

Multifocal Meningioma Recurrence Detected on Ga68-DOTANOC Scan

Abstract

Meningiomas arise from meningotheial cells of the arachnoid membranes. They are classified into three grades according to the WHO criteria, Grade I (Benign), Grade II (atypical), and Grade III (anaplastic). Radiological and structural imaging computed tomography (CT) and magnetic resonance imaging are done routinely for defining the location, extent, and follow-up. However, these imaging techniques have their limitations. Since meningiomas have overexpression of somatostatin receptor 2, DOTANOC positron-emission tomography (PET)/CT scan is suggested for their delineation and distinguish postradiotherapy necrosis from recurrence. Here, we present a case where DOTANOC PET/CT scan helped in confirming recurrence postsurgery and radiotherapy.

Keywords: Ga-68 DOTANOC scan, meningioma, recurrence

Description

A 31-year-old male, histopathologically proven case of atypical Meningioma, WHO Grade II, with Ki-67 proliferation index 7%–8%, who underwent left fronto-parietal crossing middle craniotomy with excision of tumor and radiotherapy, 1 year back, presented with bilateral lower limbs weakness for 10–12 days. Magnetic resonance imaging (MRI) brain findings were equivocal in differentiating recurrence from necrosis. Whole-body DOTANOC positron-emission tomography-computed tomography (PET-CT) scan was advised in view of suspicion of recurrence. The maximum intensity projection (MIP) image of the brain [Figure 1a] revealed abnormal increased DOTANOC uptake in midline and MIP of the whole body [Figure 1b] showed no site of any other abnormal DOTANOC uptake. Further PET, CT, and fused PET/CT axial [Figure 1c-e], coronal [Figure 1f-h], and sagittal images [Figure 1i-k] revealed DOTANOC-avid multifocal enhancing plaque-like dural-based lesions of varying sizes in the left frontoparietal, left parieto-occipital, and left inferior parietal regions. Subsequent surgical resection and pathology report confirmed meningioma recurrence with WHO Grade II.

Meningiomas account for 20%–30% of all primary intracranial neoplasms and are the most common intracranial

tumors in adults.^[1] The high-grade meningiomas (WHO Grade II and III) show significantly more aggressive behavior and poor prognosis as compared to low-grade meningiomas.^[2] Molecular imaging, PET/CT scan can characterize specific metabolic and cellular information, which may help in management as compared to details provided by structural magnetic resonance or CT imaging alone. These structural imaging techniques have limitations in delineating meningiomas, particularly at the skull base, bony involvement, and tumors with complex geometry and in suspected recurrence to distinguish viable tumor from scar tissue.^[3] 18F-fluorodeoxyglucose is the most commonly used tracer in PET/CT scans. However, there are several limitations in its use in meningioma, as they are slow-growing tumors, and their glucose metabolism might be only moderately elevated^[4] and due to low tumor-to-background ratio.^[5] Somatostatin receptors (SSTRs) are expressed in the normal leptomeninges and are overexpressed in meningiomas.^[6] The major receptor subtype overexpressed is SSTR 2. Their overexpression in meningiomas increases with tumor grade.^[7] The overexpression of these receptors is used in 68Ga-DOTA-peptide PET/CT in meningioma for imaging and as well for therapy purposes.

The literature review describes SSTR expression and various DOTANOC positive meningioma,^[8,9] detecting recurrence pattern

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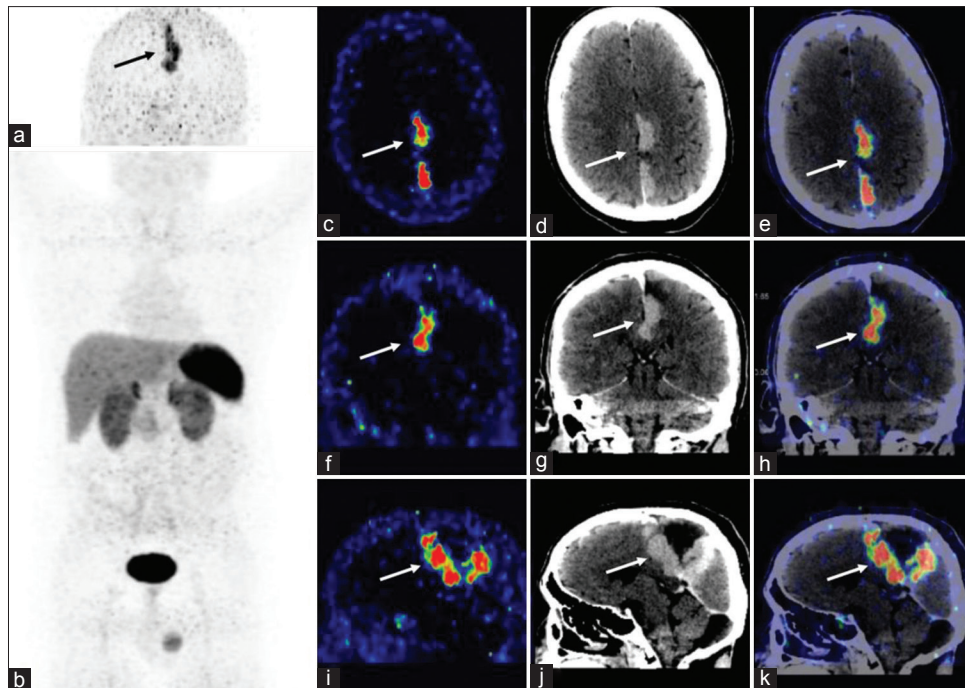


Figure 1: Maximum intensity projection image of the brain (a) showing DOTANOC uptake in midline and maximum intensity projection of the whole body (b) showing physiological DOTANOC distribution. Positron emission tomography, computed tomography and fused axial, coronal and sagittal images (c-k) suggestive of DOTANOC avid plaque-like dural-based lesions in left fronto-parietal, left parieto-occipital, and left inferior parietal regions

on DOTA PET/CT scan,^[10,11] predicting tumor growth.^[12] The one limitation of the ⁶⁸Ga-DOTANOC scan is the parasellar region because of the pituitary gland expressing SSTR2. ⁶⁸Ga-DOTANOC also allows the detection of additional lesions in patients with multiple meningiomas, for adequate delineation of meningiomas for radiation treatment^[13] may strongly complement anatomical data from MRI and CT and improve target volume definition, especially in cases with complex meningioma, recurrent disease after the surgery.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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