Clinical note

11C-Methionine uptake in secondary brain epilepsy

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A B S T R A C T

Carbon-11 methionine (11C-Methionine) is a radio-labeled amino acid currently utilized in Positron Emission Tomography (PET) for imaging primary and metastatic brain tumors. Its clinical use relies mostly on oncologic applications, but the tracer has the potential to investigate other non-malignant conditions. So far, very limited evidence concerns the use of 11C-Methionine in patients suffering from seizure; however, the tracer can find a proper utilization in this setting especially as a diagnostic complement to 18F-Fluorodeoxyglucose (18F-FDG).

Herein we report the case of a 57-year-old patient presenting with epileptic crises secondary to a brain metastasis from bladder carcinoma, who was investigated in our institution with 11C-Methionine PET. The scan documented the disease recurrence in the left parietal lobe associated with a diffused tracer uptake in the surrounding cerebral circumsolutions, derived from the comitial status. After surgical removal of the metastatic lesion, the patient experienced a complete recovery of symptoms and no further onset of secondary seizure.

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Captación de la 11C-metionina en la epilepsia cerebral secundaria

R E S U M E N

La 11C-metionina es un aminoácido radiomarcado que se utiliza actualmente en la tomografía por emisión de positrones (PET) para obtener imágenes de tumores cerebrales primarios y metastáticos. Su aplicación clínica más extendida es la oncología, pero tiene el potencial de investigar otras situaciones no oncológicas. Hasta el momento existe una limitada evidencia del uso de 11C-metionina en pacientes con crisis convulsivas; sin embargo, el radiotrazador puede tener utilidad en este campo especialmente como complemento diagnóstico de la 18F-fluorodeoxiglicosa (18F-FDG). Presentamos el caso de un paciente de 57 años de edad con crisis epilépticas secundarias a metástasis cerebrales de un carcinoma de vejiga que fue explorado en nuestra institución con 11C-metionina PET. El estudio demostró la recidiva de la enfermedad en el lóbulo parietal izquierdo asociada con captación difusa en las circunsoluciones cerebrales de alrededor, derivada del status comicial. Después de la extirpación quirúrgica de la metástasis cerebral, el paciente experimentó una recuperación completa de los síntomas sin posterior inicio de crisis convulsivas secundarias.

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Introduction

The broadest evidence regarding the use of Positron Emission Tomography (PET) imaging in patients affected by seizure relies on 18F-Fluorodeoxyglucose (18F-FDG).\textsuperscript{1–5} Typically the pattern of 18F-FDG distribution is characterized by reduced metabolism (hypometabolic area) at the level of the epileptogenic tissue when the tracer is administrated during the interictal phase; or vice versa there is an elevated tracer uptake (hypermetabolic area) in the involved area when there is a prompt injection during the comitial crisis. The site and the precise definition of the pathologic areas directly influence the treatment options;\textsuperscript{3} but despite the overall good sensitivity of 18F-FDG PET, localization of epileptic foci is not always possible and requires in most cases the use of additional software to overcome difficulties derived from pure visual analysis.\textsuperscript{2,5}

Carbon-11 methionine (11C-Methionine) is a radio-labeled amino acid currently utilized in PET for imaging primary and metastatic brain tumors.\textsuperscript{5} Its clinical use relies mostly on oncologic applications, but the tracer has the potential to investigate other non-malignant conditions. So far, very limited evidence concerns the use of 11C-Methionine in patients suffering from seizure; however, the tracer can find a proper utilization in this setting especially as a diagnostic complement to 18F-Fluorodeoxyglucose (18F-FDG).\textsuperscript{7–10}

We present the clinical case of a patient affected by brain metastasis associated with secondary seizure, which was correctly identified on 11C-Methionine PET.

Case report

The clinical case presented herein regards a 57-year-old female affected by a cerebral recurrence of bladder carcinoma localized
Discussion

The first report documenting the use of 11C-Methionine in epileptic patients belongs to Madakasira et al., who in 2002 described the utility of the dual-tracer imaging (18F-FDG and 11C-Methionine) in the same child affected by focal cortical dysplasia (FCD). In their report the authors describe a complementary pattern in the distribution of the two radiopharmaceuticals in the epileptic focus during the interictal phase, typically characterized by hypometabolism on 18F-FDG PET with on counterpart an increased uptake on 11C-Methionine PET. Something similar has been reported also in two other case reports, both investigating intractable seizure in children.

More recently, also Phi et al. have thoroughly investigated the role of 11C-Methionine in epileptic children when trying to differentiate FCD from neural and glial tumors as underlying etiopathology. Their findings documented a different uptake pattern for malignant lesions and FCD, with the latter one associated to hypometabolism on 18F-FDG PET and mild-hypo to normal uptake on 11C-Methionine PET.

In our patient the underlying cause for seizure appears to be the tumor recurrence, whereas the epileptic alteration is documented as a mildly diffused uptake of 11C-Methionine in the cortical areas involved by the secondary seizure manifesting with functional deficit and motor crises. This setting is quite new and to our knowledge this is the first report of its kind in adults. Undoubtedly age and clinical setting must have somehow influenced differences in imaging findings and outcome data; anyhow our case study and all previous reports similarly suggest the potential benefit and application of 11C-Methionine PET in epileptic patients. This would be particularly relevant when selective ablation is advised and a precise contouring of the area involved in seizure must be given prior to surgery.

Further studies are therefore welcome in order to investigate the role of 11C-Methionine PET in this setting and assess its proper application in the management of patients affected by seizure.

References