The efficacy of pulsed dye laser treatment for inflammatory skin diseases: A systematic review

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Background: The position of the pulsed dye laser (PDL) in the treatment of inflammatory skin diseases is still unclear. Evidence-based recommendations are lacking.

Objectives: We sought to systematically review all available literature concerning PDL treatment for inflammatory skin diseases and to propose a recommendation.

Methods: We searched for publications dated between January 1992 and August 2011 in the database PubMed. All studies reporting on PDL treatment for an inflammatory skin disease were obtained and a level of evidence was determined.

Results: Literature search revealed 52 articles that could be included in this study. The inflammatory skin diseases treated with PDL consisted of: psoriasis, acne vulgaris, lupus erythematodes, granuloma faciale, sarcoidosis, eczematous lesions, papulopustular rosacea, lichen sclerosis, granuloma annulare, Jessner lymphocytic infiltration of the skin, and reticular erythematous mucinosis. The efficacy of PDL laser treatment for these inflammatory skin diseases was described and evaluated.

Limitations: Most conclusions formulated are not based on randomized controlled trials.

Conclusions: PDL treatment can be recommended as an effective and safe treatment for localized plaque psoriasis and acne vulgaris (recommendation grade B). For all other described inflammatory skin diseases, PDL seems to be promising, although the level of recommendation did not exceed level C. (J Am Acad Dermatol 2013;69:609-15.)

Key words: inflammatory; pulsed dye laser; skin diseases; treatment.

The flash lamp pumped pulsed dye laser (PDL) was the first laser specifically developed for the treatment of vascular lesions. The mode of action of the PDL is based on the principle of selective photothermolysis,[1] a targeted damaging of specific structures in the skin without damaging the surrounding area and by direct cutaneous immunologic activation.[2,3] Omi et al[3] have shown acute inflammatory changes (neutrophils, monocytes, and mast cells) 3 hours after laser treatment. Four weeks later, many lymphocytes and fibroblasts were observed, still increasing in week 5, whereas the capillaries showed an almost normal structure at week 2.

Abbreviations used:

CDLE:	chronic discoid lupus erythematodes
GF:	granuloma faciale
LOE:	level of evidence
LT:	lupus tumidus
PDL:	pulsed dye laser
RCT:	randomized controlled trials
SCLE:	subacute cutaneous lupus erythematodes
SLE:	systemic lupus erythematodes
UVB:	ultraviolet-B

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The current PDL is able to vary the different parameters such as the spot size (up to 12 mm), the pulse duration (ranging from 0.35-40 milliseconds), and the energy fluence, which has increased in recent years because of the development of protective cooling systems.[4] The most frequently used wavelengths are 585 and 595 nm allowing the penetration depth to a maximum of 1.5 mm. So, the fields of application are limited to superficial structures. Side effects during and after treatment with PDL are dependent of the chosen parameters, location, and skin type. They include erythema, purpura, edema, blistering, crusting, pigmentary changes, and, rarely, scarring.[5]

Today, the PDL is considered the laser of choice for most congenital and acquired vascular lesions.[6-8] In addition, it is used for the treatment of many other nonvascular or vascular-dependent indications, such as viral infections,[9,10] scars,[11] and stretch marks.[12] In 1992, Hacker and Rasmussen[13] described for the first time the treatment of an inflammatory skin disease, psoriasis, with the PDL.

To examine the position of PDL for the treatment of inflammatory skin diseases, we reviewed the current literature and provided updated information on the treatment of inflammatory skin diseases with PDL.

CAPSULE SUMMARY

- Although many inflammatory skin diseases have been treated with pulsed dye laser, evidence-based recommendations are lacking.
- In this review, the evidence published in the literature concerning the efficacy of PDL treatment for inflammatory skin diseases is discussed.
- Varying levels of evidence exist to support the efficacy of the PDL in the treatment of different inflammatory skin diseases.

METHODS

The focus of attention was the use of PDL in patients with inflammatory skin diseases. We searched for peer-reviewed publications dated between January 1, 1992, and August 31, 2011, in the computerized bibliographic database PubMed. Selected languages were limited to English, German, and Dutch. The key terms used were "pulsed dye laser" and "pulsed dye lasers." The term "inflammatory skin diseases" includes an extensive range of different diagnoses. Therefore, the literature on PDL was systematically scanned by a dermatologist, to be sure that all possible inflammatory skin diseases were found. Full details on the search strategy are available upon request.

Exclusion criteria were: treatment of lesions other than inflammatory skin diseases, the use of laser systems other than the PDL, and the use of concomitant local therapies, except for keratinolytic pretreatment to reduce scale and enhance PDL penetration. The use of concomitant systemic therapy was allowed, if this was not started or altered more than 6 weeks before the study onset or during the study itself. Outcome measures depended on the investigated skin disease. Because the available literature about PDL for inflammatory skin diseases is limited, all found articles were reviewed, including case reports, case series, retrospective studies, open-label trials, and randomized controlled trials (RCT). The bibliographies of all articles identified were checked for additional relevant articles that were not identified in the PubMed search. After the initial search was performed, all abstracts were screened for suitability for inclusion. Full texts of the suitable abstracts were obtained. Articles were assigned a level of evidence (LOE) and afterward graded according to the Oxford Center for Evidence-based Medicine Levels of Evidence[14] (Tables I and II) by 3 dermatologists.

RESULTS

Trial flow

In total, 2215 articles regarding PDL were identified. After screening of titles, abstracts, and full-text articles if applicable, 52 of these articles were suitable to be used in the review. The publications of inflammatory skin diseases treated with PDL consisted of: psoriasis (13), acne vulgaris (9), lupus erythematosus (including systemic, chronic discoid, and subacute cutaneous) (8), granuloma faciale (GF) (7), sarcoidosis (5), chronic eczema (1), lichen sclerosis (3), granuloma annulare (2), Jessner lymphocytic infiltration of the skin (1), reticular erythematous mucinosis (1), and papulopustular rosacea (2). All results are shown in Table III (available at http://www.jaad.org). Because of limited space, however, the inflammatory skin diseases with 3 publications or less (chronic eczema, lichen sclerosis, granuloma annulare, Jessner lymphocytic infiltration of the skin, reticular erythematous mucinosis, and papulopustular rosacea) will not be discussed in detail, but are listed in Table III (available at http://www.jaad.org).

Psoriasis

Literature search revealed 11 articles[13,15-24] describing PDL treatment for localized plaque-type psoriasis[15,16]; localized, chronic stable plaque psoriasis[17-20];