Chaos and Clues

From dermoscopedia

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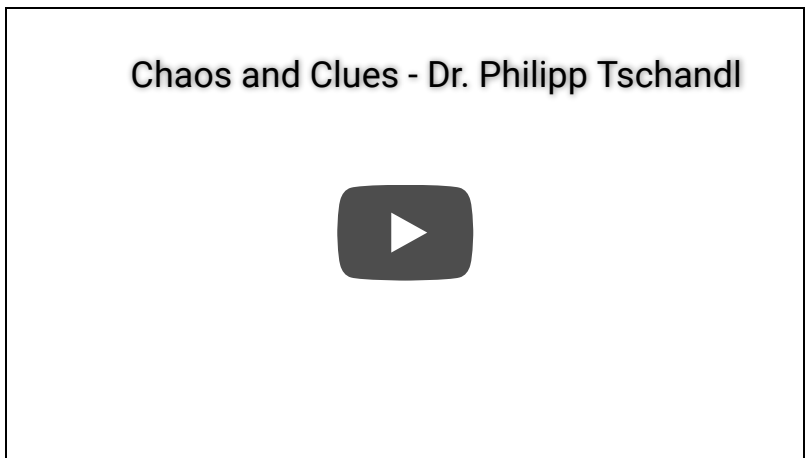
Contents

Chaos and Clues: a decision algorithm for pigmented lesions based on revised pattern analysis

Revised pattern analysis is designed to lead to a provisional diagnosis in a logical stepwise process[1]. Chaos and Clues on the other hand is an algorithmic method which uses pattern analysis to guide the clinician in a stepwise process to the decision about whether (excision) biopsy is indicated[2].



Applying Chaos and Clues in Routine Practice: Red Flags, Chaos and Clues

Before considering the dermatoscopic decision algorithm Chaos and Clues, it is relevant to also consider what is actually done in the daily routine of clinical practice. Although the clinician is ideally encouraged to apply the dermatoscope to all lesions on a patient, a detailed algorithmic analysis of every lesion is neither realistic nor necessary. The vast majority of skin lesions are benign and can be diagnosed dermatoscopically by pattern recognition [3]. The main benign lesions, pigmented and non-pigmented, which can be encountered every working day can be divided into 5 groups: nevus; benign keratinocytic; hemangioma; dermatofibroma and sebaceous gland hyperplasia. Because these lesions are ubiquitous the clinician can very rapidly become an expert at recognising them by deliberately looking at thousands of them to understand their characteristic protean variations [4]. [5].

What chaos really means

There are two steps used to triage skin lesions in the decision making process. The first step is to decide if a lesion is suspicious and the second is to decide whether it is likely to be malignant. Dermatoscopic chaos is the most compelling factor in deciding whether a pigmented lesion is suspicious, and this along with some other “red flags” should determine the first part of the triage process. Benign lesions tend to have biological symmetry and this symmetry occurs in the form of recognisable patterns, just as faces of different species of animals have recognisable patterns. We will recognise any dog’s face by pattern-recognition even though there are many different morphological varieties of dog faces. In figure 1 there are six different images of animal faces. The first five are recognisable as “normal” faces because even though they are not necessarily perfectly symmetrical they are biologically symmetrical and therefore recognisable. They do not exhibit chaos. The sixth image on the other hand is not biologically symmetrical. It is chaotic and therefore unrecognisable which means that pattern analysis must be used to weigh clues to identify what it represents.

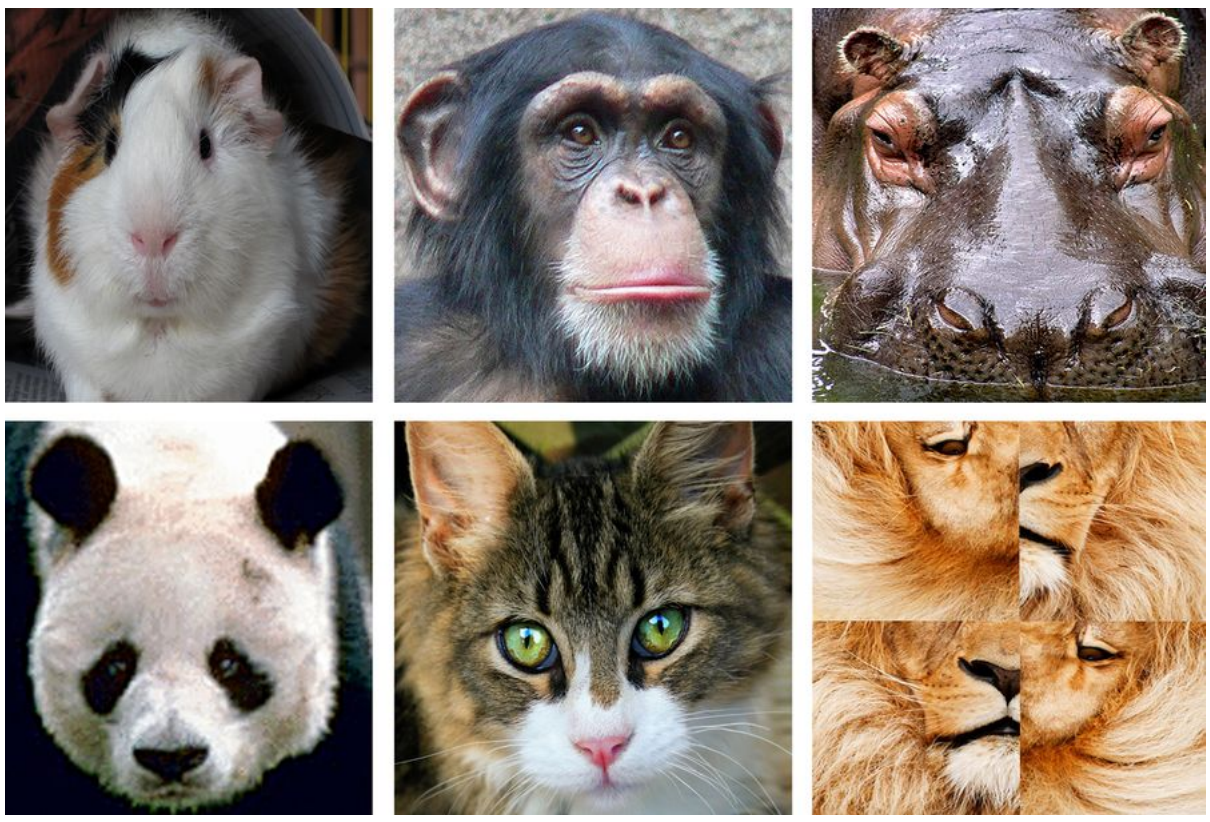

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Figure 1: In this collage of faces the first five are recognisable by pattern recognition because they are biologically symmetrical. The sixth exhibits biological asymmetry (chaos) and therefore may require analysis of the patterns present to achieve recognition.

The common benign skin lesions we may see every day are also recognisable because of biologically symmetrical characteristic patterns (figure 2). Just as there are many different morphological varieties of dogs and fish there are many different morphological types of nevus and of seborrheic keratosis but the experienced clinician will recognise them instantly through the dermatoscope as naevi or seborrheic keratoses and move to the next lesion. Becoming an expert at pattern recognition of common benign lesions just requires one thing – the deliberate examination of thousands of them with a dermatoscope.

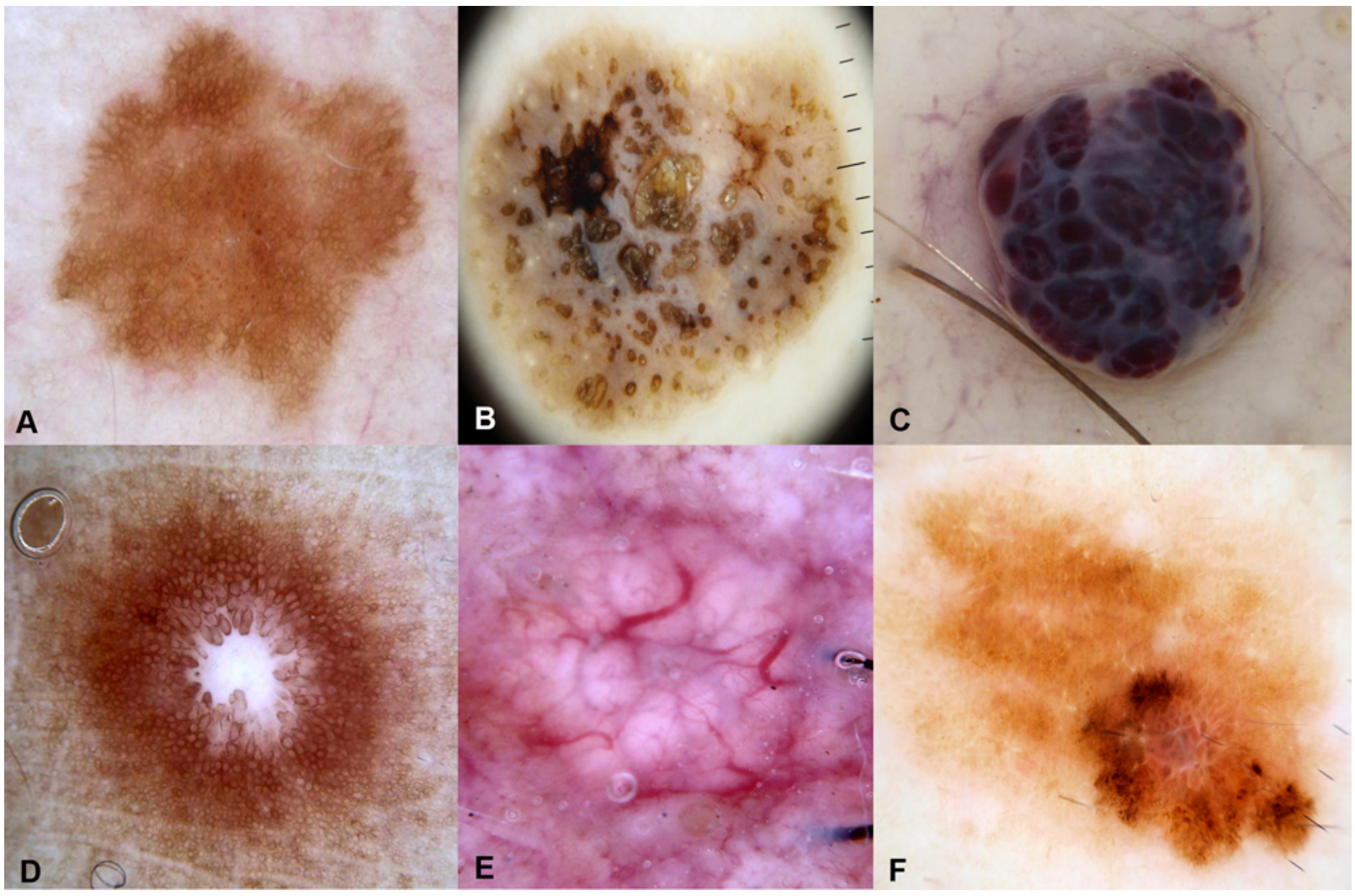

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Figure 2: To an experienced dermatoscopist the first five lesions in this collage are biologically symmetrical (no chaos) and will be diagnosed by pattern recognition as (A) nevus, (B) seborrheic keratosis, (C) hemangioma, (D) dermatofibroma and (E) sebaceous gland hyperplasia. The last lesion (F) is asymmetrical and cannot be recognised as any of the common benign lesions so pattern analysis is applied. It is disorganised (chaotic) with clues to malignancy; melanoma invasive.

Red Flags

Red Flags represent the features that flag a lesion as suspicious and therefore warranting formal algorithmic assessment. These features are such that they will either be known (patient concern), be obvious (clinical pattern-breaker) or be recognisable during scanning dermatoscopic evaluation (chaos of pattern, colour or border abruptness, dermatoscopic clues to change and dermatoscopic uniqueness).

Red flags in addition to dermatoscopic chaos

Patient concern or clinical evidence of change

No lesion of patient concern should ever be dismissed without targeted examination including dermatoscopy [6]. Patients may be concerned because a seborrhoeic keratosis is large and black, because a

haemangioma has apparently suddenly appeared or because a mole is perceived to have changed. Patient concern should automatically flag a lesion as suspicious and lead to an analytical assessment. Similarly documented evidence of change at mature age, including deliberately monitored change, flags a lesion as suspicious therefore requiring focussed dermatoscopic assessment.

Clinical pattern-breaker

The same disorganised and uncontrolled behaviour of malignant tissue that causes dermatoscopic chaos often causes malignant lesions to break the pattern of the surrounding skin clinically. Malignant lesions may arise randomly, have an irregular unexpected shape or colour and eventually their unrestrained growth may make them larger than surrounding benign lesions. A lesion which breaks the pattern clinically should be flagged as suspicious and dermatoscopically analysed[2].

Dermatoscopic clues to change

Peripheral clods, radial lines and pseudopods are all dermatoscopic clues to change. Peripheral clods may not cause concern in adolescence but any clues to change should flag a lesion as suspicious at mature age (see figure 3). At intermediate age this feature should be assessed in the context of other lesions on the patient. Segmental radial lines or pseudopods should be recognised as a Red Flag at any age.

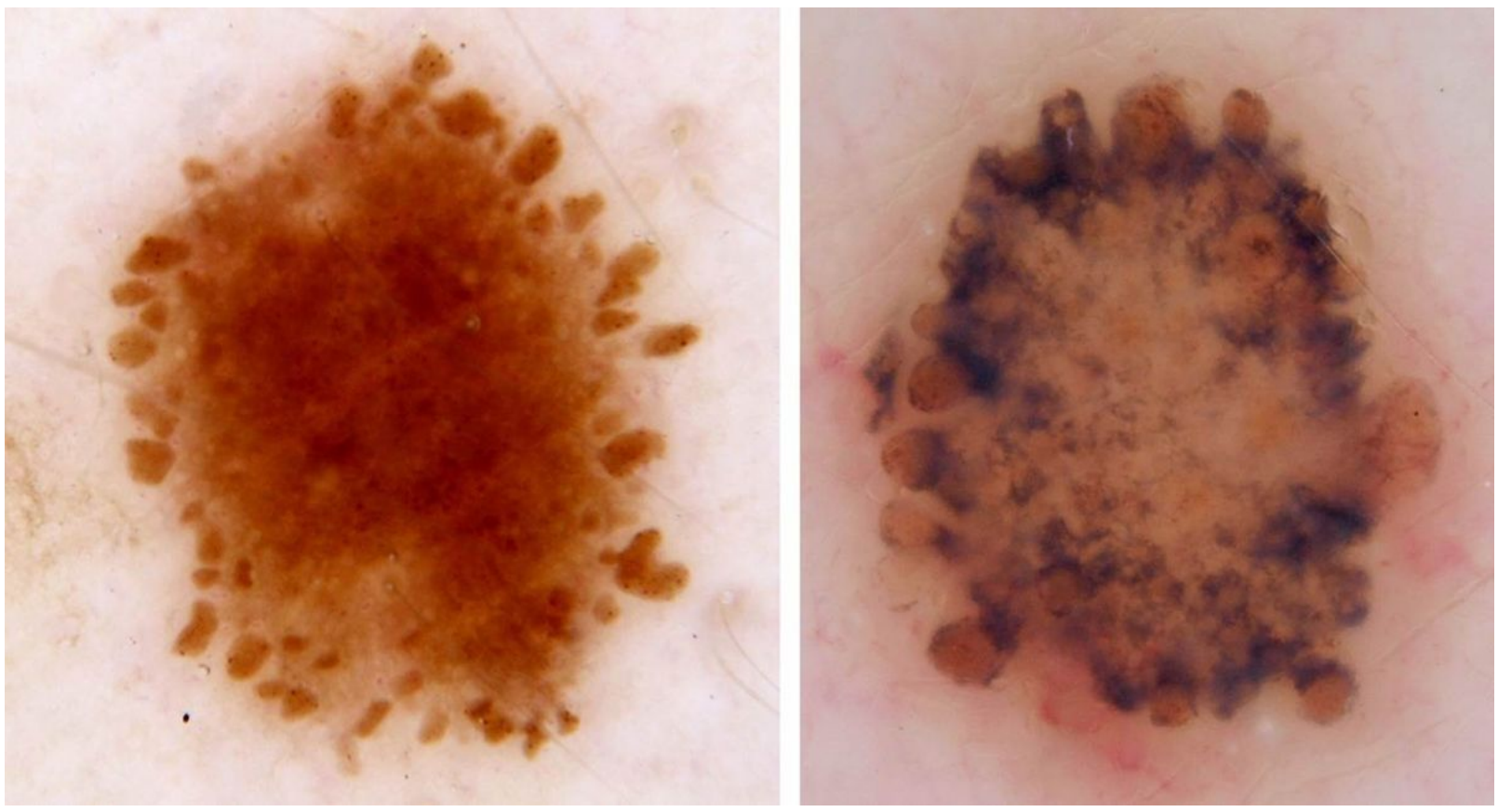

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Figure 3: Two lesions both with the dermatoscopic clue to change of peripheral clods. The lesion on the left was a growing nevus on the back of an adolescent (not excised). The lesion on the right was on the back of a 60 year-old woman and it was excised; nodular melanoma 3mm in diameter with a Breslow thickness of 0.9mm. Note that the melanoma, although arguably symmetrical, has a disorganised structure compared to the naevus, consistent with the chaotic behaviour of malignant tissue.

Dermatoscopic uniqueness

Any lesion which has a dermatoscopic pattern different to all other lesions on the patient should be flagged as suspicious. This feature has been previously described as the dermatoscopic ugly-duckling sign [7]. This is particularly relevant with respect to a clod-pattern nevus at mature age at which stage of life this pattern is not expected (see figure 4)

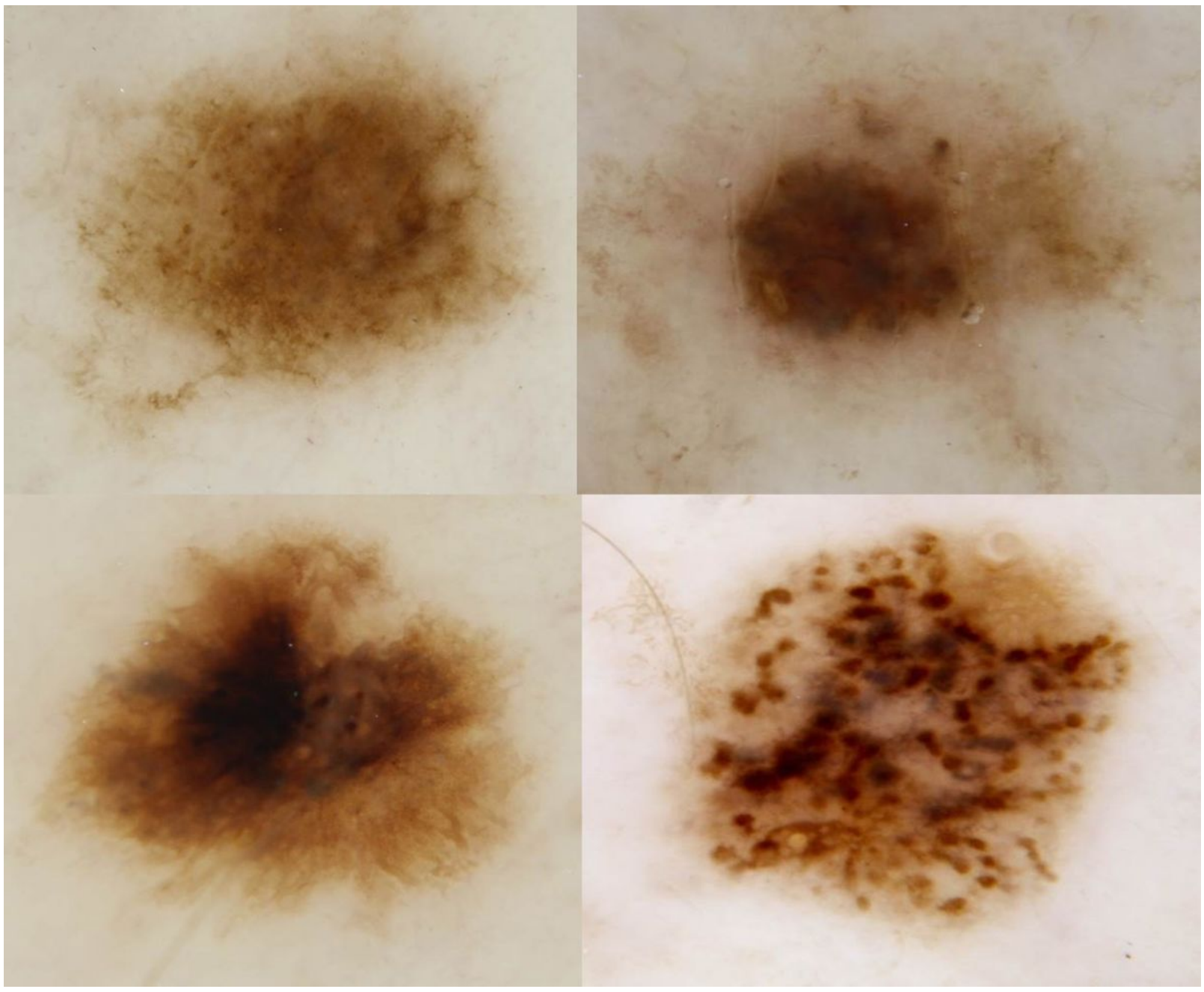

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Figure 4: Four lesions on a 50 year-old woman's anterior thigh. The first three lesions were all consistent with the patient's signature naevi being structureless and with reasonable biological symmetry. The fourth lesion (lower right) was also reasonably symmetrical but being the only clod pattern lesion, making it dermatoscopically unique, it was excised; melanoma in situ

Chaos and Clues: a dermatoscopic decision algorithm

When clinical and dermatoscopic examination identifies a Red Flag as defined above, the lesion is flagged as suspicious and is subjected to careful, methodical examination by the method of choice. While we prefer to use Chaos and Clues, we do not believe that the performance of an expert using an alternative method will be in any way inferior. We prefer Chaos and Clues because we have found that it is easy to teach and relatively easy to employ in busy routine practice. It also uses clearly defined geometric terminology facilitating unambiguous communication between professionals, this being particularly relevant with teledermatoscopy. Expert diagnosis has more to do with experience and expertise than choice of method. However a method that cannot be taught is barely a method at all[8].

The flowchart for the Chaos and Clues algorithm is shown in figure 5.

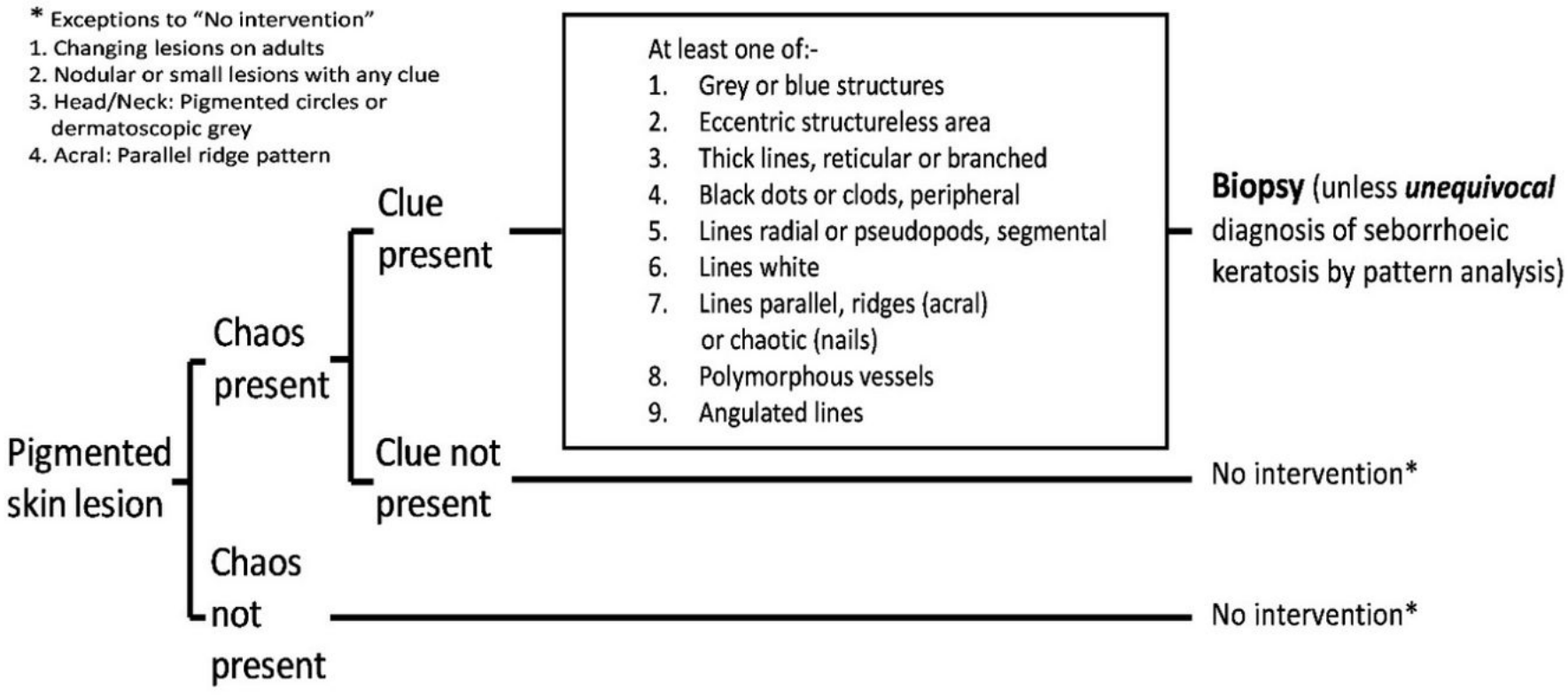

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Figure 5: Flowchart for the Chaos and Clues algorithm. Pigmented lesions are first assessed for the presence of chaos (chaos is defined as the presence of dermatoscopic asymmetry of any or all of, pattern, colour and border abruptness) and if chaos is present they are examined for any one or more of nine clues to malignancy. If a clue is present an excision biopsy is considered unless an unequivocal diagnosis of seborrhoeic keratosis can be made by pattern analysis. There are four exceptions in which excision biopsy is considered even for non-chaotic lesions: any changing lesion on an adult, a nodular or small (<6mm) lesion (lacking the morphology of a known benign lesion) which has any clue to malignancy, any lesion on the head or neck (lacking the morphology of a known benign lesion). with either pigmented circles or dermatoscopic grey colour and any acral lesion, with a parallel ridge pattern pigmented by melanin.

Chaos

While natural laws (gravity, electrical and magnetic fields, surface tension and feedback mechanisms) favour symmetry, malignant tissue defies natural laws and this is the basis for both dermatopathological and dermatoscopic chaos in malignant tissue (see figure 6)[9]. This chaotic behaviour of malignant tissue also produces all of the other red-flag characteristics described earlier as well as the clues to malignancy described hereunder. If a dermatoscopist is equivocating about the presence of chaos the situation is usually resolved by considering whether the dermatoscopic pattern is consistent with the chaotic behaviour of malignant tissue.

Chaos is defined as the presence of dermatoscopic asymmetry of any or all of, pattern, colour and border abruptness. This differs from asymmetry as assessed by the method described for revised pattern analysis in that chaos of border abruptness is not included in that method (see figures 7, 8 and 9)[10].

Any irregularity of the shape of a lesion is not relevant.

Chaos of pattern requires that there be more than one pattern (a pattern covering a significant area of the lesion, arbitrarily defined as at least 20%) with the patterns being combined asymmetrically.

If either of the highly specific defined clues: peripheral black clods/dots, lines radial segmental/pseudopods, is present asymmetrically in a lesion, that suffices to produce chaos even if the structure does not cover sufficient area to produce a pattern.

Chaos of colour requires that there be more than one colour (light and dark brown being regarded as different colours if the transition between them is abrupt), with those colours being combined asymmetrically. There is no lower limit on the area required to be covered by a colour to create asymmetry if that variation is obvious and abruptly demarcated.

Chaos of border abruptness is defined as definite and asymmetric variability in the abruptness of demarcation of the border of a lesion*.

While border abruptness is also assessed in the ABCD method of dermatoscopy, this is given most significance in that method when the total border is abrupt. The ABCD method would therefore allocate the highest score for border abruptness to an ink-spot lentigo (figure 8) or solar lentigo and a lower score for a lesion which has abruptness of only a portion of the border (figure 9). In fact abruptness of the total border is a feature of benignancy while chaos of border abruptness is more likely in a malignant lesion. [11]

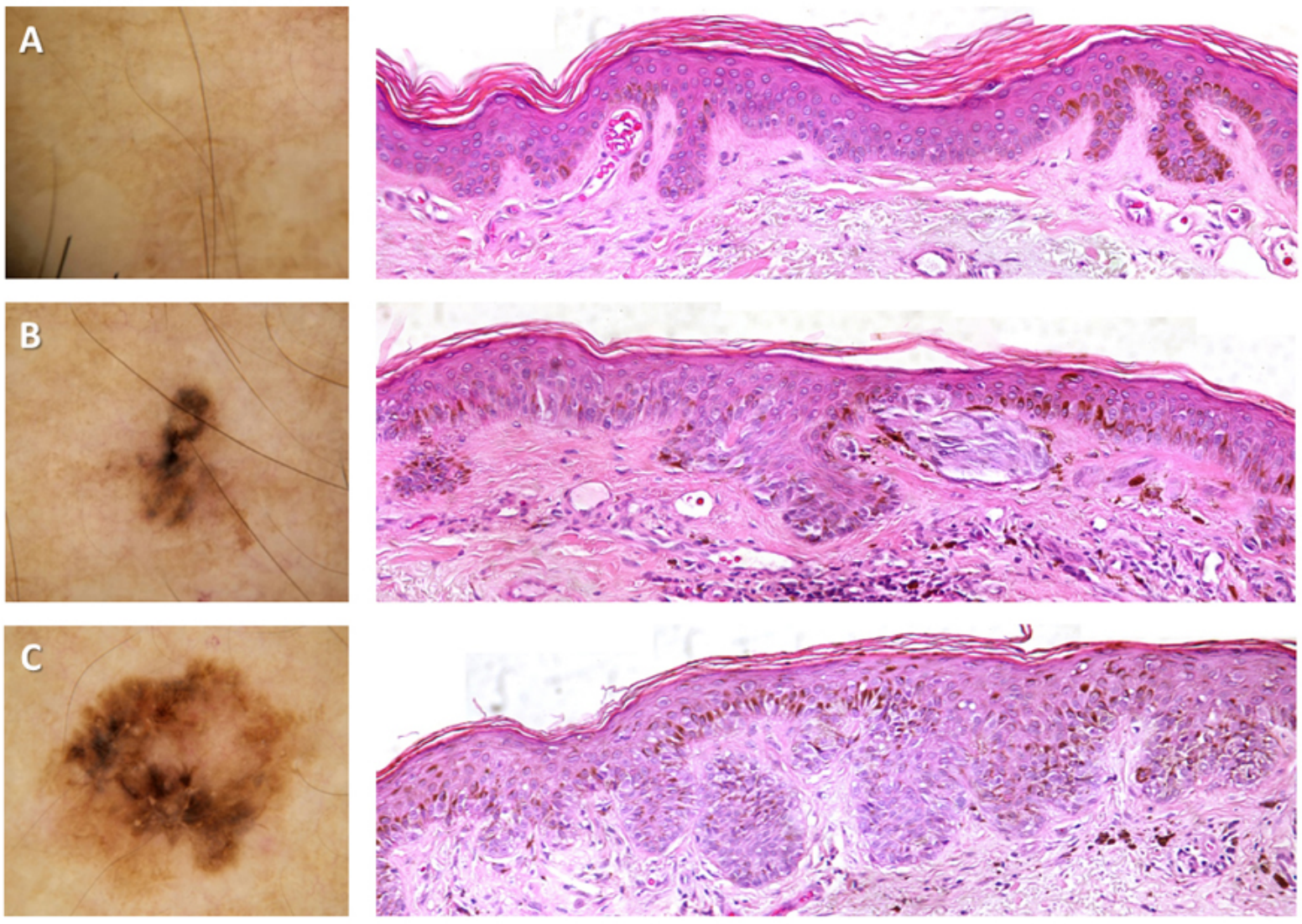

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Figure 6: Dermatoscopic chaos can be seen to increase along with histological disorganisation moving from peri-lesional skin (a) to melanoma in situ (b) to invasive melanoma (c), all being encountered on the same patient on the same day.

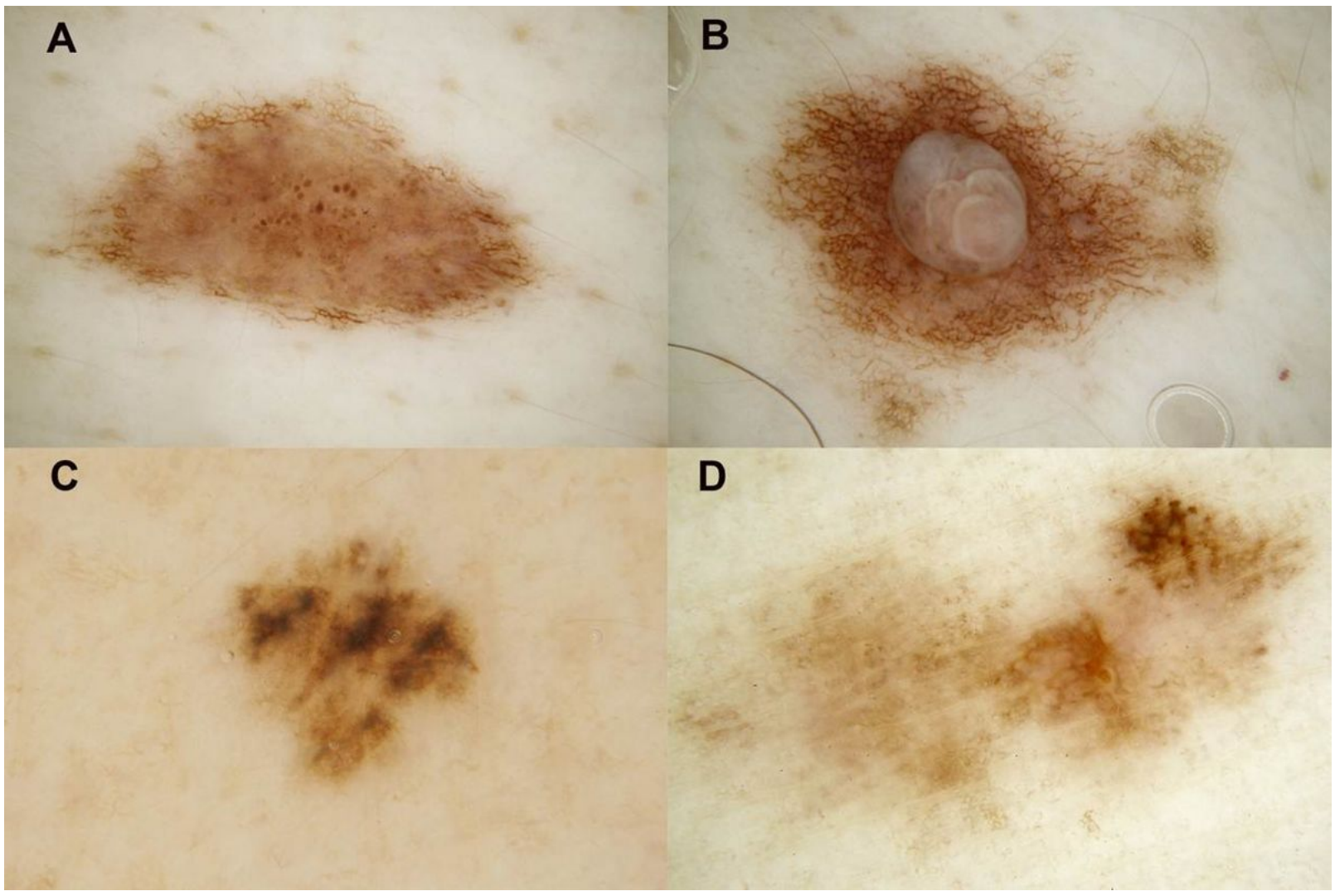

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Figure 7: This composite of four lesions from the same patient shows only one (lower right) with dermatoscopic chaos. It was excised and confirmed as a melanoma in situ. The other three lesions have been confirmed as benign by stability over time. Their morphology is consistent with the diagnosis of compound congenital-type nevus. A: Central clod pattern surrounded by a structureless pattern with a pattern of lines at the periphery – concentric symmetry; B: Central skin-coloured clods and peripheral pattern of lines – concentric symmetry; C: Structureless pattern with central grey and brown above and below – symmetry. Shape is irrelevant and none of the lesions A-C has a pattern consistent with the chaotic behaviour of malignant tissue; D: unequivocal asymmetry of both pattern and colour consistent with the chaotic behaviour of malignant tissue. It is also the only one with chaos of border abruptness.

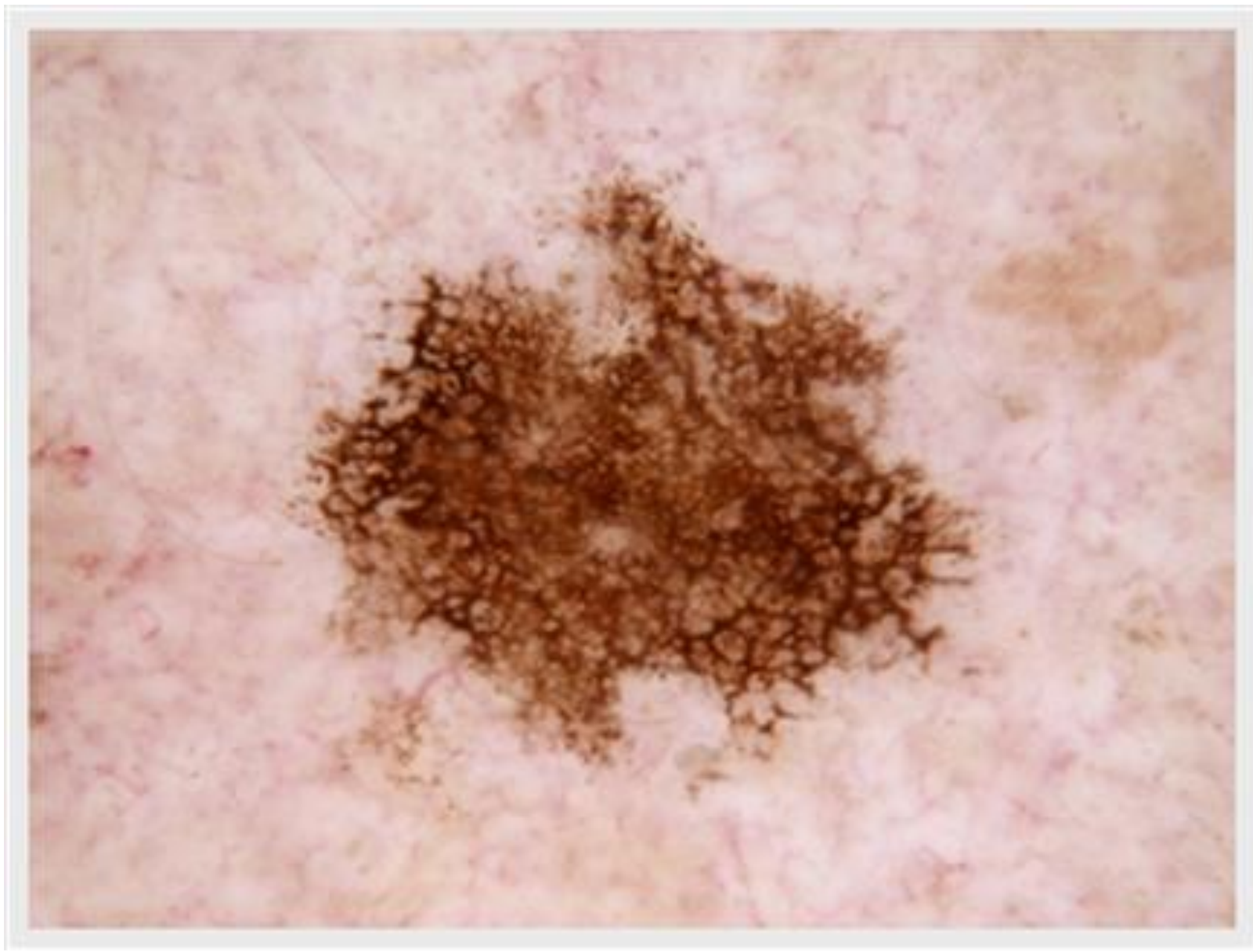

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Figure 8:An ink-spot lentigo has an abrupt border over the total periphery which would give it a high score in the ABCD method of dermatoscopy. However the lack of chaos of border abruptness is a feature of benignancy according to revised pattern analysis which is consistent with the diagnosis of ink-spot lentigo.

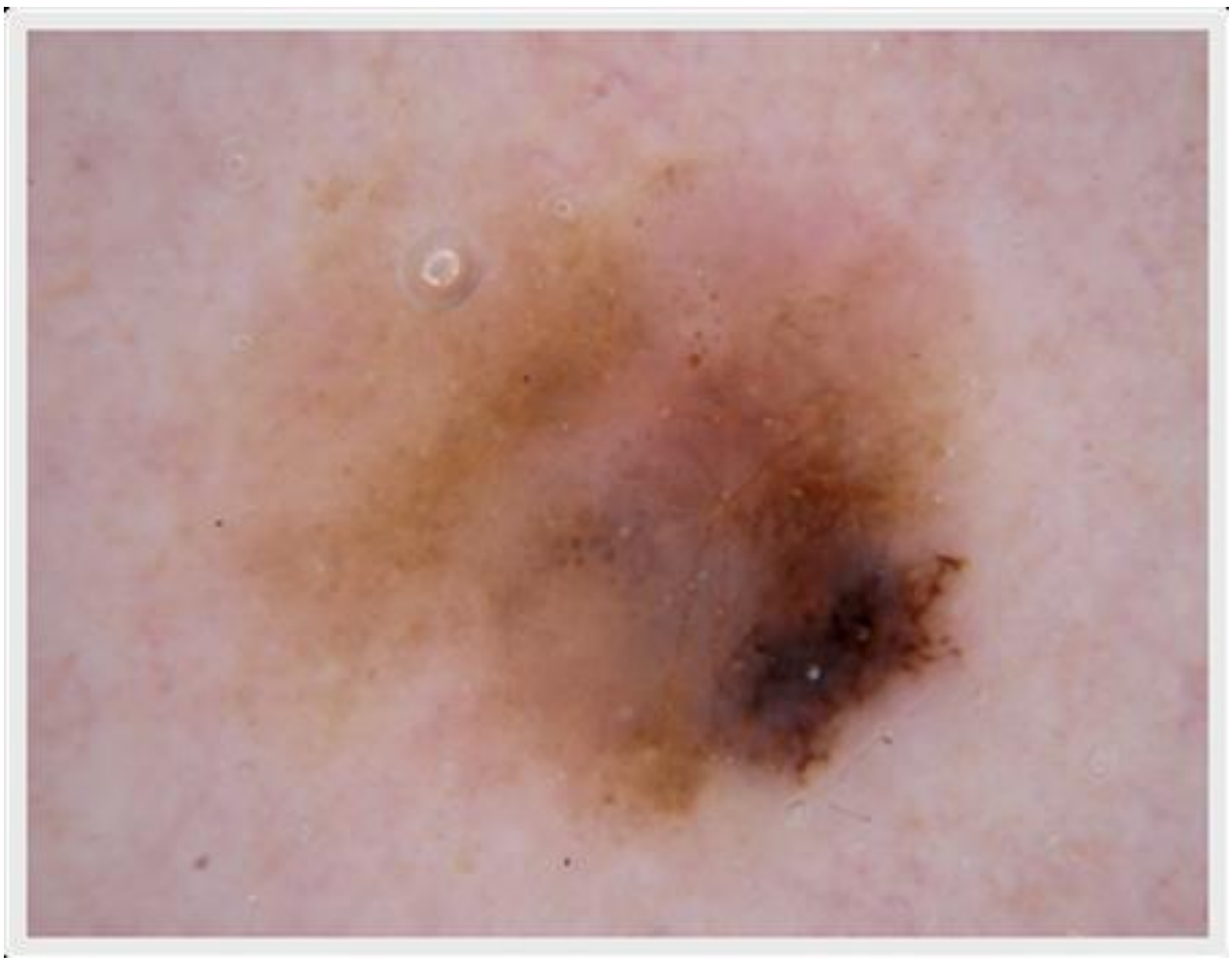

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Figure 9:As well as having chaos of pattern and colour this invasive melanoma has chaos of border abruptness with an abrupt border at the lower right extremity and a gradual border elsewhere.

Clues

Grey or blue structures (including grey or blue structureless).

This clue, in a chaotic lesion, applies to both melanocytic and non-melanocytic malignancies. Grey colour correlates with melanin in the superficial dermis and this can be in melanocytes, keratinocytes or as melanin incontinence in melanophages, which is frequently the result of an immune attack even on lesions that remain confined to the epidermis. Grey colour is the most sensitive clue to malignancy and is seen in most in situ melanomas (see figure 10) and many pigmented basal cell carcinoma (pBCC) and pigmented squamous cell carcinoma (pSCC). In a study on flat pigmented facial lesions the presence of grey colour was found to have a sensitivity and specificity for the diagnosis of melanoma of 95.8% and 30.6% respectively [12].

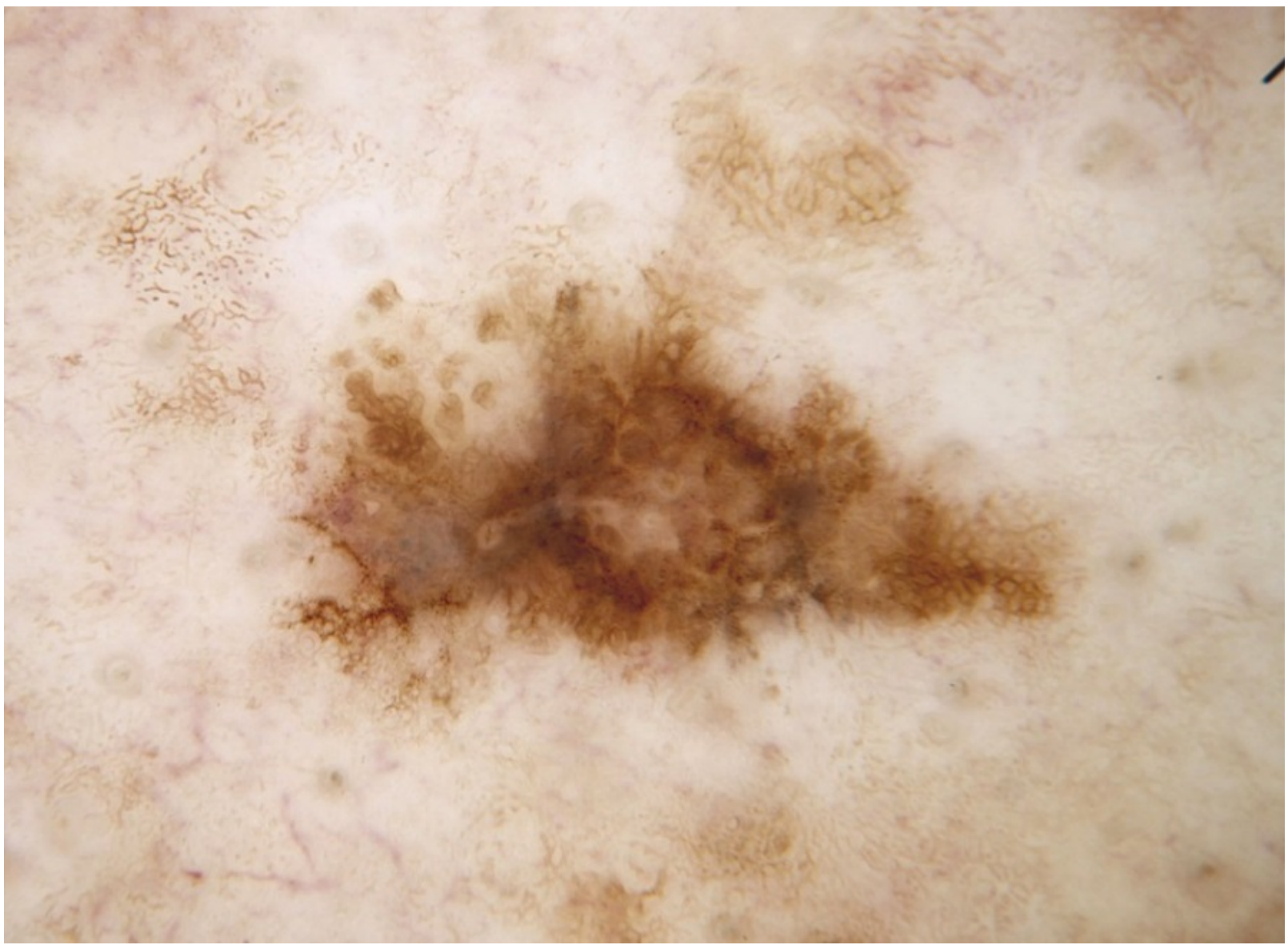

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Figure 10: Grey colour in this in situ melanoma is seen as contrasting with the background colour of brown – a colour invariably present in a pigmented (melanotic) melanocytic lesion.

Blue colour correlates with pigment in the deep dermis, most commonly in nested melanocytes or nests of BCC (see figure 11).

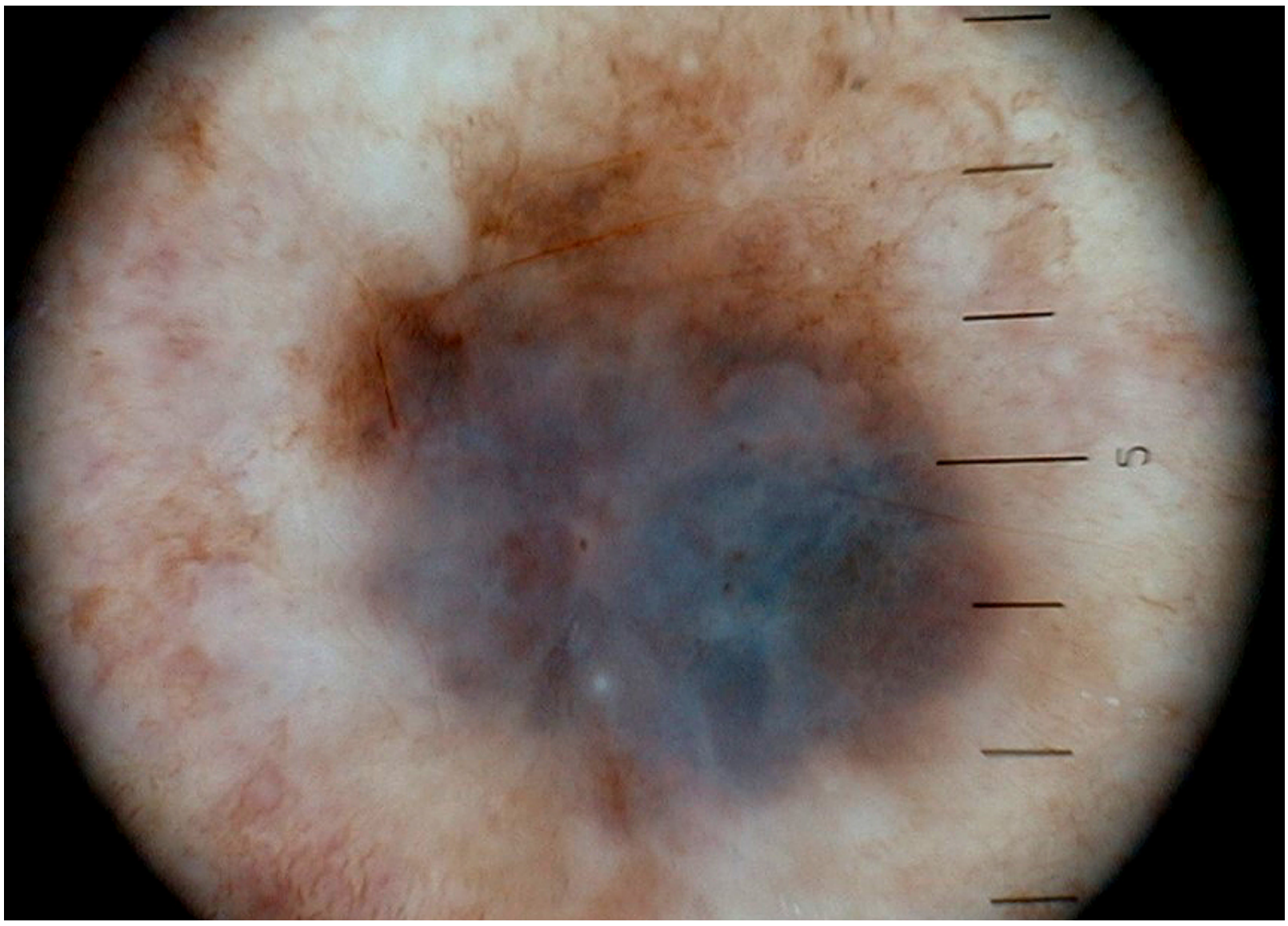

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Figure 11: Blue colour in this invasive melanoma again contrasts with brown colour.

Eccentric structureless area

An Eccentric structureless area must cover a sufficient portion of the lesion for it to form a pattern, it must be eccentrically located, it much be contrasted to a structured pattern, or alternatively to an area of distinctly different colour which is also within the lesion and it must be a colour other than skin-coloured. If coloured with the colours of melanin it may have been produced by the chaotic behaviour of malignant melanocytes, if pink it is may be caused by increased blood flow from the high metabolic demand of tumour tissue and if white it may correlate with fibrosis after regression. This clue applies to both melanocytic and non-melanocytic malignancies (see figure 12).

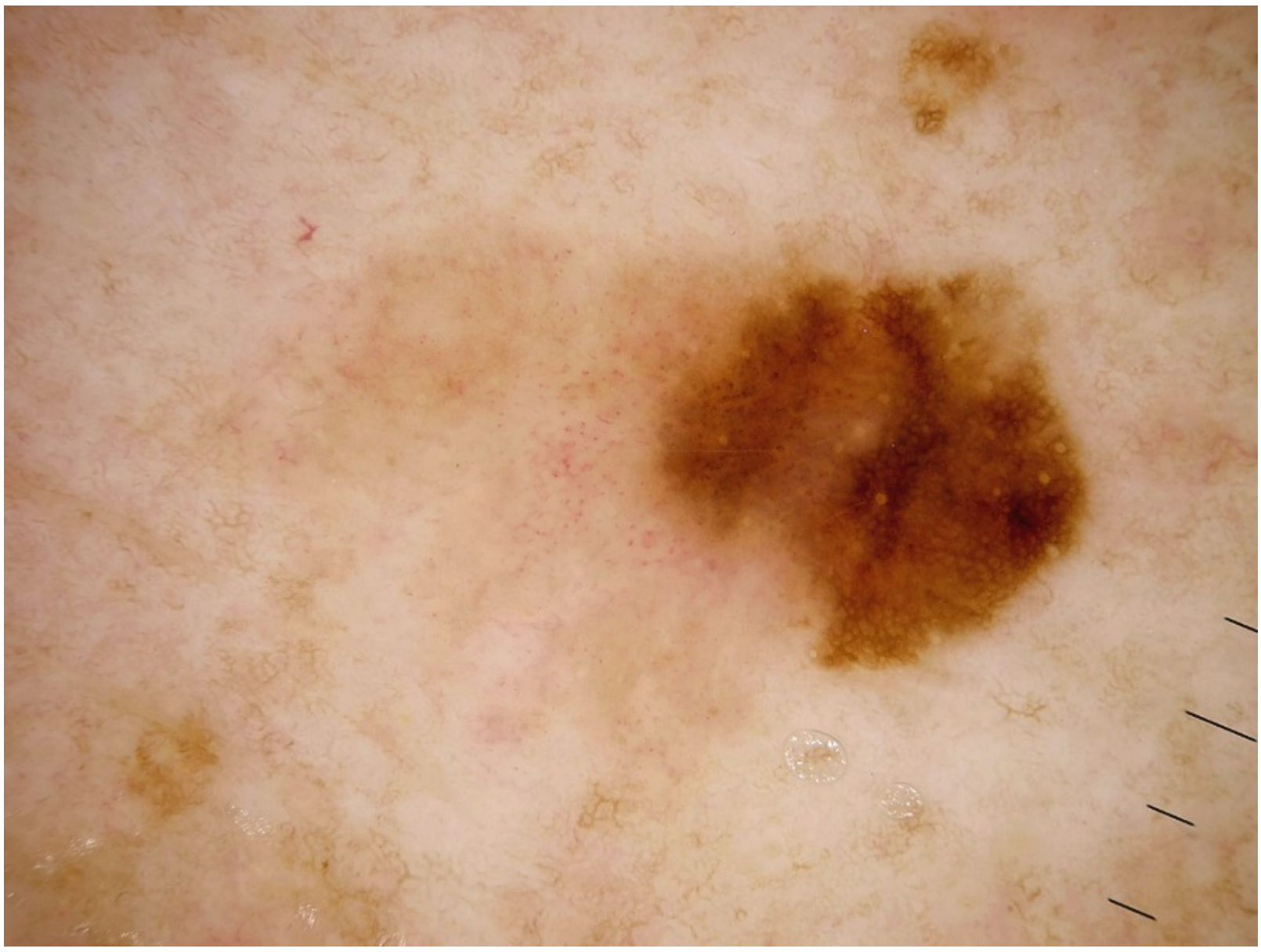

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Figure 12: An eccentric structureless (light brown) area extends to the left of a structured (lines reticular) area in this in situ melanoma.

Thick lines reticular

Thick lines reticular are defined when the lines are at least as thick as the holes that they surround and in melanocytic lesions they may correlate with rete ridges which are widened by pigment laden malignant melanocytes. They are a clue to malignancy in a chaotic lesion and will be focal rather than evenly widespread over the lesion (see figure 13). This clue is specific to melanoma as the presence of reticular lines effectively rules out the diagnosis of basal cell carcinoma or squamous cell carcinoma. Thick reticular lines frequently occur in seborrhoeic keratoses due to acanthotic rete ridges (due to a proliferation of pigmented keratinocytes) but they will be widespread and other clues to seborrhoeic keratosis are expected to be present.

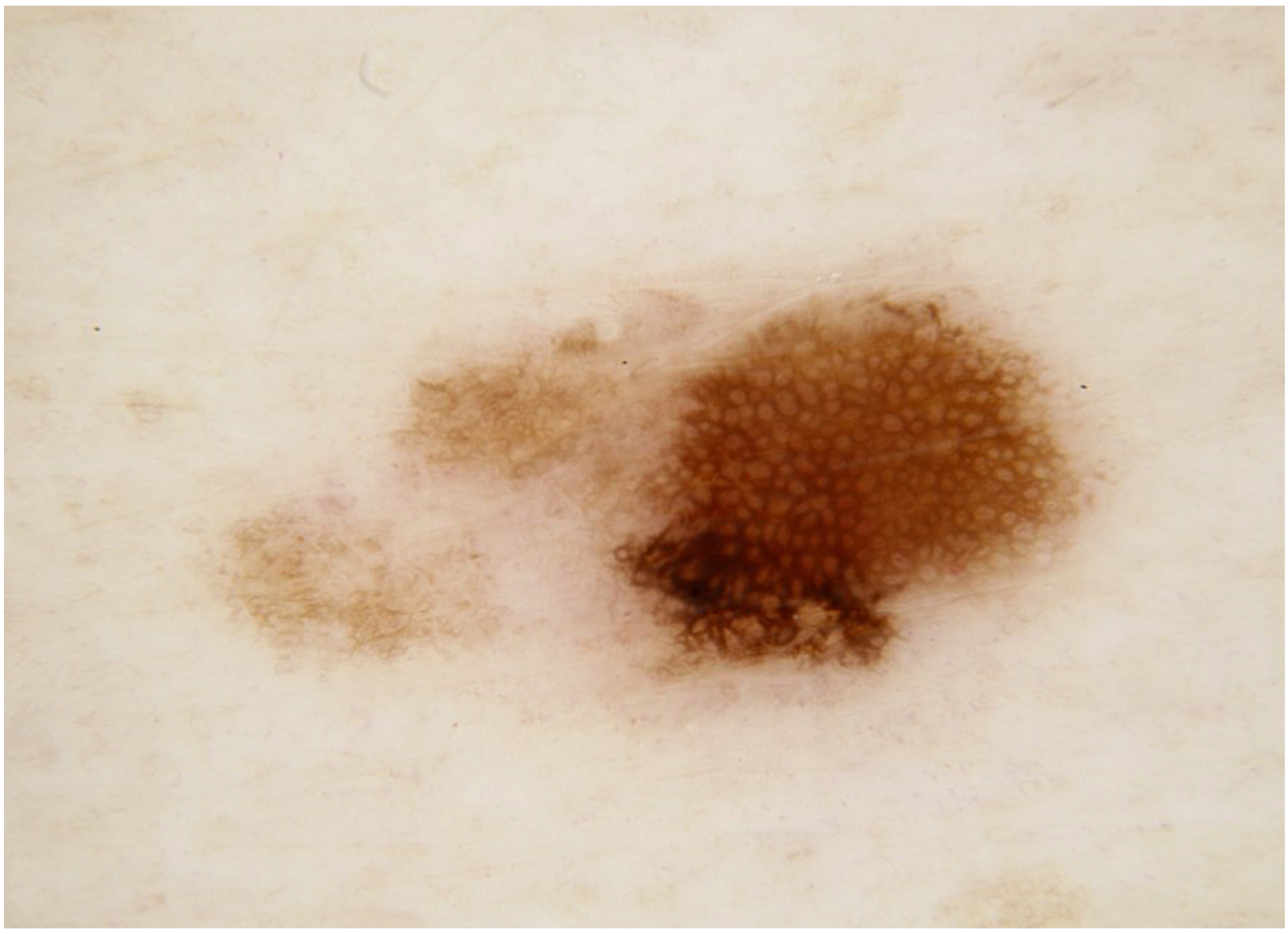

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Figure 13: This in situ melanoma has more than one pattern with lines reticular on the right and an eccentric structureless area on the left. Inferiorly the reticular lines are focally thicker than the holes they surround. The fact that this clue to malignancy is unequivocal but focal is consistent with the chaotic behaviour of malignant tissue.

Black dots and clods, peripheral

Black dots and clods, peripheral, correlate with pigmented pagetoid melanocytes and nests of melanocytes in melanomas and therefore this clue should be specific to melanoma. In reality, because dots are common in both pBCC and pSCC in situ, and because grey may be perceived as black, this clue can also be seen in those lesions. The reason for the designation that they be peripherally located is because black dots can be seen centrally in nevi which have been traumatised, correlating with pigment in ascending keratinocytes. Pagetoid spread can occur anywhere in a melanoma so when black dots or clods are seen peripherally they are regarded as a clue to malignancy (see figure 14).

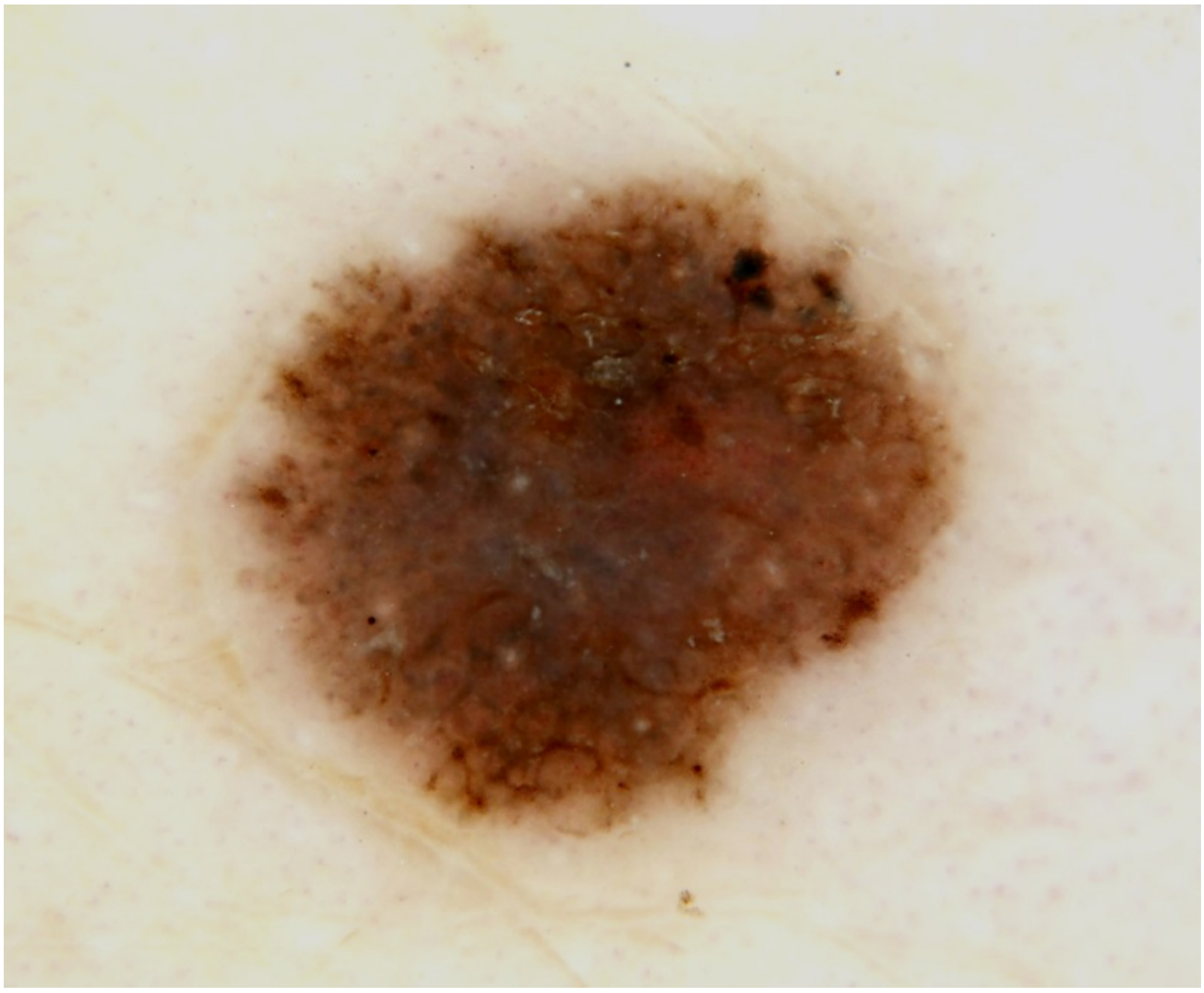

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Figure 14: In this small (4mm diameter) young melanoma in situ the feature of peripheral black clods at the upper right border of the lesion gives the lesion both chaos and a clue.

Lines radial or pseudopods, segmental

Lines radial or pseudopods, segmental, are clues to malignancy, pseudopods being specific to melanoma and lines radial segmental being found in all three pigmented malignancies. In melanocytic lesions these structures correlate with fascicles of pigmented melanocytes extending from the periphery of a lesion and they signify growth. In melanomas they should be distributed asymmetrically and should extend from reticular lines, clods or structureless areas of equivalently dense pigmentation to the radial lines or pseudopods (see Figure 15).

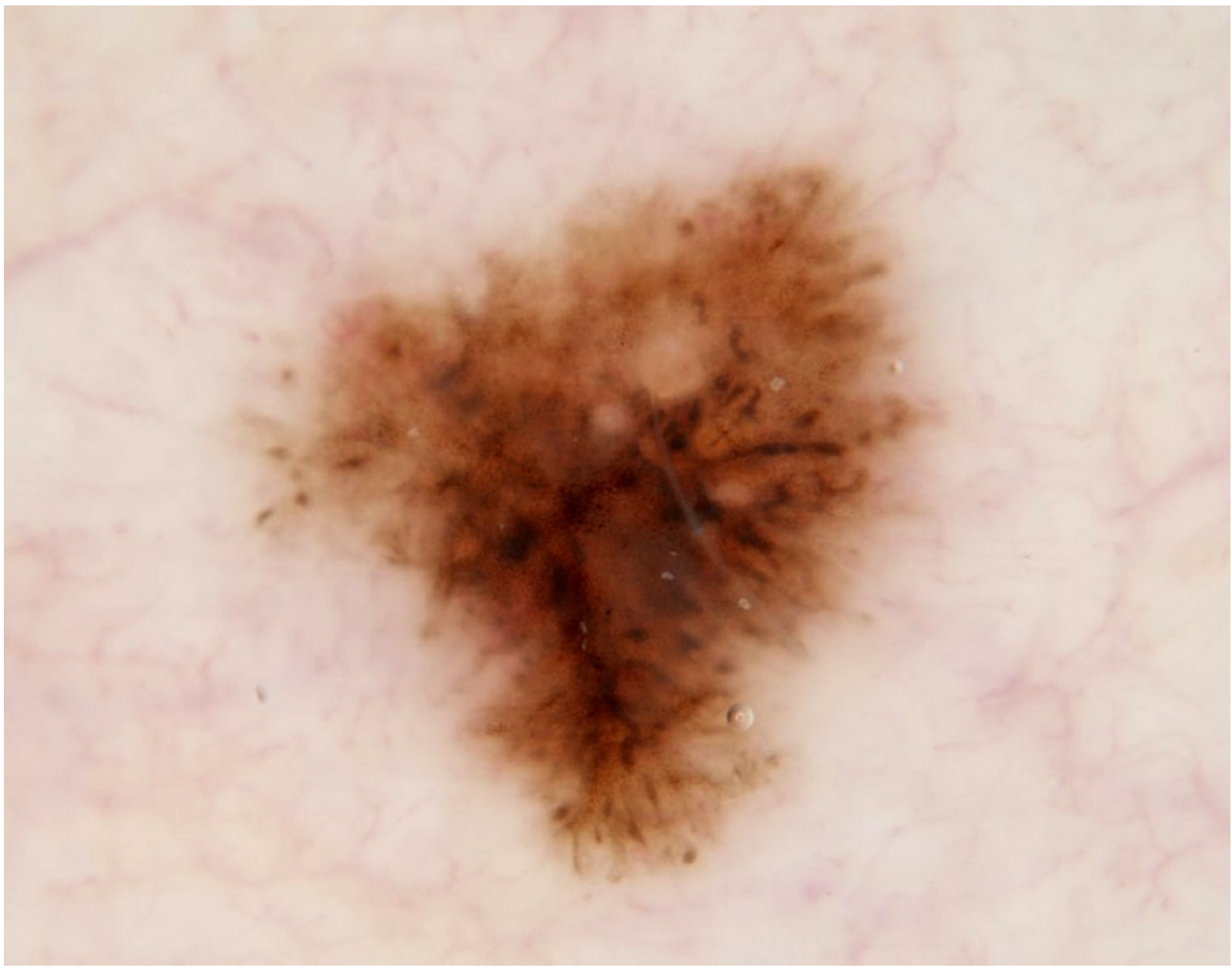

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Figure 15: Lines radial/pseudopods segmental in a melanoma in situ extend from pigmented structures as dark as or darker than the radial lines/pseudopods.

This can sometimes distinguish them from the radial lines seen in BCCs, which invariably converge and may (but not always) project from hypopigmented structureless areas (see Figure 16)

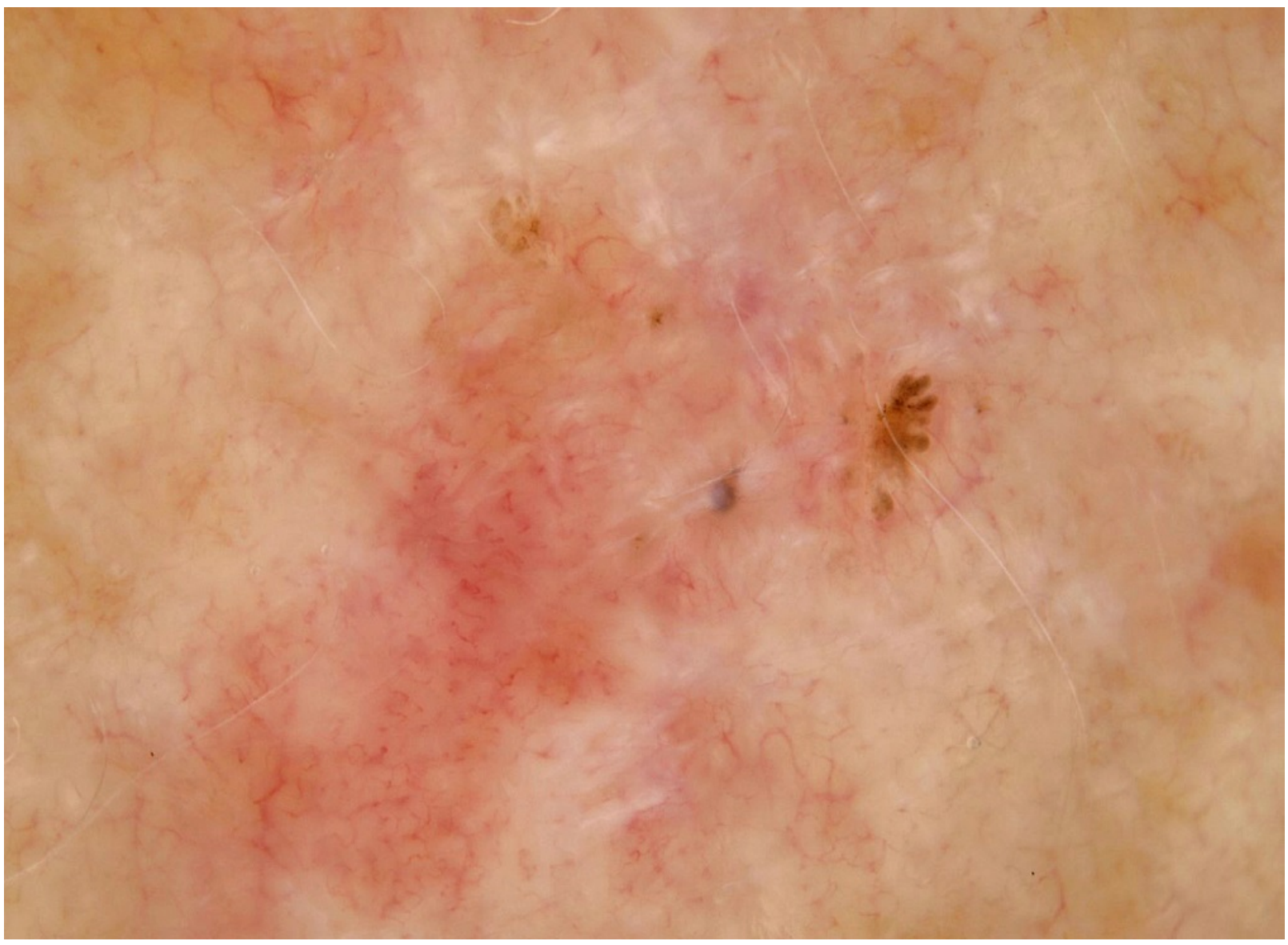

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Figure 16: In this pBCC the radial lines are of a morphology very specific to pBCC in that they converge and also extend from a non-pigmented part of the lesion.

Lines radial segmental are also seen in pSCC in situ in which they are usually created by dots in a linear arrangement (see Figure 17).

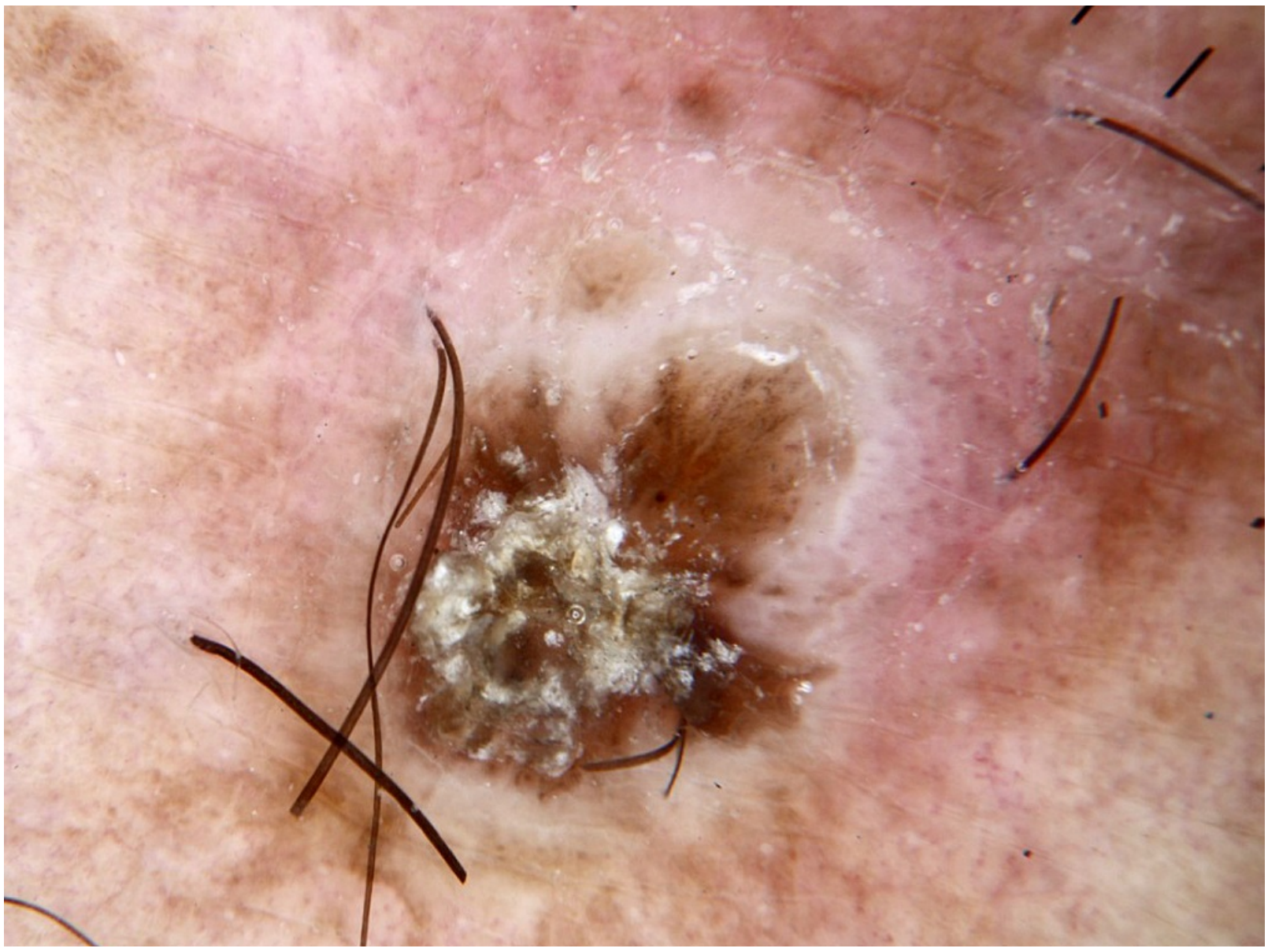

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Figure 17: Lines radial segmental are composed of dots in linear arrangement in this pSCC in situ. Surface keratin is an additional clue to the diagnosis.

White lines

White lines must be whiter than normal surrounding skin and they may be polarising-specific (polarising-specific blue lines have the same significance) or alternatively white lines that are seen with both modalities. Polarising specific white lines are straight shiny white lines orientated perpendicularly to each other but not crossing. They are only seen with polarising dermatoscopy (see figure 18) but they may sometimes correlate with reticular white lines seen with non-polarised dermatoscopy.

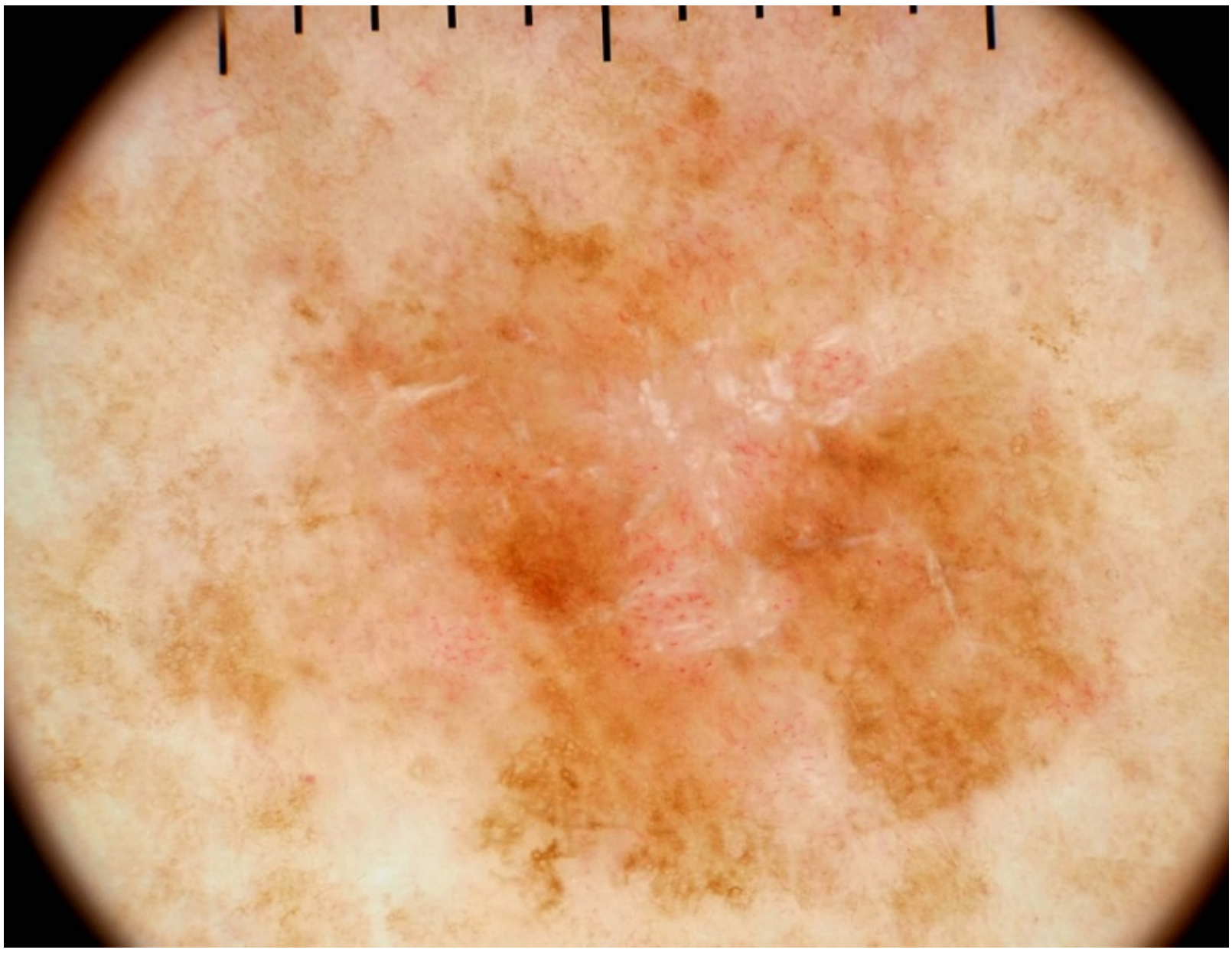

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Figure 18: Polarised dermatoscopy of this melanoma in situ displays white lines which are seen to be in a perpendicularly orientated arrangement.

Polarising-specific white lines can be seen very commonly in BCC (pigmented or non-pigmented) and they are not unusual in melanoma (pigmented or non-pigmented). They are only rarely seen in pSCC in situ. They are also commonly seen in both dermatofibroma (DF) (see figure 19) and Spitz nevi but their presence is not expected in any other type of nevus (unless traumatised) or in seborrhoeic keratosis.

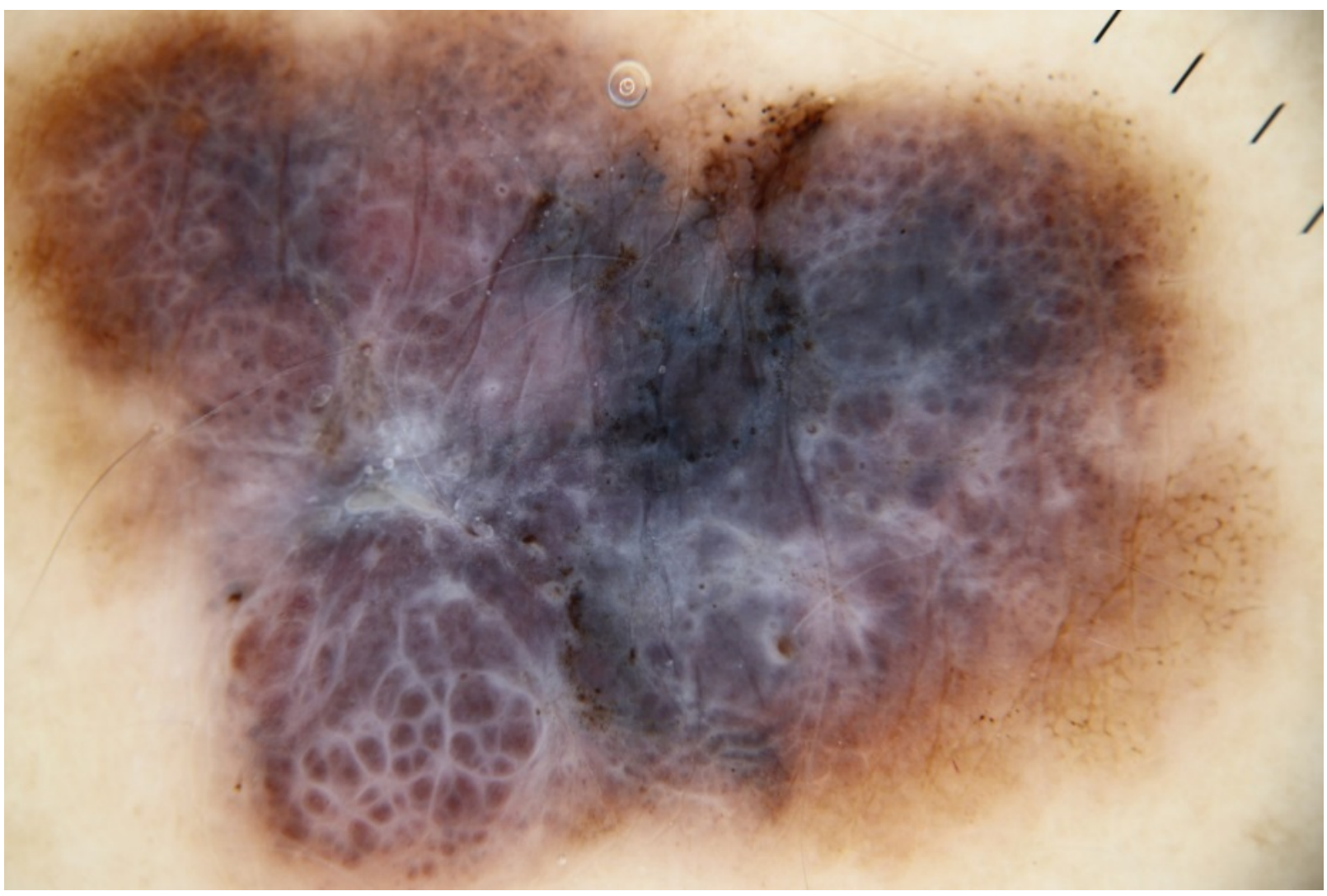

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Figure 19: Non-polarised dermatoscopy of an invasive melanoma demonstrated white lines in a reticular arrangement.

Lines parallel on the ridges (acral) or lines parallel chaotic on the nails

Lines parallel on the ridges (acral) or lines parallel chaotic on the nails are a clue to melanoma specifically on acral skin (figure 20), or in nail matrix (figure 21) respectively. This is the only one of the listed clues to malignancy which is specific to a particular anatomical site. It is important to remember that the longer an acral or nail-matrix melanoma remains untreated; the more likely it is to develop any of the other clues to melanoma.

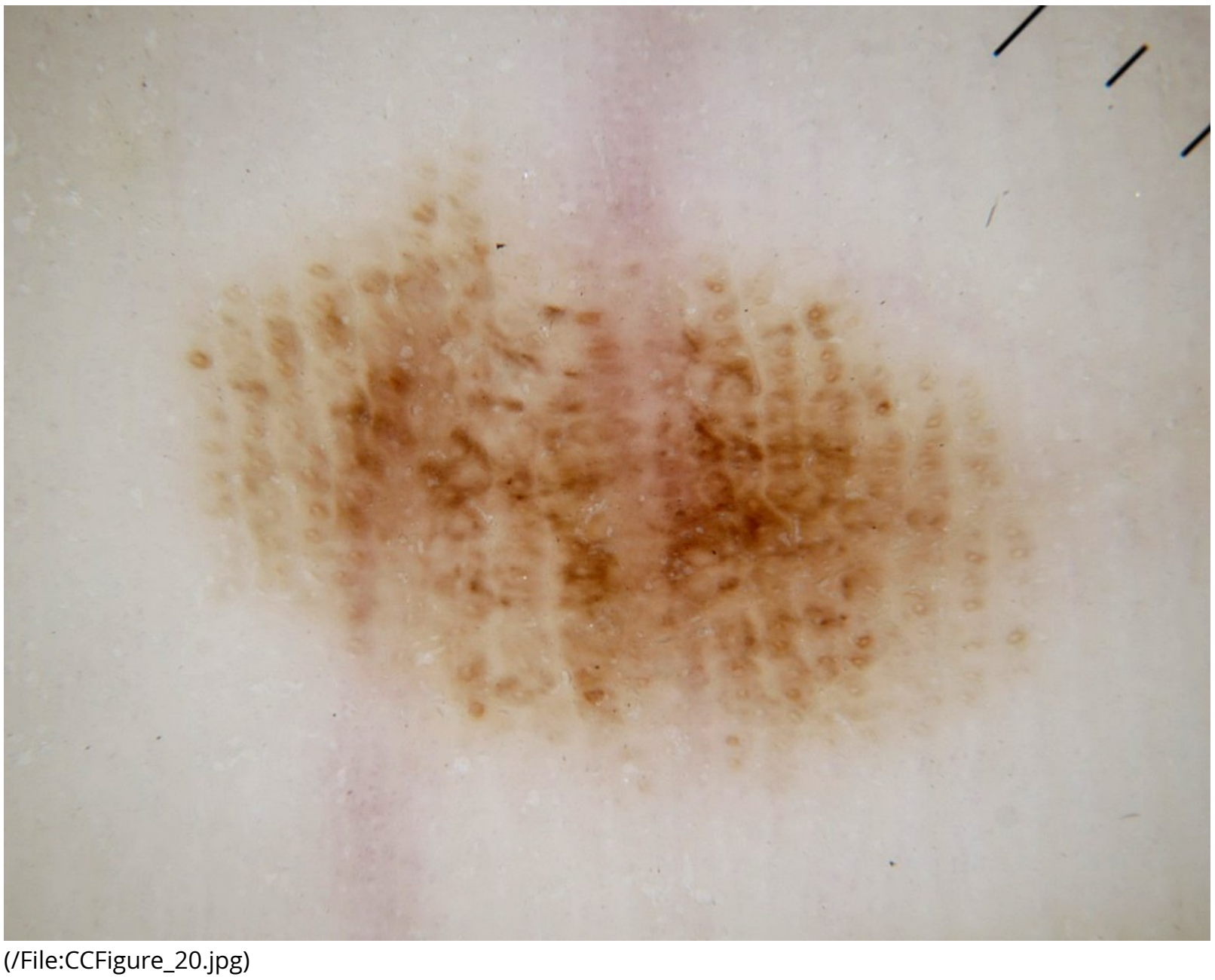

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Figure 20: This pigmented skin lesion on the sole of a 55 year-old lady’s foot has a pattern of lines parallel. Although pigment is present on both dermatoglyphic ridges and furrows, the pattern of lines, best assessed at the edges of the lesion, is a parallel ridge pattern. Pigmented circles marking the centre of the ridges correlate with pigmented malignant melanocytes in the eccrine ducts; melanoma in situ. This acral melanoma is arguably symmetrical but would qualify for excision as an “exception” (see "Exceptions" below)

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Figure 21: Lines parallel chaotic (varying in width, interval and colour) in a nail matrix melanoma.

Melanoma may also arise in an acral naevus in which case any of the other 8 clues will override a benign parallel furrow pattern which may be present (see figure 22).

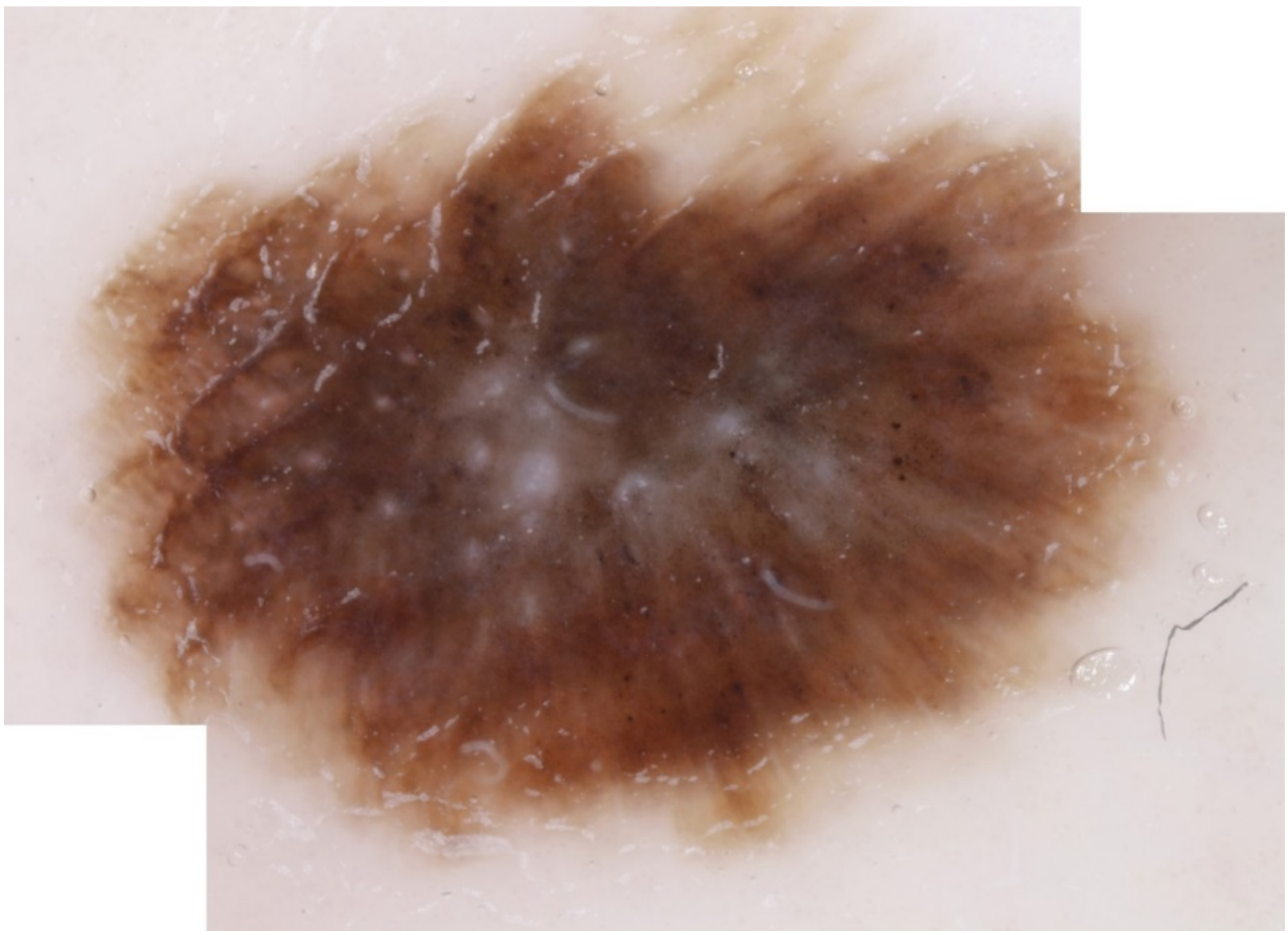

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Figure 22: In this image the clue of radial lines segmental (right and inferior portions) overrides the clue of lines parallel in a furrow pattern (upper left). This is a melanoma arising in an acral naevus. Note that in the benign furrow pattern there is pigment over the ridges but the lines (as assessed at the edges) lie in the furrows (image courtesy Agata Bulinska).

Polymorphous vessels

Polymorphous vessels are a clue to both melanoma and pBCC but not to pSCC in situ. Pigmented BCC often has a monomorphous pattern of serpentine or serpentine branched vessels but it may have a pattern of polymorphous linear vessels (see figure 23), especially on the lower limb.

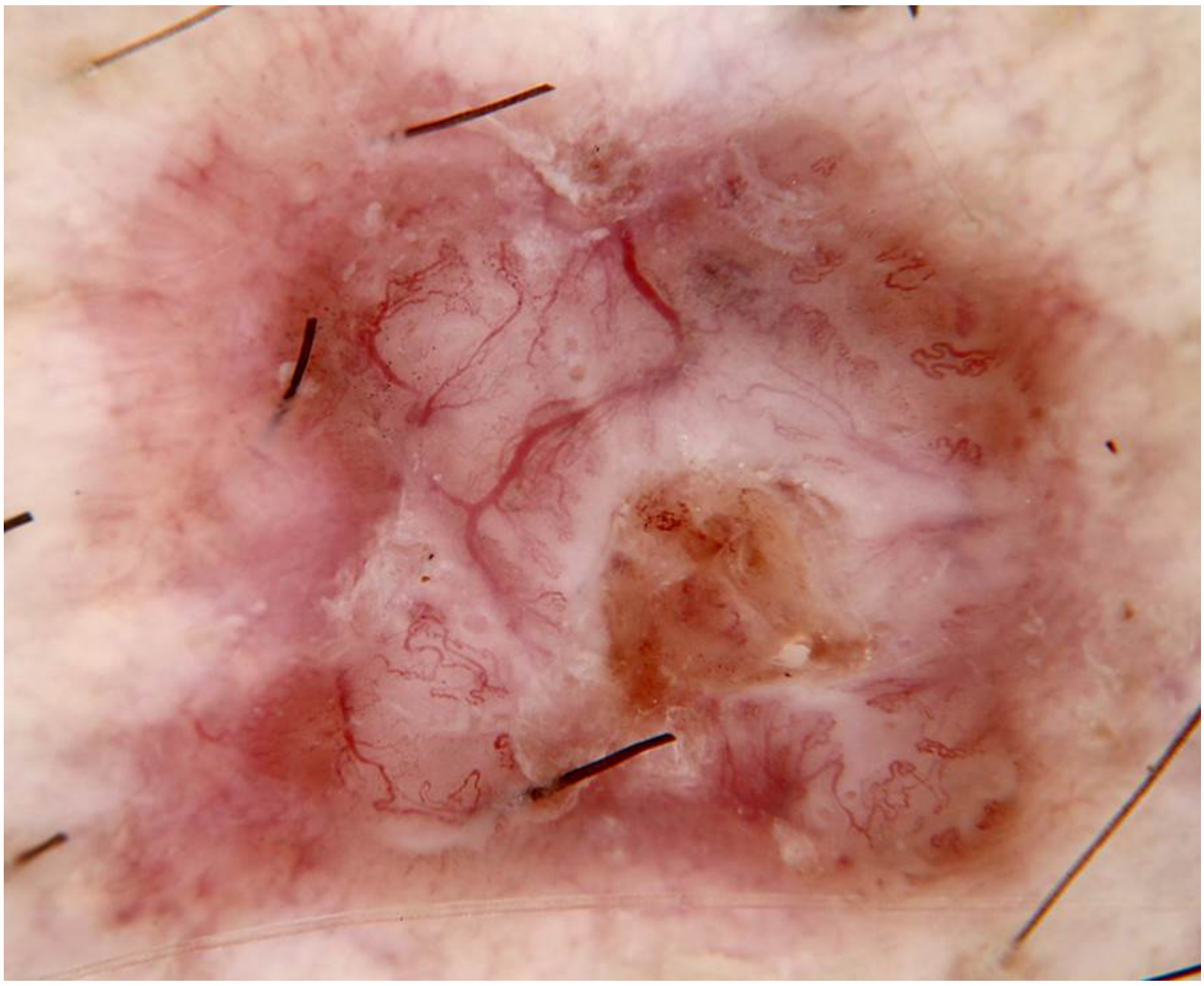

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Figure 23: This basal cell carcinoma displays linear polymorphic vessels, branched serpentine (centrally) and looped (peripherally- upper right)

A pattern of dot vessels is not expected in pBCC but ulceration, commonly present in BCC, and associated keratinisation may produce polymorphous vessels including looped vessels in radial arrangement and even dot vessels (see figure 24).

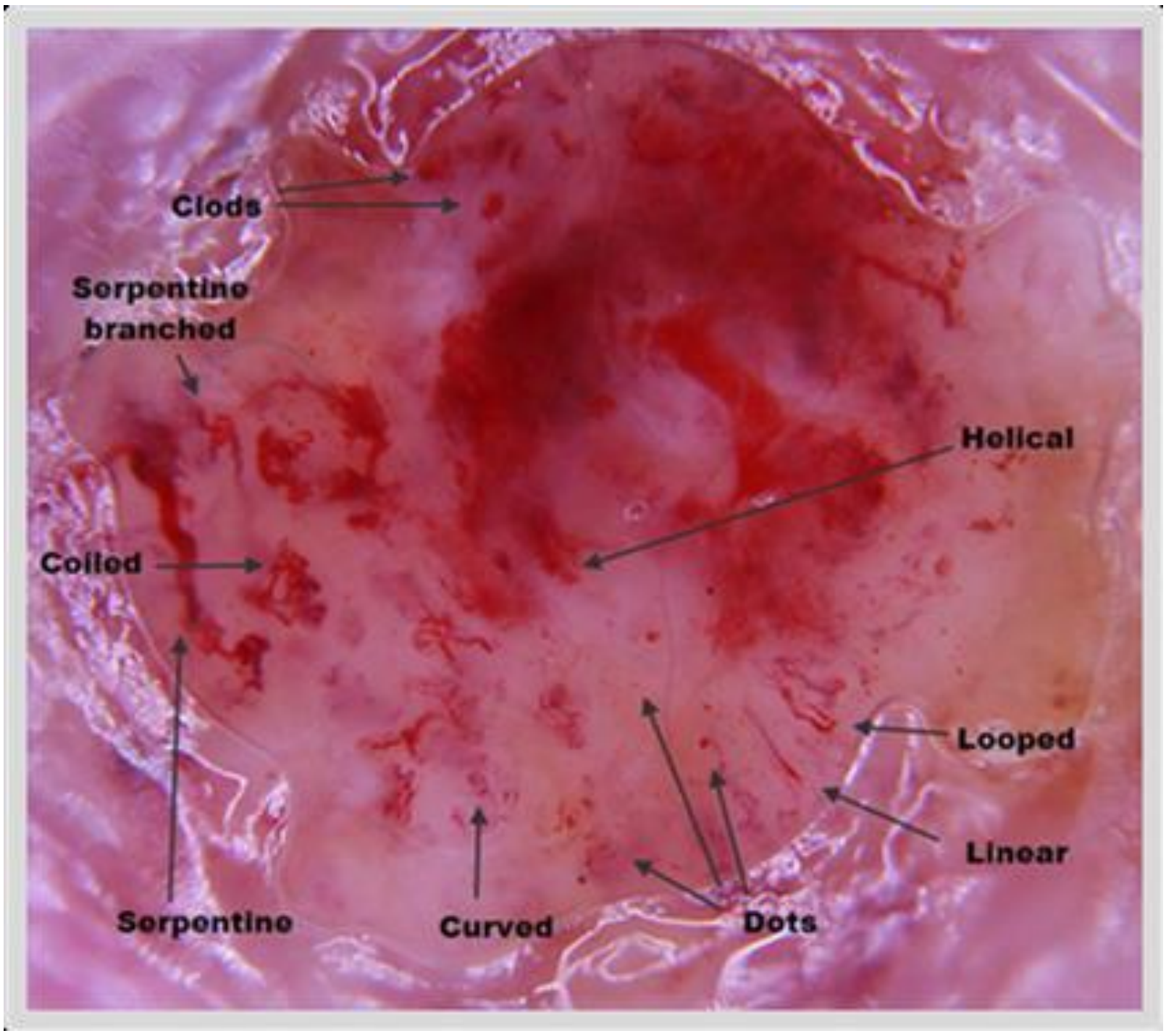

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Figure 24: Ulceration over the total surface of this basal cell carcinoma has resulted in a polymorphous pattern of vessels including every vessel type

In melanomas, polymorphous vessels may include various types of linear vessels in raised portions, and a pattern of dot vessel as well as any pattern of linear vessel in macular portions. Generally other clues apart from polymorphous vessels (pigment clues and/or white lines) are expected in a melanoma and the vessel clues are then useful in differentiating melanoma from pBCC and pSCC in situ (see figure 25). Dot vessels correlate with vessels ascending in dermal papillae and are not therefore expected in the raised portion of a melanoma in which the regular morphology of dermal papillae is not expected.

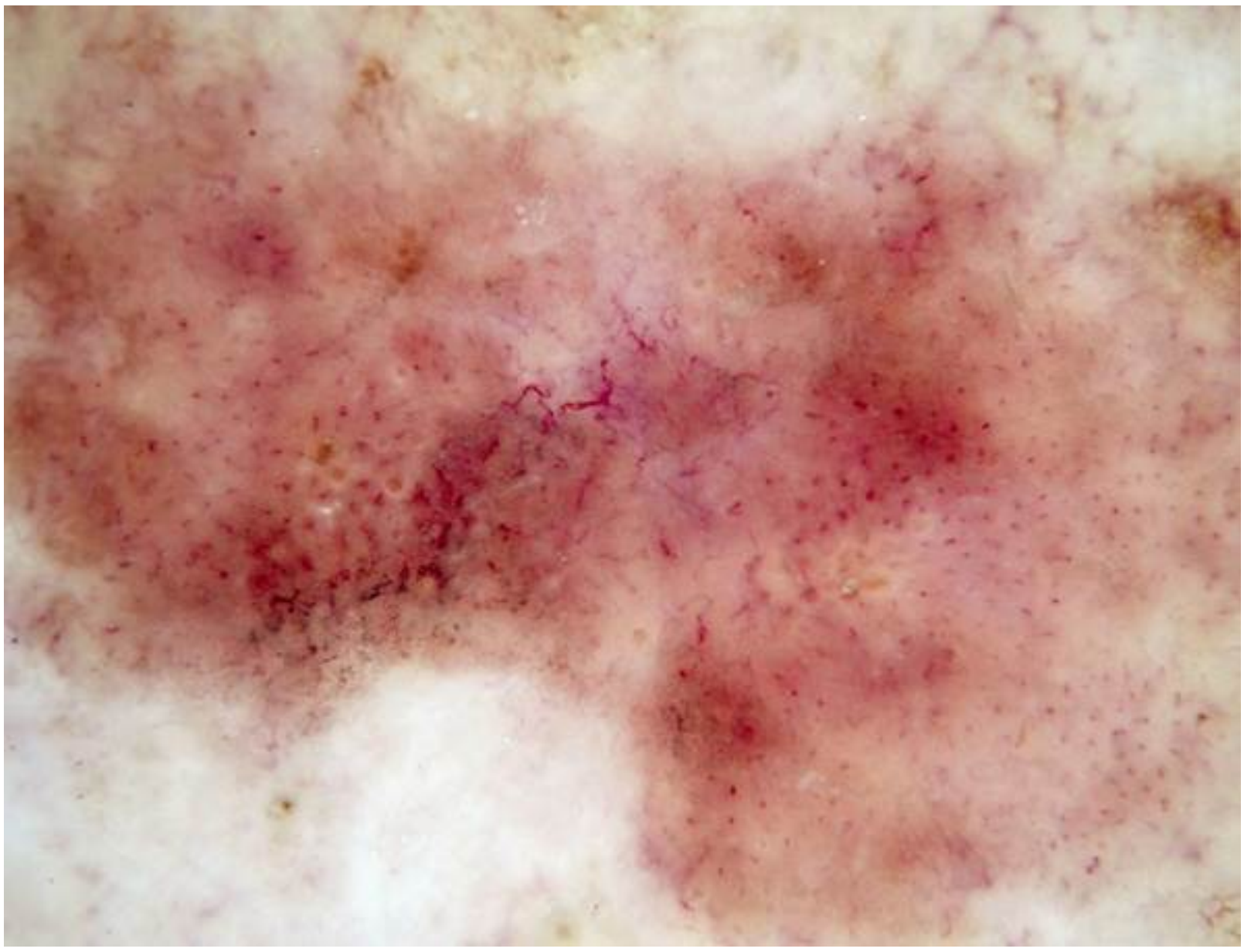

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Figure 25: Chaos and the clue of grey colour point to malignancy. A pattern of serpentine vessels centrally combined with a vast pattern of dot vessels is consistent only with melanoma; Melanoma invasive.

Pigmented SCC in situ is expected to have a monomorphous pattern of coiled vessels which may resolve as dots depending on visual acuity and magnification (see figure 26).

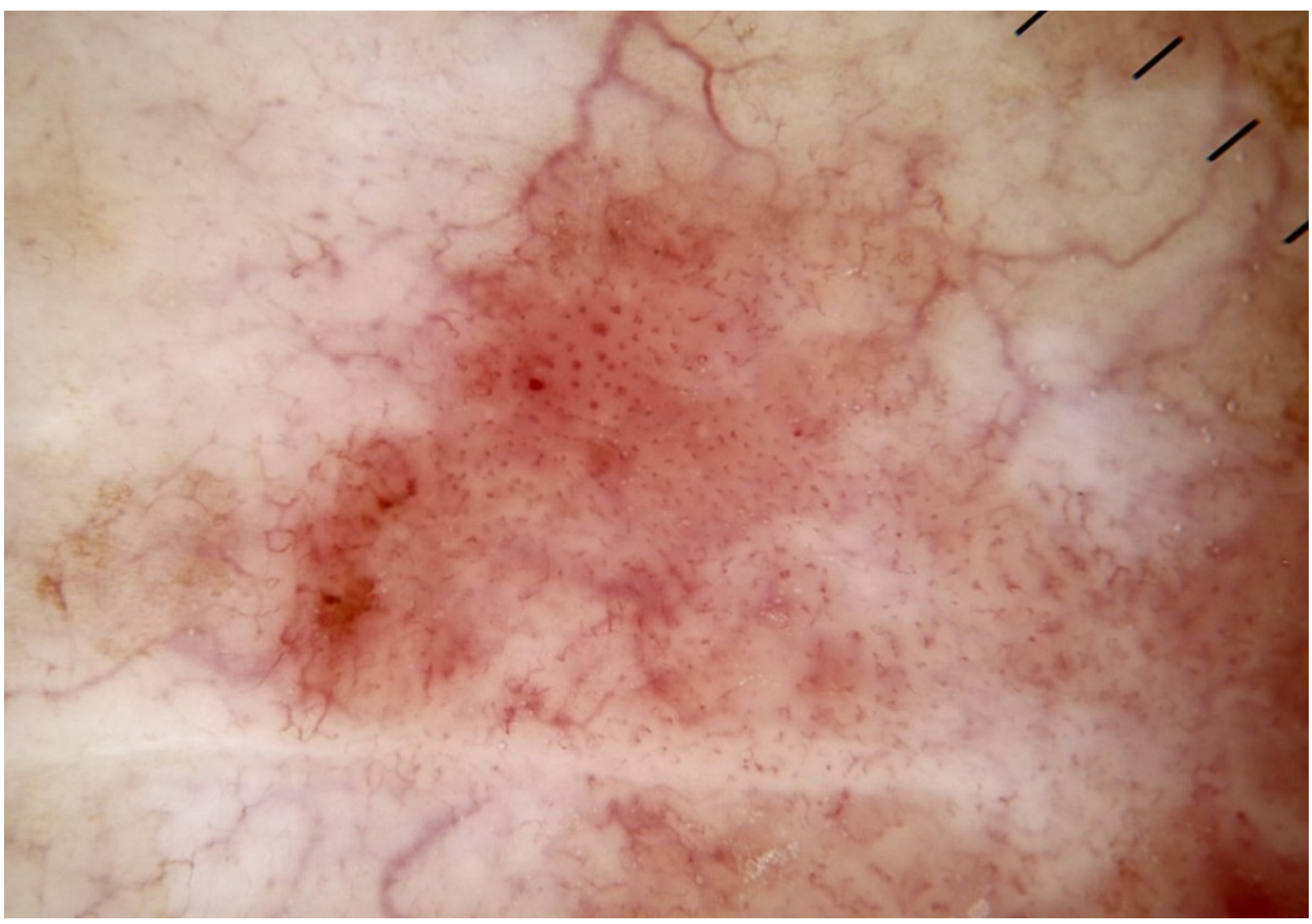

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Figure 26: A lightly pigmented SCC in situ displays a monomorphic pattern of coiled vessels, which on the right hand side of the lesion resolve as dots. A few linear serpentine vessels dermal plexus vessels seen at the edge of the lesion do not make this a polymorphous pattern.

Angulated lines

Angulated lines are straight lines, not reticular or branched, meeting at angles 90* or more, but not crossing. These lines may join to enclose a polygon. Straight pigment interfaces have the same significance as straight lines. This clue, in a chaotic lesion, is a valuable clue to melanoma (see figure 27) but may also rarely be seen in pBCC (see figure 28).

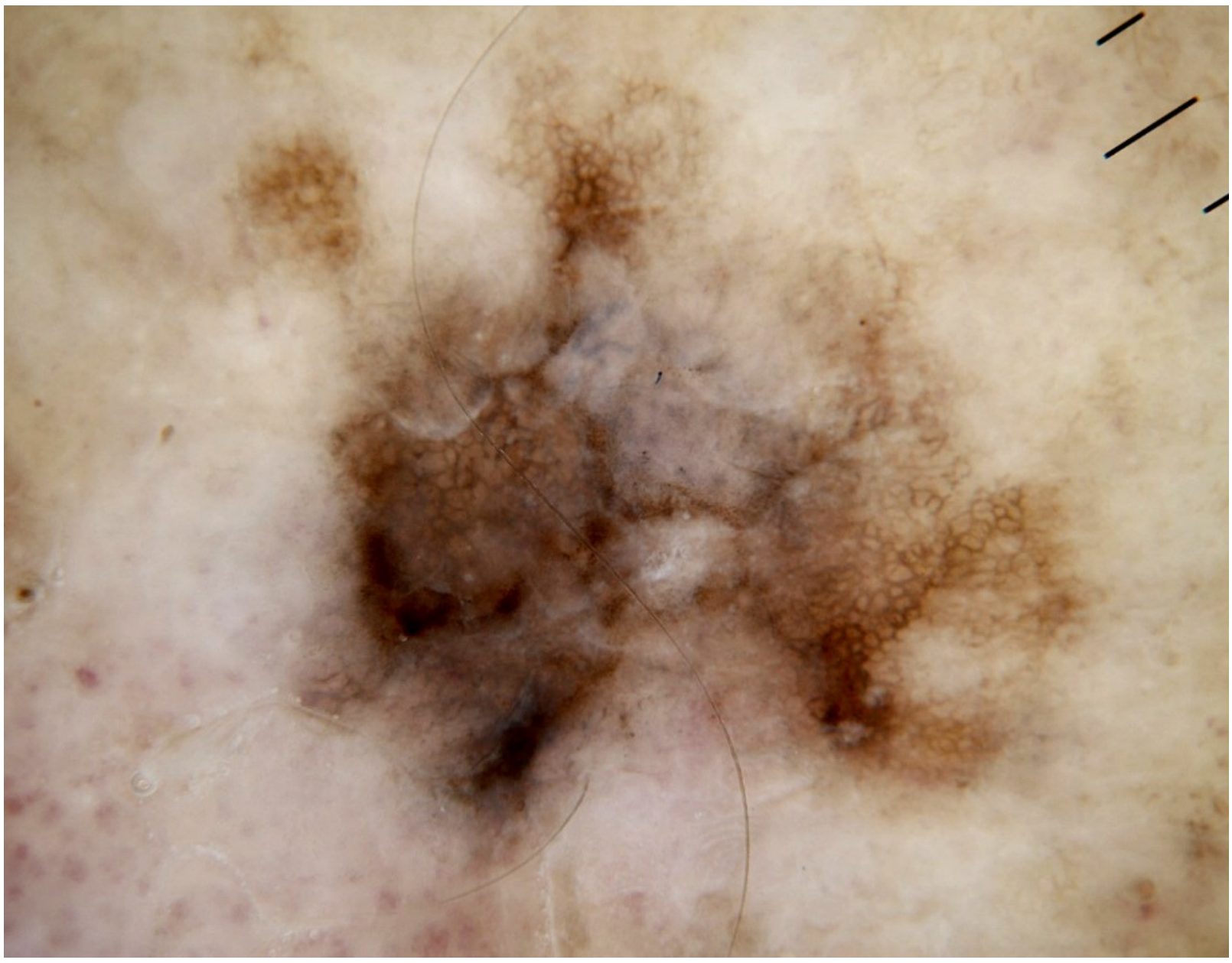

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Figure 27: Angulated lines form both complete and incomplete polygons in this melanoma in situ.

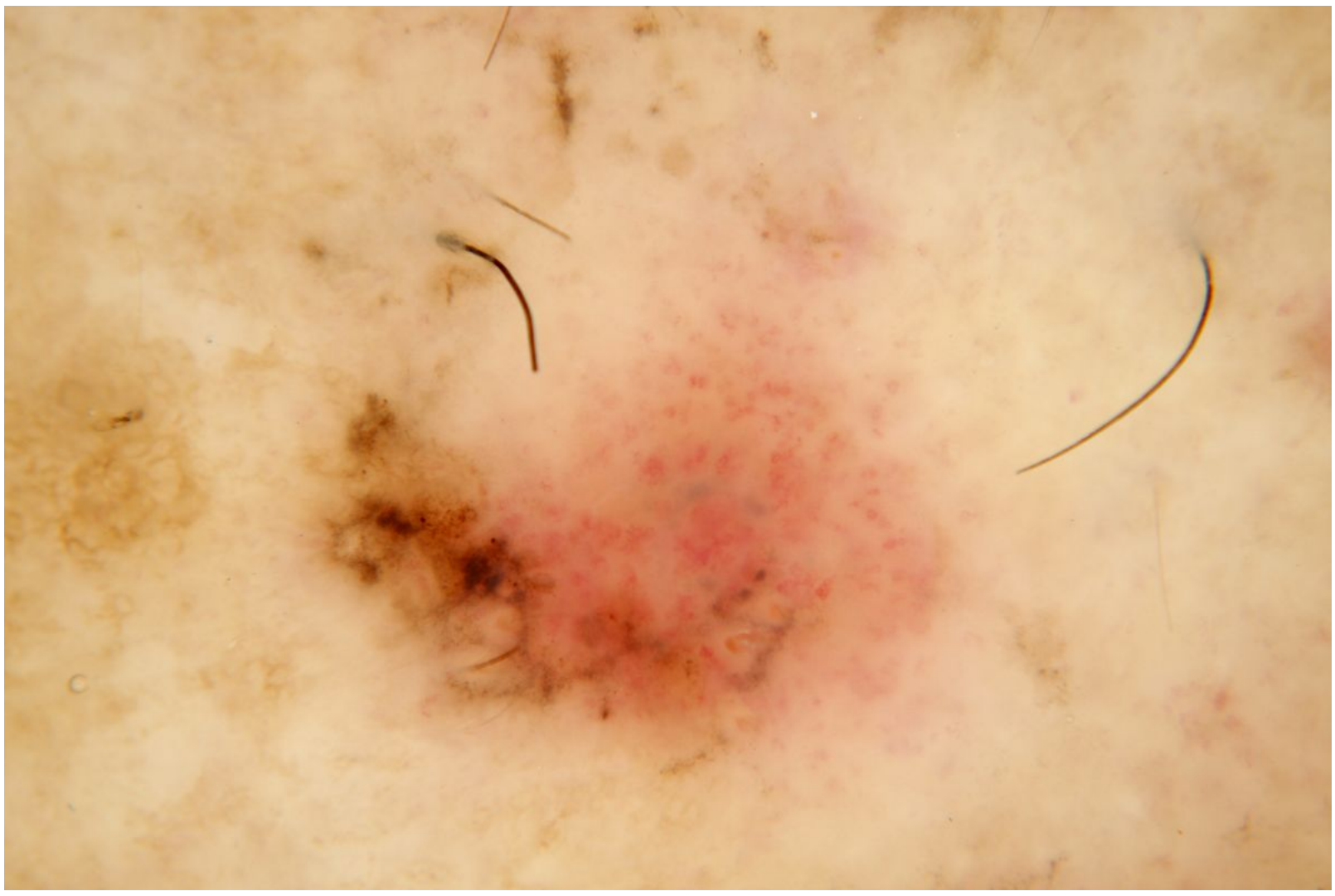

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Figure 28: Angulated lines in a pigmented BCC.

Exceptions

Chaos and clues was tested on a consecutive series of pigmented lesions, the majority of melanomas in the series being in situ, and was found to have a diagnostic sensitivity of 90.6% (BCC 98.5%, SCC 86.5%, melanoma 79.3%) with a specificity of 62.7% for the diagnosis of malignancy, any type[2]. In an attempt to move the sensitivity closer to 100% the following exceptions are included, to consider lesions for biopsy, even if not chaotic:

Any changing lesion on an adult

This includes a lesion with a history of change, lesions with monitored change (see figure 29) and lesions with dermatoscopic clues to change such as the presence of peripheral clods (see figure 30) or radial lines/pseudopods. The presence of peripheral clods must be considered in the context of the age of the patient. Peripheral clods in an otherwise unremarkable lesion with the morphology of a naevus, is consistent with the diagnosis of a growing naevus under the age of 30 but not over the age of 50. In between these ages the clues must be weighed and discretion exercised and if doubt remains then excision biopsy is prudent.

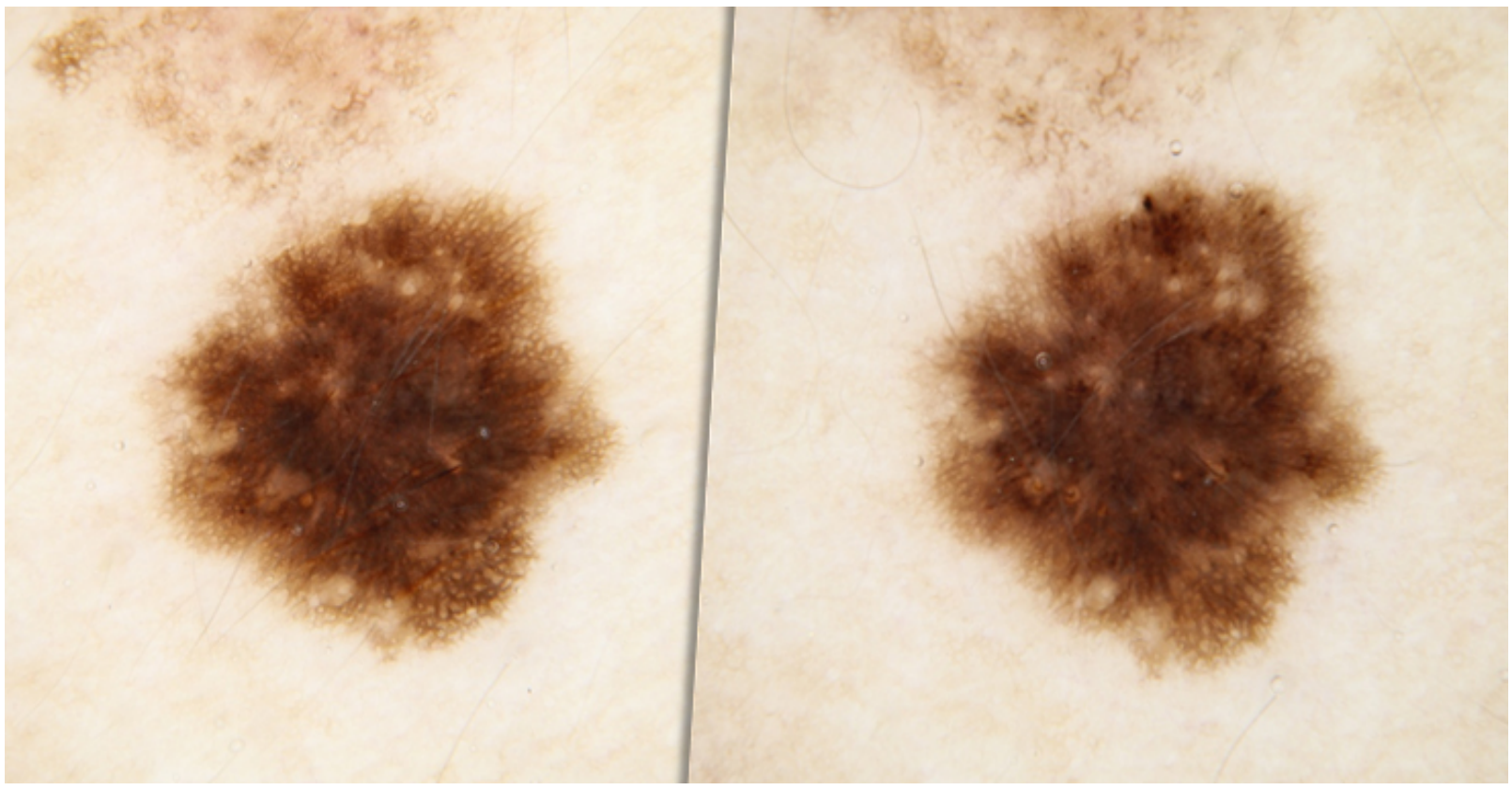

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Figure 29: A pigmented skin lesion (image on left) has been dermatoscopically monitored over 6 months (image on right). The structural change of the appearance of a small cluster of peripheral black dots (upper extremity) lead to excisional biopsy; melanoma in situ.

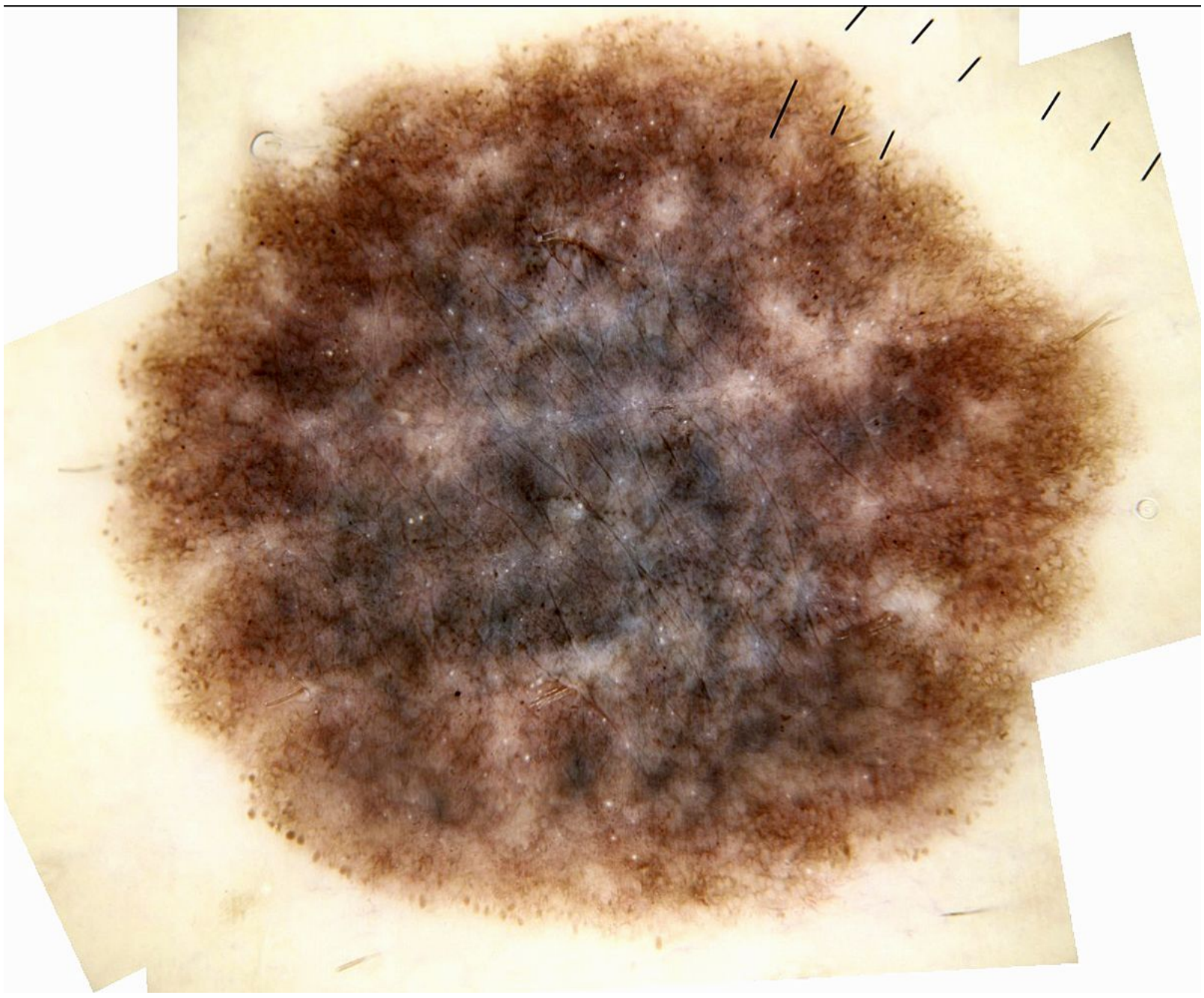

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Figure 30: A large symmetrical pigmented skin lesion on the abdomen of a 70 year old man has the dermatoscopic clue to change of peripheral clods/dots. Excisional biopsy revealed it to be an invasive melanoma.

A nodular or small lesion which has any of the clues to malignancy

We define small, arbitrarily, as less than 6mm in diameter, this being the size cited in the clinical ABCD method of dermatoscopy. This 3mm diameter nodular melanoma shown in figure 31 was arguably symmetrical but in addition to peripheral clods as a dermatoscopic clue to change, it had the clue of grey colour.

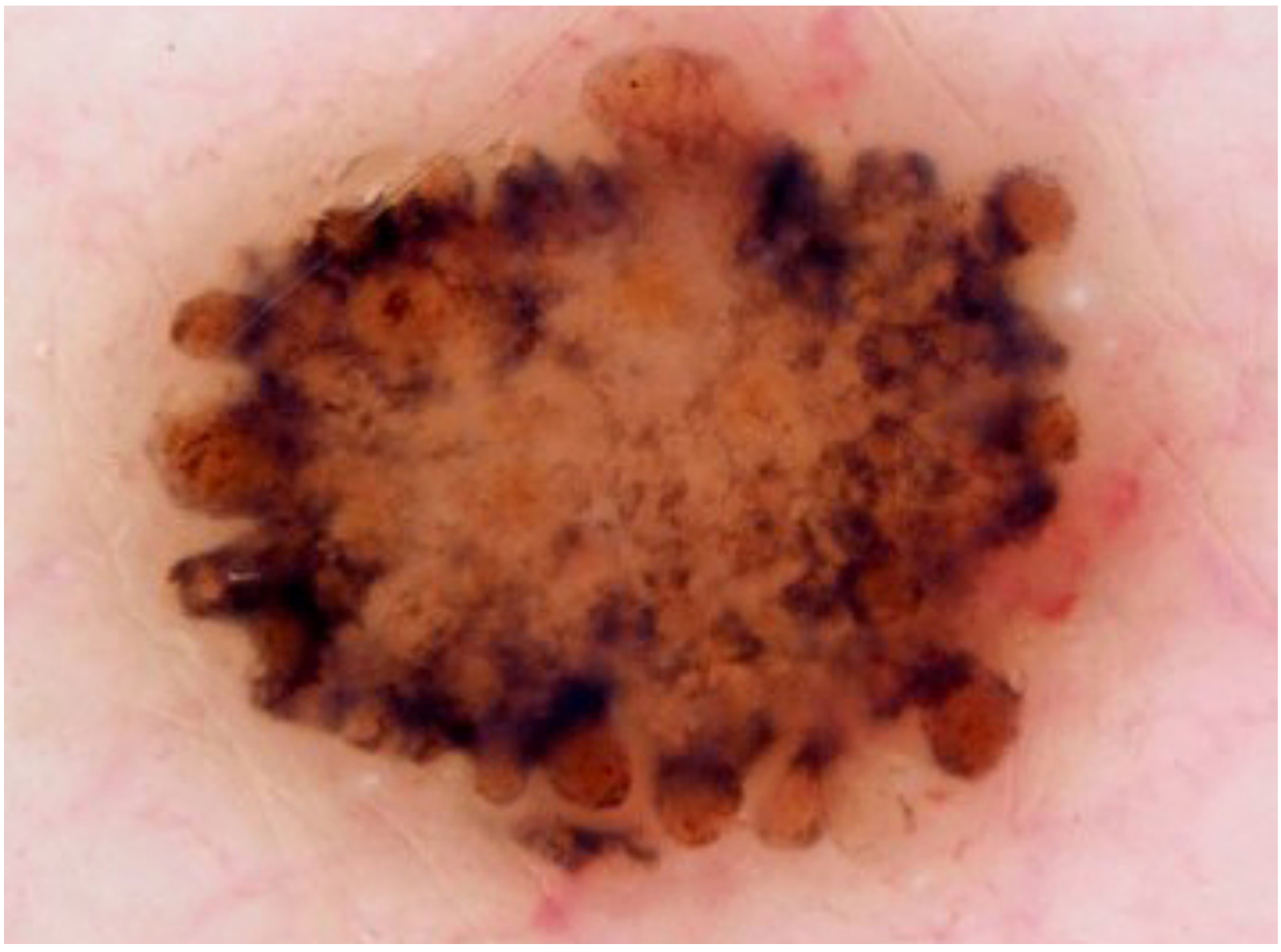

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Figure 31: This pigmented skin lesion on the flank of a 60 year-old lady was only 3 mm in diameter but it was raised. Although it had structural symmetry there were 2 relevant exceptions. Firstly there was the dermatoscopic clue to change of peripheral clods and secondly it was both small and nodular with the clue of grey structures; nodular melanoma (Breslow thickness 0.8mm).

This particular exception should only be applied with respect to small lesions if there is an additional significant cause for concern. Many naevi have grey colour or even patterns that could be interpreted as angulated lines, but if they are non-chaotic and a gradual border supports the diagnosis of naevus, there being no historical information to cause concern, a biopsy is not indicated (see figure 32)

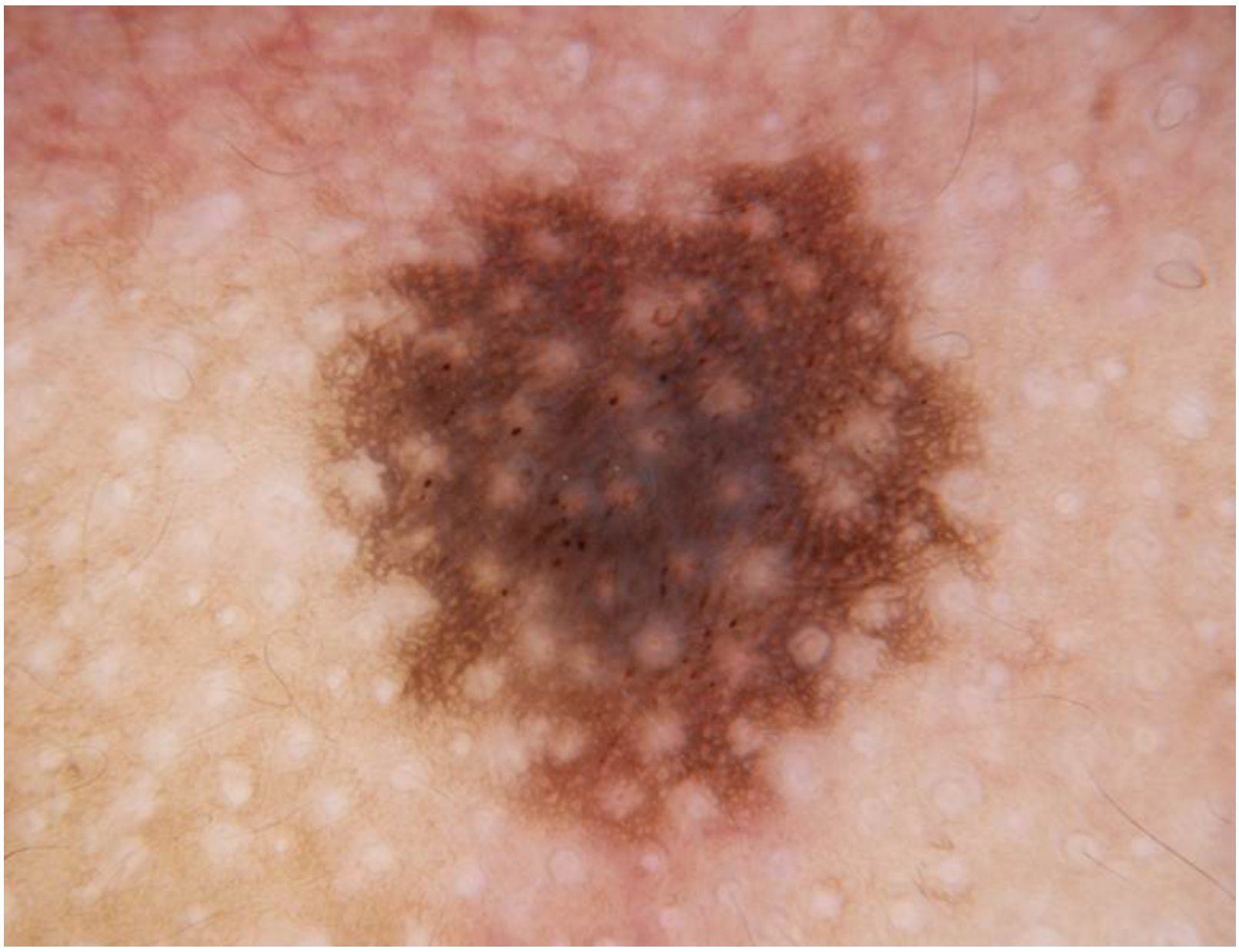

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Figure 32: A 4mm diameter pigmented skin lesion on the ear of an adult man is both a small lesion with a clue (dermatoscopic grey) and also a lesion on the head and neck with dermatoscopic grey. However a lesion which has the unequivocal morphology of a naevus (symmetry and a gradual border over the total periphery), as well as historical stability, does not need to be excised.

Also the common lesion, DF, is a small nodular lesion which frequently has central polarising-specific white lines and if DF can be diagnosed confidently by clinical and dermatoscopic criteria excision biopsy is not necessary (see figure 33).

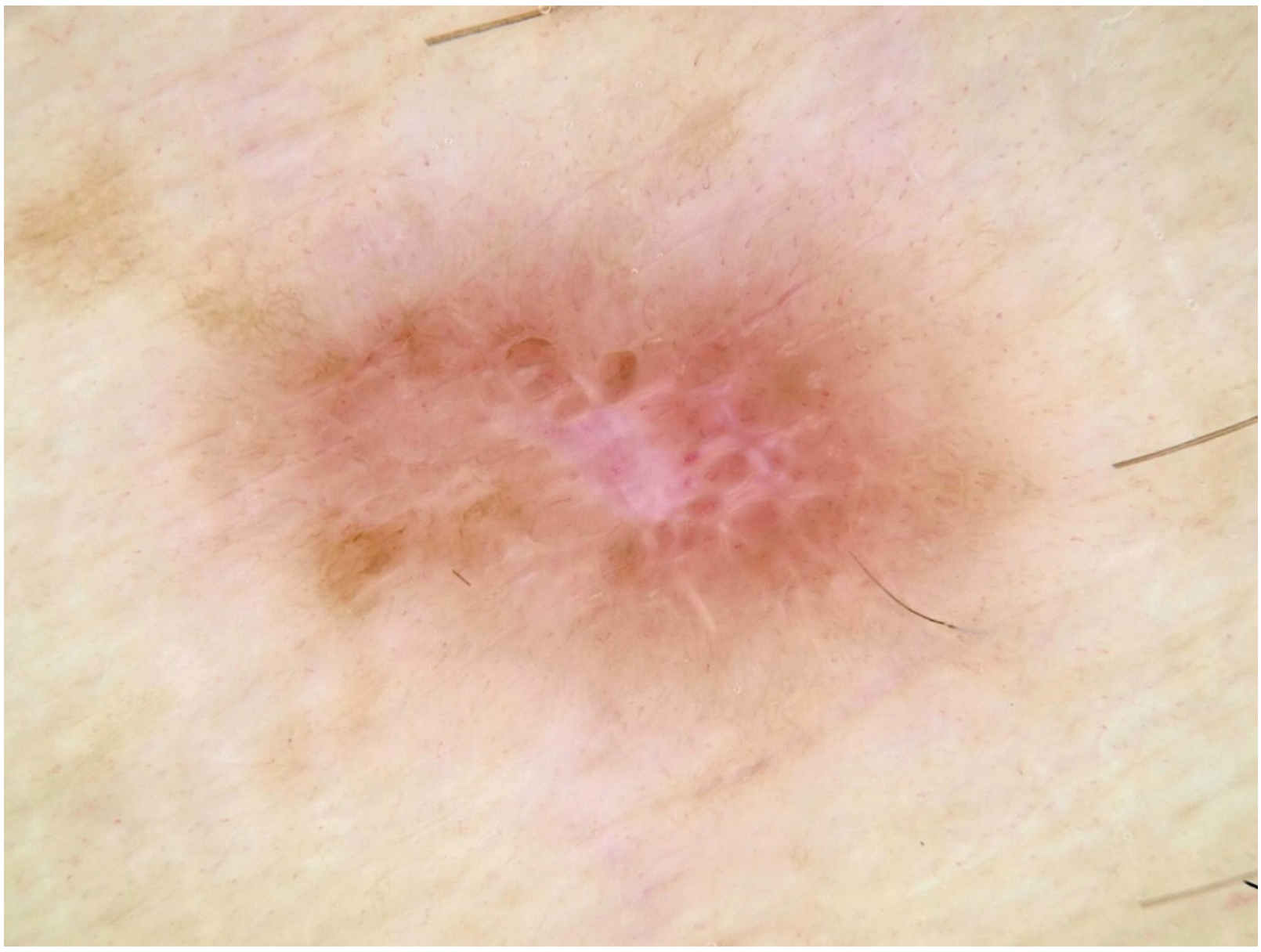

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Figure 33: This lesion is a small nodular lesion with the clue to malignancy of polarising-specific white lines. It has the morphology of a dermatofibroma with symmetry of pattern and colour and a central white area and does not require excision.

Any lesion on the head or neck with pigmented circles and/or any dermatoscopic grey

This clue acknowledges that fact that young melanomas at these locations, possibly related to a physical barrier effect of numerous follicles, may be symmetrical (see figure 34). A study on flat pigmented facial lesions found that the presence of any grey structures had sensitivity and specificity for melanoma of 95.8% and 30.5% respectively while grey circles had a sensitivity of 54.2% and a specificity of 83.3% [12]. Pigmented circles (any colour) were similar to grey circles with a sensitivity and specificity for melanoma of 70.83% and 76.9% respectively [12] (unpublished data from the same study).

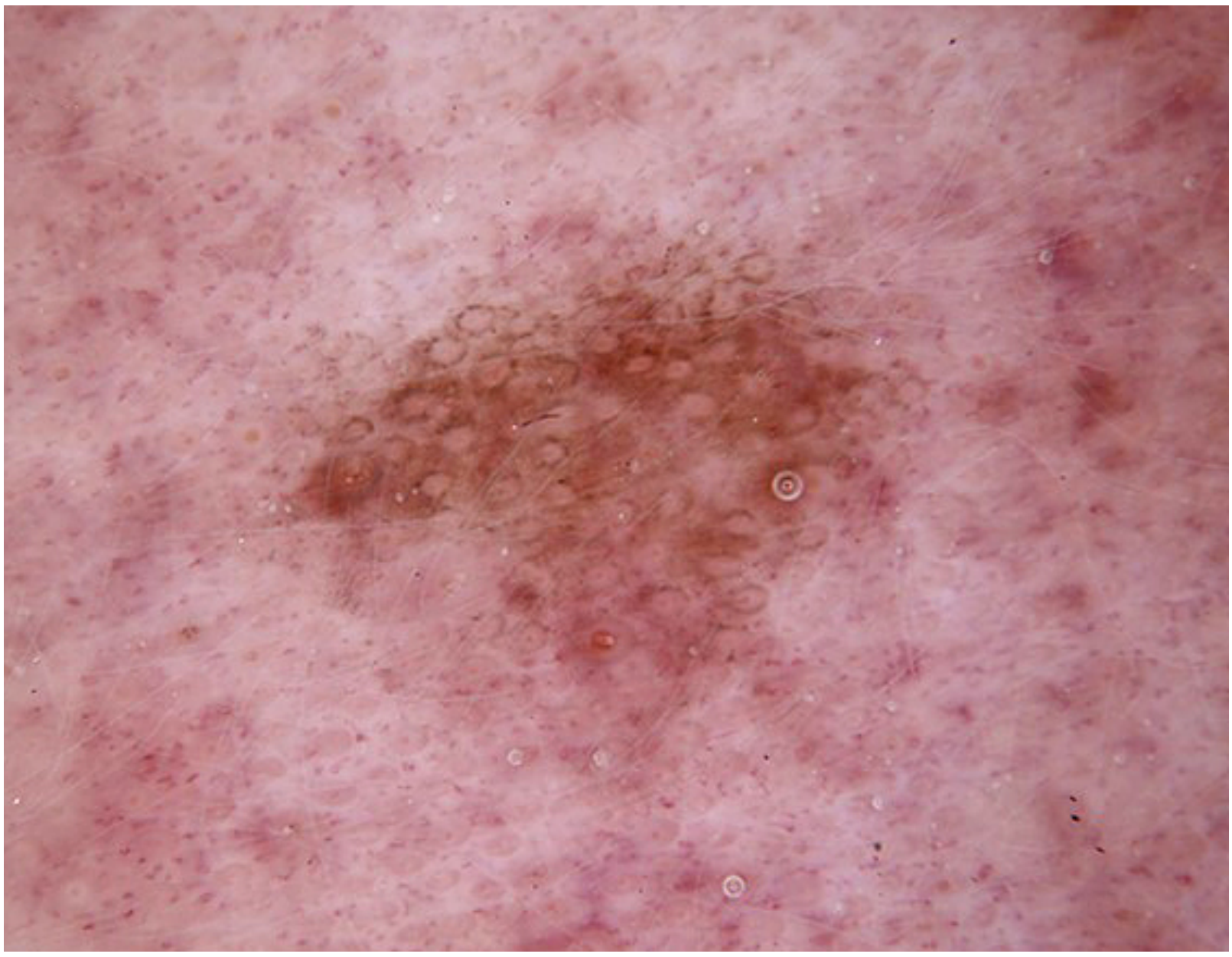

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Figure 34: This pigmented skin lesion on the ear lobe of a 42 year old man is arguably symmetrical but pigmented circles related to adnexal openings were a compelling clue to melanoma; melanoma in situ

Any lesion on acral skin with a parallel ridge pattern.

This clue acknowledges that fact that young melanomas at these locations, possibly related to a physical barrier effect of numerous eccrine ducts, may be symmetrical (see figure 20).

Chaos and clues is not a method designed for robots and it should not be regarded as an ultimate method, set in stone. It has been designed as a useful tool, avoiding tedious mathematical calculations, unburdened by a language of innumerable poorly defined metaphorical terms carrying preconceived diagnostic implications and it is suitable for seamless integration into routine practice. Individuals are encouraged to use it as a framework on which to organise their accumulated experience as they individualise the method for their own style and practice.

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