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A Split Face Comparative Interventional Study to Compare the Effectiveness of Microneedling Radiofrequency Followed by Platelet Rich Plasma vs Microneedling Radiofrequency Followed by Injectable Platelet Rich Fibrin in Post Acne Scars

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Abstract:

Background: Acne scars result from changes in the skin's healing process triggered by inflammation. MNRF is highly effective in the treatment of acne scars. However, the use of PRP vs I PRF postmnrf requires detailed studies. **Aims**: To compare the effectiveness of MNRF with PRP versus I PRF in treating acne scars. **Materials and methods:** This was a split-face comparative study including 43 patients with moderate to severe acne scars. The patients underwent three sessions of MNRF with I-PRF on the right side and MNRF with PRP on the left side of the face at intervals of 4 weeks for 12 weeks. Goodman and Baron's qualitative and quantitative grades along with a visual analogue scale and physician assessment of scars were done to assess the outcomes. The side effects were also assessed and compared. **Results:** Based on the Goodman and Baron quantitative and qualitative grades, the scars on both sides of the face had significantly improved, although this difference did not reach statistical significance. VAS score showed a larger proportion showing improvements between 50-75% after the intervention (55.8% on the right side and 65.1% on the left side) and was statistically significant. **Conclusion**: Both PRP and I-PRF post-MNRF were effective in treating acne scars. In comparison, results between the two modalities did not yield statistically significant differences. I-PRF exhibited better visual differences and longer-lasting filling effects, even though the Goodman and Baron scoring system did not show statistically significant changes.

Keywords: Microneedling radio frequency (MNRF), Platelet rich plasma (PRP), Injectable platelet rich fibrin (I-PRF).Acne scars

Introduction: Acne vulgaris is a persistent inflammatory condition of the pilosebaceous unit, commonly impacting regions with a high concentration of hormonally-sensitive Sebaceous glands, including the face, neck, chest, upper back, and upper arms.1

In most cases, acne predominantly affects the face, and a considerable number of patients develop varying degrees of scarring, the extent of which often corresponds to the severity of the acne grade.

Acne scars arise due to a modified wound-healing process in response to skin inflammation, with inflammatory cell infiltration detected in around 77% of atrophic scars.2

Numerous modalities have been implicated in the treatment of atrophic acne scarring, ranging from invasive surgical techniques to less invasive approaches.

Newer technologies like micro-needling radiofrequency, and fractional carbon dioxide laser are superior to conventional modalities in providing better efficacy, quicker action, improved safety, and non-systemic administration.

MNRF stimulates neo-collagenesis through insulated micro-needles, triggering growth factor release and collagen remodeling without harming the epidermis. It's a common alternative to laser treatments in darker skin tones, as it avoids post-inflammatory hyperpigmentation.3

PRP holds autologous growth factors, potentially synergizing with those induced by skin needling to boost wound healing. PRP contains high concentrations of platelet growth factors, with an ideal platelet concentration exceeding 10 lakhs platelets/µl, resulting in 300–700% enrichment.

I PRF is a second-generation biomaterial derived from the patient's blood. It contains platelet growth factors, lymphocytic growth factors, and collagen type 1, forming a fibrin network resembling a PRF membrane. This structure enables a gradual release of growth factors over time, prolonging its effects.4

In this split-face study, we compared the effectiveness of MNRF in combination with PRP versus MNRF in combination with I PRF in treating acne scars. This study was done to determine which treatment approach yields optimal outcomes, offering valuable guidance for scar management strategy.

Materials and methods:

This prospective, comparative split-face study was conducted over 1 year in the Dermatology department of a tertiary care center. The study was initiated after obtaining institutional ethical committee clearance and the trial was registered under CTRI (CTRI/2023/02/049617).

Acne scars on the right side and left sides of the face were graded using the Goodman and Baron qualitative scale5 and quantitative scale6, and participants were briefed on intervention details, anticipated outcomes, duration, follow-up, side effects, and prognosis. Digital photographs were taken at the start of the study, after each treatment session, and at the end of 12 weeks under standardized conditions. Topical anesthetic cream was applied 45 minutes before the procedure. Microneedling radiofrequency DERMA INDIA MR 16-2SB: Using 49 gold-plated disposable insulated microneedles, three passes were done at depths of 2mm, 1.5mm, and 1 mm with a maximum energy output of 50W. The time of needles being. Out

Was set as 300ms and the time difference between radiofrequency and needles being out was set as 2ms for each session. PRP was processed by centrifuging the blood with a first spin at 1000 RPM for 10 minutes, followed by a second spin at 2000 RPM for 5 minutes. Citrate phosphate dextrose was used as the anticoagulant to prevent platelet aggregation. The resulting PRP was then injected on the left side of the face. For I-PRF, a sterile conicalbottom centrifuge tube was filled with 10 ml of blood, with no anticoagulant added. The tube was placed in the centrifuge with a bucket-handle or swing-out rotor (remir4c model) and spun at 800 RPM for 4 minutes. After centrifugation, the yellow-orange liquid at the top was collected as injectable PRF, drawn into insulin syringes, and injected on the right side of the face.

Side effects were monitored, and participants received post-procedure antibiotics, sun protection advice, and sunscreen recommendations. After 12 weeks, digital photographs were compared, and acne scars were re-graded using :

1. Goodman and Baron's qualitative5 and quantitative score6
2. Visual Analog Scale (VAS) for Patient's Self-assessment
3. Physician assessment.

The data was entered in Microsoft Excel and analysed in SPSS version 17.0. Comparison of Goodman and Baron's qualitative scores, VAS, physician assessment, and adverse effects between both sides and before and after was done with a chi-squared test. Goodman and Barron's quantitative scores were compared between both sides with an Independent t-test. A p-value of <0.05 was considered statistically significant.

Results:

Out of 45 participants initially enrolled, 43 successfully finished the study. The gender distribution was nearly equal, with 23 females and 20 males. The majority of participants fell between the ages of 26 to 30 years.

According to Goodman and Baron's qualitative score at the baseline, a considerable number of subjects had severe scarring on both sides, with a prevalence of 51.2%, and moderate scarring with a prevalence of 48.8 %. After the intervention, there was a noticeable shift towards milder scarring, with 27.9 % on the right side and 25.6 % on the left side, 60.5 % showed moderate scarring on the right side, and 58.1 % on the left side, 16.3 % showed severe scarring on the left side and 9.3 % on the right side. But statistical analysis showed these changes weren't significant.

The average Goodman and Baron's quantitative score was assessed at baseline and at the study's conclusion. While there was a statistically significant improvement in scars, the results remained consistent across both sides.

After analysing the VAS score for patient satisfaction, most patients reported being very satisfied with both sides. Although satisfaction was slightly higher on the right side of the face, the difference in values did not reach statistical significance. A larger proportion of subjects noted enhancements ranging between 50-75% (55.8% on the right side and 65.1% on the left) and exceeding 75% (41.9% on the right side and 30.2% on the left), whereas a smaller number reported a 25-50% improvement (2.3% on the right side and 4.7% on the Left).

Initially, a significant portion of participants were on the physician assessment scale Grade II (44.1%), Grade I (39.5%), and Grade III (16.3%). After the intervention, most Grade II participants progressed to Grade III (88.2%), with some advancing to Grade IV (42.1%) on the physician assessment scale. The change in physician assessment grades on the right side was significant. Erythema was uniformly reported in all participants. Edema, or swelling, was noted in a substantial proportion notably higher on the left, though statistically nonsignificant.

Pigmentation rates were comparable on both sides lasting for 3-5 days.

Discussion:

Treating acne scars has consistently posed a dilemma for dermatologists, demanding a comprehensive approach this study assessed and compared the effectiveness of MNRF in combination with PRP (Platelet-Rich Plasma) versus MNRF in combination with injectable PRF (Platelet-Rich Fibrin).

In our study, there were 43 subjects between the age of 21-37 years with the mean age group of the participants being 27.7 years. Whereas in a study by Reddy K Y et al, the mean age group of the participants was 25.86 years.7 In research by Pall, Anuj et al, participants' ages spanned from 19 years minimum to 49 years maximum with the average age of each subject

Being 30.3 years.8

In our study, women constituted the majority at 23 (53.5%), while men represented 20 (46.5%) of the total sample of our study. This was comparable with a study by Pall, Anuj et

Al., where of the 32 participants, 62.5% were women and 37.5% were men.8

Our study contradicts the finding in the study by R.G. Sharada et al, where Males (72.5%) were more commonly affected than females.3 Among the total sample of 43 individuals, the majority, 26 (60.5%), displayed scars with a duration spanning between 6 to 10 years, and 15 (34.9%) participants, exhibited scars that were up to 5 years old which was in concurrence with a study by Reddy K Y et al where the majority of the participants (46.66%)exhibited duration of scars between 5-10 years.7

Rolling scars exhibited the highest prevalence, followed by 51.2 % of patients who had combination scars. Based on subjective assessment, the rolling type of scars exhibited superior improvement. In our study, rolling scars and box scars exhibited superior results than ice-pick scars which was consistent with research performed by Chandrashekar BS et al.9

According to Goodman and Baron's qualitative Assessment scale 5 initially, in our study, 51 % of the participants exhibited severe scarring on both sides and 49 % moderate scarring on both sides. After 3 sessions, on the right side, 37 % (16) had a reduction by 1 grade, 48 %

(21) participants had a reduction by 2 grades, and 13 % (6) had a reduction by 3 grades.

On the left side, 30 % (13) showed a reduction by 1 grade, 62% (27) had a reduction by 2 grades and 6 % (3) had a reduction by 3 grades.

Likewise in research by Chandrashekar BS et al, 14 participants with Grade IV scars, 85.71% experienced a two-grade improvement, while 14.28% saw a one-grade improvement. Among 17 participants with Grade III scars, 76.47% experienced a two-grade improvement, with

23.52% seeing a one-grade improvement. For the 31 participants with Grade III and Grade IV acne scars, 80.64% experienced a two-grade improvement, while 19.35% saw a one-grade Improvement.9

In a study by Reddy et al, 66 % had a reduction by 2 grades, 13 % had a reduction by 1 grade And 20 % had a reduction by 3 grades which is almost similar to our study.7

In our study according to Goodman and Baron's quantitative analysis6 at the end of one last session revealed that a very good reduction was seen in 20 %(9) participants, a good reduction in 25 % (11) participants, Moderate reduction in 39% (17) participants, Minimal reduction was seen in 13% (6) participants.

According to Reddy K Y et al 20% (3), participants showed a very good reduction, 26.7% (4) participants showed good reduction, 40% (6) participants showed a moderate reduction, and 13.3% (2) participants had minimal reduction which was in concordance with our study.7

In a research conducted by Chandrashekar BS et al, where 3% exhibited very good improvement, 9% demonstrated good improvement, 58% experienced moderate improvement, and 29% showed minimal improvement, these results paralleled those of our Study. 9

In our study, based on the visual analogue scale, on the right side, 41 % had very good improvement, 55 % had good improvement, and 2 % had moderate improvement. Whereas on the left side, 30 % had very.good improvement, 65% had good improvement, and 4 % had moderate improvement. Whereas in a study by Reddy K Y et al, at the conclusion of the study, out of the 15 participants, 33.33% (5) participants were very satisfied with the treatment, 46.44% (7) participants were satisfied, and 20% (3) participants were slightly Satisfied with the treatment.7

In our study patient's experience according to the visual analogue scale and physician assessment grade showed slightly better improvement and longer-lasting filling effect on the right side which was treated with MNRF followed by I PRF, though not statistically significant that stayed true with a study by Diab NAF et al10, where after the Global scarring grading system (GSGS) and patient satisfaction, the enhancement observed in the I-PRF group, whether administered alone or combined with needling, was notably superior to that of the PRP group. The severity of scarring, evaluated by GSGS, exhibited greater improvement in the I-PRF group compared to PRP. However, the contrast between the side treated solely with I-PRF and the side treated solely with PRP did not demonstrate statistical significance.

In our study though the patient reported improvement on the left side which was treated with MNRF followed by PRP it was slightly lower when compared to that of the right side which was treated with MNRF followed by I PRF is comparable with a study by Nandini AS et al, micro-needling was shown to enhance all types of scars, regardless of the use of PRP.

However, when microneedling was combined with PRP, there was a notably higher occurrence of excellent improvement, defined as a two-grade improvement.11

Erythema was consistently observed in all participants, with a prevalence of 100% on the right cheek and 97.7% on the left cheek. Edema was noted in a significant proportion of cases, with rates of 44.2% on the right side and notably higher at 67.4% on the left side.

However, in all cases, both redness and edema disappeared within 2–3 days after the sessions.

This agreed with the study by Diab NAF et al.10
Given the distinctiveness of our study, there was limited availability of comparable research to corroborate our findings. This scarcity underscores the novelty and importance of our study in contributing to the existing body of knowledge in this area. Despite the lack of extensive similar studies, our findings provide valuable insights into the subject matter and highlight the need for further research to validate and build upon our results.

Strengths:
I-PRF, a novel treatment modality, was incorporated into our study as an an emerging option for addressing acne scars. No prior studies have compared the efficacy of PRP and I-PRF in treating acne scars, making our study the first of its kind in this regard.
Injectable platelet rich fibrin had better visual differences and longer filling effects.

Limitations:
Firstly, the sample size employed in our research is relatively small. This raises concerns regarding the representativeness of our findings to the broader population. Increasing the sample size could enhance the robustness and generalizability of our results.
Secondly, the follow-up period in our study is limited. This restricts our ability to observe any potential long-term effects or changes. Extending the follow-up period would allow for a more comprehensive understanding of the dynamics at play.

Conclusion:
This study presented encouraging results regarding the efficacy and safety of I PRF, particularly in addressing atrophic acne scars. While both PRP and PRF have demonstrated efficacy in treating atrophic acne scars, PRF presents certain advantages in terms of simplicity, speed, and cost-effectiveness. However, further research and direct comparative studies are needed to fully elucidate the relative benefits and optimal use of each treatment modality in clinical practice.

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Tables

Table 1: Distribution of study participants with type of scar

Type of scars	Number	Percentage
Rolling	40	93.0
Box scar	29	67.4
Ice pick	36	83.7
Box and Ice pick	22	51.2
Box and Rolling	27	62.8
Rolling and Ice pick	35	81.4
Box, rolling, and Ice pick	22	51.2

Table 2 : Comparison of Goodman and Baron qualitative scores between both the sides of the face at baseline and at the end of the study

Time point	**Goodman and Baron's qualitative scoring**	**Right side**		**Left side**		**P value**
	Grades	**n**	**%**	**n**	**%**	
Before	Moderate	21	48.8	21	48.8	0.44
	Severe	22	51.2	22	51.2	
After	Mild	12	27.9	11	25.6	0.41
	Moderate	26	60.5	25	58.1	
	Severe	4	9.3	7	16.3	
	Hyperplastic	1	2.3	0	-	
P value		0.01		0.05		

Table 3: Comparison of Goodman and Baron quantitative scores between both the sides of the face at baseline and at the end of the study

	Goodman and Baron's quantitative scoring				
Time point	**Right side**		**Left side**		**P value**
	Mean	**SD**	**Mean**	**SD**	
Before	10.7	1.9	10.5	2.0	0.40
After	6.6	1.5	6.6	1.6	0.91
P value	<0.001		<0.001		
Change in score between before and after	4.1±1.5		3.9±1.5		0.32

Table 4 : Comparison of VAS scores between both the sides of the face at baseline and at the end of the study

Time point	VAS score	Right side		Left side		P value
	Grades	n	%	n	%	
Before	10-25% improvement	20	46.5	18	41.9	0.70
	25-50%	23	53.5	25	58.1	
After	25-50%	1	2.3	2	4.7	0.59
	50-75%	24	55.8	28	65.1	
	>75%	18	41.9	13	30.2	
P value		<0.001		0.03		

Figure legends:

Figure 1: Distribution of study participants with type of scar

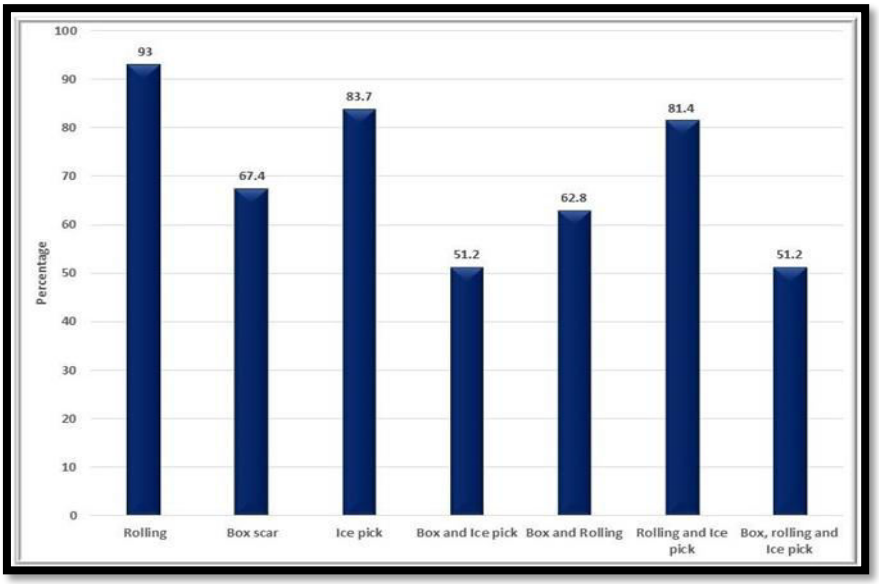

Figure 2: Comparison of Goodman and Baron qualitative scores between both the sides of the face at baseline and at the end of the study

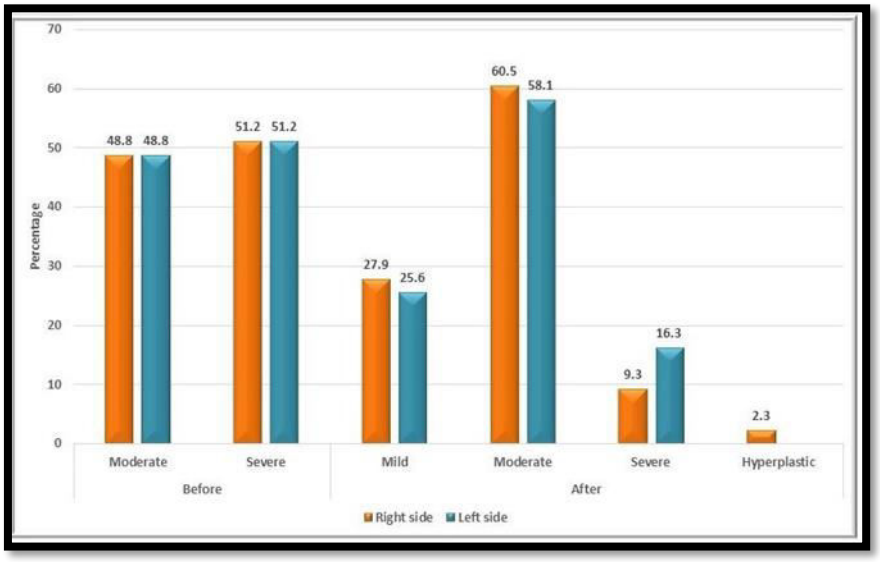

Figure 3 : Comparison of Goodman and Baron quantitative scores between both the sides of the face at baseline and at the end of the study

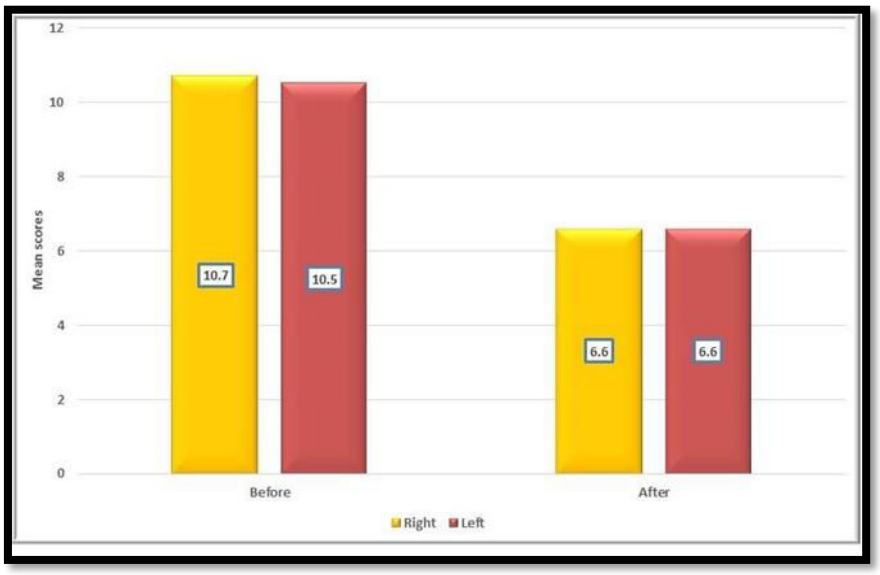

Figure 4 : Comparison of VAS scores between both the sides of the face at baseline and at the end of the study

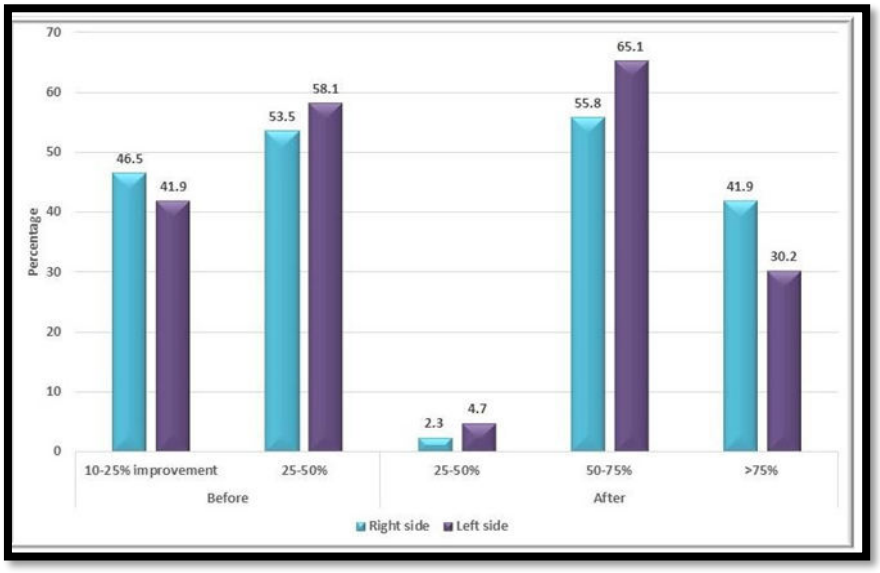

Figure 5 (a) : Baseline Right side (I PRF)-Patient 1 Goodman and Baron grade IV

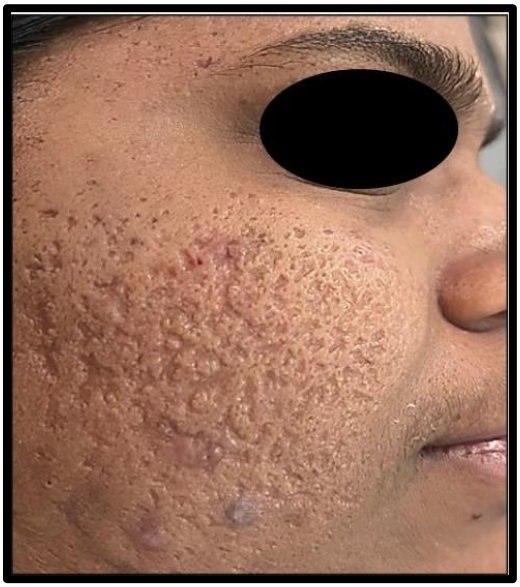

Figure 5 (b) : After 12 weeks Right Side (I PRF)-Patient 1 Goodman and Baron grade II

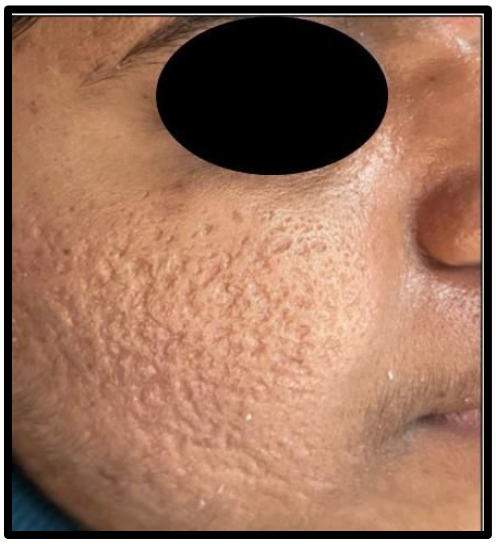

Figure 5 (c) : Baseline Left side (PRP)-Patient 1 Goodman and Baron grade III

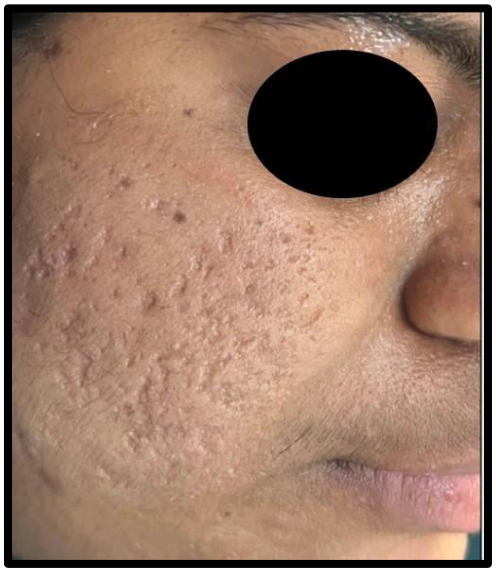

Figure 5 (d): After 12 weeks Left side (PRP)-Patient 1Goodman and Baron grade II

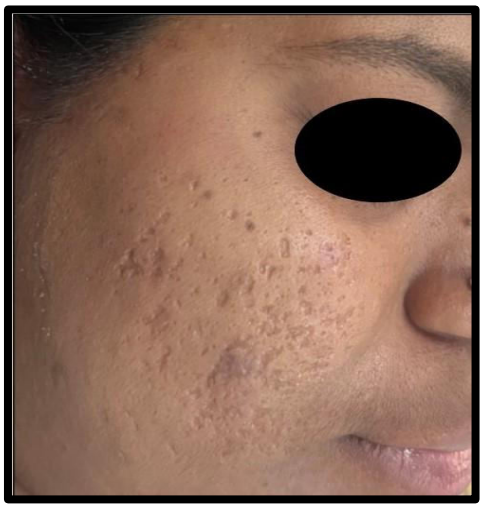

Figure 6 (a) : Baseline Right side (I PRF)-Patient 2 Goodman and Baron grade III

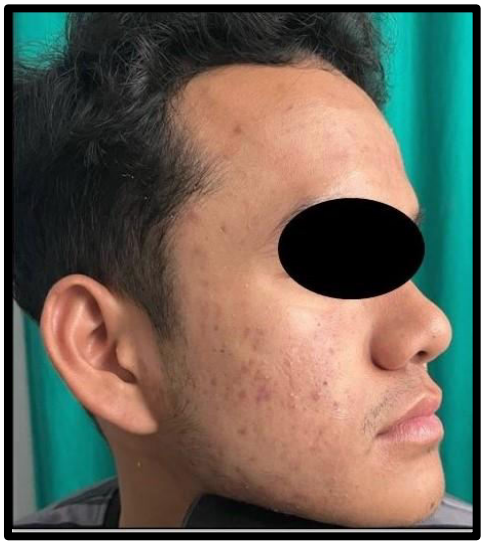

Figure 6 (b): After 12 weeks Right Side (I PRF)-Patient 2 Goodman and Baron grade I

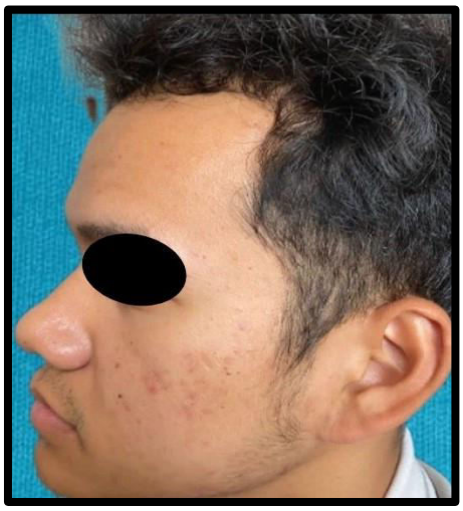

Figure 6 (c) : Baseline Left side (PRP)-Patient 2 Goodman and Baron grade III

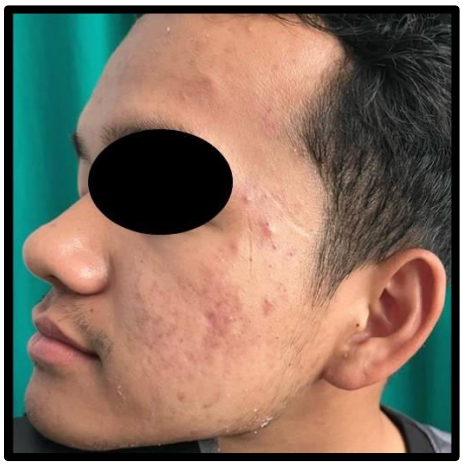

Figure 6 (d) : After 12 weeks Left side (PRP)-Patient 2 Goodman and Baron grade I