

## Discrepant uptake between fluorine-18 fluorodeoxy glucose and Tc-99m sestamibi in bronchioloalveolar cell carcinoma

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Several studies have shown the benefit of fluorine-18 fluorodeoxy glucose (FDG) imaging in the differentiation of solitary pulmonary nodules. The majority of malignant tumor have a higher glucose metabolic rate as compared to benign lesions. However, there is a considerable variety in glucose metabolic rate that depends on the aggressiveness and histological subtype of the tumor. Technetium-99m sestamibi (MIBI) is another tumor imaging agent for SPECT. We present a case of bronchioloalveolar cell carcinoma with a false negative finding in FDG imaging and a positive finding in MIBI imaging. This case clearly indicates that the FDG uptake and MIBI uptake might provide different information regarding characteristics of lung cancer.

**Key words:** fluorine-18 fluorodeoxy glucose, technetium-99m sestamibi, lung cancer, bronchioloalveolar cell carcinoma, myocardial perfusion SPECT

### INTRODUCTION

LUNG CANCER is one of the most prevalent life threatening malignant tumors. X-ray CT is preferably performed imaging in patients with suspected lung cancer.<sup>1</sup> However, X-ray CT has a limitation to differentiate between benign and malignant the lesions, because they mainly reflect only morphological information of lesions.<sup>2</sup>

Fluorine-18 fluorodeoxy glucose (FDG) imaging and technetium-99m sestamibi (MIBI) are commonly used in the diagnosis of pulmonary lesions. FDG uptake mainly depends on glucose metabolism of the lesions, which is highly associated with proliferative activity.<sup>3,4</sup> MIBI accumulation depends on lesional blood flow, plasma membrane potentials of cells, negative charge of mitochondrial membrane and Pgp expression.<sup>5,6</sup> Both of them are poten-

tially able to differentiate benign from malignant lung nodule.

In this case report, we present a case of bronchioloalveolar carcinoma which showed discrepant uptakes from the two different tracers.

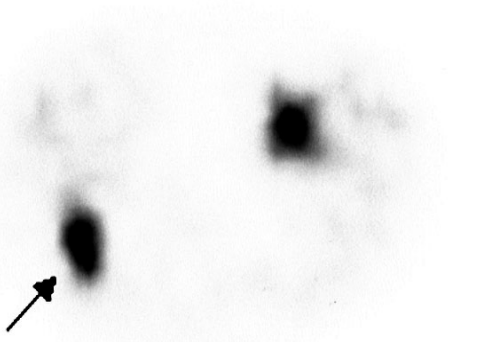
### CASE REPORT

A 67-year-old man with coronary artery disease underwent MIBI SPECT for the assessment of myocardial perfusion. The acquisition was performed one hour after MIBI (370 MBq) injection at rest with dual-headed gamma camera equipped with high-resolution parallel hole collimators. Unexpectedly, an clear hot spot was detected in the lower lobe of the right lung (Fig. 1). To characterize the lesion, we performed X-ray CT and FDG PET of the chest. FDG imaging was performed one hour after FDG (185 MBq) injection with a dual-headed coincidence gamma camera system. X-ray CT delineated a nodule of 3 × 2.5 × 2 cm in right lower lobe which corresponded to the hot spot observed in MIBI images (Fig. 2). On the other hand, no significant FDG uptake in the lesion was

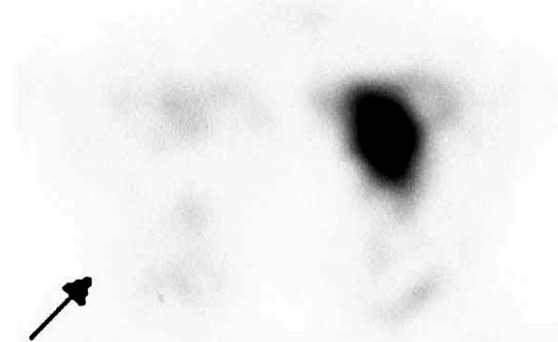
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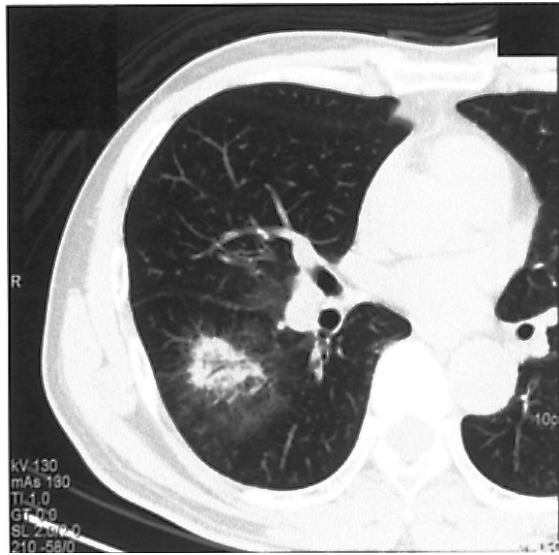
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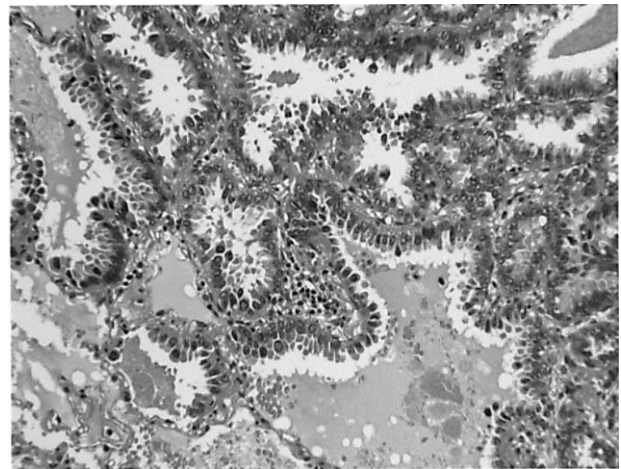
**Fig. 1** MIBI imaging of the chest shows intense nodular uptake in the right lower lung (*black arrow*).



**Fig. 3** FDG imaging showed no increased uptake in the lesion.



**Fig. 2** Chest X-ray CT shows a nodular lesion in the right lower lung which corresponds to the location of MIBI uptake.



**Fig. 4** A photomicrograph of the tumor shows well differentiated tumor cells and their alveolar pattern.

observed (Fig. 3). The pathological examination of the resected lesion revealed that the lesion was bronchioloalveolar carcinoma (Fig. 4).

### DISCUSSION

The present case of the bronchioloalveolar carcinoma showed discrepancy between FDG and MIBI imaging, that is, apparent MIBI uptake, though, with negative FDG accumulation.

FDG accumulation in tumors is highly associated with proliferative aggressiveness. Therefore, FDG imaging provides considerably high accuracy in differentiating benign from malignant pulmonary nodules in most cases.<sup>3</sup> However, bronchioloalveolar carcinoma is known to result in negative or low FDG uptake,<sup>4,7,8</sup> which must be caused by their less aggressive and slow-growing charac-

ters. Tumor size is another important factor for false negative findings in FDG imaging. Lesions less than 1 cm in diameter may be falsely negative because of the limited resolution of camera systems. However, this is not the case in our patient with a lesion of 2 cm in diameter, therefore, which was detected clearly in MIBI SPECT.

MIBI imaging also has a potential ability to differentiate benign from malignant nodules. It is reported that MIBI uptake correlates with the proliferative activity of the tumors.<sup>9</sup> Several important factors regulating MIBI uptake may include blood flow, plasma membrane electrical potentials, negative charge of mitochondrial membrane and MDR1 Pgp expression.<sup>5,6,9</sup> Although precise mechanism of increased MIBI uptake in the bronchioloalveolar carcinoma was not clear, we hypothesized that the blood flow might contributed mainly to the increased uptake in the lesion. Since MIBI and FDG uptakes are based on different mechanisms, therefore, the combination of the both tracers may provide useful infor-

mation about the character of the tumor.

It was reported that focal pulmonary uptake was found in 2.8% of patients undergoing myocardial SPECT imaging. In addition, 16% of such patients had a malignant lesion as has been observed in the present case.<sup>10</sup> These facts indicate that incidental detection of pulmonary lesions in myocardial SPECT strongly recommends further assessment of the lesions.

In conclusion, we present a case of bronchioloalveolar carcinoma with a false negative finding in FDG imaging and a positive finding in MIBI imaging. This case suggests a complementary role of FDG and MIBI imagings in diagnosing pulmonary nodular lesions, especially in low grade malignancy such as bronchioloalveolar carcinoma.

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