Dermoscopy Primer Updated:
2-step dermoscopy algorithm

Friday, Sept 16, 2016
2:00-5:00PM

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Attending Physician

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Disclosure Statement

(My entire career is Conflict of Interest)

Book: royalties

Meeting: paid to organize

Speaking: Honorarium (3GEN & others – money laundering)

Grants: Partnered with industry (3GEN, Canfield, others)
With that said

• I have no true conflicts of interest with the content of this presentation
What is a dermoscope?

- Handheld instrument with magnifying objective & light source that removes surface glare & allows us to see structures that are not visible to the naked eye
What is dermoscopy?

- The analysis of the primary morphology of microscopic subsurface skin structures that are not visible to the unaided eye.

- It is one of many methods used to study the primary morphology of lesions:
  - *Clinical (gross) primary morphology (i.e., ABCDE)*
  - *Dermoscopic (microscopic) primary morphology*
  - *Confocal (fuzzy-cellular) primary morphology*
  - *Histopathology (cellular) primary morphology*
There remains no doubt that dermoscopy improves overall diagnostic accuracy; however, skeptics question the effectiveness of dermoscopy for melanoma detection!
1. Is dermoscopy effective at detecting melanoma?

• Multiple meta-analysis have shown that dermoscopy improves diagnostic accuracy.
• Dermoscopy increases the sensitivity for diagnosing melanoma by 30% compared to the naked eye alone.
• More than 2/3 of melanomas are misclassified as benign when using the clinical ABCD rule.

Dermoscopy is more accurate than the naked eye alone for the diagnosis of melanoma

- Meta-analysis including 9 prospective studies
- Dermoscopy improves sensitivity and specificity compared to naked eye

<table>
<thead>
<tr>
<th></th>
<th>Dermoscopy</th>
<th>Naked eye</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensitivity</strong></td>
<td>90%</td>
<td>71%</td>
</tr>
<tr>
<td><strong>Specificity</strong></td>
<td>90%</td>
<td>81%</td>
</tr>
</tbody>
</table>
2. Does dermoscopy reduces the number of benign lesions biopsied?

- Besides increasing the sensitivity for diagnosing melanomas, dermoscopy also improves specificity.
- This results in a lower number of biopsies performed of benign lesions (unnecessary biopsies).
- Thus, dermoscopy improves the benign to malignant ratio
  - More MM diagnosed with less benign lesions removed
  - Lower NNT (number needed to treat) is not occurring at cost of detecting more advanced cancers.
Dermoscopy improves the benign to malignant ratio


Figure 1. Malignant/benign ratio in excised melanocytic lesions in accordance with dermoscopy use.
Dermoscopy improves the benign to malignant ratio

- 36 dermatologists divided in 3 groups
  - Group A: no digital dermoscopy, less dermoscopy training
  - Group B: no digital dermoscopy, more dermoscopy training
  - Group C: digital dermoscopy (DD)

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Melanoma/nonmelanoma ratio (M/NM-R) according to the method used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Melanomas (n)</td>
</tr>
<tr>
<td>Group A</td>
<td>85</td>
</tr>
<tr>
<td>Group B</td>
<td>70</td>
</tr>
<tr>
<td>Group C</td>
<td>62</td>
</tr>
</tbody>
</table>

NA, nonadjusted; A, adjusted for age and sex; OR, odds ratio; CI, confidence interval.
Let's see what “Big data” reveals regarding this matter

Accuracy in melanoma detection: A 10-year multicenter survey

Giuseppe Argenziano, MD, Lorenzo Cerroni, MD, Iris Zalaudek, MD, Stefania Stablano, MD, Rainer Hofmann-Wellenhof, MD, Nicola Arpata, MD, Renato Marchiori Bakos, MD, PhD, Brigitte Balme, MD, Jadran Bandic, MD, Roberto Bandelloni, MD, Alexandra M. G. Brunasso, MD, Horacio Cabo, MD, David A. Calcara, BS, Blanca Carlos-Ortega, MD, Ana Carolina Carvalho, MD, Gabriel Casas, MD, Huiting Dong, MD, DMSc, Gerardo Ferrara, MD, Raffaele Filotico, MD, Guillermo Gómez, MD, Allan Halpern, MD, Gennaro Ilardi, MTD, PhD, Akira Ishiko, MD, PhD, Gulsen Kandiloglu, MD, Hiroshi Kawasaki, MD, Ken Kobayashi, MD, Hiroshi Koga, MD, Ivanka Kovalyshyn, MD, David Langford, MB, ChB, Xin Liu, MD, Ashfaq A. Marghoob, MD, Massimo Mascolo, MD, Cesare Massone, MD,

Results: The participating clinics contributed a total of 300,215 cases, including 17,172 melanomas and 283,043 melanocytic nevi. The overall NNE values achieved in SCS and NSCS in the 10-year period were 8.7 and 29.4, respectively. The NNE improved over time in SCS (from 12.8 to 6.8), but appeared unchanged in NSCS. Most of the effect on NNE in SCS was due to a greater number of excised melanomas. Higher NNE values were observed in patients younger than 40 years and for lesions located on the trunk.

Fig 1. Trends over time of NNE in SCS and NSCS.

Fig 2. Trends over time of excised melanomas in SCS and NSCS.

Fig 3. Proportion of nevi excised over time in SCS and NSCS.

In era of cost containment: The powers to be should be helping to promote the use of dermoscopy!

• *Non-dermoscopy users performed 2.7 x more biopsies on nevi & SK and found fewer melanomas.*

<table>
<thead>
<tr>
<th></th>
<th>Non-dermoscopy users</th>
<th>Dermoscopy users</th>
</tr>
</thead>
<tbody>
<tr>
<td>SK</td>
<td>71,713</td>
<td>18,085</td>
</tr>
<tr>
<td>Nevi</td>
<td>206,860</td>
<td>76,183</td>
</tr>
<tr>
<td>Melanoma*</td>
<td>7,262</td>
<td>9,910</td>
</tr>
<tr>
<td>Total</td>
<td>285,835</td>
<td>104,178</td>
</tr>
</tbody>
</table>
3. Does dermoscopy lead to the detection of thinner melanomas?

- Early detection is the most useful strategy to improve melanoma prognosis.
- Dermoscopy shown to detect melanoma earlier, especially in high-risk patients.
Dermoscopy is associated with thinner melanomas

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Patient no. (%)</th>
<th>Mean (95% CI)</th>
<th>P-value*</th>
<th>Patients with tumour thickness ≤1 mm</th>
<th>n/N (%)</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>347 (100)</td>
<td>1.83 (1.29–2.08)</td>
<td>–</td>
<td>155/347 (44.7)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Melanoma subtype</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSM</td>
<td>245 (70.6)</td>
<td>1.35 (1.18–1.52)</td>
<td>&lt;0.0001</td>
<td>132/245 (53.9)</td>
<td>155/347 (44.7)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>LMM</td>
<td>13 (3.6)</td>
<td>1.36 (0.61–2.11)</td>
<td></td>
<td>5/13 (38.5)</td>
<td>4/14 (28.6)</td>
<td></td>
</tr>
<tr>
<td>ALM</td>
<td>14 (4.0)</td>
<td>3.07 (1.73–4.41)</td>
<td></td>
<td>4/14 (28.6)</td>
<td>4/14 (28.6)</td>
<td></td>
</tr>
<tr>
<td>NM</td>
<td>44 (12.7)</td>
<td>3.51 (2.47–4.54)</td>
<td></td>
<td>4/44 (9.1)</td>
<td>4/44 (9.1)</td>
<td></td>
</tr>
<tr>
<td>UCCM</td>
<td>31 (8.9)</td>
<td>2.84 (1.23–4.44)</td>
<td></td>
<td>10/31 (32.3)</td>
<td>10/31 (32.3)</td>
<td></td>
</tr>
<tr>
<td>Spec. screening program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>59 (17.0)</td>
<td>0.49 (0.40–0.59)</td>
<td>&lt;0.0001</td>
<td>56/59 (94.9)</td>
<td>56/59 (94.9)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>No</td>
<td>288 (83.0)</td>
<td>2.10 (1.81–3.91)</td>
<td></td>
<td>99/288 (34.4)</td>
<td>99/288 (34.4)</td>
<td></td>
</tr>
<tr>
<td>Dermoscopic examination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>232 (66.9)</td>
<td>1.40 (1.15–1.65)</td>
<td>&lt;0.0001</td>
<td>127/232 (54.7)</td>
<td>127/232 (54.7)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>No</td>
<td>77 (22.2)</td>
<td>2.59 (2.07–4.67)</td>
<td></td>
<td>18/77 (23.4)</td>
<td>18/77 (23.4)</td>
<td></td>
</tr>
<tr>
<td>Cannot remember</td>
<td>56 (17.0)</td>
<td>2.86 (1.60–4.32)</td>
<td></td>
<td></td>
<td>56/200 (28.0)</td>
<td></td>
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<tr>
<td>Diagnosis by</td>
<td></td>
<td></td>
<td>0.0002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dermatologists</td>
<td>132 (38.0)</td>
<td>1.29 (1.05–1.54)</td>
<td></td>
<td>86/132 (65.2)</td>
<td>86/132 (65.2)</td>
<td></td>
</tr>
<tr>
<td>All other</td>
<td>215 (62.0)</td>
<td>2.15 (1.78–2.52)</td>
<td></td>
<td>69/215 (32.1)</td>
<td>69/215 (32.1)</td>
<td></td>
</tr>
</tbody>
</table>

*For univariate analyses the influences of factors potentially associated with melanoma thickness (all categorical variables) were investigated by fitting generalized linear models and allowing for different variances within categories. Global significance was assessed by F tests. In addition, the portion of patients with tumour thickness ≤1 mm was calculated. The influence of the same categorical variables was then tested by $\chi^2$ tests.

Dermoscopy is associated with thinner melanomas

Table 4 Multivariate analyses

<table>
<thead>
<tr>
<th>Criterion</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction term ‘younger age’ x ‘female sex’</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Participation in specialized dermoscopic screening programs</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Melanoma subtype</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Demoscopic examination at diagnosis</td>
<td>0.040</td>
</tr>
</tbody>
</table>

*Association of the Breslow tumour thickness with the respective criterion as assessed by multivariate logistic regression analysis with stepwise backward variable selection.
Melanomas diagnosed in clinics with dermoscopy are thinner

- The rate of melanoma in situ was lower in the group that came with a pre-made diagnosis of melanoma (MMC) rather than the cases newly diagnosed by the authors using dermoscopy.

### TABLE 3. Histologic characteristics

<table>
<thead>
<tr>
<th></th>
<th>Melanoma consultation (MMC) N=35</th>
<th>Melanoma routine control (MMRC) N=52</th>
<th>Melanoma digital follow-up (MMDFU) N=12</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>In situ melanoma</td>
<td>22.9%</td>
<td>50%</td>
<td>58.3%</td>
<td></td>
</tr>
<tr>
<td>Invasive melanoma</td>
<td>77.1%</td>
<td>50%</td>
<td>41.7%</td>
<td></td>
</tr>
<tr>
<td>Ulceration</td>
<td>22.9%</td>
<td>3.8%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Breslow (mean)</td>
<td>1.43 mm</td>
<td>0.77 mm</td>
<td>0.52 mm</td>
<td></td>
</tr>
</tbody>
</table>


No dermoscopy

Dermoscopy
Let’s see what “Big data” reveals regarding this matter

**Accuracy in melanoma detection: A 10-year multicenter survey**

Giuseppe Argenziano, MD, Lorenzo Cerroni, MD, Iris Zalaudek, MD, Stefania Staubano, MD, Rainer Hofmann-Wellenhof, MD, Nicola Arpaia, MD, Renato Marchiori Bakos, MD, PhD, Brigitte Balme, MD, Jadran Bandic, MD, Roberto Bandelloni, MD, Alexandra M. G. Brunasso, MD, Horacio Cabo, MD, David A. Calcara, BS, Blanca Carlos-Ortega, MD, Ana Carolina Carvalho, MD, Gabriel Casas, MD, Huiting Dong, MD, DMSc, Gerardo Ferrara, MD, Raffaele Filotico, MD, Guillermo Gómez, MD, Allan Halpern, MD, Gennaro Ilardi, MTD, PhD, Akira Ishiko, MD, PhD, Gulsen Kandiloglu, MD, Hiroshi Kawasaki, MD, Ken Kobayashi, MD, Hiroshi Koga, MD, Ivanka Kovalyshyn, MD, David Langford, MB, ChB, Xin Liu, MD, Ashfaq A. Marghoob, MD, Massimo Mascolo, MD, Cesare Massone, MD,
<table>
<thead>
<tr>
<th>Dermoscopy</th>
<th>Melanoma &gt;1mm</th>
<th>Melanoma &lt;1mm</th>
<th>Ratio (for every thick melanoma : number of thin MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>1165</td>
<td>2734</td>
<td>1:2.3</td>
</tr>
<tr>
<td>Non-users</td>
<td>504</td>
<td>870</td>
<td>1:1.7</td>
</tr>
</tbody>
</table>

Fig 1. Trends over time of NNE in SCS and NSCS.

Fig 2. Trends over time of excised melanomas in SCS and NSCS.

Fig 3. Proportion of nevi excised over time in SCS and NSCS.

Dermoscopy

• Improves diagnostic accuracy!
• Improves the benign to malignant ratio!
• Leads to diagnosis of thinner melanomas!

• To the skeptics:
  – This is not a battle of dermoscopy vs clinical information but rather
  – How the clinical findings inform dermoscopy and vise versa (abductive reasoning)
  – Experts integrate all available information to render the most accurate diagnosis (management)
  – The key is clinical-dermoscopy correlation (concordance vs discordance)
Step 1

Melanocytic

Suspicious (Bx or STMM)

Melanoma (Biopsy)

Non-Melanocytic

Benign
DF, SK, CCA angioma, seb H

Malignant
BCC, SCC

Step 2

Nevus vs MM:
7-point, ABCD, Menzies, TADA & pattern analysis

Nevus (Reassure)

Suspicious (Bx or STMM)

Melanoma (Biopsy)
Two-step diagnostic procedure

Step 1

Is the lesion a melanocytic tumor?
Two-step diagnostic procedure

Step 1

I. Any anatomical location
   1. Network
   2. Aggregated or peripheral rim of globules
   3. Streaks
   4. Homogeneous blue pigment

In addition:

II. On volar skin (palms/soles & nails) – parallel pattern

III. On face - Pseudo-network pattern
- Network
- Aggregated or peripheral rim of globules
- Streaks
- Homogeneous blue pigment

(any location)
1. Network (**lines**)  

- **Pigment network** (**lines, reticular**)  
- **Negative network** (**lines, reticular, white**)  
- **Angulated lines** (**lines, angulated**)
1a. pigment network (lines, reticular)

- Grid-like network composed of pigmented lines and hypopigmented “holes”.
- Network lines correspond to the rete ridges. They appear pigmented due to the superimposition of melanin pigment in keratinocytes & melanocytes along the vertical axis of the rete ridges (i.e., relative increase in melanin pigment per unit area).
- The “holes” correspond to tips of the dermal papillae (i.e., supra-papillary plate)
Pigment network
Histopathologic specimen with elongated heavily pigmented rete ridges
1b. Negative network, also known as reverse or inverse network (*lines, reticular, white*)

- serpiginous interconnecting hypopigmented lines that surround irregularly shaped pigmented structures, which resemble elongated and curvilinear globules.
Or bridging of retes (with or w/o nests)
1c. **Angulated lines** (*lines, angulated, polygonal*)

- Angulated lines forming zig-zag pattern and rhomboidal/polygonal structures also indicates that the lesion is melanocytic (*one exception: pigmented AK*).
Angulated lines

- Histopathology correlation:
  - Confluent melanoma cells at DE junction with melanophages in dermis
2. Globules (3-5, usually brown, not blue-gray)
Globules \((clods, color)\)

- symmetrical, round to oval, well demarcated structures
- > 0.1mm diameter
- nests of pigmented melanocytes at dermo-epidermal junction, or in dermis
- brown, black, blue, white (red globules = vascular)
white globules (clods, white...)
3. Streaks
streaks

• Encompasses
  – radial streaming
  – pseudopods
confluent junctional nests of pigmented melanocytes
4. Homogeneous blue pigmentation
MELANOCYTIC LESION CRITERIA

- Network
- Globules
- Streaks
- Homogeneous blue pigment
Additional criteria

Volar & Nail Lesions
separate lectures

Facial & Mucosal Lesions
separate lectures
Two-step diagnostic procedure

Step 1

Is the lesion a melanocytic tumor?

If it has one of these features, then…
Skin Lesion

Step 1
- Melanocytic
- Non-Melanocytic

Step 2
- Nevus (Reassure)
- Suspicious (Bx or STMM)
- Melanoma (Biopsy)
Step 1

Melanocytic

Suspicious (Bx or STMM)

Step 2

Nevus vs MM: algorithms (7-point, ABCD, Menzies, TADA) & pattern analysis

Nevus (Reassure)  Suspicious (Bx or STMM)  Melanoma (Biopsy)
Two-step diagnostic procedure

Step 1

Is the lesion a melanocytic tumor?

If it does not manifest any of these features, then…
Two-step diagnostic procedure

Step 1

Melanocytic

Skin Lesion

Non-Melanocytic

Benign
DF, SK, CCA, angioma, sebH

Malignant
BCC, SCC
Two-step diagnostic procedure

Step 1

Melanocytic

Skin Lesion

Non-Melanocytic
Benign
DF, SK, CCA, angioma, SebH

Malignant
BCC, SCC

Order of dx.
1. DF
2. BCC
3. SCC
4. SK
5. Angioma
6. CCA
7. Seb hyp
1. Dermatofibroma
(clinical info is critical)

Delicate network (exception)

Central scar-like/crystalline

Ring-like globules

Vessels / blush in center
1. Dermatofibroma

Central white patch
Delicate peripheral network

70% of DF’s have this pattern
Increased melanin in keratinocytes

Broadened rete ridges (dirty feet) appear as ring-like globules

Vessels within scar-like area (seen better with PD)

NPD: appear as white scar-like area.

PD: will appear with a pink hue with crystalline structures.
Specific structures must support interpretation of the global pattern.
Stellate white (pink) streaks, white network (PD)

Almost exclusively seen under PD
4% in NPD
75% in PD
Blood extravasation / blood vessel dilation

Vessels within the scar like area can be seen in:
NPD: gel, minimal pressure (50%)
PD: non-contact (80%)
70% of DF’s have network structures
40% of DF’s have ring like globules
2. BCC

Positive features (At least one present):

- Large grey-blue ovoid nests
- Multiple grey-blue non-aggregated globules
- Leaflike areas
- Spoke wheel areas (concentric globules)
- Arborizing “tree-like” telangiectasia
- Ulceration
- Shiny white blotches & strands (PD)
1. leaf-like areas (lines, radial, connecting to a common base)

- brown to blue-gray to pink discrete bulbous blobs or lines connecting at a common base
- Some can manifest “leaf-like” shapes
At times a metaphor (leaf-like structure) better describes a feature compared to analytical language (lines, radial, connecting to a common base)
Structure associated with superficial BCC
2. spoke-wheel-like structures
(lines, radial, converging to a central dot or clod)

- well circumscribed
- brown to gray-blue-brown
- radial projections
- meeting at a darker brown central hub
Concentric structures:
I consider them to be variants of spoke wheels
Spoke wheels (concentric structures) & leaf like structures correspond on histopath to superficial BCC.

These structures are actually variants of the same feature.

Thus, it is not uncommon to see all 3 in same lesion
Structure associated with superficial BCC
# Classic features

<table>
<thead>
<tr>
<th>Features</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large blue-gray ovoid nests</td>
<td>55</td>
<td>97/99</td>
</tr>
<tr>
<td>Arborizing telangiectasia</td>
<td>52</td>
<td>77/92</td>
</tr>
<tr>
<td>Multiple blue-gray globules</td>
<td>27</td>
<td>87/97</td>
</tr>
<tr>
<td>Ulceration</td>
<td>27</td>
<td>87/97</td>
</tr>
<tr>
<td>Leaf-like structures</td>
<td>17</td>
<td>100/100</td>
</tr>
<tr>
<td>Spoke-wheel-like structures</td>
<td>10</td>
<td>100/100</td>
</tr>
</tbody>
</table>

*The diagnosis of a pigmented BCC is made when a lesion lacks a pigment network and has one or more of the specific features tabled. This method gives a sensitivity of 93% and specificity of 89–92% for the diagnosis of pigmented BCC.

*bThe specificity represents the percentage of melanomas (left number) or benign pigmented skin lesions (right number) lacking that feature.

**Abbreviation:** BCC, basal cell carcinoma.
3&4. blue-gray ovoid nests & non-aggregated globules (Clods, blue, small or large)

- circumscribed round to oval structures
- confluent blue-gray color
- Can resemble globules but they will not be arranged in an aggregated pattern
Non-aggregated blue-gray globules
Non-Classical features:

1. Short fine superficial telangiectasia
2. Multiple small erosions
3. Concentric structures
4. Multiple in-focus blue/gray dots
1. Not aggregated
2. Buckshot scatter
Structure associated with nodular BCC
5. arborizing vessels

- In-focus, red, branching vessels
Arborizing vessels (PPV 94%)
6. shallow ulcerations (including multiple small erosions)

- Red to orange crust / erosions
• Ulcers (red, orange)
Multiple small erosions
sBCC = leaf like
spoke wheel
short fine vessels
multiple small erosions
Shiny white B&S

nBCC = arborizing vessels
ovoid structures
ulceration

Accurancy of dermoscopic criteria for discriminating superficial from other subtypes of basal cell carcinoma

Aimilios Lallas, MD, a Thrassivoulos Tzellos, MD, c Athanasios Kyrgidis, MD, d Zoe Apalla, MD, c
Iris Zalaudek, MD, a, e Athanasios Karatolias, MD, f Gerardo Ferrara, MD, g Simonetta Piana, MD, b
Caterina Longo, MD, a Elvira Moscarella, MD, a Alexander Stratigos, MD, h and Giuseppe Argenziano, MD a
Reggio Emilia and Benevento, Italy; Thessaloniki, Volos, and Athens, Greece; and Graz, Austria

Spoke wheel–like structures in superficial basal cell carcinoma: A correlation between dermoscopy, histopathology, and reflective confocal microscopy

Alexis Stephens, DO, a Naiara Fraga-Braghiroli, MD, a Margaret Oliviero, ARNP, a Harold Rabinovitz, MD, a and Alon Scope, MD b, c
Non-classical BCC features

* Multiple dots (in focus)

Concentric structure

* Short fine telangiectasia

Multiple erosions (serous crust)
Non-classical BCC features

* Multiple dots (in focus)

* Short fine telangiectasia
Fine, sharply in focus brown/blue-gray dots in BCC (buckshot scatter)
Short fine telangiectasia
• Problem with Classical & non-classical criteria for BCC

- 4 of 6 criteria are only seen in pigmented variants of BCC (ovoid nest, blue-gray globules, leaf like and spoke-wheel like structures)

- 2 of 2 features that are seen in amelanotic BCC (>90% of BCCs) are associated with nodular BCC (arborizing vessels & ulceration)

- With these criteria it will not be possible to dx the following lesion....

Table 5a.1  Sensitivity and Specificity of Dermoscopic Structures for Pigmented Basal Cell Carcinomas (Menzies et al., 2000)

<table>
<thead>
<tr>
<th>Features</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large blue-gray ovoid nests</td>
<td>55</td>
<td>97/99</td>
</tr>
<tr>
<td>Arborizing telangiectasia</td>
<td>52</td>
<td>77/92</td>
</tr>
<tr>
<td>Multiple blue-gray globules</td>
<td>27</td>
<td>87/97</td>
</tr>
<tr>
<td>Ulceration</td>
<td>27</td>
<td>87/97</td>
</tr>
<tr>
<td>Leaf-like structures</td>
<td>17</td>
<td>100/100</td>
</tr>
<tr>
<td>Spoke-wheel-like structures</td>
<td>10</td>
<td>100/100</td>
</tr>
</tbody>
</table>
New criterion helpful in diagnosing many BCCs (including BCCs that lack the Menzies criteria)

Original Investigation

Association of Shiny White Blotches and Strands With Nonpigmented Basal Cell Carcinoma
Evaluation of an Additional Dermoscopic Diagnostic Criterion

Cristián Navarrete-Dechent, MD; Shirin Bajaj, BA; Michael A. Marchetti, MD; Harold Rabinovitz, MD; Stephen W. Dusza, DrPH; Ashfaq A. Marghoob, MD
65% of BCC lacking the classical and non-classical features of BCC could be diagnosed by SWS (blotches & strands)
7. Shiny white blotches & strands

- Structure is seen only with polarized light
- White blotches (clods) and strands
Non polarized BCC
- Multiple erosions
- Concentric structures
- Shiny white areas (PD) in clods & strands
- Multiple in focus dots (not peppering)
- Short fine telangiectasia
3. SCC
Focally scaly/keratotic and rough

Glomerular vessels
focally present at periphery

Hairpin vessels
usually with a white halo

Keratin pearls & white circles

Rosettes (strawberry pattern)

Brown dots/globules aligned in a linear fashion

NB: Pigmented AK can also have structures seen in LMM!
Glomerular Vessels

• Morphology
  – Tightly coiled vessels
• Most commonly associated with
  – Bowen’s – PPV 62%
• Distribution
  – Bowen’s – focally in clusters at the periphery
  – Psoriasis – diffuse throughout
  – CCA – string of pearls
  – Stasis – in normal skin
  – Porokeratosis – diffuse throughout
Hairpin Vessels

• Morphology
  – Vessels with a sharp bend - creating a U shape
  – May twist upon its own axis
  – Surrounded by a white halo (background) in keratinocytic tumors
  – Surrounded by a pink halo (background) in melanoma

• Most commonly associated with
  – SK – PPV 70% (but if pink background think MM)

• Distribution
  – SK & MM – random (on ridges in SK)
  – KA – around perimeter
Rosettes

Rosette derives from the natural shape of a rosette in botany, formed by leaves radiating out from the stem.

NB: Only seen with polarized light.
Non-Polarized dermoscopy

Polarized dermoscopy

Strawberry pattern
Non-Polarized dermoscopy

Few glomerular vessels

Polarized dermoscopy

Rosette structures (clover)
Focal brown dots aligned linearly at the periphery
- **Rosettes (PD)**
- **Focal scale crust**
- **White circles/pearls**
- **Vessels with white halo**
- **Glomerular vessels focally clustered at periphery**
- **Brown globules aligned linearly in rows at the periphery**
- Milia-like cyst
- Comedo-like opening
- Fissures & ridges (gyri & sulci)
- Fingerprint-like
- Hairpin vessels
- Moth-eaten borders
milia-like cysts (dots or clods, white)

- round whitish or yellowish structures
- commonly seen in seborrheic keratosis
- can also be seen in congenital nevi & MM
- if pigmented, they resemble globules
comedo-like openings (clods, brown or orange & circles)

- commonly seen in seborrheic keratosis
- also seen in papillomatous melanocytic nevi
- keratin-filled invaginations of the epidermis
multiple milia-like-cysts (3 or more)
comedo-like openings (crypts)
Milia cyst are more conspicuous under non-polarized light

- Milia cyst (superficial & small) are not usually visible with polarized dermoscopy
Milia cysts are more conspicuous under NPD.
The significance of structures is based on 2-step level

Step 1

- **Melanocytic**
  - Milia cyst not important (but helps in dx. CMN)

- **Non-Melanocytic**
  - Milia cyst important after BCC has been ruled out
FINAL DX: Melanoma 0.5mm with SK like features
Gyri & sulci (fissures & ridges)

- Confluent branching clefts
- Due to deep keratin filled invaginations of the epidermis
- Commonly seen in seborrheic keratosis
Fissures (sulci) & ridges (gyri) = cerebriform pattern
Fingerprint like network structures

- Seen in solar lentigines and early seborrheic keratosis
- Tiny ridges running in parallel & resembling fingerprints
Fingerprint-like Structures
Sometimes it is difficult to differentiate lentigo/SK from melanocytic lesions.

The ink test can
Hairpin vessels with a white halo

- Looped vessels in papillary dermis
- White halo due to keratin
Hairpin blood vessels with a whitish halo

Seborrheic keratosis
Moth eaten borders

- Seen in solar lentigines and early seborrheic keratosis
- Resembles a moth-eaten garment
Moth-eaten Border
### Frequencies and Distribution of the Criteria Identified in Step 1 According to Elementary Lesion Type

<table>
<thead>
<tr>
<th></th>
<th>Patch</th>
<th>Plaque</th>
<th>Papule/Nodule</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face</strong></td>
<td>18</td>
<td>8</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td><strong>Border</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Moth eaten</td>
<td>31</td>
<td>44</td>
<td>19</td>
<td>94</td>
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<tr>
<td>Sharply demarcated</td>
<td>32</td>
<td>91</td>
<td>60</td>
<td>183</td>
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<tr>
<td><strong>Criteria</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hairpin vessels</td>
<td>8</td>
<td>65</td>
<td>56</td>
<td>129</td>
</tr>
<tr>
<td>Comedolike openings</td>
<td>13</td>
<td>79</td>
<td>52</td>
<td>144</td>
</tr>
<tr>
<td>Fissures</td>
<td>12</td>
<td>69</td>
<td>43</td>
<td>124</td>
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<tr>
<td>Mililakic cysts</td>
<td>19</td>
<td>68</td>
<td>48</td>
<td>135</td>
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<tr>
<td>Networklike structures</td>
<td>27</td>
<td>54</td>
<td>13</td>
<td>94</td>
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<tr>
<td>Prominent network</td>
<td>19</td>
<td>37</td>
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<td>66</td>
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<tr>
<td>Thickened network</td>
<td>11</td>
<td>38</td>
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<td>58</td>
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<td>Heterogenic network</td>
<td>23</td>
<td>31</td>
<td>7</td>
<td>61</td>
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<tr>
<td>Fingerprinting</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Blotch</td>
<td>0</td>
<td>12</td>
<td>4</td>
<td>16</td>
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<tr>
<td>Crust</td>
<td>0</td>
<td>13</td>
<td>18</td>
<td>31</td>
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<tr>
<td>Dots</td>
<td>9</td>
<td>14</td>
<td>3</td>
<td>26</td>
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<tr>
<td>Whitish veil</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Exophytic papillary structure</td>
<td>0</td>
<td>12</td>
<td>4</td>
<td>16</td>
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<tr>
<td><strong>Colors</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Light brown</td>
<td>38</td>
<td>97</td>
<td>56</td>
<td>191</td>
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<tr>
<td>Dark brown</td>
<td>38</td>
<td>100</td>
<td>55</td>
<td>193</td>
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<tr>
<td>Blue gray</td>
<td>12</td>
<td>55</td>
<td>41</td>
<td>108</td>
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<tr>
<td>Yellowish</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>12</td>
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<tr>
<td>Maroonish</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Black</td>
<td>4</td>
<td>23</td>
<td>22</td>
<td>49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>101</td>
<td>63</td>
<td>203</td>
</tr>
</tbody>
</table>
The significance of structures is based on 2-step level

Step 1

- **Melanocytic**
  - BWV is a melanoma specific structure

- **Non-Melanocytic**
  - BWV is not significant
What structures do you see?

- comedo
- Fat finger like structures
- Few milia cysts
- Blue white veil
- ? globules
- B:M ratio in the hands of experienced dermoscopists is 5:1 (it is lesions like these that make up the bulk of the benign biopsies)

When dermoscopy morphology gives conflicting / mixed messages then R/O worst diagnosis.
Specific structures must support interpretation of the global pattern.
3. Left medial shin; shave biopsy:
- Melanoma, at least in situ with adnexal extension, favor focally invasive to 0.4 mm, non-ulcerated, non-mitogenic, arising in a nevus and colliding with a seborrheic keratosis, see
5. Vascular lesion

Lacunae separated by BWV septae

- red
- maroon
- blue
- black
- clear
Lacunae \((\text{Clods, red})\)

- red, maroon, blue, black lagoons \((\text{clods})\)
Hemangioma

Lacunae (saccules)

Pearl:

Caution if you see ill defined lacunae that are not separated by:
• Septae
• BWV
- Well defined lacunae
- Septae separating lacunae
- Lacunae surrounded by BWV
Thrombosed Angiomas
Blackest of Black
Thrombosed angioma
Angiokeratoma
P1 thrombosed lacunae and blue-white veil

P2 erythematous zone around lesion

P3 focal bloody crusts

Ref: Zaballos P
Angiokeratoma
6. Clear cell acanthoma

- Morphology/Distribution/Arrangement
  - Dotted or glomerular vessels distributed in a serpiginous pattern (string of pearls)
7. Sebaceous Hyperplasia

- Morphology/Distribution/Arrangement
  - Serpentine and arborizing vessels that are a bit out of focus and come from periphery and migrate towards the center of the lesion but do not cross the midline (crown/corona vessels).
  - The center of the lesion has popcorn like appearance.
Two-step diagnostic procedure

Step 1

Melanocytic

Non-Melanocytic

Benign DF, SK, CCA, angioma, sebH

Malignant BCC, SCC

Skin Lesion

If it has no melanocytic features & it has no features seen in one of the 4 (+2) common non-melanocytic lesions, then…
Two-step diagnostic procedure

Step 1

Melanocytic

Non-Melanocytic

Benign
DF, SK, CCA, hemangioma

Malignant
BCC, SCC

Skin Lesion

Vascular patterns
(morphology, distribution, arrangement)
Vascular Structures

1. Morphology

2. Distribution (focal, throughout, peripheral, central, random, not random)

3. Arrangement (string of pearls, crown)
In hypomelanotic / amelanotic lesions:

1. Analyze the morphology, distribution and arrangement of blood vessels

2. Look for additional clues such as milia/comedo to confirm your diagnosis!

3. Remember: Context, context, context!
Vessels in non-melanocytic lesions

- Hairpin – keratinizing tumors
- Arborizing – BCC
- Dotted in serpiginous distribution - CCA

Vessels in melanocytic lesions

- Glomerular – SCC
- Crown – Seb hyperplasia
- Comma - IDN
- Dotted – MM & Spitz & DN
- Linear & polymorphous - MM
- Corkscrew – MM (mets)
- Irregular hairpin (serpentine) – MM & CMN
- Milky red area
Poroma

1. Elongated looped vessels
2. Multi-pronged looped vessels
Vessels in non-melanocytic lesions

- Hairpin – keratinizing tumors
- Arborizing – BCC
- Dotted in serpiginous distribution - CCA

Vessels in melanocytic lesions

- Glomerular – SCC
- Crown – Seb hyperplasia
- Irregular hairpin (serpentine) – MM & CMN
- Milky red area

- Comma - IDN
- Dotted – MM & Spitz & DN
- Linear & polymorphous - MM
- Corkscrew – MM (mets)
Irregular hairpin or serpantine vessels
Two-step diagnostic procedure

Step 1

If it has no melanocytic features & it has no features seen in one of the 4 (+2) common non-melanocytic lesions & it has no recognizable vascular pattern, then…
Two-step diagnostic procedure

Step 1

Melanocytic

Non-Melanocytic

Benign
DF, SK, CCA angioma, Seb H

Malignant
BCC, SCC

Vascular patterns

Melanocytic

Non-melanocytic

Non-specific (structureless/featureless) lesions
Non-specific (structureless/featureless):

*Non-diagnostic via the 1\textsuperscript{st} step of the 2-step algorithm*

- While some of these lesions are truly structureless, some may in fact display structures but the presence or absence of any one of these structures cannot be relied upon to differentiate melanocytic from non-melanocytic lesions. However,…
  - *Some of these structures can assist in diagnosis when present in the correct context (e.g., extra criteria in BCC: dots, short fine vessels)*
  - *Many of these structures are important in step 2 of the 2-step algorithm (differentiating nevi from melanoma: blotches, regression structures, BWV, etc)*
Structures that do not help in differentiating melanocytic from non-melanocytic lesions

- Dots
- Shiny white structures
- Blotch
- Regression structures
- Blue-white veil
Two-step diagnostic procedure

Step 1
- Melanocytic
  - Benign: DF, SK, CCA angioma, sebH
  - Malignant: BCC, SCC

Step 2
- Nevus (Reassure)
- Suspicious (Bx or STMM)
- Melanoma (Biopsy)

R/O Melanoma:
1) Biopsy or
2) Digital monitoring (STMM) — but never for raised lesions!

Vascular patterns
- Melanocytic
- Non-melanocytic

Non-specific (structureless) lesion
Rate of growth of melanoma subtypes: Median melanoma growth in mm per month

- SSM: 0.12 mm/month
- LMM: 0.13 mm/month
- NM: 0.49 mm/month

“short term mole monitoring” helps detect melanoma based on change (sensitivity high) and helps confirm biologically senescent (indolent) lesions (increases specificity)
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
melanocytic lesion
nevus
melanoma
dermatofibroma
basal cell carcinoma
seborrheic keratosis
angioma
angiokeratoma
Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Level 1
Pattern trumps structure

Level 2

Level 3

Level 4

Level 5

Level 6

Level 7

Biopsy, Short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
nenus
melanoma
angioma
angiokeratoma
basal cell carcinoma
seborrheic keratosis
dermatofibroma
Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Level 1
Pattern trumps structure

Level 2

Level 3

Level 4

Level 5

Level 6

Level 7

Biopsy, Short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
- Melanocytic lesion
- Nevus
- Melanoma
- Angioma
- Angiokeratoma
- Basal cell carcinoma
- Seborrheic keratosis
- Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Levels:

- Level 1: Pattern, trumps, structure
- Level 2: Dermatofibroma
- Level 3: Basal cell carcinoma
- Level 4: Seborrheic keratosis
- Level 5: Angioma, angiokeratoma
- Level 6: Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia
- Level 7: Biopsy, short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
melanocytic lesion

nevus

melanoma

dermatofibroma

basal cell carcinoma

seborrheic keratosis

angioma

angiokeratoma

Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Biopsy, Short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
Level 1
- Pattern trumps structure

Level 2
- Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Level 3
- Nevi
- Melanoma

Level 4
- Dermatofibroma
- Basal cell carcinoma

Level 5
- Seborrheic keratosis
- Angioma
- Angiokeratoma

Level 6
- Biopsy, Short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
melanocytic lesion
nevus
melanoma
dermatofibroma
basal cell carcinoma
seborrheic keratosis
angioma
angiokeratoma
Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Level 1
Pattern trumps structure

Level 2

Level 3

Level 4

Level 5

Level 6

Level 7

Biopsy, Short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
melanocytic lesion
nevus
melanoma
dermatofibroma
basal cell carcinoma
seborrheic keratosis
angioma
angiookeratoma
Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Level 1
Pattern trumps structure

Level 2

Level 3

Level 4

Level 5

Level 6

Level 7

Biopsy, Short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
melanocytic lesion
- nevus
- melanoma
dermatofibroma
- basal cell carcinoma
- seborrheic keratosis
- angioma
- angiokeratoma

Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

Level 1
- Pattern trumps structure
Level 2
- Level 2
- Level 3
- Level 4
- Level 5
- Level 6
- Level 7

Step 2

Biopsy, Short term mole monitoring or Total Body Photography
This is a:
1. Melanocytic lesion
2. Non-melanocytic lesion
melanocytic lesion

Step 2

melanoma

Vascular structures in non-melanocytic tumors = Keratinizing tumor, SCC, Clear cell acanthoma, Sebaceous hyperplasia

biopeicy, Short term mole monitoring or Total Body Photography
Step 1

Melanocytic vs Non-Melanocytic

Step 2

Nevus vs MM: algorithms (7-point, ABCD, Menzies, TADA) & pattern analysis

Nevus (Reassure)  Suspicious (Bx or STMM)  Melanoma (Biopsy)
My eyes are just as good !!!
Your visual abilities “are just as good” for finding **what**?

Clinically detected cancers

Dermoscopically detected cancers
Important principle
If you only look at lesions that are of clinical concern to you than dermoscopy can only help improve your specificity.
To improve your **sensitivity** for detecting skin cancer requires that you look at lesions that clinically do not look concerning to you.
“The Ugly Duckling” to “Little Red Riding Hood,” written first in French by the Frenchman Charles Perrault and in German by the German brothers Jacob and Wilhelm Grimm. In this second tale the wolf disguises himself as the grandmother but can still be recognized by his enormous teeth protruding from his big muzzle. Similarly, the differential clinical features of melanocytic nevi include:

Jose M. Mascaro, Jr, MD
Jose M. Mascaro, MD
Department of Dermatology
Hospital Clinic
University of Barcelona
Casanova 143
Barcelona 08036, Spain
FINAL DX: Nodular melanoma 0.6mm
Nevus (DN) vs. Melanoma
The “Beauty and the Beast” sign

- Benign nevi (DN) tend to adhere to one of ten recurrent patterns (finite #).

- These patterns all fit the definition of beauty, demonstrating symmetry of pattern, structure, and color.

The most common benign patterns are:
Benign Patterns

1. Diffuse Reticular
2. Patchy Reticular
3. Peripheral reticular with central hypopigmentation
4. Peripheral reticular with central hyperpigmentation
5. Homogeneous
6. Peripheral globules/starburst
7. Peripheral reticular with central globules
8. Globular
9. Two-components
10. Symmetric multi-component
Pattern analysis
1. Diffuse network pattern
Diffuse network pattern

Diagnosis: Benign nevus
2. Patchy network pattern
Patchy network pattern

Diagnosis: Benign nevus
3. Peripheral network with central hypopigmentation
4. Peripheral network with central hyperpigmentation
5. Homogeneous

CMN

Nevi in red-heads

Blue
6. Peripheral globules

Starburst
Peripheral globules with central network pattern

Diagnosis: Benign enlarging nevus
Starburst with radial streaming

Courtesy of Adam Korzenko
Starburst with pseudopods
Starburst pattern with tiered globules
Peripheral globules & Starburst patterns are manifestations of the same biologic process – radial growth!
7. Reticulo-globular
8. Globular pattern
Diagnosis: Benign nevus
9. Two-component
10. Multi-component*
Melanoma, symbolized by the beast, is a melanocytic lesion that deviates from the benign patterns (infinite # of patterns).

Melanomas almost invariably display some degree of asymmetry of pattern, color, and structure, which elicits a sense of unease in the viewer.

The “Beauty and the Beast” sign
Reticular Patterns:
- Diffuse Reticular
- Patchy Reticular
- Peripheral Reticular & central hypopigmentation
- Peripheral Reticular & central hyperpigmentation (blotch)
- Structureless (homogeneous) +/- few globules &/or network
- Peripheral globules & central reticular (includes starburst & diffuse reticular/ globules)
- Globular (includes cobblestone)
- Multi-component (symmetric)

Two component nevus
Melanoma Patterns:

✓ Deviate from global benign patterns
✓ Have at least one of the melanoma specific features listed below

<table>
<thead>
<tr>
<th>Melanoma Specific Structures</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atypical network, including angulated lines</td>
<td>4.1 - 9</td>
</tr>
<tr>
<td>Negative network</td>
<td>1.8</td>
</tr>
<tr>
<td>Streaks (pseudopods &amp; radial streaming)</td>
<td>1.6 – 5.8</td>
</tr>
<tr>
<td>Atypical dots and/or globules</td>
<td>2.9 – 4.8</td>
</tr>
<tr>
<td>Off-centered blotch</td>
<td>4.1 – 4.9</td>
</tr>
<tr>
<td>Peripheral tan structureless areas</td>
<td>2.8 – 2.9</td>
</tr>
<tr>
<td>Blue-white veil overlying raised areas</td>
<td>2.5 – 13</td>
</tr>
<tr>
<td>Regression structures</td>
<td></td>
</tr>
<tr>
<td>• Blue-white veil overlying macular areas, scar-like areas and/or peppering</td>
<td>3.1– 16.3</td>
</tr>
<tr>
<td>Atypical vascular structures</td>
<td></td>
</tr>
<tr>
<td>• Dilated, serpentine, corkscrew, and polymorphous vessels (&gt;1 morphology), milky-red areas, red globules</td>
<td>1.5– 7.4</td>
</tr>
<tr>
<td>Shiny white lines (Crystalline structures)</td>
<td>9.7</td>
</tr>
<tr>
<td>MM SPECIFIC STRUCTURE / FEATURE</td>
<td>SENSITIVITY (highest reported)</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Atypical network</td>
<td>77%</td>
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<tr>
<td>Streaks</td>
<td>23%</td>
</tr>
<tr>
<td>Negative network</td>
<td>22%</td>
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<tr>
<td>Crystalline (shiny white lines)</td>
<td>5%</td>
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<td>Atypical dots &amp; globules</td>
<td>88%</td>
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<td>Atypical blotch</td>
<td>38%</td>
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<tr>
<td>BWV</td>
<td>51%</td>
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<td>Regression structures</td>
<td>46%</td>
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<td>Atypical vessels</td>
<td>63%</td>
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<tr>
<td>Peripheral brown structureless areas</td>
<td>63%</td>
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<thead>
<tr>
<th>Melanoma specific structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Atypical network</td>
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<td>7. Blue-white veil over raised areas</td>
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<td>8. Regression structures (BWV over flat, peppering, scar)</td>
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<td>10. Peripheral tan/brown structureless areas</td>
</tr>
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</table>
Pigment network
Remodeling of the Dermoeipidermal Junction in Superficial Spreading Melanoma

Insights Gained From Correlation of Dermoscopy, Reflectance Confocal Microscopy, and Histopathologic Analysis

Diagnosis in dermatology, whether rendered clinically or histopathologically, relies on the analytical examination of the primary morphologic features of the lesion on the gross or microscopic level, respectively. During the past 2 decades, we have begun to appreciate a new dimension in primary morphologic analysis, namely, the in vivo, en face macroscopic and microscopic morphologic features as seen via dermoscopy and reflectance confocal microscopy (RCM). Like dermoscopy, RCM reveals morphologic details of architecture in the en plane, but, in addition, it provides morphologic information on the cellular level. The ability to visualize a lesion’s primary morphologic features on multiple different levels has fueled new insights into the biological evolution of lesions. This month’s Archives of Dermatology features an important article by Pellacani et al that correlates dermoscopic structures of melanocytic lesions with RCM and histopathologic analysis. This editorial, which is based on the findings reported by Pellacani et al and other correlation studies on dermoscopy, RCM and histopathology, offers new therapeutic insights.
Nevus

Typical / regular network

Network symmetrically distributed with minimal variability in line thickness, color & hole sizes. Network is sharp, & usually without any gray colors.

Melanoma

Atypical / irregular network

Increased variability of line thickness and color (*gray). Variability of hole size. Network distributed asymmetrically & disrupted forming branched streaks. Often the lines are smudged.
typical vs atypical is defined relative to the network quality within the rest of the lesion! (degree of variability)
Network:

- Pigment network
- Negative network
- Angulated lines
Angulated lines (lines, angulated, polygonal)

- Angulated lines joining to create zig-zag lines & polygons (rhomboidal structures).
Angulated lines creating a zigzag pattern &/or polygonal / rhomboidal structures
Melanoma specific structures

1. Atypical network
2. Irregular streaks (pseudopods &/or radial streaming)
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4. Shiny white lines or Crystalline structures (only with PD)
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10. Peripheral tan/brown structureless areas
Streaks Encompasses radial streaming pseudopods
Confluent junctional nests of pigmented melanocytes:
- Reflection of radial growth.
- In MM it is associated with the superficial spreading type.
Streaks = radial streaming & pseudopods

Nevus

Regular streaks

Streaks symmetrically distributed around the entire perimeter

Melanoma

Irregular streaks

Streaks asymmetrically distributed & focally present at the periphery
Melanoma specific structures

1. Atypical network
2. Irregular streaks (pseudopods &/or radial streaming)
3. Negative pigment network
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5. Atypical dots & globules
6. Irregular blotch
7. Blue-white veil over raised areas
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10. Peripheral tan/brown structureless areas
Negative network (reverse network)

Serpiginous interconnecting hypopigmented lines that surround irregularly shaped pigmented structures, which resemble elongated and curvilinear globules.

This structure can be seen with both polarized and non-polarized dermoscopy.
bridging of retes (with or w/o nests)
Nevus

Rare in benign nevi except for some CMN & Spitz. Usually symmetrically distributed (ordered). In CMN also see rounded brown structures.

Melanoma

Brown structures are more elongated & curvilinear in appearance. Present focally in asymmetric distribution.
Negative pigment network: An additional dermoscopic feature for the diagnosis of melanoma

Maria A. Pizzichetta, MD, a Renato Talamini, ScD, a Ash A. Marghoob, MD, b H. Peter Soyer, MD, c

Conclusions: The overall morphologic pattern of NPN, such as the irregular distribution and the peripheral location of NPN, along with the multicomponent pattern and the asymmetric pigmentation could be used as additional features in distinguishing melanoma from Spitz nevus and other benign lesions. (J Am Acad Dermatol 2013;68:552-9.)

However, ..........
<table>
<thead>
<tr>
<th>Lesions, N</th>
<th>Dermatofibroma</th>
<th>Melanocytic nevus</th>
<th>Spitz nevus</th>
<th>Melanoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
</tbody>
</table>
|\hline
Dermoscopic types |                 |                  |            |         |
| Reticular   | 0 (0.0)        | 1 (2.8)          | 0 (0.0)    | 1 (1.5) |
| Globular    | 1 (8.3)        | 3 (8.1)          | 9 (25.7)†  | 2 (2.9) |
| Homogeneous | 1 (8.3)        | 1 (2.7)          | 0 (0.0)    | 0 (0.0) |
| Globular-recticular | 0 (0.0) | 2 (5.4)        | 0 (0.0)    | 0 (0.0) |
| Globular-homogeneous | 2 (16.7) | 11 (29.7)† | 3 (8.6) | 3 (4.4) |
| Reticular-homogeneous | 0 (0.0) | 1 (2.7)        | 1 (2.9)    | 3 (4.4) |
| Starburst   | 0 (0.0)        | 0 (0.0)          | 8 (22.9)†  | 1 (1.5) |
| Multicomponent | 2 (16.7) | 15 (40.5)†  | 11 (31.4)† | 47 (68.1)|
| Asymmetric pigmentation pattern | 7 (53.9)† | 31 (77.5)† | 23 (59.0)† | 65 (92.9)|
| Overall morphologic pattern |         |                  |            |         |
| Homogeneous | 1 (7.7)†       | 21 (52.5)        | 20 (50.0)  | 26 (36.6) |
| Heterogeneous | 11 (84.6) | 18 (45.0)        | 19 (47.5)  | 45 (63.4) |
| Irregular distribution | 8 (61.5)† | 28 (70.0)† | 23 (57.5)† | 62 (87.3) |
| NPN localization |          |                  |            |         |
| Peripheral  | 3 (23.1)†      | 15 (37.5)†      | 16 (40.0)† | 47 (66.2) |
| Central     | 3 (23.1)†      | 11 (27.5)†      | 6 (15.0)   | 6 (8.5)  |
| Throughout lesion | 7 (53.9)† | 13 (32.5) | 18 (45.0) | 18 (25.4) |
“White” network in Spitz nevi and early melanomas lacking significant pigmentation

Iris Zalaudek, MD, Harald Kittler, MD, Rainer Hofmann-Wellenhof, MD, Juergen Kreusch, PhD, Caterina Longo, MD, Joseph Malvehy, MD, Susana Puig, MD, Elvira Moscarella, MD, Simonetta Piana, MD, Cesare Massone, MD, Carlo Cota, MD, Gerardo Ferrara, MD, Mariella Fleischer, MD, and Giuseppe Argenziano, MD

(88.5%) and 24 (92.3%) Spitz nevi

10 (25.6%) and 8 (20.5%) cases of 39 melanomas,

**Conclusion:** Although white network occurs at significantly higher frequency among hypopigmented/amelanotic Spitz nevi compared with early melanoma, it is not exclusively seen in Spitz nevi. Thus, excision of melanocytic tumors showing this pattern is mandatory. (J Am Acad Dermatol 2013;69:56-60.)
Negative network can be seen with both PD & NPD
Melanoma specific structures

1. Atypical network
2. Irregular streaks (pseudopods &/or radial streaming)
3. Negative pigment network
4. Shiny white lines or Crystalline structures (only with PD)
5. Atypical dots & globules
6. Irregular blotch
7. Blue-white veil over raised areas
8. Regression structures (BWV over flat, peppering, scar)
9. Atypical vascular structures
10. Peripheral tan/brown structureless areas
Crystalline (Shiny white lines)

Short, white, linear lines that can only be seen with polarized dermoscopy.

The lines are often oriented in an orthogonal fashion, one to the other.

Due to birefringent properties of collagen, causing polarized light to randomize its polarization rapidly. Also explains angular dependence.
Non-polarized Dermoscopy vs. Polarized Dermoscopy: Crystalline Feature
Chrysalis and Negative Pigment Network in Spitz Nevi

Rafael Botella-Estrada, MD, PhD, *† Celia Requena, MD, PhD, † Victor Traves, MD, † Eduardo Nagore, MD, PhD, † and Carlos Guillen, MD, PhD†

**FIGURE 2.** A, Spitz nevus on the leg of an 18-year-old female. Chrysalis were present on dermoscopy (B), and histology demonstrated fibroplasia in the papillary dermis, Kamino bodies, and discrete elongation of the rete ridges (C, ×100; D, ×400).
Crystalline (Shiny white lines) structures

Nevus
Can be seen in Spitz

Melanoma
Often seen in melanoma
Study: 11,225 consecutive prospectively examined lesions (JAAD)

<table>
<thead>
<tr>
<th>Melanocytic lesions with crystalline:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 / 9860 DN</td>
<td>0% (1 traumatized)</td>
</tr>
<tr>
<td>0 / 91 CMN</td>
<td>0%</td>
</tr>
<tr>
<td>0 / 15 blue nevi</td>
<td>0%</td>
</tr>
<tr>
<td>2 / 182 IDN</td>
<td>1%</td>
</tr>
<tr>
<td>3 / 3 Spitz</td>
<td>100%</td>
</tr>
<tr>
<td>16 / 17 invasive melanomas</td>
<td>94%</td>
</tr>
<tr>
<td>0 / 5 MMIS</td>
<td>0%</td>
</tr>
</tbody>
</table>

- In melanocytic tumors the presence of crystalline is highly suggestive of invasive melanoma (or Spitz).
- OR for melanoma in biopsied lesions is 9.7.
229 consecutively diagnosed “melanomas” (retrospective review)

- 65 of 110 (41%) invasive MMs had crystalline/chrysalis
- 20 of 119 (17%) in situ MMs had chrysalis/crystalline

Invasive melanomas with chrysalis/crystalline were significantly thicker as compared to those without chrysalis/crystalline (0.68 vs. 0.43mm)
Collagen XVII is expressed in malignant but not in benign melanocytic tumors and it can mediate antibody induced melanoma apoptosis

T. Krenacs • G. Kiszner • E. Stelkovics • P. Balogh • I. Teleki • I. Nemeth • E. Varga • I. Korom • T. Ritz • V. Plotar • J. Timar • E. Raso

These results suggest that the accumulation of collagen XVII endodomain in melanocytic tumors is associated with malignant transformation to be a potential marker of malignancy and a target for antibody-induced melanoma apoptosis.
• Predictors of thicker MM >0.75mm:
  – blue gray areas
  – vessels
  – abrupt cutoff
  – > 4 colors
  – blue white veil
  – > 2 structures

• Predictors of thicker MM & +SLNB (negative predictor: atypical network)
  – Blotch
  – ulceration

• Predictors of thicker MM & distant metastasis
  – Shiny white streaks
  – Milky red areas
Melanoma specific structures

1. Atypical network
2. Irregular streaks (pseudopods &/or radial streaming)
3. Negative pigment network
4. Shiny white lines or Crystalline structures (only with PD)
5. Atypical dots & globules
6. Irregular blotch
7. Blue-white veil over raised areas
8. Regression structures (BWV over flat, peppering, scar)
9. Atypical vascular structures
10. Peripheral tan/brown structureless areas
**Dots (clods, small)**

- small, round structures with a diameter < 0.1 mm
- black, brown, blue-gray, or red
  - **black dots** = pigment in the stratum corneum and the upper part of the epidermis
  - **brown dots** = small nests at or near the DEJ or in epidermis (below stratum corneum)
  - **blue-gray dots** = free melanin in dermis or in macrophages
  - **red dots** = dotted vessels
Dots located
- centrally
- situated on network lines
- situated in hole of network

Dots distributed asymmetrically, located focally at the periphery & not associated with network lines.
Regular black or brown dots

Centrally located

Overlying network lines (even if found at periphery of lesion)
Important to determine if dots are on the network or not
Figure 1. Schematic representation of the normal pigment network. The lines of the network represent melanin along the rete ridges while the holes correspond to the dermal papillae. A brown dot on the network (in color) corresponds to a pigmented nest within the rete.
Also important to determine if dots are within hole of network
Pigment network mesh centered by a brown globule
Regular black or brown dots

Situated in hole of network = target globules
Irregular black or brown dots

Not associated with network lines, or in hole of network, or in center.

They tend to be distributed asymmetrically and are often located towards the periphery of the lesion.
Brown (or black) dots not on the network lines
While black dots can often be tape stripped off, they are still significant if located off the network lines.
globules

- symmetrical, round to oval well demarcated structures, >0.1mm in diameter
- brown – nests at or below DE-junction in papillary to upper reticular dermis (most common)
- black - heavily melanized nests
- blue – nests in deeper dermis
- white – balloon cell nests
- red - vascular structures
Nevus

Globules of uniform size, shape and color. Symmetrically distributed

- throughout the lesion
- at periphery
- or centrally

Melanoma

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

Typical / regular globules

Atypical / irregular globules
<table>
<thead>
<tr>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Globules of relative uniform size, shape and color located throughout the lesion</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>Globules of relative uniform size, shape and color located centrally and surrounded by a network</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>Globules of relative uniform size, shape and color located around the entire perimeter of the lesion</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Irregular Globules

Globules of differing shapes, sizes, and colors. Also, tiered globules.

Globules asymmetrically distributed, often aggregated focally. Also includes tiered globules & globules at periphery.
Melanoma specific structures

1. Atypical network
2. Irregular streaks (pseudopods &/or radial streaming)
3. Negative pigment network
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6. Irregular blotch
7. Blue-white veil over raised areas
8. Regression structures (BWV over flat, peppering, scar)
9. Atypical vascular structures
10. Peripheral tan/brown structureless areas
Blotch

- Large concentration of melanin pigment
- Throughout epidermis (with or without melanin in dermis)
- Visually obscuring the underlying structures

-NB: large concentrations of melanin in the stratum corneum is called a black lamella. A lamella can resemble a blotch.
Nevus

One centrally located homogeneous, symmetric, hyperpigmented blotch. Only one blotch is present.

Melanoma

Hyperpigmented area(s) is at periphery (off center). There can be more than one blotch and they can be asymmetric.

Typical / regular Blotch

Atypical / irregular Blotch
Melanoma specific structures

1. Atypical network
2. Irregular streaks (pseudopods &/or radial streaming)
3. Negative pigment network
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5. Atypical dots & globules
6. Irregular blotch
7. Blue-white veil over raised areas
8. Regression structures (BWV over flat, pepperling, scar)
9. Atypical vascular structures
10. Peripheral tan/brown structureless areas
Blue white veil (structureless zone, blue)

- Bluish blotch with overlying white ground–glass haze
- Not associated with scar-like depigmentation or peppering/granularity
- Associated with palpable (raised) portion of the lesion
Blue-white veil
compact orthokeratosis
BWV due to orthokeratosis is more conspicuous with NPD
Homogeneous BWV (hue) throughout entire lesion (NPD). However, it may appear more heterogeneous with PD!

Heterogeneous BWV (with PD or NPD). Often focally and asymmetrically located but can also encompass the entire lesion.
Melanoma specific structures

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### Regression structures

<table>
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<tr>
<th>Peppering/granularity (<strong>dots, gray</strong>) consists of fine gray particles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depigmented area/scar like depigmentation (<strong>structureless zone, white</strong>) is a structureless area that is white in color. Thus, it is lighter in color as compared to the lesion and the background skin color.</td>
</tr>
<tr>
<td>The combination creates a BW color or veil (on palpation it will be macular / flat)</td>
</tr>
</tbody>
</table>
Papillary dermis thickened by fibrosis – note a few melanophages
Regression structures = peppering &/or scar like depigmentation (BWV overlying macular areas)

**Nevus**
Pepper ing (uncommon to have scarring) that is usually symmetrically located & involving <10% of lesion area

**Melanoma**
Pepper ing (+/- scarring) that is asymmetrically located & involves >50% of lesion area
Melanoma specific structures

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Vascular Structures: Nodular lesions

**Nevus**

- Comma vessels (IDN, CMN)

**Melanoma**

- Dotted, globular, serpentine/linear polymorphous, milky-red
Vascular Structures: Flat lesions

Nevus

Monomorphous dotted “target network” vessels (in CMN can be polymorphous), milky-red

Melanoma

Dotted, globular, serpentine/linear, milky-red (polymorphous)
Objective: To determine the predictive dermoscopic features of amelanotic and hypomelanotic melanoma.

Design: A total of 105 melanomas (median Breslow thickness, 0.76 mm), 170 benign melanocytic lesions, and 222 nonmelanocytic lesions lacking significant pigment (amelanotic, partially pigmented, and light colored) were imaged using glass-plate dermoscopy devices and scored for 99 dermoscopic features. Diagnostic models were derived from and tested on independent randomly selected lesions.

Setting: Predominantly hospital-based clinics from 5 continents.

Main Outcome Measures: Sensitivity, specificity, and odds ratios for individual features and models for the diagnosis of melanoma and malignancy.

Results: The most significant negative predictors of melanoma were having multiple (>3) millilike cysts (odds ratio, 0.09; 95% confidence interval, 0.01-0.64), comma vessels with a regular distribution (0.10; 0.01-0.70), comma vessels as the predominant vessel type (0.16; 0.05-0.52), symmetrical pigmentation pattern (0.18; 0.09-0.39), irregular blue-gray globules (0.20; 0.05-0.87), and multiple blue-gray globules (0.28; 0.10-0.81). The most significant positive predictors were having a blue-white veil (odds ratio, 13; 95% confidence interval, 3.9-40.0), scarlike depigmentation (4.4; 2.4-8.0), multiple blue-gray dots (3.5; 1.9-6.4), irregularly shaped depigmentation (3.3; 2.0-5.3), irregular brown dots/globules (3.2; 1.8-5.6), 5 to 6 colors (3.2; 1.6-6.3), and predominant central vessels (3.1; 1.6-6.0). A simple model distinguishing melanomas from all nonmelanomas had a sensitivity of 70% and a specificity of 56% in the test set. A model distinguishing all malignant lesions from benign lesions had a sensitivity of 96% and a specificity of 37%.

Conclusion: Although the diagnostic accuracy of dermoscopy for melanoma lacking significant pigment is inferior to that of more pigmented lesions, features distinguishing the former from benign lesions can be visualized on dermoscopic evaluation.

Arch Dermatol. 2008;144(9):1120-1127
<table>
<thead>
<tr>
<th>Table 7. Simple Dermoscopic Model for the Diagnosis of Melanoma Lacking Significant Pigment$^a$</th>
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</thead>
<tbody>
<tr>
<td>Negative feature (if present, nonmelanoma)</td>
</tr>
<tr>
<td>&gt;3 Milialike cysts</td>
</tr>
<tr>
<td>Positive features (if any 1 present, then melanoma)</td>
</tr>
<tr>
<td>Irregularly sized or distributed brown dots/globules</td>
</tr>
<tr>
<td>Multiple blue/gray dots</td>
</tr>
<tr>
<td>Irregularly shaped depigmentation</td>
</tr>
<tr>
<td>Blue-white veil</td>
</tr>
<tr>
<td>&gt;1 Shade of pink</td>
</tr>
<tr>
<td>Predominant central vessels</td>
</tr>
<tr>
<td>Dotted and linear irregular vessels</td>
</tr>
</tbody>
</table>
Dotted vessels
Linear irregular (hairpin) serpentine vessels
Amelanotic 1.65mm melanoma arising in DN
Polymorphous = Dotted & linear irregular
Dotted vessels

Linear vessels
Melanoma specific structures

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10. Peripheral tan/brown structureless areas
Histologically – flattening of rete ridges at DEJ, melanocytes arranged predominately as solitary units + less melanin, pagetoid scatter of melanocytes
Tan to brown structureless areas

**Nevus**
Tan, symmetric & homogeneous structureless (hypopigmented) area in center of lesion.

**Melanoma**
Brown structureless area(s) at periphery of lesion.
Light brown structureless area towards center

Light brown structureless area towards periphery
Remodeling of the Dermoeipidermal Junction in Superficial Spreading Melanoma

Insights Gained From Correlation of Dermoscopy, Reflectance Confocal Microscopy, and Histopathologic Analysis

Diagnosis in dermatology, whether rendered clinically or histopathologically, relies on the analytical examination of the primary morphologic features of the lesion on the gross or microscopic level, respectively. During the past 2 decades, we have begun to appreciate a new dimension in primary morphologic analysis, namely, the in vivo, en face macroscopic and microscopic morphologic features as seen via dermoscopy and reflectance confocal microscopy (RCM). Like dermoscopy, RCM reveals morphologic details of architecture in the en face plane, but, in addition, it provides morphologic information on the cellular level. The ability to visualize a lesion’s primary morphologic features on multiple different levels has fueled new insights into the biological evolution of lesions. This month’s Archives of Dermatology features an important article by Pellacani et al that correlates dermoscopic structures of melanocytic lesions with RCM and histopathologic analysis. This editorial, which is based on the findings reported by Pellacani et al and other correlation studies on dermoscopy, RCM, and histopathology, offers new therapeutic insights.

Figure 1. Progression model of superficial spreading melanoma. A, Step 1 showing undulating dermoeipidermal junction (DEJ) with preserved rete ridges that are infiltrated by confluent aggregates of melanoma cells. B, Step 2 showing a focus undergoing remodeling with flattening of the DEJ, associated with inflammation, angiogenesis, and fibroplasia. C, Step 3 showing an invasive tumor nodule arising adjacent to the area of remodeling.
### Slow-growing melanoma: a dermoscopy follow-up study


<table>
<thead>
<tr>
<th>Color</th>
<th>n (%) lesions with color or structure at baseline *</th>
<th>Change</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>more prominent**</td>
<td>no change**</td>
<td>less prominent**</td>
<td>disappeared**</td>
<td>appeared new ***</td>
</tr>
<tr>
<td>Light Brown</td>
<td>88 (95.7)</td>
<td>11 (12.5)</td>
<td>28 (31.8)</td>
<td>46 (52.3)</td>
<td>3 (3.4)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Dark Brown</td>
<td>78 (84.8)</td>
<td>47 (60.3)</td>
<td>17 (21.2)</td>
<td>14 (17.9)</td>
<td>0 (0.0)</td>
<td>9 (64.3)</td>
</tr>
<tr>
<td>White</td>
<td>3 (3.3)</td>
<td>2 (66.7)</td>
<td>1 (33.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>6 (6.7)</td>
</tr>
<tr>
<td>Gray</td>
<td>17 (18.5)</td>
<td>9 (52.9)</td>
<td>6 (35.3)</td>
<td>2 (11.8)</td>
<td>0 (0.0)</td>
<td>12 (16.0)</td>
</tr>
<tr>
<td>Blue</td>
<td>6 (6.5)</td>
<td>1 (16.7)</td>
<td>3 (50.0)</td>
<td>1 (16.7)</td>
<td>1 (16.7)</td>
<td>7 (8.1)</td>
</tr>
<tr>
<td>Black</td>
<td>30 (32.6)</td>
<td>16 (53.3)</td>
<td>7 (23.3)</td>
<td>7 (23.3)</td>
<td>0 (0.0)</td>
<td>11 (17.7)</td>
</tr>
<tr>
<td>Red</td>
<td>27 (29.3)</td>
<td>18 (66.7)</td>
<td>4 (14.8)</td>
<td>4 (14.8)</td>
<td>1 (3.7)</td>
<td>12 (18.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure</th>
<th>n (%) lesions with color or structure at baseline *</th>
<th>Change</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigmented network</td>
<td>56 (60.9)</td>
<td>13 (23.2)</td>
<td>13 (23.2)</td>
<td>23 (41.1)</td>
<td>7 (12.5)</td>
<td>9 (25.0)</td>
</tr>
<tr>
<td>Atypical network</td>
<td>19 (20.7)</td>
<td>4 (21.1)</td>
<td>5 (26.3)</td>
<td>5 (26.3)</td>
<td>0 (0.0)</td>
<td>7 (36.8)</td>
</tr>
<tr>
<td>Negative Network</td>
<td>11 (12.0)</td>
<td>8 (72.7)</td>
<td>1 (9.1)</td>
<td>2 (18.2)</td>
<td>0 (0.0)</td>
<td>4 (36.4)</td>
</tr>
<tr>
<td>Structureless area</td>
<td>37 (40.2)</td>
<td>18 (48.6)</td>
<td>11 (29.7)</td>
<td>6 (16.2)</td>
<td>2 (5.4)</td>
<td>4 (7.3)</td>
</tr>
<tr>
<td>Blotch</td>
<td>16 (17.4)</td>
<td>7 (43.8)</td>
<td>8 (50.0)</td>
<td>1 (6.3)</td>
<td>0 (0.0)</td>
<td>18 (19.7)</td>
</tr>
<tr>
<td>Atypical dots (not on network)</td>
<td>18 (19.6)</td>
<td>5 (27.8)</td>
<td>4 (22.2)</td>
<td>4 (22.2)</td>
<td>5 (27.8)</td>
<td>7 (9.5)</td>
</tr>
<tr>
<td>Typical dots (on network)</td>
<td>33 (35.9)</td>
<td>4 (12.1)</td>
<td>14 (42.4)</td>
<td>8 (24.2)</td>
<td>7 (21.2)</td>
<td>5 (8.5)</td>
</tr>
<tr>
<td>Globules</td>
<td>12 (13.0)</td>
<td>1 (8.3)</td>
<td>2 (16.7)</td>
<td>4 (33.3)</td>
<td>5 (41.7)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Regression structures</td>
<td>15 (16.3)</td>
<td>11 (73.3)</td>
<td>4 (26.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>7 (9.1)</td>
</tr>
</tbody>
</table>

---

*percentage is among total number of lesions (n=92)

**percentage is among the lesions which demonstrated the respective color or structure at baseline

***percentage is among the lesions which did not have the respective color or structure at baseline, that is, the denominator is the number of lesions without the color or structure at initial evaluation.
<table>
<thead>
<tr>
<th>Melanoma Specific Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atypical network</strong></td>
</tr>
<tr>
<td><strong>Streaks</strong> (pseudopods and radial streaming)</td>
</tr>
<tr>
<td><strong>Negative pigment network</strong></td>
</tr>
<tr>
<td><strong>Shiny white lines</strong> (Chrysalis/crystalline)</td>
</tr>
<tr>
<td><strong>Atypical dots and/or globules</strong></td>
</tr>
<tr>
<td><strong>Off-centered blotch</strong></td>
</tr>
<tr>
<td><strong>Peripheral tan structureless areas</strong></td>
</tr>
<tr>
<td><strong>Blue-white veil overlying raised areas</strong></td>
</tr>
<tr>
<td><strong>Regression structures</strong></td>
</tr>
<tr>
<td>- Blue-white veil overlying macular areas, scar-like areas and/or peppering</td>
</tr>
<tr>
<td><strong>Atypical vascular structures</strong></td>
</tr>
<tr>
<td>- Dotted + serpentine vessels, serpentine vessels, polymorphous vessels, milky-red areas, red globules, corkscrew vessels</td>
</tr>
</tbody>
</table>
Any melanocytic lesion on any anatomical site that reveals any of the 10 melanoma specific dermoscopic structures should be viewed with suspicion. In addition, additional melanoma specific structures exist for lesions on volar skin, nails, mucosal surfaces and on the face.
Pseudo-network pattern (face)
Annular-granular pattern:
1. Granularity around follicles
2. Grayish follicular openings (asymmetric or symmetric)

Polygonal lines:
1. Rhomboidal structures
2. Zig-zag lines

Homogeneous areas:
1. Blotch with follicular openings preserved
2. Blotch with no follicular openings visible
- Parallel pattern (volar skin = palms/soles)
Nests of melanoma cells
(invasion of the crista intermedia)

Parallel ridge pattern

Malignant pattern
Dermoscopy of Pigmented Lesions of the Mucosa and the Mucocutaneous Junction

Results of a Multicenter Study by the International Dermoscopy Society (IDS)

Andreas Blum, MD; Olga Simionescu, MD; Giuseppe Argenziano, MD; Ralph Braun, MD; Horacio Cabo, MD; Astrid Eichhorn, MD; Herbert Kirchesh, MD; Josef Malvuh, MD; Ashfaq A. Marghoob, MD; Susana Pazig, MD; Fezal Ozdemir, MD; Wilhelm Stolz, MD; Isabelle Tromme, MD; Ulrike Weigert, MD; Ingrid H. Wolf, MD; Iris Zalaudek, MD; Harald Kittler, MD

Objective: To better characterize the dermoscopic patterns of mucosal lesions in relation to the histopathologic characteristics.

Design: Retrospective and observational study.

Setting: Fourteen referral pigmented lesion clinics in 10 countries.

Patients: A total of 140 pigmented mucosal lesions (126 benign lesions, 11 melanomas, 2 Bowen disease lesions, and 1 metastasis) from 92 females (66%) and 48 males (34%) were collected from October 2007 through November 2008.

Main Outcome Measures: Scoring the dermoscopic patterns (dots, globules, or clods, circles, lines, or structureless) and colors (brown, black, blue, gray, red, purple, and white) and correlation with the histopathologic characteristics.

Results: Based on univariate analysis and 2 diagnostic models, the presence of structureless zones inside the lesions with blue, gray, or white color (the first model) had a 100% sensitivity for melanoma and 92.9% sensitivity for any malignant lesion, and 82.2% and 83.3% specificity for benign lesions in the group with melanoma lesions and the group with malignant lesions, respectively. Based on the colors (blue, gray, or white) only (the second model), the sensitivity for the group with melanoma was 100%, and for the group with any malignant lesion was 92.9%, and the specificity was 64.3% and 69.1%, respectively. Patients with malignant lesions were significantly older than patients with benign lesions (mean [SD] ages, 60.1 [22.8] years vs 43.2 [17.3] years, respectively).

Conclusion: The combination of blue, gray, or white color with structureless zones are the strongest indicators when differentiating between benign and malignant mucosal lesions in dermoscopy.


CLINICAL AND LABORATORY INVESTIGATIONS

Dermoscopy of pigmented lesions on mucocutaneous junction and mucous membrane

J. Lin, H. Koga, M. Takata and T. Saida

BJD British Journal of Dermatology
Multi-component pattern (75%)
Homogenous pattern (25%)

Dermoscopy of Pigmented Lesions of the Mucosa and the Mucocutaneous Junction

Results of a Multicenter Study by the International Dermoscopy Society (IDS)

Andreas Blum, MD; Olga Simionescu, MD; Giuseppe Argenziano, MD; Ralph Braun, MD; Horacio Cabo, MD; Astrid Eichhorn, MD; Herbert Kirchschlager, MD; Josep Malvehy, MD; Ashfaq A. Marghoob, MD; Susana Puig, MD; Fezal Ozdemir, MD; Wilhelm Stolz, MD; Isabelle Tromme, MD; Ulrike Weigert, MD; Ingrid H. Wolf, MD; Iris Zalaudek, MD; Harald Kittler, MD

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Conclusion: The combination of blue, gray, or white color with structureless zones are the strongest indicators when differentiating between benign and malignant mucosal lesions in dermoscopy.

Arch Dermatol.
Published online June 16, 2011.
<table>
<thead>
<tr>
<th>Melanoma Specific Structures</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atypical network, including angulated lines</td>
<td>1.1 - 9</td>
</tr>
<tr>
<td>Negative pigment network</td>
<td>1.8</td>
</tr>
<tr>
<td>Streaks (pseudopods &amp; radial streaming)</td>
<td>1.6 - 5.8</td>
</tr>
<tr>
<td>Atypical dots and/or globules</td>
<td>2.9 - 4.8</td>
</tr>
<tr>
<td>Off-centered blotch</td>
<td>4.1 - 4.9</td>
</tr>
<tr>
<td>Peripheral tan structureless areas</td>
<td>2.8 - 2.9</td>
</tr>
<tr>
<td>Blue-white veil overlying raised areas</td>
<td>2.5 - 13</td>
</tr>
<tr>
<td>Regression structures</td>
<td>3.1 - 18.3</td>
</tr>
<tr>
<td>• Blue-white veil overlying macular areas, scar-like areas and/or peppering</td>
<td></td>
</tr>
<tr>
<td>Atypical vascular structures</td>
<td>1.5 - 7.4</td>
</tr>
<tr>
<td>• Dotted, serpentine, corkscrew, and polymorphous vessels (&gt;1 morphology), milky-red areas, red globules</td>
<td></td>
</tr>
<tr>
<td>Shiny white lines (Crystalline structures)</td>
<td>9.7</td>
</tr>
</tbody>
</table>
Does this lesion manifest one of the 10 benign nevus patterns?
1) yes
2) no
Peripheral network

Central hypopigmented and structureless area
Does this lesion manifest any MM specific structures?

1) yes
2) no
### Melanoma Specific Structures

- Atypical network
- Streaks (pseudopods and radial streaming)
- Negative pigment network
- Shiny white lines (Chrysalis/crystalline)
- Atypical dots and/or globules
- Off-centered blotch
- Peripheral thin/structureless areas
- Blue-white veil overlying raised areas
- Regression structures
  - Blue-white veil overlying macular areas, scar-like areas and/or peppering
- Atypical vascular structures
  - Dotted + serpentine vessels, serpentine vessels, polymorphous vessels, milky-red areas, red globules, corkscrew vessels

---

### Nevus

- Benign Patterns
  - Diffuse Reticular
  - Patchy Reticular
  - Peripheral reticular with central hypopigmentation
  - Peripheral reticular with central hyperpigmentation
  - Homogeneous
  - Peripheral globules/starburst
  - Peripheral reticular with central globules
  - Globular
  - Two-components
  - Symmetric multi-component
Does this lesion manifest one of the 10 benign nevus patterns?

1) yes
2) no
Does this lesion manifest any MM specific structures?

1) yes
2) no
### Melanoma Specific Structures

- Atypical network
- Streaks (pseudopods and radial streaming)
- Negative pigment network
- Shiny white lines (Chrysalis/crystalline)
- Atypical dots and/or globules
- Off-centered blotch
- Peripheral tan structureless areas
- Blue-white veil overlying raised areas
- Regression structures
  - Blue-white veil overlying macular areas, scar-like areas and/or peppering
- Atypical vascular structures
  - Dotted + serpentine vessels, serpentine vessels, polymorphous vessels, milia-rod areas, cephalic, corkscrew vessels

### Benign Patterns

- Diffuse Reticular
- Patchy Reticular
- Peripheral reticular with central hypopigmentation
- Central hyperpigmentation
- Homeogeneous
- Peripheral globules/starburst
- Peripheral reticular with central globules
- Globular
- Two-components
- Symmetric multi-component
Melanoma 0.78mm
Does this lesion manifest one of the 10 benign nevus patterns?

1) yes
2) no
peripheral rim of globules
Does this lesion manifest any MM specific structures?

1) yes
2) no
Nevus
Does this lesion manifest one of the 10 benign nevus patterns?
1) yes
2) no
Does this lesion manifest any MM specific structures?

1) yes
2) no
Negative network
Melanoma Specific Structures

- Atypical network
- Streaks (pseudopods and radial streaming)
- Negative pigment network
- Shiny white lines (Chrysalis/crystalline)
- Atypical dots and/or globules
- Off-centered blotch
- Peripheral tan structureless areas
- Blue-white veil overlying raised areas

Regression structures
- Blue-white veil overlying macular areas, scar-like areas and/or peppering

Atypical vascular structures
- Dotted + serpentine vessels, serpentine vessels, polymorphous vessels, milky-red areas, red globules, corkscrew vessels
Does this lesion manifest one of the 10 benign nevus patterns?

1) yes
2) no
Does this lesion manifest any MM specific structures?

1) yes
2) no
Focal streaks

Milky red area

Peripheral tan structureless areas
Melanoma Specific Structures

- Atypical network
- Streaks (pseudopods and radial streaming)
- Negative pigment network
- Shiny white lines (Chrysalis/crystalline)
- Atypical dots and/or globules
- Off-centered blotch
- Peripheral tan structureless areas
- Blue-white veil overlying raised areas
- Regression structures
  - Blue-white veil overlying acral areas, scar-like areas and/or pepping
- Atypical vascular structures
  - Dotted + serpentine vessels, serpentine, vessels, polymorphous vessels, milky tea areas, actors, corkscrew vessels
Melanoma

0.15mm
Does this lesion manifest one of the 10 benign nevus patterns?
1) yes
2) no
Does this lesion manifest any MM specific structures?

1) yes
2) no

<table>
<thead>
<tr>
<th>Melanoma Specific Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atypical network</td>
</tr>
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<tr>
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<tr>
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</tr>
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<td>Atypical dots and/or globules</td>
</tr>
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</tr>
<tr>
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</tr>
<tr>
<td>Blue-white veil overlying raised areas</td>
</tr>
<tr>
<td>Regression structures</td>
</tr>
<tr>
<td>Blue-white veil overlying scar-like areas and/or peeping</td>
</tr>
<tr>
<td>Atypical vascular structures</td>
</tr>
<tr>
<td>Dilated + serpentine vessels, serpentine vessels, polymorphous vessels, milky-red areas, red globules, corrugated vessels</td>
</tr>
</tbody>
</table>
BWS - regression

Structureless areas
Melanoma Specific Structures:
- Atypical network
- Streaks (pseudopods and radial streaming)
- Negative pigment network
- Shiny white lines (Chrysalis/crystalline)
- Atypical dots and/or globules
- Off-centered blotch
- Peripheral tan structureless areas
- Blue-white veil overlying raised areas
- Regression structures
  - Blue-white veil overlying macular areas, tar-like areas and/or peppering
- Atypical vascular structures
  - Dotted + serpentine vessels, serpentine vessels, polymorphous vessels, milky-red areas, red globules, corkscrew vessels

Benign Patterns:
- Diffuse Reticular
- Patchy Reticular
- Peripheral reticular with central hypopigmentation
- Peripheral reticular with central hyperpigmentation
- Homogeneous
- Peripheral globules/starburst
- Peripheral reticular with central globules
- Globular
- Two-components
- Symmetric multi-component
Melanoma in situ
Does this lesion manifest one of the 10 benign nevus patterns?

1) yes
2) no
Does this lesion manifest any MM specific structures?
1) yes
2) no
Negative network

Dotted vessels

Crystalline structures
Melanoma Specific Structures

- Atypical network
- Streaks (pseudopods and radial streaming)
- Negative pigment network
- Shiny white lines (Chrysalis/crystalline)
- Atypical dots and/or globules
- Off-centered blotch
- Peripheral tan structureless areas
- Blue-white veil overlying raised areas
- Regression structures
  - Blue-white veil overlying macular areas, scar-like areas and/or peppering
- Atypical vascular structures
  - Dotted + serpentine vessels, serpentine vessels, polymorphous vessels, milky-red areas, red globules, cotton wool vessels

Benign Patterns

- Diffuse Reticular
- Patchy Reticular
- Peripheral reticular with central hypopigmentation
- Peripheral reticular with central hyperpigmentation
- Homogeneous
- Peripheral globules/starburst
- Peripheral reticular with central globules
- Globular
- Two-components
- Symmetric multi-component
DN with focal severe atypia & with minor Spitzoid features
Does this lesion manifest one of the 10 benign nevus patterns?
1) yes
2) no
Does this lesion manifest any MM specific structures?

1) yes
2) no
Nevus
Does this lesion manifest one of the 10 benign nevus patterns?
1) yes
2) no
Does this lesion manifest any MM specific structures?

1) yes
2) no
Focal peripheral globules

Atypical dots
Melanoma Specific Structures

- Atypical network
- Streaks (pseudopods and radial streaming)
- Negative pigment network
- Shiny white lines (Chrysalis/crystalline)
- Atypical dots and/or globules
- Off-centered blotch
- Peripheral tan structureless areas
- Blue-white veil overlying raised areas
  - Regression structures
    - Blue-white veil overlying macular areas, scar-like areas and/or peppering
  - Atypical vascular structures
    - Dotted + serpentine vessels, serpentine vessels, polymorphic vessels, milky-red areas, red globules, corkscrew vessels

Benign Patterns

- Diffuse Reticular
- Patchy Reticular
- Peripheral reticular with central hypopigmentation
- Peripheral reticular with central hyperpigmentation
- Homogeneous
- Peripheral globules/starburst
- Peripheral reticular with central globules
- Globular
- Two-components
- Symmetric multi-component
DN with focal severe atypia
Does this lesion manifest one of the 10 benign nevus patterns?

1) yes
2) no
Does this lesion manifest any MM specific structures?

1) yes
2) no
Spitz nevus
First Step

Level 1

Melanocytic Lesion

DIF

Level 2

BCC

Level 3

SCC

Level 4

SK

Level 5

Hemangioma/angioma/angiokeratoma

Level 6

Vascular structures in non-melanocytic tumors

Level 7

Vascular structures in melanocytic tumors

Level 8

Unclassifiable lesion

Second Step

Nevus Indeterminate Melanoma

Step 1: Melanocytic vs. Non-melanocytic

Concept and design by Natalia Jairus, MD and Ashfaq A. Marghoob, MD.

Card 1-Back
EVERYTHING SHOULD BE MADE AS SIMPLE AS POSSIBLE BUT NOT SIMPLER
Goal

Find skin cancer!
Are there simpler dermoscopic methods for melanoma (skin cancer) detection?
Triage algorithm

- Simplify dermoscopy (bare-bones)
- Identify concerning lesions
- High sensitivity with reasonable specificity
- Easy to teach, learn, & implement
Insights gained from teaching experience

• SK, hemangioma & DF are usually easy to identify (for dermoscopists) and should be excluded from entering algorithm

• Clear cut benign or malignant lesions should be excluded from entering algorithm

• Only lesions for which the diagnosis is unknown enter the algorithm
While many structures have the power to discriminate nevi from melanoma, most have extremely poor inter-observer agreement.

The most powerful discriminator was “architectural disorder” (disorganized/dermoscopic asymmetry) with an OR of 6.6.

The feature with highest inter-observer agreement was also “architectural disorder” (the subjective view had higher agreement than the objective view!)
You do not need to be able to identify the individual objects on the table to know if the desktop is organized or disorganized.
Put it all together
Triage
Amalgamated Dermoscopy Algorithm

- Unequivocal SK, DF or angioma
  - Yes: Reassure/Monitor
  - No: Asymmetric distribution of colors or structures or starburst pattern
    - Yes: Biopsy/refer
    - No: Blue-black or gray color, white structures, negative network, ulceration/vessels
      - Yes: Biopsy/refer
      - No: Reassure/Monitor
Isolated Skin Lesion (viewed using polarized dermoscopy)

Unequivocal Seborrheic Keratosis, Hemangioma or Dermatofibroma

Yes

Asymmetric distribution of colors or structures OR Starburst pattern

Yes

Biopsy or refer

No

Reassure/ Monitor*

No

Blue-Black or Gray color, White Structures, Negative Network, or Ulceration/Vessels

Yes

Biopsy or refer

No

Reassure/ Monitor*

*Patient can be informed that the lesion in question does not reveal any features suggestive of malignancy. These lesions can be followed and monitored by the physician or monitoring can be patient-directed. Change should always warrant re-evaluation!

Exceptions:
1) Any changing lesion on an adult patient
2) Any solar lesion with a parallel ridge pattern
If the lesion is NOT a clear-cut SK, DF or Angioma then what’s next?
Isolated Skin Lesion

Unequivocal seborrheic keratosis, hemangioma or dermatofibroma

* Algorithm is based on use of polarized dermoscopy
* Ulceration without history trauma

Exceptions: 1) Any changing lesion on an adult patient
2) Any volar lesion with a parallel ridge pattern
Definition of:

Symmetry (organized) / Asymmetry (disorganized)

Symmetry of SHAPE (but disorganized pattern)

According to dermoscopy this lesion is considered asymmetric (disorganized)

Organized PATTERN (but asymmetry of shape)

According to dermoscopy this lesion is considered symmetric (organized)
Examples

- Symmetry in pattern
- No symmetry of shape (asymmetric shape)
- According to dermoscopy this is symmetric & organized

- No symmetry in pattern (asymmetric pattern)
- Symmetry of shape
- According to dermoscopy this is asymmetric & disorganized
Pizza Margherita
SYMMETRY (organized)

Pizza Quattro Stagioni
ASYMMETRY (disorganized)
Starburst Pattern
If the lesion does NOT manifest a disorganized or starburst pattern, what’s next? (these are all symmetric lesions!)
Symmetric Cancers

• Nodular MM
  – blue, black, gray

• Spitzoid MM
  – negative network or starburst pattern

• Amelanotic cancers
  – SWS, vessels, ulceration
Symmetric lesion
Sharply demarcated borders
Symmetric lesion
Symmetric lesion
SCC in situ / KA
All others get “monitored”
# How did TADA perform

<table>
<thead>
<tr>
<th></th>
<th>Overall Sensitivity</th>
<th>Overall Specificity</th>
<th>Malignancies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Point</td>
<td>91.0</td>
<td>71.9</td>
<td>Melanoma, pBCC</td>
</tr>
<tr>
<td>Chaos and Clue</td>
<td>90.6</td>
<td>62.7</td>
<td>Melanoma, BCC, pSCC</td>
</tr>
<tr>
<td>Blue-Black Rule</td>
<td>78.2</td>
<td>80.5</td>
<td>Melanoma</td>
</tr>
<tr>
<td>AC Rule</td>
<td>94.0</td>
<td>62.0</td>
<td>Melanoma</td>
</tr>
<tr>
<td>TADA</td>
<td>94.8</td>
<td>72.3</td>
<td>Melanoma, BCC, SCC</td>
</tr>
</tbody>
</table>
TADA results by lesion type and dermoscopic training

<table>
<thead>
<tr>
<th>Lesion Type</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>94.8</td>
<td>72.3</td>
</tr>
<tr>
<td>Previous training Dermoscopy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>95.2</td>
<td>71.7</td>
</tr>
<tr>
<td>No</td>
<td>93.4</td>
<td>70.4</td>
</tr>
<tr>
<td>Lesion Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melanoma (MM, MMIS, AMM, NM)</td>
<td>94.3</td>
<td>-</td>
</tr>
<tr>
<td>BCC</td>
<td>95.0</td>
<td>-</td>
</tr>
<tr>
<td>SCC</td>
<td>96.0</td>
<td>-</td>
</tr>
<tr>
<td>Seborrheic Keratosis</td>
<td>-</td>
<td>81.0</td>
</tr>
<tr>
<td>Dermatofibroma</td>
<td>-</td>
<td>93.0</td>
</tr>
<tr>
<td>Hemangioma</td>
<td>-</td>
<td>73.0</td>
</tr>
<tr>
<td>Nevus</td>
<td>-</td>
<td>63.0</td>
</tr>
</tbody>
</table>
Figure: Triage Amalgamated Dermoscopic Algorithm (TADA)

*This algorithm is based on the use of polarized dermoscopy.*
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