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Case Series

Direct intraindividual comparison of wound healing after fractional picosecond laser-induced optical breakdown at 0.2 versus 0.3 J/cm² under topical postprocedural care: a prospective intraindividual case series

Stefan Bigge[1]*, Chirine Tempelmann[2], Bianca Bigge[1]

[1]Praxis Dr. Bigge/Ungerechts, Cologne, North Rhine-Westphalia, Germany
[2]Hochschule Fresenius, University of Applied Sciences, Düsseldorf, North Rhine-Westphalia, Germany

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***Correspondence:**
Dr. Stefan Bigge,
E-mail: stefanbigge@ocloud.com

ABSTRACT

This prospective intraindividual case series evaluated early visible wound healing after fractional 1064 nm picosecond laser-induced optical breakdown (LIOB) at two intermediate fluence settings under standardized topical postprocedural care. Ten adult volunteers with Fitzpatrick skin type II underwent paired treatment of volar forearm fields at 0.2 and 0.3 J/cm². Six predefined topical preparations were applied to adjacent areas: Bepanthen wound and healing ointment, Medigel, Laser doctor cream, SkinCeuticals RGN 6, Teoxane post procedure, and Vichy collagen specialist 16 serum. Dermatoscopic images were obtained on days 1, 4, and 8 using non-polarized, polarized, and 405 nm illumination and were rated by two blinded dermatologists on a seven item 5-point scale. The complete case-series dataset included 10 participants, 6 products, 2 fluence levels, and 3 time points. Across all 18 product-timepoint composite comparisons, scores were higher at 0.3 than at 0.2 J/cm², with median paired differences of 1.0 to 3.5 points. After Holm adjustment, the day 4 comparison for Vichy collagen specialist 16 serum remained significant. Item-level signals mainly involved crusting/scabbing, surface texture, vascularization, irritation, and overall assessment, while surface level remained unchanged. Both fluence settings showed progressive visible improvement by day 8. This case series suggests that a moderate increase from 0.2 to 0.3 J/cm² increases short-term visible post-LIOB reaction without evidence of delayed early healing in this small Fitzpatrick type II cohort.

Keywords: Laser-induced optical breakdown, Picosecond laser, Fractional laser, Wound healing, Postprocedural care, Dermatoscopy

INTRODUCTION

Laser-induced optical breakdown (LIOB) refers to the photomechanical formation of intradermal microcavitation zones after ultrashort laser pulses. In fractional picosecond laser systems, energy is delivered through a microlens array, generating localized optical breakdown zones with limited thermal diffusion. This mechanism differs from conventional ablative resurfacing because the epidermal surface is largely preserved while dermal remodeling pathways are induced.

Fractional picosecond lasers are increasingly used for acne scars, photoaging, enlarged pores, striae, and pigmentary disorders.[1,7] Histological and experimental studies indicate that LIOB can induce dermal vacuole formation, collagen remodeling, elastin changes, and repair-associated molecular responses.[2,4,6-8]

The extent of the visible tissue reaction is expected to depend on fluence, pulse energy, skin pigmentation, and treatment density.[3,7]

Postprocedural topical care is clinically relevant because it may influence erythema, crust formation, barrier recovery, patient comfort, and downtime.[9-11] However, evidence on product-specific post-treatment effects after LIOB remains sparse. Existing data from fractional ablative procedures cannot be transferred directly to non-ablative or epidermis-sparing LIOB, as the injury morphology and healing dynamics differ.[9-11]

A separate analysis from the same prospective observational study platform evaluated the outer fluence range of 0.1 and 0.4 J/cm² and suggested that fluence is a major determinant of acute visible post-LIOB reaction intensity. However, that analysis addressed a different clinical question, namely the contrast between low and higher fluence settings. It did not resolve whether two commonly usable intermediate settings, 0.2 and 0.3 J/cm², already differ meaningfully in early visible wound-healing dynamics under identical topical postprocedural care. The present manuscript therefore focuses specifically on this intermediate-fluence comparison and uses a separate predefined paired analysis restricted to the 0.2 and 0.3 J/cm² treatment fields.

The aim of this case series was to provide a direct paired intraindividual description of early wound healing after fractional 1064 nm picosecond LIOB at 0.2 versus 0.3 J/cm². The main objective was to compare clinical and dermatoscopic healing scores between both fluences for each topical product and time point.

Secondary descriptive objectives were to outline product-specific healing trajectories and to evaluate whether the higher intermediate fluence was associated with more pronounced erythema, crusting, pigmentation, irritation, or delayed normalization.

CASE SERIES

Design and setting

This was a prospective, single-center, non-randomized, intraindividual case series conducted under routine dermatological treatment conditions. Each participant served as his or her own intraindividual comparator. Separate marked treatment fields on the volar forearm were treated with fractional 1064 nm picosecond LIOB at 0.2 J/cm² and 0.3 J/cm². Within each fluence condition, six predefined adjacent areas received standardized topical postprocedural care according to a predefined application protocol.

The present manuscript reports the direct paired comparison of the intermediate fluence levels 0.2 J/cm² and 0.3 J/cm².

Relationship to other analyses from the same study platform

The present manuscript reports a distinct analysis from a broader prospective observational study platform. It is restricted to the direct paired comparison of the intermediate fluence levels 0.2 and 0.3 J/cm². Other fluence levels, including 0.1 and 0.4 J/cm², are analyzed separately and are not included in the analyses of the present manuscript. The rationale, hypothesis, statistical comparisons, tables, and conclusions of the present case series are therefore confined to the clinically relevant question of whether a moderate increase from 0.2 to 0.3 J/cm² produces a measurable difference in early visible postprocedural reaction under identical topical care. No pooled efficacy claim across all fluence levels is made in this manuscript.

The case series was exploratory in nature. It was not designed or powered to establish product superiority, long-term efficacy, or clinical outcome differences beyond early visible wound-healing dynamics. Because topical product allocation was fixed and not randomized, product-specific findings are interpreted as exploratory and potentially affected by positional effects along the forearm. The methodological focus was the paired intraindividual comparison between the two fluence conditions under otherwise standardized treatment, imaging, and postprocedural care conditions.

Planning, documentation, and reporting were guided by the STROBE principles for observational clinical research, with additional attention to transparent reporting of the laser parameters, topical application protocol, assessment time points, image acquisition, blinded rating procedure, and multiplicity-adjusted paired exploratory analysis.

Cases and participant characteristics

The case series comprised 10 adult volunteers. All participants had Fitzpatrick skin type II and were recruited from medical personnel with professional familiarity with aesthetic dermatology and postprocedural wound care. Inclusion criteria were age of at least 18 years, Fitzpatrick skin type II, intact skin at the treatment site, and ability to comply with the follow-up schedule. Exclusion criteria were active dermatoses in the treatment area, systemic retinoid therapy within the preceding 6 months, immunosuppression, known allergy to ingredients of the test products, pregnancy, and breastfeeding.

The 10 cases included 7 men and 3 women aged 42 to 47 years. The median age was 44 years. One participant was receiving chronic candesartan 8 mg therapy for arterial hypertension, and three participants were receiving levothyroxine. Relevant medical history included arterial hypertension in one male participant and glaucoma in one male participant. No participant had active dermatoses in the treatment area, immunosuppression, systemic retinoid therapy within the preceding 6 months, pregnancy,

breastfeeding, or a known allergy to any of the tested products. These baseline characteristics were not expected to materially affect early cutaneous wound healing in the present case series setting.

Ethics and informed consent

The case series was conducted in accordance with the Declaration of Helsinki and applicable German data protection requirements.

All participants received oral and written information about the purpose of the project, the laser procedure, topical postprocedural care, image documentation, potential risks, data handling, anonymized analysis, and scientific publication. Written informed consent was obtained from all participants before inclusion. Participants were informed that participation was voluntary and that they could withdraw consent at any time without disadvantage.

Treatment site

All treatments were performed on the volar aspect of the forearm. The same anatomical region was used for all participants to reduce anatomical variability in skin thickness, vascularization, sun exposure, and hair density.

Laser intervention

Treatments were performed with the Intros Pico: Premium laser system using a 1064 nm wavelength, a pulse duration of 300 ps, and a fractional microlens array Zoom handpiece. The spot size was 7 mm and the pulse rate was 2 Hz. Two passes were performed for each treatment field. The two intermediate fluence settings were 0.2 J/cm² with a pulse energy of 100 mJ and 0.3 J/cm² with a pulse energy of 125 mJ. Both conditions used a pulse duration of 300 ps, a 7 mm spot size, a pulse rate of 2 Hz, two passes, and the fractional microlens array Zoom handpiece (Table 1).

Table 1: Laser parameters for the paired fluence comparison.

Parameter	0.2 J/cm² condition	0.3 J/cm² condition
Wavelength	1064 nm	1064 nm
Pulse duration	300 ps	300 ps
Pulse energy	100 mJ	125 mJ
Spot size	7 mm	7 mm
Pulse rate	2 Hz	2 Hz
Passes	2	2
Handpiece	Fractional MLA zoom handpiece	Fractional MLA zoom handpiece

The treatment areas were marked before treatment to allow reproducible imaging and follow-up assessment.

Topical products and application protocol

Six adjacent treatment areas were assigned to Bepanthen wound and healing ointment, Medigel, Laser doctor cream, SkinCeuticals RGN 6, Teoxane post procedure, and Vichy collagen specialist 16 serum.

The first application was performed immediately after laser treatment. Thereafter, products were applied twice daily, in the morning and evening. The amount applied corresponded approximately to half a fingertip unit per product area.

Participants were instructed not to use additional topical products on the study fields during the observation period. During the first five days, the treated regions were covered with sterile compresses and Tegaderm dressings.

To minimize cross-contamination between product areas, physical separation of the fields was maintained according to the study protocol. The products were applied in a fixed order. This fixed allocation is a limitation because positional effects along the forearm cannot be excluded.

Imaging

Dermatoscopic documentation was performed with the Casio DZD100 dermatoscopy camera. For each product area, fluence condition, and time point, non-polarized dermatoscopy, polarized dermatoscopy, and 405 nm illumination images were acquired. For clinical assessment, all available image modes were used. For optional objective image analysis, non-polarized images may be used for erythema and colorimetric evaluation, whereas 405 nm images may support the detection of residual dots, pigmentation, or crust-like optical residua.

Assessment time points

The predefined assessment time points were day 1, day 4, and day 8 after LIOB. Day 20 documentation was used only if residual lesions remained identifiable at day 8 or if extended documentation was available. For the direct 0.2 versus 0.3 J/cm² comparison, the main time points were day 1, day 4, and day 8.

Observer rating and exploratory quantitative analysis

Images were evaluated using a seven-item observer rating scale. Each item was scored on a 5-point Likert scale, with

1 indicating skin comparable to adjacent normal skin and 5 indicating marked deviation from normal skin.

The seven items were vascularization, pigmentation, surface texture, surface level, crusts, scabs, or coagulation points, signs of irritation including swelling, oozing, pustular reaction, or irritative dermatitis, and overall assessment.

Two independent dermatologists with more than 10 years of clinical experience evaluated anonymized image series in a blinded manner. Inter-rater agreement was assessed descriptively by comparing the distribution of paired observer scores before averaging.

The main descriptive comparison was the paired difference between 0.2 J/cm² and 0.3 J/cm² in the composite seven item wound healing score for each topical product and assessment time point. The composite score was calculated as the sum of the seven predefined observer rated items. Higher composite scores indicated a stronger visible postprocedural reaction.

Secondary exploratory comparisons included fluence-dependent differences in each individual rating item, product-specific temporal changes within each fluence condition, differences in the speed of visible clinical normalization between 0.2 J/cm² and 0.3 J/cm², and the frequency of complete or near complete normalization by day 8. Optional objective image metrics were considered exploratory if available.

Data were analyzed using paired non-parametric methods because scores were ordinal and the sample size was small. For each product, time point, and rating item, 0.2 J/cm² was compared directly with 0.3 J/cm² using the Wilcoxon signed-rank test for paired samples. Median paired differences and interquartile ranges were reported. Positive paired differences indicate higher scores, and therefore stronger visible reaction, at 0.3 J/cm².

For the composite seven item score, Holm adjustment was applied across the 18 composite product-timepoint comparisons. Effect sizes were reported as matched-pairs rank-biserial correlation. For secondary item-level analyses, Holm adjustment was applied within each product-day family of seven item-level comparisons. Item-level findings were interpreted as exploratory and supportive of the composite score analysis.

Temporal trajectories across day 1, day 4, and day 8 were analyzed separately for each fluence and product using the Friedman test. Kendall's W was reported as the effect size. If significant temporal effects were detected, post hoc Wilcoxon signed-rank tests were performed for day 1 versus day 4, day 4 versus day 8, and day 1 versus day 8.

A two-sided $p<0.05$ was considered statistically significant for exploratory analysis. Because this was a case series with a small sample size, emphasis was placed on effect sizes, median trajectories, and clinical plausibility rather than on isolated p values.

Case-series data completeness and qualitative healing course

A total of 10 participants were included in the paired analysis. The day 1, day 4, and day 8 datasets were complete for all six products and both fluence conditions. The case-series dataset therefore comprised 10 participants×6 products×2 fluences×3 time points=360 product-timepoint observations and 2520 item-level scores. All analyses were verified against the fluence-specific source sheets for the 0.2 J/cm² and 0.3 J/cm² conditions before statistical evaluation. Both fluence settings showed the expected early post-LIOB pattern with punctate erythematous microareas and discrete coagulation-like or crust-like points on day 1 (Figure 1).

The 0.3 J/cm² fields generally showed a stronger visible reaction than the paired 0.2 J/cm² fields. This difference was most apparent in surface texture, crusts/scabs or coagulation points, irritation, vascularization, and the overall assessment. By day 4, the reaction had decreased in both fluence conditions, although 0.3 J/cm² still tended to show higher scores in selected product areas. By day 8, most fields had largely normalized, but small paired differences between 0.2 and 0.3 J/cm² persisted for some products and items (Figure 2).

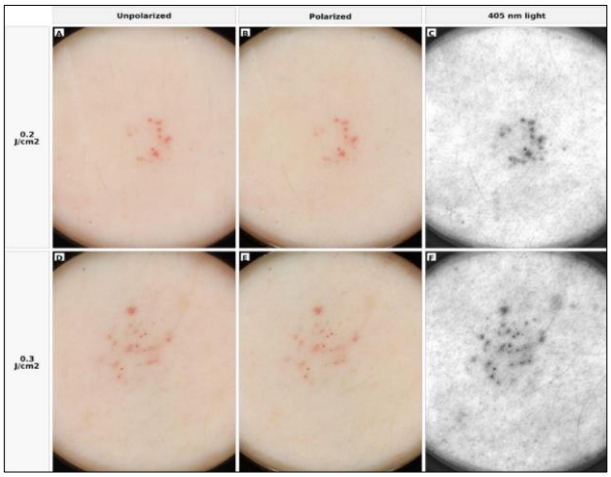

Figure 1: Representative images after fractional 1064 nm picosecond laser-induced optical breakdown at 0.2 and 0.3 J/cm² on day 1. Columns show unpolarized, polarized, and 405 nm images.

Main composite paired comparison of 0.2 versus 0.3 J/cm²

The composite seven item score was higher at 0.3 J/cm² than at 0.2 J/cm² for every product and time point.

After Holm adjustment across the 18 composite comparisons, Vichy collagen specialist 16 serum on day 4

remained statistically significant (median difference 3.5 points; p=0.002, p_Holm=0.035). Bepanthen on day 1, Teoxane on day 8, and Vichy on day 1 did not remain statistically significant after Holm adjustment (each p_Holm=0.066), despite showing the same direction of effect. The largest median composite differences were observed for Vichy on day 4 (3.5 points), and for Bepanthen day 1, Medigel day 1, SkinCeuticals RGN 6 day 1 and day 4, Teoxane day 8, and Vichy day 1 (each 3.0 points) (Table 2).

Item-level paired comparison of 0.2 versus 0.3 J/cm²

At the item level, 22 of 126 product-timepoint-item comparisons were nominally significant before adjustment. These nominal differences clustered mainly in crusts/scabs or coagulation points (6 comparisons), surface texture (5 comparisons), vascularization (4 comparisons), irritation (3 comparisons), overall assessment (3 comparisons), and pigmentation (1 comparison).

Surface level did not differ between 0.2 and 0.3 J/cm² in any product-timepoint comparison. After Holm adjustment within each product-day family of seven items, only two item-level comparisons remained statistically significant: Vichy collagen specialist 16 serum on day 4 for vascularization (median difference 1.0; p=0.008, p_Holm=0.047) and Vichy collagen specialist 16 serum on day 4 for crusts/scabs or coagulation points (median difference 1.0; p=0.004, p_Holm=0.027). The direction of these significant differences indicated higher scores at 0.3 J/cm² (Table 3).

Table 2: Composite seven item score, paired comparison of 0.3 versus 0.2 J/cm².

Product	Day	0.2 median (IQR)	0.3 median (IQR)	Median paired difference	P value	p_Holm	Effect size
Bepanthen	1	11 (10.5-12)	15.5 (13.5-16)	3 (2-4)	0.004	0.066	1.00
Bepanthen	4	10 (9-11)	11 (11-13.5)	2 (1-4)	0.016	0.109	1.00
Bepanthen	8	8 (7.5-8.5)	10 (8.5-12)	1.5 (1-2.5)	0.008	0.109	1.00
Medigel	1	11 (11-16)	15.5 (15-16)	3 (1.5-4)	0.008	0.109	1.00
Medigel	4	10 (8.5-11)	11 (11-11)	2.5 (1-3)	0.008	0.109	1.00
Medigel	8	8 (7.5-9.5)	9 (8.5-11)	1 (0.5-2.5)	0.016	0.109	1.00
Laser doctor cream	1	11.5 (10-16)	16 (14-16)	2.5 (0.5-3.5)	0.016	0.109	1.00
Laser doctor cream	4	10.5 (8-11)	11 (11-11.5)	2.5 (0.5-3)	0.016	0.109	1.00
Laser doctor cream	8	8 (8-10)	9.5 (9-12.5)	2 (1-2.5)	0.008	0.109	1.00
SkinCeuticals RGN 6	1	11.5 (10-14.5)	15.5 (13.5-16)	3 (2.5-3.5)	0.008	0.109	1.00
SkinCeuticals RGN 6	4	10.5 (9.5-11)	11.5 (11-16)	3 (1.5-5)	0.008	0.109	1.00
SkinCeuticals RGN 6	8	7 (7-8)	8 (8-11)	1 (0.5-2.5)	0.016	0.109	1.00
Teoxane post procedure	1	13 (11-16)	15 (14-16.5)	2 (0.5-3)	0.016	0.109	1.00
Teoxane post procedure	4	10 (9-10)	11.5 (11-12)	2 (1-3)	0.008	0.109	1.00
Teoxane post procedure	8	10 (8-11)	12.5 (10.5-14)	3 (2.5-3)	0.004	0.066	1.00
Vichy collagen specialist 16 serum	1	11 (10-11.5)	14 (13-15)	3 (2.5-4)	0.004	0.066	1.00
Vichy collagen specialist 16 serum	4	9.5 (8-11)	13 (11-15.5)	3.5 (3-4)	0.002	0.035	1.00
Vichy collagen specialist 16 serum	8	7.5 (7-8.5)	9.5 (8-11)	1 (1-3)	0.008	0.109	1.00

Composite score=Sum of the seven item scores. Median paired difference=score at 0.3 J/cm² minus score at 0.2 J/cm². Positive values indicate a stronger visible reaction at 0.3 J/cm². p_Holm refers to Holm adjustment across the 18 composite comparisons. Effect size is matched-pairs rank-biserial correlation.

Table 3: Item-level comparisons with nominal p<0.05.

Product	Day	Item	0.2 median (IQR)	0.3 median (IQR)	Median diff	P value	p_Holm within product-day	Effect size
Bepanthen	1	Surface texture	1 (1.0-1.5)	2 (2.0-2.0)	1 (0.5-1)	0.016	0.094	1.00
Bepanthen	1	Irritation	1 (1.0-1.0)	2 (2.0-2.0)	1 (1-1)	0.008	0.055	1.00
Bepanthen	4	Vascularization	2 (1.0-2.0)	2 (2.0-2.5)	1 (0-1)	0.031	0.219	1.00
Bepanthen	4	Crusts/scabs	2 (1.5-2.0)	2 (2.0-2.5)	1 (0-1)	0.031	0.219	1.00
Medigel	1	Surface texture	1 (1.0-2.0)	2 (2.0-2.0)	1 (0-1)	0.031	0.219	1.00

Continued.

Product	Day	Item	0.2 median (IQR)	0.3 median (IQR)	Median diff	P value	p_Holm within product-day	Effect size
Medigel	1	Overall assessment	2 (2.0-3.0)	3 (3.0-3.0)	1 (0-1)	0.031	0.219	1.00
Medigel	4	Crusts/scabs	1.5 (1.0-2.0)	2 (2.0-2.0)	1 (0.5-1)	0.016	0.109	1.00
Laser doctor cream	1	Surface texture	1 (1.0-2.0)	2 (2.0-2.0)	1 (0-1)	0.031	0.219	1.00
Laser doctor cream	4	Crusts/scabs	1.5 (1.0-2.0)	2 (2.0-2.0)	1 (0.5-1)	0.016	0.109	1.00
SkinCeuticals RGN 6	1	Pigmentation	1 (1.0-2.0)	2 (2.0-2.0)	1 (0.5-1)	0.016	0.109	1.00
SkinCeuticals RGN 6	1	Surface texture	1 (1.0-2.0)	2 (2.0-2.0)	1 (0-1)	0.031	0.188	1.00
SkinCeuticals RGN 6	1	Irritation	1 (1.0-2.0)	2 (2.0-2.0)	1 (0-1)	0.031	0.188	1.00
SkinCeuticals RGN 6	4	Vascularization	2 (1.5-2.0)	2 (2.0-3.0)	1 (0.5-1)	0.016	0.109	1.00
SkinCeuticals RGN 6	4	Crusts/scabs	2 (1.5-2.0)	2 (2.0-3.0)	1 (0.5-1)	0.016	0.109	1.00
Teoxane post procedure	4	Crusts/scabs	1.5 (1.0-2.0)	2 (2.0-2.0)	1 (0-1)	0.031	0.219	1.00
Teoxane post procedure	8	Vascularization	2 (1.0-2.0)	2.5 (2.0-3.0)	1 (1-1)	0.008	0.055	1.00
Vichy collagen specialist 16 serum	1	Surface texture	1 (1.0-1.0)	2 (2.0-2.0)	1 (1-1)	0.008	0.055	1.00
Vichy collagen specialist 16 serum	1	Irritation	1 (1.0-1.0)	2 (2.0-2.0)	1 (1-1)	0.008	0.055	1.00
Vichy collagen specialist 16 serum	4	Vascularization	1.5 (1.0-2.0)	2.5 (2.0-3.0)	1 (1-1)	0.008	0.047	1.00
Vichy collagen specialist 16 serum	4	Crusts/scabs	2 (1.0-2.0)	2.5 (2.0-3.0)	1 (1-1)	0.004	0.027	1.00
Vichy collagen specialist 16 serum	4	Overall assessment	1.5 (1.0-2.0)	2 (2.0-2.0)	1 (0-1)	0.031	0.156	1.00
Vichy collagen specialist 16 serum	8	Overall assessment	1 (1.0-1.0)	2 (1.0-2.0)	1 (0-1)	0.031	0.219	1.00

Only item-level comparisons with nominal p<0.05 are shown. p_Holm refers to adjustment within each product-day family of seven item-level comparisons. Only Vichy day 4 vascularization and Vichy day 4 crusts/scabs remained significant after this adjustment.

Product-specific trajectories

Bepanthen wound and healing ointment

The composite score was higher at 0.3 J/cm² at all time points. Median composite scores were 11.0 versus 15.5 on day 1, 10.0 versus 11.0 on day 4, and 8.0 versus 10.0 on day 8 for 0.2 versus 0.3 J/cm², respectively. Median paired differences were 3.0 points on day 1, 2.0 points on day 4, and 1.5 points on day 8. Nominal item-level differences were observed for surface texture and irritation on day 1 and for vascularization and crusts/scabs on day 4, but none remained significant after Holm adjustment.

Medigel

Medigel also showed consistently higher composite scores at 0.3 J/cm². Median composite scores were 11.0 versus 15.5 on day 1, 10.0 versus 11.0 on day 4, and 8.0 versus 9.0 on day 8. Median paired differences were 3.0, 2.5, and 1.0 points, respectively. Nominal item-level differences were observed for surface texture and overall assessment on day 1 and for crusts/scabs on day 4.

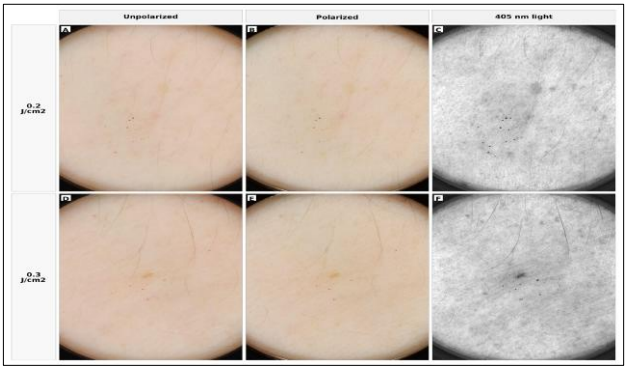

Figure 2: Representative images after fractional 1064 nm picosecond laser-induced optical breakdown at 0.2 and 0.3 J/cm² on day 8. Columns show unpolarized, polarized, and 405 nm images.

Laser doctor cream

For Laser doctor cream, median composite scores were 11.5 versus 16.0 on day 1, 10.5 versus 11.0 on day 4, and 8.0 versus 9.5 on day 8. Median paired differences were 2.5, 2.5, and 2.0 points, respectively. Nominal item-level

differences were limited to surface texture on day 1 and crusts/scabs on day 4. No adjusted item-level comparison was significant.

SkinCeuticals RGN 6

SkinCeuticals RGN 6 showed median composite scores of 11.5 versus 15.5 on day 1, 10.5 versus 11.5 on day 4, and 7.0 versus 8.0 on day 8 for 0.2 versus 0.3 J/cm². Median paired differences were 3.0, 3.0, and 1.0 points, respectively. Nominal item-level differences involved pigmentation, surface texture, and irritation on day 1, and vascularization and crusts/scabs on day 4. None remained significant after within-family Holm correction.

Teoxane post procedure

For Teoxane Post Procedure, median composite scores were 13.0 versus 15.0 on day 1, 10.0 versus 11.5 on day 4, and 10.0 versus 12.5 on day 8. Median paired differences were 2.0, 2.0, and 3.0 points, respectively. The most notable item-level signal was higher vascularization at 0.3 J/cm² on day 8 (median difference 1.0; p=0.008, p_Holm=0.055), which narrowly missed statistical significance after Holm adjustment.

Vichy collagen specialist 16 serum

Vichy collagen specialist 16 serum demonstrated the clearest product-specific fluence effect. Median composite scores were 11.0 versus 14.0 on day 1, 9.5 versus 13.0 on day 4, and 7.5 versus 9.5 on day 8. Median paired differences were 3.0, 3.5, and 1.0 points, respectively. The day 4 composite comparison remained significant after Holm adjustment across all composite comparisons (p_Holm=0.035). At item level, day 4 vascularization and crusts/scabs remained significant after Holm adjustment within the product-day family (Figures 3-5).

Temporal course within each fluence condition

Across time, both fluence conditions showed progressive improvement from day 1 to day 8. At 0.2 J/cm², Friedman tests demonstrated significant temporal improvement in vascularization, crusts/scabs or coagulation points, and overall assessment for all six products. Surface texture improved significantly in five of six products, while irritation improved significantly in three of six products. Pigmentation and surface level were comparatively stable.

At 0.3 J/cm², significant temporal improvement was observed for surface texture, crusts/scabs or coagulation points, irritation, and overall assessment in all six products. Vascularization improved significantly in five of six products. As in the 0.2 J/cm² condition, surface level remained stable and unremarkable (Table 4).

Safety and adverse findings

No pattern suggesting severe or persistent irritation was present in the rating dataset. Surface level remained at or near normal throughout, and no product showed evidence of a clinically relevant persistent elevation or depression within the day 8 observation window.

The observations therefore support favorable short-term tolerability for both intermediate fluence settings under the standardized postprocedural care protocol.

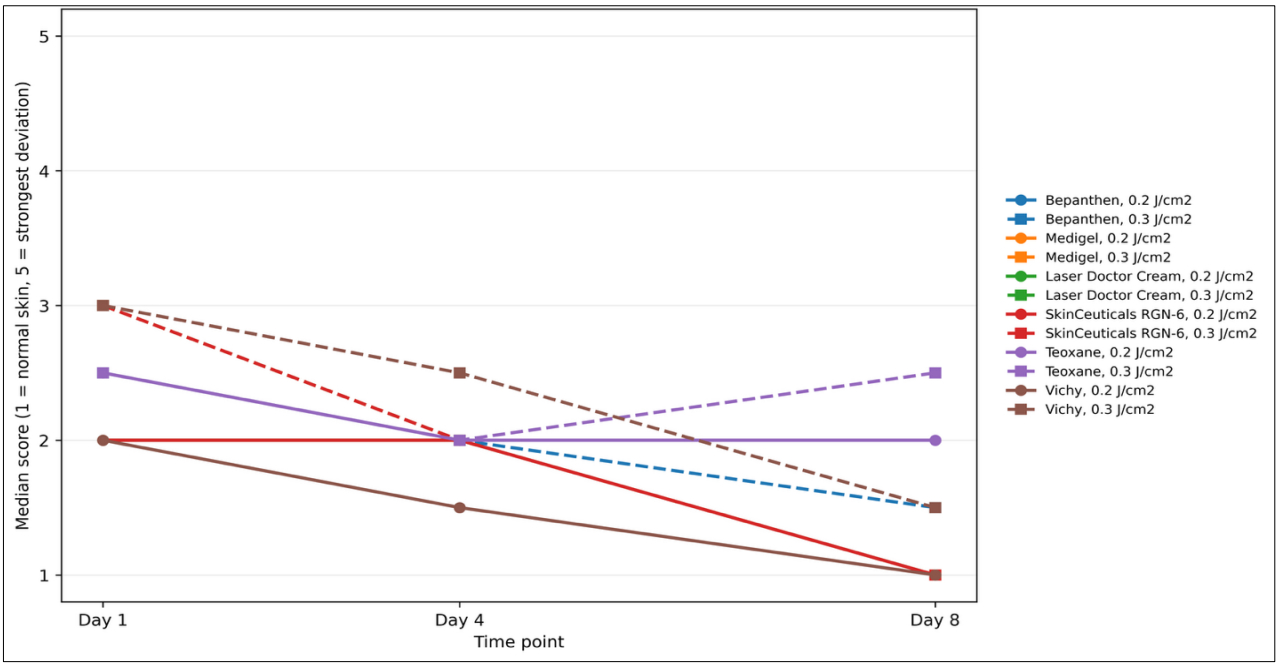

Figure 3: Median vascularization score over time by topical product.

Table 4: Summary of temporal improvement by fluence.

Fluence	Items improving significantly across day 1, day 4, and day 8	Items largely stable
0.2 J/cm²	Vascularization, crusts/scabs, and overall assessment in all 6 products; surface texture in 5 of 6 products; irritation in 3 of 6 products	Pigmentation and surface level
0.3 J/cm²	Surface texture, crusts/scabs, irritation, and overall assessment in all 6 products; vascularization in 5 of 6 products	Pigmentation and surface level

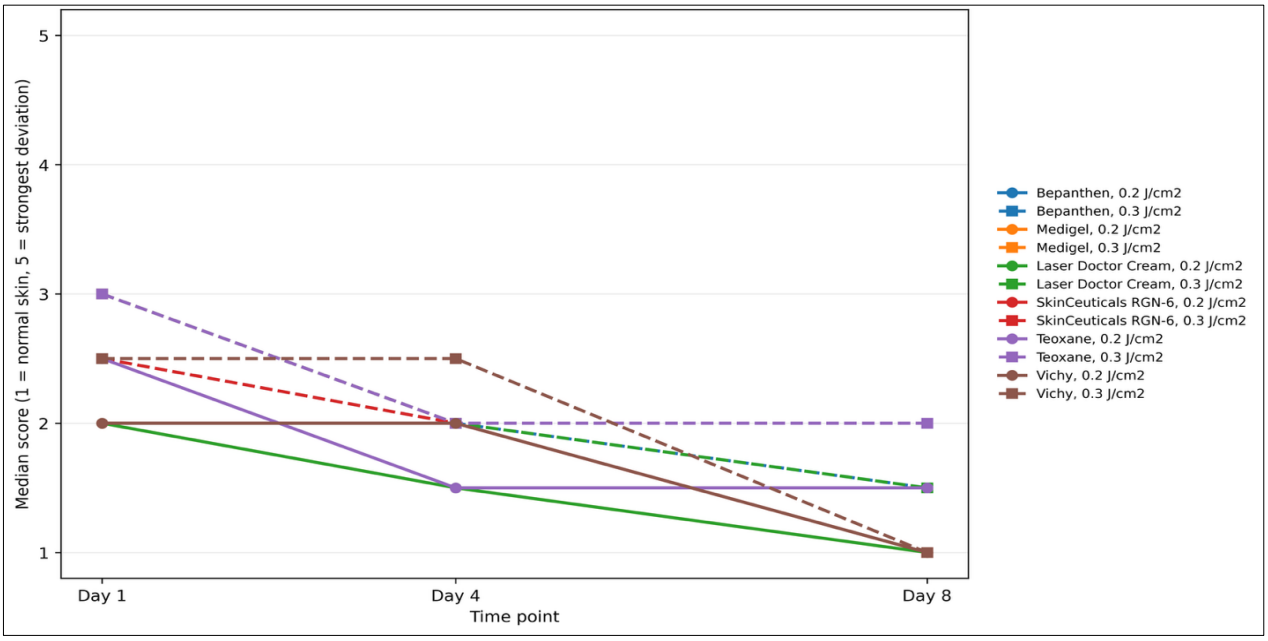

Figure 4: Median crusting/scabbing score over time by topical product.

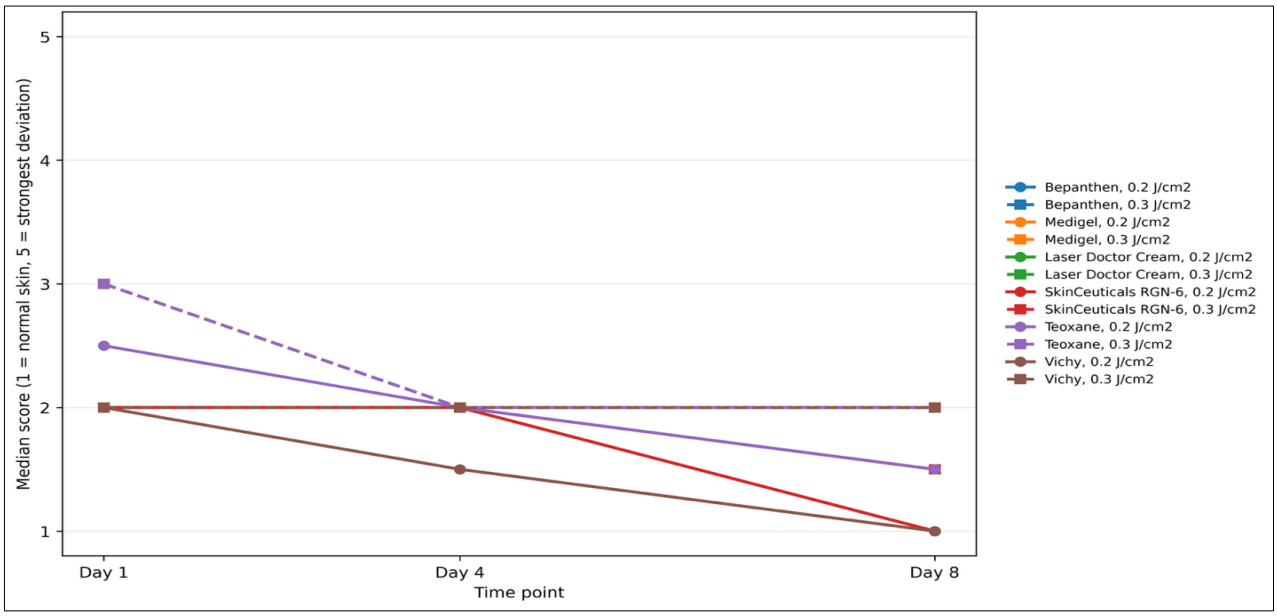

Figure 5: Overall assessment over time by topical product.

DISCUSSION

This prospective intraindividual case series was designed to directly compare early wound healing after fractional 1064 nm picosecond LIOB at two intermediate fluence settings, 0.2 and 0.3 J/cm², under identical topical postprocedural regimens. The paired design allowed each participant to serve as his or her own comparator and thereby reduced interindividual variability in vascular reactivity, barrier recovery, and pigmentary response.

The central observation was that 0.3 J/cm² produced consistently higher early visible reaction scores than 0.2 J/cm² across all topical product areas and assessment time points. This fluence-dependent pattern is biologically plausible because the increase in pulse energy from 100 mJ to 125 mJ may increase the number, density, or optical visibility of LIOB-related microalterations.

The clinical relevance of this difference appears to be related primarily to short-term visible downtime rather than delayed healing. Although 0.3 J/cm² was associated with stronger early vascularization, crust-like residua, surface texture changes, irritation, and overall deviation from normal skin, both fluence conditions showed progressive improvement by day 8. These findings suggest that the higher intermediate fluence increases the early visible postprocedural reaction while remaining compatible with favorable short-term healing in Fitzpatrick skin type II under the standardized topical care protocol used in this case series.

The product-specific analysis is relevant because postprocedural preparations may differ in occlusivity, water content, barrier support, humectant properties, and subjective cosmetic acceptability. However, topical agents are unlikely to override the primary biological effect of fluence. The most clinically meaningful product effects would therefore be expected in the early phase, especially erythema quality, crusting, surface texture, irritation, and overall visible downtime.

Surface level is expected to remain largely unaffected because LIOB is a fractional intradermal photomechanical injury rather than an ablative resurfacing procedure. Persistent elevation or depression would therefore be unexpected at the tested intermediate fluences and should be interpreted as an adverse or artifact-prone finding if observed.

The absence of clinically relevant irritation, oozing, pustular reaction, infection, or delayed re-epithelialization supports the short-term tolerability of both intermediate fluence settings under standardized topical care. Nevertheless, this conclusion is limited to the studied population, anatomical site, and skin type.

Comparison with existing literature

Existing studies on fractional picosecond lasers show that LIOB can induce tissue remodeling while preserving the epidermal surface.[1-8] The present case series adds clinically oriented wound-healing data by focusing on the early postprocedural phase and on topical aftercare. In contrast to studies on fractional ablative lasers, the injury morphology after LIOB is less epidermally destructive, and therefore the kinetics of crust formation, erythema, and barrier recovery cannot be assumed to be identical.[9-11]

The comparison between 0.2 and 0.3 J/cm² is particularly relevant for clinical practice because both settings are likely to be considered intermediate-intensity options. If the additional acute reaction at 0.3 J/cm² is small and transient, clinicians may choose the higher setting when stronger tissue stimulation is desired. Conversely, if 0.3 J/cm² produces clearly greater day 1 or day 4 downtime without meaningful clinical advantage in short-term normalization, 0.2 J/cm² may be preferable for patients prioritizing minimal visible recovery time.

Strengths

The strengths of this case series include the intraindividual paired design, standardized anatomical treatment site, controlled laser parameters, predefined topical regimens, repeated dermatoscopic documentation, blinded dermatological rating, and itemized scoring of clinically relevant wound-healing domains.

Limitations

This case series has several limitations. First, the sample size was small and chosen pragmatically, which is why the manuscript has been framed as a case series rather than as a full research article. Second, all participants had Fitzpatrick skin type II, which limits generalizability to darker skin types and to patients at higher risk of post-inflammatory hyperpigmentation. Third, product allocation was not randomized, allowing potential positional effects along the forearm. Fourth, the use of topical products under occlusion may not fully reflect routine clinical practice after cosmetic LIOB treatments. Fifth, the observation period was focused on early healing and cannot assess long-term remodeling, collagen induction, acne scar improvement, or sustained pigmentary effects. Sixth, the present manuscript is derived from a broader prospective observational study platform that also included other fluence levels. This creates a potential risk of perceived overlap with separate analyses from the same platform. To address this, the present report is deliberately restricted to the predefined intermediate-fluence comparison of 0.2 versus 0.3 J/cm². Other fluence levels, including 0.1 and 0.4 J/cm², are not included in the statistical analyses, tables, or conclusions of this manuscript. The findings should therefore be interpreted as a focused case series on intermediate-fluence wound-healing dynamics rather than as a duplicate report of the broader study platform.

If objective image analysis is included in future work, additional limitations apply. Without a calibration card, chromametry is relative rather than absolute. Automated region-of-interest detection may be affected by hairs, marker remnants, reflections, focus variability, and faint residual lesions at later time points.

Clinical implications

The clinically relevant question is not only whether 0.3 J/cm² produces higher acute scores than 0.2 J/cm², but whether this difference persists long enough to matter for

patient downtime and satisfaction. A stronger day 1 reaction with convergence by day 8 would suggest that the higher intermediate fluence remains tolerable but may require more conservative counselling regarding transient erythema and punctate crusting.

The product-specific observations may help refine postprocedural recommendations. Preparations that show lower early irritation, less crusting, and faster cosmetic normalization may be preferable when downtime is a priority. However, definitive product recommendations should be avoided because this case series is exploratory and not powered for product superiority.

CONCLUSION

In this prospective intraindividual case series of 10 Fitzpatrick type II participants, increasing fractional 1064 nm picosecond LIOB fluence from 0.2 to 0.3 J/cm² produced a consistent increase in early visible postprocedural reaction across all tested topical product areas, while both fluence settings showed favorable short-term healing by day 8. The main fluence-dependent signals involved crusting/scabbing, surface texture, vascularization, irritation, and overall appearance, whereas surface level remained unchanged, consistent with the non-ablative intradermal injury profile of LIOB. This case series advances practical understanding by showing that even a small intermediate-fluence increase can measurably alter visible early downtime under identical topical care, supporting individualized fluence selection according to the desired balance between procedural intensity and acceptable recovery time.

Recommendations

For fractional 1064 nm picosecond LIOB in Fitzpatrick skin type II, 0.3 J/cm² should be considered a setting that may produce greater transient visible reaction than 0.2 J/cm², especially during the first postprocedural days. When minimal visible downtime is the main priority, clinicians may consider starting with 0.2 J/cm² and escalating only after individual tolerance has been assessed. When a stronger procedural reaction is desired, 0.3 J/cm² may be considered with explicit counselling about potentially greater day 1 to day 4 erythema, punctate crusting, and surface texture changes. No definitive recommendation for superiority of any topical product can be made from this non-randomized case series.

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