Successful Treatment of Disfiguring Hemosiderin-Containing Hyperpigmentation With the Q-Switched 650-nm Wavelength Laser

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Report of a Case

A 63-year-old white woman presented with a 3-year history of progressive dark facial discoloration. Findings from physical examination included prominent brown patches covering much of her face (Figure, A) and yellow-orange plaques on her breasts. The facial pigmentation also had a slight yellow tint.

The result from a biopsy performed in 2009 had been interpreted as plane xanthoma. The patient was found to have an IgG λ monoclonal gammopathy and was later diagnosed as having chronic lymphocytic leukemia not requiring treatment. Selected areas had been treated with the pulsed-dye laser (595 nm) and 3-millisecond alexandrite laser (755 nm) without benefit.

We performed a skin biopsy of the cheek, which revealed a dermal histiocytic infiltrate with scattered xanthomatous cells, Touton giant cells, and perivascular lymphocytic inflammation. An iron stain was positive within some of the histiocytes and giant cells, consistent with hemosiderin, and the presence of dermal melanophages was confirmed by a Fontana-Masson stain. The breast lesions showed similar changes, with palisading granulomas with central necrosis, cholesterol clefts, and scattered extravasated erythrocytes. The findings were compatible with a diagnosis of necrobiotic xanthogranuloma. The dark pigmentation seen clinically appeared to be caused by the combination of hemosiderin and melanin.

The patient sought treatment for the disfiguring intense pigmented patches that covered most of her face, which severely affected her quality of life. She is an astronomer and could not examine telescopes because her thick makeup transferred to their lenses. The patient stopped swimming laps at the local pool because she worried that children would find her appearance frightening, and she experienced a great deal of social discomfort.

Therapeutic Challenge

The challenge was to identify a treatment, laser or other energy-based device, that would ameliorate her facial pigmentation.

Solution

The patient’s facial pigmentation had not responded to areas treated either with millisecond domain pulses of the pulsed-dye laser or alexandrite laser, but we hypothesized that use of lasers at other wavelengths and shorter pulse durations might be effective.

Test spots were performed with lasers at 5 different wavelengths and/or pulse durations, each chosen because of their reported or potential effect on pigmentation resulting from melanin or hemosiderin. There was no improvement within areas treated with the 3-millisecond pulsed-dye 595-nm laser or the quality-switched (Q-switched) 15-nanosecond 1064 Nd:YAG laser. Mild and moder-

THE PATIENT UNDERWENT 9 TREATMENTS WITH THE Q-SWITCHED 650-NM WAVELENGTH LASER (REVILITE), BROKEN UP BY COSMETIC SUBUNITS, WITH EACH AREA RECEIVING A TOTAL OF 2 TO 3 TREATMENTS. THE SETTINGS WERE AS FOLLOWS: FLUENCE OF 3.2 J/CM², SPOT SIZE OF 2 MM, AND PULSE DURATION OF 5 TO 20 NANOSECONDS. BECAUSE THE FLUENCE AND SPOT SIZE ON THIS LASER ARE PREDETERMINED AND FIXED AND THE IMPACT INTENSE, AN ADDITIONAL 2-CM SPACER WAS USED TO DEFOCUS THE ENERGY AND INCREASE THE SPOT SIZE TO ACHIEVE THE DESIRED END POINT OF A CLOUDY WHITE CHANGE IN THE SKIN AFTER EACH LASER PULSE. EACH TREATMENT CONSISTED OF 1 PASS WITH MINIMAL OVERLAP OF PULSES, JUST ENOUGH TO ACHIEVE CONFLUENT COVERAGE. WE AVOIDED DOUBLE PULSING INDIVIDUAL SPOTS OR TREATING AREAS TWICE DURING THE SAME VISIT. LIDOCAINE OINTMENT, 30%, WAS APPLIED TO THE TREATMENT AREA FOR AN HOUR PRIOR TO EACH TREATMENT, AND COLD FORCED AIR WAS USED DURING THE TREATMENT TO INDUCE ADEQUATE ANESTHESIA.

THE PATIENT’S FACIAL HYPERPIGMENTATION DIMINISHED ALMOST ENTIRELY (FIGURE, B), AND SHE WAS ABLE TO REEMERGE INTO THE PUBLIC WITH LARGE IMPROVEMENT IN QUALITY OF LIFE. AT THE 5-MONTH FOLLOW-UP AFTER THE LAST TREATMENT, SHE MAINTAINED HER RESULTS WITHOUT RECURRENCE OR DEVELOPMENT OF NEW LESIONS.

DISCUSSION
NECROBIOTIC XANTHOGANGLOMA IS A VERY UNCOMMON PROBLEM, BUT HYPERPIGMENTATION UNRESPONSIVE TO TREATMENT WITH TOPICAL AGENTS OR ENERGY DEVICES IS NOT. Q-SWITCHED LASERS MAY TREAT A VARIETY OF PIGMENTED LESIONS WITH SUCCESS, BUT THERE ARE MANY TYPES OF HYPERSPECTRUM. WE PRESENT A NOVEL USE FOR THE Q-SWITCHED 650-NM WAVELENGTH FOR THE TREATMENT OF DISABLING FACIAL HYPERPIGMENTATION IN A PATIENT WITH MINIMAL RESPONSE TO OTHER Q-SWITCHED OR MILLISECOND PULSED LASERS. THE DARK PIGMENTATION RESULTED FROM HEMOSIDERIN AND MELANIN DEPOSITION IN AN ATYPICAL PRESENTATION OF NECROBIOTIC XANTHOGANGLOMA.

HEMOSIDERIN HAS BEEN SHOWN TO HAVE AN ABSORPTION PEAK IN THE 660- TO 680-NM RANGE, FURTHERMORE, AN ANALYTICAL MODEL THAT TAKES INTO ACCOUNT DERMAL BLOOD VESSELS INDICATES THAT WAVELENGTHS BETWEEN 595- AND 700-NM SHOULD BE EFFECTIVE IN TREATING DERMAL HEMOSIDERIN. AS SUCH, THE Q-SWITCHED 694-NM RUBY LASER HAS BEEN REPORTED TO LIGHTEN, TO VARYING DEGREES, POSTSCLEROTHERAPY HYPERPIGMENTATION, A RESULT OF HEMOSIDERIN IN THE DERMIS SECONDARY TO EVACUATED RED BLOOD CELLS. WE PRESUME THAT Q-SWITCHED 650-NM WAVELENGTH ENERGY IS WELL ABSORBED BY HEMOSIDERIN PRESENT WITHIN DERMAL HISTIOCYTES AND GIANT CELLS, LIGHTENING THAT COMPONENT OF OUR PATIENT’S PIGMENTATION, AND THAT THIS WAVELENGTH WAS EFFECTIVE IN DIMINISHING THE DERMAL MELANIN AS WELL.

THIS DRAMATIC RESULT SUGGESTS THE Q-SWITCHED 650-NM WAVELENGTH MAY HAVE USE IN A VARIETY OF HYPERPIGMENTED LESIONS IN THE BROWN-RUST-YELLOW SPECTRUM. HEMOSIDERIN, SOMETIMES ALONG WITH MELANIN, IS PRESENT IN MANY TYPES OF HYPERPIGMENTED LESIONS INCLUDING STATIS DERMATITIS, PIGMENTED PURPURAS, PURPURA AFTER TRAUMA OR LASER PROCEDURES, AND POSTSCLEROTHERAPY HYPERPIGMENTATION. TEST AREAS AND POTENTIAL TREATMENTS WITH THE Q-SWITCHED 650-NM WAVELENGTH MAY BE A NEW, EFFECTIVE APPROACH FOR DRAMATICALLY REDUCING THE PIGMENTATION IN THESE DISORDERS, MANY OF WHICH RESPOND SPARSELY, IF AT ALL, TO OTHER Q-SWITCHED LASERS. WE RECOMMEND USING THE METHOD DESCRIBED FOR OUR PATIENT AND WOULD ALTER THE TREATMENT INTENSITY AS NEEDED TO ACHIEVE THE END POINT OF DIFFUSE CLOUDY WHITENING OF THE SKIN. THIS MAY VARY DEPENDING ON THE SITE BEING TREATED. OFF-FACE AREAS MAY REQUIRE A LESS-INTENSE BEAM, WHICH MAY BE ACHIEVED BY INCREASING THE DISTANCE FROM THE HAND PIECE TO THE SKIN TO APPROXIMATELY 3 CM.

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REFERENCES