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ORIGINAL RESEARCH

Real-World Broadband Light Treatment Strategies and Early Treatment Response in Facial Vascular Lesions: A Retrospective Observational Study

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ABSTRACT

***Introduction*:** Broadband light (BBL) therapy is increasingly used for the treatment of facial vascular lesions; however, real-world data regarding individualized treatment strategies and factors associated with treatment outcomes remain limited. This study aimed to evaluate real-world BBL treatment approaches for facial vascular lesions and to investigate the relationship between early treatment response and overall treatment outcomes.

***Methods*:** This retrospective real-world study included 111 patients with facial vascular lesions treated with BBL therapy between March 2023 and September 2025 at a tertiary dermatology center. Diagnoses included rosacea (n = 59), facial telangiectasia (n = 37), hemangiomas (n = 11), and port-wine stains (n = 4). Treatment characteristics, clinical outcomes, and adverse events were analyzed. Clinical efficacy was assessed by two blinded dermatologists using standardized photographs. First-session and overall treatment responses were categorized according to the degree of clinical improvement. Associations between early and overall treatment responses were evaluated using Spearman's rank correlation analysis.

***Results*:** Treatment outcomes differed significantly among diagnostic groups ($p < 0.001$). Rosacea and hemangiomas demonstrated the most favorable responses, whereas facial telangiectasia showed comparatively lower response rates. A moderate positive correlation was observed between first-session and overall treatment responses ($\rho = 0.533$, $p < 0.001$). All patients who were early responders (≥ 50% improvement after the first session) subsequently achieved overall treatment success, compared with 46.5% of patients who were non-early responders ($p < 0.001$). Patients who were early responders also required fewer treatment sessions ($p < 0.001$). Within major diagnostic groups, no significant associations were identified between specific treatment parameter combinations and overall treatment responses, whereas treatment session number correlated positively with treatment outcomes. Localized microcrusting occurred in 17.1% of patients and resolved without sequelae; no serious adverse events were observed.

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Conclusions: The observed treatment patterns and outcomes suggest that BBL therapy may be integrated into routine management of facial vascular lesions. Early treatment response was associated with subsequent treatment outcomes and treatment burden, and may provide clinically useful information for individualized treatment planning and patient counseling.

Keywords: Broadband light; Early treatment response; Facial vascular lesions; Intense pulsed light; Real-world study; Rosacea; Telangiectasia

Key Summary Points

Why carry out this study?
Real-world data describing individualized broadband light (BBL) treatment strategies for facial vascular lesions remain limited despite increasing clinical use.
This study investigated whether early treatment response was associated with overall treatment outcomes and treatment burden in patients undergoing BBL therapy.
What was learned from the study?
Treatment outcomes differed according to diagnosis, with rosacea and hemangiomas demonstrating more favorable responses than facial telangiectasia.
Early treatment response showed a significant association with overall treatment outcomes and treatment burden, with patients who were early responders requiring fewer treatment sessions.
These findings suggest that early response assessment may support individualized treatment planning and patient counseling in routine clinical practice.

INTRODUCTION

Vascular skin lesions constitute a broad and heterogeneous group of conditions frequently encountered in dermatologic practice, particularly on the face, where both therapeutic efficacy and cosmetic outcomes are of paramount importance. Laser-based modalities such as pulsed dye laser (PDL), Alexandrite laser, and neodymium-doped yttrium aluminum garnet (Nd:YAG) laser remain established treatment options for vascular lesions; however, their use may be limited by treatment-related adverse effects, including purpura, pigmentary alterations, and prolonged recovery periods, which may negatively affect patient satisfaction, particularly in facial treatments [1–3].

Intense pulsed light (IPL) technology has emerged as an effective alternative for the treatment of vascular lesions, utilizing the principle of selective photothermolysis to target oxyhemoglobin while minimizing collateral tissue injury [2, 4]. Unlike laser systems operating at fixed wavelengths, IPL devices emit noncoherent, polychromatic light across a broad spectrum and permit adjustment of wavelength cutoff filters, pulse durations, pulse structures, and fluence settings, allowing individualized treatment according to lesion characteristics and skin type [4, 5].

In addition to their therapeutic efficacy, IPL-based technologies offer several practical advantages, including the ability to treat larger surface areas, shorter procedure times, shorter recovery periods, and greater versatility across different vascular conditions, making them attractive options in routine dermatologic practice [5].

Broadband light (BBL™) is an advanced IPL platform that delivers continuous polychromatic light across a broad spectral range, generally between approximately 420 and 1400 nm. The versatility of BBL systems derives from the availability of multiple filter configurations,

adjustable treatment parameters, and the ability to target vascular chromophores across varying vessel sizes and depths [5]. These characteristics allow individualized treatment approaches for different vascular lesions while maintaining a favorable safety profile and limited posttreatment recovery time [6].

Beyond its established role in photorejuvenation and pigmentary disorders, BBL has demonstrated clinical utility in various vascular-associated conditions including facial telangiectasias, rosacea-associated erythema, and hemangiomas [1, 6]. Furthermore, BBL has been shown to induce molecular and structural changes associated with skin rejuvenation, contributing to improvements in overall skin quality and photodamage-related changes [7].

However, the broad spectral emission profile underlying the versatility of IPL and BBL systems may also reduce treatment selectivity and increase nonspecific absorption in surrounding tissues when treatment parameters are not appropriately selected. Therefore, treatment efficacy and safety are highly dependent on individualized selection of parameters such as wavelength filters, fluence settings, and pulse configuration [4, 5].

Early treatment response may provide clinically relevant information regarding subsequent treatment outcomes, yet evidence regarding this association in BBL therapy remains limited.

Therefore, this study aimed to characterize real-world treatment strategies in facial vascular lesions treated with BBL and to investigate the relationship between early treatment response and overall treatment outcomes. We hypothesized that early treatment response would be associated with subsequent therapeutic outcomes.

METHODS

Study Design and Setting

This study was designed as a retrospective, real-world observational analysis conducted at a single tertiary dermatology center. Medical records of patients who underwent BBL therapy for facial vascular lesions between March 2023 and September 2025 were reviewed.

Patient Selection

Patients aged ≥ 18 years who received BBL treatment for facial vascular lesions were eligible for inclusion. Target conditions included erythematotelangiectatic rosacea, facial telangiectasias, hemangiomas (including cherry angiomas), and port-wine stains. All patients in the rosacea group had an erythematotelangiectatic clinical phenotype, as BBL treatment was selected specifically for patients with prominent facial erythema and/or telangiectatic vascular features.

Only patients with adequate clinical documentation and follow-up data were included in the analysis.

Exclusion criteria included:

- Pregnancy or lactation.
- History of photosensitivity disorders.
- Active skin infection at the treatment site.
- Recent use of systemic photosensitizing medications.
- Prior laser or light-based treatment to the same anatomical area within the previous 6 months.
- Incomplete clinical records.

Ethical Approval

This study was approved by the local clinical research ethics committee (approval no.: 2026/409) and conducted in accordance with the Declaration of Helsinki. Informed consent for study participation was waived due to the retrospective design; written consent was obtained for publication of clinical images.

Data Collection

Demographic and clinical information extracted from electronic medical records included age, sex, Fitzpatrick skin phototype, lesion type, number of treatment sessions, treatment parameters, and concomitant

rosacea-specific treatments. In patients with rosacea, vascular involvement was predominantly centrofacial. In patients using topical brimonidine, treatment was discontinued at least 3 days before each BBL session.

Clinical photographs were obtained before each treatment session and at the primary follow-up visit, which was performed 4 weeks after completion of the final treatment session. Photographs were acquired using a high-resolution camera or the Observ® 520X imaging system (Sylton Inc., Michigan, USA), with the same imaging system used for all comparative photographs within each patient. Observ® images were acquired under standardized system settings, while camera-based photographs were obtained in a dedicated photography room with fixed lighting, camera position, and patient positioning.

Treatment Procedure

All treatments were performed using a BBL system (Super Veloce 4800™, Ilooda, Gyeonggi-do, Korea) by a single dermatologist at a single center. Treatment sessions were performed at 3–4-week intervals. Before each session, the treatment area was cleansed with an alcohol-free antiseptic solution and standardized clinical photographs were obtained. No local or topical anesthesia was used.

Treatment parameters were selected according to routine clinical practice rather than a predefined protocol. Cutoff filters and treatment strategies were individualized based on diagnosis, lesion morphology, vascular distribution, and Fitzpatrick skin phototype. When multiple filters were used, treatment proceeded sequentially from the 590 nm to the 560 nm and PW500 filters, with broader-field applications preceding targeted spot treatment. A 45 × 15 mm applicator was used for larger treatment areas, whereas a 6 mm applicator was used for localized lesions.

One or two test pulses were initially delivered, and fluence was adjusted according to the immediate treatment response, with perilesional erythema, transient blanching, and visible vessel clearance used as clinical endpoints. All selected filters were applied using a double-pass technique, with the second pass delivered perpendicular to the first in a crosshatched pattern and with minimal overlap.

Ultrasound gel was used for coupling and surface cooling, with an interval of approximately 1 min between filter applications to allow additional cooling. Following treatment, short-term cooling with ice packs was applied only in patients with port-wine stains. All patients were instructed to use daily sunscreen protection throughout follow-up.

Efficacy Assessment

Clinical efficacy was evaluated using pre- and posttreatment photographs. Each patient was evaluated separately, with photographs randomized within the individual patient image set and presented without chronological labeling. Evaluations were performed independently by two dermatologists who were not involved in treatment and were blinded to clinical information and image time point.

First-session response was defined as the degree of clinical improvement observed at assessment before the second treatment session.

Overall treatment response was defined as the degree of improvement observed at the primary follow-up visit performed 4 weeks after the final treatment session.

Treatment responses were categorized according to the degree of clinical improvement as follows [1]:

- Minimal response: 0 – < 25% improvement.
- Visible response: 25 – < 50% improvement.
- Moderate response: 50 – < 75% improvement.
- Marked response: 75 – 100% improvement.

Interobserver agreement between the two dermatologists was evaluated for both first-session and overall treatment response assessments. In cases of disagreement, a consensus score was established through joint review and used for final analyses.

Safety Assessment

Adverse events were evaluated retrospectively based on documented clinical records obtained during treatment sessions and follow-up visits. Only treatment-related adverse events that were consistently recorded in patient records were included in the analysis. Adverse events were categorized descriptively according to type and clinical severity.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 21.0 (IBM Corp., Armonk, NY, USA). The distribution of continuous variables was assessed using the Shapiro–Wilk test. Normally distributed variables were presented as mean ± standard deviation (SD), whereas nonnormally distributed variables were reported as median (minimum–maximum). Categorical variables were presented as frequencies and percentages.

Comparisons among diagnostic groups were performed using the Kruskal–Wallis test, with pairwise comparisons conducted using the Mann–Whitney *U* test where appropriate. The relationship between first-session and overall treatment responses was evaluated using Spearman's rank correlation analysis. Interobserver agreement was assessed using Cohen's kappa coefficient. Exploratory analyses of treatment parameters and outcomes were performed within diagnostic groups when feasible. A two-sided p-value < 0.05 was considered statistically significant.

RESULTS

Patient Characteristics and Clinical Distribution

A total of 111 patients were included in the study. The median age was 38 years (range 21–62 years). Of the study population, 93 patients (83.8%) were female and 18 patients (16.2%) were male.

Indications for BBL treatment included rosacea in 53.2% (n = 59) of patients, facial telangiectasia in 33.3% (n = 37), hemangiomas—including cherry angiomas—in 9.9% (n = 11), and port-wine stains in 3.6% (n = 4). Among patients with rosacea, 7 of 59 (11.9%) were receiving topical brimonidine as concomitant rosacea treatment, which was discontinued at least 3 days before each BBL session.

Fitzpatrick skin phototype distribution showed that 69.4% of patients had type II skin, followed by type III in 21.6% and type I in 9.0%. No patients with Fitzpatrick skin phototypes IV–VI were included.

Treatment Outcomes according to Diagnosis

First-Session Response

When first-session treatment responses were evaluated according to diagnosis, patients with rosacea and facial telangiectasia predominantly demonstrated minimal (0% to < 25%) and visible (25% to < 50%) response categories. In both groups, the median first-session response was classified as minimal (0% to < 25%).

In contrast, patients with hemangiomas tended to demonstrate higher first-session response categories, with a substantial proportion achieving moderate responses (50% to < 75%). The median first-session response in this group was moderate.

Comparison of first-session response distributions among diagnostic groups demonstrated a statistically significant difference according to diagnosis (Kruskal–Wallis test, p = 0.004).

Overall Response

Overall treatment responses also differed significantly among diagnostic groups (Kruskal–Wallis test, p < 0.001).

Patients with rosacea predominantly achieved moderate overall responses (50% to <75%), whereas patients with facial telangiectasia most commonly demonstrated responses within the visible response category (25% to < 50%).

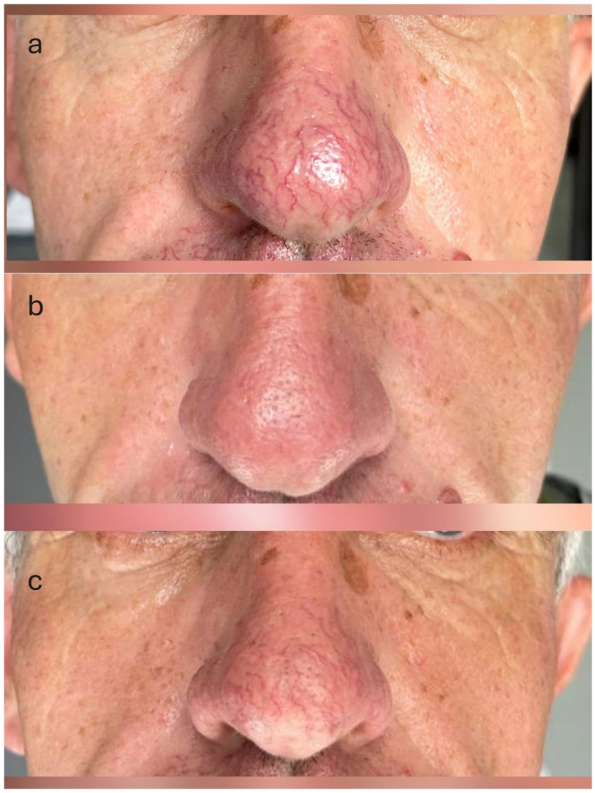


Fig. 1 Representative response of nasal telangiectasia to broadband light therapy. **a** Baseline. **b** Immediate posttreatment vascular blanching. **c** Moderate clinical improvement after the second treatment session

Patients with hemangiomas tended to show higher response categories, with a proportion achieving moderate or marked responses.

Representative examples of treatment response in facial telangiectasia and rosacea with concomitant facial angioma are shown in Figs. 1 and 2, respectively.

Detailed response distributions according to diagnosis and assessment time point are summarized in Table 1.

Association between First-Session and Overall Treatment Outcomes

Spearman's rank correlation analysis demonstrated a moderate positive correlation between first-session treatment response and overall treatment outcome ($\rho = 0.533$, $p < 0.001$).

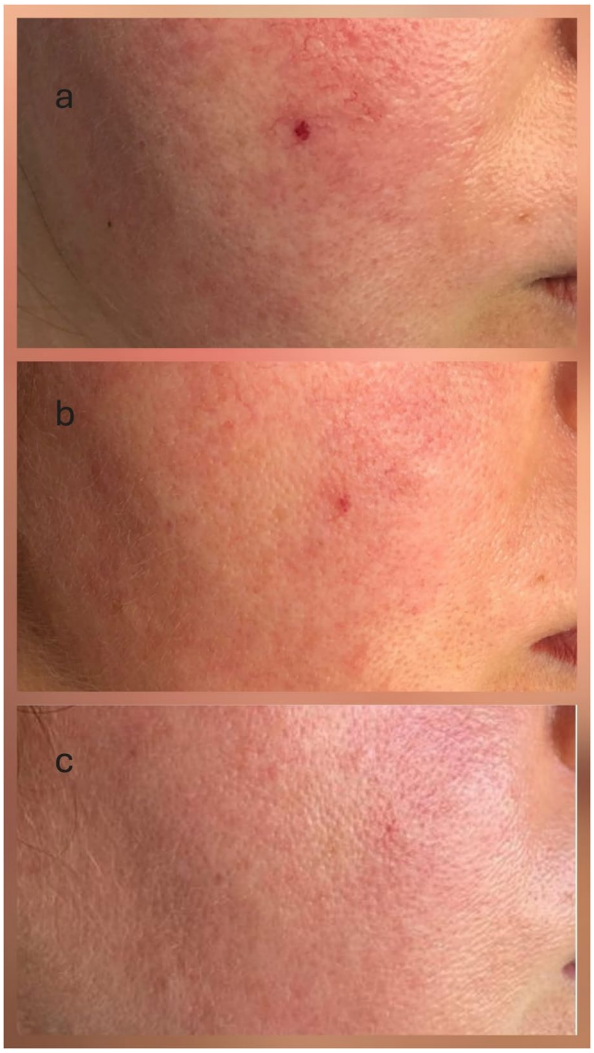


Fig. 2 Rosacea with concomitant facial angioma treated with broadband light therapy. **a** Baseline. **b** Minimal rosacea response and moderate angioma response after the first treatment session. **c** Visible rosacea response and marked angioma response after the second treatment session

Further analysis demonstrated a significant association between first-session and overall treatment response categories ($\chi^2 = 64.9$, $p < 0.001$). Among patients with minimal first-session responses, 76.5% subsequently progressed to higher response categories during follow-up. Similarly, among patients with visible first-session responses, 70% ultimately achieved moderate or marked overall responses. Patients achieving marked responses after the

Table 1 Distribution of first-session and overall treatment responses across diagnostic groups (values are presented as percentages)

Diagnosis	Timepoint	0% to < 25%	25% to < 50%	50% to < 75%	75–100%
Rosacea (n = 59)	First session	64.4	33.9	1.7	0.0
	Overall response	5.1	25.4	61.0	8.5
Facial telangiectasia (n = 37)	First session	67.6	24.3	8.1	0.0
	Overall response	32.4	48.6	13.5	5.4
Hemangiomas (n = 11)	First session	27.3	9.1	27.3	36.4
	Overall response	9.1	9.1	36.4	45.5

first session consistently maintained marked responses at final assessment.

To further investigate the clinical relevance of early treatment response, patients were categorized as early responders (≥ 50% improvement after the first session) and non-early responders (< 50% improvement after the first session). Among patients who were early responders, all patients (12/12, 100%) subsequently achieved overall treatment success (≥ 50% improvement), whereas only 46 of 99 patients (46.5%) in the non-early responder group achieved overall

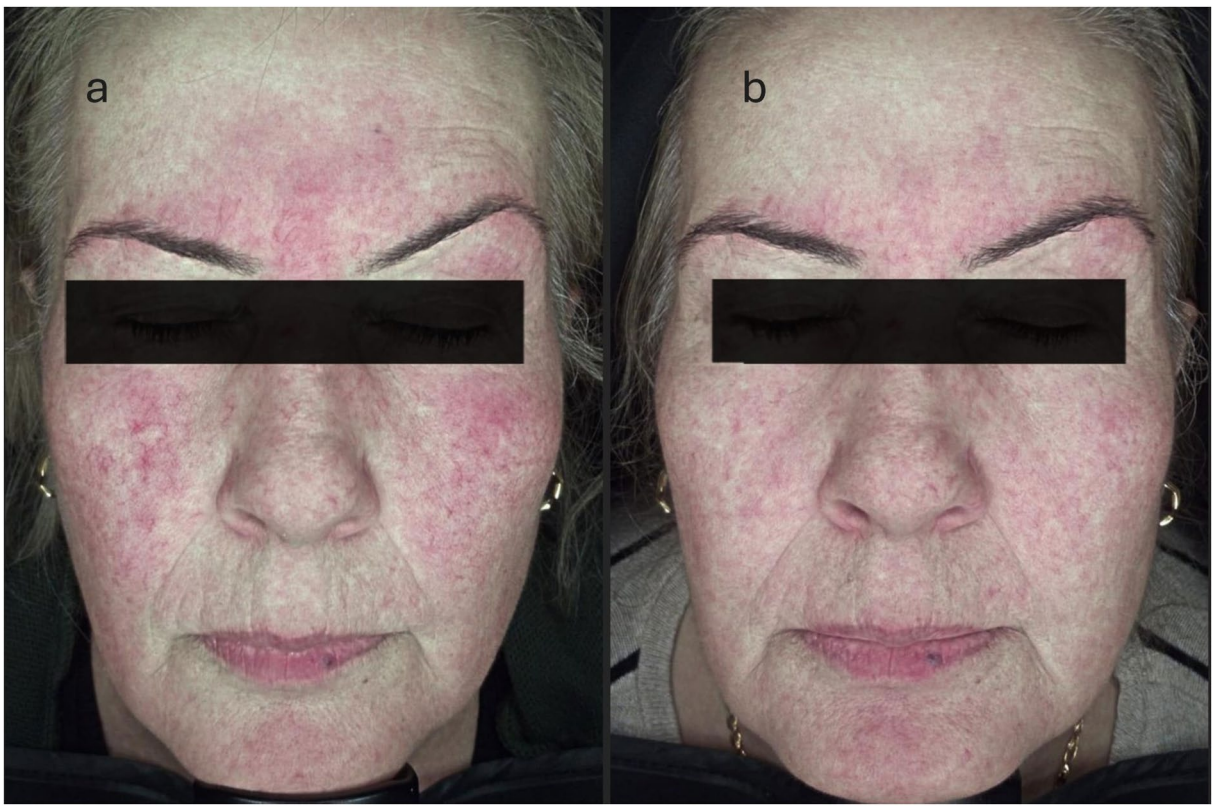


Fig. 3 Vascular imaging mode (Observ® × 520) in rosacea. **a** Baseline. **b** Early treatment response after the first broadband light treatment session, demonstrating reduced vascular signal intensity

treatment success. This association was statistically significant ($\chi^2 = 12.295$, $p < 0.001$).

In addition, patients who were early responders required significantly fewer treatment sessions compared with patients who were non-early responders (Mann–Whitney $U = 212$, $p < 0.001$). An example of early treatment response assessed using vascular imaging is shown in Fig. 3.

Real-World Treatment Strategies across Diagnostic Groups

Session Characteristics

Patients underwent a median of two BBL treatment sessions (range 1–6). Treatment session numbers differed significantly among diagnostic groups (Kruskal–Wallis test, $p < 0.001$), with median values of two for rosacea, two for facial telangiectasia, and one for hemangiomas.

Filter and Parameter Selection Patterns

Distinct treatment strategies were observed across diagnostic groups. Rosacea treatments involved combined use of PW500, 560 nm, and 590 nm filters, whereas facial telangiectasia was treated exclusively with spot-based applications, most commonly using the 560 nm spot filter. Detailed distributions of filter, fluence, and pulse–duration combinations are presented in Table 2.

Skin-Type-Based Parameter Adjustment

When Fitzpatrick skin phototypes were categorized as types I–II versus III, no significant associations were observed between skin type and filter selection or fluence settings (all Fisher's exact test $p > 0.05$).

Detailed Analyses in Common Diagnoses

Within rosacea and facial telangiectasia subgroups, no statistically significant associations were identified between specific treatment parameter combinations and overall treatment response (all $p > 0.05$).

However, a significant positive correlation between treatment session number and overall treatment response was observed in both rosacea ($\rho = 0.32$; $p = 0.013$) and facial telangiectasia ($\rho = 0.45$; $p = 0.006$).

Given the small sample size of the port-wine stain subgroup ($n = 4$), no subgroup-specific inferential analyses were performed, and data for this subgroup were retained for descriptive purposes only.

Safety and Adverse Events

Localized microcrusting was observed in 19 patients (17.1%), was predominantly mild in severity, and typically lasted 4–5 days, resolving within 7 days without sequelae. Transient erythema and edema subsided within hours. No serious adverse events including blistering, permanent pigmentary alterations, scarring, or treatment discontinuation were observed.

Interobserver Agreement

Interobserver agreement was almost perfect for both first-session treatment response ($\kappa = 0.816$, $p < 0.001$) and overall treatment response ($\kappa = 0.814$, $p < 0.001$).

DISCUSSION

In this real-world retrospective study, treatment outcomes following BBL therapy varied across diagnostic groups, with more favorable short-term photographic responses observed in patients with rosacea and hemangiomas than in those with facial telangiectasia. Given the clinical and biological heterogeneity of the included vascular conditions, these findings should be interpreted primarily at the diagnosis-specific level. Patients with rosacea and hemangiomas showed the most favorable responses, whereas patients with facial telangiectasia exhibited substantially lower response rates. Importantly, these outcomes were achieved through

Table 2 Real-world broadband light treatment strategies according to diagnosis

Diagnosis	Cutoff filter	Fluence (J/cm^2)	Pulse duration (ms)	*n* (%)
Rosacea	PW500 (spot)	8–9	10	39 (66.1)
		10–11	10	20 (33.9)
	590 + 560 (wide)	8–9	20	11 (18.6)
		10–11	20	39 (66.1)
		12–13	20	9 (15.3)
	560 (spot)	Not applied		
Telangiectasia	PW500 (spot)	8–11	10	5 (13.5)
	560 (spot)	18	20	13 (35.1)
		19	20	6 (16.2)
		20	20	13 (35.1)
	590 + 560 (wide)	Not applied		
Hemangiomas	560 (spot)	18	20	4 (36.4)
		19	20	2 (18.2)
		20	20	5 (45.5)
	590 + 560 (wide)	Not applied		
	PW500 (spot)	Not applied		

Percentages are based on the total number of patients in each diagnostic group. In rosacea, PW500 spot treatment and 590 + 560 nm wide-field treatment were applied sequentially as components of a combined treatment protocol. Treatments were mutually exclusive in facial telangiectasia; all hemangiomas were treated using the 560 nm spot applicator

individualized, diagnosis-driven treatment strategies reflecting routine clinical practice. A moderate positive correlation between first-session and overall treatment responses suggests that early clinical response may provide useful information regarding subsequent treatment outcomes and treatment burden. Furthermore, treatment success appeared to be more consistently associated with treatment session number than with specific parameter combinations.

Comparison with Existing Literature

The marked female predominance observed in our cohort is consistent with previous reports describing female predominance in patients with facial vascular disorders, particularly rosacea, which may reflect both epidemiological patterns and greater treatment-seeking behavior for cosmetic facial concerns [8].

Consistent with previous studies, our findings demonstrate diagnosis-specific differences in short-term treatment response following BBL therapy. Differences in treatment response among patients with vascular lesion subtypes may reflect variations in vascular architecture, including vessel diameter, vessel depth, and chromophore distribution, which influence light absorption, tissue penetration, and photothermal injury. In our cohort, diagnosis-specific differences in treatment response further support the importance of lesion characteristics in determining clinical outcomes following BBL therapy [1, 5, 6].

Similarly, patients with hemangiomas demonstrated relatively higher early and overall

treatment responses despite requiring fewer treatment sessions; however, these findings should be considered descriptive given the small size of this subgroup. Patients with facial telangiectasia showed comparatively lower response rates, which may reflect the heterogeneity of these lesions in vessel diameter and depth. Because these vascular characteristics influence the optimal wavelength and depth of light penetration, a single treatment approach may not uniformly target all telangiectatic vessels [9, 10].

Relationship between Early and Overall Treatment Response

One of the most clinically relevant findings of the present study was the observed relationship between early and overall treatment responses.

Early responders, defined as patients demonstrating ≥ 50% improvement after the first treatment session, consistently achieved overall treatment success (100%), whereas only 46.5% of patients who were non-early responders subsequently achieved treatment success. Patients who were early responders also required fewer treatment sessions compared with patients who were non-early responders. Although causal relationships cannot be inferred from the retrospective design of the study, these findings demonstrate an association between early treatment response and subsequent treatment outcomes and treatment burden in routine practice.

An additional important observation was that a substantial proportion of patients demonstrating minimal first-session responses subsequently progressed to higher response categories during follow-up. Specifically, 76.5% of patients with minimal first-session responses progressed to higher response categories during follow-up.

These findings suggest that limited improvement after a single session should not necessarily be interpreted as treatment failure, particularly in diffuse vascular disorders such as rosacea, where clinical improvement may occur over repeated treatment sessions [1, 11].

Real-World Treatment Strategies and Clinical Implications

One of the distinguishing aspects of this study is the evaluation of real-world treatment strategies. Unlike controlled studies employing fixed protocols, treatment approaches were individualized according to diagnosis, lesion morphology, vascular distribution, and immediate procedural endpoints.

The use of multiple filters and applicator sizes in rosacea appears biologically plausible given its diffuse vascular involvement and heterogeneous vascular morphology, whereas localized vascular lesions such as facial telangiectasia and hemangiomas may permit more targeted parameter selection [11, 12].

No significant associations were identified between specific treatment parameter combinations and overall treatment responses within the major diagnostic groups. In contrast, treatment session number demonstrated a more consistent relationship with clinical improvement, with higher session numbers being associated with more favorable outcomes, particularly in diffuse vascular disorders.

The predominance of lighter Fitzpatrick skin phototypes in our cohort may reflect routine clinical practice, as IPL/BBL systems may increase epidermal melanin absorption and pigmentary risk in darker phototypes [5]. Consistent with this observation, no significant associations were identified between skin type and treatment parameter selection within our cohort.

Safety Considerations

Few treatment-related adverse events were documented in our cohort. Localized microcrusting occurred in 17.1% of patients, with no documented cases of blistering, scarring, permanent pigmentary changes, or treatment discontinuation.

These findings are consistent with previous reports suggesting that IPL/BBL systems are generally well tolerated in vascular indications [6, 13]. However, given the retrospective assessment of adverse events, the present findings should be interpreted cautiously.

Limitations

This study has several limitations inherent to its retrospective design. The relatively limited sample size of the hemangioma subgroup reduced the statistical power of subgroup analyses. Furthermore, because only patients with Fitzpatrick skin phototypes I–III were included, our findings may not be generalizable to darker skin phototypes. Standardized baseline disease severity, disease duration, and reasons for treatment continuation or discontinuation were not uniformly available in the retrospective records, limiting the ability to attribute the observed improvement specifically to BBL therapy. Photographic response assessment was subjective and may have been influenced by the fluctuating clinical course of rosacea. In addition, adverse-event assessment was based on retrospective clinical documentation and may therefore not have captured all transient treatment-related reactions.

CONCLUSIONS

In this real-world retrospective cohort, BBL treatment was associated with short-term photographic improvement in patients with selected facial vascular lesions, with treatment responses varying across diagnostic groups. Treatment outcomes appeared to be more closely associated with diagnosis and treatment session number than with specific treatment parameter combinations. Early treatment response was associated with subsequent treatment outcomes and treatment burden. These findings support the potential value of individualized treatment strategies in routine clinical practice, although prospective studies with longer follow-up are needed to evaluate treatment durability and confirm these observations.

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Author Contributions. Pinar Dursun contributed to the conception and design of the study, data analysis, and drafting of the manuscript. Gamze Yanpar Erdem performed the BBL treatments. Selen Gezmen and Abdullah Fatih Acik performed the independent photographic assessments. Ayca Yazici contributed to data collection and critical review of the manuscript. All authors reviewed and approved the final manuscript.

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Data Availability. The datasets are available from the corresponding author on reasonable request.

Declarations

Conflict of Interest. Pinar Dursun, Selen Gezmen, Abdullah Fatih Acik, Gamze Yanpar Erdem, and Ayca Yazici have nothing to disclose.

Ethical Approval. This study was approved by the local Clinical Research Ethics Committee (Approval No: 2026/409) and conducted in accordance with the Declaration of Helsinki. Informed consent for study participation was waived due to the retrospective design; written consent was obtained for publication of clinical images.

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