Metastatic Breast Lesion to the Falx Detected with PET-CT

Chester Harrison · David M. Schuster

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Intracranial dural metastasis is increasingly encountered in imaging. Autopsies conducted on patients with advanced metastatic disease demonstrate dural involvement in 9% of cases, with breast and prostate cancer the most common primaries [1]. Awareness of this entity and imaging appearances is especially important in evaluating malignancies prone to dural metastasis.

A 57-year-old woman with a strong family history of breast cancer initially presented after self-detection of a right breast lump. Subsequent mammogram and biopsies yielded a diagnosis of right infiltrating ductal carcinoma with a positive lymph node as well as left invasive lobular carcinoma. Initial staging PET-CT (not shown) at the time of diagnosis demonstrated no abnormal FDG uptake remote from the breast. Neoadjuvant chemotherapy was instituted, and a PET-CT was obtained to evaluate disease response, demonstrating an approximately 1.8 cm hypermetabolic intracranial mass, localized to the region of the anterior corpus callosum on axial PET (Fig. 1a), axial fused PET-CT (Fig. 1b), and sagittal fused PET-CT (Fig. 1c) with a maximum SUV of 15.9. There was associated bifrontal vasogenic edema (Fig. 1d) on the CT demonstrated on brain windows. Marked progression of disease was noted elsewhere, including hypermetabolic adenopathy and skeletal disease.

A contrast-enhanced MRI of the brain was obtained demonstrating extensive T1 hypointensity, T2, and FLAIR (Fig. 2a) hyperintensity in the bilateral paramedian frontal lobes representing vasogenic edema. Post-contrast imaging demonstrated three solidly enhancing masses in the areas of described vasogenic edema, one large extra-axial and two sub-centimeter parenchymal lesions. The large extra-axial mass demonstrated homogeneous solid enhancement, in the midline anteriorly centered on the falx, just superior to the anterior corpus callosum. This measured 1.7 cm transverse $\times$ 3.1 cm AP $\times$ 2.4 cm craniocaudal on T1 post-contrast axial (Fig. 2b), coronal (Fig. 2c), and sagittal images (Fig. 2d). Enhancement within the adjacent sulci suggested subarachnoid or leptomeningeal components. This lesion and associated edema produced mass effect with sulcal effacement. The patient was started on intravenous steroids and referred to radiation oncology in anticipation of whole brain radiation.

Imaging features of intracranial dural metastasis are well described by Nayak et al. [1] who reported that 56% percent of patients with intracranial dural metastasis, in the absence of intraparenchymal or leptomeningeal disease, had a single dural metastasis, with 25% diffuse dural involvement. Common sites of involvement included the parietal (36%) and frontal (32%) dura. Just over half of patients demonstrated mass effect upon the underlying brain parenchyma with resultant vasogenic edema, and just over one-third had intraparenchymal invasion. Additional radiologic findings include involvement of the venous sinuses, resulting in possible occlusion or compression of the sinus, as well as traversing structures such as cranial nerves within the cavernous sinus. Less commonly reported associations include subdural hematoma [1–3].

C. Harrison (✉) · D. M. Schuster
Department of Radiology and Imaging Sciences,
Division of Nuclear Medicine and Molecular Imaging,
Emory University,
1364 Clifton Road NE,
Atlanta, GA 30322, USA
e-mail: chesterharrison@gmail.com

Fig. 1 Axial PET (a), axial fused (b), and sagittal fused (c) PET-CT demonstrating an approximately 1.8 cm hyper-metabolic intracranial mass, localized to the region of the anterior corpus callosum. Associated bifrontal vasogenic edema is also seen on brain windows (d)

Dural metastasis can initially present with unexpected imaging findings. Truong et al. presented a case of invasive lobular breast carcinoma with dural metastasis detected on a Tc-99 m MDP bone scan as a large area of unusual tracer activity in the right frontoparietal skull region [4]. Subsequent contrast enhanced CT confirmed abnormal thickening and enhancement of the dura in this region, with analogous findings on MRI.

Metastatic involvement of the falx, an in-folding of the dura separating the cerebral hemispheres, is a less common but potential site for metastasis, with unique imaging features. As an extra-axial structure, falx metastasis can have bihemispheric effects of vasogenic edema and mass effect. Diagnosing metastasis to this structure can be difficult, especially in the absence of a known primary malignancy. Falx metastasis may display imaging features characteristic of meningioma such as a dural tail and

homogenous enhancement. Richiello et al. described a case of breast metastasis to the anterior falx initially suspected to represent meningioma, found to be metastasis only after surgical resection [2]. A similar paper reports prostate adenocarcinoma involving the anterior parasagittal dura, again simulating a meningioma [5].

Intracranial lesions may be difficult to detect on PET given the high background metabolic activity of the brain [6]. This is demonstrated by the subtlety of the falx lesion in this case using a conventional PET body window (Fig. 2e), which is the same image as Fig. 1a, which was windowed with brain settings. Thus, it is important that the interpreting physician carefully use appropriate windows to review the CT and PET images of the brain and have a high index of suspicion for metastasis when confronted with a dural-based mass with any degree of abnormal FDG uptake.

Fig. 2 Axial FLAIR (a), and post-contrast axial (b), coronal (c), and sagittal (d) MRI of the brain demonstrating vasogenic edema and three solidly enhancing masses. In the conventional PET body window (e; same image as Fig. 1a), note the subtlety of the falx lesion,

emphasizing the importance that the interpreting physician carefully use appropriate windows to review the CT and PET images of the brain and have a high index of suspicion for metastasis when confronted with a dural-based mass with any degree of abnormal FDG uptake

Conflict of interest We declare that we have no conflict of interest.

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