

Malignant Melanoma or Compound Nevus: Distinguishing Malignant Melanoma in the Foot and Ankle

Richard W. Sieber, BS

Abstract

Pigmented lesions of the foot and ankle can be hard to distinguish. The difference in size, color, shape and texture can aid in a physician's suspicion, but biopsy remains the gold standard. Different sources have suggested specialized photography, laser therapy or immuno-injections; however, while less invasive, they may delay treatment or misrepresent the progression of the disease. Because malignant melanoma in the foot and ankle often carries a worse prognosis, this is especially troubling. Combined with other risk factors, early diagnosis and treatment become increasingly important. A case is presented of a 24-year-old Caucasian male with a suspicious pigmented lesion of the plantar foot. This case report illustrates the assessment, treatment and outcome of the patient.

Introduction

Distinguishing malignant melanoma from other more benign skin lesions can be problematic, especially since malignant melanoma is one of the most serious cutaneous neoplasms of the skin. While melanoma accounts for approximately 4% of all skin cancers, it is responsible for around 79% of all skin cancer deaths.¹ It is currently estimated that there will be 55,100 new cases and 7,910 deaths from malignant melanoma in 2004.²

Overall survival of all races remains around 90% at 5 years for malignant melanoma.² Early detection of the disease greatly enhances the prognosis, however Walsh et al., as well as several other authors, have associated a poorer survival rate with a diagnosis of primary melanoma of the foot.^{3,4} The foot not only carries a poorer prognosis once detected, but is often a site where melanoma is more likely misdiagnosed.³ It is hoped that this paper will emphasize the need for early, accurate detection of malignant melanoma even when clinical suspicion is low because of the poorer prognosis associated with primary melanoma of the foot and ankle.

Literature Review

Melanoma is a neoplasm that begins in the melanocytes, located in the epidermis. Melanocytes produce a skin pigment known as melanin, which is a tan or brown pigment that helps to protect the deeper layers of the skin from the harmful effects of the sun.¹ Once the melanocyte becomes neoplastic, it evolves through two stages. The first is the radial (horizontal) growth phase which is confined to the epidermis with minimal penetration into the papillary and reticular layers of the dermis.⁵ There is a disc like or circular enlargement of the lesion with relatively slow progression.⁶ The second stage is the vertical growth phase which is more aggressive and spreads at a faster rate. Possibility of metastasis is greater in this stage because of penetration into the dermis.⁵

There are four common anatomical growth patterns by which cutaneous melanoma are often classified. The first and most common is superficial spreading melanoma. This form usually arises from pre-existing nevi and can be located anywhere on the body. Prognosis is directly related to the duration that the primary lesion is present. Nodular melanoma is the second most common and is very aggressive with a purely vertical growth phase. Because of this, they are often elevated with a stalk or cauliflower appearance. The third type is known as lentigo maligna melanoma and appears most often on sun-exposed areas. This type is uncommon before the age of 50. There is often a prolonged horizontal growth phase associated with this type. Acral lentiginous melanoma is the fourth type and is primarily seen on the palms, soles or beneath the nail beds. This is not to say that all plantar melanomas are of the acral lentiginous type. Unlike the other types, acral lentiginous melanoma is more frequently seen in dark skinned individuals. Acral lentiginous melanomas have a greater tendency to ulcerate and tend to move more quickly into the vertical growth phase.^{5,7,8,9}

People with an increased risk of developing melanoma include: those with a family history of melanoma, (family history alone increases the risk 8 to 13 fold⁸), fair complexion, red or blonde hair, freckles, sun sensitivity or those who sunburn easily, exposure to tanning booths and immuno-suppressed patients.^{2,5} There are also increased risks to those with occupational

exposure to coal tar, pitch, creosote, arsenic compounds or radium. Common acquired and dysplastic nevi are also considered risk factors for melanoma.¹⁰ Previous melanomas also increase the risk of developing melanoma. In Fitzpatrick's dermatology text, he recognizes the mnemonic "MMRISK" to promote awareness.⁸ The mnemonic stands for:

- Moles: atypical
- Moles: greater than 50 common moles
- Red: red hair and freckles
- Inability: to tan (skin phototypes I and II)
- Sun: sunburn easily
- Kindred: family history

Patient education is also important in early detection of malignant melanoma, especially in those individuals with increased risk factors. The American Cancer Society recommends a cancer-related checkup, including skin examination every 3 years for people between 20 and 40 years of age and every year for anyone older than 40.¹ Patients should be made aware to look for any unusual sores, lumps, blemishes or markings on their skin. They should also be advised to regularly check any pigmented spots on their skin for changes according to the ABCDE criteria.^{2,5,7,11} The ABCDEs of melanoma are as follows:

- A = asymmetry
- B = border irregularity
- C = color variation
- D = diameter greater than 6mm
- E = elevation above the surrounding skin

While the ABCDE criteria is a good system to help determine suspected melanoma, a histological evaluation is essential for definitive diagnosis.⁵ A biopsy should be considered for any pigmented lesion that exhibits any of the ABCDE criteria. According to John et al., "A biopsy is also justified if a patient is concerned about the possibility of malignancy and cannot be

reasonably assured that the lesion is benign.⁷ Some feel the ABCDE criteria can possibly be improved upon clinically by the use of skin photography to observe lesion changes, however, there are varied views in the literature. In two separate trials conducted in Australia, there were opposing results for ratios of excised pigmented lesions to diagnoses of melanoma. In the more recent study, which contained greater randomized trials, English et al. concluded that the photography of pigmented skin lesions did not decrease the total number of benign skin lesions excised leading to diagnosis of melanoma.^{12,13} Other proposed methods for improving the sensitivity of the ABCDE criteria include the use of epiluminescence microscopy or dermoscopy. This allows for inspection of deeper layers of the skin (dermal-epidermal junction) by using a lighted hand lens with magnification capabilities. A Wood's lamp may also be used to accentuate epidermal hyperpigmentation.^{8,14}

Biopsy becomes important not only for diagnosis, but for staging of melanoma as well. Though the need to biopsy a lesion may seem obvious, certain types of malignant melanoma may initially be misdiagnosed up to 39% of the time.¹⁵ This can be problematic because early diagnosis and treatment lends to a better prognosis.⁷ Some of the more common pedal misdiagnoses associated with malignant melanoma include: warts, hyperkeratotic lesions, tinea pedis, fungal disorders, keratoacanthoma, non-healing ulcers, foreign bodies, infections, subungual hematomas, pyogenic granules, blisters, ganglionic cysts and benign nevi. Lesions may also be unnoticed by patients and disregarded by physicians, especially if they are not painful.³

While there is a staging system based on clinical appearance, it is imprecise in determining a patient's prognosis; therefore histological staging is more commonly used. For completeness, classification by clinical appearance is as follows⁵:

- Stage I: localized disease only
- Stage II: primary lesion with palpation of regional lymph nodes
- Stage III: widespread disseminated melanoma

Clark's level and Breslow's depth remain the classical histopathological staging systems for malignant melanoma. Clark et al. proposed a five-tiered system that was based upon invasion of the skin's tissue layers.⁹ Clark's classification is listed in Table 1. Breslow developed a similar staging system based upon the actual depth (in millimeters) of the tumor.^{16,17} There are four stages to this classification as illustrated in Table 2. There are inherent drawbacks to both systems, as John et al. points out. For example, some argue that distinctive dermal levels of the skin are difficult to distinguish, making Clark's levels biased. While others argue that poor histological preparation, i.e. shrinkage of tissue and tangential sectioning, exaggerate Breslow's stages.⁷

The American Joint Committee on Cancer has also proposed a staging system. Their hopes were to develop an internationally recognized staging system. This system is known as the TNM classification, standing for primary **T**umor, lymph **N**ode assessment, and **M**etastatic presence.¹⁸ This system not only combines Breslow's depth with Clark's level, but takes lymph node involvement and metastasis into account, which will more clearly predict prognosis.⁷ There are five stages to the TNM classification as shown in Tables 3 and 4.¹⁸

While prevention is always the best cure, total excision of the primary lesion is the gold standard of treatment for cutaneous melanoma, although there is debate as to which lesions and how much of the lesion should be biopsied. One concern is that dysplastic and congenital nevi do not simply increase the risk of acquiring melanoma, but are themselves precursors of malignant melanoma.¹⁹ There are statistics^{10,19,20} and counter arguments for both sides, including: lack of specific histological criteria in studies,¹⁹ overall percentage of dysplastic nevi being greater than melanoma and thus statistically more possible,⁶ to the realization that prophylactic removal of all nevi would be impossible in some individuals.²⁰ In the end, most seem to agree that pigmented lesions should be excised when they violate one of the ABCDE criteria.^{6,7,19,20}

John et al. suggest that for any lesion less than 0.76mm thick (confined to the epidermis) an excision with 1cm margins should be taken and for any lesion greater than 0.76mm thick, a margin of 3cm to 5cm should be taken. They also note that in both instances full thickness (to the

fascia) biopsies should be made. If an incisional biopsy is performed, where the total lesion is not excised, they recommend a suture be placed in the specimen and its orientation noted, should further excision be required at a later time.⁷

Treatment of malignant melanoma varies depending upon the stage. In earlier stages, wide excision or amputation is all that is needed to stop the advancement of melanoma, however as the stage increases, treatment becomes more difficult and survivability decreases.^{2,6} If a suspected lesion comes back positive for melanoma, consults with oncology and possibly plastic surgery are required, as regional lymph node dissection and full body radiographs, MRIs, or CT scans are often needed. Patients positive for melanoma will also need to be monitored periodically for recurrence, metastasis and new malignancies for the rest of their lives.^{5,8}

Future treatments for malignant melanoma include such modalities as vaccine therapy,²¹ the use of carbon dioxide lasers,²² cytokine therapy with interferon-alpha and interleukin-2, and molecular staging.¹ While some of these treatments show promising results, they are not fully understood and have not yet been thoroughly tested.

Case Report

A 24-year-old Caucasian male presents for evaluation of a lesion over the plantar aspect of his left foot. He first noticed the lesion a couple weeks before being seen. He denies any trauma, pain or complications associated with the area. Patient admits a positive family history of melanoma. His review of systems and physical exam were unremarkable except for a small hyperpigmented lesion measuring 7mm X 3mm on the plantar lateral aspect of his left foot near the base of the fifth metatarsal. The lesion exhibited asymmetrical, smooth, well-defined borders, with slight elevation from the surrounding skin. There was no color variation appreciated and the skin lines were intact (Figures [1](#) & [2](#)). No pain on palpation was present. A 4mm marginal punch biopsy was performed and sent to pathology for further analysis. Antibiotic ointment and a dry compressive dressing were then applied to the wound.

Discussion

Given the relatively young age of the patient, his positive family history for melanoma, the fact that the lesion was identified unexpectedly and exhibited asymmetry, elevation and diameter greater than 6mm, the physician was concerned. Early diagnosis was a main concern since melanoma of the foot have been shown to have a poorer prognosis.^{3,4,11} The patient was also apprehensive about the lesion because of his family history. A punch biopsy was preferred in this case due to the plantar location of the lesion. It was reasoned that if the pathology report should come back positive, plastic surgery would be consulted to obtain a significant margin, while allowing as little trauma to the plantar foot as possible. Fortunately the pathology reports revealed a compound nevus, despite the patient's risk factors and suspicious onset.

Conclusion

Malignant melanoma is a serious skin disease that can be particularly devastating when primarily diagnosed in the foot and ankle. Since prognosis of the disease is inversely proportional to the depth and duration of the tumor, it is important for early, accurate diagnosis and treatment.^{5,7,8} Hopefully this case illustrates the fact that podiatrists must continually be aware of the risk factors, signs and symptoms, prevention, prognosis and treatment options available when distinguishing malignant melanoma from other more benign skin lesions of the foot and ankle.

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Tables and Figures

Table 1

Clark's Level ^{7,9}
Level I: All neoplastic cells are above the basement membrane.
Level II: Neoplastic cells have broken through the basement membrane and extended into the papillary dermis, but not into the reticular dermis.
Level III: Neoplastic cells have reached the papillary-reticular junction.
Level IV: Neoplastic cells have penetrated the reticular dermis.
Level V: Neoplastic cells have invaded the subcutaneous tissue or beyond.

Table 2

Breslow's Depth ^{7,16,17}
Stage I: Neoplastic involvement less than 0.76mm thick.
Stage II: Neoplastic involvement between 0.76mm and 1.5mm thick.
Stage III: Neoplastic involvement between 1.6mm and 4.0mm thick.
Stage IV: Neoplastic involvement greater than 4.0mm thick

Table 3

American Joint Committee on Cancer ¹⁸		
Proposed TNM Classification		
Tumor Classification	Node Classification	Metastasis Classification
T1: ≤ 1.0mm a: without ulceration b: with ulceration or level IV or V	N1: One lymph node a: micrometastasis ^a b: macrometastasis ^b	M1: Distant skin, SQ, or lymph node metastases, Normal LDH
T2: 1.01-2.0mm a: without ulceration b: with ulceration	N2: 2-3 lymph nodes a: micrometastasis ^a b: macrometastasis ^b c: in-transit met(s)/satellite(s) <i>without</i> metastatic nodes	M2: Lung metastases, Normal LDH
T3: 2.01-4.0mm a: without ulceration	N3: 4 or greater metastatic lymph nodes, matted lymph	M3: All other visceral or any distant metastases, Elevated

b: with ulceration	nodes, or combinations of in-transit met(s)/satellite(s), or ulcerated melanoma <i>and</i> metastatic lymph node(s)	LDH
T4: > 4.0mm		
a: without ulceration		
b: with ulceration		

mets: metastases

^a micrometastases are diagnosed after elective or sentinel lymphadenectomy.

^b macrometastases are defined as clinically detectable lymph node metastases confirmed by therapeutic lymphadenectomy or when any lymph node metastasis exhibits gross extracapsular extension.

(From Balch et al.,¹⁸ with permission.)

Table 4

American Joint Committee on Cancer ¹⁸								
Proposed Stage Groupings for Cutaneous Melanoma								
Clinical Staging ^a				Pathologic Staging ^b				
<i>Stage 0</i>	Tis	N0	M0		<i>Stage 0</i>	Tis	N0	M0
<i>Stage IA</i>	T1a	N0	M0		<i>Stage IA</i>	T1a	N0	M0
<i>Stage IB</i>	T1b, T2b	N0	M0		<i>Stage IB</i>	T1b, T2a	N0	M0
<i>Stage IIA</i>	T2b, T3a	N0	M0		<i>Stage IIA</i>	T2b, T3a	N0	M0
<i>Stage IIB</i>	T3b, T4a	N0	M0		<i>Stage IIB</i>	T3b, T4a	N0	M0
<i>Stage IIC</i>	T4b	N0	M0		<i>Stage IIC</i>	T4b	N0	M0
<i>Stage IIIA</i>	Any T 1-4a	N1b	M0		<i>Stage IIIA</i>	T1- T4a	N1a	M0
<i>Stage IIIB</i>	Any T 1-4a	N2b	M0		<i>Stage IIIB</i>	T1- T4a	N1b, N2a	M0
<i>Stage IIIC</i>	Any T	N2c, N3	M0		<i>Stage IIIC</i>	Any T	N2b, N2c, N3	M0
<i>Stage IV</i>	Any T	Any N	Any M		<i>Stage IV</i>	Any T	Any N	Any M

^a Clinical staging includes microstaging of the primary melanoma and clinical/radiologic evaluation for metastases; by convention, it should be used after complete excision of the primary melanoma with clinical assessment for regional and distant metastases.

^b Pathologic staging includes microstaging of the primary melanoma and pathologic information about the regional lymph nodes after partial or complete lymphadenectomy, except for *pathologic Stage 0 or Stage 1A patients, who do not need pathologic evaluation of their lymph nodes.*

(From Balch et al.,¹⁸ with permission.)

Figure 1



Figure 2

