

Original Article

Adjunctive use of dermoscopy to reduce recurrence of melanocytic nevi following laser treatment: a study in an Asian population

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Abstract: Melanocytic nevi are commonly treated by irradiation with CO₂ lasers, but the rate of recurrence is high. This study aimed to evaluate the effect of using dermoscopy in CO₂ laser treatment on the recurrence rate of melanocytic nevi. All patients were treated with a pulsed CO₂/Er: YAG laser for removal of facial melanocytic nevi. From March 2013 to February 2014, patients were treated with CO₂ laser alone, with physicians judging by naked eye whether treatment was complete. From March 2014 to February 2015, physicians employed dermoscopy to judge whether CO₂ laser treatment was complete. The rate of recurrence of melanocytic nevi with pigmented areas visible to the naked eye within 6 months of treatment and the degree of patient satisfaction with the outcome of treatment ('satisfactory', 'generally effective', or 'dissatisfactory') were measured for each treatment regimen and compared. CO₂ laser treatment was administered to 85 patients (294 lesions) in the first group and 128 patients (340 lesions) in the second group. Although in all cases CO₂ laser treatment was judged by the naked eye as providing complete removal, dermatoscopic observation of the wound indicated the need for further treatment in 88.5% (301/340) of the treated nevi. The recurrence rates of melanocytic nevi and patient satisfaction were significantly better in the group receiving CO₂ laser treatment plus dermoscopy than in the group without dermoscopy (5.0% vs. 17.4%, P<0.001). CO₂ laser treatment for melanocytic nevus under the guidance of dermoscopy was meaningful to reduce the recurrence rate.

Keywords: Dermatoscope, dermoscopy, CO₂ laser, melanocytic nevus

Introduction

Melanocytic nevus is a common, largely benign, skin condition resulting from a proliferation of pigmented nevus cells. Melanocytic nevi do not usually require treatment unless malignancy is suspected, and in most circumstances removal is performed solely for cosmetic reasons [1]. The major treatment for removal of melanocytic nevus is surgical excision [2], although CO₂ lasers are used in many clinics and are the preferred choice in some places [3].

Laser treatment has the advantage of being fast and minimally invasive and is ideally suited to removal of small nevi (<5 mm in diameter) without leaving visible scarring. Nevertheless, the rate of recurrence of melanocytic nevi after laser therapy is high, which might be related to pigmented cells not visible to the naked eye remaining after treatment [4]. Additionally, although laser treatment is generally safe [5],

there are concerns that after repeated treatment there is a possibility that laser irradiation might induce malignant melanoma [6, 7]. However, there have been no reported cases of this occurring [8], and there is some evidence that laser treatment might actually reduce the risk of benign pigmented lesions becoming malignant [9]. Considering that the long-term impact of repeated laser treatment is currently not fully known, in our department melanocytic nevi with a diameter of greater than 5 mm are usually treated by surgical resection; but CO₂ laser therapy is utilized if the diameter of the nevus is less than 5 mm or if the patients cannot accept surgery.

Dermoscopy is the examination of skin lesions, including melanocytic nevi, with a dermatoscope, which is a kind of hand-held illuminated magnifying glass (10×-30× magnification). Dermoscopy is a non-invasive technique helpful for observing fine morphological structures that

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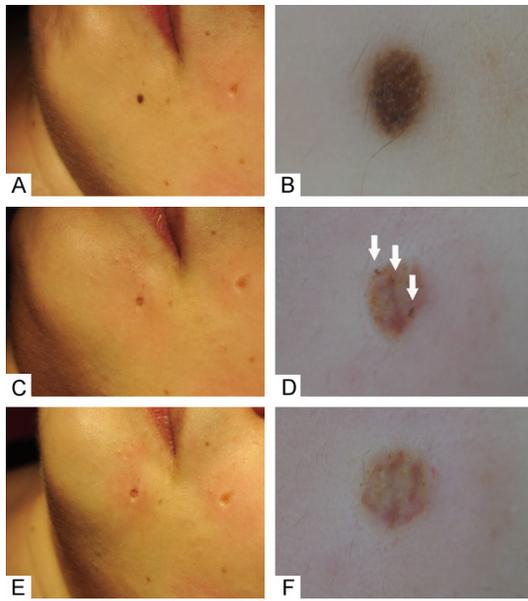


Figure 1. CO₂ laser treatment for pigmented nevus under naked eye and dermoscopy. A: Melanocytic nevus observed by the naked eye before treatment; B: Observed under dermatoscope; C: No pigment residue determined by naked eye after CO₂ laser treatment; D: Dermoscopy reveals three suspected residual pigmented areas (indicated by white arrows); E, F: Appearance of wounds under naked eye and dermatoscope with pigmented areas completely removed under the guidance of dermoscopy.

are invisible to the naked eye [10], and can play a significant supporting role in the diagnosis of pigment diseases, vascular diseases, and hair diseases, and can help to distinguish between benign and malignant diseases of the pigmentation [11]. Dermoscopy is mainly used to help identify atypical nevi and malignant melanomas, but whether including dermoscopy in the laser treatment of melanocytic nevi can be of help to clean up residual pigmented cells, or is of benefit in reducing recurrence rate of melanocytic nevi, has not yet been reported.

In this study, a non-contemporary comparison was used to examine the effect of adjunctive use of dermoscopy on the rate of melanocytic nevus recurrence following CO₂ laser treatment.

Materials and methods

Subjects

When patients with melanocytic nevus come to our department, laser treatment is offered if

the melanocytic nevus (1) is an acquired pigmented nevus with diameter of less than 5 mm, (2) has a clear border, has symmetrical pigment distribution, and has not enlarged in the previous 6 months, and (3) has no subjective symptoms.

For this study, we recruited patients treated between March 2014 and February 2015, a period when we were using dermoscopy to judge whether laser treatment of melanocytic nevi is complete. Patients treated between March 2013 and February 2014 with whom we did not use dermoscopy were recruited for comparison and analysis of the recurrence rates. All patients gave their written informed consent before being enrolled into this study.

Laser treatment

We used a CO₂/Er: YAG laser (UltraPulse; Lumenis, Yokneam, Israel). Before laser treatment, the lesion and surrounding skin was cleaned and disinfected. Laser energy parameters (1-9 W, 100-500 mJ/pulse, 2-40 Hz) were chosen according to the size of the pigmented nevus and likely thickness. The operator fixed the pigmented nevus and surrounding skin with left thumb and forefinger, and applied the laser treatment layer by layer until there was no pigment visible in the substrate. After treatment, the wound was topically disinfected with povidone-iodine until the wound scabbed, and the scab was allowed to fall off naturally.

Laser treatment combined with dermoscopy

With patients who received laser treatment between March 2014 and February 2015, we also utilized dermoscopy to observe the wound substrate after we had completed the conventional laser surgery described above and had determined that there was no pigmented residue observable by the naked eye (**Figure 1**). If dermoscopy revealed pigmented tissue that could not be wiped away by a saline-soaked swab, then laser treatment was continued until no suspicious pigmented skin tissue could be observed under the dermatoscope.

Determination of removal efficacy

Recurrence was defined as the reappearance of pigmented areas visible to the naked eye within 6 months of treatment. Patients classi-

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Table 1. Patient characteristics

	Patients (n = 213)			Nevi (n = 634)		
	Control group (n = 85)	Dermoscopy group (n = 128)	P-value	Control group (n = 294)	Dermoscopy group (n = 340)	P-value
Age (yrs)	35±2.4	37±4.4	P<0.05	-	-	-
Gender (male/female)	31/54	44/84	P>0.05	-	-	-
Number of nevi			P>0.05			
1	25	34		-	-	-
2-3	30	45		-	-	-
4 or more	30	49		-	-	-
Size (diameter, mm)	-	-	-	3.5±1.2	4.1±1.7	P<0.05
Position						P>0.05
Nose	-	-	-	53	77	
Forehead	-	-	-	32	54	
Underjaw and neck	-	-	-	65	58	
Cheek	-	-	-	75	70	
Around mouth	-	-	-	31	40	
Temple	-	-	-	21	22	
Other part of the body	-	-	-	17	19	

Control group: treated with CO₂ laser only, March 2013-February 2014. Dermoscopy group: treated with CO₂ laser plus adjunctive dermoscopy, March 2014 February 2015.

fied the outcome as 'satisfactory' if they were not conscious of the treatment affecting their cosmetic appearance and the melanocytic nevus did not recur; 'generally effective' if scarring affected their cosmetic appearance but the nevus did not recur; and 'dissatisfactory' if scarring affected their appearance and the pigmented nevus recurred.

In patients who underwent laser treatment with adjunctive dermoscopy, after the initial treatment had been judged by naked eye to be complete, we observed the wound again by dermoscopy. We calculated the number of patients whose nevus was completely removed following the initial round of laser treatment and the number of patients who needed continuing treatment as determined by dermoscopy.

We contacted patients through outpatient follow-up, telephone, text messaging, or email to investigate whether recurrence had occurred within 3 months or 6 months after surgery.

Statistical analysis

Data were analyzed by Pearson's chi-squared test using IBM SPSS Statistics for Windows (version 19.0; IBM Corp., Armonk, NY, USA).

Results

A total of 213 patients (all Asian) with 634 nevus lesions were subjected to CO₂ laser treatment from March 2013 to February 2015. Patients ranged in age from 12 to 61 years old (average 36 years old). There were 75 male patients (35.2%) with 238 lesions (37.5%), and 138 female patients (64.8%) with 396 lesions (62.5%). We treated 59 patients with a single nevus, and the rest had 2 to 12 lesions. Of the 634 lesions, 130 (20.5%) were located on the nose, 86 (13.6%) on the forehead, 123 (19.4%) on the under jaw and neck, 145(22.9%) on the cheek, 71 (11.2%) around the mouth, 43 (6.8%) on the temple, and 36 (5.7%) on other parts of the body (**Table 1**).

From March 2013 to February 2014, we treated 294 lesions with CO₂ laser without adjunctive dermoscopy. Of these lesions, 51/294 (17.4%) reappeared, and patients reported that they were satisfied with the outcome of treatment of 204/294 lesions (69.4%).

From March 2014 to February 2015, we treated 340 lesions with CO₂ laser plus adjunctive dermoscopy. Of these lesions, there were 301/340 (88.5%) for which the treatment was incorrectly judged by naked eye to be complete,

and which needed retreatment. Of those 340 lesions, recurrence occurred in only 17/340 lesions (5.0%), and patients were satisfied with the results achieved in 280/340 lesions (82.4%). There were significantly fewer recurrences of melanocytic nevi (Pearson chi-squared value = 25.10; $P < 0.001$) and significantly higher patient satisfaction rates (Pearson chi-squared value = 14.67; $P < 0.001$) when adjunctive dermoscopy was used with laser treatment of melanocytic nevi.

Although adding dermoscopy to laser treatment did increase the time (from an average of 2 min 20 sec to 4 min 23 sec), there was no increase in expense. Localized swelling was common after laser treatment, and was not recorded as an adverse event. Infection, pain, and bleeding were defined as adverse events, but these did not occur in any patients.

Discussion

In this study, we examined whether adjunctive use of dermoscopy was helpful in reducing the rate of melanocytic nevus recurrence following CO₂ laser treatment. Recurrence of melanocytic nevi was significantly less in patients who received dermatoscope-assisted laser treatment than in patients who received laser treatment without dermoscopy.

CO₂ lasers are widely used for the treatment of melanocytic nevi because of their rapid treatment time, simple wound care, reduced bleeding, and faster recovery time compared to surgical excision. CO₂ lasers are used in hospitals of all levels, but especially in primary hospitals where skin surgery is less frequently performed [12]. CO₂ laser treatment is especially suited to those patients with a large number of melanocytic nevi, patients with small nevi who do not wish to have linear surgical scars, and patients who feel that surgical resection is too expensive. However, the physician should emphasize the higher possibility of recurrence following CO₂ laser treatment. Although some recent studies report that CO₂ laser treatment can be repeated several times on melanocytic nevi [13, 14], at the present time we prefer to minimize repetitive stimulation of pigmented nevi until the long-term impacts of repeated laser treatments on melanocytic nevi have been identified.

The main reasons for the recurrence of pigmented nevi after CO₂ laser treatment are reported to be the regeneration of epidermal nevus cells, residual nevus cells in the superficial layer of the dermis, a large number of nevus cells remaining in the deep dermis, and the formation of pigmentophages cells after an inflammatory response; however, almost all relapsing patients have nevus cells that are not really completely cleared [4].

Dermoscopy allows dermatologists to observe details of the skin that are not visible to the naked eye. The polarized light source and high magnification reveal the color and structure of the skin surface, the epidermis, the junction of the epidermis and the dermis, and the dermal papilla layer [15]. This is the reason why we started using dermoscopy as an aid to help with CO₂ laser treatment of melanocytic nevi. By means of dermoscopy, we can reveal residual pigment that the naked eye struggles to observe and make a more thorough treatment.

In this study, almost all wounds had pigmented residues visible under the dermatoscope despite no obvious residual pigment being observed with the naked eye. Of 340 pigmented nevi whose CO₂ laser treatment was judged by the naked eye to be complete, 301 had residual pigment visible under the dermatoscope. The rate of melanocytic nevi recurring after laser treatment dropped from 17.4% recurrence in melanocytic nevi treated without the assistance of dermoscopy to 5.0% recurrence after use of dermoscopy and additional laser treatment.

There are a number of factors we consider important when conducting dermatoscope-assisted laser treatment of melanocytic nevi: (1) When observing the residual pigment under the dermatoscope, it is necessary to first remove the eschar with a saline-soaked cotton swab after CO₂ laser treatment to avoid mistaking it for pigmented residue and to prevent the eschar from sheltering any pigmented residue beneath it. (2) The use of infiltration anesthesia in the treatment may cause localized skin edema, consequently weakening the effect of CO₂ laser treatment and possibly increase pigment cell residues. For this reason, we used topical lidocaine cream for 1 hour to reduce the pain to an acceptable level, and to ensure that there is no edema in the dermis where the

pigment most easily remains, which is more conducive for observation and removal of pigmented cells. (3) In addition, we advocate surgical resection for recurrent pigmented nevi. After the initial CO₂ laser treatment, recurrence of a pigmented nevus is often accompanied by scarring which is difficult to eliminate with laser treatment again, resulting in yet further recurrence.

We also noticed that dermatoscopic observation of the wound following initial laser treatment indicated that 88.5% of laser-treated melanocytic nevi required further treatment. However, the recurrence rates in melanocytic nevi treated without the assistance of dermoscopy were not nearly this high. The reason is not clear, but it is possibly because the less easily wiped eschar and surrounding follicular units were mistaken as pigmented residues when the wound was observed under the dermatoscope, which would increase the false-positive rate. It is also possible that the “pigmented residues” were actually pigment cells or non-functional cells that would undergo apoptosis soon after, or it is possible that the low rate of recurrence might be related with a short follow-up period.

One limitation of the study is that several patients were followed-up by telephone, text messaging, or email; because patients were not medically educated and cannot exactly assess recurrence, this might have resulted in an increase in missed diagnosis of recurrence. Nevertheless, patient satisfaction with the final outcome was higher with dermoscopy-assisted laser treatment despite the expanded and deepened wound after the removal of the suspected pigment residues, which is maybe because of the fact that scar expansion is not obvious after healing and the recurrence rates of pigmented nevi are reduced at the same time. In addition, patients' perception of the work ethic of physicians who repeated treatment after using dermoscopy to determine whether there is residual pigment left and their experience of being treated more seriously maybe improved levels of patient satisfaction.

In conclusion, the use of dermoscopy in the CO₂ laser treatment of melanocytic nevi was able to significantly reduce the recurrence rate of melanocytic nevi and increase patient satisfaction with treatment outcome.

Disclosure of conflict of interest

None.

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