



# Treatment of xanthelasma palpebrarum by 1064 nm Q-switched Nd:YAG laser: a study of 11 cases

T. Fusade

Centre Laser, 23 Rue de Saint-Petersbourg, F-75008 Paris, France

## Summary

### Correspondence

Thierry Fusade.

E-mail: thierry.fusade@club-internet.fr

### Accepted for publication

28 May 2007

### Key words

cholesterol levels, eyelids, hypercholesterolaemia, laser treatment, Q-switched Nd:YAG, xanthelasma palpebrarum

### Conflicts of interest

None declared.

**Background** Xanthelasma palpebrarum (xanthelasma) is a common disease involving the eyelids. It consists of yellowish plaques of esterified cholesterol situated in the middle and superficial layers of the dermis. Many techniques, including laser treatments, have been proposed to destroy these lesions. A preliminary study demonstrated the efficacy of 1064 nm Q-switched Nd:YAG laser in treating xanthelasma.

**Objectives** To present the results of a prospective study using 1064 nm Q-switched Nd:YAG laser to treat xanthelasma.

**Methods** Thirty-eight lesions in 11 patients were treated.

**Results** The results observed after a single treatment by Q-switched Nd:YAG laser were scored as good or excellent in eight patients, i.e. for 26 of 38 lesions.

**Conclusions** The treatment of xanthelasma by 1064 nm Q-switched Nd:YAG laser is a valuable treatment option to eliminate lesions, with rapid and good quality healing. The absence of any associated skin destruction allows treatment to be repeated when necessary.

Xanthelasma palpebrarum (xanthelasma) is a disease involving the eyelids. It is usually bilateral and is characterized by the development of yellowish plaques related to the presence of cholesterol. Lesions are initially situated in the medial canthus and gradually spread to all of the periorbital region in advanced forms.<sup>1</sup> Histological examination reveals esterified cholesterol deposits situated in the cytoplasm of histiocytes in the middle and superficial layers of the dermis. The epidermis is otherwise normal.<sup>1</sup>

Many treatments have been proposed due to the extension and unsightly nature of these lesions, including surgical resection, trichloroacetic acid (TCA) peeling, continuous or pulse mode CO<sub>2</sub> lasers, erbium:YAG laser or pulsed dye laser.<sup>2–5</sup> However, these various treatment options present certain limitations. As a preliminary study demonstrated the efficacy of 1064 nm Q-switched Nd:YAG laser treatment,<sup>6</sup> the results of a prospective study in 11 patients are presented in the present paper.

## Patients and methods

The treatment of xanthelasma plaques by Q-switched Nd:YAG laser was proposed to our patients after obtaining their informed consent. Lesions were situated in the upper, lower or both eyelids, depending on the patient. Involvement of one eyelid was considered to constitute a single lesion. Cholesterol

serum levels were evaluated in 10 patients: they were increased ( $> 2 \text{ g L}^{-1}$ ) in six cases and normal in four. Two patients with hypercholesterolaemia were treated by lipid-lowering treatment before evaluation.

Photographs were taken before and after treatment and were then evaluated by an independent observer. The evaluation of the results was made 2 months after this single treatment. The results were scored on a 0–4 scale: 0, no result; 1, moderate result ( $< 25\%$  clearing); 2, satisfactory result (25–50% clearing); 3, good result (50–75% clearing); 4, excellent result ( $> 75\%$  clearing). The final evaluation assessed the presence or absence of hypochromic or achromic scars.

## Laser therapy

Before treatment, the eyelids were anaesthetized by intradermal infiltration of 1% lidocaine with adrenaline (Xylocaine<sup>®</sup>; AstraZeneca, Rueil Malmaison, France). The eyeballs were protected by blind metallic glasses with a nonspecular surface when the lesions were situated away from the free edge of the eyelid or by shells placed in contact with the eyeball when the lesions were situated close to the eye. In this last situation, the ocular conjunctiva was anaesthetized by oxybuprocaine (Cebesine<sup>®</sup>; Bausch & Lomb, Montpellier, France) anaesthetic eye drops and, after several minutes, carboxymethylcellulose sodium protective gel (CelluVisc<sup>®</sup>;

Allergan, Mougins, France) was applied before placing the protective shell.

This study required the use of a Q-switched Nd:YAG laser (MedLite® C3; Hoya ConBio, Courtaboeuf, France). Treatment was performed with a handpiece delivering a 2-mm diameter impact at a frequency of 10 Hz. The pulse width of the laser was 5–7 ns and the wavelength was 1064 nm. During the session, overlapping impacts were distributed all over the surface of xanthelasma until punctate bleeding was obtained. The laser fluence at the beginning of treatment was set at  $4 \text{ J cm}^{-2}$ , then gradually increased by increments of  $0.5 \text{ J cm}^{-2}$  to obtain the desired effect. The effective fluences used ranged between 4 and  $8 \text{ J cm}^{-2}$  according to the patient.

Postoperative care consisted of cleaning the treated zone by compresses soaked in physiological saline (0.9% NaCl solution) completed by application of sterile petrolatum repeated several times a day until complete healing. Patients were reviewed after 2 months.

## Results

Eleven patients were treated (five women and six men). The total number of lesions treated was 38, as all patients presented several lesions. The results of treatment are reported in Table 1. Two months after treatment, the result was scored as 4 (i.e. with a clearing of lesions evaluated as being > 75% and in fact assessed by the independent observer as complete resolution) in six patients for a total of 20 lesions (Fig. 1); scored as 3 in two patients for a total of six lesions (Fig. 2), and as 2 in three patients for a total of 12 lesions (Fig. 3). No patient presented a result scored as 0 or 1.

The postoperative course was uneventful, with rapid healing within 6–10 days and no pain requiring analgesics. Two patients presented hypochromic sequelae, assessed as being aesthetically minimal by the patients. One of these two patients also received the highest fluence in this series. No retractile scars or ectropion were observed.

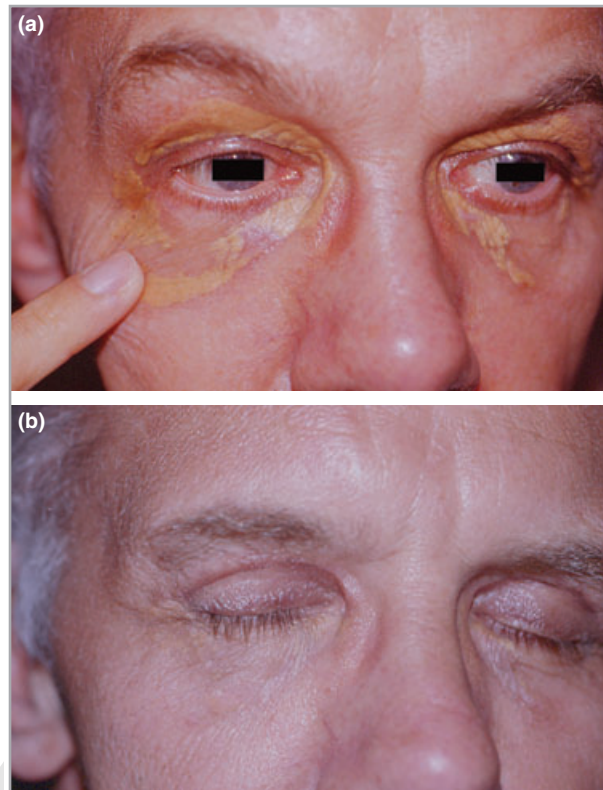


Fig 1. Patient 11. Clinical appearance of the upper and lower eyelids before (a) and after (b) treatment. Evaluation scale: 4, excellent result (> 75% clearing).

## Discussion

Q-switched lasers have been used since the middle of the 1990s for the treatment of pigmented lesions and tattoos. Their pulse time of about 10 ns is much shorter than the thermal relaxation time of targets composed of melanosomes or carbonaceous pigment particles. A sudden energy transfer

Table 1 Summary of clinical presentations and results of the Q-switched Nd:YAG treatment among 11 patients

Patient	Age (years)	Sex	Location of xanthelasma lesions	Number of lesions	Fluence ( $\text{J cm}^{-2}$ )	Sequelae	Results	Serum cholesterol levels (normal < $2 \text{ g L}^{-1}$ )
1	42	F	Upper eyelids	2	4	0	4	Unknown
2	47	F	Lower eyelids	2	6.5		3	Increased
3	45	F	Upper and lower eyelids	4	6.5	0	2	Increased
4	64	F	Upper and lower eyelids	4	8	Hypochromia	4	Increased
5	62	F	Upper and lower eyelids	4	4.5	0	3	Increased
6	46	M	Upper and lower eyelids	4	6/4	0	4	Normal
7	65	M	Lower eyelids	2	5	0	4	Normal
8	62	M	Upper and lower eyelids	4	5	0	4	Increased
9	70	M	Upper and lower eyelids	4	5.5	Hypochromia	2	Normal
10	53	M	Upper and lower eyelids	4	6.5		2	Increased
11	58	M	Upper and lower eyelids	4	7	0	4	Normal

Results evaluation scale: 0, no result; 1, moderate result (< 25% clearing); 2, satisfactory result (25–50% clearing); 3, good result (50–75% clearing); 4, excellent result (> 75% clearing).

COLOUR

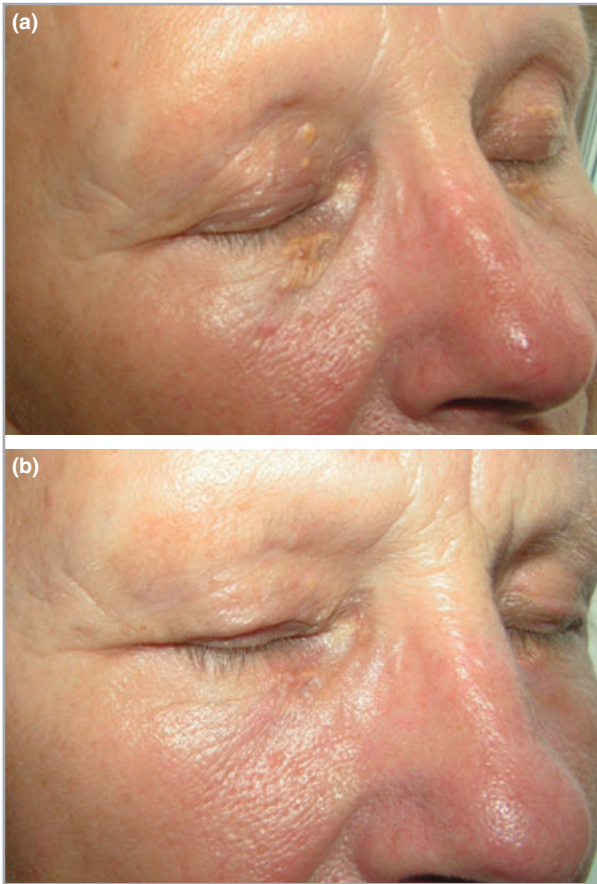


Fig 2. Patient 5. Clinical appearance of the upper and lower eyelids before (a) and after (b) treatment. Evaluation scale: 3, good result (50–75% clearing).

occurs when the laser impact meets the chromophore target. The resulting energy confinement induces a shock wave via a photoacoustic phenomenon, leading to fragmentation of the target, and destruction of melanin-loaded keratinocytes and active melanocytes or fibroblasts containing tattoo pigments.<sup>7,8</sup>

In the context of treatment of pigmented lesions, the Q-switched lasers can therefore be used successfully to treat solar lentigos, café-au-lait spots, Becker hamartomas and naevus of Ota.<sup>9</sup> The Q-switched Nd:YAG laser is the only Q-switched laser allowing the use of two distinct wavelengths: 1064 and 532 nm. This last wavelength is obtained by doubling the frequency of 1064 nm by a potassium titanyl phosphate crystal.<sup>7</sup> Most pigmented lesions are treated with the 532 nm wavelength. The 1064 nm wavelength allows destruction of carbon pigment particles observed in most tattoos, but also melanin pigments when they are situated too deeply to be destroyed at a wavelength of 532 nm, as in the case of naevus of Ota.

Xanthelasma is more frequent in women and its prevalence increases with age. It is the most widespread form of xanthoma. Although it is usually associated with type 2A hypercholesterolaemia, xanthelasma can also occur in normolipidaemic patients. Clinically, it is characterized by the appearance of a moderately raised yellowish plaque initially situated



COLOUR

Fig 3. Patient 3. Clinical appearance of the upper and lower eyelids before (a) and after (b) treatment. Evaluation scale: 2, satisfactory result (25–50% clearing).

in the medial canthus with a tendency to spread gradually. During the course of this disease, new lesions appear in the upper and lower eyelids. Xanthelasma plaques subsequently become confluent and thickened.<sup>1</sup> Histologically, xanthelasma differs from other xanthomas by its more superficial site in the middle and superficial layers of the dermis. It is composed of foamy histiocytes arranged around dermal capillaries. Intrahistiocytic vacuoles contain esterified cholesterol.<sup>1</sup>

The visible and unsightly nature of xanthelasma has led to the proposal of numerous treatments. Surgery currently remains the most widely used technique. When plaques are limited to the upper eyelid, percutaneous resection of xanthelasma plaques followed by direct suture gives excellent cosmetic results. Reconstruction by a flap or full-thickness skin graft may be necessary in the presence of excessively large lesions or lesions involving the medial canthus. The possibilities of surgical resection appear to be more limited in the lower eyelid, as the more limited skin laxity rapidly induces a risk of ectropion.<sup>10</sup> An additional problem is raised in the case of recurrence of xanthelasma, as the eyelid skin capital does not allow repeated resections.<sup>10</sup> In view of this last problem and in order to spare eyelid skin, the destruction of dermal layers containing cholesterol deposits by TCA peeling or CO<sub>2</sub> or erbium:YAG laser vaporization has also been proposed, but this could induce the development of hypochromic or achromic scars.<sup>11</sup> Finally, some publications have reported clinical improvement after pulsed dye laser therapy.<sup>5</sup>

In the present series, the results of treatment after a single session were encouraging, as a good or excellent result was obtained in eight of 11 cases, corresponding to a total of 26 of 38 lesions. A clinically substantial improvement was observed in all cases, suggesting that treatment can be repeated in the case of persistent or recurrent lesions. The postoperative course was uneventful, as healing was rapidly obtained. The pinkish skin colour observed after healing also resolved after 1–2 months.

With a Q-switched laser, pulses of about 10 ns promote fragmentation of the target without inducing any peripheral thermal effect, thereby limiting the risk of scarring. Destruction of histiocytes loaded with esterified cholesterol probably occurs via the same mechanism at the 1064 nm wavelength. To our knowledge, the absorption spectrum of esterified cholesterol has not been studied. During treatments performed at 1064 nm, we observed that passage of the beam over xanthelasma plaques produced a characteristic noise very different from that observed in healthy skin. This characteristic noise is equivalent to that observed during destruction of carbonaceous pigment tattoos at the same wavelength. This could reflect increased absorption by the lesions and therefore increased absorption by cholesterol at 1064 nm.

In conclusion, no reliable, easily reproducible treatment that does not reduce the skin surface area in the intraorbital zone is currently available. However, the use of a Q-switched Nd:YAG laser to treat xanthelasma rapidly provides excellent cosmetic results. This treatment option also has the advantage of being able to be repeated in the case of recurrence.

## References

- 1 Beergman R. The pathogenesis and clinical significance of xanthelasma palpebrarum. *J Am Acad Dermatol* 1994; **30**:236–42.
- 2 Raulin C, Schoenermark MP, Werner S, Greve B. Xanthelasma palpebrarum: treatment with the ultrapulsed CO<sub>2</sub> laser. *Lasers Surg Med* 1999; **24**:122–7.
- 3 Levy JL, Trelles MA. New operative technique for treatment of xanthelasma palpebrarum: laser inverted resurfacing. *Ann Plast Surg* 2003; **50**:339–43.
- 4 Borelli C, Kaudewitz P. Xanthelasma palpebrarum: treatment with the erbium:YAG laser. *Lasers Surg Med* 2001; **29**:260–4.
- 5 Schoenermark MP, Raulin C. Treatment of xanthelasma palpebrarum with the pulsed dye laser. *Lasers Surg Med* 1996; **19**:336–9.
- 6 Fusade T. Laser YAG déclenché: une nouvelle proposition de traitement des xanthélasmas. *Ann Dermatol Venerol* 2004; **131**:15271–2.
- 7 Anderson RR, Margolis RJ, Watanabe S et al. Selective photothermolysis of cutaneous pigmentation by Q switched Nd YAG laser pulses at 1064, 532 and 355 nm. *J Invest Dermatol* 1989; **93**:28–32.
- 8 Kilmer SL, Lee MS, Grevelink JM et al. The Q-switched Nd:YAG laser effectively treats tattoos. *Arch Dermatol* 1993; **129**:971–8.
- 9 Kilmer SL, Wheeland RG, Goldberg DJ, Anderson RR. Treatment of epidermal pigmented lesions with the frequency doubled Q switched Nd YAG laser. *Arch Dermatol* 1994; **130**:1515–19.
- 10 Parkes ML, Waller TS. Xanthelasma palpebrarum ectropion. *Laryngoscope* 1984; **94**:1238–40.
- 11 Ullmann Y, Har-Shai Y, Peled IJ. The use of CO<sub>2</sub> laser for the treatment of xanthelasma palpebrarum. *Ann Plast Surg* 1993; **31**:504–7.

# MARKED PROOF

## Please correct and return this set

Please use the proof correction marks shown below for all alterations and corrections. If you wish to return your proof by fax you should ensure that all amendments are written clearly in dark ink and are made well within the page margins.

<i>Instruction to printer</i>	<i>Textual mark</i>	<i>Marginal mark</i>
Leave unchanged	... under matter to remain	Ⓟ
Insert in text the matter indicated in the margin	∧	New matter followed by ∧ or ∧ <sup>Ⓢ</sup>
Delete	/ through single character, rule or underline or ┌───┐ through all characters to be deleted	Ⓞ or Ⓞ <sup>Ⓢ</sup>
Substitute character or substitute part of one or more word(s)	/ through letter or ┌───┐ through characters	new character / or new characters /
Change to italics	— under matter to be changed	↙
Change to capitals	≡ under matter to be changed	≡
Change to small capitals	≡ under matter to be changed	≡
Change to bold type	~ under matter to be changed	~
Change to bold italic	≈ under matter to be changed	≈
Change to lower case	Encircle matter to be changed	≡
Change italic to upright type	(As above)	⊕
Change bold to non-bold type	(As above)	⊖
Insert 'superior' character	/ through character or ∧ where required	Υ or Υ under character e.g. Υ or Υ
Insert 'inferior' character	(As above)	∧ over character e.g. ∧
Insert full stop	(As above)	⊙
Insert comma	(As above)	,
Insert single quotation marks	(As above)	ʹ or ʸ and/or ʹ or ʸ
Insert double quotation marks	(As above)	“ or ” and/or ” or ”
Insert hyphen	(As above)	⊥
Start new paragraph	┌	┌
No new paragraph	┐	┐
Transpose	└┐	└┐
Close up	linking ○ characters	○
Insert or substitute space between characters or words	/ through character or ∧ where required	Υ
Reduce space between characters or words		↑