

A Case of Non-small Cell Lung Cancer with False-positive Staging by Positron Emission Tomography

Masaki Tomita, MD,¹ Hideki Ichinari, MD,¹ Yuji Tomita, MD,¹ Kazuhiko Mine, MD,¹ Hirotoishi Iiboshi, MD,² Atsushi Kisanuki, MD,³ and Koichiro Shibata, MD¹

A 70-year-old woman with right lung cancer was admitted to our hospital. Chest computed tomography (CT) revealed an approximate 2.5 cm sized mass in the right middle lobe, and enlarged hilar and mediastinal lymph nodes. The 2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET) showed high uptake in the right hilar and mediastinal nodes. Therefore we diagnosed N2 (mediastinal nodal involvement) disease. Microscopically, however, all dissected lymph nodes revealed anthracosilicosis and negative for malignancy. Although false-positive evaluation of mediastinal involvement by PET can occur in the setting of metabolically active inflammatory disease, this case did not have these active diseases. The FDG-PET result of this case was unusual. (Ann Thorac Cardiovasc Surg 2003; 9: 397–400)

Key words: FDG-PET, false-positive, non-small cell lung cancer, mediastinal lymph nodes

Introduction

The current system for staging lung cancer is based on the TNM classification. The staging of lung cancer patients not only provides important prognostic information with regard to survival, but also guides the decision-making process with regard to choosing the optimal treatment modality. Computed tomography (CT) is the imaging modality used most commonly for preoperative non-invasive mediastinal staging.^{1,2} However, CT criteria have been reported to yield a high false-positive result rate^{3,4} and the reliability of CT size criteria for node metastasis remains controversial. Several previous studies described 2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET) to have a higher accuracy in the detection of mediastinal lymph node involvement.⁵⁻⁷ On the other hand, it has been reported that false-positive PET scan results may be obtained because of metabolically active but benign conditions involving inflammation or infection (e.g., tuberculous granulomas, coccidioidomycosis, aspergillosis).^{8,9}

From Departments of ¹Surgery, ²Internal Medicine and ³Pathology, Miyazaki Prefectural Nichinan Hospital, Miyazaki, Japan

Received May 19, 2003; accepted for publication June 10, 2003. Address reprint requests to Masaki Tomita, MD: Department of Surgery, Miyazaki Prefectural Nichinan Hospital, Kiyama 1-9-5, Nichinan-city, Miyazaki 887-0013, Japan.

We herein report an unusual case of false-positive staging by FDG-PET scan.

Case Report

A 70-year-old asymptomatic woman was admitted to our hospital for evaluation of an abnormal shadow on chest roentgenogram. She was non-smoker and did not have a history of industrial exposure. On admission, physiological and laboratory examinations, including tumor markers, were within normal limits. A plain chest roentgenogram showed an abnormal mass in right middle field of the lung. Chest CT revealed an approximate 2.5 cm sized mass in the right middle lobe (S⁴), and enlarged mediastinal lymph nodes (Figs. 1, 2). The pathological diagnosis of this primary tumor by means of transbronchial lung biopsy was adenocarcinoma. No evidence of distant metastases was detected by abdominal CT, bone scan and magnetic resonance imaging of the brain. The FDG-PET showed high uptake in not only primary tumor but also right hilar and mediastinal nodes (Figs. 2, 3). Taken together with these clinical findings, she was diagnosed as clinical stage IIIA (T1N2M0) lung cancer. Therefore we suggested preoperative induction chemotherapy; however, she refused. She underwent thoracotomy. Black, hard and enlarged lymph nodes were found intraoperatively. Pathological findings of all dissected lymph nodes showed that



Fig. 1. CT image showing right middle lobe mass.

these nodes had nodular hyaline scars and contained polarizable material suggestive of silica with focally contained fine anthracotic pigments, and negative for malignancy (Fig. 4). Thus her pathologic stage changed to stage IA (T1N0M0).

The patient is now doing well without recurrence for about six months after thoracotomy.

Discussion

PET imaging is a technology that is used to identify focal areas of increased cellular metabolism. FDG is an excellent tracer for detecting malignant disease because of the high glucose metabolism observed in cancer cells. Tumor cells take up glucose and FDG in a similar fashion.⁵⁾

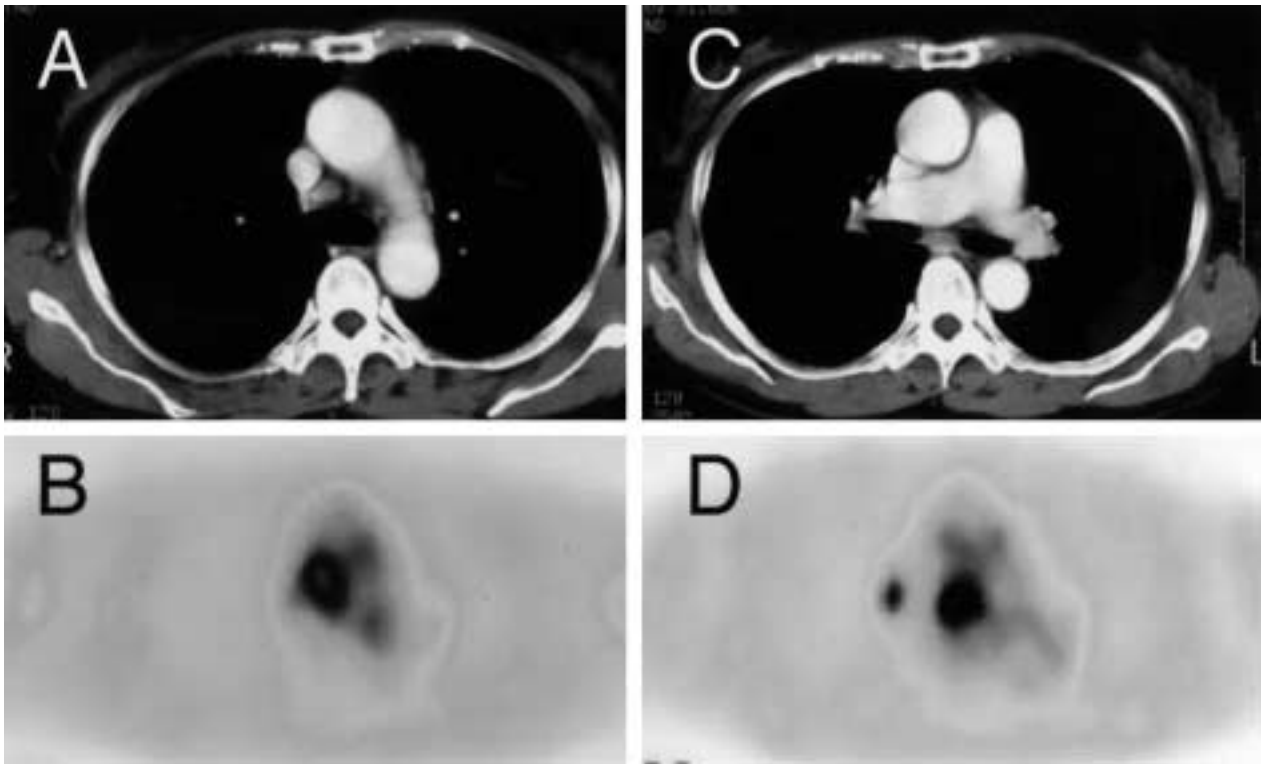


Fig. 2. CT scan showing prominent pretracheal (A) and subcranial (C) mediastinal lymph node. PET image showing intense uptake in the pretracheal lymph node (B), and hilum and subcranial lymph nodes (D).



Fig. 3. A coronal image of PET scan showing intense uptake in the right lung mass and mediastinum.

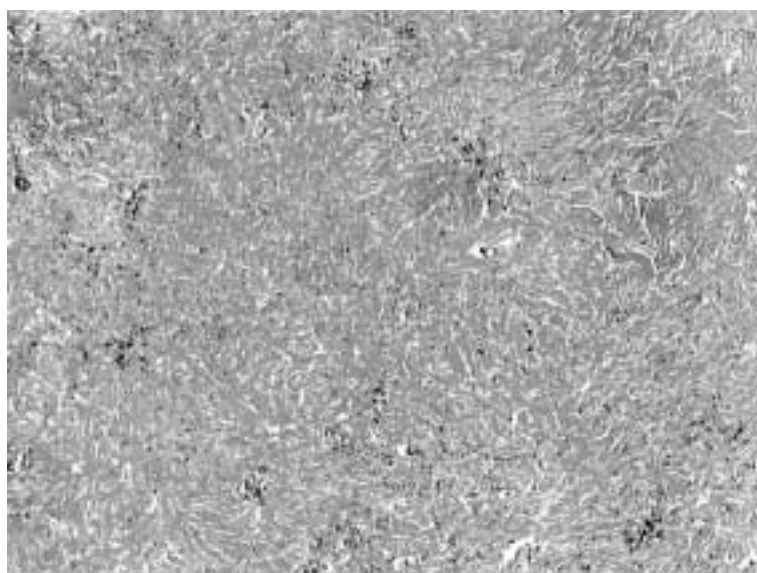


Fig. 4. The pathologic sections of dissected lymph nodes revealed silicosis with anthracotic pigments and negative for malignancy.

However, once FDG becomes phosphorylated, it does not proceed further down the cellular metabolic pathways. Phosphorylated FDG remains trapped in tumor cells with minimal amounts leaving the cell able to act as an excellent marker of increased cellular metabolism.⁵ With this technique, whole body images can be created to accurately identify malignant primary neoplasms and metastatic disease, and to assess tumor growth rates.⁶ PET imaging has been compared to other staging modalities in an effort to determine which test is best for identifying the presence of metastatic disease in mediastinal lymph nodes.^{5,6} Consistently, PET has demonstrated sensitivity and specificity rates of 80-90% compared to 50-60% for CT.⁷

However there have been scattered reports of the causes of false-positive PET findings and it had been reported

that false-positive PET scan results might be obtained because of metabolically active but benign conditions involving inflammation or infection (e.g., tuberculous granulomas, coccidioidomycosis, aspergillosis).^{8,9} Roberts et al.¹⁰ reported seven patients with false-positive staging by PET. They concluded that false-positive evaluation of mediastinal metastases by PET can occur in the setting of concurrent inflammatory lung diseases or for centrally located tumors.¹⁰ However the present case did not have these active inflammatory diseases. The silicosis with anthracotic pigments in mediastinal lymph nodes might be caused by inhalation of irritant dusts and attendant distortion of local lymphatic vessels. These lymph nodes might not be metabolically active and it is difficult to understand that these lymph nodes might take up glucose actively. Therefore the reason for false-positive stag-

ing in our case is difficult to interpret.

PET imaging may have greater usefulness in its negative predictive value thereby showing increased sensitivity. However, with a positive FDG-PET scan result, further diagnostic procedures should be pursued in order to avoid overstaging. Poncelet et al.¹¹⁾ also concluded that every effort should be pursued to confirm or exclude mediastinal lymph nodes involvement so as not to overlook false-positive patients who otherwise would be denied surgical exploration with a curative intent.

In conclusion, we report a rare case of false-positive staging by FDG-PET scan. Further studies for the mechanism of such false-positive results of PET scan were warranted.

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