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Case Study

Multimodal Advanced Imaging Assessment of Atypical Presentation of Cardiac Myxoma with Incidental Pulmonary Finding: A Case Report

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ABSTRACT

Cardiac myxomas are benign tumors representing approximately 50% of all benign cardiac neoplasms. However, atypical presentations with unusual imaging characteristics and incidental findings remain diagnostically challenging. This case report presents a unique instance of cardiac myxoma with unusual superior vena cava involvement and concurrent pulmonary findings detected through multimodal imaging integration. A 62-year-old female presented with nonspecific constitutional symptoms initially misinterpreted as thromboembolic disease. Comprehensive multimodal imaging including transthoracic echocardiography (TTE), computed tomography (CT), and cardiac magnetic resonance (CMR) imaging with advanced diffusion-weighted imaging (DWI) sequences revealed the diagnosis. This case demonstrates the critical value of multimodal imaging correlation, standardized reporting using RECIST 1.1 criteria for lesion characterization, and the importance of recognizing incidental findings that may impact overall patient management. We discuss the diagnostic pearls, imaging pitfalls, and novel quantitative imaging parameters that enhanced diagnostic confidence. This case contributes to the growing literature on atypical cardiac presentations and provides practical guidance for radiologists encountering complex cardiac masses.

Keywords: Cardiac Myxoma, Multimodal Imaging, Diffusion-Weighted Imaging, Cardiac MRI,

INTRODUCTION

Primary cardiac tumors are rare, with reported autopsy incidences ranging from 0.02% to 0.3% in the general population. [1] Among these, cardiac myxomas represent the most common benign neoplasm, accounting for approximately half of benign cardiac tumors and a small fraction of all cardiac masses. [2] Although myxomas classically arise from the interatrial septum of the left atrium, atypical locations and unusual growth patterns are occasionally encountered and may complicate diagnosis. [3] Conventional diagnostic evaluation of cardiac masses has historically relied on transthoracic echocardiography (TTE), supplemented by invasive angiography in selected cases. However, recent advances in cross-sectional and functional imaging have significantly expanded diagnostic capabilities. High-resolution cardiac computed tomography (CT) and cardiac magnetic resonance (CMR) imaging now allow comprehensive assessment of cardiac tumors, combining morphological evaluation with quantitative tissue characterization. [4] Techniques such as T1 and T2 mapping, diffusion-weighted imaging (DWI), extracellular volume (ECV) quantification, and late gadolinium enhancement (LGE) provide insight into tissue composition beyond conventional contrast enhancement patterns. [5] This report describes an unusual case of cardiac myxoma arising in the right atrium with extension into the superior vena cava (SVC), an exceptionally rare anatomical presentation. The case is further distinguished by the incidental detection of a pulmonary nodule on cardiac CT, highlighting the importance of systematic image review and standardized management of secondary findings. The

case illustrates the clinical value of an integrated multimodal imaging approach in achieving accurate diagnosis, guiding management, and improving diagnostic confidence beyond traditional morphological criteria. [6]

CASE PRESENTATION

A 62-year-old postmenopausal woman presented with a three-week history of progressive fatigue, low-grade fever, exertional dyspnea (New York Heart Association class II), intermittent palpitations, and unintentional weight loss of approximately 2.2 kg. She denied chest pain, orthopnea, or syncope. Her medical history included well-controlled hypertension and hyperlipidemia, managed with amlodipine and atorvastatin, respectively. There was no history of malignancy, thromboembolic disease, or prior cardiac surgery. Laboratory evaluation revealed mildly elevated inflammatory markers, including erythrocyte sedimentation rate (34 mm/h) and C-reactive protein (8.2 mg/L), along with mild normocytic anemia (hemoglobin 11.8 g/dL). Cardiac enzymes, renal function, and coagulation parameters were within normal limits. Given the constitutional symptoms and dyspnea, differential considerations included infective endocarditis, intracardiac thrombus, and occult malignancy, prompting urgent cardiac imaging.

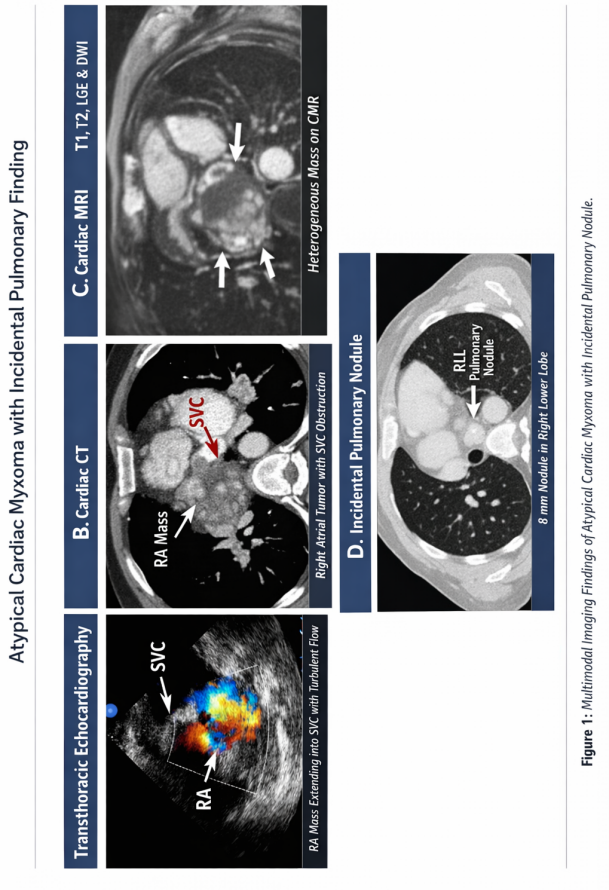

Figure 1: *Multimodal Imaging Findings of Atypical Cardiac Myxoma with Incidental Pulmonary Nodule.*

IMAGING FINDINGS

Transthoracic Echocardiography: Initial TTE revealed a large, heterogeneous, mobile mass measuring approximately 4.2 × 3.8 cm within the right atrium, extending into the superior vena cava and producing significant luminal narrowing. The mass exhibited variable echogenicity with internal echolucent areas. Color Doppler imaging demonstrated turbulent flow across the narrowed SVC. Left ventricular systolic function was preserved (ejection fraction 62%), while tissue Doppler imaging suggested right ventricular strain secondary to venous obstruction.

Cardiac Computed Tomography: Electrocardiography-gated cardiac CT demonstrated a well-defined, lobulated mass within the right atrium and proximal SVC, measuring 4.3 × 4.0 × 3.9 cm. The lesion showed predominantly low attenuation (18–32 HU) with focal areas of higher attenuation, suggestive of hemorrhagic or proteinaceous components. Post-contrast imaging revealed heterogeneous enhancement with persistent venous-phase attenuation, favoring a vascularized neoplasm rather than thrombus. The SVC lumen was narrowed to approximately 6 mm, consistent with functionally significant obstruction. An incidental, non-enhancing pulmonary nodule measuring 8 mm was identified in the right lower lobe. The nodule demonstrated smooth margins and lacked suspicious morphological features.

Cardiac Magnetic Resonance Imaging: Comprehensive CMR confirmed a heterogeneous right atrial mass with partial attachment to the interatrial septum and extension into the SVC. Quantitative tissue characterization revealed elevated native T1 (1120 ± 85 ms) and T2 (67 ± 12 ms) relaxation times compared with normal myocardium, consistent with myxoid composition. The calculated ECV fraction was markedly increased (0.68), reflecting extensive extracellular matrix expansion. DWI demonstrated intermediate diffusion restriction with an apparent diffusion coefficient of $1.2 \pm 0.2 \times 10^{-3}$ mm²/s, consistent with benign myxoid tumors. LGE imaging showed heterogeneous peripheral enhancement with central non-enhancing areas corresponding to myxoid degeneration. First-pass perfusion imaging demonstrated heterogeneous enhancement without evidence of myocardial ischemia. Biventricular systolic function was preserved, although diastolic dysfunction related to elevated right atrial pressure was observed.

Differential Diagnosis: The multimodal imaging profile favored cardiac myxoma over alternative diagnoses. The presence of heterogeneous enhancement, elevated T1/T2 values, markedly increased ECV, and intermediate ADC values excluded thrombus, lipoma, fibroma, and malignant cardiac tumors. The anatomical attachment

and clinical presentation further supported the diagnosis of myxoma.

DISCUSSION

Myxomas are benign tumors of mesenchymal origin characterized by a myxoid extracellular matrix and variable cellularity. Although left atrial involvement is typical, right atrial and SVC extension is rare and may lead to atypical presentations such as venous obstruction and constitutional symptoms. The patient's clinical features were likely mediated by both mechanical obstruction and inflammatory cytokine release. Advanced CMR techniques played a pivotal role in this case by providing quantitative tissue characterization that enhanced diagnostic confidence. Elevated T1 and T2 values, high ECV fraction, and intermediate diffusion restriction represent characteristic imaging biomarkers of myxoid tumors. These findings illustrate the advantage of CMR over conventional imaging in differentiating benign from malignant cardiac masses. The incidental pulmonary nodule underscores the importance of comprehensive image review during cardiac CT interpretation. Application of Fleischner Society guidelines allowed appropriate risk stratification and follow-up planning, avoiding unnecessary intervention while ensuring patient safety.

CONCLUSION

This case highlights an atypical presentation of cardiac myxoma involving the right atrium and superior vena cava, diagnosed through an integrated multimodal imaging approach. Advanced CMR tissue characterization techniques, combined with CT and echocardiography, enabled accurate diagnosis, exclusion of critical differentials, and effective surgical planning. The case also emphasizes the importance of standardized management of incidental findings in cardiovascular imaging. Systematic multimodal assessment should be considered essential in the evaluation of complex cardiac masses to optimize diagnostic accuracy and patient outcomes.

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