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Case Report

Right Ventricle Tumoral Mass in Acute Promyelocytic Leukemia (AML M3): Cardiac Magnetic Resonance Findings

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ABSTRACT

Intracardiac masses found on 2D echocardiography in patients with leukemia can present diagnostic challenges. A correct differentiation between thrombi, metastases, and infective vegetations is important in the management of patients with leukemia.

We describe a 24-year-old male patient, who was diagnosed with acute myelogenous leukemia (APL, AML M3). 2D transthoracic echocardiography showed 2 inhomogeneous highly mobile masses (10×13 and 6×9 mm) in the right ventricle (RV). The masses were attached to the chordae tendineae and exhibited movements compatible with the cardiac cycle. Cardiac magnetic resonance imaging revealed 3 mobile masses in the RV attached to the RV trabeculations with isosignal intensity on steady-state free precession sequence. There was no obvious evidence of mass invasion or necrosis. On the last transesophageal echocardiography (6 months after the initial admission), the mass did not exist anymore. At the time of paper compilation, the patient has no complaints and is in remission.

This report underscores the importance of cardiac magnetic resonance imaging in differentiating intracardiac thrombi from aggregations of tumoral cells in APL, AML M3. ***(Iranian Heart Journal 2016; 17(3):46-50)***

Keywords: Right ventricle ■ Mass ■ Tumor ■ Leukemia ■ Cardiac magnetic resonance imaging

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Intracardiac masses are usually synonymous with challenge. Generally speaking, such masses are categorized into primary and secondary ones. Primary cardiac tumors are relatively rare, and about 80% of such primary tumors are benign such as myxomas and lipomas.[1] Secondary or metastatic tumors occur more commonly in the 6th and 7th decades of life. With recent advances in the treatment of primary tumors, cardiac metastases have increased.[2] Apart from the tumors of the central nervous system, every malignant tumor can metastasize to the heart. Particularly, lung and breast tumors as well as lymphomas and leukemia have been implicated in the literature.[2]

One of the most important malignancies in which intracardiac metastases have been implicated is leukemia. Cardiac infiltrates have been detected in the post-mortem examinations of about 30% of patients who died from leukemia.[2] In fact, infiltrates in

various locations such as the pericardium, myocardium, and endocardium have been noted in this entity.[2]

Acute myelogenous leukemia (AML) encompasses a group of hematologic malignancies affecting the precursor (blast) cells of the myeloid lineage. These are characterized by uncontrolled proliferation of immature blast cells mainly in the bone marrow, but also in the peripheral blood and other tissues. Through histochemical, immunological, and morphological findings, AML is classified into different types. One of these types is acute promyelocytic leukemia (APL, AML M3). This type of AML has somehow particular features that have attracted the attention of many clinicians. These include higher risks of disseminated intravascular coagulation and increased risks of coagulopathy manifested either as thrombocytopenia or thrombosis.[3]

Intracardiac tumors in APL have been reported in a limited number of case reports.[4-6] The differential diagnoses for intracardiac masses in patients diagnosed with AML include coincidental primary cardiac tumors, infective vegetations because of the malfunction of the immune system in leukemia, or formation of thrombi due to coagulation dysfunction as a result of leukemia.[4-6] A 4th possible differential may be tumoral masses as a result of the aggregation of tumoral leukemic cells inside a cardiac chamber. All these conditions are rare. In the reports indicated in the literature,[4-6] all masses were verified as thrombi resulting from APL.

Apropos the diagnosis and follow-up of such intracardiac lesions, 2D echocardiography has been a useful diagnostic method in that it can help with the diagnosis of the presence of an intracardiac mass and with its follow-up. Echocardiography can yield valuable information about the location, appearance, and mobility of such masses. However, transthoracic echocardiography (TTE) alone may not be a sufficient diagnostic tool in differentiating between metastases from a primary tumor and vegetations. Hence, transesophageal echocardiography (TEE) or other diagnostic imaging modalities and clinical observations are usually necessary.[7]

In addition to 2D echocardiography, cardiac magnetic resonance imaging (CMR) can be drawn upon to diagnose these masses.[6,8] Some studies have claimed that CMR is superior to both TTE and TEE in the detection and evaluation of cardiac masses.[1,9,10] A correct diagnosis of any of the above-mentioned conditions is, albeit difficult, crucial. Differentiating between a thrombus and a cardiac tumoral mass, based solely on echo appearance, could be challenging.

We herein report our experience regarding a patient, who had a confusing picture of an intracardiac mass, and discuss his echocardiographic findings and CMR images.

Case Presentation

The patient described here is a 24-year-old man, who presented in September 2013 to another hospital complaining of fever, chills, coughs, and hemoptysis of 10 days' duration. He had no remarkable past medical history. His temperature was 38°C, and his respiratory rate was 18/min. His conjunctivae were pale. Cardiac auscultation was normal. Lung examination showed basilar rales. For the exclusion of infective endocarditis, TTE was done at that center: It ruled out infective endocarditis but showed intracardiac masses. In the patient's complete blood count test, leukocytosis (51300/micL), anemia (hemoglobin=10.7g/dL), and thrombocytopenia (61000/micL) were observed. The patient was then referred to our tertiary medical center for further evaluation. With the clinical suspicion of hematologic malignancies, we performed bone marrow aspiration, which showed 80% blasts and abnormal promyelocytes. Based on the bone marrow studies, the diagnosis of APL, AML M3 was made.

For the evaluation of the intracardiac masses reported earlier, the patient underwent 2D TTE, which showed 2 inhomogeneous highly

mobile masses (10×13 and 6×9 mm) in the right ventricle (RV). The masses were attached to the chordae tendineae and had movements compatible with the cardiac cycle. Some densities were also observed in the RV. The left ventricular ejection fraction was 60% (Fig. 1).

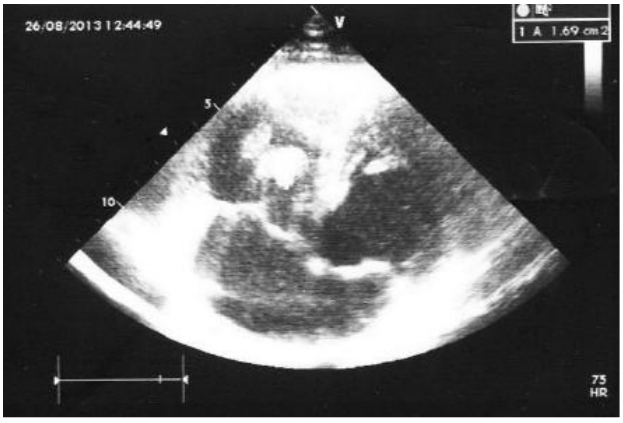

Figure 1. Parasternal right ventricular inflow view of transthoracic echocardiography shows 2 inhomogeneous highly mobile masses (10×13 and 6×9 mm) in the right ventricle attached to the chordae tendineae.

Spiral chest computed tomography scan demonstrated air space consolidation in both lower lobes with a few paratracheal lymph nodes with no pleural effusion. Lower limb and pelvic Doppler ultrasound did not demonstrate deep venous thrombosis. Since cardiac biopsy was not possible, CMR was performed: It showed 3 mobile masses (17×3, 4×4, and 6×4 mm) in the RV attached to the RV trabeculations with isosignal intensity on steady-state free precession (SSFP) sequence. There was no obvious evidence of mass invasion into the other cardiac or extracardiac structures. On T1-weighted images with fat suppression, there was no evidence of significant fat components in the masses. The mass was not enhanced with gadolinium. RV size was normal (Fig. 2).

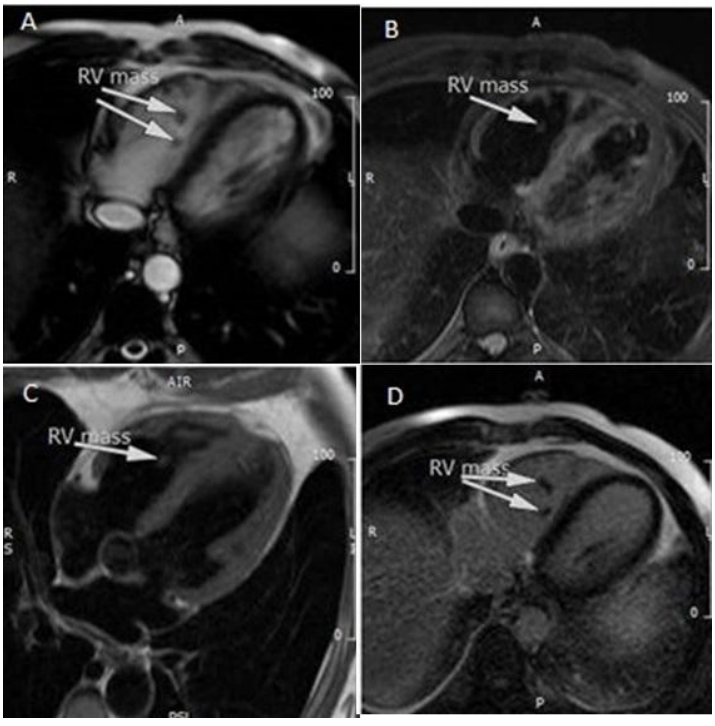

Figure 2. (A) Sine steady-state free precession (SSFP) image shows small and round mobile right ventricular (RV) masses, which are attached to the RV trabeculations. (B) Short T1 inversion recovery (STIR) image shows an RV mass with isosignal intensity. (C) T1-weighted image shows an RV mass with isosignal intensity. (D) First-pass perfusion image in the SAX plane does not show Gadolinium enhancement.

Chemotherapy with arsenic and all-trans retinoic acid (ATRA) was initiated along with warfarin. Antibiotics (vancomycin and gentamicin), started earlier for the presumptive diagnosis of infective endocarditis, were discontinued. After 1 month, repeated TTE showed a 50% decrease in the size of the mass. The chemotherapy was then continued for 4 more cycles with arsenic and hydroxyurea. Warfarin has been continued since the patient's discharge from the hospital. On the last TEE (6 months after the initial admission), the mass did not exist anymore. At the time of the compilation of this paper, the patient has no complaints and is in remission.

DISCUSSION

APL is a distinct subtype of AML. APL is characterized by a balanced chromosomal translocation between chromosomes 15 and 17, young age of the patients at the time of diagnosis, and unique response to ATRA treatment.[6] It constitutes about 15% to 20% of all cases of AML. Vegetations secondary to infections caused by defective leukocyte function, thrombus formation owing to coagulopathy seen in AML, and tumoral masses secondary to the aggregation of tumoral leukemic cells are the differential diagnoses regarding the intracardiac masses seen in patients with AML.

Here, initially, echocardiography enabled us to detect 2 intracardiac masses in the patient's RV. The approach to such masses can be challenging. First, in light of consultation with the hematology services, a diagnosis of thrombus was high on our differential list. Indeed, thrombi in APL have been reported previously in the literature, with 10% of patients with APL known to have thrombosis upon admission.[3-6] As regards our patient, however, after a long-term follow-up and in light of the CMR images, we are of the belief that that this mass was likely an aggregate of blastocysts and not a thrombus. Evidence favoring the tumoral nature of the mass secondary to AML is that the size of the tumor decreased significantly by half after the 1st month of chemotherapy. This evidence was further bolstered by CMR appearance. And as for echocardiography, in case of a mass, echo appearance will show central necrosis and peripheral calcification, whereas in case of a thrombus, echo appearance will demonstrate clot lysis—which usually starts from its periphery. Another finding that rules out a thrombus here is that we did not find deep vein thrombosis on Doppler studies. A thrombus in the right heart usually is found in the setting of embolization from a deep vein thrombosis in the pelvis or lower extremities.[4]

Cahill et al.[5] described a 29-year-old female patient, who presented with sudden-onset chest pain. Her ECG as well as cardiac biomarkers showed myocardial infarction. Echocardiogram revealed a mass at the left ventricular apex. CMR demonstrated apical scarring, suggestive of myocardial infarction as well as apical thrombi in the left ventricle and the RV. Early gadolinium image differentiated the thrombus from the myocardium. Diagnostic coronary angiography did not reveal coronary artery disease. The patient had elevated D-dimer, dropping neutrophil count, and prolonged prothrombin time and partial thromboplastin time. Based on bone marrow biopsy, the diagnosis of APL was made for the patient. CMR of the patient showed that the mass was isointense to the myocardium. The patient received ATRA and idarubicin chemotherapy and remained in remission at the last follow-up after 2 months. Repeated CMR showed a reduction but not the resolution of the cardiac thrombus.

Potenza et al.[6] described a 22-year-old male patient, who presented with the initial complaint of palpitation. 2D echocardiography showed a mobile heterogeneous bilobate mass in the RV. CMR demonstrated a mass with heterogeneous signal intensity on T1-weighted images with no contrast enhancement. With leukopenia found on laboratory investigations, bone

marrow biopsy was done and it demonstrated 90% blasts. With the diagnosis of APL, ATRA was ordered for the patient. Then, after the recovery of the bone marrow, the mass was removed surgically. Histological examination showed amorphous eosinophilic material with inflammatory cells, consistent with thrombosis as a result of APL. The patient remained in remission until the last follow-up.

To the best of our knowledge, our report of an APL patient with a tumoral mass—as demonstrated by CMR and echocardiography—is the 1st of its kind in the literature. Our report highlights not only the importance of the correct diagnosis of such masses with the use of CMR but also the advantages of CMR over 2D echocardiography. Echocardiography was not sufficiently informative in differentiating the thrombus from the aggregation of tumoral cells. It can be concluded that when faced with a patient diagnosed with APL, clinicians can draw upon CMR as a useful method to differentiate between thrombi and tumoral masses.

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