Case Report

Hypertrophic pulmonary osteoarthropathy on bone scintigraphy and 18F-fluorodeoxyglucose positron emission tomography/computed tomography in a patient with lung adenocarcinoma

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ABSTRACT

Hypertrophic pulmonary osteoarthropathy (HPOA) is not an uncommon paraneoplastic syndrome that is frequently associated with lung cancer. A 54-year-old male patient with lung adenocarcinoma underwent bone scintigraphy and fluorodeoxyglucose (FDG) positron emission tomography/computed tomography (PET/CT) scanning for initial staging. Bone scintigraphy revealed increased periosteal activity in lower extremities. FDG PET/CT revealed hypermetabolic right lung mass, mediastinal lymph nodes, and mildly increased periosteal FDG uptake in both femurs and tibias. The findings in lower extremities on bone scan and FDG PET/CT were interpreted as HPOA.

Keywords: Adenocarcinoma of lung, hypertrophic osteoarthropathy, periostitis, positron emission tomography/computed tomography

INTRODUCTION

Hypertrophic pulmonary osteoarthropathy (HPOA) is often associated with lung carcinoma, but other intrathoracic tumors or nonmalignant diseases including hepatopulmonary syndrome of advanced liver or cirrhosis, cyanotic heart diseases may also associated with this clinical condition.[1,2] It is distinguished by painful, swollen joints, digital clubbing, and periostitis.[3,4] Radiologically, periostitis presents as new bone formation and appearance of a smooth layer to the bones. Bone scintigraphy is a highly sensitive method for the diagnosis of HPOA and the typical scintigraphic presentation is a diffuse, symmetrically increased uptake in the diaphysis and metaphysis of tubular bones, with a distinctive double stripe or parallel track sign.[5] In addition, diffuse moderately increased fluorodeoxyglucose (FDG) uptake in the periostea of long bones had been reported.[6,7]

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Here, we present a lung cancer patient who demonstrated findings consistent with HPOA on bone scintigraphy and FDG positron emission tomography/computed tomography (PET/CT) imaging.

CASE REPORT

A 54-year-old male patient complaining of cough, generalized bone pain and weakness was referred to our hospital. He was smoking for 30 years/1 packet/day. On physical examination, he had Grade I clubbing of fingers and toes. Complete blood count and biochemistry tests were normal except mild anemia. CT of the thorax demonstrated 5 cm × 6 cm mass lesion with speculated margins in the upper lobe of the right lung. In addition, there was mediastinal lymphadenopathy. Bronchoscopy and biopsy were done, and histopathology revealed adenocarcinoma of the lung. The patient was referred nuclear medicine department for bone scintigraphy and 18F-FDG PET/CT. Bone scintigraphy was performed 3 h after intravenous injection of 20 mCi (740 MBq) methylene diphosphonate (MDP). It demonstrated no osseous metastases but revealed increased periosteal activity in the long bones of the legs corresponding to hypertrophic osteoarthropathy [Figure 1]. PET/CT images were acquired 60 min after intravenous injection of 7 mCi (259 MBq) FDG

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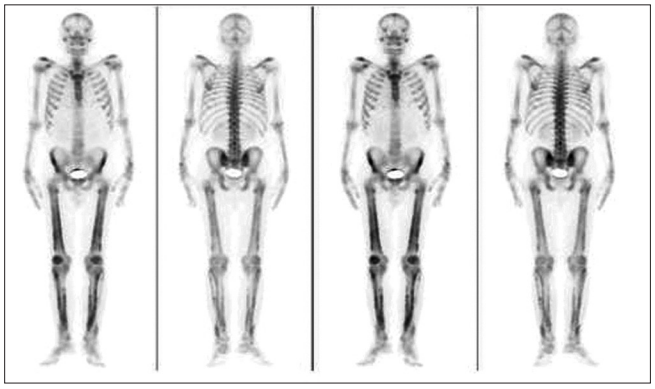

Figure 1: Three-hour whole body Tc-99m methylene diphosphonate images shows intense periosteal uptake in the long bones of the legs

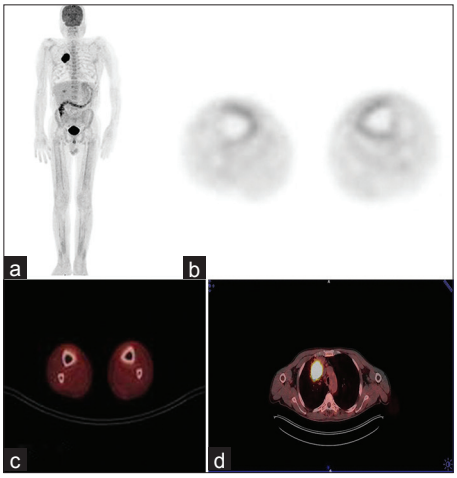

Figure 2: Maximal intensity projection (a) transaxial positron emission tomography (PET) (b) transaxial fusion of lower extremities (c) and transaxial fusion of thorax (d) PET/computed tomography imaging show increased fluorodeoxyglucose accumulation in the primary tumor and mediastinal lymph nodes as well as along periosteum of long bones of legs in a symmetrical fashion with an SUVmax 2.4–3.0

an integrated PET/CT camera. Maximum intensity projection and transaxial images showed increased FDG accumulation in the primary tumor (SUVmax: 17), mediastinal lymph nodes (SUVmax: 3.3) and mild, symmetrical periosteal FDG uptake along both femuri and tibias (SUVmax: 2.4–3.0) [Figure 2].

DISCUSSION

Hypertrophic pulmonary osteoarthropathy is a commonly seen paraneoplastic manifestation of lung cancer or some nonmalignant diseases.

Incidences of HPOA of 0.2–17% in lung cancer patients have been reported.[8-14] In a study, Ito *et al.* analyzed lung cancer patients with HPOA and were found to have more often HPOA in males, adenocarcinoma subtype, heavy smokers and Stage IIIb and V diseases.[14] Our patient's diagnosis was adenocarcinoma, and he was the current smoker. In published reports, adenocarcinoma accounted for 11–53% of lung cancer patients with HPOA.[10-14]

The pathogenesis of periostitis and HPOA is unclear. Involvement of vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), and platelets in the pathogenesis of HPOA has been indicated in some publications.[15-17] They found that plasma VEGF and PDGF levels were significantly higher in patients with HPOA compared with healthy controls.

Hypertrophic pulmonary osteoarthropathy is diagnosed based on clinical symptoms such as continuous pain and edema in the extremities and imaging findings. Periostitis is the hallmark of HPOA and bone radiography reveals periosteal membrane thickening and periosteal new bone formation.[14] Magnetic resonance imaging findings in patients with HPOA were described in a number of cases and observed soft-tissue changes and periostitis. The findings consisted of the muscular and septal edema associated with extensive soft-tissue swelling that surrounded the femur and the attached cortex. Periostitis appeared as a wavy, thin, hypointense line surrounding the cortex.[18,19]

Bone scintigraphy is a highly sensitive method for the detection of HPOA. The typical scintigraphic presentation is a diffuse symmetrically increased uptake in the diaphysis and metaphysis of tubular bones with a distinctive double stripe or parallel track sign.[14] Makis *et al.* also showed mild hyperemia surrounding the long bones of the legs at blood pool images and intense Tc-99m MDP uptake in the periostea at delayed bone scan imaging.[6] Recently, increased FDG uptake along the periosteum of long bones at PET/CT imaging was shown in some reports.[6,7] In this case, increased FDG uptake was observed concordant with the inflammatory reaction in the periostea of the lower extremities.

CONCLUSION

Bone scintigraphy and FDG PET show increased metabolic activity in the long bones of patients with HPOA. Physicians interpreting PET/CT images should be aware of these findings especially in patients with lung cancer. Correct interpretation of bone scan as well as PET/CT findings is important to make proper treatment decisions. Hence, nuclear medicine physicians should be aware and familiar with these findings and avoid reporting them as bone metastases.

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