

Coal worker's pneumoconiosis and sarcoid-like reaction mimicking lymph node metastases in a patient with lung cancer: A case report

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ABSTRACT

Sarcoid-like reactions occur in a small percentage of cancer patients. This reaction causes lymph nodes to appear hypermetabolic when viewed with Fludeoxyglucose-Positron Emission Tomography (FDG-PET). This is clinically important, because it could be confused with tumor metastasis and could affect the staging and treatment of the cancer. In addition to sarcoid-like reactions and metastasis, several other disease processes can cause lymph nodes to appear hypermetabolic with FDG-PET, including coal worker's pneumoconiosis. We present the case of a 61-year-old coal miner who was diagnosed with lung cancer. FDG-PET showed increased uptake in ipsilateral and contralateral mediastinal lymph. The patient had bronchoscopy with endobronchial ultrasound (EBUS) guided biopsy of the mass and needle aspiration of bilateral lymph nodes of the mediastinum. All the biopsies were negative. The patient then had a left upper lobectomy and left mediastinal lymph node dissection. The PET findings were originally attributed to metastasis of the tumor, but pathology of the ipsilateral nodes showed silicotic changes due to pneumoconiosis and non-caseating granulomas from a sarcoid-like reaction. Because the ipsilateral lymph nodes had no evidence of metastasis and EBUS biopsy of the contralateral nodes was negative, it was unlikely that the changes in the contralateral nodes were due to metastasis, and no adjuvant treatment was offered. At more than one year after surgery, the patient remains stable with no evidence of recurrence, and we have clinical assurance that the changes in the lymph nodes were due to the sarcoid-like reaction and pneumoconiosis and not metastasis. FDG-PET is useful for detection of lung cancer, but pathology is necessary for staging and determining treatment for the patient.

Keywords: lung neoplasms, anthracosis, sarcoid-like reaction, fludeoxyglucose-positron emission tomography

INTRODUCTION

Lymph node involvement is important for the staging and treatment of lung cancer. In lung cancer patients pathologically confirmed spread to contralateral mediastinal lymph nodes is termed N3 and is a

contraindication to surgery.¹ However, there are many other diseases which can also cause lymph nodes to appear hypermetabolic, including coal worker's pneumoconiosis (CWP) and sarcoid-like reactions, which could be confused with metastasis. A sarcoid-like reaction occurs in some cancer patients. While the pathogenesis is not completely understood, it likely reflects an immune response that protects the patient from metastasis.² Sarcoid-like reactions cause the formation of non-caseating granulomas inside lymph nodes, causing them to appear hypermetabolic when imaged with Positron Emission Tomography (PET). In

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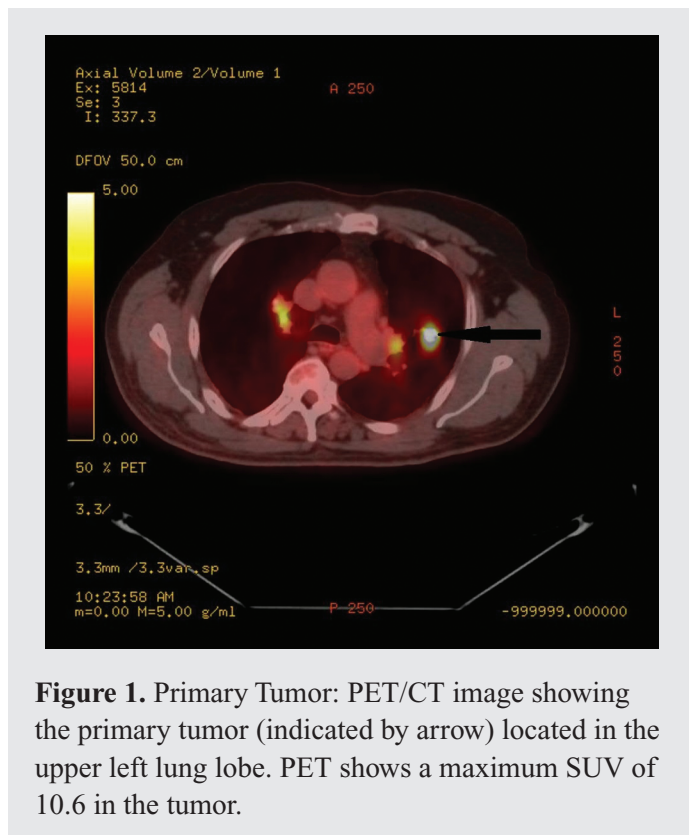


Figure 1. Primary Tumor: PET/CT image showing the primary tumor (indicated by arrow) located in the upper left lung lobe. PET shows a maximum SUV of 10.6 in the tumor.

this case report, we present a patient with lung cancer whose lymph nodes appeared hypermetabolic on FDG-PET. While originally thought to be metastatic tumor, pathology studies ultimately revealed a sarcoid-like reaction and changes due to CWP.

CASE

A 61-year-old male coal miner from Virginia presented to our clinic while on vacation with a chief complaint of cough and shortness of breath on exertion. He had a social history significant for working in a coal mine for 38 years, a 44 pack-year history of smoking, and use of chewing tobacco. His medical history was significant for Stage II colon cancer 11 years previously, which was treated with low anterior resection without any complications. He did not receive any adjuvant therapy. His family history was significant for cancer of the head and neck. His physical examination was within normal limits.

Spirometry showed a normal FVC at 4.01 (predicted: 4.20, 95.5% of predicted) and normal FEV1 at 2.88 (predicted: 3.36, 85.8% of predicted), a low normal FEV1/FVC at 0.72, and a decreased diffusing capacity (DLCO) at 67% of predicted.

A computed tomography (CT) scan of the chest showed a non-calcified speculated nodule measuring $1.4 \times 1.4 \times 1.6$ cm in the upper lobe of the left lung. The CT scan did not show any hilar or mediastinal lymphadenopathy. A Positron Emission Tomography/computed tomography (PET/CT) scan showed a hypermetabolic mass with a Standard Uptake Value (SUV) of 10.6. The PET/CT also showed bilateral hilar and mediastinal lymph nodes that were hypermetabolic with SUVs between 4 and 6.5, consistent with tumor metastasis.

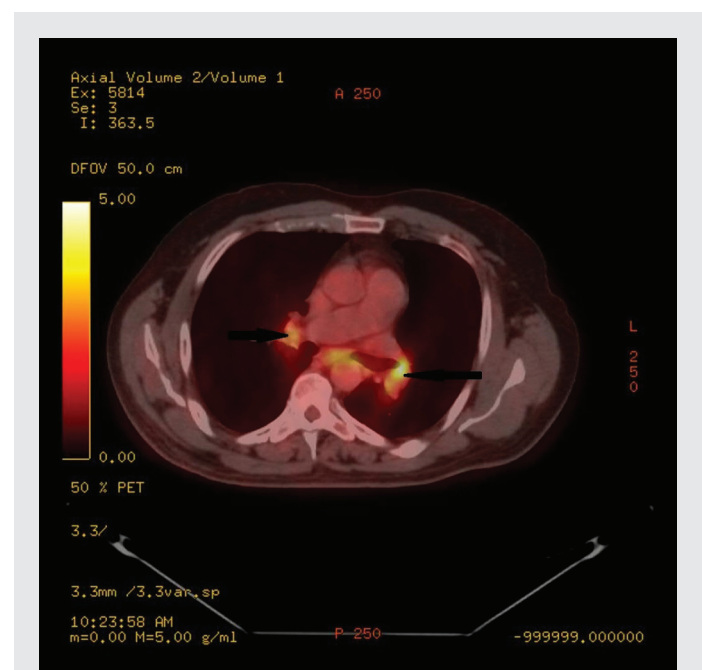


Figure 2. Pre-operative bilateral lymphadenopathy: PET/CT image showing bilateral mediastinal lymphadenopathy (indicated by arrows). PET shows SUVs between 4 and 6.5. These were initially worrisome for metastasis of the primary tumor; however, pathology did not show any evidence of malignancy but did show mixed dust deposition and non-caseating granulomas.

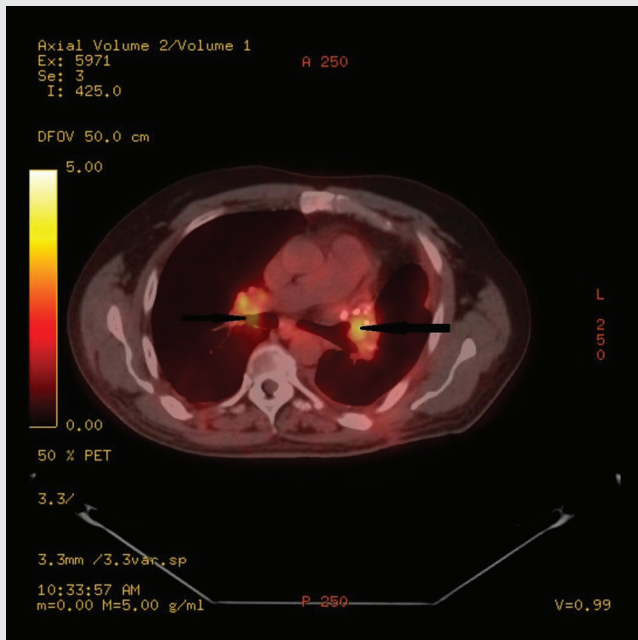


Figure 3. Post-Operative bilateral lymphadenopathy: PET/CT image showing bilateral mediastinal lymphadenopathy (indicated by arrows) persisting after surgical removal of the tumor. This was initially worrisome for metastasis; however, lymph nodes biopsied during surgery had not shown any malignancy. The absence of malignancy in the draining lymph nodes made it unlikely that these nodes were hypermetabolic due to malignancy. It is much more likely that the increased uptake was due to the coal worker's pneumoconiosis and the sarcoid-like reaction.

Due to the abnormal findings on PET/CT, the patient was diagnosed with a probable carcinoma. He then had bronchoscopy with endobronchial ultrasound (EBUS) guided biopsy of the mass and needle aspiration of bilateral lymph nodes. Five samples each were taken from the subcarinal lymph nodes, 11R right interlobar lymph nodes and 10L left hilar lymph nodes. All samples were analyzed by cytology and were found to be negative for metastatic disease.

Because of the extensive history of smoking and high SUV, he was referred for resection of the mass and had a left upper lobectomy. Nine lymph nodes

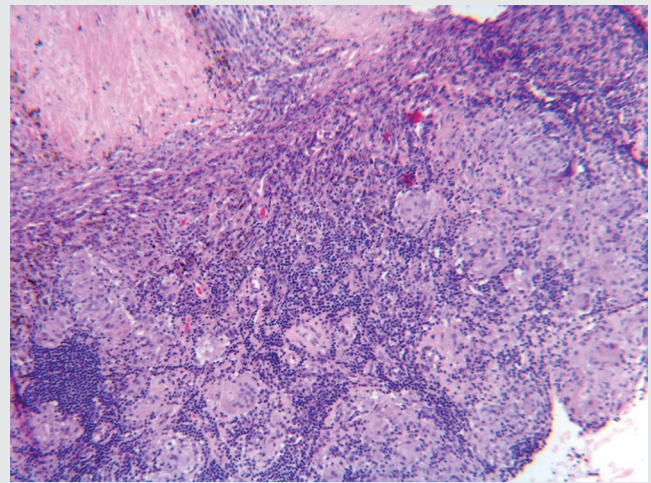


Figure 4. L4 Lymph node: Low power view of granulomatous area (lower right) and scar (upper left), both areas containing anthracotic (black) pigment and birefringent crystals consistent with silica on polarized microscopy. Original magnification 50x.

from the left mediastinum, left hilum, L4, L7 and L9 were also removed. Pathology reported a moderately differentiated squamous cell carcinoma with margins free from malignancy. Lymph nodes from the left mediastinum, L4, L7 and L9 showed non-caseating granulomatous lymphadenitis, dust deposition with a silicotic component, and no metastasis. The patient was staged as pT1apN0M0, stage IA, and no adjuvant chemotherapy was given.

The dust deposition was due to the patient's history of CWP, but the etiology of granulomas in the lymph nodes was unclear. Sarcoidosis, histoplasmosis, and mycobacterial infections were all considered in the differential diagnosis. Stains of the specimens were negative for fungal and mycobacterial organisms. Because the patient did not have symptoms of sarcoidosis, it was determined that the non-caseating granulomas were due to a sarcoid-like reaction occurring in the lymph nodes.

The patient recovered and was discharged from the hospital 11 days post-operatively. A PET/CT two months postoperatively again showed hypermetabolic lymph nodes (SUV 3.6-6.5) on the contralateral

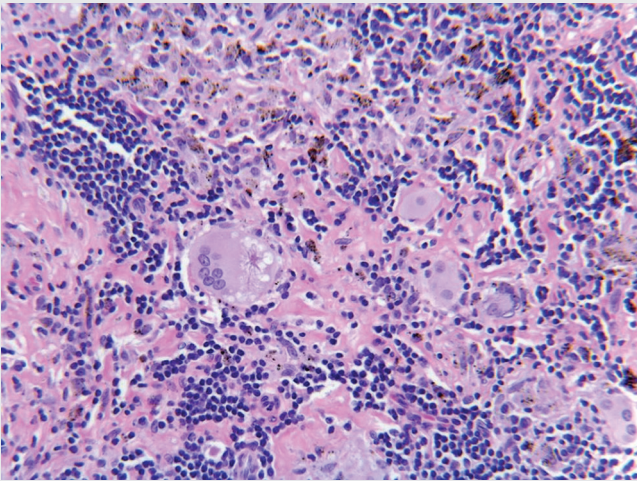


Figure 5. L4 lymph node: Granulomatous inflammation with multinucleated giant cells, one with an asteroid body; note anthracotic (black) pigment. Original magnification 125x.

side. These were initially worrisome for metastasis; however, the lymph nodes draining the tumor had no malignancy, and EBUS guided needle aspiration prior to surgery had shown no evidence of malignancy, so metastasis to the contralateral lymph nodes seemed unlikely. It was decided that the changes in the lymph nodes were not due to metastasis and that no adjuvant treatment was necessary. CT scans performed one, two, and three years later have shown stable lymph nodes with no evidence of recurrence. Because the lymph nodes have remained stable for over three years, we concluded that the changes did not represent metastasis but represented changes due to CWP and the sarcoid-like reaction.

DISCUSSION

In this case report we present a patient whose lymph nodes appeared hypermetabolic on FDG-PET, causing concern for lung cancer metastasis. EBUS guided needle aspiration and surgical pathology ultimately showed no evidence of malignancy in the lymph nodes but did show changes consistent with CWP and a sarcoid-like reaction due to lung cancer.

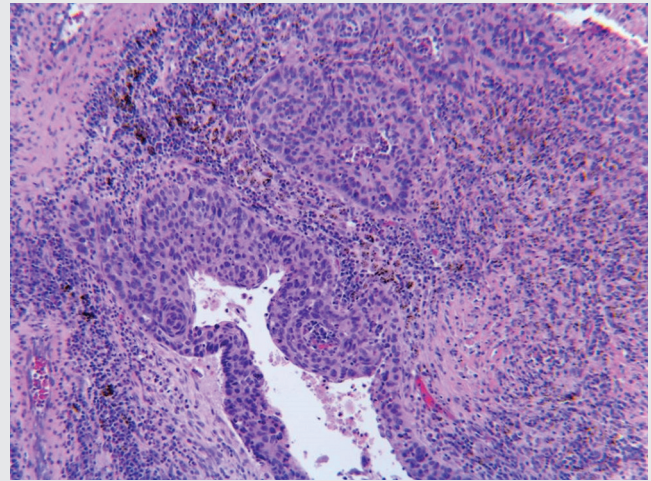


Figure 6. Left upper lobe of lung: Squamous cell carcinoma; original magnification 50x.

Sarcoid-like reactions are rare phenomena that occur in about 0.6% of cancer patients³ and represent an immune response which prevents metastasis of the tumor through uncertain mechanisms.² Sarcoid-like reactions generally form non-caseating granulomas in the draining lymph nodes, but occasionally the granulomas form in the tumor itself or in adjacent tissues.^{4,5} These reactions can cause lymph nodes to appear hypermetabolic on FDG-PET, and one study reported a median SUV of 7.3.¹ In our patient, the sarcoid-like reaction was accompanied by changes due to CWP.

Coal worker's pneumoconiosis is an occupational lung disease caused by the accumulation of coal dust in the lungs. As the name implies, coal workers are the population most commonly affected, but it can also occur in people with a long history of exposure to biomass smoke. Coal worker's pneumoconiosis often presents as a black discoloration of the bronchial mucosa due to the deposition of coal dust but can also cause lymphadenopathy.⁶ Coal worker's pneumoconiosis lymphadenopathy can cause the lymph nodes to appear hypermetabolic with FDG-PET⁷⁻⁹, mimicking metastasis^{10,11} or tuberculosis.¹²

Our patient was diagnosed with lung cancer, and because of the abnormal appearance of lymph nodes on FDG-PET, it was originally believed the cancer had

metastasized to ipsilateral and contralateral lymph nodes. Cytological analysis of needle aspirate taken during bronchoscopy showed no evidence of metastasis in ipsilateral or contralateral lymph nodes. Surgical resection and pathology of the ipsilateral lymph nodes also showed no evidence of malignancy but did show changes due to CWP and a sarcoid-like reaction. Because there was no tumor in the ipsilateral nodes, it was decided that no treatment was necessary for the contralateral lymph nodes, even though they appeared hypermetabolic on FDG-PET. The patient has remained in a stable condition for three years after surgery with no evidence of recurrence, providing some clinical assurance that the changes in the contralateral lymph nodes were also due to CWP and sarcoid-like reactions. Because metastasis, CWP, sarcoid-like reactions, and other disease processes can all appear hypermetabolic with PET, it is important to obtain histology to decide on the proper course of treatment.

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