

# Breast cancer detected as an incidental finding on $^{99m}\text{Tc}$ -MIBI scintigraphy

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## Abstract

We report a case of breast cancer detected as an incidental finding on  $^{99m}\text{Tc}$ -MIBI scintigraphy.  $^{99m}\text{Tc}$ -MIBI scintigraphy is usually used to evaluate cardiac perfusion or to detect ectopic parathyroid adenomas; however, it is also known to sensitively detect breast cancer. Accordingly, a few reports have described the incidental detection of breast cancer by  $^{99m}\text{Tc}$ -MIBI scintigraphy performed to detect parathyroid adenoma. Our present case underscores the importance of attending to any incidental findings when searching for parathyroid adenomas using  $^{99m}\text{Tc}$ -MIBI scintigraphy.

## Keywords

$^{99m}\text{Tc}$ -MIBI, breast cancer, magnetic resonance image (MRI), scintigraphy

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## Introduction

$^{99m}\text{Tc}$ -methoxyisobutylisocyanide (MIBI) scintigraphy is widely used for cardiac perfusion imaging. It is also valuable to detect adenoma of the parathyroid gland. There have been a few reports of incidental breast cancer diagnosis by  $^{99m}\text{Tc}$ -MIBI scintigraphy performed for the detection of parathyroid adenoma. We herein report a case of breast cancer that was diagnosed after an incidental uptake of  $^{99m}\text{Tc}$ -MIBI.

## Case report

A 69-year-old woman presented with a history of hypercalcemia without clinical symptoms. No mass was palpated in the neck. The blood sampling data indicated primary hyperparathyroidism ( $\text{Ca}^{2+}$  11.4 mg/dL, Alb 4.6 g/dL, vitamin D<sub>3</sub> 78 pg/mL, iPTH 115 pg/mL, PTHrP < 1.1 pmol/L), and thus  $^{99m}\text{Tc}$ -MIBI scintigraphy was performed to detect a functioning parathyroid adenoma. There was no focal uptake at the front of the neck, such as would be indicative of parathyroid adenoma, in either the early (Fig. 1a) or delayed (Fig. 1b) images, except for the normal physiological uptake of the thyroid. However, a focal uptake

was detected in the right chest (Fig. 1a), and remained at the delayed phase (Fig. 1b). Contrast-enhanced computed tomography (CT) following the  $^{99m}\text{Tc}$ -MIBI scintigraphy revealed a nodule in the upper region of the right mammary gland (Fig. 1c). An ectopic parathyroid or breast cancer was suspected.  $^{18}\text{F}$ -fluorodeoxyglucose ( $^{18}\text{F}$ -FDG) PET/CT showed a focal uptake in this nodule (Fig. 1d; axial image, Fig. 1e; MIP image) and no other abnormal uptake of  $^{18}\text{F}$ -FDG. Further evaluations such as ultrasonography, mammography (Fig. 2), and magnetic resonance imaging (MRI) (Fig. 3) supported the diagnosis of primary breast cancer. Although a PTH-producing tumor

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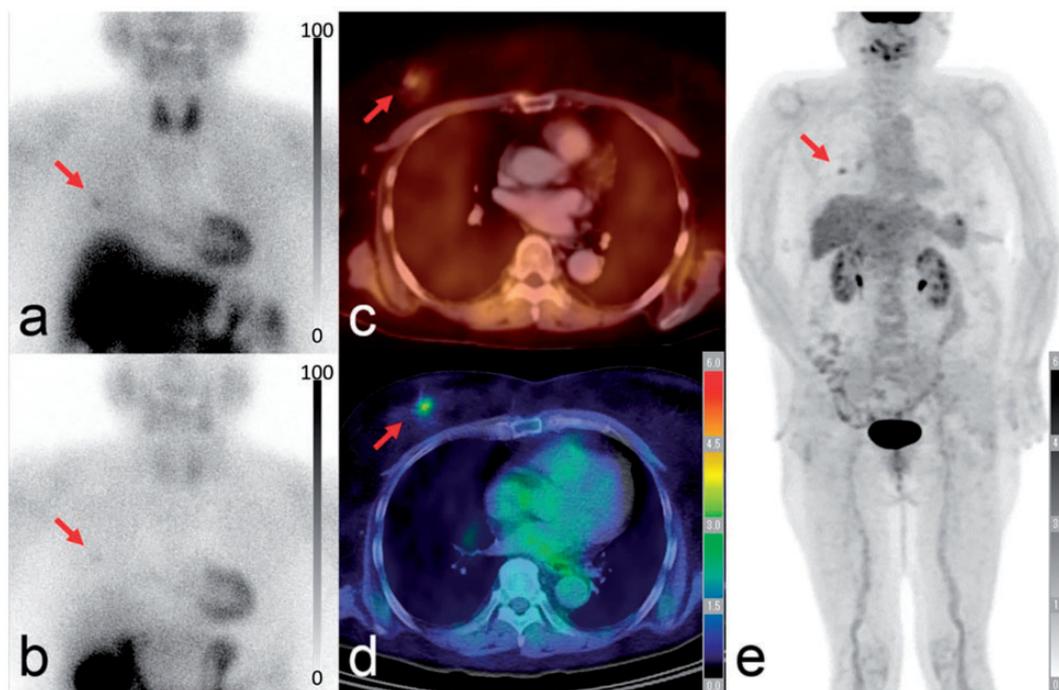
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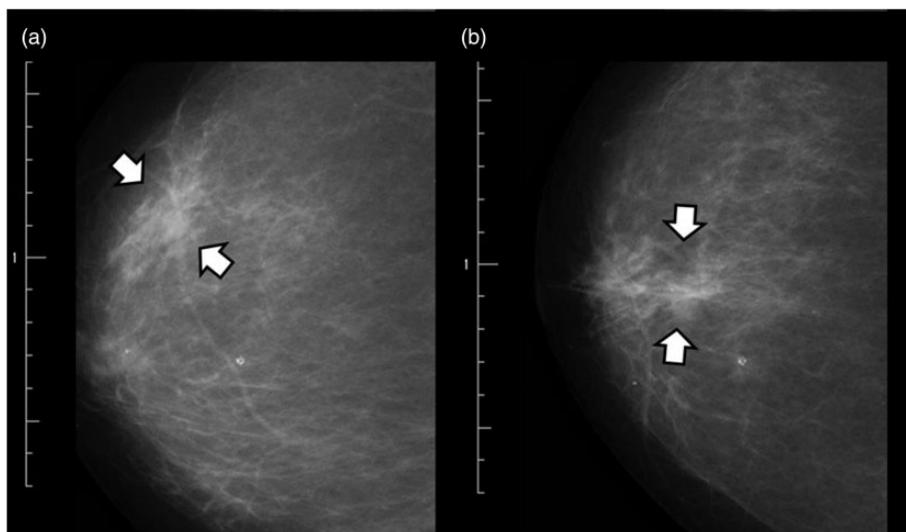
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**Fig. 1.**  $^{99m}\text{Tc}$ -MIBI scintigraphy and  $^{18}\text{F}$ -FDG PET/CT imaging. A focal  $^{99m}\text{Tc}$ -MIBI uptake is found on the right chest in the early phase image (a), and remained in the delayed phase (b). There was no focal uptake at the front of the neck, such as would be indicative of parathyroid adenoma, except for the normal physiological uptake of the thyroid. Contrast-enhanced CT revealed a nodule in the upper region of the right mammary gland ((c) axial fused image of the  $^{99m}\text{Tc}$ -MIBI scintigraphy and the contrast-enhanced CT).  $^{18}\text{F}$ -FDG PET/CT showed a focal uptake in the same nodule ((d) axial image by fused PET and CT; (e) MIP image) with a maximum standardized uptake value (SUV) of 3.63. The SUV of the blood pool was 1.78.

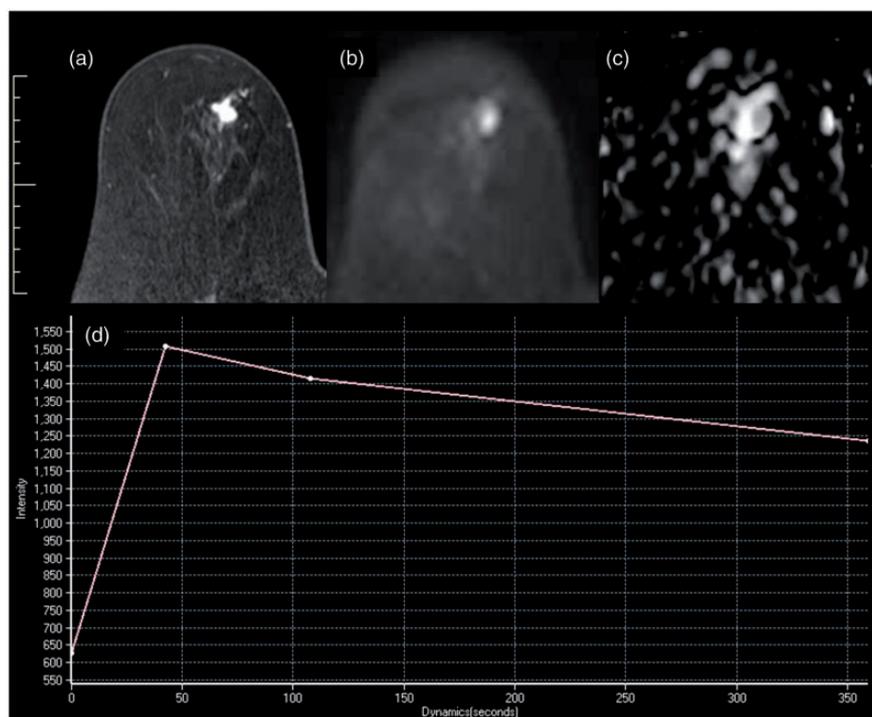


**Fig. 2.** Mammographic images. The mediolateral-oblique view (a) and cranial-caudal view (b) are displayed. The mammographic images show a small nodule in the right mammary gland with suspicious indistinct margins.

could not be excluded, biopsy was avoided to prevent the disseminated spread. Partial mastectomy was performed for both diagnosis and treatment. The pathological diagnosis of the surgical specimen was invasive ductal carcinoma.

### Discussion

$^{99m}\text{Tc}$ -MIBI scintigraphy is usually used to evaluate cardiac perfusion or to detect the ectopic parathyroid parenchyma; however, it is known to sensitively detect breast cancer as well (1,2).



**Fig. 3.** MRI images. Axial contrast-enhanced fat-suppressed T1-weighted imaging demonstrates a hyperintense mass with an irregular shape and margin (a). The mass shows high signal intensity on diffusion-weighted images (b) and slightly lower intensity on the apparent diffusion coefficient map (c). The time-intensity curve of the mass in the dynamic study shows a fast initial enhancement followed by washout (d).

The uptake mechanism of  $^{99m}\text{Tc}$ -MIBI is thought to consist of increased regional blood flow and reduced cell membrane integrity, with only a fraction of the  $^{99m}\text{Tc}$ -MIBI passing into mitochondria (3). Mutations or altered expression of key molecules, such as P-glycoprotein, which is responsible for the active outward transport in the extracellular compartment, may affect the mitochondrial status and hence the tracer uptake in breast cancer (4).

$^{99m}\text{Tc}$ -MIBI scintigraphy has been studied by many investigators not only with regard to staging of breast cancer, but also as prognostic marker for response to chemotherapy (5). The reported sensitivity and specificity of  $^{99m}\text{Tc}$ -MIBI scintigraphy for these purposes are 75.4% and 82.7%, respectively (6). Although  $^{99m}\text{Tc}$ -MIBI might not be sufficiently sensitive for cancer screening, we need to pay attention to focal lesions with increased tracer uptake found in the chest wall, even if the examination was performed for other purposes (7).

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