FET PET in primary CNS vasculitis

Lothar Burghaus, MD[1,2], Christoph Kabbasch, MD[3], Martina Deckert, MD[4], Maximilian I. Ruge, MD[5], Gereon R. Fink, MD[2,6], Karl-Josef Langen, MD[6,7], and Norbert Galldiks, MD[2,6,8]

[1]Dept. of Neurology, Heilig Geist-Hospital, Cologne, Germany
[2]Dept. of Neurology, University Hospital Cologne, Cologne, Germany
[3]Dept. of Radiology and Neuroradiology, University Hospital Cologne, Cologne, Germany
[4]Dept. of Neuropathology, University Hospital Cologne, Cologne, Germany
[5]Dept. of Stereotactic and Functional Neurosurgery, University Hospital Cologne, Cologne, Germany
[6]Inst. of Neuroscience and Medicine (INM-3, -4), Forschungszentrum Juelich, Juelich, Germany
[7]Dept. of Nuclear Medicine, University Hospital Aachen, Aachen, Germany
[8]Center of Integrated Oncology (CIO), Universities of Cologne and Bonn, Cologne, Germany

Correspondence:
Lothar Burghaus, MD
Dept. of Neurology
Heilig Geist-Krankenhaus
Grasegger Str. 105,
50737 Cologne, Germany
Phone +49 221-7491-8421
Fax +49 221-7491-8912
Email: lothar.burghaus@cellitinnen.de

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The authors disclose no potential conflicts of interest.

ABSTRACT

Primary CNS vasculitis is confined to the brain and spinal cord. While serological markers of inflammation are usually normal, conventional angiography may confirm the diagnosis. The diagnostic method of choice is CNS biopsy. A 57-year-old man suffered from a first generalized epileptic seizure. MRI revealed a contrast-enhancing lesion and O-(2-[^{18}F]fluoroethyl)-L-tyrosine amino acid PET displayed increased metabolic activity, both findings highly suspicious for a malignant glioma. Surprisingly, histology obtained following stereotactic biopsy revealed small vessel vasculitis.

FIGURE LEGEND

A 57-year-old right-handed man with an unremarkable past medical history presented with a first generalized tonic-clonic epileptic seizure. Clinical examination did not reveal a focal neurological deficit. MRI showed a contrast-enhancing lesion in the right temporal lobe (A, MRI). As a brain tumor was suspected[1], the patient was referred for an amino acid PET using O-(2-[^{18}F]fluoroethyl)-L-tyrosine (FET), which showed increased metabolic activity (maximum tumor/brain ratio, 2.5) consistent with a high-grade glioma[1] (A, FET PET). Spatially, the metabolic activity extended considerably beyond the area of contrast enhancement (A, fusion image) and was partially located outside the FLAIR signal hyperintensity. Thus, clinical symptoms, MRI and PET findings all suggested a malignant glioma.

Surprisingly, histology obtained following stereotactic biopsy was consistent with vasculitis of small vessels. Hypo- and hypervascularization as well as calcification of blood vessel walls were prominent. Furthermore, there was no evidence of vascular malformation or a glioma. Additionally, blood vessel thrombosis, brain tissue necrosis, and destruction of blood vessel walls were noticed (B, Anti-CD34 immunostaining, counterstaining with hemalum, original magnification x400: The incomplete endothelial lining of a blood vessel wall indicates its destruction [arrows]. Furthermore, leukocytes infiltrate the blood vessel wall [arrowheads]).

Following histology, further serological workup for systemic inflammation including systemic lupus erythematosus, systemic vasculitis and other autoimmune disorders, as well as a lumbar puncture, yielded unremarkable results. Conventional angiography (C, magnified image, lateral view, arterial phase, obtained after right internal carotid artery injection) did not provide evidence of vasculitis. Finally, based upon the histology primary CNS vasculitis (PCNSV) was diagnosed, and cyclophosphamide treatment was initiated.

PCNSV is a rare disease and a diagnostic challenge because clinical manifestation is typically unspecific. PCNSV is confined to the brain and spinal cord; serological markers of inflammation are usually normal. The establishment of the diagnosis is, therefore, difficult, and permanent disability and even death are common outcomes. Neurological symptoms not attributable to other pathologies in association with angiographic features of vasculitis may suggest PCNSV, which can be proven by

CNS biopsy[2]. However, the accuracy of angiography in small-vessel disease remains uncertain, and signs suggestive of vasculitis may also be present in non-vasculitic disorders[3]. If less invasive methods do not allow a distinct diagnosis, the diagnostic method of choice is CNS biopsy.

Although increased amino acid uptake in non-neoplastic lesions is rare, false-positive uptake has been reported in brain abscesses, demyelinating lesions, and hematomas[4-7], and more recently also in status epilepticus[8]. Nevertheless, it has previously been described that a maximum tumor/brain uptake ratio of FET more than 2.5 yields a high positive predictive value for neoplastic tissue (98%)[4]. In the present case, the maximum tumor/brain ratio of FET uptake was 2.5, representing a borderline constellation. Especially in combination with the MRI, which showed a contrast-enhancing lesion, the neuroimaging findings were highly suspicious for a malignant glioma.

In conclusion, neuroinflammatory brain lesions, such as PCNSV, may mimic a brain tumor in both MRI and FET PET.

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