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Intracranial leptomeningeal carcinomatosis from breast cancer detected on ^{18}F-FDG PET

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Abstract

Leptomeningeal carcinomatosis (LC) is an uncommon manifestation of non-central nervous system (CNS) metastatic disease. Diagnosis, however, has important prognostic and treatment implications. Despite low sensitivity for detection, we present a case of intracranial LC from a primary breast cancer detected with ^{18}F-FDG PET/CT.

Key Words: ^{18}F-FDG PET/CT; Leptomeningeal carcinomatosis; breast cancer

Introduction

Leptomeningeal carcinomatosis is an uncommon late manifestation of non-CNS solid malignancies. ^{18}F-FDG PET/CT has a low sensitivity for detection of CNS metastases from non-CNS primary tumors (*1*). ^{18}F-FDG PET/CT detection of LC from other non-CNS primary tumors has been described (*1*) and few cases of ^{18}F-FDG PET/CT detection of spinal LC from breast cancer (*2,3*) have been reported. To our knowledge, however, this is the first reported case of intracranial LC from breast cancer detected with ^{18}F-FDG PET/CT.

Case Report

A 38 year-old female with stage IV inflammatory ductal carcinoma of the breast metastatic to the bones presented with ataxia two weeks following completion of palliative chemotherapy. Contrast enhanced brain MRI demonstrated nodular leptomeningeal enhancement primarily of the cerebellar folia (Fig. 1). A differential diagnosis of LC versus infectious meningitis was provided. A total of 4 cerebrospinal fluid (CSF) samples were negative for infection and metastatic disease.

^{18}F-FDG PET/CT was performed for restaging purposes. Imaging from the skull vertex through the mid-femora was begun 90 minutes following intravenous injection of 384 MBq ^{18}F-FDG. Imaging revealed increased FDG avidity conforming to the sites of leptomeningeal enhancement on brain MRI, as well as progression of osseous metastatic disease (Fig. 2). Despite negative

CSF cytology, the presence of other metastatic disease detected on FDG PET/CT and a lack of infectious symptoms supported a diagnosis of LC. Neurologic symptoms rapidly regressed after placement of a ventriculostomy and initiation of high dose steroids and intrathecal chemotherapy.

Discussion

The most common intracranial locations of CSF tumor seeding are the basilar cisterns and cerebellum. While breast cancer is the most common non-hematologic tumor with leptomeningeal spread, the incidence remains low at only 1-5% (*4,5*). LC has a poor prognosis with median survival of only 2-4 months (*2*).

Detection of metastatic cells within the CSF remains the gold standard for diagnosis, but the yield is poor with detection rates of only 50% on initial CSF sampling (*4*). Contrast enhanced MRI is the imaging modality of choice for diagnosis showing leptomeningeal enhancement. Despite its low sensitivity, ^{18}F-FDG PET/CT may show increased leptomeningeal metabolic activity (*1*).

Leptomeningeal enhancement and increased FDG avidity are both nonspecific findings and can be seen in infectious meningitis, LC, or neurosarcoidosis. In conjunction with clinical information, however, they can suggest the diagnosis of LC. While MRI is likely more sensitive in detecting LC, whole body ^{18}F-FDG PET/CT has the advantage of demonstrating other metastatic disease, an important finding as LC is usually a late manifestation of metastatic disease and less commonly seen in isolation (*5*).

Conclusion

While the sensitivity of ^{18}F-FDG PET/CT for detection of CNS metastases is poor, routine staging examinations cover the most common locations of intracranial leptomeningeal metastases. Detection is therefore possible and has important prognostic and treatment implications. Despite MRI being the imaging modality of choice for diagnosing leptomeningeal metastasis, whole body ^{18}F-FDG PET/CT is uniquely able to detect other systemic metastatic disease, important information supporting a diagnosis of LC.

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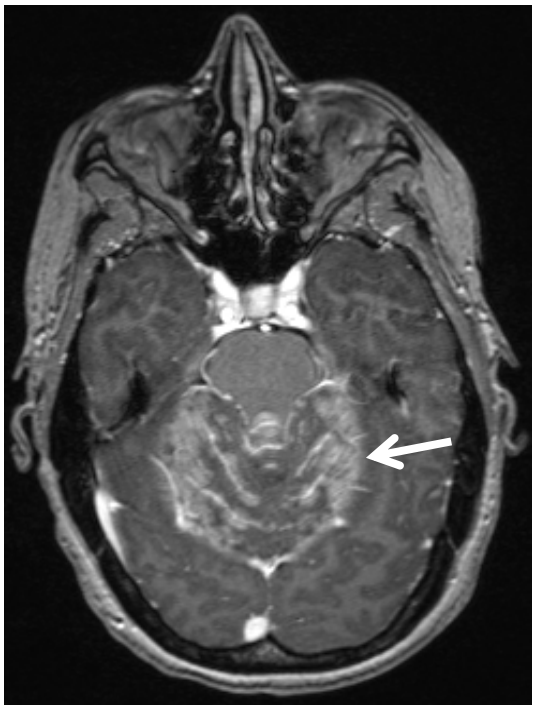

FIGURE 1. Post-contrast Axial T1 image of the brain demonstrating leptomeningeal enhancement of the cerebellar folia (arrow).

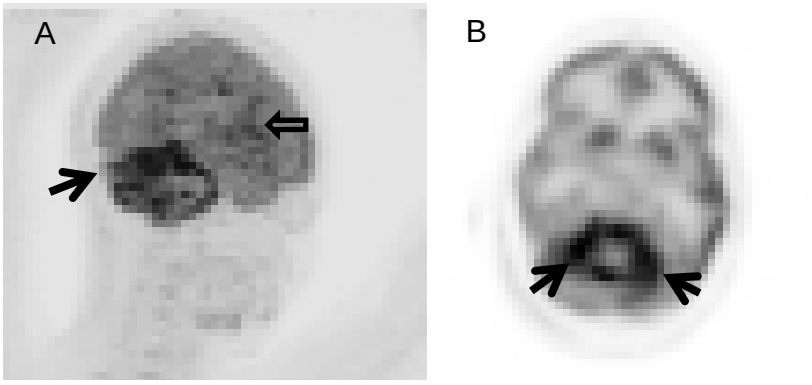

FIGURE 2. Maximum intensity projection (A) and axial image (B) from ^{18}F-FDG PET showing increased leptomeningeal radiotracer uptake of the cerebellum (arrows) and temporal lobe (open arrow).