

Case Report

## Dry Small Pleural Dissemination of Adenocarcinoma of the Lung Preoperatively Detected by PET/CT: A Report of Two Cases

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Dry pleural dissemination in non-small cell lung cancer, defined as solid pleural metastasis of lung cancer without pleural effusion, is a condition occurring in T4 lung cancer. Positron emission tomography (PET) has been reported to be useful for the diagnosis and staging of lung cancer. It has been reported that positive findings on PET scans of indeterminate pleural abnormalities at computed tomography (CT) are sensitive to malignancy. We encountered two cases of dry small pleural dissemination of adenocarcinoma of the lung preoperatively detected by PET/CT. A 75-year-old man and a 66-year-old man underwent CT scan, which demonstrated solitary tumor in the lung, an enlarged mediastinal lymph node, and a small pleural nodule less than 10 mm in size, all of which were positive findings on the fluorine 18 fluorodeoxyglucose (FDG) PET portion of an integrated PET/CT. Both patients underwent thoracoscopic biopsy of the dry pleural nodule revealing dissemination of adenocarcinoma of the lung (T4). Whereas histological thoracoscopic diagnosis remains mandatory before planning treatment, our cases may suggest that PET/CT will be useful as a screening modality for dry pleural dissemination of lung cancer.

**Key words:** non-small cell lung cancer, pleural dissemination, positron emission tomography, PET/CT

In the management of non-small cell lung cancer (NSCLC), obtaining an accurate staging of the disease is important to treating patients appropriately [1]. Dry pleural dissemination in NSCLC, defined as solid pleural metastasis of lung cancer without pleural effusion is a condition occurring in T4 lung cancer. Positron emission tomography (PET) with the labeled

glucose analogue fluorine 18 fluorodeoxyglucose (FDG) is known to map both normal and abnormal tissue function, and complements computed tomography (CT) imaging, which allows for the viewing of exquisite anatomic details. When combined, these 2 modalities can help both identify and localize functional abnormalities. There have been a couple of papers about the role of an FDG PET in pleural diseases showing that positive findings on FDG PET scan of indeterminate pleural abnormalities at CT are sensitive to malignancy [2]. We report herein 2 cases of

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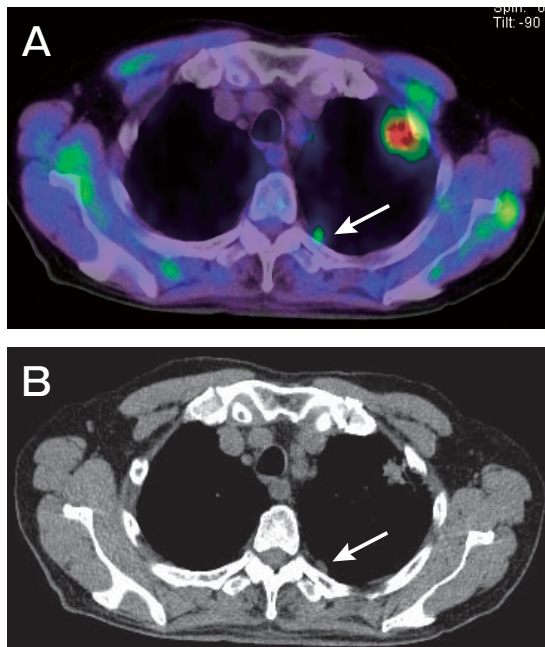


Fig. 1 PET/CT evaluation of both a pulmonary tumor and a dry small pleural nodule in a 75-year-old man. **A**, PET scan shows intense focal FDG uptake on a pulmonary tumor and a small pleural nodule (arrow); **B**, CT scan shows a pulmonary nodule 25 mm in size and a pleural nodule 9 mm in size (arrow).

dry small pleural dissemination of adenocarcinoma of the lung that were preoperatively detected by PET/CT.

### Case Report

**Case 1.** A 75-year-old man with a past medical history of pneumoconiosis underwent a CT scan showing a 25-mm solitary tumor in the left upper lobe, an enlarged mediastinal lymph node, and a small pleural nodule 9 mm in size on the left mediastinal side, all of which were positive findings on the FDG PET portion of an integrated PET/CT (Fig. 1). The maximum standardized uptake values (SUV (max)) of the primary tumor and the small pleural nodule were 8.64 (early phase) and 9.97 (late phase), respectively, in the primary tumor, and 3.01 (early phase) and 3.41 (late phase) in the pleural nodule. The diagnosis of adenocarcinoma was confirmed by CT-guided biopsy of a solitary tumor in the left upper lobe. Video assisted thoracic surgery (VATS) biopsy of a small pleural nodule was performed. As a histologic examination of

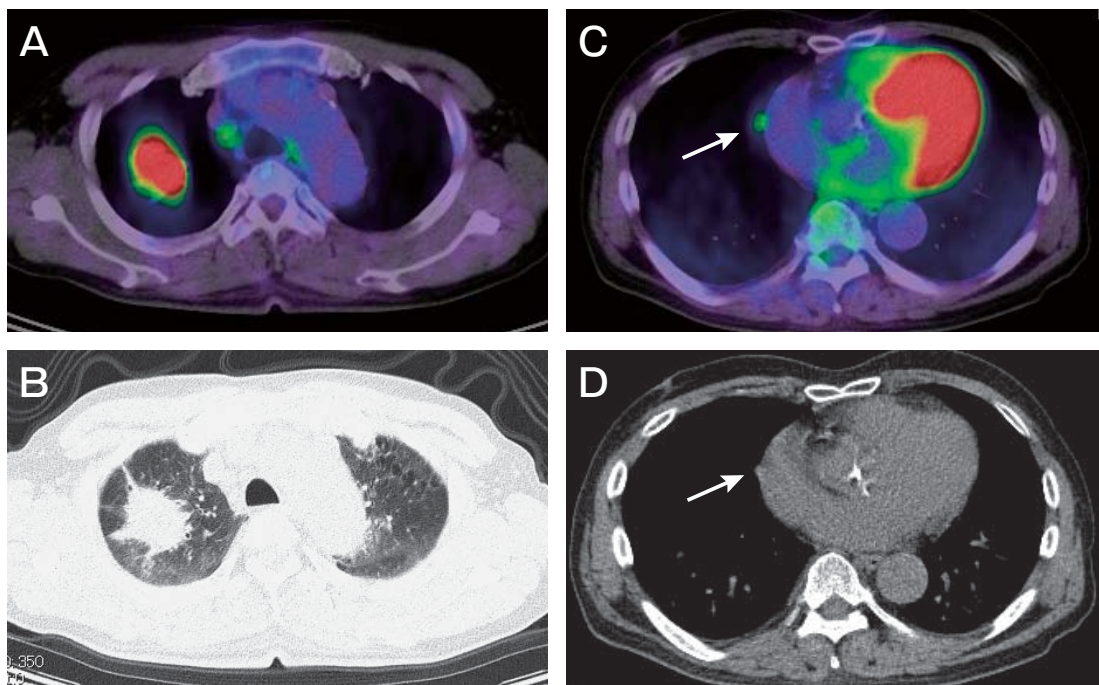


Fig. 2 PET/CT evaluation of both a pulmonary tumor and a dry small pleural nodule in a 66-year-old man. **A**, PET scan shows intense focal FDG uptake on a pulmonary tumor; **B**, CT scan shows a pulmonary tumor 55 mm in size; **C**, PET scan shows intense focal FDG uptake on a small pleural nodule (arrow); **D**, CT scan shows a pleural nodule 7 mm in size (arrow).

the biopsy specimen demonstrated adenocarcinoma, his staging was finally classified as p-Stage IIIB (T4N0M0). Systemic chemotherapy was then initiated with carboplatin and gemcitabine.

**Case 2.** The patient was a 66-year-old man with liver cirrhosis. During a regular check-up, a 55-mm mass shadow in the right lung was detected on his chest X-ray film. CT scan revealed a tumor in the region of right S1, an enlarged mediastinal lymph node, and a small pleural nodule 7 mm in size on the right mediastinal side (Fig. 2). FDG PET findings at integrated PET/CT also demonstrated an accumulation corresponding to these lesions (Fig. 2). SUV (max) of the primary tumor and the small pleural nodule were 20.0 (early phase) and 27.6 (late phase) in the primary tumor, and 3.27 (early phase) and 3.98 (late phase) in the pleural nodule, respectively. A biopsy specimen of the small pleural nodule was obtained under VATS. The pleural abnormality proved pathologically to be dissemination of adenocarcinoma of the lung (T4). He was considered a poor candidate for surgical intervention, and systemic chemotherapy consisting of carboplatin and paclitaxel was begun.

## Discussion

In patients with NSCLC, pleural dissemination is considered a contraindication to surgical treatment. The differentiation of a small dry pleural nodule between benign and malignant is important for accurate staging and appropriate therapeutic strategies. Currently, CT scan has been the mainstay of assessment of dry pleural dissemination; this assessment, however, is based on morphological criteria and can therefore be misleading. It has been reported that 71% of the pleural abnormalities examined by CT scan are classified as indeterminate [1].

FDG PET has been extensively used in the assessment of lung cancer [2]. A significant improvement in the evaluation of lymph node metastasis and distant metastasis has been shown in comparison to CT scan [3]. Moreover, FDG PET seems to have great potential in the differential diagnosis of pleural diseases. Several studies have reported the role of FDG PET with identification of pleural malignancies [4–6]. According to Bury *et al.* the specificity and sensitivity were found to be 78% and 100%, respectively, in 25 patients with benign and pleural diseases [4]. Benard

*et al.* have reported favorable results in the differential diagnosis between benign and malignant with a specificity of 100% and a sensitivity of 91% [5]. An SUV threshold of 2 has been proposed as a distinguishing point between benign and malignant diseases with an accuracy of 92% [6]. While these data are encouraging, there are a couple of limitations of FDG PET to be considered. First, nonmalignant processes such as tuberculosis, fungal infections, sarcoidosis, and pneumoconiosis can take up FDG and mimic the appearance of a malignant nodule on PET or PET/CT images. It is therefore necessary to obtain details about the patient regarding exposure, as well as pertinent medical history. In addition, in order to obtain a definite diagnosis, biopsy would be required because FDG PET cannot reliably help in distinguishing between benign and malignant pulmonary nodules. Secondly, false-negative scans of pleural dissemination can be seen due to a limited resolution of PET for 6–12 mm lesions [2], as can a decreased maximum SUV related to respiratory motion [7]. Shim and colleagues have demonstrated that, by PET only, the sensitivity, specificity, and accuracy of dry small pleural dissemination are 25% (2/8), 90% (147/164), 87% (149/172), respectively; by PET plus CT, these were 100% (8/8), 100% (164/164), 100% (172/172), respectively [7]. The CT portion of an integrated PET/CT helps improve the diagnostic accuracy of dry pleural nodules. Whereas histological thoracoscopic diagnosis remains mandatory before planning treatment, our cases may suggest that PET/CT should be considered useful as a screening modality for dry pleural dissemination of lung cancer.

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