Use of an 800-nm Pulsed-Diode Laser in the Treatment of Recalcitrant Dissecting Cellulitis of the Scalp

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REPORT OF A CASE

A 35-year-old black man with adult-onset diabetes mellitus presented to our clinics in July 1999 with a 2-year history of alopecia and a boggy scalp with cysts and pustules. He had been previously treated with 40 mg daily of isotretinoin for 3 months (Accutane; Roche Laboratories Inc, Nutley, NJ) and 25 mg daily of dapsone for 2 months with minimal improvement. Oral antibiotic administration was ineffective. The patient complained that in addition to being unsightly, his condition was continuously uncomfortable.

Physical examination of his scalp demonstrated patchy cicatricial alopecia on the crown, vertex, and occiput with variable dyschromia (Figure 1). Numerous pustules, cysts, and erosions were noted.

A punch biopsy specimen was taken, which demonstrated a diminished number of follicles with scarring, follicle rupture (Figure 2), and aggregates of neutrophils (Figure 3). These features are compatible with dissecting cellulitis of the scalp.

The patient was treated with 100 mg of isotretinoin per day for 5 months, which resulted in diminution of the condition but not complete remission. Three months later, the condition flared, and he was treated again with isotretinoin for an additional 2 months with little improvement. Colchicine treatment, 0.6 g twice daily, was begun but discontinued after 2 months because of gastrointestinal adverse effects. Modest improvement was noted. After the treatment with medications was discontinued, however, the cysts and erosions returned. Over the ensuing 6 months, the patient’s condition worsened and was associated with increasing discomfort. He was treated with azathioprine, methotrexate, dapsone, ketoconazole, cephalexin, and clarithromycin for the cutaneous disease and celecoxib and gabapentin for the associated pain.

The patient was offered x-ray epilation, but he declined, citing concern over long-term cutaneous malignancy risk. Because the inflammatory response centered around the patient’s pilosebaceous units, removal of the offending adnexal structures was undertaken.

SOLUTION

Test areas on affected scalp follicles and unaffected follicles from the right mandible were selected and treated using an 800-nm diode laser (Coherent, Santa Clara, Calif) with an actively cooled sapphire tip. Fluences of 10, 15, 20, 23, 26, and 29 J/cm² were tested at separate sites using a spot size of 9 x 9 mm and pulse duration of 30 milliseconds. At 2 weeks after treatment, there was no evidence of textural or color changes, and the fluence of 29 J/cm² was selected for use over the entire scalp. The patient’s scalp was shaved and treated using a 10% overlapping pattern. Ice packs were applied as needed in the first 24 hours after treatment for pain and swelling. Antibiotic ointment was applied to any areas of crusting, and prednicarbate ointment (Dermatop; Ortho Dermatological, Raratin, NJ) was used for persistent discomfort. Treatment with all systemic medications was discontinued 6 weeks prior to laser treatment. The patient underwent 4 treatment sessions 4 weeks apart to allow sufficient time to evaluate regrowth of treated follicles.

Figure 1. Diffuse scarring of the scalp from dissecting cellulitis prior to laser-assisted epilation.
Significant epilation was noted along with a dramatic decrease in the patient’s discomfort from the disease (Figure 4). At 6-month follow-up, his condition was quiescent and hair regrowth was not detected.

**COMMENT**

Dissecting cellulitis of the scalp, also known as perifolliculitis abscedens et suffodiens or Hoffman disease, typically affects young black men, although the condition has been described in whites. In association with acne conglobata and hidradenitis suppurativa, it is one condition of the so-called follicular occlusion triad, or when considered with pilonidal sinus, the follicular occlusion tetrad. Follicular retention of keratogenous materials suggests a basic pathologic mechanism for these conditions. An immunologic attack on displaced follicular or pilar antigens in the deep dermis may be operative. Patients initially present with firm to fluctuant nodules on the crown and occiput, which subsequently form sinus tracts that communicate with the skin surface. Secondary infection is common, as is considerable discomfort and embarrassment. Hair follicles are destroyed with ensuing permanent, scarring alopecia. In long-standing cases, squamous cell carcinoma has been reported.

Determining the best therapy for this condition is frustrating. Systemic antibiotics, x-ray epilation, systemic steroids, zinc sulfate, periodic drainage of fluctuant swellings, and excision with grafting have all been used. Curettage of marsupialized cyst walls and ablation using a carbon dioxide laser with healing by secondary intent has also been described. Recently, isotretinoin has emerged as the medical treatment of choice. The drug should be given at 1 mg/kg per day for at least 4 months after the disease is clinically inactive.

The theory underlying laser-assisted hair removal hinges on selective photothermolysis of the targeted follicles by selecting a wavelength that is well absorbed by melanin (400 to 1000 nm) but poorly absorbed by other naturally occurring chromophores such as hemoglobin and water. Longer wavelengths improve penetration into the skin, with the most penetrating wavelengths in the range of 600 to 1200 nm. Using a wavelength of 700 nm results in significant absorption by basal-layer melanin and inadvertent cutaneous damage during hair removal. The duration of the laser pulse must be less than or equal to the thermal relaxation time of the target. This allows the follicle to be heated without affecting surrounding tissues. The thermal relaxation time of the human hair follicle is estimated to be between 40 and 100 milliseconds. Epidermal melanin disruption is ameliorated by selecting pulse durations longer than the thermal relaxation time of the epidermis, estimated to be 3 to 10 milliseconds. Damage to the superficial skin may also be limited by cooling the surface during treatment. Absorption by underlying oxyhemoglobin within cuta-
neous blood vessels is minimized by exerting pressure on the laser tip while it is in contact with the skin. Several laser epilation systems have been developed, including the ruby laser (694 nm), pulsed-diode laser (800 nm), Nd:YAG laser (1064 nm), alexandrite laser (755 nm), and intense pulsed light source (590-1200 nm).

The largest study to date using the pulsed-diode laser for hair removal involved the treatment of 38 men and women at varying sites and with variable Fitzpatrick skin types (including types V and VI). The pulse width was restricted to half the fluence in joules per square centimeter. The mean treatment fluence was 33.4 J/cm² using a pulse duration of 5 to 20 milliseconds. Patients were given up to 4 treatments. Fifty-nine percent reported "sparse" regrowth at a mean follow-up time of 8.7 months. Those treated with fluences higher than 30 J/cm² experienced greater hair loss than those treated with fluences lower than 30 J/cm². Multiple treatments produced an additive effect. There were no reported cases of infection, textural changes, dyschromia, or scarring. Hair that regrew tended to be thinner and lighter in color.

Use of this laser in patients with follicle-associated disease has been described in 10 women with pseudofolliculitis barbae of the face, neck, groin, and axilla. An 810-nm pulsed-diode laser was used with a 9-mm spot size. Pulse duration was held constant at 20 milliseconds with fluences ranging from 30 to 38 J/cm². Three treatment sessions were administered 6 to 8 weeks apart. All patients reported more than a 50% decrease in hair density and more than a 75% reduction in papule and pustule formation at 2 months after their final treatment. Two patients with associated hyperpigmentation and fibrotic papules also experienced global improvement.

Dissecting cellulitis of the scalp is often a frustrating and recalcitrant disease. In patients not responding to more conservative therapies, laser-assisted epilation should be considered.

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REFERENCES


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