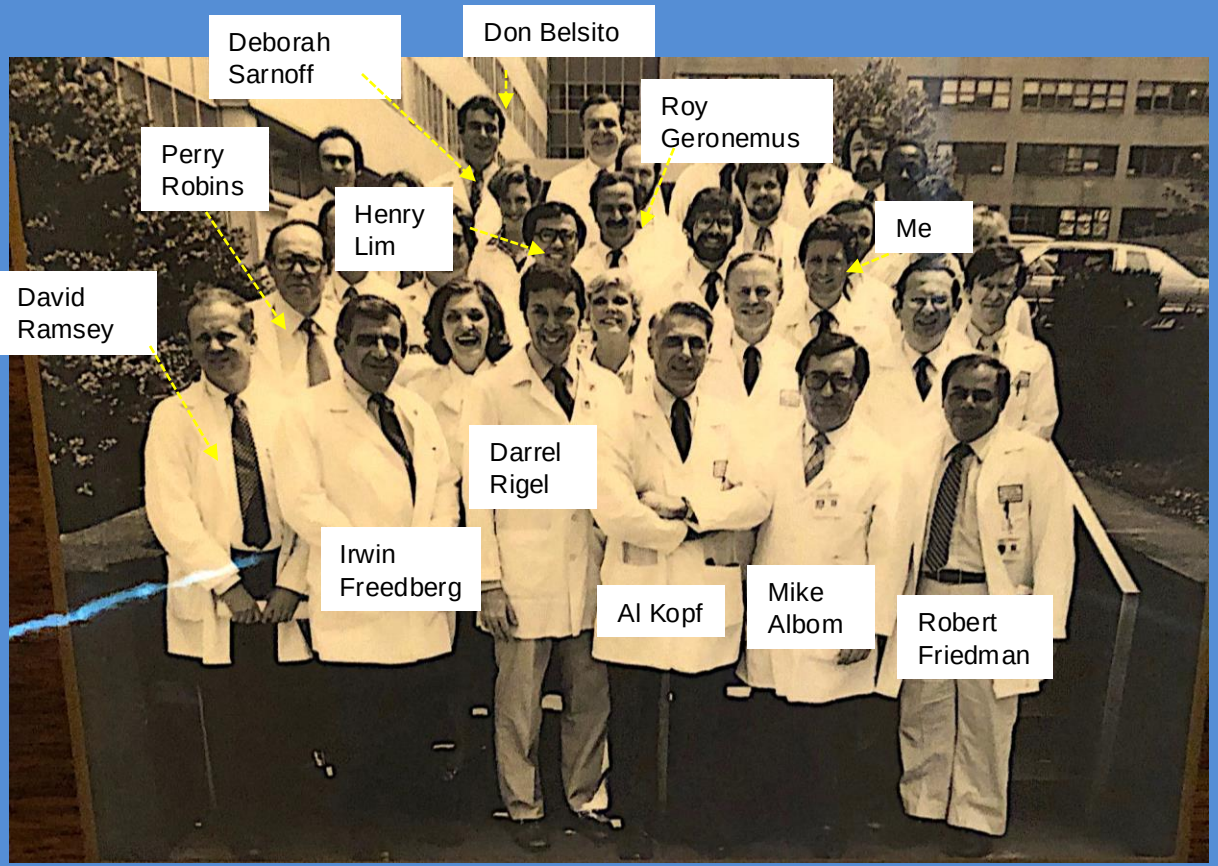
Lessons in Dermoscopy

Harold Rabinovitz MD



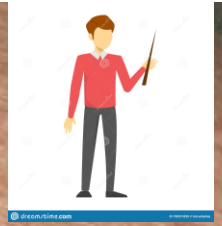
In 1981 I finished my dermatology residency and Mohs surgery fellowship and joined a dermatology group in South Florida.

- In 1996 after having performed thousands of Mohs surgical cases, I called Dr. Kopf and asked him if I could work on a project with him.

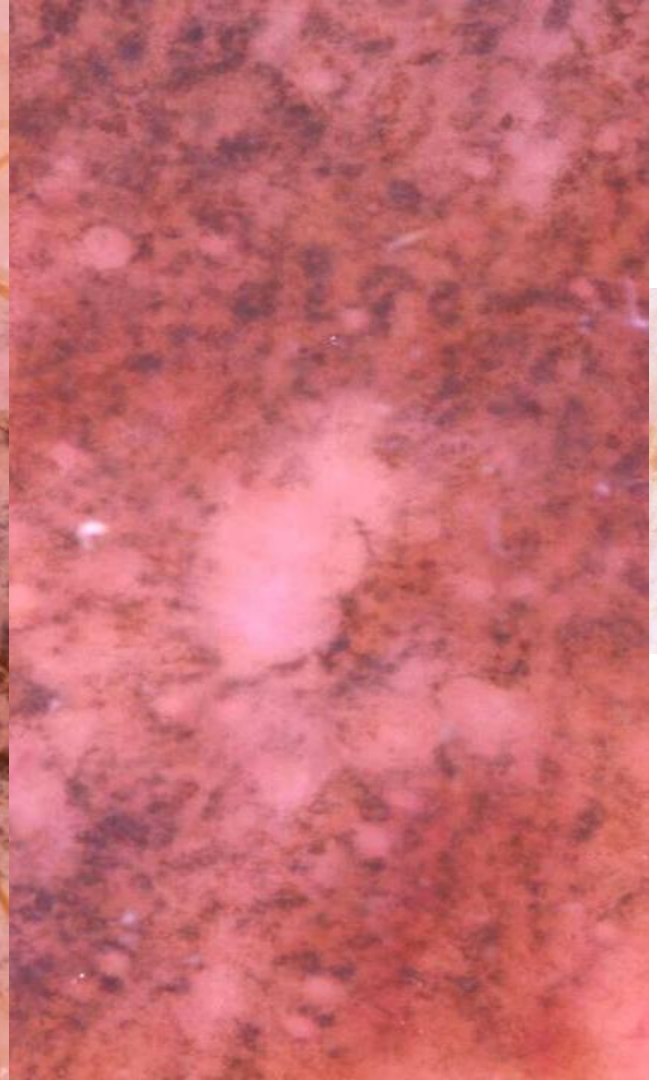
- He suggested that I collaborate with him on dermoscopy and so began my journey with imaging devices.

- Over the next two years we acquired thousands of images of malignant and benign melanocytic and non melanocytic neoplasms of the skin.
- We quickly realized that different neoplasms have different patterns and often have different degrees of color, symmetry, and organization.

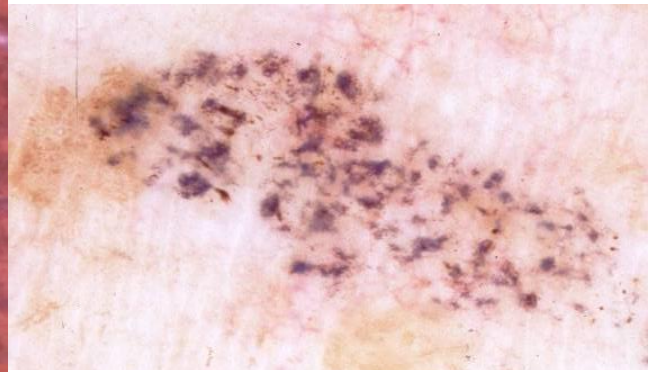
The dermoscopy lesson 1



One of my favorite early group of cases were the following.



Clinically these lesions were suggestive of melanoma. When sent to a world expert such as Dr. Ackerman the pathology report would often be interpreted as a completely regressed nevus or melanoma. The differential diagnosis would include a lichenoid keratosis.



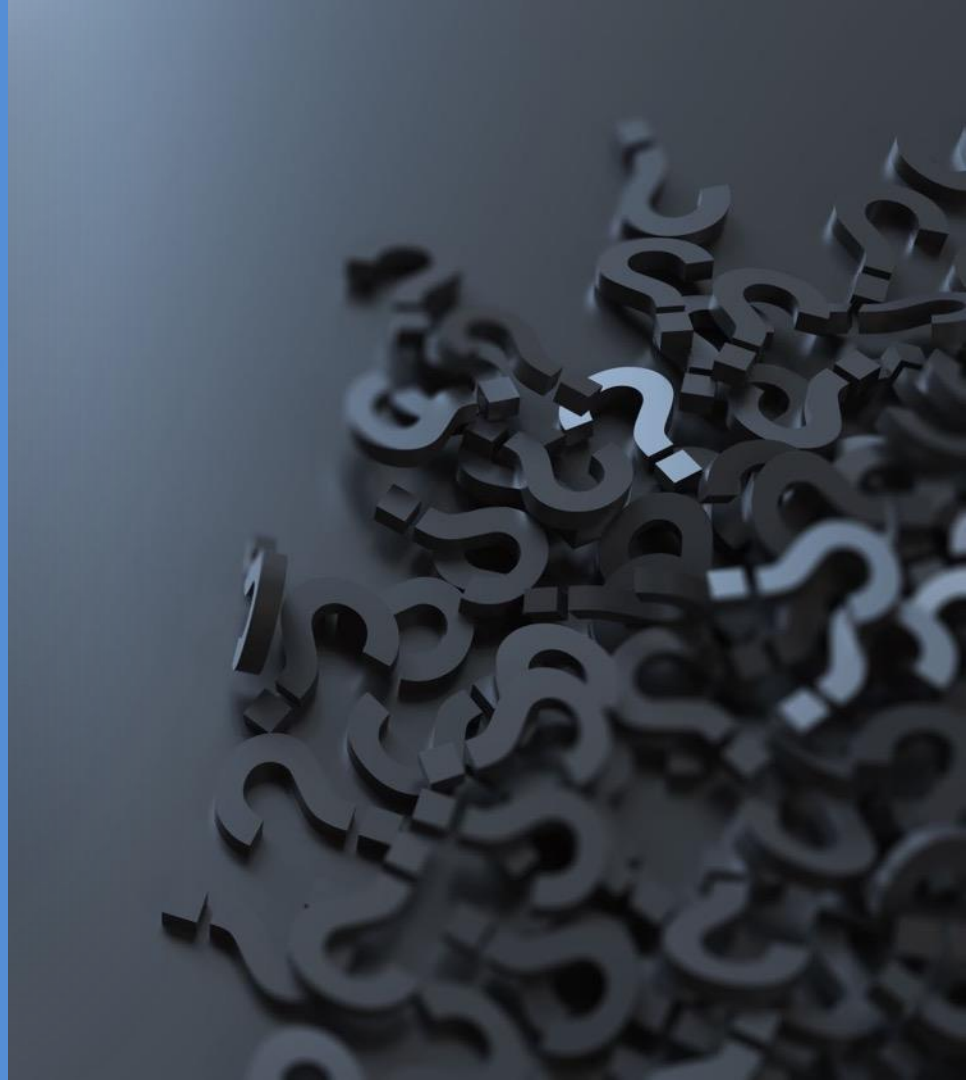
After reviewing a large series of cases, it was concluded that this type of pattern is characteristic of LPLK.

In a literature search there is only one case of diffuse gray dots/ granules associated with a regressed melanoma.

- Lichen planus-like keratosis or benign lichenoid keratosis

- A solar lentigo or a seborrheic keratosis undergoing regression

- 1966 Lumpkin and Helwig reported the first case.
- Later that year, Shapiro and Ackerman concluded that lichen planus-like keratosis was a distinct entity.



The most detailed clinical-histopathologic correlation was published in 1981 by Lauer, et al. in the Journal of the American Academy of Dermatology.

In that article Lauer describes the following clinical presentation:


Pink


Pinkish brown


Pinkish orange


Purplish brown


Dark purplish brown
Rust color
Accentuated skin markings
Fine scaling

Clinical Presentation

There are times when lichen planus-like keratosis ⇏ r[illegible], p[illegible]k, p[illegible]ple, f[illegible]t colored

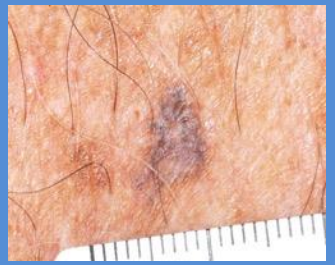
May have features that can simulate early malignant melanoma.

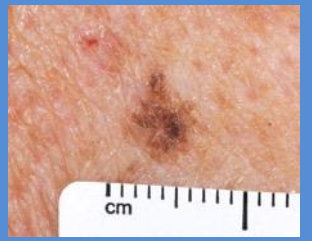
Lichen planus-like keratosis

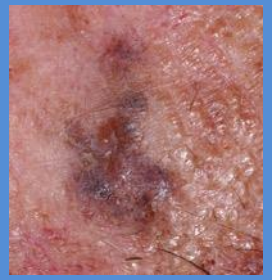
Lichen planus-like keratosis

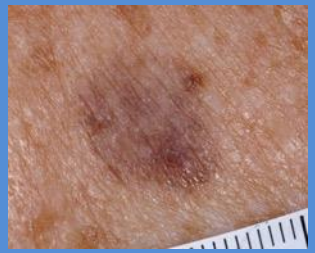
Dermoscopy can be a useful diagnostic aid in the evaluation of the majority of lichen planus-like keratosis.

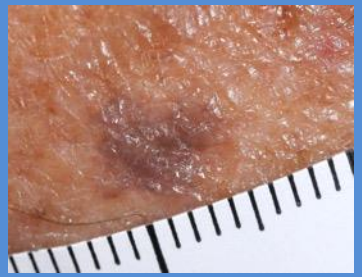
When a solar lentigo undergoes regression, it often simulates a melanoma on sun-damaged skin

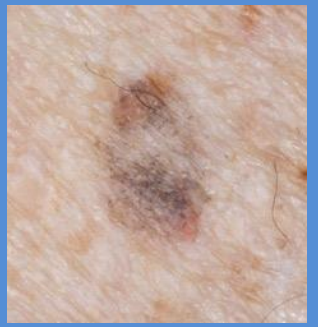






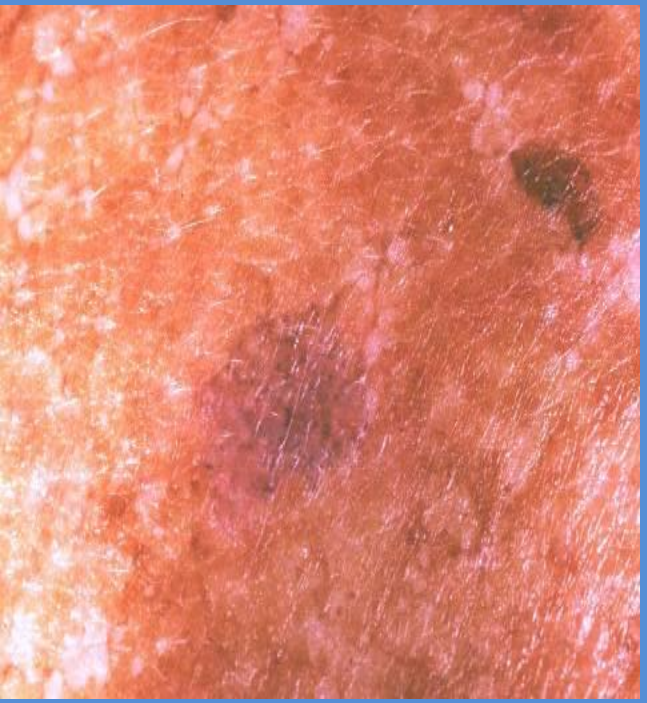




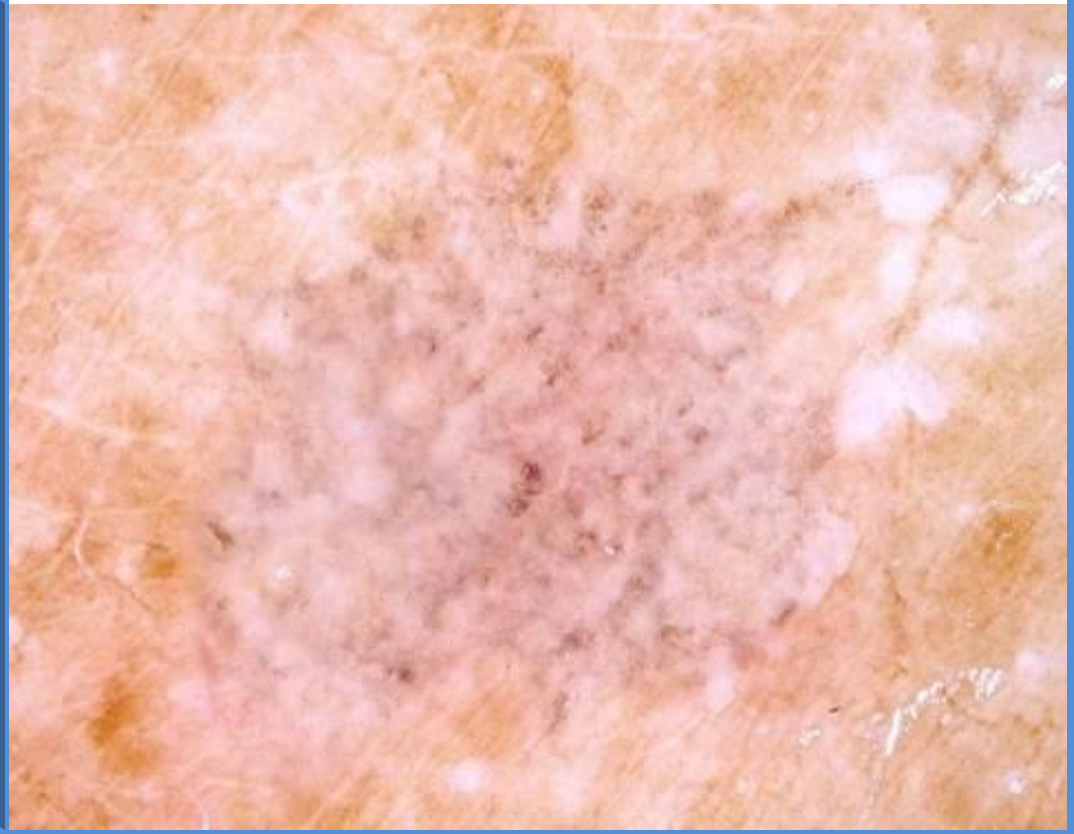


The most common dermoscopic pattern of a solar lentigo undergoing regression (LPLK) is a diffuse granular pattern characterized by gray dots/granules.

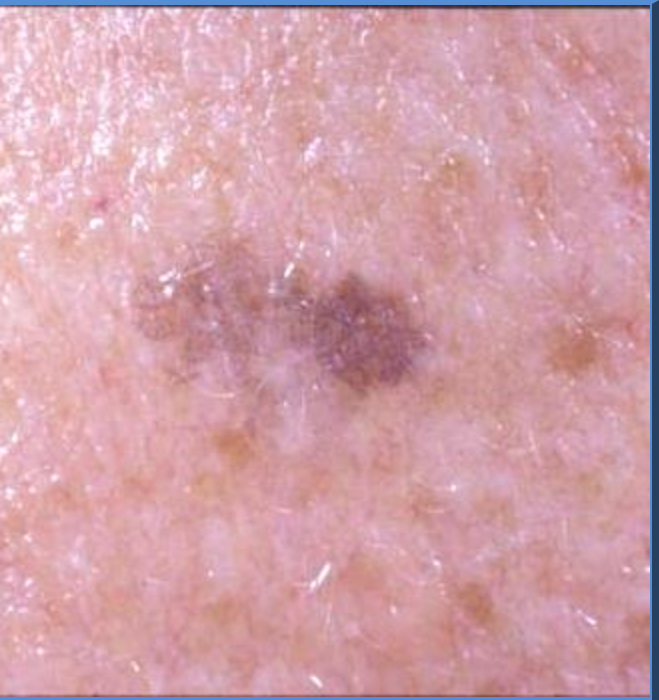
Diffuse granular pattern characterized by gray dots/granules.

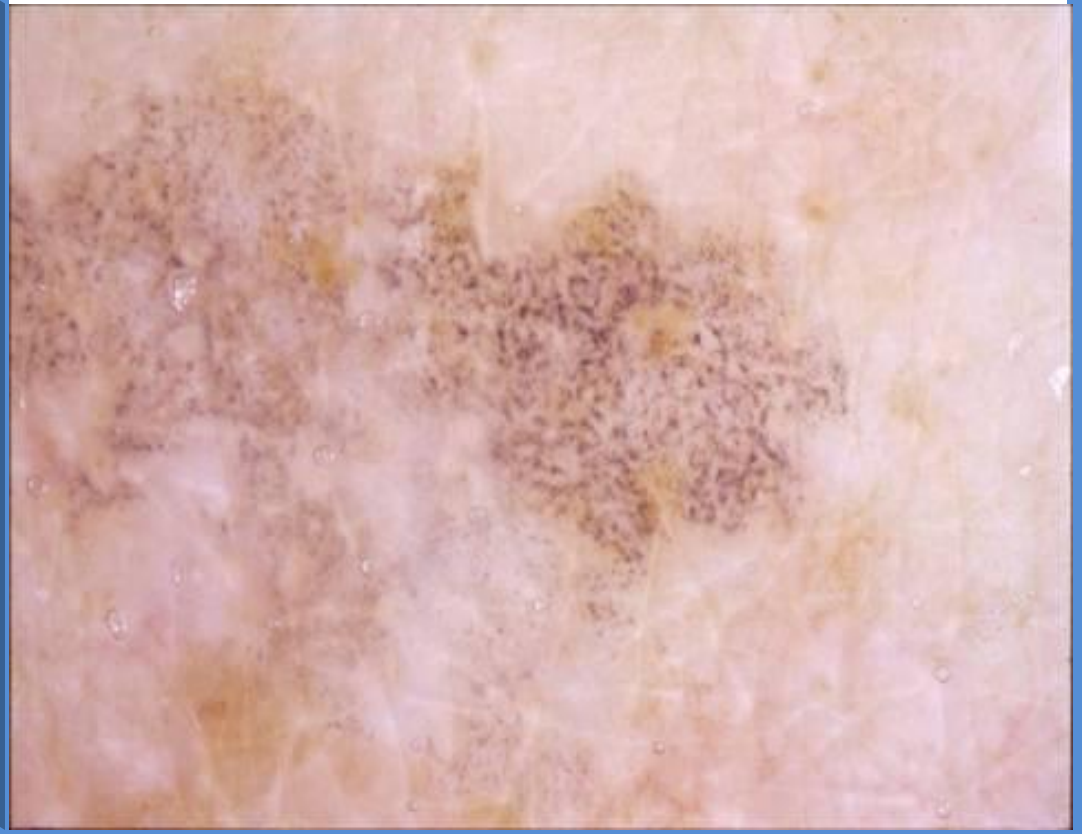


Diffuse granular pattern characterized by gray dots/granules.



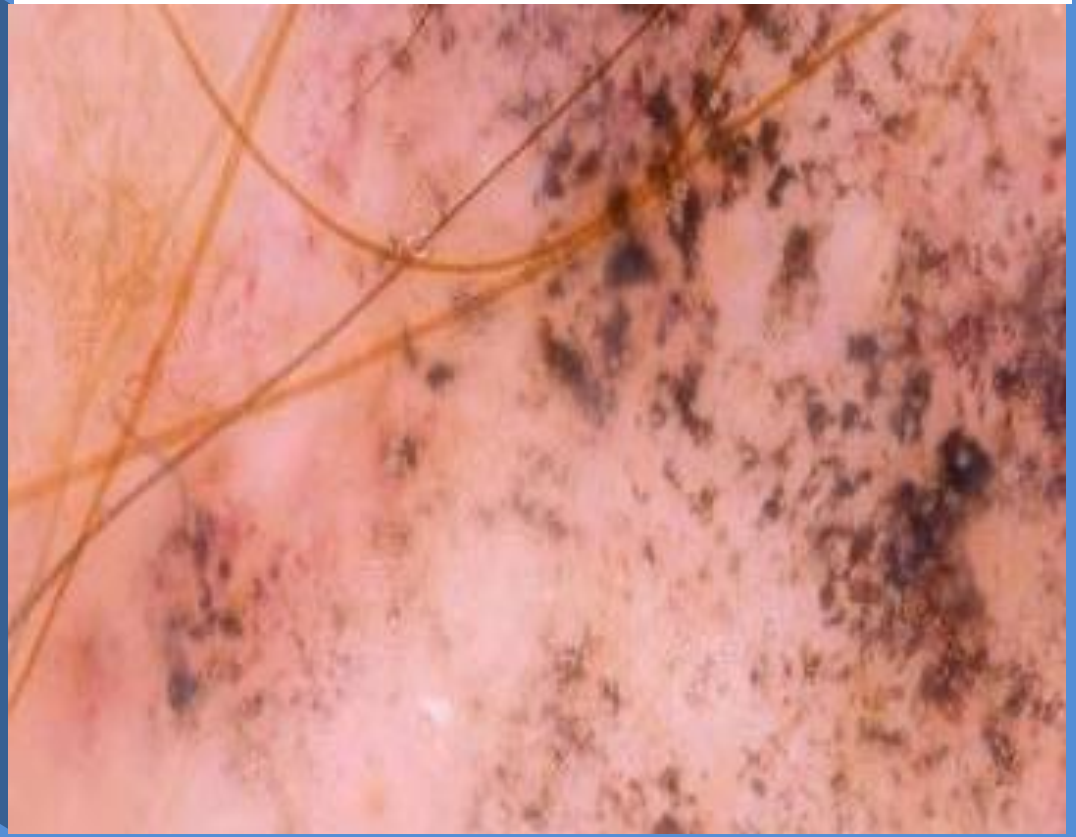
Diffuse granular pattern characterized by gray dots/granules.



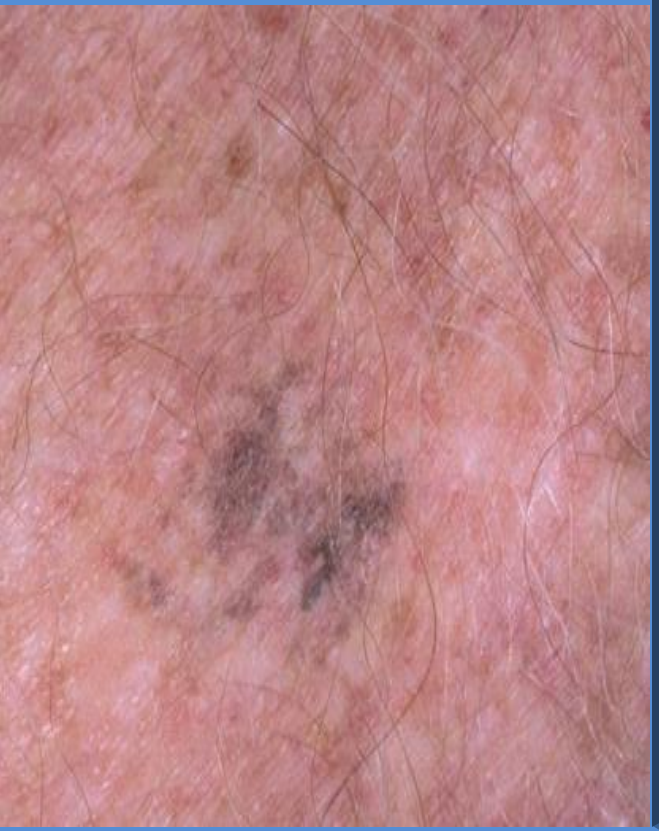


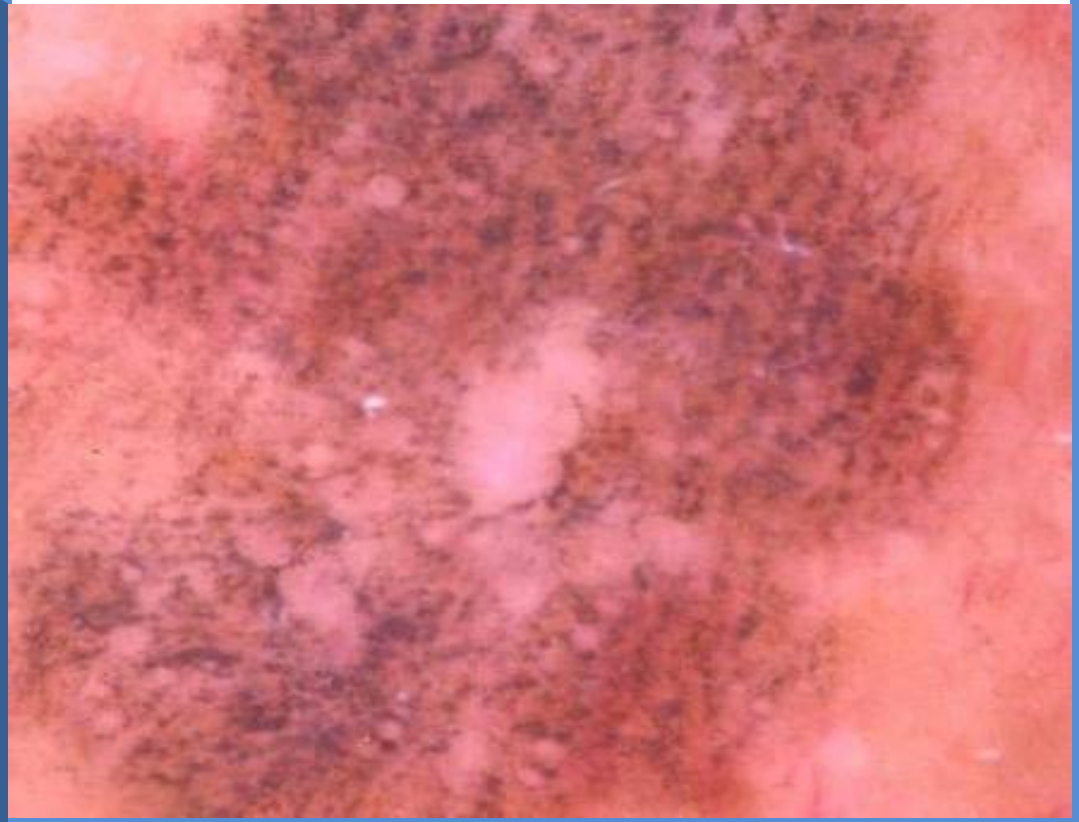
Another common pattern is diffuse gray dots/granules with scattered clumps of pigment.

Diffuse gray dots/granules with scattered clumps of pigment.

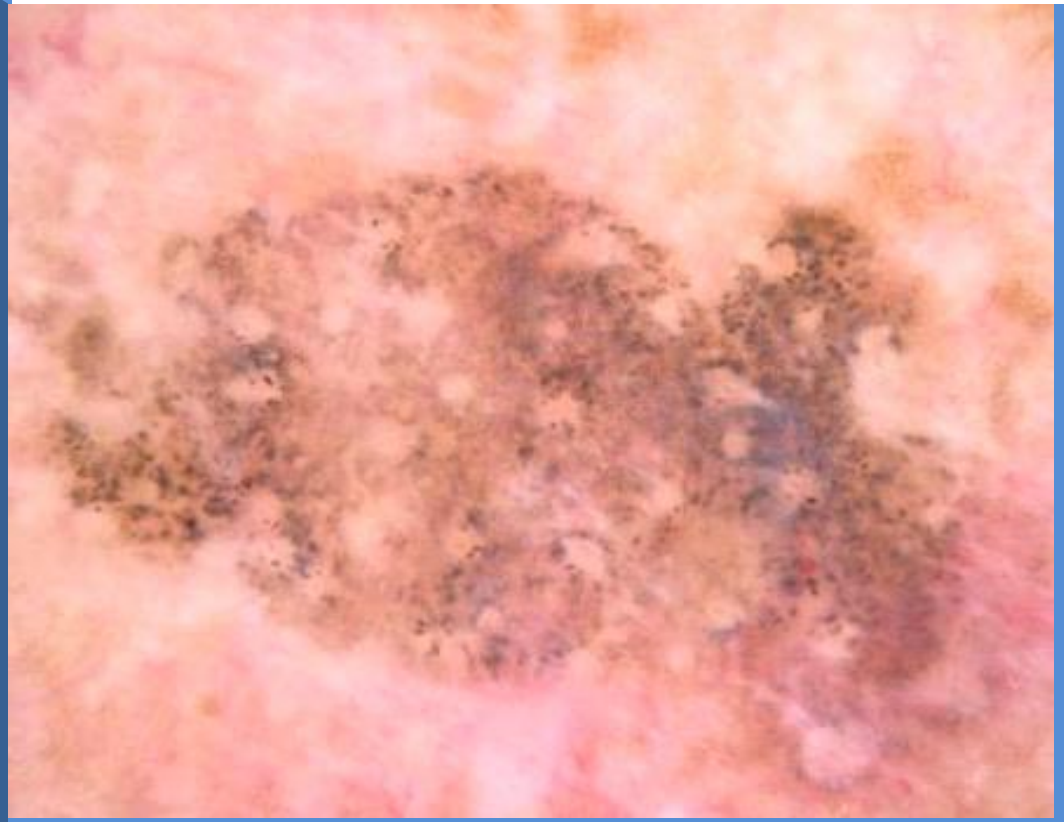


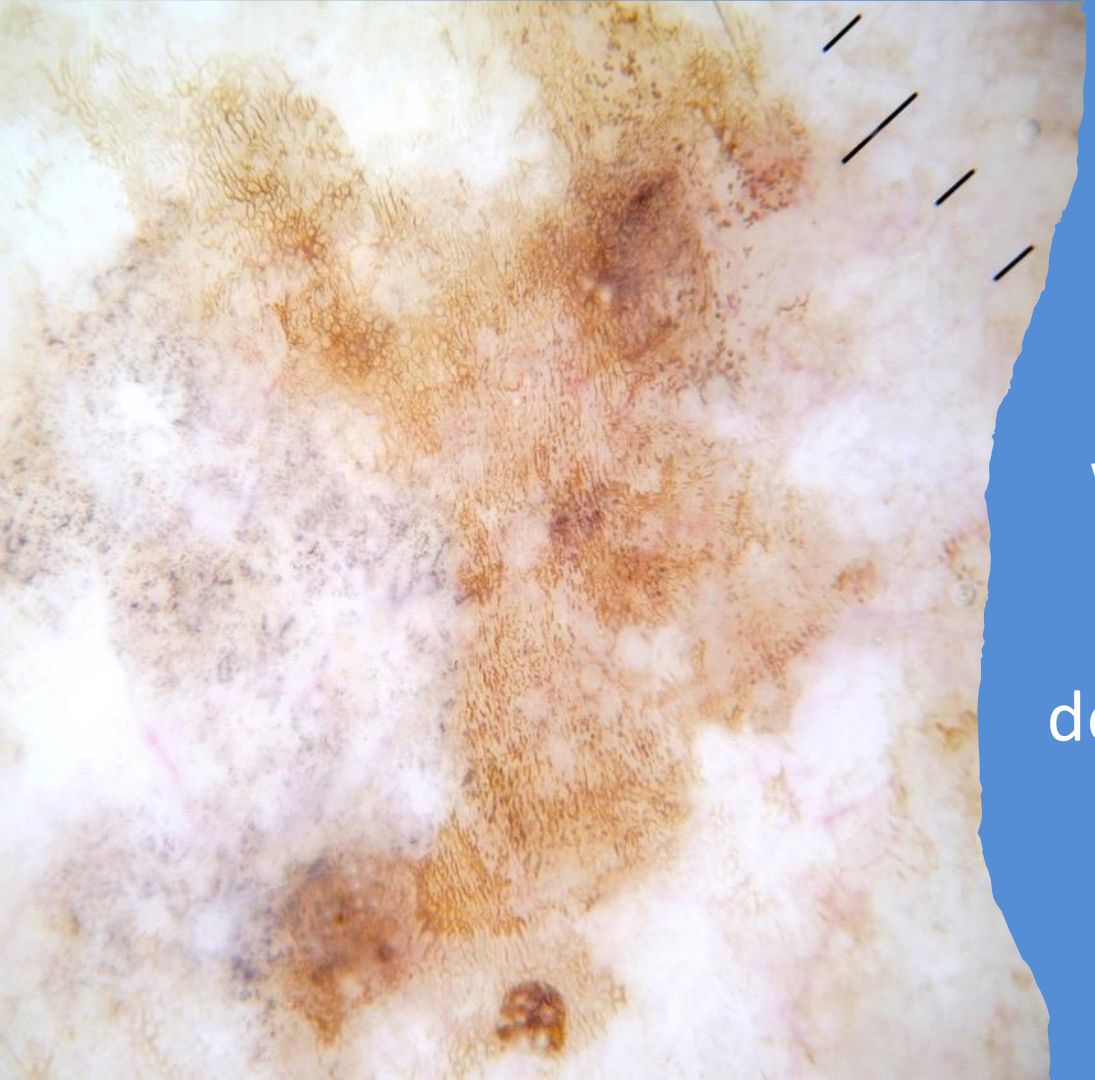
Diffuse gray dots/granules with scattered clumps of pigment.



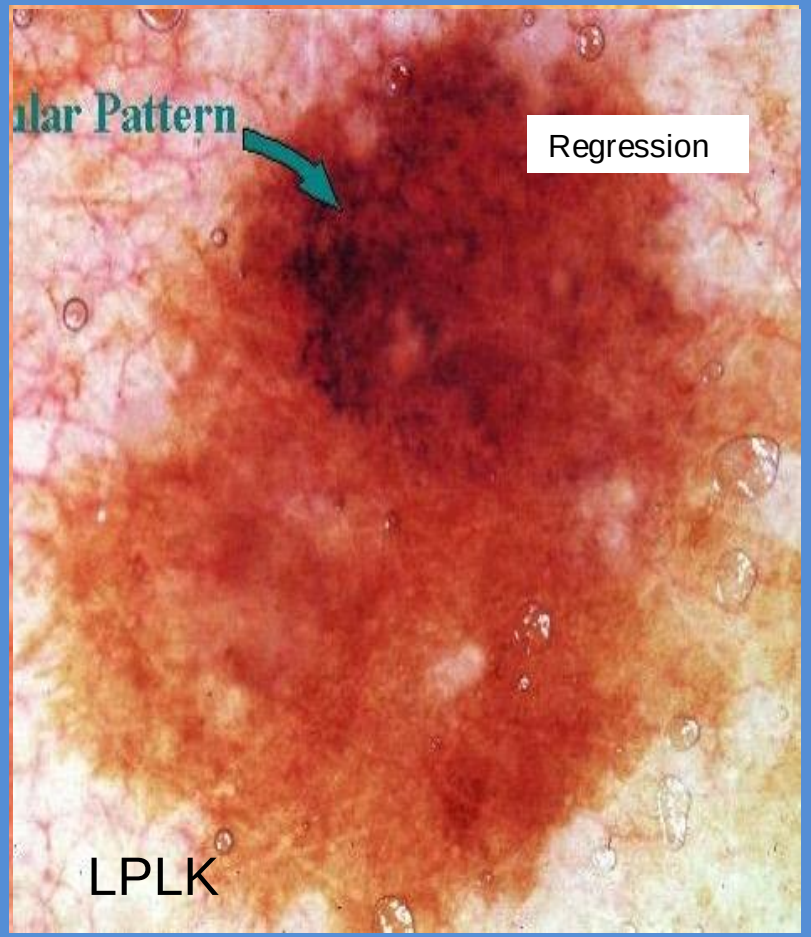


Diffuse gray dots/granules with scattered clumps of pigment.





One final pattern seen with LPLK is a localized granular pattern with remnants of the dermoscopy features of a lentigo



This is a solar lentigo! Note the scalloped borders.

When this solar lentigo undergoes regression, we call this lesion a lichen planus like keratosis.

Solar Lentigo

Lichen Planus-like Keratosis

Solar Lentigo

Lichen Planus-like Keratosis

The differential diagnosis of intermediate and late stage LPLK

Melanoma on sun damaged skin

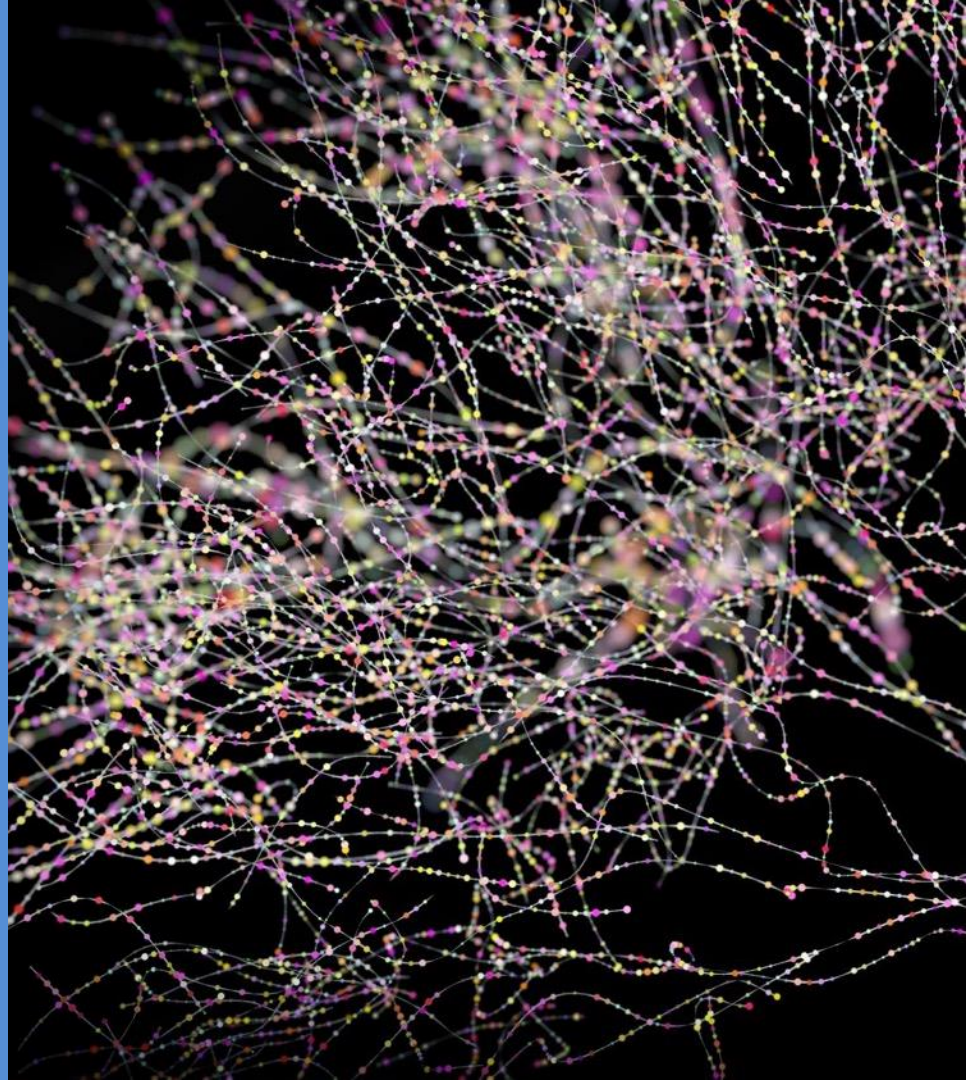
How do we distinguish the dermoscopy features of LPLK from melanoma on sun-damaged skin?

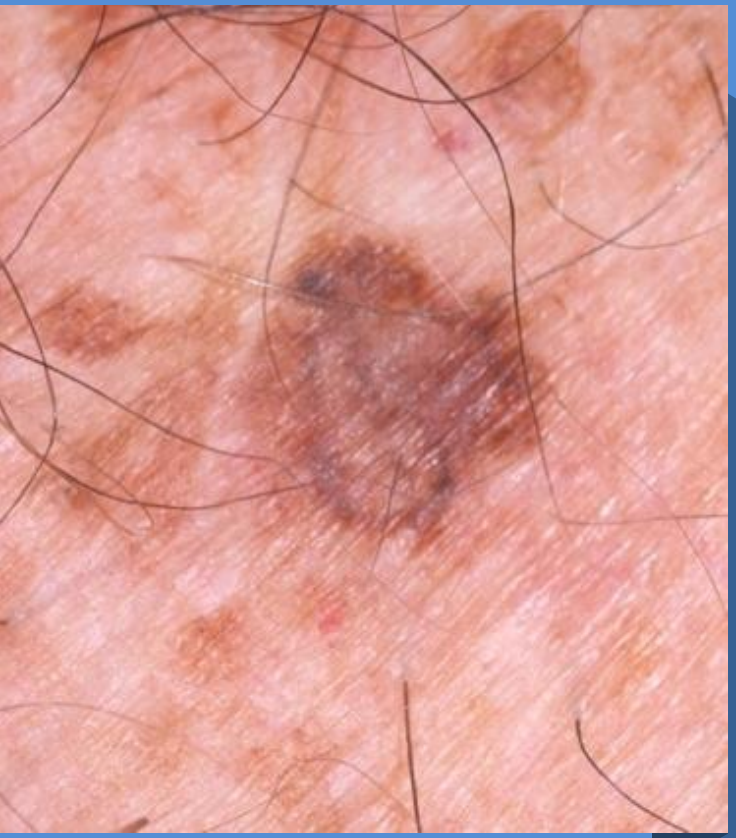
Melanoma on sun damaged skin

- Lentiginous melanoma
- Lentigo maligna melanoma

Lentiginous melanoma

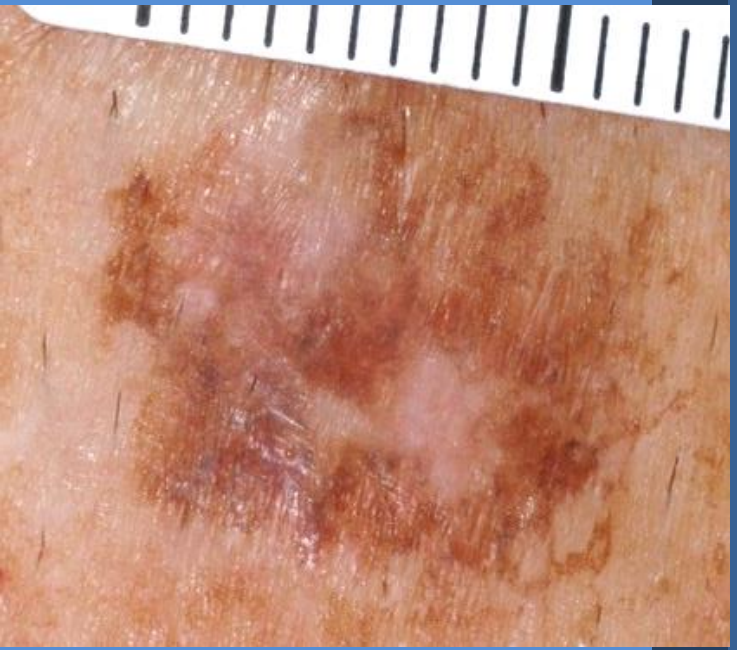
- Network or network-like structures
- Focal gray dots/granules (granularity appears to be finer)





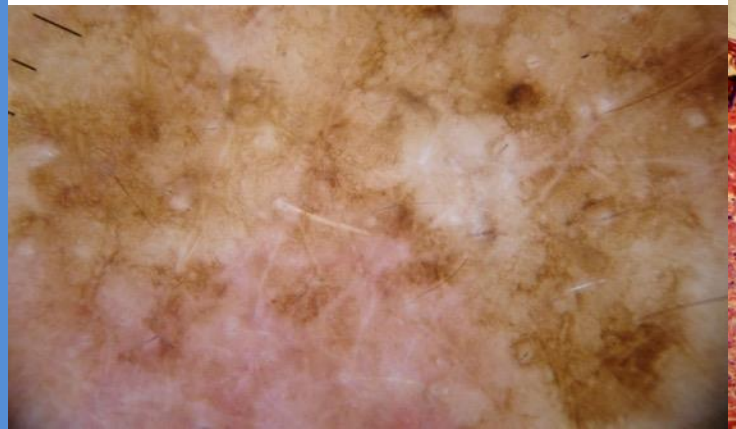
Atypical network or network-like structures
Focal gray dots/granules
Scar like depigmentation.

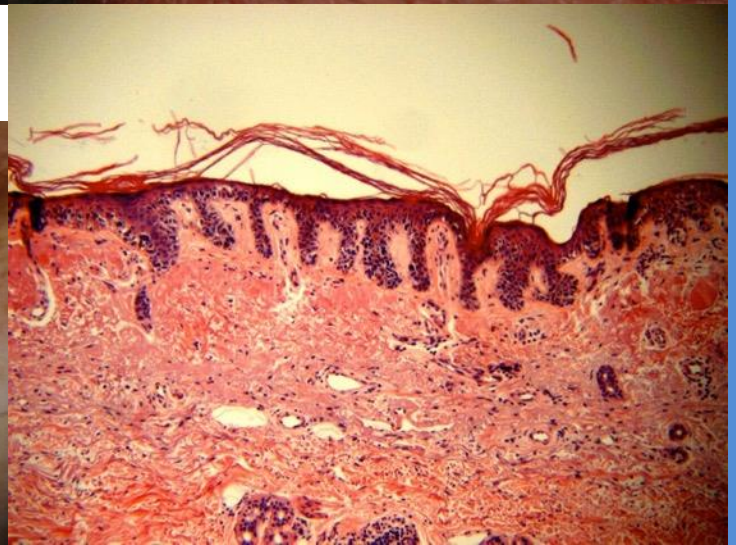
Atypical network or network-like structures
Focal gray dots/granules



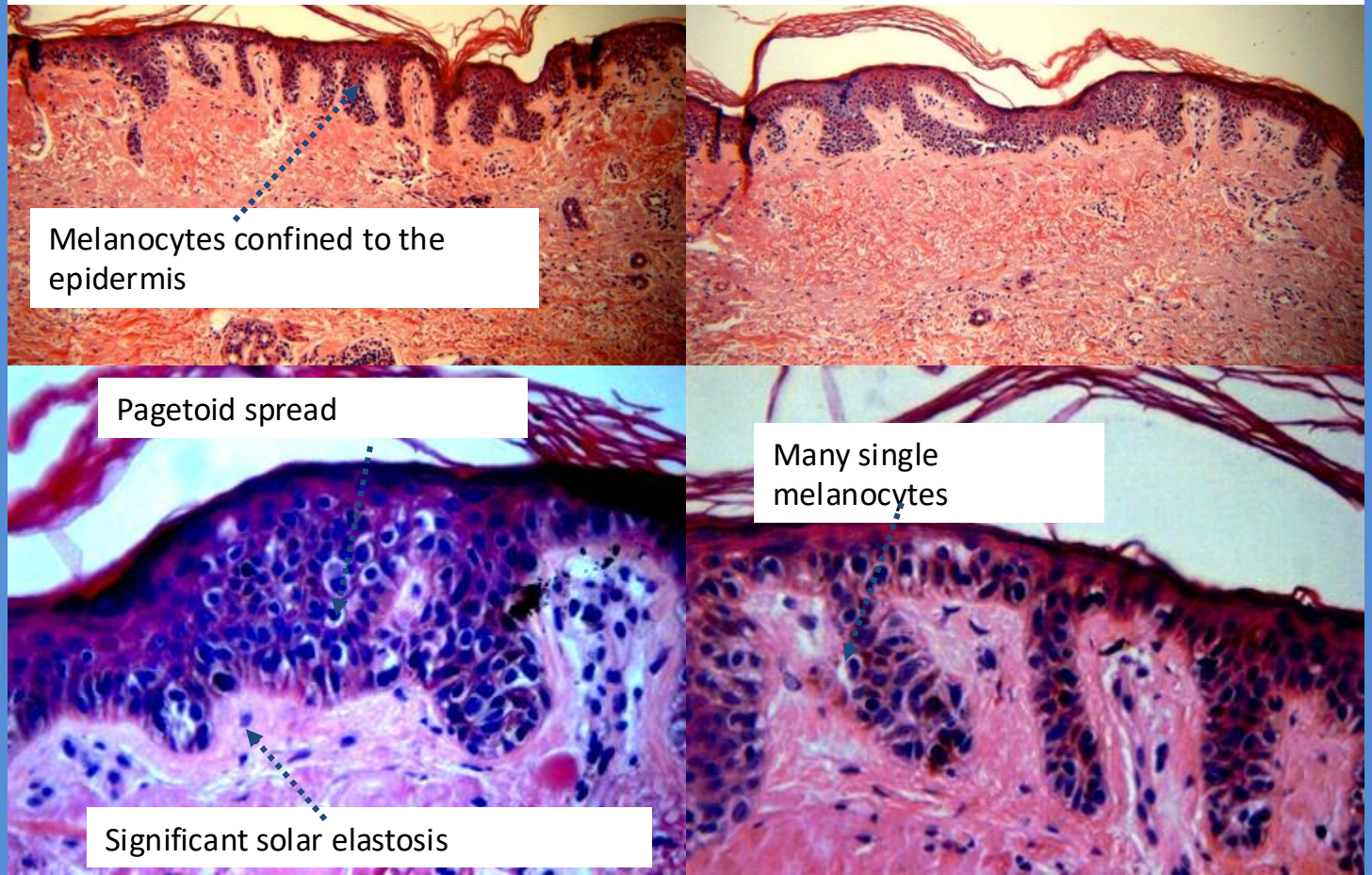
Atypical network or network-like structures
Focal gray dots/granules

Predominant feature reticular pattern with focal gray dots/granules





Melanoma with preservation of rete ridges seen with lentiginous melanoma

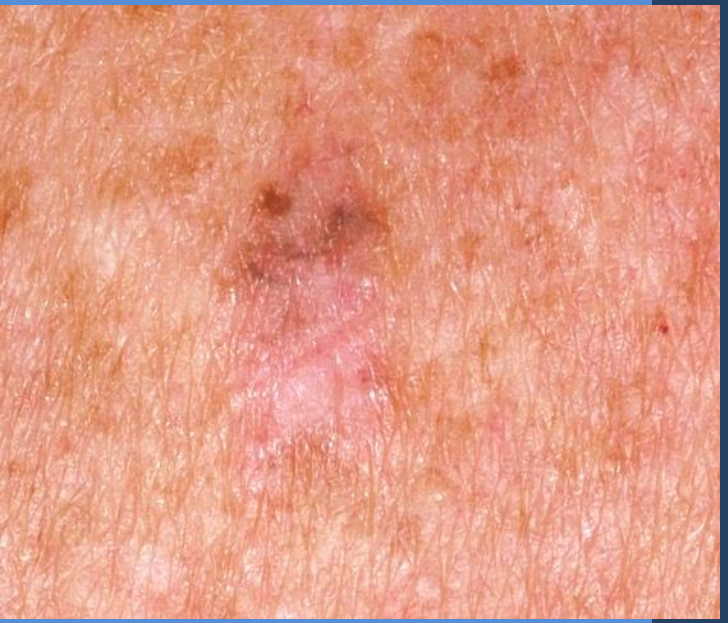


Lentigo maligna melanoma

1. Diffuse gray dots/granules (granularity appears to be finer)

2. Minimal or no discernible network

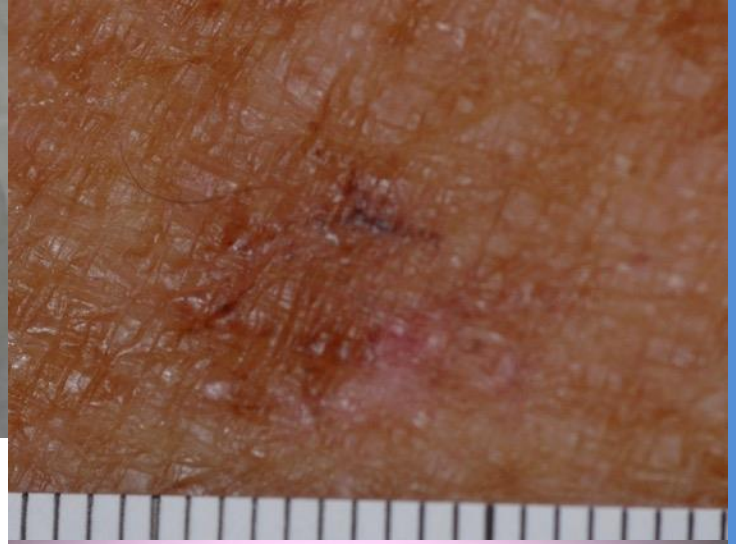
Diffuse gray dots/granules (granularity appears to be finer)
Minimal or no discernible network

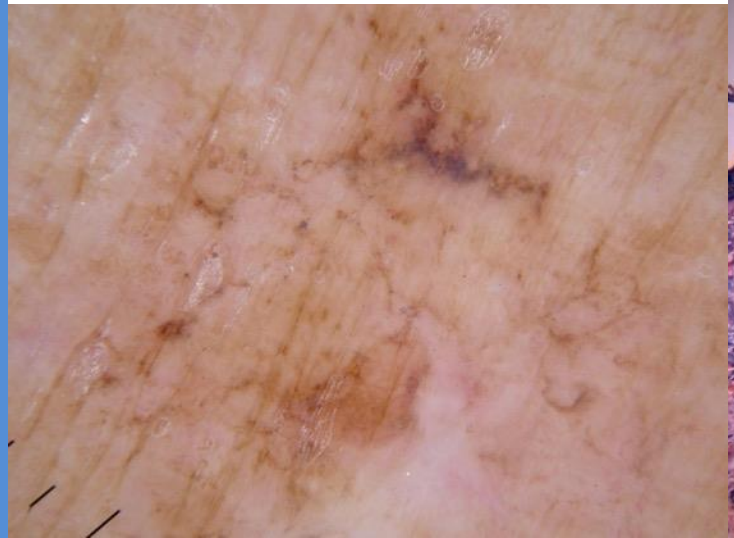


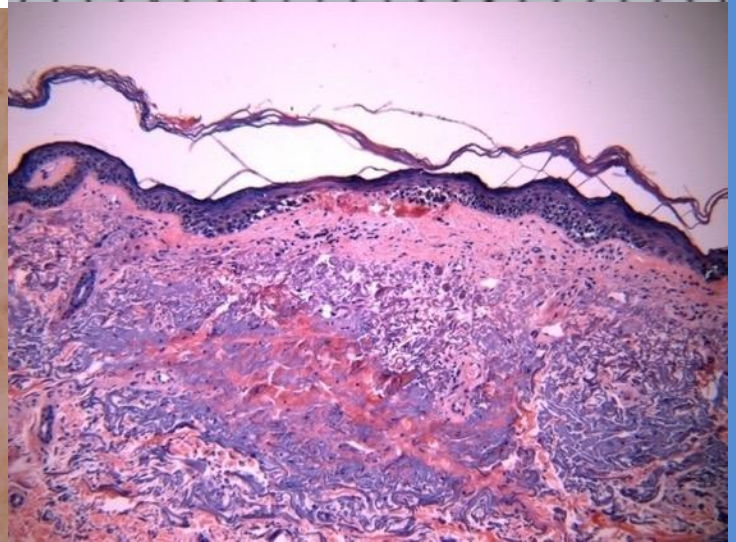
Diffuse gray dots/granules (granularity appears to be finer)
Minimal or no discernible network

Diffuse gray dots/granules (granularity appears to be finer)
Minimal or no discernible network

Predominant feature diffuse gray dots/granules with minimal network network

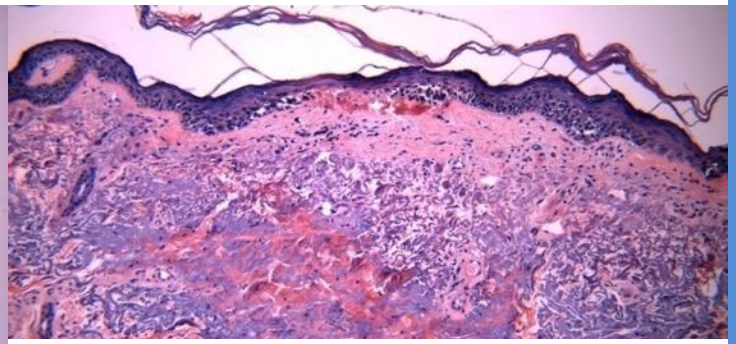






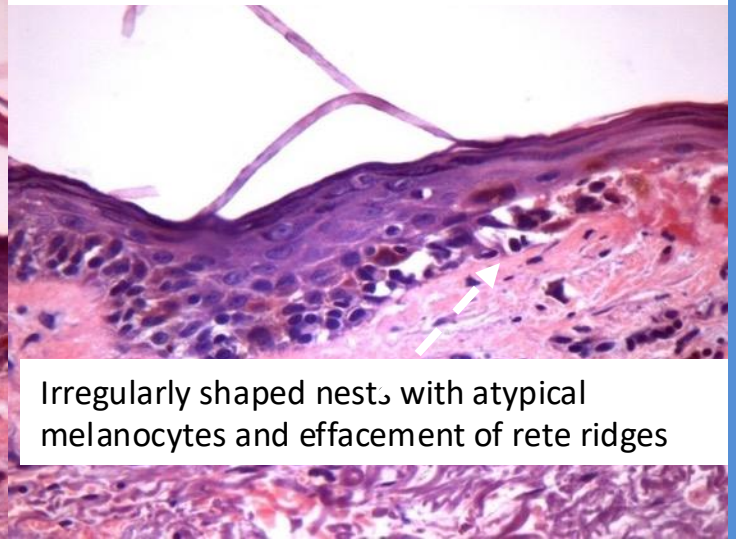
Melanoma with flattening of rete ridges and solar elastosis seen with lentigo maligna melanoma

Extensive solar elastosis



Confluence of melanocytes effacing rete and filling the epidermis

Focal pagetoid spread



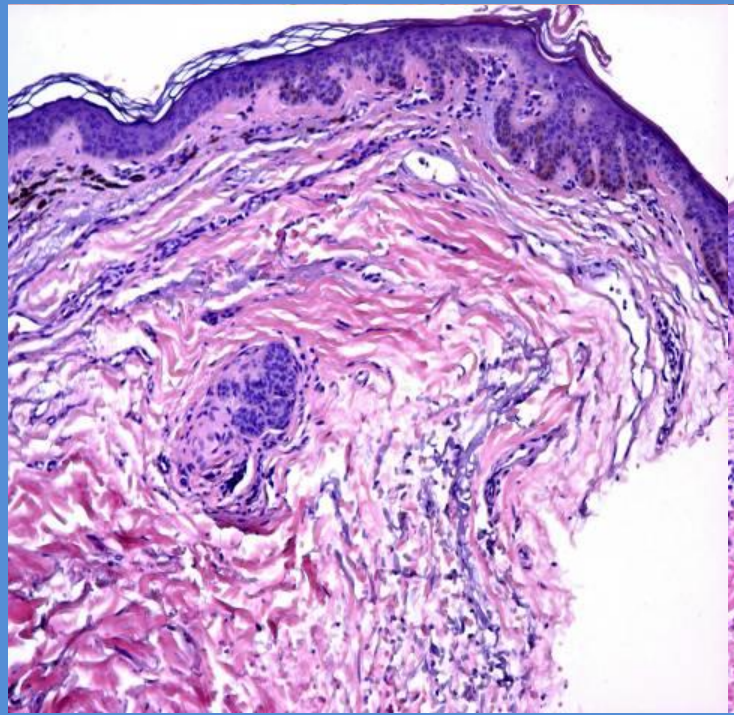
Irregularly shaped nests with atypical melanocytes and effacement of rete ridges

Points of interest

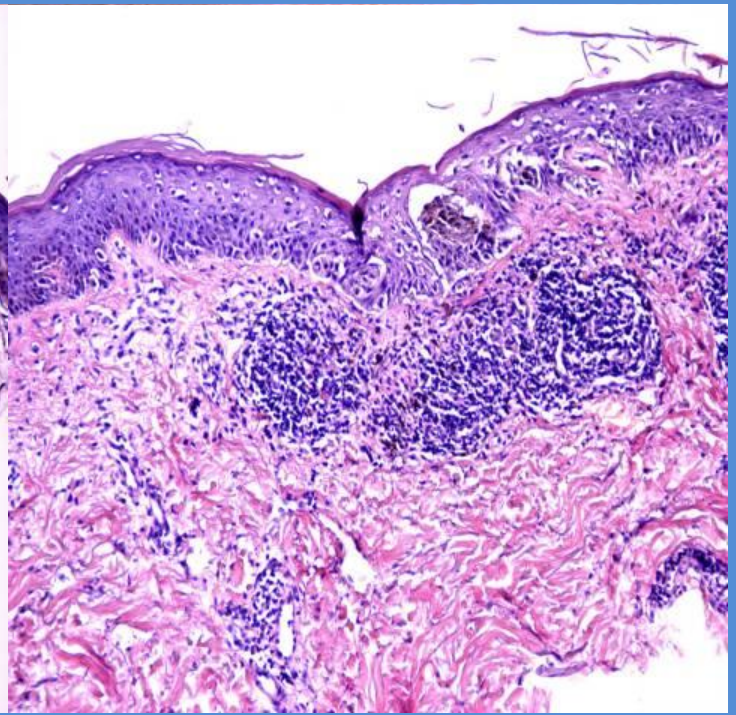
The dermatoscopic features of LPLK and melanoma are sometimes indistinguishable

Lichen planus-like keratosis vs. melanoma?

Lichen-planus-like keratosis

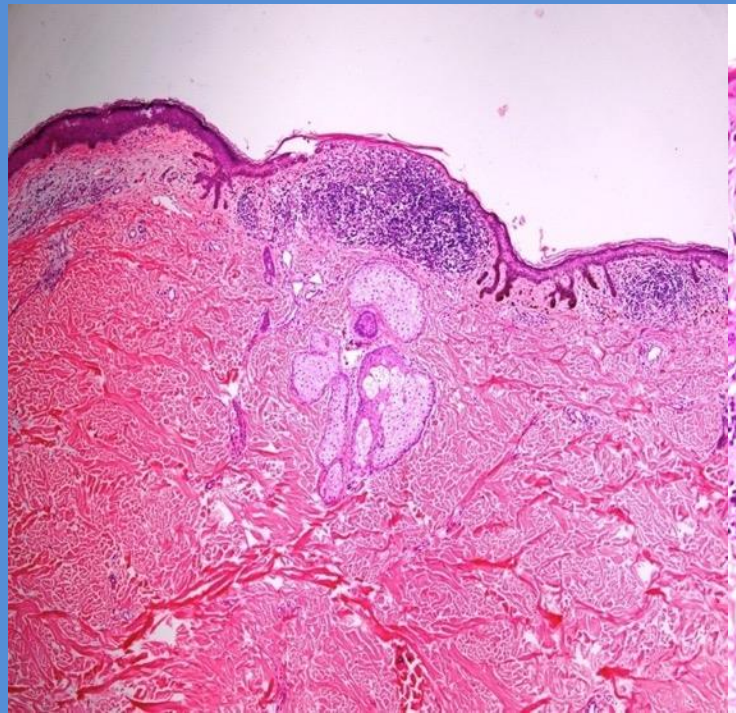


Melanoma in-situ

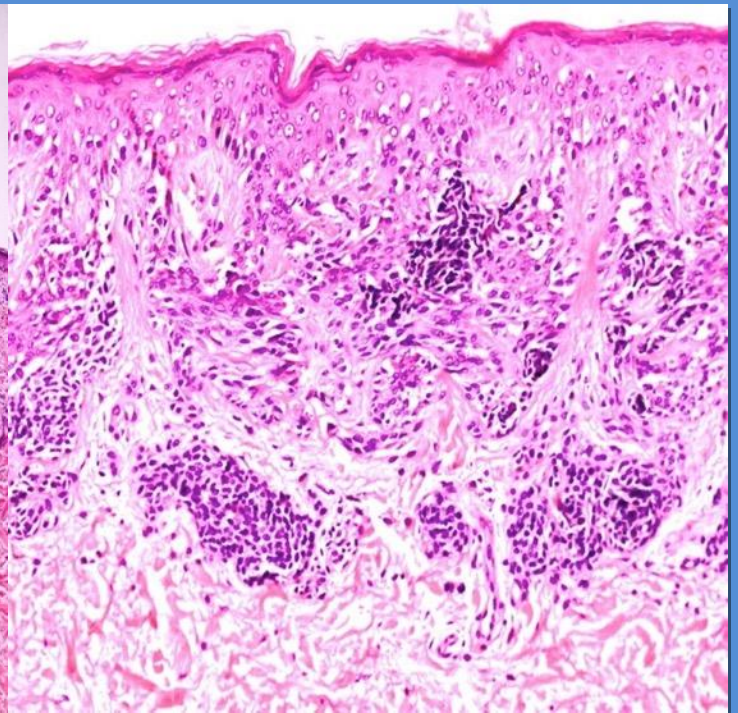


Lichen planus-like keratosis vs. melanoma?

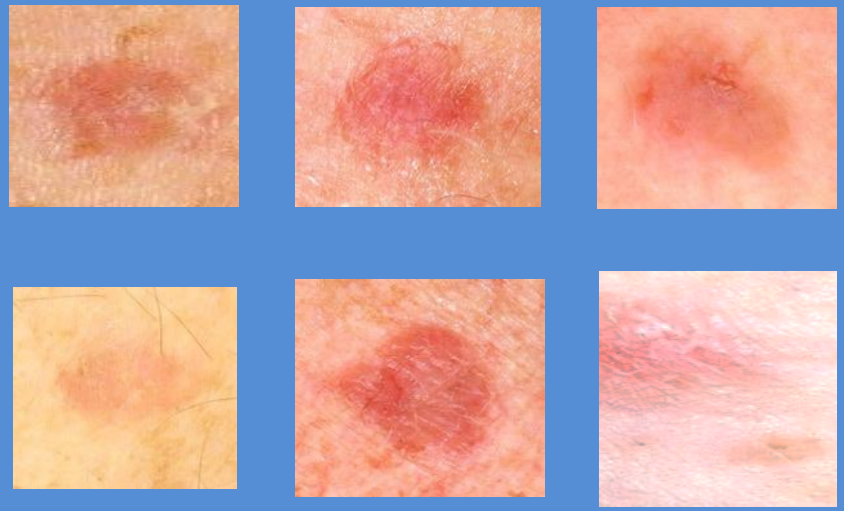
Lichen-planus-like keratosis



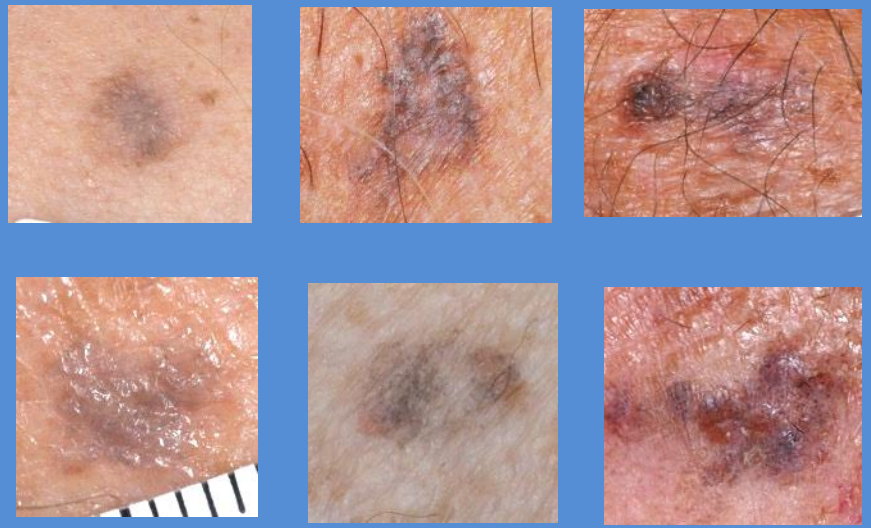
Melanoma in-situ

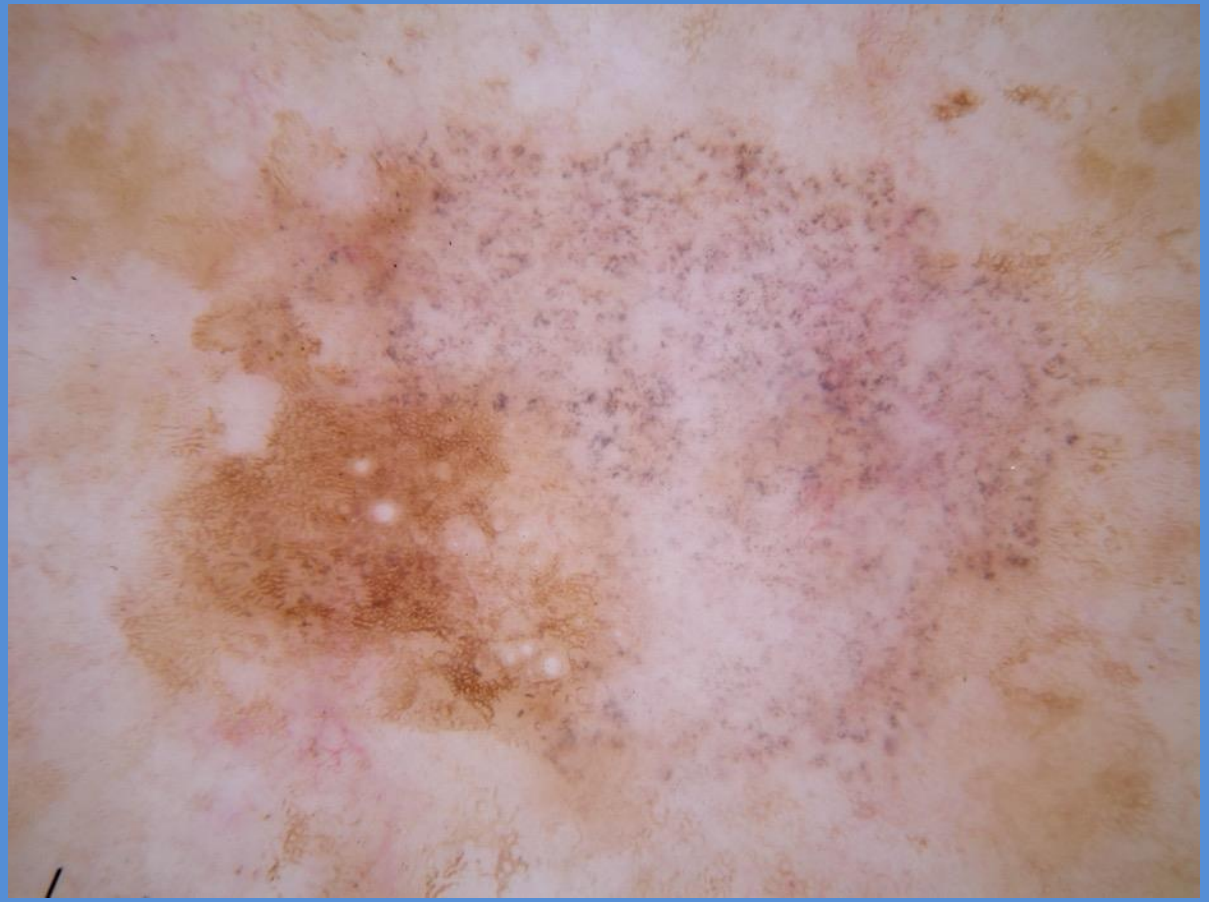


When a seborrheic keratosis undergoes regression if it is pink it can have features of either a BCC , SCC or an amelanotic melanoma.

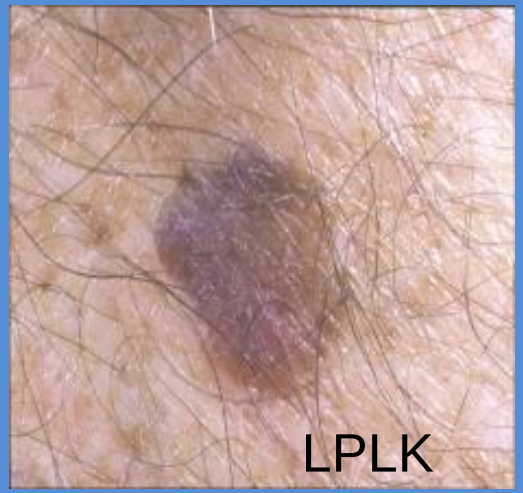


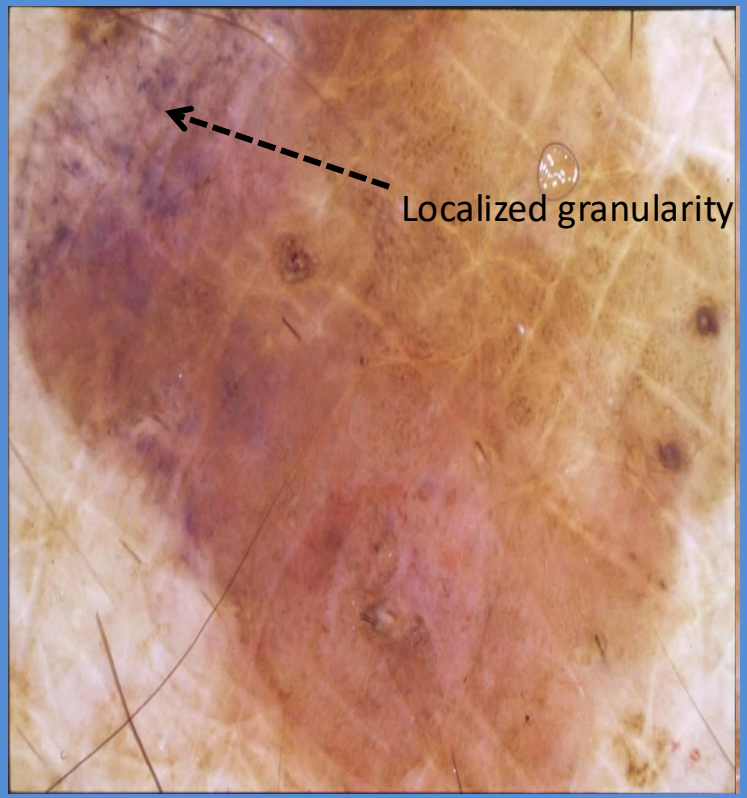
When a seborrheic keratosis undergoes regression if it is pigmented it can simulate a melanoma.





The most common dermoscopic pattern of a pigmented seborrheic keratosis undergoing regression (LPLK) is gray dots/granules in association with dermoscopic structures of a seborrheic keratosis

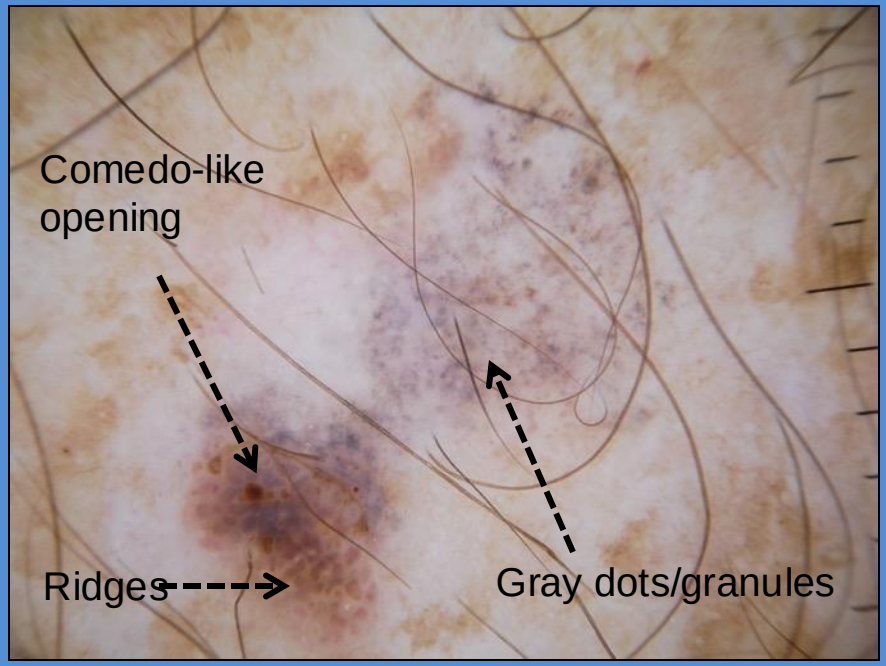


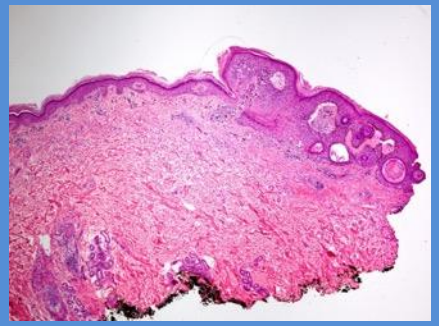


This is an early seborrheic keratosis! Note the scalloped borders and the thickened lines.

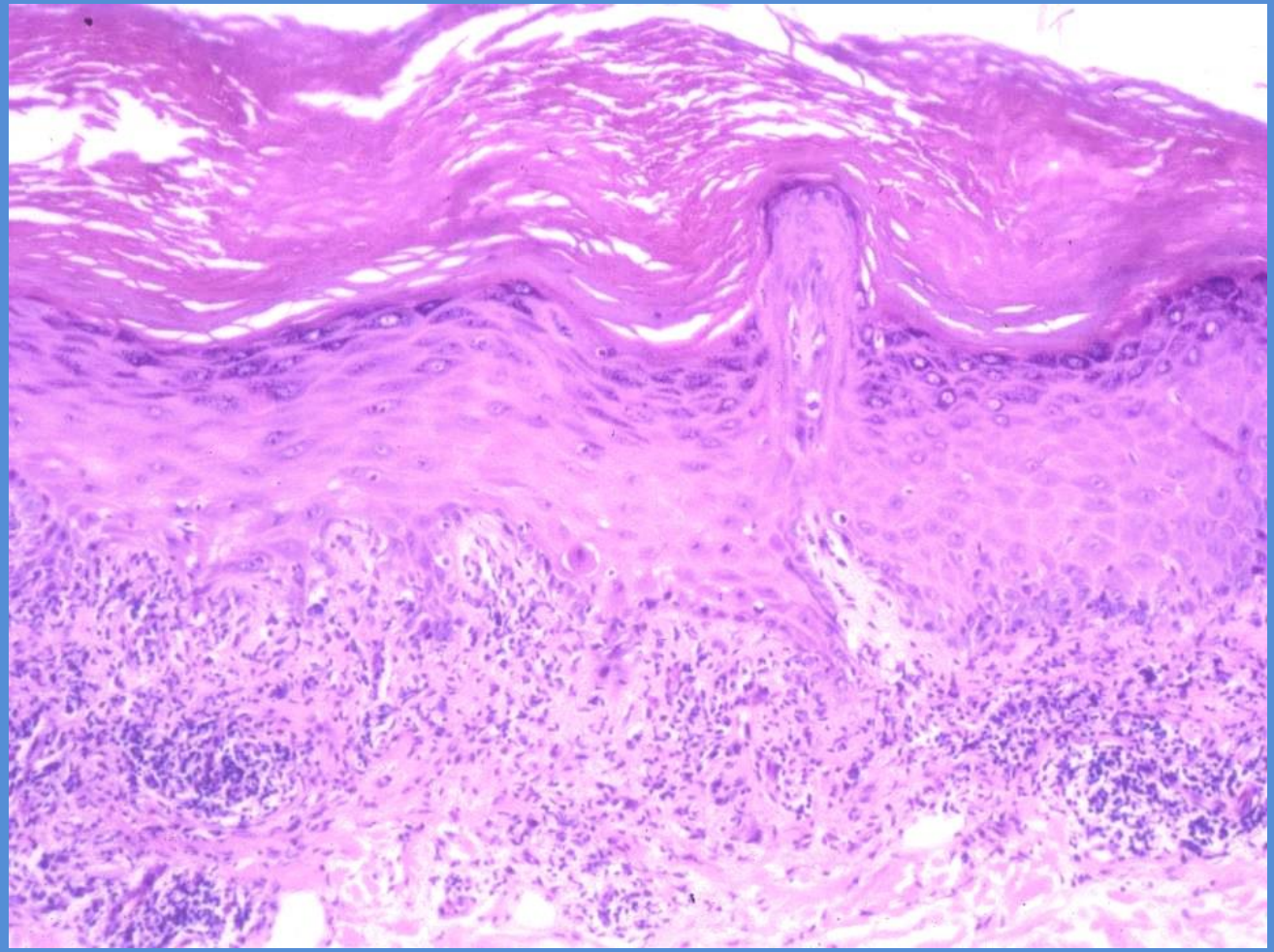
When this seborrheic keratosis undergoes regression, we call this lesion a lichen planus like keratosis.

- ✧ Ridges
- ✧ Comedo-like openings
- ✧ Gray dots/granules



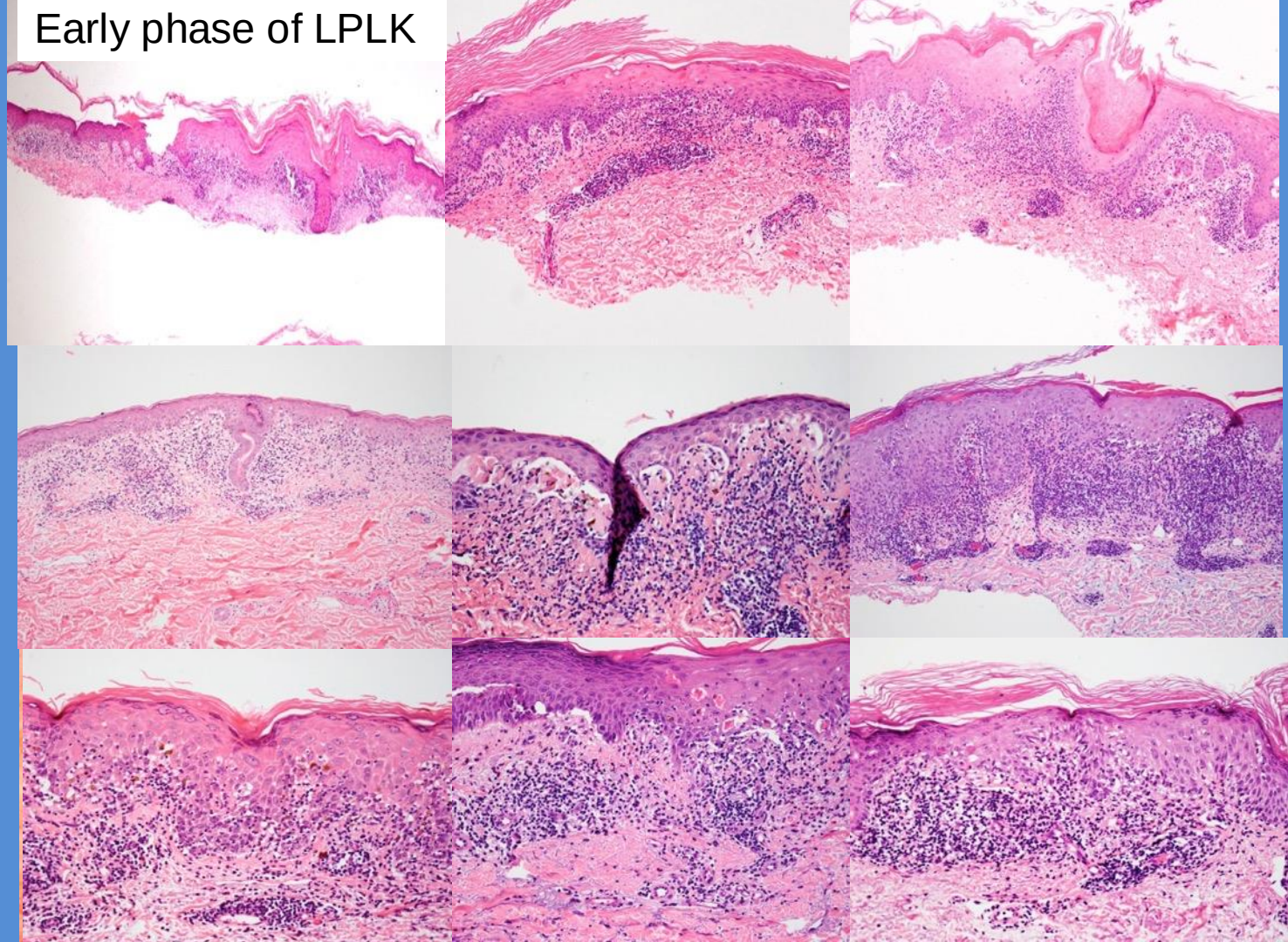


LPLK



LPLK associated with non-pigmented seborrheic keratosis have distinct histologic features. They are characterized by a band like lichenoid infiltrate, epidermal hyperplasia, and necrotic keratinocytes.

Early phase of LPLK



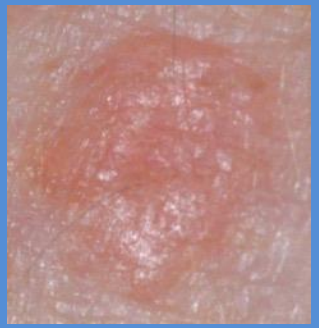
Dermoscopically the most important feature are the colors.

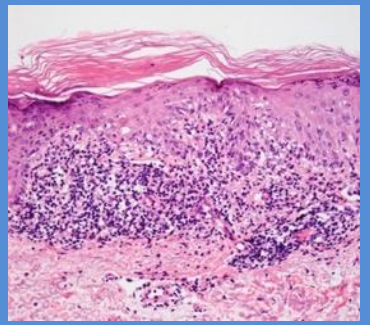
They are:

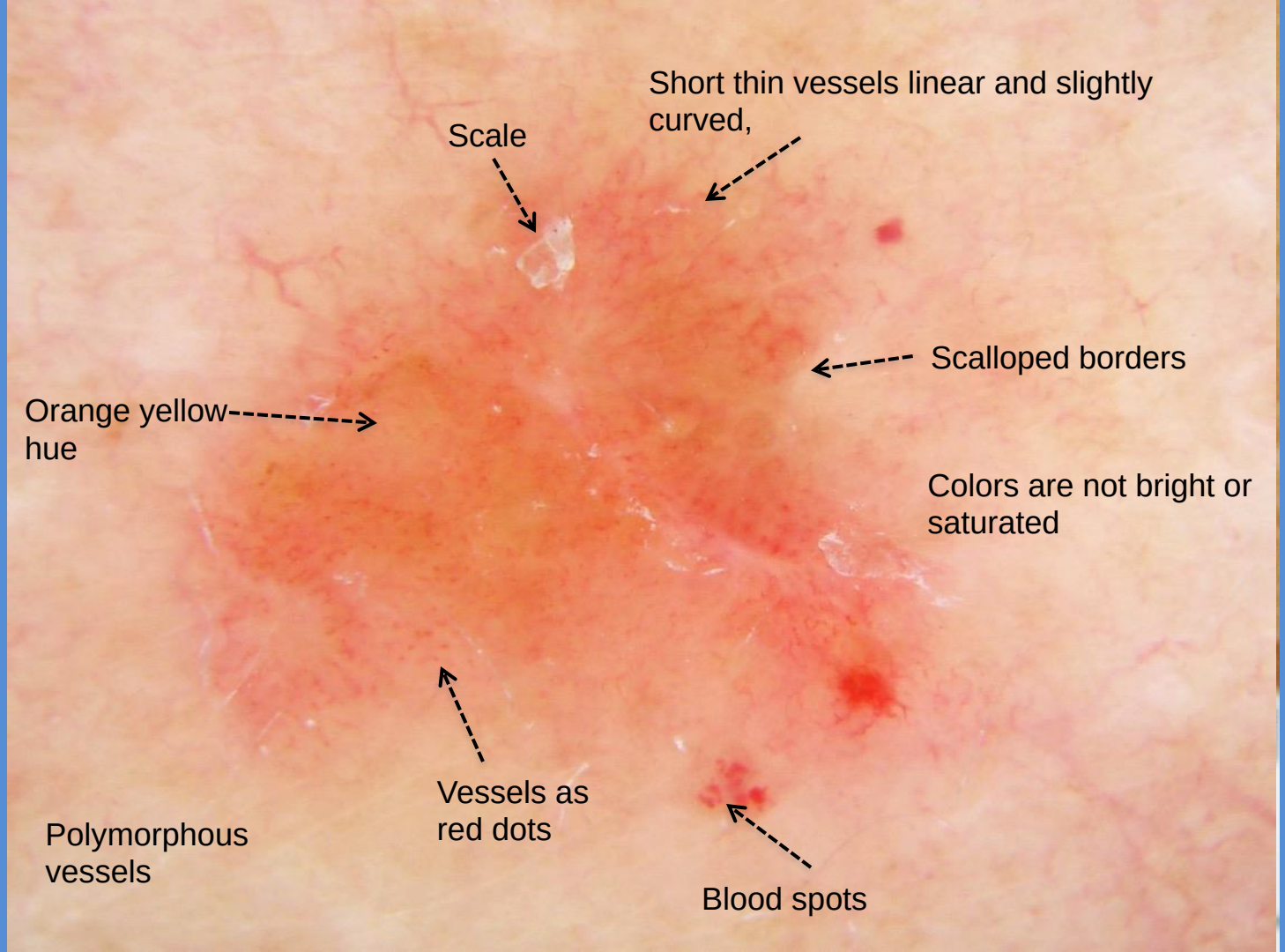
1. Orange yellow hue
2. Pink white with some orange or yellow
3. Colors are not bright or saturated

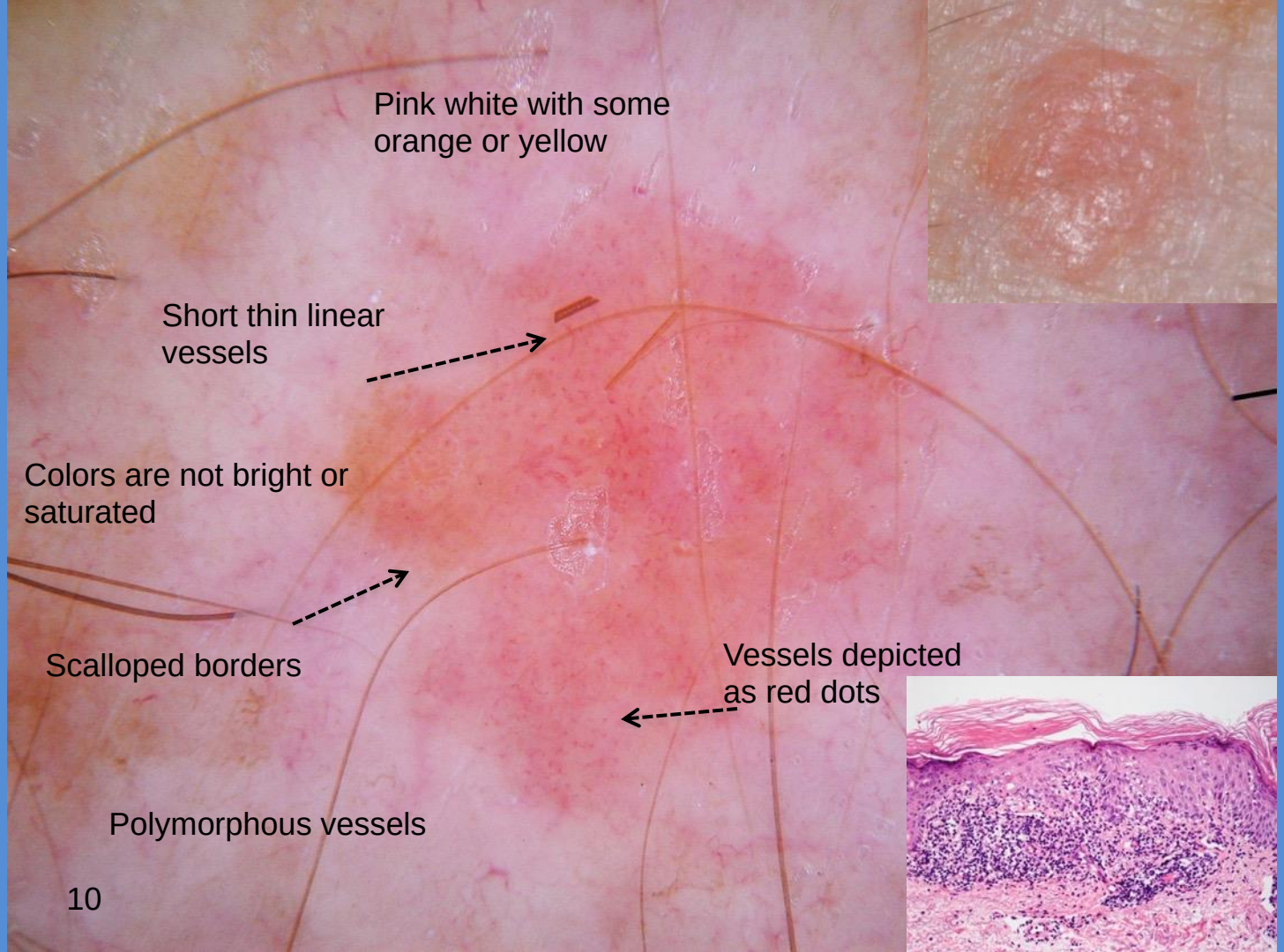
Other features include:

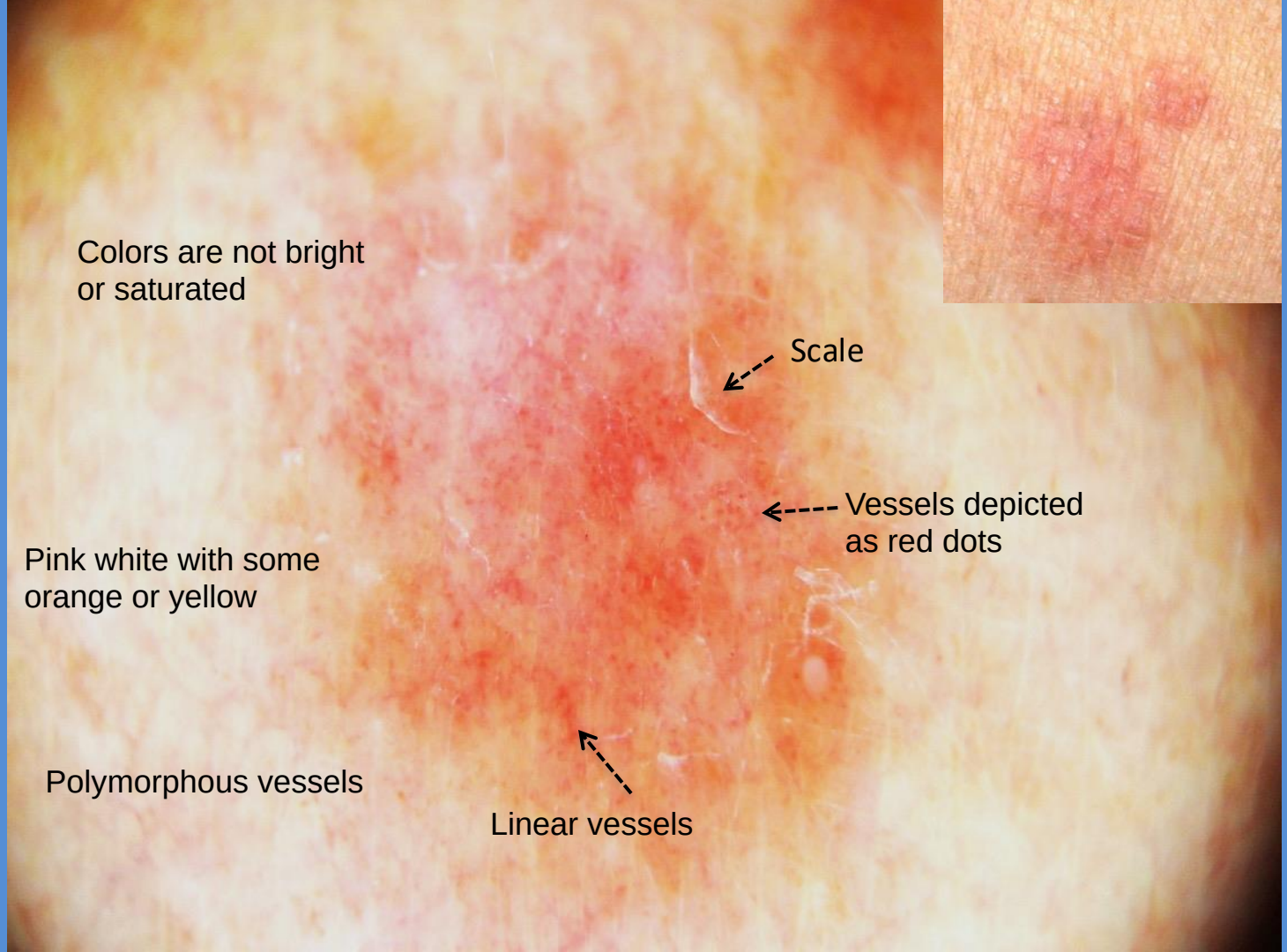
1. Polymorphous vessels
2. Short thin vessels either linear, slightly curved, or serpentine in appearance
3. Vessels depicted as red dots (Tend to be focal)
4. Scalloped borders
5. Scale






Short thin vessels linear and slightly curved,
Scale
Scalloped borders
Orange yellow hue
Colors are not bright or saturated
Vessels as red dots
Polymorphous vessels
Blood spots


Pink white with some orange or yellow
Short thin linear vessels
Colors are not bright or saturated
Scalloped borders
Vessels depicted as red dots
Polymorphous vessels

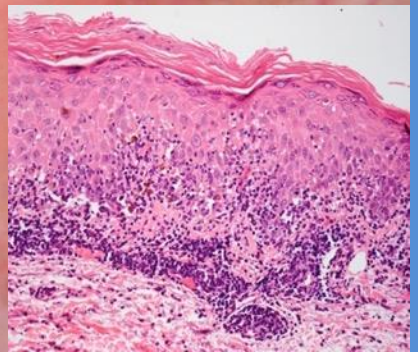

Colors are not bright or saturated
Scale
Vessels depicted as red dots
Pink white with some orange or yellow
Polymorphous vessels
Linear vessels

Pink white with some orange or yellow

Structureless area

Colors are not bright or saturated

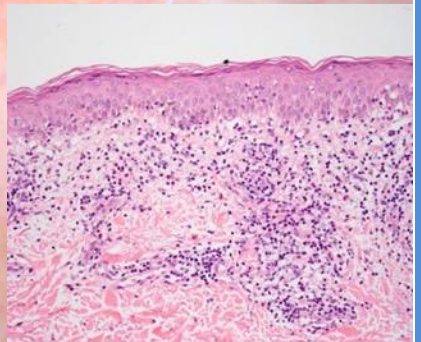
Scalloped borders



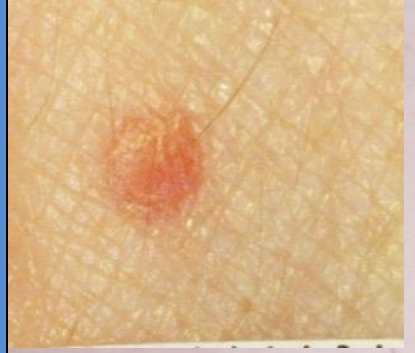
Structureless area

Colors are not bright or saturated

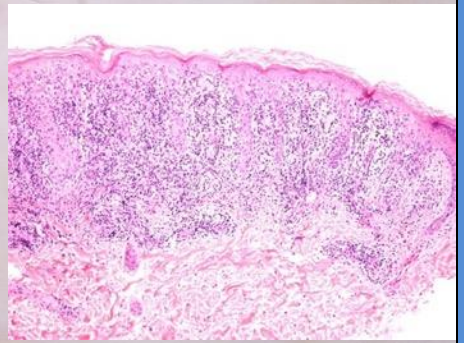
Homogenous pink to brown areas

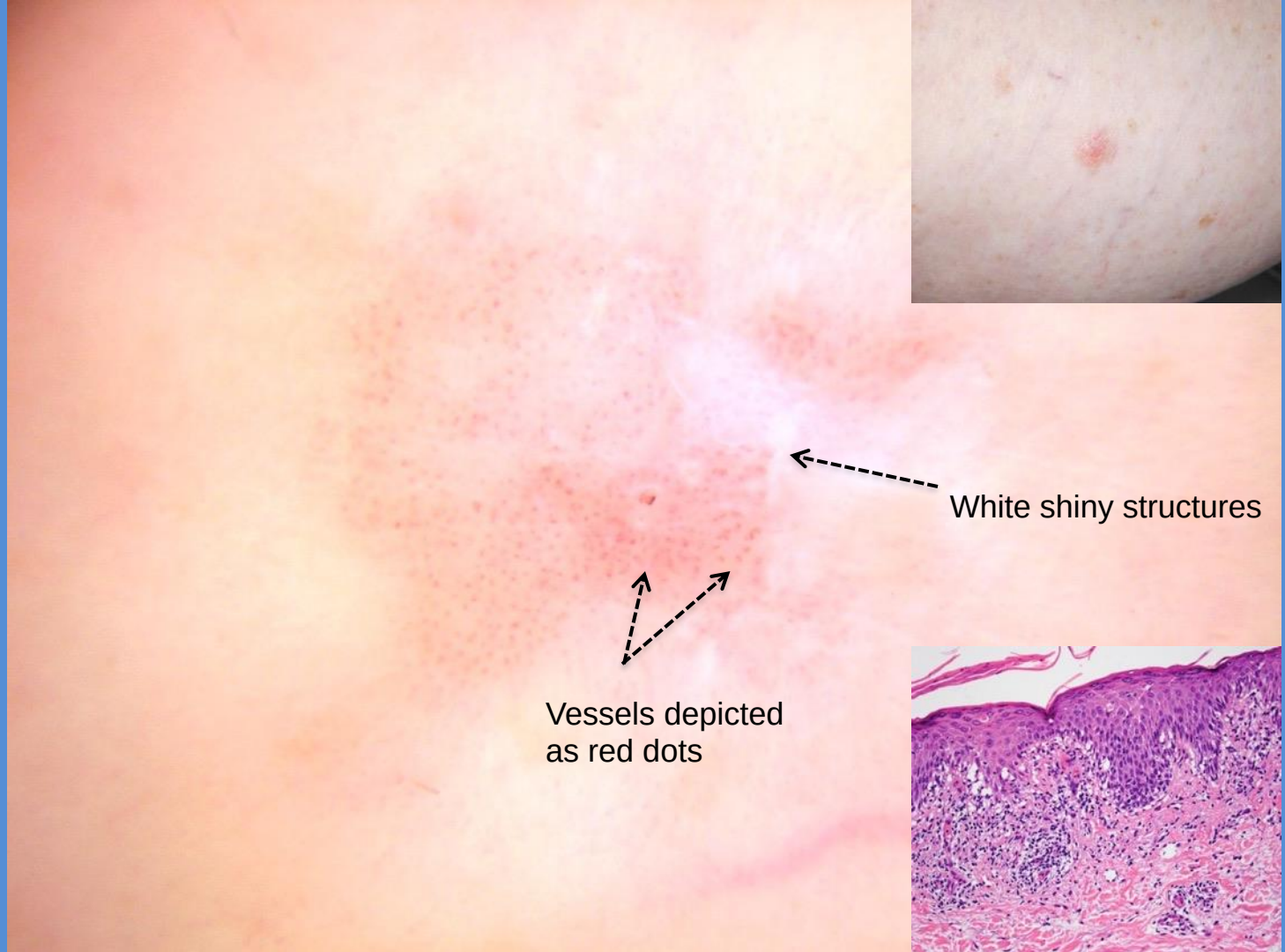


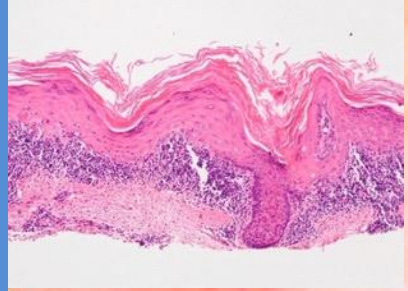
Lichen planus like keratosis that simulate SCC



Vessels depicted as red dots




White shiny structures
Vessels depicted
as red dots

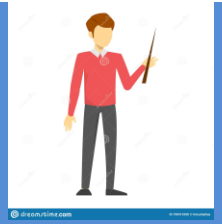


Vessels surrounded by a halo

Circular or oval structures with an orange brown (tan) structure and a white peripheral rim (keratin pearls)

Vessels as red dots

The dermoscopy lesson 2



The Pink Panther

- “The differential diagnosis of a pink papule can vary from innocent lesions like an intradermal naevus to a potential fatal amelanotic melanoma.”
- He commented that this was not an uncommon presentation.

2003-2004

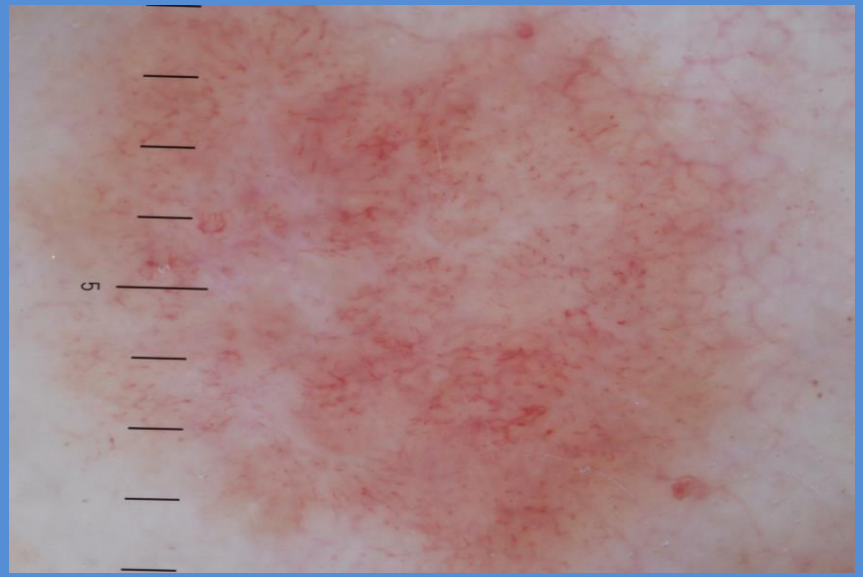
.

UM/Sylvester dermatologist Robert Johr, M.D., assesses the need for a biopsy by using a noninvasive, handheld microscope to detect melanomas.

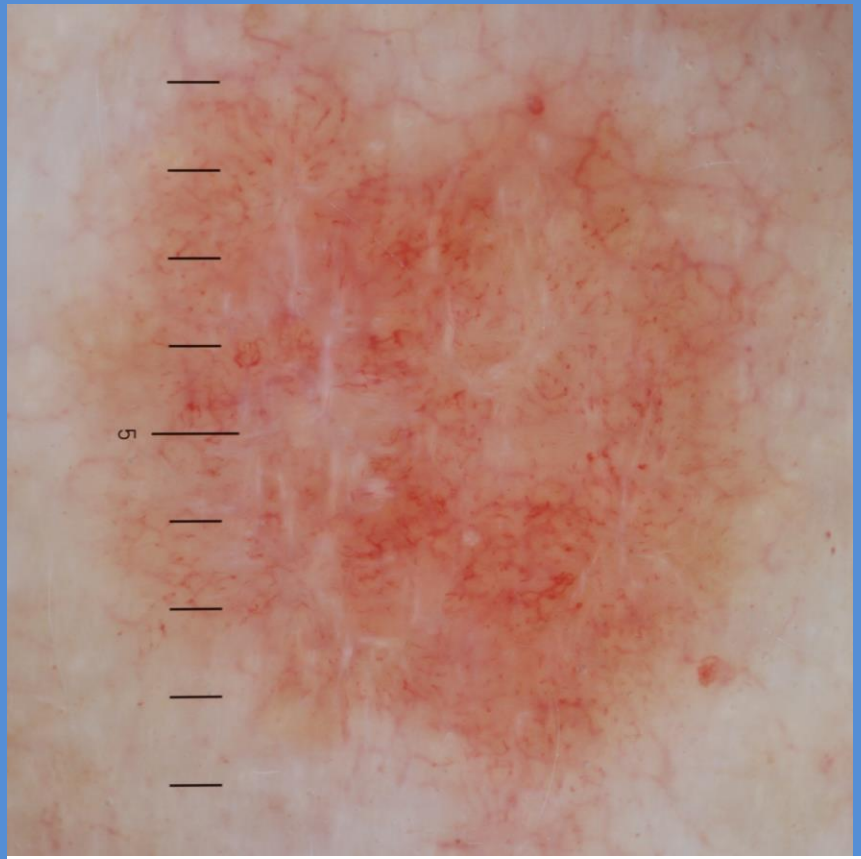
How come I was not seeing these cases. Was I missing them?

The major breakthrough was the use of polarized dermoscopy to diagnose the shades of pink melanomas.

The two important features in the polarized mode were the vasculature features and white shiny structures.



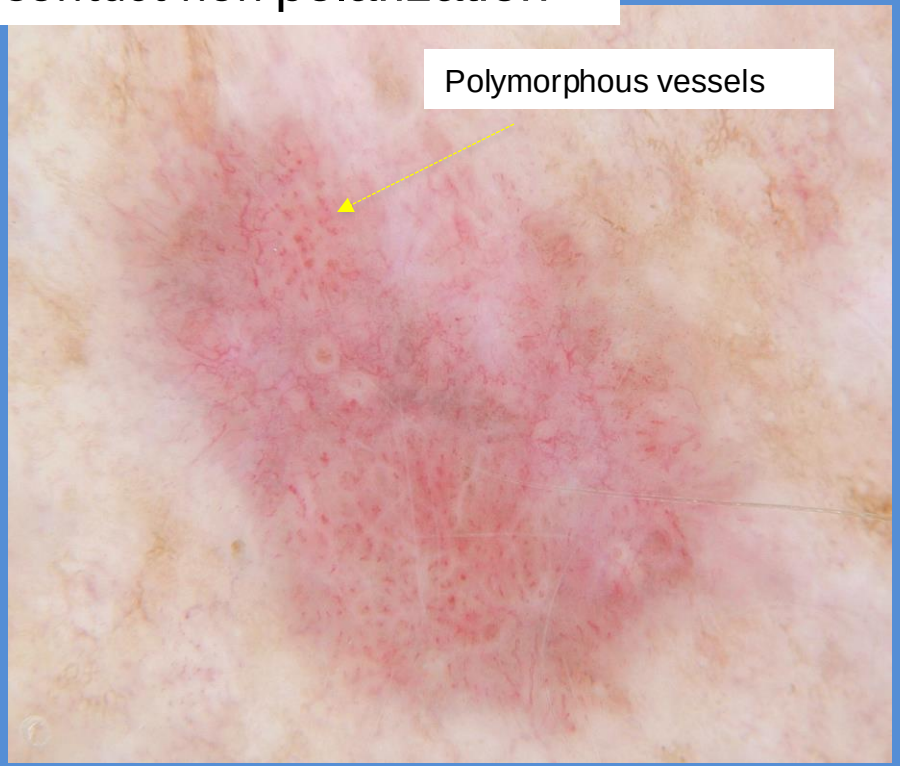
Contact non-polarized mode difficult diagnosis to make.



In the contact polarized mode the polymorphous vessels and white shiny structures clinch the diagnosis..

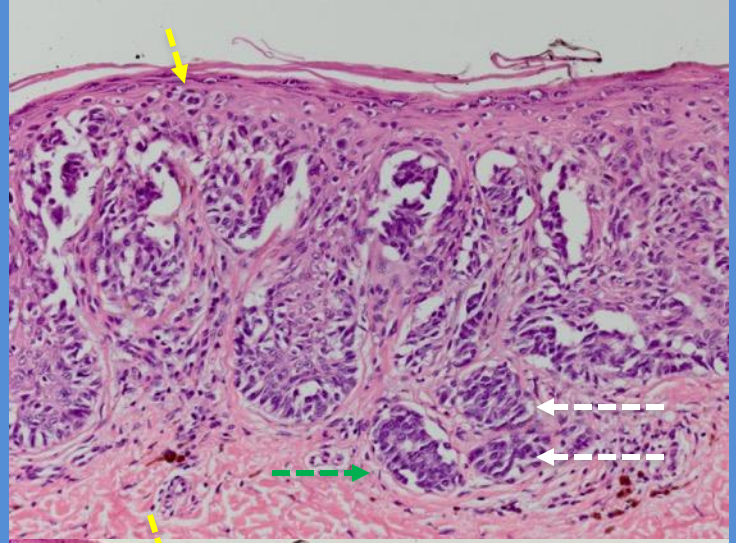
60-year-old man with a family hx of melanoma, on an initial total body skin exam, had an 8mm pink papule of the back.

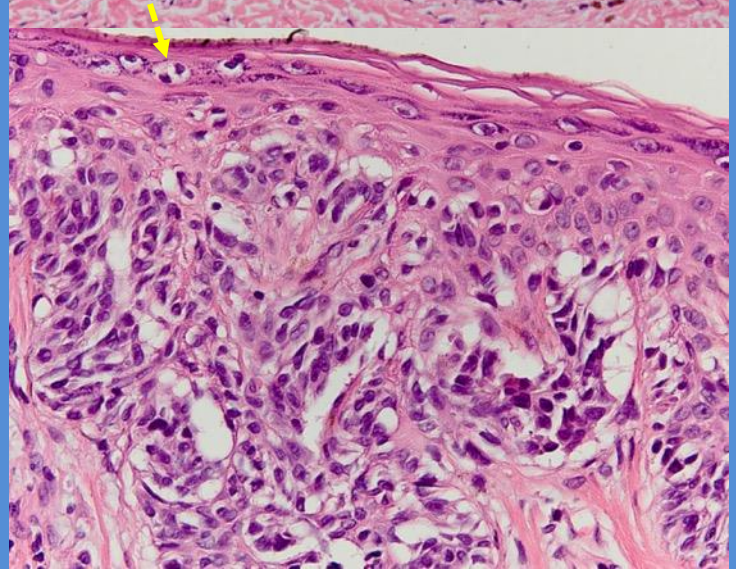
Contact non polarization

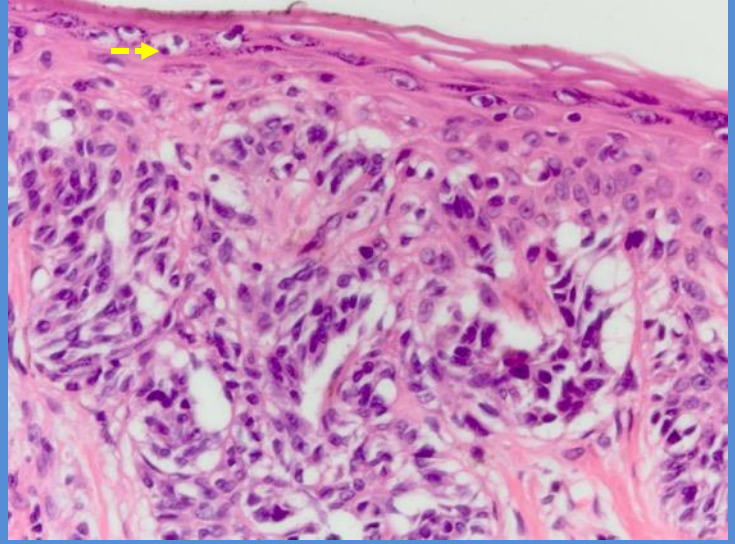


Contact polarization

(In my opinion) the key features are best seen in the polarized mode. White lines and vessels as dots or polymorphous vessels are often seen in shades of pink melanomas or Spitz nevi.



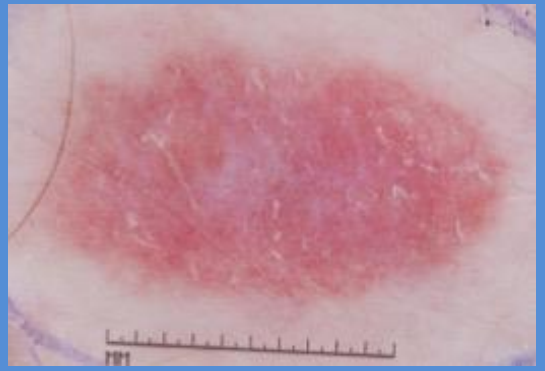




- Single & aggregated atypical melanocytes at DEJ & extending down adnexa (green arrow)
- Nest of melanocytes vary in size & shape with a tendency to confluence (discohesion, bridging)
- Single pagetoid melanocytes above the DEJ (Yellow arrows)
- Nests of atypical melanocytes in papillary dermis (black arrows) with inflammation, melanophages and lamellar fibrosis.

Shades of pink melanomas

Papule



Plaque

Nodule

Shades of pink melanomas

There is usually more than one shade of pink:
pink brown
pink red
pink blue
pink black

Shades of pink melanomas

Key dermoscopy features:

1. Vascular pattern
2. White lines
3. Shiny white structures
4. Brown structureless areas at the periphery

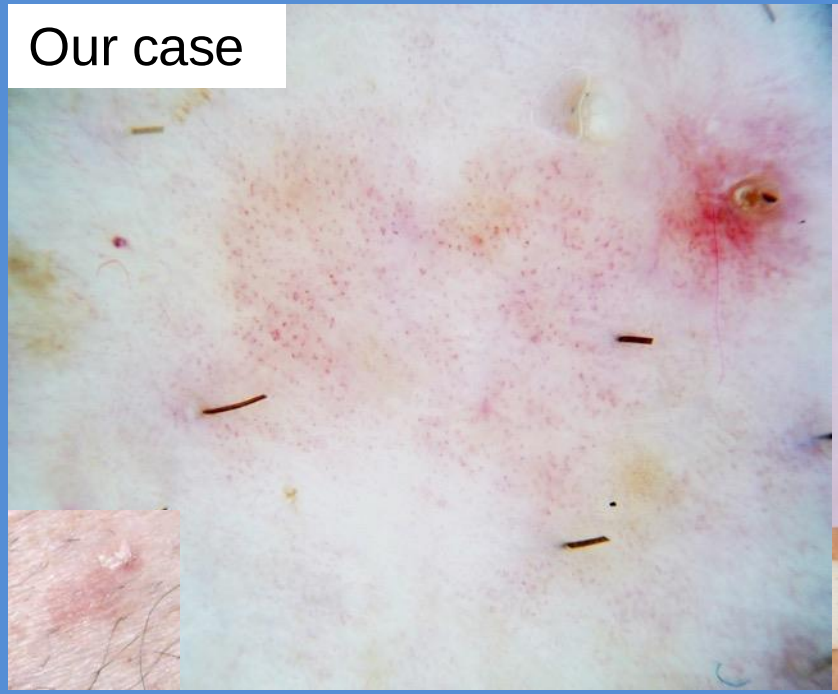
Vascular structures

The most common vascular structures in shades of pink include:

- Vessels as red dots
- Linear random vessels
- Polymorphous vessels
- Pink and red oval structures (milky-red globules)
- Milky white areas

Diffuse vessels as red dots

Our case



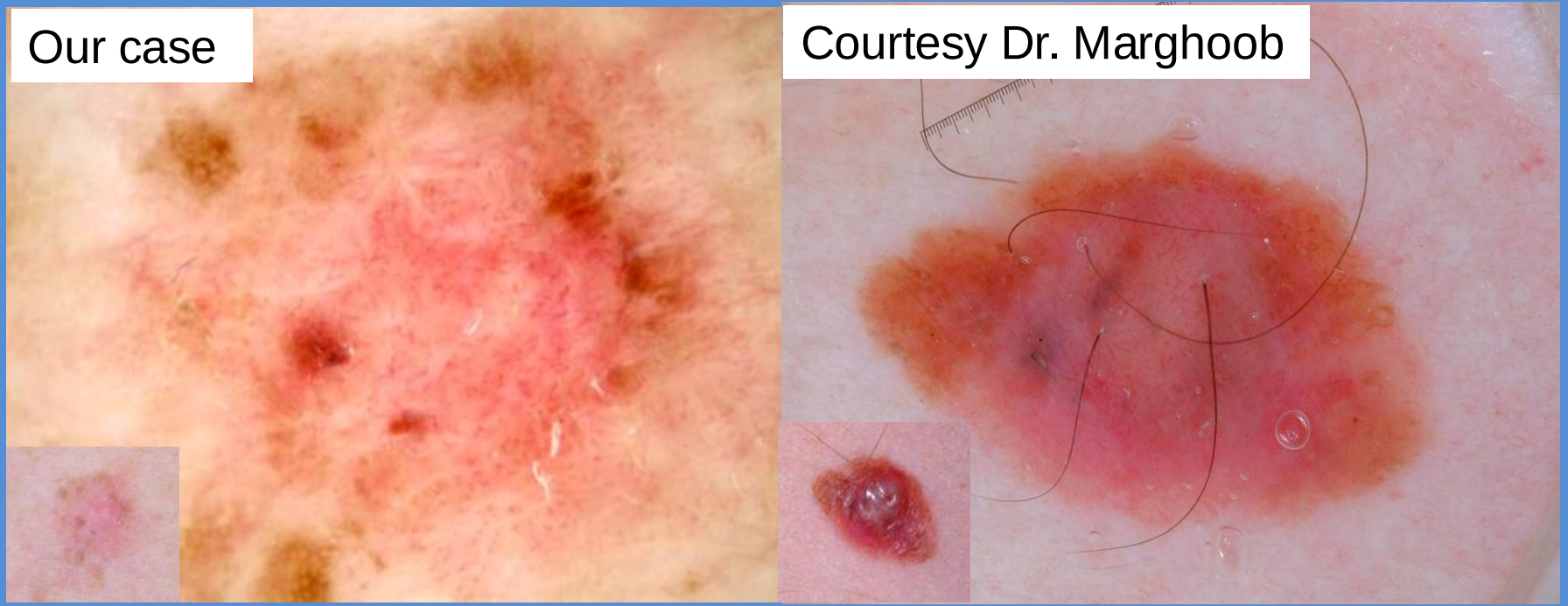
Not common. Seen in early melanomas
A biopsy diagnosis!

Vascular structures

The most common vascular structures in shades of pink include:

- Vessels as red dots
- Linear random vessels
- Polymorphous vessels
- Pink and red oval structures (milky red globules)
- Milky white area

Linear random vessels (linear irregular vessels)



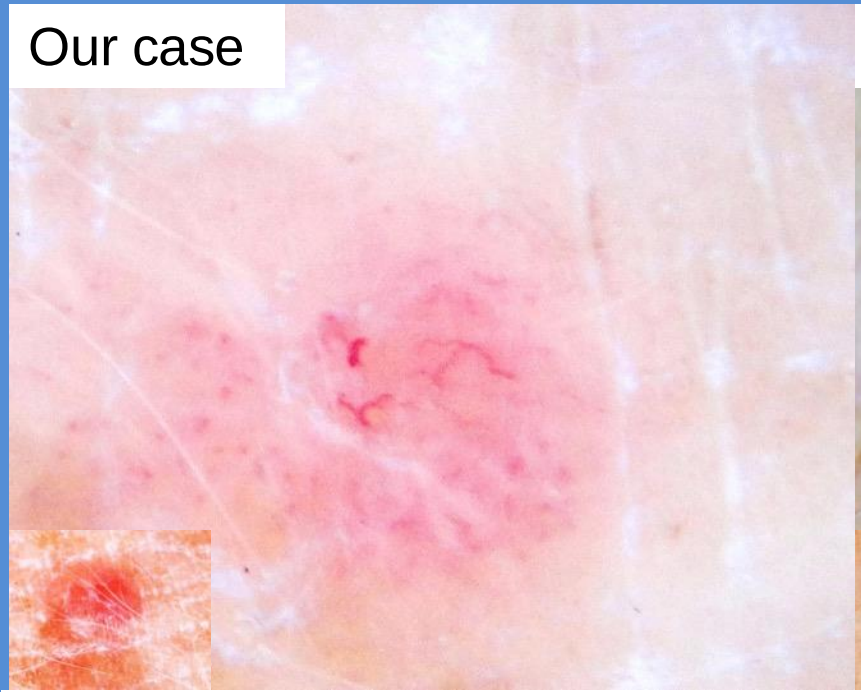
Commonly seen in thin melanoma!

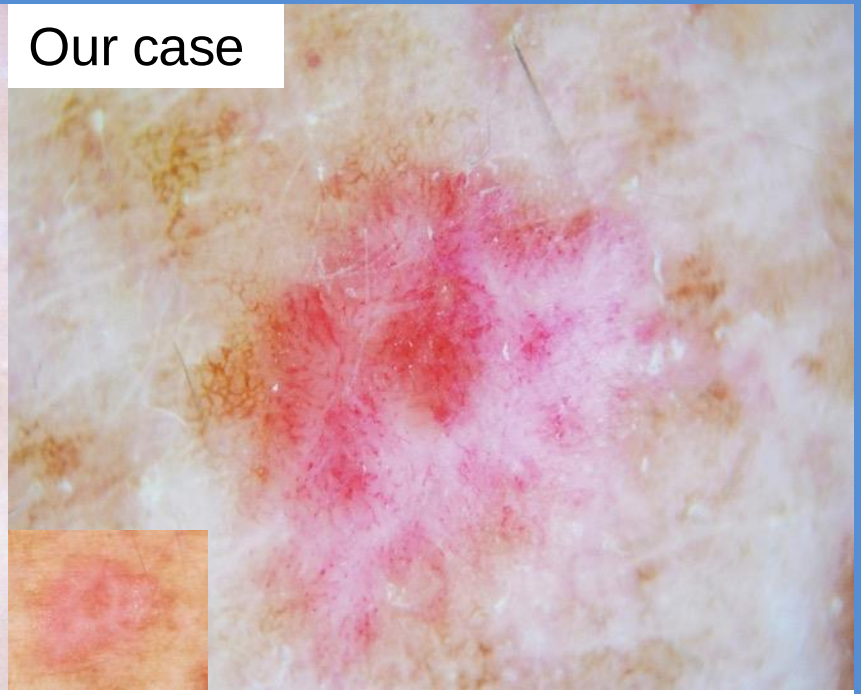
Vascular structures

The most common vascular structures in shades of pink include:

- Vessels as red dots
- Linear random vessels
- Polymorphous vessels
- Pink and red oval structures (milky red globules)
- Milky white areas

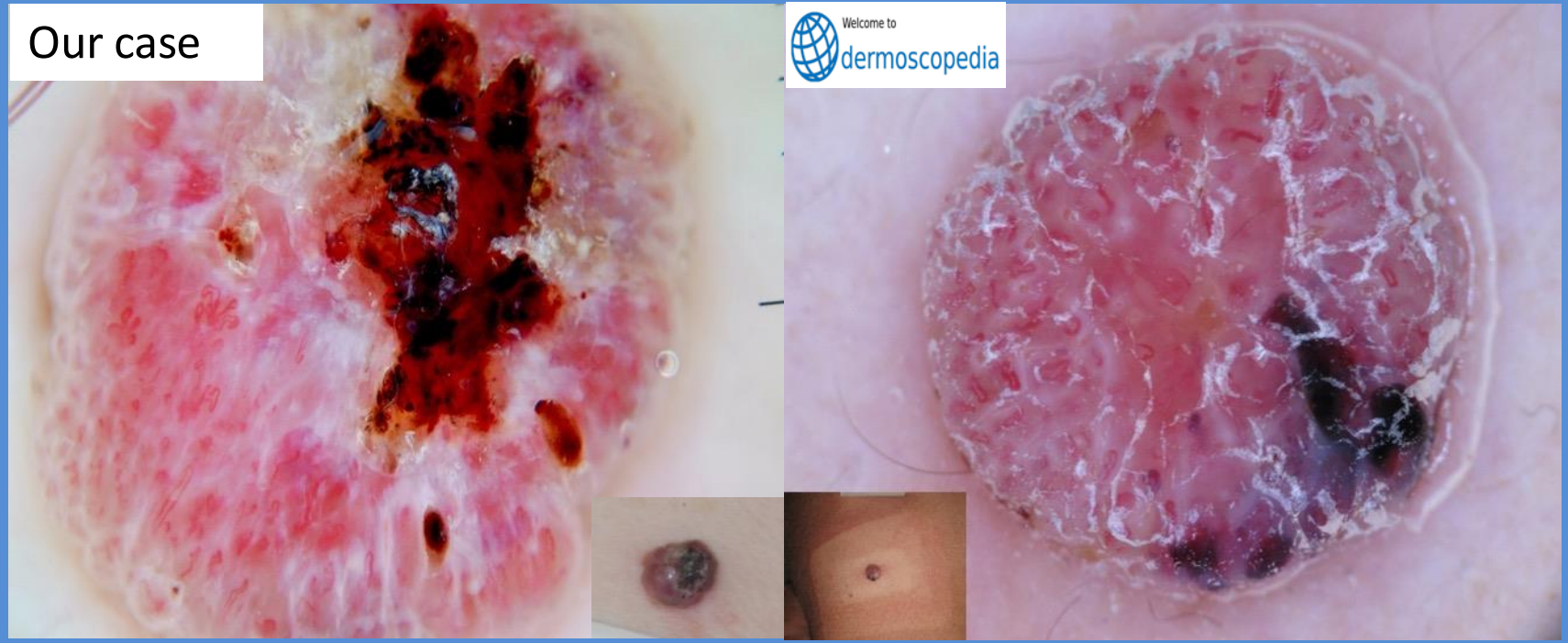
Polymorphous vessels





Polymorphous vessels: combination of 2 or more vessels.
Most common pattern: vessels as red dots in combination with linear random vessels.
Fine thin vessels seen in melanoma in situ and thin melanomas

Polymorphous vessels



Polymorphous vessels: Thick melanomas often have loop vessels more twisted, splintered and irregularly distributed

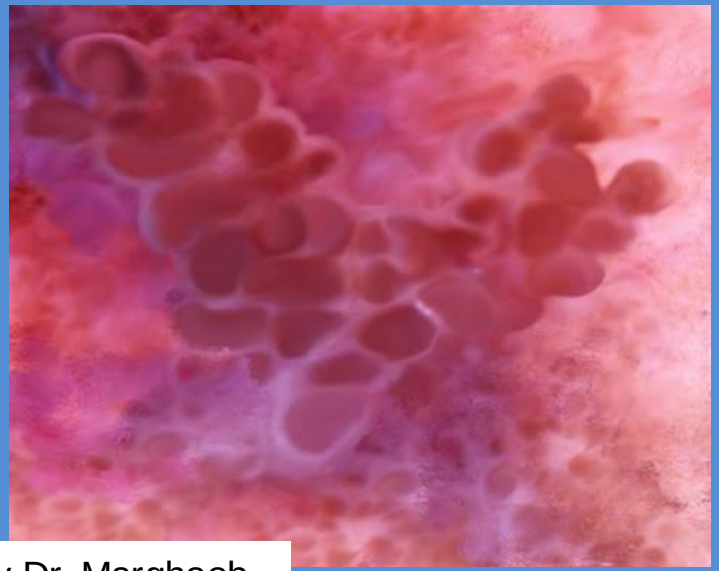
Vascular structures

The most common vascular structures in shades of pink include:

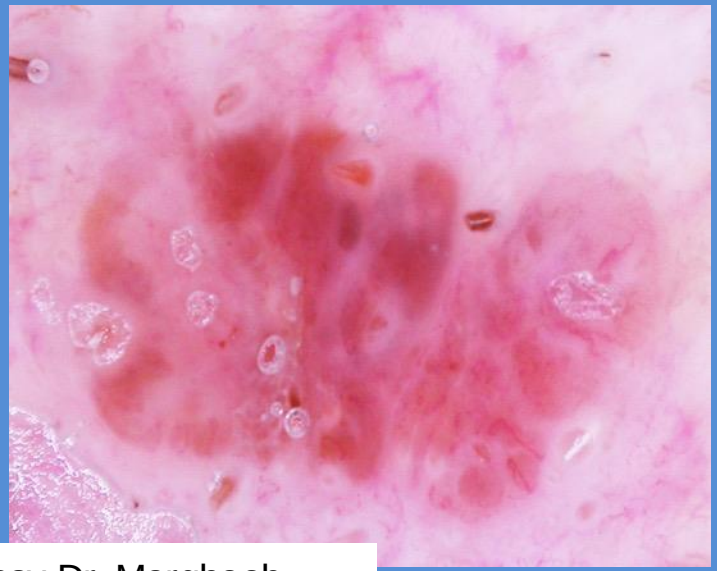
- Vessels as red dots
- Linear random vessels
- Polymorphous vessels
- Pink and red oval structures (milky red globules)
- Milky white areas

Pink and Red Oval Structures (Milky Red Globules)

Often seen with melanomas that clinically are thick or have the colors red or pink



Courtesy Dr. Marghoob



Courtesy Dr. Marghoob

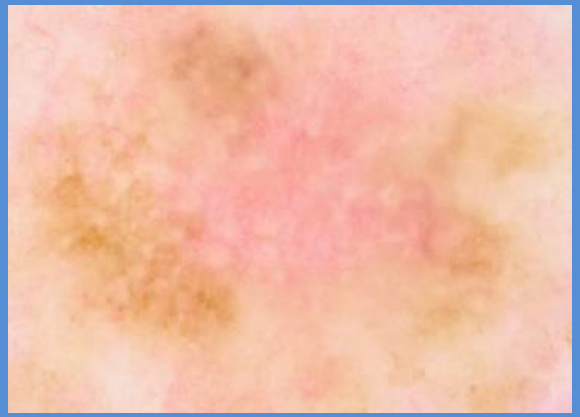
Vascular structures

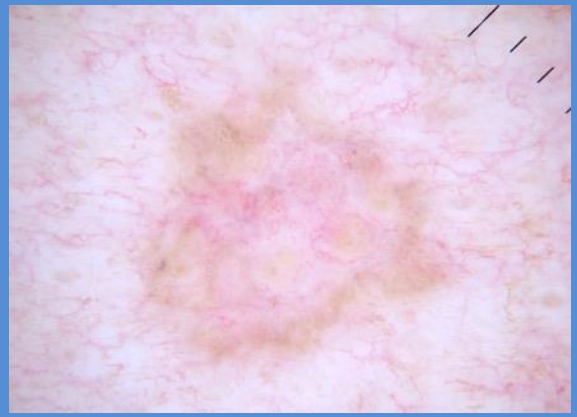
The most common vascular structures in shades of pink include:

- Vessels as red dots
- Linear random vessels
- Polymorphous vessels
- Pink and red oval structures (milky red globules)
- Milky white areas

Pink and Pink-White Areas (Milky-red Areas)

Described as having a milky-white appearance or scar-like depigmentation.

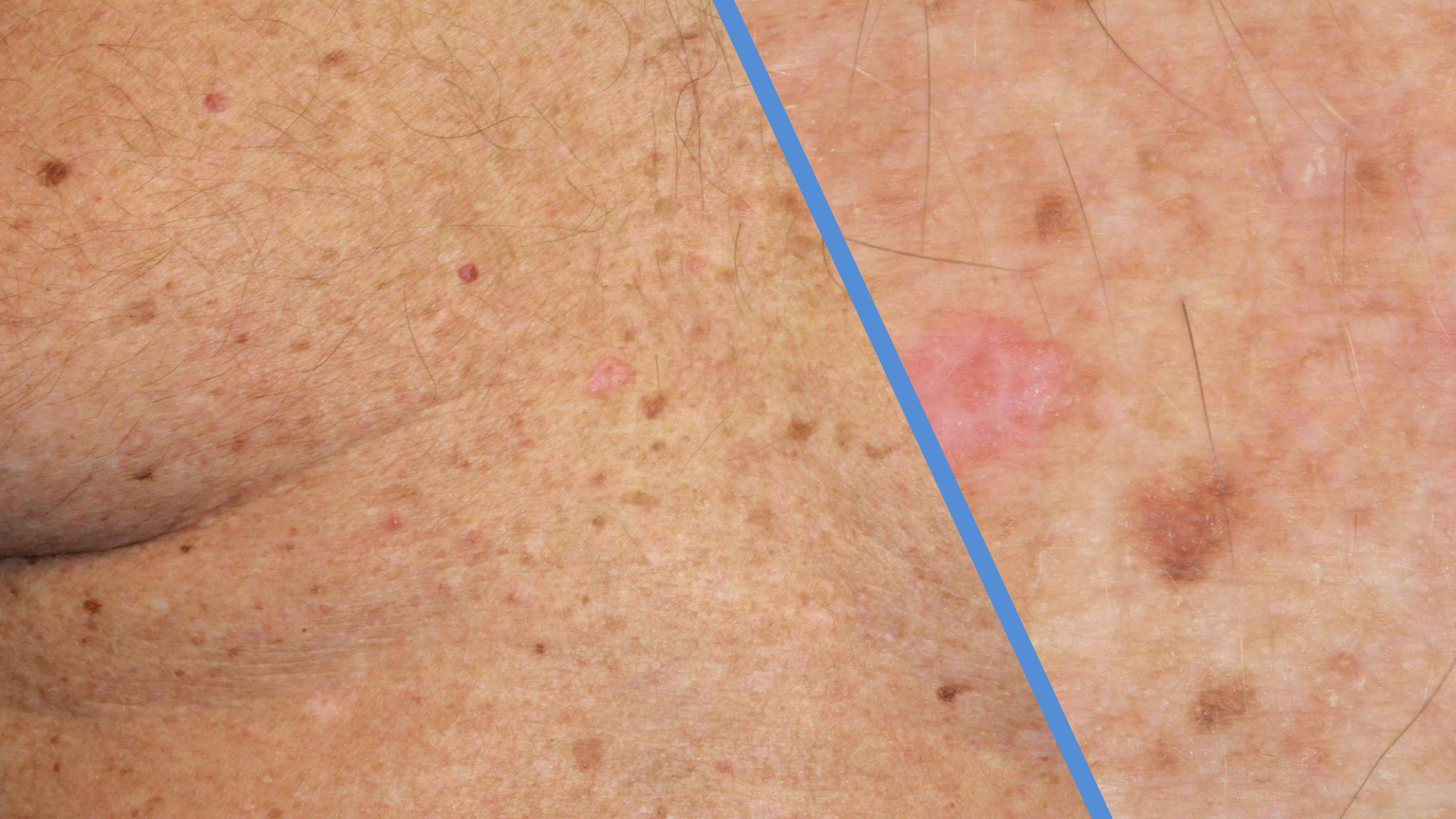


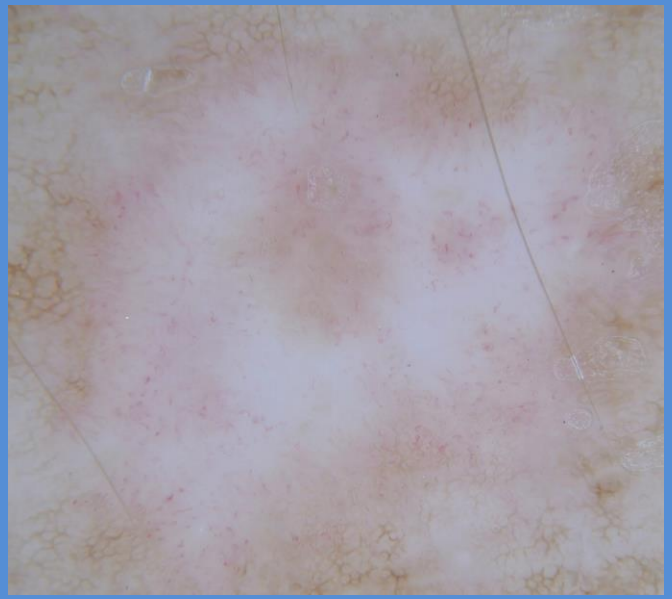


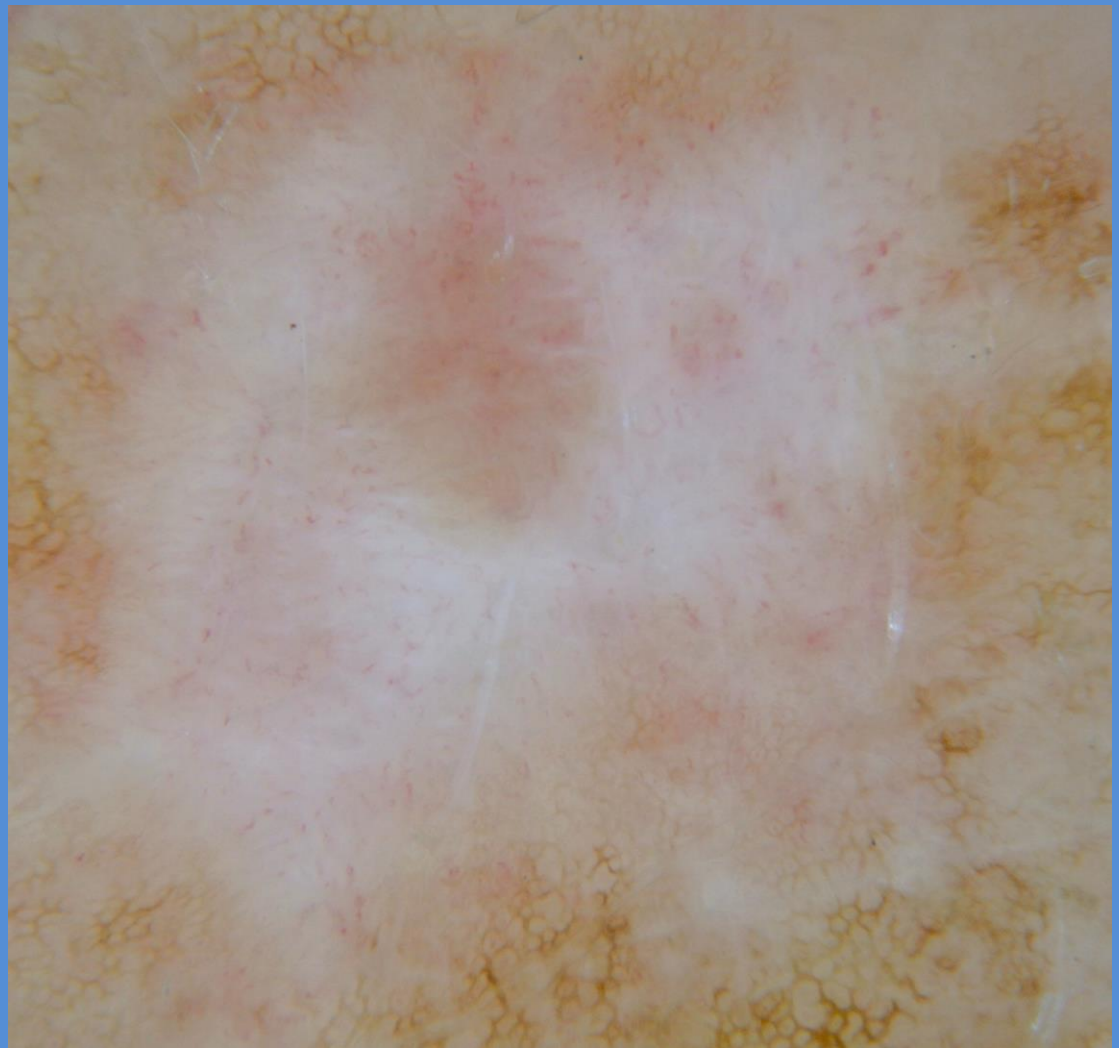
Shades of pink melanomas

Key dermoscopy features:

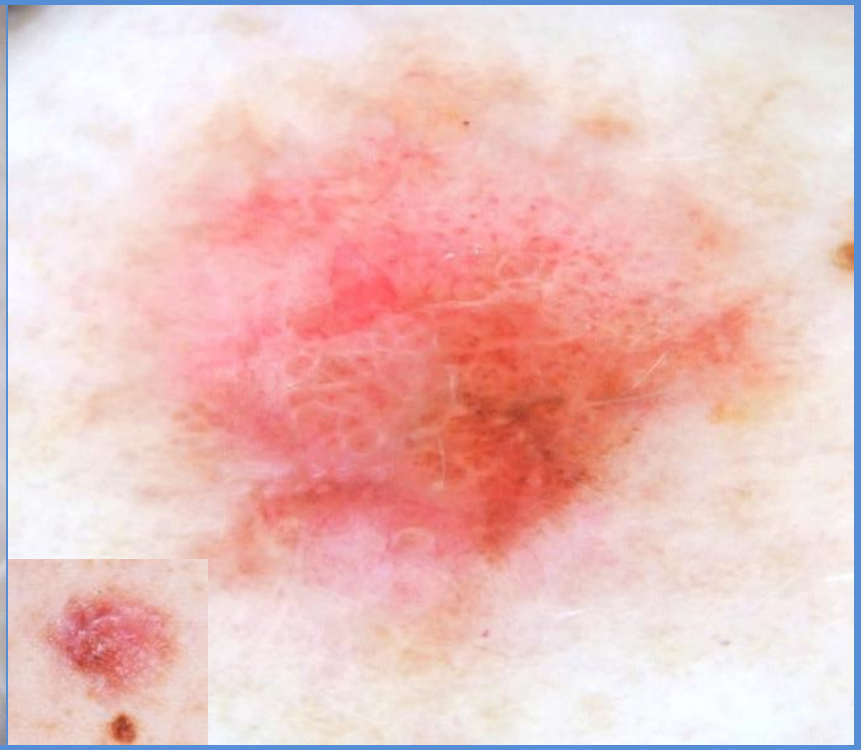
1. The vascular pattern
2. White lines
3. Shiny white structures
4. Brown structureless areas at the periphery







White lines

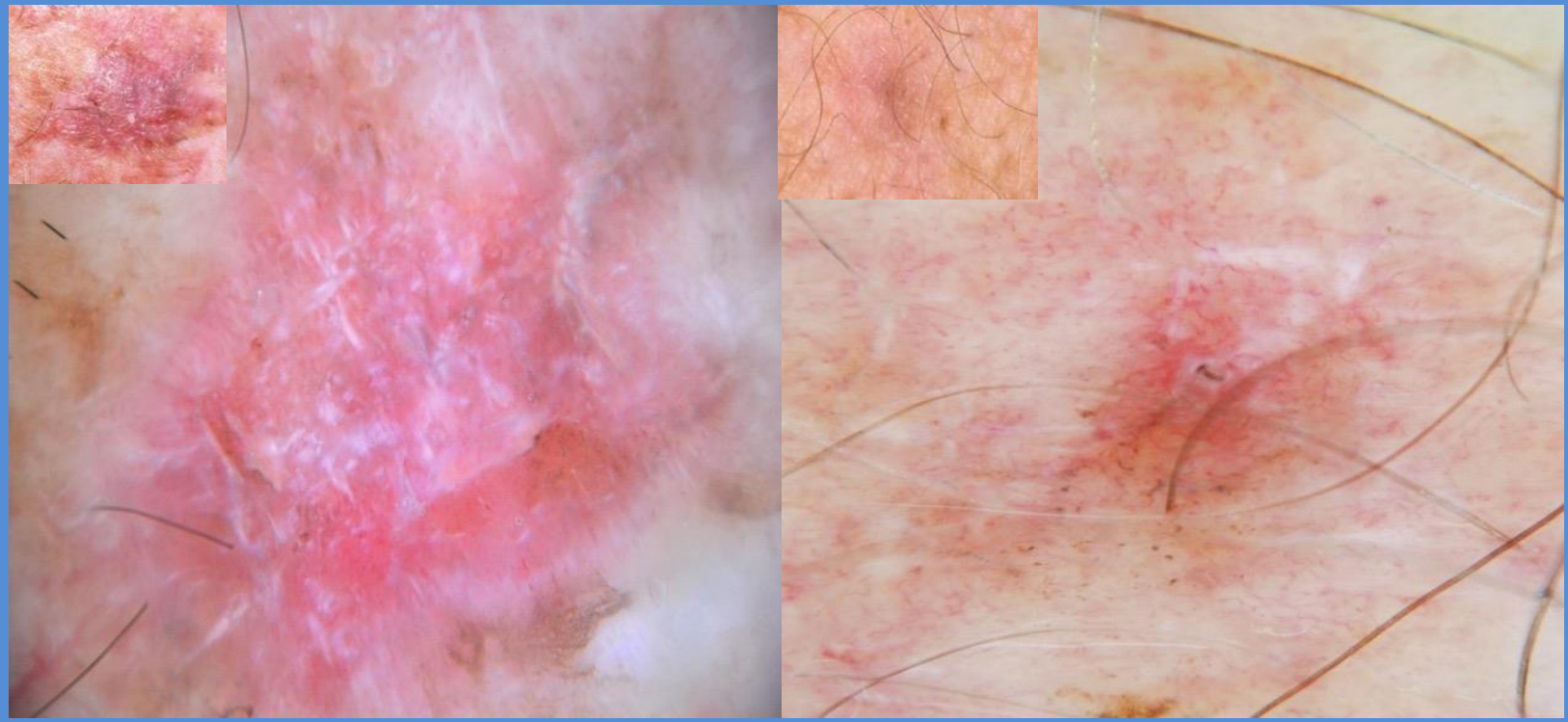


Shades of pink melanomas

Key dermoscopy features:

1. The vascular pattern
2. White lines
3. Shiny white structures
4. Brown structureless areas at the periphery

Shiny white structures



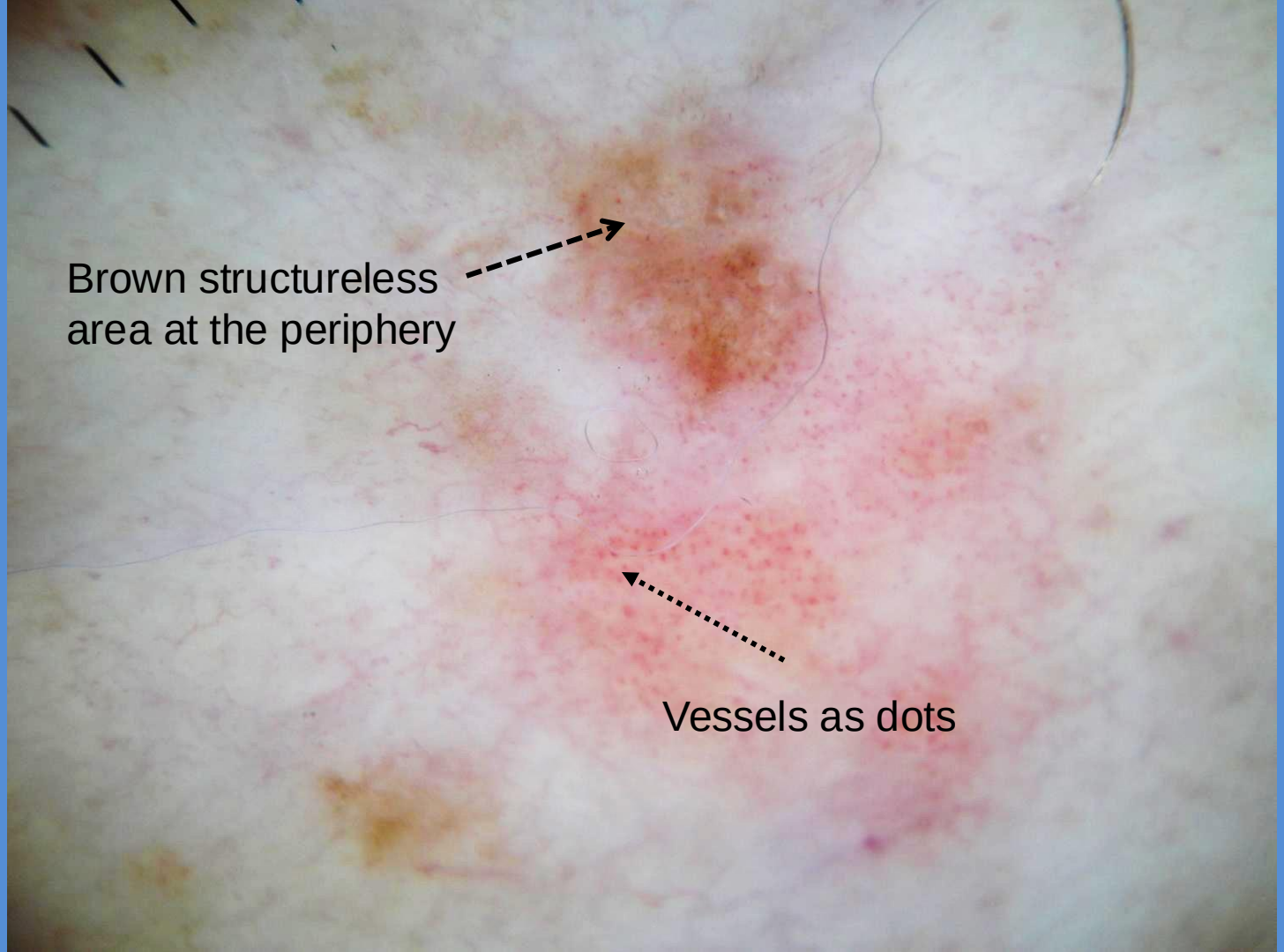
Commonly seen in invasive melanoma!

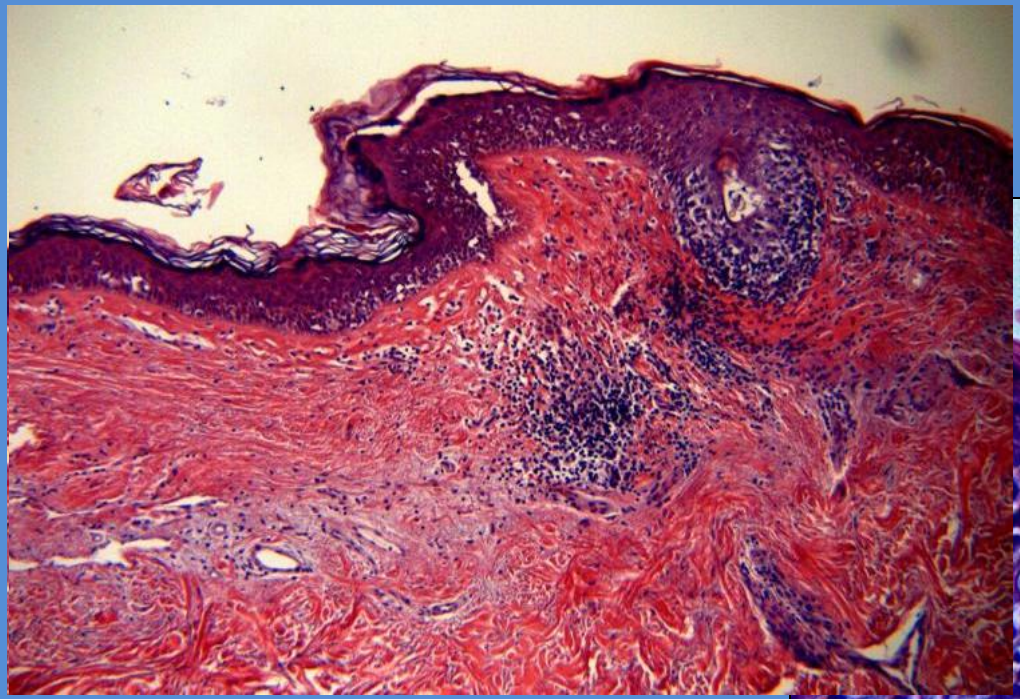
Shades of pink melanomas

Key dermoscopy features:

1. The vascular pattern
2. White lines
3. Shiny white structures
4. Brown structureless areas at the periphery

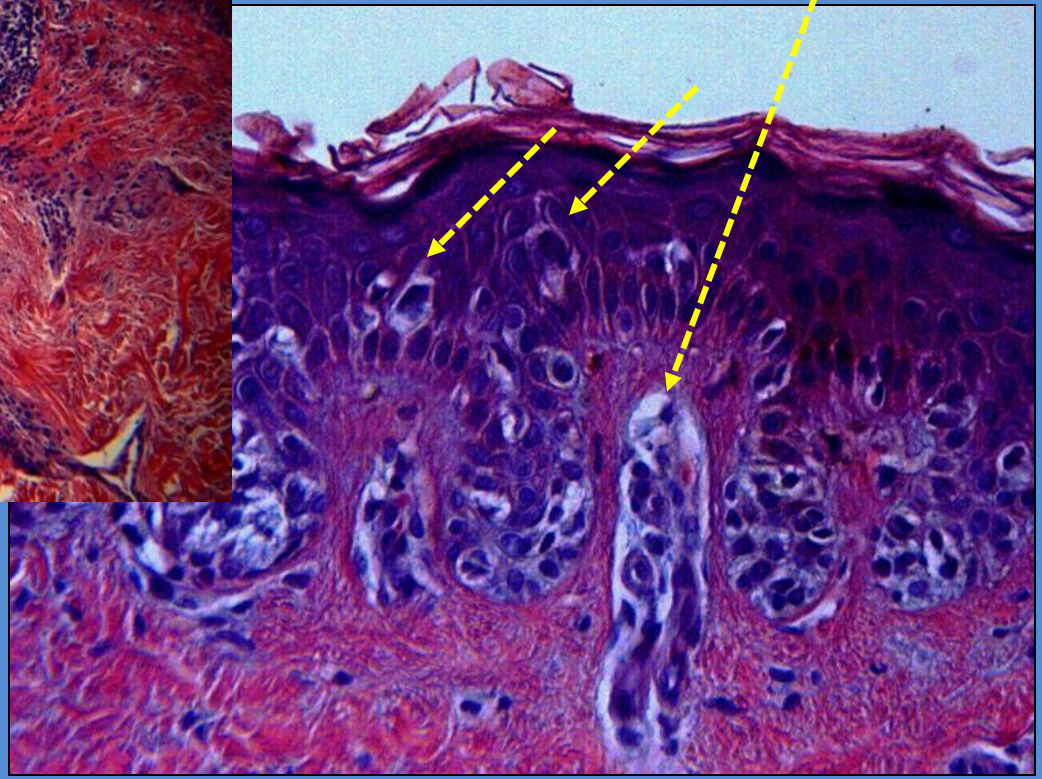
58 y/o man with a hx of melanoma had this pink-light brown slightly palpable lesion of unknown duration.


Brown structureless
area at the periphery
Vessels as dots

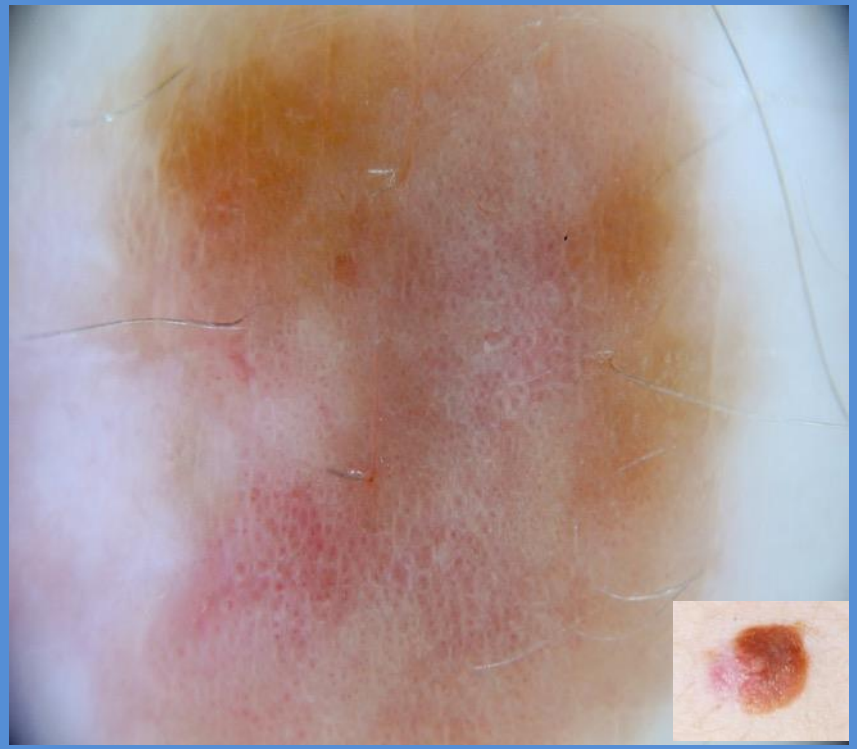


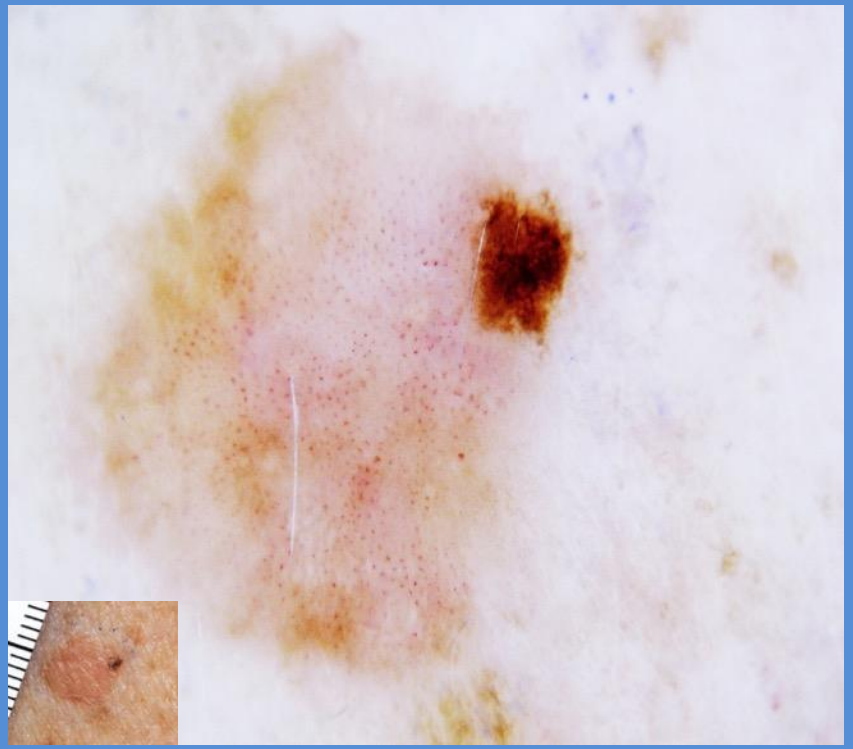
There is single & aggregated AMH at the DEJ, focally above the DEJ, & extending down adnexae

AMH extending down eccrine duct



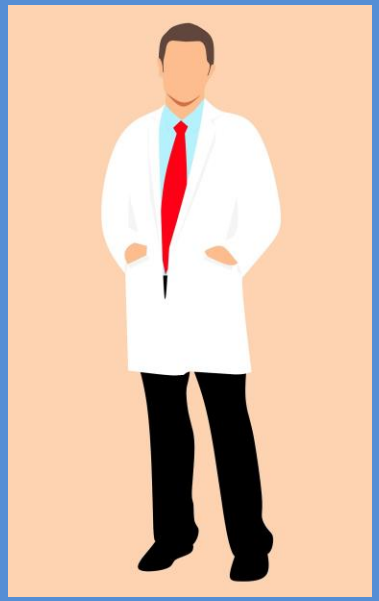
Brown structureless areas at the periphery





Examples of challenging cases?

1. Challenge where the dermoscopy diagnosis does not match the pathology diagnosis
2. Challenge where dermoscopy needs additional tools to confirm a correct diagnosis

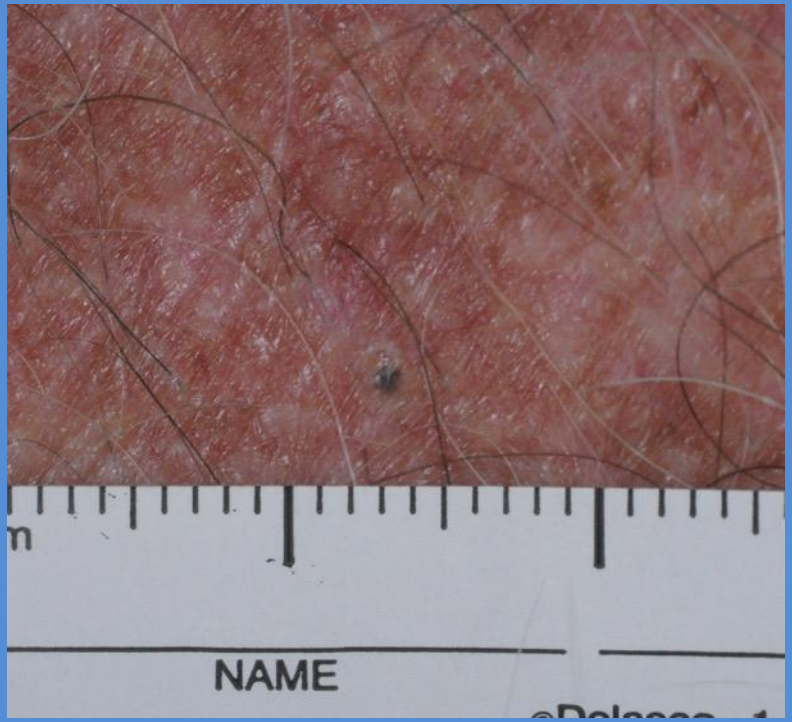


We rely on our dermatopathologist!

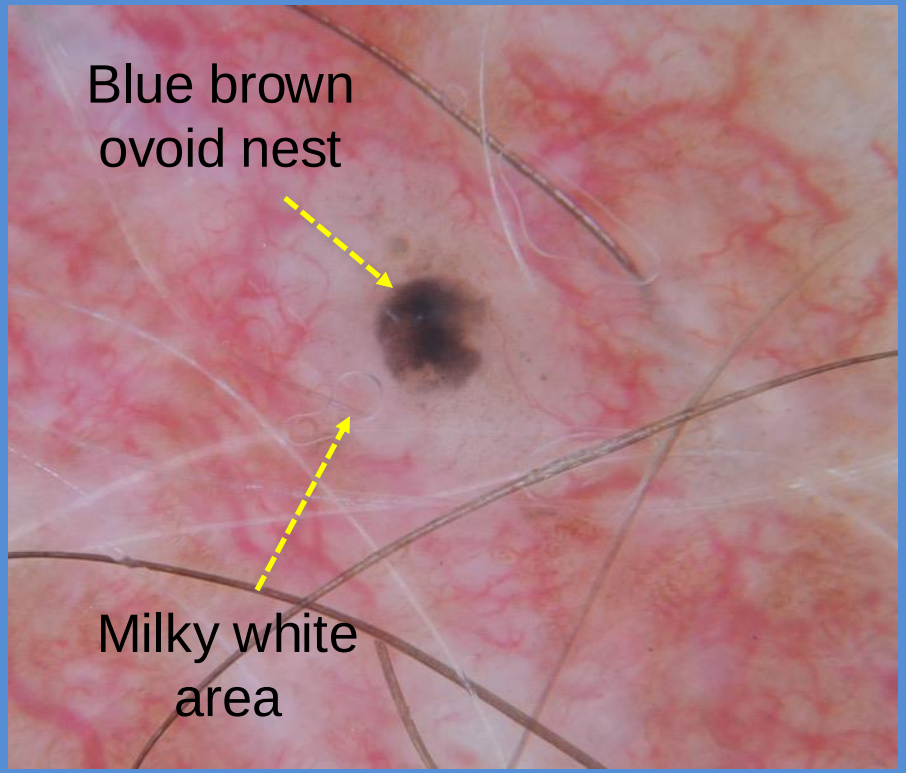
They are not superman!

Mistakes can occasionally be made!

Communicate with your colleagues when there is a disagreement in diagnosis.



This-54 yo man with photodamage had a 2mm blue papule of the chest.

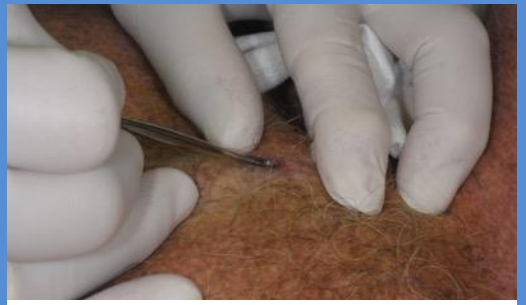


Blue brown ovoid nest surrounded by a milky white area.

These features are suggestive of a pigmented BCC

Score the lesion

Shave biopsy

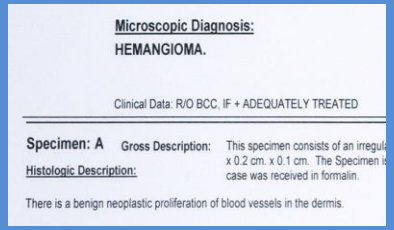


Curette the base

Cautery

Final defect

Step sections,S100, & Mart 1 stains were requested

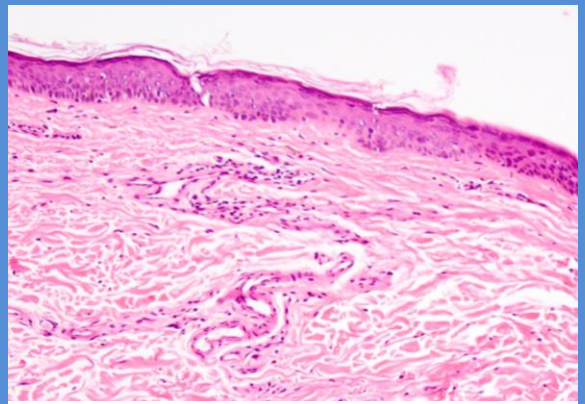


Microscopic Diagnosis:
HEMANGIOMA.

Clinical Data: R/O BCC, IF + ADEQUATELY TREATED

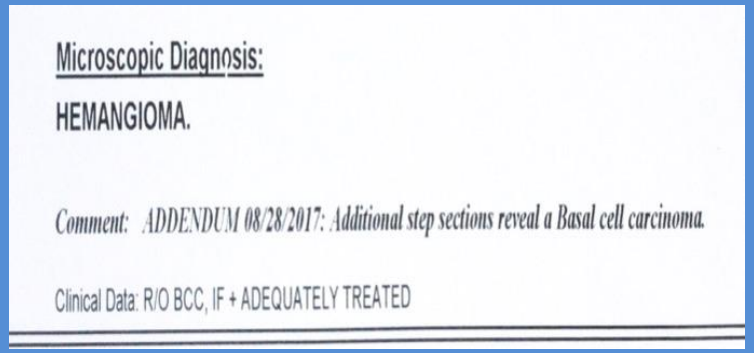
Specimen: A Gross Description: This specimen consists of an irregul
x 0.2 cm. x 0.1 cm. The Specimen i
Histologic Description: case was received in formalin.

There is a benign neoplastic proliferation of blood vessels in the dermis.



Dilated endothelial lined spaces

This is impossible so it is important to push the pathologist to cut more slides



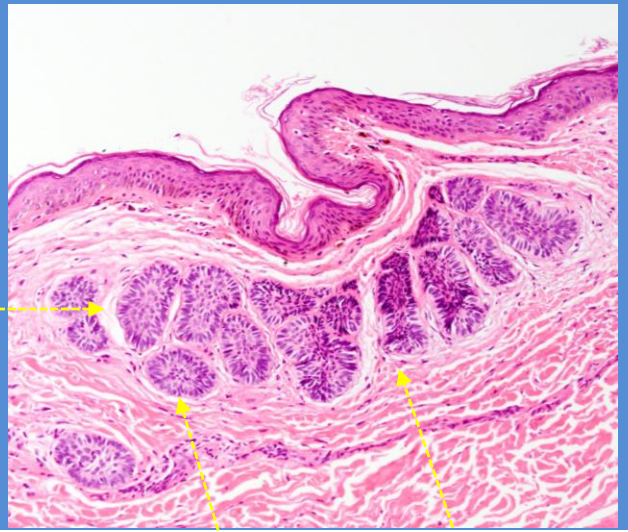
Microscopic Diagnosis:

HEMANGIOMA.

Comment: ADDENDUM 08/28/2017: Additional step sections reveal a Basal cell carcinoma.

Clinical Data: R/O BCC, IF + ADEQUATELY TREATED

Stromal retraction

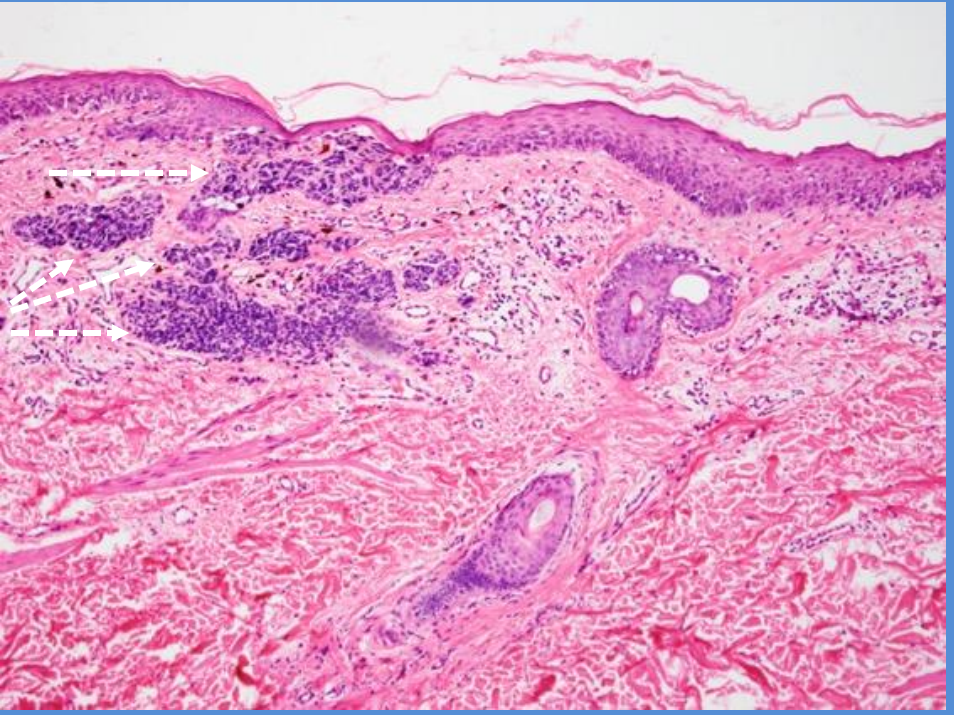


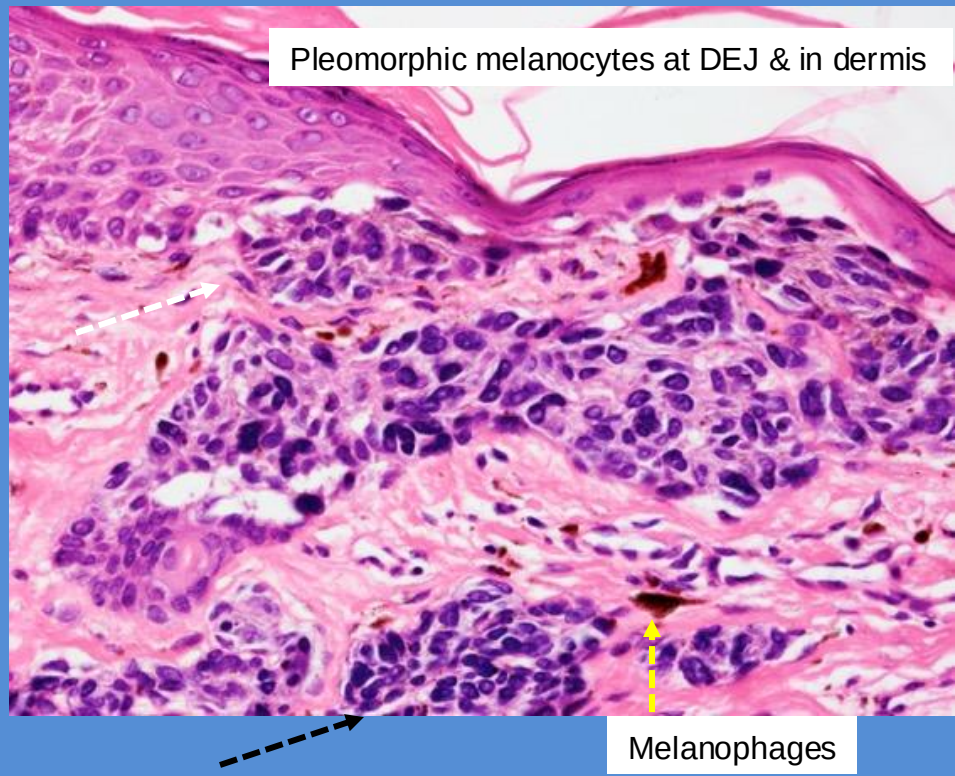
Aggregates of basaloid cells w/ palisading of the peripheral nuclei

This 27 yo woman had hundreds of nevi of different sizes and shape.

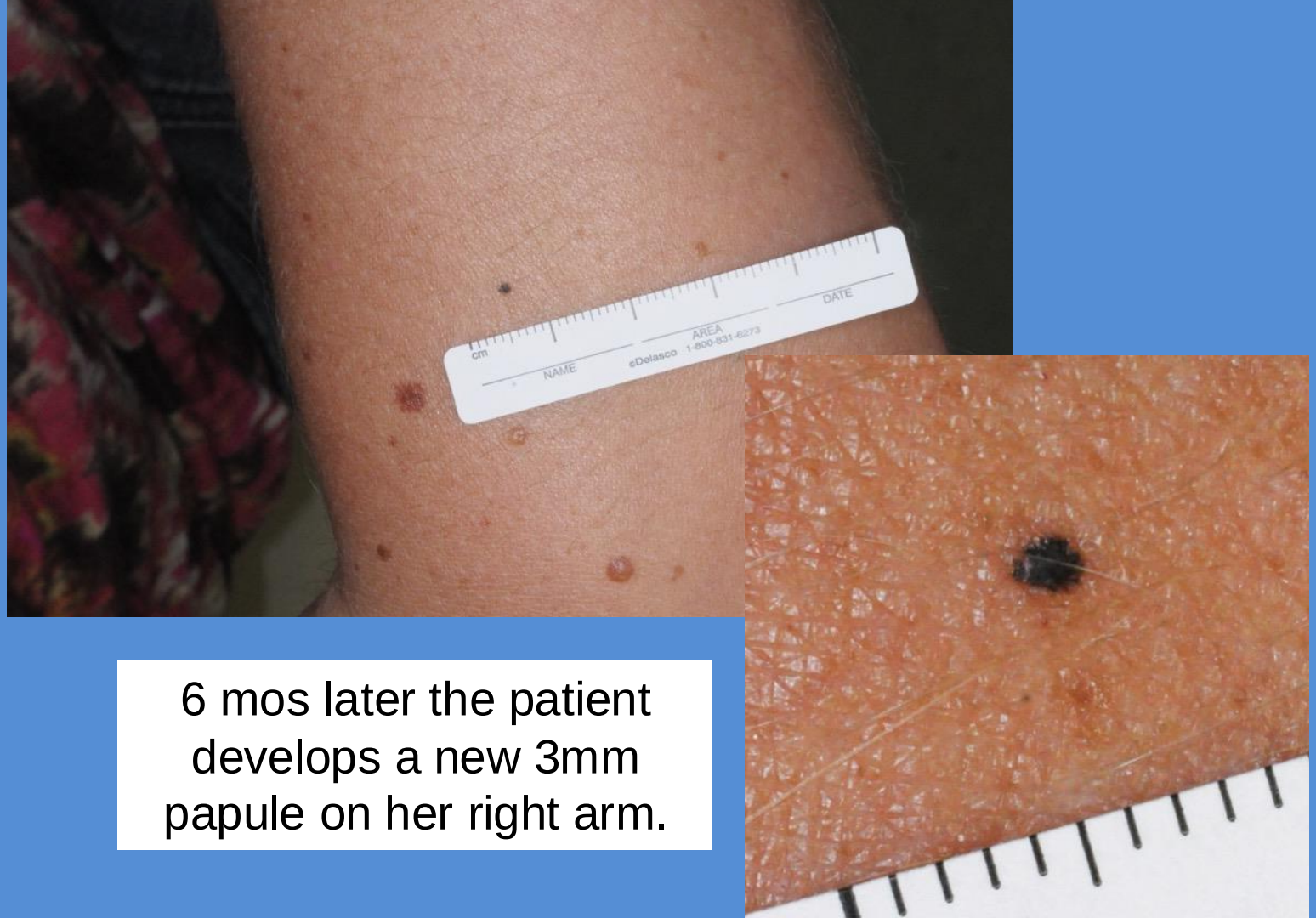
In January 2016 a new 3mm papule was noted on her left upper arm.


Relatively featureless with
perhaps polymorphous
vessels and shades of gray?





Junctional nests of atypical melanocytes vary in size & shape & demonstrate confluence. The melanocytes have large hyperchromatic pleomorphic nuclei & abundant pale staining cytoplasm. A scant LH infiltrate with melanophages is noted.



6 mos later the patient develops a new 3mm papule on her right arm.

There is a multicomponent disorganized pattern w/ either asymmetrical streaks or asymmetrical peripheral globules w/ a striking gray brown black color..
The ddx is an atypical melanocytic nevus w/ spitzoid features or an early melanoma.

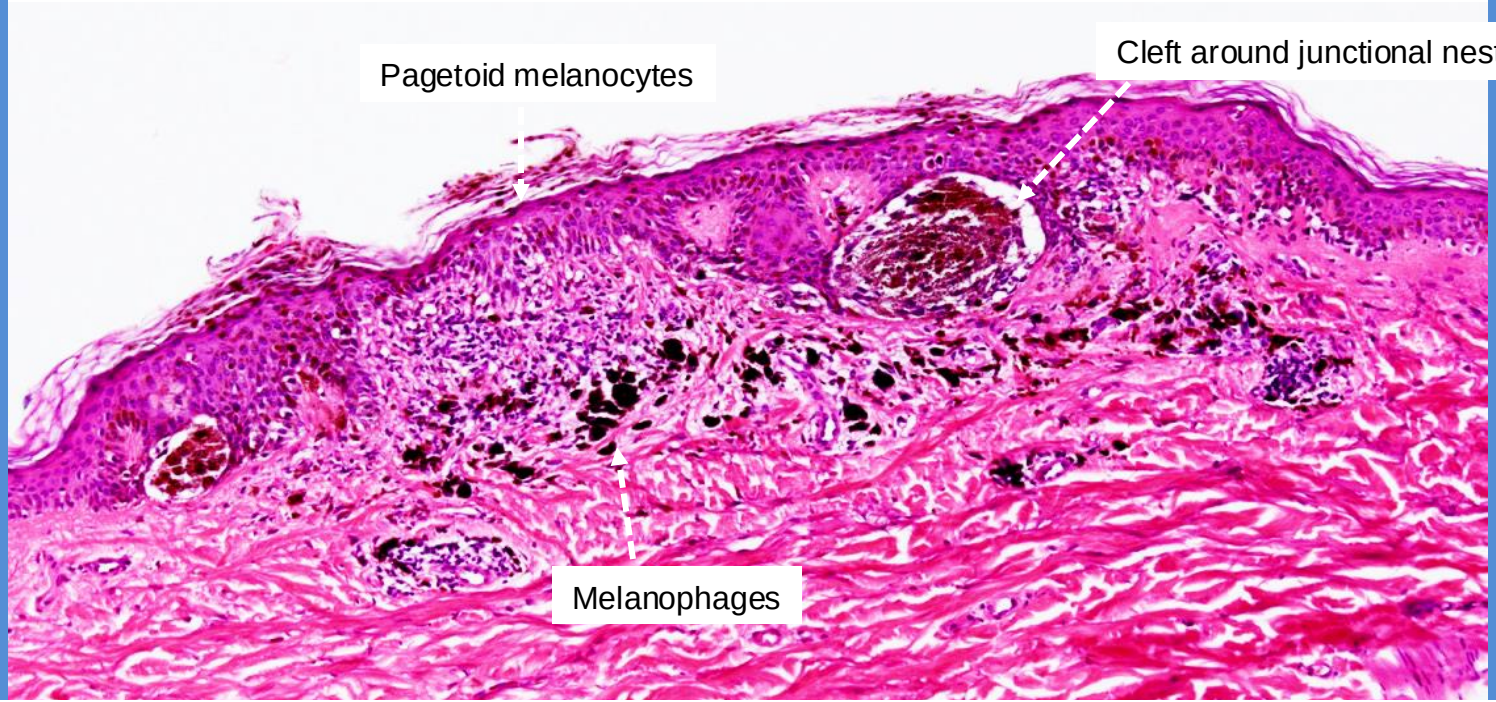
Microscopic Diagnosis:

MILD LENTIGENOUS MELANOCYTIC HYPERPLASIA WITH PAPILLARY DERMAL FIBROSIS AND TELANGIECTASIAS.

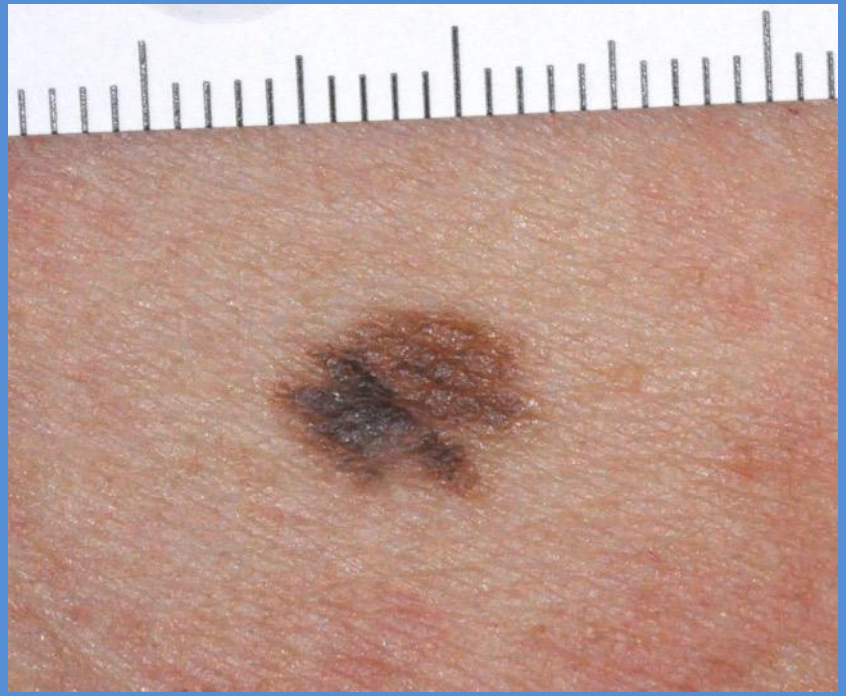
Comment: The lesion extends to a peripheral margin.

We insisted that our pathologist cut through the entire block.

The final diagnosis was a high-grade dysplastic nevus with spitzoid features



This well circumscribed melanocytic lesion demonstrates single & aggregagted melanocytic hyperplasia at the DEJ. Some of the junctional nests are noted to have a surrounding cleft. Occ pagetoid melanocytes are present in the center of the lesion. There is a lymphohistiocytic inflamm infiltrate with many melanophages in the dermis.



This 25 yo woman came to the office concerned with acne scarring. On a complete exam an ill defined pigmented lesion was noted. The patient was supposed to have a FU visit with a dermatologist but never returned.

1. Globular homogeneous disorganized pattern
2. Multiple colors
3. Gray dots/granules

The overall features are suggestive of a melanoma in association with a nevus.

These are features characteristic of melanoma in association with a nevus.

Anatomic Site: RIGHT NECK ANTERIOR.

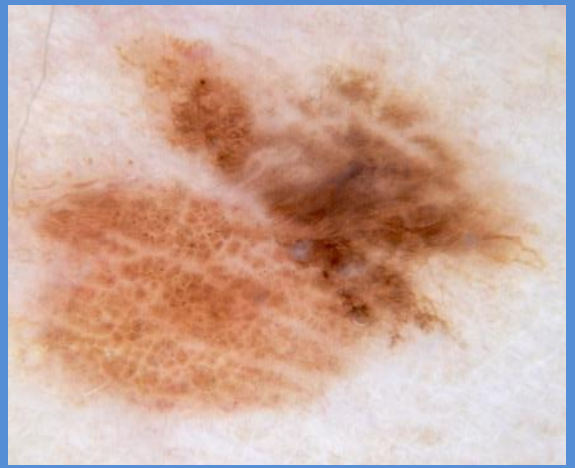
Microscopic Diagnosis:

COMPOUND CONGENITAL MELANOCYTIC NEVUS, SUPERFICIAL TYPE.

Comment: The margins are free of neoplasm. The slide will be sent to Dr. Geoff Gottlieb in consultation as well as Myriad Cytogenetics.

Clinical Data: R/O ATYPICAL MELANOCYTIC LESION.

No way!



Excisional biopsy is performed

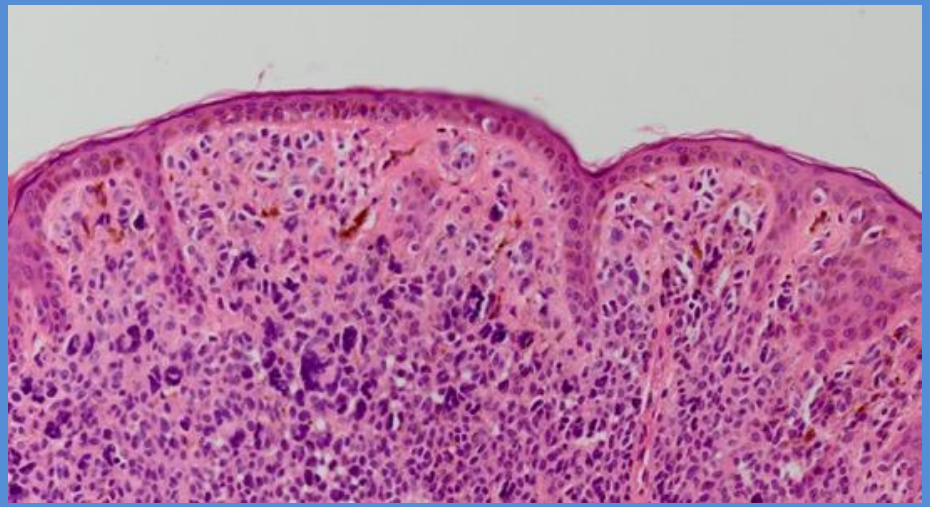
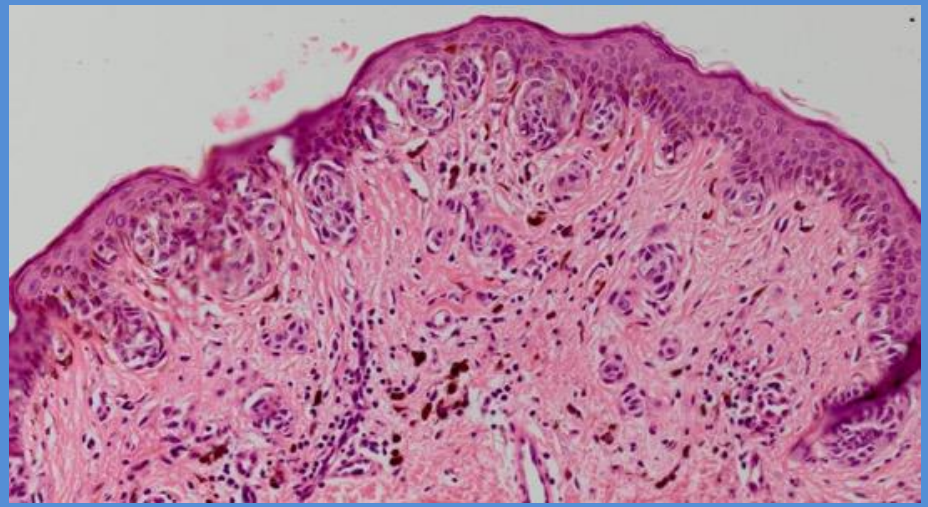
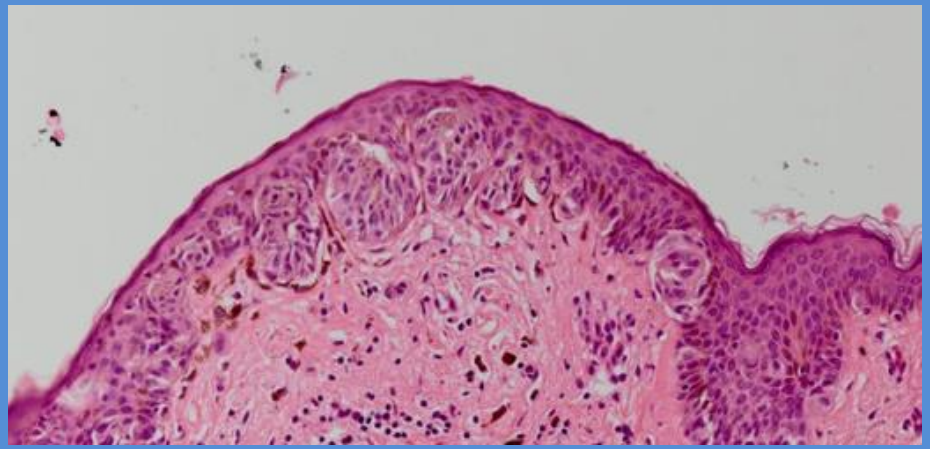
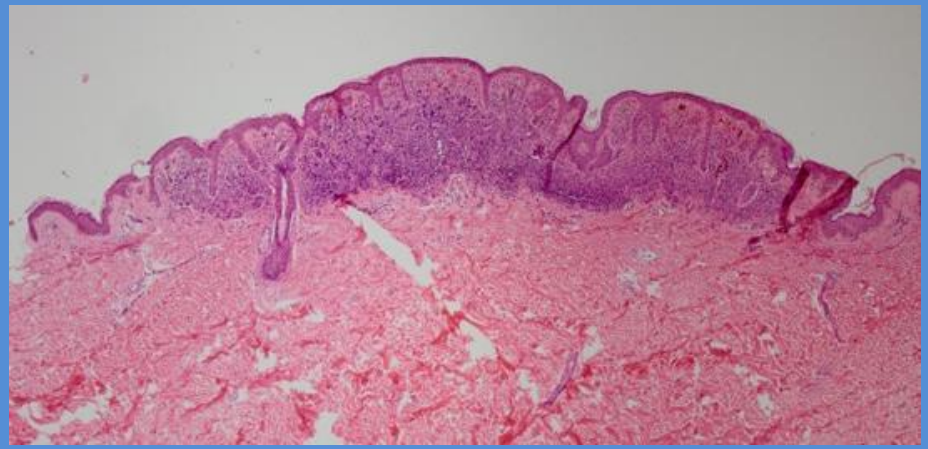
Microscopic Diagnosis:

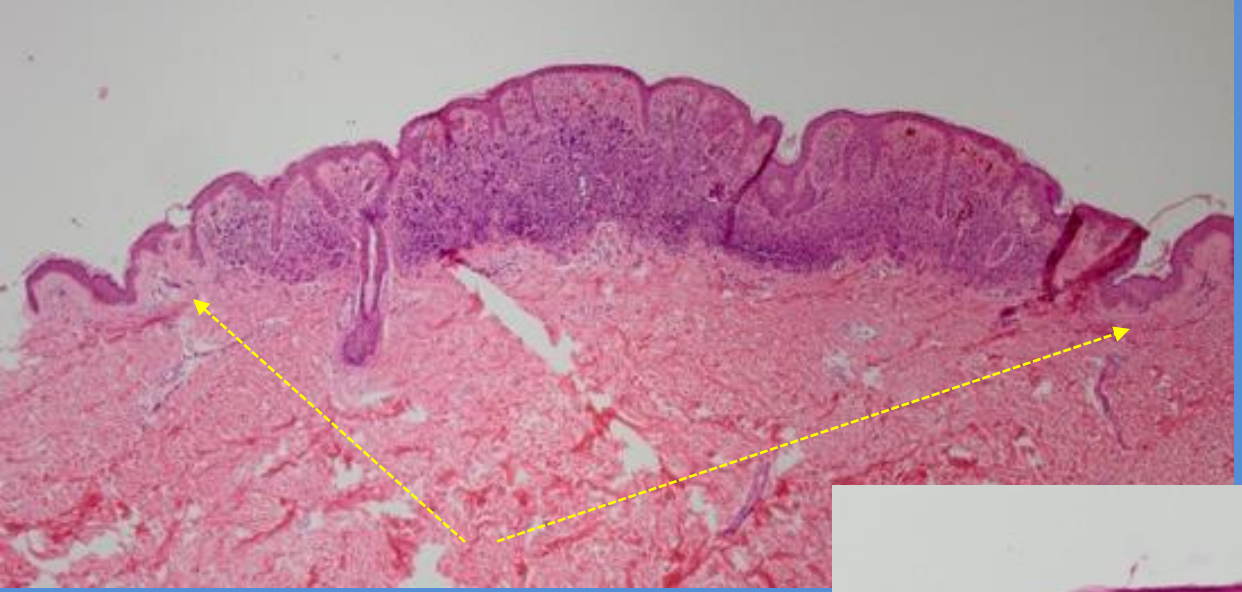
MALIGNANT MELANOMA MEASURING 0.20MM IN BRESLOW THICKNESS.

Comment: There is no ulceration and very minor regression. There is less than one (1) mitotic figure per high power field.

02/21/2018 ADDENDUM:

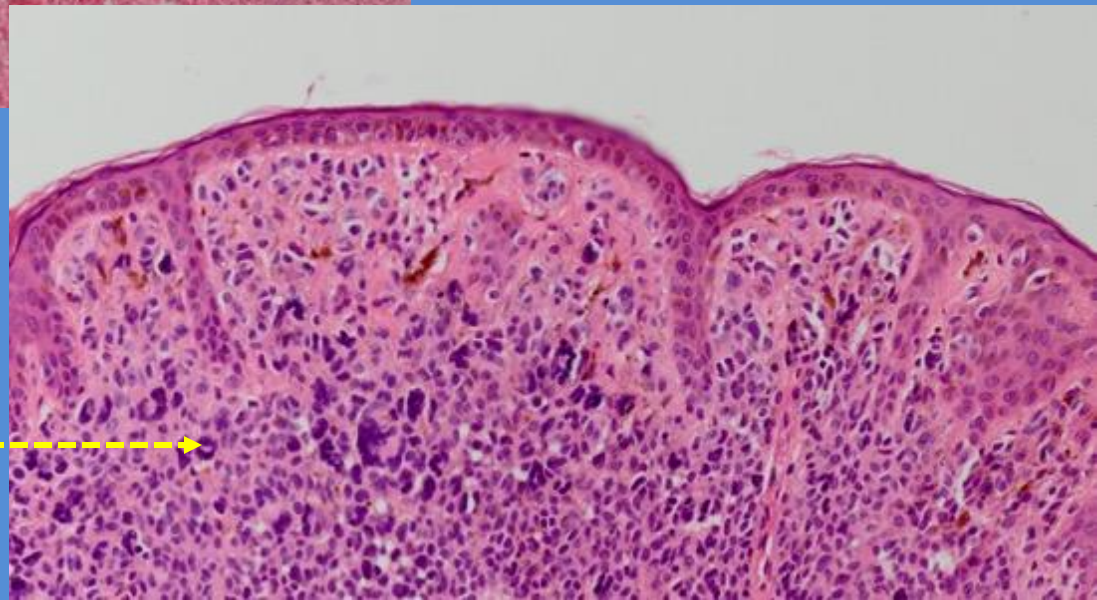
Deeper sections demonstrate the neoplasm to actually demonstrate the neoplasm to be 0.45mm in Breslow thickness.

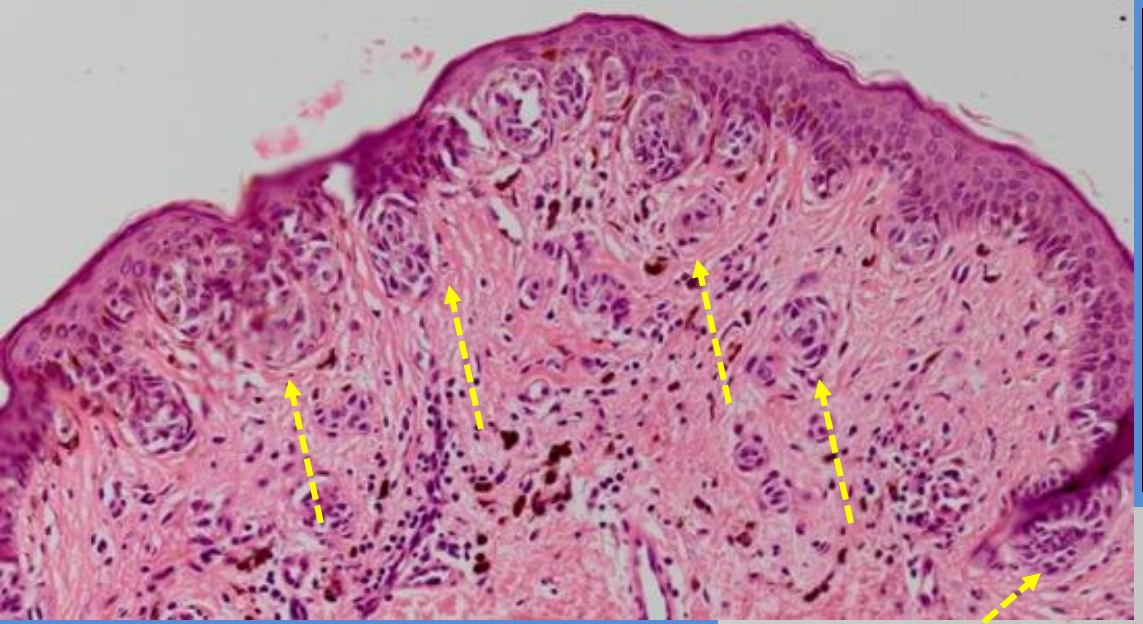







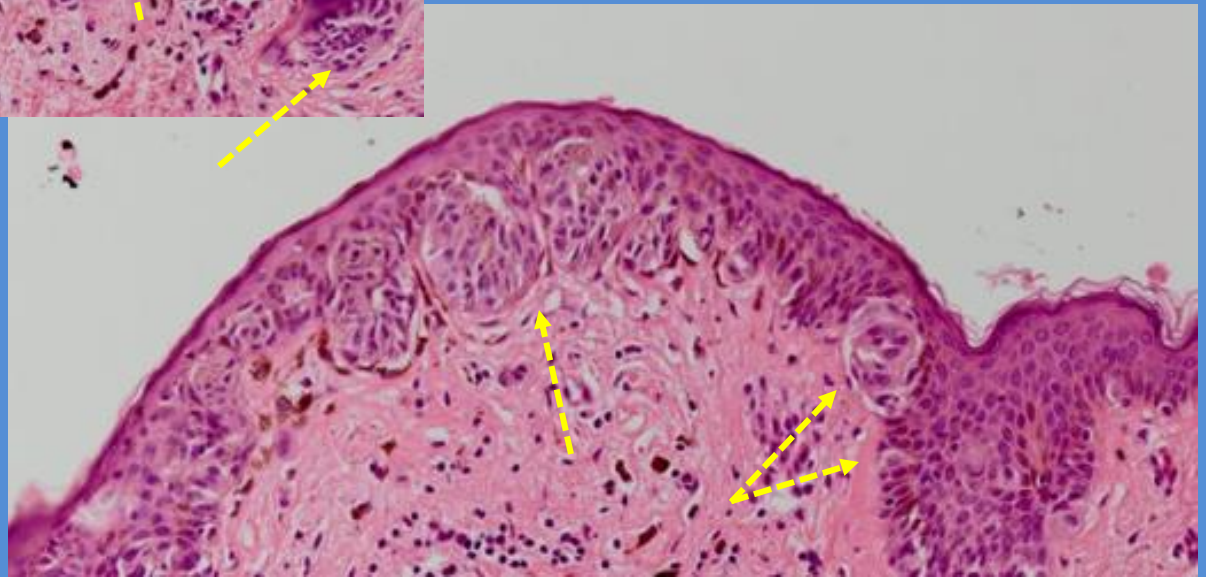
Well circumscribed symmetrical melanocytic lesion

Within the dermis there are nests and strands of melanocytic nevus cells



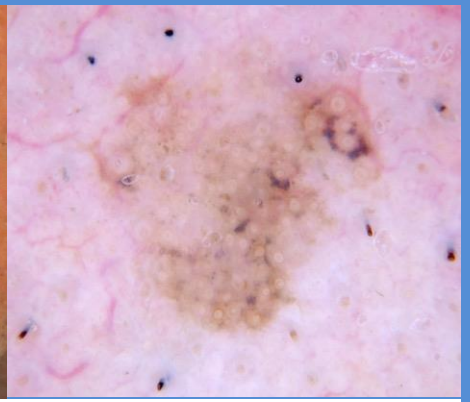


Focally at the DEJ + extending down adnexa there is single & aggregated AMH w/ nests varying in size & shape & demonstrating confluence. Some similar nests are noted in the sup dernis assoc'd w/ inflammation & melanophages

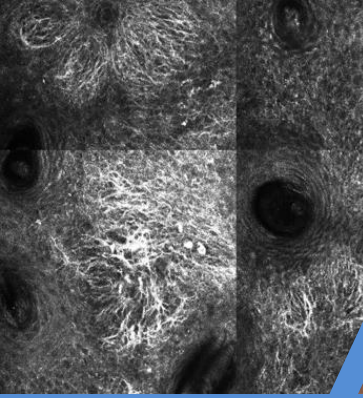


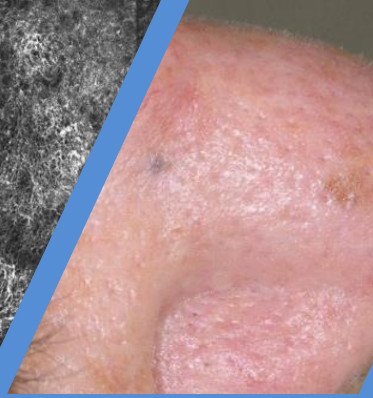
Examples of challenging cases?

1. Challenge where the dermoscopy diagnosis does not match the pathology diagnosis
2. Challenge where dermoscopy needs additional tools to confirm a correct diagnosis



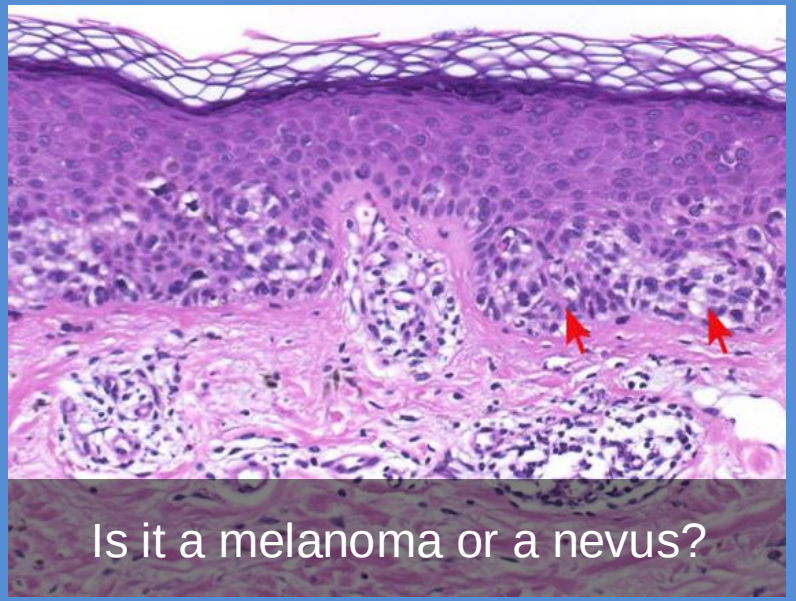
Dermatoscope





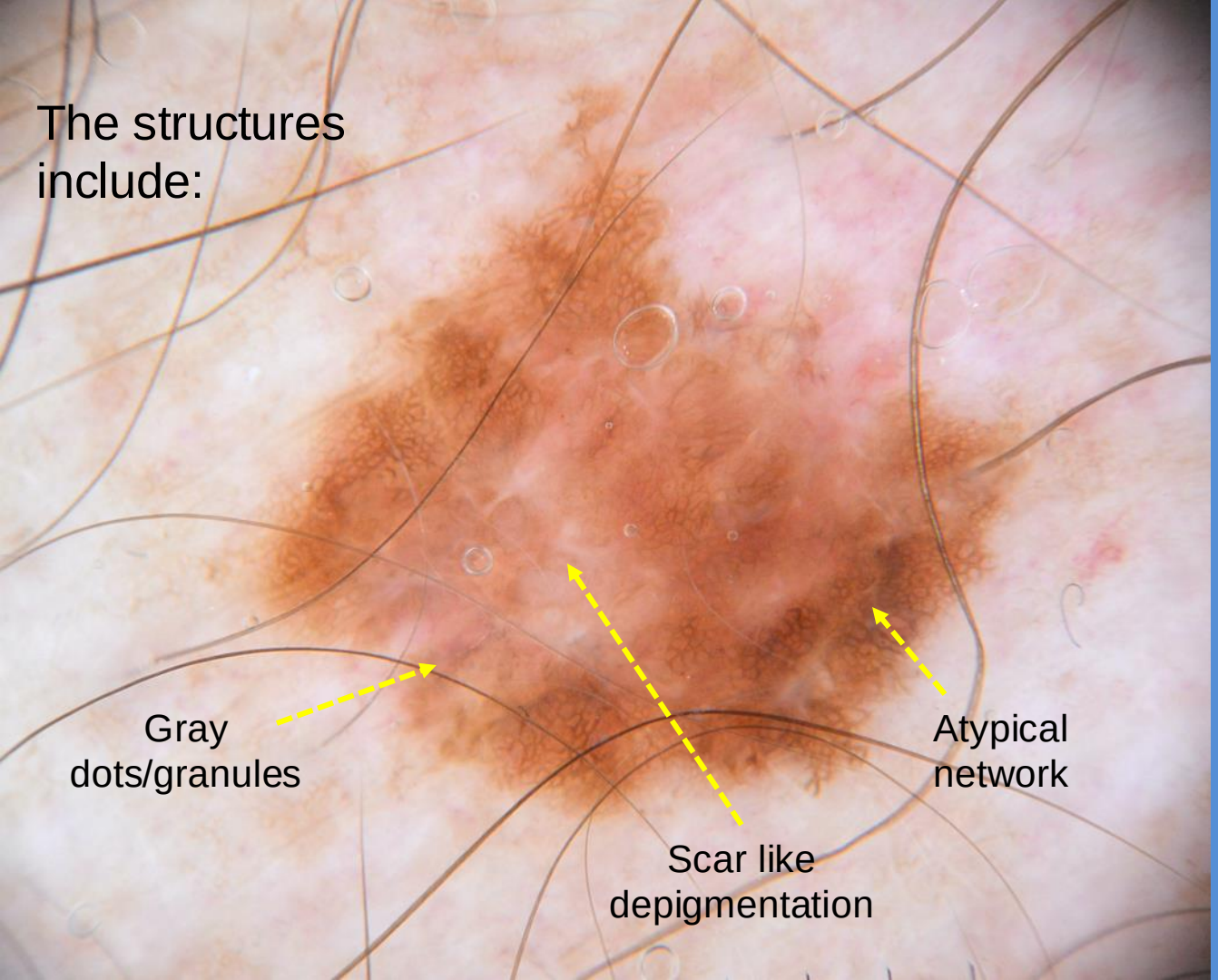
Reflective Confocal Microscopy

Gene Expression Profiling

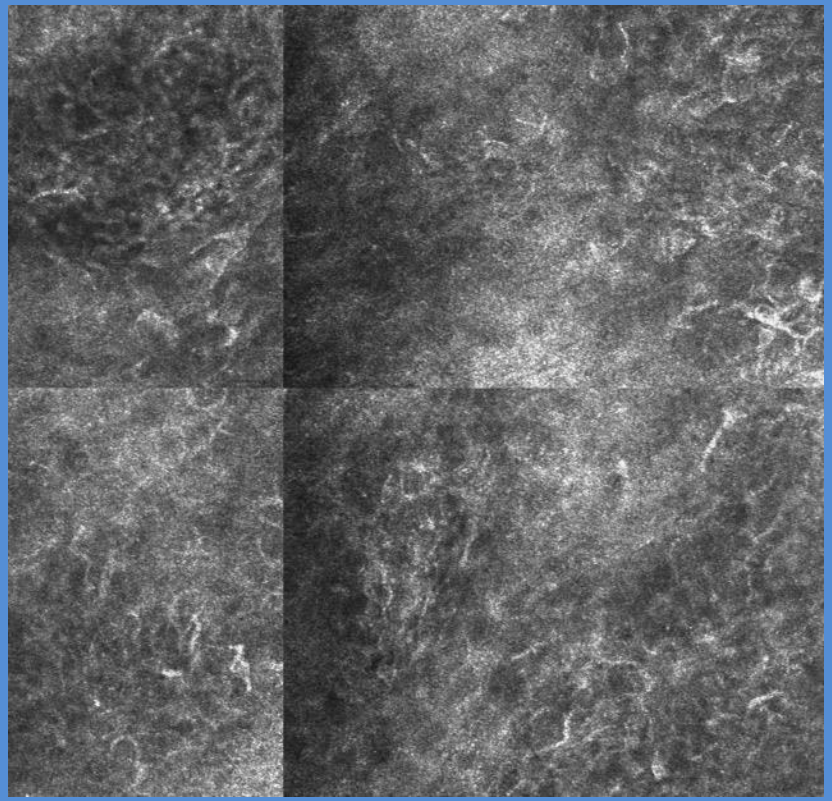


Is it a melanoma or a nevus?

84 yo man with hx of melanoma had a changing pigmented lesion of the right lateral inferior chest.



The dermoscopy features of an atypical network, gray dots/granules, & scar like depigmentation are most suggestive of a melanoma on sun-damaged or an atypical melanocytic nevus.



There is an atypical honeycomb pattern & numerous dendritic structures infiltrating the epidermis

There is an atypical meshwork pattern w/ junctional thickening & bright cells infiltrating the rete.

Overall features suggestive of a malignant neoplasm. The ddx is a dysplastic nevus w/ severe atypia & melanoma on sun-damaged skin. An excision with 5mm margins is recommended.

Original diagnosis

Anatomic Site: LEFT MID CHEST.

Microscopic Diagnosis:

MELANOCYTIC NEVUS, JUNCTIONAL CLARK'S TYPE (SO-CALLED "DYSPLASTIC NEVUS").

Comment: The margins are free of neoplasm. Immunostains for Melan- A and S-100 were medically necessary to characterize this proliferation, and the diagnosis is confirmed. All positive and negative controls were examined and stained appropriately as required.

Clinical Data: R/O MALIGNANT MELANOMA IN ASOCIATION WITH NEVUS.

Malignant	**Gene expression profile suggestive of malignant neoplasm**	**Score: 2.8**

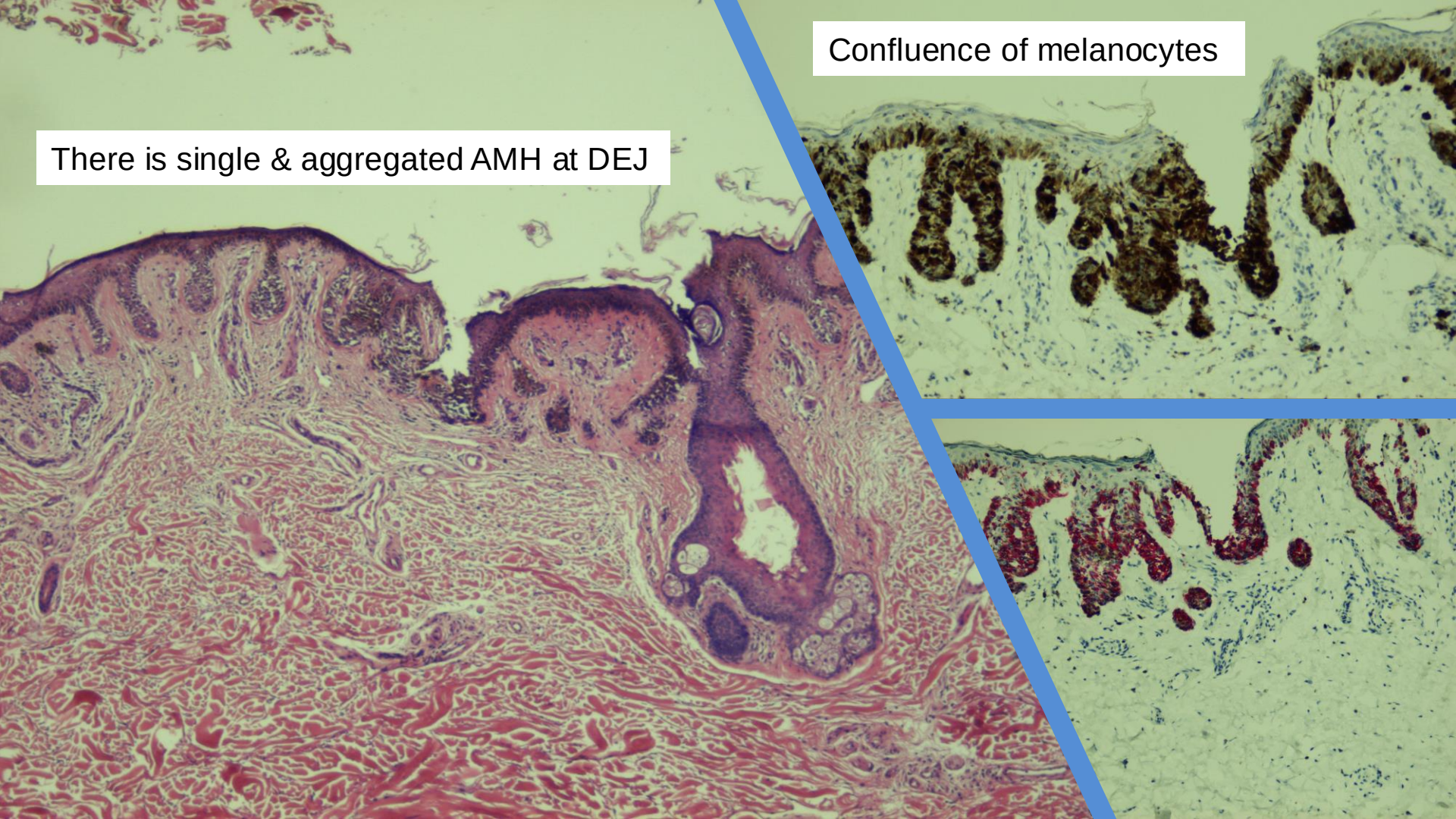
Second opinion

2ND OPINION, LESION OF UNKNOWN DURATION

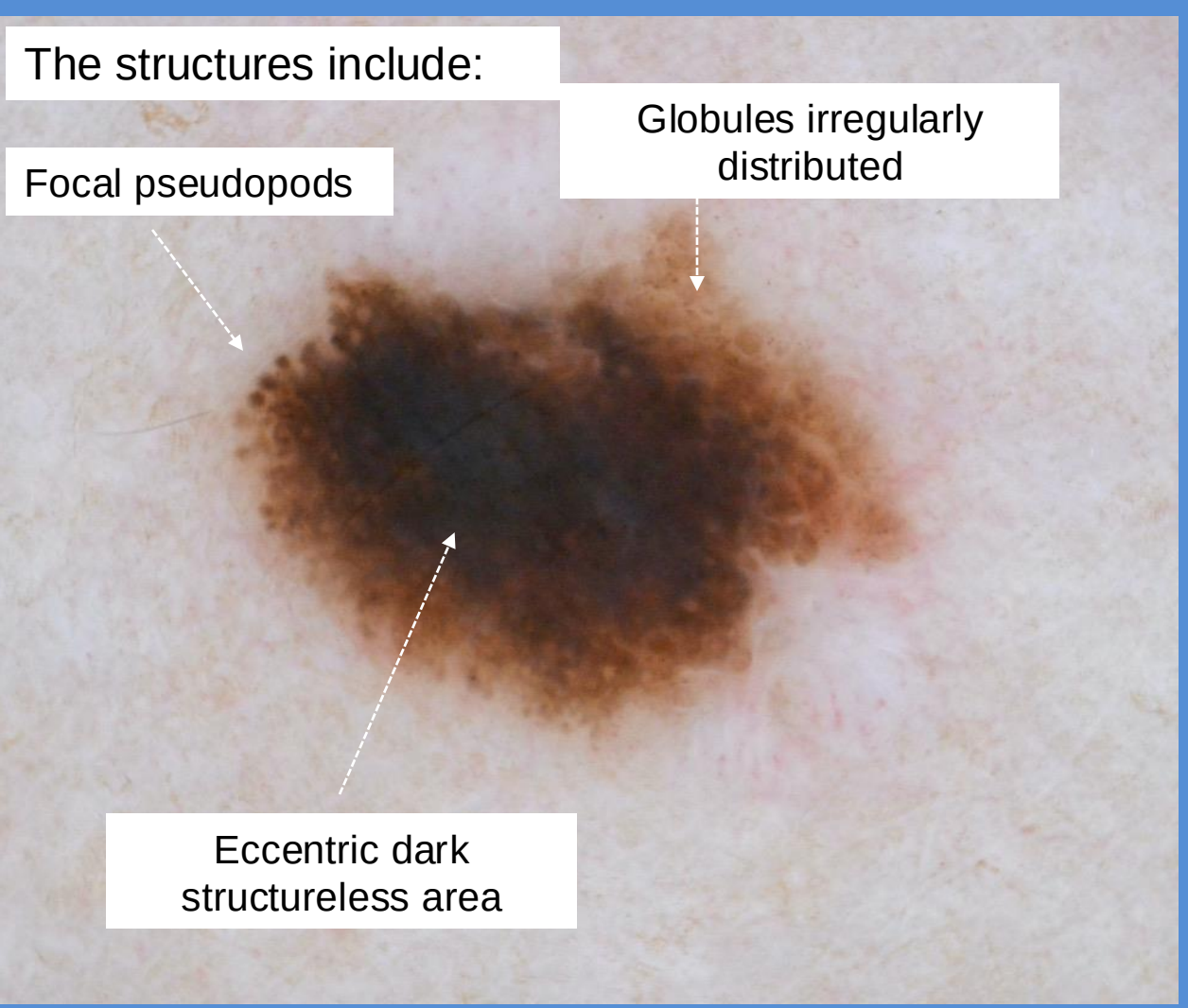
MELANOMA IN SITU (D03.59)

(LEFT MID CHEST)

NOTE: This is a challenging case. The lesion is broad and poorly circumscribed, with a predominance of single cells, posing a differential diagnosis of a junctional dysplastic nevus and a dysplastic nevus-like form of melanoma in situ, with an area of partial regression, in which there is loss of rete ridges and a subjacent band-like lymphocytic infiltrate. This area has suprabasilar scatter of single melanocytes as well. The margins appear clear in the planes of section examined.


There is single & aggregated AMH at DEJ
Confluence of melanocytes

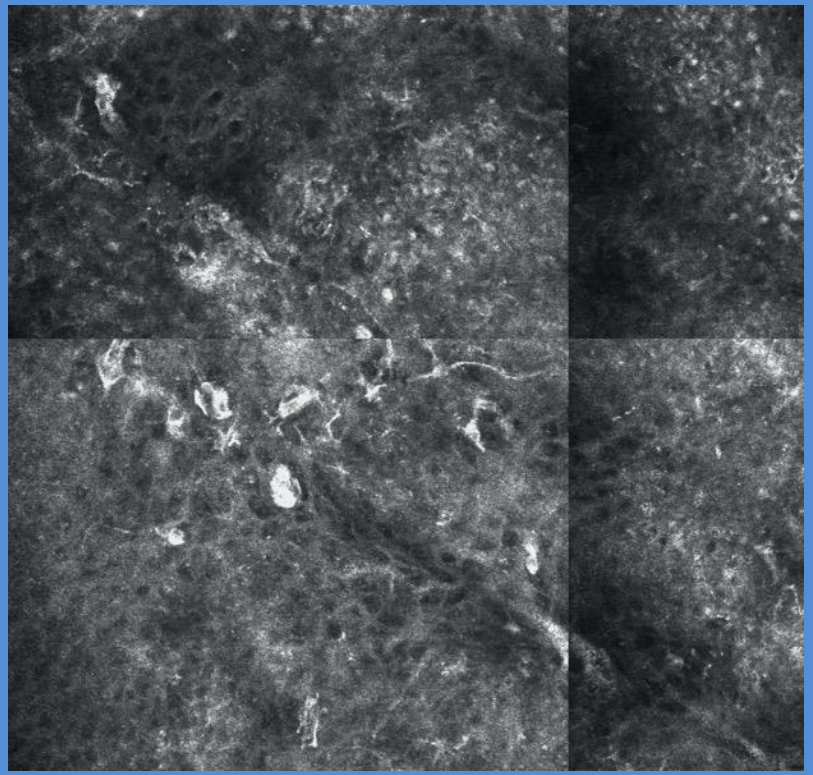
This 38 yo woman was referred by her dermatologist for evaluation of a pigmented lesion of the inner thigh.



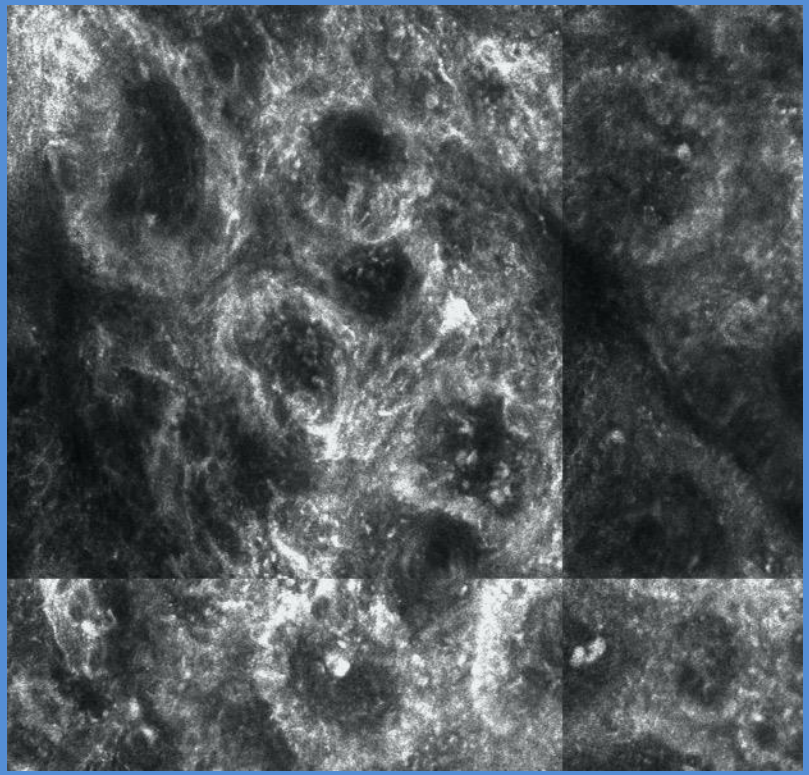
Globular Disorganized Pattern

- Focal pseudopods
- Eccentric dark structureless area

The features are suggestive of a melanoma.

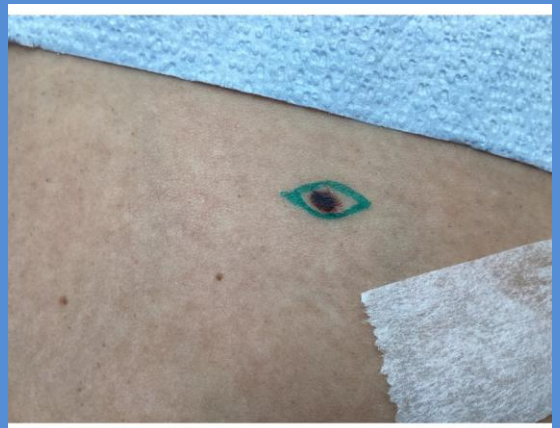


Dendritic & pagetoid cells in the epidermis



Atypical ring pattern with cells infiltrating the rete & junctional thickening

The overall features are suggestive of a melanoma



Excision with 1mm margin

A. Right Anterior Proximal Thigh, Excision

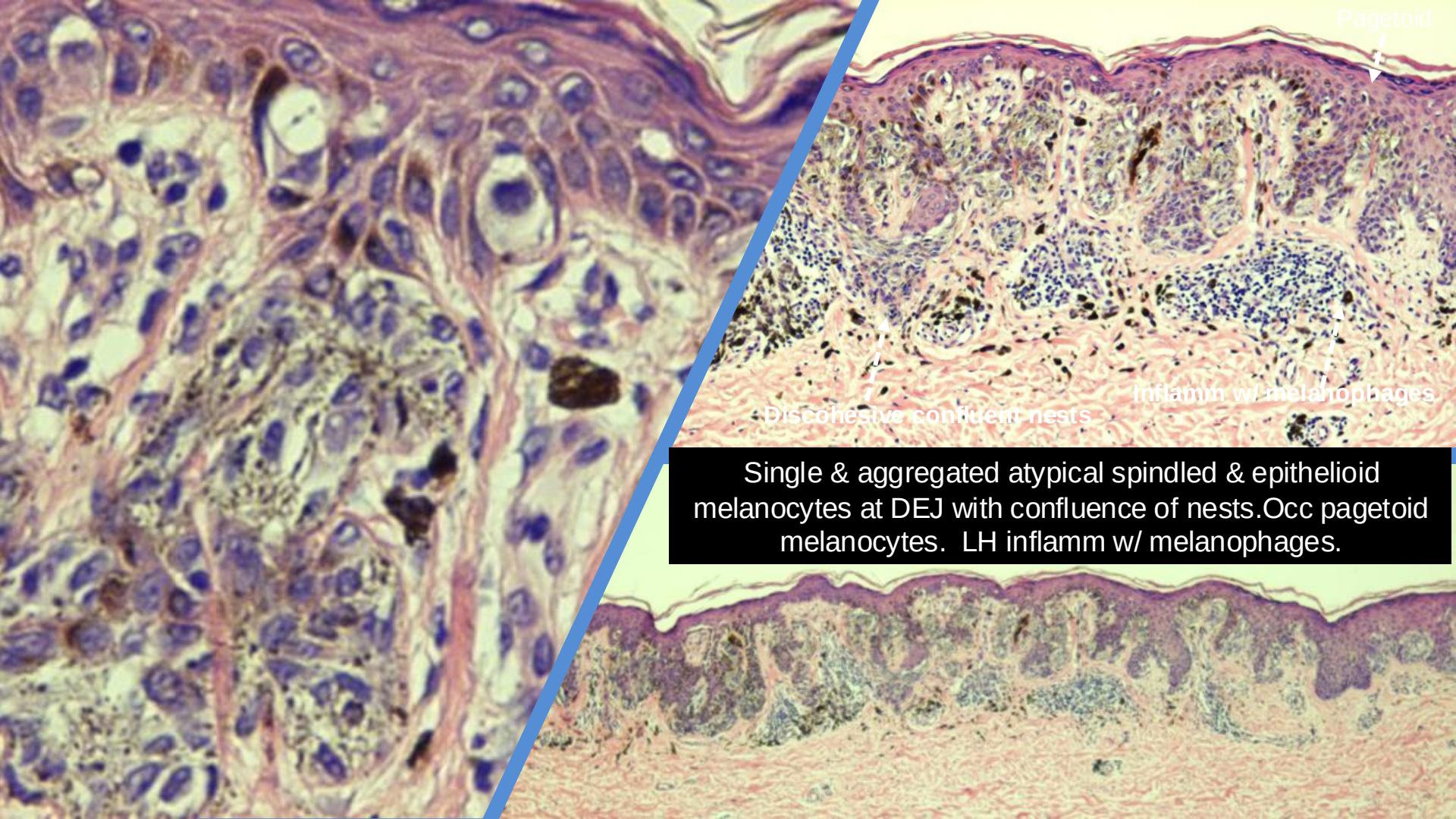
MELANOCYTIC NEOPLASM WITH UNUSUAL FEATURES.

COMMENT: The differential diagnosis is between that of a Clark's nevus with spitzoid features or a very subtle melanoma measuring approximately 0.25mm in Breslow thickness. The margins are free of neoplasm. I favor the former diagnosis. the slides will be sent to Castle Biosciences, as well as [redacted] in consultation. (D48.5)

Addendum

A. The slide was sent to [redacted] consultation who believes this is a compound Spitz nevus.

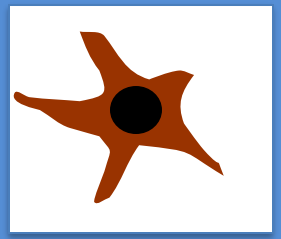
Final Test Result	
Gene expression profile suggestive of benign neoplasm	Score: -5.3



Single & aggregated atypical spindled & epithelioid melanocytes at DEJ with confluence of nests.Occ pagetoid melanocytes. LH inflamm w/ melanophages.

Dermoscopy Facial Pearls

Spoke wheel structures are pathognomonic for a superficial pigmented basal cell carcinoma

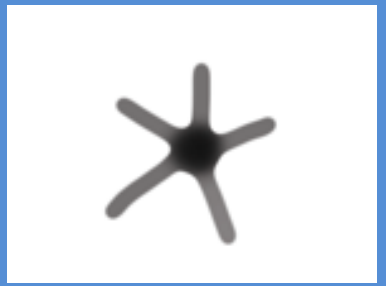


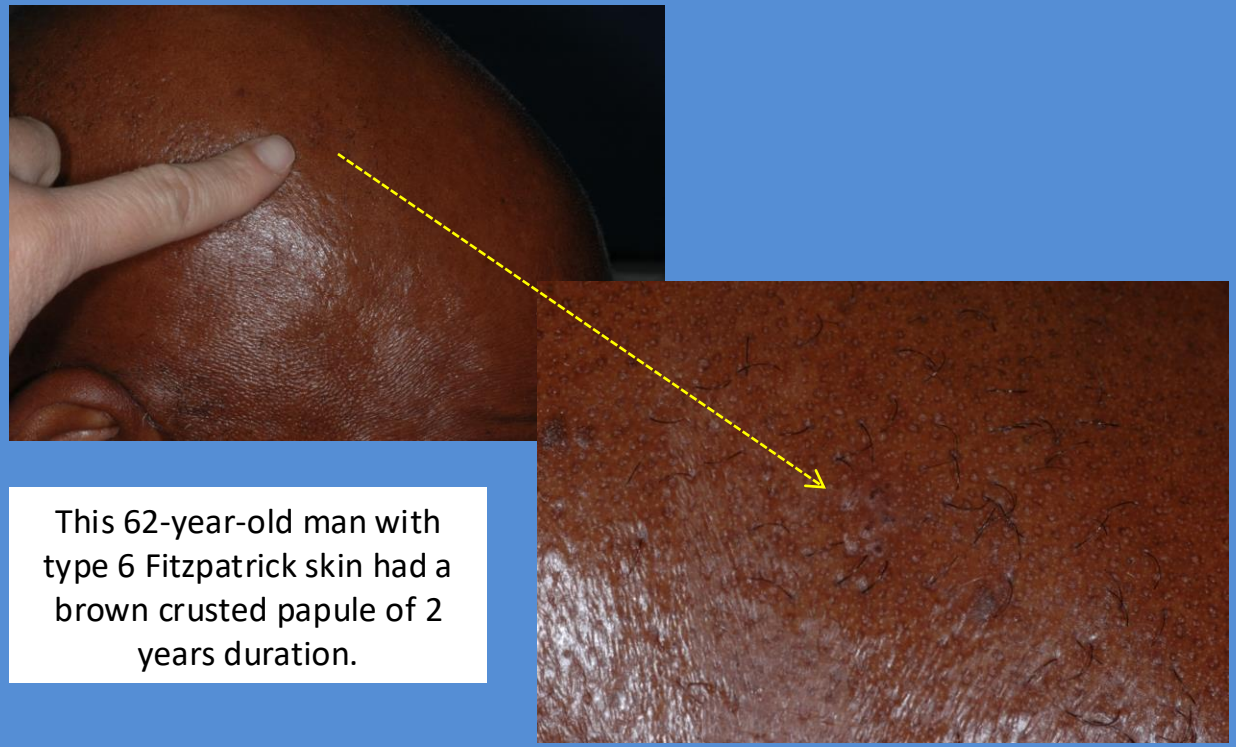
Spoke wheel areas

Radial lines converging to a central dot or oval structure

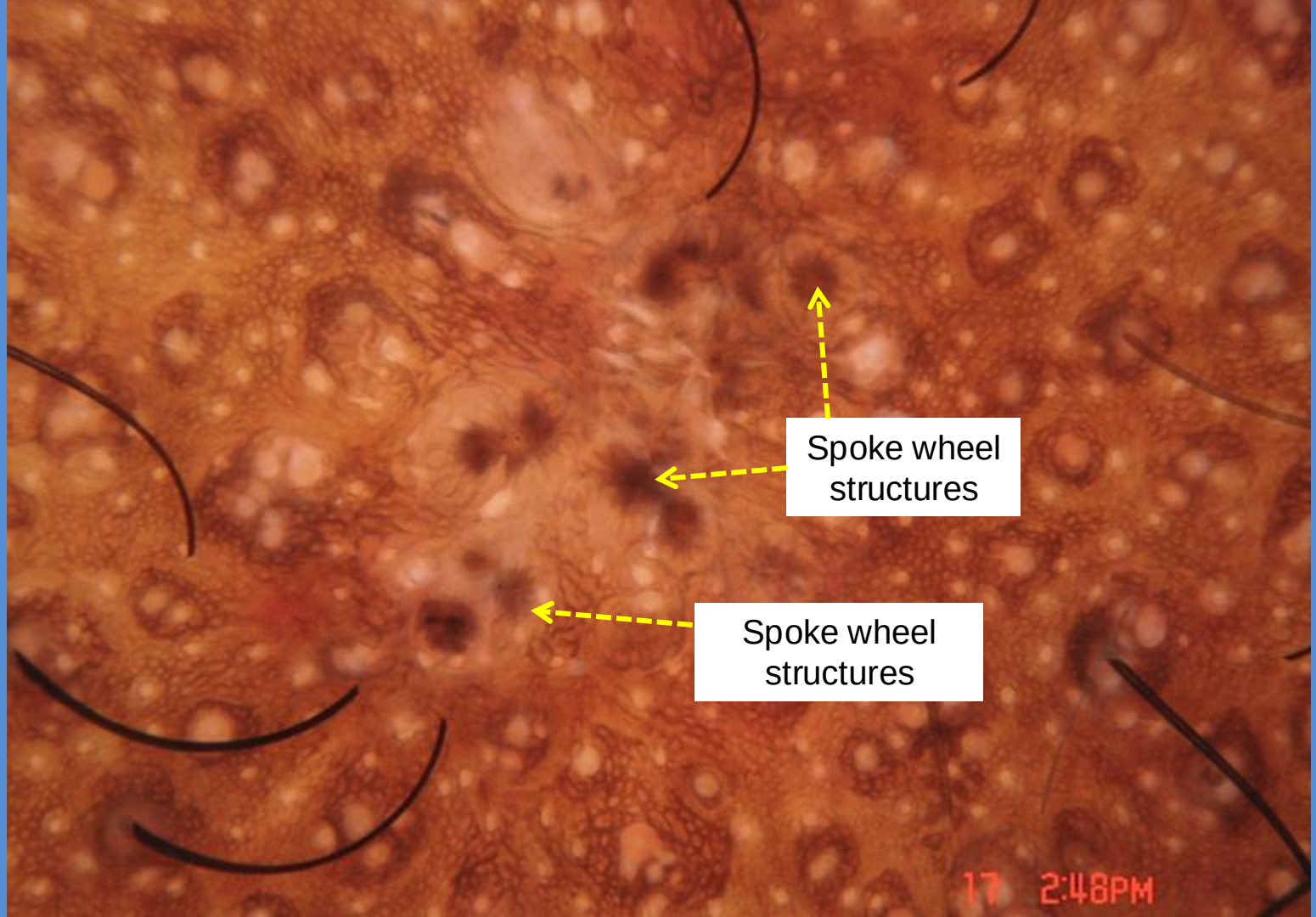
Well-circumscribed projections that meet at a central darker oval point

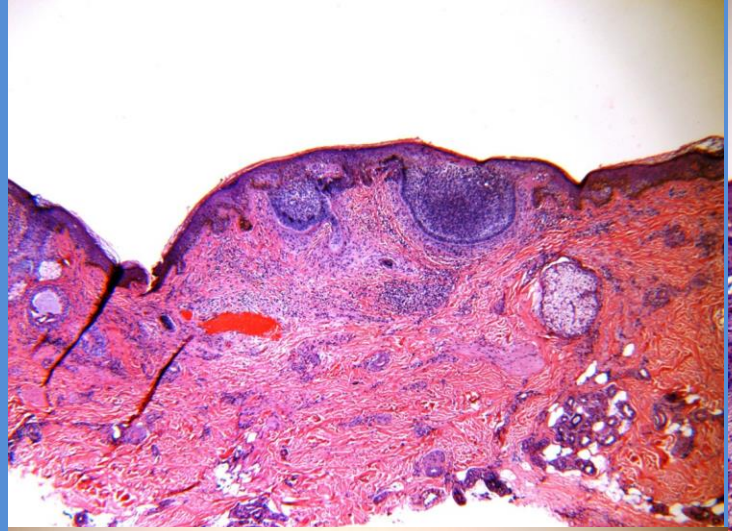
They manifest “spoke wheel” shapes

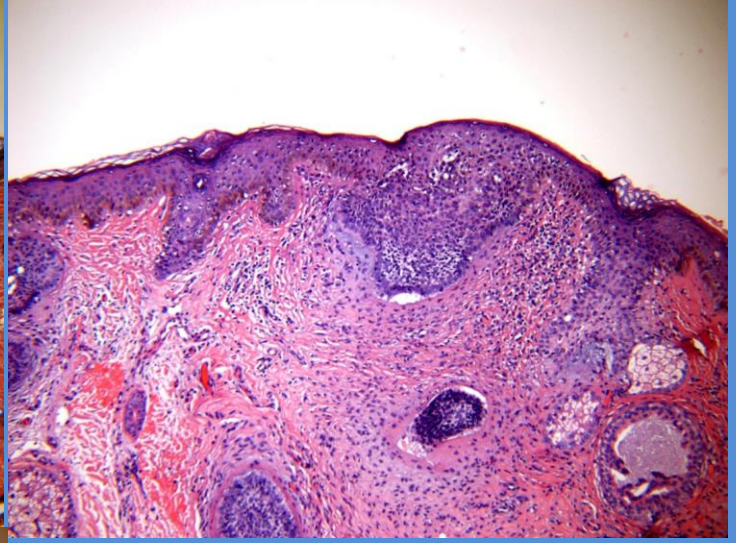


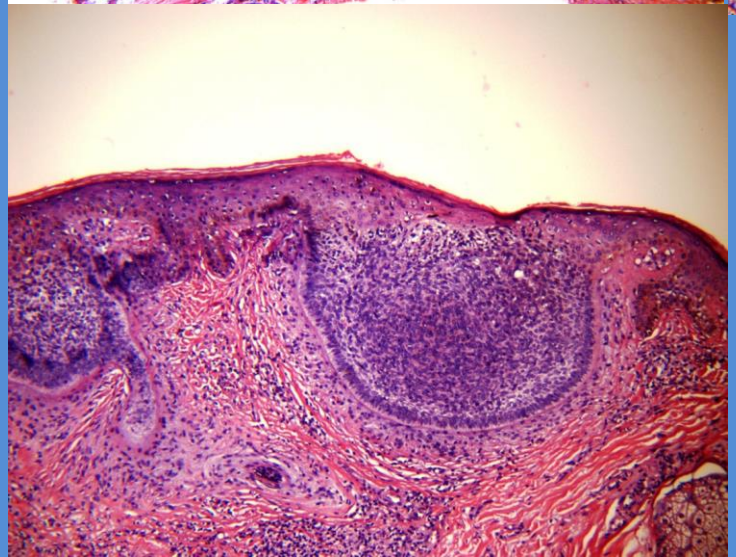


This 62-year-old man with type 6 Fitzpatrick skin had a brown crusted papule of 2 years duration.

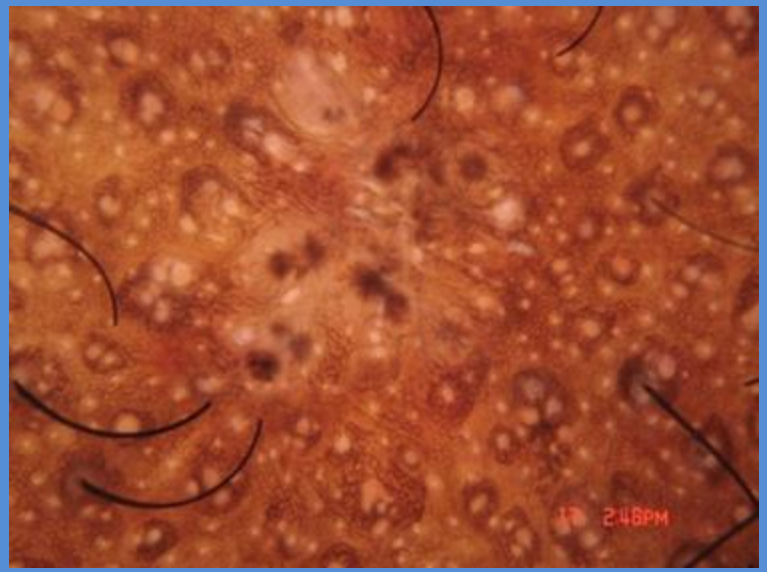

Spoke wheel structures
Spoke wheel structures
17 2:48PM

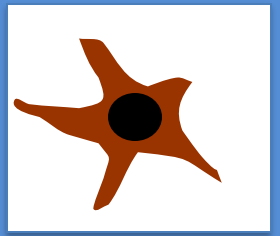


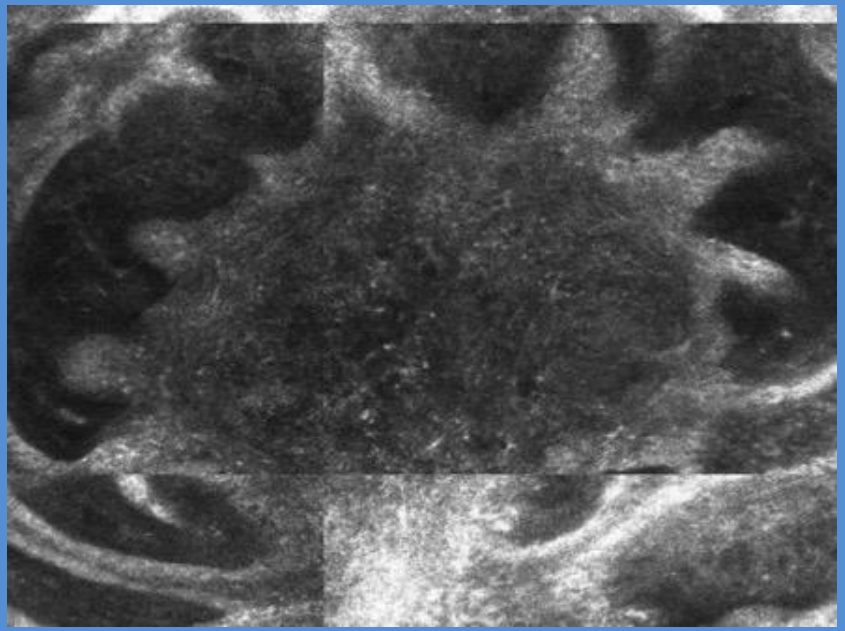




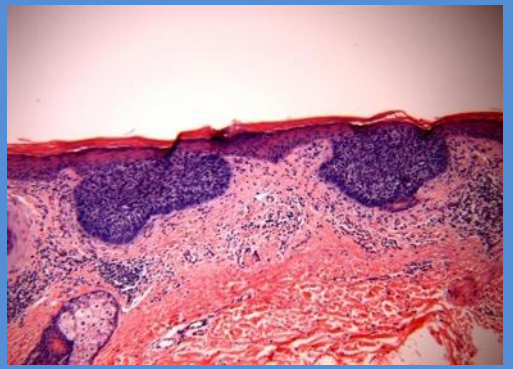
Superficial basal cell carcinoma

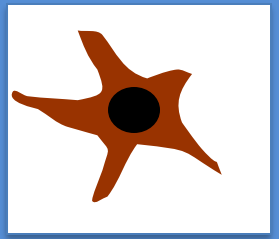






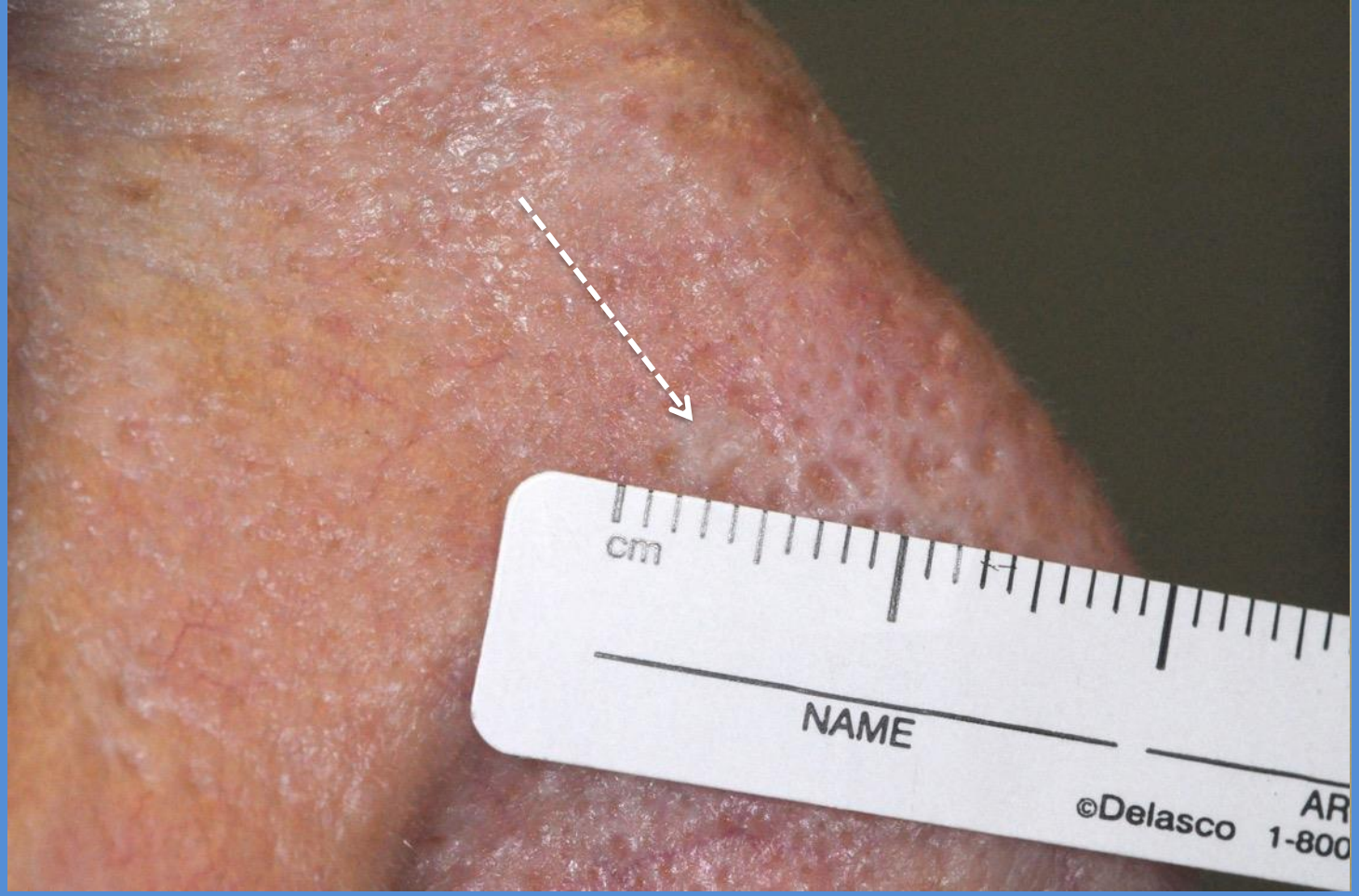
Spoke wheel RCM structure





Spoke wheel structures

With a white papule of the face consider a basal cell carcinoma in the differential!

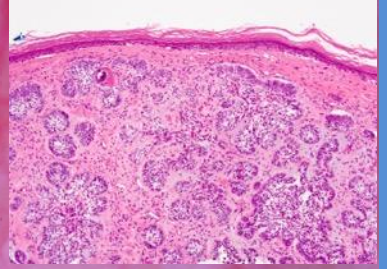


White papules of the face are often BCC

Teaching point

The dermoscopy features that can be seen with white papules of the face include:

1. A milky or ivory white background
2. Serpentine or linear curved red lines depicting blood vessels
3. White round structures (milia-like cysts)
4. White shiny structures
5. Featureless

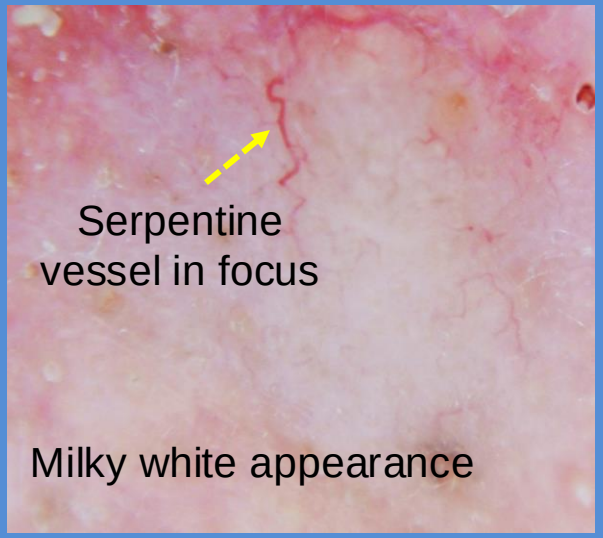


Serpentine branched vessels

White round reflective structures

Milky white area

White 3mm papule on the left nose

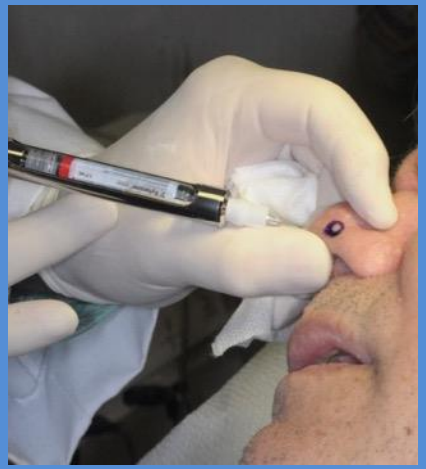


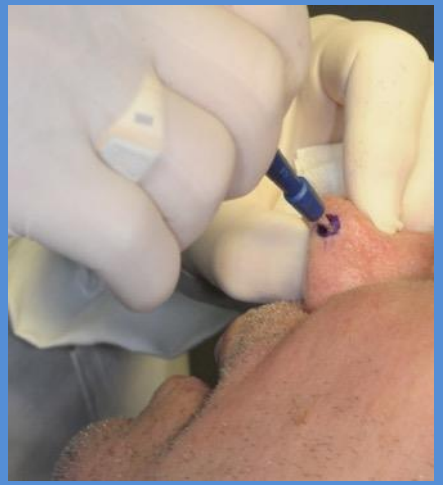
Morpheaform BCC

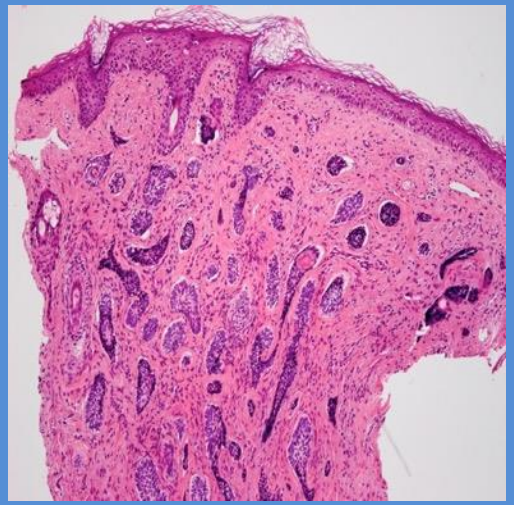
Milky white appearance often seen with morphea-form BCC

Management

Punch biopsy followed by Mohs surgery







Microscopic Diagnosis:

BASAL CELL CARCINOMA, INFILTRATIVE TYPE.

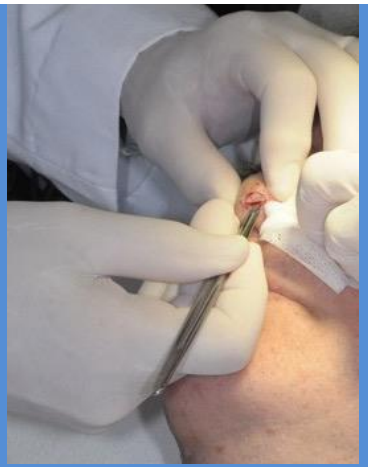
Clinical Data: PUNCH BIOPSY. R/O MORPHIA LIKE BCC IF POSITIVE MOHS

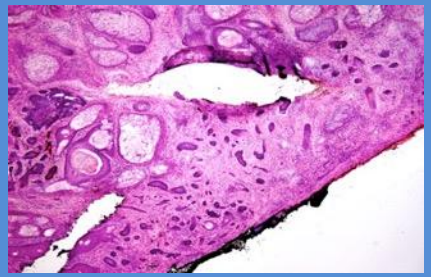
pecimen: 1 Gross Description: This specimen consists of a Punch piece of tissue measu
0.2 cm

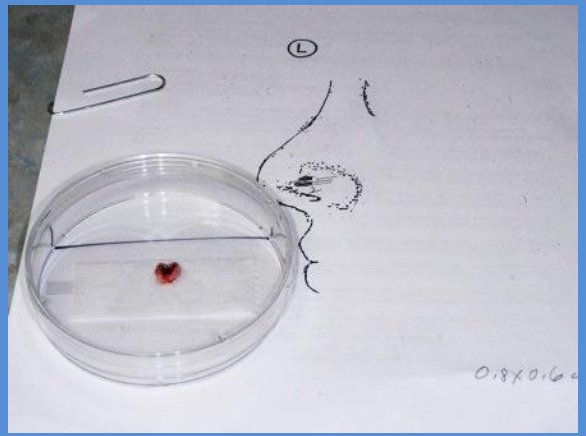
tologic Description:

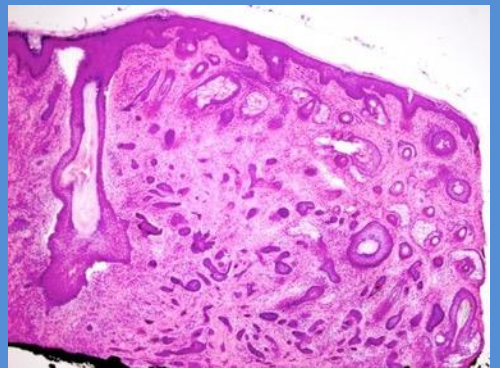
ere are aggregates of basoloid cells with atypical nuclei, scant cytoplasm, and peripheral palisadin
nds have jagged borders with infiltration of these borders between collagen bundles.

First stage of Mohs surgery

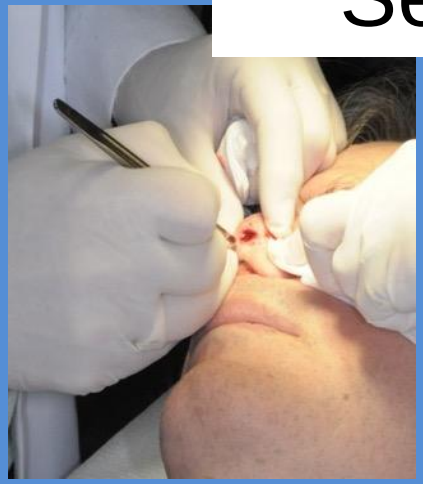


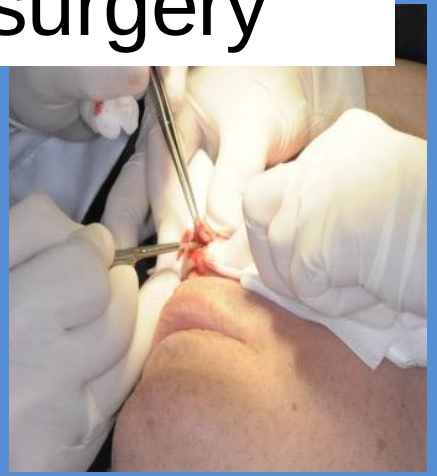


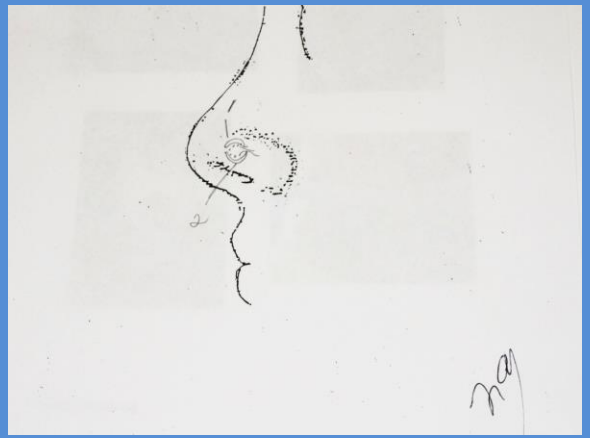


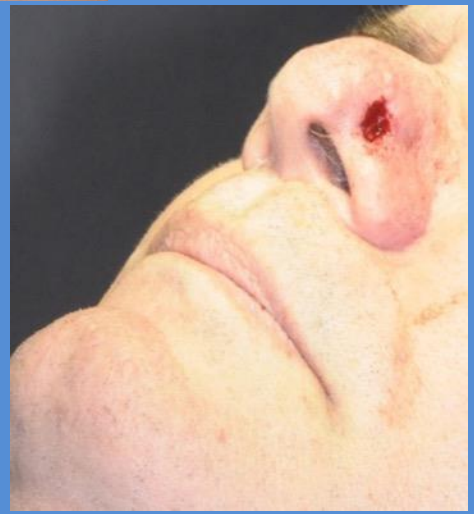


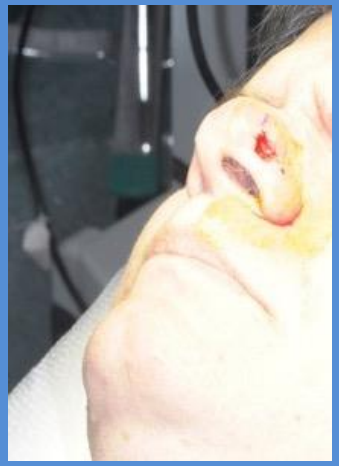
Second stage of Mohs surgery

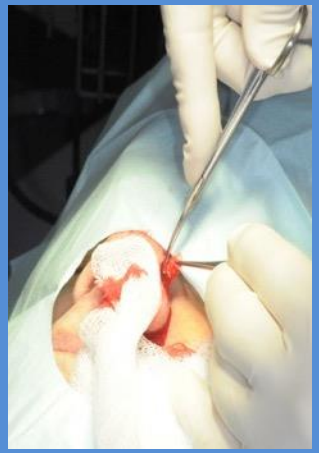




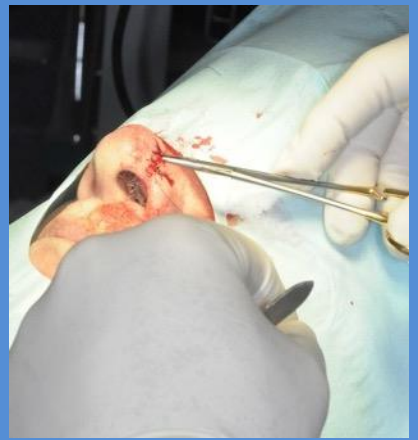
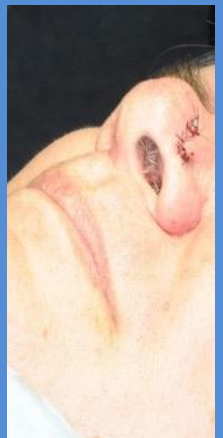










Two months post reconstruction

May globules are a clue to an infiltrative BCC

MAY globules

MAY globules are defined as aggregated, white-yellow structures visualized in polarized and non-polarized light.

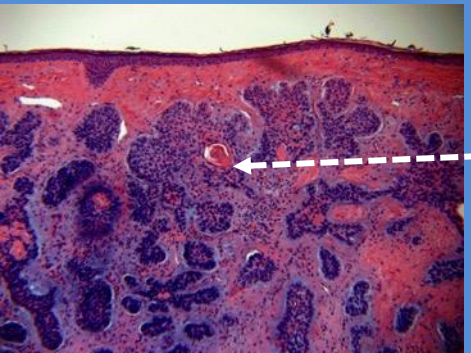
They were negatively associated with superficial BCC and positively associated with deeper-seated, histologic, higher-grade tumor subtypes.

JAMA Dermatol
2020 Aug 1;156(8):882-890.
Association of Multiple Aggregated Yellow–White Globules With Nonpigmented Basal Cell Carcinoma

White-yellow structures

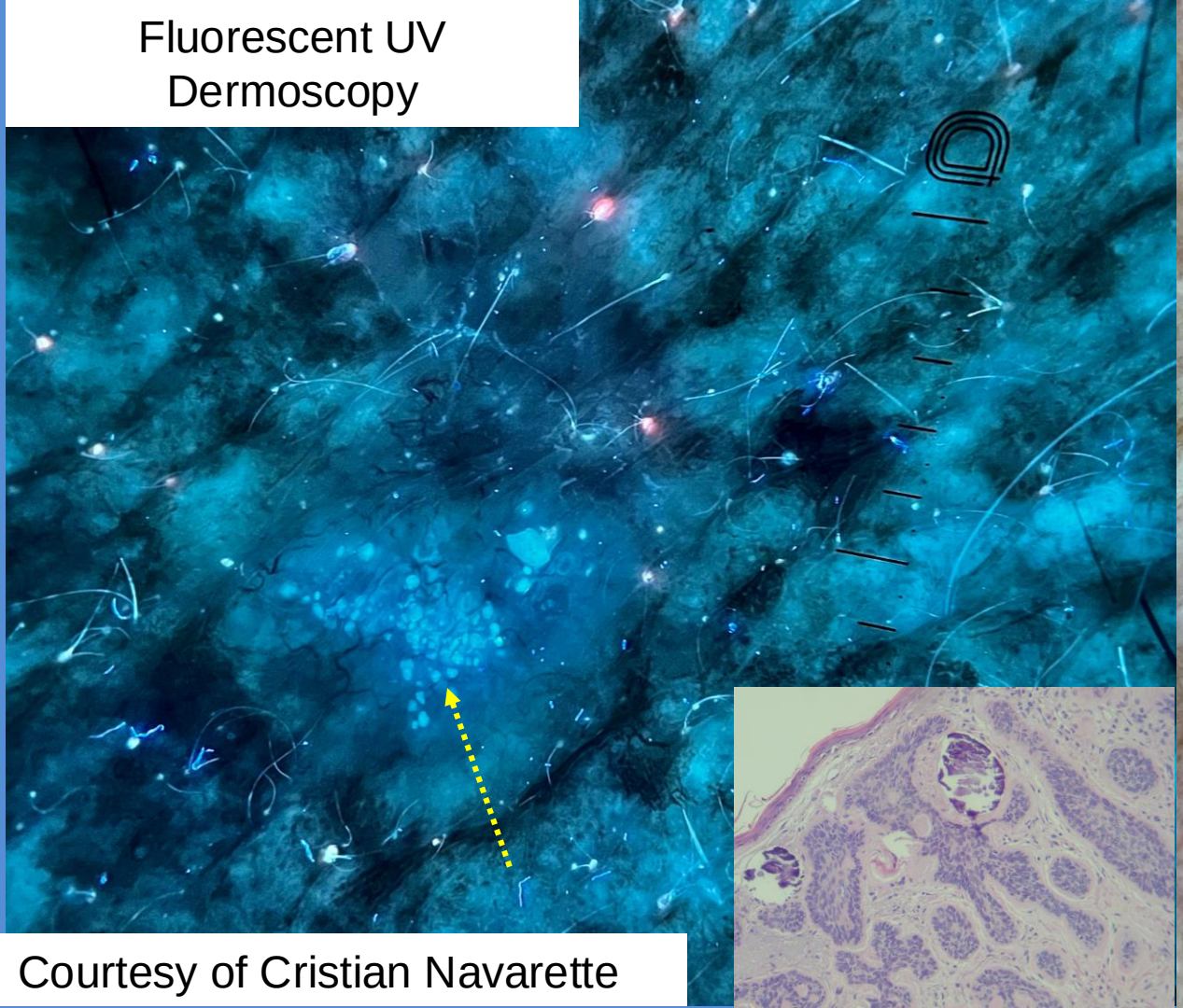
Contact non-polarized

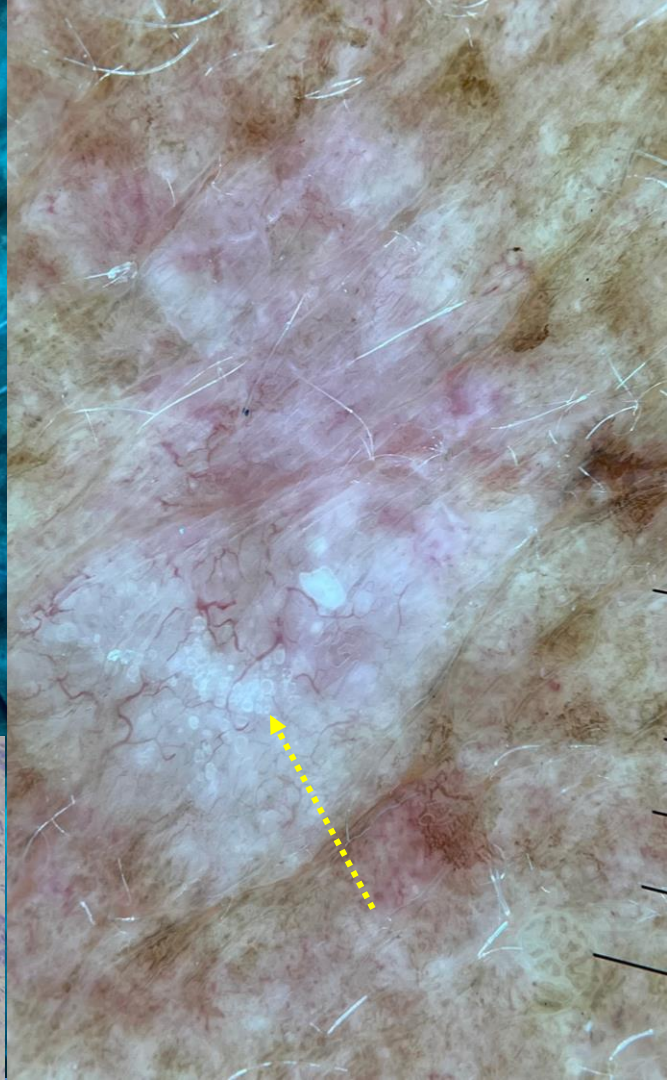
Contact polarized



Calcification

Fluorescent UV Dermoscopy

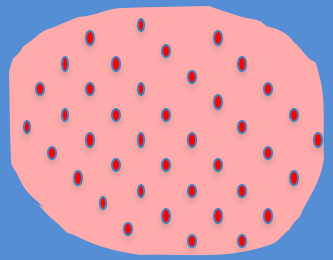




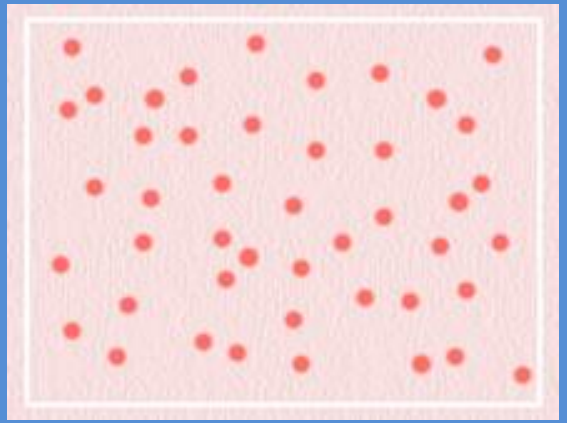
Courtesy of Cristian Navarette

The most important feature for SCC in situ is vessels as dots or coils

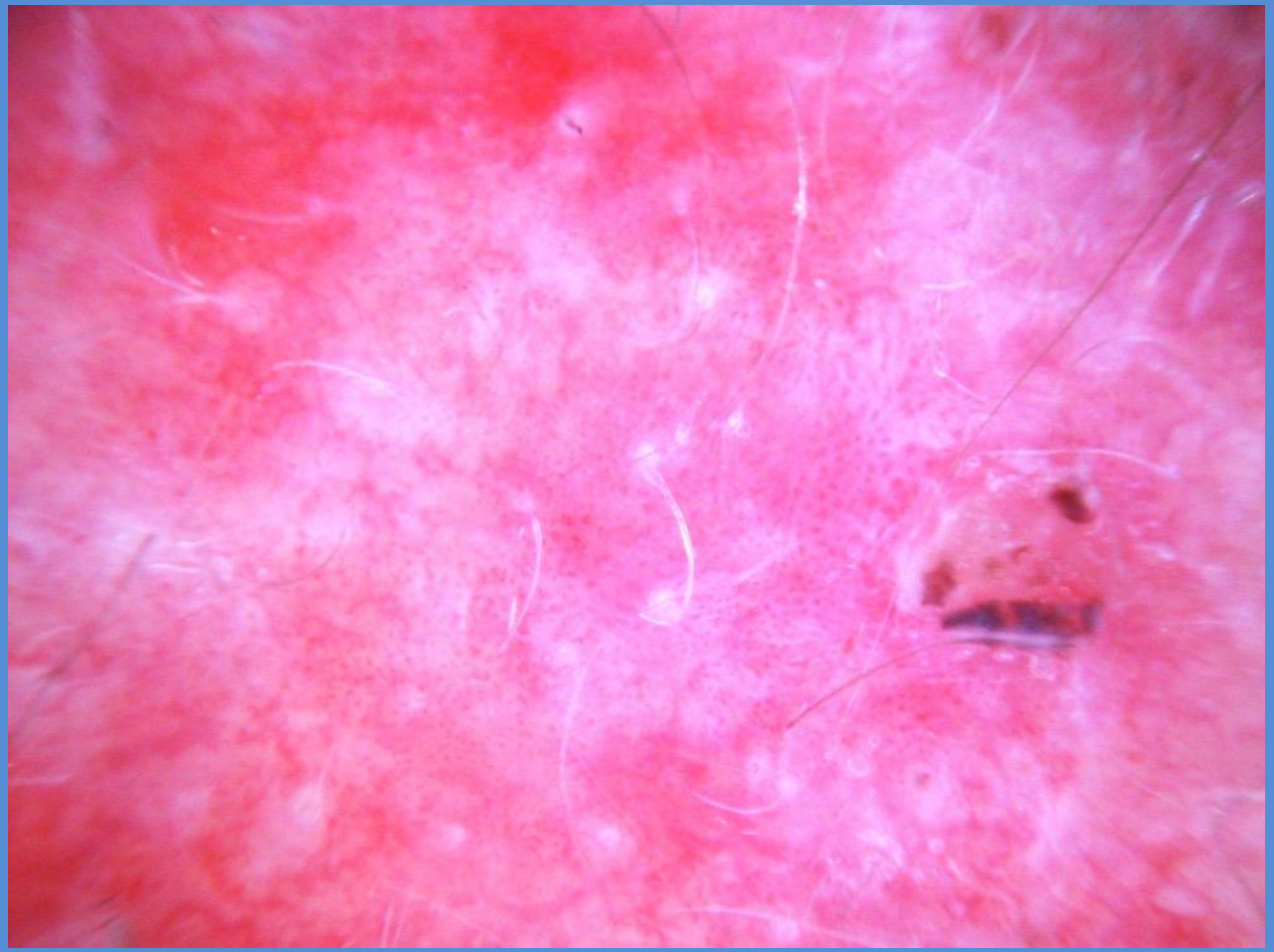
Vessels appearing as red dots



Diffuse

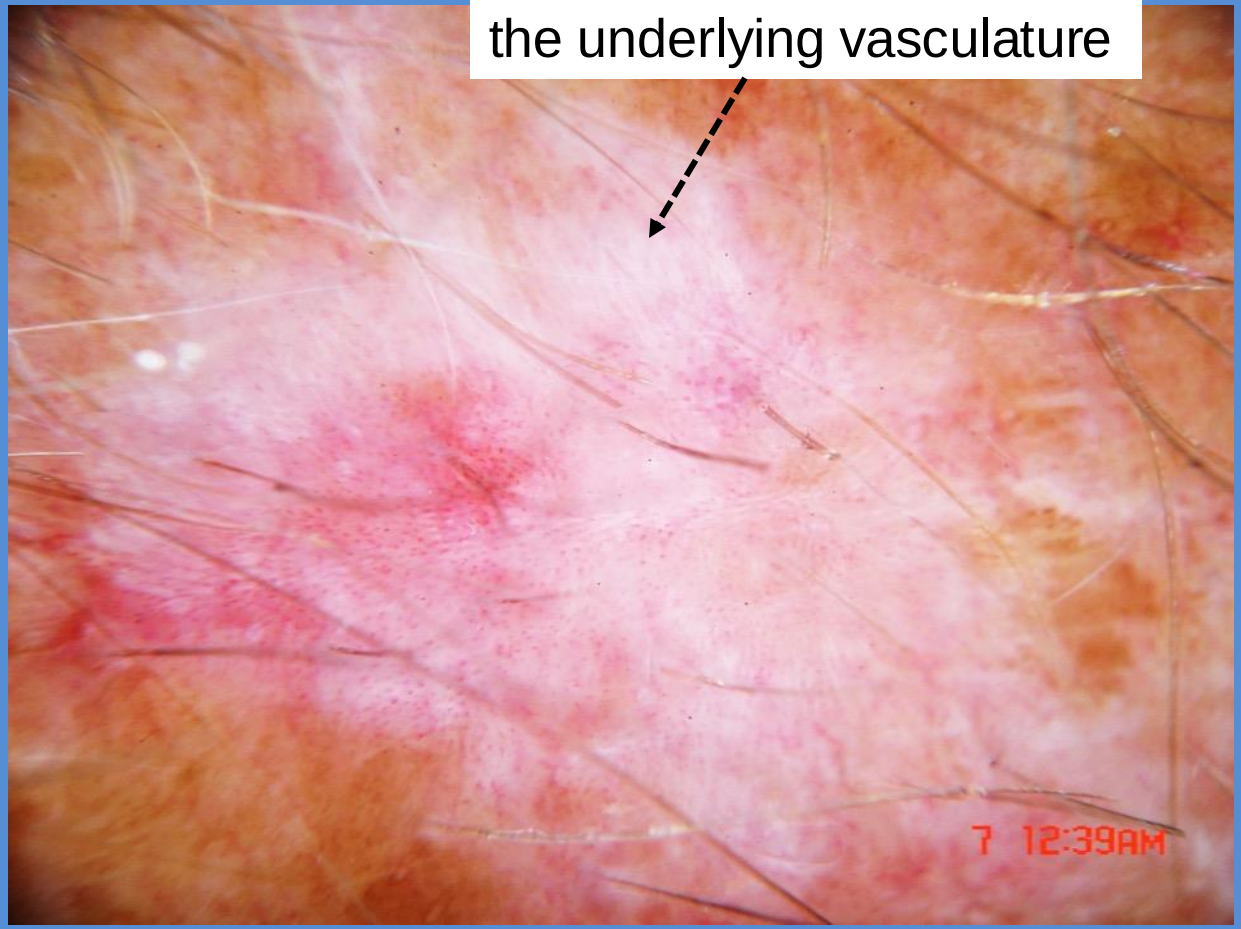


Clustered



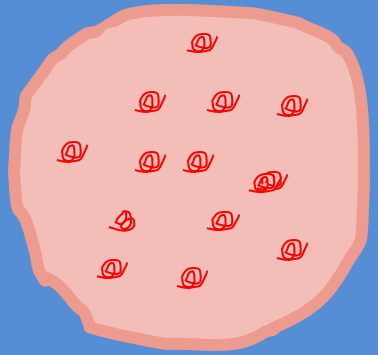
Diffuse vessels as red dots

The white scale obscures the underlying vasculature

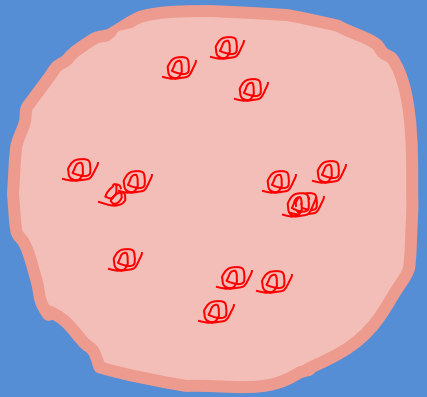


Clustered vessels as red dots

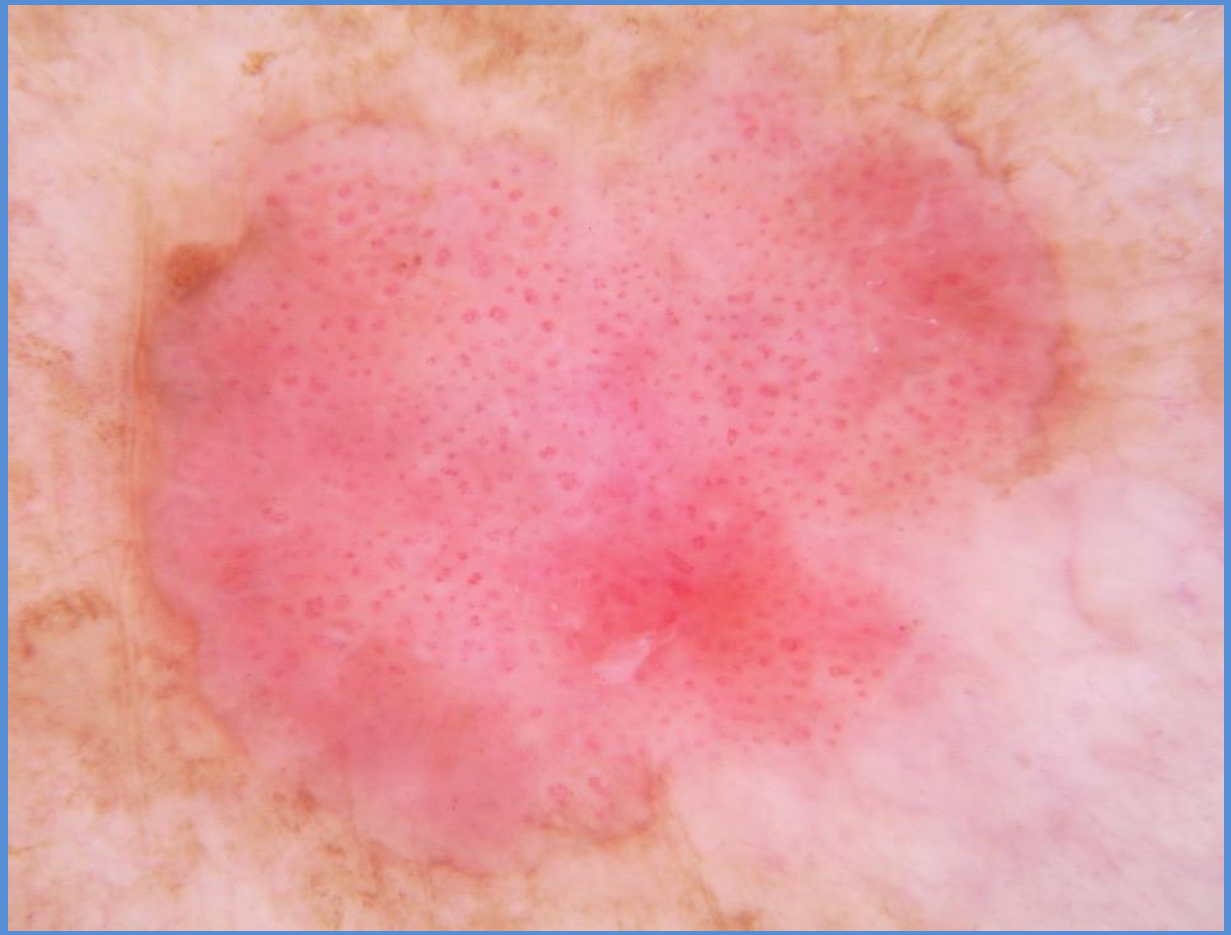
Vessels appearing coiled (glomerular vessels)



Diffuse
Diffuse



Clustered



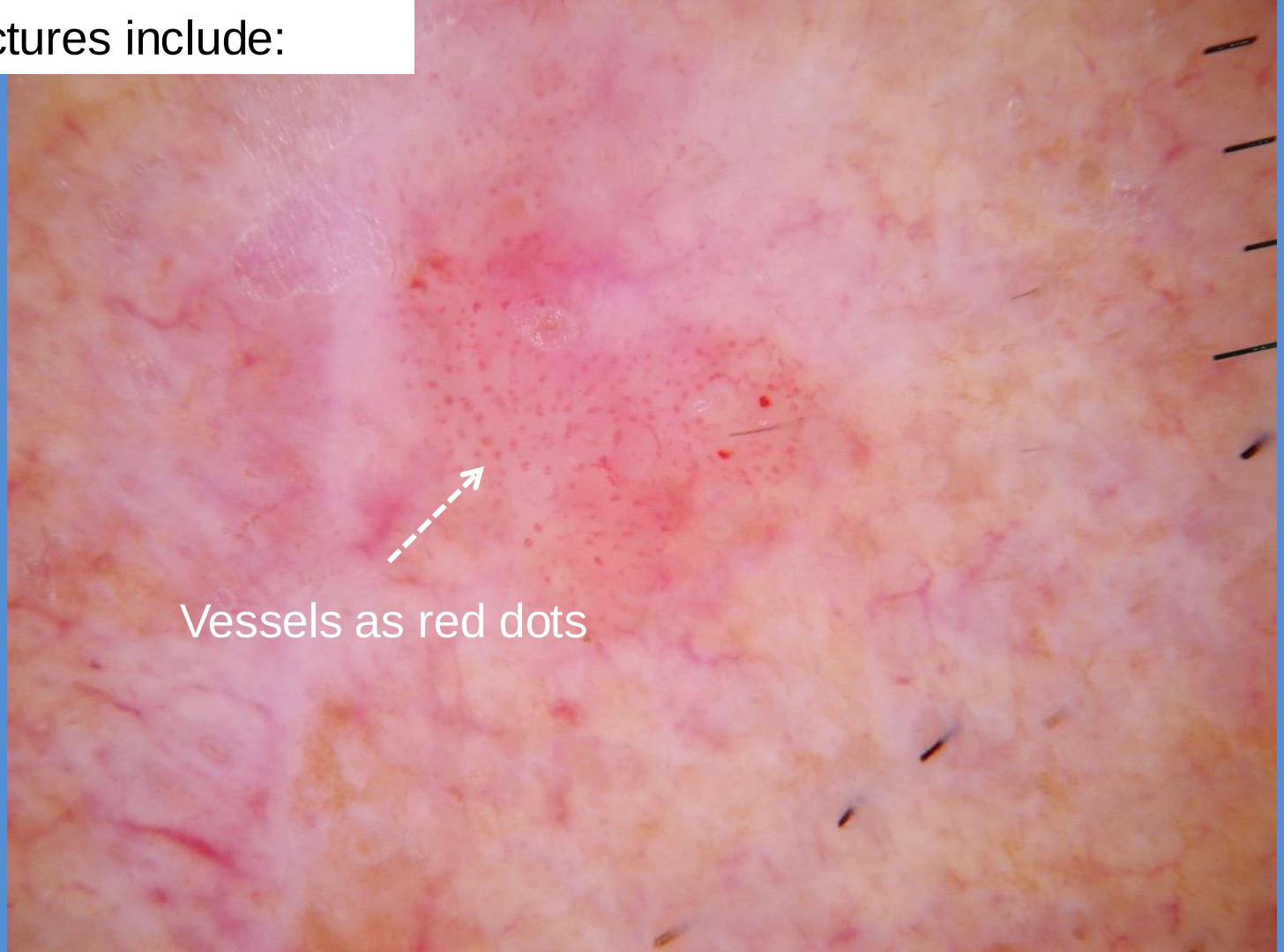
Diffuse vessels coiled

The white scale obscures the underlying vasculature

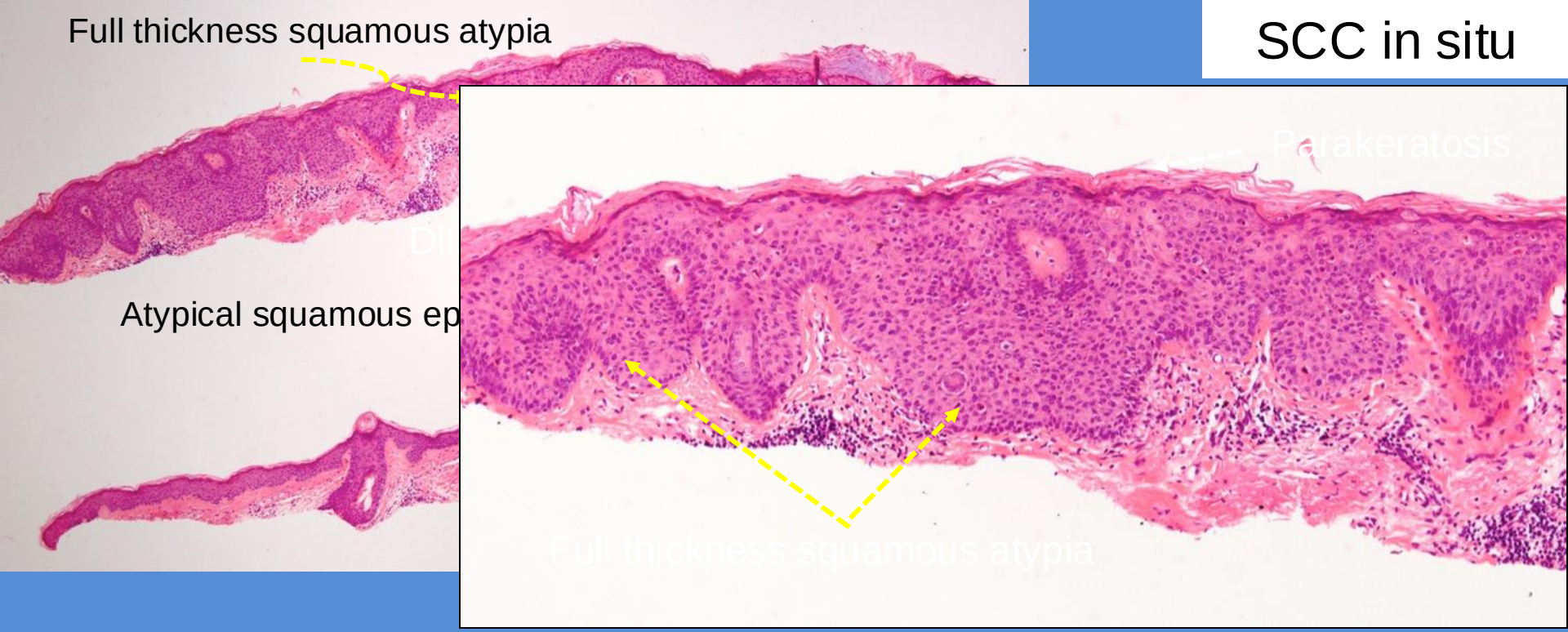
Clustered vessels coiled

This 55-year-old man had a pink papule adjacent to an old scar.

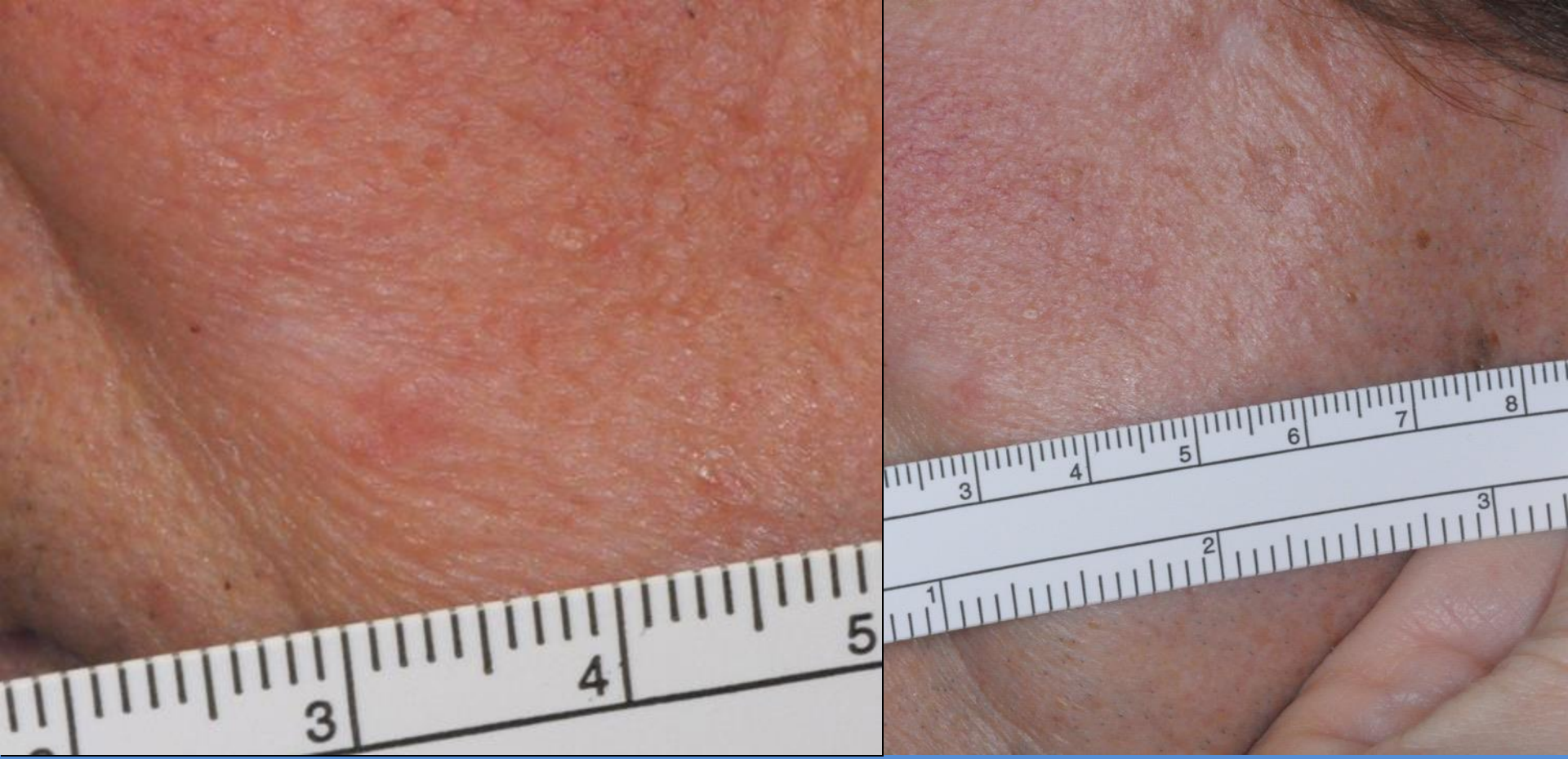
The structures include:



SCC in situ

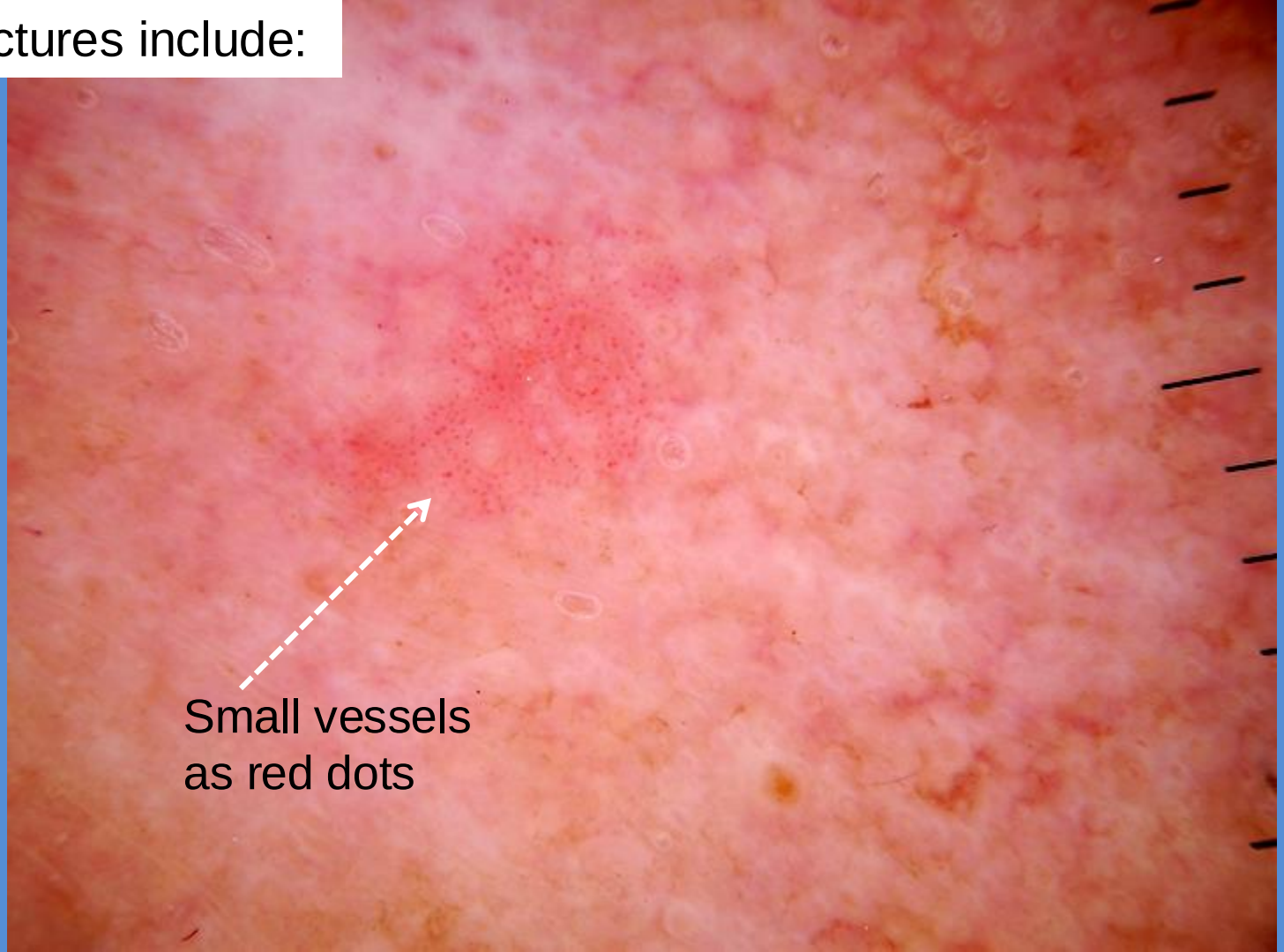


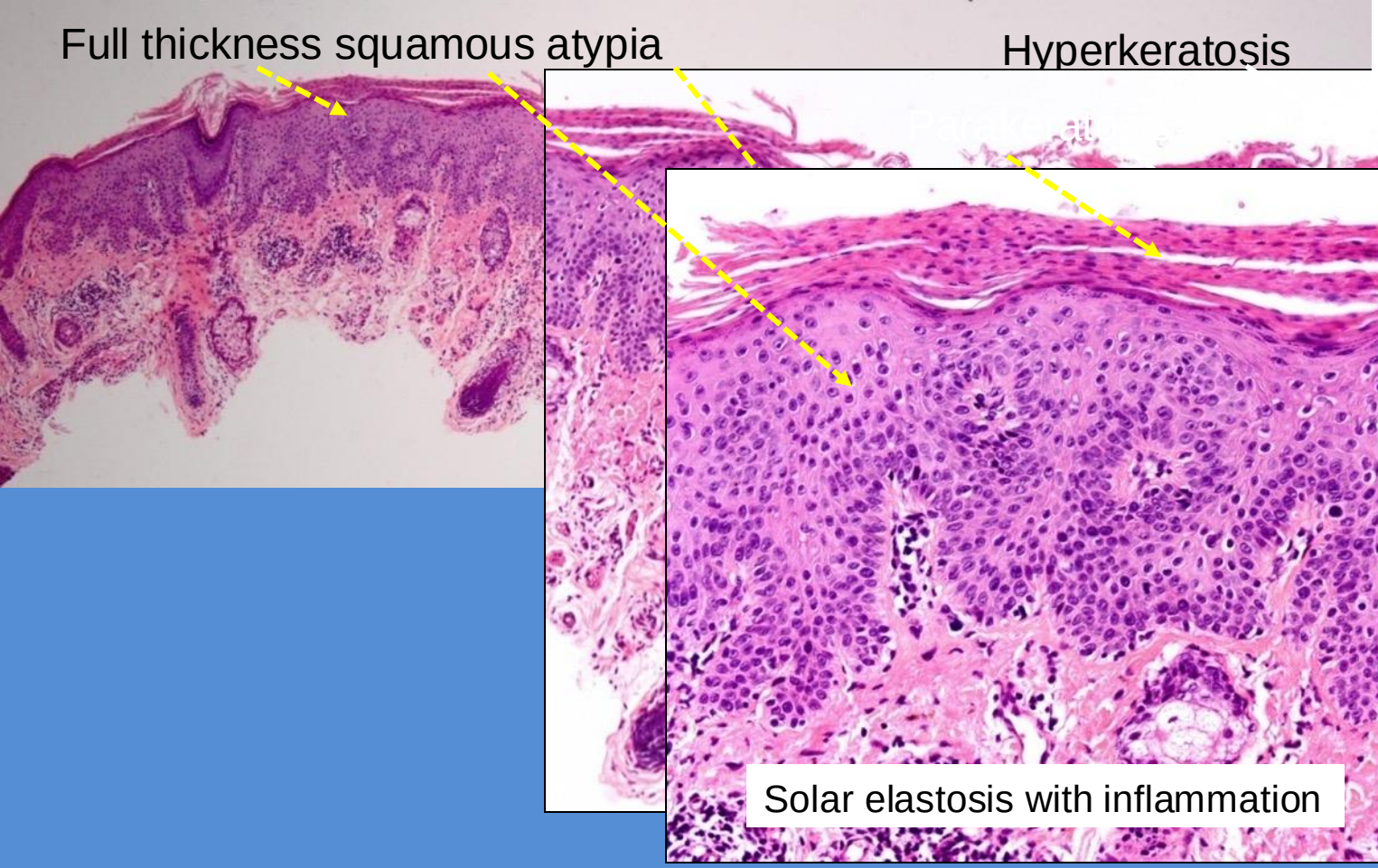
There is hyperkeratosis, focal parakeratosis and epidermal hyperplasia with full thickness squamous atypia that is noted to extend down adnexa. In the solar altered dermis there is a perivascular L-H inflammatory infiltrate & dilated papillary blood vessels.



This 67 yo man had a 3mm papule adjacent to a scar.

The structures include:



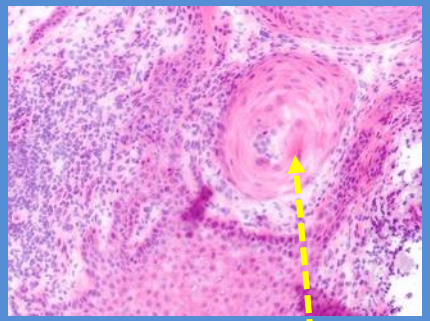


There is hyperkeratosis, focal parakeratosis, full thickness squamous atypia, & an inflammatory infiltrate in the solar altered dermis.

An important dermoscopic clue to an invasive SCC are white circles with a central yellow plug (keratin pearls)

Circular or ovoid structure of an orange brown (tan) color & a white peripheral rim (keratin pearls)

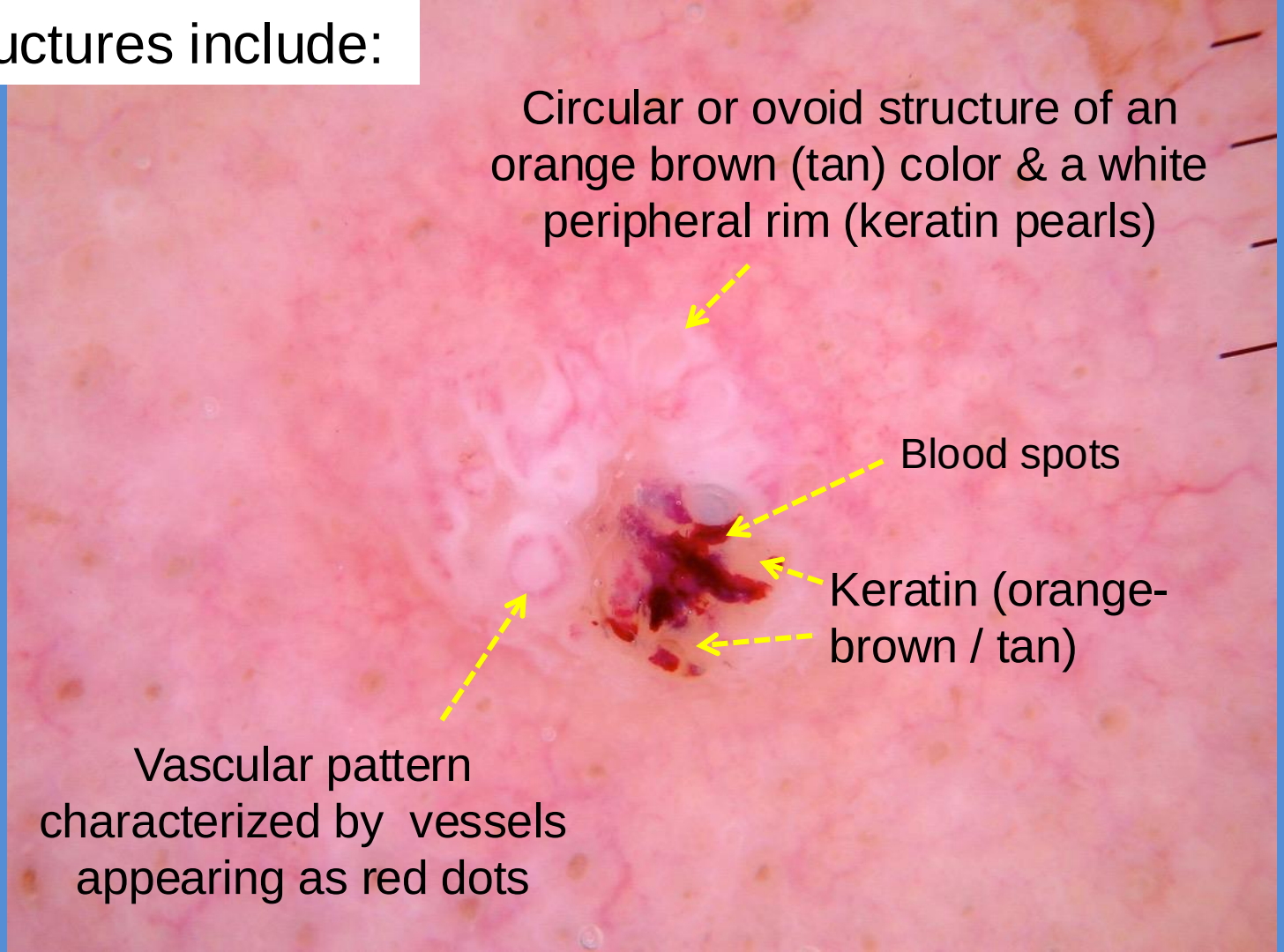
Circular or ovoid structure of an orange brown (tan) color and a white peripheral rim (keratin pearls)

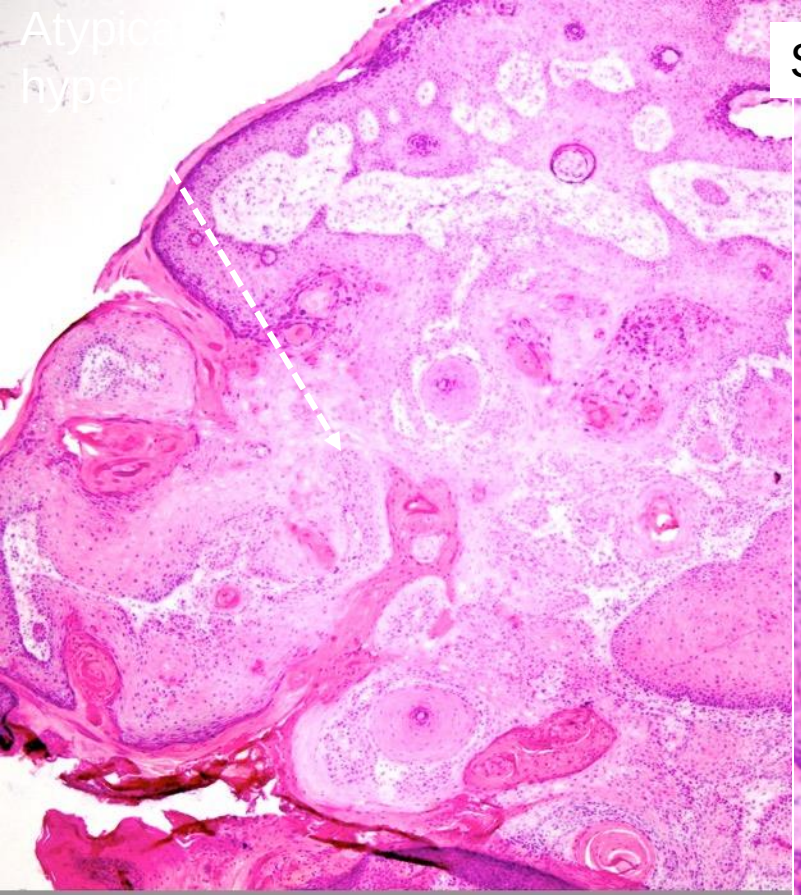


Keratin pearl

This 82 yo man with a hx of NMSCs had a tan papule with a central crust of the left paranasal area

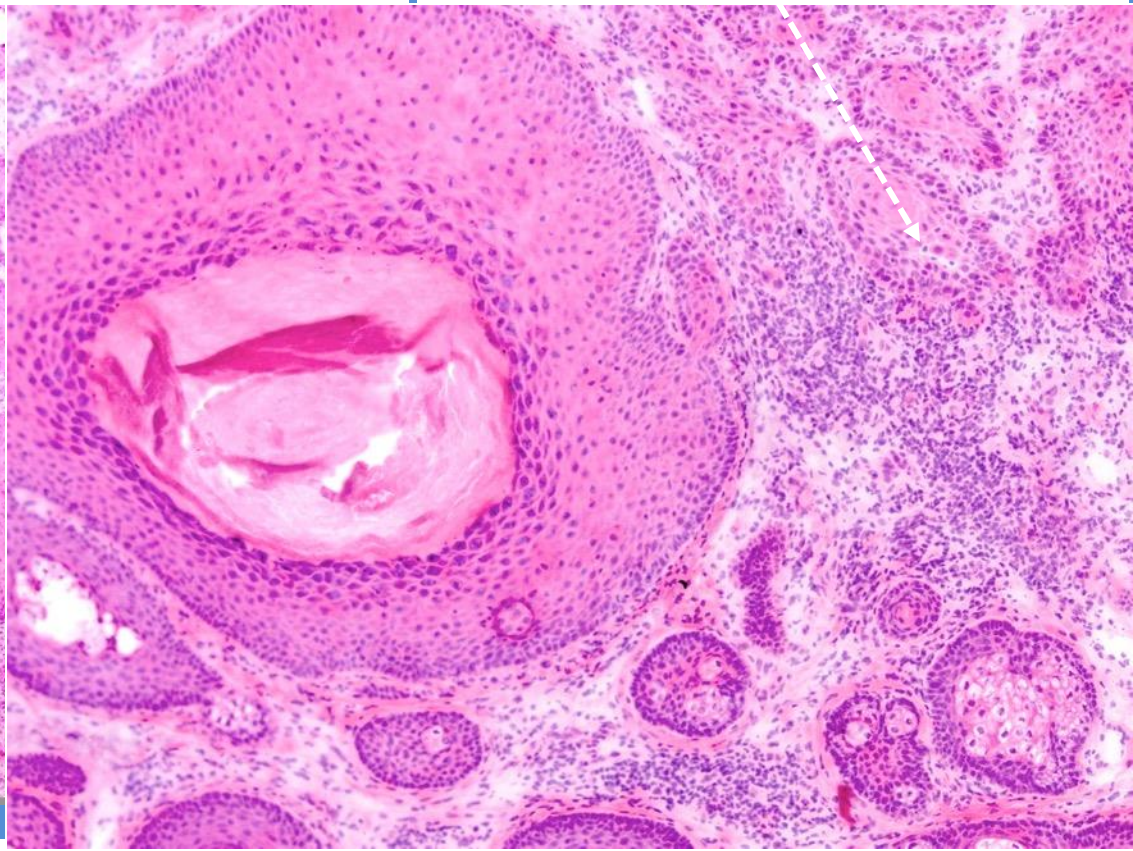
The structures include:





Squamous eddies

Atypical epithelium



There is atypical epidermal hyperplasia with full thickness squamous atypia & squamous eddies that extend into the reticular dermis.

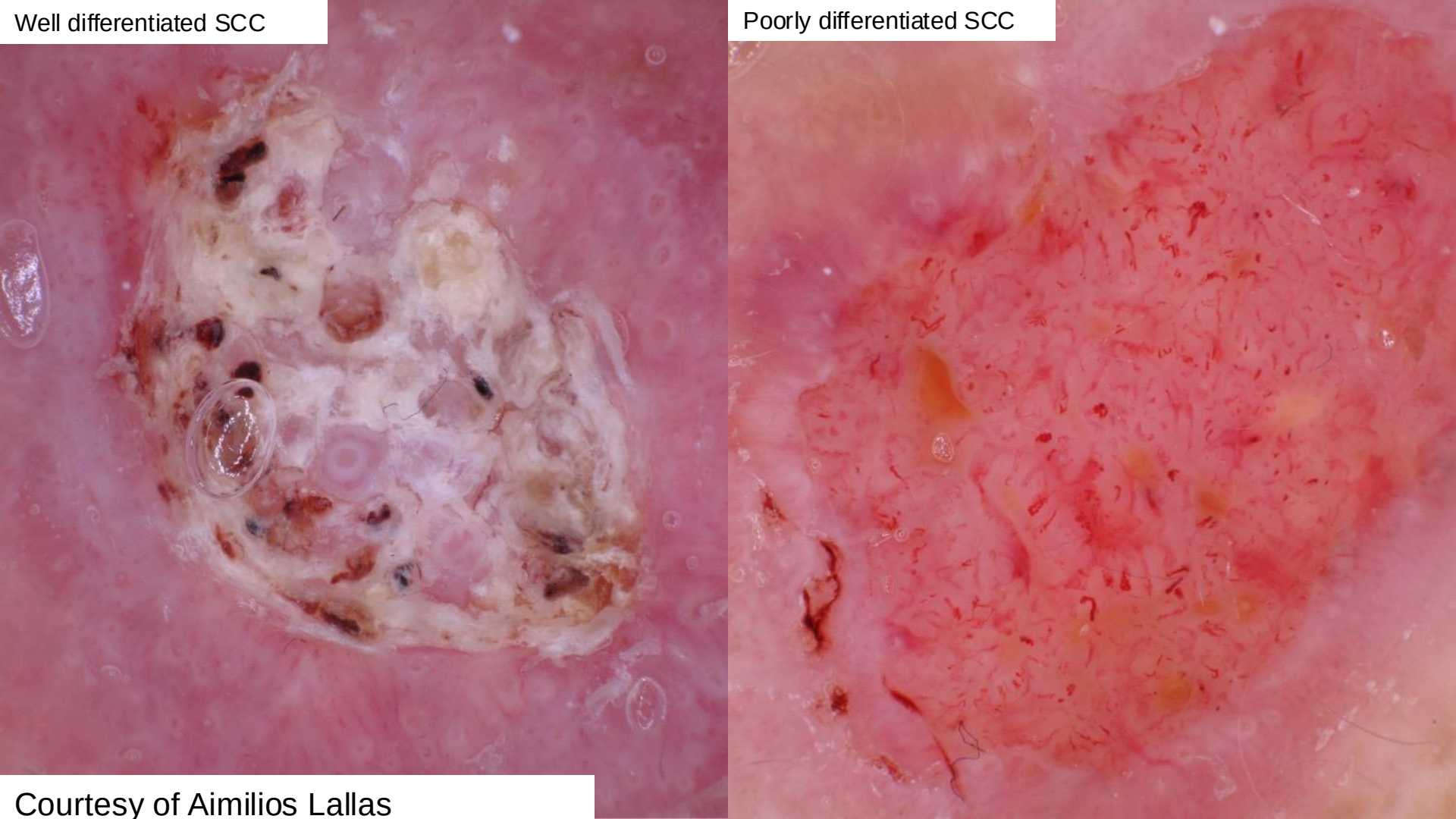
Can dermoscopy distinguish well differentiated versus poorly differentiated SCC

Well-differentiated versus poorly differentiated SCC

1.The presence of vessels in more than half of the tumor's surface with a diffuse distribution of vessels and bleeding significantly increased the possibility of poorly differentiated SCC.

2.Conversely, keratin/scales are a potent predictor of well- and moderately differentiated SCC .

3. Moderately and poorly differentiated SCC displayed more branched and serpentine vessels than well-differentiated SCC



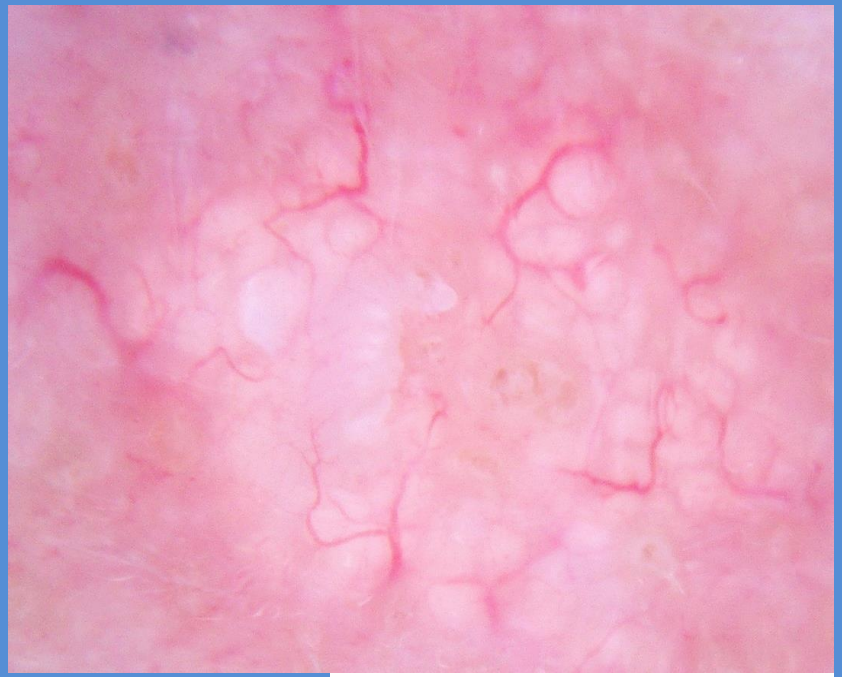
Courtesy of Aimilios Lallas

Sebaceous neoplasms often have yellow to white lobular structures

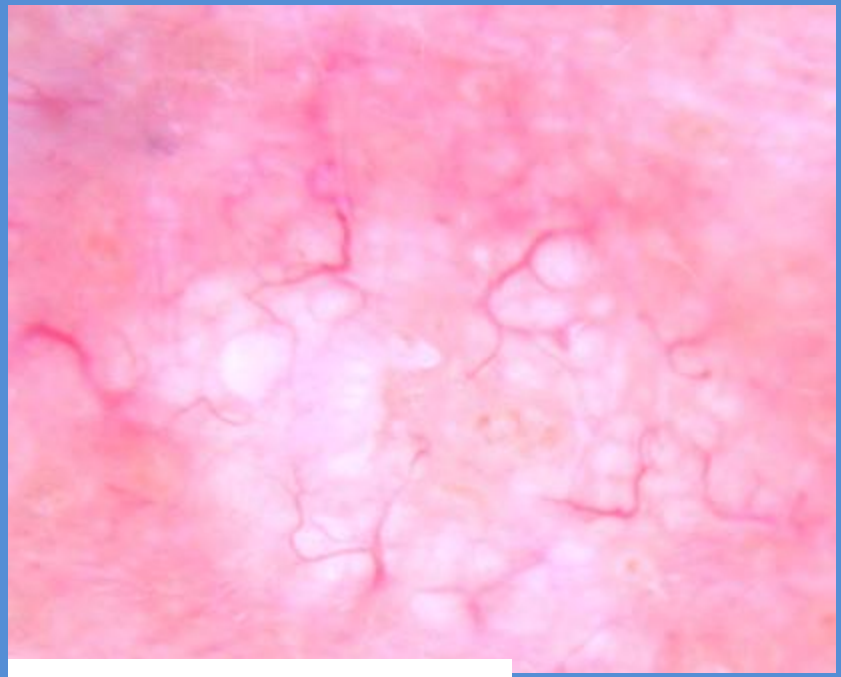
Dermoscopically the most important feature are yellow to white lobular structures

Sebaceous hyperplasia

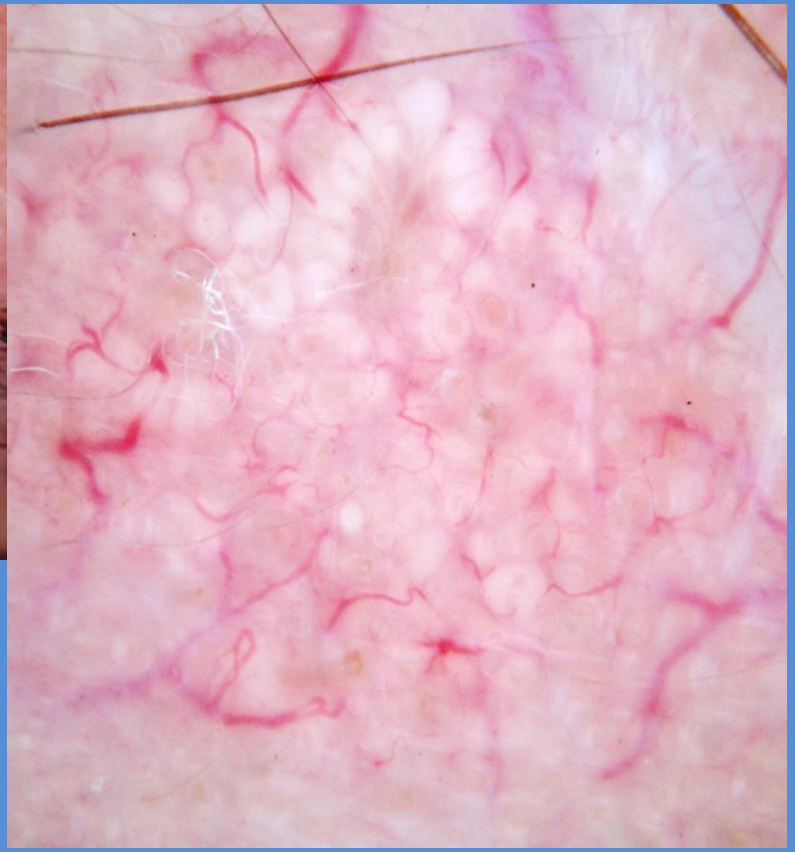
Additional feature includes:



Serpentine radial vessels



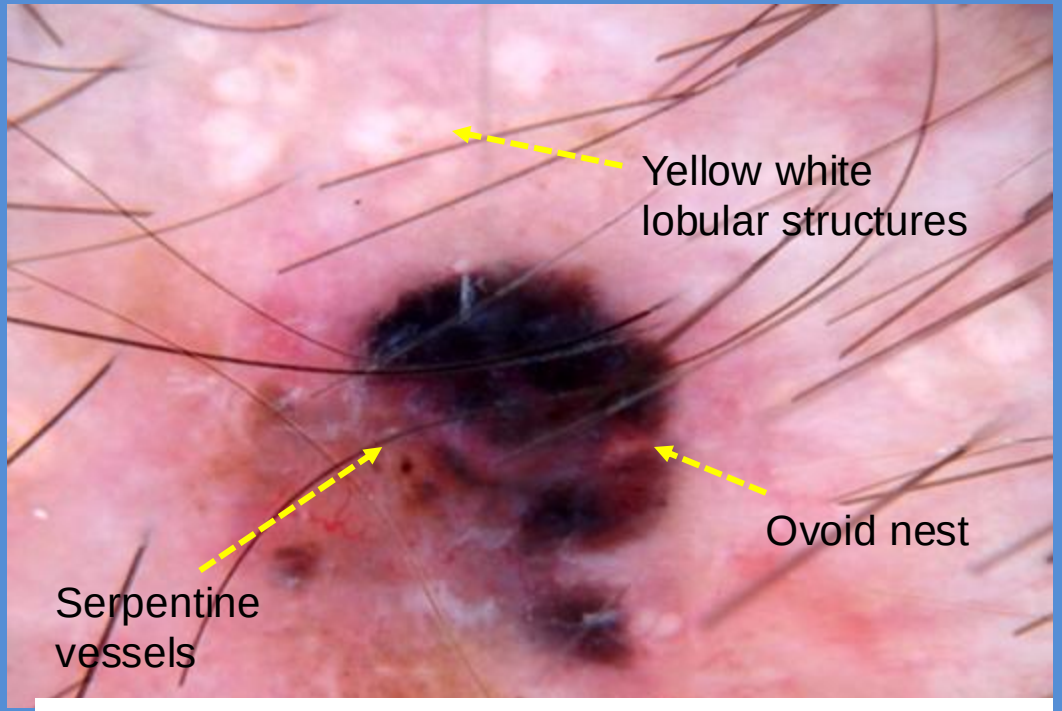
Serpentine radial vessels



Sebaceous hyperplasia

Yellow plaque in association with a dark blue black papule

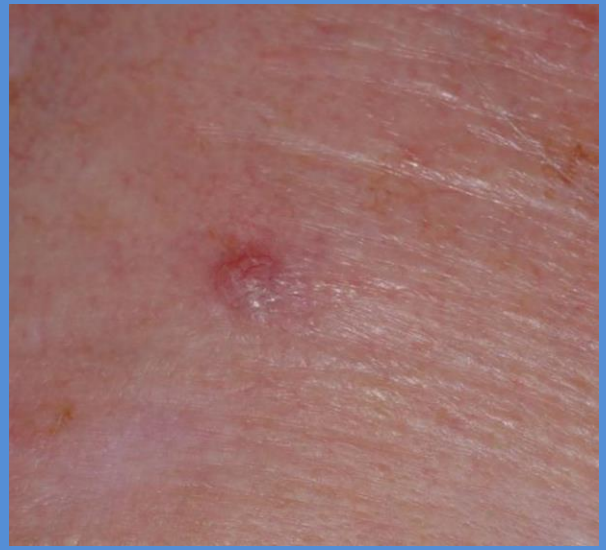
Trichoblastoma

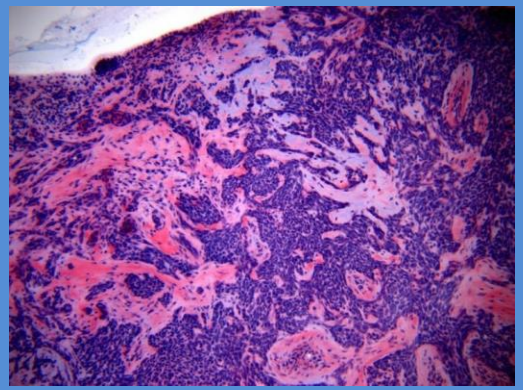


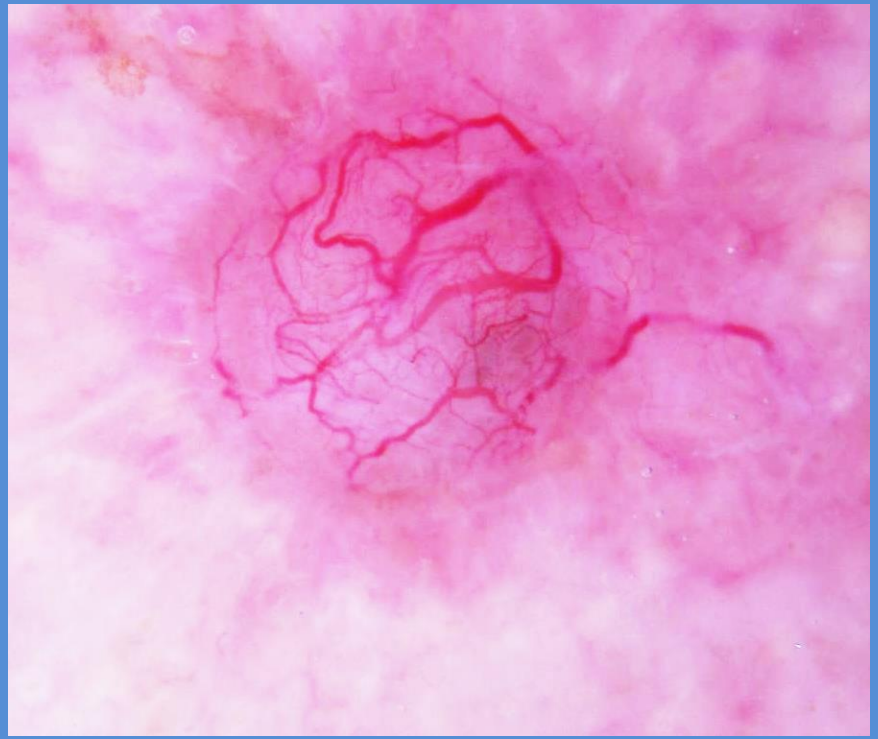
Nevus sebaceous in association with a trichoblastoma

Yellow white lobular structures in a sebaceous carcinoma

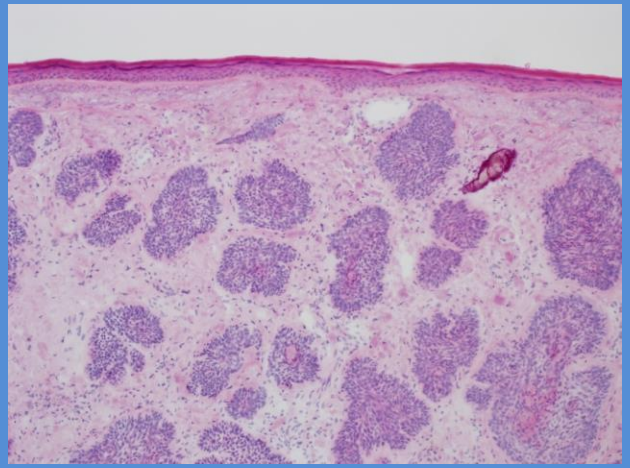
Serpentine branched vessels are sharply in focus within the BCC



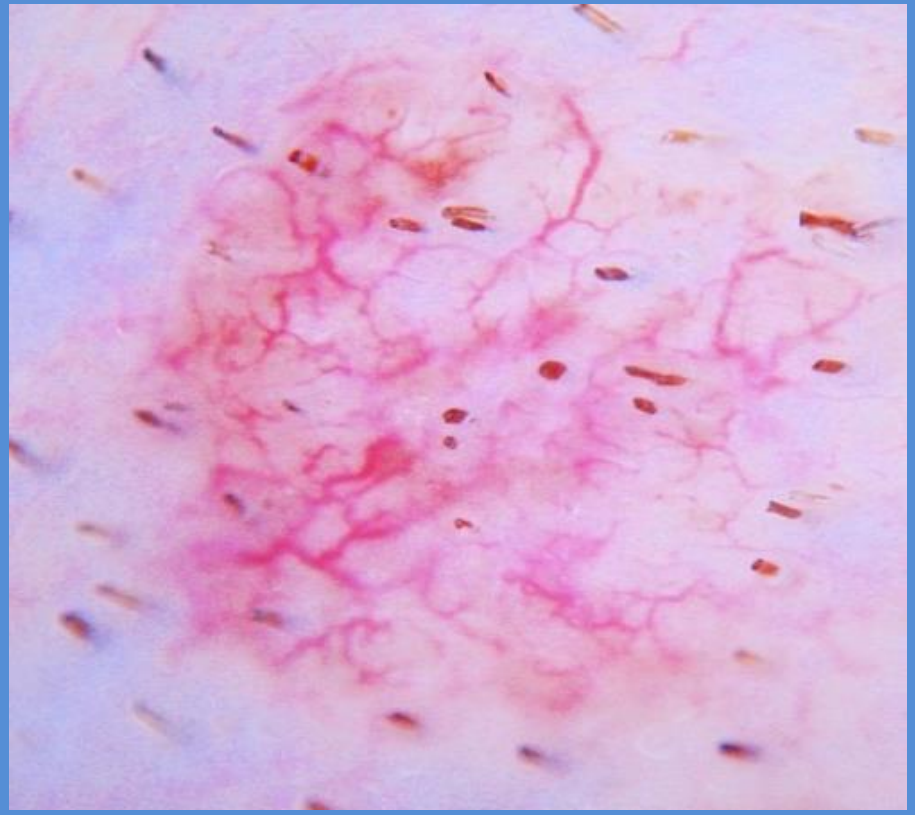




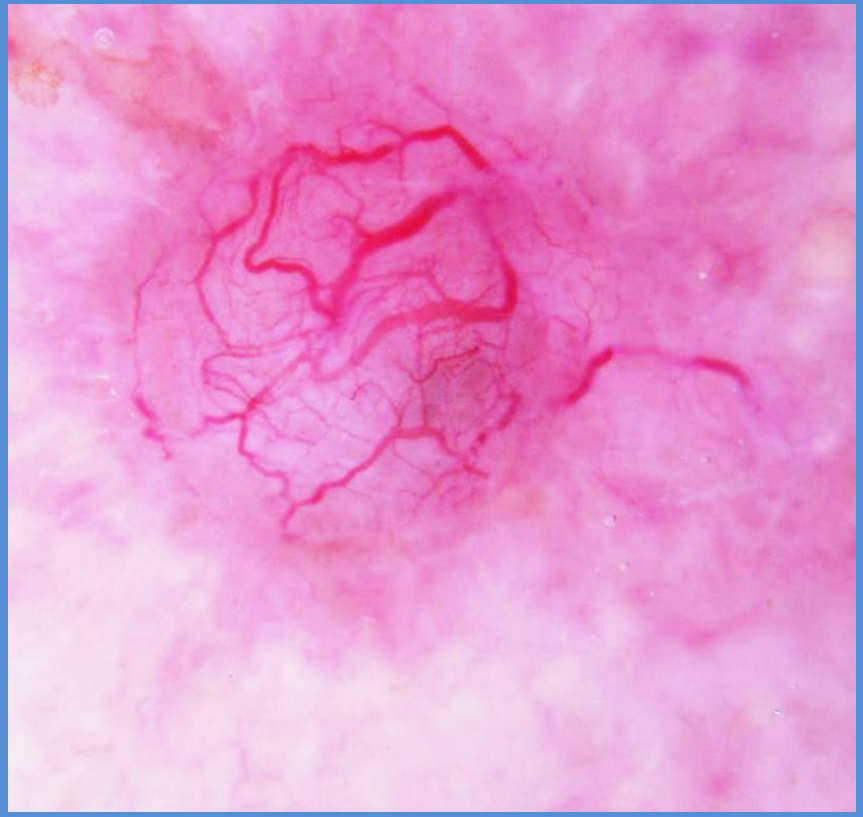

cm



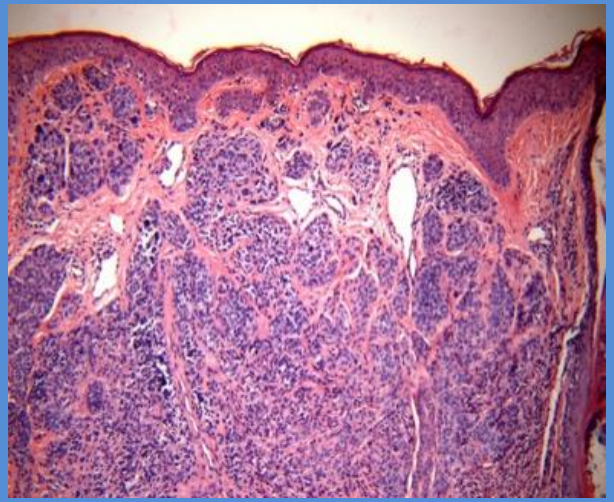
Serpentine branched vessels not in focus or fuzzy within the neoplasm are characteristic of intradermal nevus.

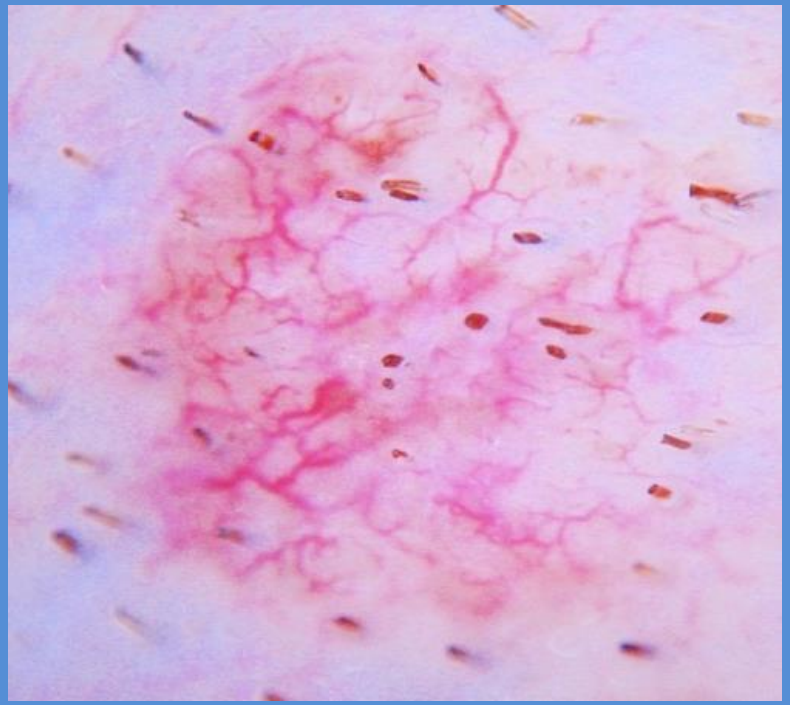


Meischer or Intradermal nevus



Basal cell carcinoma





Anything else?

Thank you for your attention!