Glowing in the Dark
Use of Confocal Microscopy in Dark Pigmented Lesions

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KEYWORDS

• Reflectance confocal microscopy • Melanoma • Basal cell carcinoma • Blue nevus

KEY POINTS

- Black color in melanoma is associated with melanin in upper epidermis.
- Under reflectance confocal microscopy (RCM), multiple bright atypical pagetoid cells or atypical cobblestone are visible in upper layers of the epidermis.
- Blue color in dermoscopy corresponds with pigment deep in the dermis.
- Blue color may correspond with bright nests or sheets of atypical cells in melanoma, spindle cells in blue nevus, or a tumor island wrapped by dendrites in pigmented basal cell carcinomas.
- Exogenous pigmentation can also be evaluated by RCM.

INTRODUCTION

In vivo reflectance confocal microscopy (RCM) is a noninvasive imaging technique[1–3] that provides images of the superficial layers of the skin at nearly histologic resolution generated thanks to backscatter of light by several structures. Melanosomes, which are highly reflective,[4] are among the structures that generate white images in RCM. Thus, clinically dark lesions are easily visible by RCM because of melanin. In the RCM, light penetrates to a subsurface focus of the laser and reflects back from that focus out of the skin and into a detector in the microscope. Light that reflects superficial to the focus is eliminated, so if the focus is too deep, there will be no signal. For the same reason, if much melanin exists in superficial layers, like in black lamella (**Fig. 1**), no signal is generated from the deep epidermis or dermoepidermal layer. RCM can also detect pagetoid melanocytes in the epidermis, which correlate with black dots or dark blotches in dermoscopy.

The depth penetration of RCM is limited to 100 to 200 μm in human skin at the 830 nm laser wavelength used in the commercial system. The variability in the imaging penetration depth also depends on natural variations in the concentration of other reflective components comprising skin, such as keratin or collagen in addition to melanin.[5] RCM criteria found in more superficial anatomic layers may be more readily identified, because there is decay in laser light intensity with increasing imaging depth and hence decrease in optical resolution. Because of the limitation in the penetration, those dark blue lesions, in which melanin is deep in dermis, are not always visible by RCM.[6] Finally, some lesions can be clinically dark owing to substances or structures other than melanin structures, such us hemoglobin[7] or exogenous materials.[8] According to the reflective properties of the material, the images generated will be different. In the present article, the RCM criteria of several dark lesions are reviewed (**Table 1**).

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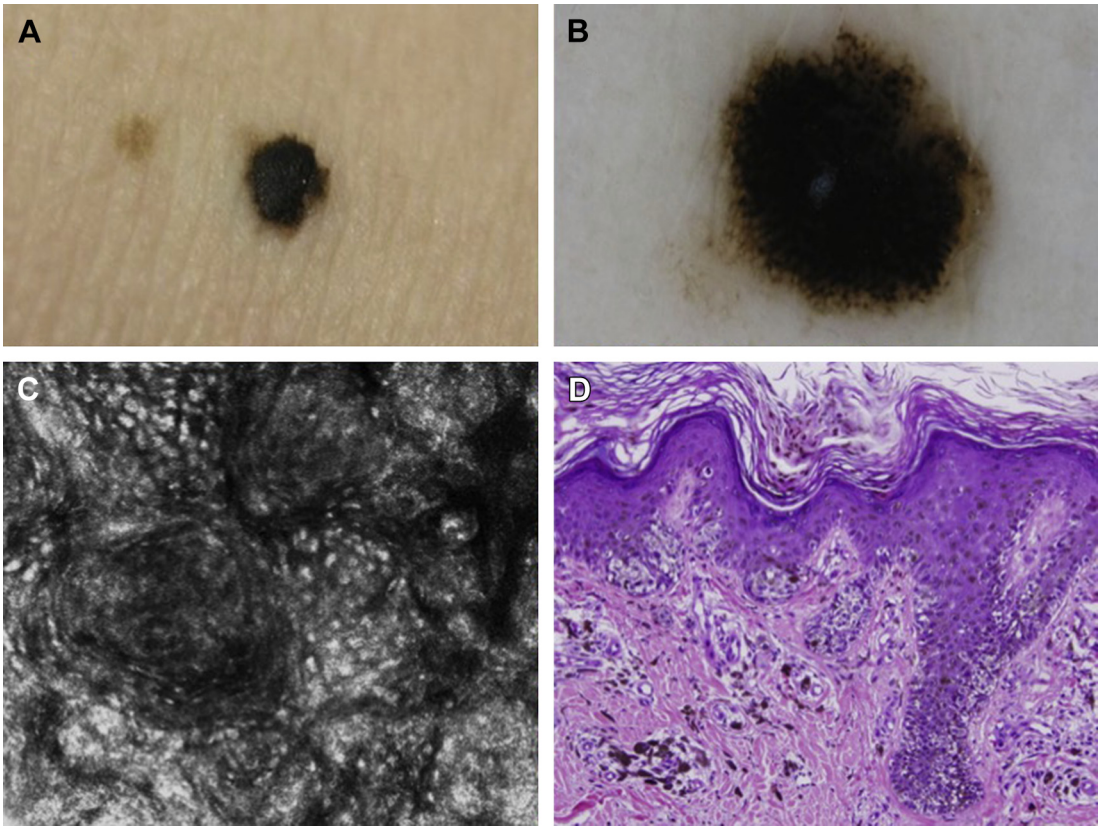

Fig. 1. Black melanoma. (*A*) Clinical image of a small melanoma on the knee of a woman in her 60s with personal and familial history of melanoma and carrier of a G101W mutation in *CDKN2A*. (*B*) Under dermoscopy, the lesion is showing a multicomponent pattern with presence of peripheral pigment network, focal globules, and central blotch. Predominant colors are black and blue. (*C*) Reflectance confocal microscopy (RCM) only reaches superficial layers of the epidermis showing a typical cobblestone pattern and presence of keratin. (*D*) Hematoxylin and eosin staining (original magnification, ×20) showing an atypical proliferation of melanocytes in the dermoepidermal junction with some nests and focal pagetoid growing. Hyperkeratosis with presence of pigmented corneocytes correlates with the typical cobblestone pattern seen in RCM.

Table 1
Most common cutaneous dark lesions with reported criteria with reflectance confocal microscopy

	Melanocytic	Non Melanocytic
Benign	Black nevus Blue nevus Spitz	Seborrheic keratosis Ink spot lentigo Angioma Angiokeratoma Pilomatricoma Ocronosis, argiria Tattoos
Malignant	Melanoma Seborrhoeic-like melanoma Malignant blue nevus Blue nevus like cutaneous metastasis	Basal cell carcinoma