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Cutaneous metastatic lung cancer detected with ^{18}F-FDG PET

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A 48-year-old male smoker presented with a chief complaint of persistent cough for three months. A CT scan revealed only a large right paratracheal mass. The plan was to obtain histological confirmation of suspected lung cancer via bronchoscopy and mediastinoscopy. A whole body ^{18}F-FDG (2-deoxy-2-[^{18}F]fluoro-D-glucose) PET Scan was ordered for staging and localization of the most accessible biopsy site. There was a large, intense hypermetabolic focus corresponding to the paratracheal lesion seen on CT, as well as a lesion in the right adrenal gland. There was also a superficial, subcutaneous hypermetabolic lesion in the mid-back. The subcutaneous lesion, which previously had not been noted, was biopsied and proved to be metastatic adenocarcinoma consistent with the lung primary. This case illustrates the clinical utility of reporting soft tissue abnormalities, which may provide an alternative, more readily accessible location for biopsy that is both safer and less expensive than bronchoscopy or mediastinoscopy.

Key words: PET, ^{18}F-FDG, adenocarcinoma, non-small cell lung cancer, skin metastasis

INTRODUCTION

^{18}F-FDG PET has been approved and widely used for distinguishing between malignant and benign pulmonary nodules, staging for mediastinal or distant metastatic disease, detection of recurrent or residual tumor following definitive therapy, and determining the optimal anatomic location to perform an invasive diagnostic procedure.[1] A recent large multicenter clinical trial was conducted to assess the value of adding ^{18}F-FDG PET to conventional imaging in the workup of potentially resectable lung cancers. The authors concluded that the superior ability of ^{18}F-FDG PET in the detection of advanced disease (stages IIIA, IIIB, and IV) could potentially help avoid unnecessary surgical procedures in 1 of 5 patients.[2] By avoiding unnecessary surgeries, the addition of ^{18}F-FDG PET to preoperative imaging routines results in a significant decrease in the average costs per patient.[3] The sensitivity and specificity of ^{18}F-FDG PET for detection of distant metastatic disease have been reported to be 95% and 83% respectively.[4]

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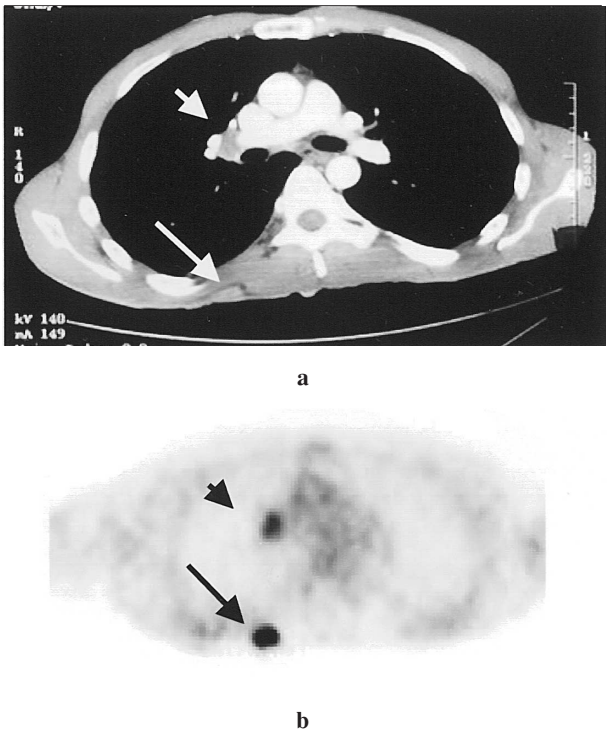
CASE

A 48-year-old male smoker presented to his primary care doctor with a 3-month history of a persistent cough without hemoptysis, chest pain, stridor, or voice changes. He reported no constitutional symptoms of fevers, chills, night sweats, or weight loss. He denied headaches, dizziness, seizures, vision changes, as well as any new musculoskeletal symptoms. During workup he had a CT scan that showed a 6 cm mass in the right paratracheal region surrounded by emphysematous blebs and no other abnormalities (Fig. 1a, 2a).

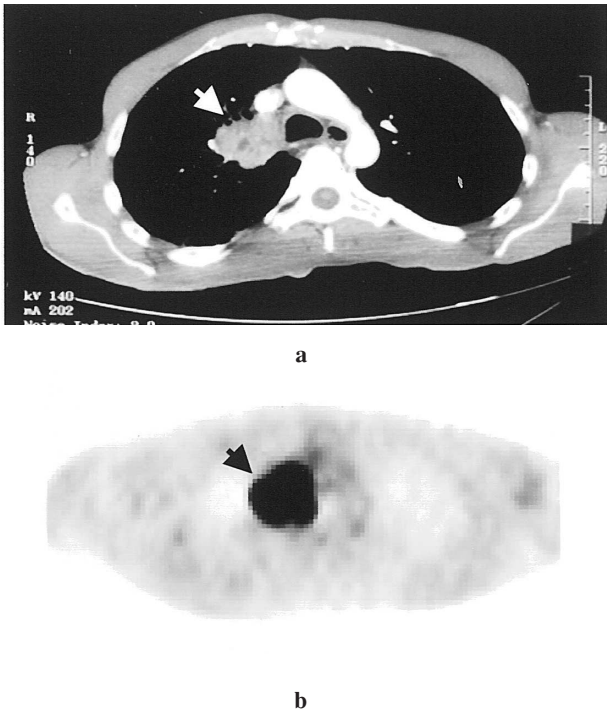
The surgeon noted a thin middle-aged male who had normal cardiopulmonary and abdominal exams, no adenopathy, cyanosis, clubbing or edema. Options to obtain



a

b

Fig. 1 a) Contrast enhanced axial CT scan image at the level of main pulmonary artery bifurcation reveals right hilar adenopathy (*short arrow*). A small hyperdense subcutaneous nodule (*long arrow*) is also present in the right posterior chest wall. b) Corresponding focal intense FDG uptake is seen in both locations on an axial PET scan image (*short and long arrows*). Small chest wall lesions can frequently be overlooked during routine CT scan evaluations, especially in patients with a paucity of fatty tissue that could decrease soft tissue contrast and lesion conspicuity.



a

b

Fig. 2 a) A contrast enhanced (soft-tissue window) axial CT scan demonstrates a right suprahilar mass (*arrow*) invading the mediastinum. b) A corresponding axial PET scan image shows intense FDG uptake within the mass (*arrow*).

a tissue diagnosis including bronchoscopy, CT-guided needle biopsy, mediastinoscopy, thoracoscopy, or thoracotomy were discussed with the patient. After weighing the risks/benefits of each method, the plan was to proceed with a whole body ^{18}F-FDG PET scan for staging and localization of the most accessible biopsy site, followed by bronchoscopy and mediastinoscopy.

Whole body ^{18}F-FDG PET demonstrated a large, intense hypermetabolic focus in the right paramediastinal area of the upper lobe of the right lung that extended into the mediastinum (Fig. 2b). A smaller focus of moderate uptake was seen in the right hilum immediately inferior to this large lesion (Fig. 1b). A small, lobulated hypermetabolic lesion was noted in the right adrenal gland. There was moderate uptake around a right hip prosthesis. There was also a small, superficial, subcutaneous hypermetabolic lesion in the back at approximately the T8–T9 level. The patient was re-examined and a mobile, non-tender nodule was palpated in that location. Review of the CT scan with knowledge of the ^{18}F-FDG PET findings did reveal a lesion in the same location on the back, which had not been noted or reported previously (Fig. 1a).

With hopes of avoiding a more invasive diagnostic method and its inherent risks, the subcutaneous lesion on the back was biopsied. It proved to be metastatic adenocarcinoma, consistent with a lung primary. The planned diagnostic bronchoscopy and mediastinoscopy were cancelled and the patient was referred to a medical oncologist for treatment of stage IV adenocarcinoma of the lung.

DISCUSSION

^{18}F-FDG PET imaging has been widely used in the staging and management of the patients with lung cancer.[1,2,4] Its potential for diagnosis of advanced disease and avoidance of unnecessary, perhaps futile invasive procedures is well known.[2–4] PET imaging may lead to an accessible site for biopsy that had not been previously identified. In our case, whole body ^{18}F-FDG PET was done prior to scheduled bronchoscopy and mediastinoscopy and showed a very superficial skin lesion on the patient's back, which was readily accessible to biopsy. Histopathological confirmation was obtained by means of a procedure with significantly less morbidity and cost to the patient than either of the other diagnostic options.

Between 0.7% and 9% of patients with any type of cancer develop metastases to skin.[5] In lung cancer, the

prevalence of biopsy proven skin metastasis is reported to be between 1.3% and 3.1%.[6–9] Adenocarcinoma is the histologic subtype in 20–40% of patients with lung cancer with a soft tissue skin metastasis.[7,8] The most frequently encountered locations are the back, chest wall, and abdomen, and they are frequently accompanied by metastases to other organs as well.[8–10,12]

The presence of a skin metastasis in a patient with a lung cancer indicates a poor prognosis with a median survival of 2–4 months.[7–12] Thus histopathologic confirmation is mandatory, not only to confirm the suspected diagnosis but also to exclude other etiologies such as a concurrent second malignant lesion i.e., melanoma, and less likely infectious etiologies. The presented case highlights the importance of maintaining a high index of suspicion for cutaneous metastatic disease, which can frequently be overlooked especially in patients with low fatty tissue that would make the lesion less obvious on CT.

The prevalence of skin metastases in lung cancer is known only from retrospective biopsy and autopsy studies. This number may be biased because of failure to inspect the entire body or to appreciate metastases that are not visually obvious from physical examination. True whole body ^{18}F-FDG PET imaging, which includes scanning from the top of the skull to the bottom of the feet, may be of some benefit in detecting clinically occult skin metastases. To our knowledge, there have been no studies that systematically reported the prevalence of skin metastases from lung cancer on true whole body ^{18}F-FDG PET.

Our patient's skin lesion could have been detected even if a PET scan with a regular field of view was used. However, inspired by this case we retrospectively analyzed 136 consecutive patients with biopsy proven non-small cell lung cancer who underwent true whole body ^{18}F-FDG PET imaging for staging purposes. Five percent of the patients had soft tissue metastasis. Of these, 88% (16 of the 18) of the metastatic soft tissue lesions were present outside the area of the so-called whole body field, which usually includes from the base of the skull to the upper thigh.[13]

CONCLUSION

An ^{18}F-FDG PET scan, especially one that includes the true whole body, can direct attention to a relevant lesion that might have been over looked on physical or CT exams. This case illustrates how a cutaneous metastatic lung lesion was detected with an ^{18}F-FDG PET scan and how this finding altered the patient's course of management by avoiding invasive and costly bronchoscopy and mediastinoscopy.

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