CHAPTER **14**

EXCISION OF MALIGNANT MELANOMA OF THE FOOT WITH ROTATIONAL NEUROVASCULAR FLAP

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INTRODUCTION

Melanoma has become a major health problem in many countries. Throughout the world, cases of melanoma are increasing at a rate of approximately 5% per year. It is estimated that 1 in 75 persons will be diagnosed with melanoma in their lifetime. In the US, it is estimated that 51,000 new cases are seen yearly with 8,000 deaths per year. The cause is excessive sun exposure especially at a young age. Melanoma is the leading cause of death from cutaneous malignancies and accounts for 1-2% of all cancer deaths in the US. The median age at diagnosis is 50 years, and the disease affects mostly whites with a low incidence in African Americans, Asians, and Hispanics.

Although incidence of melanoma has risen, the survival rate has improved. In the 1960s, 60% of those diagnosed with melanoma died of the disease, while today, ~11% die. This improvement is due to early detection as well as appropriate treatment. Preoperative history, physical examination, wide excision, sentinel node biopsy, and adjuvant therapy all improve the prognosis.

Acral-Lentiginous melanomas often are difficult to diagnose early due to their location and therefore are deeper or perhaps ulcerated on initial finding. Unfortunately, this will affect prognosis and long-term survival. Wide excision of melanomas affecting the foot pose significant and challenging problems due to soft tissue coverage. Split-thickness skin grafting is adequate for only non-weightbearing defects. Local flaps are often adequate for small weightbearing areas. Microvascular free tissue transfer do provide a reliable method for difficult to cover lower leg wounds. Although free flaps work well in these cases, they are labor intensive, technically demanding, and require intense and costly postoperative care. Soft tissue defects of the heel pose a particularly difficult reconstruction due to specialized tissues and extreme weightbearing loads. Heel defects should be classified into 3 parts (plantar, posterior, and lateral). Plantar defects, especially when large pose the most difficulty for the surgeon who is attempting to provide adequate coverage for a plantar-grade foot. The reverse sural artery flap is frequently used to reconstruct the distal third of the leg, ankle and heel.

CASE PRESENTATION

A 73-year-old white female presented to the office with a painful, non-healing wound on the right heel. She previously sought pedicure treatment for a painful heel plantar callous. She related that during the pedicure, she was cut and the wound would not heal (Figures 1, 2).

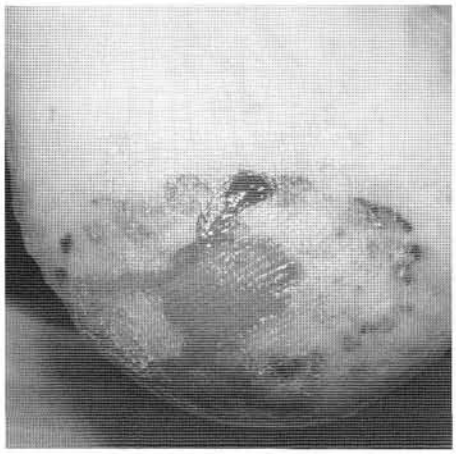

Figure 1. Heel ulceration after local wound care and immediate punch biopsy. There are multiple peripherally located black pigmented lesions.

Figure 2. The ulceration involves the posterior calcaneus as well. There are multiple black irregularly shaped lesions. There is color variegation, asymmetry, border irregularity and diameter greater than 6mm.

Biopsy of the ulcerated area revealed malignant melanoma. The patient was sent for surgical oncologic and plastic surgical consultation.

Discussion of superficial sural artery flap

The distally based superficial sural artery flap, first described as a distally based neuroskin flap by Masquelet et al, is a skin island flap supplied by the vascular axis of the sural nerve. The advantages of the flap are reliable blood supply, elevation is quick and easy, and the major arteries are not sacrificed.

The flap can be used to cover soft tissue defects of the lower one-third of the leg where tightness of tissue and poor circulation present additional concerns. The flap can reach the heel, medial and lateral malleoli, and the anterior aspect of the leg. Clinical indications include trauma, open sores from spinal cord injury, wounds created after excision of malignant lesions, and diabetic foot wounds. The flap is supplied by the superficial sural artery that accompanies the sural nerve. The artery gives off small branches to the skin in the lower two-thirds of the leg. In the lower part of the tibiofibular space, the superficial sural artery anastomoses with septocutaneous branches from the peroneal artery.

The flap can be raised anywhere in the lower two-thirds of the leg, provided the center of the flap is along the centerline of the posterior aspect of the leg. With the patient in the prone position, a skin island is marked according to a previously prepared pattern of the recipient defect. The pivot point of the pedical must be at least 5 cm above the lateral malleolus to allow anastomosis with the peroneal artery (Figure 3).

The skin incision is begun along the line in which the fascial pedicle will be taken (Figure 4). The subdermal layer is dissected to expose the sural nerve, accompanying superficial sural vessels and the short saphenous vein (Figure 5). The subcutaneous fascial pedicle is elevated, with a width of 2 cm to include the nerve and the vessels (Figures 6-9). At the proximal margin of the flap, the vein is ligated and severed, and the nerve and accompanying vessels are also cut. The skin island is elevated with the deep fascia (Figure 10). The sural artery flap is then turned down to cover the heel defect. The donor site is primarily closed if the flap is less than 3 cm wide. Here a split thickness skin graft is necessary (Figures 11-13).

Primary tumor resection

The tumor, involving the heel measured approximately 2.5 cm around and was ulcerated. The tumor was excised with a 2 cm border of healthy tissue. Preoerative lymphoscintigraphy was performed. This involves injection of the primary tumor with radiolabelled Tech-99m colloid and then taking delayed 2 hour scans. The residual radioactivity can then be used to locate the sentinel node intraoperatively, by using hand held gamma probes. Injection of a blue dye around the melanoma site

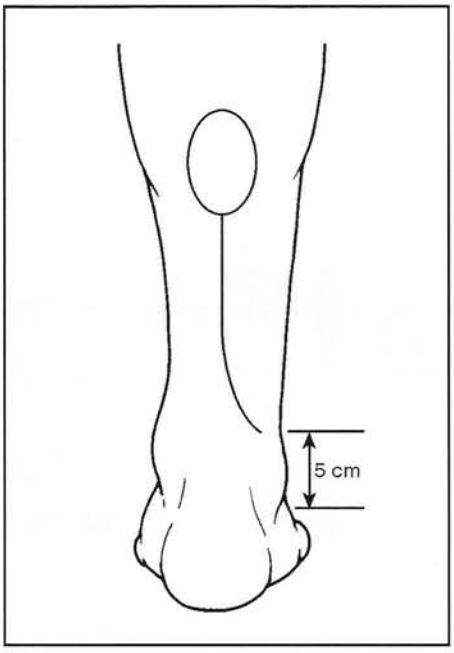

Figure 3. Skin to be mobilized is marked and incision planning is performed. Retrograde blood flow into the flap occurs from a point 5 cm. above the lateral malleolus.

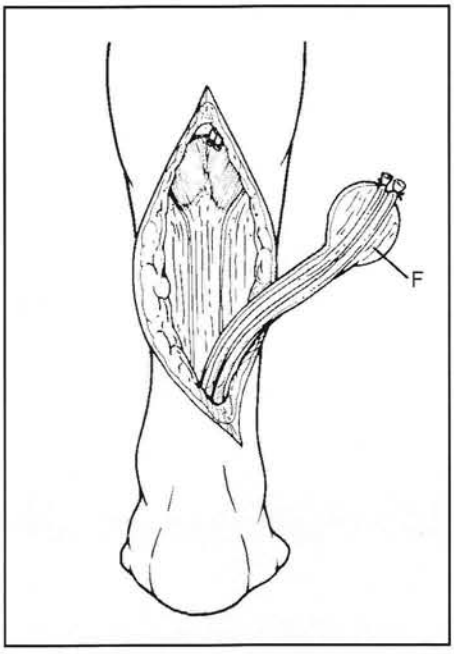

Figure 4. The raised flap is shown with its relation to the sural nerve, and the superficial sural artery and the short saphenous vein. The vein is most medial (VAN).

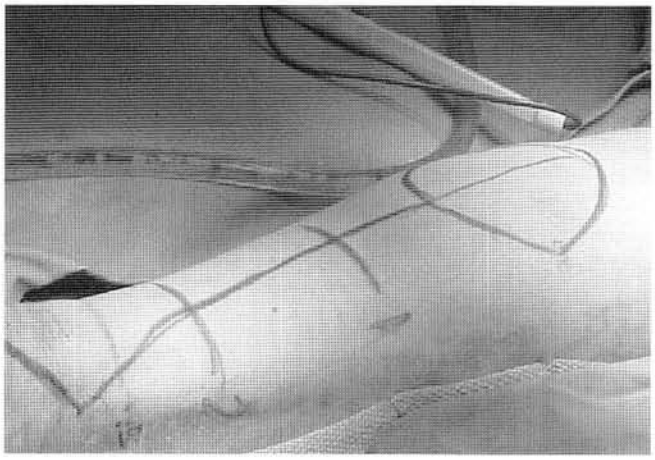

Figure 5. Skin markings.

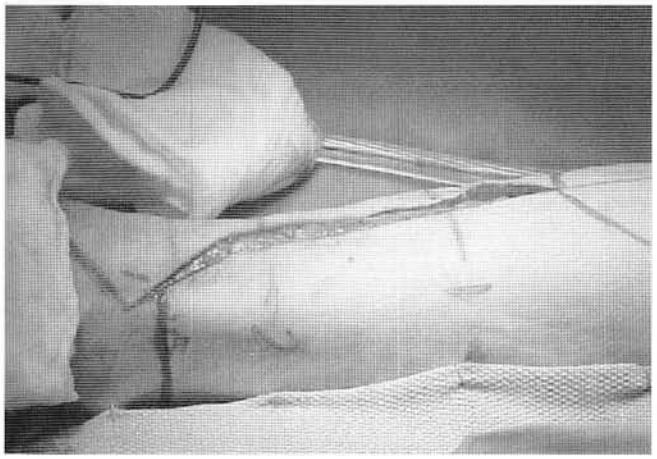

Figure 6. Incision is made. Subcutaneous vascular pedicle to be raised.

Figure 7. Identifying fascial pedicle.

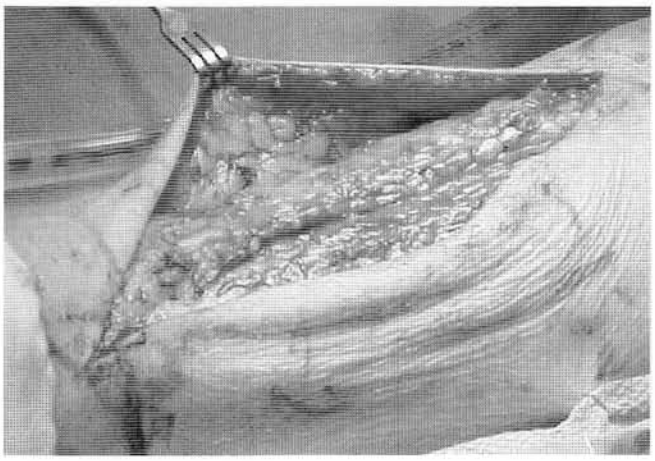

Figure 8. Fascial pedicle containing nerve and vessels.

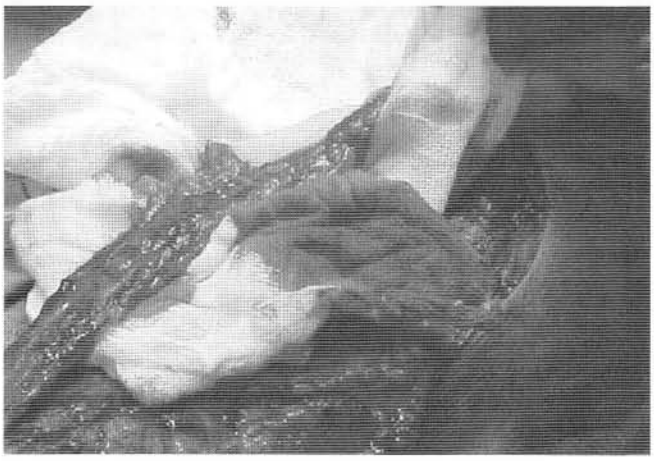

Figure 9 Full exposure of fascial pedicle.

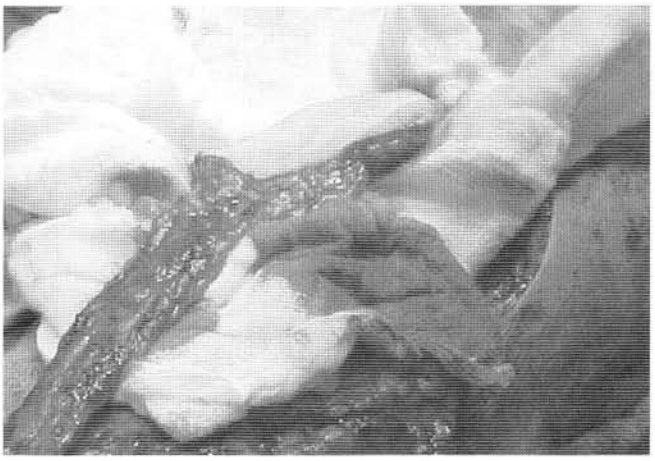

Figure 10. Skin island is elevated with the deep fascia. Proximal vessels and nerve are resected and tied as necessary.

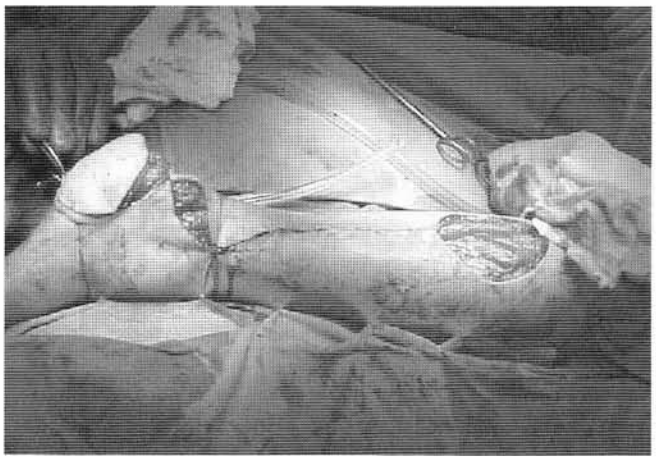

Figure 11. Flap rotated into position, and central incision line is closed.

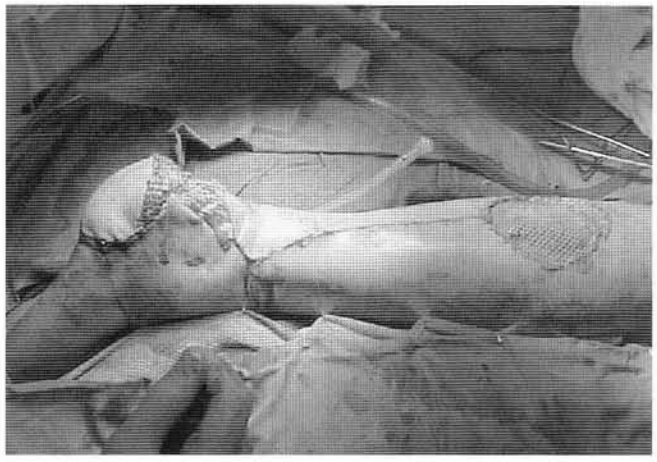

Figure 13. Coverage of secondary defects with split-thickness skin grafts. Flap is viable without venous congestion.

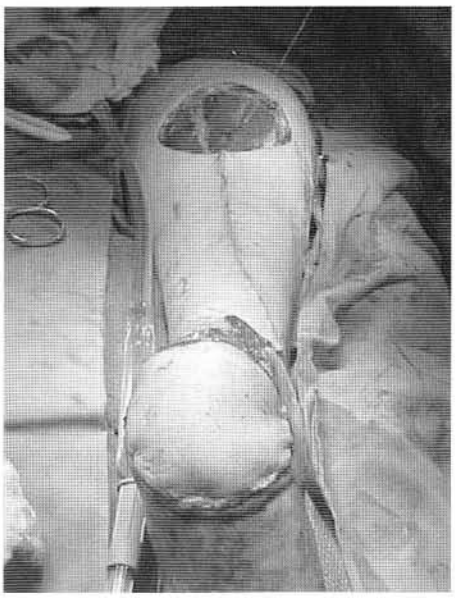

Figure 12. Excellent coverage of heel defect is demonstrated.

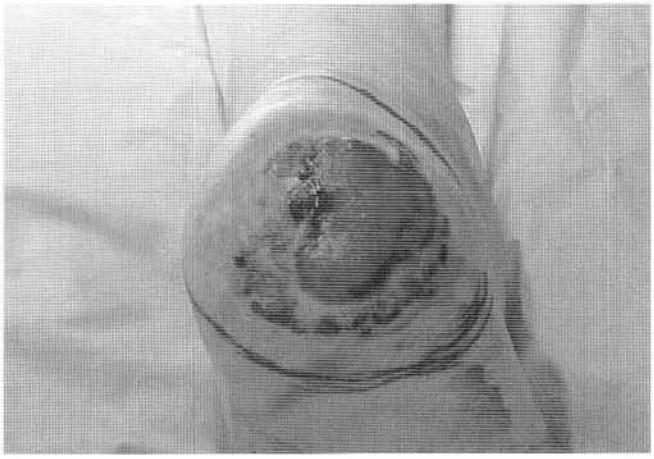

Figure 14. Tumor, methylene blue, and marked borders for resection.

immediately preoperatively also helps identify the sentinel node. All three modalities help identify the sentinel node most accurately.

The sentinel node concept is simple, lymph passing from a tumor site passes first to a so-called sentinel node before onward passage to other nodes in the regional node field. Thus the sentinel node is most likely to contain the tumor cells, and if none are present in this node, tumor cells are unlikely to be present in other nodes in the nodal field (Figures 14-17). Sentinel node biopsy may identify patients with nodal micrometastases as candidates for lymph node dissection.

The patient did well postoperatively. At one week postoperative, the flap was viable with mild edema and split-thickness skin grafts were incorporating well (Figures 18, 19).

Pathology

The tumor was invasive with a Breslow thickness of 4.5 mm, Clarke's level 4, and HMB45 positive. The sentinel lymph note biopsy was negative for tumor and HMB45 immunostain negative. Additional deep margins of hindfoot fibroadipose tissue were negative for tumor.

DISCUSSION

Increased tumor thickness, ulceration of the primary tumor and sentinel lymph node biopsy status are the most important independent prognostic factors. It seems that tumor ulceration has a crucial weight on survival (even

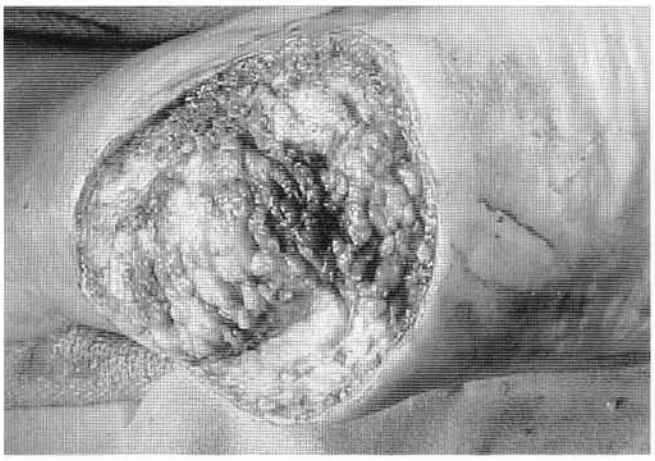

Figure 15. Wide excision of tumor.

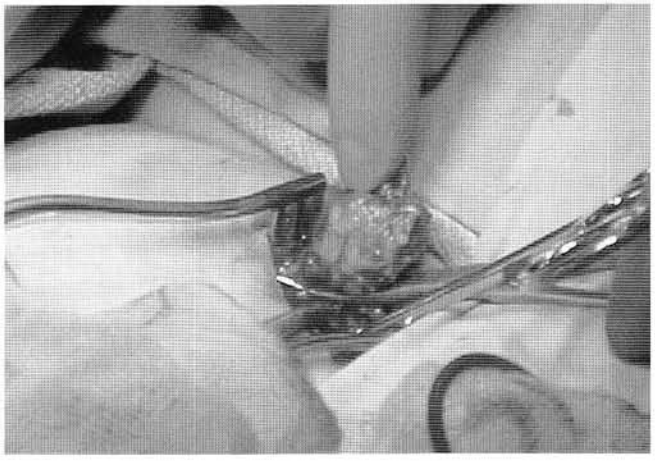

Figure 16. Sentinel node resected. The node was negative for tumor cells. HMB45 immunostain negative.

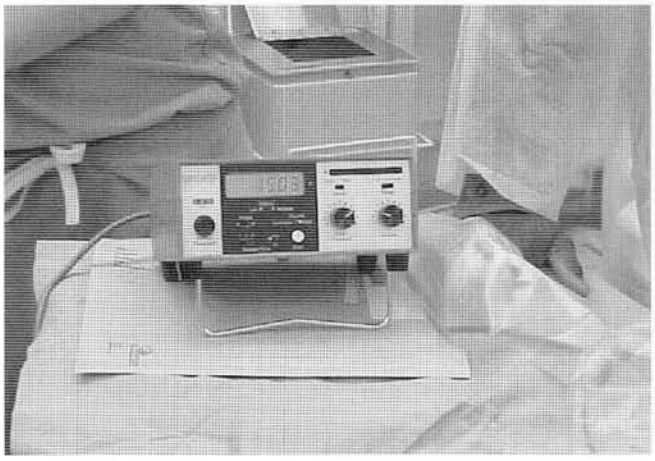

Figure 17. Gamma probe used to map out sentinel node.

Figure 18. Flap is viable.

when the sentinel lymph node biopsy is negative). Patients exhibiting tumor ulceration are at greater risk of developing distant metastases. Therefore, the importance of early tumor diagnosis cannot be stressed enough.

The concept of neurocutaneous territories have improved the design of fasciocutaneous flaps. This concept teaches that the cutaneous nerves of the body are frequently accompanied by small arteries and veins that supply the nerve and send perforators to the overlying skin. First discovered when vascularized nerve grafts were elevated, experience subsequently demonstrated that the skin overlying these nerve territories could be elevated based on this blood supply, even in a retrograde fashion, to cover defects as distal as the forefoot. The sural nerve flap is one such flap. The flap allows for one stage, reliable coverage of wounds of the distal one-third of the leg. Careful pedical dissection and inclusion of the peroneal artery perforators and lesser saphenous vein maximizes flap blood supply and allows for the transfer of large islands of skin as far distally as the foot. The main disadvantage of the flap is sacrifice of the sural nerve. Flaps may be bulky at times. If a thin flap is needed, the deep fascia without a skin island can be elevated safely. The fascial flap is then covered with a split-thickness skin graft.

Figure 19. Close up view of heel flap.

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