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^{18}F-FDG PET/CT in Primary myoepithelial carcinoma of breast: Case report with clinicopathologic correlation and review of literature

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ABSTRACT

Primary myoepithelial carcinoma (MEC) of the breast is exceptionally rare, and evidence on the value of fluorine-18 fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F-FDG PET/CT) is limited.A 52 year old woman with a remote history of right breast ductal carcinoma treated with modified radical mastectomy, chemotherapy, radiotherapy and tamoxifen 14 years earlier presented with a new left breast lump and a right neck nodule. Whole body ^{18}F-FDG PET/CT demonstrated intense uptake in the left breast primary lesion (maximum standardized uptake value [SUVmax] 9.8) with additional fluorodeoxyglucose (FDG) avid lesions in the thyroid and regional lymph nodes. Histopathology and immunohistochemistry confirmed primary breast MEC. Myoepithelial carcinoma can be markedly FDG avid. In selected patients, ^{18}F-FDG PET/CT can provide clinically relevant whole body staging and a quantitative baseline for treatment response assessment.

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Introduction

Myoepithelial lesions of the breast include myoepitheliosis and adenomyoepithelioma (AME) as well as malignant myoepithelial carcinoma (MEC) (1). Breast MEC is very uncommon and may mimic metaplastic carcinoma, sarcoma, or malignant phyllodes tumor because of its morphologic heterogeneity; therefore, diagnosis typically requires an immunohistochemistry (IHC) panel demonstrating myoepithelial differentiation (eg, p63, S100, smooth muscle markers and high molecular weight cytokeratins), often with a "triple negative" (estrogen receptor/progesterone receptor/human epidermal growth factor receptor-2 [ER/PR/HER2 negative) phenotype (1-7).

In breast cancer more broadly, ^{18}F-FDG uptake varies by histology, grade and molecular subtype; higher uptake is generally reported in high grade, triple negative and HER2 positive cancers, while invasive lobular carcinoma is often less FDG avid (8-11). Evidence for PET/CT specifically in breast MEC remains limited. We present a case of primary breast MEC with high FDG avidity and clinically significant extra mammary FDG avid disease.

Case presentation

A 52 year old postmenopausal woman presented with a firm, mobile, non-tender lump (approximately 1.8×1.6 cm) in upper inner quadrant of left breast and a right neck nodule. She had been treated 14 years earlier for right breast ductal carcinoma with modified radical mastectomy, adjuvant chemotherapy and radiotherapy, followed by tamoxifen. There was

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no nipple discharge or skin change, and both axillae were clinically negative. Mammography showed a Breast Imaging Reporting and Data System (BI-RADS) 4 lesion; ultrasonography demonstrated a hypoechoic lesion with posterior shadowing, and breast magnetic resonance imaging showed a heterogeneously enhancing mass with washout kinetics.

A whole body ^{18}F-FDG PET/CT scan (Figure 1) was performed approximately 60 minutes after intravenous injection of ^{18}F-FDG (~3.7 MBq/kg). PET/CT demonstrated intense FDG uptake in the left breast mass (approximately 2.0×1.8 cm, SUV_{max}= 9.8). In addition, FDG avid lesions were identified in the right thyroid lobe (SUV_{max}=10.1), a right infraclavicular/lower cervical lymph node (SUV_{max}=10.4) and a right internal mammary lymph node (SUV_{max}=6.4).

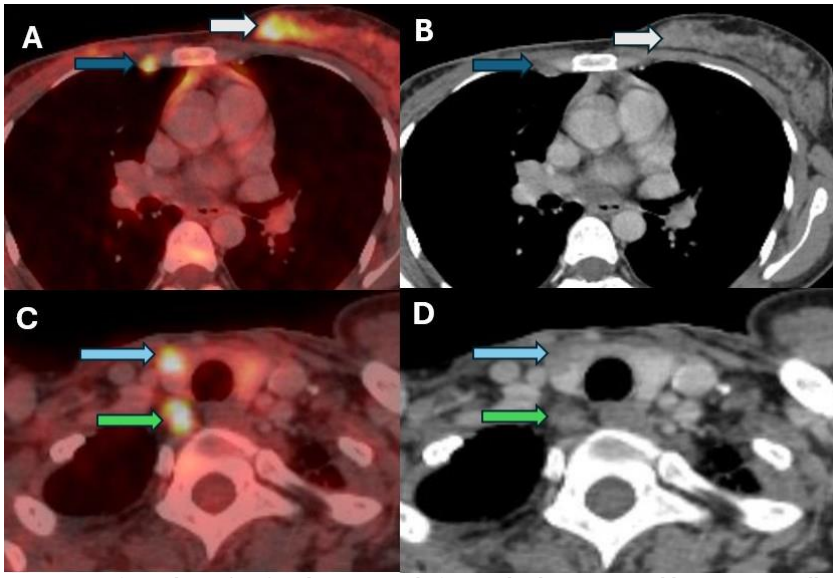

Figure 1. A) Axial PET/CT fused images and **B**) CT only show FDG avid heterogenous ill-defined soft tissue thickening of glandular tissue at medial aspect of left breast (**white arrows**) and a right internal mammary lymph node (**dark blue arrow**). **C**) Axial PET/CT fused images and **D**) CT only show FDG avid non enhancing lesion in the right lobe of thyroid (**sky blue arrow**) and right lower cervical (station 1R)/ infraclavicular lymph node (**green arrow**)

Ultrasound guided fine needle aspiration cytology (FNAC) from the right thyroid lesion suggested metastatic carcinoma with poor differentiation. Core biopsy of the left breast lesion showed a biphasic tumor with a dominant malignant myoepithelial component composed of atypical spindle and epithelioid cells with marked pleomorphism and brisk mitotic activity. On immunohistochemistry, tumor cells were positive for p63, S100 and cytokeratin 5/6, negative for ER/PR/HER2, and the Ki-67 labeling index was approximately 20% (Figure 2), supporting a diagnosis of myoepithelial carcinoma.

Given metastatic disease on cytology and PET/CT, the patient was planned for systemic chemotherapy followed by radiotherapy. At the time of reporting, she had received two cycles of carboplatin and paclitaxel based chemotherapy and was tolerating the treatment reasonably well.

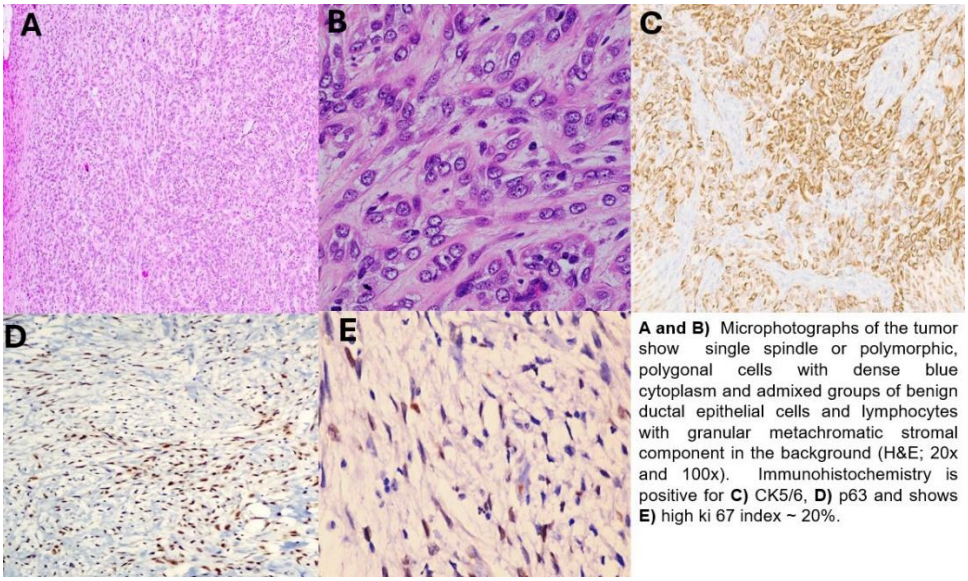

Figure 2. Histopathology and immunohistochemistry of the left breast lesion demonstrating malignant myoepithelial differentiation (description within the image)

Discussion

Breast MEC is a rare malignant neoplasm composed predominantly or entirely of malignant myoepithelial cells. In a clinicopathologic series of 15 diagnostically challenging cases, misclassification at initial evaluation was common, underscoring the diagnostic difficulty (2). MEC may arise de novo or in association with AME (1, 3, 5). Because morphology overlaps with metaplastic carcinoma and sarcomatoid lesions, a broad IHC panel is critical; diffuse p63 and S100 positivity with high molecular weight cytokeratin expression supports myoepithelial differentiation, while ER/PR/HER2 are frequently negative (1,2,6,7). Imaging appearances are non-specific and prior reports have emphasized the importance of correlating imaging with histopathology (12).

FDG PET/CT is not routinely indicated for staging of small, early breast primaries, but it is commonly used in selected patients for systemic staging and for evaluation of suspected recurrence or metastatic disease. FDG uptake in breast cancer is influenced by tumor size, grade and biology. A review of FDG PET/CT in breast disease summarizes that PET/CT is generally more informative in higher grade tumors and advanced disease, while small lesions and low grade tumors can be underestimated (8). Large cohort data show significantly higher uptake in triple negative and HER2 positive cancers compared with luminal A tumors (9). Invasive lobular carcinoma tends to show lower SUV_{max} than invasive ductal carcinoma, and SUV_{max} correlates with proliferation (Ki-67) and other aggressive features (10). Accordingly, an intensely FDG avid breast lesion, particularly when accompanied by receptor negativity and higher proliferation indices, should raise concern for biologically aggressive disease and potential high grade transformation over time.

In our patient, the breast MEC demonstrated intense FDG uptake (SUV_{max}=9.8), consistent with an aggressive, triple negative like biology. Whole body PET/CT also demonstrated FDG avid disease outside the breast, including the contralateral thyroid and regional nodal sites, which directly affected management. False positive FDG uptake may also occur in benign myoepithelial rich tumors such as AME (13), and a wide spectrum of benign and malignant breast entities may show increased uptake, reinforcing the need for correlation with dedicated breast imaging and tissue diagnosis (11).

A noteworthy aspect of this case is the patient's history of prior breast cancer treated with chemotherapy and radiotherapy 14 years earlier. Second primary malignancies after breast radiotherapy have been described, including a modestly increased risk of contralateral breast cancer, particularly in women irradiated at younger ages, reflecting unavoidable scatter dose to the opposite breast (14). However, a specific causal association between prior chemoradiation and subsequent breast MEC has not been established. Recent literature includes rare reports of epithelial myoepithelial carcinoma presenting at the site of a previously treated ductal carcinoma in situ, emphasizing that epithelial/myoepithelial tumors can be encountered during post

treatment surveillance and may complicate the differential diagnosis of a new breast mass (15).

In the present case, the tumor arose in the contralateral breast, outside the original radiotherapy field, so any relationship to prior therapy is speculative.

Management of breast MEC is not standardized. Surgery with negative margins is considered the mainstay for localized disease, and adjuvant radiotherapy is often used for local control, extrapolating from other aggressive breast histologies. For advanced or metastatic disease, published experience is limited but includes responses to platinum and taxane based regimens and combined modality approaches (16-19). In our patient, baseline PET/CT provided a quantitative reference for treatment response assessment.

In conclusion, breast MEC can demonstrate marked FDG avidity. In selected patients, particularly when there are clinical signs of metastatic disease, high grade pathology, or atypical histology, ^{18}F-FDG PET/CT can complement conventional breast imaging by providing whole body staging and an objective metabolic baseline for follow up.

Acknowledgement

None.

Conflict of interest

None declared.

Ethical consideration

Not required for a single retrospective de-identified case under institutional policy.

Contribution of author

Concept/design: Nitin Gupta. Literasure search and PET/CT analysis: Nitin Gupta. Oncology care: Amit Rana. Literature review & drafting: Nitin Gupta, Amit Rana. Critical revision & final approval: Both authors.

All relevant data are included in the article/supplement; additional de-identified data available on reasonable request.

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