FEATURE ARTICLE

NCPD 2.0 Contact Hours

Dermoscopy for Nurse Practitioners

Introduction to Dermoscopy

Kaylyn Bourne

ABSTRACT: Dermoscopy refers to the examination of skin by use of a dermatoscope. These devices provide a practical, noninvasive, painless, and incredibly detailed view of the skin. When used in the hands of a trained clinician, dermoscopy significantly increases diagnostic accuracy. Although most known for its role in pigmented lesion assessment, dermoscopy use has expanded to include the evaluation of nonpigmented lesions, conditions of the hair (trichoscopy), infestations (entomodermatoscopy), nail disease (onychoscopy), and cutaneous inflammatory disease (inflammatoscopy). Studies suggest that dermoscopy is valuable as it increases sensitivity for skin cancer detection. This is especially important in the setting of melanoma as it accounts for most skin-cancer-related deaths. Overall, utilization enhances diagnosis, prompts treatment, reduces morbidity and mortality, and increases healthcare cost-effectiveness. This article is written with the intent to inform dermatology nurse practitioners about this innovation. It may additionally serve as a useful resource for other advanced care providers who perform cutaneous assessment. Examples of such clinicians may include, but are not limited to, urgent care providers, pediatricians, dentists, podiatrists, and primary care providers.

Key words: Dermoscopy, Dermatoscope, Skin Cancer, Nurse Practitioner

The birth of dermoscopy dates to 1655, far before the emergence of dermatology as a science (Buch & Criton, 2021; Khopkar, 2020). Initially used for inspection of nail bed capillaries, the contributions of scientists over centuries have led to the evolution of dermoscopy as an independent, dynamic field of study (Buch & Criton, 2021). Today, dermoscopy is known as a practical, noninvasive, diagnostic technique used to assess the skin in detail. It involves use of a handheld device, known as a dermatoscope. These devices are widely available in a variety of styles with basic and advanced features. With training and practice, dermatoscopes allow clinicians to observe features invisible to the naked eye. These features hold both clinical and histological significance, making them important in the diagnosis and management of cutaneous diseases (Campos-do-Carmo & Ramos-e-Silva, 2008).

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NONPOLARIZED VERSUS POLARIZED VERSUS HYBRID DERMATOSCOPES

The basic principle of dermoscopy is transillumination coupled with high-power magnification. Nonpolarized, polarized, and hybrid dermatoscopes are available to achieve optimal visualization. These devices range in price from just under $300 to $1,495 on average. Cost is dependent on style, size, lighting, infection prevention features, polarization, optics, battery life, camera capability, and smartphone adaptability.

Nonpolarized devices (NPDs) require what is known as interface fluid between the skin and scope lens. This medium eliminates the skin's reflective surface, thus allowing for a clearer view (Benvenuto-Andrade et al., 2007; Khopkar, 2020). Examples of interface fluids include ultrasound gel and isopropyl alcohol. NPD allows the observer to visualize structures within the outermost layer of the skin including scale, milia-like cysts, and comedo-like openings (Benvenuto-Andrade et al., 2007; Khopkar, 2020; Yelamos et al., 2019). Polarized dermatoscopes (PDs) do not require an interface fluid and are useful in viewing deeper structures within the skin such as crystalline structures, blood vessels, and dermal pigmentation (Khopkar, 2020; Yelamos et al., 2019). Finally, hybrid dermatoscopes are available. These allow the user to toggle between nonpolarized and

polarized light. Toggling provides complementary information by displaying detail within the superficial and deep layers of the skin (Benvenuto-Andrade et al., 2007; Khopkar, 2020). This detail, combined with clinical context and physical assessment, can enhance diagnostic accuracy and promote clinician confidence.

Figure 1 represents the side-by-side comparison of a seborrheic keratosis viewed under PD and NPD. Note the presence of round, whitish structures that shine brightly under NPD. These structures are milia-like cysts that histologically correspond to superficial intraepidermal keratin-filled cysts (Jaimes & Marghoob, 2017). Under PD, these structures are not visible.

Figure 2 represents the side-by-side comparison of melanoma viewed under PD and NPD. Observe the presence of confluent blue discoloration with a white haze under NPD. Histologically, this dermoscopic structure represents superficial clustering of heavily pigmented cells and orthokeratosis (Jaimes & Marghoob, 2017). With the use of PD alone, this finding is not visualized.

Figure 3 represents the side-by-side comparison of another melanoma viewed under PD versus an NPD. Note the presence of parallel, shiny white streaks under PD as identified by the red arrows. Histologically, these dermoscopic structures represent increased collagen at the superficial dermis (Jaimes & Marghoob, 2017). Utilizing NPD alone does not allow for this visualization.

INDICATIONS FOR DERMOSCOPY

Dermoscopy is appropriate in any setting in which closer cutaneous examination is indicated. Patients may present in clinic with a subjective complaint such as "this spot has grown rapidly and bleeds often." Dermoscopy can be used in this situation to enhance assessment, thus creating a more accurate differential diagnosis. This may lead to biopsy, lesion surveillance, or patient reassurance. During skin cancer screenings, or other nondermatologic physical examinations, a lesion may appear concerning on initial inspection. For example, a large and irregular black patch may be noted on a patient's back while listening to lung sounds. Dermoscopy can be used in this situation to determine if a referral or biopsy is needed. In addition, collision lesions (i.e., basal cell carcinoma and a seborrheic keratosis) can be better identified, and suspicious foci in otherwise normal-appearing lesions may be revealed (i.e., melanoma occurring within a congenital nevus) with dermoscopy (Yelemos et al., 2019). Finally, although most known for its role in lesion assessment, dermoscopy can also be applied in the setting of hair conditions (trichoscopy), cutaneous infestations (entomodermatoscopy), nail disease (onychoscopy), and inflammatory disease of the skin (inflammatoscopy).

ADVANTAGES OF DERMOSCOPY

There are benefits to dermoscopy for patients and clinicians alike. Use of this diagnostic tool helps differentiate melanocytic lesions from nonmelanocytic lesions. The term melanocytic refers to lesions that are produced by melanocytes such as acquired nevi, blue nevi, Spitz nevi, atypical nevi, and melanoma (Marghoob et al., 2013). In contrast, nonmelanocytic lesions include other pathologies such as sebaceous gland hyperplasia, squamous cell carcinoma, and clear cell acanthoma.

Dermoscopy may help differentiate benign from malignant skin lesions. When malignant lesions are identified with dermoscopy, they are often detected at much earlier

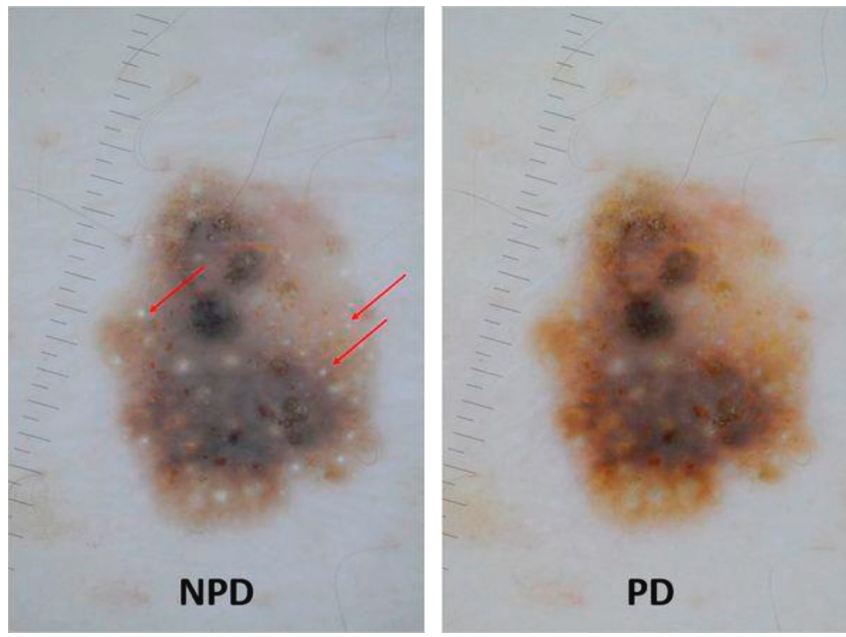


FIGURE 1. Seborrheic keratosis visualized under nonpolarized and polarized dermoscopy. Images courtesy of Dermoscopedia.

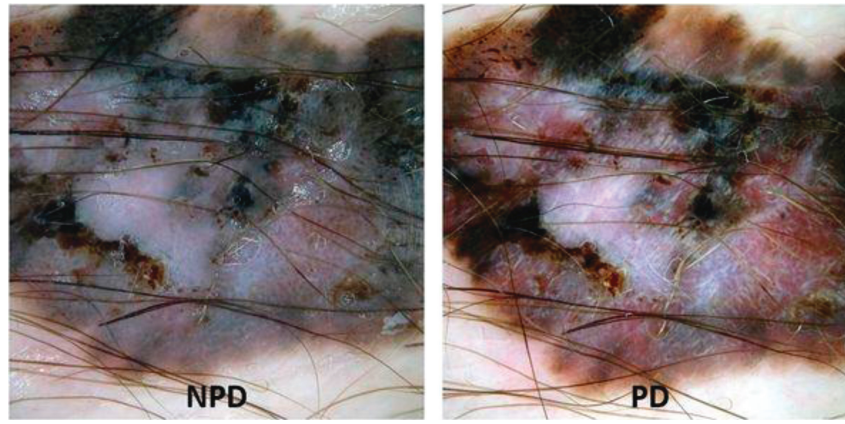


FIGURE 2. Melanoma visualized under nonpolarized and polarized dermoscopy. Images courtesy of Dermoscopedia.

stages. This presents an opportunity for early diagnosis and promotion of better patient outcomes. This benefit is particularly important in the setting of melanoma, as it accounts for most skin-cancer-related deaths. Per Marghoob et al. (2013), by integrating dermoscopy into practice, diagnostic accuracy, sensitivity, and specificity for the diagnosis of melanoma can be improved. Dr. Marghoob et al. (2013) states that primary care physicians can reduce their referral rate, or benign-to-malignant excision ratio, from 9.5 to 3.5 when trained to use dermoscopy. These providers can also improve their accuracy in identifying suspicious lesions from 54% without dermoscopy to 76%–79% (Marghoob et al., 2013).

Another advantage of dermoscopy includes the ability to monitor lesions with digital surveillance. When this is performed, photography is utilized in capturing the view displayed on dermoscopy. These images can be saved and labeled within the patient's chart for future review. This is often useful in the management of pediatric nevi or in patients who have numerous nevi. Dermoscopy is a tool that reduces unnecessary referrals and biopsies, creates an an opportunity to reduce health care spending, and promotes patient quality of life by eliminating biopsy associated complications (i.e., infection), restrictions (i.e., exercise or travel), and undesirable expectations (i.e., scarring). Other benefits of dermoscopy include the promotion of clinician confidence in their diagnoses, patient reassurance, and opportunities for patient education (Marghoob et al., 2013).

LIMITATIONS OF DERMOSCOPY

Although dermoscopy improves diagnostic accuracy, it is important to understand that it is a tool used for screening purposes only. History, clinical appearance, and lesion

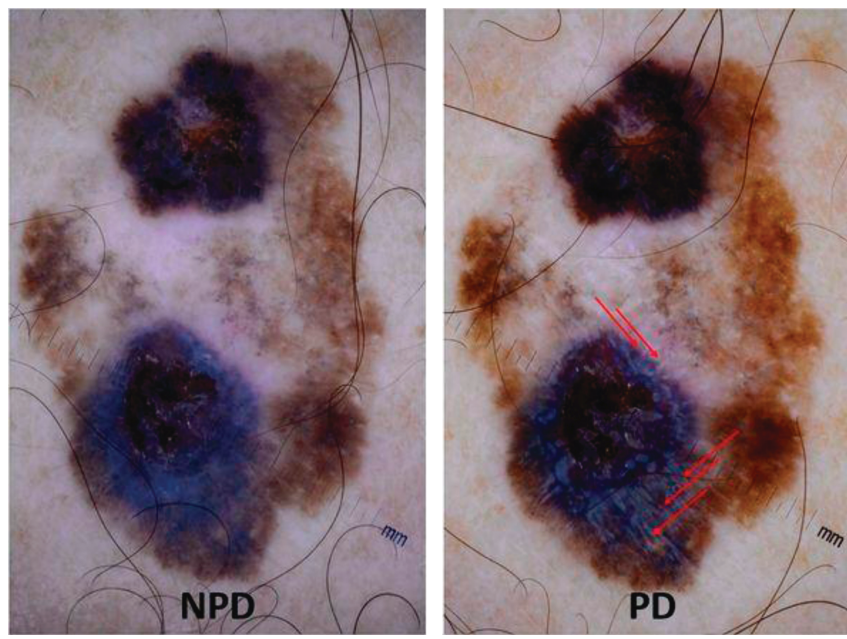


FIGURE 3. Melanoma visualized under nonpolarized and polarized dermoscopy. Images courtesy of Dermoscopedia.

symptoms remain important despite dermoscopic picture alone. For this reason, it is critical to recognize that dermoscopy is not a substitution for histopathologic evaluation (Skvara et al., 2005). Biopsy with subsequent histological correlation remains the gold standard for cutaneous diagnosis (Skvara et al., 2005). It is also important to note that accuracy is user dependent. Therefore, training and continuous education are advised. Reduced diagnostic accuracy can occur if the healthcare provider does not recognize or incorrectly interprets the dermoscopic observations (Marghoob et al., 2013).

TERMINOLOGY FOR THE NOVICE DERMOSCOPIST

Dermoscopy involves the acquisition of a dermoscopic vocabulary. This article offers the basics and aims to introduce readers to this language. First, the concept of color will be reviewed. Color, perhaps a seemingly simple observation, is important for the dermoscopist to take note of. It represents the location of melanin deposition and is a clue to determining lesion type and cutaneous involvement. The colors seen with dermoscopy include black, brown, gray, blue, white, yellow, and red (Jaimes & Marghoob, 2017). Table 1 illustrates histopathological correlation to color.

Dermoscopic Structures

Dermoscopic structures must also be understood to accurately describe and assess lesions. These structures have direct histopathologic correlations; therefore, recognition of such features must be acquired to diagnose and manage lesions Table 2 details and illustrates dermascopic structure and histopathological correlation.

Dermoscopic Algorithms

Time and training are necessary to incorporate dermoscopy into clinical practice. Although an experienced dermoscopist may simultaneously appraise lesion structures quickly, new users may wish to review algorithms to triage lesions for treatment and evaluation (Wolner et al., 2018).

Two-Step Algorithm

The two-step dermoscopy algorithm is easy to follow and an outstanding resource for the novice dermoscopist. Step 1 involves deciding if the lesion is melanocytic or nonmelanocytic based on dermoscopic criteria. Step 2 of the algorithm involves further evaluation of melanocytic lesions only. On the basis of dermoscopic evaluation, one will determine whether the lesion is benign, suspicious, or malignant. The decision to then monitor, biopsy, or refer is made (Figure 4).

The Triage Amalgamated Dermoscopic Algorithm

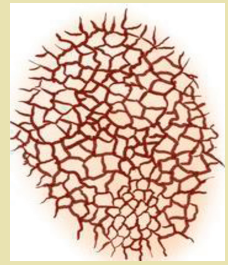
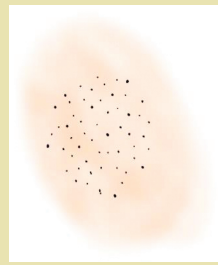
The Triage Amalgamated Dermoscopic Algorithm (TADA) is an additional algorithm available to consider in the management and decision making of lesions (Figure 5). TADA elaborates on the previously discussed two-step algorithm. Of note, its application is for lesions on nonglabrous skin

TABLE 1. Histopathological Correlation to Color

Color	Histopathological Correlation
Black	Melanin in the epidermis or dermis with or without dermal involvement
Brown	Melanin below the stratum corneum. Its level will determine color intensity.
Gray	Free melanin or melanin within the papillary dermis
Blue	Melanin in the deep dermis
White	Collagenous stroma with paucity of melanin and blood
Yellow	Keratin devoid of melanin and blood. Also seen in lesions of sebaceous differentiation.
Red	Blood in the vessels

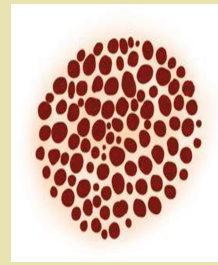
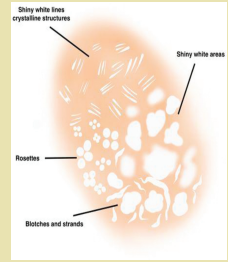
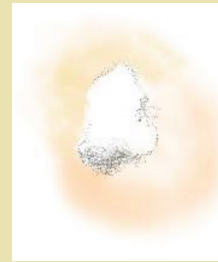
Note. Adapted from Jaimes and Marghoob (2017).

TABLE 2. Introduction to Basic Dermoscopic Structures

Structure and Histopathological Correlation	Schematic View	
	Regular pigment network	Atypical pigment network
1. Pigment network: consists of intersecting lines and holes. The lines are honeycomb-like and correspond to increased pigmentation along the elongated rete ridges. The holes within the network represent suprapapillary plates. Pigment networks can be regular or atypical. Atypical networks display variegation in line thickness, color, and size. Such findings are present in dysplastic nevi and melanoma (Dermoscopedia.org, 2020).		
2. Negative network: interconnecting hypopigmented lines that surround irregularly shaped pigmented structures. Note that pigmented structures are curvilinear. This may be related to bridging of rete ridges or compression of rete ridges because of large nests in the papillary dermis (Jaimes & Marghoob, 2017).		
3. Angulated lines: geometrical lines in a zigzag pattern. These lines may form polygon-like shapes, also referred to as rhomboids. Angulated lines are consistent with a flattened dermoepidermal junction (DEJ) and fewer and more blunted rete pegs (Dermoscopedia, 2020; Vanden Daelen et al., 2016).		
4. Dots/granules: free melanin or melanin within the papillary dermis. Color may vary from brown, black, gray, blue to red (Dermoscopedia.org, 2020).		

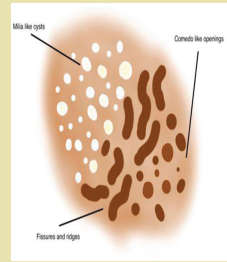
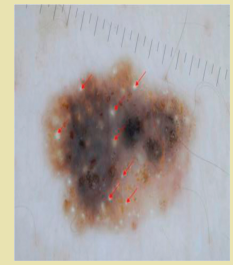
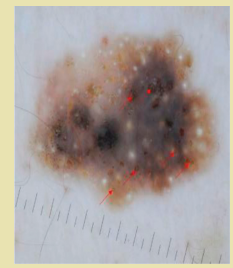
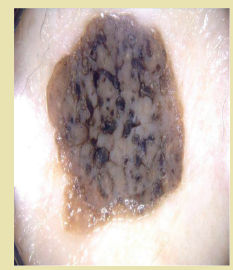
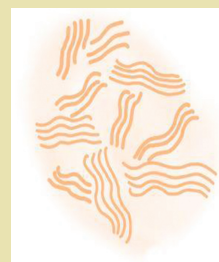
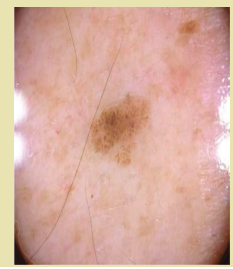
(continues)

TABLE 2. Introduction to Basic Dermoscopic Structures, Continued

Structure and Histopathological Correlation	Schematic View		
5. Globules: clustered, well-demarcated, round and/or oval structures representing nests of nevomelanocytes at the DEJ or dermis. Globules may be tan, brown, blue, or white (Jaimes & Marghoob, 2017).			
6. Streaks: represent melanin in the deep dermis. Histologically, streaks reveal the radial growth phase of a melanocytic tumor (Dermoscopedia.org, 2020).			
7. Shiny white structures: only observed beneath polarized light on dermoscopy. Shiny white formations represent collagenous stromal alteration and fibrosis (Dermoscopedia.org, 2020). Examples include shiny white lines, shiny white areas, rosettes, blotches, and strands as pictured on the right.			
8. White circles: white/yellow round structures representative of horn pearls within the dermis. Such structures are typically seen in well-differentiated keratinizing tumors (Jaimes & Marghoob, 2017).			
9. Regression structures: indicate that the lesion is evolving, most often into a malignant state.	Scar-like depigmentation: corresponds to fibrosis. The bony white depigmentation will be lighter than the surrounding skin (Jaimes & Marghoob, 2017). 	Granularity/peppering: correlates with melanin in the superficial dermis. It has been likened to sprinkled pepper because of its presentation and blue–gray coloration (Jaimes & Marghoob, 2017). 	Blue–white veil: presents as confluent blue pigmentation. It corresponds to an aggregation of heavily pigmented cells or melanin in the dermis. Orthokeratosis is also noted (Dermoscopedia.org, 2020). 

(continues)

TABLE 2. Introduction to Basic Dermoscopic Structures, Continued

Structure and Histopathological Correlation		Schematic View
10. Milia-like cysts: most often observed as round whitish or yellowish structures likened to "stars in the sky." They correspond to intraepidermal keratin horn pseudocysts (Minagawa, 2017).		
11. Comedo-like openings: round-to-ovoid craters that have black or brown comedo-like plugs. Histologically, they correlate with keratin-filled invaginations of the skin surface (Dermoscopedia.org, 2023).	See Schematic 10	
12. Fissures and ridges: dark, linear comedo-like openings that manifest as linear-to-curvilinear structures within the lesion. They represent deep invaginations of the epidermis, filled with keratin (Dermoscopedia.org, 2023).	See Schematic 10	
Fingerprint-like structures: fine lines running in a parallel distribution reminiscent of fingerprints that correspond to ridges (Dermoscopedia.org, 2023).		

Note. Adapted from Jaimes and Marghoob (2017). Images courtesy of Dermoscopedia (Dermoscopedia.com).

only. To utilize the TADA method, the clinician must be proficient in recognition of organized versus disorganized colors, structures, and patterns. In addition, they must be able to accurately recognize shiny white structures, vascular structures, blue–black or gray color, and ulceration (Jaimes & Marghoob, 2017). TADA Step 1 involves determining

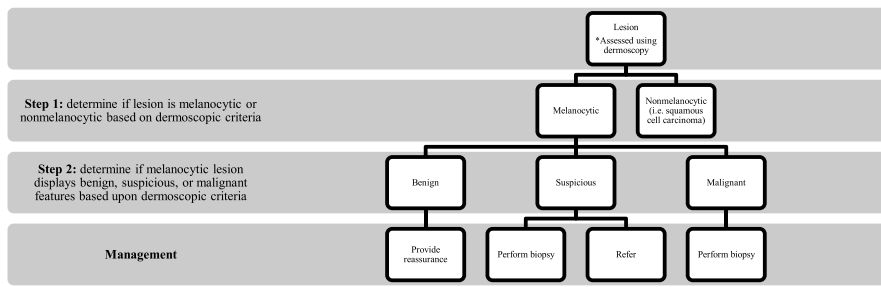


FIGURE 4. The two-step algorithm for dermoscopy. Adapted from Marghoob et al. (2017).

whether the lesion is undeniably benign based on clinical observation and dermoscopic assessment. Toggling between NPD and PD may be necessary to reach this conclusion. If the lesion is unequivocally benign, monitoring or reassurance can be advised. Under this circumstance the patient should be educated on the importance of self-monitoring and provider notification of changes in appearance or symptom.

If the lesion does not meet undeniably benign criteria, the clinician will proceed to TADA Step 2. This step requires use of PD. It involves assessment of the lesion to determine if it displays an organized or disorganized pattern. In this application, disorganization refers to the asymmetric distribution of colors and structures. If in fact disorganized, the lesion should be biopsied, or the patient should be referred for expert management. If the lesion is deemed dermoscopically organized, the clinician should proceed to TADA Step 3. In TADA Step 3, the clinician must identify the presence of a starburst pattern, blue–black color, gray color, shiny white structures, white circles, a negative pigment network, vessels, or ulceration without trauma. Such findings should raise concern about malignancy, and a biopsy or referral is advised. If the lesion does not display such characteristics, short-term monitoring, long-term monitoring, or self-monitoring is acceptable (Jaimes & Marghoob, 2017). The patient should be educated on the importance of reporting changes in symptom or appearance.

Pattern Analysis

Depending on the pattern, clinicians can determine the best or most likely diagnosis. Figure 6 shows the most common patterns found in benign nevi, including intradermal nevi. Other lesions (i.e., melanoma, nonmelanoma skin cancer, seborrheic keratoses, sebaceous gland hyperplasia, angiomas) have their own unique characteristics that will not be reviewed within this article. Figure 6 describes and depicts the most common patterns found in benign nevi. To best interpret Figure 6, read left to right. Pattern description is followed by a schematic image with an example of its corresponding dermoscopic image.

CONCLUSION

This article has reviewed the fundamentals of dermoscopy. Although color, dermoscopic structures, and pattern analysis in benign nevi have been introduced, much remains

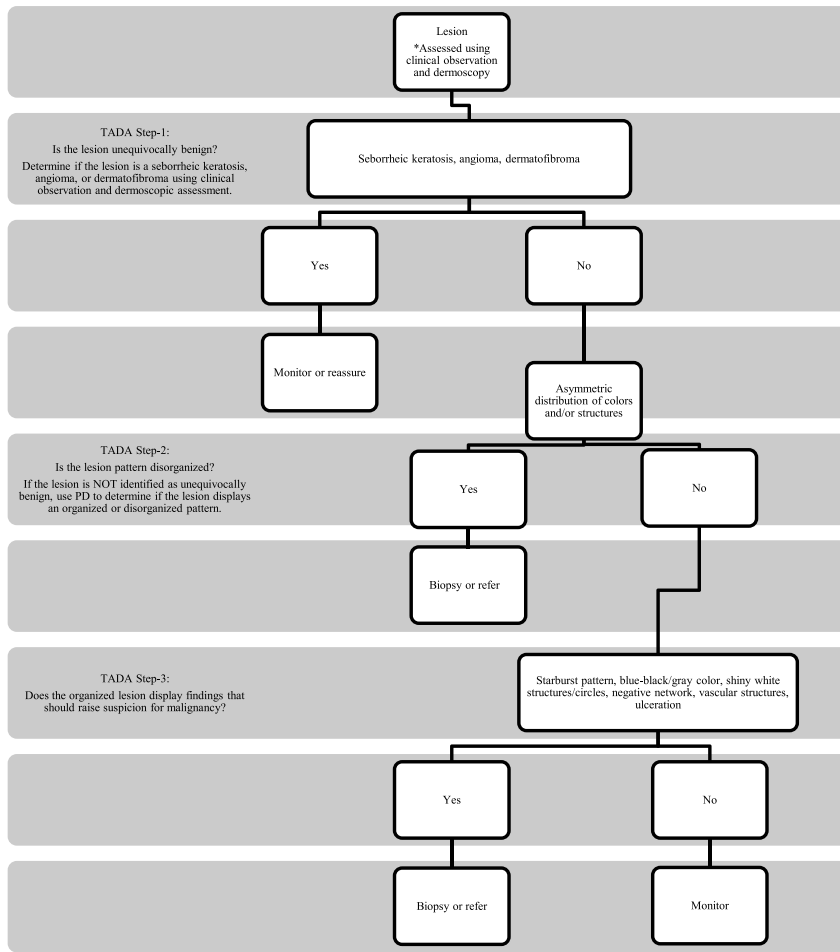


FIGURE 5. The Triage Amalgamated Dermoscopy Algorithm (TADA) for dermoscopy. Adapted from Jaimes and Marghoob (2017).

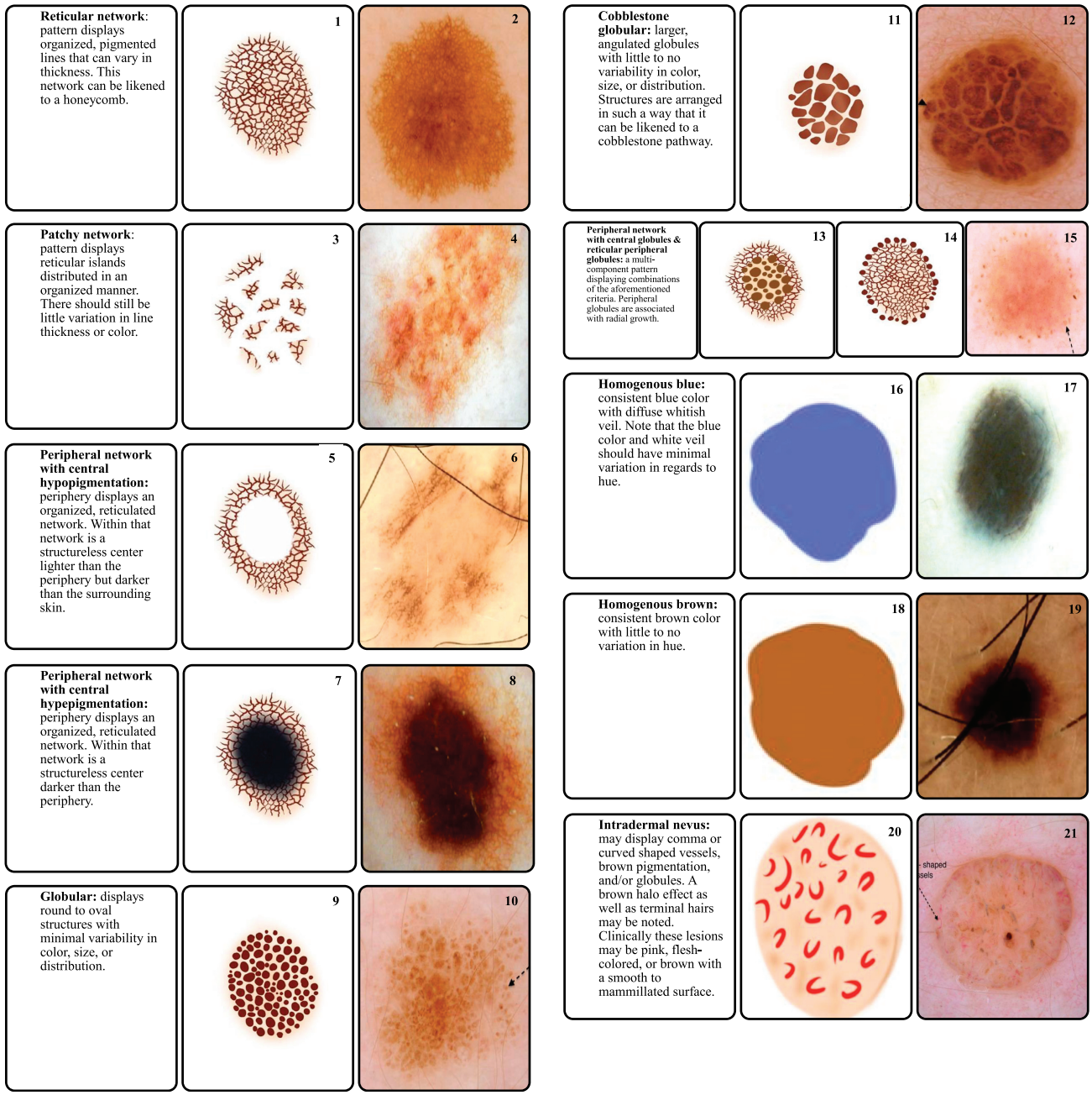


FIGURE 6. The most common patterns found in benign nevi. Adapted from Marghoob et al. (2013). Images 10, 12, 15, and 21 appear with permission from VisualDx (VisualDx.com). Images 1–3, 5, 7, 9, 11, 13, 14, 16, 18, and 20 courtesy of Dermoscopedia (Dermoscopedia.com). Images 4, 6, 8, 17, and 19 courtesy of ISIC Archive (isic-archive.com).

to be learned. This article is the first of what is intended to be a series that will introduce healthcare providers to the subject of dermoscopy. Training is encouraged, and it is recommended that readers utilize other resources including books, meetings, educational websites, and clinical practice to hone their dermoscopic skills. In this issue of the *Journal of the Dermatology Nurses' Association*, the following are recommended resources for training:

1. *Dermoscopy: The Essentials (3rd ed.)* by H. Peter Soyer, MD, FACD; Giuseppe Argenziano, MD; Ranier Hofmann-Wellenhof, MD; and Iris Zalaudek MD (ISBN-13: 978-0702068829)
2. American Dermoscopy Meeting by in-person or "live-stream" virtual attendance (https://americandermoscopy.com/2024/)

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This activity is also provider approved by the California Board of Registered Nursing, Provider Number CEP 11749 for 2.0 contact hours. Lippincott Professional Development is also an approved provider of continuing nursing education by the District of Columbia, Georgia, West Virginia, New Mexico, South Carolina, and Florida, CE Broker #50-1223. Your certificate is valid in all states.

Payment: The registration fee for this test is $10 for members; $20 for nonmembers.