

Bi-atrial cardiac myxoma with glandular differentiation: a case report with detailed radiologic-pathologic correlation

Nir Flint^{1,2*}, Robert J. Siegel¹, Serguei Bannykh³, and Daniel J. Luthringer³

¹Heart Institute, Cedars-Sinai Medical Center, 127 S San Vicente Blvd, Los Angeles, CA 90048, USA; ²Department of Cardiology, Tel-Aviv Sourasky Medical Center affiliated to the Sackler Faculty of Medicine, Tel-Aviv University, 6 Weizmann st., Tel-Aviv 6423906, Israel; and ³Department of Pathology, Cedars-Sinai Medical Center, Los Angeles, CA, USA

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Introduction

Myxoma is the most common cardiac benign tumour. While a typical myxoma is generally a straightforward diagnosis, some myxomas have unusual features that can make the diagnosis challenging. Glandular myxomas and metastatic adenocarcinomas, the most common type of metastatic carcinoma to the heart, can have very similar features.

Case presentation

We report a 60-year old man who presented with progressive shortness of breath on exertion. Echocardiography demonstrated a large heterogeneous, cystic left and right atrial mass. He was referred for surgery where a smooth and multilobulated left atrial mass was excised. Histopathological analysis with special stains revealed an unusual form of cardiac myxoma with extensive glandular differentiation.

Discussion

Cardiac myxomas can present with diverse clinical, radiological, and pathological features. Echocardiography is a modality of choice for diagnosis but can also miss small or multiple masses. Cardiac myxoma with glandular features is a rare type of myxoma. In our case, there was extensive glandular differentiation and the echocardiographic appearance provided clues for the unusual features of the tumour, suggesting a potential role for echocardiography in the detection and recognition of this morphologic histologic variation.

Keywords

Case report • Cardiac myxoma • Glandular myxoma • Echocardiography

Learning points

- Cardiac myxoma is the most common primary tumour of the heart.
- Myxomas most commonly originate from the left atrium (75%) but occasionally can grow into the right atrium or both atria.
- Large atrial myxomas can obstruct the mitral valve resulting in various degrees of functional mitral stenosis.
- Echocardiography is the cornerstone of diagnosing cardiac myxomas. CT and MRI can further characterize the tissue composition of the tumour.
- Cardiac myxomas can have unusual morphologic features which can complicate diagnosis.
- Glandular myxoma is a rare sub-type of cardiac myxoma that accounts for less than 5% of all myxomas. It can have a distinctive echocardiographic and pathological appearance.
- It is important to recognize the glandular components as part of the unusual histologic variations of myxoma, and not mistake them for mucin-secreting adenocarcinoma, which is one of the most common metastatic malignancies to the heart.

* Corresponding author. Tel: +1 310 423 3849, Fax: +1 310 423 4627, Email: nir.flint@cshs.org. This case report was reviewed by Hajnalka Vágó and Christian Jøns.

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Introduction

Cardiac myxoma is the most common primary tumour of the heart and accounts for half of all benign cardiac neoplasms.¹ Myxomas arise most commonly from the left atrium, specifically from the border of the fossa ovalis. Clinically myxoma usually presents with systemic embolism, obstruction of the mitral valve inflow, and/or constitutional symptoms.²

In 2–5% of myxomas, areas of glandular differentiation are found. When present, this unusual morphologic variation typically involves only a small component of the tumour volume.^{1,3,4} Awareness that myxomas may have glandular features is important to prevent a misdiagnosis of a cardiac metastases of adenocarcinoma.⁵

Cardiac echocardiography is a sensitive methodology to detect atrial myxoma, and provide accurate information regarding the tumour's appearance, composition, mobility, size, and location. Herein, we report a case of multifocal atrial myxoma which had very prominent glandular differentiation, in which the echocardiogram showed a heterogeneous and lobular appearance that correlated with the histopathology.

Timeline

Day	Events
1	Patient first notices shortness of breath with exertion.
45	A chest X-ray suggests pneumonia consequently treated with antibiotics.
53	Brief syncopal episode.
60	Presents to the cardiology clinic with progressive dyspnoea on exertion. Transthoracic echocardiography reveals an obstructive mass located at the left atrium. Another mass is seen at the right atrium.
63	Hospitalized for emergent surgery. Coronary angiography is performed demonstrating a 2-vessel disease.
64	Patient undergoes surgery with excision of a left and right atrial myxoma, extensive reconstruction of the intra-atrial septum, and right atrial wall and a single coronary bypass. Histopathology confirms myxoma with glandular features.
74	Patient is discharged home.
Follow-up (2 months post-operative)	Seen in outpatient clinic. Feels well overall. Electrocardiogram in sinus rhythm.

Case presentation

A 60-year old man with a past medical history of hypertension, presented with 3-months of progressive dyspnoea on exertion. He had no known cardiac history. Based on his complaints and abnormal

chest X-ray, he was treated with ciprofloxacin for pneumonia. However, his symptoms were nonetheless becoming progressively worse. In addition, he began to have dizziness and worsening shortness of breath with minimal exertion. He reported three separate occasions of briefly losing consciousness after exertion, from which he awoke abruptly. A transthoracic echocardiography (TTE) performed at an outside institution revealed a left atrial mass.

On examination, he was afebrile with a blood pressure of 100/60 mmHg and a regular pulse rate of 81 beats per minute. Room air oxygen saturation was 93%. There were no signs of distress; the lungs were clear; no murmur or friction was audible over the heart. There were no overt signs of heart failure.

An electrocardiogram (ECG) revealed normal sinus rhythm with T wave inversions in the anterior precordial leads. Chest X-ray showed vascular congestion and small bilateral effusions blunting the costophrenic angles consistent with congestive heart failure. Laboratory findings included normocytic anaemia with haemoglobin level of 11.6 g/dL (normal 14–18), a thrombocytosis of 524 000/UL (normal 150 000–500 000), and normal white cell count. Serum creatinine was 1.4 mg/dL (normal 0.7–1.2), troponin I level was 0.24 ng/mL (normal <0.04), and B-type natriuretic peptide level was 1340 pg/mL (normal <100).

As shown in *Figure 1*, a transoesophageal echocardiography (TOE) revealed a large (3.4 cm × 4.5 cm) lobulated mass in the left atrium adherent to the intra-atrial septum, and another smaller mass in the right atrium, both highly suggestive for atrial myxoma. However, as seen in *Figure 2* (arrows) the mass consisted of multiple echo-lucent areas compatible with cystic elements inside the tumour. During diastole, the mass prolapsed from the left atrium into the mitral valve orifice creating severe functional mitral stenosis with a mean gradient of 11.6 mmHg across the mitral valve ([Supplementary material online, Video S1](#)). Left ventricular ejection fraction was mildly reduced (45%).

The patient was promptly referred to cardiothoracic surgery, and he was hospitalized for an emergent surgery. Upon his admission, he developed rapid atrial fibrillation. Preoperative coronary angiography revealed a 60% stenosis of the proximal left anterior descending (LAD) artery which was found to be haemodynamically significant by fractional flow reserve (FFR).

The patient underwent robotic-assisted surgical excision of the atrial masses. After a standard median sternotomy, cardiopulmonary bypass was obtained, and the left atrium was approached. The mass was close to the mitral valve but arising from the superior and medial aspects of the atrial septum with a broad base, so wide excision of the atrial septum was necessary to excise the tumour. Once the left atrial mass was removed, the right atrium was opened, and another separate mass was noted, occupying the entire septum anteriorly all the way to the orifice of the coronary sinus. This second mass also required a wide excision afterwards the intra-atrial septum and the right atrial wall had to be reconstructed using bovine pericardium patches. A single coronary artery bypass grafting to the LAD was performed. The patient tolerated the procedure well.

On gross pathology, the excised tumours measured 4.5 and 4.0 cm, had a smooth and multilobulated surface with a white colour and gelatinous texture (*Figure 3A*). Microscopically, the tumours consisted mostly of conventional myxoma histology, characterized by classic stellate and fusiform myxoma cells in myxoid stroma (*Figure 3D*). A

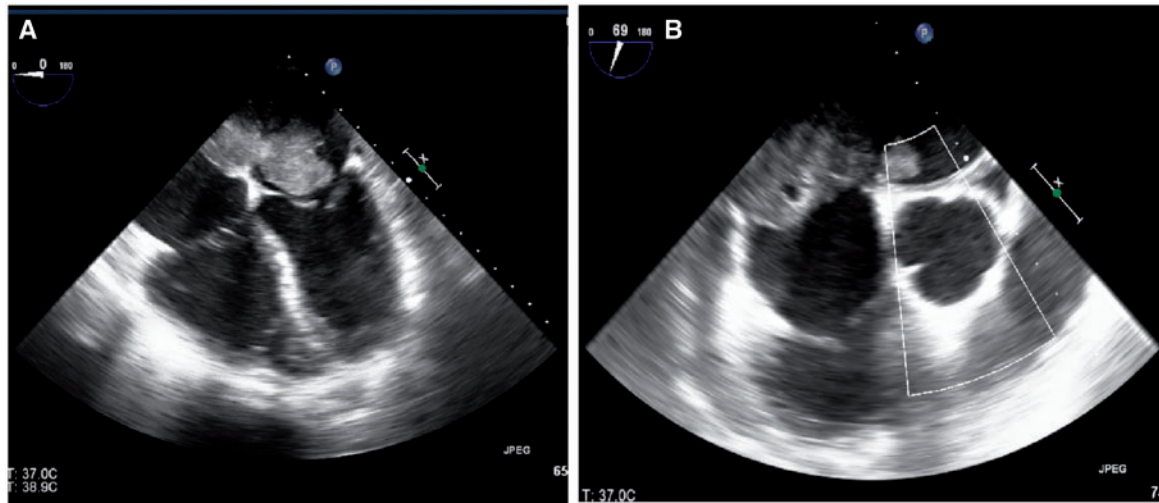


Figure 1 Transoesophageal echocardiography showing both left (A) and right (B) atrial mass.

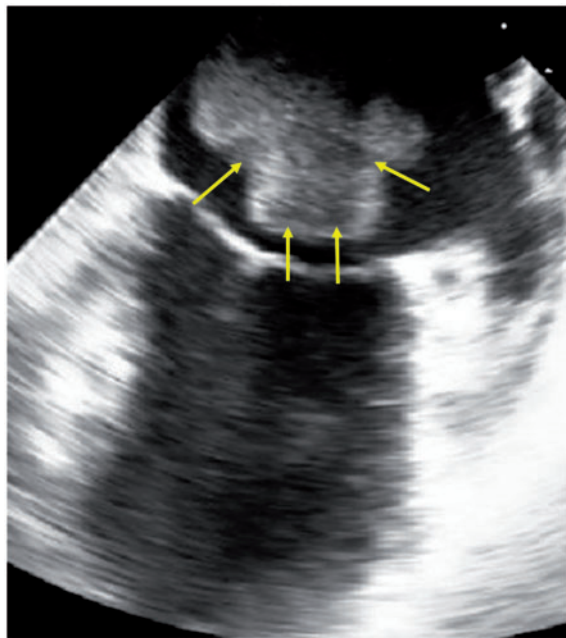


Figure 2 Multiple echo-lucent areas inside the left atrial mass.

significant amount of each tumour volume (~20%) showed evidence of glandular differentiation that manifest through formation of small and large cystic glandular elements measuring up to 1.4 cm (Figure 3B and C). The content of the glands was mucin which was confirmed using special studies. No cytologic atypia or mitotic activity was found.

The post-operative period was uneventful. The atrial fibrillation resolved spontaneously. On post-operative echocardiography, the left atrium appeared normal, and there was no obstruction of mitral inflow. There was no transit of agitated saline bubbles across the

septum. The patient was discharged home on the 10th post-operative day. Two-months post-operatively, the patient was feeling well.

Discussion

Cardiac myxomas represent the most frequent benign primary tumour of the heart.⁶ This tumour is thought to arise from multipotent mesenchymal cells of the endocardium in the region of the fossa ovalis that can differentiate into endothelial cells, smooth muscle cells and fibroblasts among other lineages.⁷ Cardiac myxoma occurs most frequently during the 3rd to 6th decades of life, with an average age at presentation of 50 years, and occurs more often in females than in males.^{1,2,8} 75% of myxomas arise from the intra-atrial septum into the left atrium, 20% arise into the right atrium, and the remainder originate from the ventricles. Rarely, as in this case, myxomas can grow into both atria.^{1,2} The clinical manifestations of cardiac myxoma is highly variable and is determined by tumour size, mobility, location, and consistency, among other factors.

Echocardiography is a sensitive methodology for detection of cardiac myxomas and provides accurate information about its features. Multiple myxomas can be missed, especially if the echocardiographer is engaged in the more prominent tumour.⁹ As in our case, when internal irregularities, heterogeneity or cystic areas are identified, the differential diagnosis of glandular differentiation must be considered as well as areas of necrosis or haemorrhage. Both computed tomography (CT) and magnetic resonance imaging (MRI) can provide important tissue specific information that can help differentiate myxomas from other intracavitary cardiac masses such as thrombi and vegetations.¹⁰

Glandular differentiation in cardiac myxoma is a rare morphologic variant that is found in less than 5% of all tumours, with fewer than 50 cases reported. It is characterized by well-formed glandular structures lined by columnar cells with variable mucin-secreting goblet cells that typically involve much less than 15% of the tumour mass.^{5,11} It is important to recognize the glandular components as part of the unusual histologic variations of myxoma, and not mistake them for mucinous

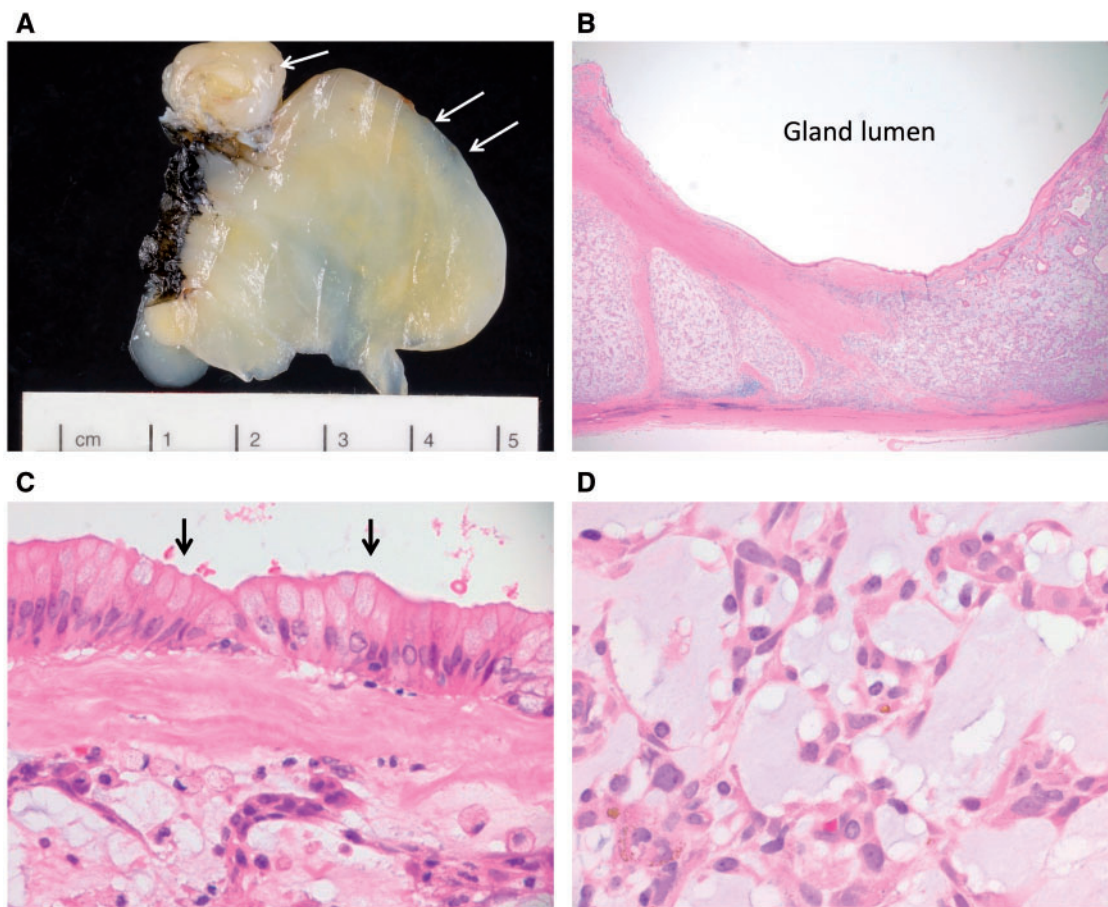


Figure 3 Gross photo of atrial myxoma (A), with typical myxoid, gelatinous appearance on cut surface. Arrows indicate cystic areas filled with mucin, which measure up to 12 mm in greatest dimension, corresponding to glandular differentiation. Low power microscopy (B) highlights typical myxoma (bottom) with cystic glandular differentiation (top). Higher magnification (C) highlights the columnar and mucin-secreting epithelium (black arrows). Typical myxoma cells with myxoid stroma with haemosiderin (D).

adenocarcinoma, which is one of the most common metastatic malignancies to the heart. This is specifically relevant in patients who have a history of adenocarcinoma. The lack of cytologic atypia, mitotic activity, and necrosis are clues to distinguish myxoma from adenocarcinoma. Glandular myxomas typically have a benign course with a low rate of recurrence, yet both recurrence and metastasis have been described and long-term surveillance with echocardiography is warranted.^{11–13}

In summary, this is an unusual case of cardiac myxoma involving both atria, with an exuberant component of the rare glandular morphologic variation that was identified on clinical imaging studies. This case highlights the many faces of cardiac myxomas, and the utility of echocardiography in its detection and recognition.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and

associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

Author Contributions: N.F and S.B were involved in collecting data and writing of this manuscript. R.J.S and D.J.L were involved in the management of the case and were the senior authors of the manuscript.

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