

## Uncommon Reason for High Fluorodeoxyglucose Positron Emission Tomography Uptake

A 32-year-old woman presented with a local recurrence of breast cancer. She had first been diagnosed in 2006 with clinical stage II (T4.5 cm N0 M0), triple-negative breast cancer of the left breast; she received neoadjuvant chemotherapy and breast-conserving surgery followed by adjuvant chemotherapy and breast irradiation. She remained disease-free until May 2009, when a 0.9-mm lump appeared in her left breast. A tru-cut biopsy showed infiltrating ductal carcinoma. A computed tomography/positron emission tomography (PET) scan showed diffuse high fluorodeoxyglucose (FDG) uptake in her right breast with no pathologic findings or uptake elsewhere (Fig 1).

The PET scan is one of the most useful tools for metastatic evaluation. In an extensive review of the FDG-PET literature, comprising 419 articles from 1993 to 2000, the overall sensitivity and specificity was estimated to be 84% and 86%, respectively, and results from a PET scan changed the management of one third of the patients in the literature.<sup>1</sup> Tumor cells have higher metabolic rates than normal cells; therefore, they take up greater amounts of glucose and FDG than surrounding tissues do.<sup>1</sup> However, it is not only tumor cells that may have an increased FDG uptake. Lesions with high concentrations of inflammatory cells may also show increased FDG uptake, which can be mistaken for malignancy in patients with proven or suspected cancer.<sup>2</sup> Incidental increased FDG uptake in the thyroid can be seen in 2% of PET scans, including scans of Graves' disease.<sup>3</sup> Increased FDG uptake has also been reported in the normal uterus during menstruation;<sup>4,5</sup> in healing bone, joints, and sites of infection;<sup>6</sup> in granulomatous diseases like sarcoidosis;<sup>7-9</sup> in chronic inflammatory diseases like tuberculosis;<sup>10</sup> and in other infrequent conditions like Lhermitte-

Duclos disease.<sup>11</sup> Some other rare reasons for high FDG uptake include atherosclerotic plaque formation,<sup>12</sup> adenomatous polyps of the colon,<sup>13</sup> diffuse bone marrow uptake after erythropoietin or granulocyte colony-stimulating factor administration,<sup>14,15</sup> and thalassemia.<sup>16</sup> Finally, high FDG uptake has also been reported in breast-feeding women.<sup>17</sup>

In this patient, there was no FDG uptake in her left breast recurrence of a tumor the size of less than 1 cm under the scan resolution. Unexpectedly, there was an extensive high FDG uptake in her contralateral breast, which was otherwise clinically normal. The patient was breast-feeding her three-month-old newborn, which provides an uncommon reason for high FDG uptake that is not widely recognized as a cause for a false-positive PET scan in clinical practice. Radiation therapy may lead to a substantially reduced milk supply, even to the point of no milk at all.<sup>18,19</sup> After having had her left breast irradiated three years before when the disease was first diagnosed, the patient's milk production occurred in her contralateral breast only—the one showing high FDG uptake.

Delay of PET scanning until after completion of breast-feeding should be considered to avoid a work-up of a false-positive result. On the other hand, if PET scanning must be performed, then breast-feeding should be interrupted both before the exam and afterward until the radioactivity has left the breast.

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### AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The author(s) indicated no potential conflicts of interest.

### REFERENCES

- Ghambir SS, Czernin J, Schwimmer J, et al: A tabulated summary of the FDG PET literature. *J Nucl Med* 42:1S-93S, 2001 (suppl)
- Brown RS, Leung JY, Fisher SJ, et al: Intratumoral distribution of tritiated-FDG in breast carcinoma: Correlation between Glut-1 expression and FDG uptake. *J Nucl Med* 37:1042-1047, 1996
- Kang KW, Kim SK, Kang HS, et al: Prevalence and risk of cancer of focal thyroid incidentaloma identified by 18F-fluorodeoxyglucose positron emission tomography for metastasis evaluation and cancer screening in healthy subjects. *J Clin Endocrinol Metab* 88:4100-4104, 2003
- Yasuda S, Ide M, Takagi S, et al: Intrauterine accumulation of F-18 FDG during menstruation. *Clin Nucl Med* 22:793-794, 1997
- Chander S, Meltzer CC, McCook BM: Physiologic uterine uptake of FDG during menstruation demonstrated with serial combined positron emission tomography and computed tomography. *Clin Nucl Med* 27:22-24, 2002
- Shreve PD, Anzai Y, Wahl RL: Pitfalls in oncologic diagnosis with FDG PET imaging: physiologic and benign variants. *Radiographics* 19:61-77, 1999
- Abouzie MM, Crawford ES, Nabi HA: 18F-FDG imaging: Pitfalls and artifacts. *J Nucl Med Technol* 33:145-155, 2005
- Takanami K, Kaneta T, Yamada T, et al: FDG PET for esophageal cancer complicated by sarcoidosis mimicking mediastinal and hilar lymph node metastases: Two case reports. *Clin Nucl Med* 33:258-261, 2008
- Muggia FM, Conti PS: Seminoma and sarcoidosis: A cause for false positive mediastinal uptake in PET? *Ann Oncol* 9:924, 1998
- Bakheet SM, Powe J, Ezzat A, et al: F-18-FDG uptake in tuberculosis. *Clin Nucl Med* 23:739-742, 1998
- Nakagawa T, Maeda M, Kato M, et al: A case of Lhermitte-Duclos disease presenting high FDG uptake on FDG-PET/CT. *J Neurooncol* 84:185-188, 2007

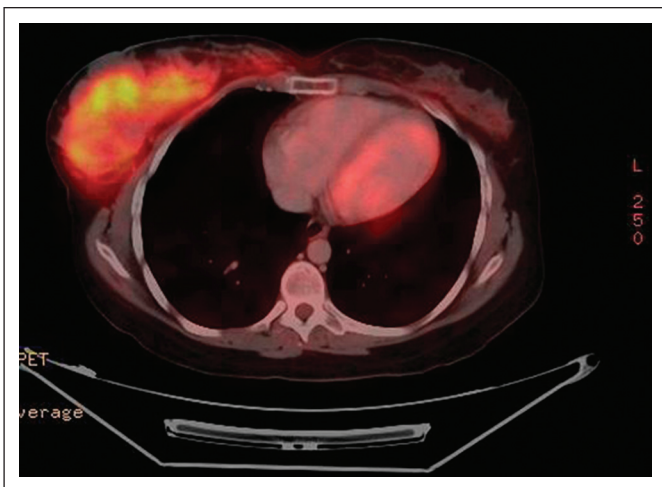


Fig 1.

12. Rudd JH, Warburton EA, Fryer TD, et al: Imaging atherosclerotic plaque inflammation with [18F]-fluorodeoxyglucose positron emission tomography. *Circulation* 105:2708-2711, 2002

13. Kamel EM, Thumshirn M, Truninger K, et al: Significance of incidental 18F-FDG accumulations in the gastrointestinal tract in PET/CT: Correlation with endoscopic and histopathologic results. *J Nucl Med* 45:1804-1810, 2004

14. Blodgett TM, Ames JT, Torok FS, et al: Diffuse bone marrow uptake on whole-body F-18 fluorodeoxyglucose positron emission tomography in a patient taking recombinant erythropoietin. *Clin Nucl Med* 29:161-163, 2004

15. Abdel-Dayem HM, Rosen G, El-Zeftawy H, et al: Fluorine-18 fluorodeoxyglucose splenic uptake from extramedullary hematopoiesis after granulocyte colony-stimulating factor stimulation. *Clin Nucl Med* 24:319-322, 1999

16. Wong CL, Fulham MJ: Increased splenic FDG uptake on PET in beta-thalassemia. *Clin Nucl Med* 29:266-267, 2004

17. Hicks RJ, Binns D, Stabin MG: Pattern of uptake and excretion of (18)F-FDG in the lactating breast. *J Nucl Med* 42:1238-1242, 2001

18. David FC: Lactation following primary radiation therapy for carcinoma of the breast. *Int J Radiat Oncol Biol Phys* 11:1425, 1985

19. Higgins S, Haffty BG: Pregnancy and lactation after breast-conserving therapy for early stage breast cancer. *Cancer* 73:2175-2180, 1994

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