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MIBI Uptake in a Huge Breast Mass Obscuring the Anterior and Lateral Myocardial Walls in Perfusion Imaging

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ABSTRACT

Background: Cardiac risk assessment with myocardial perfusion imaging (MPI) is a common practice for some elderly breast cancer patients who are candidates for operation. In rare cases the tumor may become visible in the images.

Case presentation: This is the report of a case with a huge slow-growing breast tumor suspicious for malignancy and presenting with methoxy-isobutyl-isonitrile (MIBI) uptake in the tumor. The patient was referred to the nuclear medicine department for preoperative cardiac risk assessment with MPI.

Conclusion: There was high uptake in the tumor was note worthy in two different aspects: 1)high MIBI uptake in the tumor is more suggestive of malignant rather than benign tumors and thus, underscores the importance of extra-cardiac uptake sites in pre-operation MPI; and 2)high uptake in the left breast tumor may obscure the MPI image and hinder proper interpretation.

Introduction

Myocardial perfusion imaging (MPI) is routinely used for preoperative cardiac risk stratification as well as prediction of long term cardiac prognosis.[1] In this technique, the extra-cardiac activities might hinder proper inter-pretation and could be suggestive of incidental tumors.[2, 3] The source of extra-cardiac uptake could be either normal gastrointestinal tract resulting in Methoxyisobutyl isonitrile (MIBI) secretion - the tracer used in many MPIs - into the lumen of the bowels and the liver or accumulation in the hyper metabolic cells including tumoral cells.[3]

Case presentation

The patient was an 81-year-old woman and a known case of colon cancer. Her colon cancer was successfully treated with surgical resection followed by adjuvant chemotherapy eight years before the recent presentation.

She had also a suspicious breast lesion four years before the recent presentation for which she was advised to be operated. However, she refused the treatment for years. The breast tumor gradually enlarged within four years. Afterwards, she continued the medical work up for her breast problem and performed full clinical and radiological examinations, as presented in table 1, based on

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Table 1. The clinical and radiological characteristics of the left breast mass

Clinical examination	Solid 10 cm firm mass in the upper outer and lower outer quadrants
Mammography	Lobulated well defined hyper dense mass with skin thickening and nipple retraction (BI-RADS IVc)
Ultrasonography	Large heterogeneous hypo-echoic lobulated mass with skin thickening

BI-RADS: breast imaging, reporting and data system

which needle biopsy was performed.

Before availability of the result of the biopsy, she was sent to nuclear medicine department to undergo MPI for pre-operative cardiac risk assessment. MPI was performed with a 2-day protocol with pharmacological stress (i.e.dipyridamole0.14 mg/kg/min for 4 minutes). Imaging was done with double-headed gamma camera (ADAC Forte, Philips Medical, USA) via 8-frame electrocardiogram (ECG)-gated single-photon emission computed tomography (SPECT). Circular 180 degree rotation was employed with 32 projections each 25 seconds. The MPI images showed hypoactivity in the anterior, anterolateral and inferolateral walls with less than 10 % reversibility in rest phase images (Figure 1; panel A). The motion and contractility of the denoted walls were normal using the QGS application of the AutoQuant software.

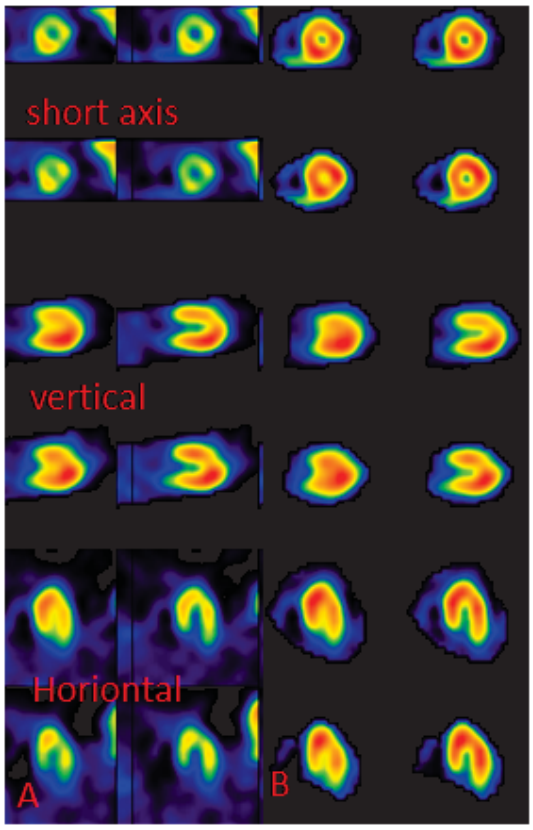

Figure 1. Hypoactivity of the anterior, anterolateral and inferolateral walls in both stress and rest phases; the finding was found to be secondary to halo effect of intense uptake in the huge breast mass (panel A). The halo artifact disappeared after region extracted process of the myocardium perfusion (panel B).

The review of the cinematic images indicated a huge mass within the left breast with intense uptake. To compensate halo artifact and normalize errors, we manually extracted the myocardium using region extracted software (Figure 1; panel B). Also, two additional planar images were obtained (Figure 2). The hypoactivity in the anterior and lateral walls was considered a consequence of the halo artifact and normalization error of the intense uptake in the breast mass over the myocardium and the reported MPI was not indicative of ischemia.

In addition high possibility of malignancy of the breast mass was suggested in the MPI report. The patient underwent modified radical mastectomy. The pathologic report of the mass was invasive ductal carcinoma directly invading the dermis without skin ulceration. In axillary assessment, one out of 11 dissected axillary lymph nodes was involved with the tumor.

Discussion

There are similar reports in the literature that emphasize on the incidental malignant tumor findings in MPI and the unfavorable effect of the breast uptakes on the MPI.[4,5] The advent of molecular imaging for breast cancer has introduced MIBI imaging of the breast as an optimal way to discriminate between the malignant and benign breast tumors with favorable accuracy.[6,7] Mammoscintigraphy with MIBI is proposed to be employed adjunct to breast mammography or ultrasonography for screening and pre-operative assessment of breast tumors.[6] Herein we intended to highlight the unexpected accumulation of MIBI in a malignant breast tumor. Intense MIBI uptake in an already-known malignant tumor also provides the clinician with additional information to predict response to treatment and prognosis of the condition.[8]

Extra-cardiac activity can interfere with the proper interpretation of MPI.[2] These extra-cardiac uptakes are mainly due to normal secretion of MIBI into the gastrointestinal (GI) tract or abnormal retention of the tracer within the liver.[2] Nevertheless, sometimes abnormal uptakes elsewhere or within the thorax obscure the cardiac MIBI uptake. MIBI may accumulate in axillary lymph nodes when they are pathological or when they are normal but the tracer was infiltrated subcutaneously by mistake.[2] The reports of problems in MPI interpretation secondary

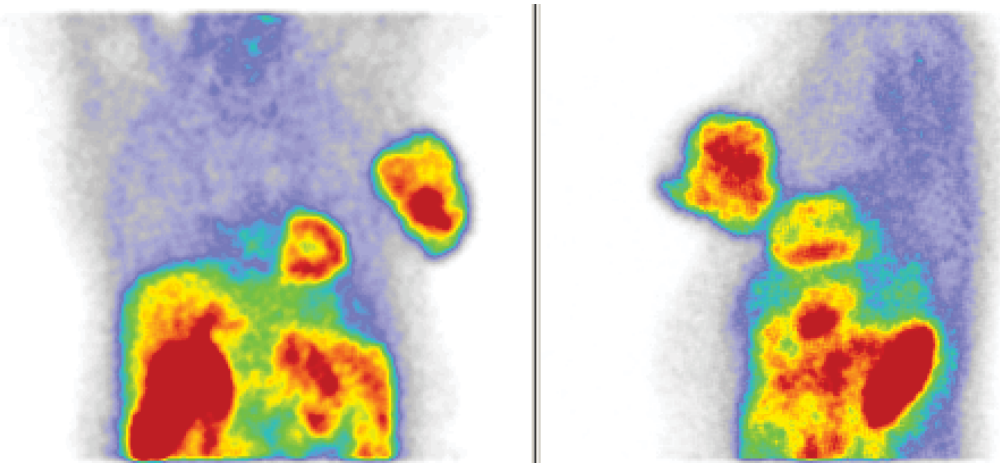

Figure 2. Anterior and left lateral image of the 10 cm breast mass.

to breast uptake are scant in the literature.[5] In this case, the tumor uptake posed a halo effect on all of the anterior, anterolateral and inferolateral walls. The ramp filter artifact - halo effect- is defined as reduced uptake in a less intense uptake zone due to higher registration of the counts into a highly intense uptake focus.[9] This occurs due to the ramp filter effect. This phenomenon may cause false positive results when interpreting MPIs. The patient's MPI was reported as normal, mainly because the reversibility from stress to rest images was minimal and the motion and contractility of the hypoactive walls were normal. It should be kept in mind that in the presence of extra-cardiac activity, the nuclear physician should be prudent about reporting hypo-activity as real hypo-perfusion; the gated SPECT images may assist to prevent false positive readings or the study may be repeated with different protocols or tracers.[2]

This case report reminds the importance of reviewing cinematic displays in MPI and the intervening effect of extra-cardiac uptake over the cardiac image.

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