



Utility of ¹¹¹In-octreotide for the Characterization of an Extra-axial Lesion with uptake of ¹⁸F-choline PET-CT in a Patient with Adenocarcinoma of the Prostate

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Abstract

We present a case of a 76-year-old male patient diagnosed with prostatic adenocarcinoma that in clinical follow-up an extra-axial brain lesion located in clivus was detected due to a ¹⁸F-choline PET scan. However nor MRI or a ¹⁸F-choline PET-CT could exclude the metastatic origin nor confirm a meningioma lesion.

Our finding suggests the relevance and clinical implication derived from the performance of a complementary brain SPECT-CT with ¹¹¹In-octreotide to characterize the extra-axial lesion.

Key words: Prostate Cancer; ¹¹¹In-octreotide SPECT-CT; ¹⁸F-choline PET-CT; Meningioma

Background

Meningiomas account approximately 20% of primary brain tumors and nearly 1-2% are incidentally postmortem findings. Meningiomas are considered hormone-sensitive tumors and express, among others, receptors for prolactin, androgens and estrogens [1]. Consequently, luteinizing hormone-releasing hormone (LHRH) analogues and other hormone treatments, commonly used in patients with prostate cancer, can stimulate their growth and produce neurological symptoms [2]. According this, in the intracranial lesions detected with ¹⁸F-Choline Positron Emission Tomography (PET)-Computed Tomography (CT) in the context of prostate cancer, the presence of meningiomas should be taken into account [3].

¹⁸F-Choline PET-CT has a high diagnostic accuracy in patient management to detect the early clinical relapse and facilitates the re-staging patients with prostatic cancer [4, 5]. The current data published indicates that ¹⁸F-choline can be fixed on meningiomas. Also, the choline metabolism rate valued by this radioactive drug has been used to differentiate between typical and atypical meningiomas [3, 6]. Therefore, in the context of a biochemical relapse in prostate adenocarcinoma and a single ¹⁸F-choline uptake in the brain, the differential diagnosis between a meningioma and a possible brain metastasis may be difficult.

On the other hand, numerous publications have reported overexpression of somatostatin receptors in meningiomas and the usefulness of ¹¹¹In-octreotide in the non-invasive differential diagnosis of this type of lesions [7]. In addition, there are no conclusive data in the literature about an uptake of ¹¹¹In-octreotide in brain metastases, except for tumors of neuroendocrine strain or with somatostatin receptors overexpression.

We present a patient with prostate adenocarcinoma in whose evolution presented a biochemical relapse and the finding of ¹⁸F-choline uptake in an extra-axial brain lesion located in clivus with no conclusive MRI for metastases. Our findings highlight the relevance and clinical implication derived from the performance of a cerebral SPECT-CT with ¹¹¹In-octreotide to the lesion characterization.

Case report

We present a case of a 76-year-old male patient diagnosed with intermediate-risk prostate adenocarcinoma in November 2007 (PSA 6.7 ng/ml, Gleason 4 + 3 and T2b by prostate MRI). Radical prostatectomy was performed in January 2008, and pathological analysis resulted on prostate adenocarcinoma Gleason 4 + 3, with perineural permeation and free margins, pT3a. The post-operative PSA was 0.1 ng/mL.

During the follow-up, he presented a biochemical relapse in May 2009 with PSA of 0.6 ng/mL and was considered for Radiotherapy to surgical bed. We administered 70 Gy in 35 fractions of 2 Gy per fraction, ending in August 2009. After Radiotherapy, the patient reached nadir PSA of 0.17 ng/mL in July 2010. The patient continued analytical controls every six months, detecting biochemical progression in April 2013 (PSA of 3.84 ng/mL), without locoregional or distant radiological recurrence. Hormone blockage was initiated with biannual LHRH analog, achieving biochemical response until November 2015 when biochemical progression was detected. He was considered to complete the hormonal blockade by adding an antiandrogen (bicalutamide). In June 2016, resistance to hormonal treatment was evident (PSA 3.6 ng/mL with testosterone at castration levels). Bone scintigraphy was requested, which ruled out bone metastasis. In a subsequent control performed in February 2017 it was a new increase in PSA (7.83 ng/mL), and a ¹⁸F-choline PET-CT (Figure 1) was requested. It observed one hypermetabolic focus in the left posterior margin of the clivus (SUVmax 6.3 g/mL), without clear morphological translation on CT-scan. In consequence it was recommended to assess the finding in a Magnetic Resonance Imaging (MRI).

The MRI showed an extra-axial image in the posterior fossa, with a base of meningeal implantation in the left aspect of the clivus, sized 10 x 10 x 20 mm, with intense and homogeneous gadolinium uptake, and was insinuated to the entrance of the internal auditory canal without clear distortion of cranial nerves or evident mass effect on the protuberance. It was concluded that the lesion could correspond

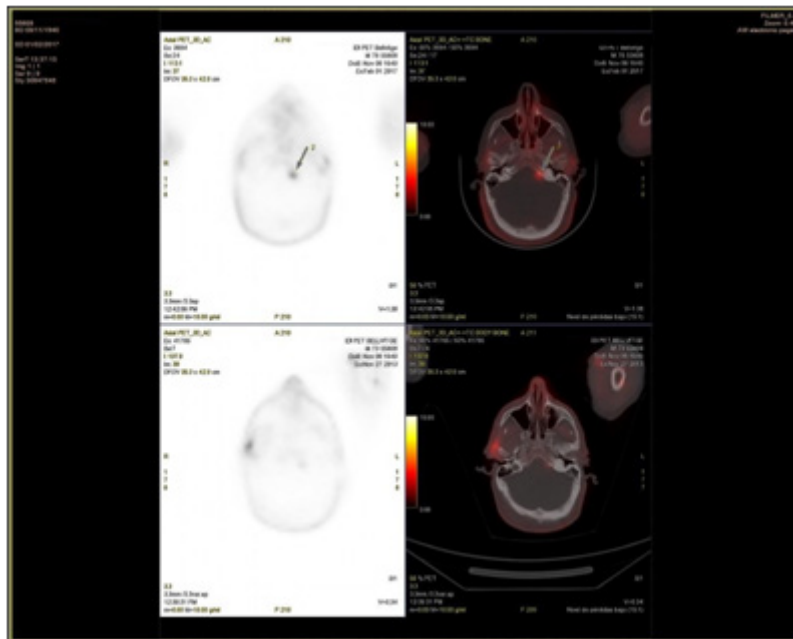


Figure 1. Hypermetabolic focus in left posterior border of clivus (SUVmax: 6,3), not evident in CT-scan, not being able to exclude metastatic disease.

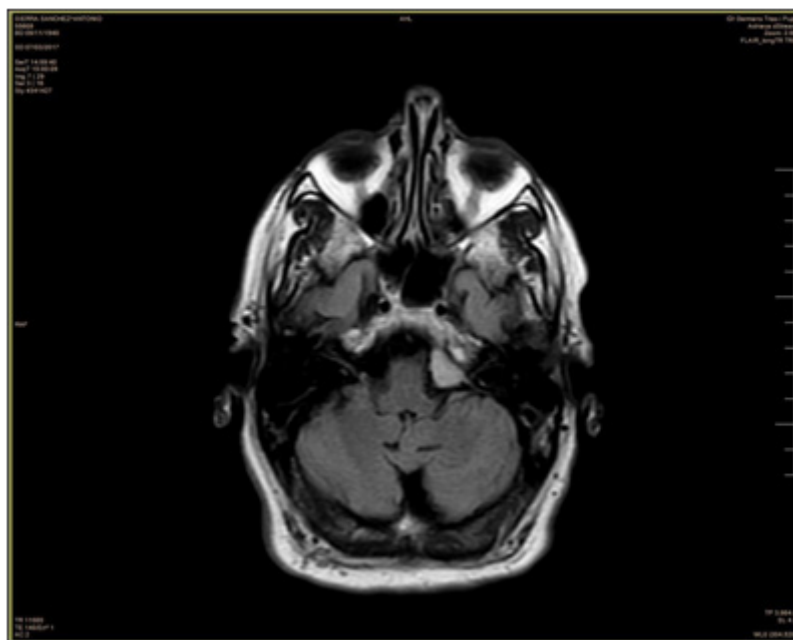


Figure 2. MRI shows an extra-axial image in the posterior fossa, with a meningial implantation base on the left aspect of the clivus. It shows intense and homogeneous gadolinium uptake.

to the one mentioned in the PET-CT and radiologically it was consistent with meningioma (Figure 2.).

Given the findings of ^{18}F -choline PET-CT, brain MRI and confirmed biochemical progression resistant to castration, the case was evaluated in the Neuro-Oncology Tumors Committee of our center, which decided to perform a SPECT-CT with ^{111}In -octreotide to be able to clarify the differential diagnosis between a brain metastasis or meningioma in this location.

The cerebral SPECT-CT with somatostatin receptors -6.71 mCi of ^{111}In -octreotide- identified intense focal fixation in clivus, which correlated anatomically with the finding of the brain PET-CT and MRI, suggesting the presence of a lesion with overexpression of somatostatin receptors, compatible with meningioma (Figure 3).

In subsequent MRI controls, extra-axial lesion persists centered on the left border, has not changed its diameters and neither the appearance of edema or other underlying bone infiltration are appreciated.

Both, the iconography and the evolution experienced by the patient supported the diagnosis of meningioma.

Discussion

The incidental uptake of ^{18}F -choline in meningiomas has been reported in approximately 1% of patients with prostate cancer [3]. The disruption of choline metabolism in meningiomas is an evidence from in vivo and in vitro studies. The product derived from the enzyme choline kinase activity is the increase in phosphocholine. The high ratio between phosphocholine and glycerophosphocholine is

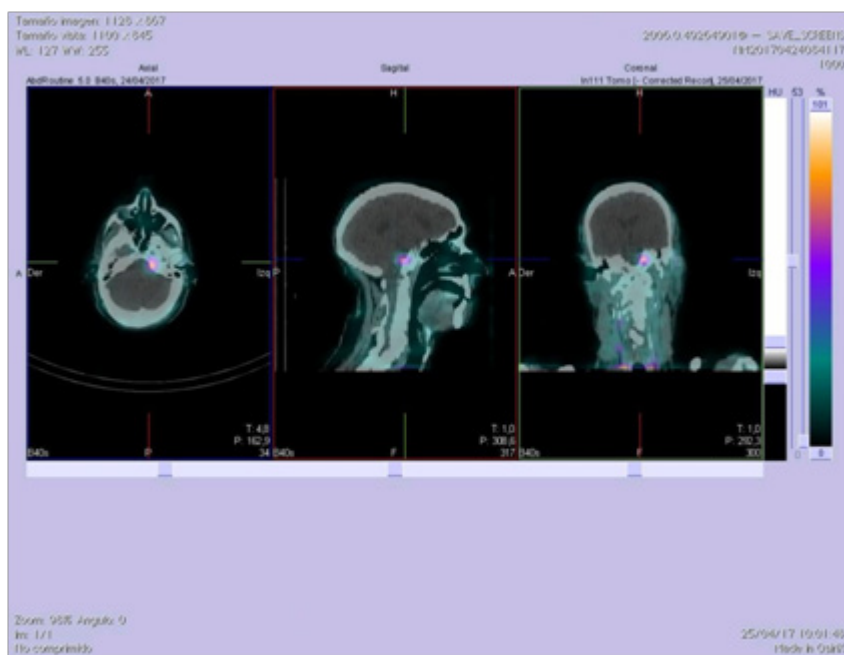


Figure 3. Intense focal fixation of ^{111}In -Octreotide in the posterior fossa extra-axial lesion, which would suggest the presence of a probable lesion with somatostatin receptor overexpression, compatible with the suspicion of meningioma.

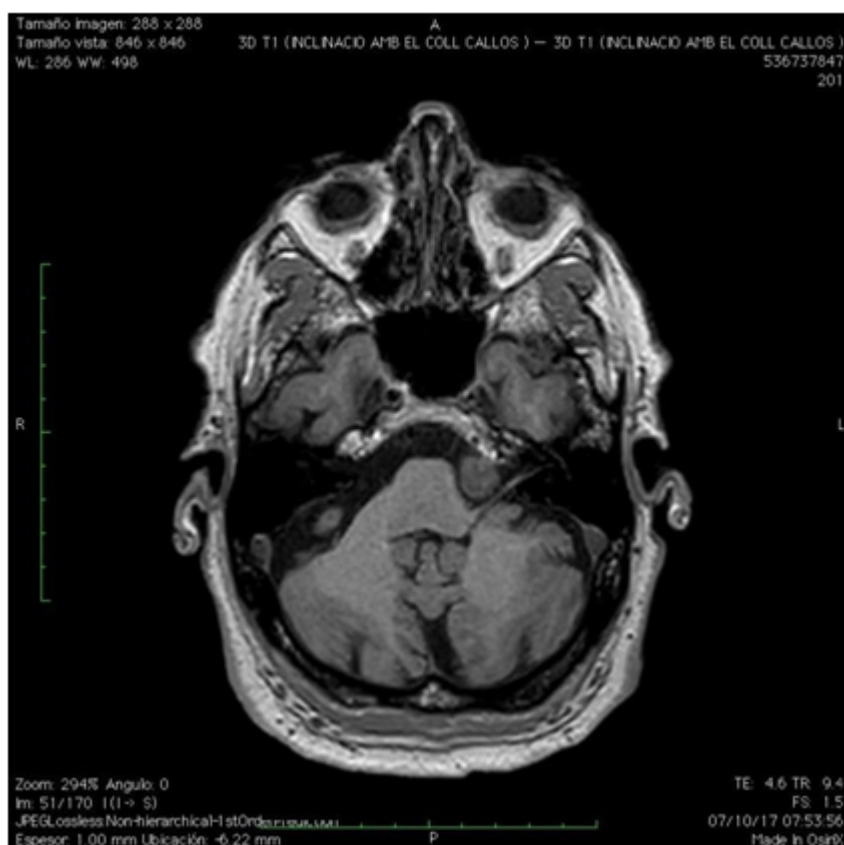


Figure 4. In MRI control, extra-axial lesion persisted. Regarding the previous study, its diameters had not changed, and the appearance of edema or other underlying bone involvement was not appreciated. No other extra-axial lesions or other relevant changes with respect to the previous study.

responsible for cellular transformation and cell immortalization and, in addition, this ratio is higher in atypical meningiomas [8].

The LHRH analogues and antiandrogenic treatment received by patients with prostate cancer could trigger the growth and symptoms of an unknown meningioma, due to their hormone sensitivity and their

greater expression of prolactin, androgens and estrogens' receptors.

On the other hand, it is increasingly to perform a PET-CT with ^{18}F -choline in patients with biochemical relapse in prostate cancer and, in this context, it is frequent finding incidentaloma in brain that should be characterized. One of the advantages offered by PET-CT

with ^{18}F -choline with respect to ^{18}F -FDG is the absence of physiological brain activity, who facilitates the identification of avid intra or extra-axial lesions, including gliomas, medulloblastomas, and meningiomas [3, 9, 10].

Although MRI findings demonstrate classical semiology for meningioma, in our case the context of biochemical relapse and the presence of a single focus of brain activity in the PET-CT with ^{18}F -choline did not rule out a metastatic lesion. In neuro-oncology committee of our center it was decided to perform a SPECT-CT with ^{111}In -octreotide that allowed to reveal overexpression of somatostatin receptors and characterize the lesion as a meningioma.

Conflict of interests: The authors declare no conflict of interest.

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