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ED2000®: 585 nm collagen remodelling pulsed dye laser

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The wavelength of 585nm corresponds to an absorption peak of haemoglobin. The heating effect in these skin layers triggers the release of various growth factors that stimulate collagen remodelling and tightening. We report our experience with a 585nm collagen remodelling, double flashlamp excited pumped dye laser was used (ED2000®, Deka MELA, Calenzano, Italy), spot size 5 mm, energy density (fluence J/cm^2) from 2 to 4 J/cm^2, emission modality (repetition rate) at 0.5 Hz, with a short pulse duration of 250 µsec. The efficiency of 585 nm collagen remodelling pulsed dye laser is controversial in only one session. It is probably reasonable to inform patients that 3–4 treatment sessions are necessary, and that 10% of the patient have no response to nonablative photorejuvenation.

Because of its low fluence and is shorter pulse duration, the 585 nm collagen remodelling pulsed dye laser has limited efficacy for the treatment of port wine stains. However, it may offer patients with erythematous, raised or hypertrophic acne scars or striae distensae a permanent cosmetic solution. This laser is safe and effective in the treatment of surgical scars starting as soon as possible, on the day of suture removal if possible. We found that 96.3% of molluscum contagiosum healed after the first treatment, the other 3.7% after the second.
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Introduction

We have long been seeking an effective laser treatment of facial rhytids with epithelial preservation. The clinical manifestations of photodamage can be repaired by the application of selective wavelengths of light energy.[1,2] Various nonablative laser systems have recently been developed.[3] Nonablative photorejuvenation can be done with 585 or 595 nm flashlamp pumped dye laser, 1320 nm Nd:Yag laser, 1540nm Erbium:Glass laser,[3] or intense pulsed light sources.[2] The interest in the 585 nm collagen remodelling, double flashlamp excited pumped dye laser ED2000® (Deka© MELA Calenzano, Italy) is to see if it permits other indications in addition to wrinkles or rhytids treatment.

Technical points

We used the 585 nm collagen remodelling, double flashlamp excited pumped dye laser ED2000®. Laser energy is delivered to the skin through an optical fibre and lens which focuses the beam. The spot size is 5 mm, the energy density (fluence J/cm^2) from 2–4 Joules/cm^2 (J/cm^2). The emission modality (repetition rate) is repeated at 0.5 Hz (1 pulse per 2 second), at a short pulse duration of 250 µsec.

The wavelength of 585 nm corresponds to an absorption peak of haemoglobin (the major chromophore in blood). The pulse energy is mainly absorbed by blood vessels, and converted to heat causing thermal damage and selectively destroys ectatic blood vessels. It appears to release a cell-mediated reaction, with a local mast cell increased, histamine delivery, and elevation in T lymphocytes,[4] and collagen turnover.[5,6]

Aesthetic indications

Laser remodelling involves use of a non ablative laser for the treatment of facial rhytides.[5,6] The laser selectively targets the microvasculature, with an enhances collagen production by an average of 84%, measured 72 hours after a single laser treatment.[5] There is no damage to the epidermis. The dye laser increased collagen type III production rate by 144%.[5] This results from organized

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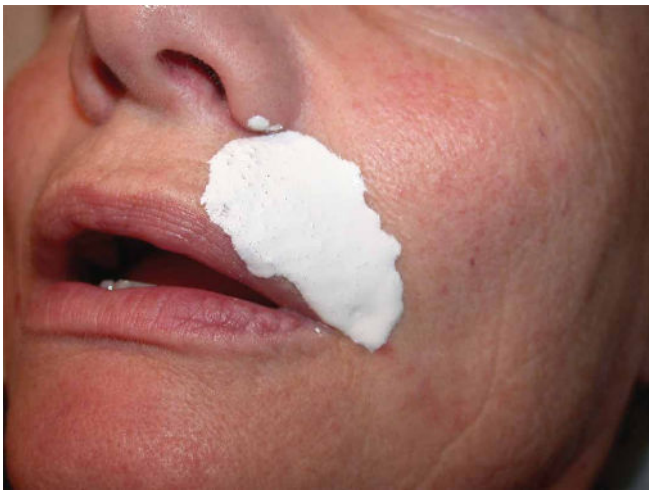

Figure 1
Using silicone molds for profilometry.

elastin and collagen fibbers replacing pre-treatment elastic tissue (Figure 1).[6] We have used profilometry of silicone moulds. Treatment regimens ranged from 3–4 treatments at 8–12 weeks intervals. The end point was a consistent decrease in anisotropy. On most occasions the treatment appeared to be effective after at least two sessions (Figure 2).[5–7]

Medical indications

Owing to its low fluence and shorter pulse duration, the 585 nm collagen remodelling pulsed dye laser has limited efficacy for the treatment of hemangiomas and port wine stains in children and adults, without any side effect because of the low energy used.

585 nm collagen remodelling pulsed dye laser may offer a solution, after one to two treatments, for patients with erythematous, raised or hypertrophic acne scars (72% decrease).[8,9] The appearance and topography of acne scarring can be improved following application of a 585 nm pulsed dye laser with a temporal profile and pulse duration designed specifically to target healthy microvasculature in the dermis.[9] This can be evaluated by assessment of

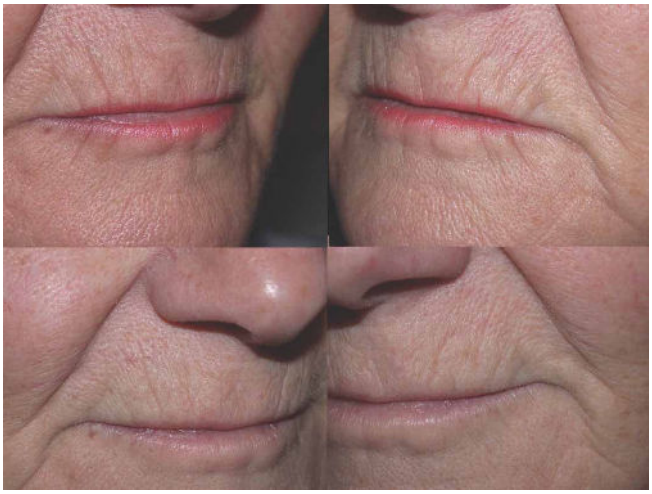

Figure 2
Non ablative laser for the treatment of facial rhytides.

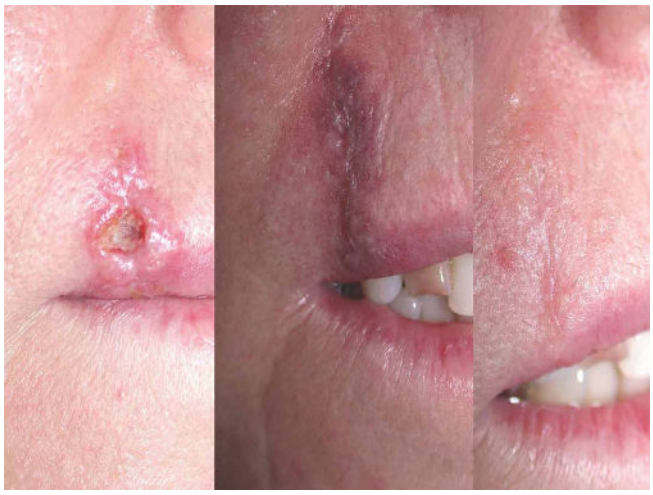

Figure 3
585nm pulsed dye laser in the treatment of surgical scars starting on the suture removal day.

pre- and posttreatment photography, patient assessment surveys, and surface profilometry using silicone imprints in order to quantify the degree of clinical improvement. All patients reported visible cosmetic improvement in the treated areas. Surface profilometry showed that the average depth of the acne scars was reduced by 47.8%. The treatment of acne scars with a 585 nm pulsed dye laser with a temporal profile and pulse duration designed specifically to target healthy microvasculature in the dermis may be a safe and effective alternative.[9]

The 585 nm collagen remodelling pulsed dye laser is also safe and effective in the treatment of surgical scars if done as soon as possible (Figure 3),[10] on the day of suture removal if possible.[8] We have done 3–4 treatment with 2–4 week

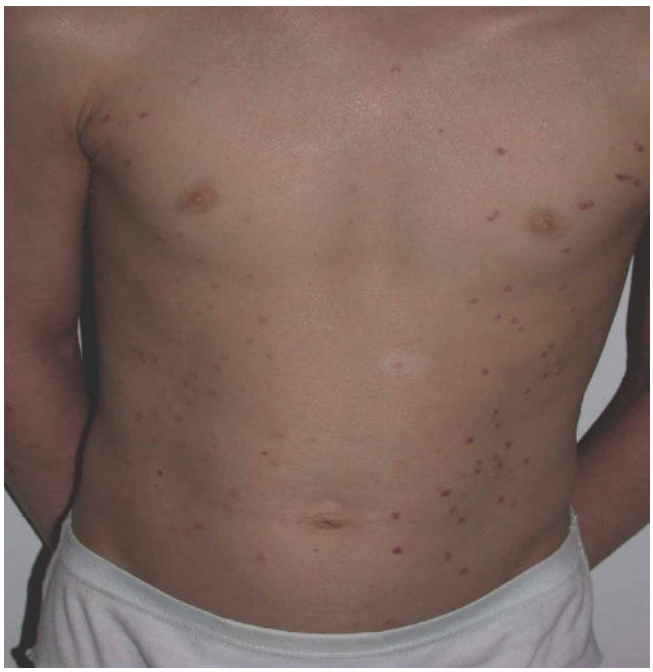

Figure 4
Extensive recalcitrant molluscum : First treatment of the right half (223 MC): hyperpigmentation in the treated area; left half of the body in state of treatment 1 month later, no recurrence on the right area.

intervals with an improvement in the quality and cosmetic appearance. A 585 nm flashlamp pumped pulsed dye laser is preferred for the treatment of hypertrophic scars, keloids and striae distensae.[8] When properly used, lasers can effect the best clinical responses in hypertrophic scars and keloids that have been observed. Further advances in laser technology as well as the addition of concomitant lasers or other treatments may enhance clinical results.

Striae distensae, better known as stretch marks, are a common disfiguring skin disorder of significant cosmetic concern. This disorder can occur following pregnancy, growth spurts or weight changes.[8] The aetiology of striae distensae is yet to be defined. Stretch marks do not impair bodily function, but are of considerable cosmetic consequences, and concern to many patients. The successful management of stretch marks has long been a source of frustration and curiosity for both the clinician and the researcher. Traditional treatment options are limited and unsatisfactory. Controlled clinical studies of the various treatment modalities available for striae are relatively uncommon, and much of the clinical data are anecdotal. Striae rubra and alba have been treated with long pulsed dye laser with marginal success.[8,11,12] However, great care must be taken with skin types IV–VI[8,11] because of the risk of hyperpigmentation or persistent erythema. The 585 nm flashlamp pumped pulse dye laser allows the skin of striae to return toward the appearance of normal skin with all protocols regimen of low energy laser.[12]

The obligatory regression of molluscum contagiosum (MC) has been the major argument in favour of leaving the lesions to spontaneous involution.[4] Conventional therapies are frequently ineffective and require multiple visits. Many of these treatments are not applicable, especially in anxious children, because they are often invasive, painful, time intensive or difficult to conduct. We treated 76 patients with cutaneous MC with 1 to 176 lesions. The therapy was well tolerated. No scars or pigment anomalies were observed. 96.3% of the lesions healed after the first treatment, the other 3.7% after the second. At a fluence from 2–3 J/cm^2 the success rate was of 67%, but there was no pain, and no complaint from the children, even the younger ones. At a fluence from 3.5 to 4 J/cm^2 there was a cure rate of 98% of the lesions, but the pain and complaint increased and for younger children the treatment must be performed under local anesthesia with lidocaïne cream (EMLA®). This larger study confirms the positive findings indicated in case studies.

The first report of the use of dye laser in the treatment of MC in infancy was made with a pulsed tuneable dye laser at 685 nm wavelength with a 5 mm beam width and a fluence of 6.5 J/cm^2.[4] Each lesion received two pulses, and 247 lesions had been treated under general anaesthetic. At one-month follow-up, there were only 17 remaining lesions. Patients with AIDS, who had widespread recurrent MC that were recalcitrant to conventional therapy, have been treated with success, and without complications with a 585 nm pulsed dye laser. The pulsed dye lasers ($\lambda = 585$ nm) allow for a certain efficacy in one single session with molluscum that are recalcitrant with other extensive therapies.[4,13] The protocol used a double pulse with a frequency of 1Hz with a fluence of 7–8 J/cm^2 for a spot with a 3 mm diameter, and 6.8–7.2 J/cm^2 for a spot with a 5 mm diameter. A follow up was therefore necessary two weeks after the first treatment. Treated areas remained disease-free after four months.[13] A 7 mm spot size can be also used, together with a pulse duration of 0.5–6 msec, and a fluence of 5–7 J/cm^2. Dye laser photocoagulation, however, cannot protect against relapse. Hyperpigmentation may occur, at some sites at least, however this fades after one month. In conclusion, the 585 nm flashlamp-pumped pulsed dye laser with very short pulse duration has proved to be an effective method with few side effects in the treatment of MC in young children. An example is shown in Figure 4.

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