Tattoo-Induced False-Positive FDG PET/CT Interpretation while Staging for Lung Cancer

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A previously healthy 48-year-old man was incidentally discovered to have a 3.1-cm left upper lobe subsolid nodule (Fig. 1*A*) that was later proved to be lung cancer of the adenocarcinoma histologic type. Staging with fludeoxyglucose (FDG) positron emission tomography (PET)/computed tomography (CT) revealed an incidental 1.8 × 1.2-cm FDG-avid right axillary lymph node with no FDG avid mediastinal or hilar lymph nodes (Fig. 1*B*). After the radiologist confirmed with the treating clinician that the right arm had no recent intervention, inflammation, or injury, the PET-CT report determined the right axillary lymphadenopathy to be equivocal. Although a right axillary metastasis was thought to be unlikely on account of its atypical location for a lung cancer solitary metastasis, because of the patient's intensive sun exposure owing to a variety of sport activities, the possibility of an incidental malignancy perhaps from skin malignancy was entertained. Under ultrasound guidance, three core biopsy specimens were obtained from the lymph node; they demonstrated reactive lymphoid tissue containing multiple clumps of free-lying black pigment (Fig. 1*C*). Upon further questioning of the patient regarding the presence of a tattoo, the patient confirmed he had received a tattoo on this right arm 1.5 years before the FDG PET-CT scan (Fig. 1*D*).

As tattooing has been increasing over the years, with 14% of Americans having at least one tattoo and with a prevalence of up to 40% in Americans age 40 years or younger,[1] discovery of FDG-avid lymph nodes while staging patients for cancer is expected to increase. Although most tattoo complications are local and subside within the first 2 weeks after tattooing, numerous types of local skin inflammatory reactions may occur, some even years thereafter.[2] Tattoo pigment is taken up by dermal macrophages and delivered to draining lymph nodes. Lymphadenopathy in the tattoo nodal draining basin is a known phenomenon that can occur up to 30 years after tattooing without any evident skin inflammation described.[3] FDG uptake in such nodes has been described even up to 24 years after tattooing, with FDG uptake similar to or even higher than the primary tumor FDG uptake.[4] The FDG uptake in such benign inflamed lymph nodes is of no surprise, as FDG is a glucose analogue and its distribution mirrors that of the glucose-metabolizing cells. Just as it is transported into tumor cells by glucose transporters, which are commonly overexpressed in tumor cells, it is also transported into inflamed nonmalignant tissue owing to increased glycolysis in leukocytes, lymphocytes, and macrophages in a wide variety of infectious and inflammatory conditions. There is no magic threshold FDG uptake number that can differentiate neoplastic from inflammatory FDG uptake. Also, there is no particular ink color that one can attribute to this nodal FDG uptake. It is difficult to determine which specific ink component is responsible for a particular inflammatory reaction given the variability in composition of tattoo inks, even among similar-appearing colors.[2]

It is important to remember that for the interpreting radiologist, such FDG-avid lymph nodes may mimic those harboring metastatic disease, as the radiologist cannot appreciate the tattoos in the different imaging modalities. Such erroneous upstaging of patients is more confusing when the FDG-avid lymph node is in the expected draining basin of the primary cancer.[5–8] This case illustrates the

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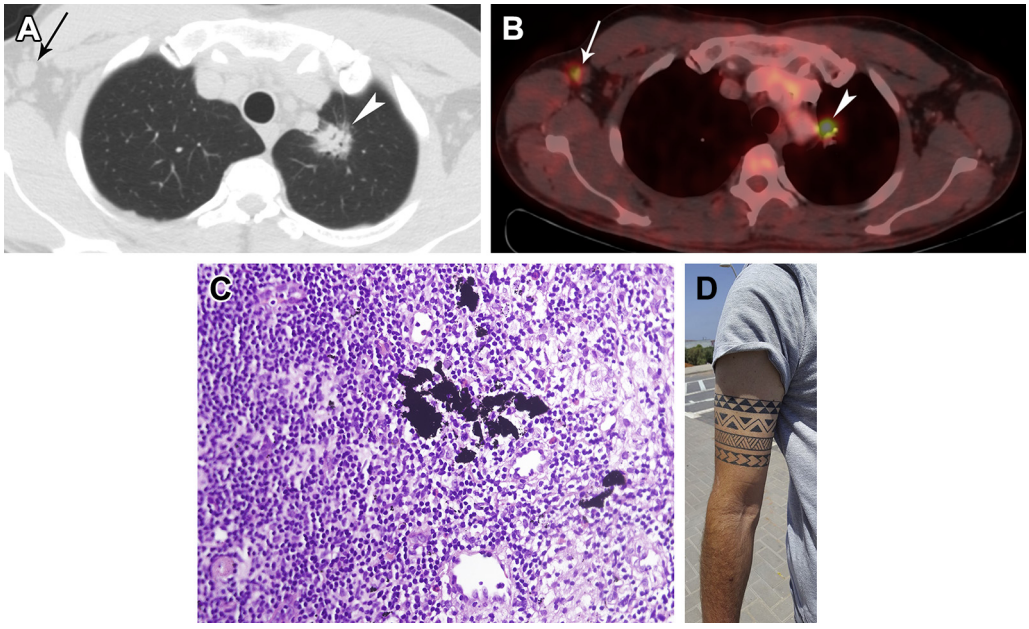

Figure 1. A 48-year-old man with newly diagnosed lung cancer. (*A*) Unenhanced chest computed tomography shows the primary, a 3.1-cm subsolid nodule (*arrowhead*), and an enlarged right axillary lymph node *(arrow*). (*B*) Fused fludeoxyglucose positron emission tomography/computed tomography shows the primary adenocarcinoma (*arrowhead*) with a maximum standardized uptake value of 5.7 and the 1.8 × 1.2-cm fludeoxyglucose-avid right axillary lymph node with a maximum standardized uptake value of 2.5. (*C*) Hematoxylin and eosin stain of the core needle biopsy specimen from the right axillary lymph node (original magnification, ×400) shows reactive lymphoid tissue containing clumps of free-lying black pigment. The results of immunostains for HMB45, S100, and melanA (melanoma markers) and MNF116 (pancytokeratin) were all negative. (*D*) Photograph of the patient's right arm demonstrates a tattoo obtained 1.5 years before imaging.

importance of ongoing communication between the referring clinician and the radiologist and careful physical examination, as well as the importance of performing a confirmatory biopsy for FDG-avid lymph nodes, especially when they upstage the patient's N or M staging.

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