

## CASE REPORT

# Schwannomas mistaken for metastases of melanoma in PET-CT: A diagnostic challenge with consequences

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**Abstract**

The incidence of skin cancer and especially cutaneous malignant melanoma is rising, as are indications for staging examinations to detect metastasis. Schwannomas are common benign nerve tumors, which can be mistaken for metastasis even in highly specialized imaging. Risk of nerve lesion is high in inadvertent biopsy.

**KEYWORDS**

cutaneous malignant melanoma, FDG-PET, metastasis, schwannoma

## 1 | INTRODUCTION

The incidence of invasive melanoma continues to increase in Europe.<sup>1</sup> Although survival in metastatic melanoma has been markedly increased thanks to major breakthroughs in therapy, it is still a potentially lethal illness.<sup>2</sup> The diagnosis of metastatic disease is crucial for guiding systemic therapy.<sup>3</sup> Fluorodesoxyglucose positron emission tomography with computed tomography (FDG-PET-CT) is useful in the staging of cutaneous malignant melanoma (CMM)<sup>4</sup> and is especially helpful in advanced disease or when suspecting recurrence.<sup>5</sup> Other malignant skin tumors like dermal sarcomas are very rare but occurred in one of the clinical cases described below.<sup>6</sup> Although FDG-PET-CT can often help to distinguish between malignant and benign lesions,<sup>7</sup> some high-uptake lesions are benign. The latter is especially true for schwannoma, a benign encapsulated tumor of the peripheral nervous system arising from the Schwann cells in the nerve sheath. If metastasis is suspected in FDG-PET-CT, histologic confirmation by image-guided or surgical biopsy is usually indicated for confirmation. The differential diagnosis of schwannoma is important, as percutaneous and even open surgical biopsies carry a risk of

associated neurologic lesion.<sup>8</sup> In our unit, we treated two patients with melanoma and one patient with pleomorphic dermal sarcoma and suspected lymphatic metastasis in FDG-PET-CT, which were diagnosed as schwannomas on histologic evaluation of the biopsies. One patient suffered neurologic lesions following the biopsy.

## 2 | CASE PRESENTATION

### 2.1 | Case 1

A 66-year-old patient was diagnosed with CMM in the right scapular area. After excisional biopsy, the histology showed a Breslow depth of 5 mm with ulceration and satellite nodes. A computer tomography revealed no suspicion of metastasis at the time leading to an initial classification of pT4b pN2c cM0, AJCC-stage IIIC in November 2012. Three years later during follow-up, a lumbar cutaneous melanoma metastasis was excised and histologically confirmed.

For staging, the patient had a FDG-PET-CT that showed a suspicious lesion in his right axilla ([Figure 1](#))

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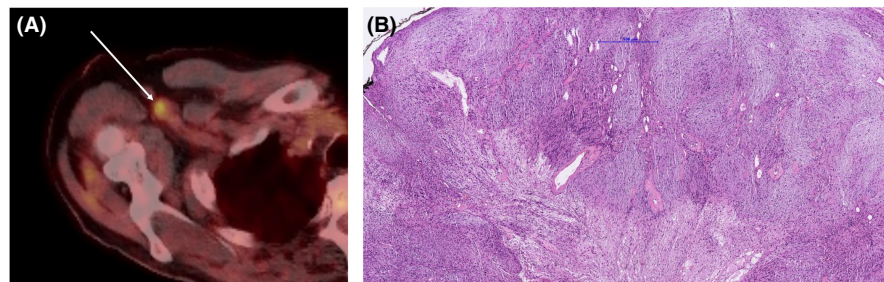
with recommendation of excision and histopathologic evaluation by the interdisciplinary skin cancer tumor conference. Excision was performed and histologic examination showed a schwannoma (Figure 1B). Unfortunately, partial nervous injury occurred during surgery causing neuropathic pain of the I–III finger and paresis of flexor pollicis longus and flexor digitorum profundus dig. II muscles.

Two years later in 2017, 5 years after the initial diagnosis, an FDG-PET-CT showed a 5-mm subcutaneous lesion in the left gluteal area, which was excised and showed an angioliipoma. In 2019, the patient was diagnosed with a lumbar melanoma metastasis and is currently treated for metastatic disease with immune therapy (Pembrolizumab 2 mg/kg body weight i.v. every 3 weeks).

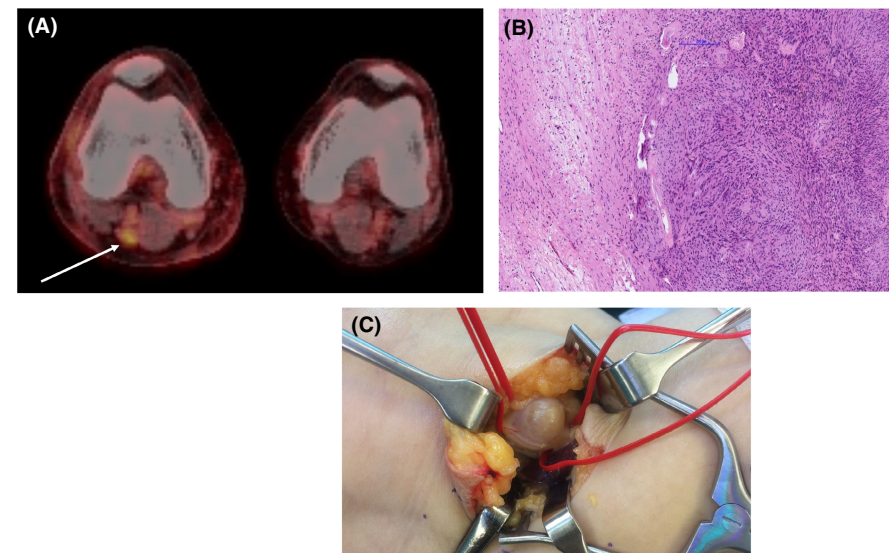
The neurologic deficit has improved over time, but slight sensory and motor impairment is persistent with a Tinel sign along the median nerve, atrophy of the thenar muscles, but a good pinch force of 5 kg versus 6 kg on the healthy contralateral side.

## 2.2 | Case 2

A 67-year-old patient was diagnosed with a CMM of the superficial spreading type of the dorsal foot in August 2017.



**FIGURE 1** (A) FDG-PET-CT with high-uptake right axillary lesion. (B) Histologic overview of the lesion showing typical features of schwannoma with hyper- and hypocellular areas.



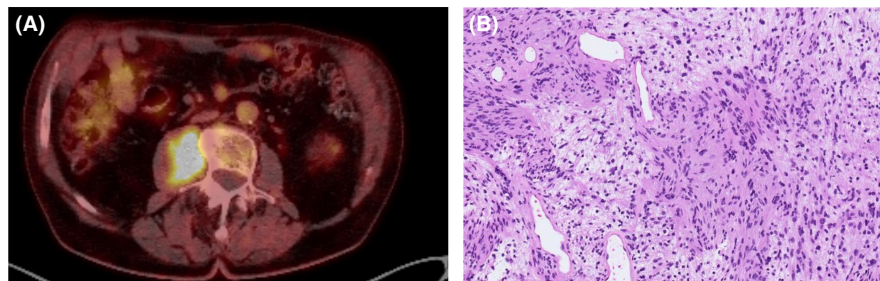
**FIGURE 2** (A) FDG-PET-CT with high-uptake right popliteal lesion. (B) Antoni A areas (hypercellular, with palisading) and Antoni B areas (hypocellular, myxoid) are characteristic for schwannoma. (C) Intraoperative suspicion of schwannoma

Excision showed a Breslow of 2.35 mm, Clark level IV with ulceration. An excision with safety margin and inguinal SLNB was conducted with confirmation of an inguinal lymphatic metastasis. At that time, the lymphoscintigraphy showed only inguinal SLNs. The initial classification was pT3b pN1a cM0, AJCC-stage IIIC. Seven days postoperatively, an ultrasound was conducted for swelling of the leg to exclude a thrombosis. No thrombosis, but a popliteal tumor suspicious for lymph node metastasis was described by the radiologists. An FDG-PET-CT confirmed a popliteal high-uptake tumor, interpreted as a pathologic lymph node suspect for metastasis or malignancy with recommendation of excision (Figure 2A). Surgery and complete open excision of a perineurally located tumor along the superficial sural nerve was performed 3 weeks later, histologic analysis revealing schwannoma (Figure 2B). The sural nerve could be spared since the intraoperative situation was clinically highly suspicious of a schwannoma (Figure 2C). Postoperatively, the patient is asymptomatic concerning all potentially involved nerves.

## 2.3 | Case 3

An 80-year-old patient was operated for a CMM of superficial spreading type with nodular growth on the left upper

**FIGURE 3** (A) FDG-PET-CT with high uptake in right psoas muscle lesion. (B) Image-guided core-needle biopsy showing same typical morphology of schwannoma: intermingled Antoni A and B areas.



arm in June 2010. Excision and SLNB was performed and showed a Breslow 1.42 mm without ulceration, Clark level IV and no lymphatic metastasis in June 2010. The initial classification was pT2a pN0 cM0, AJCC-stage IB.

One year after the melanoma diagnosis, in 2011, a pleomorphic dermal sarcoma (PDS) of the left shoulder was found, which was resected in toto. In 2017, he developed a recurrence of the PDS, which was confirmed by biopsy before wide excision with 2 cm tissue margins. A staging PET-CT showed a tumor in the psoas muscle (Figure 3A), highly suspect for metastasis and an MRI confirmed the suspicion. Image-guided biopsy of the tumor deemed the suspicion wrong and revealed the histologic diagnosis of a schwannoma, confirmed by immunohistochemical staining in 12/2017 (Figure 3B). Post intervention, the patient did not suffer from any neuropathic pain or deficits.

### 3 | DISCUSSION/CONCLUSION

We present two patients who have been operated for suspected melanoma lymph node metastasis and one patient with pleomorphic dermal sarcoma (and melanoma in the past), which all turned out to be asymptomatic benign schwannomas. In one patient, the surgical procedure had significant adverse effects in form of functional deficit and persistent neuropathic pain. If the differential diagnosis of schwannoma had been considered preoperatively, the surgery could have been performed with more attention to the nerve involved and injury might have been prevented. The differential diagnosis between malignant and benign lesions is not always possible by FDG-PET-CT, which is especially true in the case of schwannomas.<sup>9,10</sup>

Magnetic resonance imaging can often help to localize the tumor in association with a nerve, but most of the times the exact tumor type cannot be differentiated.<sup>11</sup> To help differentiate between malign and benign lesions, functional diffusion tensor imaging can be performed as a valuable adjunct. The latter allows fiber tracking and whereas complete disruption of nerve fibers in tractography and low diffusivity values suggests malignancy in

neural masses, orderly fibers, and nerve continuity are suggestive for schwannoma.<sup>12</sup>

Due to the increased incidence of melanoma and the widespread use of FDG-PET-CT for staging, the incidence of false-positive lesions and thus nerve lesions due to inadvertent biopsy of schwannoma might increase.

In conclusion, schwannoma should be kept in mind as a differential diagnosis for metastatic lesions of melanoma that show high intensity in FDG-PET-CT. The main risk of surgical but also image-guided biopsies is symptomatic nerve injury. Recent developments in imaging are promising, but no gold standard has yet been defined. In the future, functional diffusion tensor imaging might help to differentiate schwannoma from metastasis or other malignant tumors in uncertain cases.

#### AUTHOR CONTRIBUTIONS

**Stefanie Hirsiger:** Visualization; writing – original draft; writing – review and editing. **Radu Olariu:** Conceptualization; supervision; validation; writing – review and editing.

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#### CONFLICT OF INTEREST

All authors hereby declare that they have no potential conflicts of interest to disclose.

#### DATA AVAILABILITY STATEMENT

Data available on request from the authors.

#### CONSENT

An approval of the ethics committee is not required for case series according to Swiss law. Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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