High $^{18}$F-fluorodeoxyglucose uptake in cardiac tumor
A case report

Ying Liu, MD, Hua Pang, MD, PhD*, Lu Xu, MD, Qiong Liu, MD, Wenbo Li, MD

Abstract

**Background:** Cardiac tumors, especially malignant, are rare but aggressive tumors that mostly arise from the mesenchymal cells and represent a challenging diagnosis for clinicians. Recently, fluorine-18-fluorodeoxyglucose positron emission tomography and computed tomography ($^{18}$F-FDG PET/CT) is an increasingly popular new technique with diagnosis of tumor.

**Methods:** We report a case of a right heart tumor showing intense uptake of $^{18}$F-fluorodeoxyglucose ($^{18}$F-FDG) on position emission tomography/computed tomography (PET/CT) imaging. We discuss the clinical course and diagnostic evaluations.

**Results:** The maximal standardized uptake values (SUV$_{max}$) for the cardiac and metastatic lesion were 17.2 and 12.9, respectively.

**Conclusion:** $^{18}$F-FDG PET/CT imaging, which enables both morphological characterization and visualization of tumor metabolism, may be an effective and feasible noninvasive method for the diagnosis of malignant cardiac tumors.

**Abbreviations:** $^{18}$F-FDG PET/CT = fluorine-18-fluorodeoxyglucose position emission tomography and computed tomography, CT = computed tomography, CTN = computerized tomography number, MRI = magnetic resonance imaging, SUV$_{max}$ = maximum standardized uptake value.

**Keywords:** $^{18}$F-FDG PET/CT, cardiac tumors, malignant, SUV$_{max}$

1. Introduction

Primary cardiac tumors are rare entities, with an incidence of 0.02% in autopsy studies, and ~25% of these tumors are malignant.[1] Computed tomography (CT), magnetic resonance imaging (MRI), and echocardiography can provide information regarding the morphological characteristics of cardiac lesions and are thus helpful for their diagnosis[2,3]; however, some tumors are difficult to diagnose. Most tumors show a high uptake of fluorodeoxyglucose (FDG). At present, $^{18}$F-FDG PET/CT is considered an important tool in the diagnostic management of various types of malignant tumors.[4-6] However, few studies have reported the integrated evaluation of malignant cardiac tumors by $^{18}$F-FDG PET/CT imaging. In this report, we describe a case of a patient with malignant cardiac tumor that showed intense FDG uptake on $^{18}$F-FDG PET/CT imaging.

2. Case report

2.1. Patient information

A 66-year-old male patient presented to our hospital on September 05, 2015, complaining of chest pain for 4 months, which gradually progressed to symptoms of right heart failure. The patient had no previous history or family history of heart disease.

2.2. Clinical findings

Physical examination showed an increased cardiac dullness and a swollen jugular vein.

2.3. Diagnostic assessment

Biochemical investigations showed considerably elevated plasma levels of brain natriuretic peptide (BNP: 4144 ng/L) and cardiac troponin (0.584 ug/L). Electrocardiogram showed an abnormal ST-segment analysis. Coronary angiography, performed in 3 months before admission, did not provide evidence of coronary artery anomalies. Chest x-ray showed cardiomegaly with increased interstitial pulmonary markings. Echocardiography revealed a medium echogenic mass in the right ventricle with a rich blood flow signal; it had a maximum thickness of 6.2 cm, and occupied the medium echogenic mass in the right ventricle with a rich blood flow signal; it had a maximum thickness of 6.2 cm, and occupied the medium echogenic mass in the right ventricle with a rich blood flow signal; it had a maximum thickness of 6.2 cm, and occupied the right ventricular outflow tract (Fig. 2A). Enhanced CT images demonstrated a 14 cm × 11 cm solid mass with uneven density, and irregular and obscure edges in the right heart, which partially covered the aortic root and the right coronary artery. Some small branches of the right coronary artery, septal artery, and the internal thoracic artery were involved in tumor blood supply. The...
computed tomography number (CTN) ranged 23–29 HU in normal scan, and 34–72 HU, 38–86 HU, and 48–102 HU in enhanced scan in the arterial, venous, and lag phase, respectively (Fig. 1), suggesting the possibility of a malignant cardiac tumor. 18FDG PET/CT imaging revealed a significantly increased FDG uptake in the right atrium. The maximal standardized uptake value (SUVmax) of the right cardiac lesion was 17.2, which was suggestive of malignancy, and abnormal uptake in the mediastinal lymph node and the right hilar lymph node with an SUVmax of 12.9 was suggestive of metastasis (Fig. 2C and D).

2.4. Therapeutic intervention and outcomes

Treatment was focused on improving the heart condition of the patient, providing nutritional support, and heteropathy. About 20 days after admission, the solid mass measured 7.3 cm at its largest thickness, as visible in the second echocardiography (Fig. 2B). In the consultation, cardiovascular surgeon pointed the superior difficulty to drawing the materials from heart and the high risk to surgical operation. Surgical treatment has not been implemented as a result of the patient’s critical condition and patient’s willingness of nonoperative therapy. Finally, the patient died due to heart failure and liver damage a month after admission, and no histopathological information regarding the tumor was acquired. Our proposal for autopsy was rejected by the patient’s family dependents, but we gained the informed consent to report this case after communicating with them.

3. Discussion

The treatment of benign and malignant tumors varies considerably. Unlike most malignant tumors, many types of benign tumors are completely resectable. Also, most cardiac tumors are not suited for catheter-based biopsy.[7,8] Therefore, it is extremely important to accurately determine the nature of the cardiac mass before considering surgery. In the present case, the patient was diagnosed with heart failure by clinical symptoms, physical signs and laboratory examinations; and we could get that heart failure was due to the large cardiac mass by imaging examinations. The mass was more likely to be malignant tumor because of the significant enhancement on enhanced CT imaging, abundant blood flow and rapid growth on Echocardiography, also the terrible deterioration of the patient’s condition.

18F-FDG PET/CT can reveal not only the morphological features of cardiac tumor but also its glucose uptake, and thus, may be a useful indicator of tumor malignancy and the whole-body metastasises.[9,10] Many studies have found that there is a correlation between the glucose accumulation in tumor tissue and the presence of malignancy. Most of these studies supported that the higher 18FDG uptake suggests the greater possibility of malignancy.[8,6,11] Benign cardiac tumors are expected to show only slight 18F-FDG uptake, an exception was reported of a myxoma presenting with high 18F-FDG uptake.[12] A study by Rahba et al[11] revealed that tumors with a higher SUV are more malignant, and malignant cardiac tumors could be differentiated.
from benign ones using the SUV\textsubscript{max} with a cutoff of 4.6, which higher than many other organs may be due to the physiological 18FDG-uptake of the myocardium. In our case, the SUV\textsubscript{max} of the cardiac lesion was 17.2, which was suggestive of malignancy. In addition, PET/CT revealed a lesion with SUV\textsubscript{max} 12.9, which was highly suggestive of metastasis.

It is a pity that no histopathological findings were reported in this case. The clinical manifestations, imaging characteristics, and the high FDG uptake by the tumor only suggested a clinical diagnosis of malignant cardiac tumor. However, as for the rare malignant cardiac tumors, this is a typical case with abundant initial data. Maybe helpful to the noninvasive diagnosis of the malignant cardiac tumor, especially on the potential of \textsuperscript{18}F-FDG PET/CT.

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