Breast hemangioma mimicking metastasis at PET-CT*

Hemangioma de mama simulando metástase no PET-CT

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Abstract Breast hemangioma is a rare benign tumor that presents either absent or low ^{18}F-fluoro-2-deoxy-D-glucose (FDG) uptake at positron emission tomography (PET). The authors report the case of a breast nodule pathologically compatible with hemangioma in a woman whose PET-scan has demonstrated increased FDG uptake (simulating a malignant tumor). A brief review of factors leading to false positive and false negative PET results is also undertaken.
Keywords: PET/CT; FDG-^{18}F; Hemangioma; Breast.

Resumo Hemangioma de mama é um tumor benigno raro que apresenta pouca ou nenhuma captação de ^{18}F-flúor-2-deoxi-D-glicose (FDG) na tomografia por emissão de pósitrons (PET). Relatamos um nódulo mamário compatível, patologicamente, com hemangioma, em uma mulher cuja PET *scan* demonstrou captação elevada de FDG (simulando tumor maligno). Também fizemos breve revisão das causas que levam a resultados falso-positivos e falso-negativos pela PET.
Unitermos: PET/CT; FDG-^{18}F; Hemangioma; Mama.

Vieira SC, Silva JS, Madeira EB, França JCQ, Martins Filho SN. Breast hemangioma mimicking metastasis at PET-CT. Radiol Bras. 2011 Nov/Dez;44(6):401–402.

INTRODUCTION

Hemangiomas are benign vascular tumors, rarely found in the breast, which present low ^{18}F-fluoro-2-deoxy-D-glucose (FDG) uptake at positron emission tomography (PET), being differentiable from malignant tumors[1].

Positron emission tomography with FDG has been utilized to differentiate malign from benign lesions, since this imaging modality can detect the glucose metabolism that is generally greater in malignant than in benign tumors[2]. However, such a method does not present the same anatomical accuracy of computed tomography (CT), so a technique combining both scanners (PET/CT) is utilized. Even so, false-negative and false-positive results have been reported[3].

The present study reports a case of breast hemangioma in a woman whose PET/CT scan has demonstrated increased FDG uptake (simulating a malignant tumor). A brief review of factors leading to false positive and false negative PET results is also undertaken.

CASE REPORT

At clinical examination, a female, 63-year-old patient presented a nodule measuring about 1.5 cm in the junction of the lower quadrants of her right breast. The nodule had partially defined contours and fibroelastic consistency. The axilla was clinically negative. The patient presented a previous history of surgery for a colon tumor, with adjuvant chemotherapy and that later progressed with development of pulmonary metastasis.

Mammography demonstrated a partially delimited, lobulated nodular lesion in the right breast, and ultrasonography revealed a solid lesion measuring 1.8 × 0.7 cm, that was isoechoic in relation to the breast tissue, classified as BI-RADS 4.

The patient was submitted to FDG-PET/CT that demonstrated increased FDG uptake by the breast nodule (Figure 1). Such finding determined the nodule resection. The final histopathological study revealed the presence of a benign vascular neoplasm measuring 1.6 × 1.5 × 0.5 cm, consisting of thin-walled, ectatic, congested blood vessels inserted in the conjunctival stroma, and absence of atypias, compatible with capillary hemangioma.

DISCUSSION

Capillary hemangiomas are benign vascular tumors characterized by proliferation of capillary vessels[4]. Breast hemangiomas primarily affect post-menopausal women and may increase in size in the setting of hormone replacement therapy[5].

Several imaging methods are available for detection, diagnosis and decision making on the approach to be adopted in the setting of breast diseases. However, mammography still remains as the most relevant imaging technique for breasts. In order to standardize mammographic findings reporting, the BI-RADS classification was developed, subdividing imaging findings into five classes as follows: negative, benign, probably benign, suspicious and highly suspicious of malignancy [6].

Some studies have reported the finding of breast hemangiomas as well circumscribed, macrolobular lesions that may con-

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Received January 14, 2011. Accepted after revision June 21, 2011.

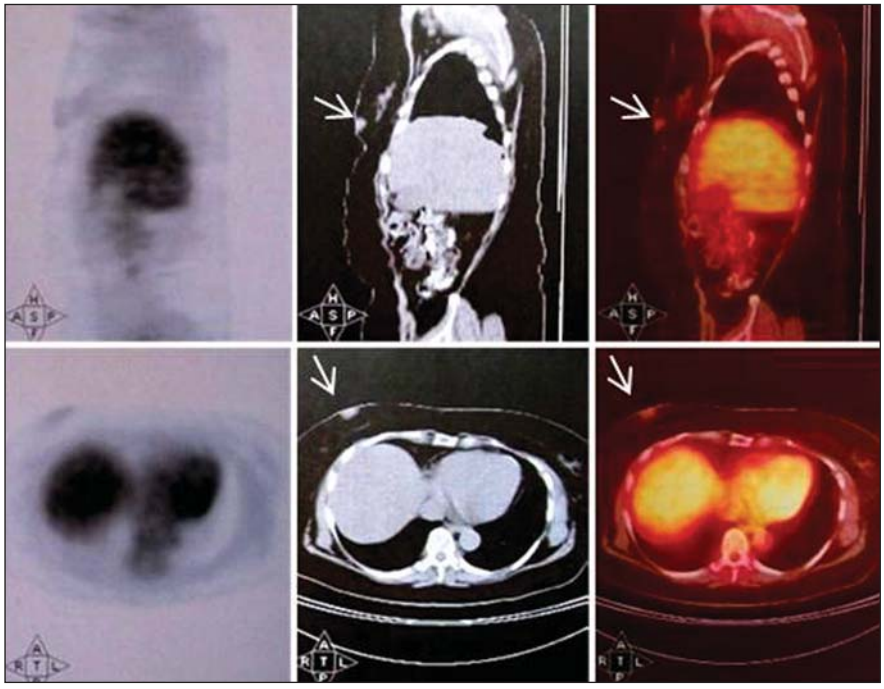

Figure 1. Positron emission tomography/computed tomography (FDG-PET/TC) demonstrating increases FDG uptake in a breast (arrows).

tain calcification[7,8]. However, such findings are nonspecific, which may explain the significant number of hemangiomas classified either as BI-RADS 3 or 4 and the non differentiation from fibroadenomas or cysts[8].

PET/CT detects glycolytic hyperactivity of malignant cells through FDG (a glucose analogue) uptake. Such uptake is caused by an increase in the number of glucose transporter proteins and in hexokinase and phosphofructokinase levels which promote glycolysis[3]. Once phosphorylated at FDG-6-phosphate by hexokinase, structural changes prevent FDG to be catabolized or transported back into the extracellular space, being selectively accumulated within tumor cells[2].

False-negative results may be observed at PET scan in tumors with low glycolytic activity such as adenomas, low-grade lymphomas and small-sized lesions[9]. Additionally, in cases of disease adjacent to sites of physiological uptake (heart, kidneys, bladder and liver), FDG-PET should be supplemented with other imaging modalities to confirm the results[3]. FDG-PET scan performed within up to one month following chemotherapy may present decreased sensitivity because of the reduced number of metabolically active tumor cells, which is not always predictive of a good response[2].

On the other hand, false-positive results may be observed in infectious and inflammatory diseases where activated macrophages and neutrophils show increased FDG accumulation, since they utilize glucose as a source of energy for chemotaxis and phagocytosis[10]. It has been suggested that inflammatory cells utilize more glucose under hyperglycemic than under euglycemic conditions and, therefore, lesions containing such cells are most frequently interpreted as malignant lesions under hyperglycemic conditions[3].

Accumulation of FDG in hemangiomas may be related to blood retention in the lesion, resulting in focal ischemia. Then, the secondary hypoxia may accelerate the anaerobic glycolysis, leading to a high FDG uptake[11].

CONCLUSION

Despite its significant contribution to the evaluation, diagnosis and treatment of cancer patients, FDG-PET/CT may present false-positive and false-negative results. Therefore, the understanding of the causes of false results is critical to avoid equivocal diagnoses.

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