Growing Cardiac Hemangioma on Serial F-18 FDG PET/CT

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Abstract Cardiac hemangiomas are extremely rare, benign tumors, which can occur anywhere in the heart. Symptoms are variable according to the size, extension and tumor location, but most cases are asymptomatic and are detected incidentally. They may grow, remain stable and regress; therefore, the natural course of the tumors is unpredictable. Diagnosis mainly depends upon echocardiography, CT, MRI and angiography. Reports of detection by F-18 FDG PET/CT are very limited. We report a case of cardiac hemangioma attached to the right ventricle, compressing the ventricle. It was revealed incidentally on F-18 FDG PET/CT for routine evaluation of thyroid cancer. During two serial F-18 FDG PET/CTs, it grew from 2.8 cm to 4.0 cm with mild FDG uptake. After surgery, the patient remained stable without any complications.

Keywords Cavernous hemangioma · Cardiac tumor · F-18 FDG · PET/CT

Introduction

Cardiac hemangioma is a very rare, benign vascular tumor. It is usually detected incidentally as most patients are asymptomatic. Previously reported preoperative imaging findings mainly come from ultrasonography, computed tomography (CT) or magnetic resonance imaging (MRI). The experience with 2'-deoxy-2'-[F-18] fluoro-D-glucose (F-18 FDG) positron emission tomography/computed tomography

(PET/CT) in detection of the tumor is limited. Herein, we present a case of a cardiac hemangioma that was incidentally observed on F-18 FDG PET/CT. The change of tumor size and FDG avidity could be readily appreciated on initial and follow-up F-18 FDG PET/CTs.

Case Report

A 67-year-old woman, who had history of total thyroidectomy with central neck dissection due to papillary thyroid cancer, followed by high-dose radioactive I-131 treatment about 17 months ago, was referred for F-18 FDG PET/CT as a part of her routine annual evaluation. She had been healthy for the previous 17 months and did not complain of any discomfort. There was no evidence of recurrence of malignancy by tumor marker or imaging studies involving F-18 FDG PET/CT and I-123 whole-body scan. However, F-18 FDG PET/CT showed an incidental pericardial mass near the right ventricle (4.0 cm). The tumor was compressing the ventricle, but there was no evidence of direct invasion into the ventricle (Figs. 1, 2). Contrast-enhanced CT of F-18 FDG PET/CT revealed intense enhancement in the central portion of the mass, and PET demonstrated mild FDG avidity (SUVmax: 2.5). Subsequent transthoracic echocardiography showed an immobile, round, echogenic mass at the right ventricular apex area (Fig. 3). Chamber size, wall motion, ventricular and valvular functions were normal. An electrocardiogram showed T wave inversion in the anterolateral leads.

We retrospectively reviewed the initial F-18 FDG PET/CT performed approximately 1 year earlier. In that initial image, the pericardial mass was also detected with similar characteristics, but with a smaller size (2.8 cm) and lower FDG avidity (SUVmax: 2.0), respectively, than those of follow-up F-18 FDG PET/CT (Fig. 4).

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Fig. 1 Annual follow-up F-18 FDG PET/CT shows a 4.0 cm pericardial mass with abnormal, mild FDG uptake (SUVmax: 2.5). It is located at the apex of the right ventricle and compresses the ventricle. Strong enhancement is revealed in the central portion of the mass on contrast-enhanced CT of F-18 FDG PET/CT. There is no evidence of abnormal extracardiac FDG uptake to suggest recurrence of malignancy (a: maximum intensity projection image, b: axial PET image, c: axial CT image, d: axial fusion image)

Because of growth of the pericardial mass, it was surgically excised through a left anterior thoracotomy. At surgery, a popcorn-like, pulsatile mass was located in the pericardial space of the apex of the right ventricle and focally attached to the outer wall of the ventricle. In addition, an impending rupture of the mass was suspected. Grossly, the mass was brownish white in color with a smooth margin and multiple chambers, looking like a sponge, on cut section. Histopathologic examination revealed a vascular tumor composed of thin-walled dilated vessels, indicative of a cavernous hemangioma. During the follow-up period after surgery, the patient remained well without any evidence of recurrence.

Discussion

Cardiac hemangiomas are an extremely rare benign vascular tumor of the heart, accounting for 5 % to 10 % of benign cardiac tumors [1]. The tumors can be located anywhere in the heart (in the intramyocardial, subendocardial and pericardial areas), but the most common sites are the anterior wall of the right ventricle and the lateral wall of the left ventricle [2]. Histologically, the tumors are classified into three categories according to the composition of the vascular structure: capillary, arteriovenous or cavernous type [3].

Fig. 2 Coronal CT image depicts compression of the right ventricle by the pericardial mass well. The cavity-like area with strong enhancement is shown in the center of the mass. There is no evidence of direct invasion into the right ventricle

Fig. 3 Transthoracic echocardiography shows a round, echogenic mass, 3.8 cm in diameter, at the apex of the right ventricle. On Doppler images, the mass has small, multiple cavities with color flow (not shown)

Fig. 4 Initial F-18 FDG PET/CT images reviewed retrospectively. There is abnormal, mild FDG uptake in the apex of the heart, corresponding to the lesion seen in the follow-up F-18 FDG PET/CT. It is smaller in size and shows less FDG avidity than seen in the follow-up scan (**a**: maximum intensity projection image, **b**: axial PET image, **c**: axial CT image, **d**: axial fusion image)

Most cardiac hemangiomas are asymptomatic and are detected incidentally as in our case. When they do present themselves, the various symptoms will mainly depend upon the location, size and extent of the tumors. Reported clinical manifestations include dyspnea on exertion, arrhythmia, pericarditis, pericardial effusion, congestive heart failure, outflow tract obstruction, coronary insufficiency, embolism and sudden death [3, 4]. Surgical resection is the treatment of choice, and patients with a resectable tumor usually have a good prognosis [3].

Because they may proliferate, remain stable, or regress, the natural course of the tumors is unpredictable. In the present case, the tumor size had grown 43 % over approximately 1 year. Due to the relatively rapid growth, it compressed the right ventricle, and raised the probability of an impending rupture that could develop into a pericardial effusion and cardiac tamponade unless treated in time.

Echocardiography, CT, MRI and angiography have been used to detect and evaluate cardiac tumors including cardiac hemangioma; therefore, the imaging findings of such tumors using these modalities are relatively well established in the literature. However, F-18 FDG PET/CT experience in imaging cardiac hemangiomas is very limited; two case reports have described different FDG avidity of cardiac hemangioma: mild FDG uptake (SUVmax: 2.4) in one case [5] and no abnormal FDG uptake in the other [6]. In the current case, two serial F-18 FDG PET/CTs also showed mild FDG uptake in the tumors [SUVmax: 2.0 (initial), 2.5 (follow-up)]. This finding is the same as found in extracardiac hemangiomas. In general, F-18 FDG PET/CT shows mild

FDG uptake in hemangiomas anywhere in the body. FDG uptake of the tumors can be explained by enhanced blood pool and FDG retention in the vascular chambers of the tumors [7]. Although misdiagnosis is rare, low-grade angiosarcoma, which has high FDG avidity, should be included in the preoperative differential diagnosis, especially when a rapidly growing tumor is seen, as was the situation in our case. We suggest that the degree of FDG uptake by F-18 FDG PET/CT can be a useful parameter to discriminate between benign and malignant cardiac tumors. This is important in the management of cardiac tumors, because pathologic evaluation of the tumor may not be feasible in organs such as the heart.

In this case, we observed a growing cardiac hemangioma through two serial F-18 FDG PET/CTs. It could be a useful tool not only in the detection of cardiac tumors involving cardiac hemangiomas, but also to differentiate benign from malignant tumors.

Conflict of Interest No.

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