

## CASE REPORT

# Uncommon finding of a “black node” in a patient with malignant melanoma and arthroplasty: A case report

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## Abstract

Postarthroplasty lymphadenopathy should be kept in mind particularly in patients with tumor (eg, melanoma) with a long-term history of total joint replacement therapy. Microscopy is mandatory in establishing diagnosis and is thus helpful for therapy.

## KEYWORDS

electron energy loss spectroscopy, lymphadenopathy, malignant melanoma, microscopy, titanium

## 1 | INTRODUCTION

A 75-year-old patient underwent surgical excision due to malignant melanoma. Sentinel lymph node was suspicious for melanoma metastasis as it appeared black colored. Histology revealed foreign-body reaction with metal and polyethylene wear particles. Previously, total knee replacement was performed in 1997 and 2012. Electron energy loss spectroscopy revealed titanium.

Inguinal lymphadenopathy due to foreign-body reaction may serve as differential diagnosis in patients with malignant neoplasms of the lower extremity. Histological examination is *mandatory* for these lesions that even can mimic melanoma metastasis as presented in this case study.

In patients with malignant melanoma, lymphadenopathy especially of regional lymph nodes may serve as pitfall both in diagnosis and therapy. There is an increasing number of case studies on patients with malignant melanoma and so-called black lymph nodes due to high accumulation of foreign bodies, in particular tattoo pigment.<sup>1,2</sup> On the other hand, it has been known for several decades that patients with total joint

replacement loosening may present with lymph node sinus histiocytosis and granulomatous reaction due to spreading of wear particles.<sup>3,4</sup> We present an unusual case of particle-induced lymphadenopathy in patient suffering from malignant melanoma and discuss the relevant differential diagnoses.

## 2 | CASE PRESENTATION

A 75-year-old female patient was admitted to hospital due to malignant melanoma on the right lower leg. Following the guidelines, the tumor was surgically excised with a 1-cm margin. Histological examination revealed a superficial spreading type melanoma stage pT1b. Scintigraphy identified a radionuclide tracer-active sentinel lymph node in the ipsilateral groin. The removal of the inguinal sentinel lymph node was decided. By macroscopy, a prominent black node measuring up to 3.8 cm was obtained being suggestive for melanoma metastasis. The tissue specimens were processed for histological examination according to standard protocols for sentinel nodes. y means of histology, the

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lymphatic tissue was displaced by numerous histiocytes and multinucleated foreign giant cells, particularly in the inter-follicular region and the sinusoids. The cytoplasm of both mononuclear histiocytes and giant cells contained numerous small polygonal granular and needle-shaped black particles, which did not polarize (Figure 1). Furthermore, all histiocytes were immunohistochemically positive for CD68 (Figure 2). By contrast, there was no specific staining for melan A or HMB45. Moreover, a number of retractile particles transmitted polarized light. They could be stained by Oil red reaction (Figure 3) and thus were interpreted as polyethylene wear particles, while black granula were either suggestive for carbon pigment which is found in tattoo pigment or for metallic wear debris. We therefore performed electron energy loss spectroscopy (EELS) on lymph node sections according to standard methods. This analysis revealed a titanium peak (Figure 4).

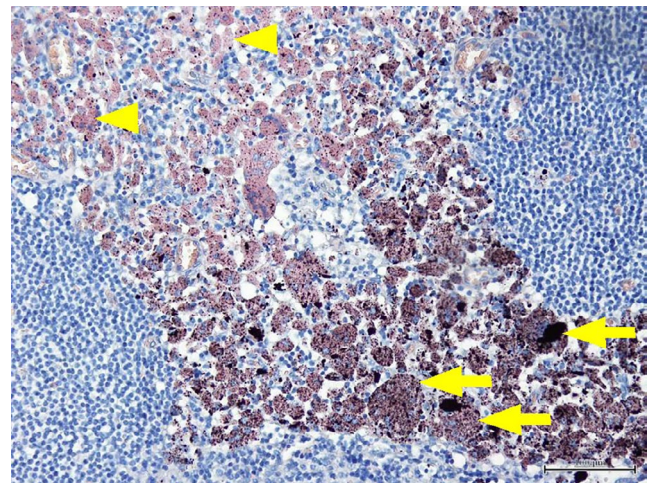
Further anamnesis revealed that in 1997 the patient underwent total knee joint replacement had been performed which was revised in 2012 (prosthesis type Search™ in 1997, prosthesis type e.motion™ in 2012, both Braun-Aesculap). In both types, titanium has been applied as a component of the prosthesis. Finally, the findings were diagnosed as lymphadenopathy following joint prosthesis wear.

### 3 | DISCUSSION

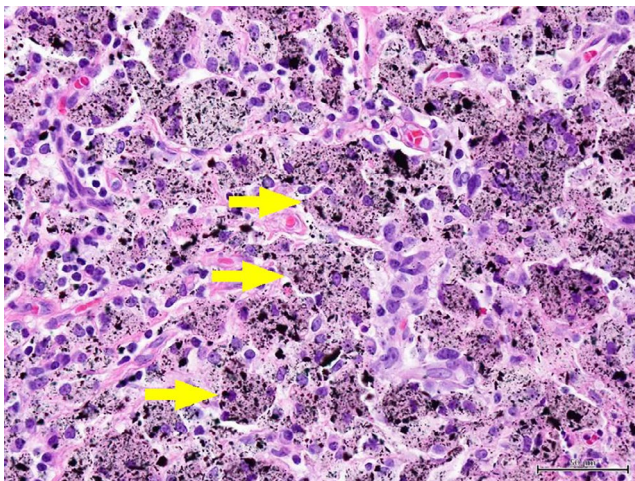
In patients suffering from malignant melanoma, *enlargement of regional lymph nodes* is commonly described. There is a large variety of causes for this lesion. On the one hand, it might be either directly associated with the underlying tumor such as in the case of a hitherto unknown primary<sup>5</sup> or a tumor-specific therapy.<sup>6</sup> On the other hand, *this type of*

lymphadenopathy could serve as a coincidental finding in a melanoma. An increasing number of case studies are dealing with this phenomenon, particularly in patients with tattoos.<sup>7</sup> In the present case, the lymph node was suggestive for melanoma metastasis due to the macroscopic presentation as so-called “black node.” *Standard histology was crucial, since metastatic melanoma and melanin pigment could be ruled out by the presentation of numerous black foreign-body granules.* Especially in patients who underwent tattooing the feature of a so-called black node as result of the pigment deposition lymph node parenchyma has been previously described.<sup>1,8</sup>

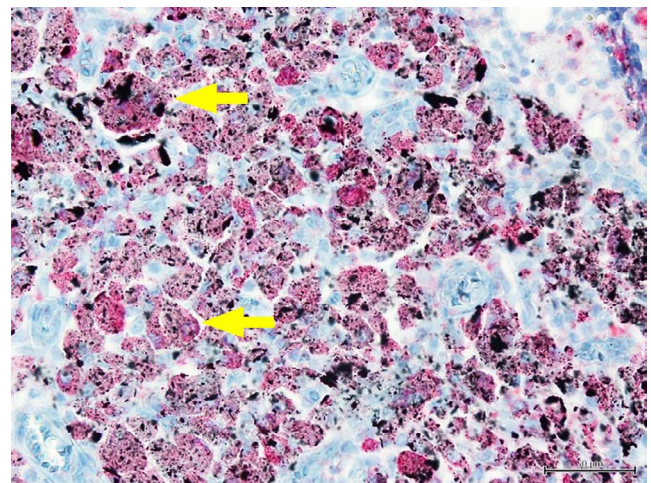
On the other hand, it has been known for several decades that patients with total joint replacement loosening may present with lymph node sinus histiocytosis and



**FIGURE 2** Oil red reaction demonstrates histiocytes containing polyethylene particles being salmon-red stained (arrowheads). Note that there are many cells also filled with black metal wear particles (arrows; bar = 100  $\mu$ m)

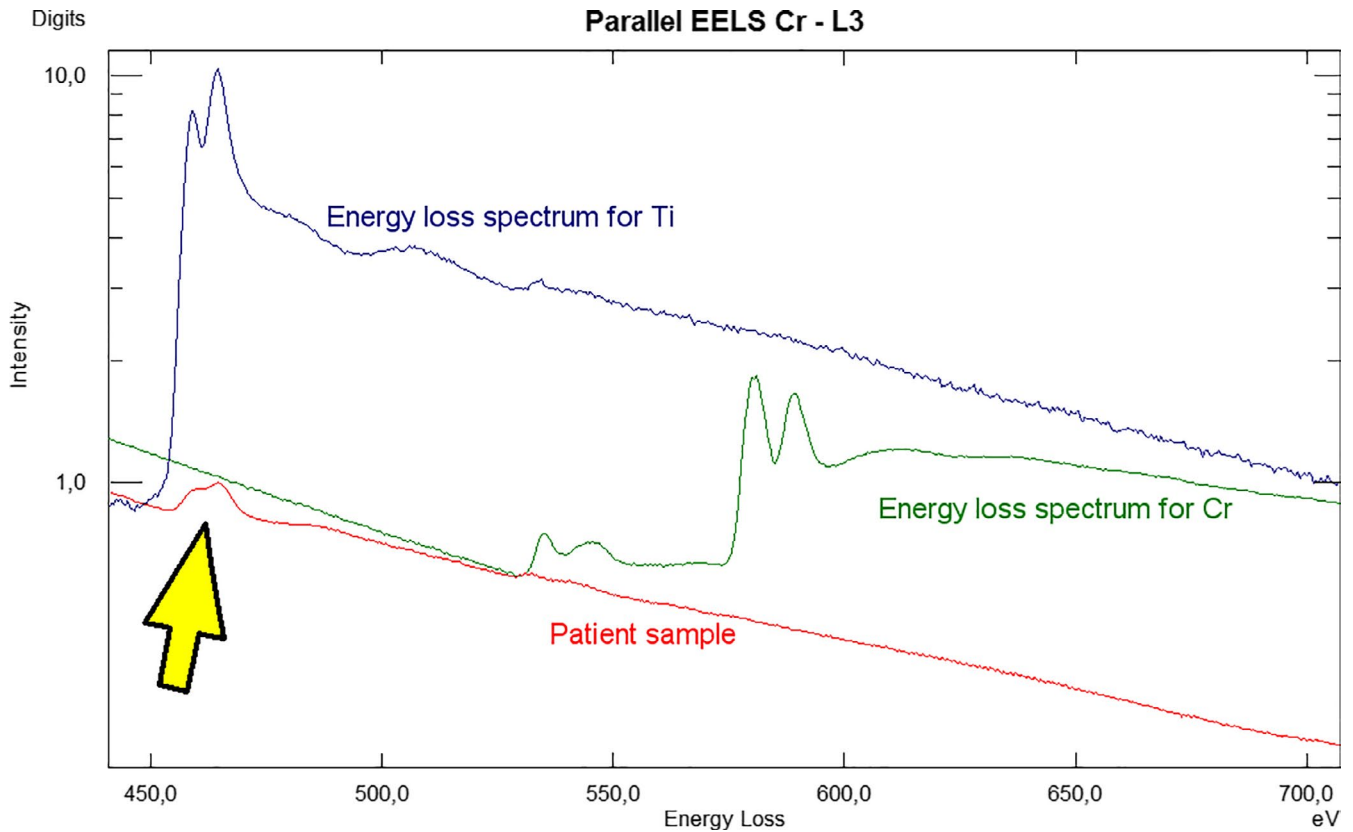


**FIGURE 1** Hematoxylin and eosin staining of the lymph nodes reveals numerous mononuclear and multinucleated histiocytes containing black stained granula (arrows), that is, metallic wear particles (bar = 50  $\mu$ m)



**FIGURE 3** Immunohistochemistry shows numerous CD68-positive macrophages (red; arrows) containing black particles (bar = 50  $\mu$ m)





**FIGURE 4** Results of the electron energy loss spectroscopy microanalysis showing a titanium peak (arrow)

granulomatous reaction due to spreading of wear particles.<sup>3,4</sup> Typically, the metallic particles are microscopically observed as black-stained cytoplasmic particles. In cases with extensive metallic wear, tissue appears black stained as presented in this case, also called "metallosis." Polyethylene debris may occur extra- and intracellularly. It can be detected either by polarized light due to the birefringence or by oil red staining.<sup>9</sup> Moreover, EELS analysis can serve as helpful method in the differential diagnosis between carbon particles contributing to the black appearance of lymph nodes in patients with tattoo and the metallic particles such as titanium, chrome, or molybdenum. It has been suggested that the wear particles constantly accumulate in the vicinity of vessels and that they are eliminated from the joint capsule by lymphatic transport thus reaching regional lymph nodes.<sup>4</sup> In addition, it has been also shown that particularly metallic wear particles had been disseminated to liver and spleen.<sup>10</sup>

Considering the differential diagnosis of the histological findings of black granules in cases with lymphadenopathy, a clear distinction between metal particles and tattoo pigment might be difficult. In both cases, the pigment is commonly found in the sinus and perisinusoidal areas. However, the finding of granulomatous reaction as well as induction of foreign-body giant cells has been rarely reported in the case of lymphadenopathy associated with

tattooing while this is a typical morphological feature in lymph nodes from patients with arthroplasty combined with lymphadenopathy.<sup>3,4,11</sup> Furthermore, size of metal particles as a cause from prosthesis loosening such as titanium or titanium-based alloys ranges between 0.5 and 20  $\mu\text{m}$ .<sup>4</sup> By contrast, the average particle size in tattoo inks may vary from <100 nm to about 1  $\mu\text{m}$ .<sup>12</sup> EELS analysis might be an additional help for establishing the metallic origin of a foreign-body granule. However, one have to keep in mind that tattoo pigments can also consist of inorganic colorful metals such as nickel, chromium, and particularly titanium oxide, which is the second most commonly used ingredient of tattoo inks.<sup>12</sup>

To our knowledge, this is the first report on a patient with both malignant melanoma and postarthroplasty lymphadenopathy. It should be kept not only in the case of malignant melanoma, but also in all tumor patients with a long-term history of total joint replacement therapy. Microscopy is *mandatory* in establishing diagnosis and can be confirmed by histochemistry and/or EELS analysis.

#### ACKNOWLEDGEMENTS

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#### CONFLICT OF INTEREST

Authors declare that there are no conflicts of interest.

## AUTHOR CONTRIBUTIONS

TH: contributed to design of the study, supervision of histopathological diagnosis, and preparation of the manuscript; AK: involved in performing the clinical studies, following patients' history, and revision of the manuscript; CB: involved in performing the EELS analysis and revision of the manuscript; BS: involved in performing histopathological diagnosis and revision of the manuscript; HS: involved in supervision of the clinical studies and revision of the manuscript.

## ETHICAL APPROVAL

No ethical approval was necessary for this clinical image.

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