

Metabolic Super Scan in ^{18}F -FDG PET/CT Imaging

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A 50-yr-old man presented with intermittent hemoptysis and was diagnosed small cell lung cancer. ^{18}F -FDG PET/CT for staging demonstrated extensive hypermetabolic lesions throughout the skeleton and liver. Interestingly, skeletal muscles of limbs, mediastinum, bowel, and especially brain showed very low FDG uptake. Because of some characteristics in common with super scan on skeletal scintigraphy, this case could be considered as 'metabolic super scan'.

Key Words: FDG PET/CT; Metabolic Super Scan; Extensive Metastasis

INTRODUCTION

The "super scan" of bone scintigraphy is defined as a bone image that "looks too good." Its characteristics include intense activity in the bones and diminished renal parenchymal activity (1). Su et al. (2) had reported the case of ^{18}F -fluorodeoxyglucose positron emission tomography (FDG PET) super scan involving skeletons, similar to the super scan of bone scintigraphy. A "hepatic super scan" by FDG PET has been reported in a patient with Hodgkin disease who had unusually elevated hepatic radioactivity, in addition to the multiple areas of focal uptake in the chest, mediastinal, left axillary, and abdominal lymph nodes, and the adrenal glands. A liver biopsy demonstrated diffuse hepatic involvement (3). Here we report a case of ^{18}F -FDG PET/CT super scan showing extensive hypermetabolic lesions throughout the skeletons and liver. Contrary to the intense hypermetabolism of skeletons and liver, the skeletal muscles of limbs, mediastinum, bowel, and especially brain showed very low FDG uptake.

CASE REPORT

A 50-yr-old man presented with intermittent hemoptysis. The patient has a history of alcoholic liver cirrhosis and primary hypertension. Subsequent diagnostic CT imaging of chest and abdomen revealed 3.8 cm sized mass in left lower lung with multiple lymph nodes and hepatic metastasis. Excision biopsy of supraclavicular lymph node was performed and histopathologic diagnosis was small cell lung cancer.

The patient's mental status was clear and he underwent ^{18}F -FDG PET/CT (Biograph Sensation 16, Siemens Medical Systems, USA) for staging of lung malignancy, 1 hr after injection of 444 MBq (12 mCi) ^{18}F -FDG. ^{18}F -FDG PET/CT demonstrated focal hypermetabolic lung mass in left lower lobe with diffuse and intense hypermetabolism throughout the skeleton and liver. Interestingly, skeletal muscles of limbs, mediastinum, bowel, and especially brain showed very low FDG uptake (Fig. 1). This patient had no medications could disturb cerebral glucose metabolisms, such as corticosteroids and sedatives.

DISCUSSION

A super scan is well-known phenomenon which is characterized by a strikingly high bone to soft tissue ratio on skeletal scintigraphy, with a uniform symmetrical increase in bone uptake and absent renal visualization (4). The super scan is associated with various malignancies, and most commonly in carcinomas of the prostate, stomach and breast (5). Metastasis from lung cancer rarely causes a super scan, although multiple bone metastases or bone marrow involvement frequently occur in patients with lung cancer (6). Sy et al. (7) hypothesized that the increased uptake of radiopharmaceutical by diseased bone results in reduced phosphate excretion, thereby producing faint renal images in the bone scintigraphy.

This case had some characteristics in common with super scan on skeletal scintigraphy. First, even though this is not uncommon feature in patients with extensive metastasis, intense and diffuse hypermetabolism throughout the skeleton and liver

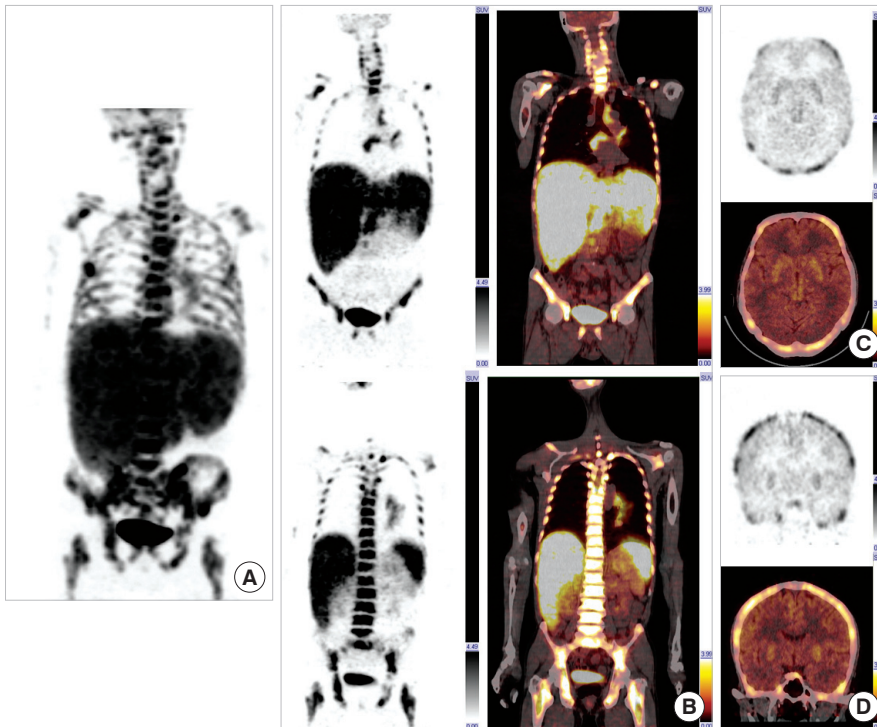


Fig. 1. ¹⁸F-FDG PET/CT demonstrated focal hypermetabolic lung mass in left lower lobe with diffuse and intense hypermetabolism throughout the skeleton and liver. Interestingly, skeletal muscles of limbs, mediastinum, bowel, and especially brain showed very low FDG uptake. (A) Maximal intensity projection image. (B) Coronal images of torso. (C) Transaxial image of brain. (D) Coronal image of brain.

was demonstrated. The similar findings had reported in other cases of FDG PET super scan, however, this case had shown the best contrast between metastatic organs and non-metastatic organs (2, 3, 8). Second, FDG uptakes in skeletal muscles of limbs, mediastinum, bowel, and especially brain were remarkably low and this is the unique characteristic of the present case. The faint visualization of the brain, renal cortex, and soft tissue might be the result of extraordinarily high uptake of FDG by bony and hepatic metastatic lesions. Low brain uptake of FDG has been reported when using corticosteroids and sedatives, and these conditions should be taken into consideration (9, 10). The present patient had no medications could disturb cerebral glucose metabolisms, such as corticosteroids and sedatives. Because of some characteristics in common with super scan on skeletal scintigraphy, this case could be considered as 'metabolic super scan.'

REFERENCES

- Podoloff DA, Kim EE. 'Sub'-super scan-manifestation of bone narrow metastases? *Clin Nucl Med* 1989; 14: 597-602.
- Su HY, Liu RS, Liao SQ, Wang SJ. F-18 FDG PET superscan. *Clin Nucl Med* 2006; 31: 28-9.
- Basu S, Nair N. Unusually elevated liver radioactivity on F-18 FDG PET in Hodgkin's disease: hepatic 'superscan.' *Clin Nucl Med* 2004; 29: 626-8.
- Pour MC, Simon-Corat Y, Horne T. Diffuse increased uptake on bone scan: super scan. *Semin Nucl Med* 2004; 34: 154-6.
- Kim SE, Kim DY, Lee DS, Chung JK, Lee MC, Koh CS. Absent of faint renal uptake in bone scan etiology and significance in metastatic bone disease. *Clin Nucl Med* 1991; 16: 545-9.
- Manier SM, Van Nostrand D. Super bone scan. *Semin Nucl Med* 1984; 14: 46-7.
- Sy WM, Patel D, Faunce H. Significance of absent or faint kidney sign on bone scan. *J Nucl Med* 1975; 16: 454-6.
- Fujii M, Kiura K, Takigawa N, Takeda H, Tanimoto M. Super scan using positron emission tomography in lung cancer patients. *J Thorac Oncol* 2007; 2: 1042-3.
- Fulham MJ, Brunetti A, Aloj L, Raman R, Dwyer AJ, Di Chiro G. Decreased cerebral glucose metabolism in patients with brain tumors: an effect of corticosteroids. *J Neurosurg* 1995; 83: 657-64.
- Gaillard WD, Zeffiro T, Fazilat S, DeCarli C, Theodore WH. Effect of valproate on cerebral metabolism and blood flow: an ¹⁸F-2-deoxyglucose and ¹⁵O water positron emission tomography study. *Epilepsia* 1996; 37: 515-21.