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Case Report

Beyond hypertrophic cardiomyopathy: Cardiac amyloidosis as the first manifestation of myeloma

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ABSTRACT

Cardiac amyloidosis is a frequently overlooked cause of heart failure with preserved ejection fraction, often mimicking hypertrophic cardiomyopathy (HCM). Its clinical presentation may include nonspecific findings such as pleural effusions and dyspnea, contributing to diagnostic delays. We report a 51-year-old woman previously diagnosed with HCM, who presented with progressive dyspnea and recurrent pleural effusions with a near-preserved left ventricular ejection fraction (~50%). This case emphasizes the importance of considering infiltrative cardiomyopathies in the differential diagnosis of unexplained hypertrophy and highlights the role of multimodal imaging in unveiling systemic diseases with cardiac involvement.

Keywords: Cardiac amyloidosis, global longitudinal strain, hypertrophic cardiomyopathy, multiple myeloma, pleural effusion.

Cardiac amyloidosis is an infiltrative cardiomyopathy characterized by the extracellular deposition of misfolded protein fibrils within the myocardium, leading to progressive heart failure, arrhythmias, and increased mortality. Despite advances in imaging and biomarker-based diagnostics, the disease remains underrecognized due to its heterogeneous clinical presentation and frequent overlap with more common cardiac conditions such as hypertrophic cardiomyopathy. Immunoglobulin light-chain (AL) amyloidosis represents the most aggressive form of cardiac amyloidosis and may occasionally be the initial manifestation of an underlying plasma cell dyscrasia. We report a patient initially diagnosed with hypertrophic cardiomyopathy whose recurrent pleural effusions and progressive dyspnea ultimately led to the diagnosis of AL cardiac amyloidosis secondary to multiple myeloma, highlighting the importance of multimodal imaging and systematic evaluation in patients with unexplained ventricular hypertrophy.

CASE REPORT

A 51-year-old woman with a known history of hypothyroidism initially developed recurrent pleural effusions and was later diagnosed with HCM at an outside facility, before presenting to our cardiology outpatient clinic with gradually progressive exertional dyspnea. Echocardiography raised suspicion for an infiltrative/restrictive phenotype, which prompted strain imaging and cardiac magnetic resonance imaging. Subsequent hematologic testing demonstrated monoclonal light-chain abnormality, and bone marrow evaluation confirmed multiple myeloma-associated AL amyloidosis. Her physical examination was unremarkable except for decreased breath sounds over the right hemithorax. Written informed consent was obtained from the patient

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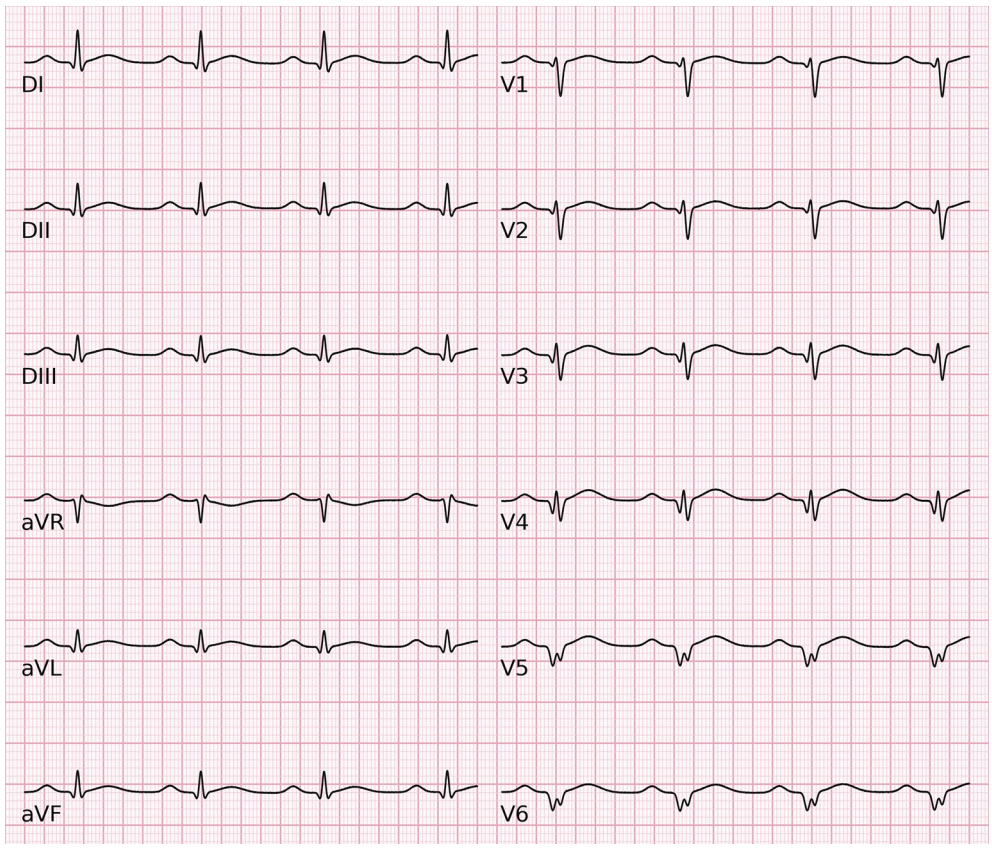


Figure 1. Twelve-lead ECG recorded at 25 mm/s and 10 mm/mV, showing low limb-lead QRS voltage with poor R-wave progression and pseudo-infarct pattern in V5-V6, consistent with voltage-mass discordance.

ECG: Electrocardiogram.

for publication of this case report and any accompanying images.

Electrocardiography revealed sinus rhythm with low QRS voltage in precordial leads, as shown in Figure 1. Transthoracic echocardiography (TTE) showed a preserved left ventricular ejection fraction (LVEF: 50%), concentric left ventricular hypertrophy (wall thickness: 1.6 cm), mild pericardial effusion, and estimated systolic pulmonary artery pressure of 45 mmHg based on tricuspid regurgitation velocity.

Thoracic computed tomography revealed a large right-sided pleural effusion. Given her recent history of COVID-19 pneumonia 15 days prior, she was admitted for diagnostic thoracentesis. With no malignant or infectious findings and clinical improvement, she was discharged with pleural effusion initially attributed to infection.

Two months later, the patient was re-hospitalized due to recurrence of dyspnea and pleural effusion. Repeat TTE revealed imaging features suggestive of cardiac amyloidosis: concentric biventricular wall thickening, sparkling myocardium, biatrial enlargement, reduced mitral annular tissue Doppler velocities (*e′* septal: 4 cm/s, *e′* lateral: 5 cm/s), and preserved LVEF. Global longitudinal strain (GLS) analysis revealed an apical sparing pattern, also known as the "cherry-on-top" sign, highly suggestive of cardiac amyloidosis.

Fabry disease was ruled out with normal α-galactosidase A enzyme activity and negative galactosidase alpha gene sequencing. Cardiac magnetic resonance imaging demonstrated

markedly elevated native T1 values (> 1300 ms), increased extracellular volume (ECV > 45%), and diffuse global subendocardial late gadolinium enhancement, consistent with amyloid infiltration.

Given the imaging findings, hematologic work-up was initiated. Serum free light chain analysis revealed significantly elevated lambda free light chains (λ: 222 mg/L) with suppressed kappa chains (κ: 8.2 mg/L), resulting in an abnormal κ/λ ratio. Complete blood count, renal function, calcium levels, and urinalysis were within normal limits. Bone marrow biopsy revealed a hypercellular marrow with approximately 30% plasma cell infiltration, some of which were binucleated. Congo red staining of a buccal mucosa biopsy showed apple-green birefringence under polarized light, confirming systemic amyloidosis.

A diagnosis of AL-type cardiac amyloidosis secondary to multiple myeloma was established. The patient was initiated on a daratumumab-bortezomib-cyclophosphamide-dexamethasone (DARA-VCD) regimen for 12 cycles, followed by autologous hematopoietic stem cell transplantation (ASCT). Sacubitril/valsartan was discontinued early in treatment due to symptomatic hypotension, while furosemide 20 mg/day, spironolactone 25 mg/day, and bisoprolol 5 mg/day were maintained.

Three months post-ASCT, bone marrow biopsy showed normocellular marrow without abnormal plasma cells, indicating hematologic remission. During two years of follow-up, the patient remained asymptomatic (New York Heart Association [NYHA] Class I) with no recurrence of pleural or pericardial effusion and stable cardiac imaging findings.

DISCUSSION

Cardiac amyloidosis, particularly AL type, is a frequently misdiagnosed infiltrative cardiomyopathy. It commonly mimics HCM due to the presence of left ventricular hypertrophy, especially in the absence of hypertension or valvular disease.[1,2] In our patient, the presence of low voltage on the electrocardiogram despite significant hypertrophy on TTE raised the suspicion of amyloid cardiomyopathy.[2]

Advanced echocardiographic modalities such as strain imaging provide early diagnostic clues.[2,3] The apical sparing pattern on GLS, in conjunction with reduced mitral annular velocities, is highly sensitive and specific for cardiac amyloidosis.[3] In our case, these findings prompted cardiac magnetic resonance imaging, which confirmed diffuse subendocardial enhancement and increased ECV, both characteristic of amyloid infiltration.[2]

Importantly, systemic evaluation revealed a clonal plasma cell disorder. Although the patient lacked CRAB features typically associated with multiple myeloma (hypercalcemia, renal impairment, anemia, and bone lesions), the markedly abnormal light chain profile and bone marrow findings confirmed the diagnosis.[4] This underscores the necessity of thorough hematologic evaluation when cardiac amyloidosis is suspected.

Early treatment with DARA-VCD and ASCT has shown improved cardiac and hematologic responses in patients with AL amyloidosis.[5] Our patient's clinical recovery and sustained remission reflect the benefit of prompt multidisciplinary intervention.

The main limitation of this report is its single-case nature, which limits the generalizability of the findings.

In conclusion, in patients presenting with unexplained dyspnea, recurrent pleural effusions, and concentric left ventricular hypertrophy, cardiac amyloidosis should be considered, especially when accompanied by low QRS voltage and apical strain preservation. Multimodal imaging and early hematologic evaluation are crucial for the diagnosis and treatment of this life-threatening yet treatable condition.

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