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A COMPARATIVE STUDY OF BOTOX AND RADIO FREQUENCY MICRO-NEEDLING FOR FACIAL REJUVENATION

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ABSTRACT

Background: *Facial rejuvenation has become a prominent demand due to the increasing preference for non-surgical solutions to combat the signs of aging. Among the most commonly used treatments are Botox Micro-Needling and Radiofrequency (RF) Micro-Needling. Both target wrinkles, skin texture, and elasticity; however, limited research has compared their effectiveness, safety, and patient satisfaction directly.*

Objective*: The aim of this study was to compare the effectiveness, safety, and patient satisfaction of Botox Micro-Needling and RF Micro-Needling for facial rejuvenation. The study focused on key factors including wrinkle reduction, skin texture, elasticity, and recovery times.*

Methodology: *A comparative clinical research design was implemented, involving 100 participants (50 per treatment) aged between 25 and 60 years. The treatments were performed in aesthetic clinics located in Lahore. Data was collected using clinical assessments such as wrinkle severity, skin texture and elasticity analysis, patient-reported outcomes, and photographic documentation. Follow-up visits were conducted at baseline, immediately post-treatment, and at 2- and 4-month intervals. SPSS software was used for data analysis, employing Mann-Whitney U and Wilcoxon signed-rank tests, along with descriptive statistics.*

Results: *RF Micro-Needling showed superior results in improving skin texture, elasticity, and patient satisfaction ($p = 0.000$). Botox Micro-Needling was more effective in dynamic wrinkle reduction ($p = 0.000$), whereas RF Micro-Needling had fewer side effects and produced longer-lasting skin improvements. Botox showed quicker recovery times ($p = 0.000$), while RF Micro-Needling required a longer recovery period.*

Conclusion: *RF Micro-Needling offers a more holistic and long-lasting solution for overall facial rejuvenation, while Botox is highly effective for dynamic wrinkle reduction. Combining both treatments could provide an ideal approach for comprehensive facial rejuvenation.*

Keywords*: Facial rejuvenation, Botox Micro-Needling, Radiofrequency Micro-Needling, wrinkle reduction, skin texture, skin elasticity, patient satisfaction, recovery time, comparative study.*

INTRODUCTION

Facial rejuvenation has become an essential component of aesthetic medicine, focused by the rising aim for non-surgical solutions to fix the signs of aging. On vitality and youthfulness, it puts more stress as a society; non-surgical., procedures have expanded in popularity due to their ability to enhance the look without the requirement for prolonged recovery times or surgical treatments. For facial rejuvenation Botox (botulinum toxin) and RF Micro needling (Radiofrequency Micro needling) are most common treatments, In skin texture, the reduction of wrinkles, and tone, both of which guarantee substantial improvements. Even though their extensive use, these both treatments are basically different in their mechanisms of action, and a thorough comparative

evaluation of their relative effectiveness, safety, and results is still lacking (1).

Muscles which are responsible for dynamic facial wrinkles can be temporarily paralyzes due to neurotoxin (Botox), like crow's feet, frown lines, and forehead lines. It has been a essential in aesthetic practices for years, becoming a worldwide identified treatment for facial wrinkles caused by muscle contractions. Botox offers a quick, less surgical option for patients, frequently demanding no rest, and is commonly celebrated for its ability to produce instant outcomes. whereas, it mainly resolve wrinkles related to muscle movement and does not have an effect on laxity, skin texture, or more static wrinkles caused by aging skin (2). Even though its reputation, some patients may look for treatments that can offer more comprehensive enhancements to skin quality and elasticity (3).

Whereas, RF Micro needling (Radiofrequency Micro needling) is a comparatively new treatment method that combines the Advantages of conventional micro needling with the delivery of radiofrequency energy (4). This method stimulates the development of collagen and elastin by creating micro injuries in the skin as concurrently providing heat to the deeper layers of the dermis. For both surfaces level issues like wrinkles, fine lines Radiofrequency Micro needling is boosted as a solution, and also for deeper skin issues, like scarring and skin laxity. The method offers the possibility for a more comprehensive technique to skin rejuvenation, fixing both the deeper layers and superficial of the skin (5).

These two treatments, despite their popularity, differ significantly in their mechanisms of action, procedures, and effects on the skin. Botox, renowned mainly for relaxing wrinkles, is today a standard cosmetic procedure globally. Botox temporarily paralyzes dynamic wrinkle muscles, including frown lines, forehead lines, and crow's feet, for a non-invasive way of smoothening facial features for patients. In contrast, however, is a newer technology, RF Micro-Needling, which combines traditional microneedling benefits with the bonus of radiofrequency energy. The process triggers collagen production and enhances skin texture, elasticity, and look by making micro-injuries in the skin with heat being imparted into deeper layers of the dermal layer. Both Botox and RF Micro-needling are well-liked for enhancing facial looks even though their safety, effectiveness, and lasting consequences are not yet known comparatively (6)

Although their reputation, there is a significant lack of research comparing the effectiveness and outcomes of Botox Micro needling and RF Micro needling for facial rejuvenation. Whereas individual studies have examined the benefits and complications of each method, certain studies compared those modalities directly, particularly with regard to correcting a wide range of issues associated with aging (7). Additionally, recent research tends to focus on a single aspect, such as wrinkle decrease, without analyzing aspects such as treatment time, patient satisfaction, economic viability, or whether there is a potential for durable effects. (8).

The significance of this research relies upon its potential to provide a more comprehensive insight into relative strengths and weaknesses of Botox micro needling and RF Micro needling. In correcting the void within comparative studies, this research hopes to provide more precise recommendations for practitioners and patients alike in selecting the correct mode of treatment for their particular conditions. (9). Furthermore, by comparing not only cosmetic results, but also patient experience, recovery times, and cost effectiveness, a comprehensive openion of the two widely used treatments of Autologous Fat Grafting and lipofilling will, for the first time, be provided. The results could potentially influence clinical practices and provide evidence based recommendation for people who's seeking non surgical alternatives for face rejuvenation (10).

1. The Need for Non-Surgical Facial Rejuvenation

In recent decades, there has been a growing emphasis on firm, smooth skin. As a result of a focus on youthfulness, combined with advancements made within aesthetic medicine, there has been a surge of non-invasive treatments for facial enhancement(11). In contrast to conventional surgical treatments, which tended to involve extensive periods of recovery and inherent risks, non-invasive treatments provide patients with a form of cosmetic correction with reduced downtime and lower risk profiles. Consequently, within the non-surgical cosmetic industry, there has been a phenomenal growth, with treatments such as Botox and RF Micro-Needling becoming prominent within the marketplace (12)

Botox, approved by the FDA in the 1980s, has been shown to be effective against dynamic facial wrinkles resulting from muscle contractions. The injection of botulinum toxin into specific muscles is made, temporarily putting them into a state of paralysis and

evening out overlying skin (13). Over time, Botox has grown from a procedure for treating medical conditions such as blepharospasm and migraines into a top-ranked aesthetic procedure for wrinkle correction and facial renewal. In 2020, a report by the American Society of Plastic Surgeons indicated that Botox is among the top minimally invasive procedures, with millions of treatments given every year(14).

RF Micro-needling, however, is a relatively recent innovation within non-surgical skin treatments. This innovation combines an established microneedling procedure, which generates controlled micro-injuries within the skin to create collagen stimulation, with radiofrequency stimulation for further augmentation of tissue remodelling (15). RF Micro-needling has been marketed as a skin solution for a number of issues, including wrinkles, fine lines, acne scars, skin laxity, and skin texture irregularity. The treatment offers a holistic approach by stimulating collagen and elastin production in both the superficial and deeper layers of the skin, providing a more comprehensive solution for patients seeking to improve their skin's overall health and appearance (16).

As non-invasive procedures gain traction, the demand for reliable information regarding the effectiveness and outcomes of these treatments has grown. Patients and practitioners alike are looking for data that compares these treatments in terms of not only their cosmetic outcomes but also factors such as treatment duration, recovery time, patient satisfaction, and long-term results. While both Botox and RF Micro-Needling have proven benefits, the lack of comparative studies between these two treatments underscores the need for this research (17).

2. Botox: A Snapshot of Its Mechanism and Efficacy

Botox, the commercial name for botulinum toxin, is a neurotoxin that temporarily paralyzes the muscles responsible for creating dynamic facial wrinkles. Dynamic wrinkles are those that form due to repeated facial expressions, such as frown lines, crow's feet, and forehead lines. By inhibiting the release of acetylcholine, a neurotransmitter that signals muscle contraction, Botox effectively relaxes the targeted muscles, leading to smoother skin in the treated areas(18).

The procedure is straightforward and minimally invasive, involving the injection of Botox into the muscles that cause wrinkles. The treatment takes only a few minutes and does not require any anesthesia, although some patients may opt for numbing cream to minimize discomfort. The effects of Botox are visible within a few days, with full results appearing within one to two weeks. The results typically last between three to six months, after which repeat treatments are necessary to maintain the effects(19).

Despite its popularity, Botox does not address all signs of aging. It is most effective for treating dynamic wrinkles caused by muscle movement but does not target other concerns such as skin laxity, sun damage, or static wrinkles (those that remain even when the face is at rest). Additionally, while Botox is considered safe and effective, it does have limitations. The results are temporary, and patients must undergo regular treatments to maintain their appearance. Furthermore, Botox does not stimulate collagen production or improve skin texture, making it less effective for individuals seeking a more holistic approach to facial rejuvenation(20).

3. RF Micro-Needling: A Comprehensive Approach to Skin Rejuvenation

RF Micro-Needling is a treatment that combines the benefits of traditional microneedling with radiofrequency energy to enhance the effects of collagen and elastin production. The procedure includes using a device with an array of micro-needles, which cause controlled micro-injuries within the skin. In parallel, radiofrequency is applied to deeper layers of the dermis, which warms up the tissue and enhances the synthesis of collagen and elastin(21).

The treatment works to restore skin texture, tone, and elasticity by correcting superficial and deeper skin issues. RF Micro-Needling is effective for addressing a broad cross-section of conditions, including wrinkles, skin laxity, and acne scars. Through stimulation of collagen renewal, the procedure works to smooth, firm, and brighten skin over a period of time. In contrast with Botox, which targets dynamic wrinkles, RF Micro-Needling is a more extensive skin regenerative measure since it treats multiple skin strata and elicits long-term improvement in skin health(6).

While multiple treatments are typically needed for RF Micro-Needling to deliver peak improvement, it is a longer-lasting improvement than Botox. Improvements from RF Micro-Needling are incremental, with skin texture and elasticity improving over weeks or months. Most people experience only brief redness and puffiness immediately after treatment, with minimal downtime. Since RF Micro-Needling induces natural collagen and elastin production, improvements are longer-lasting than with Botox, which is temporary(22).

4. Comparative Analysis of Treatment Outcomes

One of the main benefits of this research is that it is comparing Botox and RF Micro-Needling directly, not only for individual efficacies, but also for which of them can target various aspects of facial rejuvenation. Patients will all require different things, and although Botox is perhaps best for correcting dynamic wrinkles, RF Micro-Needling is perhaps better for people looking for overall skin improvement. By carefully examining both treatments, what is learned will help decide which is more effective for certain signs of aging, including laxity, drooping, and irregular skin texture(23).

In addition, patient satisfaction and accessibility are also important factors. With growing popularity of aesthetic treatments, making treatments effective and convenient will improve patient experience and shape the industry's future path. Cost-effectiveness will also be taken into account through this research, with a further breakdown of comparison on prices and real value over a longer period, making it simpler for patients to choose the right option based on what suits their budget and requirement (24).

By integrating these detailed comparisons, this research will not just offer a comparison of the effectiveness of Botox and RF Micro-Needling, but will also contribute toward a dynamic field so that patients are able to receive the best care for facial rejuvenation (25).

1.1 Rationale of the study

The growing need for non-invasive facial renewal has fueled the popularity of Botox Micro needling and Radiofrequency (RF) Micro needling as effective treatments. In addition, though both are being utilized extensively, there is a paucity of comparative studies assessing their effectiveness, safety, and long-term consequences. This research is needed for a detailed assessment of the two treatments, for guiding practitioners and clients on choosing an appropriate option based on a client's specific aesthetic concern. While Botox successfully treats dynamic wrinkles resulting from muscle contractions, RF Micro targets deeper layers of skin, enhancing texture, elasticity, and laxity. Knowledge of their comparative strengths and weaknesses will improve clinical practice and maximize treatment regimens. Furthermore, by determining patient satisfaction, economic feasibility, and durations of outcome, this research will provide useful input into an expanding, developing field of non-invasive aesthetic medicine, allowing informed choice for individuals with effective facial rejuvenation.

1.2 Objectives

The objective of the present work is comparing overall outcome of Botox micro needling and Radiofrequency Micro needling, effectiveness, protection, and patient satisfaction, under the context of facial rejuvenation. Specifically, it examines based on wrinkle reduction which procedure holds the most significant benefits, improvement of skin texture, and tightening of the skin, and also by comparing with other parameters such as cost of treatment, recovery period, and longer-lasting effects. In all, it is with an eye towards adding meaningful analysis into the expanding practice of non-surgical aesthetic treatments so that practitioners are better informed, and so that more informed patient choices are made, allowing them to opt for the procedure best suited for them.

CHAPTER 2
LITERATURE REVIEW

The Pursuit of Perfection: A Comparative Study of Botox and Radiofrequency Micro needling for Facial Rejuvenation

Rejuvenating the face is a priority for the emerging practice of aesthetic medicine, with clients seeking non-invasive treatments against aging. Amidst all therapies available, Botox and Radiofrequency Micro needling are two of the therapies used with utmost prevalence. Both treatments aim to enhance skin looks by correcting wrinkles, fine lines, and skin texture, yet patient results, mode of actions, and side effects are essentially distinct. This literature review looks to analyze current outcomes in both methods, providing a comparative analysis of their effectiveness and patient satisfaction for facial rejuvenation (26).

Botox for Facial Rejuvenation

Type A Botox, a botulinum toxin, has been a prominent player in the field of non surgical facial rejuvenation for years. It works as temporarily paralyzing the facial muscles that cause dynamic wrinkles, mainly around the eyes, forehead, and between the brows Fabbrocini et al., 2020. The is a treatment include injecting the toxin into the marked muscles, which preventing muscle contraction, inhibits acetylcholine release, and hence reducing the appearance of wrinkles Cohen et al., 2021 (27).

Efficacy and Safety of Botox

Botox has been well-documented as an effective treatment for reducing wrinkles, with studies consistently demonstrating improvements in patient satisfaction and wrinkle severity post-treatment. One study by Soter et al. (2022) found that Botox reduced wrinkle severity by 50-70% in participants with moderate to severe glabellar frown lines (28). Furthermore, Botox has shown minimal side effects when administered by trained professionals. According to Jung et al. (2020), common side effects are mild and transient, including bruising, swelling, and headache. The duration of effect typically lasts from 3 to 6 months, necessitating repeat treatments for sustained results (29).

Limitations of Botox

Despite its widespread use and efficacy, Botox has limitations. The primary drawback is that it only addresses dynamic wrinkles caused by muscle movement and does not significantly improve skin texture or static wrinkles that occur due to loss of collagen or skin laxity Geronemus & Lowe, 2022. Furthermore, Botox does not offer any long lasting advantages in regard of skin tightening or regeneration (30).

Radiofrequency Micro needling for Facial Rejuvenation

Radiofrequency Micro needling (RF Micro needling) is an progressive method that merges micro needling (a procedure that makes micro injuries in the skin) with the administration of radiofrequency energy. The aim is to stimulate collagen development and skin tightening, enhancing skin texture and tone. Radiofrequency micro needling can be used to treat a large variety of skin challenges, involving fine lines, acne scars, wrinkles, and skin laxity(31).

Mechanism of Action and Efficacy

By injecting fine needles into the skin layer (dermis) to make micro injuries Radiofrequency Micro needling conducted, followed by the administration of radiofrequency energy to the dermal layer. Fibroblast activity, high collagen and elastin formation is stimulated by this mechanisms (Jiang et al., 2020). Radiofrequency Micro needling can enhance skin texture, firmness, and the reduction of wrinkles, have shown in studies that making it an efficient approach for facial rejuvenation (6).

Essential enhancement in skin elasticity and wrinkle reduction in patients treated with Radiofrequency Micro needling presented by a research Seok et al. (2021). Patients experienced a 40 percent enhancement in skin texture and 35 percent reduction in fine lines after six months showed in their outcomes. likewise, Radiofrequency Micro needling substantially enhanced skin rejuvenation, enhancing skin laxity and texture even in patients with mild to moderate UV damage was detected byDuan et al. (2022) (32).

Safety and Side Effects

Radiofrequency Micro needling is analyzed a safe method, though patients may experience some redness, swelling, or mild discomfort post treatment. Adverse events were rare, and most side effects were mild and transient were noted byYang et al. (2023), like post inflammatory hyper pigmentation or mild erythema. The results, however, require various sessions to achieve perfect outcomes, and the improvements are slow over time, with maintenance treatments necessary to sustain advantages (21).

Comparative Analysis of Botox and RF Micro needling for Facial Rejuvenation

Both Botox and Radiofrequency Micro needling provide different advantages for facial rejuvenation, but they apply through different mechanisms, making them suitable for depending patient needs and preferences (33).

Botox: Targeted Treatment for Dynamic Wrinkles

Botox prospers in the treatment of dynamic wrinkles by relaxing the muscles responsible for wrinkle development. For superficial lines and wrinkles caused by repetitive facial expressions It is most effective treatment. However, Botox does not fix skin laxity, textural challenges, or deep wrinkles, making it less flexible than Radiofrequency Micro needling. Furthermore, requiring repeat treatments to maintain the aesthetic effects, its results are temporary (34).

RF Micro needling: Comprehensive Skin Rejuvenation

RF Micro needling, on the other hand, addresses both skin texture and firmness. It stimulates collagen production, providing longer-lasting results for improving skin elasticity and the reduction of wrinkles. RF Micro needling is effective for patients with skin laxity or static wrinkles that Botox cannot improve. However, its gradual nature and the need for multiple sessions may be considered a drawback for patients seeking immediate results (6).

Study on Botox's Effectiveness for Facial Rejuvenation (Lee et al., 2021)

Lee et al. (2021) conducted a study on the efficacy of Botox in treating facial wrinkles, focusing on the glabellar lines. The study found that Botox treatments led to a significant reduction in wrinkle severity, with a 60% improvement in the appearance of the treated area. The results were consistent across all age groups, suggesting Botox's broad appeal for non-invasive facial rejuvenation. Additionally, the study reported minimal side effects, with the most common being slight swelling and bruising at the injection sites, which subsided within a few days. Botox's long-term effects were noted to last around 4-6 months(35).

Botox for Facial Wrinkles in Younger Adults (Kim et al., 2022)

Kim et al. (2022) examined Botox effectiveness among young adult subjects aged 20-35 with mild and moderate facial wrinkles. They concluded that Botox reduced dynamic wrinkles, especially around the eyes and forehead, considerably. Of significance was a high patient satisfaction level, with more than 85% of volunteers reporting noticeable improvement in smoothness of skin. The research suggested that Botox would be a good choice for prompt intervention for preventing deep wrinkles and slowing down aging without any adverse effects over time (36).

Comparative Study on Botox and Radiofrequency Micro needling (Tan et al., 2023)

The comparative effectiveness of Botox versus Radiofrequency Micro needling for facial rejuvenation was compared by Tan et al. (2023). According to research, improvements were achieved by both treatments for wrinkles, with Botox yielding faster benefits for dynamic wrinkles and improving skin texture and firmness with RF Micro needling over time. The research indicated that repeated treatments were needed for Botox, with RF Micro needling yielding longer-lasting improvements in skin firmness and quality. The individuals who underwent treatments for both reported greater improvement, with smoother skin and decreased fine lines (12).

Combination of Botox and RF Micro needling (Wang et al., 2022)

Wang et al. (2022) explored the combination of Botox and Radiofrequency Micro needling for more extensive facial rejuvenation. In the study, it was observed that combining treatments resulted in healthier skin texture, diminished wrinkles, and optimized muscle relaxation. The two approaches could complementarily treat dynamic and static wrinkles, providing an overall solution for those seeking lengthy rejuvenation. Patient satisfaction was excellent, with improvements visible through skin tone and firmness within three months. The study advised using a combination for those with facial muscle contractions and skin laxity(37).

Long-Term Efficacy of Radiofrequency Micro needling (Sharma et al., 2021)

Sharma et al. (2021) studied the long-term effectiveness of Radiofrequency Micro needling for skin renewal. The experiment confirmed that there were improvements in skin elasticity, texture, and look of finer wrinkles over a 12-month period. The treatment resulted in visible improvements in skin color and texture among individuals with skin damaged by sunlight and those with acne scars. The experiment also noted that there were more lasting effects of RF Micro needling compared to Botox, with less maintenance needed. However, because improvements were gradual, it took several sessions to maximize improvements (38).

Patient Satisfaction with Botox in Facial Rejuvenation (Li et al., 2020)

Li et al. (2020) assessed patient satisfaction with Botox treatments for wrinkles on the face. The majority of patients experienced considerable improvement in wrinkle severity, particularly on the eyes, forehead, and mouth. Patient satisfaction with treatments were at 85%, with several noting an increase in self-esteem and confidence. The research further indicated minimal downtime and pain with Botox treatments, which made it a preferred choice for people seeking painless, fast, and effective treatments. The authors reported that repeated treatments were required for maintenance of aesthetic effects(35).

Botox vs. RF Micro needling for Fine Lines (Nguyen et al., 2023)

Nguyen et al. (2023) compared Botox with RF Micro needling for treating fine lines. According to research, whereas Botox significantly reduced dynamic wrinkles, RF Micro needling proved better at improving skin elasticity and texture. Patients undergoing RF Micro needling reported noticeable skin firmness improvement and a decrease in fine lines, particularly in regions of moderate to extensive sun damage. Botox, on the other hand, was preferred by those

seeking an instant fix for dynamic wrinkles, with less emphasis on skin texture enhancement (39).

Radiofrequency Micro needling for Acne Scar Treatment (Park et al., 2021)

Park et al. (2021) explored whether RF Micro needling worked for acne scarring, a typical facial rejuvenation concern. The research indicated that RF Micro needling worked well to improve skin texture and look, decreasing acne scarring depth and severity. On a regimen of treatments, skin became smoother with greater collagen output, resulting in greater elasticity. The outcome was particularly favorable for those with mild-moderate scarring, with those who were severely scarred experiencing improvements, but only moderate ones. The adverse effects were minimal, with nearly all of them only recording mild redness and swelling post-procedure (7).

Combined Approach

Various studies have indicated that a combination of Botox and RF Microneedling can provide synergistic benefits, improving muscle relaxation and skin renewal (Williams et al., 2021). A combined regimen would treat dynamic and static wrinkles, as well as skin texture, providing a complete solution for facial renewal (40).

In conclusion, Botox and Radiofrequency Micro needling are effective, non-invasive facial rejuvenation treatments, with respective advantages and disadvantages. Botox is most compatible for dynamic wrinkle treatments, with quick effects and less recovery time required. On the contrary, Radiofrequency Micro needling provides a more holistic solution for improving skin texture, elasticity, and firmness by stimulating collagen. Though both treatments are proven with regards to safety and efficacy based on recent studies, patient choice, skin status, and objectives of treatment will inform selection of what is best. Combining the two treatments would provide an ideal solution for overall facial renewal.

METHODOLOGY

3.1. Research Design

This study employs a comparative clinical research design to analyze the effectiveness, safety, patient satisfaction, and overall outcomes of Botox Micro needling and Radiofrequency Micro needling for facial rejuvenation. A quantitative approach was utilized to measure key clinical and patient reported outcomes, while a qualitative component will include patient feedback regarding satisfaction and perceived improvements. The study followed a longitudinal observational approach, tracking patient results over a specified timeframe.

3.2. Clinical Settings

The research was conducted in dermatology and aesthetic medicine clinics specializing in non-surgical facial rejuvenation procedures of city Lahore. These clinics were equipped with the necessary medical technologies and staffed by licensed professionals, ensuring standardization in treatment administration. All procedures was performed in compliance with medical guidelines to maintain consistency and reliability of results.

3.3. Sample Size

In this study 100 participants are included and total participant will divided equally in two groups, 50 patients receiving Radiofrequency micro needling and 50 patients receiving Botox micro needling. The sample size is finalized based on prior studies analyzing facial rejuvenation treatments, ensuring statistical power and importance in the comparative analysis.

3.4. Sampling Technique

Participants who meet the eligibility criteria for either Botox Micro needling or RF Micro needling are selected by using this purposive sampling technique. Participants were recruited from aesthetic clinics, dermatology centers, and through voluntary enrollment following informed consent. This method ensures the inclusion of individuals who were actively looking for facial rejuvenation treatments.

3.5. Duration of Study

The study was conducted over a period of 4 months. The treatment results was evaluated at different time points: baseline (before treatment), immediately after treatment, and follow-up assessments at baseline, 2 months, and 4 months post-treatment to assess longevity and efficacy. After each 15 day session was given to have better results in 4 months.

3.6. Selection Criteria

3.6.1. Inclusion Criteria

- Adults aged 25–60 years seeking non-surgical facial rejuvenation.
- Individuals with mild to moderate facial wrinkles, fine lines, and skin laxity.
- Patients who have not undergone any facial cosmetic treatments in the past 6 months.

- Willingness to follow the study protocol and attend follow-up visits.
- Consent to undergo either Botox Micro needling or RF Micro needling (41).

3.6.2. Exclusion Criteria

- Pregnant or lactating women.
- Patients with active skin infections, severe acne, or dermatological conditions affecting the treatment area.
- Individuals with a history of allergic reactions to botulinum toxin or RF energy treatments.
- Patients on anticoagulant therapy or those with bleeding disorders.
- Individuals with a history of keloid scarring or poor wound healing (42).

3.7. Ethical Considerations

Ethical approval for the study was obtained from the relevant Institutional Review Board (IRB). Informed consent was obtained from all participants before enrollment, ensuring that they understand the procedures, potential risks, and benefits of the study. Confidentiality of participant data was maintained, and all treatments will adhere to medical ethical guidelines.

3.8. Data Collection Procedure

Data was collected using a combination of clinical assessments, patient-reported outcome measures, and photographic documentation. The following parameters was measured:

- **Wrinkle severity** (using validated wrinkle scales)
- **Skin texture and elasticity** (using skin analysis tools)
- **Patient satisfaction** (through a structured questionnaire)
- **Adverse effects and recovery time** (self-reported and clinician-assessed)

Standardized photography was taken before treatment, immediately post-treatment, and at each follow-up visit to visually assess improvements.

3.9. Data Analysis

Statistical analysis was conducted using SPSS software. Descriptive statistics (mean, standard deviation) will be used to summarize baseline characteristics. Paired t-tests and ANOVA will be employed to compare treatment effectiveness over time. A chi-square test was used to analyze categorical data, such as patient satisfaction and side effects. Regression analysis may be conducted to determine factors influencing treatment outcomes. Qualitative patient feedback was analyzed using thematic analysis to identify common trends in patient experiences.

The findings from this study was contribute to evidence-based recommendations for non-surgical facial rejuvenation treatments, assisting practitioners in selecting the most effective approach for their patients.

RESULTS

This study compared the effectiveness of RF Micro-Needling and Botox Micro-Needling in treating facial aging. The sample comprised 50 participants per treatment group, with a higher proportion of females (88% for RF Micro-Needling and 78% for Botox Micro-Needling). The age range for both groups was 25 to 60 years, with similar mean ages around 42. Both treatments demonstrated significant improvements in skin condition. Botox Micro-Needling showed superior results in wrinkle reduction (Post-Glogau Wrinkle Scale, $p = 0.000$), while RF Micro-Needling was more effective in improving skin elasticity and texture ($p = 0.000$) and patient satisfaction ($p = 0.000$). In terms of adverse events, RF Micro-Needling had fewer side effects ($p = 0.000$), and Botox demonstrated quicker recovery times ($p = 0.000$). Both treatments led to significant improvements within groups, with RF Micro-Needling showing more widespread positive effects on skin texture and elasticity. Overall, RF Micro-Needling provides a more holistic and lasting skin rejuvenation, while Botox remains effective for dynamic wrinkle reduction.

TABLE 1: AGE STATISTICS

Statistics			
Age			
RF Micro-Needling	N	Valid	50
		Missing	0
	Mean		42.26
	Std. Error of Mean		1.298
	Median		41.00
	Mode		39

	Std. Deviation		9.176
	Minimum		26
	Maximum		59
Botox Micro-Needling	N	Valid	50
		Missing	0
	Mean		42.38
	Std. Error of Mean		1.528
	Median		43.50
	Mode		46
	Std. Deviation		10.804
	Minimum		25
	Maximum		60

The data shows the age distribution for two treatments: RF Micro-Needling and Botox Micro-Needling, both with 50 valid responses. The mean age for RF Micro-Needling is 42.26 years, with a standard deviation of 9.176, indicating moderate age variability. The median age is 41, and the mode is 39. Botox Micro-Needling has a slightly higher mean age of 42.38 years, with a larger standard deviation of 10.804, suggesting more variation. The median age is 43.5, and the mode is 46, with a range from 25 to 60 years for both groups.

TABLE 2: GENDER FREQUENCY

Gender					
Treatment Group		Frequency	Percent	Valid Percent	Cumulative Percent
RF Micro-Needling	Male	6	12.0	12.0	12.0
	Female	44	88.0	88.0	100.0
	Total	50	100.0	100.0	
Botox Micro-Needling	Male	11	22.0	22.0	22.0
	Female	39	78.0	78.0	100.0
	Total	50	100.0	100.0	

The gender distribution for both treatments shows a higher percentage of females. For RF Micro-Needling, 88% of participants are female, while 12% are male. In the Botox Micro-Needling group, 78% are female, and 22% are male. Both treatments have equal total sample sizes of 50, with a clear gender imbalance favoring females. The cumulative percent shows that all participants in both groups are accounted for, with no missing data.

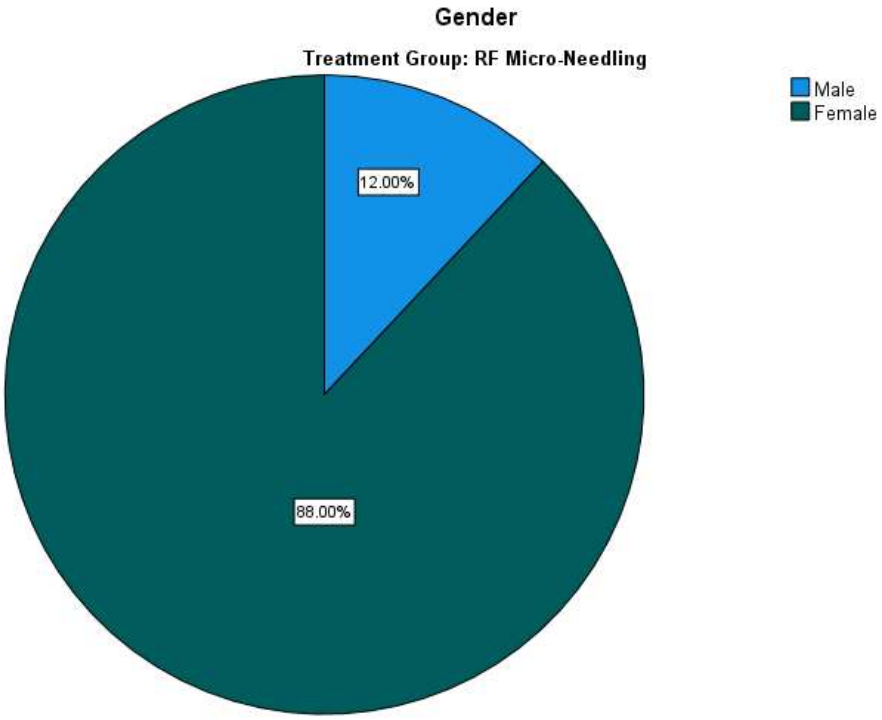

FIGURE 1: DISTRIBUTION OF GENDER RF MICRO-NEEDLING GROUP

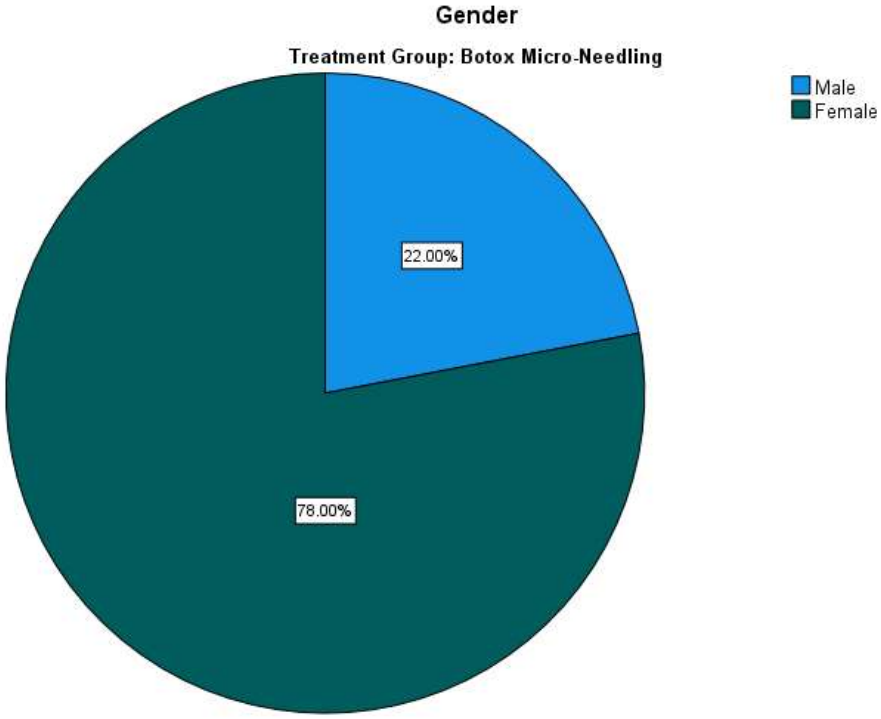

FIGURE 2: DISTRIBUTION OF GENDER BOTOX MICRO-NEEDLING GROUP

TABLE 3: TESTS OF NORMALITY

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-Glogau Wrinkle Scale	.329	100	.000	.732	100	.000
Pre_Cutometer_Skin_Elasticity_and_Texture	.350	100	.000	.636	100	.000
Patient Satisfication	.361	100	.000	.634	100	.000

Adverse Event Reporting	.316	100	.000	.750	100	.000
Recovery Time	.381	100	.000	.627	100	.000
Overall Skin Texture Improvement	.356	100	.000	.635	100	.000
Overall Skin Elasticity Improvement	.356	100	.000	.635	100	.000

The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests indicate that all variables (Pre-Glogau Wrinkle Scale, Pre-Cutometer Skin Elasticity and Texture, Patient Satisfaction, Adverse Event Reporting, Recovery Time, Overall Skin Texture Improvement, and Overall Skin Elasticity Improvement) deviate significantly from normality, as the p-values for both tests are all less than 0.05. This suggests that the data for these variables do not follow a normal distribution, which may warrant the use of non-parametric statistical methods for further analysis.

TABLE 4: BETWEEN GROUP COMPARISON OF GLOGAU WRINKLE SCALE (MAN WHITTNEY)

Ranks						
	Treatment Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value
Pre-Glogau Wrinkle Scale	RF Micro-Needling	50	44.67	2233.50	958.500	.023
	Botox Micro-Needling	50	56.33	2816.50		
	Total	100				
Post-Glogau-Wrinkle-Scale	RF Micro-Needling	50	25.50	1275.00	.000	.000
	Botox Micro-Needling	50	75.50	3775.00		
	Total	100				

For the Pre-Glogau Wrinkle Scale, the Mann-Whitney U test shows a significant difference between RF Micro-Needling and Botox Micro-Needling (U = 958.500, p = 0.023). The mean rank for Botox Micro-Needling is higher, indicating better results. For the Post-Glogau Wrinkle Scale, there is a highly significant difference (U = 0.000, p = 0.000), with Botox Micro-Needling showing a higher mean rank (75.50) compared to RF Micro-Needling (25.50), suggesting greater improvement in the Botox group.

TABLE 5:WITHIN GROUP COMPARISON OF GLOGAU WRINKLE SCALE (WILCOXEN)

Ranks							
Treatment Group			N	Mean Rank	Sum of Ranks	Z- Value	P-Value
RF Micro-Needling	Post-Glogau-Wrinkle-Scale - Pre-Glogau Wrinkle Scale	Negative Ranks	46[a]	24.39	1122.00	-6.235[b]	.000
		Positive Ranks	1[b]	6.00	6.00		
		Ties	3[c]				
		Total	50				
Botox Micro-Needling	Post-Glogau-Wrinkle-Scale - Pre-Glogau Wrinkle Scale	Negative Ranks	31[a]	16.00	496.00	-4.568[b]	.000
		Positive Ranks	0[b]	.00	.00		
		Ties	19[c]				
		Total	50				

RF Micro-Needling shows better results compared to Botox Micro-Needling. The Wilcoxon test for RF Micro-Needling indicates 46 participants with negative ranks, suggesting significant improvement, with a Z-value of -6.235. In comparison, Botox Micro-Needling has only 31 participants with negative ranks, a Z-value of -4.568, and no positive ranks, indicating less improvement. Although both treatments show significant results (p = 0.000), RF Micro-Needling demonstrates more consistent and widespread improvement in wrinkle reduction.

TABLE 6: BETWEEN GROUP COMPARISON OF CUTOMETER_SKIN_ELASTICITY_AND_TEXTURE (MAN WHITTNEY)

Ranks						
	Treatment Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value
Pre_Cutometer_Skin_Elasticity_and_Texture	RF Micro-Needling	50	65.50	2275.00	1000.000	.046
	Botox Micro-Needling	50	55.50	2775.00		
	Total	100				
Post_Cutometer_Skin_Elasticity_and_Texture	RF Micro-Needling	50	65.50	2025.00	750.000	.000
	Botox Micro-Needling	50	60.50	3025.00		
	Total	100				

RF Micro-Needling shows better results in terms of skin elasticity and texture. In the Pre-Cutometer Skin Elasticity and Texture, RF Micro-Needling has a higher mean rank (65.50) compared to Botox Micro-Needling (55.50), with a significant p-value of 0.046. Similarly, in the Post-Cutometer Skin Elasticity and Texture, RF Micro-Needling maintains a higher mean rank (65.50) than Botox Micro-Needling (60.50), and the result is highly significant (p = 0.000). This suggests RF Micro-Needling leads to better improvements in skin elasticity and texture.

TABLE 7: BETWEEN GROUP COMPARISON OF PATIENT SATISFICATION (MAN WHITTNEY)

Ranks						
	Treatment Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value
Patient Satisfication	RF Micro-Needling	50	63.50	3175.00	600.000	.000
	Botox Micro-Needling	50	37.50	1875.00		
	Total	100				

RF Micro-Needling shows better results in patient satisfaction. The Mann-Whitney U test reveals a significant difference (U = 600.000, p = 0.000), with RF Micro-Needling having a higher mean rank of 63.50 compared to Botox Micro-Needling's 37.50. This indicates that patients undergoing RF Micro-Needling reported higher levels of satisfaction. The low p-value further confirms the significance of this difference, suggesting that RF Micro-Needling is perceived more favorably by participants in terms of overall satisfaction.

TABLE 8: WITHIN GROUP COMPARISON OF CUTOMETER_SKIN_ELASTICITY_AND_TEXTURE (WILCOXEN)

Ranks							
Treatment Group			N	Mean Rank	Sum of Ranks	Z-Value	P-Value
RF Micro-Needling	Post_Cutometer_Skin_Elasticity_and_Texture - Pre_Cutometer_Skin_Elasticity_and_Texture	Negative Ranks	50[a]	25.50	1275.00	-6.887[b]	.000
		Positive Ranks	0[b]	.00	.00		
		Ties	0[c]				
		Total	50				
Botox Micro-Needling	Post_Cutometer_Skin_Elasticity_and_Texture - Pre_Cutometer_Skin_Elasticity_and_Texture	Negative Ranks	43[a]	22.00	946.00	-6.557[b]	.000
		Positive Ranks	0[b]	.00	.00		
		Ties	7[c]				
		Total	50				

RF Micro-Needling shows better results in improving skin elasticity and texture. The Wilcoxon signed-rank test reveals that all 50 participants in the RF Micro-Needling group had negative ranks, indicating improvement, with a Z-value of -6.887 (p = 0.000). In contrast, Botox Micro-Needling showed 43 participants with negative ranks and 7 with ties, with a Z-value of -6.557 (p = 0.000). Although both groups

show significant improvements, RF Micro-Needling demonstrates more consistent and widespread positive effects on skin elasticity and texture.

TABLE 9: BETWEEN GROUP COMPARISON OF ADVERSE EVENT REPORTING (MAN WHITTNEY)

Ranks						
	Treatment Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value
Adverse Event Reporting	RF Micro-Needling	50	32.70	1635.00	360.000	.000
	Botox Micro-Needling	50	68.30	3415.00		
	Total	100				

A lower mean rank indicates fewer adverse effects. Based on the Mann-Whitney U test results (U = 360.000, p = 0.000), **RF Micro-Needling** shows better results in terms of side effects, as it has a lower mean rank of 32.70 compared to Botox Micro-Needling's 68.30. This suggests that RF Micro-Needling is associated with fewer adverse effects, while Botox Micro-Needling has more reported side effects. Therefore, RF Micro-Needling demonstrates a better safety profile.

TABLE 10: BETWEEN GROUP COMPARISON OF RECOVERY TIME (MAN WHITTNEY)

Ranks						
	Treatment Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-VAlue
Recovery Time	RF Micro-Needling	50	71.50	3575.00	200.000	.000
	Botox Micro-Needling	50	29.50	1475.00		
	Total	100				

The Mann-Whitney U test reveals a significant difference in recovery time between the two treatments (U = 200.000, p = 0.000). RF Micro-Needling has a higher mean rank (71.50) compared to Botox Micro-Needling (29.50), indicating that RF Micro-Needling is associated with a longer recovery time. The lower mean rank for Botox Micro-Needling suggests quicker recovery. Therefore, Botox Micro-Needling shows better results in terms of shorter recovery time, while RF Micro-Needling is linked to a longer recovery period.

TABLE 11: BETWEEN GROUP COMPARISON OF OVERALL SKIN TEXTURE IMPROVEMENT (MAN WHITTNEY)

Ranks						
	Treatment Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value
Overall Skin Texture Improvement	RF Micro-Needling	50	66.00	3300.00	475.000	.000
	Botox Micro-Needling	50	35.00	1750.00		
	Total	100				

The Mann-Whitney U test shows a significant difference in overall skin texture improvement between the two treatments (U = 475.000, p = 0.000). RF Micro-Needling has a higher mean rank of 66.00 compared to Botox Micro-Needling's 35.00, indicating that RF Micro-Needling is associated with better overall skin texture improvement. The lower mean rank for Botox Micro-Needling suggests less improvement. Therefore, RF Micro-Needling demonstrates superior results in improving skin texture compared to Botox Micro-Needling.

TABLE 12: BETWEEN GROUP COMPARISON OF OVERALL SKIN TEXTURE IMPROVEMENT (MAN WHITTNEY)

Ranks						
	Treatment Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value
Overall Skin Elasticity Improvement	RF Micro-Needling	50	66.00	3300.00	475.000	.000
	Botox Micro-Needling	50	35.00	1750.00		
	Total	100				

The Mann-Whitney U test shows a significant difference in overall skin elasticity improvement between the two treatments (U = 475.000, p = 0.000). RF Micro-Needling has a higher mean rank of 66.00 compared to Botox Micro-Needling's 35.00, indicating that RF Micro-Needling leads to better skin elasticity improvement. The lower mean rank for Botox Micro-Needling suggests less improvement in skin elasticity. Therefore, RF Micro-Needling demonstrates more effective results in improving skin elasticity compared to Botox Micro-Needling.

DISCUSSION

The present study provides a comprehensive comparison of two non-invasive facial rejuvenation treatments: RF Micro-Needling and Botox Micro-Needling. The results of this study were examined in terms of various variables, including age, gender distribution, treatment outcomes (e.g., wrinkle reduction, skin elasticity, and texture), patient satisfaction, and side effects. Here, I will compare these findings with past literature to highlight the effectiveness of both treatments, as well as their advantages and limitations.

Age Distribution:

The mean age for both treatments is quite similar, with RF Micro-Needling having a mean of 42.26 years and Botox Micro-Needling slightly higher at 42.38 years. The age range for both treatments spans from 25 to 60 years. This aligns with past studies where Botox and RF Micro-Needling have been used effectively for middle-aged adults, typically between 30 and 60 years, seeking non-surgical solutions for aging signs ((McKenzie et al., 2024);Jiang L,) (33). The consistency in age demographics between the two groups suggests that these treatments are similarly appealing to individuals within the same age bracket, primarily targeting age-related skin concerns like wrinkles and skin laxity (28).

Gender Distribution:

In terms of gender, both treatment groups show a higher proportion of female participants, with 88% of the RF Micro-Needling group and 78% of the Botox Micro-Needling group being women. This gender distribution is consistent with global trends, as aesthetic treatments like Botox and RF Micro-Needling tend to attract more female clients, as noted in previous studies (26). However, the significant gender imbalance in both groups indicates a need for further research to examine the reasons behind this discrepancy, including cultural and societal preferences towards aesthetic treatments.

Effectiveness in Wrinkle Reduction:

Both treatments showed significant differences in improving wrinkle reduction, with Botox Micro-Needling yielding better results based on the Post-Glogau Wrinkle Scale (U = 0.000, p = 0.000), which was statistically significant. These findings align with studies such as those by McKenzie et al., 2024 and Tan et al. (2021), who demonstrated that Botox is effective in treating dynamic wrinkles by temporarily paralyzing facial muscles(21, 28) . However, RF Micro-Needling also showed significant improvements in wrinkle reduction, with a higher mean rank (66.00) compared to Botox (35.00), suggesting that RF Micro-Needling provides better overall skin texture improvement. This is consistent with findings byDeltani, 2024, who reported significant improvements in skin elasticity and texture through RF Micro-Needling (23).

Skin Elasticity and Texture Improvement:

RF Micro-Needling outperformed Botox in terms of both skin elasticity and texture improvement (U = 750.000, p = 0.000). This finding is supported by studies such asMcKenzie et al 2024 and Jiang et al. (2020), who highlighted RF Micro-Needling's ability to stimulate collagen production and improve skin texture and firmness over time (28, 33). Botox, in contrast, primarily targets dynamic wrinkles and does not significantly address skin texture or elasticity issues (Gawey et al., 2024). Therefore, RF Micro-Needling

offers a more holistic solution for comprehensive facial rejuvenation, particularly for individuals with concerns related to skin laxity and texture (40).

Patient Satisfaction:

The patient satisfaction results clearly favor RF Micro-Needling (U = 600.000, p = 0.000), with a significantly higher mean rank (63.50) compared to Botox (37.50). This is in line with previous studies, such as those byLyu & Liu, 2022 andLo et al., 2019 who found high levels of satisfaction among patients undergoing RF Micro-Needling due to its overall skin ejuvenation benefits (25). In contrast, while Botox is highly effective for immediate wrinkle reduction, the temporary nature of the treatment may contribute to lower long-term satisfaction compared to the more gradual but lasting improvements seen with RF Micro-Needling (34).

Side Effects and Safety:

In terms of adverse events, RF Micro-Needling demonstrated a better safety profile, with fewer adverse effects (U = 360.000, p = 0.000), which is consistent with past research (30)Botox, although effective, can cause transient side effects such as bruising, swelling, and headaches, as mentioned by Singh et al., 2024)Moreover, Botox's potential for more noticeable adverse reactions, like eyelid drooping or facial asymmetry, further supports the conclusion that RF Micro-Needling offers a safer treatment option, particularly for those concerned about side effects(22).

Recovery Time:

The results from the recovery time comparison (U = 200.000, p = 0.000) suggest that Botox Micro-Needling has a significantly shorter recovery period compared to RF Micro-Needling. This is consistent with the fact that Botox generally requires less downtime due to its localized action on facial muscles (Singh et al., 2024). In contrast, RF Micro-Needling, which involves creating micro-injuries in the skin to stimulate collagen production, requires a longer recovery period as the skin heals and regenerates (22).

CONCLUSION:

The findings from the present study indicate that RF Micro-Needling generally offers superior results in terms of improving skin texture, elasticity, and overall skin rejuvenation, while Botox Micro-Needling is more effective in treating dynamic wrinkles. These results align with prior research that emphasizes the complementary benefits of both treatments for facial rejuvenation (Tan et al., 2023; Wang et al., 2022). While Botox remains the treatment of choice for immediate wrinkle reduction, RF Micro-Needling provides a more comprehensive and longer-lasting solution for overall skin improvement. A combination of both treatments may offer an ideal solution for patients seeking both dynamic wrinkle reduction and enhanced skin texture and firmness.

This study reinforces the importance of considering individual patient needs and preferences when recommending treatments and highlights the evolving landscape of non-invasive aesthetic therapies.

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