Case Report
Primary cardiac angiosarcoma confirmed by multimodality imaging guided liver biopsy

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Abstract: Primary cardiac angiosarcoma is an extremely rare malignant tumor with various clinical presentations but usually in late stage. We report a case presented with bloody pericardial effusion, in which the final diagnosis was confirmed by multiple imaging modalities such as echocardiography, computed tomography, magnetic resonance imaging and fluorine-18-fluorodeoxyglucose positron emission tomography, as well as ultrasound-guided liver biopsy.

Keywords: Cardiac angiosarcoma, pericardial effusion, multimodality imaging

Introduction

Cardiac angiosarcoma is an extremely rare malignant neoplasm that accounts for less than 10% of all resected primary tumors of the heart, which themselves are found in less than 0.3% of autopsies [1-3]. Since most cardiac tumors may remain clinically silent for a long time or cause a wide range of cardiac and systemic symptoms that mimic other diseases [4-8], it is very difficult in early diagnosis. Being a malignant type, cardiac angiosarcoma is usually originated in the right atrium (RA) and associated with a poor prognosis, because distant metastasis is present in the majority of patients at the time of diagnosis [2, 9].

Two-dimensional (2D) echocardiography is the preferred initial method for detecting cardiac tumors, however, a complete assessment of the heart and surrounding tissue may sometimes be difficult with this technique. Magnetic resonance imaging (MRI) and fluorine-18-fluorodeoxyglucose positron emission tomography (^{18}F-FDG-PET/CT) can provide precise information on the extent of involvement of tumors and distant metastasis. Therefore, the use of these multiple imaging modalities allows simultaneous evaluation of cardiac structures and surrounding tissues, as well as staging of malignant tumors and treatment monitoring in some circumstances [4]. In this paper, we report a case of primary cardiac angiosarcoma confirmed by multimodality imaging.

Case report

A 41-year-old Chinese woman was admitted to cardiac ward with exertional chest discomfort and dyspnea for 2 months. Vital signs were normal. Physical examination revealed jugular vein distention, cardiac dullness enlargement and distant heart sounds. Normal cardiac enzymes and N-terminal pro-B-type natriuretic peptide. Normal blood gas analysis, liver function, renal function and thyroid function. Negative serology for viral hepatitis, cytomegalovirus, herpes, Epstein-Barr virus and human immunodeficiency virus. Normal values of immunoglobulin (Ig) G, IgA, IgM, IgE, and CD_3, CD_4, CD_8 cell subsets. Serum tumor markers were normal including alpha fetal protein (AFP), carcinoembryonic antigen (CEA), carcinoma antigen (CA) 19-9 and CA-125. Negative tuberculosis skin test and serum antibody of tuberculosis. However, erythrocyte sedimentation rate was slightly elevated at 37 mm/hour and D-Dimer was obviously high of >38 mg/l FEU.

Transthoracic echocardiography (TTE) indicated severe pericardial effusion with normal car-
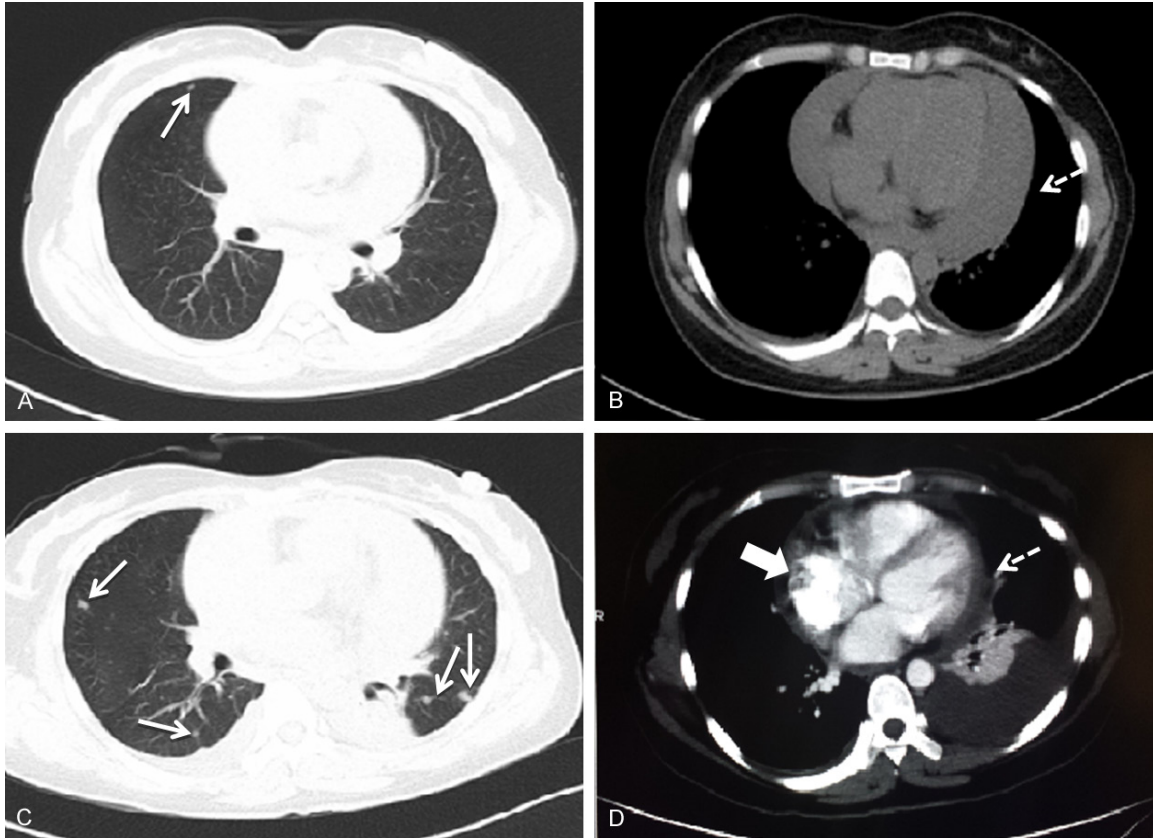
Figure 1. Images of the chest computed tomography (CT) on admission (A and B) and enhanced CT in a few days (C and D). (A and B) A scattered nodule in the lungs (arrow), and severe pericardial effusion (dashed arrow); (C and D) New scattered nodules in the lungs (arrows), mild pericardial effusion (dashed arrow), and a mass suspected in the right atrium (block arrow).
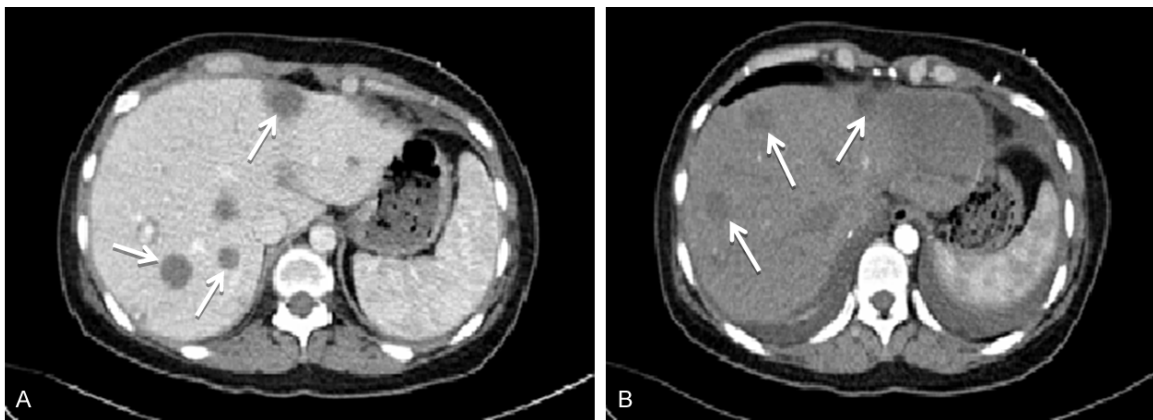

Figure 2. Images of the abdominal enhanced computed tomography. A and B: Scattered low-density nodules in the liver, indicating metastatic tumors (arrows).

diac structures and left ventricular ejection fraction of 67%. She underwent pericardiocentesis and the analysis of pericardial fluid revealed red blood cells of (++++)/HP, nucleated cells of 5-10/HP, albumin of 36.6 g/L, glucose of 4.24 mmol/L, lactate dehydrogenase of 442 IU/L, and adenosine deaminase of 15.0 IU/L. More importantly, tumor markers were strikingly high with CEA of 7.44 ng/ml, CA19-9 of >1000.00 U/ml and CA-125 of 2689.00 U/
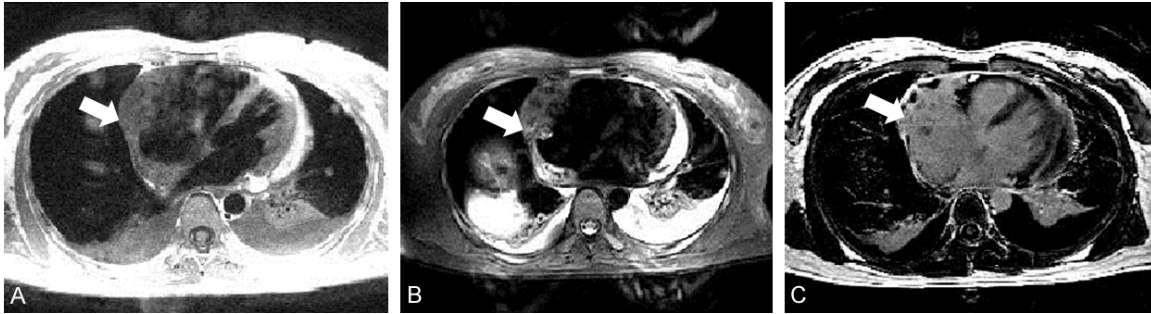
Figure 3. Images of cardiac magnetic resonance imaging with gadolinium late enhancement. A: Axial view on T1 weighted turbo spin echo (TSE) image; B: Axial view on T2 weighted TSE image; C: Axial view on late gadolinium enhancement PSIR image of the right atrial mass (block arrows).
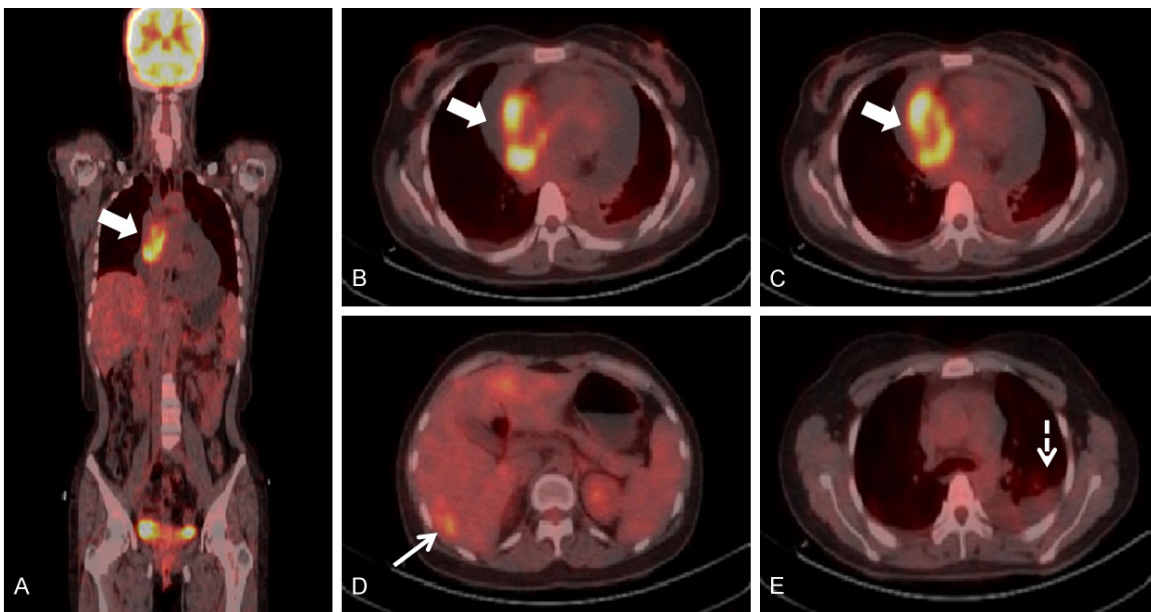

Figure 4. Images of the whole-body fluorine-18-fluorodeoxyglucose positron emission tomography (^{18}F-FDG-PET/CT). A: Maximal intensity projection image; B, C: Transaxial image showing high uptake in the right atrium (SUV$_{max}$ of 8.73) (block arrows); D: Transaxial image showing high uptake in the liver (SUV$_{max}$ of 2.73) (arrow); E: Transaxial image showing high uptake in the lung (SUV$_{max}$ of 1.97) (dashed arrow).

ml. However, neither malignant cells nor microorganisms were identified in the pericardial fluid. Because of the quick recurrence of severe pericardial effusion, a drainage catheter was implanted. Thereafter, pericardial effusion drainage was sent to analysis for several times, but similar results were obtained.

Her first chest computed tomography (CT) scan on admission revealed a few scattered well-defined nodules in the lungs with very mild pleural effusion, and the following enhanced CT scan performed a few days later suspected a mass in the RA with some new scattered nod-

ules in the lungs and moderate pleural effusion (**Figure 1**). Simultaneous abdominal enhanced CT scan also demonstrated a number of scattered low-density nodules in the liver (**Figure 2**). The pleural fluid analysis found red blood cells of >20000×10^6/L, nucleated cells of 80×10^6/L, albumin of 29.6 g/L, glucose of 4.47 mmol/L, lactate dehydrogenase of 225 IU/L and adenosine deaminase of 8.9 IU/L. Tumor markers were significantly elevated as CEA of 2.39 ng/ml, CA19-9 of 104.60 U/ml and CA-125 of 1538.00 U/ml. In order to localize and characterize the cardiac tumor, cardiac MRI with gadolinium late enhancement was also arranged,
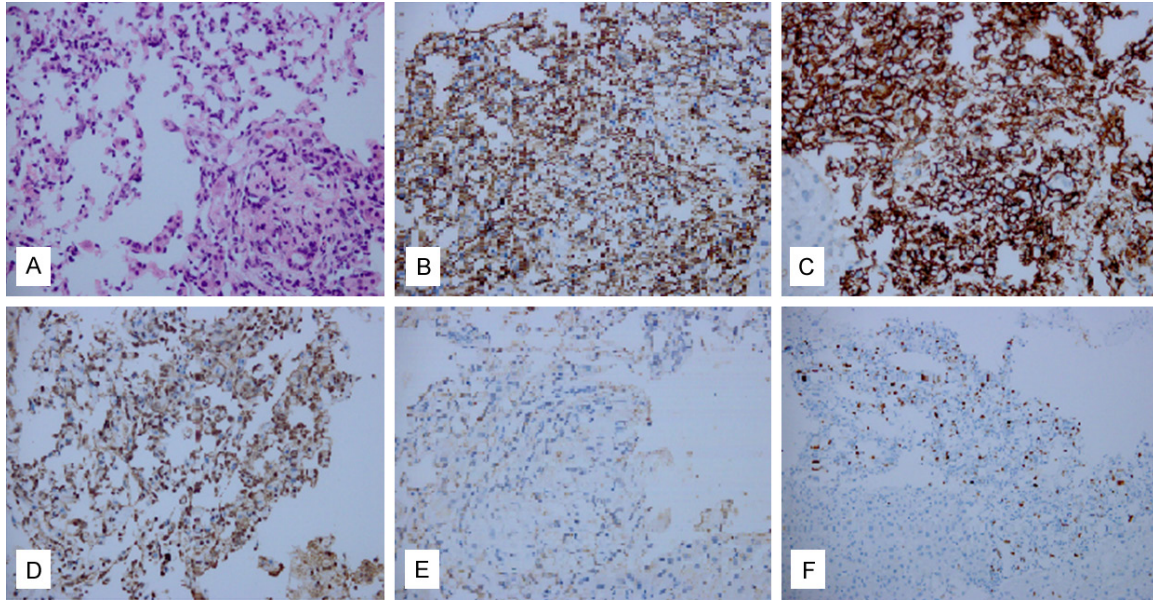
Figure 5. Histopathology of the angiosarcoma. A: Cellular area with atypical endothelial cells; B: Immunohistochemical stain for CD31 revealing positive endothelial cells; C: Immunohistochemical stain for CD34 revealing positive endothelial cells; D: Immunohistochemical stain for CK revealing positive; E: Immunohistochemical stain for factor VIII-related protein revealing positive endothelial cells; F: Ki-67 about 15%.

which clearly showed a huge mass with RA involvement (**Figure 3**).

Immediately, a whole-body ^{18}F-FDG-PET/CT scan was performed that demonstrated intense FDG uptake with maximum standardized uptake value (SUV_{max}) of 8.73 in a filling defect of 86×62 mm in the RA. Intense FDG avid was also detected in the liver (SUV_{max} of 2.73) and in the lungs (SUV_{max} of 1.97) (**Figure 4**). The result was strongly suggestive of primary malignant tumor in the RA with distant metastasis to the liver and lungs.

As abdominal ultrasound also confirmed the nodules in the liver, ultrasound-guided biopsy was performed for pathological evidences. The microscopic findings unmasked a mesenchymal, poorly differentiated tumor consisting of polymorphic, predominantly spindle-shaped cells along preformed vessels, of which immunohistochemistry for CD_{31} and CD_{34} showed positive, that corresponding to an angiosarcoma (**Figure 5**). Unfortunately, this patient refused surgical treatment where biopsy at the original site could have been performed.

Discussion

Primary cardiac angiosarcoma originates in the RA and because of the involvement of the RA, it can often present with chest pain, obstruction to filling of the right side of the heart, pericardial effusion, dyspnea, cardiomegaly, and hepatomegaly in late stage [13]. Although angiosarcoma is the most common histological type of malignant tumor in the heart, its antemortem diagnosis is difficult, in particular before the occurrence of distant metastasis. The reported case was not an exception, which presented with bloody pericardial effusion and shortly identified metastasis to the lungs and liver.

Echocardiography is the first-line imaging technique for detection of a suspected cardiac mass but carries several well-described limitations such as a restricted field of view, limited soft tissue characterization and its operator dependency [14, 15]. Unfortunately, echocardiography only detected pericardial effusion but was negative about the RA mass in the present case. Usually, enhanced CT and MRI reveal more details in cardiac soft tissue and can define extracardiac involvement and metastasis. CT does not have the imaging limitations associated with MRI and may also be used for the guidance of transthoracic biopsy, while cardiac MRI is superior to CT for soft tissue characterization and defining abnormalities intrinsic to the myocardium. Furthermore, enhanced MRI enables us to distinguish the

tumor from blood stagnation or thrombus around the tumor, because old thrombus and stagnant blood may not be enhanced by Gadolinium contrast. Due to its much less availability and higher cost, ^{18}F-FDG-PET/CT has been reserved as an important non-invasive imaging modality for suspected metastasis of unknown origin and preoperative staging of various neoplasms. It offers a high sensitivity scan for metabolic activity with precise anatomical localization, since malignant neoplasms and their metastases are always characterized by enhanced glucose utilization and therefore increased glucose uptake indicated by the ^{18}F-FDG. Therefore, successful diagnosis in this rare case relied on the comprehensive utilization of multimodality imaging techniques, in particular when a single method was inconclusive.

Disclosure of conflict of interest

None.

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