

REVIEW

Multisource radiofrequency for fractional skin resurfacing—significant reduction of wrinkles

SERGE DAHAN¹, ISABELLE ROUSSEAUX² & HUGUES CARTIER³

¹Clinique St Jean Languedoc, Toulouse, France, ²Cabinet de Dermatologie Esthétique, Lille Côté Sud, Loos, France, and ³Centre médical Saint Jean, Arras, France

Abstract

Background: Skin roughness, color change, wrinkles and skin laxity are the main characteristics of aging skin. Dermatologists and plastic surgeons look for a treatment that will provide both epidermal resurfacing for the improvement of skin roughness and deep volumetric heating that will trigger collagen remodeling in the dermis to reduce wrinkles and skin laxity. These goals should be achieved with minimal pain and downtime. **Methods:** The study included 10 subjects (Fitzpatrick's skin type 2–3) with Fitzpatrick wrinkle and elastosis scale of 5–8 (average 7.3). Treatment was done with the Fractional skin resurfacing handpiece of the EndyMed PRO multisource radiofrequency system (EndyMed Ltd, Cesarea, Israel). Treatment was repeated each month up to a total of three treatment sessions. Patients' photographs were graded according to accepted scales by a board certified dermatologists. Patients' pain and satisfaction were scored using dedicated questionnaires. Doctors' satisfaction was also evaluated. **Results:** Post treatment skin erythema was noted in all treated patients, lasting up to 10 hours. Fifty six percent of patients reported no pain after treatment, and the rest (44%) reported minimal pain. All patients showed significant reduction in the Fitzpatrick wrinkle score. Average Fitzpatrick wrinkle score was 7.3 at baseline, 4.9 at 1 month after the first treatment, 4.2 at 1 month after the second treatment, and 4.1 at 1 month after the third treatment. The score was similar at 3 months after the third treatment with a score of 4.1. When asked at the end of three treatment sessions, all patients answered they will recommend the treatment to their friends (66% "definitely yes" and 33% "yes"). When asked the same question 3 months after the end of treatment, all patients (100%) answered "definitely yes".

Key Words: lasers and light sources, surgery

Introduction

Skin roughness, color change, wrinkles and skin laxity are the main characteristics of aging skin. Dermatologists and plastic surgeons look for a treatment that will provide both epidermal resurfacing for the improvement of skin roughness and deep volumetric heating that will trigger collagen remodeling in the dermis to reduce wrinkles and skin laxity. These goals should be achieved with minimal pain and downtime.

Ablating or "resurfacing" the skin removes the upper layer of the skin, allowing the natural mechanism of epidermal and dermal renewal to form a new layer of healthier and better-looking skin after the procedure. Although full surface resurfacing by chemical peels, mechanical dermabrasion or pulsed carbon dioxide (CO₂) laser devices are considered to

be very effective treatment options for skin resurfacing (6,12–14), these full face procedures are usually quite painful and involve considerable downtime and possible infectious and pigmentation risks. Fractional skin resurfacing (FSR) using laser devices was developed to address the shortcomings of ablative and non-ablative device modalities (7,8,9), performing ablation on small microscopic "dots" of skin allowing rapid healing with minimal pain and downtime. Although fractional ablation of the epidermis can be achieved with various types of laser systems, the amount of dermal volumetric heating which is crucial for collagen remodeling is very limited (5–7%).

In the current study, we performed FSR using the unique EndyMed PRO multisource radiofrequency system. The EndyMed PRO System is an FDA cleared computerized system that generates pulses of

radio frequency (RF) energy which are emitted into the skin, causing a non-ablative deep dermal heating effect and resulting in skin tightening. In addition to the effect of skin tightening, RF energy can be used for micro-ablative FSR. The FDA cleared FSR handpiece contains a matrix of 112 tiny RF electrodes, allowing for the first time simultaneous fractional microablation of the epidermis together with volumetric heating of 100% of the dermis. In contrast to other RF systems in market that use one source of RF (monopolar/bipolar), the EndyMed system employs six independent RF generators. This unique technology provides the capability to combine epidermal fractional microablation and deep non-ablative dermal heating—allowing the optimal multi-layer treatment needed for the treatment of aged and sagged skin.

Methods

The study included 10 subjects (Fitzpatrick's skin type 2–3) with a Fitzpatrick wrinkle scale of 5–8 (average 7.3). Treatment was performed with the Fractional Skin Resurfacing handpiece of the EndyMed PRO multi-source RF system (EndyMed Ltd, Caesarea, Figure 1). Some patients were treated in more than one area. Treatment was repeated each month up to a total of three treatment sessions. Treatment parameters varied according to patient's skin condition and the specific area that was treated (Table 1). Patients' photographs were graded according to scales accepted by board certified dermatologists. Patients' pain and satisfaction were scored using dedicated questionnaires. Doctors' satisfaction was also evaluated.

Patients were assessed by an independent board of certified dermatologists at baseline, the end of three treatments and at 1 and 3 months after the end of the treatment sessions according to the Fitzpatrick's wrinkles and elastosis scale. The patients, (nine women, one man), aged 53–68 years

(average 60.9), were enrolled in the study after meeting all inclusion/exclusion criteria and providing signed informed consent forms.

Topical anesthesia (EMLA) was applied 30 minutes prior to treatment initiation. Treatment area was cleaned with a wet gauze (to remove lotion and make-up) followed by moist gauze with 70% alcohol. The treatment tip was positioned on the treated area. RF pulse was released. For the second RF pulse, the tip was repositioned next to the previous treated spot and another pulse was emitted. Procedure was repeated until all area intended for treatment was covered. The use of a moisturizing cream (Ortho Dermatologics Topical Emulsion, Biafine) was recommended post treatment.

Treated areas were visually assessed for skin responses, including edema, erythema, hypopigmentation, hyperpigmentation, and textural changes following treatment. During the treatment, subjects were asked to rate their overall pain level on a four-point scale (none, mild, moderate and severe pain).

Results

Nine of the ten treated patients completed three treatment sessions while one patient completed only one treatment (reason unrelated to the study). As expected, patients' skin was red for up to 10 hours following treatment, micro crusts were formed one to two days following treatment and resolved within 5–7 days following treatment (Table 2, Figure 2). Overall, the clinical downtime, which is considered as the time it takes until patient can resume normal life activities (such as going back to work, etc.), was less than 24 hours. No unexpected adverse side effects were detected or reported. There were no incidences of infections, scarring, hypopigmentation, or any other serious complications. Some of the patients' Before and After photos are presented in Figures 4–8 below.



Figure 1. Thermal imaging of the FSR application pulse of EndyMed PRO multi-source RF system (EndyMed Ltd, Caesarea, Israel), showing significant volumetric heating (ThermaCAM SC 640). A – Ambient temperature of air (Orange). B – Ambient temperature of treated medium (Black). C – Varying temperature after FSR pulse.

Table 1. The different parameters that were used according to the treatment area.

Treatment Area	Number of Patients	Energy (Watt)	Pulse Duration (msec)
Face	9	3–5	30
Neck	2	3	30
Decolte	1	3	30

Table 2. Appearance and disappearance of the different clinical effects post treatment.

Effect	Time of appearance after treatment	Time of disappearance after treatment
Erythema	Immediate	Up to 10 hours
Micro-Crusts	1–2 days post treatment	5–7 days post treatment



Figure 2. Appearance of micro-crusts 1–2 days post treatment (Left). Micro-crusts begin to peel off 3–4 days post treatment (Right).

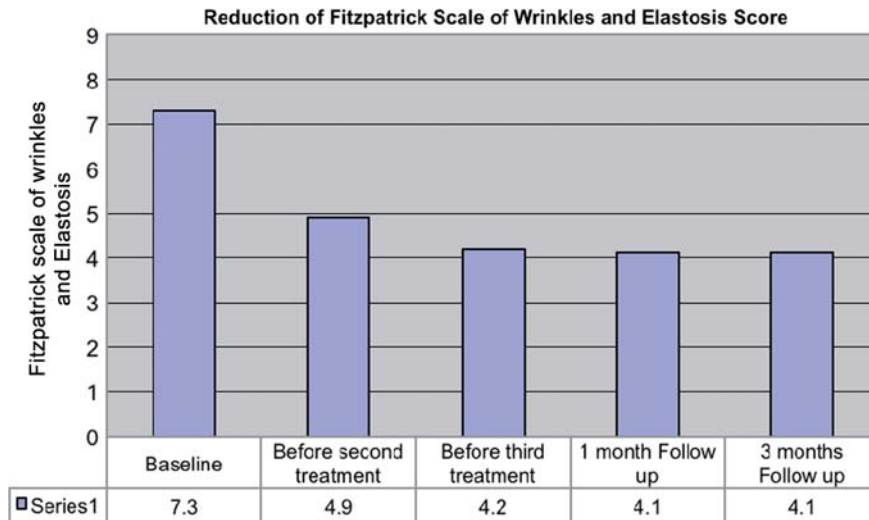


Figure 3. Significant reduction of the average Fitzpatrick’s wrinkle score after the first treatment, further decrease in 1 month after the second treatment with stabilization of the effects through the 1 and 3-month follow-ups.



Figure 4. Significant reduction of moderate depth facial wrinkles 3 weeks after one skin resurfacing treatment. Parameters; 4 Watts, 30 msec. Left – Before treatment, Right – After treatment. Fractional Skin Resurfacing handpiece of the EndyMed PRO multi-source RF system (EndyMed Ltd, Caesarea, Israel.) Photo: Dr. Serge Dahan, Toulouse, France.



Figure 5. Significant reduction of moderate depth facial wrinkles one months after one skin resurfacing treatment. Parameters; 3 Watts, 30 msec. Left – Before treatment, Right – After treatment. Fractional Skin Resurfacing handpiece of the EndyMed PRO multi-source RF system (EndyMed Ltd, Caesarea, Israel). Photo: Dr. Serge Dahan, Toulouse, France.



Figure 6. Significant improvement of skin texture and wrinkle reduction on the decollete area 3 months after one Fractional RF Resurfacing session. Parameters; 3 Watts, 30 msec. Left – Before treatment, Right – After treatment. Fractional Skin Resurfacing handpiece of the EndyMed PRO multi-source RF system (EndyMed Ltd, Caesarea, Israel). Photo: Dr. Isabelle Rousseaux, Loos, France.



Figure 7. Significant improvement of skin laxity and wrinkle reduction in the neck area 7 months after one Fractional RF Resurfacing session. Parameters; 3 Watts, 30 msec. Left – Before treatment, Down – After treatment. Fractional Skin Resurfacing handpiece of the EndyMed PRO multi-source RF system (EndyMed Ltd, Caesarea, Israel). Photo: Dr. Isabelle Rousseaux, Loos, France.



Figure 8. Significant improvement in skin laxity and wrinkle reduction on the nasolabial fold area 1.5 months after one Fractional RF Resurfacing session. Parameters: 5 Watts, 30 msec. up to 3 passes. Left – Before treatment, Right – After treatment. Fractional Skin Resurfacing handpiece of the EndyMed PRO, multi-source RF system (EndyMed Ltd, Caesarea, Israel). Photo: Dr Hugues Cartier, Arras, France.

Physician evaluation

All patients showed significant reduction in the Fitzpatrick wrinkle score improvement in skin texture as a result of the treatment. The average Fitzpatrick wrinkle score was 7.3 at baseline, decreased to 4.9 at 1 month after the first treatment, to 4.2 at 1 month after the second treatment, and to 4.1 at one month after the third treatment. The score was similar at 3 months after the third treatment with a score of 4.1 (Figures 3).

In addition to clinical evaluation of the results using the Fitzpatrick wrinkle scale, we monitored physician subjective experience using customized satisfaction questionnaires. Scoring was based on accepted satisfaction multiple-choice scales: very satisfied-5, somewhat satisfied-4, neutral-3, somewhat dissatisfied-2, very dissatisfied -1.

When physicians were asked “Over all, how satisfied are you with the EndyMed Pro system for skin resurfacing?”, the average score was 4.66 (satisfied or very satisfied) (Figure 9).

Patients’ experience

When asked “Did you experience any pain during the treatment?”, 56% of the patients reported no pain after treatment, and the rest (44%) reported minimal pain (Figure 10).

When asked “Did you experience any inconvenience after the treatment?”, 65% of patients reported no inconvenience after treatment, 11% reported minimal inconvenience and 22% reported moderate inconvenience.

When asked “Did the treatment meet your expectations?”, at the end of 3 treatments 55% responded “yes”, while 34 responded “yes to some extent” and 11% “yes to low extent”. Interestingly when asked the same question 1 months and 3 months after the end of treatment, 85 and 87.5%, respectively, answered “definitely yes” (Figure 11).

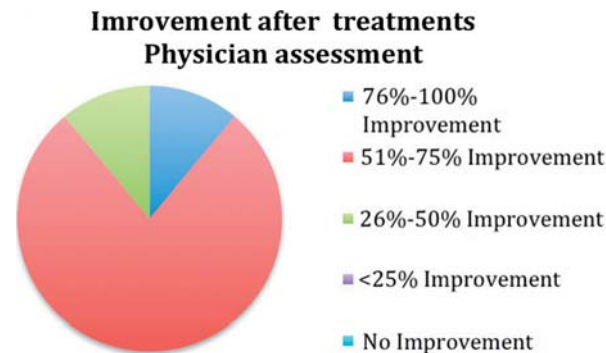


Figure 9. Physicians were asked to rate the general esthetic improvement of each of the treated patients according to the aesthetic improvement scale. 11% were graded as excellent (76–100%) improvement, 77% of patients were graded as very good (51–75%) improvement and the rest 12% as good (26–50%) improvement.

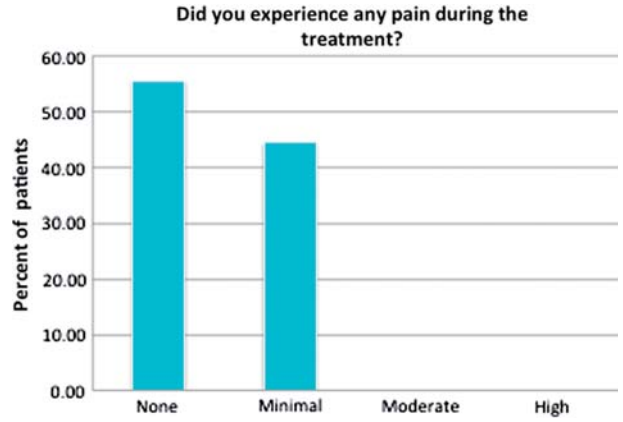


Figure 10. Fifty six percent of patients reported no pain after treatment, and the rest (44%) reported minimal pain.

When asked at the end of three treatments “Would you recommend the FSR treatment to your colleagues and friends?”, 67% of patients answered “definitely yes” and 33% answered “yes”. When asked the same question 3 months after the end of treatment all patients (100%) answered “yes” (Figure 12).

Discussion and conclusions

Body and face, non-ablative skin tightening using multisource RF (EndyMed PRO) is one of the leading technologies for this purpose in France. In the present report we describe for the first time in France, clinical data from a multiclinic study using a unique RF based Multisource Fractional RF applicator added to the same platform. This RF based Multisource Fractional RF applicator adds to potent non-ablative skin tightening, a combination of RF microablation and volumetric deep dermal heating for the simultaneous epidermal and dermal skin rejuvenation effect (1–5).

The intrinsic disadvantage of current laser fractional systems is the low volume of dermal heating

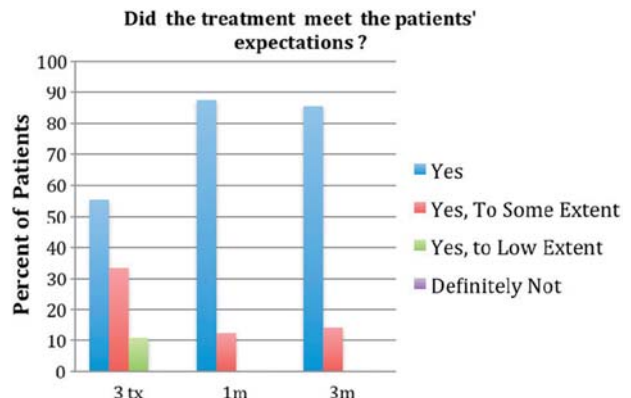


Figure 11. Patients were asked whether the treatment fulfilled their expectations; after end of three treatment session, and 1 and 3 months after the last treatment session.

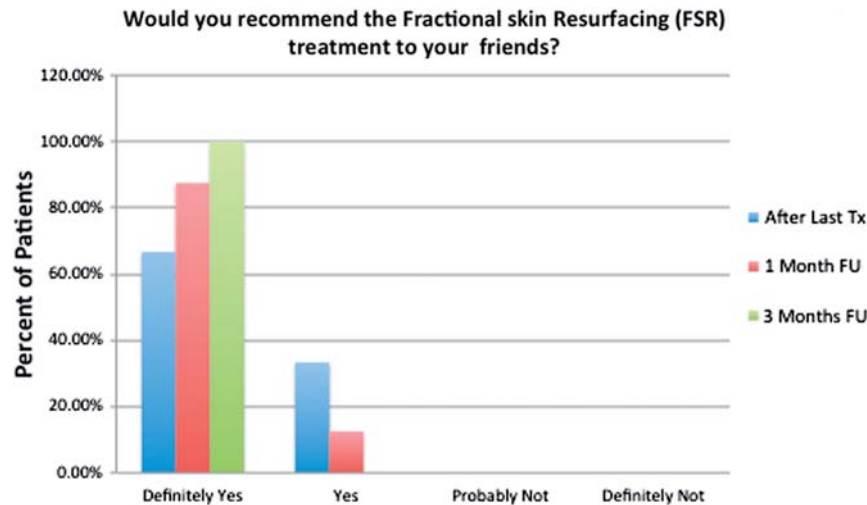


Figure 12. Patients were asked if they would recommend the treatment to their friends, after the end of three treatment session, and 1 and 3 months after the last treatment session.

(narrow laser beam) and the inability to differentiate between epidermal ablation and dermal heating. Fractional lasers must be used at a higher laser power in order to increase volumetric heating in the dermis. This will significantly increase epidermal ablation downtime and possible side effects such as prolonged erythema and post-inflammatory hyperpigmentation. Decreasing laser power will provide good epidermal results with little or no dermal effect (5).

Fractional resurfacing with RF results in dry microablation, thus downtime is shorter and the risk for side effects such as infection are minimal as compared to laser resurfacing methods that result in open wounds. Clinically, the affected areas are erythematous and mildly edematous after treatment, but resolve within few hours. This rapid healing is likely related to the persistence of healthy unaffected tissue that remains between the ablated pulses after ablative fractional resurfacing (5,8,9).

Laboratory thermal study using EndyMed's Multisource fractional handpiece on Agar, have shown volumetric heating of the dermis up to 2.8 mm. with a concomitant epidermal ablation with a contact diameter of 300 micron and a depth of 100–150 micron which is optimal for fractional epidermal skin resurfacing. Animal studies have shown formation of micro crusts 1–2 days after treatment with full recovery of the epidermis in 5–7 days.

Sadick et al. have used the EndyMed Pro on 30 patients treating wrinkles on the face and acne scar. They reported clinical improvement in skin texture in patients with both wrinkles and acne scars. They also noted that the incidence of complications was much lower than that seen following traditional ablative resurfacing (6,7,11).

The treatment was well accepted by the patients with minimal or no pain after a 5% topical anesthetic cream (Emla). There was no need for post therapy treatment and patients were able to return to work with makeup as soon as one day after therapy. Micro crusts developed 24–48 hours after therapy and resolved 5–7 days after therapy.

Beneficial epidermal effects were noted starting 1 week after therapy and included significantly improved brightness of the skin, smoothing of the skin and decrease in pigmentary changes (senile lentigines). Four to six weeks after treatment dermal changes were noted including significant improvement in skin texture, reduction of wrinkles and skin laxity.

Most of the skin improvement was noticed following the first and second sessions, but a third treatment is recommended to improve patient satisfaction and in order to verify long term improvement.

Based on the above results we believe the new EndyMed Pro RF FSR procedure provides an exciting new option for effective multilayer skin rejuvenation and treatment of skin laxity with minimal discomfort and downtime.

Declaration of interest: The authors state no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

1. Elman M, Harth Y. Novel multi-source phase-controlled radiofrequency technology for non ablative and micro-ablative treatment of wrinkles, lax skin and acne scars. *Laser Ther.* 2011;20:139–144.
2. Harth Y, Lischinsky D. A novel method for real-time skin impedance measurement during radiofrequency skin tightening treatments. *J Cosmet Dermatol.* 2011;10:24–29.

3. Royo de la Torre J, Moreno-Moraga J, Muñoz E, Cornejo Navarro P. Multisource, phase-controlled radiofrequency for treatment of skin laxity: correlation between clinical and in-vivo confocal microscopy results and real-time thermal changes. *J Clin Aesthet Dermatol.* 2011;4:28–35.
4. Elman M, Vider I, Harth Y, Gottfried V, Shemer A. Non-invasive therapy of wrinkles, lax skin using a novel multi-source phase controlled radiofrequency system. *J Cosmet Laser Ther.* 2010;12:81–86.
5. Sadick NS, Sato M, Palmisano D, Frank I, Cohen H, Harth Y. In vivo animal histology and clinical evaluation of multisource fractional radiofrequency skin resurfacing (FSR) applicator. *J Cosmet Laser Ther.* 2011;13:204–209.
6. Walia S, Alster TS. Prolonged clinical and histologic effects from CO2 laser resurfacing of atrophic acne scars. *Dermatol Surg.* 1999;25:926–930.
7. Nanni CA, Alster TS. Complications of carbon dioxide laser resurfacing. An evaluation of 500 patients. *Dermatol Surg.* 1998;24:315–320.
8. Hantash BM, Bedi VP, Chan KF, Zachary CB. Ex vivo histological characterization of a novel ablative fractional resurfacing device. *Lasers Surg Med.* 2007;39:87–95.
9. Hantash BM, Bedi VP, Kapadia B, Rahman Z, Jiang K, Tanner H, et al. In vivo histological evaluation of a novel ablative fractional resurfacing device; *Lasers Surg Med.* 2007;39:96–107.
10. Brightman L, Goldman MP, Taub AF. Sublative rejuvenation: experience with a new fractional radiofrequency system for skin rejuvenation and repair. *J Drugs Dermatol.* 2009; 8:s9–s13.
11. Tanzi EL, Alster TS. Single-pass carbon dioxide versus multiple-pass Er: YAG laser skin resurfacing: A comparison of postoperative wound healing and side-effect rates. *Dermatol Surg.* 2003;29:80–84.
12. Chapas AM, Brightman L, Sukal S, Hale E, Daniel D, Bernstein LJ, Geronemus RG. Successful treatment of cuneiform scarring with CO2 ablative fractional resurfacing. *Lasers Surg Med.* 2008;40:381–386.
13. Walgrave SE, Ortiz AE, MacFalls HT, Elkeeb L, Truitt AK, Tournas JA, et al. Evaluation of a novel fractional resurfacing device for treatment of acne scarring. *Lasers Surg Med.* 2009;41:122–127.
14. Ortiz AE, Tremaine AM, Zachary CB. Long-term efficacy of a fractional resurfacing device. *Lasers Surg Med.* 2010; 42:168–170.

Copyright of Journal of Cosmetic & Laser Therapy is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.