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Skin Priming with Polyrevitalising Solution Could Improve the Efficacy of Radiofrequency Microneedling on Skin Rejuvenation: A Comparative Split Face Randomised Pilot Study

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Abstract

Background/Aim: Skin ageing is a complex process influenced by diverse intrinsic and extrinsic factors, leading to visible changes such as wrinkles, fine lines, pigmentation irregularities, and loss of elasticity. Radiofrequency (RF) microneedling devices are popular non-invasive tools for the treatment of wrinkles, stimulating collagen and tightening skin. As skin ages, it also loses hydration and biorevitalising solutions have been shown to combat this effect. The aim of this split-face, comparative, monocentric, randomised pilot study was to assess the synergistic efficacy and tolerability of combining biorevitalising solution with non-ablative radiofrequency (RF) microneedling for facial rejuvenation. **Study design/Methods:** One side of each participant's face (N = 6) was injected with biorevitalising solution at baseline. Both sides then received Virtue RF treatment on Days 7 - 10, 30 and 50. After each RF session, topical biorevitalising solution was applied on the same side as the initial baseline injection. Evaluations were conducted at baseline, Days 7 - 10, 30, 50 and 60, using clinical scoring, the Global Aesthetic Improvement Scale (investigator and subject), photography and local reaction monitoring. **Results:** Compared to RF microneedling alone, the combined treatment with biorevitalising solution resulted in greater improvements in skin tonicity, hydration, radiance, and a significant reduction in wrinkle scores. Treatment was well tolerated. **Conclusion:** The preliminary results of this pilot study support the use of biorevitalising solution in combination with RF microneedling as an effec-

tive approach for skin rejuvenation therapy.

Keywords

Aging, Biorevitalising Solution, Radiofrequency, Skin Quality, RF Microneedling

1. Introduction

Skin ageing is driven by two main factors, intrinsic ageing, which reflects the natural passage of time, and extrinsic ageing, which results from environmental exposures like ultraviolet radiation, smoking, and pollution [1]. As skin ages, it becomes thinner, drier, and less elastic due to reduced collagen, elastin, and sebum production, while extrinsic factors accelerate these changes and contribute to deep wrinkles, uneven pigmentation, and increased risk of skin cancers [1].

Polyrevitalising solutions are injectable treatments formulated to enhance skin hydration and counteract the damaging effects of ageing and oxidative stress by replenishing essential nutrients and supporting cellular regeneration [2]-[7]. A polyrevitalizing solution containing non-crosslinked hyaluronic acid (HA) in addition to vitamins, minerals, nucleic acids, amino acids, coenzymes and antioxidants has been developed by Laboratoires FILLMED (France) in an injectable formulation designed to compensate for the detrimental effects of skin aging and oxidative stress [2]-[6]. Fanian *et al.* showed through a prospective, multicentre, randomised controlled study that this biorevitalising solution effectively compensates for loss of hydration and reduces the signs of skin aging due to oxidative stress and photoaging [8]. The clinical and safety profile of this biorevitalising solution is further supported by over 20 years of widespread use in aesthetic medicine since 2006 [7].

Radiofrequency (RF) devices are non-invasive tools which deliver controlled heat (47˚C - 70˚C) to the dermis, leading to skin tightening, fat reduction and collagen stimulation little to no damage or downtime for patients, making it an efficient solution for the treatment of wrinkles [9]-[11]. RF microneedling is a minimally invasive treatment that combines traditional non-ablative RF technology with microneedling to enhance skin rejuvenation by stimulating dermal remodelling and neocollagenesis [12]. Clinical studies have shown that RF microneedling can be safely used across diverse skin types and continues to improve skin texture, elasticity, and tone for months after treatment, making it effective for skin rejuvenation and age-related concerns [12] [13].

Both biorevitalising solutions and RF microneedling aim to improve facial skin contour and wrinkles using significantly different approaches—biochemical revitalisation versus energy-based stimulation. This is the first study to evaluate the synergistic effects of combining biorevitalising solution and RF microneedling for facial rejuvenation. This split-face, comparative, monocentric, randomised pilot

study was designed to assess whether adding biorevitalising solution to RF microneedling improves clinical outcomes and patient satisfaction with facial rejuvenation treatment.

2. Materials and Methods

This was a split-face, comparative, monocentric, randomised pilot study conducted in six healthy participants aged between 30 and 55 years. Informed consent was obtained from all participants. This study was conducted at the Hair and Skin Center, Dubai, UAE.

During their first visit, all participants received the injection of a biorevitalising solution containing non-crosslinked hyaluronic acid (HA) in addition to vitamins, minerals, nucleosides, amino acids, coenzymes and antioxidants (Laboratories FILLMED, France) on one randomized side of the face 20 - 30 minutes after topical anaesthetic had been applied. The injections were administered in a grid pattern across the treatment area to ensure an even distribution. A total of 3 mL biorevitalising solution was injected per side using the method of intradermic multi-injection. After 7 - 10 days, microneedling RF (using Virtue RF™; Shenb Co., Ltd., Seoul, Korea) was performed systematically on both sides of the participant's face, 20 - 30 minutes after topical anaesthetic had been applied, to ensure even coverage and consistent delivery of RF energy (see Table 1 for suggested parameters). This was followed by topical application of biorevitalising solution using a sterile gauze on the same side of the face as the baseline biorevitalising solution injection, which was covered by a plastic sheet for 30 minutes. RF microneedling and topical application of biorevitalising solution was repeated on Days 30 and 50.

Table 1. Microneedling RF parameters.

Area	Needle Depth (mm)	RF Power Level	Pulse Duration (ms)	Number of Passes
Periorbital	0.5 - 1.0	1 - 3	100 - 300	1 - 2
Face	1.0 - 2.5	3 - 5	400 - 600	2 - 3
Jawline & Neck	2.0 - 3.5	4 - 7	400 - 600	2 - 3

Important considerations

- Always perform a test spot before full treatment
- For darker skin types (Fitzpatrick IV - VI), use lower energy and depth to reduce the risk of post-inflammatory hyperpigmentation
- Adjust parameters based on patient's tolerance and specific indications (e.g., skin laxity, acne scars)
- Pre- and post-treatment care (e.g., sun protection, gentle cleansers, moisturizers) is essential

The participants were evaluated on both sides of the face at baseline and on Days 7 - 10, 30, 50 and 10 days after the last treatment (Day 60) by one dermatologist and one aesthetic clinician. Evaluation included clinical scores using 4 or 9-point scales for pore size, skin radiance, hydration, firmness and homogeneity. Expert grading of skin wrinkles was performed using the Bazin scale for crow's

feet, forehead and nasolabial wrinkles and for lower face sagging [14]. Global Aesthetic Improvement Scale (GAIS) investigator and subject satisfaction was recorded at baseline and on Days 7, 30, 50 and 60, and photography completed before and after treatment. Treatment tolerability was assessed using a local reaction evaluation score, which included assessments of erythema, ecchymosis, hematoma, oedema, dyschromia, papules, and pruritus. Each reaction was scored from 0 (no problem) to 3 (severe reaction).

Comparisons to baseline and between treatment sides were analysed using the Student's t-test; a p-value < 0.05 was considered indicative of clinically significant improvement. As this is a split-face paired study, the given small sample size could be acceptable considering that the distribution of paired differences was examined and showed no marked asymmetry or outliers, supporting the use of this parametric test in the present pilot study. In addition, althoughthis is a small prospective study with limited statistical power, the frequency and consistency of the observed effects is sufficiently high, sometimes present in 100% of subjects, which provides additional support for the small sample group.

3. Results

Combining biorevitalising solution with RF microneedling resulted in a clinically significant improvement from baseline at Day 50 and Day 60 for skin firmness (both $p = 0.003$), hydration (both $p = 0.03$), radiance ($p = 0.001$ and $p = 0.0005$, respectively) and homogeneity ($p = 0.01$ and $p = 0.002$, respectively) (**Figures 1(A)-(D)**). Based on the Bazin scores, significant improvements were also observed for forehead wrinkles at Day 50 and Day 60 (both $p = 0.007$) versus baseline (**Figure 1(E)**). Compared to fractional RF microneedling alone, combination treatment with biorevitalising solution achieved greater improvement across clinical scoring measures for firmness, hydration, radiance, homogeneity, pore size and crow's feet wrinkles up to Day 60, although clinically significant differences were only observed with forehead wrinkles at Day 50 and 60 ($p = 0.007$) (**Figure 1**).

Participants reported significantly improved overall aesthetic impressions based on the GAIS at Days 30, 50, and 60 compared to baseline for both sides, with a significant difference in favour of the side treated with biorevitalising solution ($p = 0.011$ at Day 50 and $p = 0.002$ at Day 60) (**Figure 2**). Investigator GAIS showed a significant improvement in satisfaction only for the side treated with biorevitalising solution at all time points after Day 7 ($p \leq 0.005$). The difference between the two treatments was pronounced at Day 30, Day 50 and Day 60 with a superiority for the side treated with biorevitalising solution, although the difference was not significant (**Figure 2**). The visual improvements are shown in **Figure 3**.

Regarding treatment tolerability, the most commonly reported reactions following the procedure were erythema and oedema, with equivalent intensity on both sides of the face.

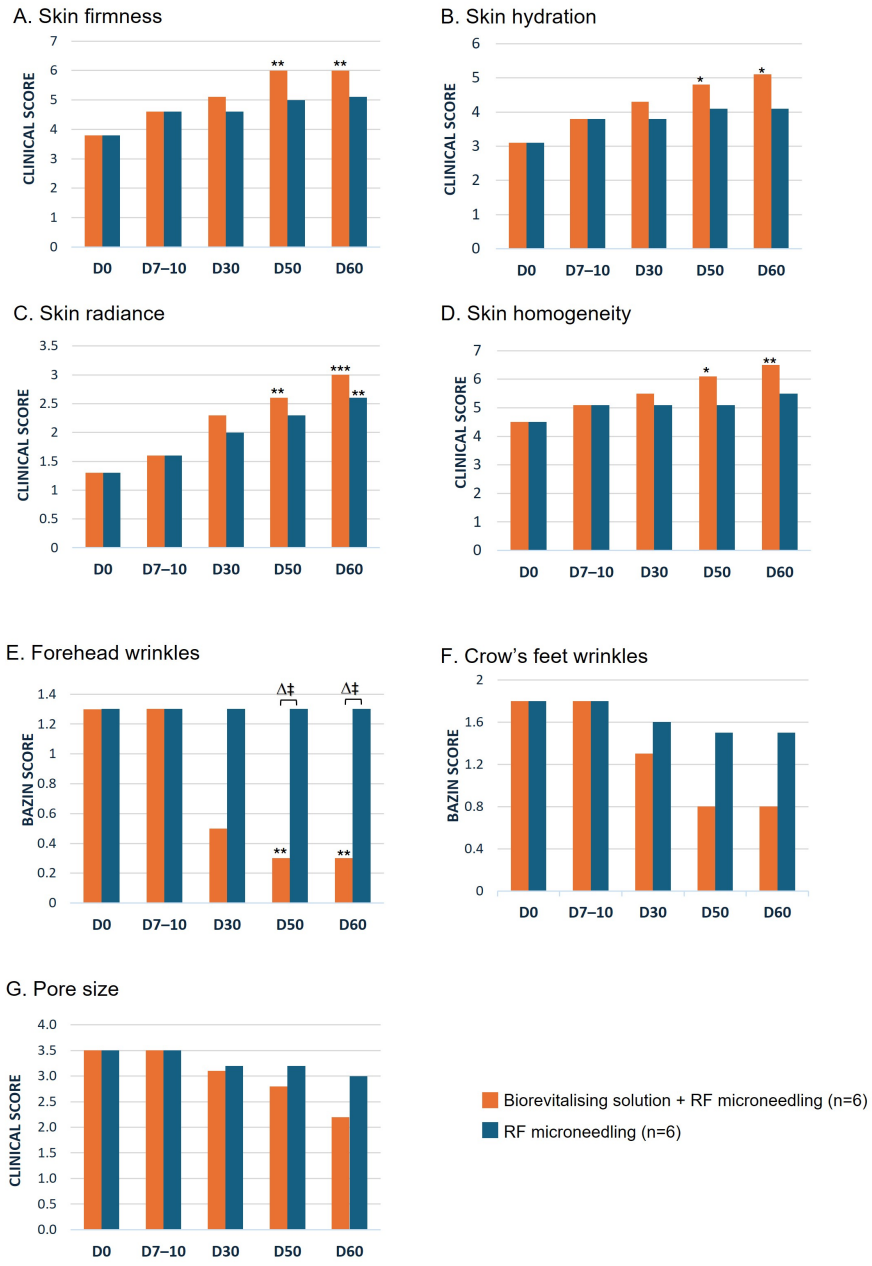

Figure 1. Clinical scoring outcomes over 60 days with biorevitalising solution and RF microneedling compared to RF microneedling alone. *p < 0.05, **p < 0.01, ***p ≤ 0.001 versus baseline; ‡p < 0.01 versus the control (RF alone) at the same timepoint. Rating scales were: Radiance, 0 (worst) to 4 (best); Pore size 0 (best) to 9 (worst); Hydration, Firmness and Homogeneity, 0 (worst) to 9 (best); Wrinkle Bazin scores, 0 (no wrinkles) to 5 (very deep). D, day; RF, radiofrequency.

4. Discussion

This pilot study demonstrated that the combination of biorevitalising solution with RF microneedling yielded significant improvements in key clinical outcomes for skin rejuvenation compared to baseline, and showed meaningful improvements compared to RF microneedling alone. Notably, statistically significant im-

provements relative to RF microneedling alone were observed in forehead wrinkles and subject GAIS scores.

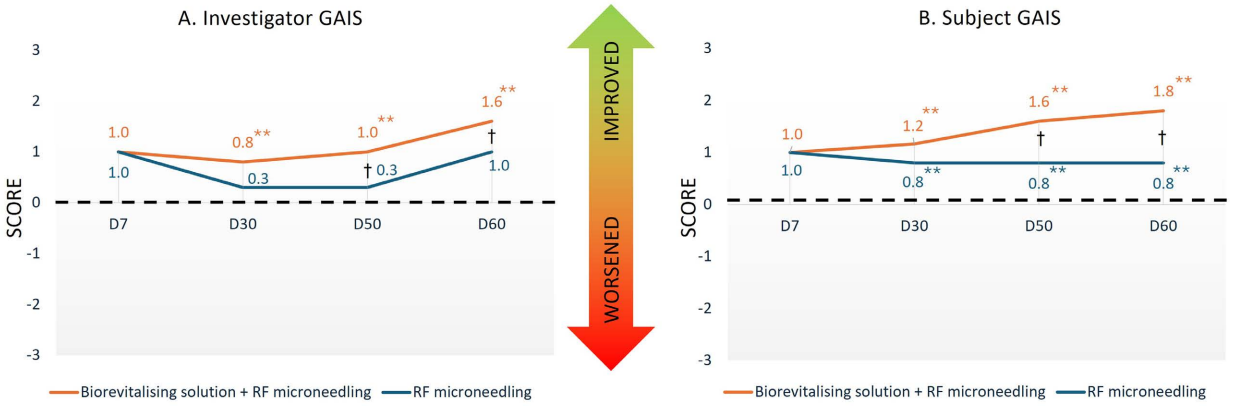

Figure 2. GAIS outcomes for investigators (panel A) and subjects (panel B) over 60 days with biorevitalising solution combined with RF microneedling compared to RF microneedling alone. **p ≤ 0.005 versus baseline; †p ≤ 0.01 versus control (RF alone) at the same timepoint. GAIS scores rate from −3 (very much worse) to 3 (very much improved) with 0 indicating "no change". D, day; GAIS, Global Aesthetic Improvement Scale; RF, radiofrequency.

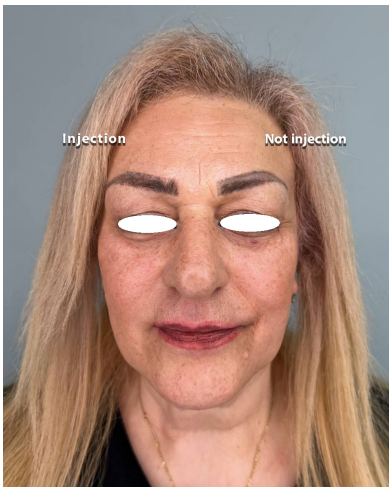

Figure 3. A 62-year-old woman, injected with biorevitalising solution combined with RF microneedling (left side) versus RF alone (right side).

Both biorevitalising solutions and RF microneedling are established, minimally invasive skin rejuvenation techniques. The classic application root of biorevitalising solution are the multiple intradermal injections with minimal discomfort and rapid recovery however it needs a 30 to 45 minutes of topical anaesthesia. On the other hand, the RF microneedling is a well known treatment for skin rejuvenation and tightening. Combining these two technologies showed a synergic effect while the small pores created by RF could be served as the microchannels of drug delivery system enhancing their biological activity. Once delivered into the RF-activated dermis, the solution's bioactive constituents may act as metabolic substrates and cofactors that enhance fibroblast activity, upregulate procollagen synthesis,

and facilitate extracellular matrix remodelling triggered by thermal micro-injuries, thereby providing a mechanistic basis for the observed synergistic effect.

It is important to note that an interval of 7 - 10 days between the baseline biorevitalising solution injection and the first RF session was used to negate any degradation of HA filler in the tissue, which has been reported when performing RF immediately after HA filler injections [15].

The strength of this pilot study was the split-face design, allowing for direct intra-individual comparison between biorevitalising solution combined with RF microneedling and RF microneedling alone. However, a key limitation of this study was the small number of participants enrolled and that it was conducted at a single centre (in Dubai), restricting the generalisability and statistical power of the findings. Given these results, further research involving a larger cohort including more diverse populations and skin types as well as extended follow-up would be valuable to more robustly evaluate this combination treatment.

5. Conclusion

In this preliminary study, combining a biorevitalising solution with RF microneedling for skin rejuvenation resulted in improved clinical and satisfaction scores compared with RF alone, with significant improvements observed for forehead wrinkles and subject GAIS. Combining these treatments would allow for personalised treatment plans to address specific skin concerns, such as aging, laxity, dehydration and uneven texture. Furthermore, powerful studies are highly recommended to prove this hypothesis.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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