

## Incidental [<sup>18</sup>F]Florbetapir uptake in a left frontal calvarial lesion, radiologically suggestive of hemangioma on amyloid PET-CT scan

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### ABSTRACT

[<sup>18</sup>F]Florbetapir PET-CT is widely used for in vivo assessment of cerebral  $\beta$ -amyloid deposition in patients with cognitive impairment and suspected Alzheimer's disease. Although interpretation mainly focuses on cortical tracer retention, incidental extracerebral uptake may occasionally be encountered. We report a 66-year-old woman with a seven-year history of progressive impairment of both recent and remote memory and clinically established Alzheimer's disease. Amyloid PET-CT imaging demonstrated diffuse cortical [<sup>18</sup>F]Florbetapir uptake with loss of normal gray–white matter contrast, consistent with cerebral  $\beta$ -amyloid deposition. In addition, focal increased tracer uptake was incidentally detected in the left frontal bone, with an SUV<sub>max</sub> of 3.2. The uptake corresponded to a benign-appearing intradiploic calvarial lesion radiologically suggestive of hemangioma. Comparison with prior imaging performed more than one year earlier demonstrated stability of the lesion, with no aggressive imaging features. No specific intervention was considered clinically necessary. This case highlights incidental [<sup>18</sup>F]Florbetapir uptake in a benign-appearing calvarial lesion radiologically suggestive of hemangioma. Awareness of this uncommon extracerebral uptake pattern as a potential interpretive pitfall, together with careful correlation with anatomical and prior imaging, may help avoid misinterpretation and unnecessary additional diagnostic evaluation.

**Keywords:** [<sup>18</sup>F]Florbetapir; Amyloid PET-CT; Calvarial lesion; Intraosseous hemangioma; Incidental finding

## INTRODUCTION

[<sup>18</sup>F]Florbetapir positron emission tomography (PET-CT) is an established imaging method for the in vivo assessment of cerebral  $\beta$ -amyloid deposition in patients with cognitive impairment and suspected Alzheimer's disease. Interpretation of amyloid PET-CT is mainly based on visual assessment of cortical tracer retention, particularly the loss of normal gray–white matter contrast and increased uptake within the cerebral cortex [1, 2]. Therefore, the diagnostic focus is usually directed toward intracerebral amyloid burden.

Despite this primary focus, incidental extracerebral tracer uptake may occasionally be encountered during amyloid PET-CT imaging. Such findings are uncommon but clinically relevant, especially when focal uptake is located adjacent to the skull, meninges, or scalp. Without careful anatomical correlation, these unexpected foci may create diagnostic uncertainty or be misinterpreted as clinically significant pathology [3].

Calvarial hemangiomas are benign vascular lesions of the skull and are usually detected incidentally on CT, MRI, or hybrid PET-CT imaging. Although they are typically asymptomatic, their imaging appearance may overlap with other calvarial lesions, making correct recognition important [4–6]. Previous literature describing [<sup>18</sup>F]Florbetapir uptake in intraosseous hemangioma is very limited.

Here, we present a case of incidental focal [<sup>18</sup>F]Florbetapir uptake in a left frontal calvarial lesion radiologically suggestive of hemangioma detected during amyloid PET-CT imaging in a patient with clinically established Alzheimer's disease. This case highlights a potential benign extracerebral imaging pitfall and emphasizes the importance of correlating amyloid PET-CT findings with anatomical imaging.

## CASE PRESENTATION

A 66-year-old woman was evaluated for progressive cognitive decline, predominantly involving memory impairment. According to the available clinical history, her symptoms had begun approximately seven years before the current imaging evaluation and involved both recent and remote memory. She also had a history of head trauma associated with memory-related complaints. Alzheimer's disease had been clinically established by her treating physician based on the clinical course and available diagnostic assessment. At the time of evaluation, the patient was receiving Trancopin as part of her clinical management.

The patient underwent amyloid PET-CT imaging with [<sup>18</sup>F]Florbetapir using a 5-ring GE Discovery IQ PET-CT scanner (GE HealthCare). A total activity of 351.5 MBq (9.5 mCi) of [<sup>18</sup>F]Florbetapir was administered intravenously, and PET imaging was initiated approximately 30 minutes after tracer injection. Brain PET acquisition was performed in a single bed position for approximately 2–4 minutes. PET images were reconstructed using an OSEM-based HD reconstruction with SharpIR (4 iterations, 12 subsets) with a 256 × 256 matrix. Low-dose CT was acquired for attenuation correction using an ASiR protocol with Smart mA at 120 kVp. SUVmax was measured using a manually placed region of interest (ROI) with the standard clinical quantification software.

PET-CT images demonstrated diffuse cortical [<sup>18</sup>F]Florbetapir retention with reduced gray–white matter contrast, consistent with a positive amyloid PET-CT scan and supporting the presence of cerebral  $\beta$ -amyloid pathology (Figure 1). In addition, a focal area of increased [<sup>18</sup>F]Florbetapir uptake was incidentally identified in the left frontal calvarium. The focal uptake was clearly

separate from the cortical uptake pattern and localized to an intraosseous calvarial lesion on fused PET-CT images (Figure 2). The lesion demonstrated an SUVmax of 3.2. The focal calvarial uptake corresponded anatomically to a benign-appearing intradiploic osseous lesion radiologically suggestive of a calvarial hemangioma. The lesion was asymptomatic, with no focal skull pain, palpable swelling, or neurological signs attributable to local mass effect.

A previous PET-MRI examination performed on August 30, 2024, had also demonstrated the calvarial lesion. According to the available radiology report, the lesion was a focal intradiploic osseous abnormality measuring approximately 19 mm, with mild peripheral contrast enhancement and no destruction of either the inner or outer table of the calvarium. As this examination had been performed outside the country, only the radiology report was available, and the original MRI images could not be retrieved for direct reassessment.

The current PET-CT examination was performed on February 17, 2026, approximately 17.6 months (536 days) after the prior PET-MRI. On the current CT, the lesion measured approximately 19 mm and demonstrated non-aggressive morphology compatible with a benign calvarial hemangioma, without interval progression or development of aggressive osseous features. The lesion was therefore considered radiologically stable over the follow-up interval.

Given the previous radiological assessment, stability over more than one-year, compatible CT morphology, absence of aggressive imaging features, and lack of local symptoms, biopsy was not considered clinically indicated. Accordingly, the diagnosis was made on radiological grounds rather than by histopathological confirmation.

## DISCUSSION

[<sup>18</sup>F]Florbetapir PET-CT is primarily used to detect cerebral  $\beta$ -amyloid deposition in patients with cognitive impairment and suspected Alzheimer's disease. In routine interpretation, the main focus is the pattern of cortical tracer retention and the loss of normal gray–white matter contrast [1, 2]. In the present case, the patient showed diffuse cortical [<sup>18</sup>F]Florbetapir uptake consistent with positive amyloid PET-CT scan and supported the presence of cerebral amyloid pathology. Importantly, a positive amyloid PET-CT scan does not independently establish the clinical diagnosis of Alzheimer's disease and should be interpreted in the context of the overall clinical assessment [1]. The notable finding in this case was the incidental focal [<sup>18</sup>F]Florbetapir uptake in the left frontal bone, corresponding to a benign-appearing intraosseous lesion radiologically suggestive of hemangioma. This uptake was clearly distinct from the diffuse cortical amyloid pattern and was localized to the calvarium on hybrid imaging. This distinction is important because focal extracerebral uptake may cause diagnostic uncertainty, especially when located close to the skull, meninges, or cortical surface.

Calvarial hemangiomas are benign vascular lesions of the skull and are often found incidentally. They are usually asymptomatic, although larger lesions may occasionally present with local swelling, pain, or cosmetic concerns. Their imaging appearance can overlap with other calvarial abnormalities, including metastasis, meningioma-related hyperostosis, fibrous dysplasia, osteoma, Paget disease, or other benign or malignant bone lesions [4–6]. Therefore, correlation between PET-CT findings and anatomical imaging is essential.

The mechanism of [<sup>18</sup>F]Florbetapir uptake in calvarial hemangioma remains uncertain. Although [<sup>18</sup>F]Florbetapir is designed to bind cerebral  $\beta$ -amyloid plaques, extracerebral uptake has previously been described in a primary intraosseous hemangioma on cerebral PET-CT [3].

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Possible explanations for tracer accumulation in a vascular osseous lesion include increased vascularity, blood-pool activity, altered local perfusion, or nonspecific tracer retention; however, these mechanisms remain speculative and have not been definitively established.

We acknowledge that a similar case has previously been reported by Sánchez-Vaño et al. [3]. Therefore, this case is not the first description of this finding. Its educational value instead lies in reinforcing awareness of focal calvarial [ $^{18}\text{F}$ ]Florbetapir uptake as a potential interpretive pitfall and in emphasizing the importance of correlation with morphological and prior imaging studies to avoid misinterpretation.

This case is clinically relevant because it highlights a potential pitfall in amyloid PET-CT interpretation. Focal extracerebral [ $^{18}\text{F}$ ]Florbetapir uptake should not automatically be interpreted as amyloid-related cortical pathology or malignant disease. Instead, careful localization on fused PET-CT or PET-MRI images is necessary. In this patient, the focal uptake was confined to the left frontal calvarium and corresponded to a benign-appearing lesion, comparison with prior imaging showed long-term stability. These findings supported a benign radiological diagnosis and helped avoid unnecessary invasive diagnostic procedures. This case was limited by the absence of the original PET-MRI images for direct review, as the previous examination had been performed abroad and only the radiology report was available. Therefore, detailed independent reassessment of the MRI morphology was not possible. In addition, histopathological confirmation was not obtained. However, the previous radiology report described a non-aggressive intradiploic osseous lesion, and the current CT was compatible with benign morphology with stability over approximately 17.6 months. Given the absence of interval progression, aggressive imaging features, or local symptoms, biopsy was not considered clinically indicated. Accordingly, the diagnosis should be regarded as radiological diagnosis rather than histopathologically confirmed.

## CONCLUSION

This case highlights that incidental [ $^{18}\text{F}$ ]Florbetapir uptake may occur in benign calvarial lesions radiologically suggestive of hemangioma. Although this phenomenon has been reported previously, available reports remain very limited. Awareness of this uncommon extracerebral uptake pattern is important because it may represent a potential interpretive pitfall during amyloid PET evaluation. Careful correlation with CT or MRI morphology and prior imaging is essential to support a benign interpretation and avoid misdiagnosis and unnecessary invasive diagnostic procedures.

## REFERENCES

1. Johnson KA, Minoshima S, Bohnen NI, Donohoe KJ, Foster NL, Herscovitch P, Karlawish JH, Rowe CC, Carrillo MC, Hartley DM, Hedrick S, Pappas V, Thies WH; Alzheimer's Association; Society of Nuclear Medicine and Molecular Imaging; Amyloid Imaging Taskforce. Appropriate use criteria for amyloid PET: a report of the amyloid imaging task force, the society of nuclear medicine and molecular imaging, and the Alzheimer's association. *Alzheimers Dement*. 2013 Jan;9(1):e-1-16.
2. Rowe CC, Villemagne VL. Brain amyloid imaging. *J Nucl Med*. 2011 Nov;52(11):1733-40.
3. Sánchez-Vaño R, Prado-Wohlwend S, Sopena-Novales P, Uruburu-García E, Monedero-Picazo MD, Martínez-Carsí C.  $^{18}\text{F}$ -florbetapir uptake in a primary intraosseous haemangioma displayed in a cerebral PET/CT. *Rev Esp Med Nucl Imagen Mol (Engl Ed)*. 2018 Jan-Feb;37(1):59-60.

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4. Gomez CK, Schiffman SR, Bhatt AA. Radiological review of skull lesions. Insights Imaging. 2018 Oct;9(5):857-82.
5. Krishnan P, Bhosle R, Patel S, Raju D, Cincu R, Moscote-Salazar LR, Gupta A, Agrawal A. Calvarial hemangiomas: Series of 6 cases and review of literature. World Neurosurg X. 2024 Mar 8;23:100297.
6. Naama O, Gazzaz M, Akhaddar A, Belhachmi A, Asri A, Elmostarchid B, Elbouzidi A, Kadiri B, Boucetta M. Cavernous hemangioma of the skull: 3 case reports. Surg Neurol. 2008 Dec;70(6):654-9.

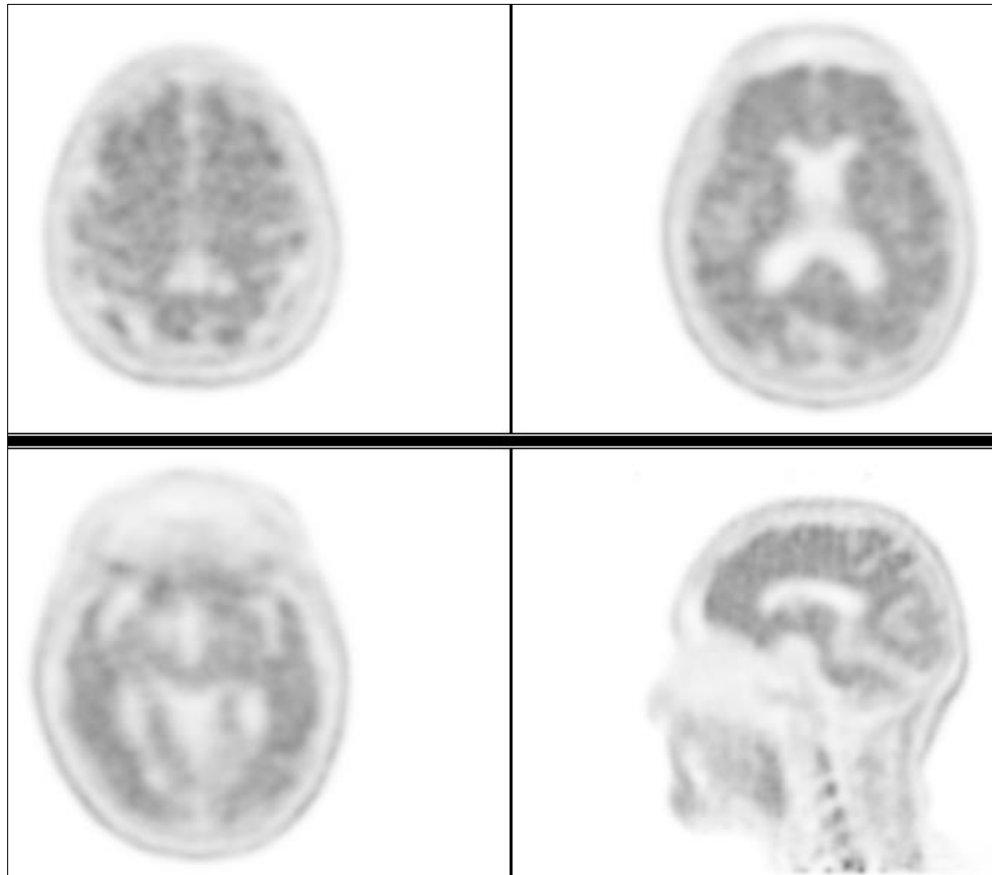


**Figure 1.** [ $^{18}\text{F}$ ]Florbetapir amyloid PET images demonstrating diffuse increased cortical tracer retention with loss of the normal gray–white matter contrast, consistent with a positive amyloid PET scan and supporting the presence of cerebral  $\beta$ -amyloid pathology

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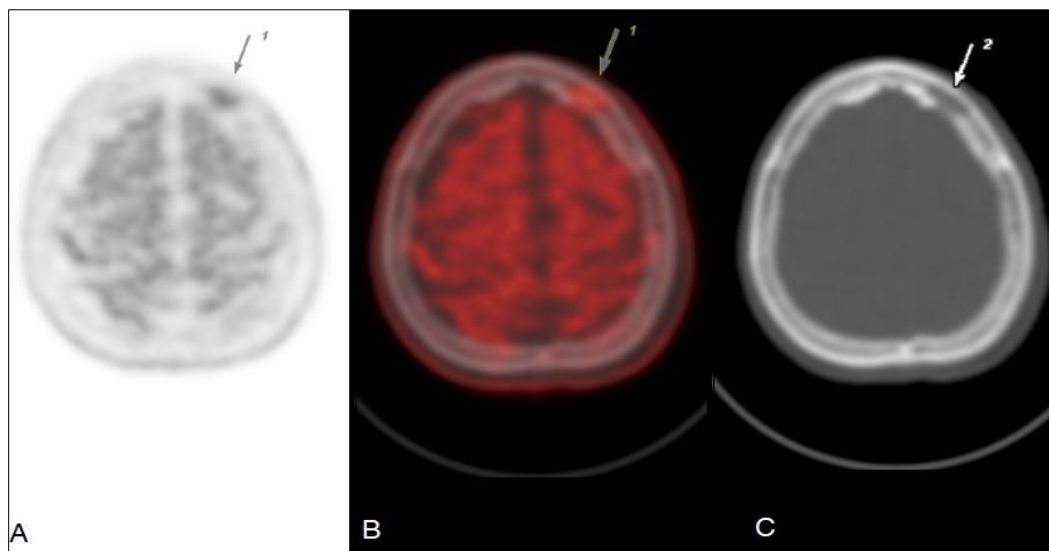


**Figure 2.** Incidental focal [ $^{18}\text{F}$ ]florbetapir uptake in the left frontal calvarium. (A) PET image demonstrates focal extracerebral tracer uptake in the left frontal region (SUVmax, 3.2). (B) Fused PET/CT image localizes the uptake to an intraosseous calvarial lesion. (C) CT bone-window image demonstrates a well-defined intradiploic osseous lesion measuring approximately 19 mm, with imaging morphology suggestive of a benign calvarial lesion (radiologically suggestive of a calvarial hemangioma) and without aggressive cortical destruction