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Microneedling Radiofrequency in Comparison with Injection PRP in Facial Rejuvenation Efficacy Among Individuals Seeking Facial Rejuvenation: A Randomized Controlled Trial

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Abstract

Facial rejuvenation treatments have become increasingly popular, with microneedling radiofrequency (MNRF) and platelet rich plasma (PRP) injections emerging as prominent options. This study aimed to compare the efficacy of MNRF and PRP injections in facial rejuvenation. A total of 40 participants, aged >18 years, seeking treatment for open pores and facial rejuvenation, were enrolled and randomly assigned to two groups: the MNRF group (n=20) and the PRP injection group (n=20). The MNRF group received five sessions of microneedling radiofrequency at third weekly intervals, while the PRP group underwent five sessions of autologous PRP injections over the same period. Efficacy was assessed using the VAS score at baseline, third, sixth, ninth and twelfth weeks by the patient and investigator. Participants in the MNRF group demonstrated a statistically significant improvement compared with the PRP group (P < 0.05%). Patient satisfaction was higher in the MNRF group, with fewer reports of side effects, which were mostly mild and transient in both groups. Microneedling radiofrequency shows superior efficacy in reducing open pores and improving skin texture and firmness compared with PRP injections. The higher patient satisfaction and more significant clinical improvements suggest that MNRF is a preferable option for individuals seeking facial rejuvenation.

Keywords: *Facial Rejuvenation, Microneedling Radiofrequency, Open Pores, Platelet Rich Plasma, Randomized Controlled Trial.*

Introduction

The increased emphasis on face rejuvenation in the field of aesthetic medicine has been driven by a desire to reduce aging signs and improve skin appearance [1]. The presence of open pores is a common cosmetic problem that is usually worsened through factors like age, excessive production of sebum and environmental stressors. These can degrade one's self confidence and are difficult to treat adequately [2]. Microneedling radiofrequency (MNRF) and platelet rich plasma (PRP) injections are some of the methods that have attracted significant attention among them all [3-5]. However, the comparative efficacy of these two treatments in achieving optimal facial rejuvenation remains a subject of ongoing investigation.

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On one hand, MNRF is a cutting edge procedure that combines traditional microneedling with the delivery of radiofrequency energy into the dermis. The microneedles create controlled micro injuries, stimulating the skin's natural wound healing process, while radiofrequency energy induces collagen remodelling and skin tightening. This dual action mechanism improves a variety of skin conditions, offering both immediate and long term benefits [6, 7].

On the other hand, PRP employs patient's platelets, which are rich in growth factors, to induce healing or regeneration [8, 9]. PRP contains a high concentration of platelets, cytokines and growth factors that promote tissue regeneration and skin repair when injected into the dermis or subdermal layers [10]. Known for its biostimulatory properties, PRP enhances collagen synthesis, accelerates healing and improves the overall skin quality. It has gained popularity due to its natural approach and minimal risk of adverse reactions. [11, 12].

This study aimed to directly compare the efficacy of MNRF and PRP injections in individuals seeking facial rejuvenation, assessing their impact on skin texture through a randomised controlled trial.

Materials and Methods

Study Design

This study was conducted as a randomized controlled trial at a tertiary healthcare centre. Approval for the study was granted by the institutional review board and all participants gave their written informed consent.

Participants

A total of 40 individuals seeking facial rejuvenation were enrolled. Inclusion criteria included: Adults (> 18 years), patients with visible open pores on the facial skin, no facial rejuvenation treatments in the previous six months and no contraindications to MNRF or PRP.

The Subjects were randomly divided into 2 groups, A and B. Those with odd number serial entries are grouped as A (MNRF group) and those with even number entries are grouped as B (PRP group):

MNRF Group (n=20): Received five sessions of MNRF, spaced three weeks apart.

PRP Group (n=20**):** Received five sessions of PRP injections, spaced three weeks apart.

Patients were further classified based on severity using VAS scoring.

VAS Score	**Visibility of pores**
Mild	Pores apparent from <20cm
Moderate	Pores are apparent from 20-40cm.
Severe	Pores apparent from >40cm

Interventions

Microneedling Radiofrequency (MNRF)

MNRF was performed using a device equipped with insulated microneedles that deliver radiofrequency energy into the dermis. Before the procedure, topical anesthesia was applied 30 min before to reduce pain and several passes were performed on the whole face for 30 min per session while targeting areas of concern. The MNRF group had five sessions of Microneedling radiofrequency spaced apart by three weeks.

Platelet Rich Plasma (PRP) Injections

15 mL of blood was drawn from a patient and centrifuged to extract plasma that is rich in platelets (PRP), which was then injected into

the facial skin using an insulin syringe, focusing more on open pores as well as poor texture of skin. The entire process took approximately 30 minutes. The PRP group received five sessions of PRP injections, spaced three weeks apart.

Outcome Measures

The visual analogue scale for the severity of pores into mild, moderate and severe was measured at baseline and three, six, nine and 12 weeks after the treatment period. Adverse effects were also recorded.

Statistical Analysis

SPSS software was used to analyze the data. Continuous variables were compared by t-test and chi-square tests were done for categorical variables. Statistically significant level was considered at $p < 0.05$.

Results

Participant Characteristics

Table 1. Comparison of demographic status and duration of illness between the treatment groups of facial Rejuvenation seeking individuals by Mann –Whitney U test

Demographic status and duration of illness	PRP Injection (N=20)		Micro Needling Radio Frequency (N=20)		p-value
	Median (IQR)	Mean rank	Median (IQR)	Mean rank	
Age	27 (4.50)	23.08	25.00 (4.50)	17.92	0.160 (ns)
Duration of Illness (months)	02 (01)	19.05	02 (02)	21.95	0.404 (ns)

Table 1 presents the demographic data and the duration of illness for participants in the two treatment groups: PRP injection (n=20) and microneedling radiofrequency (MNRF) (n=20).

Age: The median age for the PRP group was 27 years (IQR: 4.5), with a mean rank of 23.08, while the MNRF group had a slightly younger median age of 25 years (IQR: 4.5) and a mean rank of 17.92. The difference in age between the two groups was not statistically significant (p=0.160).

Duration of Illness: The median duration of illness for the PRP group was 2 months (IQR: 1 month), with a mean rank of 19.05, compared to a median of 2 months (IQR: 2 months) and a mean rank of 21.95 in the MNRF group. This difference was also not statistically significant (p=0.404).

There were no statistically significant differences between the PRP injection and MNRF groups in terms of age or duration of illness, indicating that the two groups were comparable in these baseline characteristics.

Table 2. Comparison of demographic status and duration of illness between the treatment groups of facial rejuvenation seeking individuals by the chi-squared test

Demographic status and duration of illness	PRP Injection (N=20) N (%)	Micro Needling Radio Frequency (N=20) N (%)	Total N =40 N (%)	p-value
Age distribution				
20 -25	08 (40.0)	11 (55.0)	19 (47.5)	0.527 (ns)
26 - 30	12 (60.0)	09 (45.0)	21 (52.5)	

Gender				
Male	07 (35.0)	08 (40.0)	15 (37.5)	0.744 (ns)
Female	13 (65.0)	12 (60.0)	25 (62.5)	
Duration of Illness				
< 2 year	16 (80.0)	14 (70.0)	30 (75.0)	0.465 (ns)
>2 years	04 (20.0)	06 (30.0)	10 (25.0)	

Table 2 summarizes the demographic characteristics and duration of illness for the participants in the PRP injection and microneedling radiofrequency (MNRF) groups.

Age Distribution: Among participants aged 20–25 years, 40% (8/20) belonged to the PRP group and 55% (11/20) to the MNRF group, totalling 47.5% (19/40) across both groups. For the 26–30 age range, 60% (12/20) were in the PRP group and 45% (9/20) in the MNRF group, comprising 52.5% (21/40) overall. The difference in age distribution between the groups was not statistically significant (p=0.527).

Gender: The PRP group included 35% males (7/20) and 65% females (13/20), while the MNRF group comprised 40% males (8/20) and 60% females (12/20). Overall, 37.5% of the participants were male (15/40) and 62.5% were female (25/40). Gender differences between the groups were not statistically significant (p=0.744).

Duration of Illness: In the PRP group, 80% (16/20) had a duration of illness less than 2 years, compared to 70% (14/20) in the MNRF group, with an overall prevalence of 75% (30/40). Those with illness duration greater than 2 years constituted 20% (4/20) of the PRP group and 30% (6/20) of the MNRF group, for a total of 25% (10/40). This difference was not statistically significant (p=0.465).

There were no statistically significant differences between the PRP injection and MNRF groups in terms of age distribution, gender, or duration of illness. This indicates that the two groups were comparable in these baseline characteristics, supporting the validity of the comparisons in subsequent analyses.

Effectiveness

Table 3. Comparison of VAS score between the treatment groups by Fisher's exact test

VAS Score	PRP Injection (N=20) N (%)	Micro Needling Radio Frequency (N=20) N (%)	Total N =40 N (%)	p-value
Mild	08 (40.0)	06 (30.0)	14 (35.0)	0.583 (ns)
Moderate	10 (50.0)	09 (45.0)	19 (47.5)	
Severe	02 (10.0)	05 (71.5)	07 (17.5)	

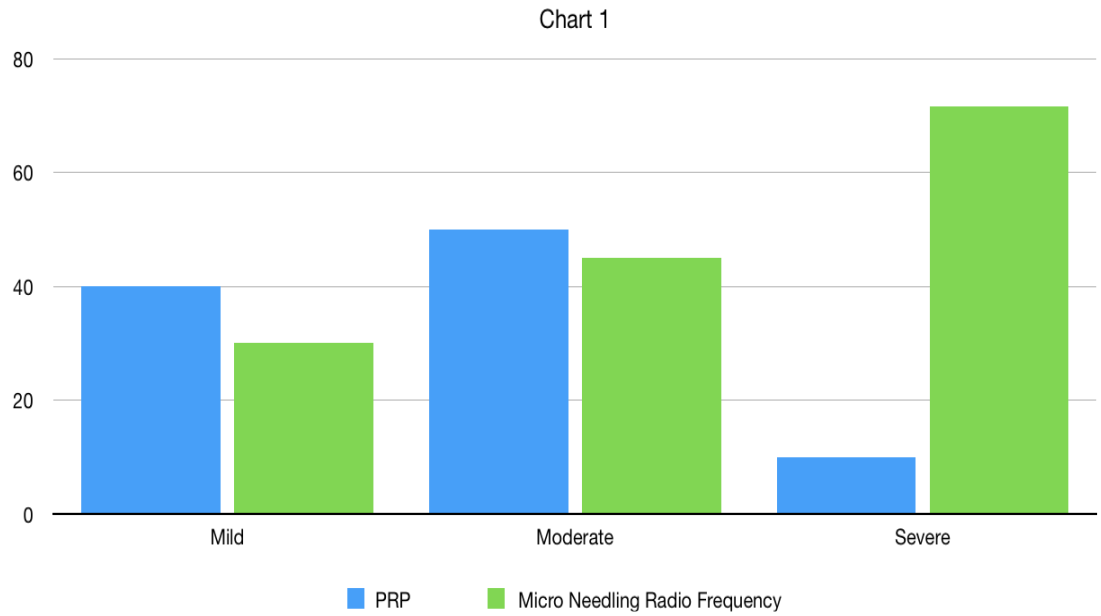

Figure 1. Comparison of VAS score between the treatment groups

Table 3 and Figure 1 present the grading of open pores using the Visual Analog Scale (VAS) in participants treated with PRP injection and microneedling radiofrequency (MNRF).

Mild Grading: Mild open pores were observed in 40% (8/20) of the PRP group and 30% (6/20) of the MNRF group, accounting for 35% (14/40) of the total participants.

Moderate Grading: Moderate open pores were reported in 50% (10/20) of the PRP group and 45% (9/20) of the MNRF group, comprising 47.5% (19/40) overall.

Severe Grading: Severe open pores were noted in 10% (2/20) of the PRP group and 25% (5/20) of the MNRF group, making up 17.5% (7/40) of the total participants.

The difference in the VAS score distribution for grading open pores between the PRP and MNRF groups was not statistically significant (p=0.583).

There was no statistically significant difference in the grading of open pores between the PRP injection and MNRF groups. Both treatments demonstrated a similar distribution of open pore severity among the participants.

Table 4. Comparison of patients' assessment and investigator assessment between the treatment groups of facial Rejuvenation seeking individuals by Fisher's exact test

Assessment	**PRP Injection (N=20) N (%)**	**Micro Needling Radio Frequency (N=20) N (%)**	**Total N =40 N (%)**	**p-value**
Patients				
Mild Improvement	06 (30.0)	02 (10.0)	08 (20.0)	0.046***
Moderate Improvement	09 (45.0)	05 (25.0)	14 (35.0)	
Significant Improvement	05 (25.0)	13 (65.0)	18 (45.0)	
Investigator				

Mild Improvement	09 (45.0)	02 (10.0)	11 (27.5)	0.011***
Moderate Improvement	08 (40.0)	07 (35.0)	15 (37.5)	
Significant Improvement	03 (15.0)	11 (55.0)	14 (35.0)	
Complication				
Erythema	08 (40.0)	10 (50.0)	18 (45.0)	0.538 (ns)
Irritation	02 (10.0)	0	02 (05.0)	
Nil	10 (50.0)	10 (50.0)	20 (50.0)	

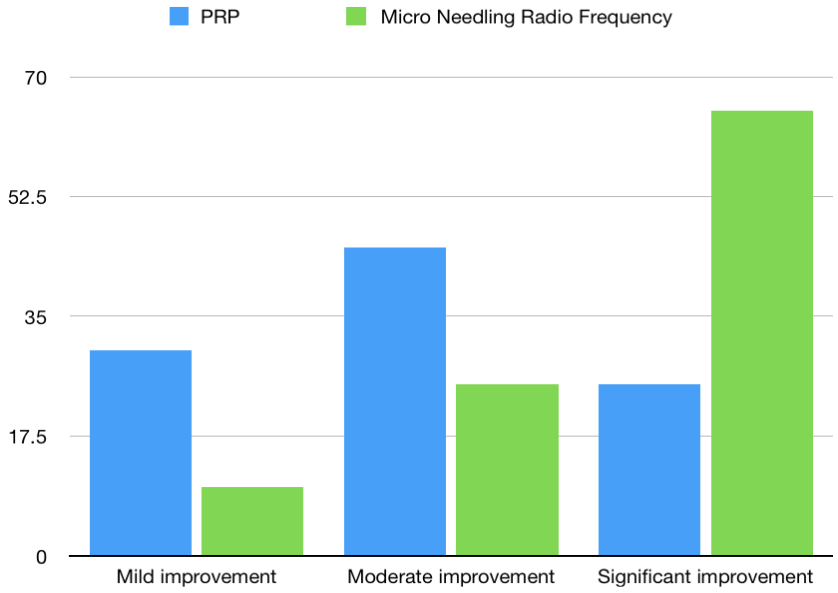

Figure 2. Comparison of patients' assessment between the treatment groups of facial Rejuvenation seeking individuals by Fisher's exact test

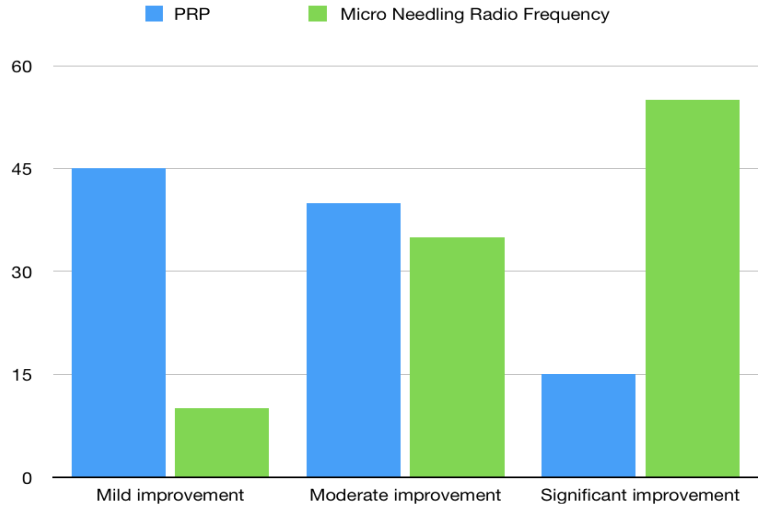

Figure 3. Comparison of the investigator's assessment between the treatment groups of facial Rejuvenation seeking individuals by Fisher's exact test

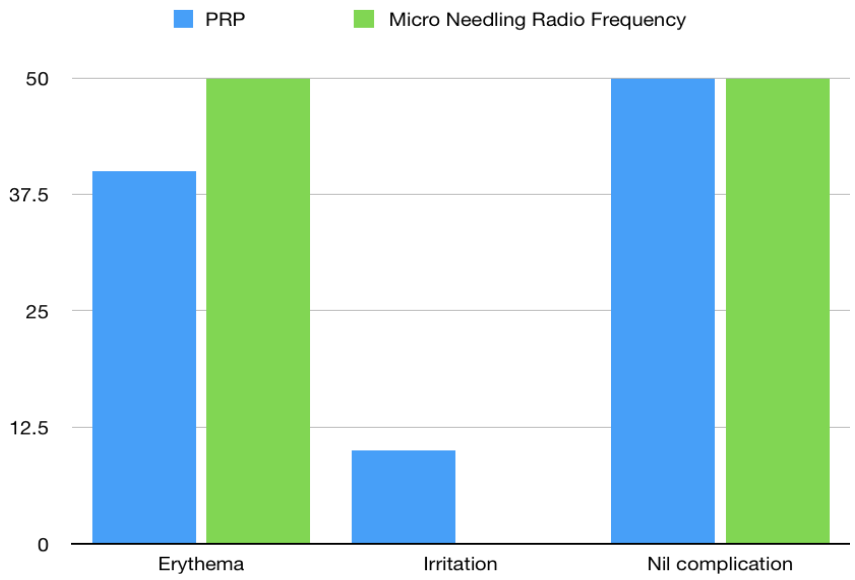

Figure 4. Comparison of adverse effects between the treatment groups of facial Rejuvenation seeking individuals by Fisher's exact test

Table 4 and Figure 2-4 compare the outcomes of PRP injection and microneedling radiofrequency (MNRF) in the assessment of pore visibility improvement, as evaluated by both patients and investigators, along with reported complications.

Patient Reported Improvement

Mild Improvement was reported by 30% (6/20) in the PRP group and 10% (2/20) in the MNRF group, totaling 20% (8/40). Moderate improvement was seen in 45% (9/20) of the PRP group and 25% (5/20) of the MNRF group, making up 35% (14/40). Significant improvement was achieved by 25% (5/20) in the PRP group and 65% (13/20) in the MNRF group, comprising 45% (18/40). The difference in patient-reported outcomes was statistically significant (p=0.046), favoring the MNRF group.

Investigator Assessed Improvement

Mild Improvement was reported in 45% (9/20) of the PRP group and 10% (2/20) of the MNRF group, totaling 27.5% (11/40). Moderate Improvement was observed in 40% (8/20) of the PRP group and 35% (7/20) of the MNRF group, accounting for 37.5% (15/40). Significant improvement was noted in 15% (3/20) of the PRP group and 55% (11/20) of the MNRF group, comprising 35% (14/40). The difference in investigator assessed outcomes was statistically significant (p=0.011), also favoring the MNRF group.

Complications

Erythema was reported in 40% (8/20) of the PRP group and 50% (10/20) of the MNRF group, affecting 45% (18/40) of the participants. Irritation was reported only in 10% (2/20) of the PRP group and none in the MNRF group. Nil Complications were reported in 50% (10/20) of participants in both groups who experienced no complications, totalling 50% (20/40). No significant differences in complications were observed between the groups (p=0.538).

Microneedling radiofrequency (MNRF) demonstrated significantly greater improvement in the visibility of pores, as reported by both patients (p=0.046) and investigators (p=0.011), compared with PRP injections. Although both treatments were associated with mild erythema, no significant differences in complication rates were observed. This suggests that MNRF may be more effective than PRP for pore visibility improvement with a comparable safety profile.

Discussion

A previous study done by Ibrahim et al. evaluated the efficacy of microneedling alone in combination with PRP for the management of atrophic acne scars, which showed insignificant improvement in both sides [13]. Badran and Nabili et al. concluded that administering topical and intradermal PRP to skin traumatized by mechanical and thermal microchannels as an addition to microneedling therapies is feasible with no added harmful effects [4].

There are no studies to date comparing the efficacy of microneedling and PRP in facial rejuvenation. This study shows that MNRF is statistically significant in improving skin texture as well as reducing open pores because it can deliver radiofrequency energy deep into the dermis, thereby stimulating extensive collagen remodelling, resulting in skin tightening [6].

Microneedling combined with radiofrequency energy (MNRF) combines controlled injury induced collagen production with dermal heating for enhanced skin tightening and texture improvement [7]. It causes an overall rejuvenation effect more robustly, especially in the improvement of skin texture. By concentrating platelets, PRP releases growth factors that help cells grow, regenerate tissue and produce collagen [11]. This results in enhanced skin elasticity and rejuvenation.

Limitations

The follow up period of 3 months may not capture the long term efficacy and safety of both treatments. The study had a smaller sample size. Additionally, objective measurements using a dermoscope were not performed. Future studies with longer follow up periods, larger sample sizes and the inclusion of additional objective measures such as histological analysis of skin biopsies could provide more comprehensive insights into the long term benefits and mechanisms of MNRF and PRP.

Clinical Implications

Why Choose MNRF

Microneedling radiofrequency (MNRF) showed better results, with more noticeable improvements in skin texture and rejuvenation compared with PRP. It is a great option for patients who want significant, visible changes in their appearance, especially for concerns like wrinkles, sagging, or acne scars.

When to Consider PRP

Platelet rich plasma (PRP) is better suited for individuals with mild skin concerns or those looking for a gentler and less invasive treatment.

Safety

Both MNRF and PRP are generally well tolerated. Patients undergoing MNRF may experience temporary redness (erythema), while those opting for PRP might notice mild irritation. Neither side effect is serious or long lasting.

Conclusion

The study concludes that the MNRF is a more efficient option for individuals prioritizing significant aesthetic improvement, positioning it as a preferred technique for those desiring noticeable facial rejuvenation effects. PRP, although less effective for profound rejuvenation, may be beneficial for patients with milder aesthetic concerns or for those who prefer a more conservative approach with potentially fewer side effects.

Conflict of Interest

The authors declare that they have no conflict of interest.

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