

Effectiveness of Fractionated Microneedle Radiofrequency in Treatment of Seborrheic Dermatitis

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Abstract

Introduction: Seborrheic dermatitis (SD) is a chronic, relapsing skin illness that causes erythematous, scaly patches and plaques on sebaceous-rich regions including the scalp, face, and chest. Fractionated microneedle radiofrequency (FMR) manages SD symptoms, reduces inflammation, controls sebum production, and improves skin quality and appearance, increasing patient satisfaction. **Objective:** The aim of this research is to determine the effectiveness of FMR in treating SD. **Materials and Methods:** Cross-sectional study. Group A included 20 SD patients. They are treated with combination medicine therapy (isotretinoin pill 10 mg on alternative days with topical emollient cream) and FMR single section each month, with an average of two sections per patient (1–4 section). Group B included 20 SD patients. Group B received isotretinoin tablets of 10 mg on alternative days and a topical emollient cream. **Results:** Group A (mean age = 31.5 ± 7.6 years, 25% females, 75% males) showed a greater reduction in SD grades after treatment compared to group B (mean age = 31.6 ± 8.7 years, 35% females, 65% males). Group A also had a higher percentage of non-relapsing SD cases (63%) and higher satisfaction levels (73.7%) post-treatment, with no significant association between gender, age, and satisfaction. Clear SD grade correlated with higher satisfaction (72.7%) and lower relapse rates (81.1%). **Conclusion:** FMR and topical therapy dramatically decrease SD severity and recurrence rates, with excellent patient satisfaction across all ages and genders. These encouraging outcomes need larger studies.

Keywords: Effectiveness, fractionated, microneedle, radiofrequency, seborrheic dermatitis, treatment

INTRODUCTION

Seborrheic dermatitis (SD) is a chronic, relapsing skin condition characterized by erythematous, scaly patches and plaques, commonly affecting areas rich in sebaceous glands such as the scalp, face, and chest.^[1] Despite its high prevalence, affecting up to 5% of the global population,^[2] the pathophysiology of SD is still not fully understood. Current theories suggest that the condition may involve a complex interplay between genetic predisposition, immunologic abnormalities, lipid metabolism, and *Malassezia* yeast, which is part of the normal skin flora.^[1,3] The skin hosts a diverse microbiome, including *Cutibacterium acnes*, a bacterium that breaks down sebum's triglycerides into free fatty acids. Skin irritation may result from a reduction in this bacteria because it raises triglycerides and lowers squalene and free fatty acids. Furthermore, skin problems are often caused by an overgrowth of the yeast *Malassezia furfur* in patients

with SD. Furthermore, androgens may exacerbate these issues by secreting more sebum. To counteract these, fractionated microneedle radiofrequency (FMR) therapy can be used. FMR uses tiny needles to deliver energy into the skin, reducing inflammation and sebum secretion. It also suppresses the expression of TRPV4, a protein involved in skin healing. Thus, FMR can be instrumental in maintaining skin health.^[3] Management of SD is challenging due to the chronic and relapsing nature of the disease, and many patients do not achieve long-term remission with conventional treatments such as topical corticosteroids, antifungal agents, or keratolytic agents.^[4] Furthermore, these treatments often have side effects

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including skin atrophy, telangiectasia, or dermatitis, especially with prolonged use.^[4] Therefore, there is an urgent need for safer, more effective, and long-lasting treatment options for SD. Over the past decade, device-based therapies have emerged as potential treatments for various dermatological conditions. Among these, microneedle radiofrequency (RF) has been gaining attention due to its proven efficacy in skin rejuvenation, acne scars, and hyperhidrosis.^[5,6] RF technology works by generating an electric current, thereby improving the skin's texture and appearance.^[6] The introduction of FMR technology recently minimises harm to the epidermis and permits a more focused approach by delivering radiofrequency energy to the dermis via several microneedles^[7] By decreasing sebum production, lowering inflammation, managing symptoms, and enhancing overall skin quality and appearance, FMR offers a complete approach to treating SD and increasing patient satisfaction^[7,8] The effectiveness of FMR in treating SD has not yet been thoroughly established, despite the fact that its usage in dermatology is growing. This introduction seeks to set the stage for a detailed analysis of the potential contribution of FMR to SD management, taking into account the opportunities and constraints brought up by recent research. A thorough grasp of this prospective use might open up new avenues for the treatment of SD and provide patients with a cutting-edge, secure, and efficient choice. So the aim of this study is to assess the effectiveness of FMR in the treatment of SD.

MATERIALS AND METHODS

Cross cross-sectional comparative study was conducted from Jan 2022 to Jun 2023 at a private clinic and dermatology outpatient clinic of Al-Yarmook Teaching Hospital. The study participants were divided into two groups: group A consisted of 20 patients with SD. They were treated with combined medical treatment (isotretinoin tab 10mg on alternative days with topical medical treatments and emollient cream) and FMR single section per month, with an average of two sections for each patient (1–4 sections). Group B consisted of 20 patients with SD. They treated with combined medical treatment (isotretinoin tab 10mg on alternative days with topical medical treatment and emollient cream). All patients were followed up for 3 months after treatment. Grading scheme: clear 0, mild 1, moderate 2, and severe 3.^[1] Relapse after 12 weeks after treatment: yes 1 and no 0. Patient satisfaction: poor 0, fair 1, and good 2.

Parameters to evaluate patient satisfaction:

1. compliance with RX,
2. free of clinical symptoms,
3. coast versus effects,
4. better life style, and
5. self-confidence with looking healthy face (better cosmetic results).

Statistical analysis

Utilizing SPSS 22, frequency and percentage are utilized for categorical data, while mean and standard deviation are utilized for continuous data. Utilizing Chi-square to evaluate the association between categorical variables. The *t* test is used to compare the means of continuous variables. *P* value ≤ 0.05 is considered significant.

Ethical approval

The research was carried out in conformity with the Helsinki Declaration's ethical criteria. Before taking a sample, the patient's verbal and analytical permission was obtained. To get this approval, a local ethics committee evaluated and approved the research protocol as well as the subject information and consent form in accordance with document number 186 (containing the number and date in January 5, 2022).

RESULTS

The mean age of group A was 31.5 ± 7.6 years and the mean age of group B was 31.6 ± 8.7 years. Gender distribution: in group A, 25% females and 75% males, whereas in group B, 35% females and 65% males. Most age groups in group A and group B were 30–39 and 20–29 years old, respectively, as shown in Table 1.

Figure 1 shows the distribution of patients in both groups according to SD grades before treatment type during treatment and after treatment. Twelve patients in group A were severe SD and 11 patients in group B were severe. Figure 2 showed during treatment, group A had 10 patients with mild changes in parallel to 5 patients in group B. Figure 3 showed after treatment, group A had 15 patients with clear grades in parallel to 7 patients in group B, also group A after treatment had 5 patients with mild grade and no patients with moderate sequences.

Table 1: Distribution of patients according to gender and age group in both group A and group B

Variables		Group	
		A	B
Gender	Females	5 25.0%	7 35.0%
	Males	15 75.0%	13 65.0%
	Total	20 100.0%	20 100.0%
Age group (years)	20–29	8 40.0%	9 45.0%
	30–39	9 45.0%	7 35.0%
	40–49	3 15.0%	3 15.0%
	50–59	0 0.0%	1 5.0%
	Total	20 100.0%	20 100.0%

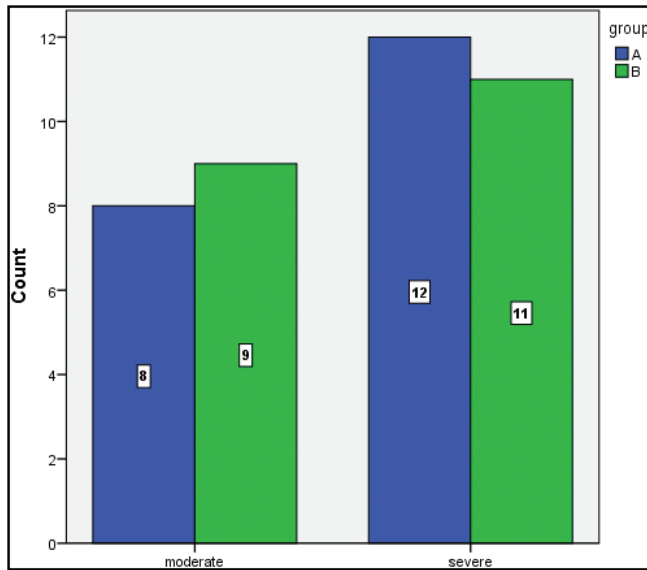


Figure 1: The distribution of patients in both groups according to SD grades before treatment type during treatment and then after treatment

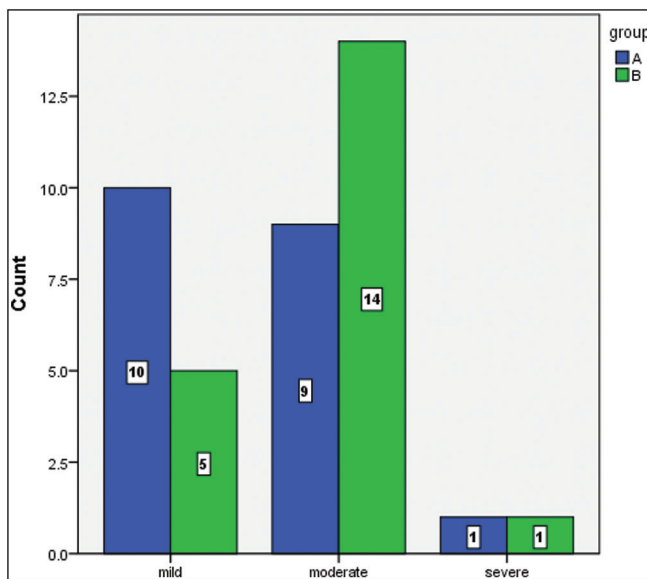


Figure 2: (A) Group A: derma scope shows SD before and (B) after the treatment. With a single section of FMR

As shown in Table 2, there is no significant difference between patients in grades of SD before and during treatment in both groups, while there is a significant difference between patients in grades of SD after treatment, the grade score decreased in group A more than in group B.

As shown in Table 3, 63% of no relapsing SDs significantly occur in group A, while just 23.1% of relapses occur in patients in group A, and 76.9% of relapses occur in patients in group B. 73.7% of patients with good satisfaction in group A patients.

As shown in Table 4, significant-good satisfaction (72.7%) of patients with a clear grade of SD have good satisfaction.

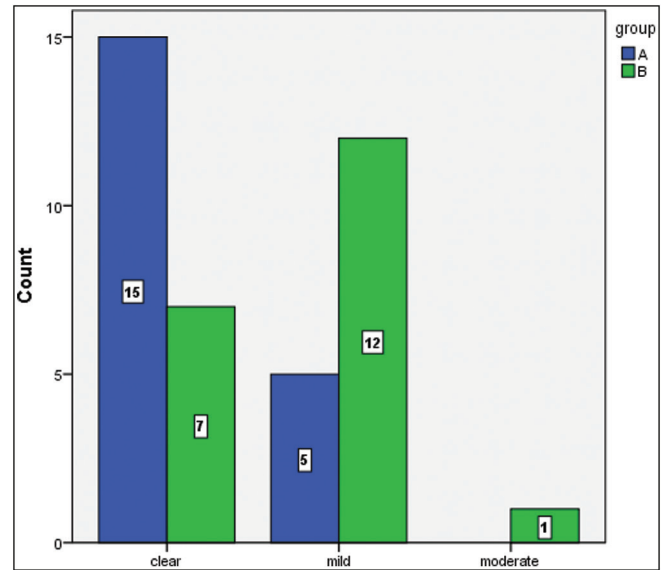


Figure 3: (A) Derma scope shows SD before and (B) after the treatment. With a single section of FMR there is a reduction in erythema, inflammation, and sebum secretion after 1 month of treatment

Table 2: Difference between patients in grades of SD in both groups

Treatment	Group	N	Mean	Standard error mean	P value
Before treatment	A	20	2.60	0.11	0.7
	B	20	2.55	0.11	
During treatment	A	20	1.55	0.13	0.17
	B	20	1.80	0.11	
After treatment	A	20	0.25	0.09	0.009
	B	20	0.70	0.12	

P value ≤ 0.05 (significant)

Table 3: Association between relapsing and satisfaction in both group

Variables		Group		Total	P value
		A	B		
Relapse	Nonrelapse	17 63.0%	10 37.0%	27 100.0%	0.041
	Relapse	3 23.1%	10 76.9%	13 100.0%	
Patients satisfaction	Poor	1 12.5%	7 87.5%	8 100.0%	0.009
	Fair	5 38.5%	8 61.5%	13 100.0%	
	Good	14 73.7%	5 26.3%	19 100.0%	

P value ≤ 0.05 (significant)

Bold value indicates significant

As shown in Table 5, significantly (81.1%) of patients with a clear grade of SD have no relapse.

As shown in Tables 6 and 7, no association between the gender and age of patients with their satisfaction after treatment front SD.

Table 4: Patient satisfaction after treatment

Severity		Satisfaction			Total	P value
		Poor	Fair	Good		
After Treatment	Clear	4	2	16	22	0.0001
		18.2%	9.1%	72.7%	100.0%	
	Mild	3	11	3	17	
		17.6%	64.7%	17.6%	100.0%	
	Moderate	1	0	0	1	
		100.0%	0.0%	0.0%	100.0%	

P value ≤ 0.05 (significant)

Bold value indicates significant

Table 5: Relapsing after treatment

Severity		Follow-up		Total	P value
		Nonrelapse	Relapse		
After treatment	Clear	18	4	22	0.05
		81.8%	18.2%	100.0%	
	Mild	9	8	17	
		52.9%	47.1%	100.0%	
	Moderate	0	1	1	
		0.0%	100.0%	100.0%	

P value ≤ 0.05 (significant)

Bold value indicates significant

Table 6: Association between patient satisfaction after treatment and gender

Severity		Satisfaction			Total	P value
		Poor	Fair	Good		
Gender	Female	4	2	6	12	0.24
		33.3%	16.7%	50.0%	100.0%	
	Male	4	11	13	28	
		14.3%	39.3%	46.4%	100.0%	

P value ≤ 0.05 (significant)

Bold value indicates significant

Table 7: Association between patient satisfaction after treatment and age group

Severity		Satisfaction			Total	P value
		Poor	Fair	Good		
Age groups (years)	20–29	2	6	9	17	0.67
		11.8%	35.3%	52.9%	100.0%	
	30–39	5	4	7	16	
		31.3%	25.0%	43.8%	100.0%	
	40–49	1	3	2	6	
		16.7%	50.0%	33.3%	100.0%	
	50–59	0	0	1	1	
		0.0%	0.0%	100.0%	100.0%	

P value ≤ 0.05 (significant)

DISCUSSION

From the results above, it is apparent that both treatment approaches, group A patients they treated with combined medical treatment (isotretinoin tab 10mg alternative

day with topical medical treatments and emollients cream) and FMR single section per month provided some degree of improvement in the symptoms of SD than group B patients they treated only with combined medical treatment (isotretinoin tab 10mg alternative day with topical medical treatment and emollients cream). However, it is noteworthy that group A demonstrated superior results compared to group B, particularly in the treatment of severe SD. These results seem to be in line with previous studies that have shown FMR to be a safe and effective treatment for various skin conditions. For example, a study by Forbat *et al.*^[9] found FMR to be effective in treating acne and acne scars. Another study by Belenky *et al.*^[10] suggested that bipolar fractional radiofrequency treatment could induce ne elastogenesis and neocollagenesis, key processes in skin regeneration and healing. These findings echo the potential therapeutic benefits of FMR in the management of skin conditions such as SD. However, when comparing the results with those achieved by traditional medical treatments, the difference is quite striking, generally, among patients, and can often lead to undesirable side effects.^[11,12] The data provided here reaffirm this variability, as group B, despite receiving systemic and topical treatments, exhibited lower rates of symptom resolution compared to group A. The results indicate that while there was no significant difference in the severity of SD between the two groups prior to and during treatment, a significant difference was observed in the post-treatment grades. Specifically, group A, treated with a combination of FMR and medical treatment, demonstrated a more pronounced decrease in SD severity compared to group B, which received topical and systemic medical treatments. These results support the effectiveness of FMR as a treatment modality for SD. Previous research has demonstrated the benefits of FMR in treating other skin conditions. For instance, a study by Cho *et al.*^[13] reported that bipolar fractional radiofrequency treatment led to ne elastogenesis and neocollagenesis, processes integral to skin regeneration and healing. Contrastingly, the more traditional treatments employed in Group B showed less effectiveness in alleviating SD symptoms. Existing literature does suggest the variability of these medications in treating dermatological conditions. Studies noted that the efficacy of systemic treatments can vary significantly among patients and can lead to unwanted side effects.^[14,15] The observed disparity in SD grade reduction between the two groups reaffirms the potential of FMR as a superior treatment strategy. However, it is crucial to bear in mind that while these results seem promising, larger-scale studies are required to confirm the effectiveness of FMR in SD treatment and establish standardized protocols. These results suggest that (group A) not only significantly reduced the severity of SD compared to a combination of topical and systemic medical treatments (group B), but it also yielded

a lower relapse rate and higher patient satisfaction. This indicates that FMR combined with medical treatment offers a long-term, sustainable solution, reducing the risk of SD recurrence. With 73.7% of patients rating excellent satisfaction, patient satisfaction likewise leaned favourably in group A's direction. This may be explained by the increased effectiveness and perhaps decreased side effects of topical therapy and FMR, which may enhance patient comfort and perception. These findings are consistent with research showing how well FMR works to treat a range of skin disorders. Study by Pongsrihadulchai *et al.*^[8] demonstrate the effectiveness of FMR in fostering skin repair and regeneration, which may be a reason in the lower recurrence rates in SD^[5]. As reported by Fakhraie *et al.*^[11] and Gollnick *et al.*^[12], the variability and possible adverse effects of isotretinoin may be the cause of Group B's greater relapse rate. These findings add to the body of research supporting the usefulness of FMR in conjunction with pharmaceutical therapy for the management of SD. More specifically, excellent satisfaction with the therapy was indicated by 72.7% of patients who received a "clear" grade of SD. This shows that the patient's quality of life and perceived health condition have improved as a result of the therapy. Improvements in skin problems may significantly increase patient satisfaction and general quality of life, according to earlier studies by Beikert *et al.*^[16] Further evidence that the therapy has a strong long-term impact on managing and controlling SD comes from the considerable 81.1% of patients with a "clear" grade of SD reporting no recurrence. This confirms other researches suggesting FMR useful in treating a range of skin disorder and may lower recurrence rate.^[17,18] Interestingly, the data showed no association between gender and age of patients with their satisfaction following treatment for SD. This suggests that the effectiveness of the treatment and patient satisfaction were consistent across different demographic groups. A study by Martins *et al.*^[19] suggested that while age and gender can sometimes influence the perception of treatment satisfaction, the overall effectiveness of a treatment is often the most influential factor.

CONCLUSION

This study demonstrates the promising effectiveness of FMR combined with medical treatment for SD. Notable benefits include a significant reduction in SD severity, fewer relapses, and high patient satisfaction, irrespective of age and gender. Further large-scale trials are recommended to substantiate these findings and establish universal treatment protocols.

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Conflicts of interest

There are no conflicts of interest.

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