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Title: Follicular thyroid carcinoma with unusual radioiodine refractory breast metastasis mimicking primary breast malignancy

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Short running head: Breast metastasis in DTC

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Abstract

Breast is unusual site for metastasis from malignant tumors though may be the first manifestation of extra-mammary malignancy with primary typically arising from lung, melanoma, ovary and lymphoma. Breast metastasis is extremely rare from thyroid carcinoma and may take years to develop as differentiated thyroid carcinoma are usually indolent, slow growing and metastasize to lymph nodes, lungs and bones. Here is a middle-aged woman (post-subtotal thyroidectomy for multi-nodular goitre 24 years ago) showing discordant FDG and iodine avidity in proven metastatic disease involving lymph nodes, bones, spleen and breast on whole-body radioiodine and FDG scans due to tumor heterogeneity.

Key words: Follicular thyroid carcinoma; iodine scan; fluorodeoxyglucose; PET/CT; breast metastasis

Introduction

Metastatic involvement of breast is unusual with primaries arising from lung, melanoma and hematological malignancies, apart from the contralateral breast with incidence of 0.5-2.0% (1). Thyroid cancer may present with synchronous/metachronous primary breast malignancy (2), but breast metastasis occurring in a case of thyroid carcinoma is quite uncommon.

Case Report

A 55-years-old woman, post-subtotal thyroidectomy for multi-nodular goitre on levothyroxin replacement treatment for 24 years, presented with low backache for past 10 months. Magnetic resonance imaging (MRI) of the spine showed a large soft tissue mass at level of L5-S1 vertebrae and histopathological diagnosis was of metastatic follicular thyroid carcinoma on fine needle aspiration (FNA). The biochemical profile showed normal serum TSH (0.9 uIU/ml; normal 0.5-4.5) and elevated thyroglobulin (Tg, >1000 ng/ml; normal 0-55) and anti-thyroglobulin (938.6 IU/ml; normal 0-125) respectively. The diagnostic radioiodine whole-body scan with SPECT/CT of the neck and thorax region done with oral dose of 74 Mbq (~2 mCi) of I-131 showed iodine-avid widespread metastatic disease and a non-iodine avid right breast lesion on whole-body radioiodine planar, SPECT/CT and CT images (Figure 1).

In view of both iodine and non-iodine avid lesions and markedly elevated Tg levels, ^{18}F-FDG whole-body PET/CT (Figure 2) was done to identify the disease extent and lesions characterization which showed FDG avid right breast, splenic and skeletal lesions and cervical lymph nodes which were non-avid on the iodine scan. Mammography revealed right breast parenchymal lesion (BIRADS-4) without the involvement of contralateral breast. FNA from the breast lesion revealed metastatic follicular carcinoma of thyroid based on cytopathological

features and FNA-Tg washout levels (Figure 3). The patient received 7400 MBq (~200 mCi) of radioiodine therapy in view of the iodine avid widespread metastatic disease though the breast lesion remained non-tracer avid in the post-therapy iodine scan confirming its radioiodine refractory nature.

Discussion

Metastasis in breast from differentiated thyroid cancer is extremely rare with few isolated case reports in the literature (3,4). There are no clinical or mammographic parameters that can point to the secondary nature of a malignant breast lesion. As in our patient, the heterogeneity in iodine and FDG uptake may correspond to varied degree of differentiation as glucose metabolism is inversely related to iodine uptake, and FDG PET/CT has an established role in detection of iodine-negative recurrent/metastatic disease. FNA cytology and/or histopathology of the breast lesion following immunohistochemistry are the mainstay for diagnosis and in differentiating primary from secondary lesions (5).

Conclusion

Primary breast lesions are managed in entirely different ways from secondary breast lesions arising from thyroid carcinoma. The widespread disease with tumor heterogeneity in this index case was appreciated on two different functional imaging, though precise sampling was essential for diagnosis and appropriate therapy.

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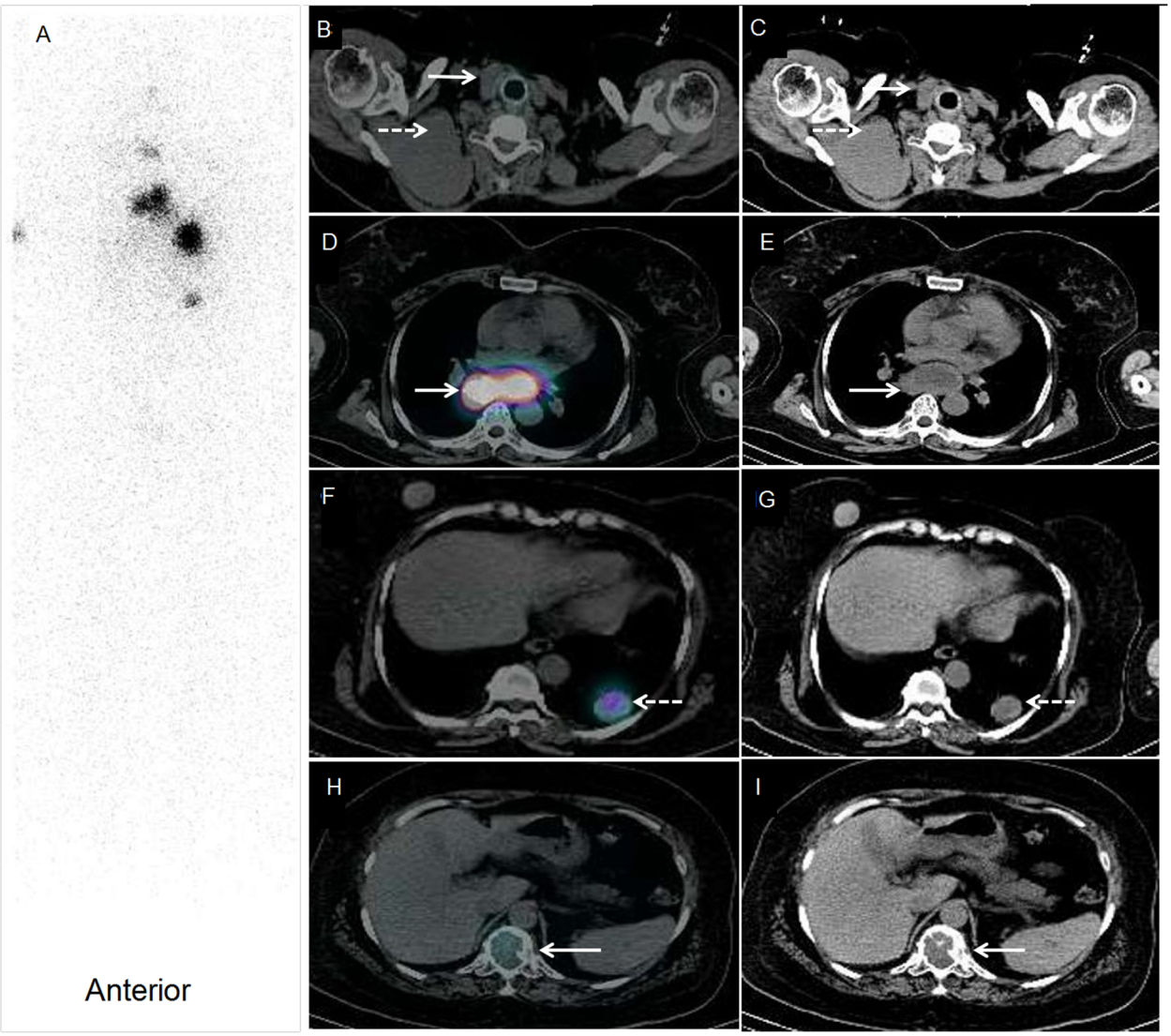

Figure 1: Whole-body radioiodine planar (a), transaxial SPECT/CT and CT images showing iodine-avid residual tissue in thyroid bed (b,c; solid arrow), multiple cervical and mediastinal lymph nodes (d,e), bilateral lung nodules (f,g), with few non-tracer avid cervical lymph nodes (b,c; dotted arrow), right breast (f,g) and skeletal (h,i) lesions.

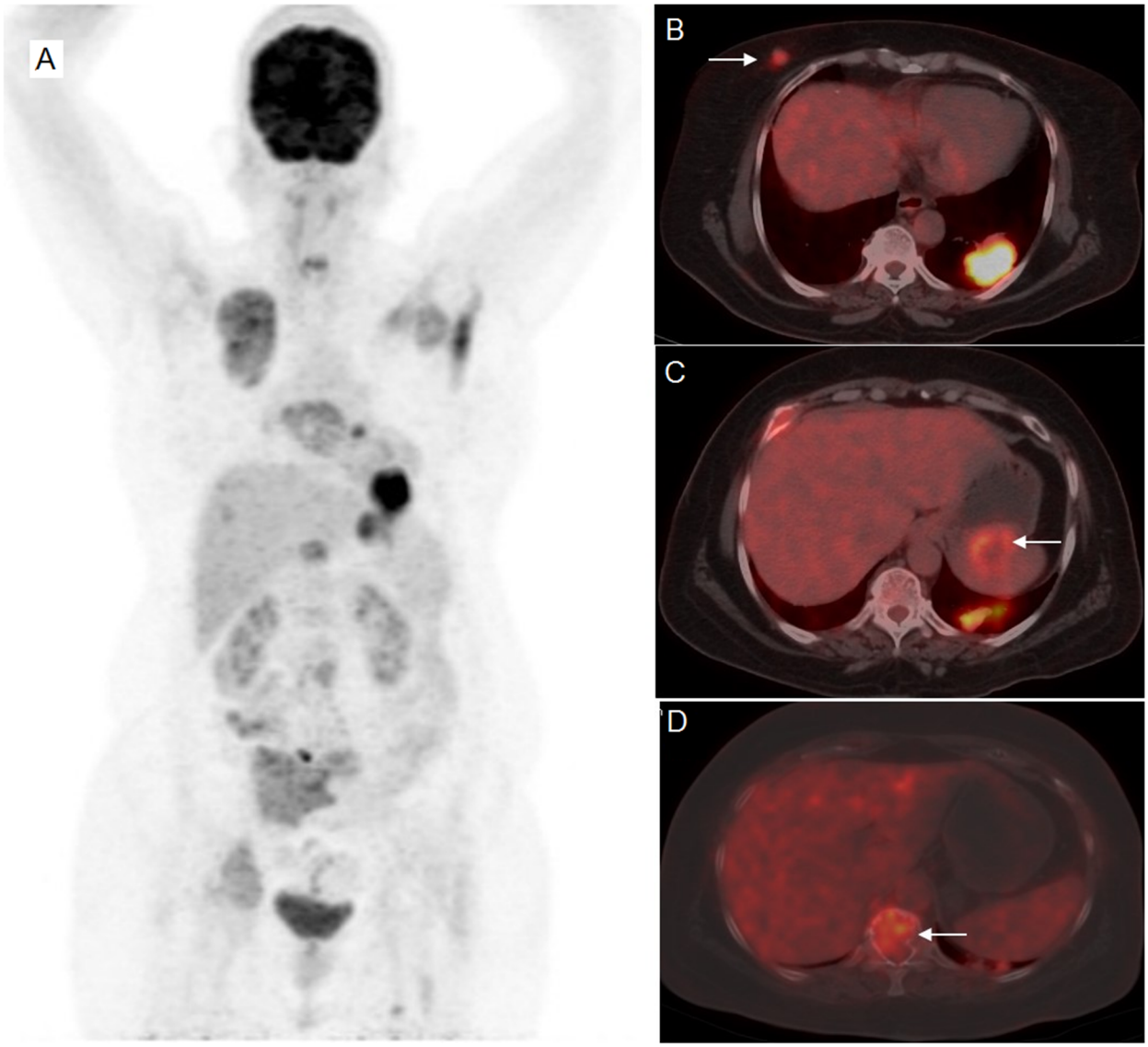

Figure 2: The maximum intensity projection (a), transaxial PET/CT images showing FDG-avid lesions in the right breast (b; SUVmax 3.6), spleen (c) and D12 vertebra (d) (non-avid on the whole-body iodine scan).

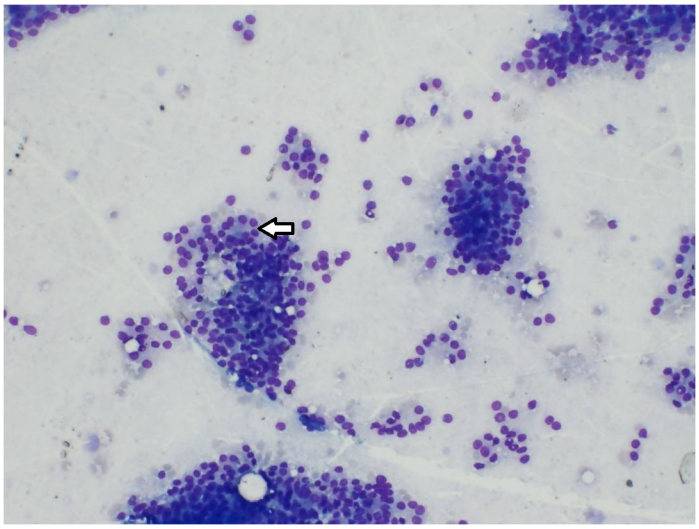

Figure 3: FNA done from right breast lesion showing monomorphic tumor cells arranged in microfollicles (May-Grunwald-Giemsa 100X; arrow), suggestive of metastatic follicular carcinoma from thyroid