Research

Osteolytic metastasis detected in a patient with lung carcinoma by F18-FDG PET

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Abstract

We present a 53-year-old man with a vocal cord paralysis observed as a primary manifestation of lung carcinoma. Tc-99m MDP whole body bone scan was performed and resulted in a normal scintiscan. The bone scan did not reveal any suspicious foci of uptake. The possibility of bone metastasis was taken into consideration. A whole body F18-FDG-PET scan showed intense uptake in the left upper lung corresponding to the primary tumor. A bronchial biopsy confirmed infiltration by small cell lung carcinoma (SCLC). SCLC is composed of poorly differentiated, rapidly growing cells with diseases usually occurring centrally rather than peripherally. It metastasizes early. The whole-body F18-FDG-PET scan clearly demonstrated a focus of increased uptake in the second lumbar vertebral body suspicious for osteolytic metastasis. A lytic bone metastasis was confirmed by MRI. The patient then received therapy and underwent follow up abdominal CT. The scan showed blastic changes in the L2 vertebra suggesting response to treatment.

INTRODUCTION

Bone metastases are diagnosed at initial presentation in 4%–60% of patients with lung cancer. Bone pain is usually considered an indicator of skeletal metastases, but up to 40% of lung cancer patients with proven bone metastases are asymptomatic. Clinical staging at presentation has been performed by means of CT of the thorax through the liver and adrenals, CT or MRI of the brain, and scintgraphy for assessment of bone involvement. This staging algorithm remains the most commonly used in places where ^{18}F-FDG PET is not a routine staging modality of lung cancer. If necessary, scintigraphy can be complemented by CT or regional MRI for further assessment of unclear lesions. ^{18}F-FDG PET and PET/CT were recently reported to be of value in assessing the presence of soft-tissue and bone spread in patients with lung cancer. They reported that ^{18}F-FDG PET had a high positive predictive value and a lower false-positive rate.

The two main histopathologic categories for lung malignancies are small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). In both categories, their clinical behaviors and treatments are different. SCLC accounts for the minority (14%) of lung cancer cases and is composed of poorly differentiated, rapidly growing cells with diseases usually occurring centrally rather than peripherally. It metastasizes early. Management for SCLC is nonsurgical, and therapy is via chemotherapy alone or in combination with radiotherapy [1].

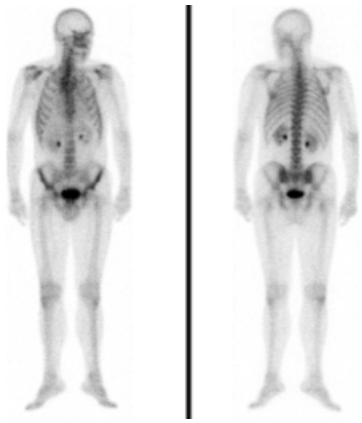

Figure 1. Tc-99m MDP whole body bone scan were performed and resulted a normal scintiscan.

CASE REPORT

Bone scintigraphy is the method used to screen the whole body for bone metastasis in patients with malignancies. We present a 53-year-old man with a 4-month history of progressive dysphonia. Patient was referred to a consultant otolaryngologist for clinical examination. Vocal cord paralysis was observed as a primary manifestation of left upper lung carcinoma elucidated by chest radiograph. Tc-99m MDP whole body bone scan wase

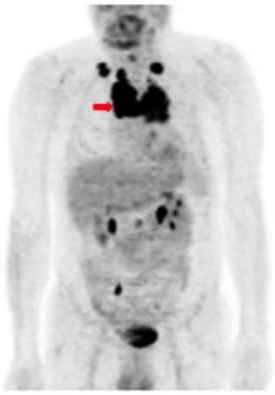

Figure 2. A whole body F18 fluorodeoxyglucose (FDG) PET scan showed intense uptake in the left upper lung corresponding to the primary tumor with a maximum standardized uptake value (SUVmax) of 19.7 (red arrow). Lung cancer was associated to paratracheal and subcarinal lymph nodes. Pathological lymph nodes are clearly demonstrated in clavicular regions (left SUVmax: 16.7; and right SUV max:10.4).

performed and resulted in a normal scintiscan (Figure 1). The bone scan did not reveal any suspicious foci of uptake. Bone metastases develop in 30% of all patients with cancer. Bone metastases are usually located in the axial skeleton. Scintigraphy does not detect pure lytic metastasis when bone turnover is slow or when the site is avascular [2]. The possibility of bone metastasis should be taken into consideration in patients with an underlying cancer history for avoiding delay or misdiagnosis.

A whole body F18 fluorodeoxyglucose (FDG) PET scan showed intense uptake in the left upper lung corresponding to the primary tumor with a maximum standardized uptake value (SUV_{max}) of 19.7 (Figure 2). Lung cancer was associated to paratracheal and subcarinal lymph nodes. Pathological lymph nodes were clearly demonstrated in clavicular regions (left SUV_{max}: 16.7; and right SUV_{max}: 10.4).

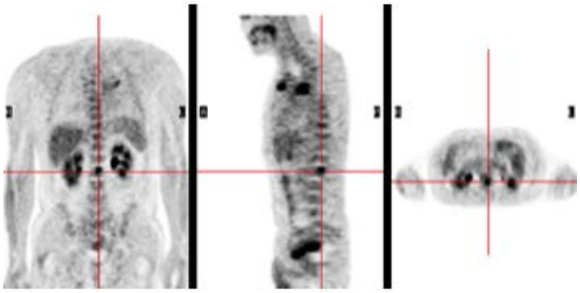

Figure 3. The whole-body F18 FDG PET scan clearly demonstrated a focus of increased uptake in the second lumbar vertebral body (red cross) which was suspicious for osteolytic metastasis and no other bony lesion was identified.

Bronchial biopsy of the upper left lobe confirmed infiltration by small cell lung carcinoma (SCLC). Cancer cells expressed: TTF1, CD56, p53, synaptophysin and chromogranin.

The whole-body F18 FDG PET scan clearly demonstrated a focus of increased uptake in the second lumbar vertebral body (Figure 3) which was suspected for osteolytic metastasis and no other bony lesion was identified. An osteolytic bone metastasis was confirmed by MRI. Thus, FDG PET is useful for detecting osteolytic metastasis in patients with a malignancy [3] [4]. PET can be a sensitive modality for diagnosing and monitoring bone metastasis [5].

Selected axial slice of diagnostic abdominal CT scan showed the presence of oteolytic metastasis in L2 vertebra (Figure 4A). The patient received radiation therapy and chemotherapy. Four weeks later the patient underwent a second follow up CT, and the scan showed blastic changes in the posterior edge of the L2 vertebra (Figure 4B) suggesting response to treatment [6].

DISCUSSION

2-deoxy-2-[^{18}F]-fluoro-D-glucose or fluorodeoxyglucose (^{18}FDG) has been used to measure glucose metabolism in many types of primary cancer and can be useful for distinguishing benign bone lesions from malignant ones. It is an analog of glucose and represents the most widely used PET radiotracer in daily practice. The mechanism of uptake in tumor cells consists of the diffusion facilitated by glucose transporters (GLUTs), phosphorylation by hexokinase and subsequent

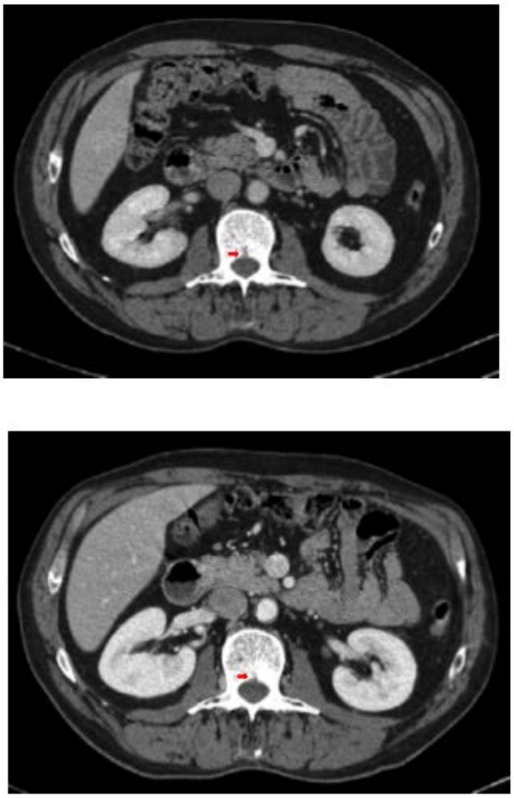

Figure 4. A) Selected axial slice of diagnostic abdominal CT scan, perfomed on March 8, 2011, showed the presence of oteolytic metastasis in L2 vertebra (red arrow). B) The patient received radiation therapy and chemotherapy. Four weeks later the patient underwent a second follow up CT, and the scan showed blastic changes in the posterior edge of the L2 vertebra (red arrow) suggesting response to treatment [6].

metabolic trapping within the cell. It is a reflection of glucose metabolism consumption on the tissue level. Although it is a very sensitive marker, it is not very specific, since any increase in tissue uptake of ^{18}FDG is not always synonymous with cancer. The main clinical application of this technique consists of diagnosing, staging and restaging of various cancer types. It is very effective in detecting metastases of breast, lung, esophagus, colon, thyroid, head and neck, melanoma and lymphoma [7].

Bone metastases are well despicted on CT. But the usefulness of CT in detecting early deposits in bone marrow is limited. Although CT is superior to radiography some advanced destructive lesions on trabecular bone may not be visible in the absence of cortical bone involvement. Therefore CT is less apparent than the marrow changes visualized on MRI [6]. CT is also better than radiography and scintigraphy for depicting lesions in the spine and calvarium. CT is useful in guiding needle biopsy in bones such as vertebrae or ilia. When assessing the therapeutic response, sclerosis of a lytic metastasis on CT suggests a response to treatment. Notwithstanding, lysis or the appearance of new lysis or an increase in the size of blastic lesion represents a disease progression [8].

Declarations

Conflict of interest

The authors declare that they have no competing interests

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