The Differentiation of Giant Right Atrial Myxoma from Metastatic Cancer with the Use of Multiple Imaging Modalities

Keisuke Nakabayashi, Satoru Murata, Hiroko Kato and Toshiaki Oka

Abstract

Whether a cardiac tumor is primary or metastatic strongly influences the therapeutic strategy. We herein present a case of a cardiac tumor that occupied most of the right atrium which required immediate treatment in a patient with breast cancer. Multiple imaging modalities, especially computed tomography and cardiac magnetic resonance imaging, provided a precise preoperative diagnosis. We performed cardiac surgery prior to breast cancer surgery because the cardiac tumor was thought to be a myxoma rather than a metastatic cancer.

Key words: cardiac tumor, atrial myxoma, metastasis, computed tomography, cardiac magnetic resonance imaging

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Introduction

Cardiac tumors are relatively rare. Whether they are primary or metastatic strongly influences the therapeutic strategy. Primary tumors are often surgically treated, whereas metastatic tumors are often treated via chemotherapy. Therefore, when a cardiac tumor is encountered, physicians should first determine whether it is primary or metastatic. We herein present the case of a woman with a giant right atrial myxoma that occupied most of the right atrium which required immediate treatment. This case was complicated by co-existing breast cancer.

Case Report

A 64-year-old asymptomatic woman with breast cancer was referred to our institution. She had no past medical history of note. Her heart rate was 95 bpm, and her blood pressure was 90/60 mmHg. An electrocardiogram, chest X-ray, and laboratory tests revealed no abnormal findings. Chest contrast computed tomography (CT) to detect metastasis incidentally revealed a mass occupying most of the right atrium (Fig. 1). Axial plane CT suggested the presence of calcification and bleeding (Fig. 1A). We suspected a large myxoma because the mass was spherical and well-demarcated, but could not rule out the possibility of metastatic cancer. Treatment strategies for primary and metastatic cancers differ substantially. We therefore employed additional modalities to distinguish between these possibilities.

Transesophageal echocardiography showed a large well-demarcated mass with a neck from the atrial septum (Fig. 2, upper image). Inflow to the right ventricle was observed on both sides of the mass (Fig. 2, lower image). Cardiac magnetic resonance imaging (CMR) revealed an isointense signal in T1-weighted images, a heterogeneous hyperintense signal in T2-weighted images (Fig. 3, left and upper right images, respectively). No jet was observed on cine magnetic resonance imaging using the gradient echo technique (Fig. 3, lower right image), and no enhancement was observed in perfusion images. Angiography showed feeding arteries (Fig. 4). These findings supported a diagnosis of atrial myxoma.

Although the patient’s hemodynamics were stable, there was a risk of sudden deterioration; cardiac surgery was therefore a higher priority than breast cancer surgery. We
Figure 1. Computed tomography. A: The axial view of the plane. B: The axial view with contrast. C: The coronal view with contrast. D: The sagittal view with contrast. The asterisks indicate a large myxoma occupying most of the right atrium. The white arrow indicates bleeding, and the black arrows indicate calcification.

Figure 2. Upper panel: A transthoracic echocardiogram, subcostal approach, shows a giant right atrial myxoma of 63×42mm in size. Lower panel: A transesophageal echocardiogram shows inflow to the right ventricle observed on both sides of the mass. The asterisks indicate a large myxoma occupying most of the right atrium.

performed a right atrial mass excision and pericardial patch implantation without complication 3 days after CT. Myxoma was pathologically diagnosed based on the findings of myxomatous interstitium, calcification, and severe bleeding (Fig. 5).

Discussion

Importantly, this case shows that CT and CMR are powerful tools for determining the timing of surgical intervention and whether a cardiac tumor is primary or metastatic.

Metastatic cardiac tumors are diagnosed approximately 40 times more frequently than primary cardiac tumors; more than 70% of the latter are benign (1, 2). The therapeutic strategy often depends on the diagnosis, which is determined via imaging. Myxoma is not usually difficult to diagnose. Transthoracic and transesophageal echocardiography are useful for the diagnosis of suspected myxoma and for assessing a patient’s hemodynamics. However, a definitive diagnosis of myxoma is needed in patients with additional malignancies, such as the patient of the present case, and contrast CT and CMR are very helpful in this regard (3-6). Features of malignant tumors visualized via CT include lymphadenopathy, pericardial effusion, the thickening of the myocardium, and the enhancement of the adjacent pericardium. The features of malignant tumors visualized via CMR include the infiltration of the myocardium and wall motion asynergy. The mass appears hypointense during first-pass perfusion and shows late gadolinium enhancement (7). On the other
hand, in contrast CT, the overall attenuation of most myxomas is lower than that of the myocardium; a few cases exhibit equivalent attenuation, but none have higher attenuation, with the exception of cases with calcification. In CMR, the signal intensity of 90% of myxomas is heterogeneous; in T1-weighted images, it is isointense and hyperintense in 79% and 14% of myxomas, respectively (8). These features are applicable to the present case.

Myxoma, the most common type of primary cardiac tumor, accounts for 30-50% of all primary tumors of the heart (9). Most myxomas occur in the left atrium; 20-28% originate in the right atrium (10). The clinical manifestations of right atrial myxoma mainly result from tricuspid valve stenosis and pulmonary embolism. The former limits cardiac output and causes systemic venous congestion without pulmonary congestion, while the latter produces dyspnea and pulmonary hypertension causing right heart failure. Although the present case was asymptomatic, and cine magnetic resonance imaging indicated that the mass had not adhered to the tricuspid valve, we could not predict sudden progression. Immediate surgery was therefore performed according to a previously published procedure (11).

The diagnosis of cardiac tumors with malignant potential
is challenging, and the differentiation of primary and metastatic tumors is essential. The use of multiple imaging modalities allowed for the diagnosis of the cardiac tumor in the present case, indicating the possibility of a precise preoperative diagnosis. Immediate surgery is important in cases in which a large mass might obstruct the atrioventricular valves.

The authors state that they have no Conflict of Interest (COI).

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References
1. Lam KY, Dickens P, Chan AC. Tumors of the heart. A 20-year experience with a review of 12,485 consecutive autopsies. Arch Pathol Lab Med 117: 1027-1031, 1993.
2. Roberts WC. Primary and secondary neoplasms of the heart. Am J Cardiol 80: 671-682, 1997.
3. Randhawa K, Ganeshan A, Hoet ET. Magnetic resonance imaging of cardiac tumors: part 1, sequences, protocols, and benign tumors. Curr Probl Diagn Radiol 40: 158-168, 2011.
4. Kassop D, Donovan MS, Cheezum MK, et al. Cardiac masses on cardiac CT: A review. Curr Cardiovasc Imaging Rep 7: 9281, 2014.
5. Restrepo CS, Largoza A, Lemos DF, et al. CT and MR imaging findings of malignant cardiac tumors. Curr Probl Diagn Radiol 34: 11-11, 2005.
6. Masui T, Takahashi M, Miura K, Naito M, Tawarahara K. Cardiac myxoma: identification of intratumoral hemorrhage and calcification on MR images. AJR Am J Roentgenol 164: 850-852, 1995.
7. Schawkat K, Hoksch B, Schwerzmann M, Puig S, Klink T. Diagnosis of cardiac metastasis from cervical cancer in a 33-year-old patient using multimodal imaging studies: a case report and literature review. Acta Radiol Short Rep 3 (in press).
8. McManus B. Primary Tumors of the heart. In: Braunwald’s Heart Disease. 9th ed. Bonow RO, Mann DL, Zipes DP, et al, Eds. Elsevier Saunders, Philadelphia, 2012: 1638-1650.
9. Burke A, Virmani R. Tumors of the Heart and Great Vessels. Atlas of Tumor Pathology. 3rd Series, Fascicle 16. Armed Forces Institute of Pathology, Washington, DC, 1996.
10. O’Donnell DH, Abbbara S, Chaitiraphan V, et al. Cardiac tumors: optimal cardiac MR sequences and spectrum of imaging appearances. AJR Am J Roentgenol 193: 377-387, 2009.
11. Tiraboschi R, Terzi A, Merlo M, Procopio A. Left atrial myxoma. Clinical and surgical features in 26 surgically treated cases. Ital Heart J Suppl 1: 797-802, 2000 (in Italian, Abstract in English).