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Clinical Outcomes of a New Solid-State 1550/1927 nm Dual-Wavelength Fractional Laser Featuring Disposable-Free Design and Customizable Delivery Patterns: A Retrospective Case Series

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Abstract

Background:
Dual-wavelength fractional lasers (1550 nm non-ablative and 1927 nm resurfacing) are well established for rejuvenation and scar remodeling. However, traditional systems often rely on consumable cartridges, fixed scanning geometries, and fiber-based optics, which can limit precision, speed, and environmental sustainability.

Objective:
To retrospectively assess clinical outcomes of facial rejuvenation and acne treatment using a next-generation, solid-state fractional laser system that eliminates disposable components and enables customizable imprint patterns. Examines a compact, maintenance-free platform offering variable density and pattern control, allowing individualized energy distribution across treatment zones.

Methods:
Ten patients underwent eighteen treatment sessions between November 2024 and August 2025 using a novel solid-state 1550/1927 nm laser device. A traditional polygonal pattern was utilized for uniform resurfacing, while the stellate pattern was applied to localized lesions. Clinical outcomes included improvement in pigmentation, texture, and scarring, as well as evaluation of tolerability, downtime, and treatment efficiency.

Results:
Dual-wavelength treatments (69%) achieved the most notable clinical responses, with reported improvement in pigmentation (50%), texture (60%), and scarring (40%). Procedures were well tolerated, frequently performed without anesthesia. The continuous 1927 nm mode allowed smoother, faster coverage of large treatment areas and reduced operator fatigue while maintaining safety and predictable recovery.

Conclusion:
This novel, solid-state, disposable-free 1550/1927 nm dual-wavelength fractional laser demonstrated safe, effective, and efficient performance across multiple indications, including facial rejuvenation and acne-related conditions. Its customizable pattern geometry and continuous energy delivery represent a significant evolution in fractional resurfacing technology, offering improved versatility, treatment uniformity, and sustainability without compromising clinical outcomes.

Keywords:solid-state fractional laser, 1550/1927 nm, customizable scan pattern, acne scarring, photoaging, pigmentation

1. Introduction

Fractional photothermolysis has been a cornerstone of dermatology since its introduction in 2004, creating precise columns of controlled thermal injury while preserving surrounding tissue for faster healing.[1] This technique allows targeted remodeling of both superficial and deep layers, making it effective for acne scarring, photoaging, pigmentary changes, and overall rejuvenation.[2]

Dual-wavelength fractional lasers combine two complementary wavelengths to reach different skin depths. The 1550 nm non-ablative wavelength stimulates dermal collagen remodeling and scar reduction, while the 1927 nm wavelength targets the epidermis to improve tone and texture.[3] Used together, these wavelengths allow treatments that balance efficacy, comfort, and downtime.

Previous studies have shown significant improvement in acne scars, dyschromia, and photodamage using dual-wavelength fractional systems, with high satisfaction and minimal adverse effects.[3,4,5] Treatments are generally well tolerated, often requiring only topical anesthesia or none.[6]

Despite the established efficacy of fractional laser technology most traditional dual-wavelength platforms, including conventional Fraxel-type and fiber-based systems, continue to rely on disposable tips or fixed scanning modules, which can introduce additional cost, procedural variability, and workflow inefficiency.

The primary aim of this study was to retrospectively evaluate the safety, tolerability, and clinical performance of a novel, solid-state, disposable-free 1550/1927 nm dual-wavelength fractional laser for facial rejuvenation and acne-related indications. Unlike earlier systems, this device features customizable stellate and variable imprint geometries, enabling individualized energy distribution and treatment flexibility beyond the constraints of fixed-pattern fractional platforms.

The secondary aim was to assess the operational and economic advantages of this technology, including reduced per-treatment cost, elimination of consumable components, and enhanced procedural efficiency stemming from its compact, maintenance-free design.

This report reviews our single-center experience with this next-generation system across common dermatologic indications, focusing on clinical outcomes, tolerability, and workflow efficiency within a real-world practice setting. Together, these findings highlight a solid-state evolution in dual-wavelength fractional resurfacing—offering reproducible energy delivery, improved sustainability, and greater accessibility without compromising patient results.

2. Methods

From November 24, 2024, to August 25, 2025, ten patients underwent a total of eighteen treatment sessions using a solid-state 1550/1927 nm dual-wavelength fractional laser (Duovive™ system, Apolomed Lasers; Bethpage, NY) for acne, acne scarring, pigmentation, photoaging, and general rejuvenation. Each patient received one to three sessions according to clinical indication and response.

The evaluated system operates with an integrated solid-state optical engine, eliminating the need for disposable tips or cartridges. This design ensures consistent beam delivery and reduces procedural setup time. Two customizable scan geometries were utilized: a Z-pattern, employed in seventeen sessions for broad, even coverage, and a stellate pattern, applied once for a localized acne cyst requiring focal energy deposition **(Figure 1).**

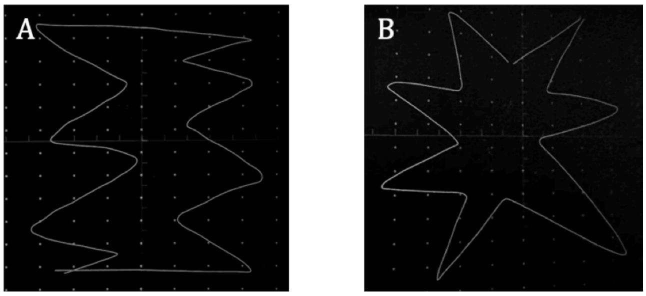

Figure 1. Comparison of fractional laser delivery patterns. The Z-pattern (A) provides uniform energy distribution across wide fields, while the stellate pattern (B) allows focused, lesion-specific energy placement.

The 1550 nm wavelength was selected for dermal collagen remodeling, while the 1927 nm wavelength targeted epidermal resurfacing and pigment correction. Dual-wavelength treatments combined both for enhanced remodeling depth and uniformity. Laser parameters including fluence, number of passes, spot size, and pulse duration were individualized based on treatment area, lesion type, and skin sensitivity.

Topical lidocaine was applied in the first five treatments to evaluate tolerability; subsequent sessions were performed without anesthesia after confirming comparable patient comfort. Data collected included patient demographics, indication, wavelength selection, treatment pattern, energy settings, clinical endpoints, patient-reported discomfort, downtime, and adverse events.

3. Results

3.1 Patient Characteristics

A total of ten patients (eighteen total treatments) were included, ranging in age from 17 to 63 years (mean 31.3 years). Most procedures targeted the face (n = 11), followed by the chin and cheeks (n = 5) and neck (n = 2). Clinical indications included acne, acne scarring, cystic lesions, pigmentation irregularities, photoaging, and overall rejuvenation **(Table 1)**.

Patient	Age	Race	Ethnicity	Gender	Primary Treatment Area	Reason for Treatment
1	63	Asian	Non-Hispanic	F	Face	Dark spots, uneven skin tone, fine lines and wrinkles
2	25	White	Hispanic	F	Face	Acne scarring and uneven skin tone
3	52	White	Non-Hispanic	M	Face and neck	Dark spots, uneven skin tone and fine lines
4	37	Asian	Non-Hispanic	F	Face and neck	Uneven skin tone and fine lines
5	22	White	Hispanic	F	Face	Acne scarring and uneven skin tone
6	24	White	Hispanic	F	Forehead and T-zone	Active acne lesions
7	45	White	Hispanic	F	Cheeks, forehead, nose, and temple	Fine lines and wrinkles
8	17	White	Hispanic	M	Chin, cheeks, temple	Active acne lesions and acne scars
9	19	White	Hispanic	F	Face	Active acne lesions and acne scars
10	22	White	Hispanic	F	Left lateral cheek and left chin (localized cyst)	Active acne cyst

Table 1. Demographic and treatment overview (age, race, gender, treatment area, and indication)

3.2 Wavelength Use

Three sessions (19%) used the 1550 nm wavelength alone, two sessions (12%) used 1927 nm alone, and eleven sessions (69%) combined both.

The 1550 nm wavelength was consistently well tolerated and most effective for dermal remodeling and texture improvement, while the 1927 nm wavelength yielded more pronounced epidermal effects such as ablation and granulation, occasionally producing transient erythema or mild burning **(Table 2)**.

3.3 Treatment Patterns

Two programmable scan geometries were used across sessions **(Figure 1).** The Z-pattern, applied in sixteen treatments, achieved broad, uniform coverage with smooth energy overlap, promoting consistent remodeling and natural blending between passes. The stellate pattern, introduced for a localized cyst, allowed focal energy concentration with gradual peripheral diffusion, improving precision for irregular or small targets.

Group	1550 nm	1927 nm	1550 + 1927 nm
Male patients – teens	Not typically used as monotherapy	Rarely used alone	Mild–moderate discomfort near lip margin. Noticeable improvement in acne lesions and texture after combination treatment.
Male patients – 50s	Well tolerated, improvements in pigmentation and texture	Neck more sensitive; visible ablation on continuous mode	More discomfort with 1927 component, but combination yielded good outcomes for face and neck rejuvenation.
Female patients – younger (teens–20s)	Minimal discomfort; effective for texture improvement	Not frequently used alone	Significant improvements in acne, scarring, and pigmentation. Redness/burning common in sensitive areas; visible ablation noted after multiple treatments.
Female patients – mid-age (30s–40s)	Pigmentation improved; occasional granules on thinner skin	Visible ablation after 2–3 pulses, mild burning noted	Melasma and pigmentation improved. Central redness and transient erythema are more common.
Female patients – older (60s+)	Pigmentation improved with mild edema	Pigmentation improved with mild edema	Combination not commonly needed; single wavelengths effective for pigmentation.

Table 2. Patient group responses to 1550 nm, 1927 nm, and combined dual-wavelength therapy

These customizable geometries reflect an advancement over fixed scanning designs used in older systems, providing adaptable control without mechanical disposables.

3.4 Tolerability

Topical lidocaine was used in the first five treatments to establish comfort baselines; subsequent sessions (n = 11) were performed without anesthesia, demonstrating comparable tolerability. Reported pain **(Figure 2)** was mild to moderate across all cases, with no significant difference between numbed and non-numbed sessions. The most sensitive sites were the upper lip, nasolabial folds, and chin, yet discomfort remained within acceptable limits.

These findings underscore the improved thermal stability and pulse consistency of the solid-state system, which helped minimize sharp energy spikes often associated with earlier fiber-based devices.

3.5 Clinical Endpoints and Adverse Effects

The most frequent immediate endpoints were erythema (n = 14) and edema (n = 8), followed by visible ablation or granulation (n = 6). All reactions resolved within 24–72 hours.

No scarring, pigmentary alteration, or infection was observed.

Patients reported visible improvement in pigmentation (n = 5), texture (n = 6), and acne scarring (n = 4).

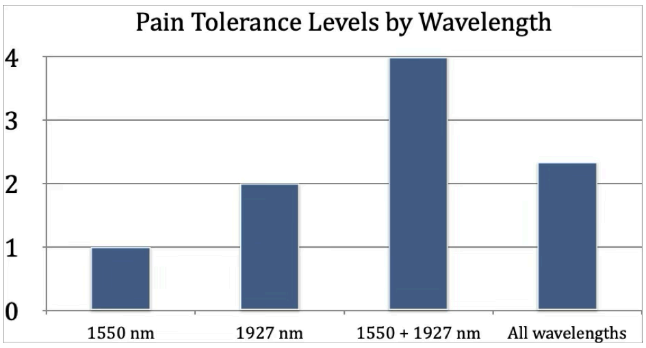

Figure 2. Patient-reported tolerability of 1550 nm, 1927 nm, and dual-wavelength treatments.

3.6 Treatment Parameters and Workflow Efficiency

Fluence values ranged from 10–40 mJ (2–7 W), with 2–3 passes per region depending on anatomic sensitivity.

The continuous 1927 nm mode proved the most time-efficient configuration, delivering energy at a higher repetition frequency (Hz) that allowed smoother handpiece motion, uniform ablation density, and faster treatment completion, particularly on large facial areas.

Patients frequently noted shorter procedure times and improved comfort with continuous delivery compared with earlier single-pulse sessions.

This gain in efficiency occasionally produced slightly greater erythema, which resolved within 48 hours. In contrast, continuous 1550 nm delivery provided steadier comfort and reduced heat accumulation in smaller or sensitive areas.

Collectively, these findings demonstrate that the solid-state, disposable-free laser platform provides consistent efficacy with enhanced workflow efficiency, energy uniformity, and patient tolerance relative to traditional fiber-based systems.

4. Discussion

Our clinical experience with the solid-state 1550/1927 nm dual-wavelength fractional laser confirms and extends prior reports of its safety, versatility, and efficacy in improving acne, scarring, pigmentation, and photoaging. [3,4,5] Unlike earlier fiber-based or consumable-tip platforms, this iteration integrates a sealed solid-state optical engine and software-controlled pattern generator, allowing reproducible energy delivery without disposable attachments. These design refinements improve energy stability, reduce consumable waste, and streamline clinical workflow while maintaining the proven benefits of dual-wavelength fractional resurfacing.

The customizable stellate patterns used across patients provided consistent energy distribution, minimized treatment overlap variability, and promoted even blending between adjacent passes **(Figure 3).** This pattern mirrors findings in fractional resurfacing literature, where evenly spaced thermal columns are associated with more uniform wound healing and improved aesthetic outcomes.[7] Its advantages include predictability and complete coverage, though precision may be reduced for small focal lesions, an issue addressed by the introduction of a second customizable geometry.

Figure 3. Clinical photographs of a 19-year-old patient before and 40 days after dual-wavelength treatment, showing progressive improvement in skin tone and scar texture.

An important observation was the treatment of an active acne cyst, where a stellate delivery pattern was selected for lesion-specific targeting **(Figure 4)**. This geometry radiates from a central point, dispersing energy outward in gradually diminishing fluence due to the contours of the cyst, producing a smooth thermal gradient. The pattern was particularly effective in targeting localized pathology without abrupt borders, supporting natural tissue transition at the margins. In the context of energy-based rejuvenation, this pattern modularity represents a meaningful advancement, providing clinicians the ability to switch between diffuse resurfacing and focal precision within a single solid-state platform.

Figure 3. A 17-year-old patient before and 21 days after treatment, illustrating reduction in inflammatory acne and post-inflammatory erythema

While fractional laser therapy is not considered a first-line intervention for cystic acne, evidence suggests that fractional photothermolysis can reduce sebaceous gland activity, modulate inflammatory mediators, and stimulate dermal remodeling.[8,9] These mechanisms may explain the observed slowing of cyst progression and reduced post-inflammatory inflammation in this case. The outcome aligns with published data demonstrating fractional laser's capacity to alter the inflammatory microenvironment and support adjunctive acne management.[10]

4.1 Wavelength Effects

Findings from the appendix dataset reinforced wavelength-specific trends reported previously. Treatments using the 1550 nm wavelength were consistently well tolerated and associated with improvements in dermal texture and pigmentation, even at higher fluences (e.g., Patient #2). In contrast, 1927 nm energy produced more visible epidermal endpoints, such as ablation and granulation (e.g., Patient #12), with transient erythema or burning. These results reflect prior observations that 1927 nm fractional resurfacing is highly effective for pigmentation and superficial rejuvenation but demands careful counseling and post-care.[11,12]

Combined dual-wavelength sessions generated the most comprehensive outcomes for complex presentations such as acne scarring and photodamage (e.g., Patients #6, #8, #15). This supports previous findings that sequential or simultaneous fractional exposure at differing depths enhances remodeling synergy.[4]

4.2 Age-Related Response

The dataset revealed age-dependent variations in tolerance and outcome. Younger patients (17–25 years) exhibited rapid improvement in acne lesions and pigmentation and demonstrated higher tolerance to energy density, with minimal discomfort even without anesthesia (e.g., Patient #10). These results align with evidence that younger skin demonstrates more efficient neocollagenesis and re-epithelialization following fractional thermal injury.[13]

Older patients (52–63 years) responded favorably to conservative, single-wavelength 1550 nm protocols, achieving pigment improvement with minimal downtime. These results corroborate prior reports suggesting that mature skin benefits from controlled, non-ablative stimulation to avoid excessive post-treatment inflammation **(Table 2)**.[14]

4.3 Treatment Parameters and Clinical Implications

Treatment outcomes correlated with procedural parameters. Higher fluence or increased passes yielded greater visible endpoints but also higher transient erythema, particularly with 1927 nm exposure (Patients #12, #15, #16). Continuous 1927 nm operation (Patients #4, #11, #12) improved coverage efficiency but required close observation for heat build-up. Localized sensitivity was greatest in thin or highly vascularized regions such as the perioral and perinasal skin (Patients #9, #11), reinforcing the importance of anatomic-specific parameter adjustment as recommended in prior research. [4,14]

Importantly, the solid-state architecture ensured stable pulse uniformity, preventing the micro-pulse fluctuations sometimes seen in earlier gas or fiber-based systems. This contributed to consistent energy deposition and reproducible endpoints across multiple sessions.

4.4 Tolerability and Workflow Efficiency

Another key finding was the sustained tolerability and workflow efficiency of the solid-state system. Topical lidocaine was used initially but was later omitted without any significant increase in reported discomfort, even for sensitive areas such as the nasolabial folds and chin (Patients #9, #11). These results reaffirm that non-ablative fractional resurfacing is generally well tolerated, while also suggesting that the enhanced stability of the solid-state beam contributes to smoother patient experience.

Eliminating numbing reduced chair time and procedural setup complexity. The continuous 1927 nm mode offered the highest treatment efficiency, delivering energy at a rapid repetition rate that allowed smooth, uninterrupted scanning of large treatment fields. This decreased total session time, reduced provider fatigue, and improved clinical throughput. Although minor erythema was slightly more common in this mode, it resolved within 48–72 hours.

The continuous 1550 nm mode offered optimal control in delicate or smaller areas, balancing comfort with effective dermal stimulation. Together, these operational modes underscore the technological advancement of the device combining precision, efficiency, and environmental sustainability within a single platform.

5. Conclusion

The solid-state 1550/1927 nm dual-wavelength fractional laser demonstrated safe and effective improvement in pigmentation, texture, and scarring with minimal downtime. Overall, the platform supports individualized wavelength selection and treatment design while offering improved workflow efficiency, precision, and sustainability through its disposable-free, software defined architecture.

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Artificial Intelligence Disclosure

No Artificial Intelligence was used for the creation of this manuscript.

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