Case Report

False Negative Report of ^{18}F -FDG PET/CT in a Patient with Liver Metastases due to Uveal Melanoma

Farhad Adhami-Moghadam [1,*], MD; Atieh Asadollah [2], MD; Parnian Adhami-Moghadam [1], MD

1. Department of Ophthalmology, Faculty of Medicine, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran.
2. School of Medicine, Tehran Medical Sciences Islamic Azad University, Tehran, Iran.

***Corresponding Author:** Farhad Adhami-Moghadam
E-mail: farhad.adhami@gmail.com

Abstract

Background: To report a false negative ^{18}F-Fluorodeoxyglucose (FDG) positron emission tomography/ computed tomography (PET/CT) of liver metastasis in a patient with malignant uveal melanoma.
Material and Methods: A 74-year-old man with left eye uveal melanoma and liver metastasis that was found seven months after the enucleation surgery.
Results: Seven months post-enucleation surgery, ultrasonography revealed a suspicious hepatic lesion. Further investigation using magnetic resonance imaging (MRI) and PET scan was recommended. MRI with and without contrast reported mild post-contrast enhancement in the right lobe of the liver, suggestive of metastasis from the known tumor of the patient. ^{18}F-FDG PET/CT surprisingly showed no metabolic evidence of malignancy throughout the body. Finally, the patient was scheduled for an ultrasound-guided biopsy. Pathology reported metastatic malignant melanoma.
Conclusion: It is important to remember not to rely solely on PET/CT since it may report false negative results in liver metastasis.

Keywords: False Negative; ^{18}F-FDG PET/CT; Uveal Melanoma; Liver Metastasis.

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Introduction

Malignant uveal melanoma is a type of cancer affecting the uvea, the middle layer of the eye, containing blood vessels and pigmented cells. Uveal melanoma is a rare type of cancer, accounting for only 5 % of all melanomas, and typically occurs in adults aged 50 to 70 years. The exact etiology of uveal melanoma is unknown; however, several risk factors have been identified, including fair skin, light eye color, exposure to sunlight or artificial sources of ultraviolet radiation, and positive family history. Symptoms of uveal melanoma may include blurred vision, flashing lights, floaters, and a dark spot on the iris or eye bulging. However, some people with uveal melanoma may not experience any symptoms. Uveal melanoma diagnosis involves a comprehensive eye exam, including pupil dilation, to allow a detailed view of the inside of the eye. Imaging tests, such as ultrasound and MRI, may also confirm the diagnosis and determine the tumor size and location. Most patients eventually develop metastasis; although less than 1 %, they already have metastatic disease when initially diagnosed at early stages. Therefore, due to the metastatic nature of uveal melanoma, metastasis surveillance has been proven crucial in these patients [1].

Abdominal cross-sectional imaging should be performed as part of the primary workup since the most common metastatic site is the liver, observed in 87 % of cases [2].

False negatives in diagnostic imaging of malignant uveal melanoma can occur for several reasons, such as the size and location of the tumor, technical issues with the scan, or biological factors, such as the tumor's ability to tracer uptake. No diagnostic tool is perfect, and sometimes multiple tests or imaging modalities may be necessary to diagnose and monitor a patient's condition accurately. In cases of high risk of metastasis, such as uveal melanoma, negative PET/CT scan results should be validated by other imaging techniques, such as MRI or ultrasound. Close monitoring and follow-up by a healthcare provider experienced in treating uveal melanoma and its potential complications are also critical to the early detection of potential metastases [3].

It has had outstanding results in detecting hepatic metastases, and combined ^{18}F-FDG PET/CT is promptly superseding PET/CT.

^{18}F-FDG PET/CT has proven to be essential in the staging and monitoring melanoma patients. ^{18}F-FDG PET/CT provides functional PET data and anatomical CT images. The sensitivity of the ^{18}F-FDG PET/CT scan for detecting hepatic metastases is 96 %. It outperforms contrast-enhanced computed tomography (CECT) to discern hepatic metastases [4].

Herein we report an unusual case of a false negative ^{18}F-FDG PET/CT scan in a patient suffering from uveal melanoma with liver metastases.

Case report

A 74-year-old man with a 6-year history of diabetes mellitus and a history of cataract surgery on both eyes ten years ago presented with left eye visual loss. On examination, visual acuity of the right eye was 10/10, and the left eye 2/10. The anterior segments of both eyes were pseudophakic; the episcleral sentinel vessels were seen (figure 1). Indirect ophthalmoscopy revealed a large black mass in the posterior segment of the left eye (figure 2). Diabetic retinopathy was not detected in either eye. Ocular sonography was then performed, which detected a large mass in the posterior segment of the left eye (figure 3). At this point, the most probable diagnosis was uveal melanoma; therefore, chest x-ray (CXR)

Figure 1: Episcleral sentinel vessels

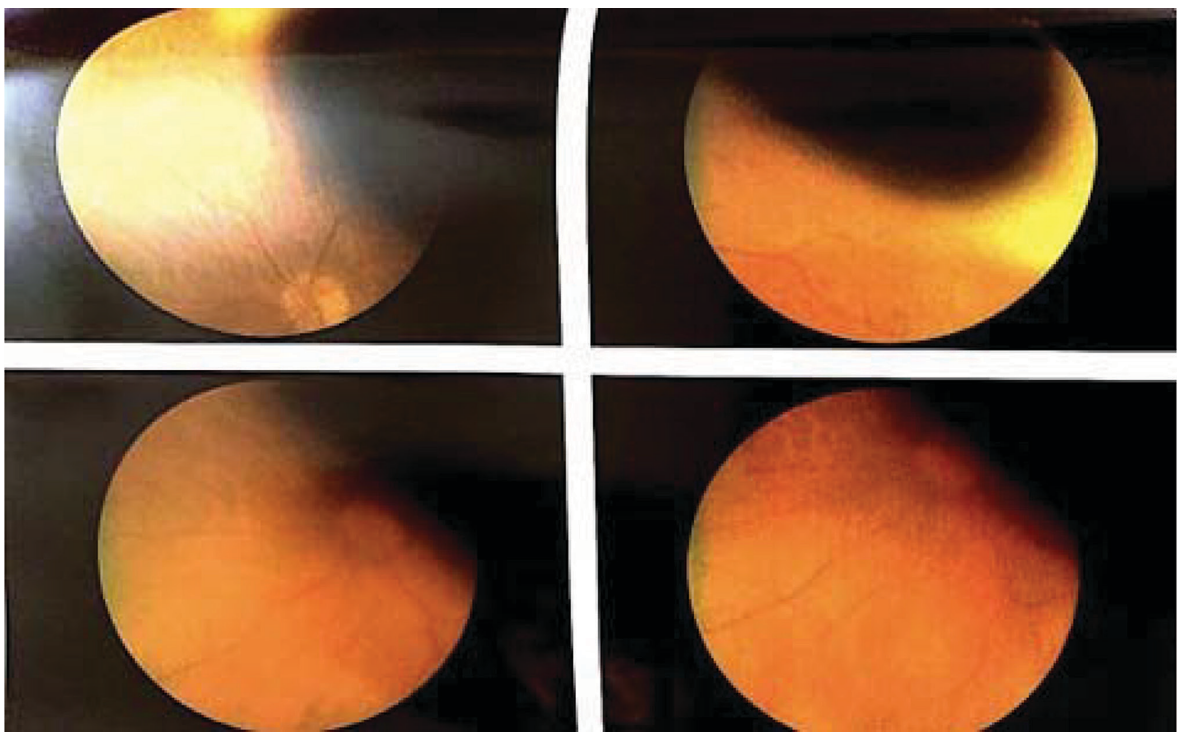

Figure 2: Fondus photography. Black area related to uveal malignant melanoma

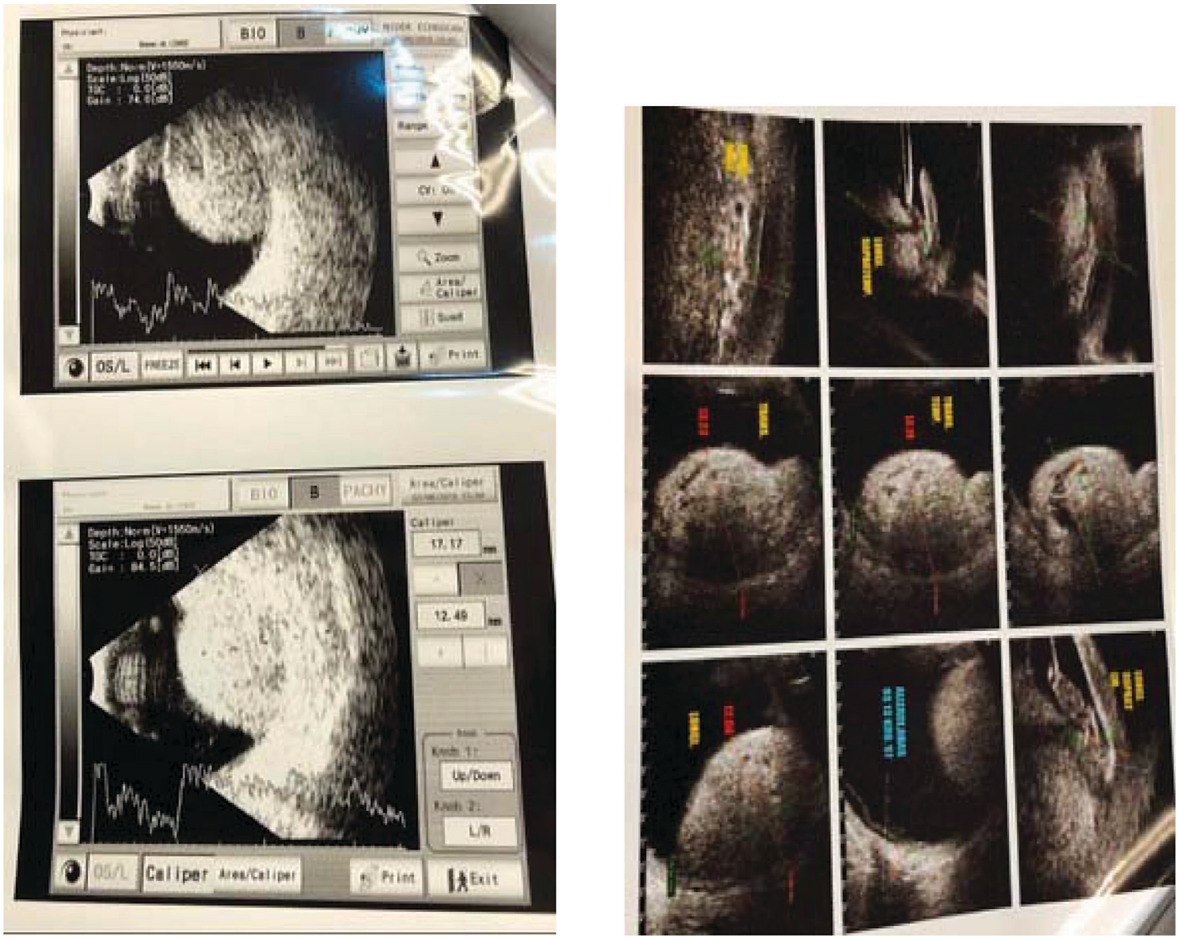

Figure 3: Left eye ocular sonography large mass detected in the posterior segment of the eye

and abdominal sonography were ordered for metastasis screening, which reported no sign of metastasis. Enucleation surgery was then performed immediately, and the enucleated eye was sent for anatomopathological (AP) evaluation.

Pathology reported a black tumor originating from the temporal aspect of the globe protruding into the vitreous and extending to the anterior parts, grossly involving superior and inferior temporal quadrants. The tumor measured 2×2×1.3 cm grossly.

Sclera, the vortex veins, and the resection margins were tumor-free (Histologic type: mixed epithelioid and spindle cells).

After surgery, the patient was discharged and asked to return for the follow-up in 6 months. The surgery site was normal on follow-up examination, and the patient had no complaints. As part of the metastatic surveillance, abdominal sonography, CXR, and laboratory tests were ordered.

CXR was normal; however, abdominal sonography identified a well-defined hypoechoic lesion about 15x14 mm in the liver, suspicious of hemangioma (figure 4).

MRI and PET/CT scans were then recommended for further evaluation. Laboratory tests reported AST: 22 U/L, ALT: 27, Alkaline phosphatase: 238 U/L, total bilirubin: 0.7 mg/dL, direct bilirubin: 0.3 mg/dL), and FBS: 101 mg/dl. Complete blood count results

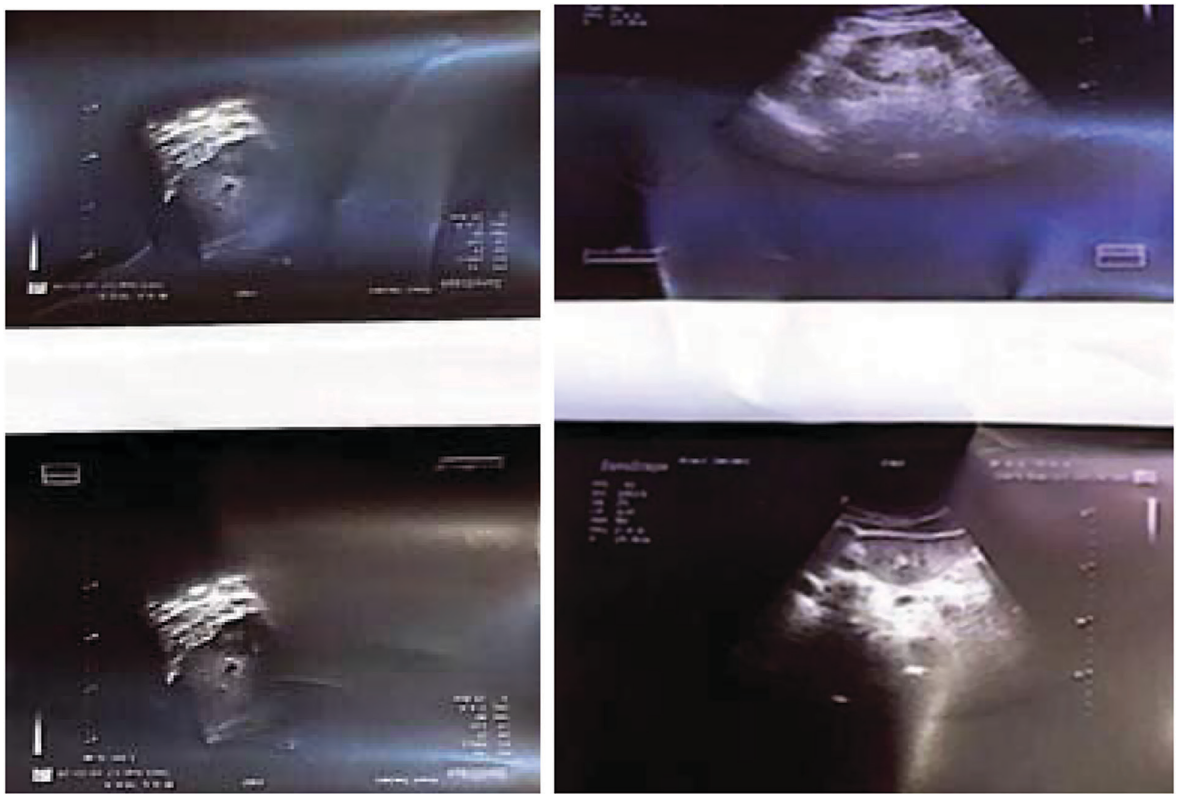

Figure 4: A well-defined hypo echoic lesion the 6th segment of the liver.

were within normal range.

MRI with and without contrast reported mild post-contrast enhancement in the right lobe of the liver, suggestive of metastasis from the known tumor of the patient. The lesion measured 16 mm. Pancreas, spleen, and kidneys were normally visualized, while the aorta and IVC were unremarkable.

^{18}F-FDG PET/CT was performed with an injected dose of 11.4 mCi from the vertex to the toes with an uptake phase duration of 60 minutes.

Unexpectedly, no metabolic evidence of malignancy was seen throughout the body, especially the eyes and liver (figure 5).

Given the contradictory evidence, the patient was scheduled for an ultrasound (US) guided biopsy. Under the US guide, a 20G needle was inserted into the liver mass. Three core biopsies were obtained by Tru-Cut needle and sent to pathology.

Pathology reported sheets of anaplastic epithelioid to spindle-like cells with brown pigmented cytoplasm, diagnosed as metastatic malignant melanoma; immunohistochemical staining was also done using antibodies against the following markers: Melan A and SOX10, which both were positive in tumor cells. Eventually, the patient was referred to an oncologist and a surgeon; however, the patient refused surgery and adjuvant therapy. The patient expired 22 months after the enucleation surgery.

Discussion

Hepatic imaging is essential in managing patients with uveal melanoma since the liver is the most common metastatic site [1].

The most commonly used imaging methods for detecting metastases are MRI, CECT, and PET, which are parts of the diagnostic process [4].

PET is a noninvasive imaging technique that

Figure 5: ^{18}F-FDG PET SCAN

lets us view the human body's functional and biochemical processes; MRI and CT are used for anatomical and structural changes. The metabolic and functional processes of the body are altered in the earliest stages of all diseases, often before any anatomical changes have occurred or become visible on MRI or CT; Therefore, abnormalities are detected at the earliest time in PET before MRI or CT.

^{18}F-FDG PET yields data based on increased glucose metabolism in most types of tumors and has been proven as a vital tool in diagnosing and treating cancers [5].

The combination of PET with other more accustomed imaging modalities such as CT, US, and MRI (PET/CT) immensely improves the diagnostic process, with PET providing functional and metabolic data and CT depicting anatomical information on the metastic sites inside the liver's segmented anatomy [6].

Rabkin et al. reported that high glucose levels at the time of the study but not DM may reduce the sensitivity of ^{18}F-FDG PET/CT in the assessment of malignancy, which supports our findings since the patient did not have high glucose levels at the time of the test [7].

This study shows that, false negative ^{18}F-FDG PET/CT results may be reported in patients with liver metastasis in patients with uveal melanoma; therefore, it is recommended not

to use only one imaging method when dealing with metastatic disease.

Authors ORCIDs

Farhad Adhami-Moghadam:
https://orcid.org/0000-0003-4811-443X

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Footnotes and Financial Disclosures

Conflict of interest:

The authors have no conflict of interest with the subject matter of the present manuscript.