

Structures in dermoscopy:
the well defined
the less well known
the pitfalls
&
the challenges

Friday March 23rd

9:15-10:15 (60 minutes)

Ashfaq A. Marghoob, M.D.

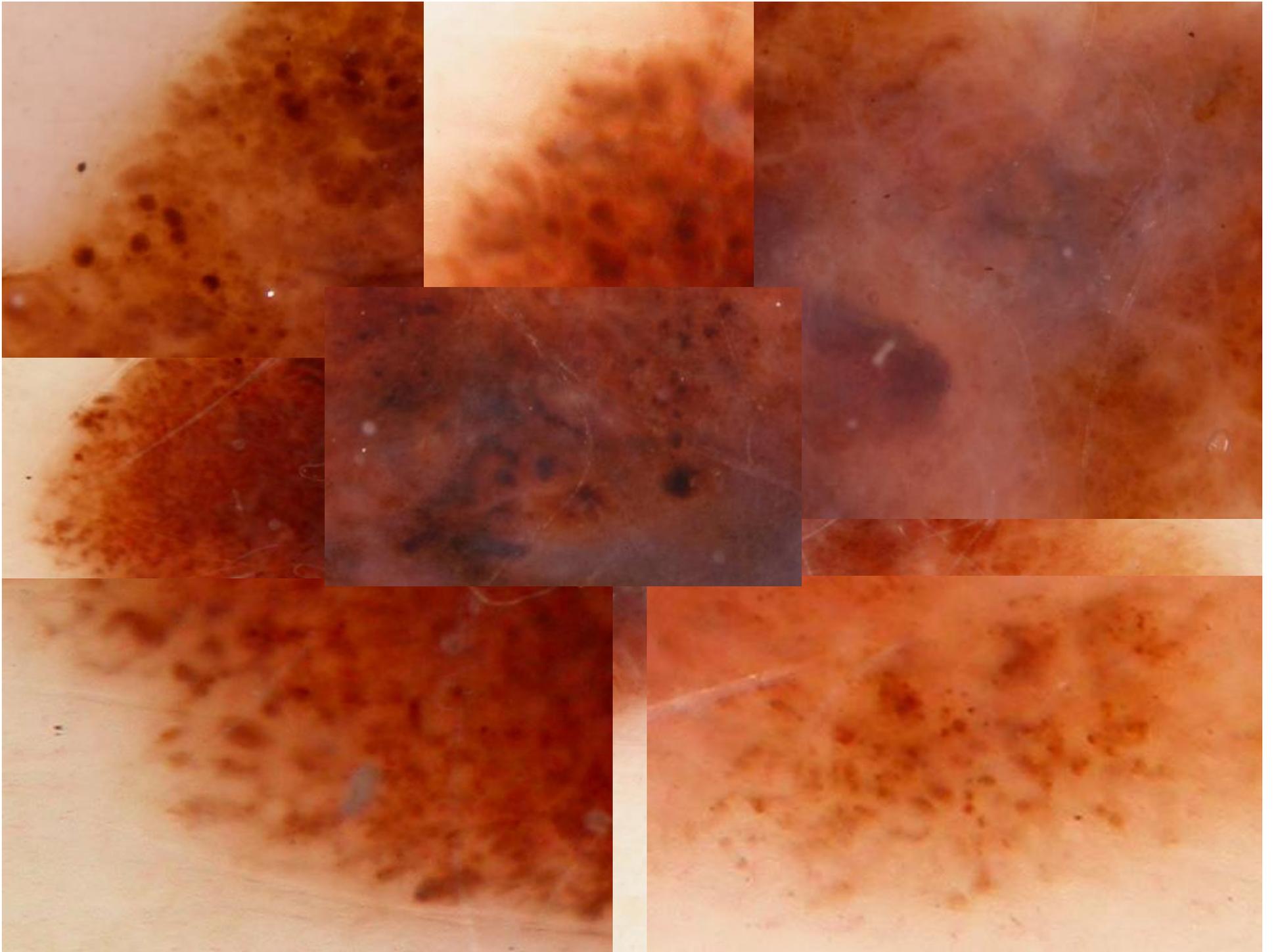
Memorial Sloan-Kettering Cancer Center



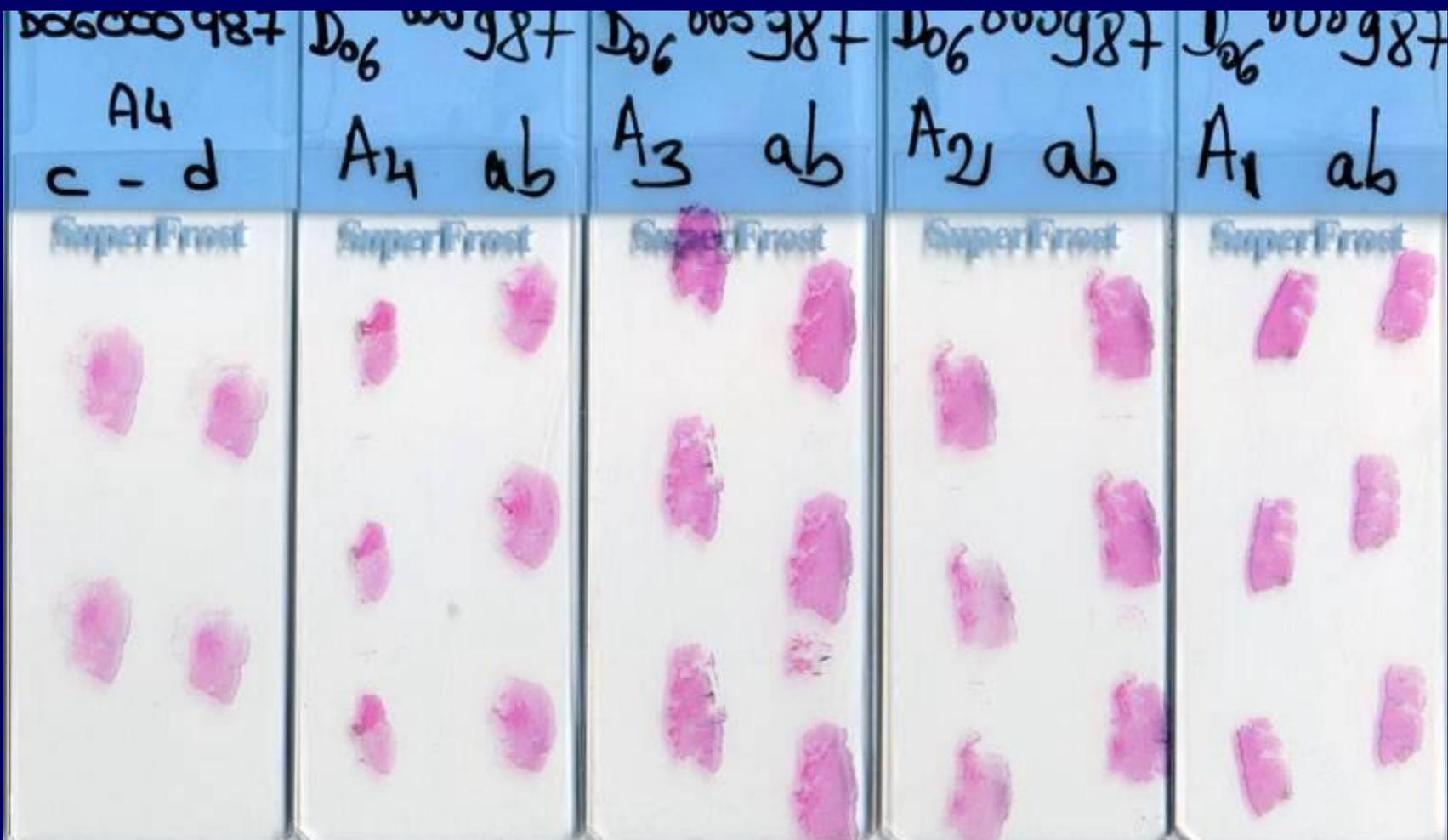
What dose the clinician see?

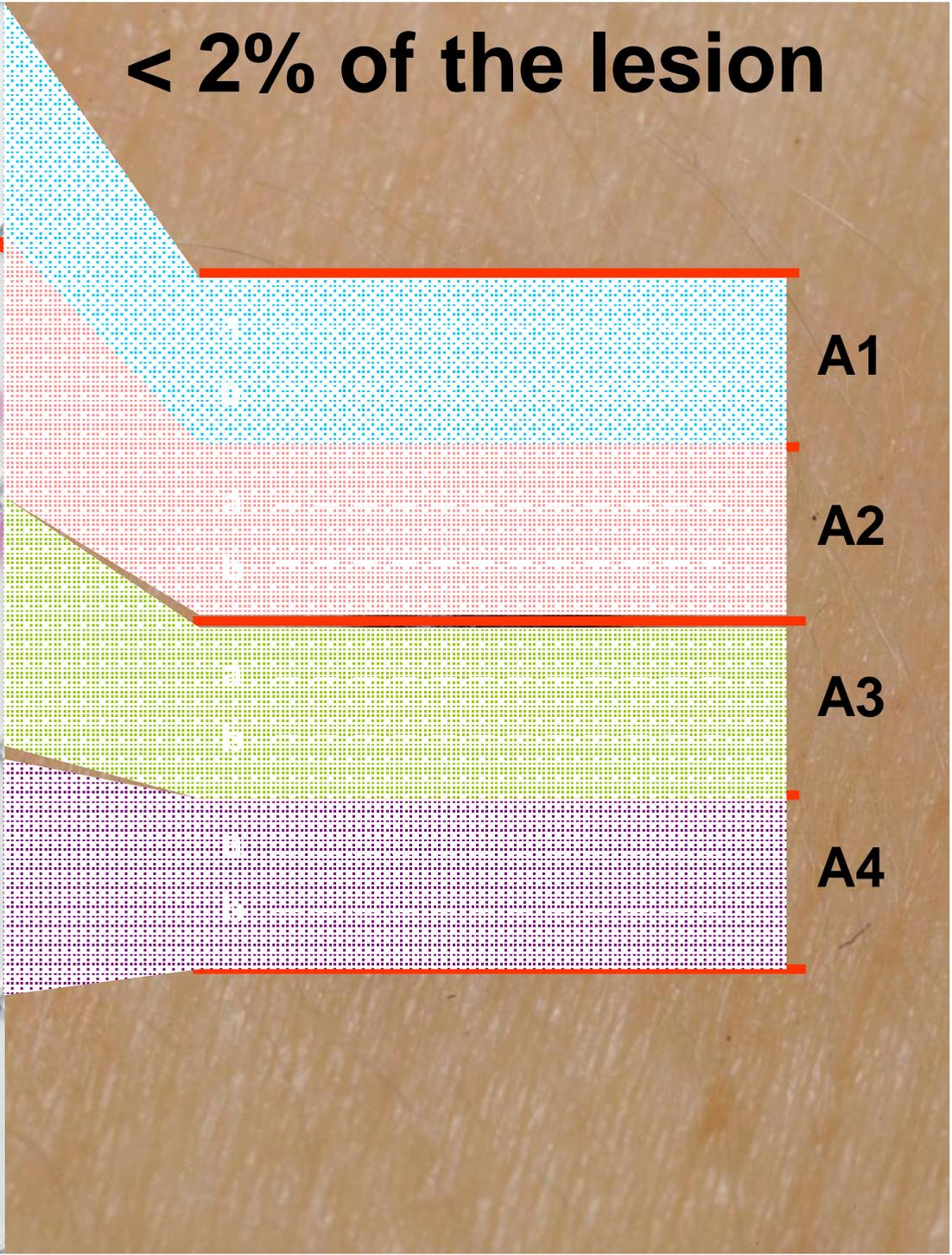
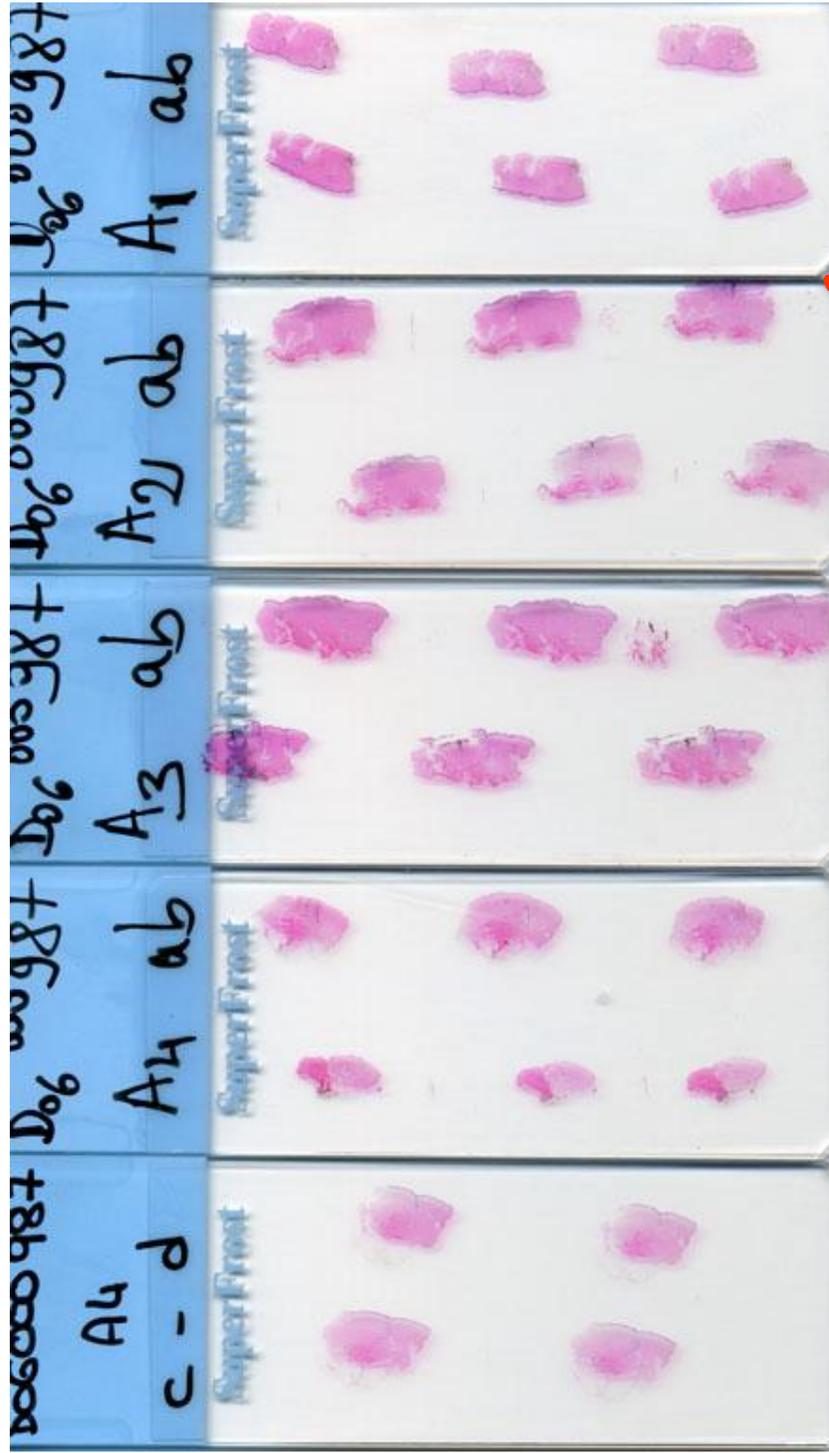


What does the dermoscopist see ?



What does the pathologist see ?



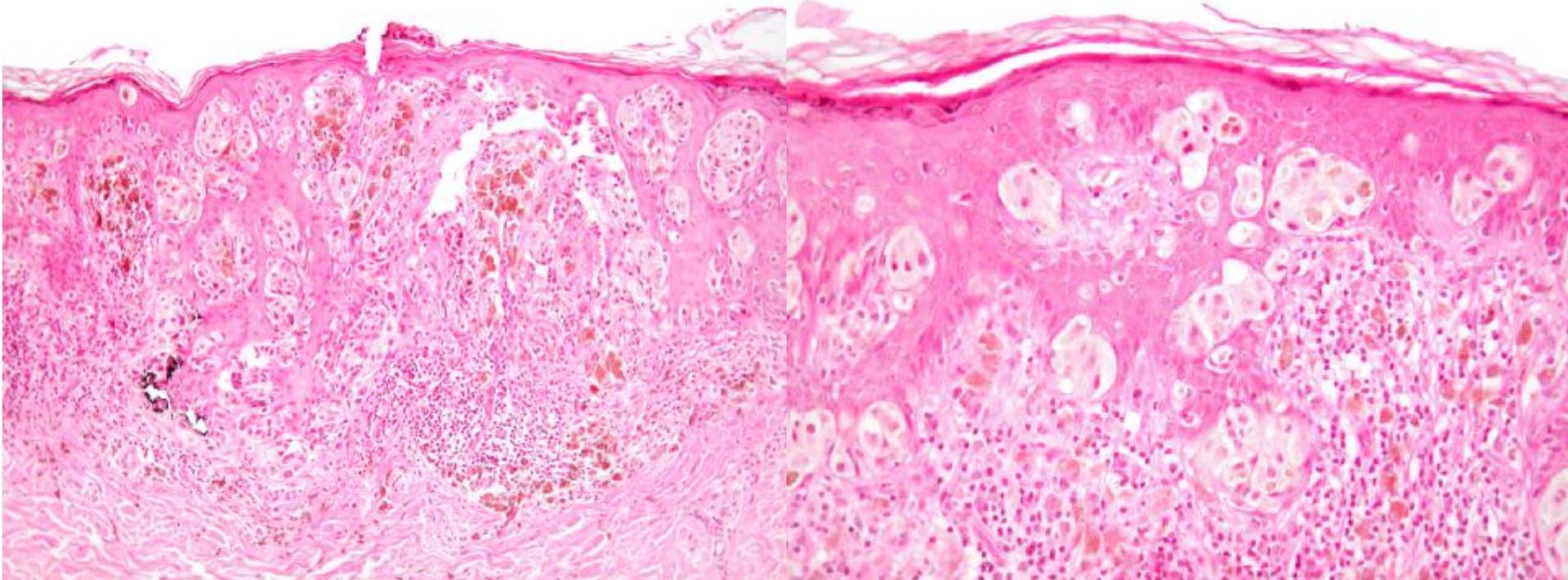
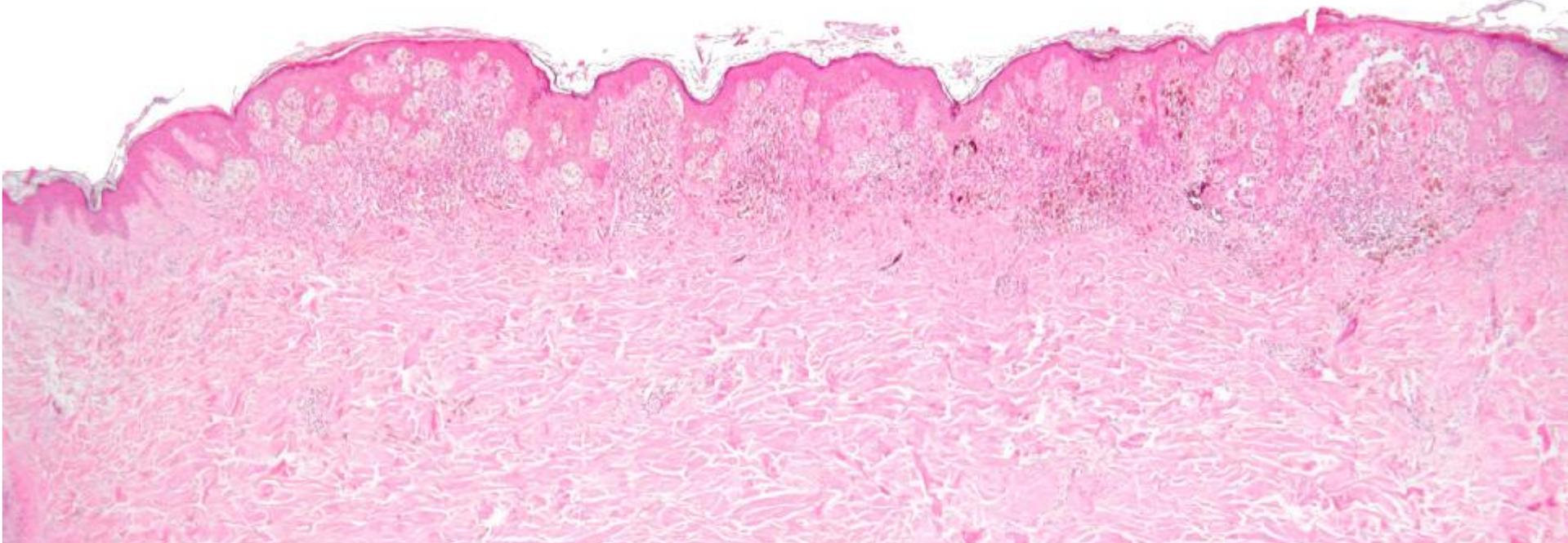


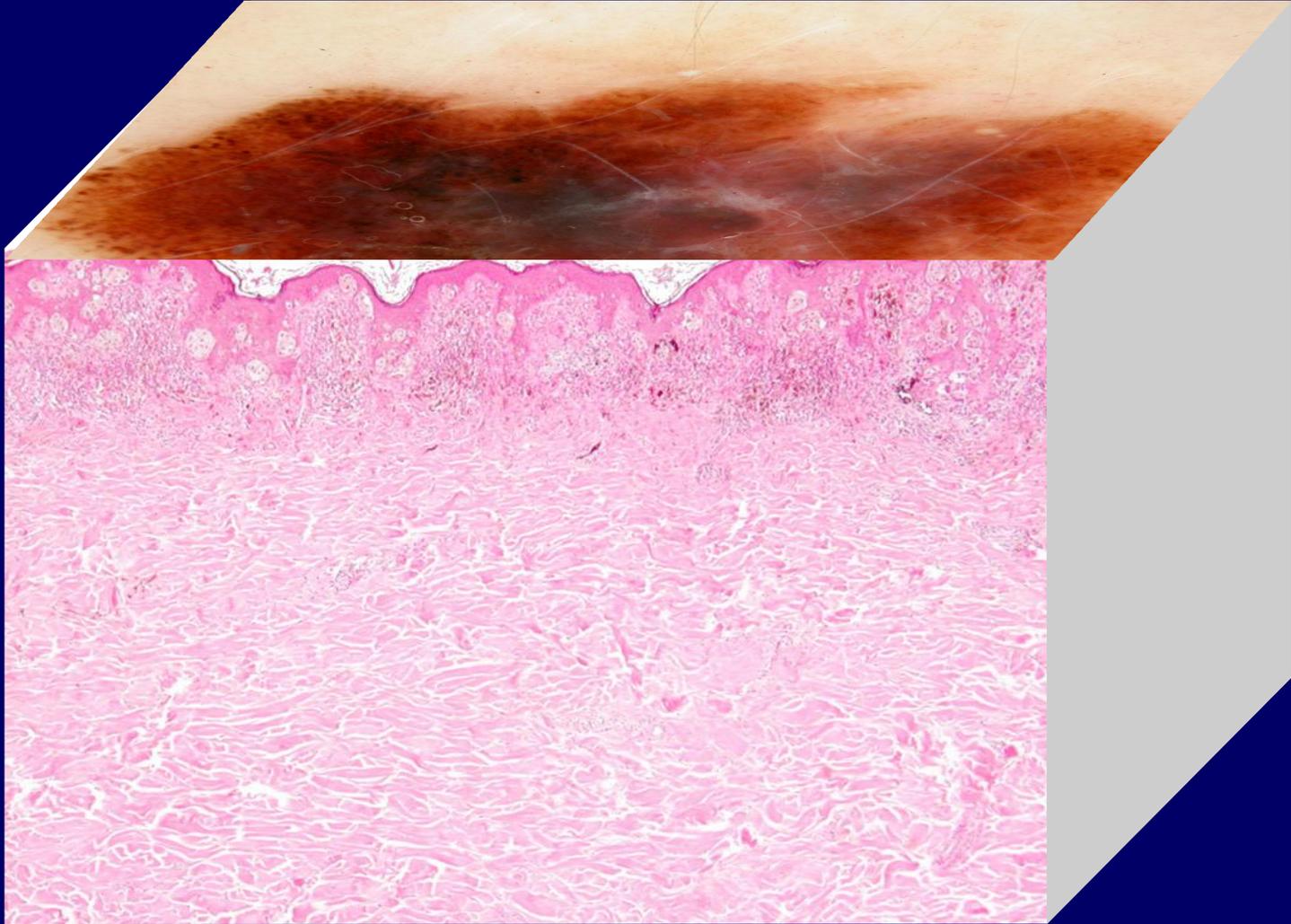
A1

A2

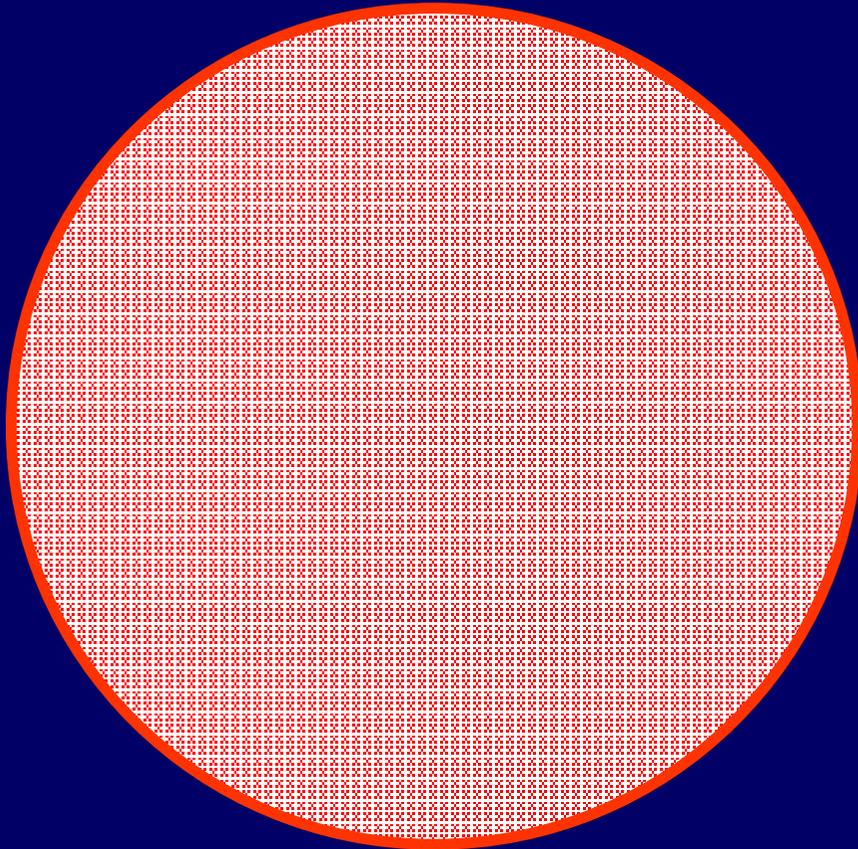
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A4

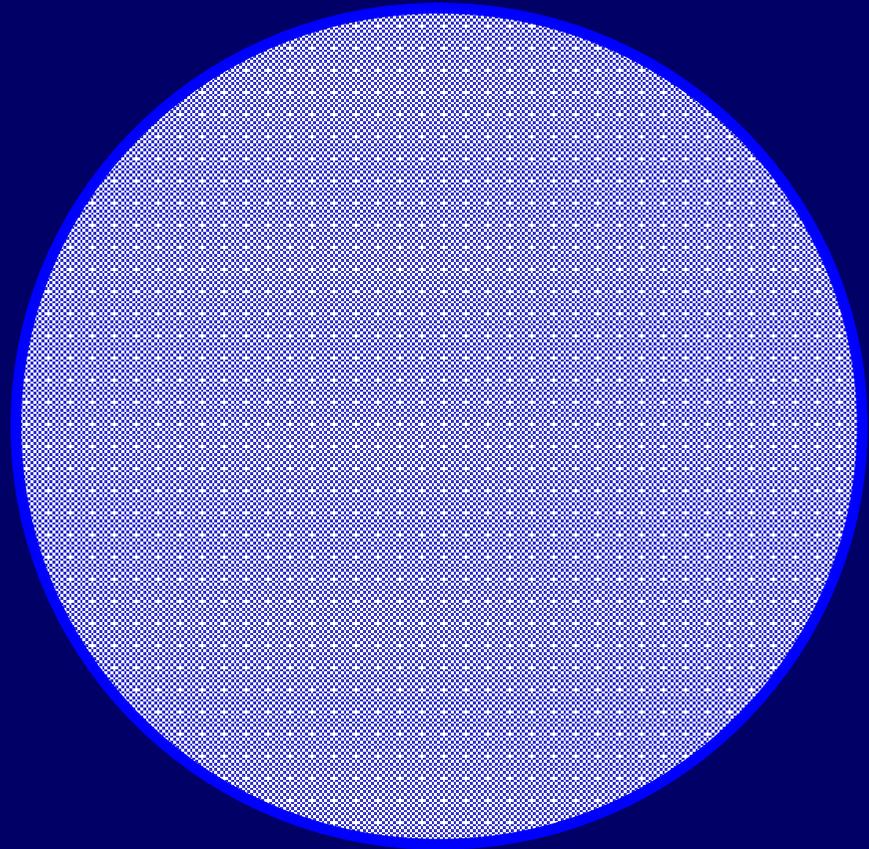




Diagnostic criteria



Dermoscopy criteria



Histopathology criteria

Colors seen on dermoscopy

yellow

black

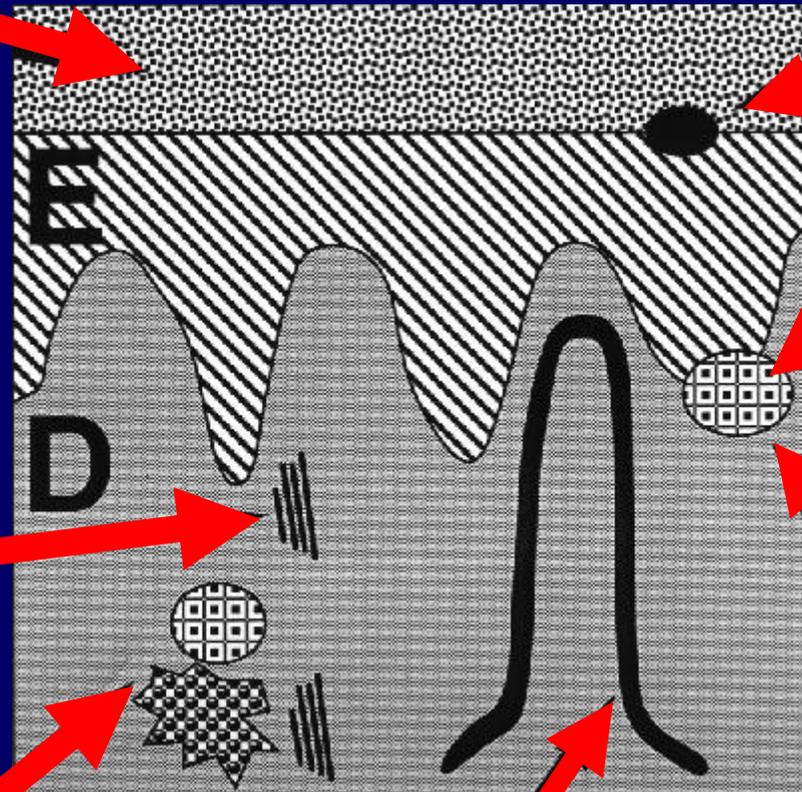
light brown

white

dark brown

blue

red



Black

§melanin in the upper epidermal layer or

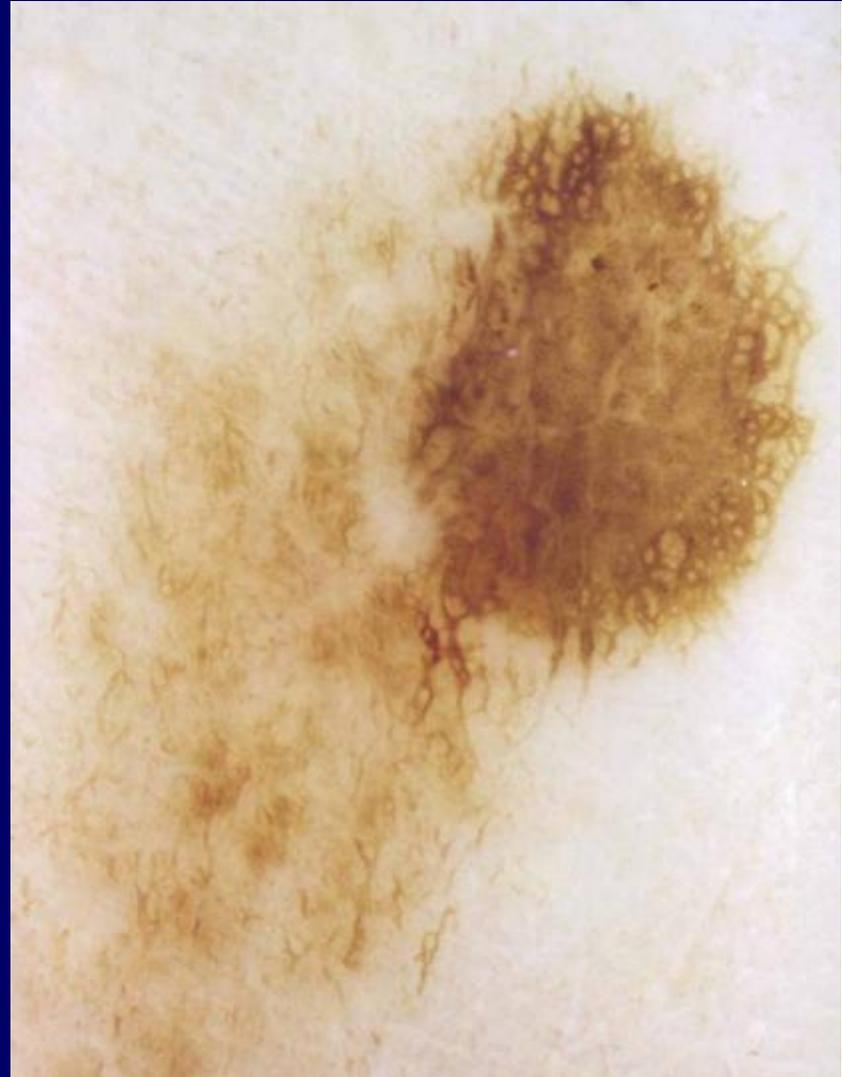
§melanin throughout all the layers of the epidermis.



Brown

§ Melanin at level of the epidermal-dermal junction.

§ The higher the concentration of melanin, the darker the shade of brown.

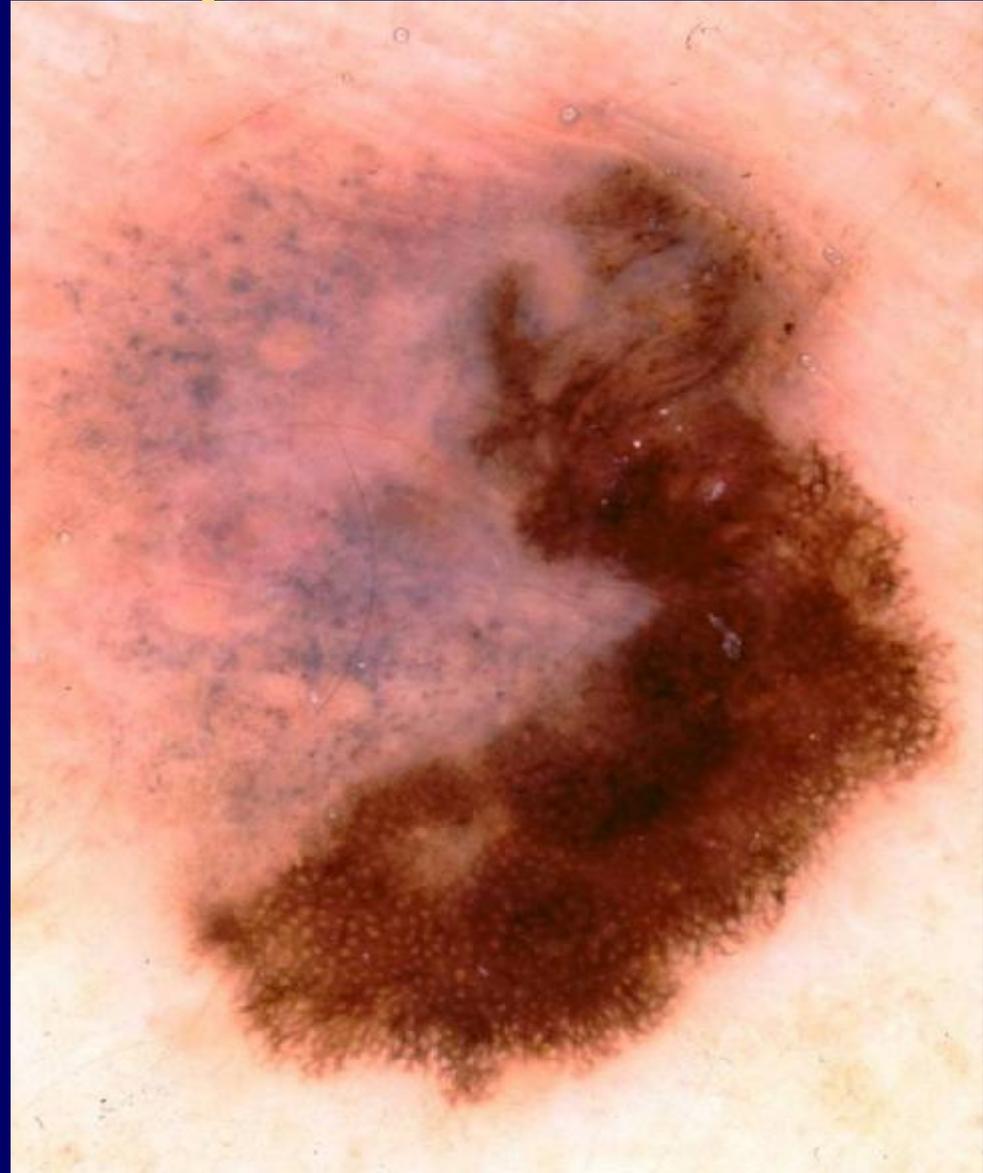


Gray

§ Represents melanophages or melanin in the mid-reticular to upper dermis

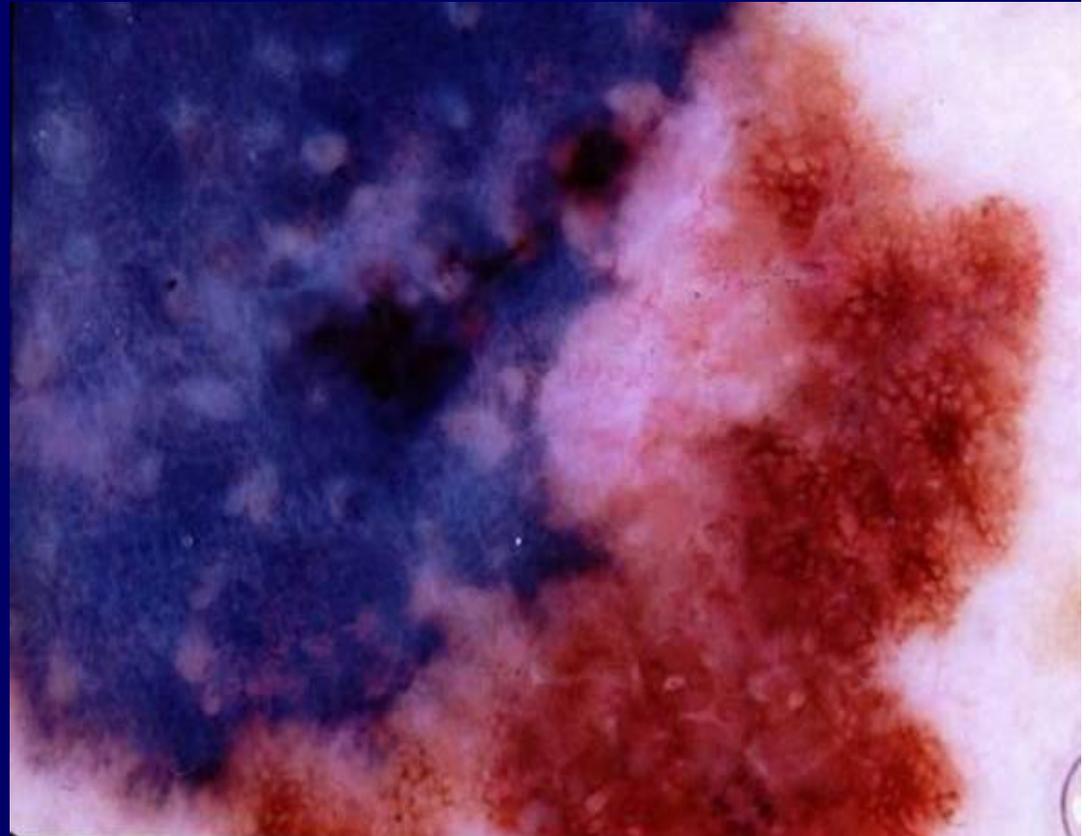
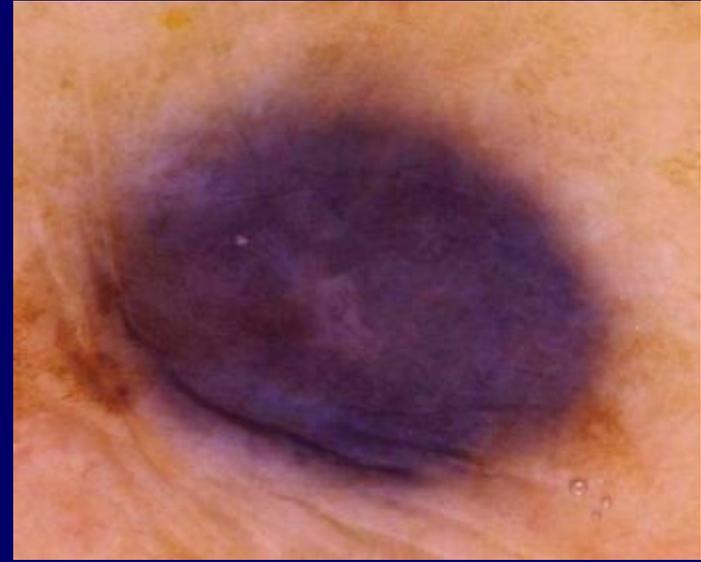
§ May appear gray-blue or blue-white (BWS)

§ This is seen only over macular (flat) areas



Blue

§ Arises from melanin in either the papillary or reticular dermis



Yellow

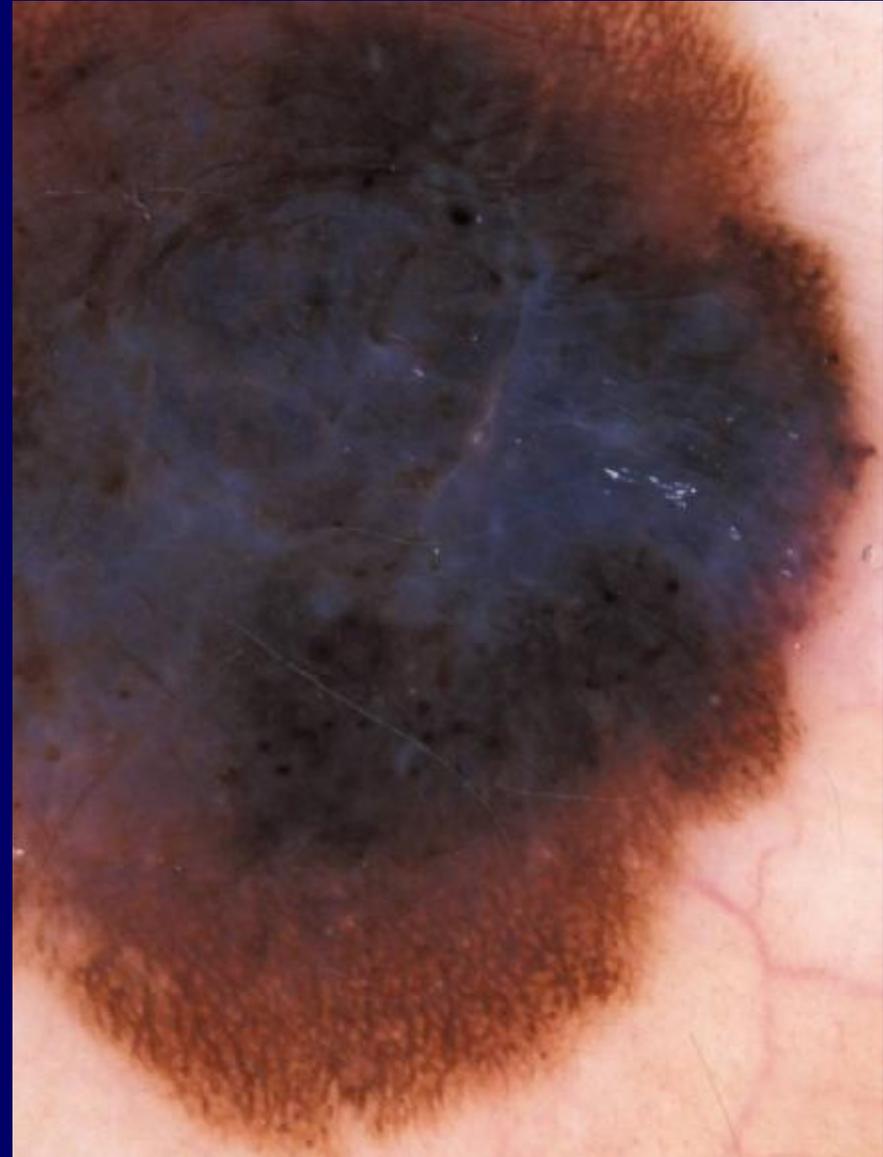
§ Stratum
cornium devoid
of blood and
melanin



Blue-White (Veil) overlying raised areas

§ An indistinct whitish film superimposed on an area of diffuse blue pigment

§ Represents dermal melanin & compact orthokeratosis



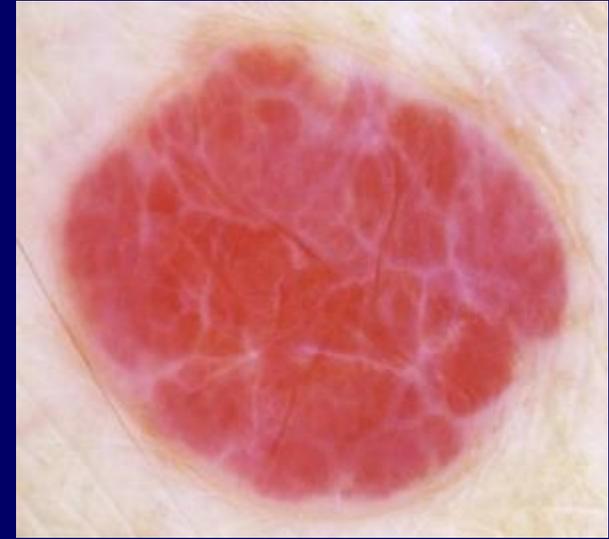
White or Blue-white veil over flat areas

§Regression

§Scarring



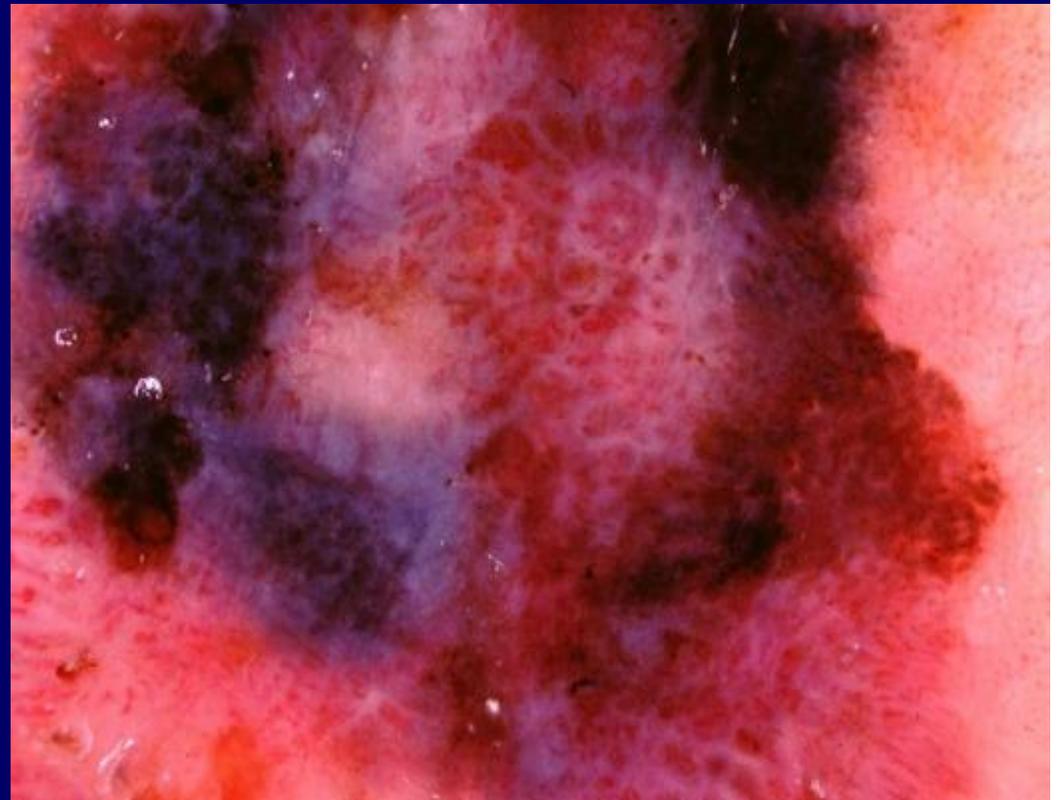
Red



§ Increased vascularity

§ Neovascularization of cell nests

§ Bleeding within the lesion



Black

Brown

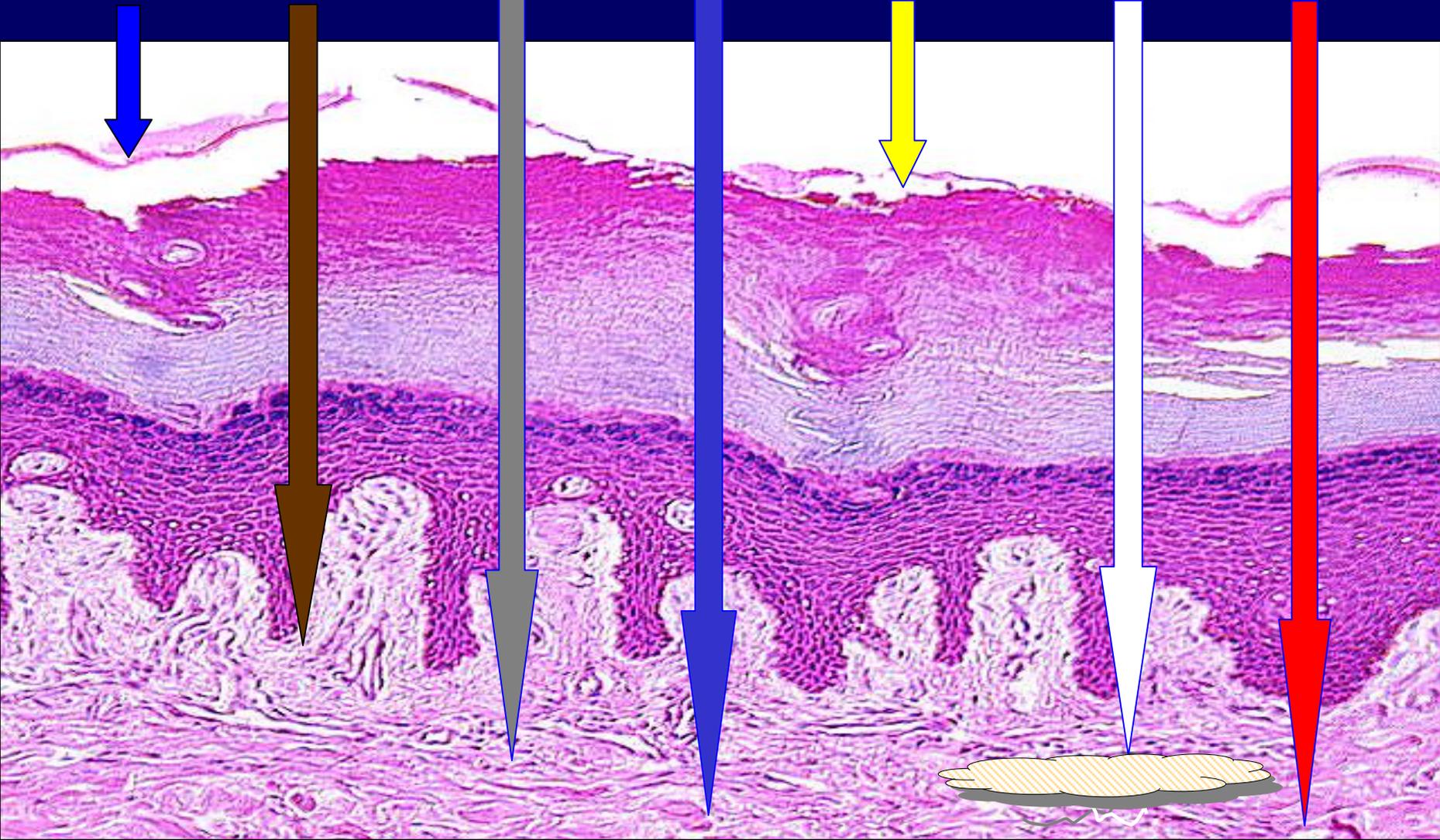
Gray

Blue

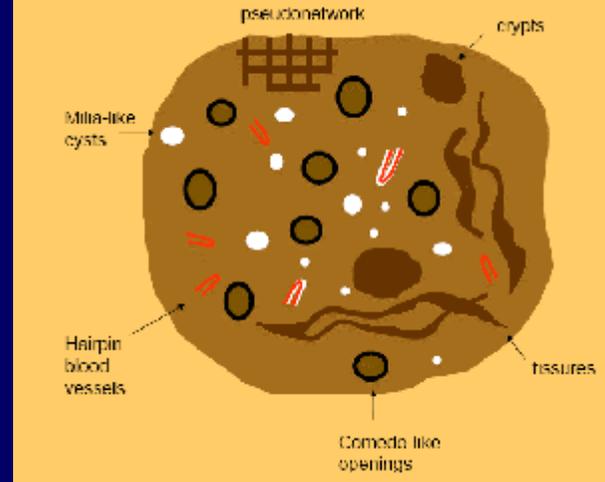
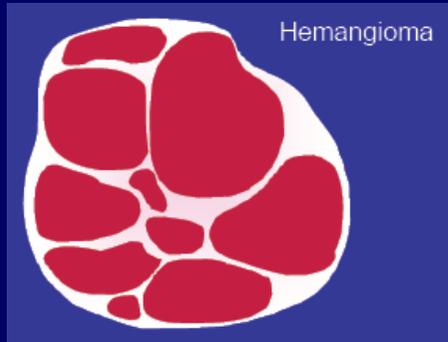
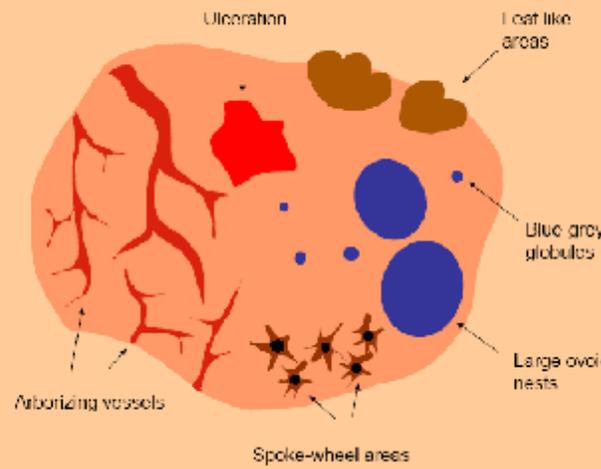
Yellow

White

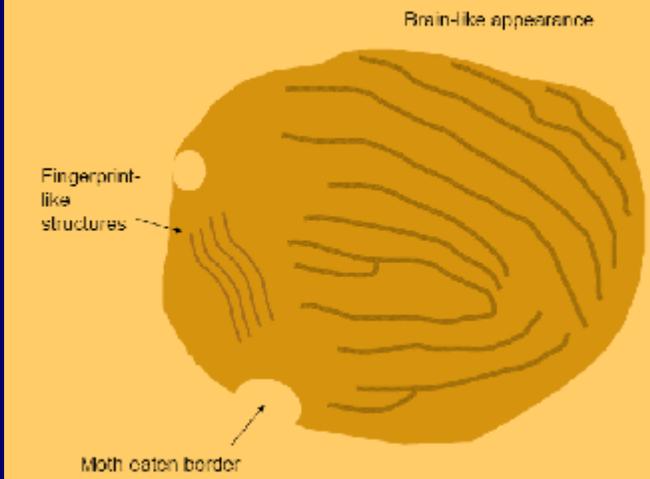
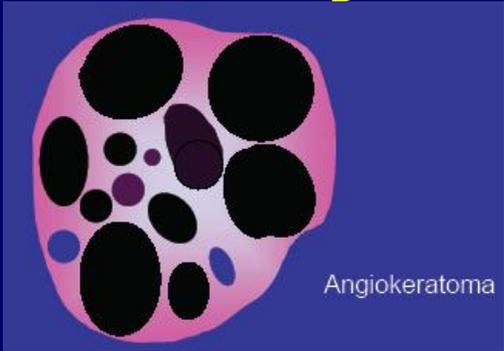
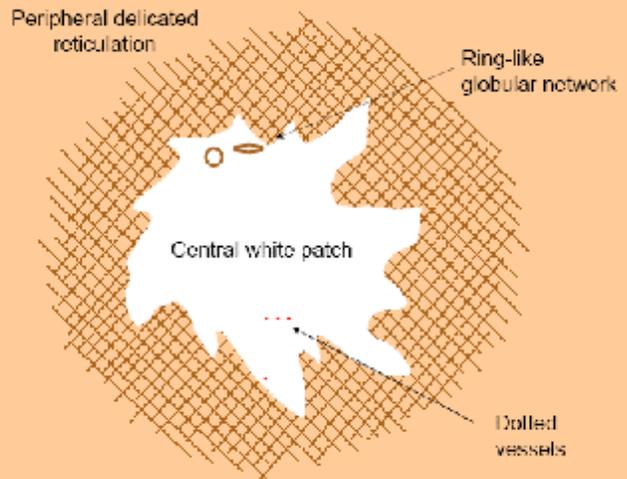
Red



Structures seen on dermoscopy



Structures seen in non-melanocytic lesions



BCC

Positive features (At least one present):

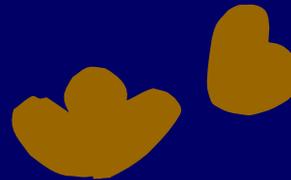
Large grey-blue ovoid nests



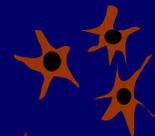
Multiple grey-blue globules



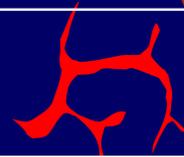
Leaflike areas



Spoke wheel areas



Arborising “tree-like” telangiectasia



Ulceration

&

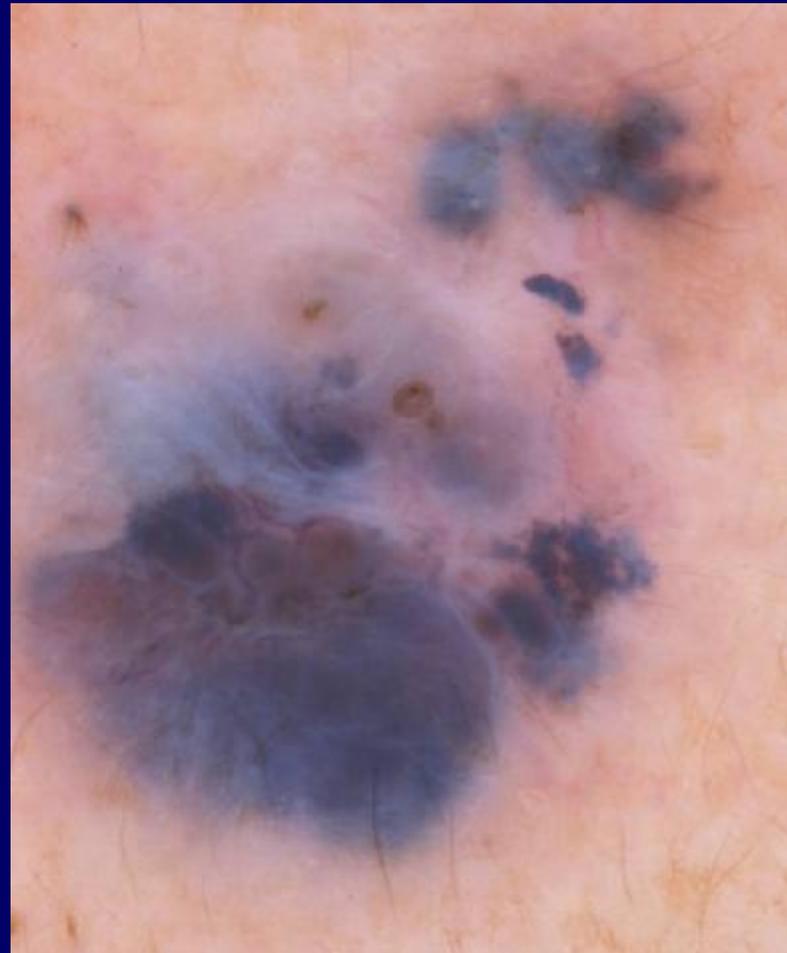
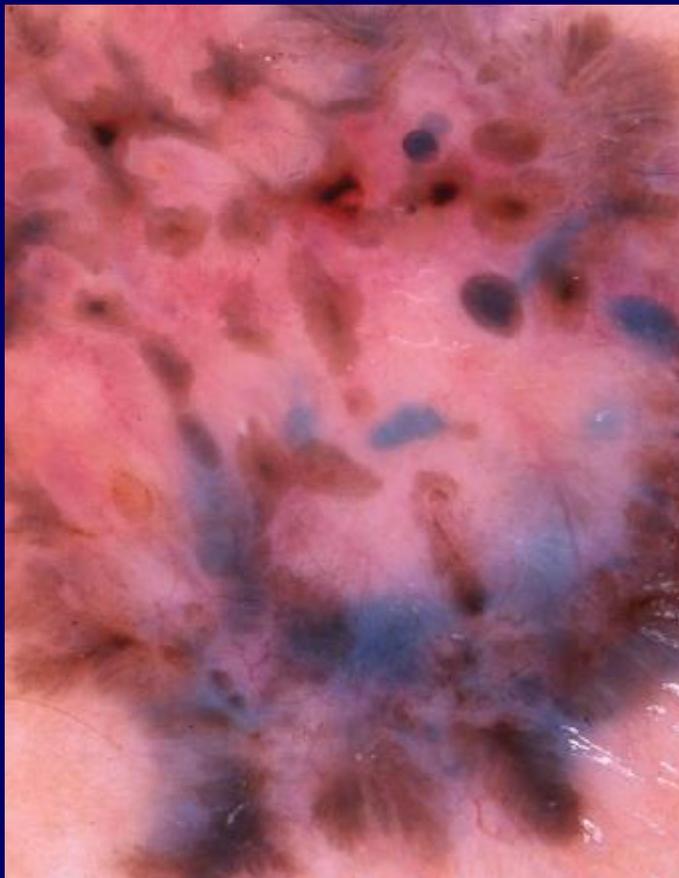
Shiny white areas / stellate streaks



Blue-Gray Globules & Large Ovoid Nests (Blue Clods)

§ Well circumscribed globules & oval structures

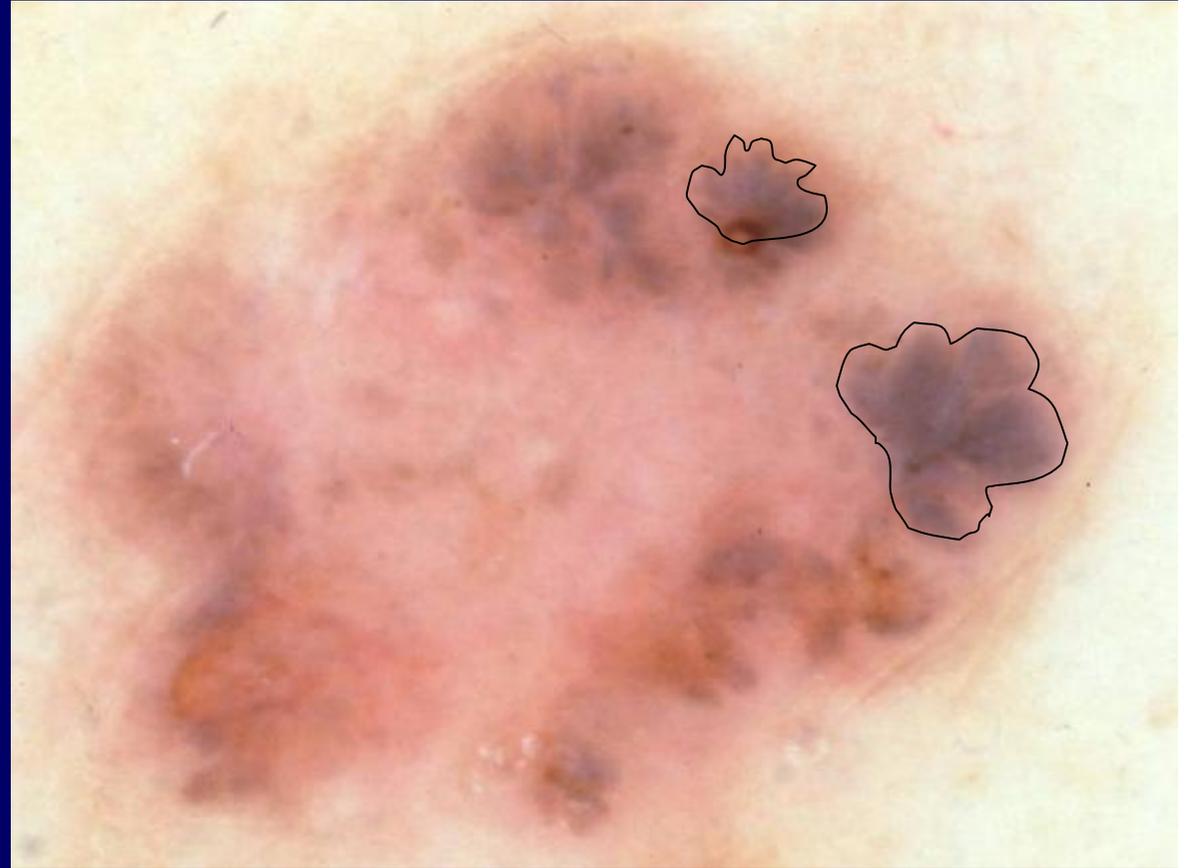
§ Basal cell tumor islands



Leaf-like Structures

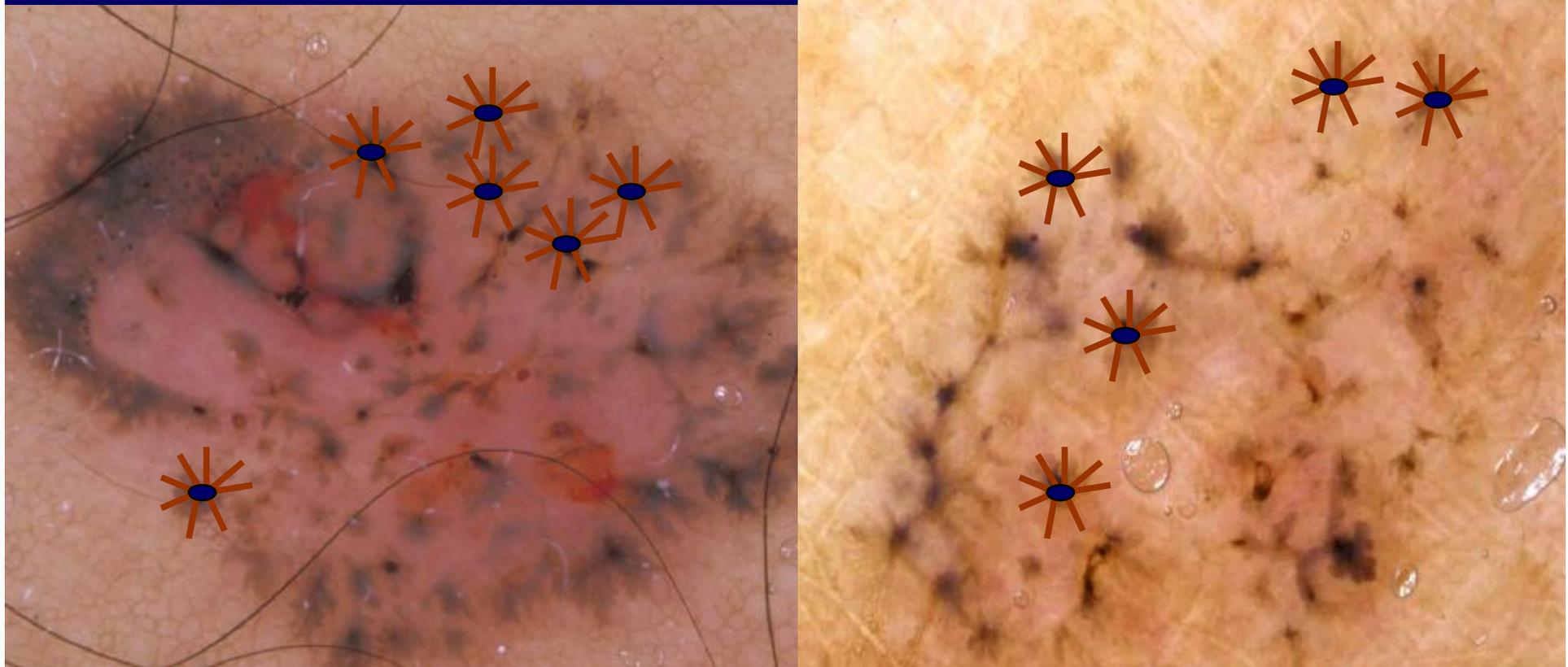
§ Brown to gray/blue bulbous areas forming a leaf-like pattern

§ Results from pigmentation within basal cell nests



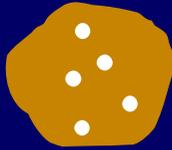
Spoke-Wheel Structures (radial lines meeting in central dot)

§ Well circumscribed radial projections meeting at a darker central hub

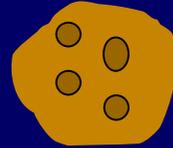


SK

- **Milia-like cyst**



- **Comedo-like opening**



- **Fissures & ridges**



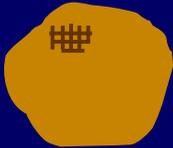
- **Fingerprint-like**



- **Hairpin vessels**



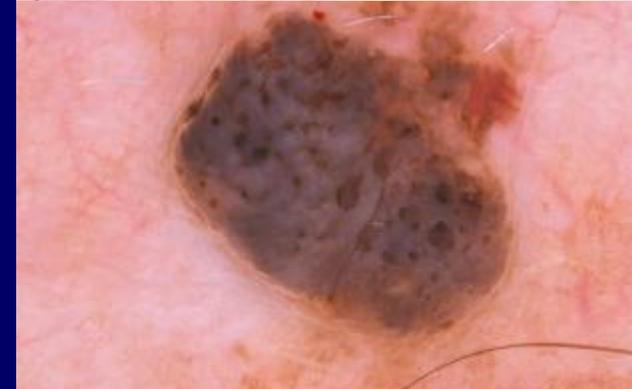
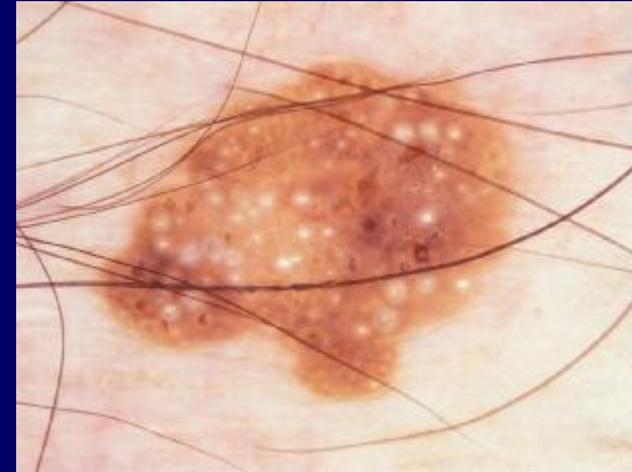
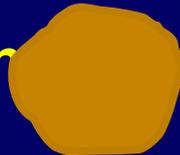
- **Network-like**



- **Moth-eaten borders**



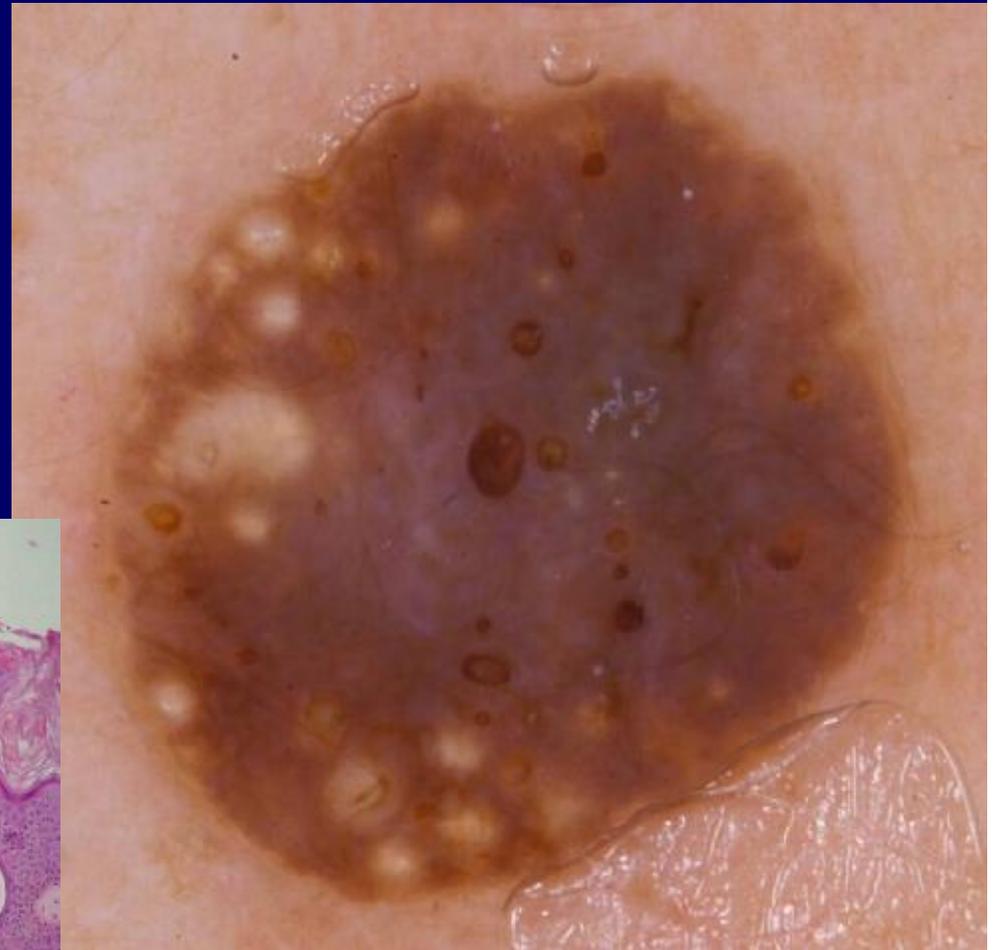
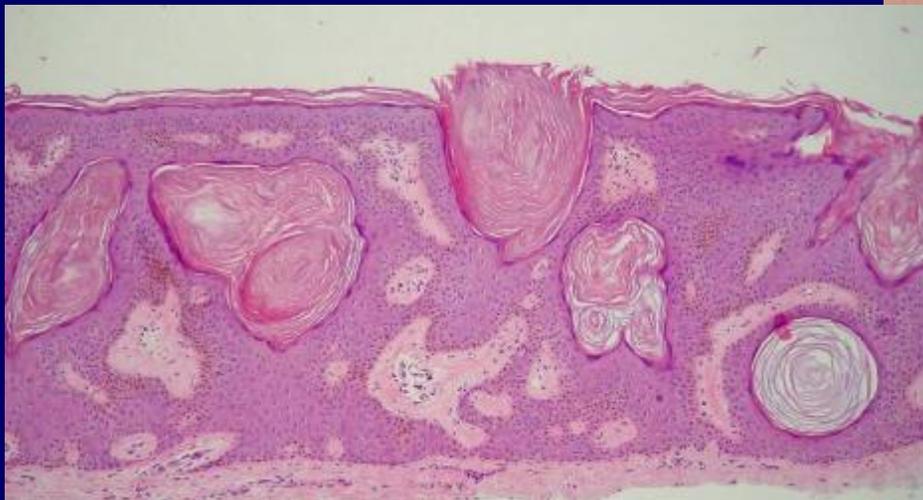
- **Sharp demarcation**



Milia-like Cysts & Comedone-like Openings (white & yellow clods, dots & circles)

§ Intraepidermal keratin-filled cysts

§ Commonly seen in seborrheic keratosis

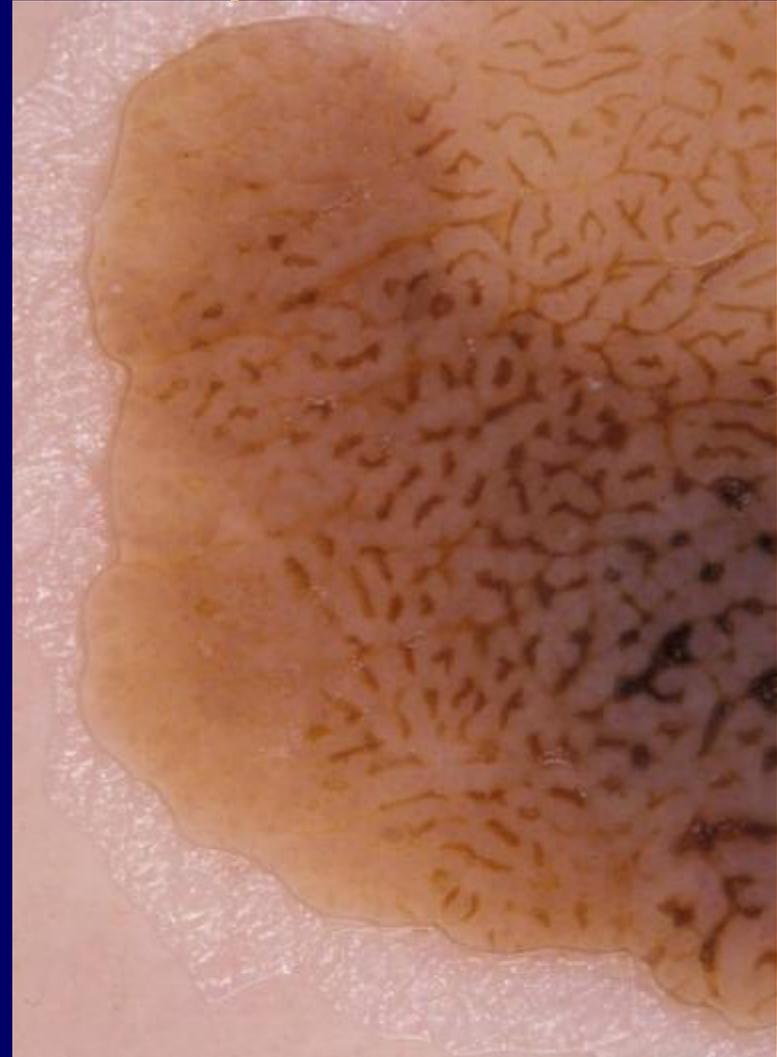


Fissures & ridges or cerebriform (curved lines)

§ Confluent branching clefts

§ Due to deep keratin filled invaginations of the epidermis

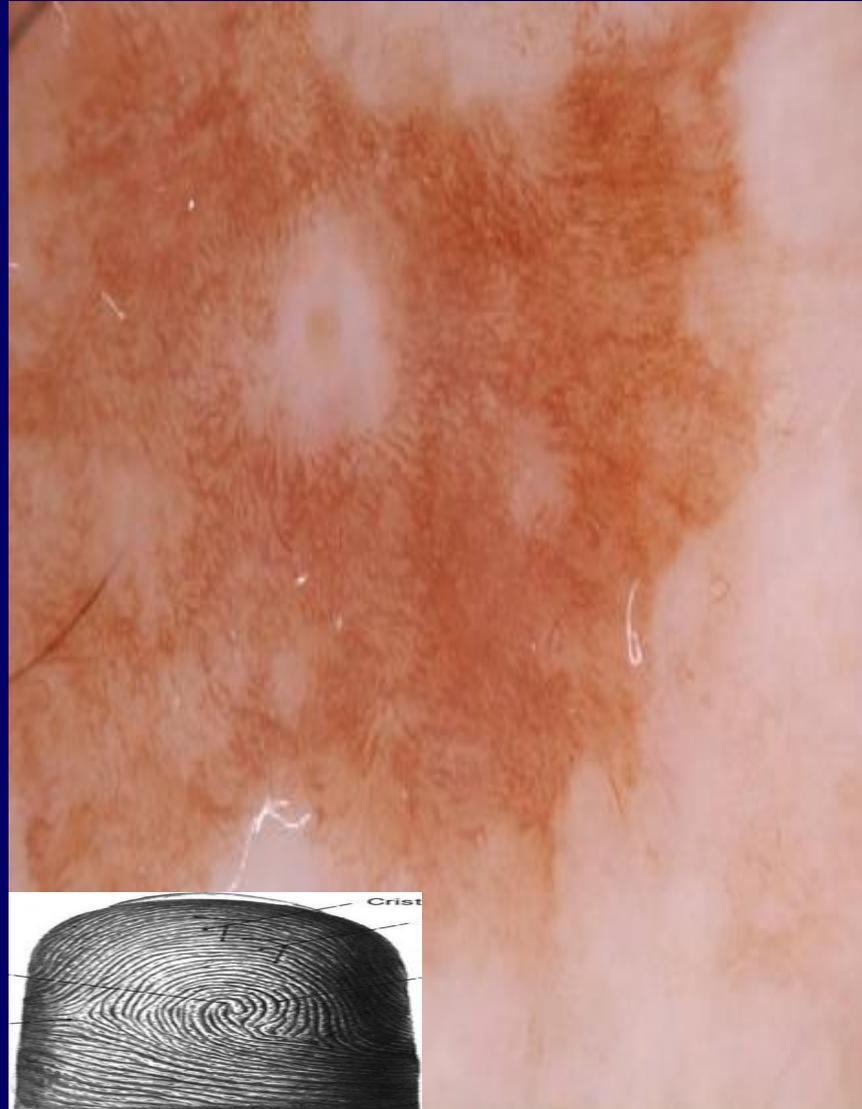
§ Commonly seen in seborrheic keratosis



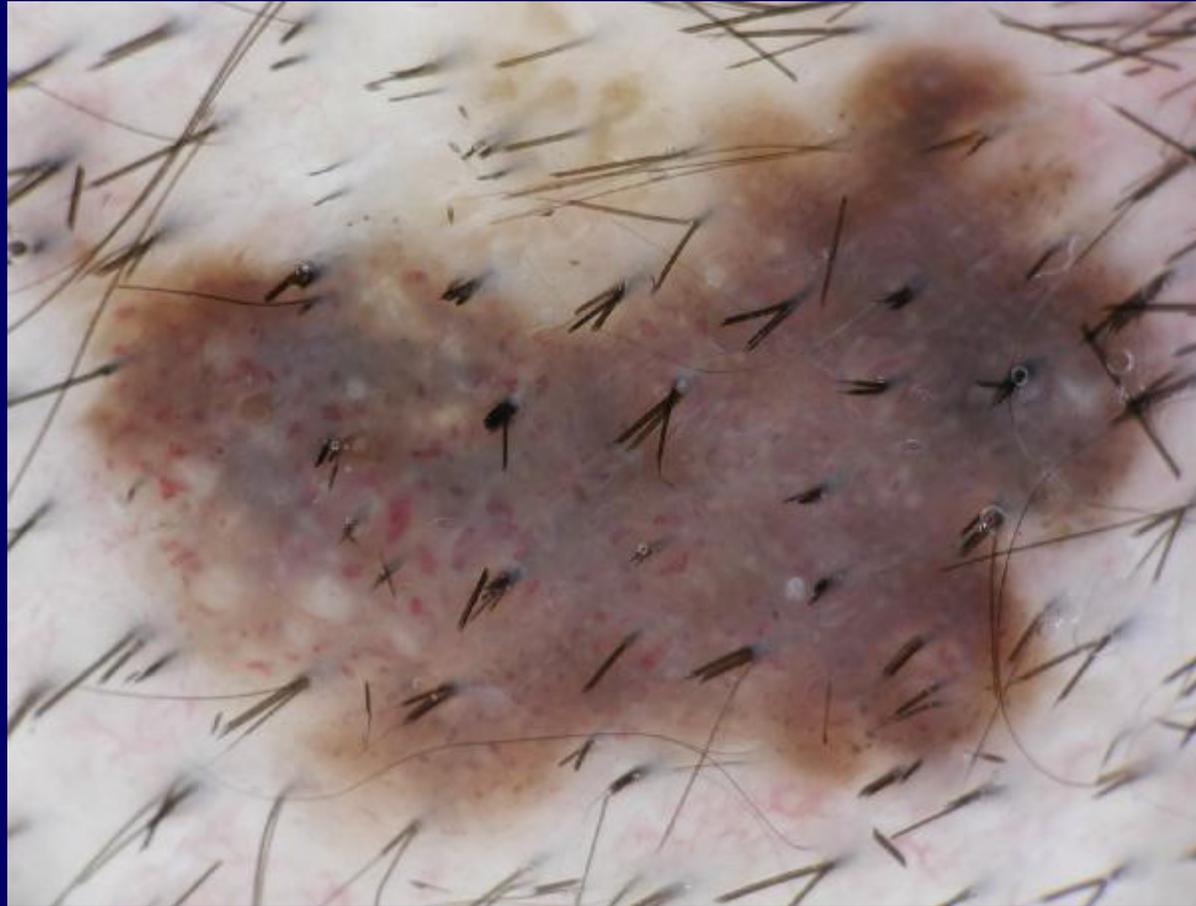
Fingerprint-like Structures

§ Seen in solar lentigines and early seborrheic keratosis

§ Tiny ridges running in parallel & resembling fingerprints



Hairpin blood vessels



Seborrheic keratosis

Moth-eaten Border

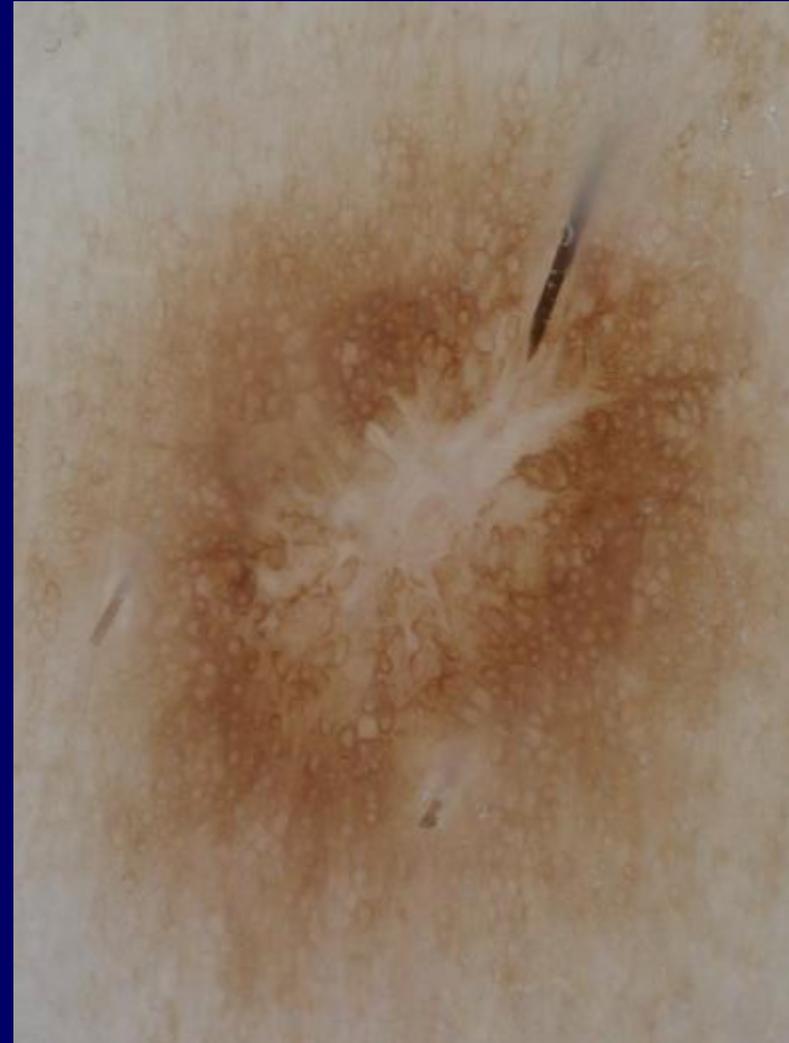
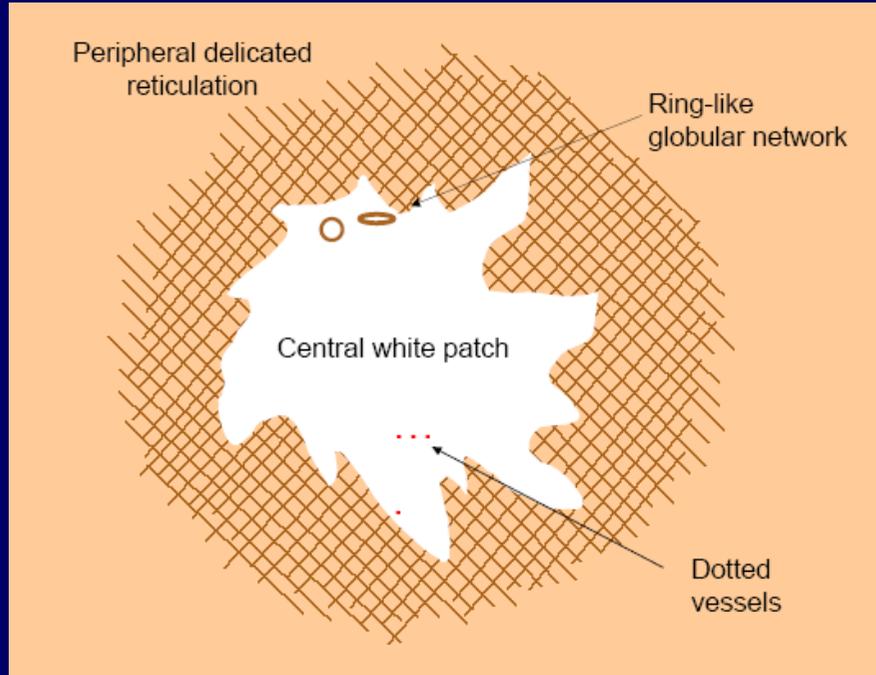
§ Resembles a moth-eaten garment

§ Characteristic of solar lentigines



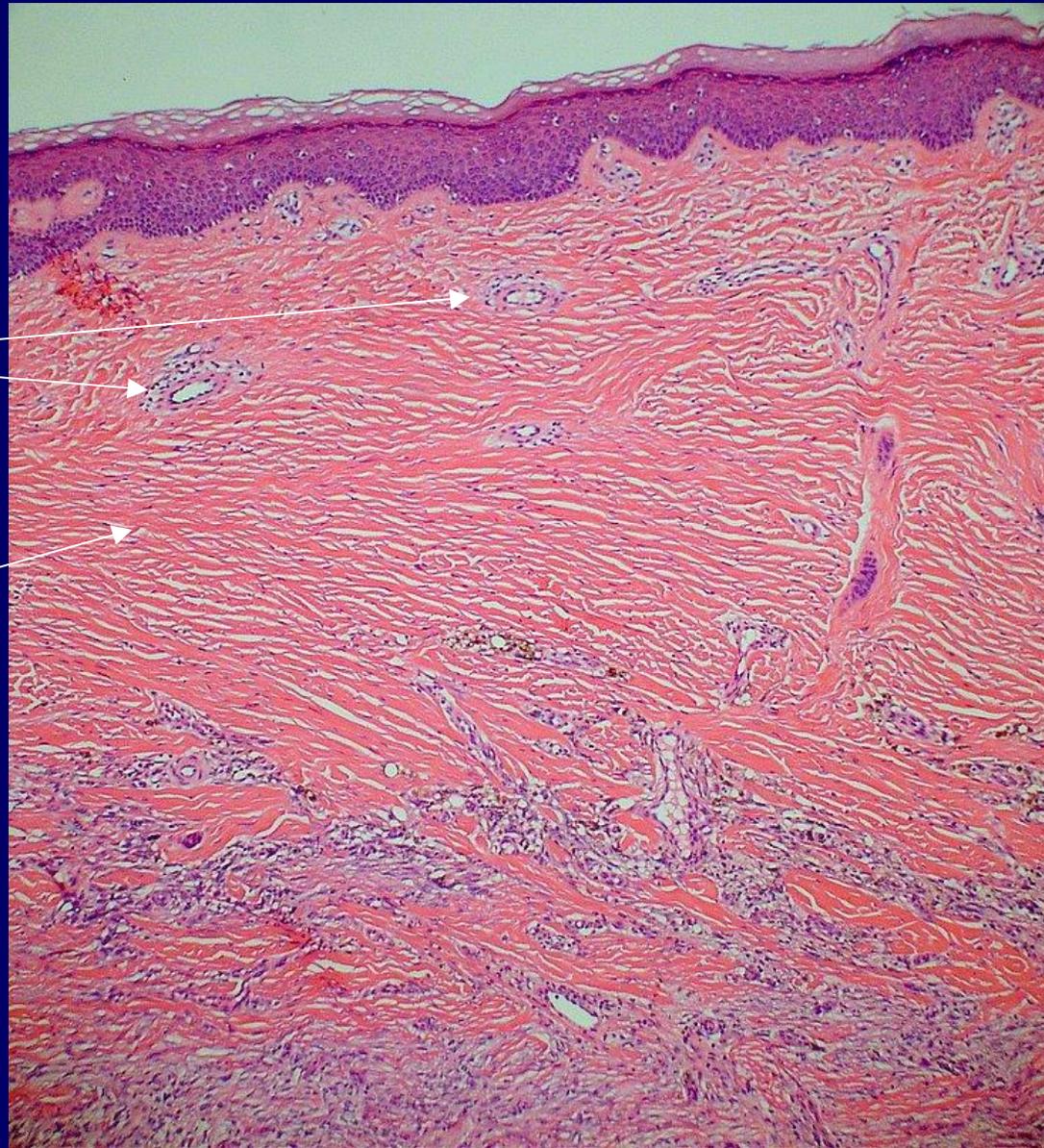
Dermatofibroma

Central white patch
Delicate peripheral network



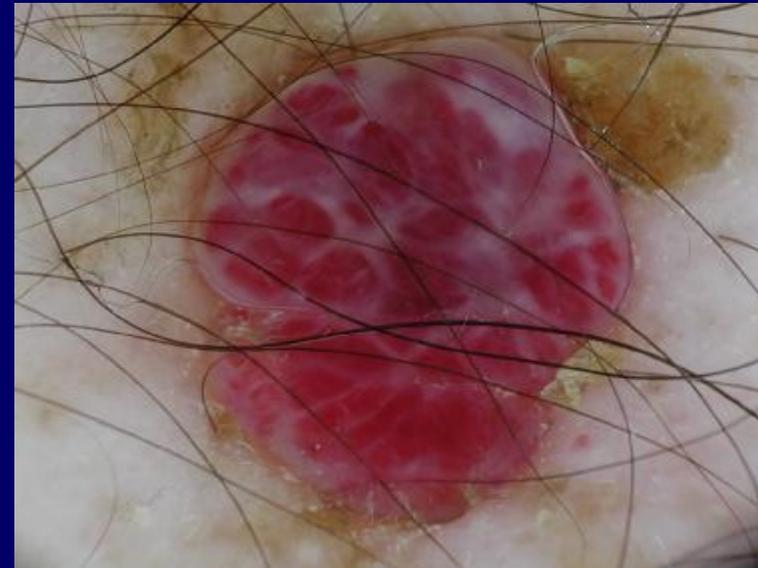
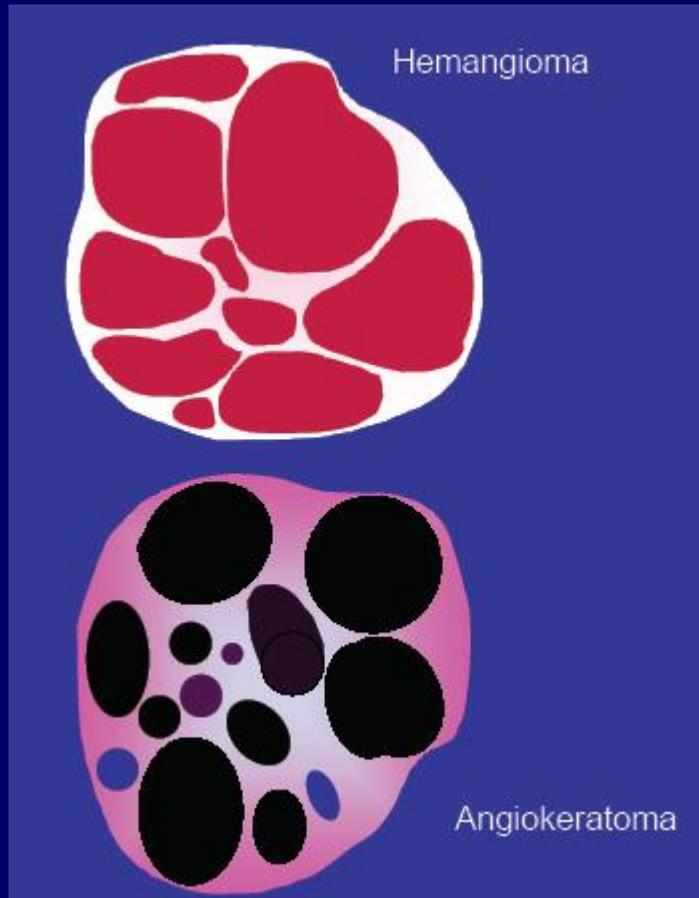
Many blood vessels within the dense collagen (pink central area as seen under polarized light)

Dense collagen bundles reflect light (shiny white areas & stellate white streaks)

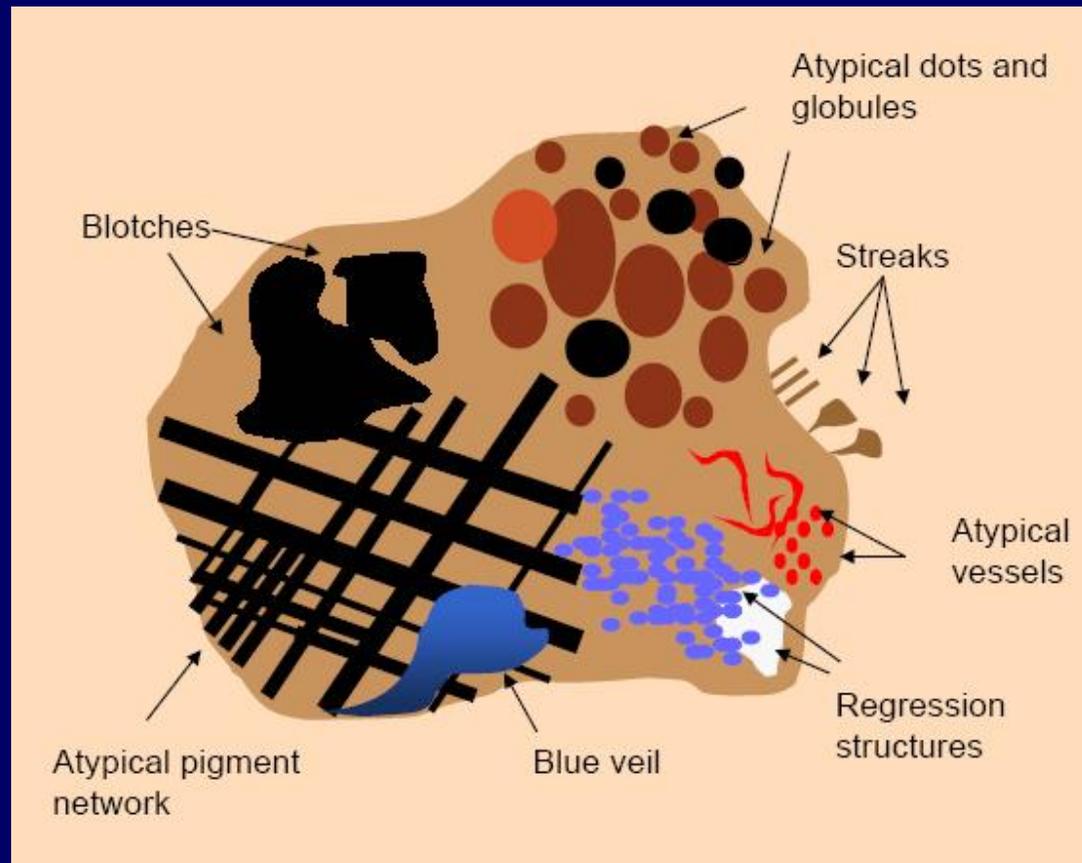


Vascular lesions

Red, blue-black
lacunae (red or black
clods)



Melanoma



Dermoscopy local features of Melanoma

- **1. Atypical network (includes branched-streaks)**
- **2. Streaks = pseudopods & radial streaming**
- **3. Atypical dots & globules**
- **4. Negative pigment network**
- **5. Blotch (off center)**
- **6. Blue-white veil / peppering over macular areas
(regression)**
- **7. Blue-white veil over raised areas**
- **8. Vascular structures**

Pigmented Network

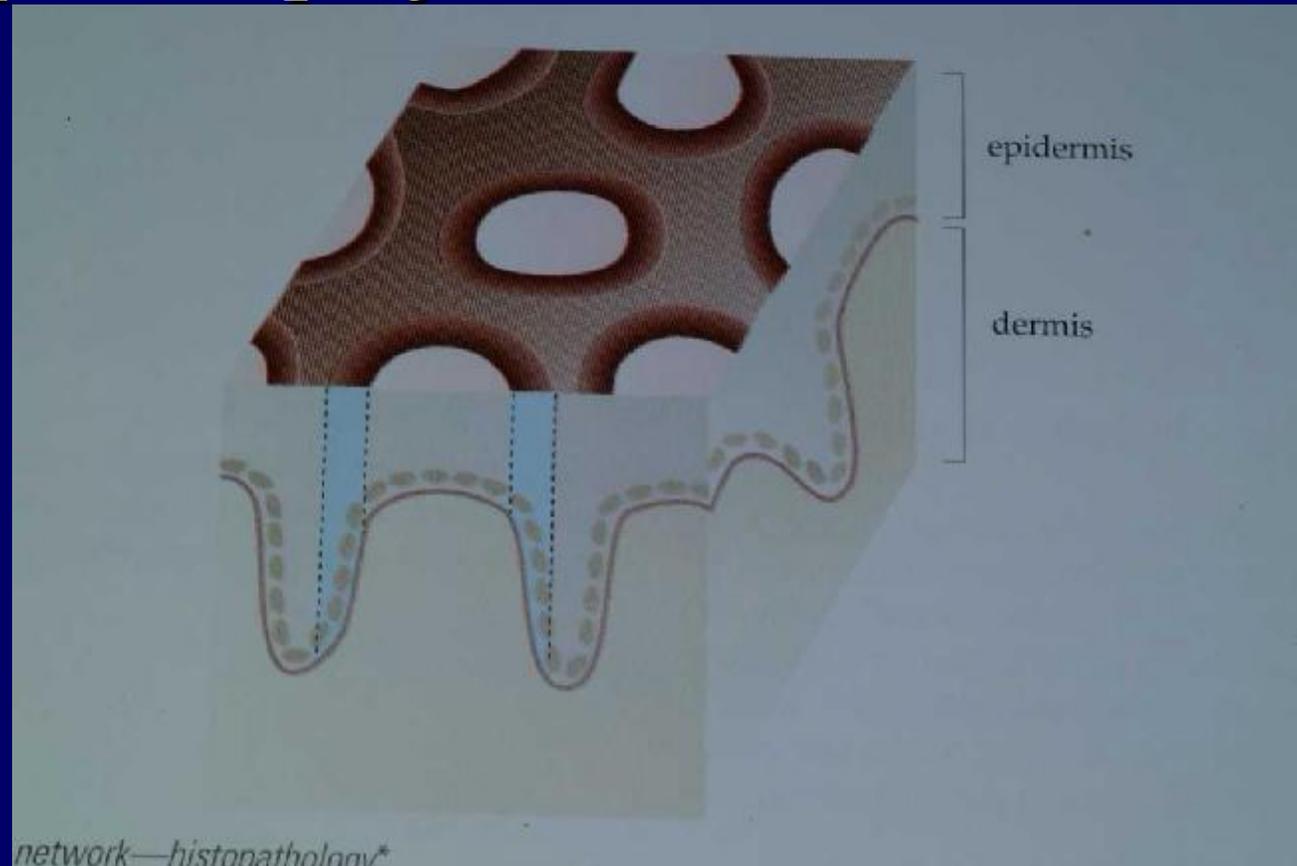
§ Grid-like structure

§ Composed of pigmented lines and hypopigmented holes



§ Lines represent melanin in the melanocytes or keratinocytes in the epidermal rete ridges.

§ Holes represent projections of the dermal papilla.



Network

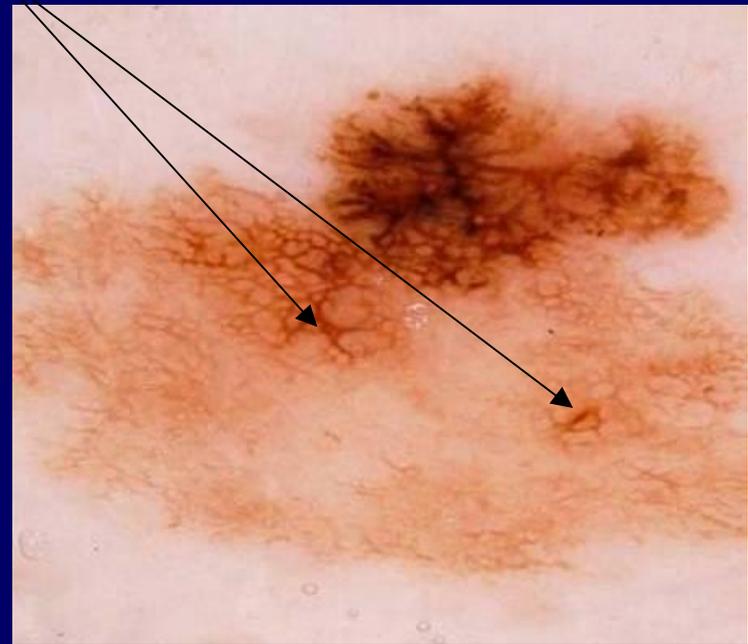
Benign Lesions

network is light to dark brown with uniform pigmented lines and hypopigmented holes.



Malignant Lesions

network with non-uniform color, broadened grids distributed asymmetrically & grids focally accentuated. Network broken-up forming branched streaks.



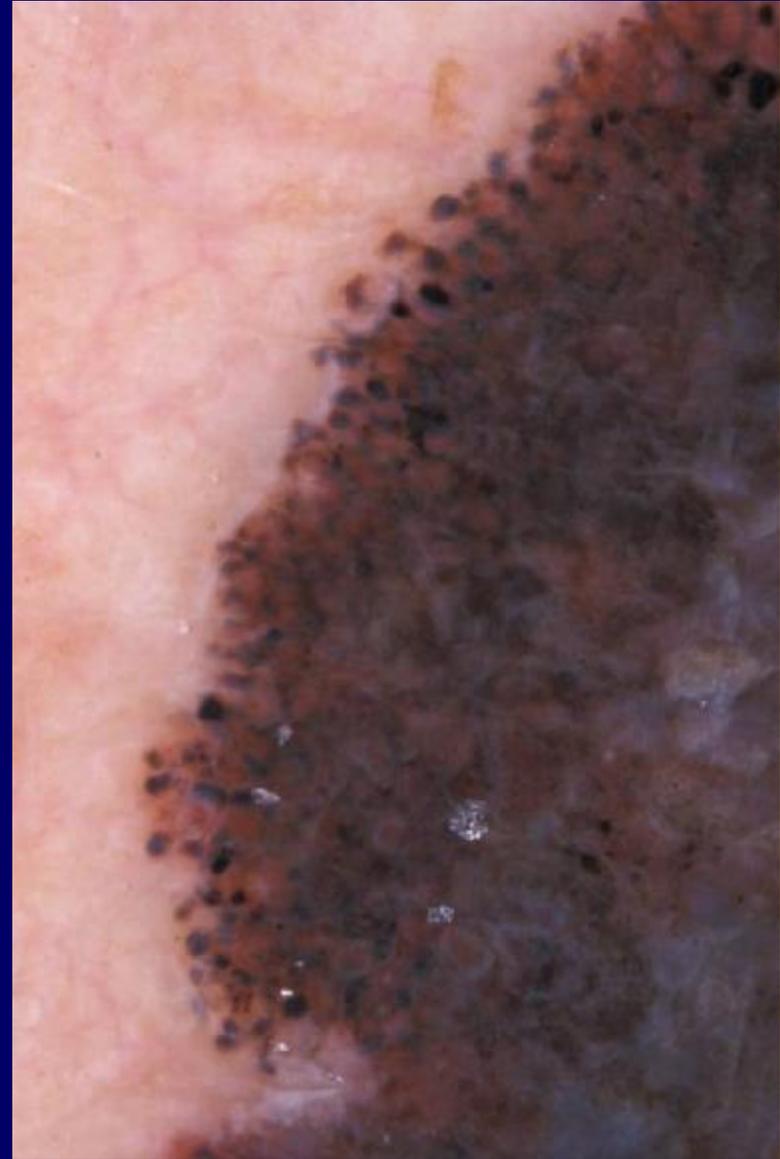
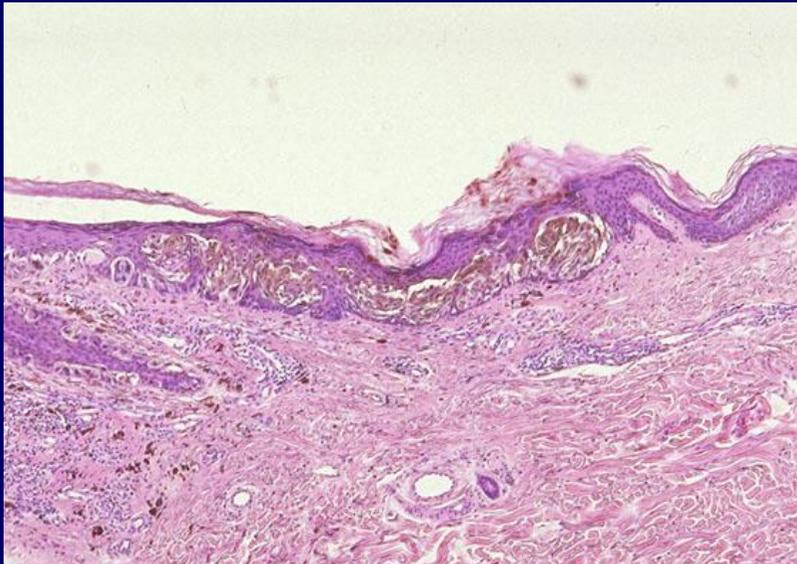
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Pseudopods / streaks

§ Finger-like projections at the periphery of a lesion with small knobs at the tip

§ Histologically represent confluent junctional nests of melanocytes



Radial Streaming / streaks

§ Linear extensions of pigment at the periphery

§ Histologically represents confluent junctional nests of melanocytes



Streaks = Radial Streaming, & Pseudopods

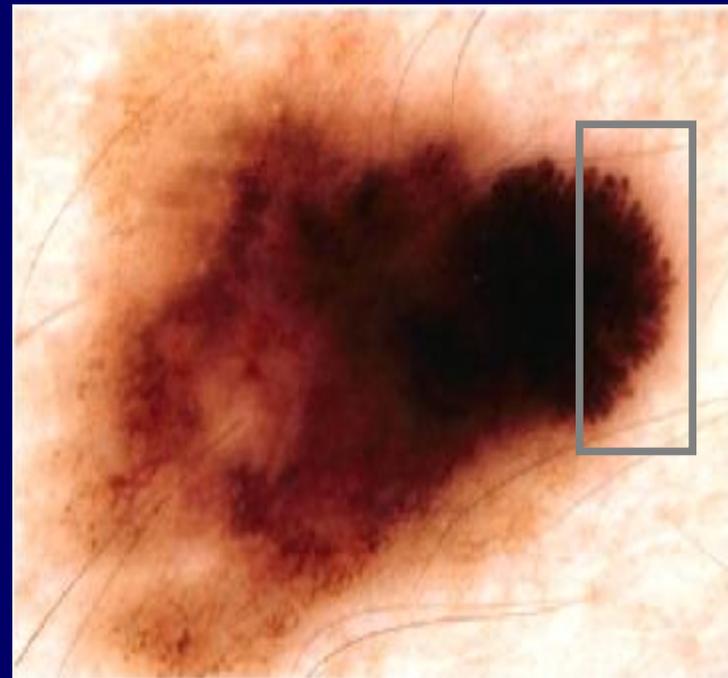
Benign Lesions

Streaks tend to be symmetrical and uniform at the periphery.

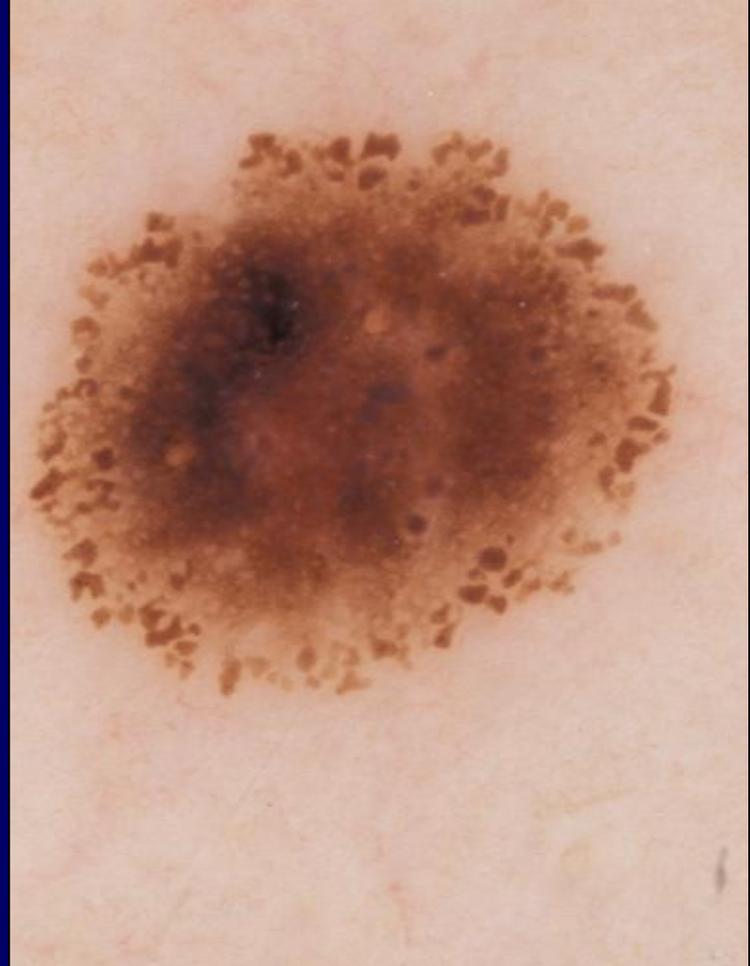
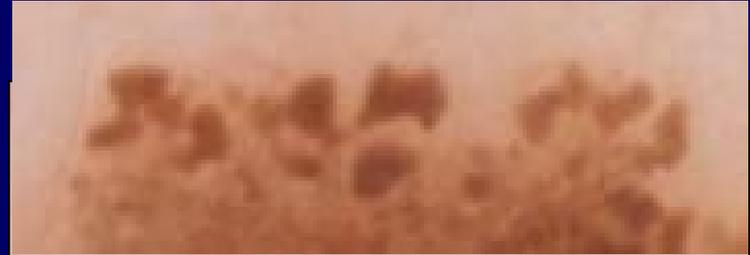
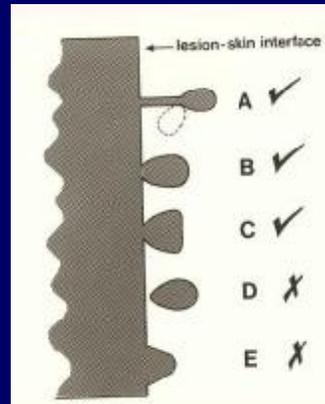


Malignant Lesions

Streaks tend to be focal and asymmetric at the periphery.

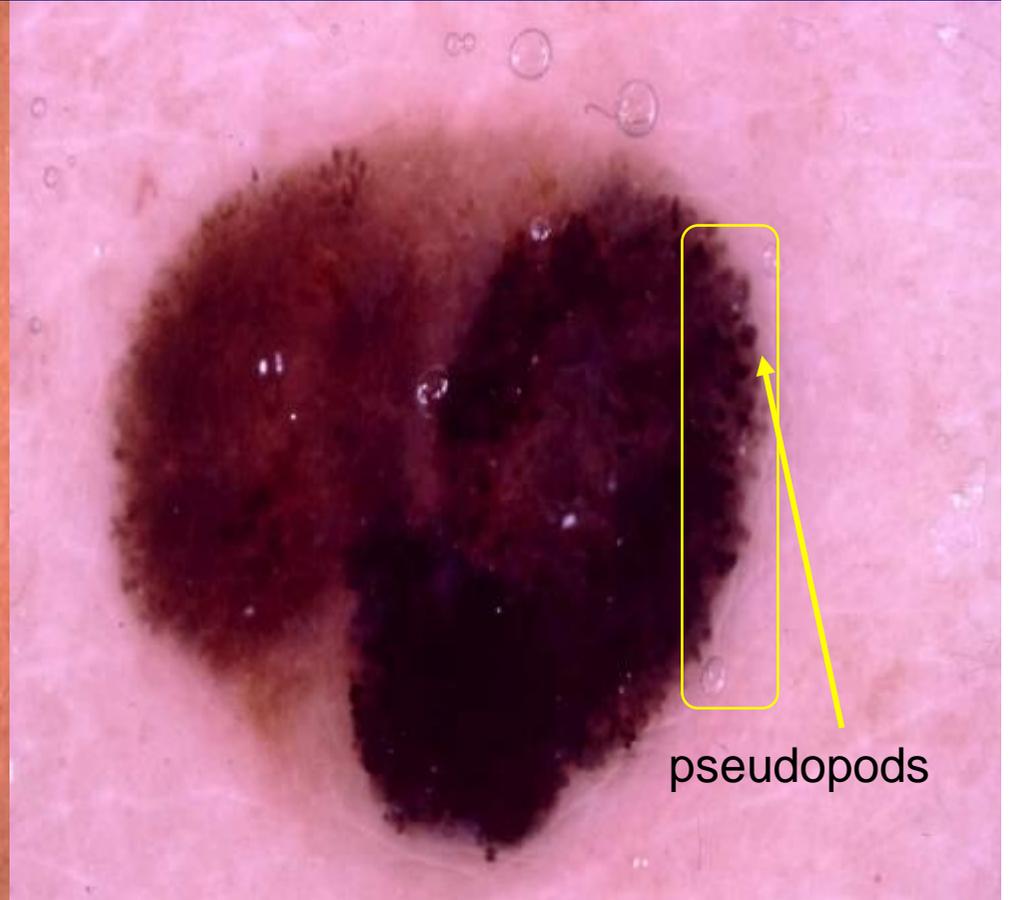


Pseudopods



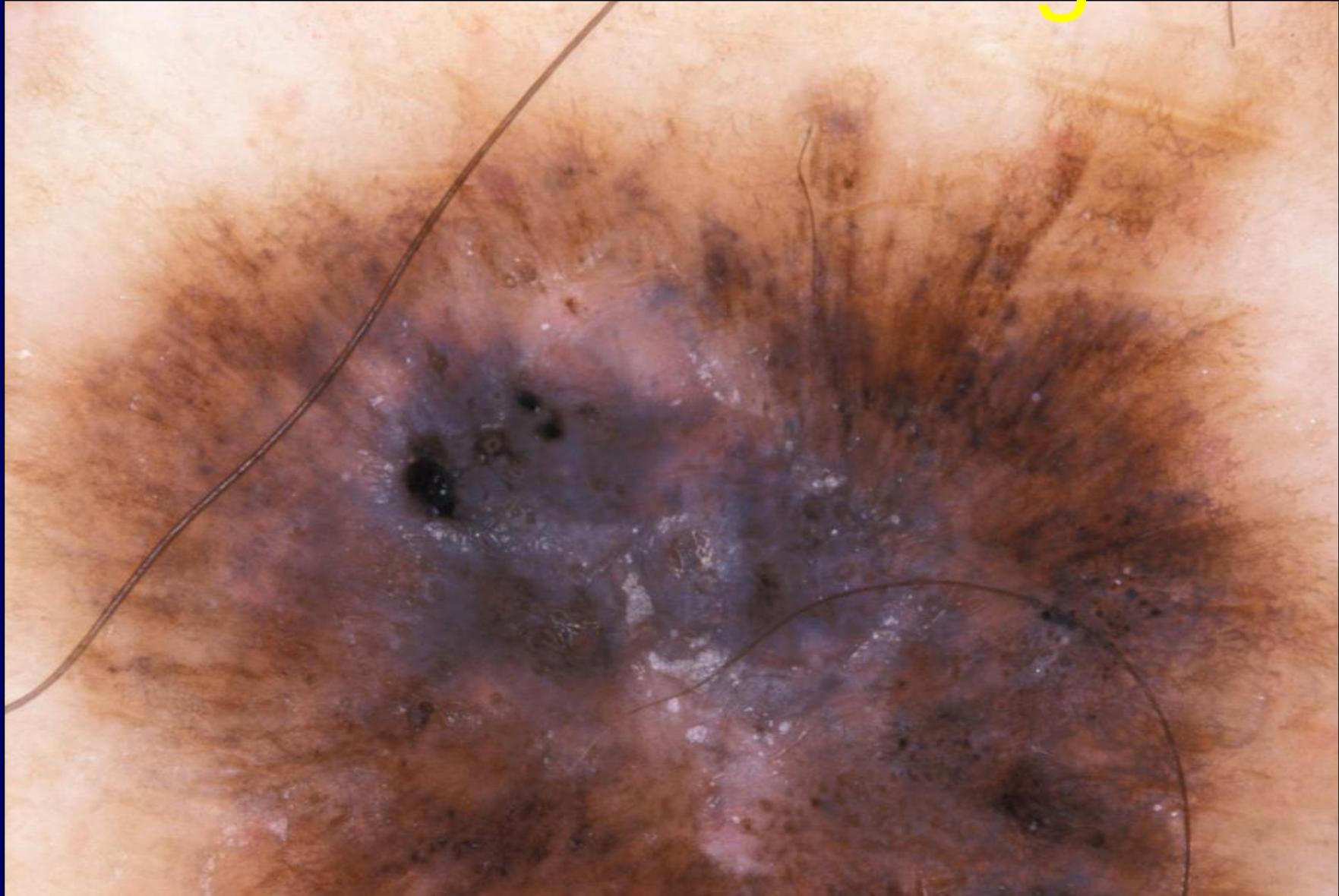


Symmetrical pseudopods



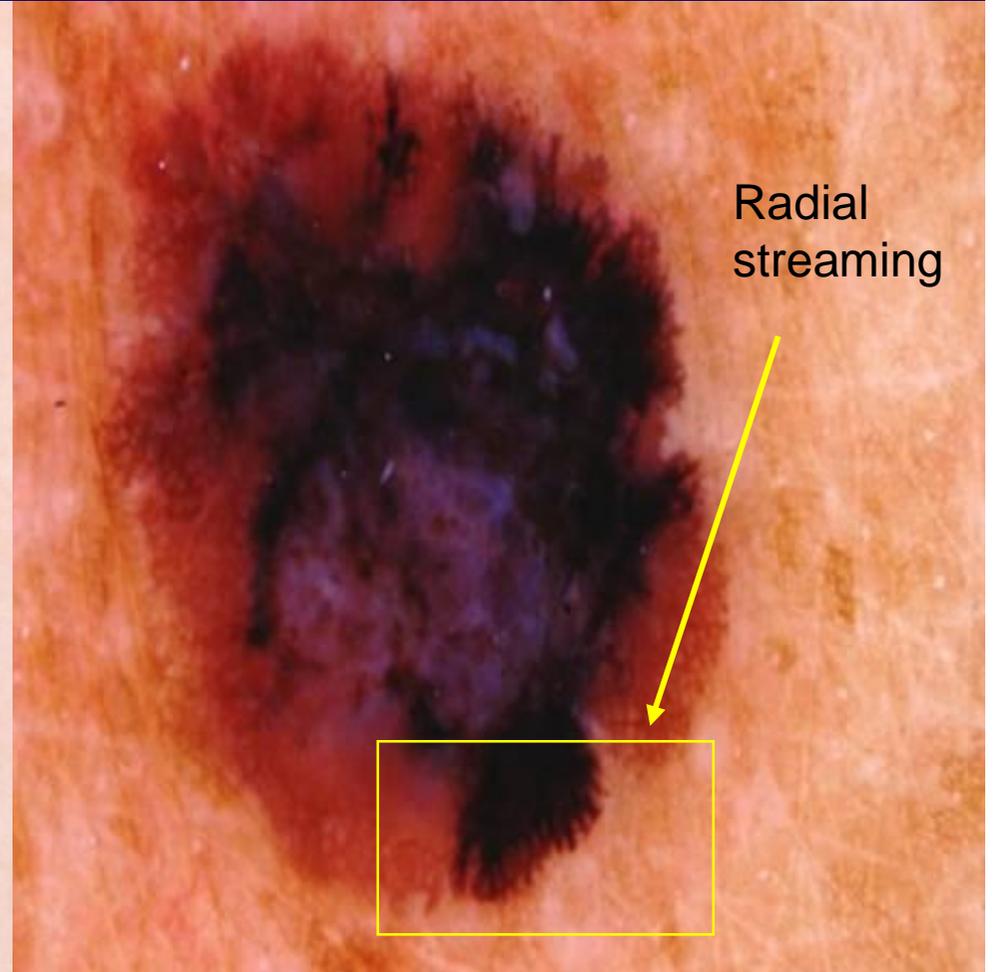
Focal pseudopods

Radial streaming





symmetrical radial streaming



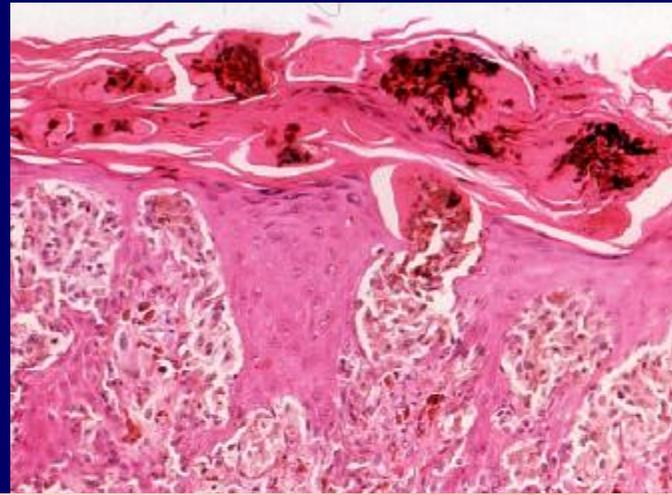
Focal radial streaming

Dermoscopy local features of Melanoma

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- **3. Atypical dots & globules**
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(regression)**
- **7. Blue-white veil over raised areas**
- **8. Vascular structures**

Black Dots

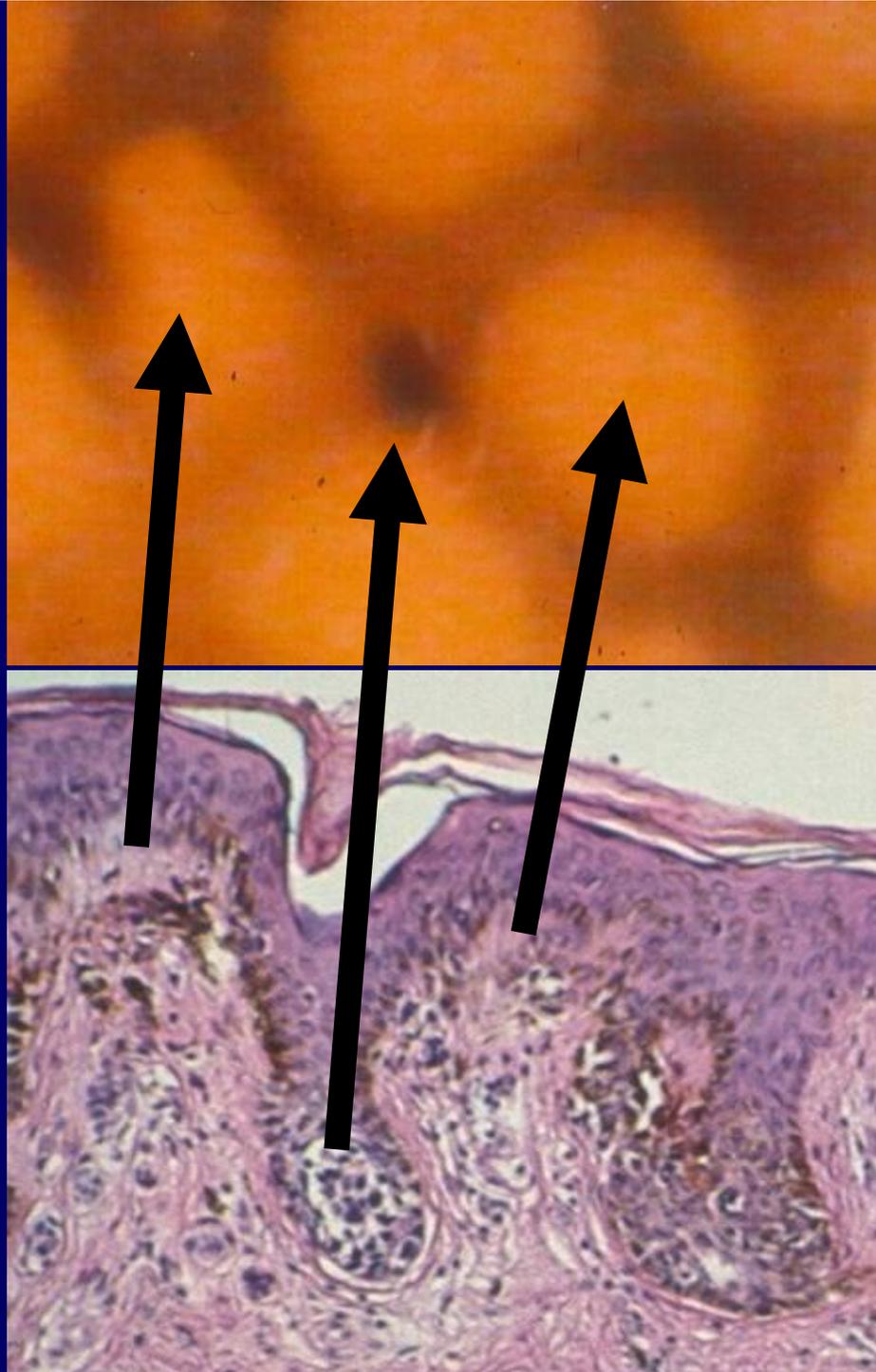
Represent
melanin
accumulation in
the stratum
corneum. They
are <0.1 mm in
diameter



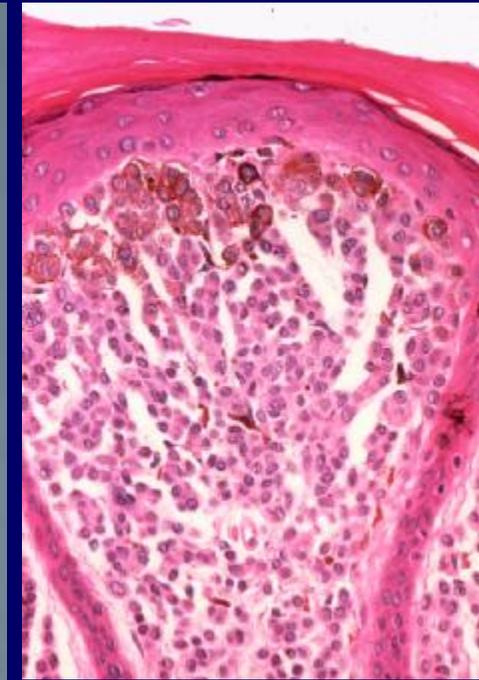
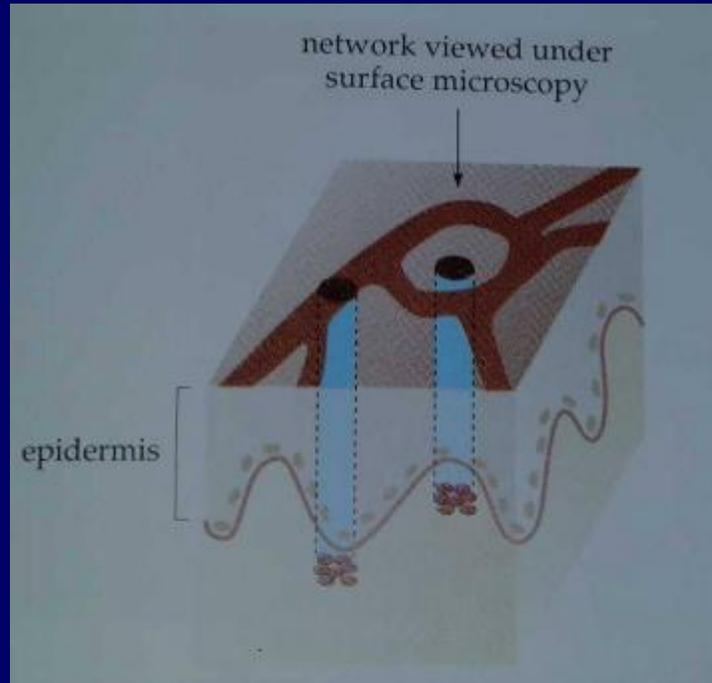
Brown Dots

Represent
pigment in the
lower
epidermis or
epidermal-
dermal
junction.

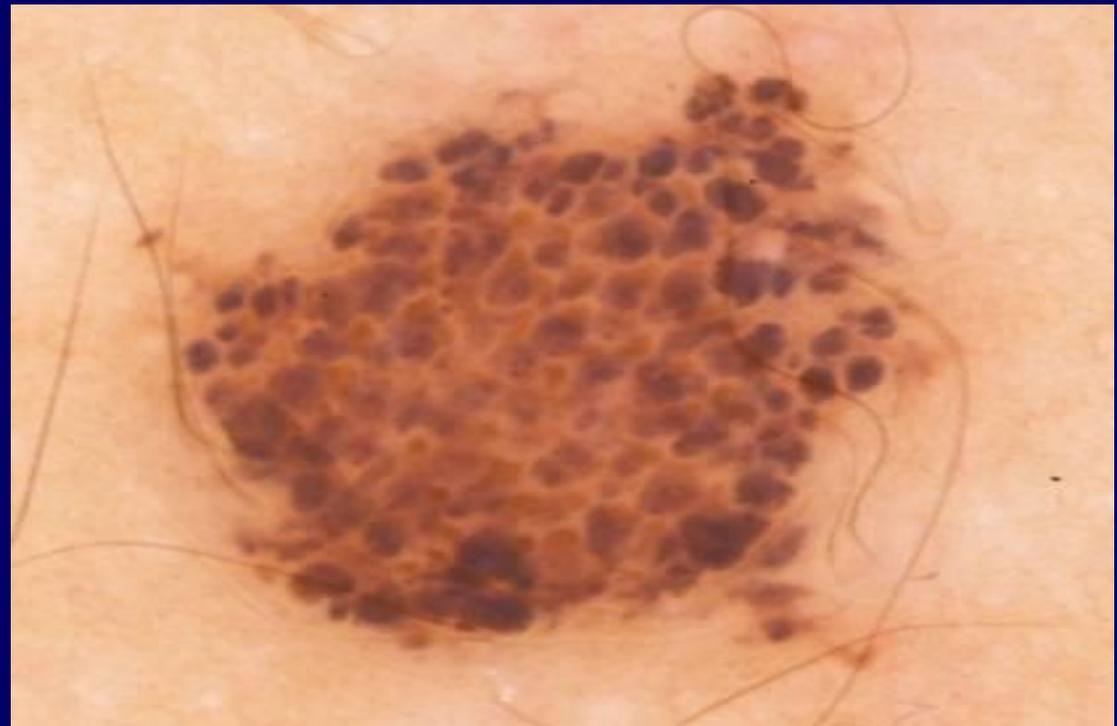




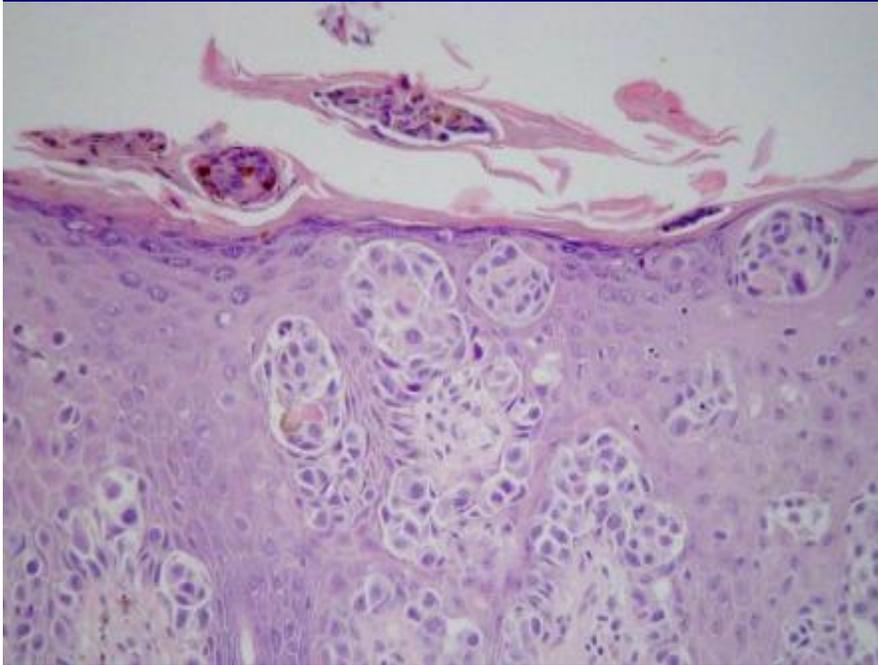
Globules



§ Represent nests of melanocytes at the epidermal-dermal junction or in the papillary dermis



dots and globules



Dots

Benign Lesions

dots are centrally located or situated on the pigmented network lines.



Malignant Lesions

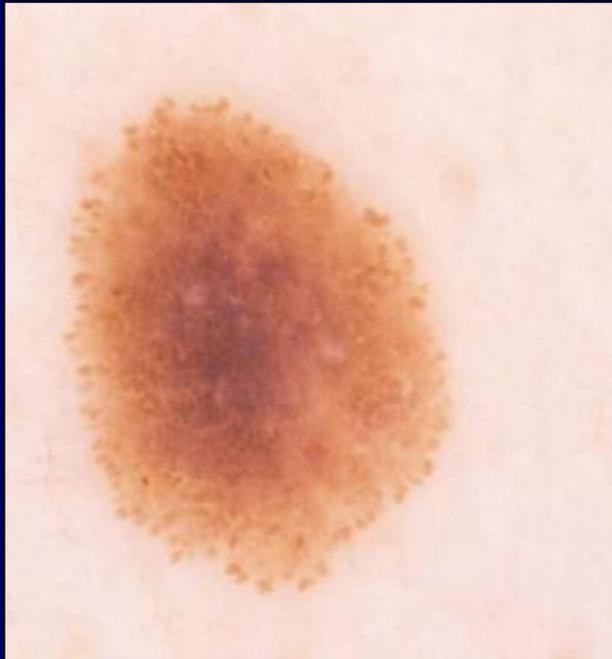
dots are distributed asymmetrically and/or focally located at the periphery.



Globules

Benign Lesions

Globules of uniform size, shape and color.
Symmetrically distributed throughout the lesion, at periphery, or centrally



Malignant Lesions

Globules are asymmetrically distributed, often aggregated focally. When reddish in color, highly suggestive of melanoma.

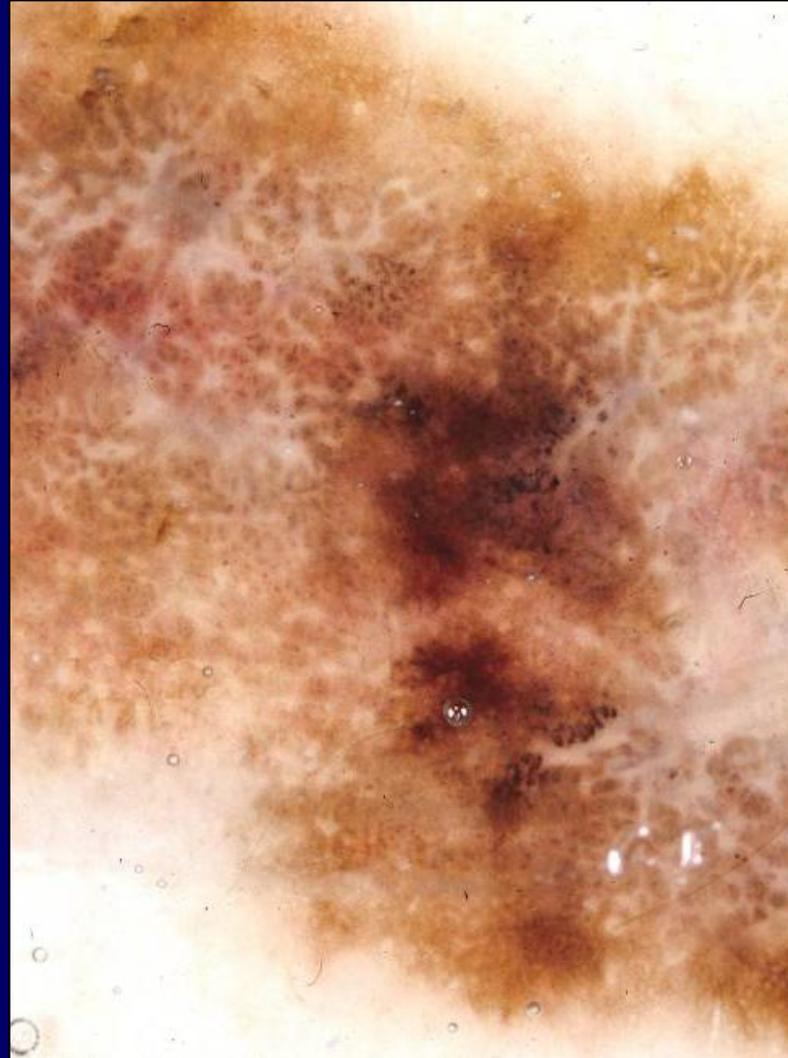


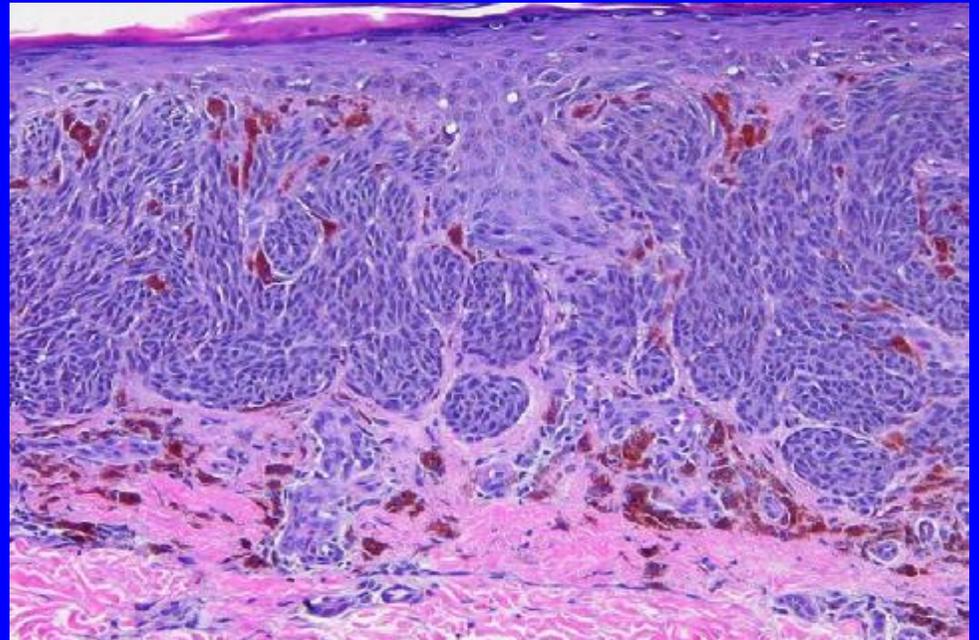
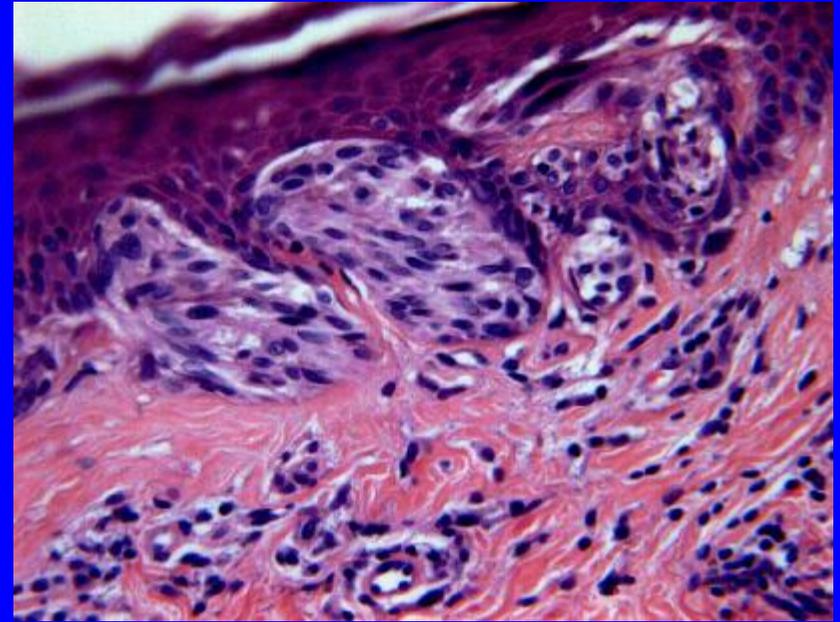
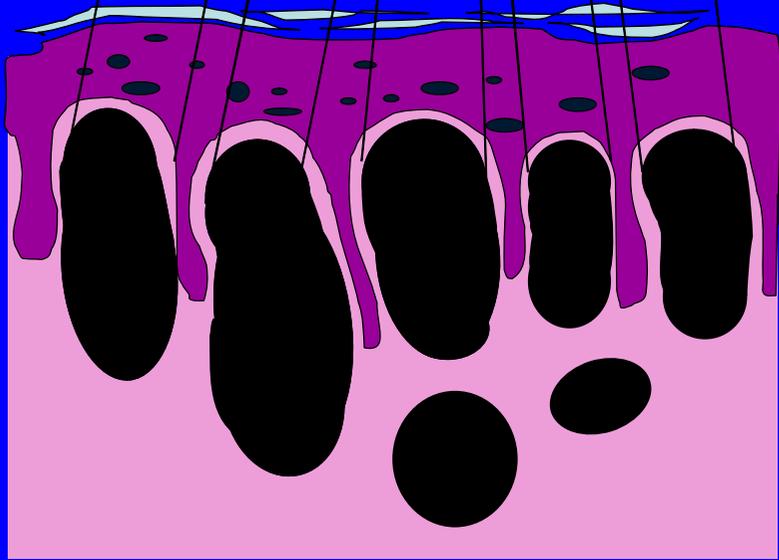
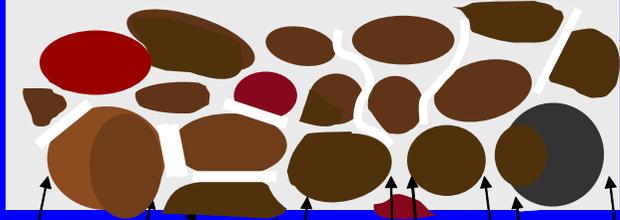
Dermoscopy local features of Melanoma

- **1. Atypical network (includes branched-streaks)**
- **2. Streaks = pseudopods & radial streaming**
- **3. Atypical dots & globules**
- **4. Negative pigment network**
- **5. Blotch (off center)**
- **6. Blue-white veil / peppering over macular areas
(regression)**
- **7. Blue-white veil over raised areas**
- **8. Vascular structures**

Negative or reverse Pigmented Network

§ the lines of the “net” are broadened and lighter in color compared to the holes of the network





Reverse (negative) pigment network

Benign Lesions

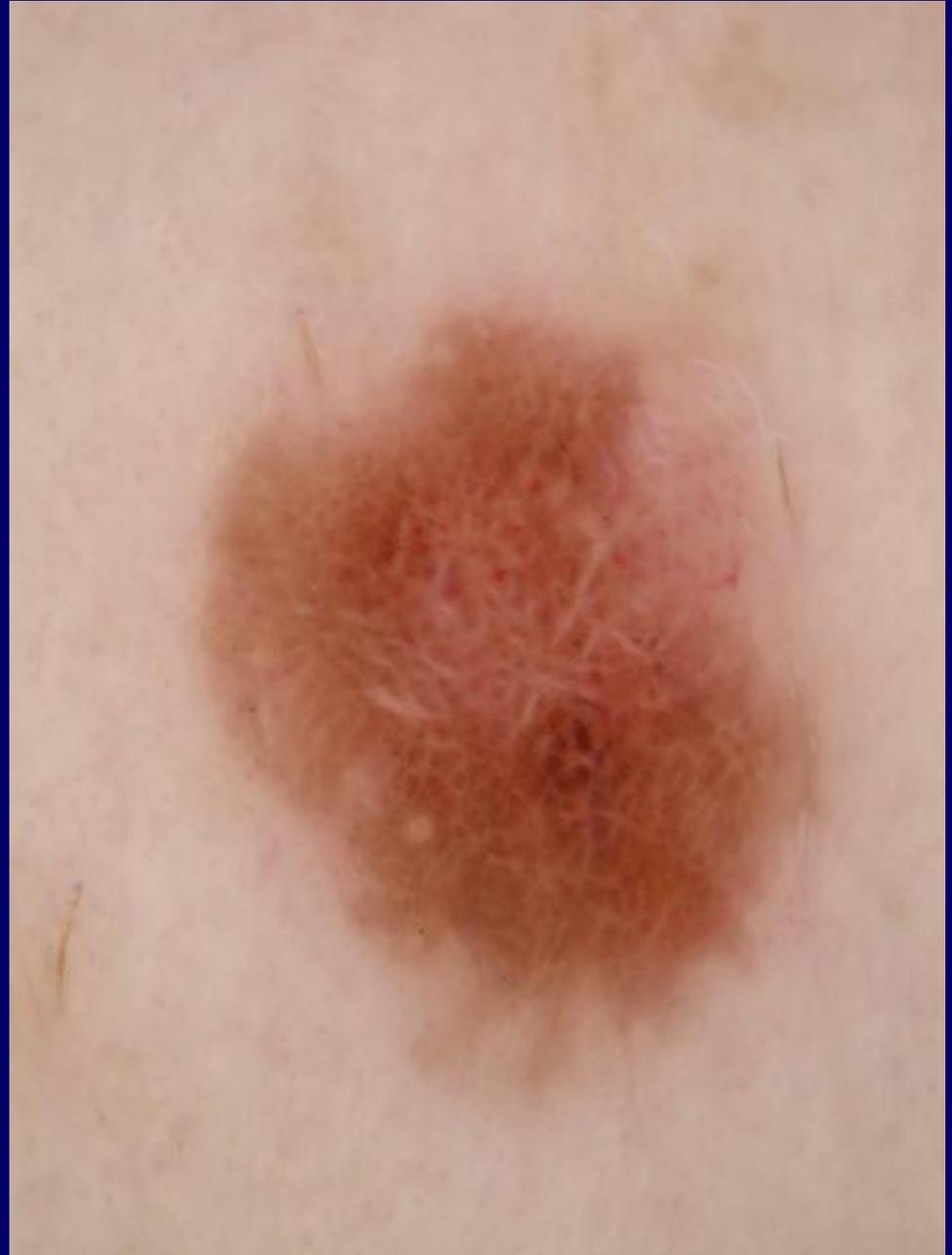
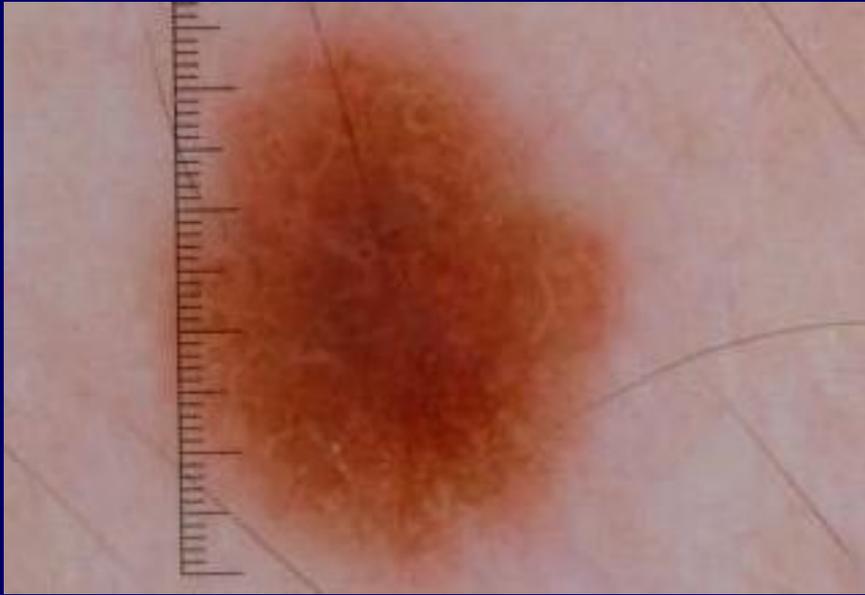
Usually homogeneous (ordered). Rare in benign lesions (except Spitz)



Malignant Lesions

asymmetrically located & disordered.



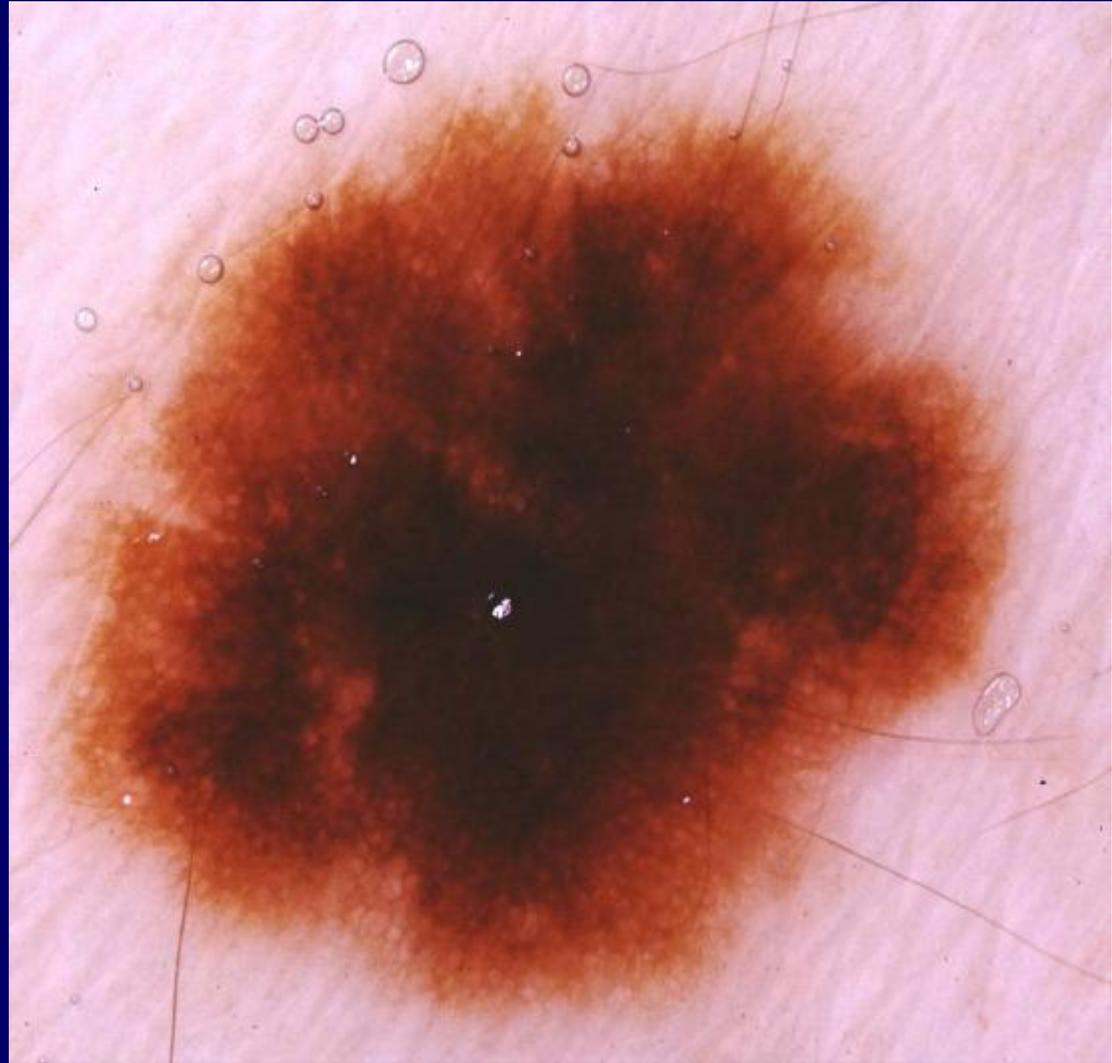


Dermoscopy local features of Melanoma

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Blotch (black)

Represents large concentrations of melanin throughout the epidermis, dermis, or both.



Blotch

Benign Lesions

hyperpigmentation is either centrally located or extends almost to the periphery of the lesion.



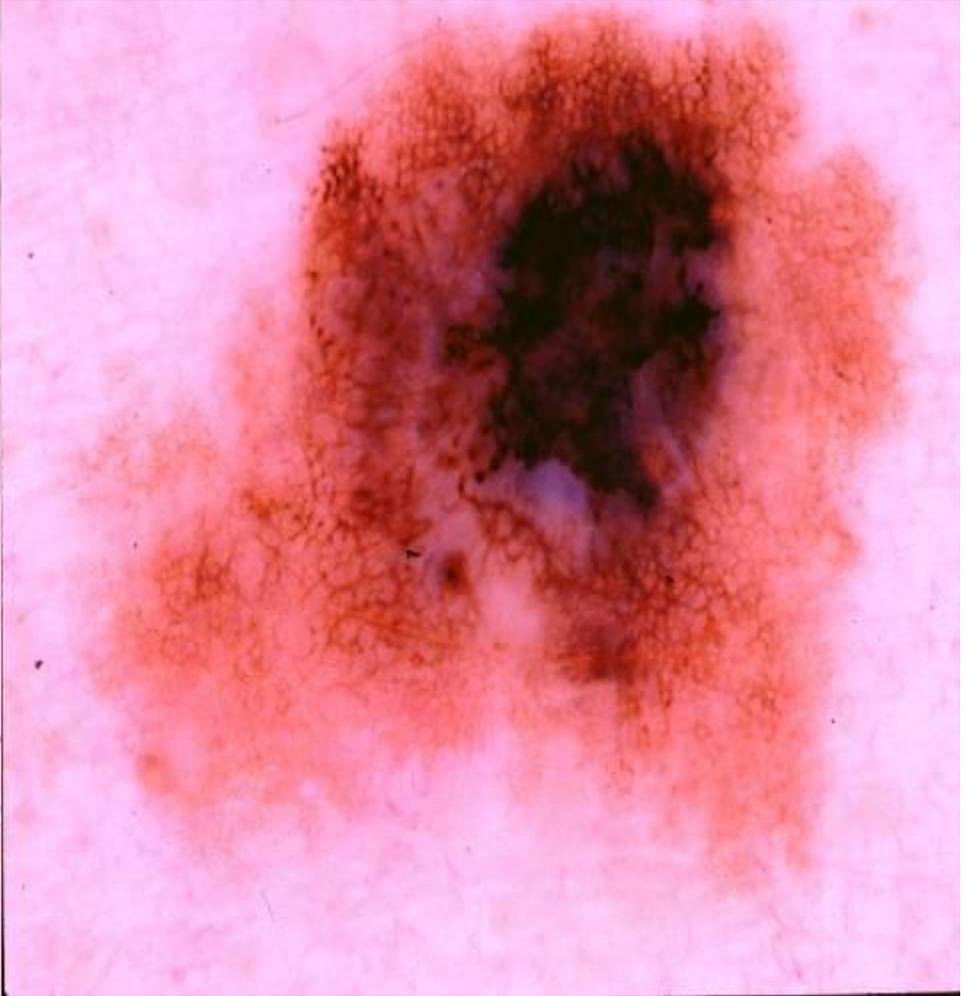
Malignant Lesions

hyperpigmented area(s) is at periphery & asymmetrically located.





Central blotch



Asymmetric Blotch

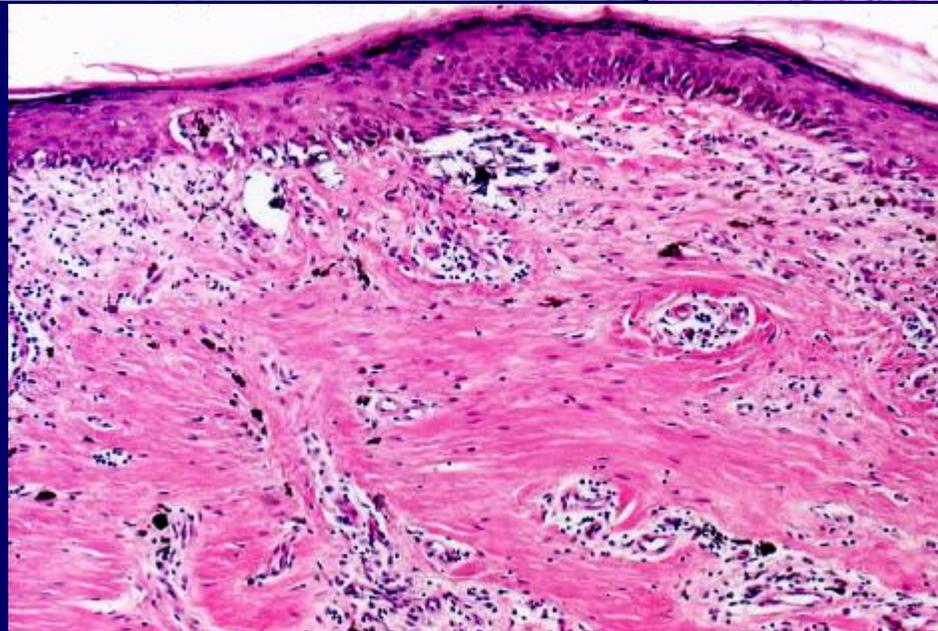
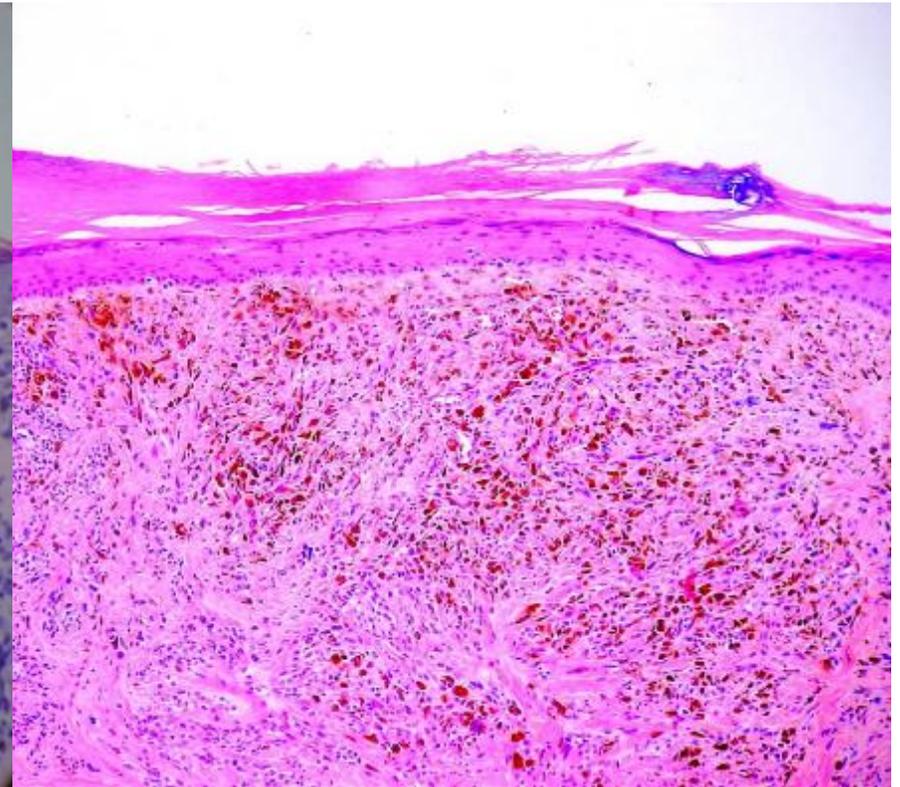
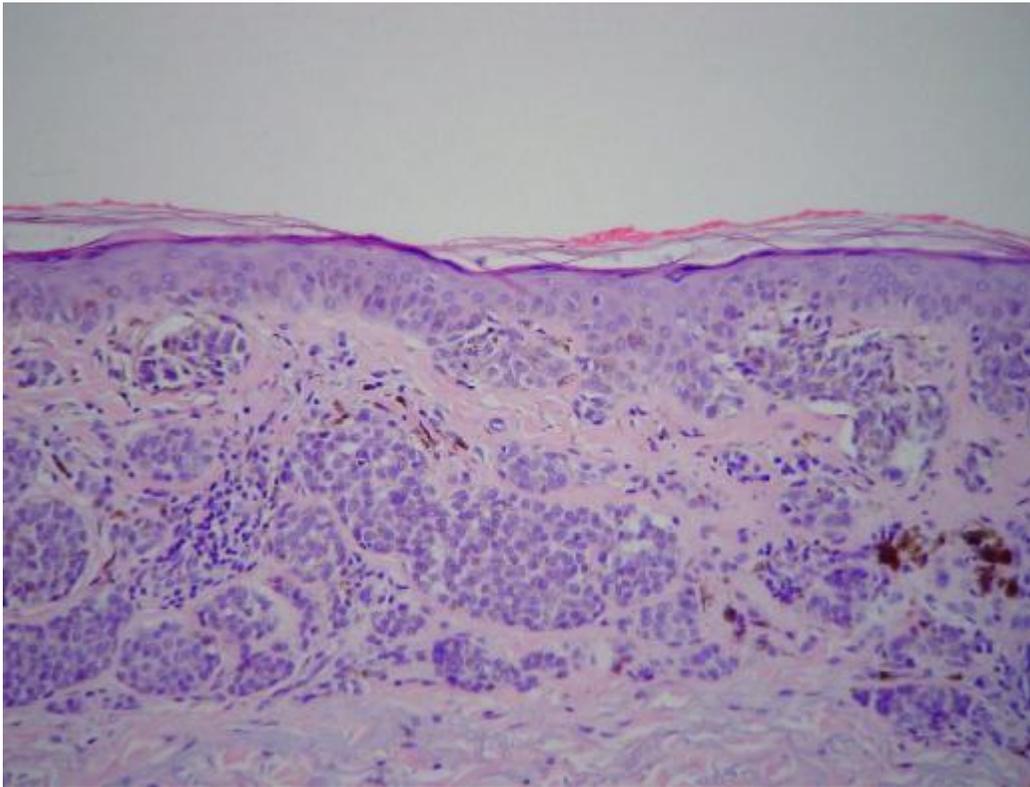
Dermoscopy local features of Melanoma

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**gray blue granules
(peppering) or
blue-white veil
over macular
areas**

- **fine melanin particles in melanophages or free in the dermis**





Papillary dermis thickened by fibrosis – note a few melanophages

Blue-white veil overlying macular areas = Regression structures (peppering)

Benign Lesions

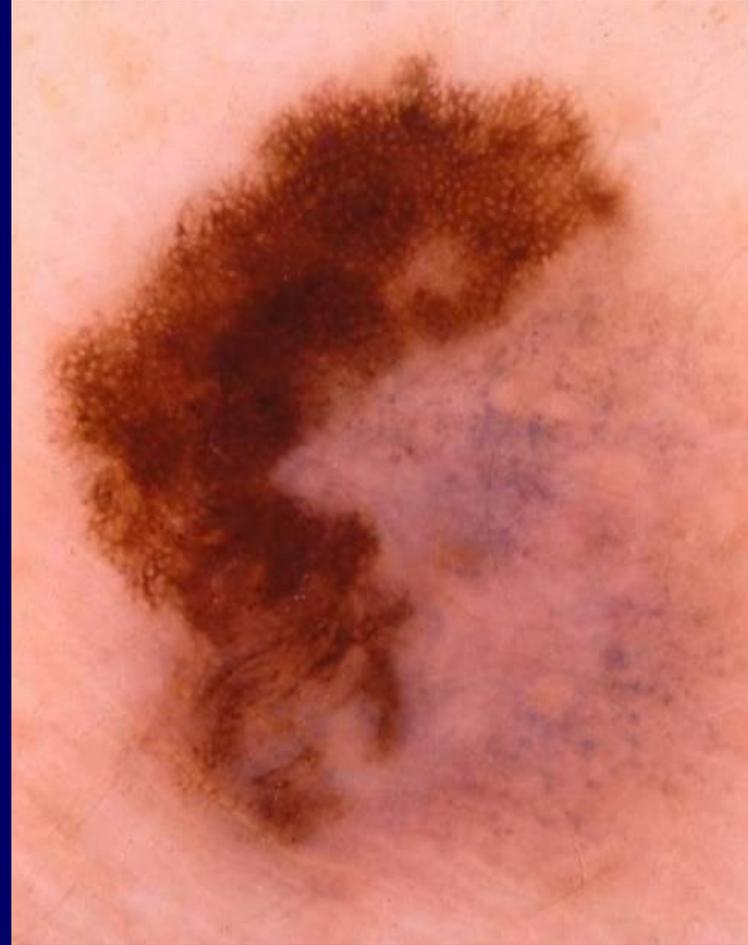
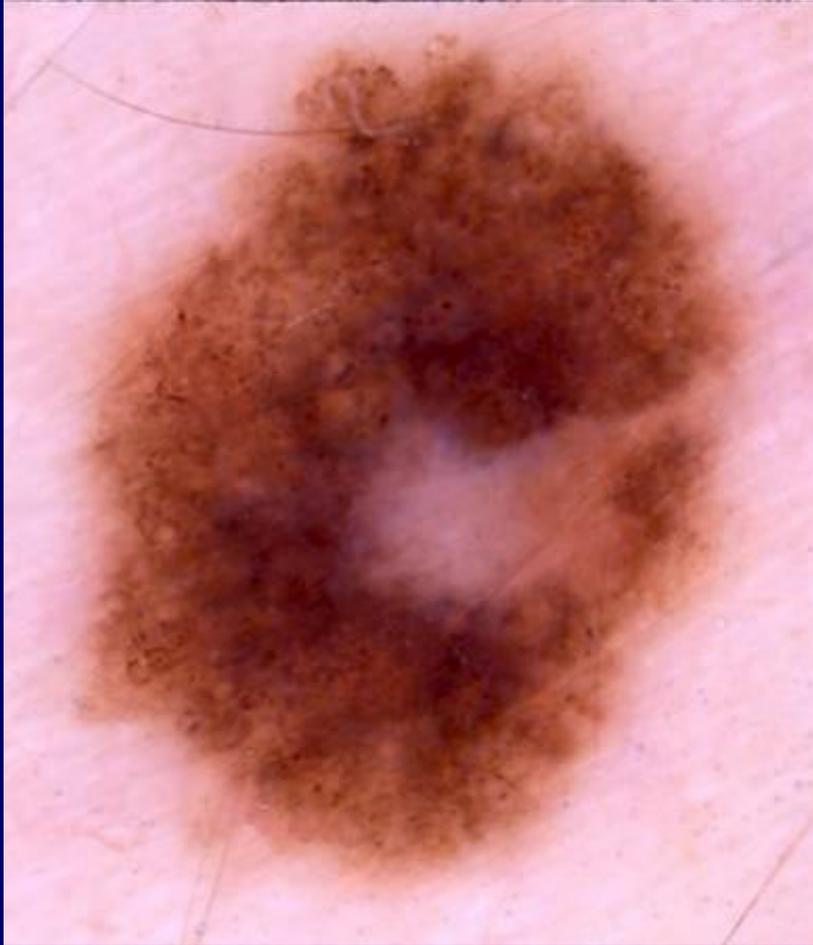
Any lesion undergoing regression. Usually symmetrically located & <10% of lesion.



Malignant Lesions

asymmetrically located & involves >50% of lesion





Dermoscopy local features of Melanoma

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- **8. Vascular structures**

Blue-white veil over raised areas

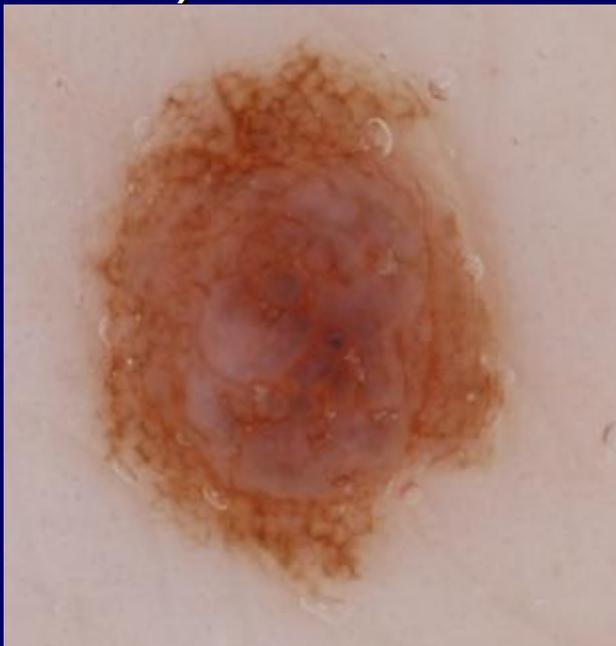
- Represent pigmented melanocytes in the dermis & orthokeratosis



Blue – White Veil overlying raised areas =
deep melanocytes & orthokeratosis

Benign Lesions

centrally located or
homogeneous
throughout (blue
nevus)



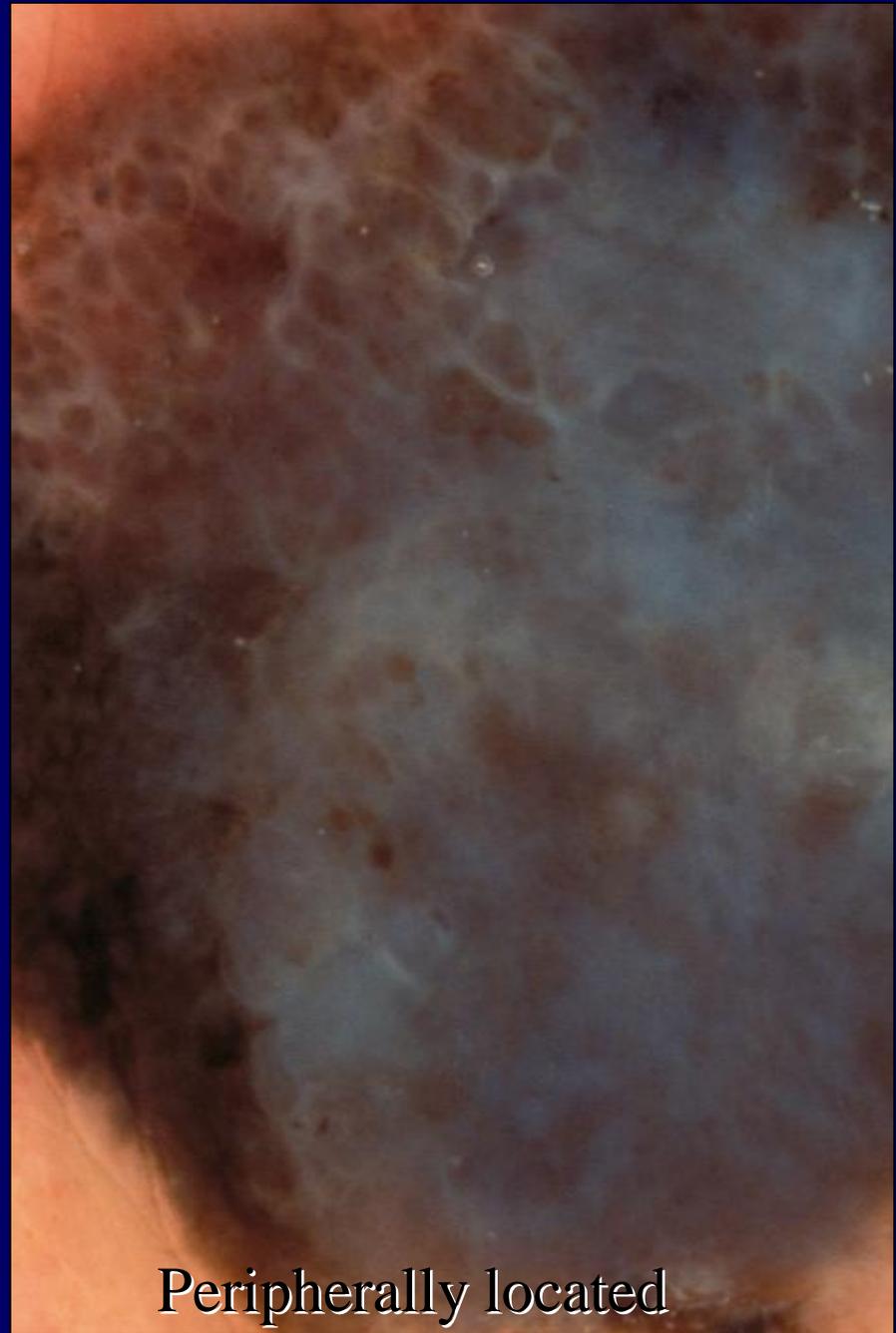
Malignant Lesions

asymmetrically located
or diffuse throughout the
lesion.

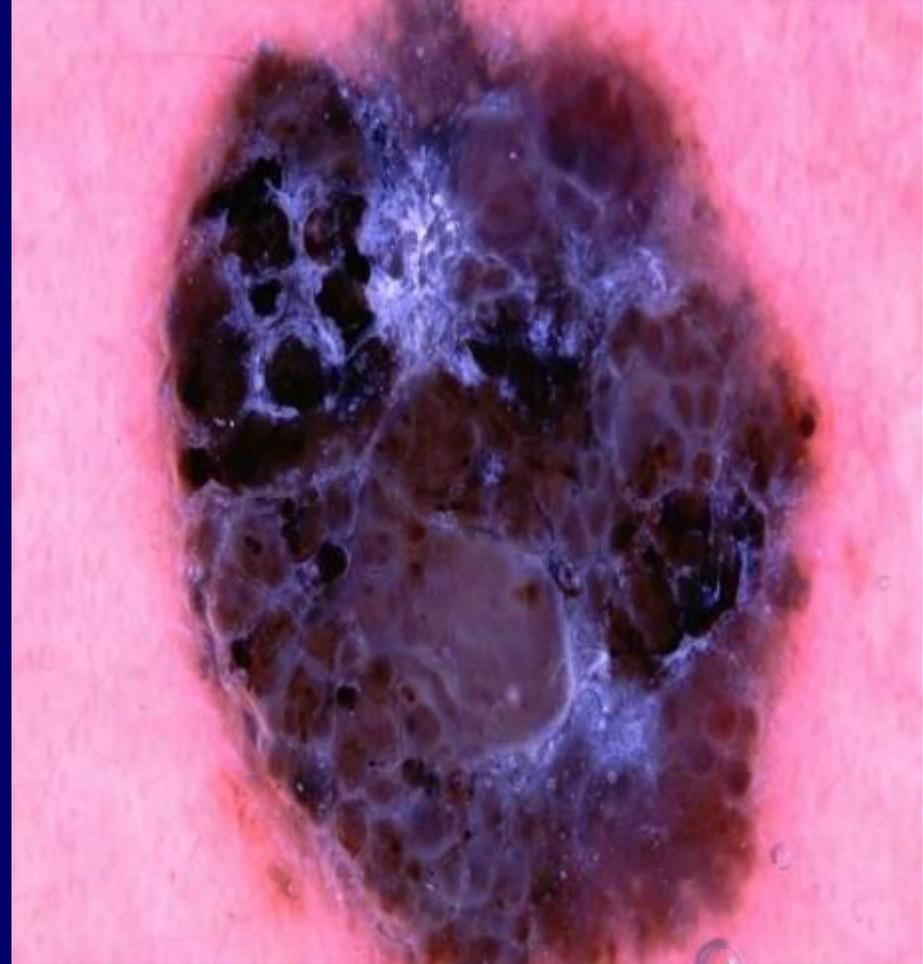




centrally located



Peripherally located



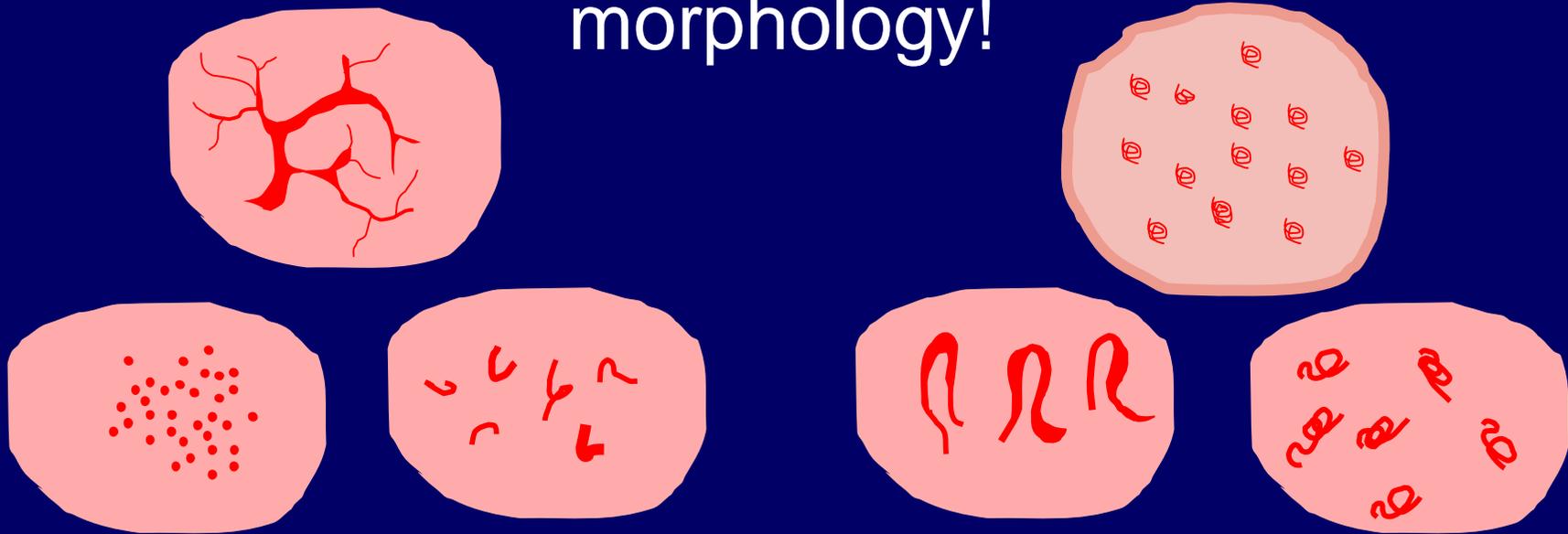
diffuse throughout the lesion (homogeneous vs heterogeneous)

Dermoscopy local features of Melanoma

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(regression)**
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To avoid missing a malignancy

Remember to look for blood vessels & their morphology!



However, be mindful of the amount of pressure being applied to skin
or
use polarized non-contact dermoscopy



Alcohol



Gel



Air



Delta 20®

Heine

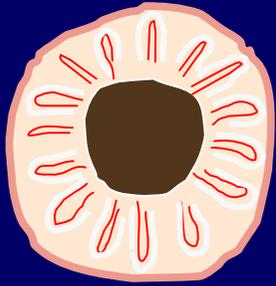


DermLite II Pro HR

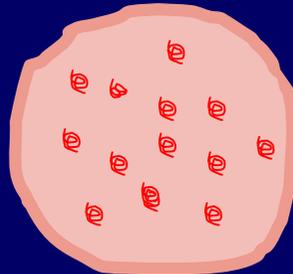
New: DermLite II PRO HR

3Gen

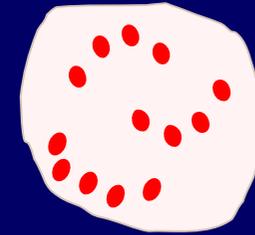
Types of vessels seen in various tumors



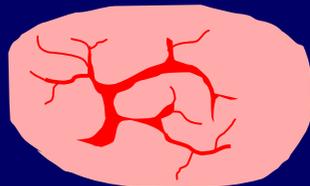
Hairpin –
keratinizing tumors



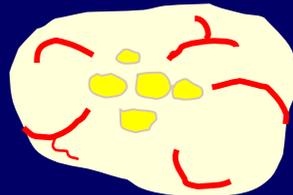
Glomerular – SCC



Dotted in
serpiginous
distribution - CCA



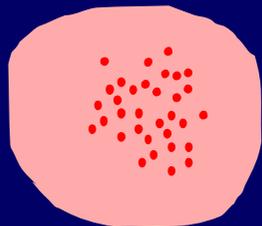
Arborizing – BCC



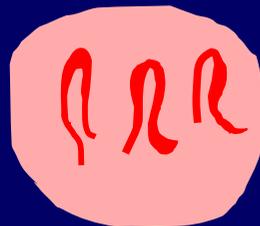
Crown – Seb
hyperplasia



Comma - IDN



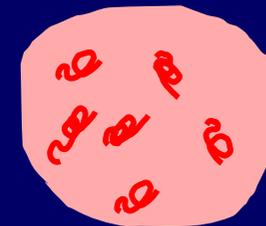
Dotted – MM &
SCC



Irregular hairpin -
MM



Linear &
polymorphous -
MM

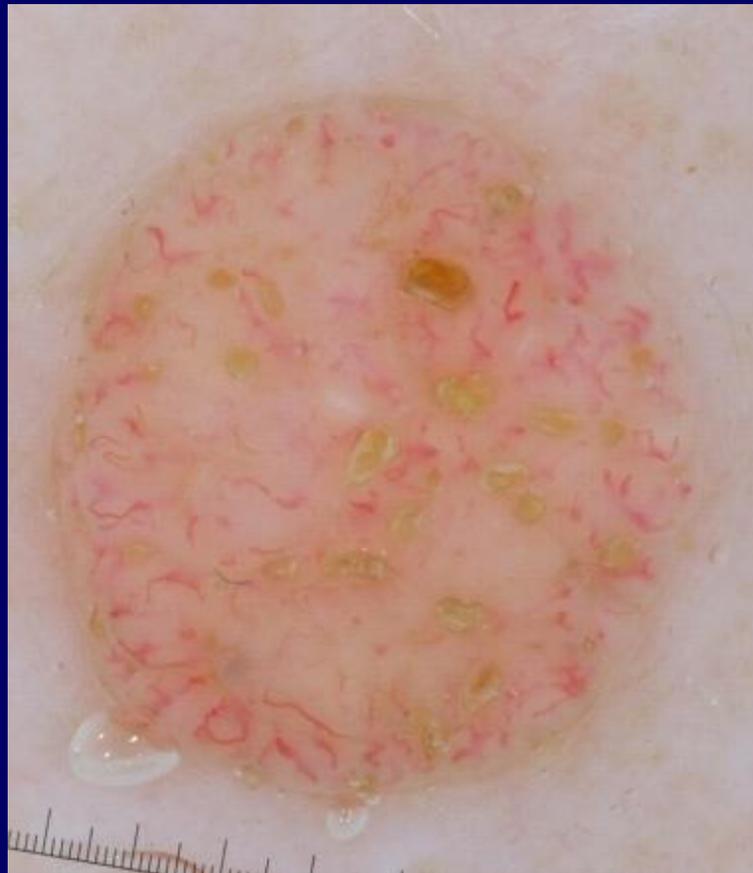


Corkscrew – MM
(mets)

Vascular structures

Benign Lesions

Comma vessels

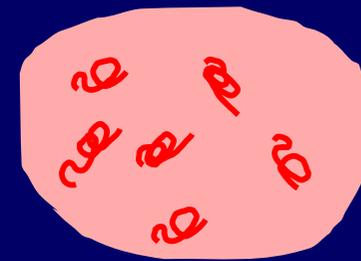
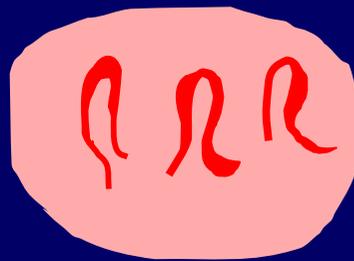
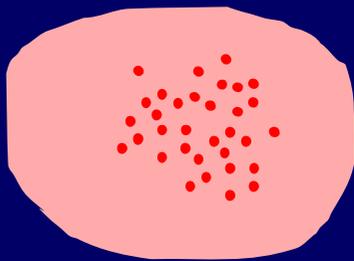
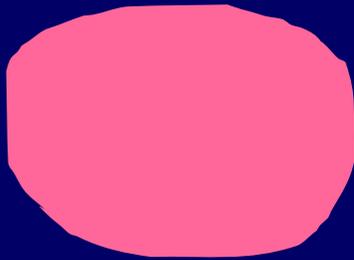
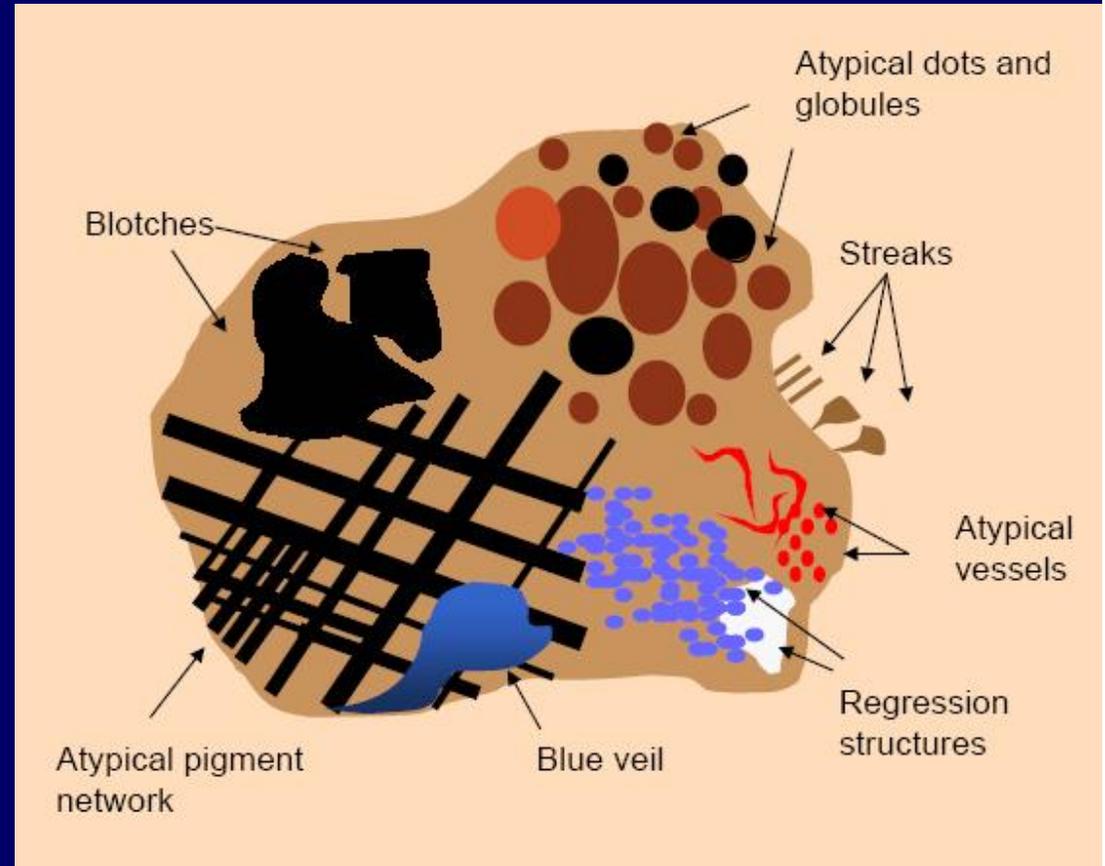


Malignant Lesions

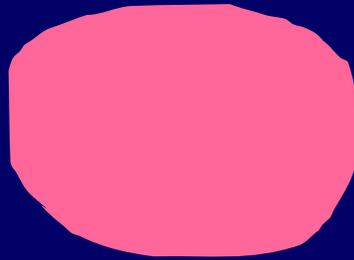
Dotted, globular, polymorphous, milky-red



Melanoma

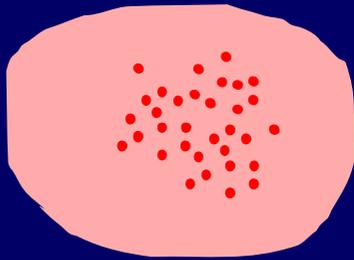


Milky red areas (pink veil)



Dotted & red globular vessels

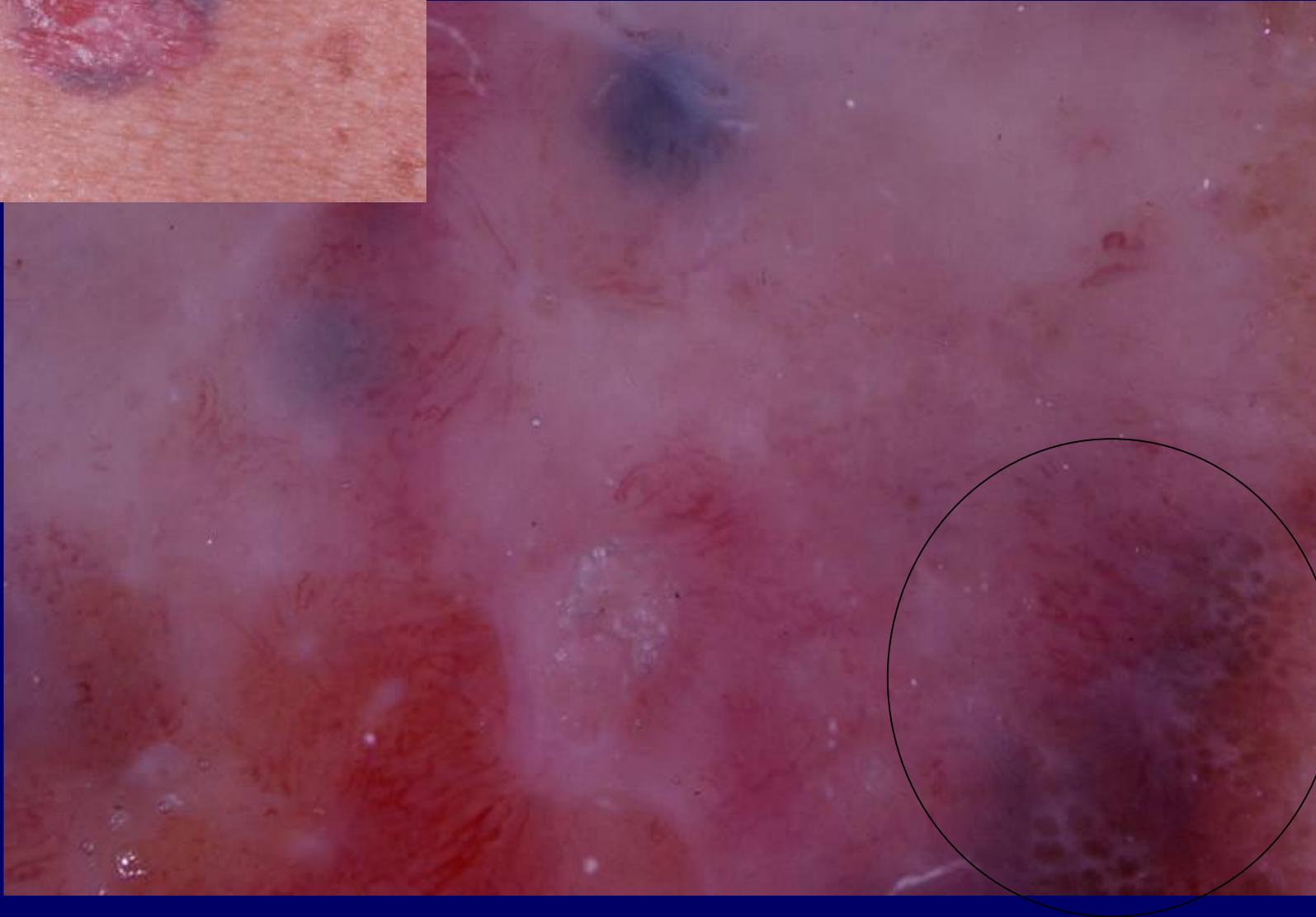
Small vessels resembling the head of a pin (but can be larger).

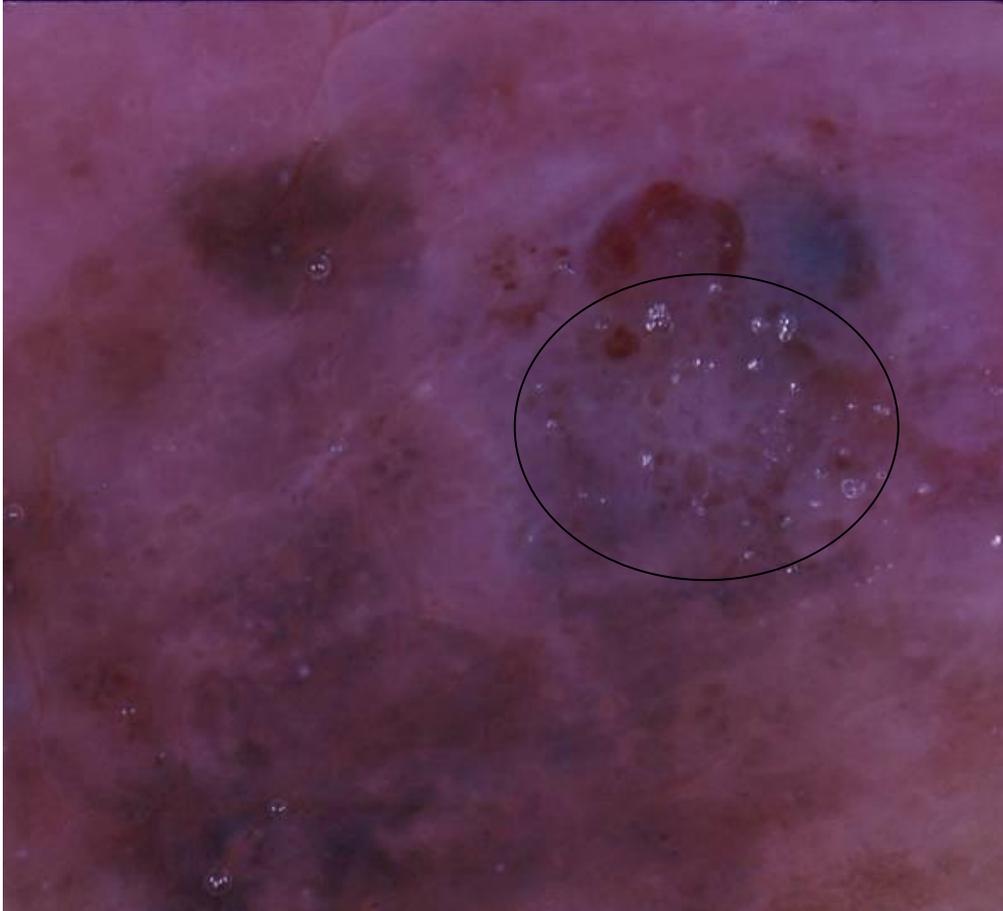


1. Spitz nevus
2. Melanoma
3. DN

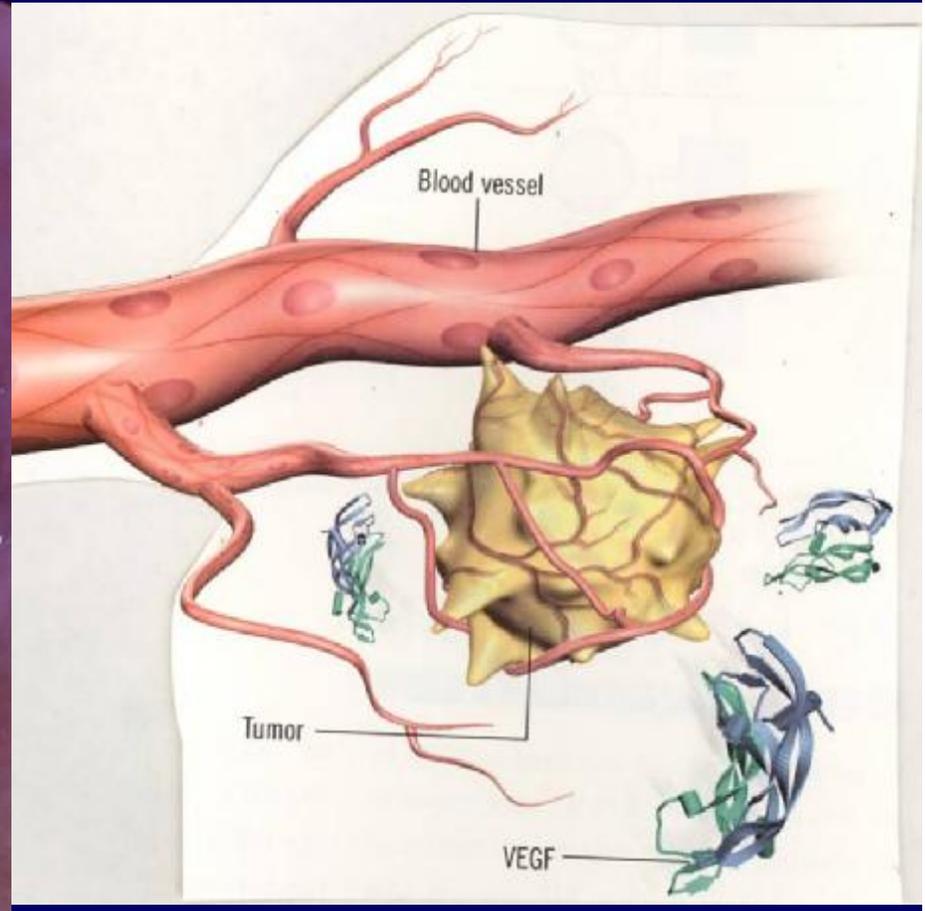
Can also be seen in other lesions such as psoriasis and SCC

Red globules

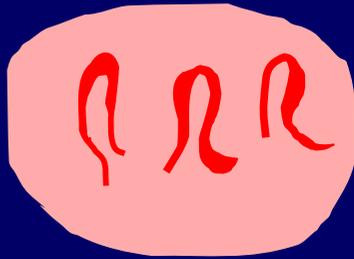




Red globules



neoangiogenesis



Irregular Hairpin vessels

Melanoma

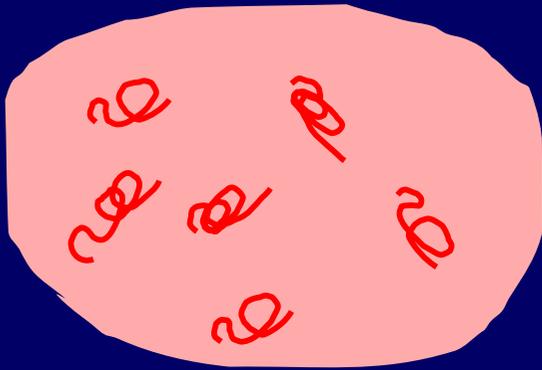
Spitz nevus



Irregular polymorphous vessels

Vessels exhibiting
variegated forms
(dotted, coiled, linear,
etc..)

Melanoma



Cork-screw or coiled vessels

Melanoma

- nodular area
- cutaneous metastasis
- desmoplastic





Challenges

- **Help define the sensitivity, specificity, PPV, NPV for structures**
 - Dr. Menzies is currently doing this for vascular structures
- **Define new structures**
 - brown structureless areas appear to be sensitive for MM
 - Cork-screw vessels seen in desmoplastic MM and metastatic MM
- **Continue to define new structures under different lighting**
 - polarized vs non-polarized



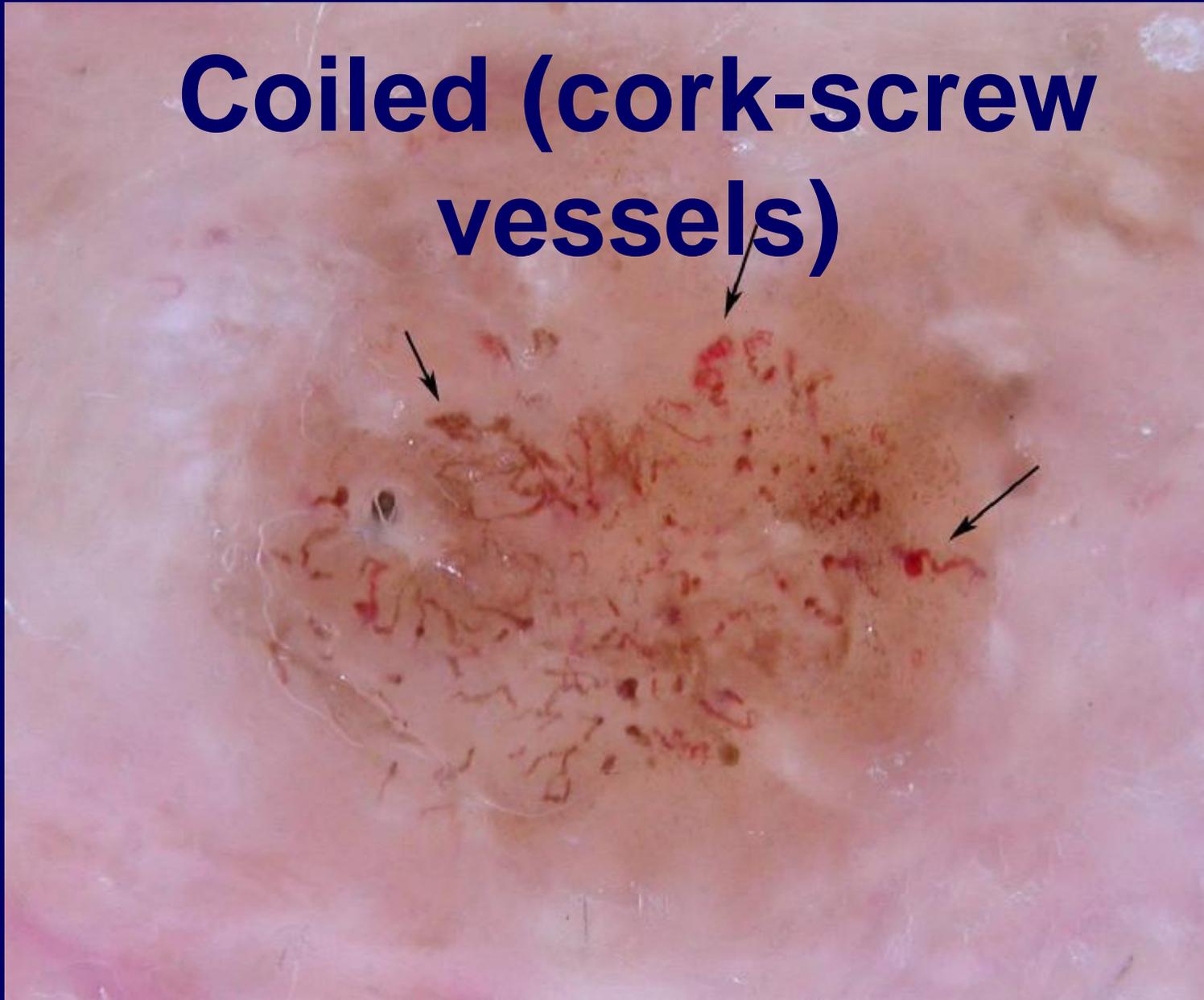
Scar like nodule

Desmoplastic Melanoma 5.6mm



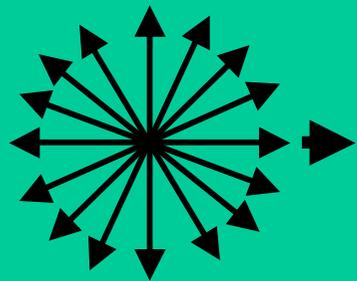
Cork-screw vessels
Coiled vessels
Torturous vessels

Coiled (cork-screw vessels)

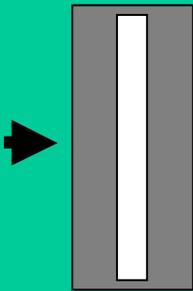


Polarized Dermoscopy





Non-polarized light



Filter A



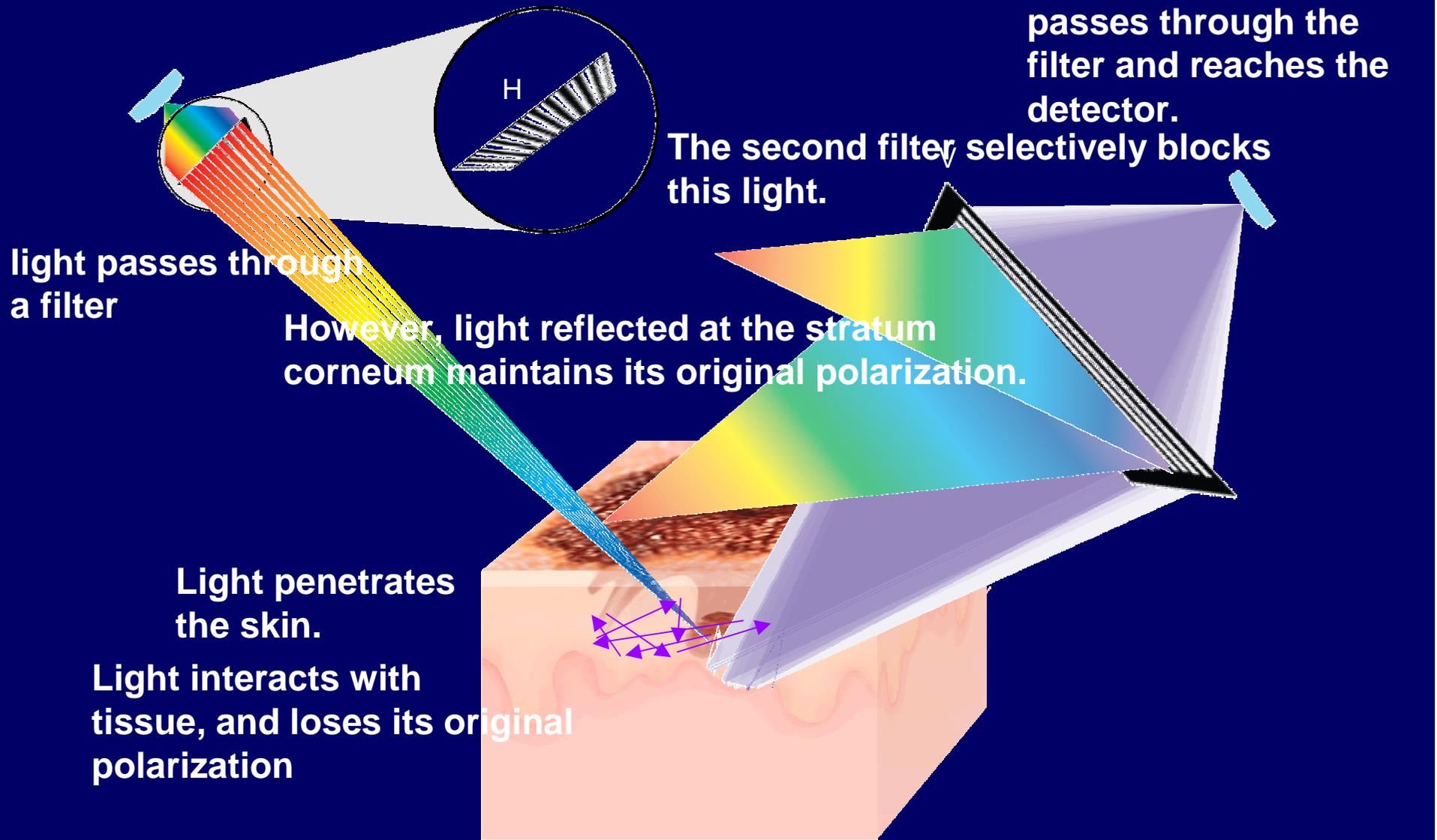
**Polarized
light**



Filter B



No light



light passes through a filter

However, light reflected at the stratum corneum maintains its original polarization.

Light penetrates the skin.

Light interacts with tissue, and loses its original polarization

The second filter selectively blocks this light.

The backscattered light passes through the filter and reaches the detector.



Clinical



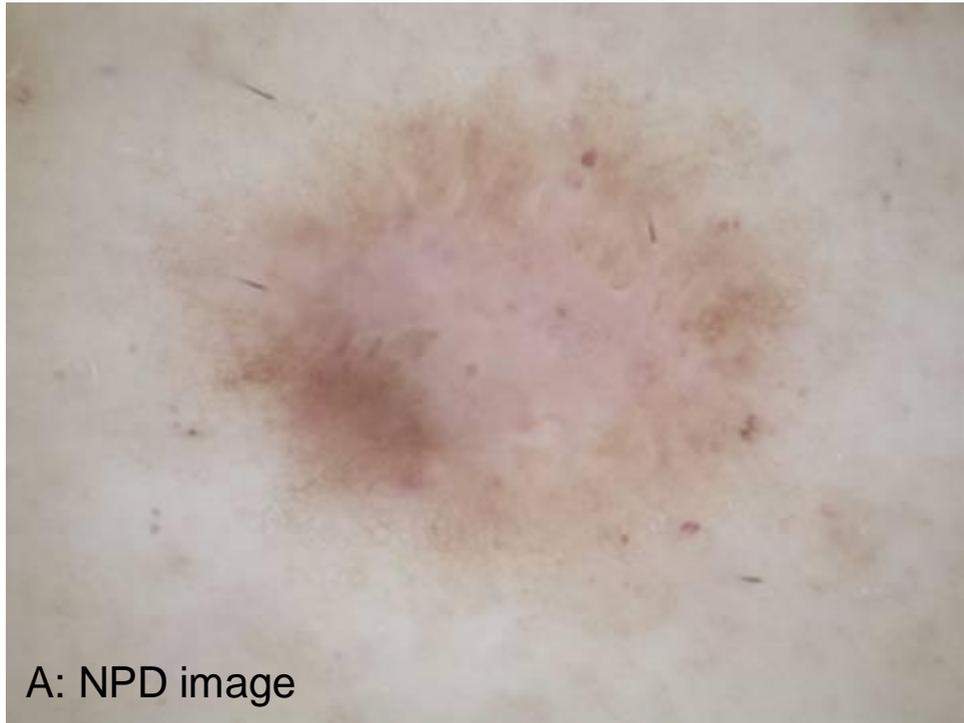
Conventional dermoscopy



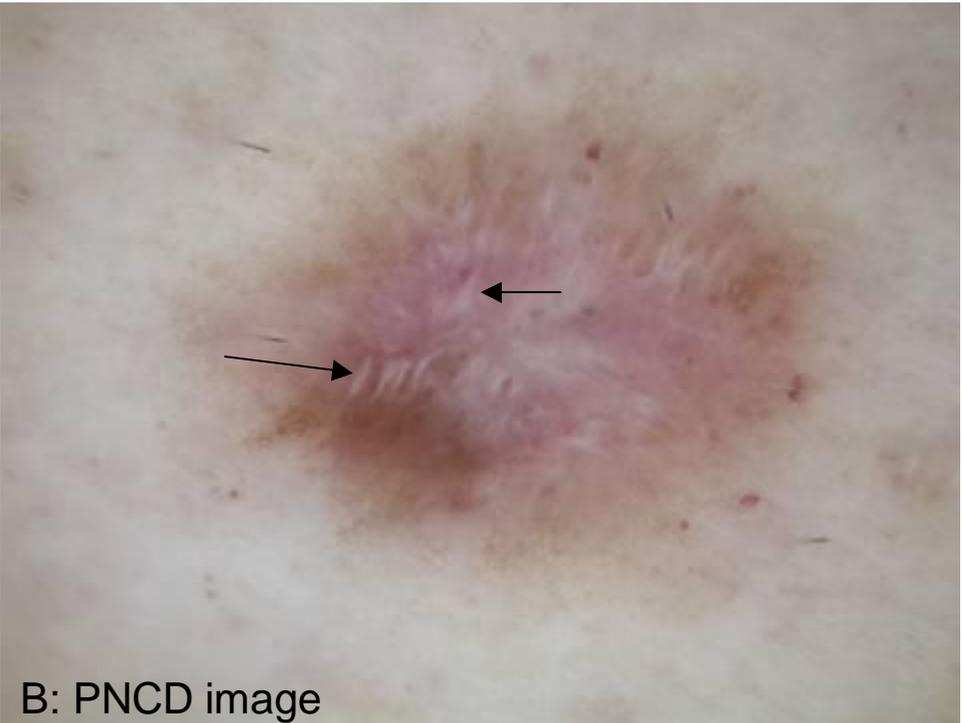
Polarized contact dermoscopy



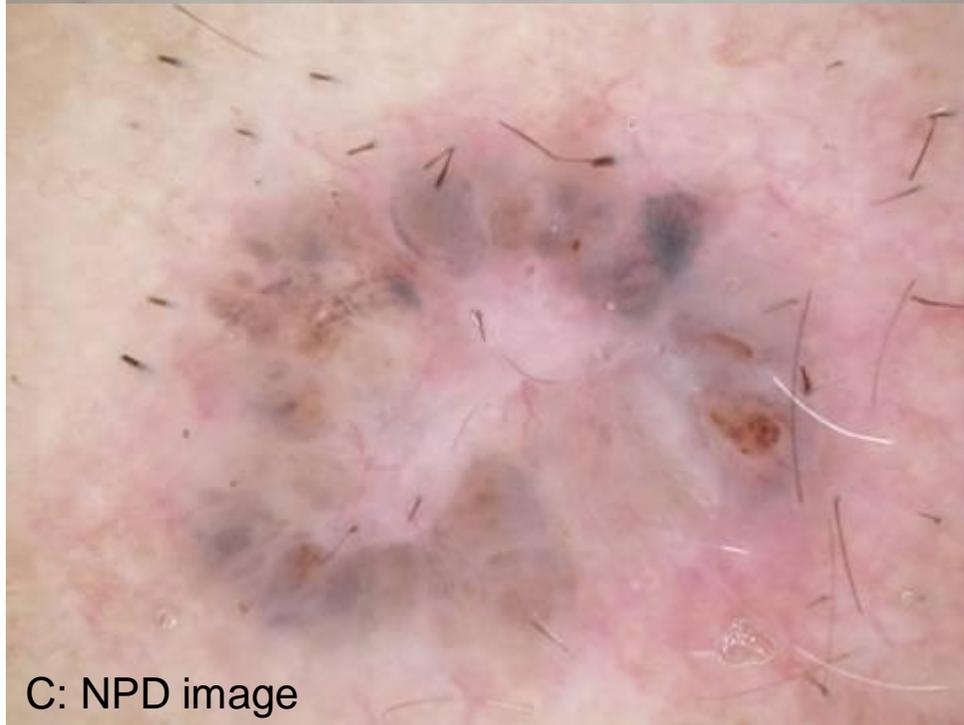
Polarized non-contact dermoscopy



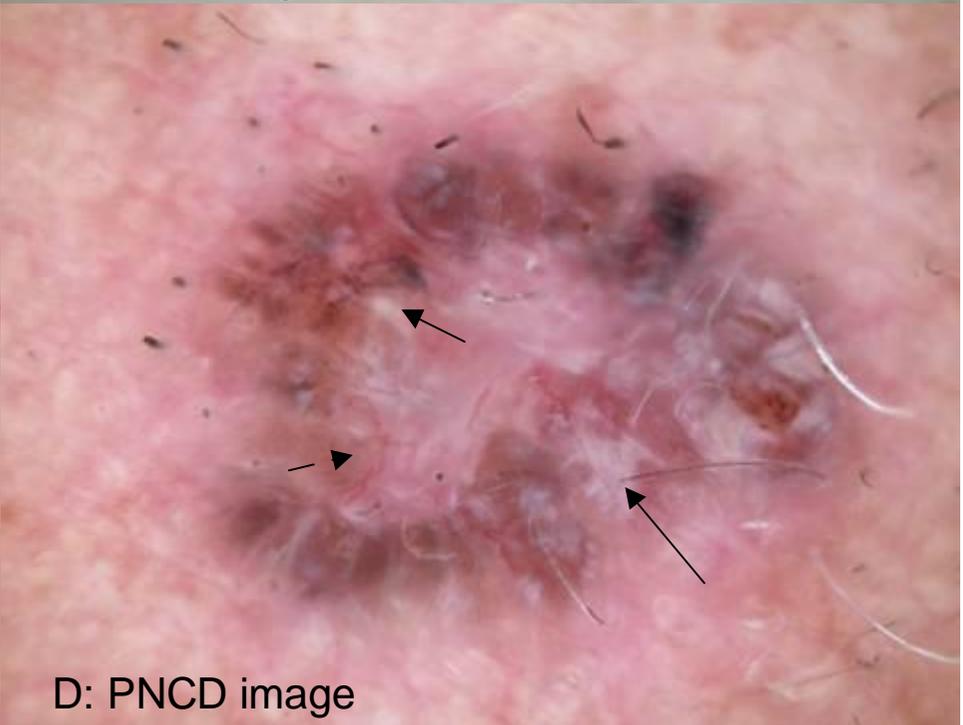
A: NPD image



B: PNCD image



C: NPD image



D: PNCD image

STUDY

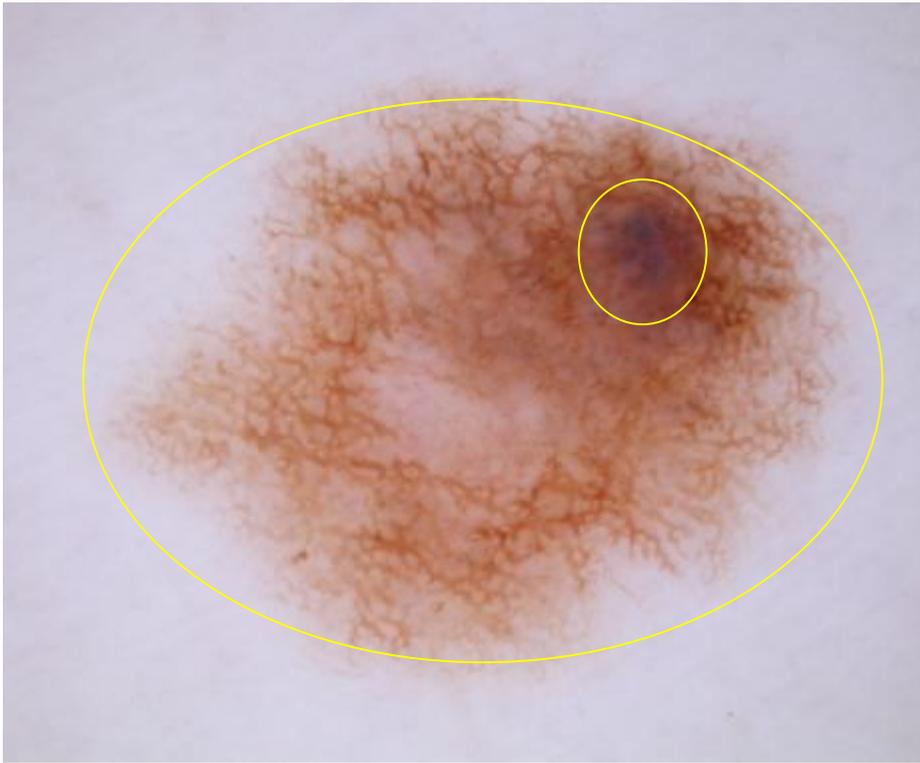
Differences Between Polarized Light Dermoscopy and Immersion Contact Dermoscopy for the Evaluation of Skin Lesions

Cristiane Benvenuto-Andrade, MD; Stephen W. Dusza, MPH; Anna Liza C. Agero, MD; Alon Scope, MD; Milind Rajadhyaksha, PhD; Allan C. Halpern, MD; Ashfaq A. Marghoob, MD

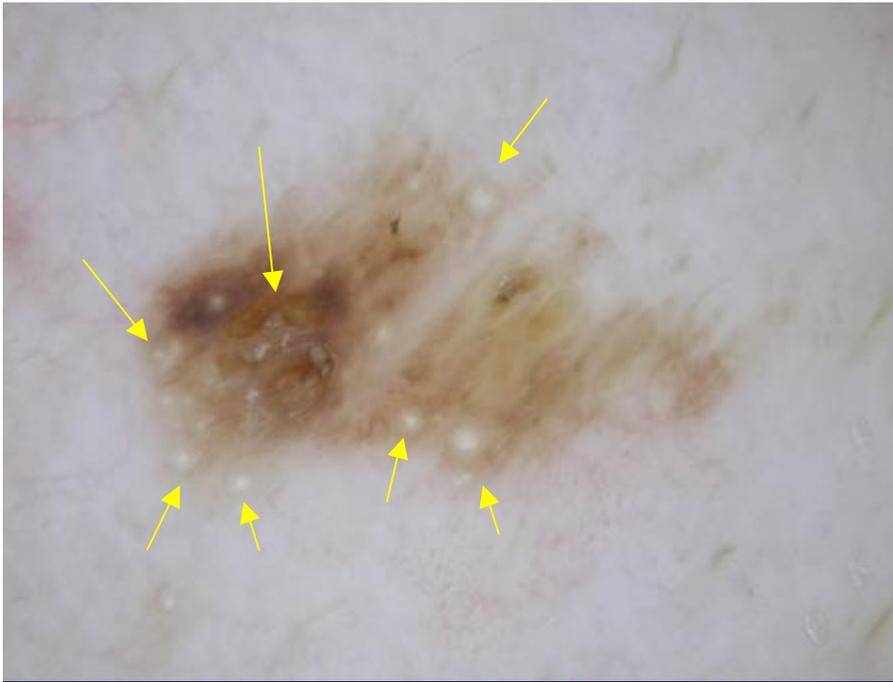
	NPD	PCD	PNCD
Colors			
Melanin pigment	+	++	++
Red or pink	+	++	++++
Blue-white	+++	++	+
Structures			
Peppering	+++		+
Shiny-white streaks	-/+	+++	++
Blood vessels	+	++	++++
Milialike cysts and comedolike openings	++++	-/+	-/+
Patterns			
Homogeneous blue pattern of a blue nevus	Homogeneous blue color	Heterogeneous with different shades of blue	Heterogeneous with different shades of blue



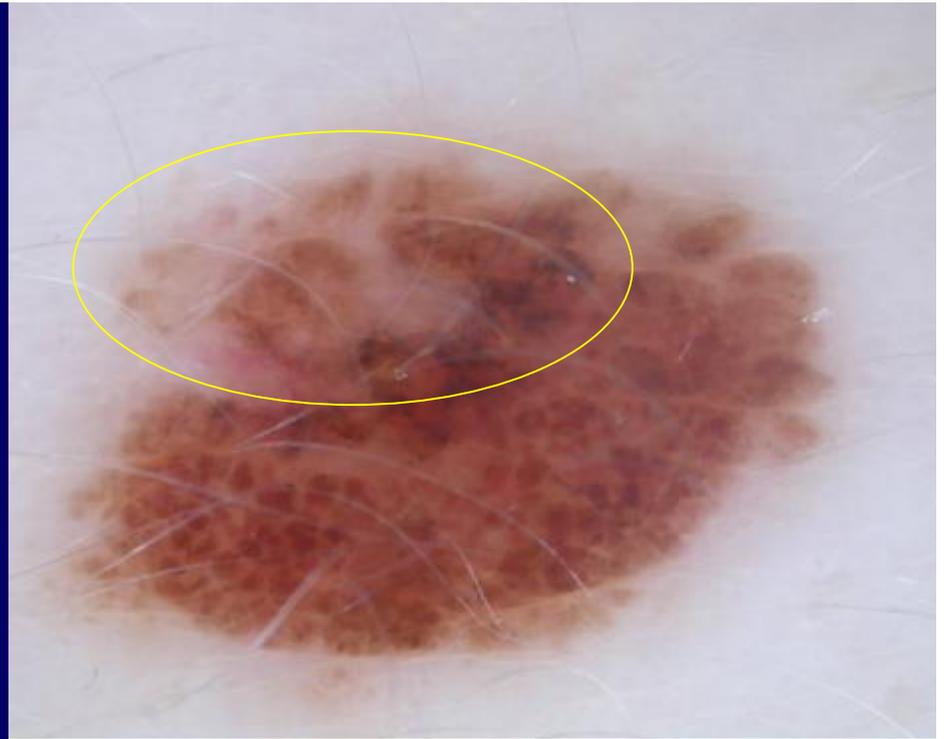
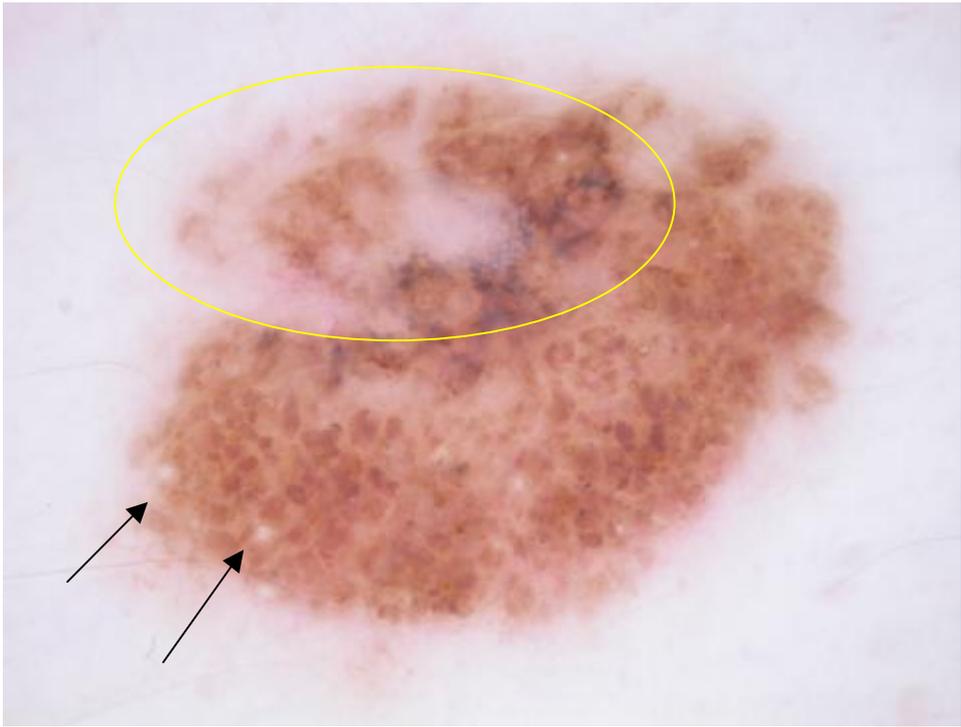
- melanin pigment is darker under polarized light
- blood vessels are more prominent under polarized light
- vascular blush is seen only under polarized light
- blue-white veil more prominent under non-polarized light



-melanin pigment is darker under polarized light thus network is more prominent under polarized light
-blue-white veil is better seen under non-polarized light



- crypts can sometimes be more or less prominent under polarized light (depends on amount of surrounding pigment)
- milia cyst are often difficult to see under polarized light



-milium cyst are often difficult to see under polarized light
-peppering (regression structures) not as evident under polarized light

What is the Clinical Relevance?

- **Diagnostic accuracy**
- **Confidence in the diagnosis**

Table 1. Differences in percent correct responses between NPD and PNCD by Lesion Type

	NPD	PNCD	
	% correct	% correct	p-value*
Basal Cell Carcinoma	72.9	69.4	0.26
Blue Nevus	58.4	57.8	0.82
Dermatofibroma	52.8	52.2	0.87
Dysplastic Nevus	19.0	33.0	0.003
Hemangioma	94.9	96.2	0.48
Melanoma	23.3	34.2	0.0008
Seborrheic Keratosis	75.1	59.2	<0.0001

* P-values for the paired analysis of npd and pncd based on McNemar's test

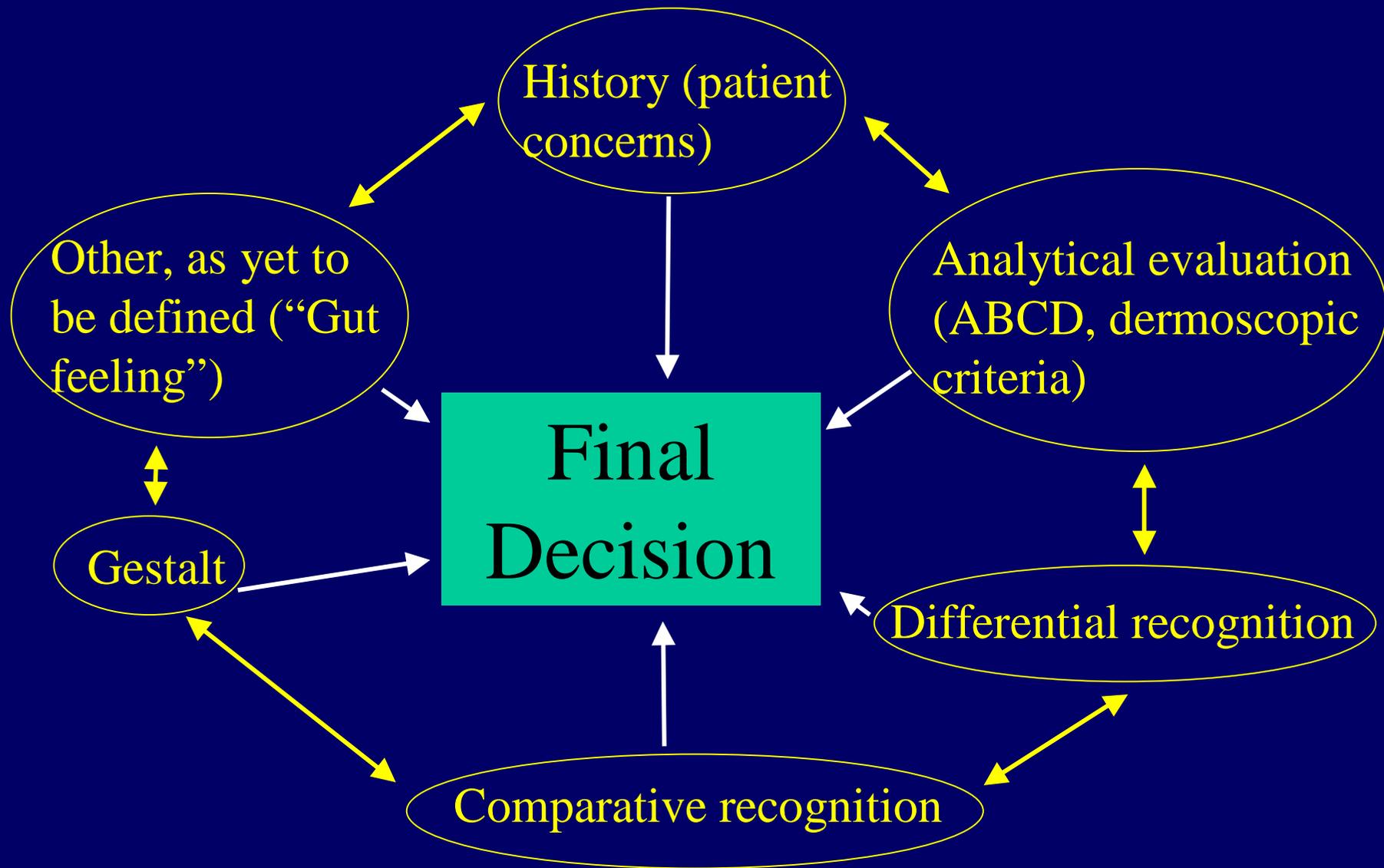
Table 2. Differences in Confidence Between NPD and PNCD by Lesion Type

	Mean Confidence Score		p-value*
	NPD	PNCD	
Basal Cell Carcinoma	2.8 (1.3)	2.5 (1.3)	0.001
Blue Nevus	3.1 (1.1)	3.0 (1.1)	0.539
Dermatofibroma	2.9 (1.2)	3.0 (1.3)	0.484
Dysplastic Nevus	2.9 (1.2)	3.3 (1.1)	0.001
Hemangioma	1.8 (1.1)	1.8 (1.1)	0.924
Melanoma	3.3 (1.1)	3.3 (1.1)	0.413
Seborrheic Keratosis	2.5 (1.2)	2.9 (1.2)	<0.0001

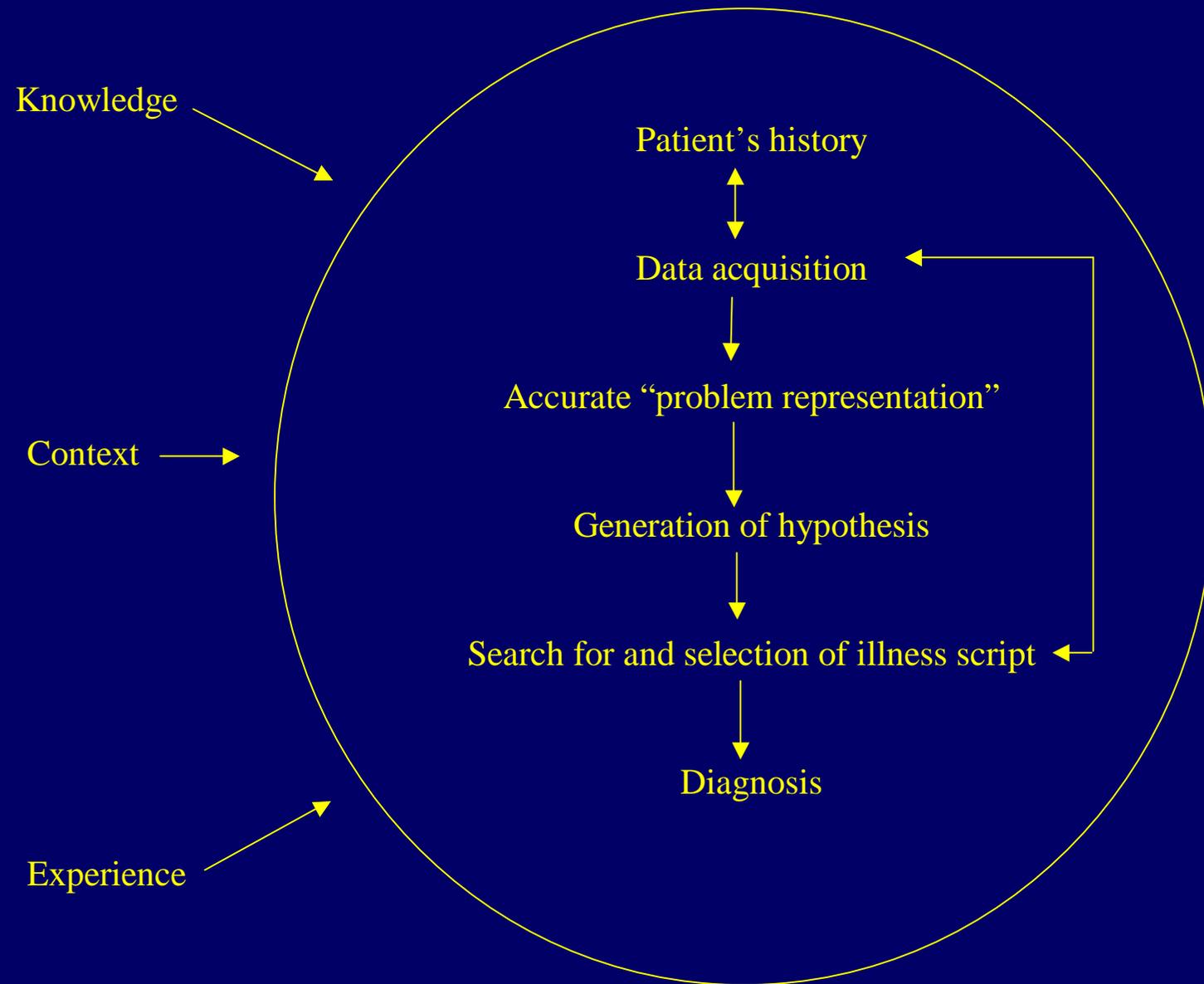
Confidence is on a scale of 1-5, with 1 =100% confident and 5 = not sure at all.

Pitfalls

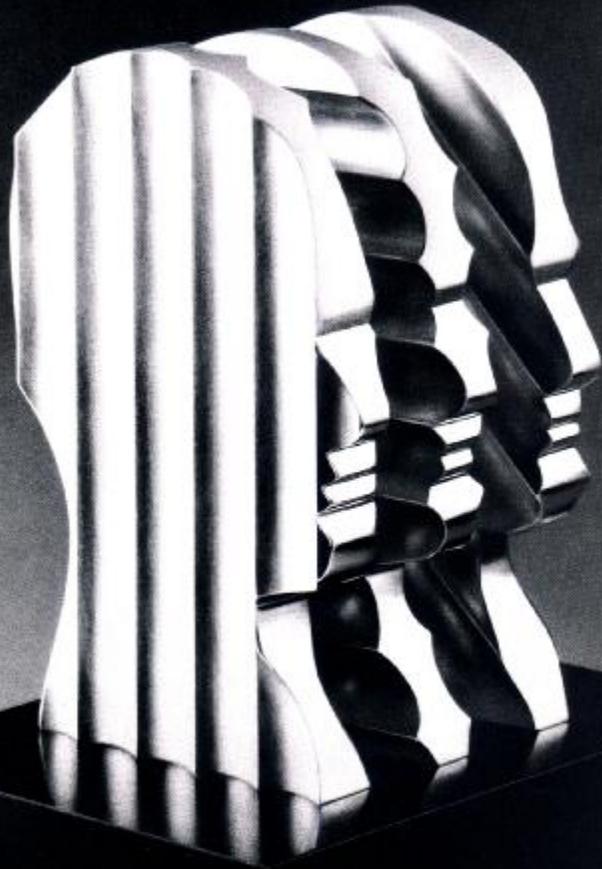
- **Always remind yourself that the decision making process is complex. Thus, use all the information at your disposal!**
- **Look carefully, completely & do not jump to conclusions!**
- **Know the strengths & limitations of the scope you are using**



Key Elements of the Clinical Diagnostic Reasoning Process



THE MANY FACES OF MALIGNANT MELANOMA



*“Melanoma writes its message on the skin
with its own ink, and it is there for all of us to see.
Unfortunately, some see but do not comprehend.”*

—Neville Davis, MD

The eye
sees what
the mind
knows
Johann Wolfgang von Goethe

**Thus, knowledge is
required for you to be
able to collect the
appropriate data.**

What does the eye see and what does the brain do?

- **We tend to evaluate a lesion and if it fits a known pattern then a diagnosis is made. However, what is it that the brain sees?**
- **Do we look at the entire lesion?**
- **Do we look at the lesion systematically (each quadrant) or do we focus on the most “diagnostic” part?**

Key Elements of the Clinical Diagnostic Reasoning Process

