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Author/s:

Denton, M;Taubman, K;Sutherland, T

Title:

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

Date:

2021-06-01

Citation:

Denton, M., Taubman, K. & Sutherland, T. (2021). 18F-Fluoroestradiol PET in the evaluation of probable oligometastatic breast cancer. *Journal of Medical Imaging and Radiation Oncology*, 65 (3), pp.333-334. <https://doi.org/10.1111/1754-9485.13136>.

Persistent Link:

<https://hdl.handle.net/11343/276778>

Title Page:

Title of paper:

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

Authors:

Dr Matthew Denton

Dr Kim Taubman

A/Prof Tom Sutherland

Address:

St Vincent's Hospital Melbourne

41 Victoria Parade, Fitzroy, Victoria, 3065.

Corresponding author:

Matthew Denton

Address: Department of Medical Imaging

St Vincent's Hospital Melbourne

41 Victoria Parade, Fitzroy, Victoria, 3065.

Email: mjdenton2@gmail.com

Mobile: 0424 564 930

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.

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/1754-9485.13136](https://doi.org/10.1111/1754-9485.13136)

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DR. MATTHEW DENTON (Orcid ID : 0000-0003-1848-3883)

A/PROF. TOM SUTHERLAND (Orcid ID : 0000-0001-9668-1995)

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. Restaging 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:

32 Standard FDG PET highlights areas of increased glucose metabolism and is therefore relatively
33 non-specific. In the setting of potential oligometastatic disease, tissue diagnosis of the
34 presumed metastatic deposit would typically be indicated to exclude synchronous primary
35 cancer or other potential false positives. Biopsy is associated with morbidity and is prone to
36 sampling error especially for small lesions that are occult on traditional imaging modalities.
37 Recent advances with specific PET tracer ligands, for example prostate specific membrane
38 antigen (PSMA) PET-imaging, has substantially improved the sensitivity and specificity of PET
39 imaging. There is a growing body of evidence for FES-PET as a non-invasive method for
40 evaluating regional ER expression in metastatic disease¹. FES has been shown to have high
41 specificity for ER in in-vitro studies, with tracer uptake shown to reflect ligand binding
42 functionality rather than simply volume of receptor protein expression². FES-PET measures
43 regional estrogen binding, allowing identification of cancers likely to respond to targeted
44 endocrine therapy^{3,4}. Due to the heterogeneous ER expression across sites of disease, FES-
45 PET may even be superior to standard immunohistochemistry⁵.

46
47 In demonstrating ER receptor activity within the solitary scapular lesion, a multidisciplinary
48 team determined this to represent a metastatic breast cancer deposit, thus avoiding biopsy
49 to exclude synchronous primary malignancy. Reports of false positives are rare within the
50 literature, and as the patient was to receive chemotherapy based on her nodal status, this
51 approach was felt reasonable. Subsequent reduction in SUV following chemotherapy is
52 supportive of this lesion being an ER-positive metastasis. While promising, further research is
53 required to explore the potential clinical role of FES PET-CT in evaluating metastatic disease
54 in patients with ER-positive breast cancer.

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FIGURES:

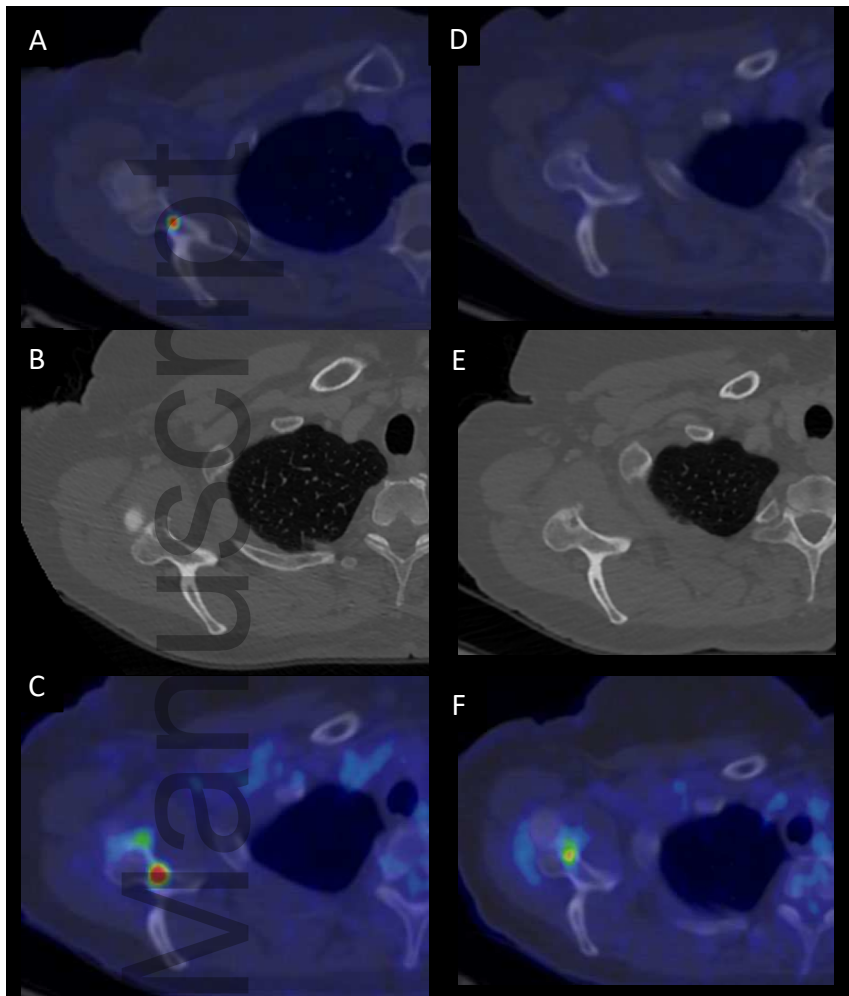


Figure 1: ^{18}F -FES PET, diagnostic CT and FDG-PET images of the right scapular lesion initially (A,B and C), and during restaging 4 months later (D, E and F).