

Invasive Breast Cancer: Medical Imaging

Context and Objective



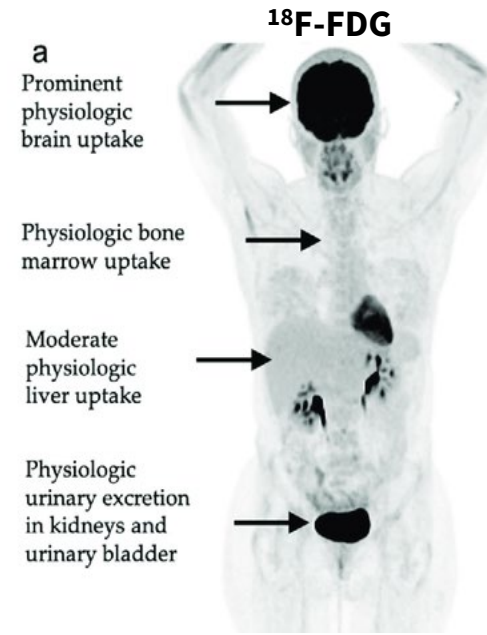
To differentiate diagnostic scans used in the management of invasive breast cancer



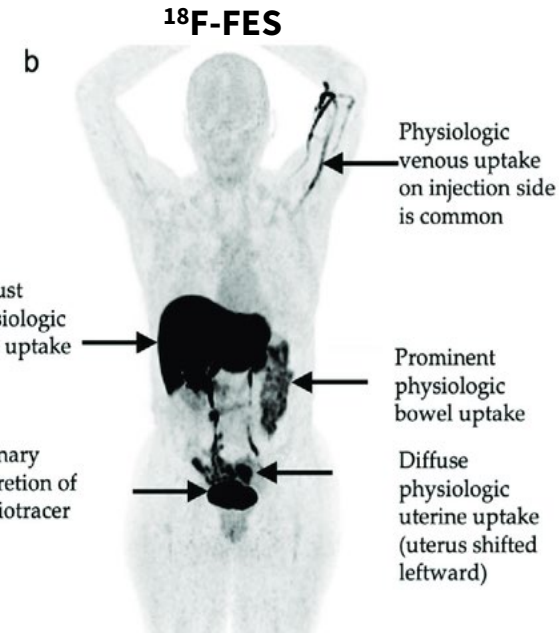
CT Scan



Tc-MDP bone scan



¹⁸F-FDG



¹⁸F-FES

CT image: Image by Mikael Häggström, MD. [Public Domain \(CC0 1.0\)](https://www.ncbi.nlm.nih.gov/publicdomain/). Bone scan image: Ulmert, D et al *Bone Res* 3, 15024 (2015). FDG/FES: Image: Covington MF, et al. *Cancers*. 2022; 14, 2689.

	CT Scan	Bone Scan	FDG-PET	FES-PET
Mechanism of Action	Anatomic imaging	Osteoblastic lesions	Glucose metabolism (osteolytic lesions)	Estrogen receptor status
Select Limitations	Not physiologic	Lower sensitivity with osteolytic lesions	Indolent disease has low glycolytic uptake, high levels of uptake in the brain and urinary collecting system	SERD/SERM interference, liver/bowel excretion
Altered Biodistribution	Benign processes	Benign processes	Inflammatory processes, muscle exertion, lack of fasting, diabetes, steroids ¹	Pulmonary atelectasis, radiation pneumonitis ²
Radiation Dosimetry	~21 mSv ¹ for Chest-Abdomen-Pelvis *with/without contrast	~2-5 mSv ² whole-body	~8 mSv ³ whole-body *additional 9-18 mSv low dose CT ³	~5 mSv ⁴ whole-body *additional 9-18 mSv low dose CT ³
Select Clinical Utility	<ul style="list-style-type: none"> Staging Baseline prior to new therapy Post chemotherapy or endocrine therapy Concern for progression of disease Axilla imaging after newly diagnosed breast cancer 	<ul style="list-style-type: none"> Initial Staging Restaging Pathologic fracture evaluation Incidental finding on other imaging 	<ul style="list-style-type: none"> Clinical suspicion of metastatic disease Restaging for detection of local recurrence, for detection of metastases Treatment response evaluation 	<ul style="list-style-type: none"> Assessing ER status in lesions that are difficult to biopsy, or nondiagnostic biopsy After initial diagnosis of metastatic disease or after progression of metastatic disease, for considering endocrine therapy Detecting ER status when other imaging tests are equivocal or suspicious

1. FDG-PET altered biodistribution: https://jnm.snmjournals.org/content/51/supplement_2/2020. 2. FES-PET altered biodistribution: Sophia O'Brien, et al. ¹⁸F-Fluoroestradiol: Current Applications and Future Directions, Volume 43, Issue 3, March 2023. 3. CT scan dosimetry: <https://www.radiologyinfo.org/en/info/safety-xray>. 4. Bone scan dosimetry: <https://www.insideradiology.com.au/nuclear-medicine-bone-scan-hp/>. 5. FDG-PET dosimetry: Yuhao Li, et al *Radiation Protection Dosimetry*, Volume 187, Issue 2, December 2019. 6. FES-PET dosimetry: CERIANNA™, Full Prescribing Information, GE HealthCare, May 2024. CT, Computerized tomography; Tc-MDP, Technetium methyl diphosphonate; ¹⁸F-FDG, ¹⁸F-fluorodeoxyglucose; ¹⁸F-FES, ¹⁸F-Fluoroestradiol; SERD, Selective estrogen receptor degrader; SERM, Selective estrogen receptor modulator; ER, Estrogen receptor.