TADA: Dermoscopy simplified

Ashfaq A. Marghoob, M.D.
Attending Physician

Saturday 28th 2017
8:00-8:50AM
Disclosure Statement (Conflict of Interest)

Meeting: paid to organize

Speaking: Honorarium (3GEN & others)

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

Book: royalties
<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 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>
Intraclass correlation for any given melanoma specific structure was poor ranging from 0.05 to 0.34!
Melanoma specific structures

1. Angulated lines-Atypical network (*ICC* = 0.05-0.21)
2. Irregular streaks (pseudopods &/or radial streaming) (*ICC* = 0.21-0.23)
3. Negative pigment network (*ICC* = 0.15)
4. Shiny white lines or Crystalline structures (only with PD)(*ICC* = 0.16)
5. Atypical dots & globules (*ICC* = 0.06-0.14)
6. Irregular blotch (*ICC* = 0.18)
7. Blue-white veil over raised areas (*ICC* = 0.34)
8. Regression structures (BWV over flat, peppering, scar)(*ICC* = 0.11-0.2)
9. Atypical vascular structures (*ICC* = 0.16)
10. Peripheral tan/brown structureless areas (*ICC* = 0.08)
While the intraclass correlation for any given melanoma specific structure was poor, each of these structures were in fact associated with melanoma!
Table 3. Association Between Dermoscopic Criteria With Melanoma Status (continued)

<table>
<thead>
<tr>
<th>Dermoscopic Criterion</th>
<th>No. (%) of Lesions</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=850</td>
<td>N=1,541</td>
<td>OR (95% CI)</td>
<td>P Value</td>
<td>ICC (95% CI)*</td>
</tr>
<tr>
<td><strong>Total colors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>140 (8.4)</td>
<td>78 (5.1)</td>
<td>1.4 (1.1-1.5)</td>
<td>&lt;.000</td>
<td>0.36 (0.31-0.40)</td>
</tr>
<tr>
<td>2</td>
<td>1373 (33.8)</td>
<td>344 (22.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1344 (31.1)</td>
<td>463 (10.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>678 (16.7)</td>
<td>548 (22.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>219 (5.6)</td>
<td>171 (11.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>68 (1.7)</td>
<td>84 (5.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>21 (0.5)</td>
<td>34 (2.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>6 (0.2)</td>
<td>11 (0.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9 (0.2)</td>
<td>5 (0.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1155 (38.4)</td>
<td>496 (32.2)</td>
<td>2.5 (2.1-3.0)</td>
<td>&lt;.000</td>
<td>0.39 (0.34-0.43)</td>
</tr>
<tr>
<td>Pseudo: present</td>
<td>1557 (26.0)</td>
<td>181 (11.8)</td>
<td>1 (Reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative: present</td>
<td>195 (5.0)</td>
<td>107 (6.9)</td>
<td>1.4 (1.1-1.8)</td>
<td>&lt;.005</td>
<td>0.15 (0.12-0.18)</td>
</tr>
<tr>
<td>Target: present</td>
<td>122 (3.0)</td>
<td>30 (2.0)</td>
<td>0.6 (0.4-1.0)</td>
<td>&lt;.03</td>
<td>0.06 (0.05-0.08)</td>
</tr>
<tr>
<td>Segmentation/areas: present</td>
<td>1934 (45.6)</td>
<td>877 (46.9)</td>
<td>1.5 (1.1-1.6)</td>
<td>&lt;.000</td>
<td>0.08 (0.06-0.10)</td>
</tr>
<tr>
<td>Hypopigmented areas: present</td>
<td>1244 (30.6)</td>
<td>638 (40.1)</td>
<td>1.5 (1.3-1.7)</td>
<td>&lt;.000</td>
<td>0.17 (0.14-0.20)</td>
</tr>
<tr>
<td><strong>Bulging</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular: present</td>
<td>374 (9.2)</td>
<td>67 (4.4)</td>
<td>0.4 (0.3-0.6)</td>
<td>&lt;.000</td>
<td>0.08 (0.06-0.10)</td>
</tr>
<tr>
<td>Irregular: present</td>
<td>1037 (25.5)</td>
<td>615 (39.9)</td>
<td>1.9 (1.7-2.2)</td>
<td>&lt;.000</td>
<td>0.18 (0.14-0.21)</td>
</tr>
<tr>
<td>Blue-white veil: present</td>
<td>759 (18.7)</td>
<td>527 (43.8)</td>
<td>2.3 (2.0-2.7)</td>
<td>&lt;.000</td>
<td>0.24 (0.20-0.29)</td>
</tr>
<tr>
<td>Blue-gray pseudop.: present</td>
<td>340 (8.6)</td>
<td>164 (16.6)</td>
<td>1.3 (1.1-1.5)</td>
<td>&lt;.01</td>
<td>0.08 (0.06-0.09)</td>
</tr>
<tr>
<td>Scar: present</td>
<td>277 (6.8)</td>
<td>233 (15.1)</td>
<td>2.4 (2.0-2.9)</td>
<td>&lt;.000</td>
<td>0.20 (0.16-0.24)</td>
</tr>
<tr>
<td>Peripheral brown dots: present</td>
<td>366 (9.0)</td>
<td>195 (12.7)</td>
<td>1.5 (1.2-1.8)</td>
<td>&lt;.004</td>
<td>0.03 (0.02-0.06)</td>
</tr>
<tr>
<td>Blue-gray dots: present</td>
<td>341 (8.4)</td>
<td>172 (11.2)</td>
<td>1.4 (1.1-1.7)</td>
<td>&lt;.000</td>
<td>0.16 (0.13-0.19)</td>
</tr>
<tr>
<td>Supernus: present</td>
<td>763 (18.7)</td>
<td>402 (26.1)</td>
<td>1.5 (1.3-1.8)</td>
<td>&lt;.000</td>
<td>0.21 (0.17-0.24)</td>
</tr>
<tr>
<td>Pseudo: present</td>
<td>296 (7.3)</td>
<td>215 (14.0)</td>
<td>2.1 (1.7-2.5)</td>
<td>&lt;.000</td>
<td>0.23 (0.19-0.27)</td>
</tr>
<tr>
<td><strong>Structures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where Unity: present</td>
<td>84 (2.1)</td>
<td>78 (5.1)</td>
<td>2.5 (2.0-3.5)</td>
<td>&lt;.000</td>
<td>0.16 (0.13-0.19)</td>
</tr>
<tr>
<td>Rhombs: present</td>
<td>74 (1.8)</td>
<td>16 (1.0)</td>
<td>0.6 (0.3-1.0)</td>
<td>&lt;.04</td>
<td>0.05 (0.03-0.06)</td>
</tr>
<tr>
<td>Regression: present</td>
<td>391 (9.6)</td>
<td>275 (17.9)</td>
<td>2.0 (1.7-2.4)</td>
<td>&lt;.000</td>
<td>0.11 (0.08-0.13)</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular black: present</td>
<td>123 (3.0)</td>
<td>40 (2.6)</td>
<td>0.9 (0.6-1.2)</td>
<td>.39</td>
<td>0.05 (0.03-0.07)</td>
</tr>
<tr>
<td>Irregular black: present</td>
<td>494 (12.2)</td>
<td>98 (6.4)</td>
<td>0.5 (0.4-0.6)</td>
<td>&lt;.000</td>
<td>0.06 (0.04-0.08)</td>
</tr>
<tr>
<td>Irregular blue: present</td>
<td>392 (9.7)</td>
<td>245 (15.9)</td>
<td>1.8 (1.5-2.1)</td>
<td>&lt;.000</td>
<td>0.13 (0.10-0.16)</td>
</tr>
<tr>
<td>Irregular brown: present</td>
<td>854 (21.0)</td>
<td>433 (26.8)</td>
<td>1.4 (1.2-1.6)</td>
<td>&lt;.000</td>
<td>0.12 (0.09-0.14)</td>
</tr>
<tr>
<td>Irregular blue: present</td>
<td>116 (2.9)</td>
<td>65 (4.2)</td>
<td>1.5 (1.2-1.0)</td>
<td>&lt;.01</td>
<td>0.06 (0.04-0.08)</td>
</tr>
<tr>
<td>Irregular nod: present</td>
<td>59 (1.5)</td>
<td>34 (2.2)</td>
<td>1.5 (1.0-2.3)</td>
<td>&lt;.05</td>
<td>0.06 (0.04-0.08)</td>
</tr>
<tr>
<td><strong>Globules</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular black: present</td>
<td>75 (1.9)</td>
<td>33 (2.1)</td>
<td>1.1 (0.8-1.7)</td>
<td>.51</td>
<td>0.05 (0.03-0.07)</td>
</tr>
<tr>
<td>Irregular brown: present</td>
<td>558 (13.7)</td>
<td>121 (7.9)</td>
<td>0.5 (0.4-0.7)</td>
<td>&lt;.000</td>
<td>0.17 (0.13-0.20)</td>
</tr>
<tr>
<td>Regular blue: present</td>
<td>45 (1.1)</td>
<td>10 (0.7)</td>
<td>0.6 (0.4-1.2)</td>
<td>&lt;.12</td>
<td>0.01 (0.00-0.03)</td>
</tr>
<tr>
<td>Irregular black: present</td>
<td>296 (7.6)</td>
<td>191 (12.4)</td>
<td>1.9 (1.5-2.2)</td>
<td>&lt;.000</td>
<td>0.14 (0.11-0.17)</td>
</tr>
<tr>
<td>Irregular brown: present</td>
<td>786 (19.3)</td>
<td>326 (21.2)</td>
<td>1.1 (1.0-1.3)</td>
<td>&lt;.11</td>
<td>0.08 (0.08-0.13)</td>
</tr>
<tr>
<td>Irregular blue: present</td>
<td>143 (3.3)</td>
<td>113 (7.3)</td>
<td>2.2 (1.7-2.8)</td>
<td>&lt;.000</td>
<td>0.07 (0.05-0.09)</td>
</tr>
<tr>
<td><strong>Vessels</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>3260 (82.0)</td>
<td>1000 (64.9)</td>
<td>0.4 (0.4-0.5)</td>
<td>&lt;.000</td>
<td>0.46 (0.42-0.51)</td>
</tr>
<tr>
<td>Comma</td>
<td>216 (5.8)</td>
<td>40 (2.6)</td>
<td>0.4 (0.1-0.6)</td>
<td>&lt;.04</td>
<td>0.44 (0.40-0.49)</td>
</tr>
<tr>
<td>Arterial</td>
<td>263 (7.2)</td>
<td>261 (16.9)</td>
<td>3.5 (1.3-7.6)</td>
<td>&lt;.000</td>
<td>0.22 (0.20-0.24)</td>
</tr>
<tr>
<td>P lateral</td>
<td>251 (6.7)</td>
<td>221 (14.3)</td>
<td>2.1 (1.3-3.1)</td>
<td>&lt;.000</td>
<td>0.15 (0.12-0.18)</td>
</tr>
<tr>
<td>Polymorphous</td>
<td>115 (2.8)</td>
<td>127 (8.2)</td>
<td>2.1 (1.4-4.0)</td>
<td>&lt;.000</td>
<td>0.16 (0.13-0.19)</td>
</tr>
</tbody>
</table>
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!)
Entropy - Chaos

This does not require knowing or being able to identify the presence or absence of specific colors or structures within a lesion (objective). It simply requires (blink) determining whether the colors and structures (whatever they may be) are distributed in an organized or disorganized manner (subjective).
Organized or disorganized?
Organized or disorganized?
You do not need to be able to identify the objects on the table to know if the desktop is organized or disorganized.
Similarly, you do not need to be able to identify specific structures to know if lesion is organized or disorganized.
Digital imaging biomarkers feed machine learning for melanoma screening

Degree of entropy:
EVERYTHING SHOULD BE MADE AS SIMPLE AS POSSIBLE BUT NOT SIMPLER

Albert Einstein
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
What has been published

• 3-point checklist
• AC rule
• BB rule
• Chaos & clues
• Prediction without pigment algorithm
What are their deficiencies?

- **3-point checklist (2004)**
  - Only for pigmented lesions (not amelanotic)
  - Designed to detect MM & pBCC (not pSCC)
  - Miss non-SSMM such as nodular

- **AC rule (2011)**
  - Cannot be used for amelanotic lesions
  - Miss detection of symmetric cancers such as nodular MM

- **BB rule (2011)**
  - Miss all cancers w/o blue-black color

- **Chaos & Clues (2012 — recognize importance of SWS)**
  - Only for pigmented lesions (not amelanotic)
  - Miss symmetric cancers such as nodular MM
  - More complex – requires looking for 8 structures (poor kappa)

- **Prediction without pigment**
  - Only for non-pigmented lesions. Complex
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.
Newer structures that have been shown to have discriminatory power.

Validity and Reliability of Dermoscopic Criteria Used to Differentiate Nevi From Melanoma
A Web-Based International Dermoscopy Society Study

Cristina Carrera, MD, PhD; Michael A. Marchetti, MD; Stephen W. Dusza, DrPH; Giuseppe Argenziano, MD; Ralph P. Braun, MD; Allan C. Halpern, MD; Natalia Jaimes, MD; Harald J. Kittler, MD; Josep Malvehy, MD; Scott W. Menzies, MBBS, PhD; Giovanni Pellacani, MD; Susana Puig, MD; Harold S. Rabinovitz, MD; Alon Scope, MD; H. Peter Soyer, MD; Wilhelm Stolz, MD; Rainer Hofmann-Wellenhof, MD; Iris Zalaudek, MD; Ashfaq A. Marghoob, MD

<table>
<thead>
<tr>
<th>Structures</th>
<th>Nevi Mean (SD)</th>
<th>Melanoma Mean (SD)</th>
<th>Odds Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>White shiny: present</td>
<td>84 (2.1)</td>
<td>78 (5.1)</td>
<td>2.5 (1.8-3.5)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Rhomboid: present</td>
<td>74 (1.8)</td>
<td>16 (1.0)</td>
<td>0.6 (0.3-1.0)</td>
<td>.04</td>
</tr>
<tr>
<td>Regression: present</td>
<td>391 (9.6)</td>
<td>275 (17.9)</td>
<td>2.0 (1.7-2.4)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
Intraclass correlation for any given melanoma specific structure was poor ranging from 0.05 to 0.34!
Aim: amalgamate these triage algorithms & new insights into something better

- Select features from each with the most discriminatory power to identify malignancy
- Address deficiencies found in each
- Add newly described features with high sensitivity for skin cancer (SWS) – This requires use of polarized dermoscopy!
- Harness features with high kappa (harness brains normal power – UDA)
A Clinical Aid for Detecting Skin Cancer: The Triage Amalgamated Dermoscopic Algorithm (TADA)

T. Rogers, MFA, M. L. Marino, MD, S. W. Dusza, DrPH, S. Bajaj, MD, R. P. Usatine, MD, M. A. Marchetti, MD, and A. A. Marghoob, MD

ORIGINAL RESEARCH

JABFM November–December 2016 Vol. 29 No. 6
Triage amalgamated dermoscopic algorithm (TADA) for skin cancer screening

Tova Rogers¹, Maria Marino¹, Stephen W. Dusza¹, Shirin Bajaj¹, Michael A. Marchetti¹, Ashfaq Marghoob¹

* This algorithm does not apply to lesions on glabrous skin (i.e., palms, soles, mucosal surfaces) and nails.
** May require toggling between PD & NPD since SK and DF are easier to diagnose with NPD.
¹ Patients should continue self-monitoring & changes in morphology or symptoms should raise concern.
² Colors & structures distributed in an asymmetric/chaotic fashion.
³ Monitoring can include short-term monitoring, long-term monitoring or self-monitoring for change.
Seborrheic Keratoses (SK)

1. Sharply demarcated borders
2. Milia-like cyst
3. Comedo-like opening
4. Fissures & ridges (gyri & sulci)
5. Fingerprint-like
6. Hairpin vessels
7. Moth-eaten borders
Dermatofibroma
(clinical info is critical)

*Delicate network (exception)*

*Central scar-like/crystalline*

*Ring-like globules*

*Vessels / blush in center*
Angioma / hemangioma

Lacunae separated by BWV septae
- red
- maroon
- blue
- black
- clear
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)
SYMMETRY (organized)  ASYMMETRY (disorganized)
Disorganized: BCC, SCC, MM
Cancers on occasion manifest an organized pattern

• Nodular MM / MM on sun damaged skin
  – blue, black, gray

• Spitzoid MM
  – negative network or starburst pattern

• Amelanotic cancers (BCC, KA, MM)
  – SWS, vessels, ulceration
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Nodular
- Desmoplastic
- Nevoid
- Nevoid with conventional SSMM features
- Nevoid with nevus-like features
- Nodular
- Non-nodular
- Verrucous
- Verrucous MM
- Collision: MM with SK
- MM in children
- MM on chronic sun damaged skin
- Other
- Spitzoid
- Pigmented
- Amelanotic
- Associated with LM
- Pure (clinically)
- Nevoid
- Epidermotropic metastatic
- Pigmented
- Amelanotic
- Nodular
- Non-nodular
- Facial skin
- Non-facial skin
• Up to 2/3 of melanomas fail to manifest clinical morphologic features to aid in their detection (lack ABCD)

• Dermoscopy has been the beacon in helping to define the morphologic features of subsets of melanoma that were routinely being missed on clinical examination
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Nodular
- Desmoplastic
- Nevoid
- Epidermotropic metastatic
- Verrucous
- Verrucoid: MM with SK
- MM on chronic sun damaged skin
- MM in children
- Non-facial skin
- Facial skin
- Other

- Pure (clinically)
- Associated with LM
- Nevoid with conventional SSMM features
- Nevoid with nevus-like features
- Nodular
- Amelanotic
- Non-nodular
Difficult to diagnose melanomas

Pigmented
Amelanotic

Nodular

Desmoplastic
Associated with LM

Nevoid with conventional SSMM features
Nevoid with nevus-like features

Verrucous
Collision: MM with SK

Verrucous MM

Epidermotropic metastatic

Spitzoid
MM in children

Facial skin
Non-facial skin

MM on chronic sun damaged skin

Other

Pigmented
Amelanotic
Dermoscopic features of Nodular Melanoma

They lack features of BCC, banal nevi & SK

<table>
<thead>
<tr>
<th>Pigmented</th>
<th>Amelanotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Network</td>
<td>- Arborizing vessels</td>
</tr>
<tr>
<td>- Streaks</td>
<td>- Comma vessels</td>
</tr>
<tr>
<td>- Regression</td>
<td></td>
</tr>
<tr>
<td>+ Symmetry</td>
<td>+ Symmetry</td>
</tr>
<tr>
<td>+ BWV</td>
<td>+ Atypical vessels</td>
</tr>
<tr>
<td>+ Blue/Black color</td>
<td>+ Crystalline structures</td>
</tr>
<tr>
<td>+ Multi-colored</td>
<td></td>
</tr>
<tr>
<td>+ Atypical vessels</td>
<td></td>
</tr>
</tbody>
</table>
Pigmented

- Network
- Streaks
- Regression
+ Symmetry
+ BWV
+ Blue/Black color
+ Multi-colored
+ Atypical vessels
Difficult to diagnose melanomas

- Pigmented
  - Amelanotic
  - Nodular
  - Associated with LM
- Desmoplastic
- Nevoid
  - Nevoid with conventional SSMM features
  - Nevoid with nevus-like features
- Verrucous
  - Verrucous MM
  - Collision: MM with SK
- Epidermotropic metastatic
  - Pigmented
  - Amelanotic
- Other
  - Spitzoid
  - MM in children
- Nodular
  - Pigmented
  - Amelanotic
- MM on chronic sun damaged skin
- Non-facial skin
- Facial skin
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*They lack features of BCC, banal nevi & SK*

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Amelanotic

- Arborizing vessels
- Comma vessels

+ Symmetry
+ Atypical vessels
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Difficult to diagnose melanomas

- Desmoplastic
  - Pure (clinically)
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- Amelanotic

Other

Facial skin
- MM on chronic sun damaged skin
Non-facial skin
- Pigmented
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Difficult to diagnose melanomas

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- Facial skin
- Non-facial skin

Other conditions:
- MM in children
- Spitzoid MM
- Verrucous MM
- Collision: MM with SK
- Pigmented
- Amelanotic
- Epidermotropic metastatic
- Verrucous
- Pigmented
- Amelanotic
- Other

Diagnosis:
- Difficult to diagnose melanomas
Difficult to diagnose melanomas

- Pigmented
  - Nodular
    - Amelanotic
  - Nevoid
    - Pure (clinically)
      - Associated with LM
    - Nevoid with conventional SSMM features
    - Nevoid with nevus-like features
  - Amelanotic
    - Nodular
    - Non-nodular

- Amelanotic
- Nodular
  - Desmoplastic

- Verrucous
  - MM in children
- Verrucous MM
  - Collision: MM with SK

- Spitzoid

- Other
  - MM on chronic sun damaged skin
  - Nevoid with conventional SSMM features

- Facial skin
  - MM on chronic sun damaged skin
- Non-facial skin
  - MM in children
  - Collision: MM with SK

- Pigmented
  - Epidermotropic metastatic

- Amelanotic
  - Nodular
  - Non-nodular

- Other
Circle within a circle (isobar)

Serpentine and tortuous vessels
Difficult to diagnose melanomas

- Nevoid
  - Nevoid with conventional SSMM features
  - Nevoid with nevus-like features
- Pigmented
  - Spitzoid
    - MM in children
- Verrucous
  - MM on chronic sun damaged skin
  - Verrucous MM
    - Collision: MM with SK
- Epidermotropic metastatic
- Amelanotic
  - Nodular
    - Associated with LM
- Other
  - MM on chronic sun damaged skin
  - Pigmented
    - Pure (clinically)
  - Desmoplastic
    - Associated with LM
- Amelanotic
  - Nodular
    - Non-nodular

Facial skin
- Non-facial skin
Polymorphous vessels
Milky red globules
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Epidermotropic metastatic
- Verrucous
  - MM on chronic sun damaged skin
  - Verrucous MM
    - Collision: MM with SK
  - Other
    - MM in children

Other

Nodular
- Pigmented
- Amelanotic

Desmoplastic
- Pure (clinically)
  - Associated with LM

Nevoid
- Nevoid with conventional SSMM features
- Nevoid with nevus-like features

Facial skin
- MM on chronic sun damaged skin
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Non-facial skin
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- Nevoid
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Verrucous
- MM on chronic sun damaged skin
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- Amelanotic
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- Non-nodular
- Facial skin
- Non-facial skin

Other
Dermoscopic features of Nodular Amelanotic Melanoma

**Amelanotic**
- Arborizing vessels
- Comma vessels

**+** Symmetry
**+** Atypical vessels
**+** Crystalline structures

*Already Discussed*
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Nodular
- Desmoplastic
- Nevoid
- Other

Facial skin
- MM on chronic sun damaged skin
  - Verrucous MM
  - Collision: MM with SK
  - Epidermotropic metastatic

Non-facial skin
- MM in children
  - Spitzoid
  - Amelanotic

- Amelanotic
  - Nodular
  - Non-nodal

- Pure (clinically)
  - Associated with LM

- Nevoid
  - With conventional SSMM features
  - With nevus-like features

- Other
The Blink sign
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Nodular
- Amelanotic
- Desmoplastic
- Pure (clinically)
- Associated with LM
- Nevoid with conventional SSMM features
- Nevoid with nevus-like features
- Nevoid
- Amelanotic
- Nodular
- Non-nodular
- Verrucous
- Verrucous MM
- Verrucous MM, collision: MM with SK
- Spitzoid
- Pigmented
- Amelanotic
- MM in children
- MM on chronic sun damaged skin
- Facial skin
- Non-facial skin
- Epidermotropic metastatic
- Other
# Dermoscopic patterns of melanoma metastases: interobserver consistency and accuracy for metastasis recognition

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue naevus-like</td>
<td>Homogeneous diffuse grey-blue to grey-black or grey-brownish pigmentation indistinguishable from blue naevus</td>
</tr>
<tr>
<td>Globular naevus-like</td>
<td>Aggregation of brown to black or bluish globules. Some reddish globules may be present. If all the globules are reddish, an angioma-like pattern is considered. Atypical vessels can be present</td>
</tr>
<tr>
<td>Nonglobular naevus-like</td>
<td>Homogeneous brown pigmentation that can be associated with multiple blue-grey dots or atypical vessels</td>
</tr>
<tr>
<td>Angioma-like</td>
<td>Homogeneous reddish or purplish coloration and/or lacunae with a red, red-blue, purplish or nearly black hue separated from each other by whitish septa. If vessels are present, it is classified as a vascular pattern. Pink homogeneous areas are a</td>
</tr>
<tr>
<td>Vascular</td>
<td>Three or more atypical vessels, where the vessel component is predominant</td>
</tr>
<tr>
<td>Unspecific</td>
<td>Presence of fewer (&lt; 3)</td>
</tr>
</tbody>
</table>

![Image of dermatoscopic patterns](image-url)
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Nodular
  - Pigmented
  - Amelanotic
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  - Pure (clinically)
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- Other
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  - MM in children
- Facial skin
- Non-facial skin

Other:
- Pigmented
- Amelanotic
- Nodular
- Non-nodular
CONCLUSIONS AND RELEVANCE  
Seborrheic keratosis–like melanomas can be dermoscopically challenging, but the presence of the blue-black sign, pigment network, pseudopods or streaks, and/or blue-white veil, despite the presence of other SK features, allows the correct diagnosis of most of the difficult melanoma cases.

- Blue-black color
- Network
- Streaks
- Blue-white veil
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Nodular
- Desmoplastic
- Nevoid
- Verrucous
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Other

- Pure (clinically)
- Associated with LM
- Nevoid with conventional SSMM features
- Nevoid with nevus like features
- Nodular
- Non-nodular

Facial skin
Non-facial skin
Difficult to diagnose melanomas

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- Other

Facial skin
- MM on chronic sun damaged skin
- MM in children
- Verrucous MM
- Collision: MM with SK

Non-facial skin
- Pigmented
- Amelanotic

Additional information:
- Pure (clinically)
- Associated with LM
- Nevoid with conventional SSMM features
- Nevoid with nevus-like features
- Nodular
- Non-nodular
Rhomboidal structure

Wavy angulated lines (incomplete rhomboidal structures)
Difficult to diagnose melanomas

- Pigmented
- Amelanotic
- Nodular
- Desmoplastic
- Nevoid
  - with conventional SSMM features
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  - Collision: MM with SK
- Spitzoid
- Other
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- Amelanotic
- Non-facial skin
- MM on chronic sun damaged skin
- Non-facial skin
Polygonal structures
Difficult to diagnose melanomas

- Pigmented
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- Epidermotropic metastatic
- Verrucous
- Verrucous MM
- Collison: MM with SK
- Pigmented
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- Other
  - Spitzoid
  - MM in children
- Nodular
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  - Amelanotic
- Desmoplastic
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  - Associated with LM
- Nevoid
  - Nevoid with conventional SSMM features
  - Nevoid with nevus like features
- Amelanotic
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  - Non-nodular
- MM on chronic sun damaged skin
- MM on facial skin
- MM on non-facial skin

Other

- Pigmented
- Amelanotic
- Epidermotropic metastatic
- Verrucous
- Verrucous MM
- Collision: MM with SK
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Difficult to diagnose melanomas

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- Nodular
- Amelanotic (clinically)
- Pure (associated with LM)
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- Nevoid
- Nevoid with conventional SSMM features
- Nevoid with nevus-like features
- Verrucous
- Verrucous MM
- Verrucous MM with SK collision
- Epidermotropic metastatic
- Pigmented
- Amelanotic
- Nodular
g
n
t Amelanotic
M in children
M in children
Faced skin
Faced skin
Nital skin
Nital skin
Difficult to diagnose melanomas tend to be symmetric & have one of the following dermoscopic features:

- Starburst pattern
- Blue-black or gray color
- White structures
- Negative network
- Vessels/Ulceration
Organized lesion with Starburst Pattern or with any of the following features:
1. Blue-black-gray color
2. SWS
3. Negative network
4. Vessels
5. Ulceration/erosions
Blue, black, &...
Organized lesion with Starburst Pattern or with any of the following features:
1. Blue-black-gray color
2. SWS
3. Negative network
4. Vessels
5. Ulceration/erosions

...gray color
Shiny white structures (PD)
White circles (PD or NPD)
Organized lesion with Starburst Pattern or with any of the following features:
1. Blue-black-gray color
2. SWS
3. Negative network
4. Vessels
5. Ulceration/erosions

Negative network
Vessels

Organized lesion with Starburst Pattern or with any of the following features:
1. Blue-black-gray color
2. SWS
3. Negative network
4. Vessels
5. Ulceration/erosions
Ulceration
The majority of these “other” lesions are:

Nevi in general should be monitored (self/clinician/app)
## 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>
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![ROC Curve](image.png)
TADA results by lesion type and dermoscopic training

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coding</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
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<tr>
<td></td>
<td></td>
<td>Estimate (95% CI)</td>
<td>P-value</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td>94.6 (93.4—95.7)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>72.5 (70.1—74.7)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMM</td>
<td></td>
<td>95.6 (91.5 -99.8)</td>
<td>0.942</td>
</tr>
<tr>
<td>BCC</td>
<td></td>
<td>95.2 (92.9 -97.6)</td>
<td>0.651</td>
</tr>
<tr>
<td>MM</td>
<td></td>
<td>94.4 (92.3 -96.6)</td>
<td>0.251</td>
</tr>
<tr>
<td>NM</td>
<td></td>
<td>91.6 (88.2 -95.1)</td>
<td>0.020</td>
</tr>
<tr>
<td>SCC</td>
<td></td>
<td>95.7 (93.8 -97.7)</td>
<td>—</td>
</tr>
<tr>
<td>Previous Dermoscopy Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>93.6 (91.8—95.5)</td>
<td>—</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>95.4 (94.8—99.6)</td>
<td>0.14</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angioma</td>
<td></td>
<td>76.4 (72.6—80.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CCA</td>
<td></td>
<td>39.1 (37.0—41.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DF</td>
<td></td>
<td>93.6 (90.0—98.1)</td>
<td>&lt;0.001</td>
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<tr>
<td>Nevus</td>
<td></td>
<td>69.4 (67.0—71.9)</td>
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<tr>
<td>SK</td>
<td></td>
<td>82.9 (79.2—86.7)</td>
<td>&lt;0.001</td>
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Abbreviations: AMM, amelanotic melanoma; BCC, basal cell carcinoma; MM, malignant melanoma; NM, nodular melanoma; SCC, squamous cell carcinoma; CCA, clear cell acanthoma; DF, dermatofibroma; SK, seborrheic keratosis.
Thank you

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

—Neville Davis, MD