

Incidental finding of [^{99m}Tc]Tc-MIBI uptake in a post-radiotherapy breast without recurrence of cancer

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Abstract

The oncophilic nature of [^{99m}Tc]Tc-MIBI makes this radiopharmaceutical useful in cancer diagnostics, with particular emphasis on breast cancer. Increased uptake of [^{99m}Tc]Tc-MIBI in tests performed for non-oncological indications always raises the suspicion of its neoplastic character and requires further clinical diagnostics, which is especially justified in patients with a previous history of cancer. However, the presented case illustrates that focally increased uptake of [^{99m}Tc]Tc-MIBI is not always associated with the presence of cancer cells and may result from post-therapeutic changes.

KEYwords: [^{99m}Tc]Tc-MIBI; breast cancer; radiotherapy

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^{99m}Tc-2-methoxy-isobutyl-isonitrile ([^{99m}Tc]Tc-MIBI) is a lipophilic cation accumulating within mitochondria of highly metabolically active cells. Its typical biodistribution includes the thyroid gland, myocardium, breasts during lactation, liver, gallbladder, bowels, and urinary tract. Nowadays [^{99m}Tc]Tc-MIBI is widely used in nuclear medicine (NM), mainly for the evaluation of myocardial perfusion (MP). Due to its oncophilic nature, each study with [^{99m}Tc]Tc-MIBI should be evaluated with particular care and all cases of its non-physiological accumulation need to be described and differentiated in terms of a possible neoplastic character. Numerous cases of incidental uptake can be found in the literature including head-and-neck, lung, breast, and hepatocellular carcinomas, osteosarcomas, and non-Hodgkin's lymphomas.

Breast cancer (BC) is one of the most commonly diagnosed malignant tumors and the second leading cause of death from malignancy among females worldwide. Increased uptake of [^{99m}Tc]Tc-MIBI was described in various kinds of BC including cases of intraductal, infiltrating lobular carcinomas and metastatic lymph nodes, as well as benign breast lesions such as fibroadenomas, fibrocystic disease, and sclerosing adenosis. The sensitivity of

[^{99m}Tc]Tc-MIBI MP studies in detecting BC is unknown, however when dedicated high-resolution gamma cameras are used for targeted breast studies reported sensitivity is comparable to MRI reaching up to 95%, with specificity up to 80%.

In oncological studies, early tracer uptake reflects the mitochondrial status of tumor cells (the permeability and the preservation of mitochondrial membrane), which is affected by both apoptosis and proliferation.

In women treated with lumpectomy and radiation therapy for carcinoma, mammography often reveals new microcalcifications, frequently benign. A significant association between [^{99m}Tc]Tc-MIBI uptake and the presence of breast microcalcifications was presented and explained by the increase of the high-transmembrane-potential of mitochondria during the formation of microcalcifications.

We report a case of focal uptake of [^{99m}Tc]Tc-MIBI in the breast seen during MP scintigraphy in a patient with a history of radiotherapy and undergoing hormone therapy due to BC, raising suspicion of its recurrence.

67-year-old female patient with a history of breast-conserving surgery due to invasive BC type luminal A (estrogen, progesterone receptor positive, ERBB2 negative, stage pT1aN0M0), localized in the upper outer quadrant of the left breast (LB) four months before, was referred for MP scintigraphy. The patient had received adjuvant teloradiotherapy (40.05 Gy/15 fractions) and brachytherapy (10 Gy/one fraction) to the LB area two months earlier and was receiving hormone therapy with aromatase inhibitor (anastrozole 1 mg per day).

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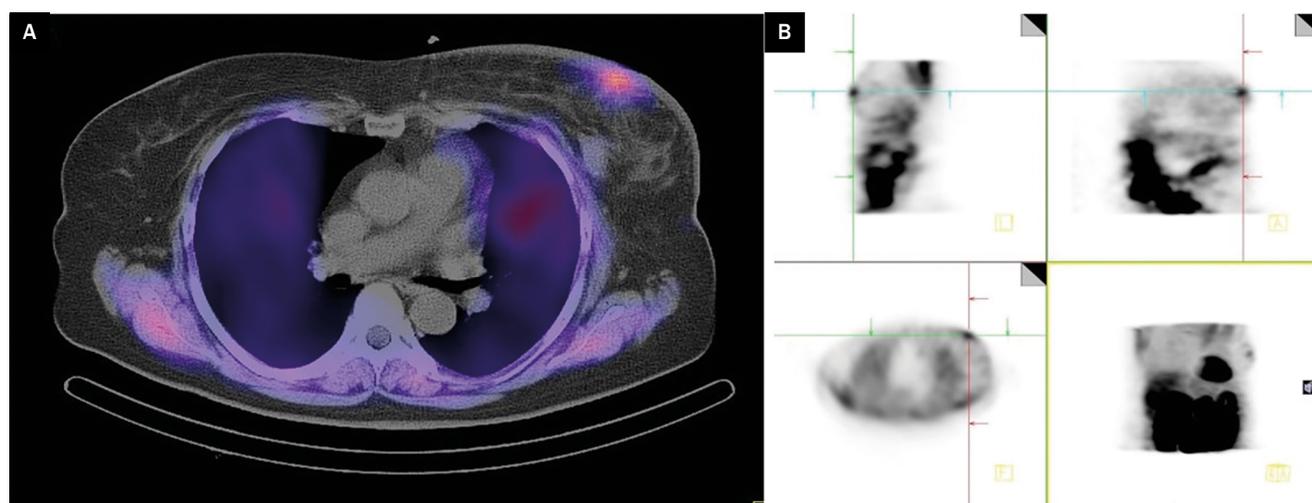


Figure 1. [^{99m}Tc]Tc-MIBI SPECT/CT transverse cross-section at the level of ascending aorta (A); [^{99m}Tc]Tc-MIBI SPECT whole-body maximum intensity projection images (B)

[^{99m}Tc]Tc-MIBI SPECT/CT examination revealed increased focal accumulation of radiotracer in the retroareolar area of the LB (Fig. 1A, B). In a low-dose CT, significant skin thickening, architectural distortion, and shape change in LB were seen (Fig. 1A). During the patient's subsequent four-year follow-up, recurrence of the BC was excluded. The probable cause of the visible increased accumulation of [^{99m}Tc]Tc-MIBI are reactive changes after breast surgery and radiotherapy. In patients with a history of BC, focally increased [^{99m}Tc]Tc-MIBI uptake does not necessarily indicate the recurrence or new carcinoma but may be a result of the formation of microcalcifications, possibly modulated by the applied treatment.

Article information and declarations

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Author contributions

The study conception and design — AT, MC; data collection — MC, KJP, JW. The first draft of the manuscript was written by KJP and AT. All authors commented on all versions of the manuscript, read, and approved the final manuscript.

Conflict of interest

The authors declare no conflict of interest.

Ethics statement

Ethical approval and consent were not required.

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Supplementary material

None.