Digital involvement of invasive melanoma and dermatofibrosarcoma protuberans, traditionally treated with wide excision, often meant complete amputation of the affected digit. We report cases of an invasive melanoma of the finger and a multiply recurrent dermatofibrosarcoma protuberans of the great toe. Mohs micrographic surgery combined with partial amputation, preserving the unaffected proximal joint and ventral digital soft tissue, are used to create a more advantageous distal amputation. The cases illustrate how this technique helps to retain greater relative function and aesthetics of digits when compared to traditional amputation. We conclude that Mohs micrographic surgery in combination with partial amputation is a superior, tissue-sparing procedure for selected aggressive digital malignancies.

**Case Reports**

**Case 1**

A 59-year-old Caucasian woman presented with a 2-year history of a hyperpigmented macule involving the central, proximal nail fold of the right third finger. After a punch biopsy showed melanoma in situ, amputation of the digit was discussed with the patient by her family physician. The patient was unwilling to undergo such aggressive treatment. She was referred to us for Mohs micrographic surgery for maximal tissue conservation and to help preserve a functional finger.

![Figure 1. Case 1: Preoperative marking of the invasive melanoma of the finger.](image-url)
Upon careful exam, a 2 × 2-cm lesion was noted with nail dystrophy and dyspigmentation; Hutchinson’s sign was present. There was mild swelling, likely secondary to the recent biopsy (see Figure 1). Although these clinical findings suggested an invasive melanoma, the patient wished to proceed with a tissue-sparing procedure, despite being informed that an amputation was likely going to be necessary for definitive treatment.

Lateral tumor-free margins were achieved with two stages of Mohs surgery. The frozen sections showed invasive melanoma that extended to the peristeum of the distal phalanx deep in the lateral nail fold. The case was interrupted at this time and a hand surgeon was consulted. He instructed the Mohs surgeon to simply sever the distal phalanx at the joint and use the preserved ventral skin and soft tissue to create a very functional stump. The distal phalanx was amputated with a No. 10 scalpel at the distal interphalangeal joint (DIP). The bone was stripped from the underlying adherent ventral soft tissue with blunt and sharp dissection and submitted for decalcification and permanent processing. Pathologic review of the reembedded Mohs sections and the amputated phalanx demonstrated invasive melanoma extending to a depth of 0.5 mm, and the margins were free of disease. No immunoperoxidase stains were utilized. The entire ventral surface of the digit, including the digital pulp, was preserved (see Figure 2). This created a well-vascularized padded flap to cover the DIP joint after amputation, creating a much more cosmetically pleasing and functional amputation than standard amputation through the proximal interphalangeal joint (PIP; see Figures 3 and 4).

The area healed well and the patient was pleased with the aesthetic appearance of her digit (see Figure 4). There was minor fingertip tenderness for many months, because she used a key...
board regularly at work, which finally resolved. The patient retained nearly full function of her digit because of preservation of the PIP joint. Owing to the nature of the partial amputation, there was little obvious deficit upon casual inspection of her hand, which the patient greatly appreciated. There was no clinical recurrence of melanoma after 3 years.

**Case 2**

A 62-year-old Filipino woman presented with a 30-year history of a multiply recurrent dermatofibrosarcoma protuberans (DFSP) of the left great hallux. This lesion had been previously excised three times with recurrences noted approximately 10 years apart. Wide excision with metatarsal–phalangeal amputation was discussed with the patient, with particular emphasis on how this may adversely affect ambulation. The patient was hesitant to have complete amputation of her great toe. A radiation oncologist was consulted, who recommended Mohs micrographic surgery to clear the tumor before radiation treatment for a relatively resistant sarcoma, particularly in this location.

Physical exam showed a $3 \times 2$-cm sclerotic plaque fixed to the underlying bone of the left distal hallux. There was complete ablation of the nail matrix (see Figure 5). An X-ray and MRI showed a soft tissue mass that was limited to the distal phalanx, with no gross invasion of the underlying bone. A chest X-ray was negative for metastatic disease.

Tumor-free margins were achieved with three stages of Mohs surgery with the exception of the deep margin of the distal phalanx, where tumor was fixed to the bone (see Figure 6). This area was stripped free of the underlying bone by transecting a
the interphalangeal joint while preserving the uninvolved ventral soft tissue as described in Case 1. The bone was submitted for de-calcification and permanent processing to evaluate the deep margins. Because the entire distal bony unit was resected, the deep margins were considered to be clear at the time of Mohs surgery.

This was subsequently confirmed after review of the decalcified resected bone with permanent paraffin-embedded sections. Standard Mohs frozen tissue sections stained with hematoxylin and eosin were utilized to delineate soft tissue margins and were subsequently re-reviewed after being reprocessed for paraffin-embedded sections. No immunoperoxidase stains were utilized.

Mohs microscopic evaluation assured tumor-free lateral margins and made it possible to preserve the unaffected proximal joint and the entire ventral surface of the digit, including the digital pulp (see Figure 7). This spared tissue then served as a suitable, well-vascularized flap to repair the surgical defect (see Figure 8), creating a much more cosmetically pleasing and functional amputation than a standard amputation at the metatarsal–phalangeal joint (see Figure 9). The patient complained of minimal problems with ambulation after the initial healing phase in contrast to the expected deficit with standard amputation of the great toe at the metatarsal phalangeal joint. There has been no clinical recurrence of disease after 2 years.

Discussion

These cases illustrate the utility of Mohs micrographic surgery to preserve function and aesthetics in digits after a tissue-sparing partial amputation. Cutaneous malignancies of the digits are trad-
Guidelines for the treatment of melanoma have evolved over time, demonstrating that the wide margins used in the past were excessive. Zitelli and coworkers cite similar or greater rates of survival after Mohs when compared to traditional wide excision. Two large, prospective studies by Veronesi and coworkers and Balch and coworkers on thin and intermediate-thickness melanomas demonstrated no difference in metastasis or survival rates for narrow excisional margins versus wide margins. This trend toward narrower margins has allowed for the use of tissue conservation surgeries, such as Mohs micrographic surgery. Brodland presented 14 cases of nail apparatus melanomas successfully resected with Mohs, confirming recent recommendations for narrower margins even for nail apparatus melanoma. Case 1 describes a melanoma extending to the periosteum. Although removal of the underlying bone was indicated, Mohs surgery still resulted in an advantage when compared to standard amputation at the PIP.

In Case 2, Mohs is utilized for DFSP affecting a digit. Parker and Zitelli demonstrated that the standard 3-cm excisional margin taken for DFSP was often excessive. Mohs examination of the margins allowed complete excision with relatively narrow margins, therefore preserving vital tissue facilitating reconstruction. Amputation was carried out at the DIP as opposed to the

Figure 8. Case 2: The ventral aspect of the digit was used to create a flap, and immediately postoperatively.
metatarsal phalangeal joint for standard surgery.

Both of these patients were treated in an outpatient setting by an experienced Mohs surgeon under local anesthesia to produce superior clearance of tumor and enable a more functional and cosmetically pleasing partial distal amputation.

References


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