Case report

Unexpected -[18F] fluoro-2-deoxy-D-glucose accumulation in subarachnoid hemorrhage due to an aneurysm rupture✩✩

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ABSTRACT

A 79-year-old Asian man with paranasal cancer underwent 2-[18F] fluoro-2-deoxy-D-glucose-positron emission tomography/computed tomography (FDG-PET/CT) to evaluate metastatic lesions. Unexpected FDG accumulation during subarachnoid hemorrhage due to an aneurysm rupture visualized with FDG-PET/CT. It is rare to encounter life-threatening diseases in FDG-PET/CT because FDG-PET/CT is usually scheduled beforehand. However, an immediate response is warranted in unexpected conditions. Physicians who perform FDG-PET/CT should be familiar with life-threatening FDG-PET findings.

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Introduction

Positron emission tomography (PET) with 2-[18F] fluoro-2-deoxy-D-glucose (FDG) is established as one of the main modalities in the diagnosis, staging, and monitoring of neoplastic conditions. Similar to neoplasms, nonneoplastic conditions such as infection, inflammation, and granulomatous diseases appear to present increased glycolysis and are easily visualized through FDG-PET imaging.

It is rare to encounter life-threatening diseases in FDG-PET/computed tomography (CT) because FDG-PET/CT is usually scheduled beforehand. However, an immediate response is warranted in unexpected conditions, and FDG-PET/CT is time consuming. Several studies have reported unexpected CT findings in the emergency department, but only few studies have evaluated the unexpected findings in FDG-PET/CT.

This study reports the case of unexpected FDG-PET/CT finding in subarachnoid hemorrhage (SAH) due to an aneurysm rupture. This is a rare case of SAH due to aneurysm

✩ Funding: The authors received no financial support for the research, authorship and/or publication of this article.
✩✩ Competing Interests: The authors have declared that no competing interests exist.
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rupture observed on FDG-PET/CT. Physicians who perform FDG-PET/CT should be familiar with life-threatening FDG-PET findings.

Case report

Paranasal cancer was suspected in a 79-year-old Asian man with a history of meningitis and optic neuritis who presented with mild dementia; however, he was conscious. Metastatic lesions were evaluated using FDG-PET/CT. The patient demonstrated a normal walk in the examination room. Before FDG PET/CT examination, the patient had a rapid blood glucose of 120, normal vital signs, and a blood pressure of 140/70 mm Hg.

FDG PET/CT imaging protocol

The patient fasted for 6h before receiving an intravenous injection of FDG (5 MBq/kg). FDG PET/CT scans were obtained using Biograph 16 (Siemens Medical Solutions; Knoxville, TN) scanners, with a 700-mm Field of view (FOV) and a slice thickness of 3.27mm. The CT was acquired to correct PET transmission using the following parameters: 140kV and 120-240mAs to produce 128 × 128 matrix images. The patient was scanned in the arms-down position, from head to thigh. Shallow breathing was advised to avoid motion artifacts and minimize misregistration of CT and PET images. Intravenous contrast material was not administered for CT scanning. After the CT scan, the PET data were acquired, and acquisition time was 3min per bed position. CT images were reconstructed using the conventional filtered back-projection method. Axial full width at half-maximum at 1cm from the center of the FOV was 6.3 mm.

After more than half a day of examination, the findings were interpreted and SAH was suspected. FDG-PET (Fig. 1A) and FDG-PET/CT (Fig. 1B) revealed FDG accumulation in the bilateral basal cistern with a 5.5 SUVmax. The corresponding plain CT (Fig. 1C) revealed high density in the same regions. Because the patient had gone home after examination, he was immediately called back to the hospital. On his way to the hospital, his consciousness deteriorated, and first aid was administered as soon as he arrived. Contrast-enhanced CT angiography revealed an aneurysm in the right internal carotid artery (Fig. 2); thus, FDG accumulation due to aneurysm rupture. Although treatment was delayed because of the diagnosis of SAH, the patient was saved by a clipping operation.

Discussion

SAH is a life-threatening condition with a 40% mortality risk. SAH progression presents several symptoms; the main
Fig. 2 – 3D-CT angiography revealed an aneurysm in the right internal carotid artery. CT, computed tomography.

symptom is a sudden severe headache that is more intense at the base of the skull and is often described as the worst headache ever experienced by a person. Approximately one-third of individuals experience no other symptoms besides this characteristic headache, and approximately 1 in 10 individuals who seek medical care with this symptom is later diagnosed with SAH [1]. In the case presented here, diagnosis was delayed due to unexpected findings in FDG-PET/CT, and the patient did not have any symptoms and or undergo a scheduled FDG-PET/CT.

A previous study has noted that 0.35% of patients with tumors had unexpected findings on FDG-PET/CT, with pneumothorax as the most unexpected finding [2]. FDG-PET/CT data acquisition and diagnosis is time consuming, and immediate interventions may be needed in emergency cases.

In a previously reported case of SAH visualized on FDG-PET images in the patient with hypoglycemia [3], diffusely reduced FDG uptake in the cerebral and cerebellar cortex improved the observation of high FDG accumulation in the subarachnoid space. However, our case of unexpected SAH was visualized through FDG-PET despite normal blood glucose levels and normal FDG accumulation in the cerebral and cerebellar cortex. To our knowledge, the present case may be the first report on FDG-PET/CT findings of SAH caused by aneurysm rupture.

CT is generally completed first during FDG-PET/CT examinations. Hence, CT images should be evaluated as soon as it is available during FDG-PET data acquisition is proceedings. In the case presented here, FDG may have accumulated in the subarachnoid space due to intracranial extravasation of FDG through the ruptured aneurysm.

In conclusion, it is rare to observe life-threatening conditions on FDG-PET/CT. However, the early diagnosis of life-threatening conditions influences prognosis. Physicians who perform FDG-PET/CT should be familiar with FDG-PET/CT imaging findings of SAH due to an aneurysm rupture.

Patient Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Authors’ contributions

All authors provided clinical expertise and participated in drafting the manuscript. All authors read and approved the final manuscript.

Acknowledgment

None.

Certificate Of English Proofreading

021.01.009.

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