Heart failure in a young adult: Cardiomyopathy or much more?

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A 35-year-old otherwise healthy male with weakness, dyspnea on exertion, peripheral edema, and palpations, which had been present for over 3 months, was admitted to the Department of Cardiology for symptoms of exacerbation. The patient denied a family history of cardiovascular disease, substance abuse, and infections before symptoms onset. Laboratory tests revealed increased concentrations of N-terminal pro-B-type natriuretic peptide (20652 pg/ml) and cardiac troponin concentrations, suggesting myocardial injury.

Transthoracic echocardiography showed severe left ventricular (LV) systolic dysfunction with reduced ejection fraction of 28%, generalized LV hypokinesis with better contractility of apical segments, grade II diastolic dysfunction, concentric LV hypertrophy with ground-glass appearance (Figure 1A–E). LV strain assessment indicated a global longitudinal strain of -4.2% with apical sparing (Figure 1F). Moreover, right ventricular (RV) hypertrophy and RV systolic dysfunction were present. Other echocardiographic findings included left and right atrial enlargement and increased interatrial septal thickness.

At this point, the patient fulfilled the diagnostic criteria for hypertrophic cardiomyopathy as wall thickness in every myocardial segment was above 15 mm; however, echocardiographic features suggested cardiac amyloidosis (CA) as a specific etiology. Further diagnosis showed severe proteinuria and increased serum concentration of lambda-type free light chains. Cardiac involvement in potentially light-chain (AL) amyloidosis was confirmed on cardiac magnetic resonance, which showed diffused subendocardial late gadolinium enhancement. After introducing treatment for heart failure (HF) composed of loop diuretic, empagliflozin, and eplerenone, a sufficient reduction in symptoms was not achieved due to persistent compensatory sinus tachycardia and proteinuria; thus, bisoprolol and ramipril were added. A bone marrow biopsy confirmed IgG lambda-type multiple myeloma (MM) and AL amyloidosis; thus, targeted treatment for MM consisting of daratumumab, bortezomib, cyclophosphamide, and dexamethasone was introduced. Taking into consideration the patient's young age, extensive subendocardial fibrosis, improvement of LVEF (over 30%), and preference, as well as thrombosis of the right subclavian and brachiocephalic veins and no evidence of atrioventricular blocks, we implanted a subcutaneous cardioverter-defibrillator as primary prevention of sudden cardiac death. Despite MM treatment and progressive improvement over 6 months, the patient suffered from rapid deterioration of HF that led to cardiac arrest in the form of pulseless electrical activity. His resuscitation proved ineffective, and the patient was declared dead. There was no evidence of prior subcutaneous cardioverter-defibrillator interventions.

CA is a rare condition that occurs in fewer than 5 cases per 10000 individuals, mostly affecting patients older than 65 years [1]. AL amyloidosis is associated with plasma cell dyscrasias such as MM, whereas cardiac involvement occurs in approximately 70% of patients with its systemic type [2, 3]. In our patient, echocardiographic features, such as apical sparring and ground-glass myocardial appearance accompanied by increased thickness of the interatrial septum, atrioventricular valve leaflets, and RV-free wall may have suggested CA, whereas the young age, massive concentric LV hypertrophy, and global hypokinesia were less typical [4]. Due to positive tests for free light chains, we decided

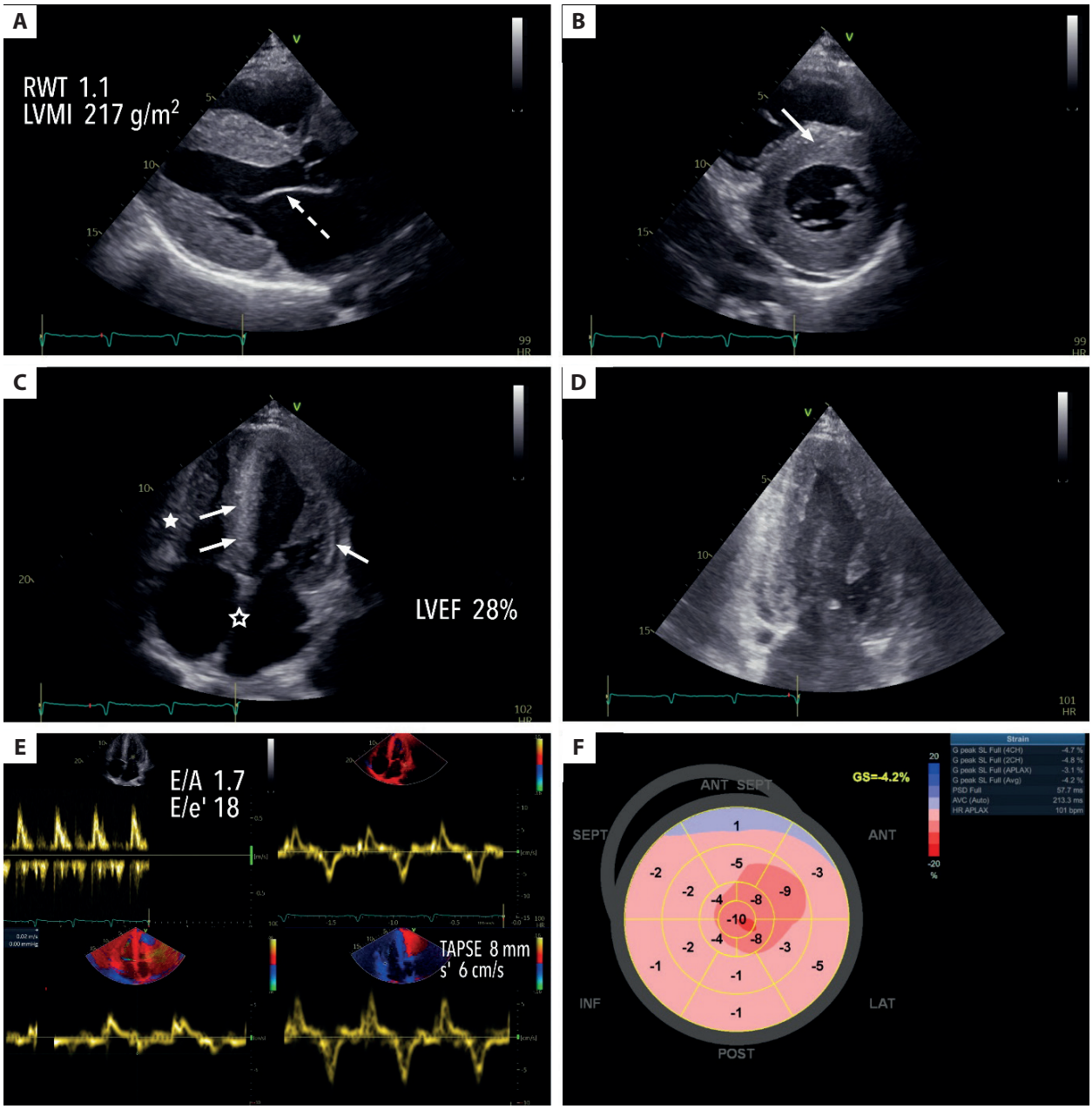

Figure 1. Findings in transthoracic echocardiography. Figures A-D showing increased thickness in all left ventricle segments, right ventricle hypertrophy (filled star), ground-glass myocardial wall appearance (simple arrow), left and right atrium enlargement. **A.** Parasternal long-axis view. Striped arrow indicates increased thickness of mitral valve. **B.** Parasternal short-axis view. **C.** Apical four-chamber view. A hollow star indicates increased thickness of interatrial septum. **D.** Apical two-chamber view with the focus on left ventricle. **E.** Pulse wave Doppler and tissue Doppler measurements showing 2. grade diastolic dysfunction and right ventricular systolic dysfunction. **F.** Bull's eye representation of global longitudinal strain with apical sparing

Abbreviations: A, late diastolic filling peak velocity of left ventricle; E, early diastolic filling peak velocity of left ventricle; e', mitral annular peak diastolic velocity; GS, global strain; LVEF, left ventricular ejection fraction; LVMI, left ventricular mass index; RWT, relative wall thickness; s', lateral tricuspid annular peak systolic velocity

to follow an invasive diagnostic pathway composed of transthoracic echocardiography, cardiac magnetic resonance, and extracardiac biopsy, which allowed us to diagnose AL type of CA. Moreover, recently increasing survival rates in MM emphasize the need for prompt bone marrow biopsy to diagnose and implement novel therapies [5]. It should be noted that beta-blockers and angiotensin-converting enzyme inhibitors/angiotensin receptor blockers are not recommended in CA-associated HF treatment due to the risk of hypotension; however, in this case, they were crucial to alleviate symptoms [2].

Article information

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