

Malignant Melanoma Management and Long-Term Follow-Up in Five Feet

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INTRODUCTION

Melanoma is the most common malignancy of the foot and ankle (1). Melanoma of the foot and ankle is more likely to be misdiagnosed or diagnosed later than melanoma of other anatomic sites, and accounts for 3-15% of all cutaneous melanomas (1-2). A malignant lesion is often misdiagnosed for a nonhealing ulcer, subungual hematoma, verruca, or fungal nail changes (3-4). Patients do not readily notice a lesion of the foot or ankle if it is not painful and especially if the location is on the sole of the foot. By the time the melanoma is correctly diagnosed, the tumors are usually thicker and at a more advanced stage resulting in poorer prognosis. It is thus paramount to be suspicious of lesions early and to make an accurate diagnosis and treatment plan to improve the rate of survival for patients affected by this aggressive cutaneous neoplasm.

In order to help reduce the overall mortality, performing a biopsy is a crucial step in the management of malignant melanoma. Guidelines suggest that excisional biopsy is the recommended procedure for suspected malignant melanoma as it allows for diagnosis, proper depth and staging of the tumor, as well as treatment and prognosis (5). Punch biopsies continue to be used by many physicians even though it is not usually the procedure of choice (6). Incisional biopsies have been reported to be less appropriate as the lesion is likely to be inadequately excised with residual tumor remaining at both the radial and deep margins. Since only the superficial portion of the tumor is removed, this results in an inaccurate estimation of tumor thickness, which is a key prognostic factor and treatment determinant (7). However, because it is quick and less invasive, this is a common procedure done in office to confirm any suspicious lesion.

Once melanoma is confirmed, definitive surgical treatment is wide local excision (8). The recommended margin of normal tissue to be resected is based on the thickness of the melanoma (9). For melanomas <1 mm thick, a 1 cm margin is recommended. For lesions that are 1-2 mm thick, a 2 cm margin of normal tissue is recommended, and for lesions that are 2-4 mm or >4 mm, a 2 cm margin is also recommended (10). There has been no evidence supporting margins >2 cm to decrease the incidence of local recurrence or improve survival rate (11).

Plantar melanoma excision sites are not usually closed primarily. The wounds are allowed to granulate and once primary healing has taken place, the use of skin grafts and flaps are usually done to restore weight-bearing function. Thus, collaborative care of various medical professionals including plastic or general surgery and oncology are necessary to improve the outcome of patients.

Currently, sentinel lymph node biopsy is considered the standard for evaluating lymph node involvement. Lymphatic mapping via lymphosyntigraphy and intraoperative injection of blue dye or radioisotope is used to identify the first (sentinel) lymph node immediately downstream from the primary tumor (12). For lesions that are more than 1 mm thick, a sentinel lymph node biopsy is recommended (13). For melanomas that are 0.75-1 mm thick with adverse characteristics such as lymphovascular invasion, ulceration, increased mitotic rate, significant vertical growth phase, and with positive margins, a sentinel lymph node biopsy should be considered (14). The literature recommends that a complete lymph node dissection should be done if there is a positive sentinel lymph node biopsy (15). Additionally, adjuvant interferon alpha is recommended for patients who have a greater than 10-year life expectancy.

In this report, we describe a case series of the surgical management and long-term follow-up results for melanoma in the foot and ankle of 5 patients. We attempted to evaluate the distinguishing features of melanoma of the foot. Each melanoma was classified according to its site on the foot, the treatment strategies, complications, and minimum 12-month follow-up were investigated. Our case series may serve as a reference point for determining treatment strategies in the future.

METHODS

Between 2013 and 2016, 5 patients who had primary cutaneous melanoma in the foot or ankle were seen at the Kaiser Permanente South Sacramento Podiatry Clinic. These 5 patients received their treatment by the same podiatric surgeon at Kaiser. A retrospective analysis and evaluation review of these 5 patients were done. The hospital records were reviewed with attention paid to the basic demographics,

the site of involvement, depth and stage of the lesion, whether there had been a delay in diagnosis, surgical management of the lesion, additional procedures, sentinel lymph node biopsy results, and 12-month follow-up.

The standard treatment plan for malignant melanoma was wide local excision and reconstruction with sentinel lymph node biopsy. We adopted wide local excision margins depending on the Breslow thickness. The surgical margin was 0.5 cm for in situ melanoma, 1 cm for lesions ≤ 1 mm in depth, 2 cm for lesions 1.01-2.0 mm in depth, and 3 cm for lesions > 2.0 mm in depth.

Lesions on or near the toe occurred in 1 of our patients and was treated with amputation of the toe. One lesion that was located on the posterior heel required a split-thickness skin graft. All other foot lesions were treated with wide excisions followed by wound VAC therapy for secondary intention skin closures. Sentinel lymph node biopsy was performed therapeutically in all 5 patients by a general surgeon at the same institution.

RESULTS

There were 5 patients who underwent both the initial biopsy and the surgical treatment for melanoma in the foot from 2013-2016 at this single institution. These 5 patients also underwent a sentinel lymph node biopsy. Of the 5 patients, 3 were female and 2 were male, and 3 were white and 2 were Asian (1 Hmong and 1 Vietnamese). The mean age at the time of presentation was 59.6 years (range 38-80 years).

The plantar aspect of the foot was the common site of involvement, found in 4 of the 5 patients, and only 1 lesion was found on the posterior heel. The Breslow thickness classification (in situ, ≤ 1 mm, 1.01-2 mm, 2.01-4 mm, > 4 mm) was used to determine the depth of invasion. Measured in millimeters, an ocular micrometer was used to measure lesions from the granular layer in the epidermis to the deepest vertical part invasion. The depth of invasion has been known to be the single most prognostic factor in melanoma (Table 1).

Case 1 was a 59-year-old white woman who presented with a plantar first metatarsal head ulcer that was present for 3 years. It was noted to be ulcerating and bleeding for 1 month. A punch biopsy was done prior to ultimate wide excision with 2 cm margins and right inguinal sentinel lymph node biopsy, negative margins and negative sentinel lymph node biopsy. The patient's wound was completely healed at 5 months postoperative (Figure 1).



Figure 1A. Clinical image of lesion when patient first noticed it 3 years ago.



Figure 1B. Appearance after punch biopsy during presentation of worsening skin lesion.

Table 1. Results of case series*

Pt	Age	Sex	PMHx	Race	Breslow thickness, mm	STSG	SLNB	Lesion	Mean follow-up, months
1	59	F	None	White	2.3	No	Neg	Plantar foot	33
2	54	M	None	Vietnamese	8.5	No	Neg	Plantar foot	5†
3	38	F	Hep B	Hmong	3.2	No	Neg	Plantar foot	20
4	67	F	MM	Black	1.05	Yes	Neg	Posterior heel	13
5	80	M	DM2	White	1.8	No	Neg	Plantar foot	6

*Age = at time of surgery; STSG = split-thickness skin graft; SLNB = sentinel lymph node biopsy; MM = multiple myeloma.

† Patient lost to follow-up. After wide excision with negative margins, the patient's wound completely healed via negative pressure wound therapy and secondary intention.

Case 2 was a 54-year-old Vietnamese man who presented with a painless plantar first metatarsal head ulcer. A shave biopsy was done prior to ultimate left foot wide excision with 1.5 cm margins with negative pressure wound therapy and left axillary sentinel lymph node biopsy; both of which were negative. The patient's wound completely healed at 3.5 months (Figure 2).



Figure 2A. Plantar first metatarsal melanoma lesion at presentation.

Case 3 is a 38-year-old Hmong woman who presented with a plantar heel ulcer that had been present for 10 years. A punch biopsy was done before an ultimate right foot wide excision with 2 cm margins and right inguinal sentinel lymph node biopsy, both of which were negative. At 4 months, the patient's wound is healed (Figure 3).



Figure 2B. View 3 weeks after wide excision of lesion and NPWT.



Figure 2C. Appearance 3 months after wide excision of lesion and NPWT.



Figure 3A. Plantar heel melanoma upon presentation.

Case 4 is a 67-year-old black woman who presented with a right posterior heel ulcer that has been present for years. A shave biopsy was done before an ultimate right heel wide excision with 2 cm margins and right inguinal sentinel lymph node biopsy, both of which were negative. The patient also underwent a split-thickness skin graft over the surgical site as it is a nonweight-bearing surface. At 1 month after the split-thickness skin graft, the wound is

healed (Figure 4).

Case 5 is an 80-year-old white man who presented with a plantar fifth metatarsal head melanoma lesion that had been present for many months. A shave biopsy was done before an ultimate right foot partial fifth ray amputation and right inguinal sentinel lymph node biopsy, both of which were negative. The patient's wound healed at 4.5 months (Figure 5).



Figure 3B. View 3 weeks after wide excision.



Figure 3C. View of the healed site, 4 months after wide excision.



Figure 4A. Posterior heel melanoma upon presentation.



Figure 4B. View 1 month after 100% take of split-thickness skin graft.



Figure 4C. View of healed site 2 months after split-thickness skin graft.



Figure 5A Plantar fifth metatarsal head melanoma upon presentation.



Figure 5B. View 3 weeks after amputation and NPWT.



Figure 5C. View 4.5 months after amputation and NPWT.

DISCUSSION

Melanoma is the most common malignancy of the foot and ankle with a reported 5-year overall survival rate of 52% (16). Melanoma of the foot or ankle is more likely to be misdiagnosed or diagnosed later than melanoma of other sites, placing patients at a higher mortality risk (17). Barnes et al reported that 282 patients who had a melanoma of the foot had poor prognosis and a shorter duration of survival compared with those who had a lesion at another site on

a lower extremity. However, the decreased duration of survival was not related to the location of the lesion but rather, associated with a more advanced histologic and clinical stage at the time of presentation (18).

The most common tumor site in our study was the sole of the foot. Nam et al reported the heel as the most common tumor site in the foot (19). Durbec et al and Ishihara et al reported the sole as the most common site (20,21). Jang et al reported that the middle of the sole followed by the heel as the most common site of melanoma (22).

In our case series, the decision to perform a biopsy of the suspicious lesion was based on clinical experience. The plantar aspect of the foot was the common site of involvement, found in 4 of 5 patients. Of the 5 patients, only 1 lesion was found on the posterior heel. Either a shave biopsy or punch biopsy was done at the central and thickest part of the lesion for proper histopathologic analysis. Once a diagnosis of melanoma is made, the biopsy scar and any remains of the lesion need to be removed to eradicate any remaining tumor.

The size of the surgical margins depend on the Breslow's tumor thickness. Haigh et al performed a meta-analysis that showed no benefit for a wide excision over a narrower excision in patients with melanoma of the trunk or extremities. Their study demonstrated that an excision margin of no greater than 2 cm is adequate for the treatment of primary melanoma. They found that overall survival, disease-free survival and local recurrence rates are not adversely affected by this margin of excision (23). Our treatment protocol included wide excision of any lesion with at least a 1.5 cm to 2 cm margin. One patient had a lesion located on the plantar fifth metatarsal head, which required amputation of the entire digit. The 1 patient that did not have a weight-bearing surface lesion had a split-thickness skin graft applied to the large defect, which helped expedite healing. All but 1 patient required negative pressure wound therapy and all of the patients healed by secondary intention uneventfully.

Sentinel lymph node biopsy has been an established recommendation in patients with intermediate-thickness tumors (0.76 to 4.0 mm) and no clinical evidence of nodal or metastatic disease. By using a combination of isotope lymphatic mapping, an intraoperative hand-held gamma probe, and intraoperative injection of blue dye, the sentinel lymph node can be identified in more than 95% of groin and axilla cases (24). In this study, all patients underwent a sentinel lymph node biopsy, which were all negative for lymph node involvement. None of our patients in this case series required adjuvant therapy. The most recent follow-ups have all been positive, with no patients requiring subsequent treatment, medically or surgically. This case series details the successful surgical management and reconstruction of melanoma in the foot and ankle and may serve as a reference point for determining treatment strategies.

REFERENCES

- Fortin PT, Freiberg A, Rees R, et al. Malignant melanoma of the foot and ankle. *J Bone Joint Surg* 1995;77:1396-403.
- Soong SJ, Shaw HM, Balch CM, et al. Predicting survival and recurrence in localized melanoma: a multivariate approach. *World Surg* 1992;16:191-5.
- Greenway H, Twersky J, Meads S, Kelley BR. Melanoma of the foot and ankle: a case series of an underrecognized entity. *Arch Dermatol* 2007;147:543-4.
- Bristow I, Acland K. Acral lentiginous melanoma of the foot and ankle: a case series and review of the literature. *J Foot Ankle Res* 2008;1:11.
- Soon S, Solomon A, Papadopoulos D, Murray D, McAlpine B, Washington CV. Acral lentiginous melanoma mimicking benign disease: the Emory Experience. *J Am Acad Dermatol* 2003;48:183-8.
- Swanson NA, Lee KK, Gorman A. Biopsy techniques: diagnosis of melanoma. *Dermatol Clin* 2002;20:677-80.
- Witheiler DD, Cockerell CJ. Sensitivity of diagnosis of malignant melanoma: a clinicopathologic study with a critical assessment of biopsy techniques. *Exp Dermatol* 1992;1:170-5.
- NIH Consensus conference. Diagnosis and treatment of early melanoma. *J Am Med Assoc* 1992;268:1314.
- Cascinelli N. Margin of resection in the management of primary melanoma. *Semin Surg Oncol* 1998;14:272.
- Balch CM, Soong S, Ross MI, Urist MM, Karakousis CP, Temple WJ, et al. Long-term results of a multi-institutional randomized trial comparing prognostic factors and surgical results for intermediate thickness melanomas (1.0 to 4.0 mm). Intergroup Melanoma Surgical Trial. *Ann Surg Oncol* 2000;7:87-97.
- Hayes AJ, Maynard L, Coombes G, Newton-Bishop J, Timmons M, Cook M. Wide versus narrow excision margins for high-risk, primary cutaneous melanomas: long-term follow-up of survival in a randomised trial. *Lancet Oncol* 2016;17:184-92.
- Stadelmann WK. The role of lymphatic mapping and sentinel lymph node biopsy in the staging and treatment of melanoma. *Clin Plast Surg* 2010;37:79-99.
- Lemon B, Burns R. Malignant melanoma: A literature review and case presentation. *J Foot Ankle Surg* 1998;37:48-54.
- Morton DL, Wen DR, Wong JH, et al. Technical details of intraoperative lymphatic mapping for early stage melanoma. *Arch Surg* 1992;127:392-9.
- Thompson JF, Shaw HM. Sentinel node mapping for melanoma: results of trials and current applications. *Surg Oncol Clin N Am* 2007;16:35-54.
- Downey MS, Lamm BM. Metastatic malignant melanoma to the foot and ankle: a review of the literature and case report. *J Foot Ankle Surg* 2000;39:392-401.
- Albreski D, Sloan SB. Melanoma of the feet: misdiagnosed and misunderstood. *Clin Derm* 2009;27:556-63.
- Barnes BC, Siegler HF, Saxby TS, Kocher MS, Harrelson JM. Melanoma of the foot. *J Bone Joint Surg* 1994;76:892-8.
- Nam KW, Bae YC, Nam SB, et al. Characteristics and treatment of cutaneous melanoma of the foot. *Arch Plast Surg* 2015;59-65.
- Durbec F, Martin L, Derancourt C, et al. Melanoma of the hand and foot: epidemiological, prognostic, and genetic features. A systematic review. *Br J Dermatol* 2012;166:727-39.
- Ishihara K, Saida T, Otsuka F, et al. Statistical profiles of malignant melanoma and other skin cancers in Japan: 2007 update. *Int J Clin Oncol* 2008;13:33-41.
- Jang KA, Kim JH, Choi JH, et al. A clinico-histopathological study of malignant melanoma. *Korean J Dermatol* 2000;38:1435-43.
- Haigh PI, DiFronzo A, McCready DR. Optimal excision margins for primary cutaneous melanoma: a systematic review and meta-analysis. *Can J Surg* 2003;46:419-26.
- Carlson GW, Page AJ, Cohen C, Parker D, Yaar R, Li A, et al. Regional recurrence after negative sentinel lymph node biopsy for melanoma. *Ann Surg* 2008;248:378-86.