

Pulsed Dye Laser for Sensory Dysesthesias Associated With Chronic Radiation Dermatitis

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ABSTRACT

Chronic radiation dermatitis (CRD) is a long-term complication of radiation therapy, typically manifesting as scarred atrophic plaques with telangiectasias. In some cases, patients report persistent sensory dysesthesias such as burning, stinging, and pruritus. These symptoms are underrecognized and likely underreported but can significantly impair quality of life and are often refractory to conventional therapies. Pulsed dye laser (PDL) has demonstrated efficacy in treating CRD-associated telangiectasias, but its role in alleviating sensory symptoms has not been reported.

We report 2 breast cancer patients with treatment-resistant CRD and debilitating dysesthesias who experienced substantial symptom improvement following PDL therapy. The first patient presented with a decade-long nonhealing chest wall wound and refractory pruritus. She underwent 10 sessions of subpurpuric PDL at 6-week intervals, in combination with advanced wound care, and achieved complete wound healing and sustained relief of pruritus and skin fragility. The second patient presented with a burning erythematous axillary plaque present for 3 years. She underwent four PDL sessions at 5-week intervals and reported her first meaningful reduction in burning immediately after the initial treatment, with nearly complete resolution of dysesthesia by her final session despite persistent telangiectasias.

These cases suggest that PDL may offer a novel therapeutic option for CRD-associated dysesthesias, particularly when integrated with multidisciplinary care involving medical dermatology, laser specialists, and wound care. Larger, prospective studies are warranted to clarify PDL efficacy for CRD-related dysesthesias.

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INTRODUCTION

Chronic radiation dermatitis (CRD) is a long-term complication of radiation therapy and usually presents as atrophic plaques with telangiectasias. In some cases, CRD can be associated with persistent sensory dysesthesias such as burning, stinging, and pruritus. These underrecognized and likely underreported symptoms can impair quality of life as they can cause discomfort, sleep disturbance, and emotional distress.¹ In many cases, they are refractory to conventional therapies.

Pulsed dye laser (PDL) has been shown to improve telangiectasias in CRD; however, its potential to relieve CRD-associated dysesthesias has not been reported. Similar to rosacea, where neurovascular dysregulation is thought to contribute to burning and stinging sensations, CRD-related dysesthesias may also have a similar pathophysiology. In this small case series, we describe 2 breast cancer patients with treatment-resistant CRD whose sensory dysesthesias improved following a series of PDL treatments.

CASE SERIES

Case 1:

A 63-year-old woman with Fitzpatrick skin type III and stage IIB invasive ductal carcinoma of the left breast underwent modified radical mastectomy and adjuvant radiation therapy. The first course delivered 50.4 Gy in 28 fractions to the left chest wall, with adjacent supraclavicular and medial parasternal regions each receiving 45 Gy in 25 fractions. Six years later, she received a second course of 50 Gy in 20 fractions to the sternum due to recurrence. Two years after her second treatment, she developed CRD with telangiectatic plaques and recurrent skin breakdown with a persistent non-healing wound. Her associated symptoms included pruritus. A biopsy was performed given persistent ulceration to rule out malignancy, which showed epidermal ulceration with mixed inflammation and focal cytologic atypia compatible with chronic radiation changes.

Over 7 years, she was evaluated at more than 50 dermatology visits and failed topical corticosteroids, calcineurin inhibitors, antifungals, doxepin, ruxolitinib, and intralesional triamcinolone.

FIGURE 1. (A) Chronic radiation dermatitis of the central chest prior to treatment, showing telangiectasias, erosions, and skin fragility. **(B)** Marked clinical improvement following ten sessions of 595-nm PDL, with reduction in skin breakdown, bleeding, and dysesthesia.



She was referred for PDL therapy due to persistent dysesthesias and refractory CRD. Ten sessions of 595-nm subpurpuric PDL were administered at approximately week 6 intervals (10 mm spot size, 20 ms pulse duration, and fluence of 4.0–5.0 J/cm² with cryogen cooling and non-overlapping pulses). Pulses were spaced to avoid bulk heating in fragile, previously irradiated skin.

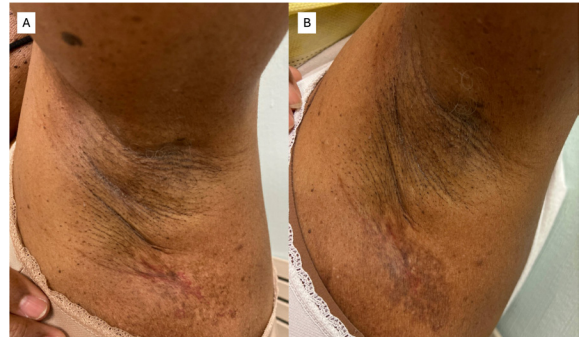
Following the first session, she reported reduced pruritus and less procedural discomfort than with intralesional corticosteroids. After her eighth PDL treatment, she was also evaluated by an academic advanced wound care center for a persistent but shrinking scabbed erosion, which improved with a bioactive wound matrix containing collagen, oxidized regenerated cellulose, and silver. Her main concern, which was the non-healing wound within the CRD that was persistent for 10 years, eventually healed completely by the tenth round of PDL and concurrent wound care (Figure 1).

Case 2:

A 73-year-old woman with Fitzpatrick skin type IV and a history of right breast ductal carcinoma in situ, previously treated with lumpectomy and adjuvant radiation, later developed stage IIB left breast cancer. She underwent lumpectomy and was followed by radiation, receiving 50 Gy in 25 fractions to the left breast and left supraclavicular region, with a 10 Gy boost to the lumpectomy cavity in 5 fractions. Four years post-treatment, she developed a persistent erythematous plaque in the left axilla with chronic burning and stinging. Biopsy confirmed chronic radiation dermatitis with dermal scarring and vascular ectasia. Over 3 years, she failed topical corticosteroids, tacrolimus, ketoconazole, and intralesional triamcinolone.

She underwent 4 sessions of 595-nm subpurpuric PDL therapy at approximately 5-week intervals (7–10 mm spot size, 10 ms pulse duration, and fluence of 5.0–7.0 J/cm²).

FIGURE 2. (A) Chronic radiation dermatitis of the left axilla prior to treatment, with persistent telangiectasias and erythema associated with burning and stinging. **(B)** Clinical appearance after four sessions of 595-nm PDL with resolution of dysesthesia.



After the first session, she reported the first meaningful reduction in burning since symptom onset. By the fourth session, dysesthesia was mild and infrequent, and so she stopped treatment due to near resolution of her symptoms. On exam, telangiectasias persisted, but sensory symptoms had nearly resolved. She did develop post-inflammatory hyperpigmentation in the axilla (Figure 2) as an adverse effect of the PDL, but this was not bothersome to her given her drastic improvement in her dysesthesias.

DISCUSSION

These 2 cases suggest that PDL may offer a novel therapeutic option for managing sensory dysesthesias in CRD, particularly in patients who are unresponsive to conventional treatment. While the efficacy of PDL in treating radiation-induced telangiectasias is well-documented, its impact on dysesthesias has not previously been described. To our knowledge, this is the first report describing PDL as a potential treatment for sensory dysesthesia in CRD.

The mechanism behind PDL's effect on sensory dysesthesia in CRD is not fully understood, but may involve modulation of neurovascular and neuroimmune pathways, similar to those proposed in rosacea. In rosacea, burning and stinging sensations are thought to be mediated by neurogenic inflammation, driven in part by activation of transient receptor potential (TRP) channels such as TRPV1 and TRPA1 on sensory neurons.² These channels respond to thermal, chemical, and inflammatory stimuli, triggering the release of neuropeptides like substance P and calcitonin gene-related peptide (CGRP), which drive vasodilation, mast cell degranulation, and hypersensitivity of the skin. In rosacea, this neurovascular dysregulation is increasingly recognized as a key driver of sensory symptoms. Although less studied in CRD than in acute radiation dermatitis, radiation-induced tissue injury may also disrupt cutaneous innervation and vascular function,³ potentially creating a comparable environment of neural sensitization. PDL, in addition

to its vascular-targeting properties, has been shown to reduce local inflammatory mediators and may attenuate this cycle of neurogenic inflammation, contributing to symptom relief.^{4,5}

These cases also highlight the importance of recognizing CRD in patients with skin of color, in whom erythema and telangiectasias may be less apparent. In such patients, sensory symptoms like burning, stinging, and pruritus may be the most prominent clues to diagnosis. These differences, along with limited representation in existing studies, may contribute to diagnostic delays and undertreatment.⁶

Limitations of this report include the limited number of patients in the case series, retrospective design, and reliance on subjective patient-reported outcomes. In addition, no validated symptom severity scale was used, and long-term durability of symptom improvement remains unknown. Nevertheless, the marked symptom improvement in both patients after years of treatment resistance proposes further clinical utility of PDL for CRD-related dysesthesias, which has great potential benefit with limited adverse effects. Larger studies would help to clarify the efficacy of PDL for CRD-associated dysesthesias.

DISCLOSURES

The authors have no conflicts of interest to disclose.

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