Title Page:

Title of paper:

18F-Fluoroestradiol PET in the evaluation of probable oligometastatic breast cancer.

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Consent:

Written consent for publication was obtained from the subject prior to submission of this paper. The signed consent document is held by the treating institution.

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Article type : Radiology Case Letter

Introduction:

This case describes the use of a novel PET tracer, 18F-Fluoroestradiol (FES) to characterise solitary FDG-PET avid lesion in a patient with locally invasive Estrogen receptor (ER) positive breast cancer.

Clinical information:

A 69 year old female presented with a spiculate lesion in the upper outer quadrant of the right breast on screening mammogram. On clinical and sonographic examination, a palpable 15mm mass was identified within the axillary tail. Core biopsy demonstrated invasive ductal carcinoma (Grade II, ER 90%, PR 60%, HER2 negative). She underwent wide local excision and sentinel lymph node biopsy, with involvement demonstrated in 2/4 sampled nodes. Re-staging with FDG-PET demonstrated a small intensely tracer-avid (SUVmax 12) focus in the neck of the right scapula, with no structural correlate on contemporaneous diagnostic CT. Adjunct FES-PET was performed as part of a clinical trial evaluating FES-PET as a non-invasive method of diagnosing occult metastases in strongly ER positive breast cancer. This also demonstrated intense tracer-avidity (SUVmax 15.6) in this lesion (Figure 1). The patient was managed with combined chemotherapy and hormonal therapy for management of oligometastatic ER-positive breast carcinoma, with adjuvant radiotherapy to the breast and axilla. Her treatment remains ongoing. Restaging at 4 months demonstrated reduced avidity of the right scapular lesion on both FES-PET (SUVmax 2.2) and FDG-PET (SUVmax 5.5), with no new focus of increased avidity. Informed consent for publication was obtained.

Discussion:

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Standard FDG PET highlights areas of increased glucose metabolism and is therefore relatively non-specific. In the setting of potential oligometastatic disease, tissue diagnosis of the presumed metastatic deposit would typically be indicated to exclude synchronous primary cancer or other potential false positives. Biopsy is associated with morbidity and is prone to sampling error especially for small lesions that are occult on traditional imaging modalities. Recent advances with specific PET tracer ligands, for example prostate specific membrane antigen (PSMA) PET-imaging, has substantially improved the sensitivity and specificity of PET imaging. There is a growing body of evidence for FES-PET as a non-invasive method for evaluating regional ER expression in metastatic disease[1]. FES has been shown to have high specificity for ER in in-vitro studies, with tracer uptake shown to reflect ligand binding functionality rather than simply volume of receptor protein expression[2]. FES-PET measures regional estrogen binding, allowing identification of cancers likely to respond to targeted endocrine therapy[3,4]. Due to the heterogeneous ER expression across sites of disease, FES-PET may even be superior to standard immunohistochemistry[5].

In demonstrating ER receptor activity within the solitary scapular lesion, a multidisciplinary team determined this to represent a metastatic breast cancer deposit, thus avoiding biopsy to exclude synchronous primary malignancy. Reports of false positives are rare within the literature, and as the patient was to receive chemotherapy based on her nodal status, this approach was felt reasonable. Subsequent reduction in SUV following chemotherapy is supportive of this lesion being an ER-positive metastasis. While promising, further research is required to explore the potential clinical role of FES PET-CT in evaluating metastatic disease in patients with ER-positive breast cancer.

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FIGURES:

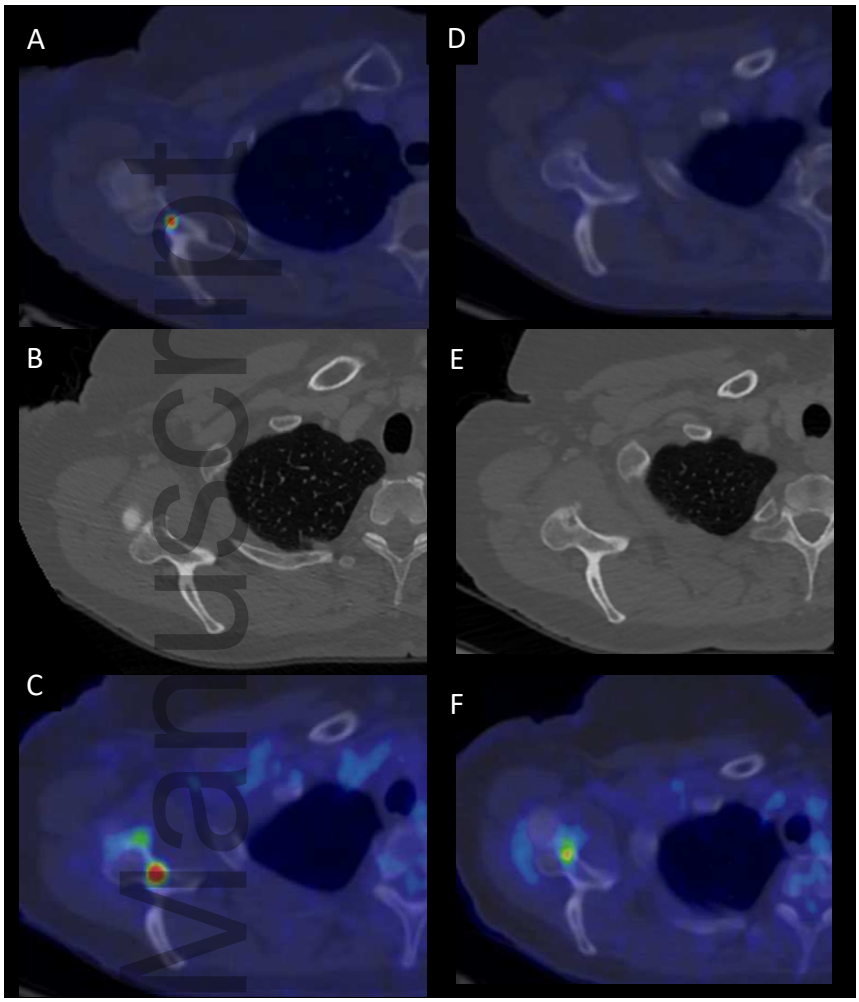

Figure 1: 18F-FES PET, diagnostic CT and FDG-PET images of the right scapular lesion initially (A,B and C), and during restaging 4 months later (D, E and F).

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