

## First case of cardiac amyloidosis presenting as right atrial mass

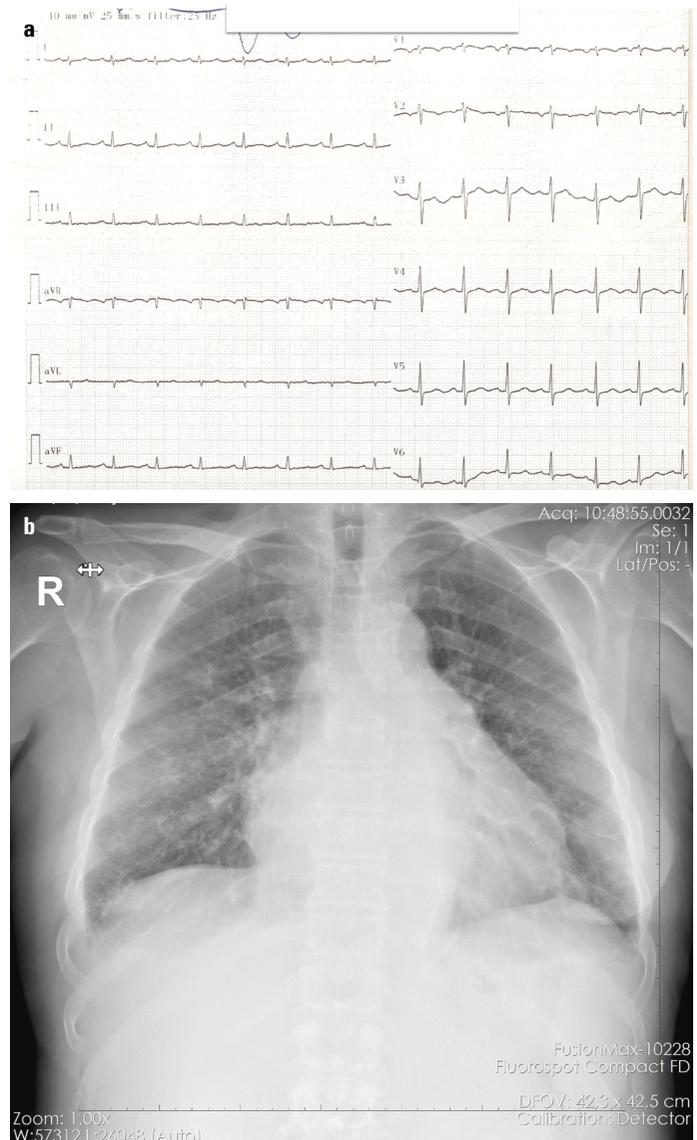
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### Introduction

Intracardiac masses can be encountered during the evaluation of patients with cardiac symptoms; myxoma, primary and metastatic neoplasms, thrombus, and vegetation should be considered in the differential diagnosis in such cases. Intracardiac masses can cause symptoms such as embolization, heart failure, valvular regurgitation, arrhythmia, and pericardial effusion. Although some of the symptoms may overlap, cardiac amyloidosis (CA) is not an expected diagnosis when investigating an intracavitary mass. Different from the previously reported cases, we report the case of a patient with CA who presented with a unique right atrial mass.

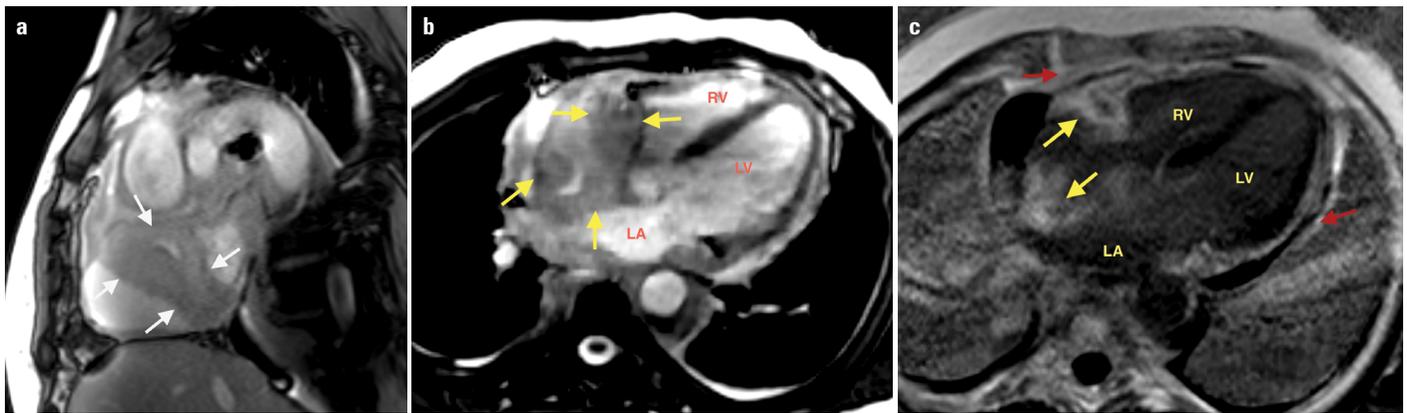
### Case Report

A 62-year-old man with diabetes mellitus was admitted to our clinic with lower limb edema, shortness of breath, and fatigue. His electrocardiogram (ECG) and chest radiogram did not show any specific signs (Fig. 1a, 1b); thus, transthoracic echocardiography (TTE) was performed, and it showed minimal pericardial effusion, mild tricuspid regurgitation, and paradoxical movement of the interventricular septum. His medical history included undergoing right heart catheterization and pericardiocentesis thrice, suggesting constrictive pericarditis (CP). His blood tests showed no remarkable abnormality except mild hypochromic microcytic anemia (12.4 g/dL). Subsequently, right and left heart catheterizations were planned to resolve his symptoms. Right heart catheterization confirmed the diagnosis of CP, for which the patient was followed up with medical therapy. Furthermore, a coronary stent was implanted in the left anterior descending coronary artery because of significant stenosis. Seven months later, the patient was admitted to our hospital due to atrial fibrillation with low ventricular rate accompanied by dizziness. Surprisingly, his TTE showed a new intracardiac mass attached to the bottom of the right atrium. Transesophageal echocardiography (TEE) was performed, but it could not detailing the mass (Videos 1-6). Thereafter, cardiac magnetic



**Figure 1.** (a) The patient's electrocardiogram showed sinus rhythm without low-voltage QRS or pseudoinfarction pattern. (b) The chest radiogram displayed mildly increased cardiothoracic ratio

resonance (CMR) imaging was performed. It demonstrated an intracardiac mass with extensive gadolinium enhancement, suggesting an infiltrative disease, but did not indicate a specific diagnosis (Fig. 2a-2c). Thus, we performed a TEE-guided percutaneous endomyocardial biopsy targeting the masses under fluoroscopy and taking samples from both the masses separately. Microscopic examination of six different biopsy samples led to a diagnosis of CA due to apple-green birefringence with Congo red stain under polarized light microscopy. Pathological diagnosis was AA-negative amyloid. Hematological test and bone marrow biopsy results led to the exclusion of the diagnosis of AL amyloid. The patient discontinued visiting the outpatient clinic during follow-up when the amyloidosis subtype was being investigated.



**Figure 2.** (a) Short axis GE (gradient echo) T2-weighted image shows a peripheral mass measuring 2–2.6 mm in thickness in the right atrium and atrial septum (white arrows). (b) Four-chamber GE T2-weighted image shows a peripheral mass comprising two separate parts (yellow arrows). Pericardial fluid and pericardial thickening were also observed. (c) Late gadolinium contrast-enhanced four-chamber image shows significant enhancement in the mass (yellow arrows) and both layers of the pericardium (red arrows)  
LA - left atrium, LV - left ventricle, RV - right ventricle

## Discussion

To the best of our knowledge, this is the first case of CA presenting as a solitary mass. The differential diagnosis of a right atrial mass should include vegetation, thrombus, myxoma, and cardiac neoplasms. The most common tumors of the right atrium are myxomas; they usually present on a stalk or attached to the interatrial septum (1). If the mass is layered against the wall of the atrium, a thrombus should be considered, especially in patients with central venous catheters or increased atrial size. If the mass invades the myocardium, initial diagnosis is a cardiac tumor. Vegetations are commonly located on the heart valves accompanying an infectious condition.

CA, which is usually not considered in the differential diagnosis of an intracavitary mass, can exhibit pericardial effusion, myocardial hypertrophy, granular sparkling pattern, or atrial dilatation on TTE images. Furthermore, diffuse subendocardial gadolinium enhancement, which appears in the late stages of the disease, can be seen on CMR imaging (2).

Patients with CA often present with shortness of breath, peripheral edema, and fatigue (2). General low-voltage or pseudoinfarction pattern on ECG is a commonly encountered sign that may not be detected in all cases, as in our patient (3). CA can be diagnosed via endomyocardial biopsy or imaging evidence of the heart signing to amyloidosis in the presence of histologic evidence of amyloid on another tissue (4).

CA occurs as a result of primarily three types of amyloidoses (5). AL amyloid is caused by monoclonal gammopathy; hereditary form appears as a result of a mutation in transthyretin protein, and senile amyloid is caused by wild-type transthyretin (6). Identification of the subtype is essential for deciding the therapeutic approach. The management of AL amyloidosis includes chemotherapy and stem cell transplantation; the hereditary form can be cured with liver transplantation, and the treatment of senile amyloidosis comprises supportive care (2).

## Conclusion

The diagnosis of CA can be overlooked because of its non-specific clinical presentation. Clinical suspicion is crucial for early recognition, as clinical outcomes are poor with late diagnosis. Therefore, physicians should be familiar with atypical presentations of CA such as an intracardiac mass.

**Informed consent:** An informed consent was obtained from the patient by phone.

**Video 1.** 0-degree four-chamber view showing no myocardial hypertrophy

LA - left atrium, LV - left ventricle, RA - right atrium, RV - right ventricle

**Video 2.** 0-degree deformed view displaying a mass attached to the bottom of the right atrium and localized pericardial effusion near the right atrium

M - mass, PE - pericardial effusion, RA - right atrium, RV - right ventricle

**Video 3.** 66-degree view exhibiting two separate mass in the right atrium

M - Mass, RA - right atrium

**Video 4.** 115-degree bicaval view exhibiting the mass comprising two separate parts

M - Mass, RA - right atrium, SVC - superior vena cava

**Video 5.** 115-degree bicaval view showing intermittent occlusion of the entrance of superior vena cava

M - Mass, RA - right atrium, SVC - superior vena cava

**Video 6.** 123-degree bicaval view showing blocked blood flow from the superior vena cava

LA - left atrium, M - mass

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## Rare presentation and wide intrafamilial variability of Fabry disease: A case report and review of the literature

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### Introduction

Fabry disease (FD) is an X-linked genetic disease caused by mutations in the *GLA* gene, which encodes  $\alpha$ -galactosidase A, leading to an intralysosomal accumulation of globotriaosylceramide (Gb3) in a wide variety of cells. Thus, FD usually presents with multiorgan damage: cardiac (hypertrophic cardiomyopathy),

renal (chronic kidney disease, proteinuria), neurological (stroke, acroparesthesia), cutaneous (angiokeratoma), and ophthalmic (cornea verticillata) (1). Although FD is X-linked, women with specific mutations are not only carriers, as it was previously expected, but most of them develop manifestations somewhat later in life than men (2, 3), due to a mosaic inactivation of the X chromosome. It is of the utmost importance to follow the FD diagnosis with a complete family screening, which can lead to timely diagnosis in other family members.

The present case report demonstrates how following the red flags of clinical suspicion for FD can lead to a correct final diagnosis in the index patient, even in case of a rare phenotypic presentation, while also highlighting the large intrafamilial variability of systemic FD manifestations.

### Case Report

A 49-year-old woman was referred for evaluation with a diagnosis of hypertrophic obstructive cardiomyopathy (HOCM) established 6 years before, to discuss management options. The patient complained of dyspnea with moderate exertion, and she did not tolerate  $\beta$ -blockers as she developed severe bradycardia even at low doses. From the patient's personal history, we noted acroparesthesia during adolescence, which was no longer present in adulthood, as well as the history of a cryptogenic transient ischemic attack at the age of 46.

The clinical examination revealed the presence of a few dark-colored macules on the edge separating the skin and the lip's mucosa (Fig. 1a). The patient's family history revealed that one of her sisters a nephew had both died while on hemodialysis, aged 54 and 27, respectively (Fig. 2). The patient had an apparently healthy son who, however, complained of severe acroparesthesia since childhood and had many angiokeratomas in the inguinal area, as well as his on the lips and fingertips (Fig. 1b).

Lab workup showed mild renal impairment (estimated glomerular filtration rate of 73 mL/min/1.73 m<sup>2</sup>) and mild proteinuria (300 mg/day); BNP of 105 pg/mL; and a slight increase in troponin (hs-TnI=0.024 ng/mL).

During the complete cardiological workup, the electrocardiogram showed sinus rhythm with a short PR interval (110 ms) (Fig. 3). The transthoracic echocardiography showed biventricular hypertrophic cardiomyopathy, with a significant dynamic gradient reaching up to 48 mm Hg at the Valsalva maneuver; the anterior mitral valve exhibited systolic anterior motion associated with moderate mitral regurgitation and turbulent flow in the left ventricular (LV) outflow tract. We also noted a normal LV ejection fraction, but with LV systolic longitudinal dysfunction characterized by low tissue velocities (septal S' 5 cm/s, septal e' 3 cm/s) and a mildly decreased global longitudinal strain (GLS) of -17.8% (Fig. 4, Video 1).

Based on the association of HOCM with short PR interval, proteinuria, perioral angiokeratoma and acroparesthesia, and