

# $^{18}\text{F}$ -FDG PET/CT for Monitoring Response to Therapy for Choroidal Metastasis

Naghmehossadat Eshghi<sup>1</sup>, John Christoforidis<sup>2</sup>, and Phillip H. Kuo<sup>1,3</sup>

<sup>1</sup>Department of Medical Imaging, University of Arizona, Tucson, Arizona; <sup>2</sup>Department of Ophthalmology and Vision Science, Banner University Medical Center, Tucson, Arizona; and <sup>3</sup>Departments of Medicine and Biomedical Engineering, University of Arizona, Tucson, Arizona

A 38-y-old woman with metastatic breast carcinoma reported seeing “halos and flashes” in her left eye. Funduscopic examination revealed an elevated mass in the choroid of the left globe consistent with metastasis. Subsequent  $^{18}\text{F}$ -FDG PET/CT revealed focal uptake in the nasal aspect of the left choroid of the eye corresponding to the mass seen on the funduscopic examination. Through correlation with the PET/CT study, the lesion was retrospectively identified on MRI. The fact that  $^{18}\text{F}$ -FDG PET/CT after radiotherapy showed a complete response supports the use of this imaging modality for diagnosis and monitoring of response. A history of breast cancer and visual symptoms should trigger the nuclear medicine physician to take extra care in reading the initial slices of the PET/CT scan through the orbits in order to make this challenging imaging diagnosis.

**Key Words:** breast; molecular imaging; oncology;  $^{18}\text{F}$ -FDG PET/CT; breast cancer; choroidal metastasis

**J Nucl Med Technol 2018; 46:59–60**  
DOI: 10.2967/jnmt.117.198341

The use of  $^{18}\text{F}$ -FDG PET/CT for follow-up and monitoring of response in patients with breast cancer has been increasing (1,2). A large study found that 47% of orbital metastases are from breast cancer but less than 1% of breast cancers metastasize to the orbit (3,4). The most common site of orbital metastasis is the choroid (88%) (3). Although rare at initial staging, orbital metastases from breast cancer typically develop years after diagnosis, with one study reporting a median of 8.5 y after diagnosis (4).

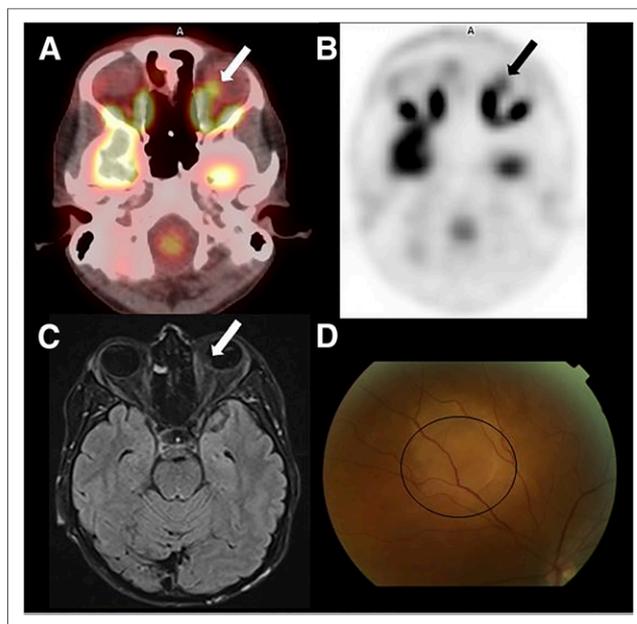
## CASE REPORT

A 38-y-old woman with infiltrating ductal carcinoma underwent neoadjuvant chemotherapy followed by bilateral mastectomy and radiation. Staging  $^{18}\text{F}$ -FDG PET/CT demonstrated no distant metastases. Three years later, the level

of serum tumor marker increased.  $^{18}\text{F}$ -FDG PET/CT then revealed widespread metastatic disease in the lymph nodes, lungs, bone, skin, and left choroid.

$^{18}\text{F}$ -FDG PET/CT showed focal  $^{18}\text{F}$ -FDG activity with an  $\text{SUV}_{\text{max}}$  of 5.0 in the nasal choroid of the left eye, consistent with choroidal metastasis (Figs. 1A and 1B). A fluid attenuation inversion recovery MRI sequence demonstrated subtle thickening of the left nasal choroid (Fig. 1C).

Radiation therapy is the treatment of choice for choroidal metastases from breast cancer, and this patient underwent intensity-modulated radiation therapy (5).  $^{18}\text{F}$ -FDG PET/CT and MRI 3 mo after radiation therapy demonstrated resolution of the lesion (Figs. 2A–2C). Fundoscopy demonstrated flattening and regression of the choroidal mass with residual atrophic pigmentary changes in the overlying retinal pigment epithelium as typically seen after radiation therapy (Fig. 2D).



**FIGURE 1.** Pretreatment imaging. (A–C) Fused PET/CT (A), axial  $^{18}\text{F}$ -FDG PET (B), and axial fluid attenuation inversion recovery MRI (C) showed focus of  $^{18}\text{F}$ -FDG uptake and thickening in left nasal choroid (arrows). (D) Photograph of fundus revealed elevated 6-mm lesion in left nasal choroid (circle).

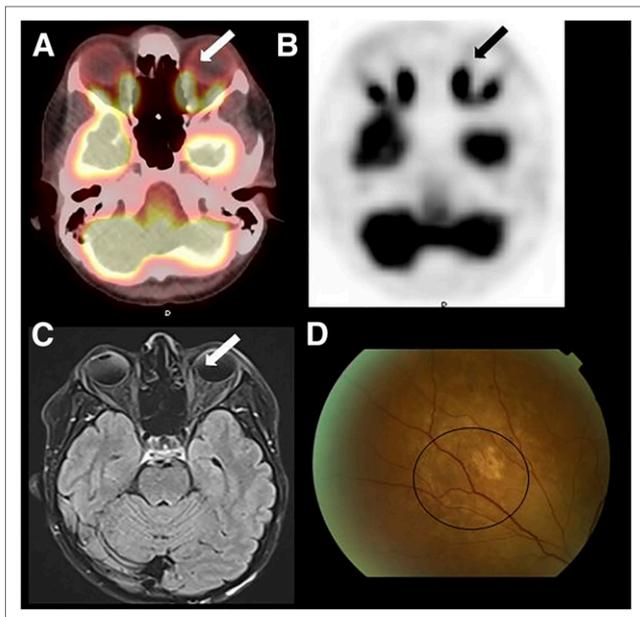
Received Jul. 31, 2017; revision accepted Aug. 28, 2017.

For correspondence or reprints contact: Naghmehossadat Eshghi, Department of Medical Imaging, Banner University Medical Center, 1501 N. Campbell Ave., Tucson, AZ 85724.

E-mail: neshghi@radiology.arizona.edu

Published online Nov. 10, 2017.

COPYRIGHT © 2018 by the Society of Nuclear Medicine and Molecular Imaging.



**FIGURE 2.** Posttreatment imaging. (A–C) Fused PET/CT (A), axial  $^{18}\text{F}$ -FDG PET (B), and axial fluid attenuation inversion recovery MRI (C) showed resolution of focus of  $^{18}\text{F}$ -FDG uptake and choroidal thickening in left nasal choroid (arrows). (D) Photograph of fundus revealed regression of choroidal mass (circle).

## DISCUSSION

Since breast cancer is the most common etiology of orbital metastasis, technologists must ensure that the orbits

are included in the field of view for all breast cancer patients. Physiologic uptake in extraocular muscles and the small size of choroidal metastases can make the diagnosis challenging. Therefore, the history of breast cancer and visual symptoms should trigger the nuclear medicine physician to take extra care in reading the initial slices of the PET/CT scan through the orbits.

## CONCLUSION

$^{18}\text{F}$ -FDG PET/CT can detect and monitor response to therapy for choroidal metastasis.

## DISCLOSURE

No potential conflict of interest relevant to this article was reported.

## REFERENCES

1. Jodłowska E, Czepeczynski R, Czarnywojtek A, et al. The application of positron emission tomography (PET/CT) in diagnosis of breast cancer. Part II. Diagnosis after treatment initiation, future perspectives. *Contemp Oncol (Pozn)*. 2016;20:205–209.
2. Xiao Y, Wang L, Jiang X, She W, He L, Hu G. Diagnostic efficacy of  $^{18}\text{F}$ -FDG-PET or PET/CT in breast cancer with suspected recurrence: a systematic review and meta-analysis. *Nucl Med Commun*. 2016;37:1180–1188.
3. Shields CL, Shields JA, Gross NE, Schwartz GP, Lally SE. Survey of 520 eyes with uveal metastases. *Ophthalmology*. 1997;104:1265–1276.
4. Pierson TM, Tebit EV, El Sayed A, Smolkin ME, Dillon PM. Orbital metastases from breast cancer: retrospective analysis at an academic cancer center. *Breast J*. 2016;22:447–450.
5. Ratanatharathorn V, Powers WE, Grimm J, et al. Eye metastasis from carcinoma of the breast: diagnosis, radiation treatment and results. *Cancer Treat Rev*. 1991;18:261–276.