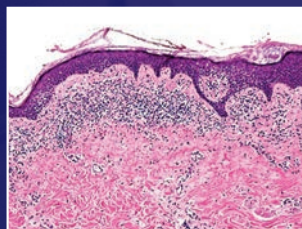


VOLUME 23 • NUMBER S3 • SEPTEMBER 2024

JCD



Journal of Cosmetic Dermatology

Real-World Experience Using a Multi-Modality
System using Intense Pulsed Light,
Radiofrequency Microneedling,
High-Intensity Focused Ultrasound, or
Thermal Radiofrequency, 808, HIFU for
Skin Rejuvenation Treatment

Editor-in-Chief
Michael H Gold

WILEY



Editor-in-Chief

Michael H. Gold, M.D.
Medical Director
Gold Skin Care Center
Tennessee Clinical Research
Center Nashville, TN, USA

Deputy Editors

Neil Sadick, MD
USA
Hector Leal-Silva, MD, PhD
Mexico
Andrzej Przylipiak, MD
Poland

Associate Editors

Mahima Agrawal, MD
India
Murad Alam, MD
USA
Michael Alfertshofer, MD
Germany
Miguel Aristizabal, MD
Columbia
Ofir Artzi, MD
Israel
Anthony Benedetto, DO
USA
Dario Bertossi, MD
Italy
Mohammad Beyzaee Amir, MD
Iran
Gabriela Casabona, MD
Spain
Mohamed Elsaie, MD
Egypt
Enzo Errichetti, MD
Italy
Susan Farshi, MD
Iran
David Goldberg, MD
USA
Mohamad Goldust, MD
Switzerland
Aditya Gupta, MD
Canada
Maya Habre, MD
Lebanon

Geraldine Jain, MD
India
Abhijeet Jha, MD
India
Lily Jiang, PhD
Singapore
Shang-Li Lin, MD
Taiwan
Chilicka Karolina, MD
Poland
Martin Kassir, MD
USA
Barkat Ali Khan,
Pakistan
Yuanhong Li, MD
China
Yi-Hua Liao, MD
Taiwan
Andrei Metelista, MD
Canada
Massimo Milani, MD
Italy
Ramin Moffarah, MD
Iran
Peter Peng, MD
Taiwan
Luca Potestio
Italy
Tina Priscilla, MD
India
Jaishree Sharad, MD
India
Eran Shavit, MD
Israel
Hector Leal Silva,
Mexico
Andrea Sisti, MD
USA
Yashdeep Singh Pathania, MD
India
Qiuning Sun, MD
China
Cuomo Roberto, MD
Italy
Payam Sadeghi, MD
USA
Cotofana Sebastian, MD
USA

Atchima Suwanchinda, MD
Thailand
Rashmi Sarkar, MD
India
Trang Vu- Unilever
USA
El Attar Yasmina, MD
India

Managing Editor

Angela Brown, B.B.A.
Executive Assistant to
Michael H. Gold, MD,
Gold Skin Care Center
Nashville, TN, USA

Senior Editor JCD Supplements

Sid Sonthalia, MD
India

Advisory Committee

Robert Baran, MD
France
Frederic Bonte, PhD
France
Joel Cohen, MD
USA
Valerio De Vita, MD
Italy
Ncoza Dlova
South Africa
Lisa Donofrio, MD
USA
Alina Fratila, MD
Germany
Bryan Fuller, PhD
USA
Barbara Green
USA
Eckart Haneke, MD
Norway
Jana Hercogova, MD
Czech Rep
Philippe Humbert, MD
France
Helen E. Knaggs, PhD
USA
Rong Kong, PhD
USA

Jurgen Lademann, MD
Germany
Jean-Luc Levy, MD
France
Torello Lotti, MD
Italy
Roger Lee Mendoza, PhD
USA
Gopi Menon, PhD
USA
Larry Millikan, MD
USA
Rhoda Narins, MD
USA
Keyvan Nouri, MD
USA
Christian Oresajo
USA
Lawrence Parish, MD
USA
Thomas Polefka, PhD
USAR
Andre Rougier, PhD
France
Tony Simion, PhD
USA
Shyam Verma, MBBS, DV&D
India
Daniel Wallach, MD
France
Teresa Weber, PhD
USA
Ronni Weinkauff
USA
Robert Weiss, MD
USA
Uwe Wollina, MD
Germany
Hana Zelenkova, MD
Slovakia

Founding Editor-in-Chief

Christopher Rowland Payne, MD,
BS, MRCP
UK

Previous Editor-in-Chief

Zoe Draelos, MD
USA

Disclaimer

The Publisher and Editors cannot be held responsible for any errors in or any consequences arising from the use of information contained in this journal. The views and opinions expressed do not necessarily reflect those of the Publisher and Editors, neither does the publication of advertisements constitute any endorsement by the Publisher, Editors, or Authors of the products advertised. Wiley Open Access articles posted to repositories or websites are without warranty from Wiley of any kind, either express or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. To the fullest extent permitted by law Wiley disclaims all liability for any loss or damage arising out of, or in connection, with the use of or inability to use the content.

Open Access and Copyright

All articles published by Journal of Cosmetic Dermatology submitted after October 12, 2022 are fully open access: immediately freely available to read,

download, and share. All articles accepted from October 12, 2022 are published under the terms of a Creative Commons license.

Copyright on any research article published by Journal of Cosmetic Dermatology is retained by the author(s).

Further information about open access licenses and copyright can be found at: <https://authorservices.wiley.com/author-resources/Journal-Authors/licensing/licensing-info-faqs.html#4>. Information on the licenses used by Journal of Cosmetic Dermatology can be found at: wileyonlinelibrary.com/journal/jocd.

For submission instructions and all other information visit: wileyonlinelibrary.com/journal/jocd

Journal of Cosmetic Dermatology

Volume 23 Number S3 September 2024



Contents

SUPPLEMENT ARTICLE

- 1 *M. Gold, B. Biesman, J. L. Cohen, D. J. Goldberg,
S. Guenin, T. Schlesinger, and Z. Taher*
Real-World Experience Using a Multi-Modality
System using Intense Pulsed Light, Radiofrequency
Microneedling, High-Intensity Focused Ultrasound,
or Thermal Radiofrequency, 808, HIFU for Skin
Rejuvenation Treatment

SUPPLEMENT ARTICLE OPEN ACCESS

Real-World Experience Using a Multi-Modality System using Intense Pulsed Light, Radiofrequency Microneedling, High-Intensity Focused Ultrasound, or Thermal Radiofrequency, 808, HIFU for Skin Rejuvenation Treatment

Michael Gold¹  | Brian Biesman²  | Joel L. Cohen³  | David J. Goldberg⁴  | Sophie Guenin⁵  | Todd Schlesinger⁶  | Zaki Taher⁷ 

¹Gold Skin Care Center, Nashville, Tennessee, USA | ²Nashville Center for Laser and Facial Surgery, Nashville, Tennessee, USA | ³AboutSkin Dermatology and AboutSkin Research, Greenwood Village, Colorado, USA | ⁴Schweiger Dermatology Group, Hackensack, New Jersey, USA | ⁵Department of Dermatology, Mount Sinai Hospital, New York, New York, USA | ⁶Clinical Research Center of the Carolinas, Charleston, South Carolina, USA | ⁷University of Alberta, Edmonton, Alberta, Canada

Correspondence: Sophie Guenin (sophiehelene.guenin@gmail.com)

Received: 5 August 2024 | **Revised:** 17 August 2024 | **Accepted:** 27 August 2024

Funding: All authors disclose support from MTF Biologics for conducting and selecting the real-world cases. MTF Biologics made the devices used for the real-world cases available.

Keywords: diode laser | Er:YAG laser | laser resurfacing | laser treatment | non-ablative lasers | pulsed laser

ABSTRACT

Background: Medical aesthetic procedures for facial rejuvenation with laser and energy-based devices (EBDs) are rapidly increasing. The following cases highlight real-life experience using a multi-modality system with various handpieces that combine intense pulsed light (IPL), laser hair removal (808 diode), high-intensity focused ultrasound (HIFU), radiofrequency microneedling (RFM), and thermal radiofrequency (RF) for antiaging and rejuvenation treatment. Laser and RFM treatments may improve skin conditions by inducing cutaneous changes that remodel the skin matrix.

Methods: Six physicians who treat patients for skin rejuvenation reported on clinical cases from their practice using a multi-modality system with various handpieces.

Results: During the meeting, the advisors discussed 15 cases and agreed to select seven patients with different ages and skin phototypes receiving various treatments for photodamage of the face, neck, and décolleté. The advisors discussed why they selected the case, previous treatment, type of treatment, results, and clinical pearls.

Conclusion: Sharing best practices in medical aesthetics using combination treatments on a single multi-modality energy-based device such as laser and MRF for facial, neck, and chest skin may support healthcare providers treating patients for skin rejuvenation to improve clinical outcomes.

Abbreviations: EBD, energy-based devices; FST, Fitzpatrick Skin Type; GAIS, Global Aesthetic Improvement Scale; HIFU, high-intensity focused ultrasound; IPL, intense pulsed light; NTTS, non-pole thermal structure; RF, radiofrequency; RFM, radiofrequency microneedling.

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2024 The Author(s). *Journal of Cosmetic Dermatology* published by Wiley Periodicals LLC.

1 | Introduction

According to the American Society of Plastic Surgeons, skin resurfacing and antiaging treatments with lasers and energy-based devices (EBD) were among the top five most popular minimally invasive procedures in 2022 within the United States [1]. In 2022, there were 3 322 292 skin resurfacing procedures performed which included dermabrasion, chemical peels, lasers (ablative/non-ablative), and microdermabrasion, while 2 915 199 skin treatments were performed using combination lasers such as laser hair removal, IPL treatment, laser tattoo removal, and laser treatment of veins. In addition, these statistics may be underestimations as they do not take into account procedures performed by physician assistants, nurse practitioners, or beauty aestheticians [2].

With the advantage of quick recovery times and rapid results, minimally invasive procedures continue to grow in demand. The Darwin workstation is a 5-in-1 device that allows for combination skin treatments that target all layers of the skin [3]. By swapping handpieces, the multi-modality system offers a customizable experience to provide treatment for hair removal, pigment and vascular lesions, acne, skin rejuvenation, scar and stretchmarks, and wrinkles. Offering five different non-invasive skin treatments, the Darwin aesthetic workstation is an efficient solution to high volume clinical practices. The five technologies offered by the Darwin system include intense pulse light (IPL), radiofrequency microneedling (RFM), high-intensity focused ultrasound (HIFU), thermal radio-frequency (RF), and laser hair removal (diode 808), which are detailed below [3].

1.1 | Intense Pulse Light (Lucent IPL)

IPL devices are a versatile tool that can treat a wide spectrum of conditions. The technology uses flashlamps and computer-controlled capacitor banks to generate pulsed polychromatic high-intensity light with wavelengths ranging from 500 to 1300nm with longer wavelengths penetrating more deeply into the skin (Figure 1) [4]. In short, IPL devices emit photons that are absorbed by endogenous or exogenous chromophores in the skin [4]. The absorption of photons leads to the transfer of energy

that generates heat to destruction of a target structure [4]. The wide spectrum of wavelengths emitted by IPL devices allows for multiple chromophores to be activated in a single exposure [4]. Therefore, skin type and condition will dictate cut-off filters and the spectrum of wavelengths to be emitted [4]. In general, IPL can treat acne vulgaris, pigmented lesions, vascular lesions, unwanted hair growth, photodamaged skin, scars, and angiokeratomas. Downtime after IPL treatment is minimal, and icepacks or low-potency steroid creams may be used to ease comfort level after the procedure [5]. Complications are rare with IPL; however, they may include burns, hyperpigmentation, hypopigmentation, or checkerboard-mottled skin [5].

The Darwin system contains seven filters for IPL treatments: 430, 516, 560, 585, 640, 700, and 755 nm [3]. In addition, the system provides four different pulse modes: single, double, triple, and toning, which provide for further adaptability of treatment regimens [3]. The IPL handpiece has three spot sizes to choose from with the largest spot size covering 14 mm x 40 mm, which optimizes patient visit times and practice efficiency [3].

1.2 | Thermal Radio-Frequency (Refresh)

RF devices produce electromagnetic radiation at varying frequencies to deliver focal thermal damage to skin tissue [6]. The dermis is heated uniformly to denature collagen and trigger collagen contraction and thickening which eventually leads to neocollagenesis and skin contraction via the natural wound-healing response [6]. Clinically, RF has been largely used for neck skin tightening, facial firming and lifting, eyelid and eyebrow lifting, and wrinkle reduction [6]. Other applications include acne vulgaris and atrophic scarring secondary to acne. Notably, unlike lasers, RF does not depend on chromophore absorption; thus, RF is suitable for all skin colors and types [6]. While uncommon, complications of RF may include erythema, bruising, and tingling pain [6].

The thermal RF handpiece in the Darwin system provides three different tip sizes and two treatment modes to treat skin aging [3]. The advantage of switching between two treatment modes, such as the shot and rubbing mode, is that it provides effective volumetric heating and therapeutic tissue stimulation [3]. While the shot mode shoots intensive thermal RF energy to the deep dermal tissues, the rubbing mode applies RF energy to the epidermal tissue in a safe and smooth manner to ensure patient comfort [3]. In addition, the RF mode integrates non-pole thermal structure (NTTS) technology which focuses the RF energy to deliver it in a uniform manner that immediately contracts collagen and promotes dermal remodeling without damaging the epidermis [3]. In addition, real-time temperature sensing technology ensures skin is heated to the correct temperature for optimal results in every treatment without the risk of burns or undertreatment.

1.3 | Radio-Frequency Microneedling (Prolift RFM)

RFM is a minimally invasive treatment that aids in skin rejuvenation through dermal remodeling and neocollagenesis [7]. It consists of RF combined with microneedling to penetrate

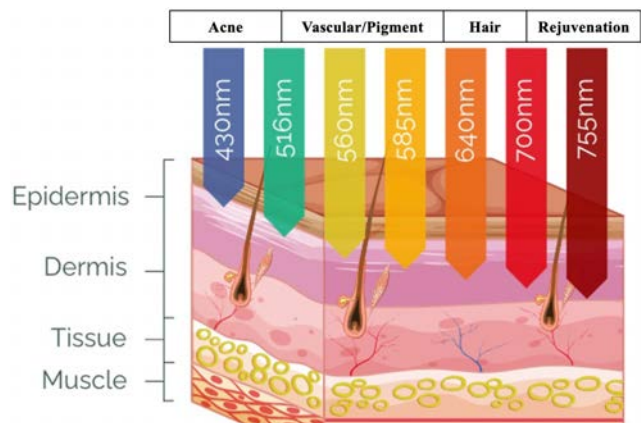


FIGURE 1 | Intense pulse light therapy wavelengths with corresponding conditions treated.

into the skin via mechanical and thermal energies [7]. The procedure relies on the mechanical effects of microneedles that penetrate into the skin to deliver heat in the form of radiofrequencies that stimulate growth factors to migrate and trigger proliferation of keratinocytes and fibroblasts necessary for skin remodeling [7]. RFM can primarily be used in the context of skin rejuvenation to improve skin tightness, reduces skin roughness, and target dyspigmentation in photoaged skin [7]. A systematic review on RFM revealed that there was about a 20% to 62% improvement in facial rhytids, skin laxity, and textural roughness after 1 to 3 RFM sessions [7]. Earliest skin rejuvenation results may be seen at 1–3 months [7]. RFM may also be used for acne vulgaris and axillary hyperhidrosis [7].

The RFM handpiece in the Darwin workstation combines vacuum technology and fractional RFM for delivery of thermal energy into the skin [3]. This thermal energy combined with microneedle penetration introduces minor injury to the skin, which stimulates the production of collagen and elastin [3]. In turn, the skin elasticity and texture are restored while decreasing the presence of fine lines and wrinkles [3]. A unique feature of the Darwin RFM is the vacuum in the hand piece which allows the needles to penetrate the skin uniformly. The vacuum feature combined with real-time impedance monitoring ensures all of the tissue is treated equally and optimally.

1.4 | High-Intensity Focused Ultrasound (Prolift HIFU)

HIFU is an energy modality that aims at skin tightening and lifting [8]. The technology functions by inducing focused thermal coagulative necrosis in the dermal layers of the skin via high-frequency ultrasound beams [8]. The volumetric tissue heating causes immediate collagen contraction and neocollagenesis over a period of 6 months, which leads to observable skin tightening [8]. This thermally induced contraction can penetrate deep into the superficial muscular aponeurotic system (SMAS), which leads to clinical lifting and tightening without damaging the epidermis or superficial skin [8]. The use of HIFU was first reported in aesthetic medicine in 2008; however, since then, the technology has been widely used for facial rejuvenation, lifting, tightening, and body contouring of the upper arms, extensor knees, and medial thighs [8, 9].

The HIFU handpiece in the Darwin system offers multiple cartridges to target different skin layers. The system includes three focused depths: 1.5mm for the superficial dermis, 3.0mm for the dermis, and 4.5mm for the SMAS where most lifting takes place [3]. Focused HIFU energy generates 65°C of heat delivered to accurate depths of the skin layer. The heat damages skin cells to stimulate collagen production, cell regrowth, and skin elasticity [3]. Complications are minimal with HIFU; however, if performed improperly, the procedure may be associated with skin burns or swelling [3]. In general, the treatment downtime is zero for most patients [3]. A unique feature of the Darwin HIFU is the safety assist transducer technology; this delivery method creates a cone shape which reduces heat buildup on the epidermis resulting in reduced pain for the patient and a significantly lower risk of potential side effects including vascular and nerve events.

1.5 | Diode Laser Hair Removal (Bare 808)

Laser hair removal and unwanted hair is one of the most commonly requested aesthetic procedures [10]. Laser hair removal aims to destroy the germinative cells in the hair follicle to produce long-lasting hair-free results [10]. Wavelengths of 600–1100 nm favor absorption by melanin in the hair matrix. Thus, long-pulse ruby (694 nm), long-pulse alexandrite (755 nm), long-pulse diode (810 nm), long-pulse Nd:YAG (1064 nm), and intense pulsed light (IPL) (590–1200 nm) destroy hair. Upon laser light emittance, melanin absorbs the light energy converting it to heat which is diffused to the surrounding hair-forming cells, thereby destroying them [10]. Despite varying wavelengths suitable for hair removal, the longer wavelengths such as diode (810 nm) and Nd:YAG (1064 nm) effect less epidermal melanin absorption and thus are associated with fewer side effects than shorter wavelengths, especially in darker skin types [10]. On the other hand, IPL and alexandrite (755 nm) lasers, which do not penetrate as deeply, may be more appropriate for hair removal in lighter skin [10]. Complications of laser hair removal include pain, transient erythema, and perifollicular edema [10]. However, more serious adverse events may also occur and include thermal burns, blisters, hyperpigmentation, hypopigmentation, or scarring [10].

The diode-808 laser hair removal feature of the Darwin system offers a large 14mm × 14mm spot size that may be used across all body sites [3]. The handpiece combines high power pulse and cooling technology that delivers the diode 808 nm wavelength that targets melanin to the root of the hair follicle without damage to the surrounding tissues [3]. The device may be used on the upper lip, chin, arm, underarm, leg, chest, abdomen, or the bikini line and pelvic area in both shot and motion modes based on user preference [3].

Herein, we present seven real-world cases demonstrating use of the Darwin multi-modality system in a variety of patients. Cases demonstrate how experts select candidates and mix and match therapies within the system to provide optimal patient outcomes.

2 | Methods

This real-world case series was composed to highlight the use of the multi-modality Darwin aesthetic workstation. The cases demonstrate how expert cosmetic physicians select multiple modes within the workstation to target a variety of skin concerns. Expert panelists' clinical reasoning and rationale are detailed in the following patient cases to guide cosmetic practitioners seeking to understand how to integrate the Darwin aesthetic workstation into their practice to offer enhanced patient and provider experiences.

2.1 | Steps in the Process

The real-world cases were compiled and selected in the following steps: (1) project definition and expert panel selection, (2) data collection and preparation of patient cases, (3) patient case discussion and selection for publication, (4) literature review to

support selected cases, (5) drafting, review, and finalization of the manuscript.

2.2 | Role of the Panel

The selected expert panel consisted of six licensed dermatologists with collective worldwide experience in cosmetic and enhancement procedures. Panelists were from Canada and the United States representing a variety of clinical practice settings and patient populations. The panel gathered during a meeting on February 10, 2024 in Miami Beach, Florida. During the meeting, panelists were asked to share patient cases in which one or multiple modes in the Darwin workstation were employed. These cases demonstrated the use of the Darwin workstation under real-world conditions and highlighted the advantages and areas of improvement for the novel tool. In total, 15 patient cases were shared at the meeting. The cases were discussed among panel members, and eventually, seven cases were chosen as meaningful demonstrations of the Darwin workstation in the real world.

2.3 | DARWIN Multi-Modal Aesthetic Workstation

The DARWIN multi-modal aesthetic workstation provides a 5-in-1 solution for providing multiple treatment modalities to patients. The workstation contains a diode laser for hair removal, IPL, RF, HIFU, and RF microneedling. Each modality can be activated by switching handpieces on the machine.

2.4 | Data Gathering and Outcome Measures

Suggested information to present included patient demographics, clinical features, cosmetic treatment goals, and qualitative and quantitative outcome measures.

The panel used the same template to gather insight through a case-based approach, comprising cosmetic evaluation and alignment of treatment goals. Information on the treatment modalities used included the type, frequency, and settings of the device. Clinician reasoning for modality selection was also included in the cases. In general, patients underwent three treatments. Treatment visits were spaced one month apart leading to treatments at Weeks 0, 4, and 8. Patients were seen at a final follow-up visit at Week 12. Deviations from these suggestions are outlined in the individual patient cases. At baseline and each treatment visit, a physician evaluation and subject-self-evaluation was conducted. Outcome was evaluated based on physician assessment of facial erythema, skin tone/discoloration, skin texture, discomfort, tolerability, and overall appearance scores on a scale of 0 (none) to 4 (severe) (Table 1). When available, patients also self-evaluated their recovery in the categories as previously described on a scale from 0 (none) to 4 (severe) (Table 2). At the end of the treatment period, physicians provided a Global Aesthetic Improvement Scale (GAIS) score at each of the follow-up visits. GAIS rates a subject's response to treatment as: very much improved (3), much improved (2), improved (1), no change (0), worse (−1), much worse (−2), and very much worse (−3). Special considerations or clinical pearls were discussed at the end of the evaluation.

TABLE 1 | Physician assessment.

Erythema		Skin tone/Discoloration		Skin texture		Discomfort		Tolerability		Overall appearance	
Item	Score	Item	Score	Item	Score	Item	Score	Item	Score	Item	Score
0 = None		0 = even, healthy skin tone		0 = Smooth appearance		0 = No discomfort; 10 = worst discomfort		0 = no irritation		0 = Healthy, youthful skin	
1 = Minimal-scant rare erythema		1 = Minimal discoloration		1 = Minimal rough patches				1 = Minimal irritation		1 = Minimal aging signs	
2 = Mild-pink coloration on some of the face		2 = Mild—some discoloration		2 = Mild rough patches				2 = Mild irritation		2 = Mild aging signs	
3 = Moderate-bright red color on some of the face or pink color on all of the face		3 = Moderate more than one area of discoloration		3 = Moderate rough patches				3 = Moderate irritation		3 = Moderate aging signs	
4 = Severe very red or bright red coloration of the whole face		4 = Severe—uneven discolored appearance of the face		4 = Severe rough facial appearance				4 = Severe irritation		4 = Severe aging signs	

TABLE 2 | Subject assessment.

Erythema		Skin tone/Discoloration		Skin texture		Discomfort		Tolerability		Overall appearance	
Item	Score	Item	Score	Item	Score	Item	Score	Item	Score	Item	Score
0 = None		0 = even, healthy skin tone		0 = Smooth appearance		0 = No discomfort; 10 = worst discomfort		0 = no irritation		0 = Healthy, youthful skin	
1 = Minimal-scant rare erythema		1 = Minimal discoloration		1 = Minimal rough patches				1 = Minimal irritation		1 = Minimal aging signs	
2 = Mild-pink coloration on some of the face		2 = Mild—some discoloration		2 = Mild rough patches				2 = Mild irritation	x	2 = Mild aging signs	
3 = Moderate-bright red color on some of the face or pink color on all of the face		3 = Moderate more than one area of discoloration		3 = Moderate rough patches				3 = Moderate irritation		3 = Moderate aging signs	
4 = Severe very red or bright red coloration of the whole face		4 = Severe—uneven discolored appearance of the face		4 = Severe rough facial appearance				4 = Severe irritation		4 = Severe aging signs	

3 | Selected Real-World Patient Cases

Seven cases were selected by the expert panel to illustrate the real-world use of the Darwin multi-modality aesthetic workstation for various skin concerns. The selected cases represent a wide array of patients with different skin treatment needs (Table 3). Use of the Darwin multi-modal system in these cases demonstrate how different treatment modalities may be mixed and matched in appropriate patients to achieve optimal skin results and patient satisfaction.

3.1 | Case 1. RFM and IPL Combination for Healthier-Looking Skin

A 56-year-old female, Fitzpatrick Skin Type (FST) III, presented to clinic with the request to “look younger and healthier.” To tackle skin rejuvenation, the expert clinician decided to combine RFM and IPL treatments in the Darwin workstation to lift and correct the patient's skin. At baseline, the patient had the following physician-assessed scores: skin tone 3, skin texture 3, erythema 1, irritation 1, and fine lines/wrinkles 2. She was scheduled for three RFM treatments spaced 1 month apart. At treatments 2 and 3, the patient also underwent IPL treatment. The RFM parameters were the following: 25 pin tip, depth 2 mm, level 2, 100ms with vacuum 1. The IPL parameters used were the 560mm filter, 5 ms pulses, triple pulse (20ms delay) with 15J/cm [2] fluence. Immediately after IPL and RFM treatment, the patient had noticeable erythema over her face (Figure 2). The facial swelling and redness subsided over the following day without any treatment required. After three treatments over 12 weeks, the patient returned for her final visit and was found to have the following physician-evaluated scores: skin tone 1, skin texture 1, erythema 0, irritation 0, and fine lines/wrinkles 1 (Figure 2). The expert noted that the variety of RFM depths was an advantage to the Darwin system as it allowed for treatment of a wider range of skin conditions.

3.2 | Case 2. Photodamaged Skin Treated With RFM and IPL Combination

A 58-year-old female, FST III, presented with a concern of photodamaged skin. She expressed that her skin goal was to have healthier skin with more collagen and to “eventually age gracefully.” While her skin did not impact her daily activities, she did report that it negatively impacted her self-image. RFM and IPL treatment were chosen as the ideal combination to target face tone and texture. At baseline, the patient was evaluated by the clinician and found to have the following assessment scores: skin tone 2, skin texture 2, erythema 1, irritation 0, fine lines/wrinkles 3. At this time, the patient was scheduled for three RFM sessions spaced 1 month apart with superimposed IPL treatments at her second and third RFM sessions. The RFM parameters used were the following: 25 pin tip, depth 2 mm, level 2, 100ms, vacuum 1. IPL parameters used were 560mm filter, 5 ms pulses, triple pulse 20ms delay, with 15J/cm² fluence. At Week 4, the physician assessment of the patient showed scores of 1 for skin tone, 2 for skin texture, 1 for erythema, 0 for irritation, and 3 for fine lines/wrinkles. At Week 8, the patient scores continued to improve with the following skin tone 0, skin texture

TABLE 3 | Summary of patient cases multi-modality Darwin system.

Case #	Patient age/sex	Intervention (settings)	Indication	Outcome
1	56F	1× RFM (25 pin tip, depth 2 mm, level 2, 100 ms with vacuum 1) 2× IPL (560 nm filter, 5 ms pulses, triple pulse (20 ms delay) with 15 J/cm ² fluence)	Skin rejuvenation	Improvement in skin tone and texture by week 12 with significant lifting of cheeks
2	58F	3× RFM (25 pin tip, depth 2 mm, level 2, 100 ms, vacuum 1) 2× IPL (560 nm filter, 5 ms pulses, triple pulse 20 ms delay, with 15 J/cm ² fluence)	Skin rejuvenation	GAIS score at week 12 with lifting of cheeks and improvement of overall facial appearance
3	60F	1× RF (42°C for 3 min per quadrant) 1× RFM (25 pin tip, depth 2 mm, level 4, 100 ms, vacuum 2)	Skin rejuvenation	Reduction of discoloration by week 12
4	55F	3× IPL (1× 640 nm filter, 1× 560 filter)	Skin rejuvenation	Improvement in skin tone and dyspigmentation by week 8
5	26 M	3× RFM (25 pin tip, depth 1.5 mm, level 2, 100 ms, vacuum 2)	Acne	Significant reduction in active acne lesions and scarring by 8 months
6	18 M	8× RFM (multiple settings over 12 months, see text)	Acne scarring	Dramatic improvement in skin texture and scarring by 12 months
7	39F	3× RFM (25 pin tip, level 5, 1.0–1.5 mm depth, vacuum 1) 1× IPL (560 nm at a fluence of 10 J/cm ² , 9 J/cm ² on the forehead)	Skin rejuvenation	GAIS 3 by week 12 Patient reported that her “skin looks great and feels much smoother”



FIGURE 2 | Case 1. 56-year-old female. 56-year-old female before and after 3 sessions of RFM and 2 sessions of IPL on the Darwin aesthetic workstation (Photo courtesy of David J. Goldberg MD JD).

1, erythema 1, irritation 0, and fine lines/wrinkles 2. By Week 12, the patient had a GAIS score of 2 and saw significant lifting and overall improvement in her facial appearance. Her Week 12 scores were the following: skin tone 0, skin texture 0, erythema 1, irritation 0, fine lines/wrinkles 2 (Figure 3). The patient tolerated the treatment without any adverse events and reported zero days of downtime. After treatment, the patient reported that she had a “positive outlook for the future of skin health.”

3.3 | Case 3. RF Followed by RFM for Neck and Chest Skin Rejuvenation

To target chest and neck skin aging, RF and RFM combination treatment has been shown to be efficient and safe in a 60-year-old FST I woman. The patient presented requesting skin rejuvenation of her neck and chest with focus on reducing wrinkles, fine lines, and dyspigmentation. She was prescribed two



FIGURE 3 | Case 2. 58-year-old female. Before and after 3 sessions of RFM and 2 sessions of IPL on the Darwin aesthetic workstation (photo courtesy of Todd Schlesinger MD).

RF treatments for her neck and chest. The RF treatment settings were set at 42°C for 3 min per quadrant of the total surface with vectoring of 50 shots to each side of the neck. On her last treatment visit, the patient was treated with RFM with the following setting: 25 pin tip, depth 2mm, level 4, 100ms, vacuum 2. At Week 12, the patient saw significant improvement in skin texture and tone and noticed reduction in discoloration (Figure 4).

3.4 | Case 4. 640 nm Followed by 560 nm IPL Filter for Photodamaged Skin

A 55-year-old female, FST III, presented with age-related photodamaged skin. To tackle the sun damage on her face, the

expert clinician prescribed two IPL sessions to target the discoloration and overall photodamaged skin. The first treatment was done with the 640 nm filter with the subsequent treatment with the 560 nm filter for better targeting of facial redness. At 8 weeks, the patient saw a dramatic improvement in her skin texture, tone, and overall appearance (Figure 5).

3.5 | Case 5. RFM For Acne in Young Adult Male With FST IV

A 26-year-old male, FST IV, presented with an extensive history of cystic acne covering his face. The patient had suffered from acne since adolescence and had notable atrophic scars across



FIGURE 4 | Case 3. 60-year-old female. 60-year-old female before and after 2RF and 1 RFM session on the Darwin aesthetic workstation (photo courtesy of Joel Cohen MD).



FIGURE 5 | Case 4. 55-year-old female. 55-year-old female before and after 3 IPL sessions (640nm, 560 nm X2) Darwin aesthetic workstation (photo courtesy of Brian Biesman MD).

his malar and mandibular face. The patient received three RFM treatments at the following settings: 25 pin tip, depth 1.5 mm, level 2, 100 ms, vacuum 2. On his forehead and nose, the RF depth was slightly increased to 1.8 mm. The patient received his first two treatments, one month apart. However, due to his busy schedule, the patient was not seen again until 8 months later for his final treatment. At the 8-month time point, the patient had seen a significant reduction in active acne lesions and scarring (Figure 6).

3.6 | Case 6. Extensive Acne Scarring Treated With 12 Months of RFM

An 18-year-old male, FST II, with extensive acne scarring presented for reduction and correction of his scars. There was presence of boxcar and rolling atrophic acne scars across his cheeks, forehead, and jawline. The patient reported that he had low self-esteem due to his scarring and sought to restore skin texture and tone. The patient was prescribed eight RFM sessions over 12 months. The first four treatments were done with the following RFM settings: 25 pin tip, depth 0.5 mm, level 4–5 for the forehead and nose; 25 pin tip, depth 2.0 mm, level 4–6 for the cheeks; and 25 pin tip, level 4 or 5, and 2.5-mm depth for the scars. Treatments 4 through 7 used the following RFM settings: 25 pin tip, level 4, depth 2.0 mm for the forehead and nose; 25 pin tip, level 3, 1.0 mm depth for the cheeks/temples. On the patient's last treatment visit, the parameters were increased to 25 pin tip, level 4–6, 2.2 mm depth for the cheeks and temples; 25 pin tip, level 4–5, 1.6 mm depth for the nose; and 25 pin tip,

level 5, 1.6 mm depth for the scars. The RFM depth parameters were gradually modified to suit the patient's needs and progress throughout the treatment period. The patient tolerated the treatment and saw a dramatic improvement in his acne scarring by 12 months (Figure 7). The patient was satisfied with the treatment and hoped to continue receiving further sessions in the future (Table 3).

3.7 | Case 7. IPL and RFM for Facial Rejuvenation and Boost of Self-Esteem

A 39-year-old female, FST II, presented with a concern of increased skin laxity and felt dissatisfied with her overall skin texture. Over the past 10 years, she reported increasingly sagging skin and rough skin texture over her face. While her skin did not impact her daily or professional activities, she felt that her facial appearance impacted her self-esteem. She reported that “my skin can sometimes have an effect on my social life and self-image.” The expert clinician decided on using a combination of IPL and RFM over a 3-month treatment period to lift, tighten, and rejuvenate her face. At baseline, the patient was reported to have the following scores for her physician assessment: skin tone 2, skin texture 3, erythema 2, irritation 1, fine lines/wrinkles 2. The patient received IPL and RFM at each treatment visit. The IPL handpiece was used to tackle facial redness while RFM was used for skin tightening and improving skin texture. The IPL filter used over the full face was 560 nm at a fluence of 10 J/cm² (9 J/cm² on the forehead). The RFM parameters used were 25 pin tip, level 5, 1.0–1.5 mm



FIGURE 6 | Case 5. 26-year-old male. 26-year-old male before and after 3 RFM for acne vulgaris using the Darwin aesthetic workstation (photo courtesy of Zaki Taher MD).

depth, vacuum 1. At 12 weeks, the patient saw significant improvement in skin tone, texture, and fine lines and wrinkles with the following physician assessment scores: skin tone 1, skin texture 2, erythema 2, irritation 0, fine lines/wrinkles 2 (Figure 8). The clinician gave the patient an overall GAIS score of 3. The patient tolerated the treatment well without any adverse events or discomfort. However, the patient did report 1 day of downtime after her second treatment due to slight facial redness. She agreed with the GAIS score of 3 and stated that her skin had significantly improved. She felt “great about the Darwin treatment” and stated that her “skin looks great and feels much smoother.”

4 | Discussion

The presented cases demonstrate the successful use of the Darwin aesthetic workstation on a variety of patients concerned with skin rejuvenation and improving skin texture, tone, and smoothness. Today, many aesthetic technologies on the market lack rigorous scientific testing to prove efficacy. Thus, real-world cases provide invaluable information on the product’s use in the real world from reputable experts in the field (Figure 8).

Patients are continuing to increasingly seek cosmetic procedures [2]. Societal pressures to appear youthful in the workplace and in life may be contributing to the heightened



FIGURE 7 | Case 6. 18-year-old male. 18-year-old male before and after 8 RFM treatments for acne scarring using the Darwin aesthetic workstation (photo courtesy of Zaki Taher MD).

popularity of rejuvenation procedures [2]. Interestingly, a person’s attractiveness has even been reported to be directly correlated to salary with plain people earning, on average, 5%–10% less than good-looking individuals [11]. Thus, providing cosmetic procedures may have a measurable impact on individuals in the real world. The Darwin aesthetic workstation offers five different treatment modalities to achieve efficacious, lasting results to keep up with the increasing demand for cosmetic procedures. The ability to switch handpieces on a single machine allows patients to receive combination treatments that best target problem areas [3]. The machine also provides economic advantages for the clinician who no longer needs to purchase five EBDs, but only one to meet all their patients’ needs.

Experts agreed that the Darwin workstation was safe, effective, and easy to use. Patients felt comfortable and satisfied with the treatments and results in all the presented cases. Few patients had transient erythema after IPL and RFM, which resolved without further treatment. The customizable workstation contains thermal RF, RFM, IPL, HIFU, and diode-808 laser hair removal, which are among the most popular non-invasive procedures [1]. In addition, the various depths for treatments allow for further customization and personalization of care. Experts also emphasized that the addition of the vacuum tip was a “game-changer” in further enhancing patient comfort and results.

One major advantage of the Darwin aesthetic workstation is that it provides many treatment modalities that can be used to tailor



FIGURE 8 | Case 7. 39-year-old female. 39-year-old female before and after 3 RFM and IPL treatment for facial rejuvenation using the Darwin aesthetic workstation (photo courtesy of Michael Gold MD).

treatments for a wide range of skin types. In general, patients with darker skin are at higher risk of adverse events such as dyspigmentation and scarring from laser and IPL [10]. The Darwin workstation provides the option of HIFU for darker phototypes or the option to use longer wavelengths, longer pulse durations, and conservative fluences to reduce the risk of these adverse effects [10]. Thus, the Darwin workstation is an inclusive device that may be offered to all patients.

In the future, it will be important to document and report various other combination treatments possible with the Darwin aesthetic workstation. It will also be interesting to evaluate how the workstation is adopted into various clinical settings and among a wider range of patients. Future developments and production of new handpieces and adaptors may also make the Darwin workstation a tool that continues on evolving with changing trends and practices. Thus, the Darwin workstation is a novel, economically sensible solution to deliver the best treatments to a vast array of patients for a variety of conditions.

5 | Limitations

The presented cases demonstrate the successful use of the Darwin aesthetic workstation in a real-world environment. The cases do not provide data from a controlled environment with comparator technologies to serve as controls. In addition, the concurrent skincare regimens were not limited or restricted in these patient cases, which may introduce confounding factors to the observed patient results. In the future, it will be important to study patient outcomes with the Darwin aesthetic workstation compared to other laser and EBDs.

6 | Conclusion

The real-world cases presented illustrate various uses of the Darwin aesthetic workstation in the hands of six physicians with expertise in cosmetic procedures and skin rejuvenation. The cumulative experience of the experts with the workstation demonstrates that it is a unique treatment technology that

allows clinicians to provide tailored combination treatments to patients across all skin types without requiring multiple machines in their office. The ease of switching handpieces allows clinicians to offer multiple treatment modalities with one machine. In turn, clinicians are better able to tailor treatment regimens, improve patient satisfaction, and, most importantly, optimize patient outcomes.

Author Contributions

All authors (M.G., B.B., J.L.C., D.J.G., S.G., T.S., Z.T.) contributed to developing and conducting real-world cases, reviewing and selecting the cases presented in this publication. All authors (M.G., B.B., J.L.C., D.J.G., S.G., T.S., Z.T.) contributed to developing the manuscript, reviewing this work, and agreeing with the content.

Disclosure

The real-world case series was supported by an unrestricted educational grant from Luvo Medical Inc. All authors contributed to the cases and development of the manuscript, reviewed it, and agreed with its content.

Consent

All authors obtained written informed consent from the individuals who participated in the real-world case series. The participants in the real-world series allowed the recording of their photographs to be used for the manuscript and its publication.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

1. "American Society for Plastic Surgery Procedural Statistics Release," accessed June 27, 2024, <https://www.plasticsurgery.org/documents/news/statistics/2022/plastic-surgery-statistics-report-2022.pdf>.
2. J. F. Sobanko, S. Imadojemu, and C. J. Miller, "Epidemiology of Cosmetic Procedures: An Update for Dermatologists," *Current Dermatology Reports* 1 (2012): 4–13.
3. "Darwin Physician Booklet," LUVO Medical™, accessed June 27, 2024, <https://luvommedical.com/wp-content/uploads/2021/10/ReducedFileSize-Darwin-Physician-booklet.pdf>.
4. P. Babilas, S. Schreml, R. M. Szeimies, and M. Landthaler, "Intense Pulsed Light (IPL): A Review," *Lasers in Surgery and Medicine* 42, no. 2 (2010): 93–104.
5. B. E. DiBernardo and J. N. Pozner, "Intense Pulsed Light Therapy for Skin Rejuvenation," *Clinics in Plastic Surgery* 43, no. 3 (2016): 535–540.
6. M. S. Lolis and D. J. Goldberg, "Radiofrequency in Cosmetic Dermatology: A Review," *Dermatologic Surgery* 38, no. 11 (2012): 1765–1776.
7. M. G. Tan, C. E. Jo, A. Chapas, S. Khetarpal, and J. S. Dover, "Radiofrequency Microneedling: A Comprehensive and Critical Review," *Dermatologic Surgery* 47, no. 6 (2021): 755–761.
8. T. S. Alster and E. L. Tanzi, "Noninvasive Lifting of arm, Thigh, and Knee Skin With Transcutaneous Intense Focused Ultrasound," *Dermatologic Surgery* 38, no. 5 (2012): 754–759.

9. H. Park, E. Kim, J. Kim, Y. Ro, and J. Ko, "High-Intensity Focused Ultrasound for the Treatment of Wrinkles and Skin Laxity in Seven Different Facial Areas," *Annals of Dermatology* 27, no. 6 (2015): 688–693.

10. S. D. Gan and E. M. Graber, "Laser Hair Removal: A Review," *Dermatologic Surgery* 39, no. 6 (2013): 823–838.

11. D. S. Hamermesh and J. Biddle, "Beauty and the Labor Market." 1993.