Successful Treatment of Porokeratosis with 585 nm Pulsed Dye Laser Irradiation

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Porokeratosis, a keratinization and fibroblast cutaneous disorder, is a progressive disease with limited treatment options. We describe a case of linear porokeratosis that responded favorably to a series of 585 nm pulsed dye laser treatments. In addition to its vascular specificity, the pulsed dye laser presumably produces a direct effect on collagen, as well as an indirect effect on histamine and mast cells that could account for the clinical changes seen in our patient.

Porokeratosis is a disorder of epidermal keratinization and dermal fibroblast function that occurs in several different clinical varieties including classic Mibelli and disseminated superficial actinic, palmoplantar, and linear forms. All of these variants share the common clinical features of a well-defined hyperkeratotic plaque with central atrophy and a peripheral keratotic ridge. On histologic examination, a column of parakeratotic keratinocytes traversing the stratum corneum (cornoid lamella) is a typical finding in lesions of porokeratosis, although it is not pathognomonic.

The cause of porokeratosis has not been firmly established, although there is evidence to suggest that both epidermal and dermal abnormalities play a role. DNA polyploidy and sensitivity of keratinocytes and fibroblasts to ionizing radiation have been documented in lesional skin. Immune function may also play a role in the expression of this disease: organ transplant recipients and patients undergoing chemotherapy have been reported to sustain porokeratosis. In addition, many forms of porokeratosis have been associated with an autosomal dominant pattern of inheritance.

Lesions of porokeratosis can be exacerbated by sunlight and may exhibit the Koebner's phenomenon. The course of porokeratosis is usually progressive and treatment frequently difficult. Patients need to be examined regularly for the presence of neoplasms arising within porokeratotic lesions, particularly squamous cell and basal cell carcinomas and Bowen's disease.

Case Report

A 49-year-old woman exhibited linear, hyperpigmented, and erythematous annular plaques extending from the dorsal surface of the right hand to the upper arm (Figure 1). The lesions first appeared at the age of 2, after she sustained a thermal burn to her right arm. Prior treatments with topical corticosteroids and cryotherapy were unsuccessful. The patient had mild hypertension, but was otherwise healthy. Her family history was noncontributory. Histologic examination of a cutaneous biopsy was consistent with the clinical diagnosis of porokeratosis.

Treatment was initiated with a 585 nm flashlamp-pumped pulsed dye laser (SPTL-1B, Candela Laser Corporation) at an energy density of 6.5 J/cm² using a 5 mm spot size. Six weeks after the initial treatment, the lesion was noted to be lighter in color and less hyperkeratotic. After a second treatment, the proximal portion of the...
FIGURE 2. Clearance of lesions after six pulsed dye laser treatments at bimonthly intervals (fluence = 6.5 to 6.75 J/cm², 5 to 7 mm spot size).

right upper extremity responded with almost complete resolution of scaling and was significantly less erythematous. Subsequent laser treatments at bimonthly intervals without adjunctive therapies resulted in continued improvement; the distal portion of the upper extremity responded more slowly than the proximal sections. After a total of six laser treatments (fluence = 6.5 to 6.75 J/cm², 5 to 7 mm spot size), all lesions were clinically resolved (Figure 2). No lesional recurrence was noted 11 months following the final treatment.

Comments
Linear porokeratosis is a cutaneous disorder of both epidermal and dermal origin. As is true with other similar disorders of keratinization, a dynamic process mediated by genetics, immunology, and environment drives the ultimate clinical expression and severity of the disease.

Treatment options for porokeratosis have included topical 5-fluorouracil, topical corticosteroids, excision, cryotherapy, and electrodesiccation. All have generally been unsuccessful in achieving remissions or have resulted in excessive scarring. Recent success with 585 nm flashlamp-pumped pulsed dye treatment of inflammatory linear verrucous epidermal nevi and psoriasis provided the rationale for attempting laser treatment of linear porokeratosis. All of these conditions are characterized by excessive epidermal growth patterns and dermal inflammation. The increased vasculature seen in these conditions serves as the primary target for the vascular-specific wavelength of the pulsed dye laser. Thus, not surprisingly, a reduction in erythema is observed after laser irradiation.

The vascular effect of pulsed dye laser treatment may also influence vessel permeability, leading to a decrease in inflammation associated with this condition. While the cause remains unclear, the improvement in skin texture and decrease in scale formation may be related in some way to the increased tissue mast cell concentration previously observed in pulsed dye laser-irradiated skin.

REFERENCES