO EVALUATE THE EFFICACY AND SAFETY OF PLATELET RICH PLASMA (PRP) IN THE TREATMENT OF ACNE SCARRING IN DIFFERENT SKIN PHOTOTYPES

Manish Kumar Meena<sup>1</sup>, Deepika Meena<sup>2</sup>, Dilip Kachhawa<sup>3</sup>, R D Mehta<sup>4</sup>

- <sup>1,2</sup> Senior Resident, <sup>3,4</sup> Senior Professor
- <sup>1,4</sup> Department of Dermatology, Venereology and Leprosy, S.P. Medical College and A.G. of Hospitals Bikaner, Rajasthan
- <sup>2</sup> Department of Dental, S.P. Medical College and A.G. of Hospitals Bikaner, Rajasthan
- <sup>3</sup> Department of Dermatology, Venereology and Leprosy, Dr. S.N. Medical College and A.G. of Hospitals Jodhpur, Rajasthan

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Corresponding Author: Manish Kumar Meena, Senior Resident, Department of Dermatology, Venereology and

Leprosy, Dr. S.N. Medical College and A.G. of Hospitals Jodhpur, Rajasthan

Conflict of interest: No conflict of interest.

## Abstract:

Background: Post acne scarring is a consequence of abnormal resolution or wound healing following the damage that occurs in the sebaceous follicle during acne inflammation

Methods: Interventional split face comparative prospective study was conduct at Department of Dermatology, Venereology and Leprology, S N Medical College and Attached Hospitals, Jodhpur.

Results: After one month of  $3^{rd}$  treatment session, 84% patients stated that they were satisfied or very satisfied on the platelet-rich plasma side, while 7% patients stated this about the normal saline side (P = 0.18). The platelet-rich plasma side was found to have a better response than the control side and participants were more satisfied with the platelet-rich plasma side than the control side.

Conclusion: In conclusion, PRP alone provides better overall clinical improvement. We suggest that PRP should be considered as a monotherapy therapeutic option in the management of acne scars.

Keywords: PRP, Scar, Acne

#### Introduction

Post acne scarring is a consequence of abnormal resolution or wound healing following the damage that occurs in the sebaceous follicle during acne inflammation. Scarring usually follows deep-seated inflammatory lesions, but may also occur as a result of more superficial inflamed lesions in scar-prone patients. Close inspection under a bright light may reveal some scarring, albeit mild, in up to 90% of patients who attend a dermatologist.<sup>2</sup>

There has been a recent rise in application of plateletrich plasma (PRP) in dermatology and aesthetic medicine. PRP is defined simply as plasma containing an above baseline concentration of platelets.<sup>3</sup> It contains an effective concentration of multiple fundamental growth factors (GFs) by virtue of platelet alone and plasma proteins, namely fibrin, fibronectin and vitronectin. Degranulation of pre-packaged GFs in platelets upon "activation" i.e. on coming in contact with coagulation triggers. The secreted GFs in turn bind to their respective transmembrane receptors expressed over adult mesenchymal stem cells, osteoblasts, fibroblasts, endothelial cells, and epidermal cells inducing an internal signal-transduction pathway, unlocking the expression of a normal gene sequence of a cell like cellular proliferation, matrix formation, osteoid production, collagen synthesis, etc., thereby augmenting the natural wound-healing process. 4PRP can be prepared either manually or by use of automated devices, in a day care setting. The American Association of Blood Banks technical manual, states that "platelet rich plasma is separated from whole blood by 'light-spin' centrifugation and subsequently the 'heavy-spin' platelets are concentrated by centrifugation with removal of supernatant plasma". 5

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The platelet yield depends mainly on conditional parameters like size and shape of the container used, rate and time of spin and anticoagulant used. In our study we have adopted the centrifugation parameters used by Gonshor et al. to obtain a desired platelet concentration of 4-7 times that of whole blood. <sup>6</sup> Being an autologous preparation, PRP is devoid of any serious adverse effects.

It has also been used in the management of acne scars as an adjuvant to other therapies such as ablative carbon dioxide fractional resurfacing, erbium fractional laser therapy and microneedling. <sup>7</sup> PRP seems to be a promising therapeutic modality but the level of evidence as of now, from the available published data is low

## **MATERIAL AND METHODS**

- Study Type- Interventional split face comparative study
- Study Design- prospective
- Study Duration- 1 year
- Study Site- Department of Dermatology, Venereology and Leprology, S N Medical College and Attached Hospitals, Jodhpur.
- Sample Size- 100 patients
- Sampling Technique- All consecutive eligible patients fulfilling inclusion criteria were enrolled till desired sample size was reached.

## **Eligibility Criteria**

- A. Inclusion Criteria
- Age 18 52 years
- Both sexes
- Atrophic scars (grade 1 to 4)
- Patients willing to give written informed consent
- B. Exclusion Criteria
- Age < 18 years and >52 years
- Pregnant and lactating women
- ➤ Patients using any medication affecting coagulation system
- Patients use any product or treatment with antiaging property for last 6 weeks.
- Patients who have unrealistic expectations.
- Hemodynamic instability,

- Acute and chronic infections,
- > Skin disease (systemic lupus erythematosus, porphyria, and allergies),
- Heavy nicotine, drug, and alcohol consumption.
- HIV positive patients.
- Psychiatric illness
- Any immunosuppression condition

#### **Baseline Evaluation:**

- A written informed consent was taken.
- A detailed demographic data along with clinical history was recorded on a predesigned proforma.
- 100 patients fulfilling the inclusion and exclusion criteria were included and divided in two randomized study groups;

Group A: Platelet rich plasma (PRP).

Group B: Norma saline (control).

Treatment procedure

About 60 min before the starting the treatment, the targeted region was treated with topical anesthetic cream (mixture of lidocaine 2.5% and prilocaine 2.5%,]) and icepacks to alleviate the pain followed by gentle cleansing and application of 70% isopropyl alcohol as disinfectant.

Subsequently, the dermatologist treated both the cheeks of each participant. Each patient was administered intradermal autologous platelet-rich plasma on one half of the face (Rt side) and normal saline was administered on the other half (Lt side). Injection sites were located within 2 cm intervals to receive 0.2 ml platelet-rich plasma or normal saline. Afterwards, the participants were required to compress their faces with gauze for 15 min before leaving. Ice packs or analgesic medications were not used after treatment. All patients were asked to avoid direct sun exposure, heat and friction on the treated areas. They were instructed to apply a topical antibiotic (mupirocin) cream twice daily for 5 days after the treatment session and a broad spectrum sunscreen with a sun protection factor (SPF) of at least 30 every morning.

One month after the initial treatment session, all participants received the second and third treatment session with the same protocol.

Patient assessment-

# 1. Serial photography

Participants underwent serial photography of the lesions at baseline, 1 month after the first treatment session and 4 months after the second, using a digital camera (>12 megapixel).

Camera setting, lighting and positioning were kept identical for all serial photographs.

2. A quartile grading scale was used by two blinded dermatologists to evaluate the overall clinical improvement

**Table 1: Level of improvement** 

Level of improvement	% improvement
Poor	<25
Fair	25-50
Good	50-75
Excellent	>75

## 3. Level of satisfaction

Each participant was instructed to evaluate his/her overall satisfaction with the treatment 1 month after the first treatment session and 1 month after the last, using a quartile grading system which defines as (Table 7)

Table 2: Level of satisfaction

Level of satisfaction	Score of satisfaction
unsatisfied,	0
slightly satisfied	1
Satisfied	2
very satisfied	3

#### 4. DLQI Questionnaire

The aim of this questionnaire is to measure how much your skin problem has affected you over the last week.

## 5. Side effects

The possible side adverse events including erythema, edema, purpuric lesions, secondary infection, acneiform eruption, dyschromia and new scar formation was also assessed.

#### **FOLLOW UP:**

Patients were asked to follow up at the dermatology opd at day 8, week 4, 6, 10, 14 and 20 weeks after the procedure and scar improvement was assessed subjectively by digital photography

Statistical analysis-

SPSS version 20 for Microsoft Windows was used for statistical analysis (SPSS Inc., Chicago, IL, USA).

The Wilcoxon rank test was used to compare the results of the two methods for the degree of clinical improvement of acne scars and patient satisfaction.

The paired *t*-test was utilized for group comparison of numerical variables (erythema and edema scores).

P < 0.05 was considered statistically significant.

## **OBSERVATIONS**

In our study we included 100 cases of post acne atrophic scars during a period of 1 year. Patient's face was divided into 2 halves (split face), on one half of the face(right) intradermal platelet rich plasma (PRP) and on the other half of the face(left) intradermal normal saline(NS) was applied.

Table 3: Age & Sex Distribution of Subjects

AGE	MALE	FEMALE
<20	2	8
21-30	14	24
31-40	10	22
41-50	2	12
50-60	0	6

In our study overall 28% were male patients and 72% were female patients.

Table 4: Fitzpatrick skin phototype (%)

SKIN TYPE	PERCENTAGE OF CASES
III	20
IV	48
V	32

The most common type of skin was skin type IV followed by type V

**Table 5: Duration of Scars (in months)** 

Group	N	Mean	Std. Deviation	P Value
GroupA (PRP)	100	37.53	21.849	0.284
Group B (NS)	100	43.67	22.052	0.264

The mean duration of post acne scarring in group A was 37.53 months whereas in group B it was 43.67 months. No significant difference was observed according to mean duration of the scars (p value=0.284)

Table 6. Dermatologists-assessed percentage of clinical improvement 1month after the first treatment session.

GROUP	POOR	FAIR	GOOD	EXCELLENT
PRP	53	31	12	4
NS	88	12	0	0

A quartile grading scale was used by two blinded dermatologists to assess the three serial photographs. A fair or good improvement was noted in 43 patients on the platelet-rich plasma side and in 12 patients on the normal saline side after the first treatment session (P = 0.15).

Table 7: Percentage of patients satisfaction 1 month after first treatment session

Percentage	Unsatisfied	Slightly satisfied	Satisfied	Very satisfied
PRP	5	95	0	0
NS	68	32	0	0

None of the patients were satisfied or very satisfied on both side (PRP and NS)

Table 8: Percentage of patients satisfaction 1 month after third treatment session

Percentage	Unsatisfied	Slightly satisfied	Satisfied	Very satisfied
PRP	4	12	52	32
NS	56	37	7	0

After one month of  $3^{rd}$  treatment session, 84% patients stated that they were satisfied or very satisfied on the platelet-rich plasma side, while 7% patients stated this about the normal saline side (P = 0.18).

The platelet-rich plasma side was found to have a better response than the control side and participants were more satisfied with the platelet-rich plasma side than the control side.

## **CHANGE IN DLQI**

Comparing the mean change in DLQI from before to 20 weeks after procedure, we observed a highly significant (p = .000) decline in DLQI in both the groups, the mean reduction in DLQI being significantly greater in PRP group compared to NS group (p = .000).

In PRP Group, the DLQI reduced from a mean value of 15.39 before procedure, to .79 after procedure; while in NS Group, it reduced from a value of 16.19 before surgery to 3.85 after procedure.

Mean reduction in DLQI were 14.60 ± 3.622 in PRP Group and 12.34 ± 1.666 in NS Group

Mean SD Std. Error Mean Pair 1 POST DLQI -PRP .79 1.134 .214 PRE DLQI 15.39 4.756 .899 Pair 2 **POST DLQI-NS** 3.85 2.892 .557 PRE DLQI 16.19 4.558 .877

Table 9: DLQI score in both groups

According to paired t test statistics, DLQI pre and post in PRP and NS was significant. Post DLQI was significantly lower in both the groups

Grade	Baseline		After 1 <sup>st</sup> session		After 3 <sup>rd</sup> session		
	Group Group		Group			Group	
	PRP	NS	PRP	NS	PRP	NS	
4	13	10	6	10	4	9	
3	59	50	19	45	17	42	
2	21	27	56	19	57	29	
1	7	13	19	26	22	20	
P value					0.016	_	

**Table 10 Qualitative Grading at Different Sessions** 

In PRP side, at baseline there were 13,59 and 21 patients in grade 4,3 and 2 respectively. One month after first session, there were 6,19 and 56 patients in grade 4, 3 and 2 respectively. One month after the third session i.e. at final follow up at the fourth month, there were 4, 17 and 57 patients in grade 4, 3 and 2 respectively.

In NS side, at baseline there were 10,50 and 27 patients in grade 4,3 and 2 respectively. One month after first session, there were 10, 45 and 19 patients in grade 4, 3 and 2 respectively. One month after the third session i.e. at final follow up at the fourth month, there were 9, 42 and 29 patients in grade 4, 3 and 2 respectively In both the groups there was a decrease in number of patients of severe grade from baseline as the patients shifted towards the moderate and mild grades. The significant difference was observed in both the groups.

Table 11: Shifts in Qualitative Grading in PRP at Final Follow Up

Grade	No. of Patients	Shift by 1 Grade	Shift by 2 Grade	No Shift
4	13	7	2	4
3	59	30	21	8
2	21	12	7	2
1	7	5	2	0
Total (%)	100	54	32	14

At the end of 4 months in 13 patients with grade 4 scarring, a shift of two grades was seen in 2 patient a shift of one grade was seen in 7 patients and no shifting was seen in 4 patients. In 59 patients of grade 3 scarring shift of one grade was seen in 30 patients a shift of two grades was seen in 21 patients and 8 patients had no shift in the grade. These results represented shifting by one grade in 54% patients, shifting by two grades in 32% patients and no shifting in 14% patients

Grade	No. of Patients	Shift by 1 Grade	Shift By 2 Grade	No Shift
4	10	2	1	7
3	50	3	5	42
2	27	12	8	7
1	13	5	4	4
Total (%)	100	22 %	18 %	60%

Table 12: Shifts in Qualitative Grading in NS side at Final Follow Up

At the final follow up in NS side, which aconsisted of 10 patients with grade 4 scarring, a shift of two grades was seen in one patient, a shift of one grade was seen in 2 patients and no shiftingwas seen in 7 patients. In 50 patients of grade 3 scarring, shift of one grade was seen in 3 patients, shift of two grade was seen in 5 patients and 42 patients had no shift in the grade. This meant overall shifting by 1 grade in 22% patients, shifting by 2 grades in 18% patients and no shifting in 60% patients at the end of the study

## **DISCUSSION**

Acne is a common condition seen in up to 80 percent of young people and in five percent of older adults. In some patients, the severe inflammatory response results in a textural change in the superficial and deep dermis, leading to post-acne scars. Different terms and surgical techniques have been used to describe the types of acne and to improve the appearance of scarring <sup>8</sup>

Microneedling is a relatively new minimally invasive procedure involving superficial and controlled puncturing of the skin by rolling with miniature fine needles to induce a normal wound healing process with release of several growth factors, including platelet-derived growth factor, fibroblast growth factor, and transforming growth factors  $\alpha$  and  $\beta$ , which stimulate the migration and proliferation of fibroblasts 9 . Another hypothesis has been also proved by Jaffe, 2007 10 who mentioned that cell membranes react to the local change with an electrical potential that creates increased cell activity and the release of potassium ions, proteins and growth factors. Over a short period of time, it has gained mass popularity and acceptance as it is a simple, cheap, safe, and effective technique requiring minimal training. Traditionally used as a collagen induction therapy for facial scars and skin rejuvenation, it is also widely used now as a transdermal delivery system for therapeutic drugs and vaccines <sup>11</sup>.

PRP is an autologous preparation of platelets in concentrated plasma. PRP contains a mixture of bioactive agents derived from both platelets and plasma. Various growth factors, including platelet-derived growth factor (PDGF), transforming growth factor (TGF), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF), are secreted from the  $\alpha$ granules of concentrated platelets activated by aggregation inducer which are very important in tissue remodeling, promoting connective tissue healing by upregulating collagen and protein synthesis. <sup>12</sup>

In our study after one month of  $3^{rd}$  treatment session, 84% patients stated that they were satisfied or very satisfied on the platelet-rich plasma side, while 7% patients stated this about the normal saline side (P = 0.18). The platelet-rich plasma side was found to have a better response than the control side and participants were more satisfied with the platelet-rich plasma side than the control side.

Majid et al <sup>13</sup> studied the efficacy of PCI through the dermaroller in treatment of atrophic facial scars of varying etiology and reported excellent response in 72.2% of patients, good response in 16.7% of patients and failure of improvement in 11.1%.

In agreement with the study of Chawla <sup>14</sup> who showed that excellent response was seen in five (18.5%) patients with PRP as compared to two (7%) patients who received treatment with vitamin C according to physician's assessment. Patients

assessment was recorded; they were more satisfied with PRP as compared to vitamin c (P = 0.01).

Nofal and co-authors <sup>15</sup> conducted a study included forty-five patients with atrophic acne scars were randomly assigned to 3 equal groups; Group A received intradermal injection of PRP, Group B received chemical reconstruction of skin scars technique with TCA 100%, and Group C was treated by combined skin needling and PRP. The 3 groups showed statistically highly significant improvement in the degree of acne scars after treatment (p < .001).

#### **CONCLUSION**

In conclusion, PRP alone provides better overall clinical improvement. We suggest that PRP should be considered as a monotherapy therapeutic option in the management of acne scars.

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