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Two-Year Follow-Up Results of Copper Bromide Laser Treatment of Striae

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ABSTRACT

Objective: **The aim of our study was to follow-up 15 patients with stretch marks treated positively with the CuBr laser (577–511 nm) in 1998–99 and followed-up for 2 years.** ***Materials and Methods:*** **The patients were Italian women, young to middle age (average 30 years old), with skin coloration classified as Fitzpatrick II–III. Biopsies were taken on some patients before the treatment and 1 month after the first treatment. Double-blind histological, histochemical and photographic evaluation was performed. Results obtained as well as to the contradictory effects reported elsewhere in the literature were compared.** ***Results:*** **On average, the results were positive and there were some pathogenic considerations that justified the use of laser.**

INTRODUCTION

CUTANEOUS STRIAE, or stretch marks, are atrophic dermal scars with overlying epidermal atrophy. They are a cosmetic defect but sometimes can be the sign of a true pathology. Their etiology is often multi-factorial[1,2] with constitutional causes: endocrine, metabolic, vascular, chronic inflammatory, traumatic, iatrogenic and sometimes, neoplastic disorders. There are multiple classifications of stretch marks following different criteria: color, morphology, etiology and age of striae. In accordance with these criteria, the striae are defined as white or red, superficial or deep, recent or old. No therapy has been codified until today and the results of all therapies are only partially positive because only in exceptional cases do the striae disappear totally. Different lasers have been proposed as a treatment modality for this defect, but the results have always been partial and/or lacking adequate follow-up.[3,4] Furthermore, the high cost of the instrumentation has prevented any systematic, wide-scale studies from being performed.

The flashlamp-pumped pulsed dye laser at 585-nm wavelength has been used most frequently, using an energy density of 3–8 Joules per square centimeter, and successfully tested in the treatment of scars.[5] More recently, incoherent intense pulsed light has been used for the same lesions, with filtered wavelengths of 515–550–570–590 nm and fluences of 30–55 Joules per square centimeter measured output. This modality is still under clinical investigation.

The effects of lasers on different phases of tissue repair have been much investigated, including studies on the phases of re-epithelialization and collagen tissue formation. Some data is now available.[6–10] Given identical conditions and lasers, dosage variations can cause opposite effects.[11–13] Usually, a dosage of 2–4 Joules/per square centimeter on the tissue *in vivo* and 4–20 Joules *in vitro* stimulates fibroblast activity and the production of granulation tissues as well as active hyperemia and an increase in re-epitheliazation. These effects were revealed with 632–904-nm wavelength lasers and with 380–1000-nm flash-lamps. By increasing the doses, the same reparative procedures are inhibited, first reversibly and then irreversibly due to cellular and sub-cellular destruction caused by the photo-thermal damage resulting in protein denaturation, micro-burns, macroscopic burns, carbonization and tissue explosion with vaporization.

Our earlier experiences in treating scar tissue led us to consider the use of lasers with wavelengths similar to pulsed 585 nm in the treatment of this cosmetic defect.

MATERIALS AND METHODS

We selected, in 1998–99, 15 early middle-aged women of phototype II–III (Fitzpatrick Scale), with stretch marks on the breasts, abdomen, dorso-lumbar region, and at the base of the lower limbs. The patients interrupted any other treatment

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2 months before the laser procedure and they were in good health. They underwent treatment with a copper bromide laser at 577 nm (ProYellow+, Asclepion-Meditec AG, Jena) at tissue doses of 4 Joules per square centimeter on the breasts, and 8 joules per square centimeter in the other regions. They were treated with one to five sessions, 1 month apart, using a 1.5-nm spot diameter, with irradiation of the edges surrounding the lesion. Overlapping of one-third between the spots was included. Off-time between the pulses was from 120 until 150 msec.

The 577-nm laser was chosen because of its greater versatility as compared with the 585-nm pulsed dye laser. In fact, with the 577-nm laser it is possible to vary more parameters including the duration of the pauses between laser pulses, and adapt them to the individual case. In addition, 577 nm is the maximum absorption peak of hemoglobin. The effects of the 577-nm laser have also been studied *in vitro*.[14]

The dosage parameters applied in each irradiation[15] are summarized in Table 1. Before irradiation, the target zone was cooled with a desensitizing cooling spray of Aloe Vera + Asialene + Echinacea. A similar combination without Echinacea, but with propylhydroxilic acid, in gel form, was applied for a week after the session. No other substances were administered before, during or after the treatment. Anti-inflammatory, and anti-erythema spray and cream were applied only for protective purposes, during and immediately post-treatment.

Histological and histochemical evaluation was performed on 3-mm-diameter punch-biopsies, including at the margin of the striae and in tissue around the lesion.

The results were evaluated on the basis of the planimetry of the lesions measured before and one month after each treatment and the morphological appearance of the lesions—using photographs, with specific reference to the depth, width, and color of the striae. The patients were evaluated after 1, 2, 3, 4 months and at 1 and 2 years. Results were divided in three groups: excellent, with total disappearance of the stretch marks; good, with reduction from 50% until 99% of the strias area; less, with reduction less than 50%; and poor, without changes.

RESULTS

The total results listed in Figure 1 were published in 2000.[16] The data from the previous study are used as a baseline and the current manuscript deals with follow up assessment and treatment above and beyond the data detailed in the original study.

Three patients with breast strias and two patients with leg strias had the total disappearance of the strias (group of excellent results). The other patients had an improvement of the strias with reduction of dimensions and deep, more than 50% until 90% (group of good results).

Two patients had no positive results after the first four sessions of treatment (group of less results). They decided to stop the treatment. Two patients had results after two laser sessions, three patients after three sessions, and eight patients after four irradiations. Some photographic evidence is shown (Figs. 1 and 2).

The patients noticed a slight burning sensation during the procedure that was immediately relieved with the desensitizing-refreshing spray. After the procedure a slight sensation of heat lasted for a few hours along with a little swelling of the treated area. There were also some transudation scabs that developed in the days following the procedure which lasted for about one week. Some patients described mild, brief, but recurring pangs. The stretch marks gradually changed in appearance over the course of one month. Then, if necessary, the patient underwent further sessions spaced one month apart, for a maximum of four sessions in eight patients.

The follow-up after one year was positive (Fig. 2) because in 13 patients out of 15 the results obtained were maintained and it seemed that sun exposure had evened-out the skin appearance. The follow-up after 2 years confirmed the stability of the results obtained at 1 year. For maintenance therapy at home after obtaining the reported results, we suggested the use of a cream (Stretch-Peel*), once a day on the regions were the striae might re-appear with most frequency.

Ultraviolet wavelengths have the greatest effect on scars. It seems that 380 nm is the most active, but it is only available from high-energy lamps and there are no such wavelength lasers. Lamps, however, do not permit precise dosage of the radiation as they emit incoherent light; nor do they permit the determination of a single wavelength.

Therefore, in the treatment of striae, 577-nm copper bromide lasers are well accepted by the patients, free of hazards and non-invasive. We have not established the exact number of applications required for each type of striae even though it would seem that stretch marks on the breast require fewer applications than the thighs, abdominal and dorso-lumbar re-

TABLE 1. DOSAGE

	Doses	*CuBr*	*Pulsed dye*
Wavelength	nm	511 and 577	585
Emission	Wave	Pulse	Pulse
Fluence	Joules/cm^2	3–10	3–6
Repeat-pulse frequency	Hertz	QCW	PW
Pulse duration	msec	20–70	1.500
Spot size	mm	1.5	10
Irradiated points	(zones)	Lesion and adjacent tissue	
Procedure of irradiation		Fixed point	
No. and spacing of sessions	1–5	Once a month	

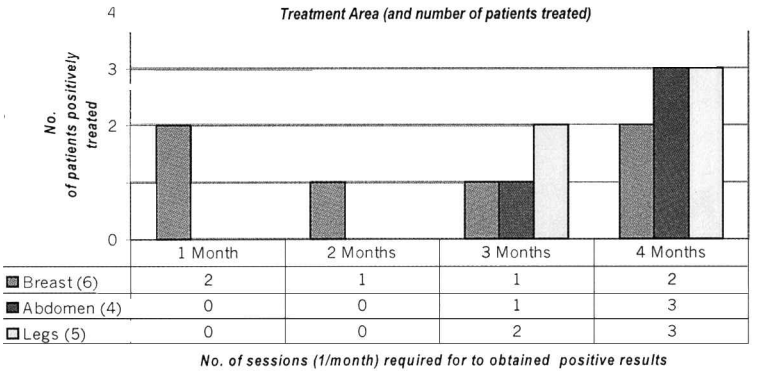

FIG. 1. Patients treated and results.

gions. The reason may be that in those regions, the skin is thicker and the striae almost always deeper. A histological evaluation of the results was not possible because the amount of the tissue biopsied was less, so the histological and histochemical findings were not precisely measurable. On the other hand, the patients accepted the use of punch biopsy specimens taken before, during and after the treatment, but they would not have accepted biopsies with a diameter of 1 cm, which we would have needed to obtain exact histological and histochemical data of statistical significance. The few biopsies obtainable from such patients could also explain the contradictory histological results reported in the literature regarding laser treatment of striae.[3,4,14,15]

CONCLUSION

Copper-bromide (577 nm) laser treatment of cutaneous striae has proven effective in this trial. Too often in the past this cosmetic defect seems to have been remedied with causal and non-causal treatments but the results were always disappointing in relation to the optimistic forecasts. For this reason, we examined our patients again after one and 2 years prior to submitting these definitive results. Fortunately, the results obtained remained the same after 1 and 2 years. At the same time, we hope that our positive clinical impressions will be confirmed by broader, multi-center studies.

The impossibility of obtaining histological and histochemical confirmation data limits the value of our data. On the other hand, *in vivo* radioimmunoassays to measure PIIINP values carried out by some authors in the study of collagen neogenesis, confirmed this effect of yellow laser light. The photographic evidence from this study also confirms it.

One thing, however, is certain: the 577-nm copper-bromide laser can greatly improve scarring especially in the remodeling and re-epithelization phases, and this is already an encouragement for the pursuit of striae reduction in further trials.

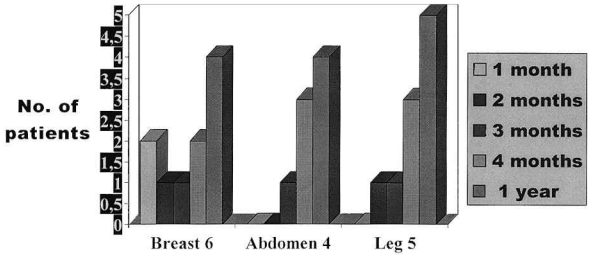

FIG. 2. One-year follow-up.

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