Case report

Incidental Detection of Asymptomatic Brain Metastases on ^{18}F-fluoride Positron Emission Tomography/Computed Tomography and ^{68}Ga DOTANOC Positron Emission Tomography/Computed Tomography in a Patient with Concomitant Breast Carcinoma and a Pancreatic Neuroendocrine Tumor

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Abstract

A 54-year-old female treated for locally advanced ductal breast carcinoma was also diagnosed with a pancreatic neuroendocrine tumour. A staging ^{68}Ga DOTANOC positron emission tomography/computed tomography (PET/CT) demonstrated somatostatin receptor-positive foci within the brain parenchyma. A whole body ^{18}F-fluoride PET/CT also demonstrated several foci of low-grade tracer uptake in the brain. Magnetic resonance imaging confirmed several cerebral and cerebellar metastases. This case highlights the need to be aware of each tumor's metastatic profile and the careful attention required for thoroughly evaluating imaging in the presence of multiple pathologies. Furthermore, such incidental findings can have significant treatment and prognostic implications.

Keywords: ^{18}F-fluoride positron emission tomography/computed tomography, ^{68}Ga DOTANOC positron emission tomography/computed tomography, brain metastases, breast carcinoma, neuroendocrine tumor

Case Presentation

A 54-year-old female underwent two whole body positron emission tomography/computed tomography (PET/CT) scans before a gadolinium-enhanced magnetic resonance imaging (MRI) of her brain. Figure 1 shows the abnormalities found in the brain parenchyma detected by the ^{18}F-fluoride PET/CT bone scan, which are more subtle when compared with the somatostatin receptor imaging in Figure 2, using ^{68}Ga DOTANOC PET/CT. The two PET/CT scans were performed within a 2-week interval and demonstrate a similar pattern of tracer uptake within the brain parenchyma.

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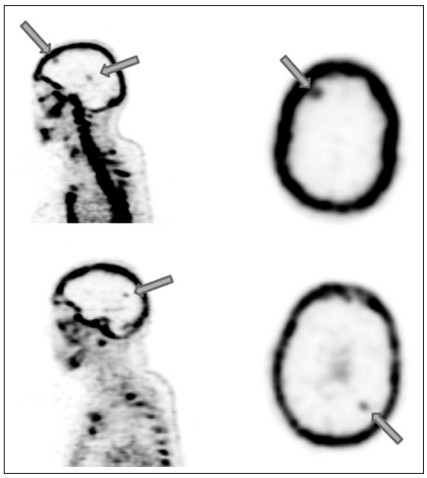

Figure 1: ^{18}F-fluoride positron emission tomography/computed tomography bone scan - abnormalities found in the brain parenchyma

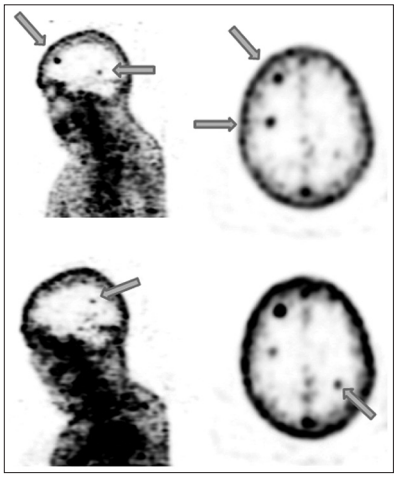

Figure 2: ^{68}Ga DOTANOC positron emission tomography/computed tomography - abnormal uptake in brain parenchyma

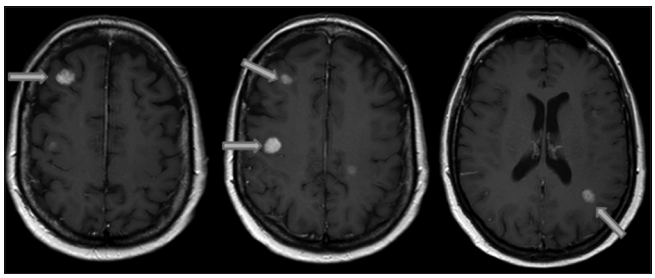

Figure 3: Magnetic resonance imaging confirming cerebral metastases

Figures 1 and 2 both correspond to the postgadolinium MRI findings as shown in Figure 3. The histology of the neuroendocrine tumor (NET) demonstrated a Ki67 index of 4.2%, and the size of the NET reduced following the chemotherapy given for the breast cancer making it unlikely to be the source of the cerebral metastases, although brain metastases from NETs have been reported.[1] Breast cancer has a recognized predisposition to metastasize to the brain;[2,3] the original histology of the T3 N3, estrogen receptor negative, human epidermal receptor 2 positive invasive ductal carcinoma had a high Ki67 index of 40%, making it more likely to be the responsible primary tumor.[4,5] Breast cancer has been shown to express somatostatin receptors accounting for the uptake demonstrated on the ^{68}Ga DOTANOC PET/CT.[6,7] In this case, there was no abnormality on the low-dose CTs that accompanied both PET scans and there was an absence of calcification in the areas of increased ^{18}F-fluoride uptake within the brain. Extra-osseous findings including brain metastases from breast carcinoma and other primary malignancies have demonstrated uptake on ^{18}F-fluoride PET/CT in the absence of calcification, similar to this case.[8,9] The patient was subsequently admitted for targeted radiotherapy to her cerebral metastases following discussion at multidisciplinary team meetings.

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Nil.

Conflicts of interest
There are no conflicts of interest.

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