1 Introduction to Dermoscopy

Diagnostic Dermoscopy: The Illustrated Guide, First Edition. Jonathan Bowling. © 2012 Jonathan Bowling. Published 2012 by Blackwell Publishing Ltd.

Introduction

The 'art' of dermatological diagnosis is a complex process that requires many skills.

If dermatologists were to be described in a single word, they would be 'diagnosticians'; the 'art' of dermatological diagnosis requires all the skills of a physician in addition to the eyes of a hawk, for lesion diagnosis cannot be made by history alone.

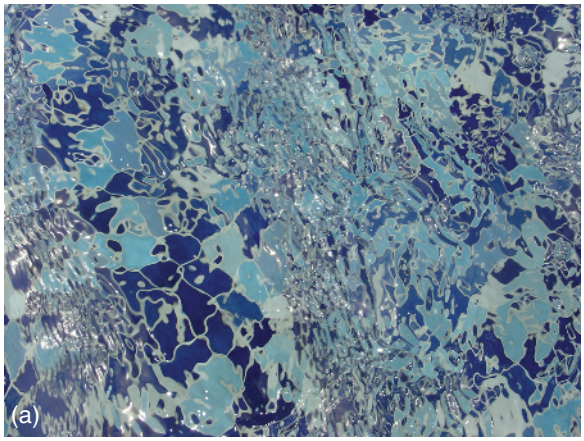
Most lesions that from afar look indistinct become obviously benign or malign on closer inspection. However, there are plenty of lesions where close visual inspection is still not enough. How do we approach these lesions? Tools to aid diagnosis, such as the magnifying lens and bright light sources, can help or – failing that – a biopsy, whereby the diagnosis appears as a line on the histology report. However, simple adjustments to our clinical practice may be all that is required to improve our diagnostic ability.

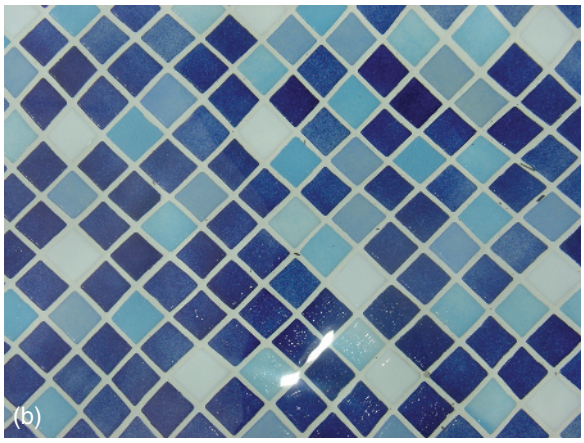
To begin with, we should search for clues to diagnosis, the diagnostic detail in lesions, and not just rely upon rather crude data such as shape, size and colour for a diagnosis. Although these crude parameters are often all that is required for a diagnosis, relying solely upon them will limit your diagnostic accuracy. Imagine an art dealer investing in a painting based solely upon the shape, size, age and colour of the picture frame, without appreciating the detail in the brushstrokes of the canvas. These dermatological 'brushstrokes' are the morphological structures that comprise skin tumours, and unfortunately many of them are invisible to the naked eye.

Viewing the invisible world ...

Two barriers need to be overcome.

First, the rough surface of the stratum corneum causes light to scatter, reducing light penetration into the skin. This scattering of light impairs the view of the morphological structures hidden within a lesion. This can be illustrated by light reflecting off the surface of this rippled pool (a), distorting the detail seen of the tiles underneath. However, if the surface is calm (b), more light penetrates deeper into the pool before being reflected and greater detail can be seen:

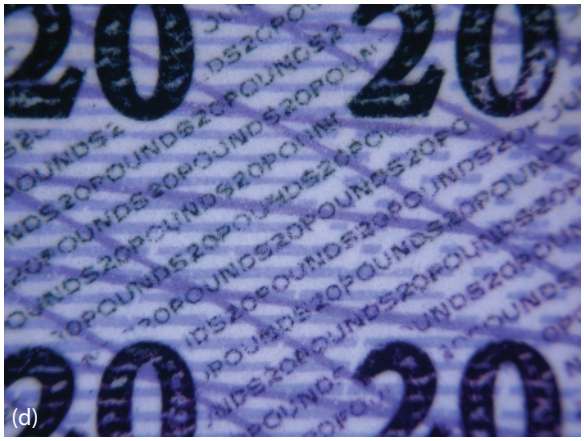

(a)


(b)

This surface scattering of light can be overcome in the clinical arena by contact with the skin using an interface medium or by means of polarised light.

The second point to consider is magnification. The benefits of magnification to augment skin diagnosis have long been recognised. Although we believe our eyes to show all the detail required for diagnosis, the truth is that they are limited. To illustrate the point, the microprint in this banknote is invisible to the naked eye (c), but is clearly visible with magnification (d):


(c)


(d)

The combination of increasing light penetration into a lesion and magnification is dermoscopy.

Dermoscopy is now used in over a hundred countries worldwide, with unequivocal evidence to support its use in skin lesion diagnosis.

The structures seen with dermoscopy equate to a histopathological correlate, and therefore an understanding of this relationship will help in diagnosis.

Throughout this book, examples are provided to illustrate the spectrum of clinical presentation and the variability of morphological structures seen for any diagnosis.

Instruments

Problem: Why do most moles just look brown? The stratum corneum reflects light, reducing the ability to see detail of structures in the underlying skin. Thus most moles look brown, with relatively little detail. The detail exists; it is just not visible.

Theory: If we are able to overcome the refractive properties of the stratum corneum, greater detail in the underlying skin can be observed. This is the underlying concept upon which dermoscopy is based. This can be achieved by the simple application of an interface medium directly to the skin, such as alcohol gel. Any bright light source and magnification lens can then be used to see increased detail in the skin, including the morphological detail and pigment distribution within naevi. However, the use of gel and a simple magnifying lens is cumbersome and impractical when assessing multiple lesions.

Solution: Dermoscopy devices can simplify the previously described process by combining a bright illumination source and a strong magnification lens in one handheld device. Dermoscopy devices overcome the refractive properties of the stratum corneum either by the use of oil immersion with an interface medium such as alcohol gel or by cross-polarisation.

There are consequently three groups of devices:

- Oil immersion devices – which require contact with the skin and the use of an interface medium to reduce surface light scatter.
- Cross-polarised devices – which use cross-polarised light to reduce surface light scatter.
- Hybrid devices – which have the option to use either cross-polarised or oil immersion to reduce surface light scatter.

Non-polarised devices (oil immersion/contact)

Although a number of contact devices are currently available, the two main devices are the Heine Delta 20 and the DermLite II fluid. Both devices give a very bright image, although subtle optical differences between the two devices exist. The majority of images in this book have been taken with the Heine Delta 20.

The Heine Delta 20

The DermLite II fluid

Polarised devices

The breakthrough in dermoscopy came with the introduction of the polarised devices. Now it was possible to examine multiple lesions with dermoscopy quickly, without the need to coat the patient in copious amounts of oil or interface fluid. The original DermLite devices, especially the DL100 – although groundbreaking when launched – were quickly surpassed in quality by newer DermLite devices making them less attractive as a device for clinical practice. The arrival of the DermLite II PRO HR saw a device at last able to compete with the established oil immersion devices, combining bright illumination with magnification to provide a very high quality image. The added versatility of non-contact enables multiple lesions to be quickly examined, making them the first choice device for many dermatologists.

The DermLite DL100

The DermLite II PRO HR

Hybrid devices

Oil immersion and cross-polarisation devices differ in the images they produce, due to the refractive properties of morphological structures under polarising light. This has led to the development of devices that can produce images by both oil immersion and cross-polarisation. The first device to combine this increased functionality was the DermLite II Hybrid m. Although not as bright as either the Heine Delta 20 or the Dermlite II PRO HR, it has nonetheless became a very popular device. However, the arrival of the brighter DermLite DL3 has effectively sealed the fate of the DermLite II Hybrid m, relegating it to the second division of hybrid devices. The DermLite DL3 has brighter imaging than the DermLite II PRO HR in the polarised mode and is comparable to the Heine Delta 20 in the non-polarised mode.

DermLite II Hybrid m

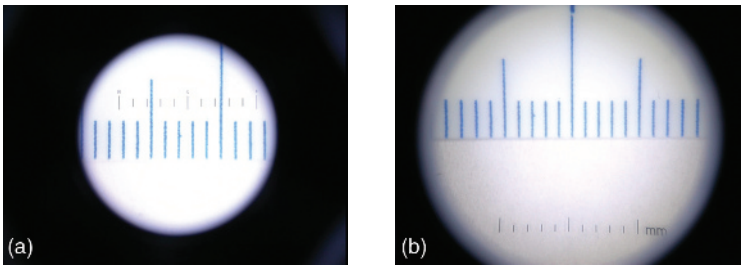
DermLite DL3

Which device is best?

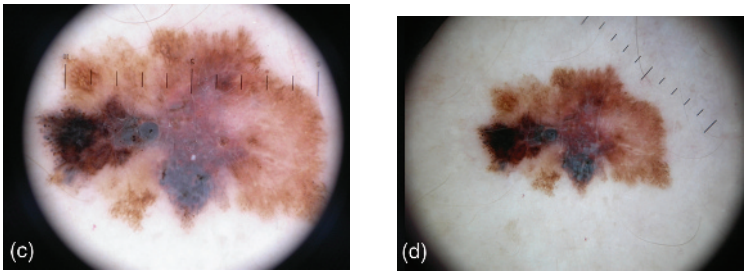
The selection of a dermoscopy device is a personal choice, reflected by clinical practice. If the clinician is looking at one or a couple of lesions, then the device that delivers the best optical quality should be considered: this is currently the DermLite DL3, the DermLite II Fluid or the Heine Delta 20. If, however, the clinician is involved in screening multiple lesions, then a polarised device that allows quick visualisation of many lesions, such as the Dermlite II PRO HR or the DermLite DL3, is the device to consider.

The Heine Delta 20 versus the DermLite II PRO HR

The DermLite range has the largest field of view of the standard dermoscopic devices, much more so than the Heine Delta 20:



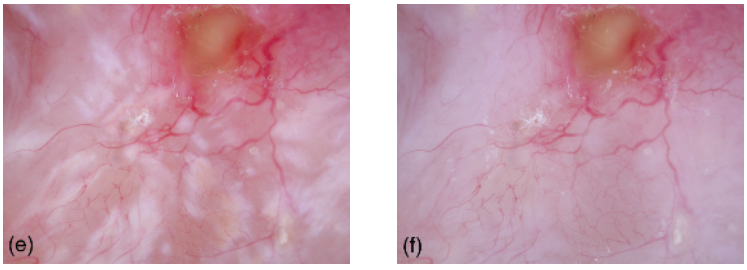
Field-of-view measurement: (a) the Heine Delta 20 and (b) the DermLite II PRO HR that can have a clinical relevance if photographing a lesion that is more than 10 mm in size



This 12 mm melanoma just fits into the field of view of the Heine Delta 20 (c); however, it is easily seen within the field of view of the DermLite II PRO HR (d)

Chrysalis structures

The polarising devices may show white scar-like structures in tumours with a dermal component, which appear as perpendicular white 'brush strokes' across the lesion. These are referred as 'chrysalis structures' or 'shiny white streaks' and are thought to reflect collagen bundles in the papillary dermis. Non-polarised devices will fail to illustrate this phenomenon:

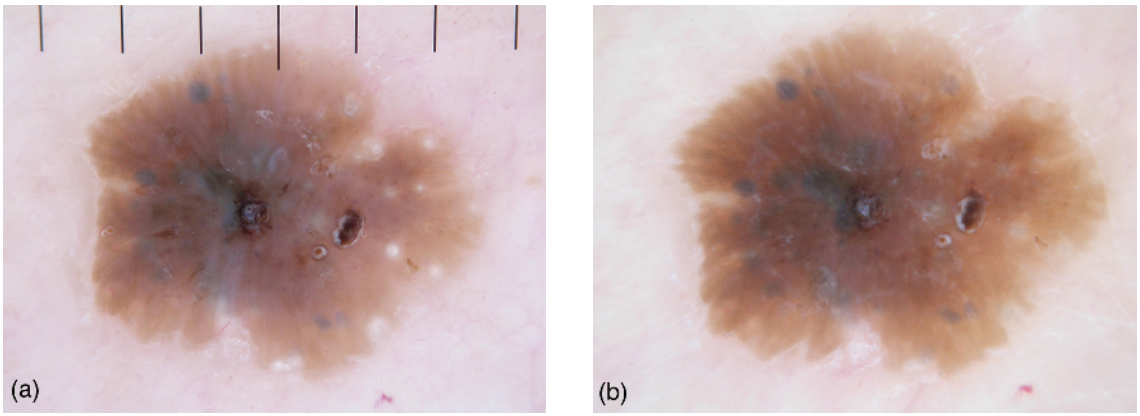


This BCC illustrates chrysalis structures/shiny white streaks when viewed with the DermLite DL3 under polarising light (e), which are absent in the non-polarising mode (f)

Benvenuto-Andrade C, Dusza SW, Agero AL, Scope A, et al. Differences between polarized light dermoscopy and immersion contact dermoscopy for the evaluation of skin lesions. Arch Dermatol 2007;143:329–38.
Marghoob A, Cowell L, Kopf AW, et al. Observation of chrysalis structures with polarized dermoscopy. Arch Dermatol 2009;145:618.

Comparisons of contact versus non-contact polarisation: structures in a seborrhoeic keratosis

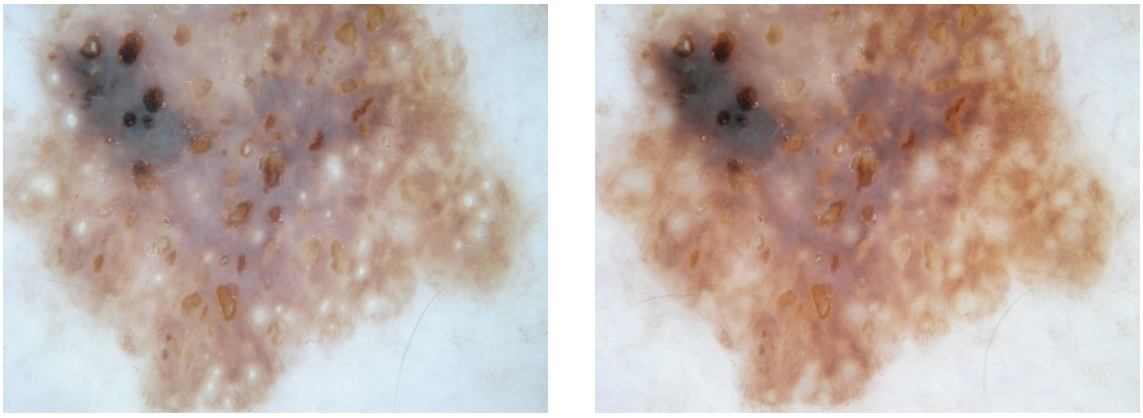
In addition to colour differences, some dermoscopic structures will have a different appearance depending on which device is used.



The milia-like cysts in this seborrhoeic keratosis are easily seen on the right of the image made using a non-polarising device (a); however, they are absent with a polarising device (b)

Comparison of the polarising mode and the non-polarising mode – the DermLite II Hybrid m

The DermLite II Hybrid m was the first combination device, which had the potential by clicking a button to change the illumination from polarising to non-polarising, allowing structures such as milia-like cysts to be seen.

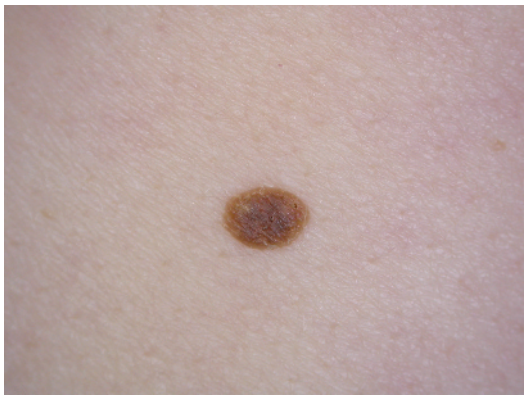


DermLite II Hybrid m contact, non-polarised

DermLite II Hybrid m contact, polarised

The dermoscopic detail from the DermLite II Hybrid m in non-polarised mode is similar to, but not as bright as, that from the Heine Delta 20. The explanation for the differing views seen between the two types of dermoscopic devices is related to the refractive properties of the different structures within the lesion and their behaviour under polarising and non-polarising `conditions.

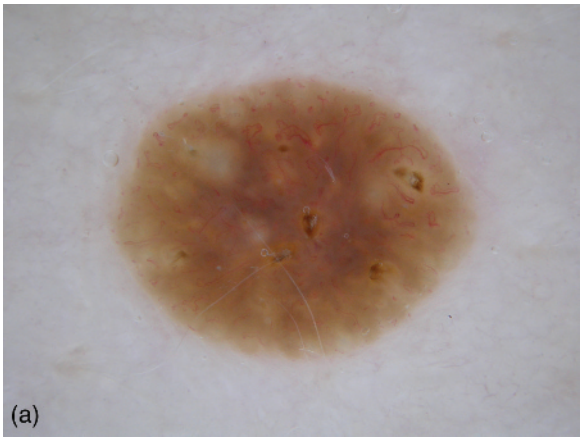
Pan Y, Gareau DS, Scope A, Rajadhyaksham M, et al. Polarized and non-polarized dermoscopy: the explanation for observed differences. Arch Dermatol 2008;144(6):828–9.



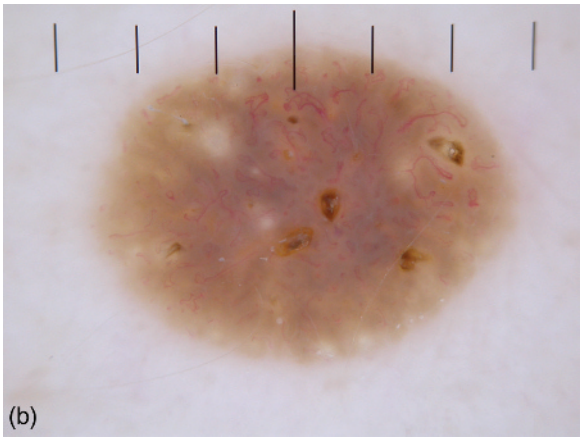
A clinical image of a seborrhoeic keratosis

DermLite DL3 versus DermLite II PRO HR versus Heine Delta 20

Different dermoscopic devices will illustrate colours and structures in lesions differently. The seborrhoeic keratosis shown left has been imaged with a standard polarised device (a), the DermLite II PRO HR and with a standard non-polarised device (b), the Heine Delta 20. Differences can be seen in the colours, with increased browns in the polarised image. However, the bright dots of milia-like cysts are more easily seen with conventional dermoscopy, but not with polarisation.

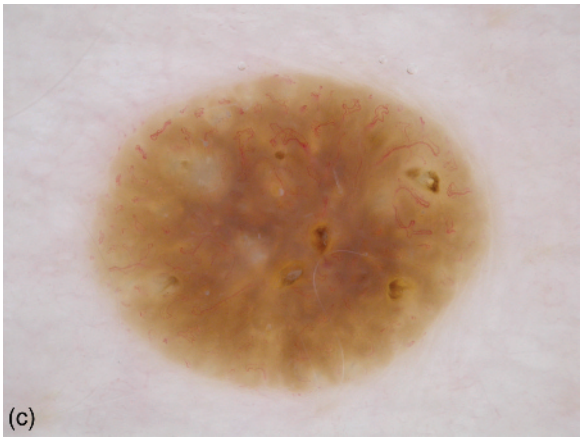


DermLite II PRO HR, polarised

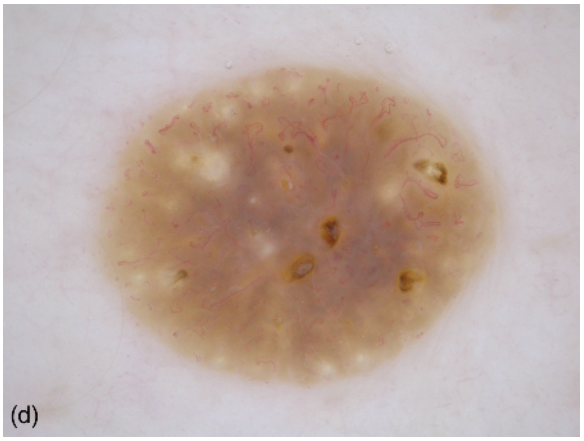


Heine Delta 20, non-polarised

With advances in technology, hybrid devices are able to produce clearer polarised and non-polarised images. The same seborrhoeic keratosis is now imaged with the DermLite DL3 in both polarised (c) and non-polarised (d) modes. The polarised image is brighter than the image made with the DermLite II PRO HR, and the non-polarised image is comparable with the Heine Delta 20's image. The ability of hybrid devices to now match or surpass imaging by their standalone predecessors will make them very versatile and popular devices for the future.



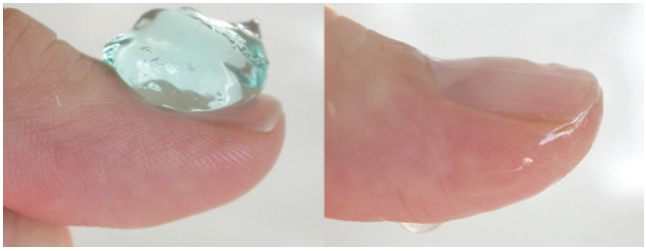
DermLite DL3, polarised



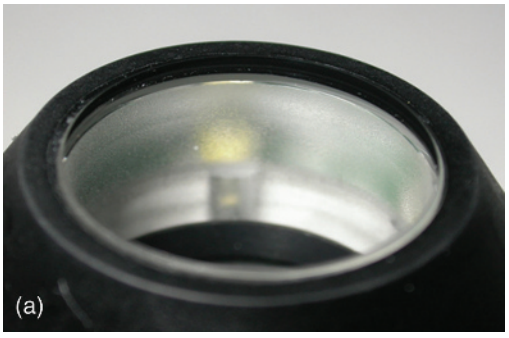
DermLite DL3, non-polarised

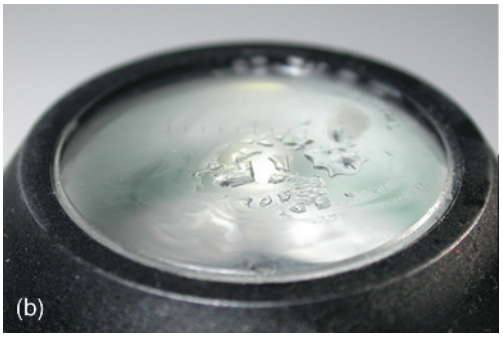
Device maintenance tips

Whichever device you choose, there are a few simple tips that will help to maximise the potential of the device.

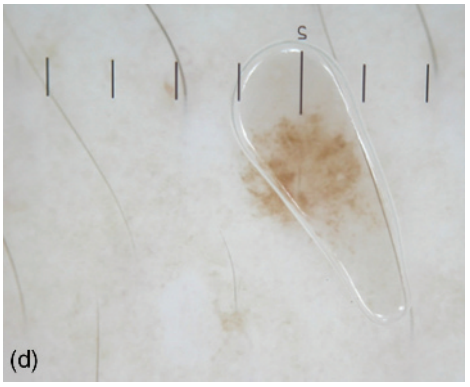


Use 70% isopropyl alcohol gel as the interface medium for contact devices, to reduce the possibility of cross-contamination between patients. Use ultrasound gel for visualising the nail folds, as alcohol gel will run off the nail. Use ultrasound gel in peri-ocular regions, to avoid irritating the eye with alcohol.





Use alcohol wipes (70% isopropyl alcohol) to clean the device between patients (a), as the alcohol and ultrasound gel can dry, leaving a residue on the faceplate (b)



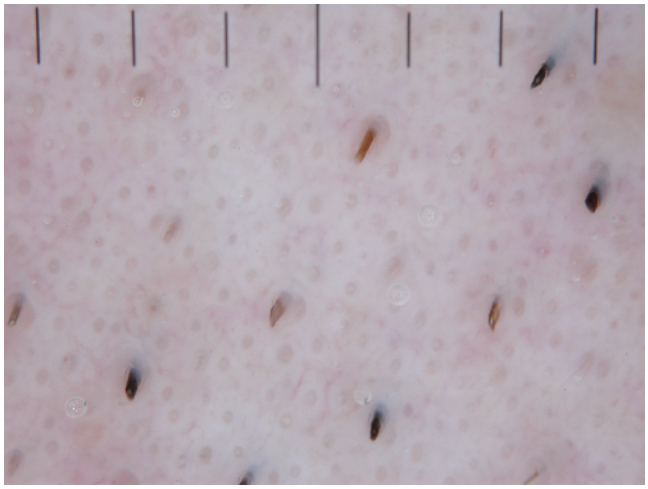
Apply the alcohol gel to the lesion if on a horizontal surface or to the faceplate of the device if on a vertical surface (c), and apply the device to the skin carefully, in a rolling motion to avoid air bubbles Air bubble obscuring view of lesion (d)

Tip: Don't forget to keep the devices fully charged!

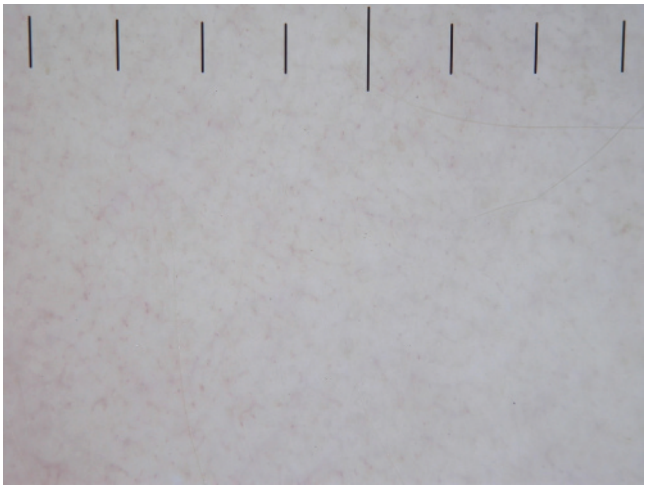
Normal skin

The structures and details of normal skin will vary depending upon the skin site, skin phototype and degree of photo-damage. Once the features of normal skin are recognised, the boundary between normality and pathology can be better visualised.

Skin phototype I

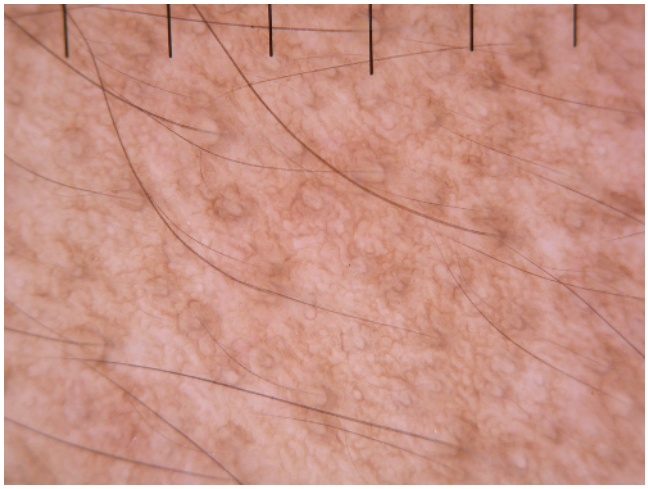


Normal facial skin (male skin, phototype I), showing dense follicular units

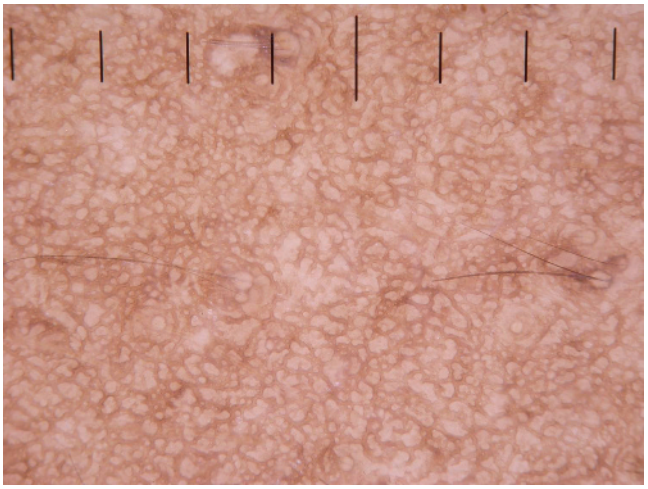


Normal truncal skin (male skin, phototype I), showing an absence of detail

Skin phototype V



Normal facial skin (female skin, phototype V), showing multiple follicular structures and feint reticular pigmentation

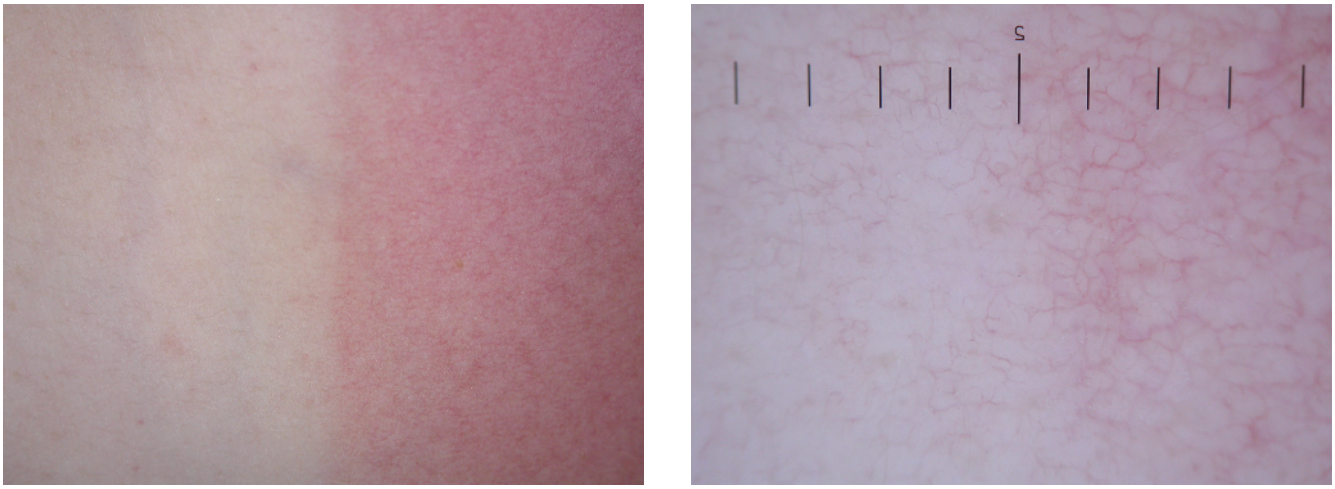


Normal truncal skin (female skin, phototype V), showing detailed uniform reticular pigmentation and fewer follicular structures

Photodamaged skin I

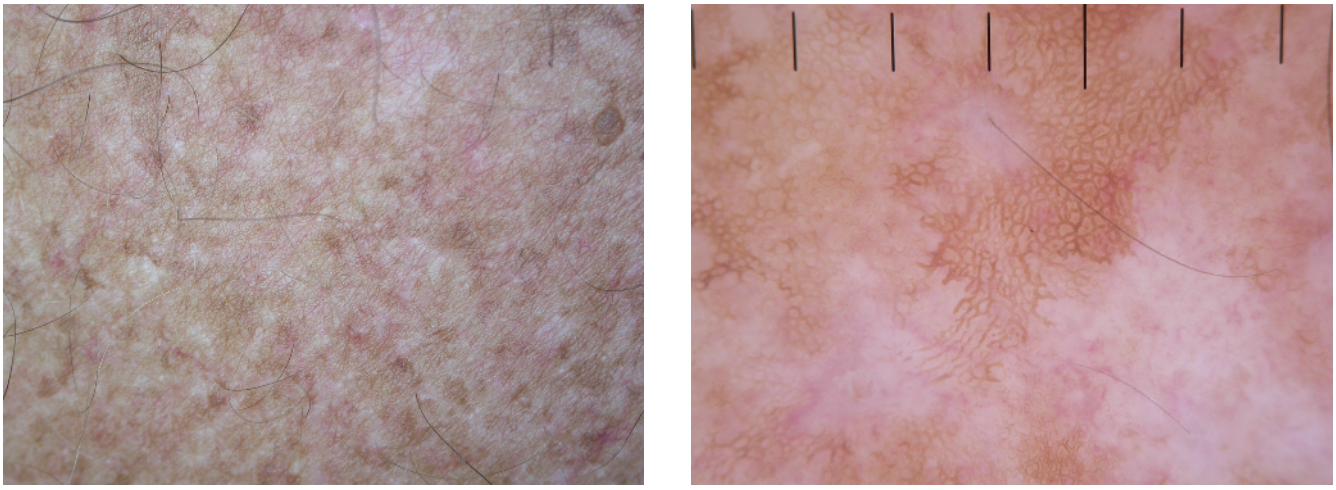
Photodamage to the skin – whether acute, such as sunburn, or chronic – will have visible effects on the skin.

Acute photodamage



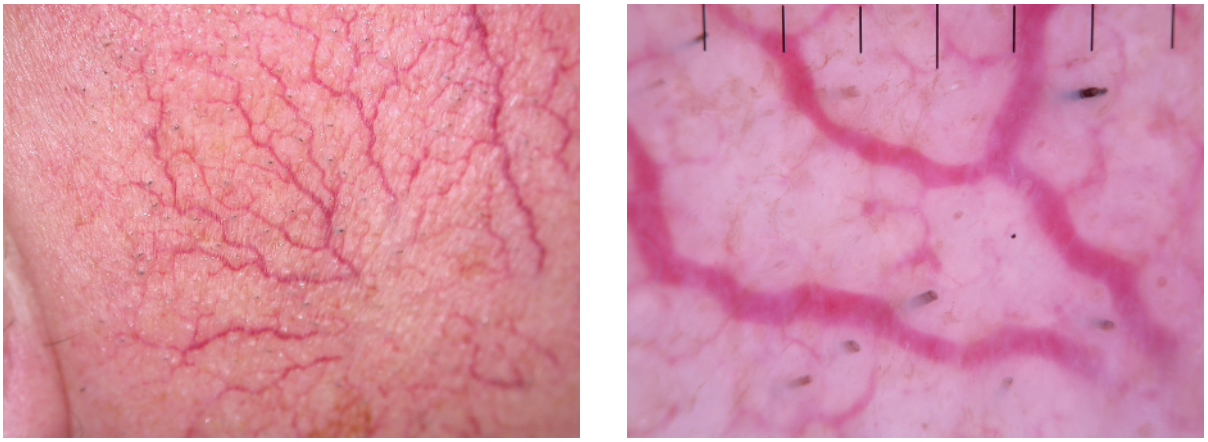
Acute photodamage (left) manifests as sunburn with clinical erythema: the initial erythema of sunburn (right) is due to dilation of the underlying blood vessels

Chronic photodamage

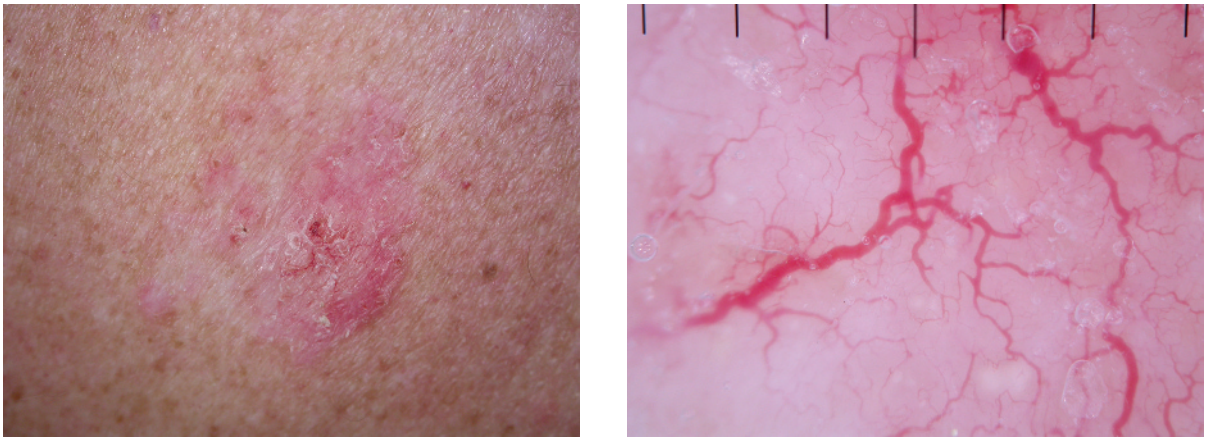


Chronic photodamage may result in pigmentation, seen as patchy reticular pigmentation

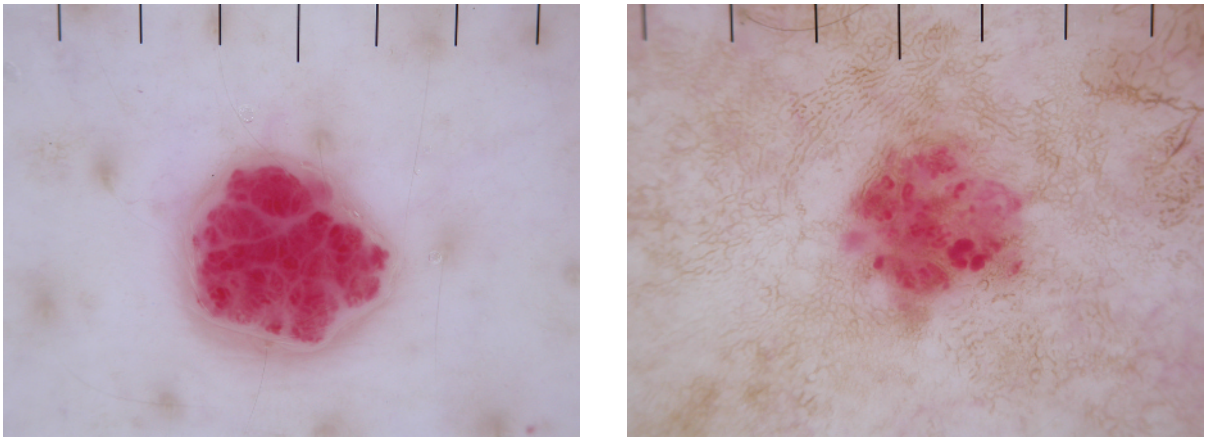
Examples of photodamaged skin



Facial telangiectasia (left) may be seen as a result of photodamage: the telangiectasia are arborising but broad (right) and poorly focused



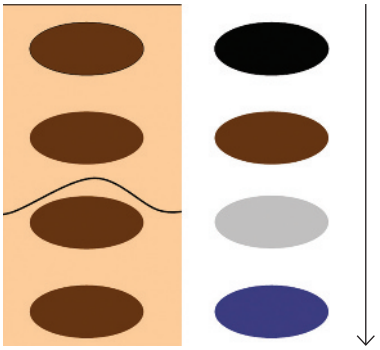
Telangiectasia may be seen clinically in skin tumours such as this basal cell carcinoma: however on dermoscopy the blood vessels are sharply focussed and branch to fine end terminal vessels



Two benign angiomas occurring on a background of both normal and photodamaged skin

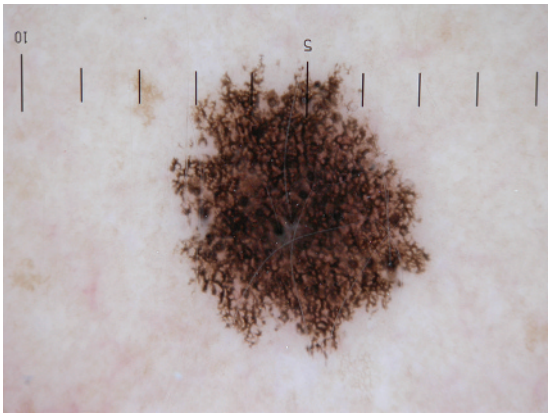
Pigment depth and colour

Melanin is the main pigment in the skin and hair. When melanin is present in skin lesion, the colour seen will depend upon: the predominant type of melanin (eumelanin = browns/black, phaeomelanin = reds/orange); the concentration of melanin; and the anatomical location or depth of the pigment in the skin.

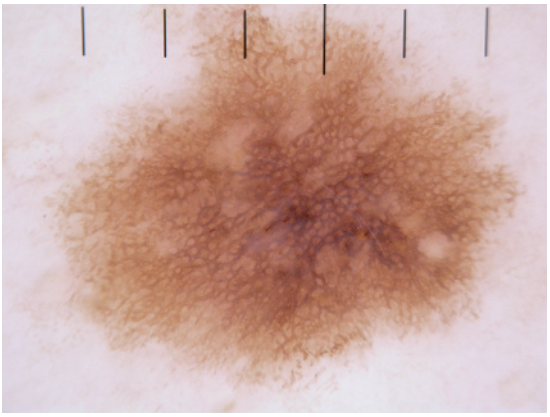


The depth of the pigment will alter the colours seen with dermoscopy.

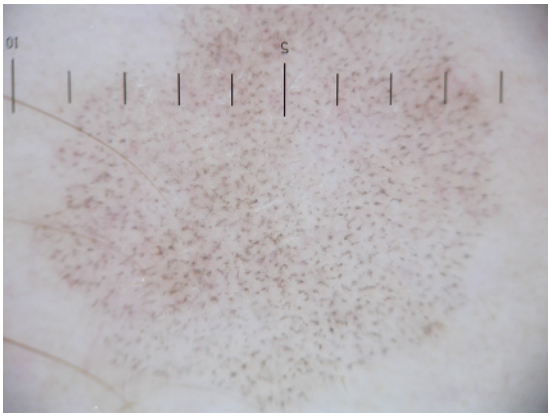
Melanin location	Dermoscopic colour seen
Superficial epidermis	Black
Epidermis	Brown
Papillary dermis	Grey
Reticular dermis	Blue



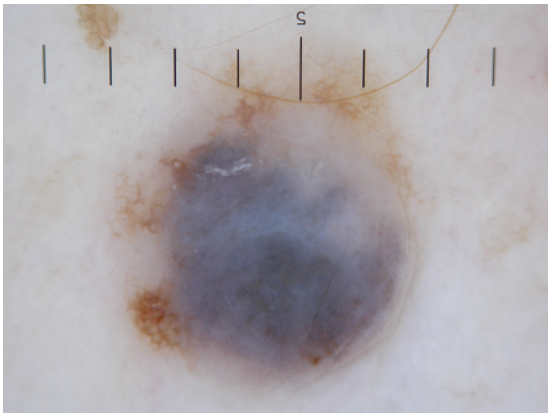
Black: ink ink-spot lentigo with black reticular pigmentation



Brown: melanocytic naevus with brown reticular pigmentation



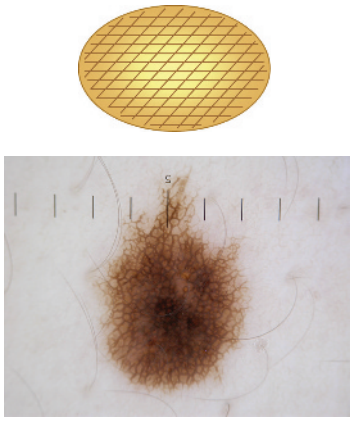
Grey: benign lichenoid keratosis with grey post-inflammatory pigment in the papillary dermis



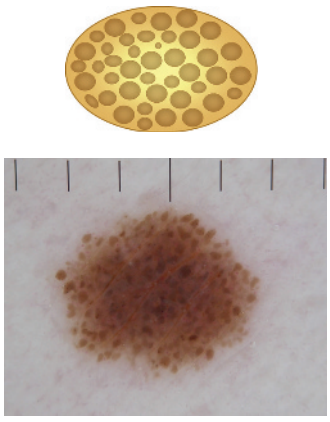
Blue: combined naevus with blue colour from the dermal component and orange/brown colour from the epidermal component

The dermoscopic alphabet

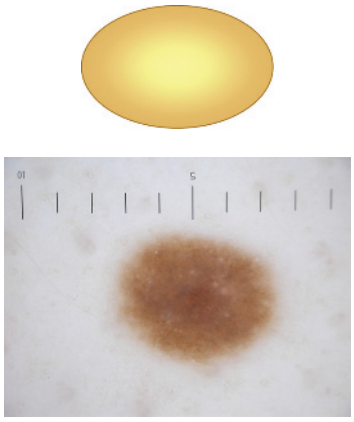
Global features To ensure consistency when describing the morphology of a lesion and the structures seen with dermoscopy, a specific language should be used. The language used comprises the dermoscopic alphabet. First, the overall morphology or global features of the lesion are described.



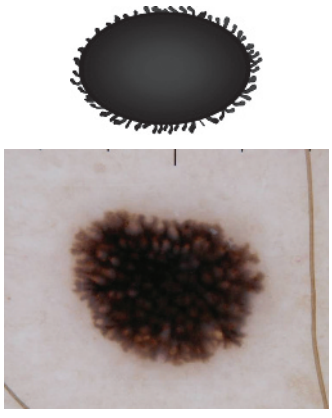
Reticular



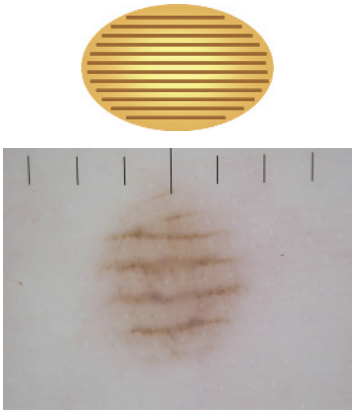
Globular



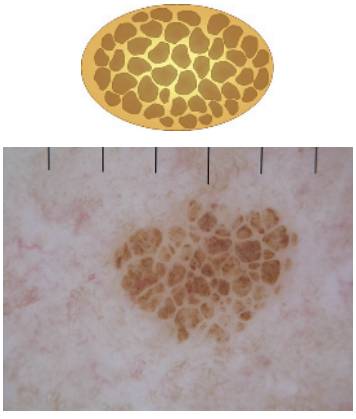
Homogeneous



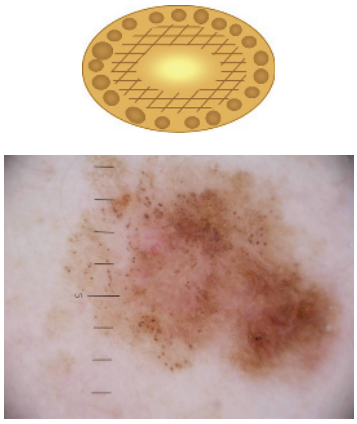
Starburst



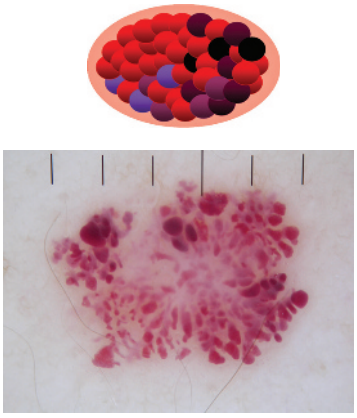
Parallel



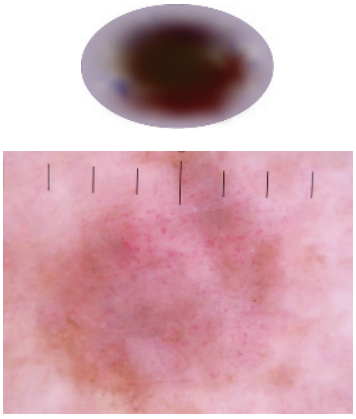
Cobblestone



Multicomponent

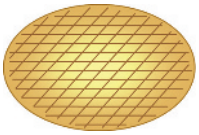


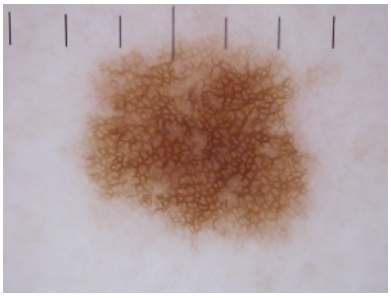
Lacunar



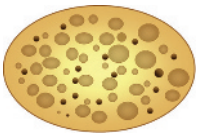
Non-specific

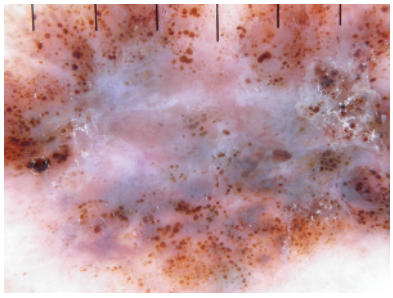
Local features Secondly, local features or dermoscopic structures, a number of which are shown below. Additional local features will be discussed under the relevant diagnostic headings later in this book.



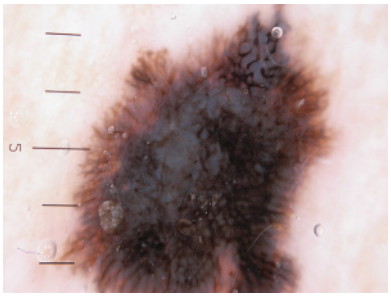


Pigment network

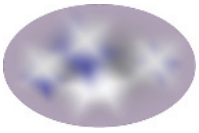


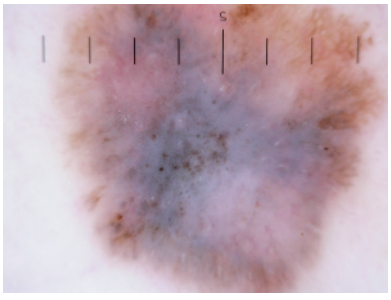


Dots and globules

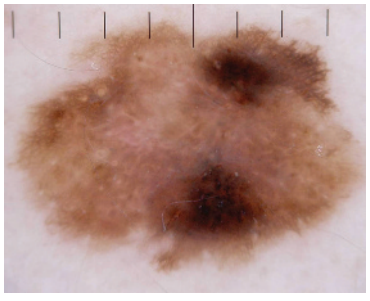


Streaks

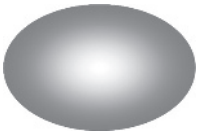


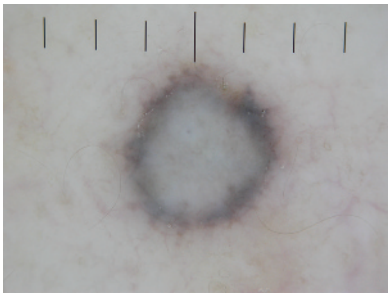


Blue–white structures

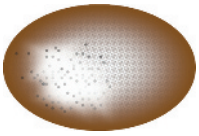


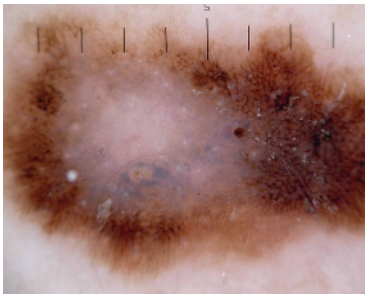
Pigment blotches



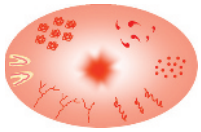


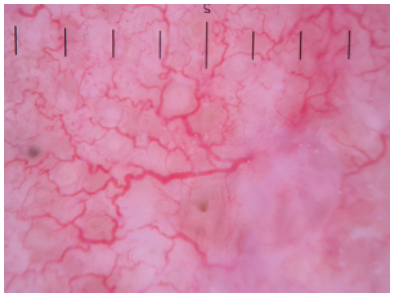
Hypopigmentation



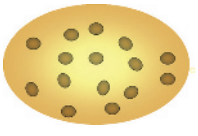


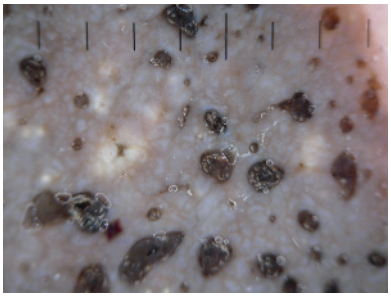
Regression structures





Vascular structure





Comedo-like openings