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CLINICAL REPORT

Metastasis of a Malignant Melanoma 2 Years after Carbon Dioxide Laser Treatment of a Pigmented Lesion: Case Report and Review of the Literature

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A 64-year-old woman with a clinically diagnosed 'lentigo simplex' on her right cheek was dermatologically treated several times with a CO_2 laser. Three years later she showed a metastasis of a malignant melanoma in her right parotid gland. Considering this case, as well as other published cases reporting malignant melanomas occurring after laser treatment, we again underscore that naevomelanocytic lesions are not a routine indication for laser treatment. ***Key words: laser therapy; pigmented lesions; misdiagnosis; recurrence; malignant melanoma.***

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Cosmetic concerns have become increasingly important in our society and subsequently in medicine as well. In the field of dermatology, the removal of vascular and pigmented lesions by laser surgery, especially on exposed parts of the body, has become particularly popular (1). Due to their pigment-specific photothermolysis (2), the use of various types of lasers allows the non-scarring removal of vascular or melanocytic lesions and is often preferred to conventional methods such as surgical excision. However, several studies on laser therapy of melanocytic lesions published since the 1990s have demonstrated that, in most cases, the complete removal of naevomelanocytic lesions by laser therapy is not possible. An additional risk is the fact that in each suspicious melanocytic lesion a malignant melanoma must first be excluded. Laser treatment of melanocytic lesions therefore not only includes the risk of incomplete removal, but also the potential for false treatment (3).

CASE REPORT

A 64-year-old woman presented to us in October 2002. Four weeks prior to consultation a tumour in the right parotid gland had been excised in an ENT clinic. Histological examination revealed a metastasis of a malignant melanoma with a positive reaction to immunohistochemical staining for HMB45 and S100.

Three years before the patient had consulted her dermatologist with the request to remove a pigmented lesion on her right cheek (Fig. 1a). At that time, under the clinical diagnosis of 'lentigo simplex', the lesion was treated in several sessions by CO_2 laser vaporization. No biopsy was performed.

A detailed physical and dermatological examination showed no suspicious cutaneous lesions and no palpable lymph nodes. In the area of the laser-treated pigmented lesion the skin was hypopigmented (Fig. 1b).

During the patient's hospitalization a complete tumour staging showed neither a primary melanoma nor other metastasis of the malignant melanoma. Following the guidelines of the AJCC 2002 (4) the patient was therefore staged as pTx N0 M1c.

The histological examination, including immunohistochemistry (S100) of two separate punch biopsies taken from the laser-treated area, confirmed the clinical diagnosis of a scar.

Since October 2002 the patient has been under the care of a general practitioner and a dermatologist for cancer aftercare at regular intervals. Currently her disease is in complete remission.

DISCUSSION

Even trained dermatologists can often only correctly differentiate between a benign and a malignant pigmented lesion in 80% of the cases (5). Breuninger & Fischler (6) analysed 661 shave biopsies of melanocytic naevi and found 4 malignant melanomas (0.6%). Meisel et al. (7) analysed 410 shave biopsies and found 2 malignant melanomas (0.5%). Based on these percentages, every 200th pigmented lesion excised as a melanocytic naevus has in actuality been a misdiagnosed malignant melanoma.

Various types of lasers have been used to remove melanocytic naevi, e.g. the quality-switched ruby laser (QSRL 694 nm, exposure time 20–40 ns) (8), the normal-mode (9) or long-pulsed ruby laser (LPRL 694 nm, pulse duration 0.3–5 ms), the quality-switched Nd:YAG laser (532/1064 nm, pulse duration 5–20 ns), the

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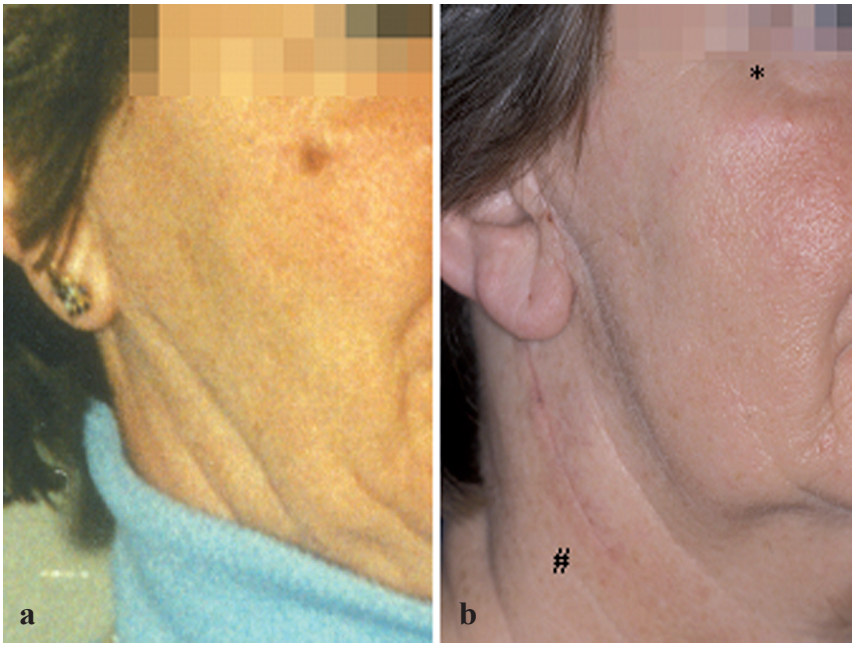

Fig. 1. (a) Pigmented lesion on patient's cheek diagnosed as 'lentigo simplex', before laser CO_2 treatment (photograph provided by patient). (b) Patients cheek with hypopigmentation (*) in the laser-treated area and scar after excision of the metastasis in the parotid gland (#).

quality-switched Alexandrite laser (755 nm, pulse duration 50–100 ns) (10), the carbon dioxide laser (10 600 nm) (11), the Er:Yag laser (2940 nm) and the IPL flash lamp (500–1200 nm) (12).

Goldberg & Stampien (13) treated four congenital naevi with the QSRL. Two naevi were improved, whereas the other two lesions were only minimally improved. Post-treatment biopsies revealed the persistence of dermal naevomelanocytic cells.

Rosenbach et al. (14) compared the effects of the Q-switched Alexandrite and Nd:YAG lasers in the treatment of 18 patients with benign melanocytic naevi. Both systems achieved significant improvement after three treatments. Histology revealed a significant reduction in intra-epidermal and junctional melanocytes, whereas the number of dermal cells had only slightly decreased.

The published studies concerning laser treatment of melanocytic lesions demonstrate that, in most cases, the complete removal of melanocytic naevi cannot be obtained either clinically or histologically. Even in cases of partial effectiveness, in terms of temporary lightening after laser therapy of melanocytic lesions, the recurrence of pigmentation is almost unavoidable. Histological investigations have shown that the maximum penetration depth of, for example, a QSRL is about 0.4 mm (15). Although this might cause a reduction in the naevus cells in the papillary and reticular dermis, residual nests of naevomelanocytes containing only a few melanin granules often remain intact as they do not absorb red light and therefore cannot be damaged by selective photothermolysis (15).

Several publications report on clinical cases showing so-called pseudo-melanoma after laser therapy. A pseudo-melanoma is defined as a pigmented lesion that histologically resembles a superficial spreading malignant melanoma and typically occurs after incomplete treatment (3, 16).

Patients who have had a naevocellular lesion removed by laser should be carefullly observed, and any signs of recurrence should be followed up as a precaution with a biopsy or a total excision of the recurrent lesion. Even for trained histopathologists, it is a challenge to differentiate between a pseudo-melanoma and a melanoma (21).

Due to the laser-induced non-lethal effects on melanocytes, laser treatment remains controversial. The observations of van Leeuwen et al. (17) demonstrated that in vitro QSRL treatment of melanoma cells showed changes in cell surface receptor expression with subsequent alteration of cellular behaviour such as migration.

Chan et al. (18) found that the effect of sublethal laser damage (Q-switched 755 nm Alexandrite laser) in melanoma cell lines caused an increase in p16 expression, which implied that DNA damage had taken place. As the mutation of the p16 gene is assumed to play a key role in the genesis of melanoma, such a side effect would be considerably undesirable for patients (18).

Sohn et al. (19) examined recurrent pigmented macules which occurred after Q-switched Alexandrite laser treatment of congenital melanocytic naevi. These recurrent pigmented macules showed increased numbers

Table I. *Malignant melanoma after laser therapy*

Reference	Patient (age in years/sex)	Laser type	Interval	Diagnosis
Arndt (1986) (20)	64/M	Argon	4 years	Relapse
Grob et al. (1999) (11)	47/M	CO_2	1 year	Amelanotic MM
Kutzner (2001) (21)	?	?	?	Desmoplastic MM
Greve & Raulin (2002) (22)	?	QSRL	?	SSM
Böer et al. (2003) (23)	37/F	Ablative laser	Several months	Nodular MM; 2.12 mm thick
	54/F	Ablative laser	Several months	MM; 1.5 mm thick
Dummer (2003) (24)	64/F	Alexandrite	6 months	LMM
	?/F	CO_2	6 months	Lymph node metastasis
Woodrow et al. (2003) (25)	27/F	Argon	11 years	SSM
Hilker & Mainusch (2004) (26)	72/F	?	1 year	LMM
This study	66/F	CO_2	3 years	Metastasis of a malignant melanoma in parotid gland

LMM, lentigo maligna melanoma; MM, malignant melanoma; QRSL, Q-switched ruby laser; SSM, superficial spreading melanoma.

of melanocytes in the epidermis, a decreased number of melanocytes in the dermis and a significant down-regulation of E-cadherin and tumour necrosis factor (TNF)-α. E-cadherin controls epidermal morphogenesis whereas TNF-α inhibits the proliferation of human melanocytes and melanogenesis. Based on these findings, Sohn et al. (19) proposed that the down-regulation of E-cadherin and TNF-α may induce a proliferation of melanocytes, leading to the occurrence of recurrent pigmented macules.

Since 1999, an increasing number of publications have reported on the incidence of malignant melanoma after laser treatment of pigmented lesions (Table I). It is still unclear whether the lesions were primary malignant melanomas treated with laser or if a malignant melanoma was induced by the laser treatment. Presumably, most cases represent an incorrect treatment based on a clinical misdiagnosis. In some cases, laser-induced progression to malignant melanoma cannot be excluded with certainty since the interval between laser therapy and progression was conspicuously short.

In conclusion, taking the above facts into consideration, we advise that clinically ambiguous tumours should be removed by surgical excision followed by histological examination. Furthermore, naevomelanocytic lesions should not be considered as a routine indication for laser therapy for cosmetic reasons.

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