Interesting images

Usefulness of $^{11}$C-Methionine PET in differential diagnosis of epileptogenic brain neoplasms

Utilidad de la PET con $^{11}$C-metionina en el diagnóstico diferencial de los tumores epileptógenos

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Brain tumors are associated to more than 50% of patients with epilepsy, of which about 30% are drug-resistant. Epilepsy associated with brain tumors is multifactorial, but fundamentally depends on its location and histology. So, low-grade tumors are more epileptogenic than high-grade. In high-grade tumors and adult epilepsy is associated with increased frequency of neurological deficits. In low-grade tumors and infant-juvenile age, epilepsy presents clinically isolated.

We present two women of similar age (27 and 25 years, respectively) following focal seizure who underwent Magnetic Resonance Imaging (MRI) that revealed similar findings: hypointense on T1-weighted and high signal on T2-weighted and FLAIR images with areas of diffusion restriction and without contrast enhancement (left frontal and parietal-temporal right, respectively). These features can be presented in different tumor types and in our case not allow the differential diagnosis between a low-grade glioma or ganglioneuronal tumor (Figs. 1 and 2).

The Dysembryoplastic Neuroepithelial Tumor (DNET) was described by Daumas-Duport et al. in 1988 as a mixed ganglioneuronal low-grade lesion (WHO grade I) containing oligodendrocytes, astrocytes and neurons, with colloid material, which may be multifocal and coexist with regions of cortical dysgenesis. It is manifested mainly by the presence of epilepsy with focal seizures with onset of symptoms between 1 and 30 years (mean 9 years), many times difficult to control, usually without associated neurological deficit. The DNET is mainly cortical, but may show subcortical extension and sits mainly in the temporal lobe (62%) and frontal (31%). MRI typically shows hypointense lesions on T1-weighted and hyperintense on T2-weighted images without peri-lesional edema, may submit gadolinium enhancement, no specific characteristics of these tumors.

$^{18}$F-Fluorodeoxyglucose (FDG) Positron Emission Tomography (PET) has a recognized role in the localization of the seizure focus. However, in tumor metabolic assessment is known absence of uptake in low-grade gliomas. However, $^{11}$C-Methionine PET shows tracer uptake in all glial tumors, although the degree of activity allows to differentiate between grades I–II of III–IV. There are few references, but has been described absence of abnormal uptake of $^{11}$C-Methionine in DNET, in contrast to the tracer uptake in glial tumors, even in low-grade gliomas.

Figure 1. Image PET, MRI and fusion PET/MRI. 27-year-old woman who presented complex partial seizure. The $^{11}$C-methionine PET showed cortical lesion on the upper-left frontal lobe with increased uptake of the tracer (ratio SUV lesion/background 1.7/0.9:1.89) suggestive of glial tumor. The excision of the lesion confirmed the existence of a grade II glioma.

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Figure 2. Image PET, MRI and fusion PET/MRI. 25-year-old woman who presented a simple partial seizure. The $^{11}$C-methionine PET showed cortico-subcortical lesion on the right parieto-temporal lobe without abnormal activity of the tracer, features suggestive of benign lesion. The stereotactic biopsy confirmed the existence of a DNET.

For these reasons we proceed to perform $^{11}$C-methionine PET in both cases. After intravenous injection of $185 \pm 18.5$ MBq of $^{11}$C-methionine, patients were in 20 min resting sensory-motor period. After performing a CT for attenuation correction PET brain images were acquired for 10 min. At the same session, we proceeded to study conducting 3D T1-weighted MRI for software fusion purpose (SPM8).

The first patient shows a pathological $^{11}$C-Methionine uptake in cortical lesion on the upper-left frontal lobe (ratio $1.7/0.9:1.89$). However, in the second patient the cortico-subcortical right parieto-temporal lesion shows no abnormal uptake of $^{11}$C-Methionine. Quantifying more widely accepted in the evaluation of brain tumors with $^{11}$C-Methionine is the relationship between the degree of uptake of the lesion (SUV max) and the background calculating on gray matter of the healthy contralateral lobe (medium SUV).

Given this different metabolic behavior differentiated therapeutic strategy is decided. In the first patient, due to suspected of glioblastoma tumor proceed to its removal, confirming grade II glioma. In the second patient, performing a stereotactic biopsy is decided and confirmed suspected metabolic DNET.

Treatment of DNET, even if it is a benign tumor, requiring surgery in the case of drug-resistant epilepsies with frequent evolution of these patients.\textsuperscript{2,3} In our case given the histological confirmation of DNET, since it was the first epileptogenic episode was decided to initiate anticonvulsant treatment. Due to medical control of seizures no tumor excision was performed, avoiding the possible neurological deficit secondary intervention, without new episodes epileptogenic.

These results suggest that $^{11}$C-Methionine PET could be very useful in differentiating the various epileptogenic tumors, especially in the characterization of DNET, information that can influence the therapeutic decision of these patients.

References