Case report

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Unexpected detection of a meningioma on ^{18}F-Fluorocholine PET/CT in a prostate cancer patient

Yassir Benameur [1,2], Ikram Zahfir [1,2], Meryem Aboussabr [1,2], Salah Nabih Oueriagli [1,2], Jaafar El Bakkali [1,2], Omar Ait Sahel [1,2], Abderrahim Doudouh [1,2]

[1]Department of Nuclear Medicine, Mohammed V Military Teaching Hospital, Rabat, Morocco.
[2]Faculty of Medicine and Pharmacy, Mohammed V University of Rabat, Morocco.

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Address for correspondence: *Yassir Benameur, Department of Nuclear Medicine, Mohammed V Military Teaching Hospital, Av. Abderrahim Bouabid, Rabat, Morocco. email: benameur.yassir@gmail.com*

A 77-year-old man with a prior diagnosis of prostate adenocarcinoma, previously treated with radiotherapy and hormone therapy, presented with rising PSA levels suggestive of biochemical recurrence. While no evidence of metastatic prostate disease was detected, the PET/CT (positron emission tomography–computed tomography) scan incidentally revealed an area of abnormal radiotracer uptake in the left temporal lobe of the brain, unrelated to the patient's known malignancy. The imaging characteristics raised the suspicion of a meningioma. A subsequent brain MRI confirmed the presence of an extra-axial lesion consistent with a meningioma. This unexpected finding highlights the additional diagnostic value of ^{18}F-fluorocholine PET/CT beyond its primary role in prostate cancer imaging, particularly in detecting clinically significant incidental intracranial lesions. This case underscores the importance of careful and systematic interpretation of imaging studies during oncologic evaluations, even in regions outside the primary area of concern.

Keywords: *prostate cancer; meningioma; ^{18}F-Fluorocholine; PET-CT*

Introduction

Meningiomas are the most common primary intracranial tumors, often discovered incidentally during imaging studies conducted for unrelated conditions. Although they are typically benign and asymptomatic, their detection can have significant clinical implications, particularly in oncologic patients undergoing advanced imaging for cancer surveillance. ^{18}F-fluorocholine PET/CT (^{18}F-FCH) is widely used to detect biochemical recurrence in prostate cancer due to its high sensitivity in identifying areas of increased choline metabolism. However, ^{18}F-FCH can also uncover unexpected findings, such as meningiomas, due to their elevated phospholipid metabolism. This clinical case describes the incidental discovery of a meningioma on ^{18}F-FCH PET/CT in a patient with prostate cancer and explores the clinical relevance of such findings.

Case report

A 77-year-old male with a history of prostate adenocarcinoma, initially treated with radiotherapy and hormone therapy, presented with biochemical recurrence, evidenced by a rising prostate-specific antigen (PSA) level of 2.54 ng/ml. To localize the site of recurrence, an ^{18}F-FCH PET/CT scan was performed. The scan revealed an isolated focus of moderate radiotracer uptake in the left temporal lobe of the brain, with a maximum standardized uptake value (SUVmax = 5.4). No other abnormal foci of ^{18}F-FCH uptake were identified from the vertex to the mid-thigh, ruling out metastatic disease or local recurrence in the prostate bed or pelvic region. The temporal lobe uptake was considered unusual, as metastases from prostate cancer to the brain are rare, and meningiomas are typically not associated with significant ^{18}F-FCH avidity. Given the unexpected PET/CT findings, a contrast-enhanced brain MRI was performed for further characterization of the lesion. The MRI revealed a well-defined, extra-axial lesion in the left temporal lobe, measuring 16mm x 6mm. The lesion exhibited homogeneous contrast enhancement and was associated with a dural tail sign, both classic imaging features of a meningioma. No significant perilesional edema or mass effect was observed (***Fig. 1***). The imaging findings were consistent with a World Health Organization (WHO) Grade I meningioma, a benign and slow-growing tumor. The patient remained asymptomatic with respect to the meningioma, with no neurological deficits or symptoms suggestive of intracranial hypertension. Given the incidental nature of the finding and the absence of complications, no immediate surgical intervention was deemed necessary. The patient was referred to the neurosurgery department for long-term monitoring and management, with a plan for periodic imaging follow-up to assess any changes in the size or characteristics of the lesion.

Discussion

^{18}F-FCH PET/CT is widely used for restaging prostate cancer in patients with biochemical recurrence, as it has high sensitivity and specificity for detecting local and distant metastases [1]. The radiotracer ^{18}F-FCH is taken up by prostate cancer cells due to increased choline kinase activity, which is involved in phospholipid metabolism and cell membrane synthesis [2]. However,

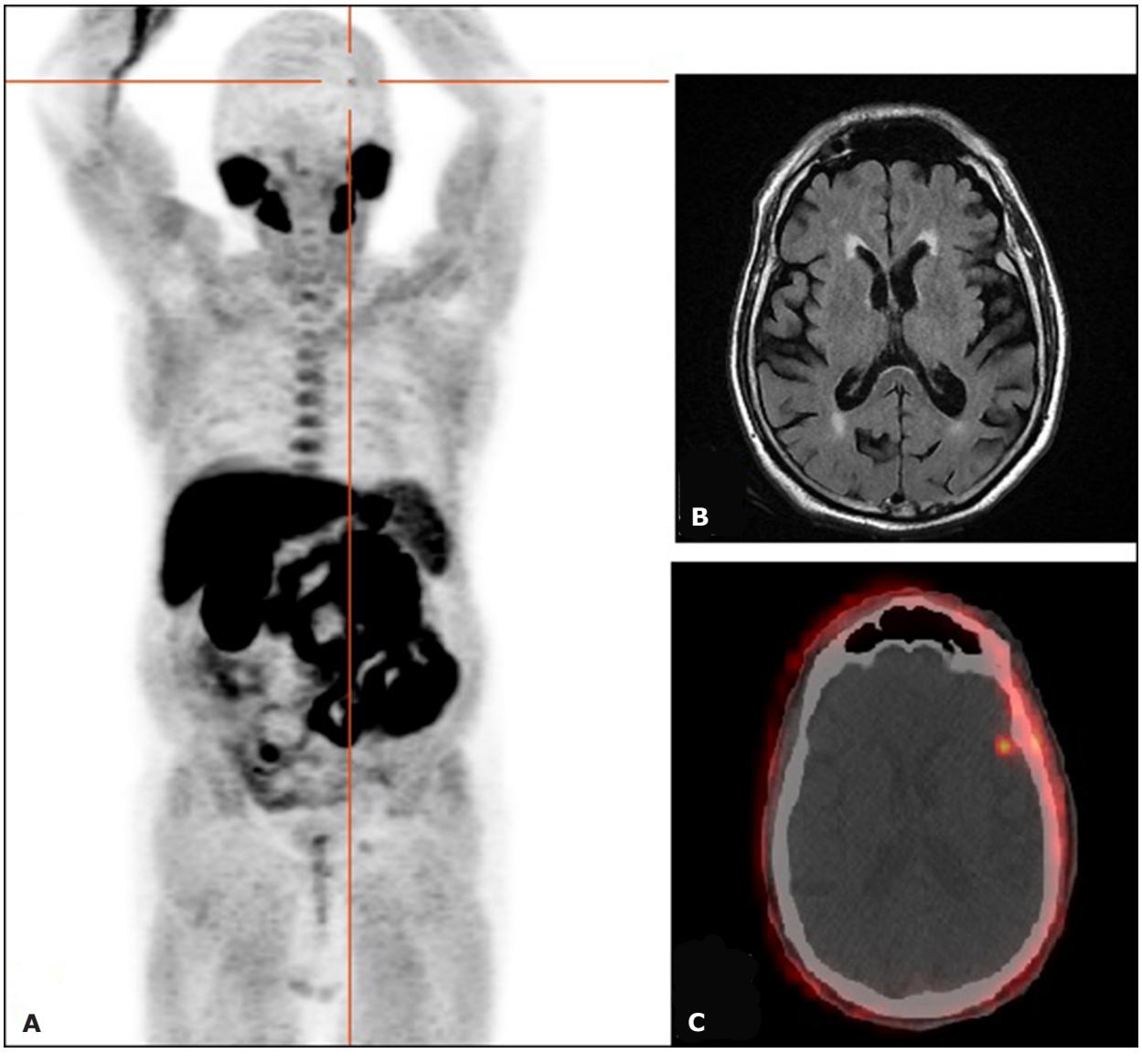

Fig. 1. A: ^{18}F-fluorocholine PET/CT MIP; B: axial Brain MRI T2 Flair; C: ^{18}F-fluorocholine PET/CT axial fusion image of the brain: an isolated uptake focus is noted in the left temporal lobe. Brain MRI confirmed the meningioma diagnosis

^{18}F-FCH uptake is not entirely specific to prostate cancer, as benign conditions and other malignancies can also exhibit radiotracer avidity [3]. In this case, the isolated focus of ^{18}F-FCH uptake in the left temporal lobe was initially suspicious for a metastatic lesion, given the patient's history of prostate adenocarcinoma. However, the absence of other abnormal foci and the subsequent MRI findings confirmed that the lesion was a meningioma.

Meningiomas are typically benign, slow-growing tumors that arise from the meninges. While they are usually detected on MRI, incidental uptake on PET/CT has been reported with various radiotracers, including ^{18}F-FCH [4]. The mechanism of ^{18}F-FCH uptake in meningiomas is not fully understood but may be related to increased cell membrane turnover or overexpression of choline transporters [2]. A study by Beheshti et al. demonstrated that meningiomas can exhibit moderate to intense ^{18}F-FCH uptake, which can lead to diagnostic challenges in differentiating them from metastatic lesions [5]. In our case, the SUVmax of the lesion was moderate, which is consistent with previous reports of ^{18}F-FCH-avid meningiomas.

Brain MRI remains the gold standard for diagnosing meningiomas due to its superior soft tissue resolution. Typical MRI features include a well-defined, extra-axial lesion with homogeneous contrast enhancement, a dural tail sign, and occasional calcifications [6]. In this case, the MRI findings were classic for a meningioma, with no evidence of perilesional edema or mass effect. These features helped confirm the diagnosis and ruled out other possibilities, such as brain metastases or primary gliomas. Additionally, ^{68}Ga-DOTATOC PET/CT imaging has proven valuable in detecting meningiomas, as it

This article contains some figures that are displayed in color online but in black and white in the print edition.

highlights areas with increased somatostatin receptor expression, a hallmark of these tumors [7].

The incidental detection of meningiomas during imaging procedures is becoming increasingly common, largely due to the widespread use of advanced imaging modalities. Most incidental meningiomas are asymptomatic and do not require immediate intervention. According to the European Association of Neuro-Oncology (EANO) guidelines, asymptomatic meningiomas can be managed with observation and periodic imaging, while symptomatic or growing lesions may require surgical resection or radiotherapy [8]. In this case, the patient was asymptomatic, and the decision was made to monitor the lesion with regular follow-up imaging.

Conclusion

This case underscores the importance of considering non-malignant etiologies for unexpected ^{18}F-FCH uptake, particularly in the context of prostate cancer imaging. It also highlights the complementary roles of PET/CT and MRI in characterizing intracranial lesions. While ^{18}F-FCH PET/CT is highly valuable for restaging prostate cancer, clinicians should be aware of its limitations and the potential for incidental findings that may require further investigation. Future studies are needed to better understand the mechanisms of ^{18}F-FCH uptake in meningiomas and to establish guidelines for managing such incidentalomas in є oncologic patients.

Disclosure

Conflict of Interests

The authors declare no conflict of interest in this study.

Acknowledgments

None.

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