



CASE REPORT

Coexistence of dynamic mitral regurgitation and dynamic left ventricular dyssynchrony in a patient with repeated episodes of acute pulmonary edema: Improvement with cardiac resynchronization therapy



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KEYWORDS

Functional mitral regurgitation;
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Stress echocardiography;
Cardiac resynchronization therapy

Abstract A 69-year-old woman with idiopathic dilated cardiomyopathy and chronic heart failure experienced repeated hospital admissions for acute pulmonary edema with no recognizable precipitating factor. Worsening mitral regurgitation was triggered by exercise echocardiography and significant intraventricular dyssynchrony was elicited by low-dose dobutamine stress echocardiography. After cardiac resynchronization therapy she remained free of hospitalizations for 12 months. This case highlights the dynamic nature of both functional mitral regurgitation and left ventricular dyssynchrony and illustrates how in some patients stress echocardiography can help to clarify clinical scenarios and help with the challenging task of selecting patients who will benefit from cardiac resynchronization therapy.

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PALAVRAS-CHAVE

Regurgitação mitral funcional;
Dissincronia ventricular esquerda;
Ecocardiografia de stress;
Terapêutica de ressincronização cardíaca

Coexistência de regurgitação mitral dinâmica e dissincronia ventricular esquerda dinâmica numa doente com episódios repetidos de edema pulmonar agudo: melhoria após terapêutica de ressincronização cardíaca

Resumo Doente do sexo feminino, 69 anos de idade, com miocardiopatia dilatada idiopática e insuficiência cardíaca, que teve múltiplos internamentos por edema agudo do pulmão sem causa precipitante aparente. A demonstração do agravamento da regurgitação mitral no ecocardiograma de esforço e o aparecimento de uma dissincronia intraventricular óbvia, para além de reserva contráctil, no eco de stress com dobutamina, foram decisivos para a orientação terapêutica. A doente foi submetida a terapêutica de ressincronização cardíaca e manteve-se sem hospitalizações durante 12 meses. Este caso realça o carácter dinâmico da regurgitação

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mitral funcional e da dissincronia ventricular esquerda. Ilustra, ainda, como a ecocardiografia de stress pode ajudar, em alguns doentes, a esclarecer quadros clínicos e ajudar na difícil tarefa que é selecionar doentes que irão beneficiar da terapêutica de ressincronização cardíaca.
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Introduction

Readmission rates are extremely high in patients with chronic heart failure (CHF). Identification of the pathophysiologic mechanism implicated in the acute deterioration of compensated CHF is essential to target treatment accordingly and prevent further readmissions.¹ Functional mitral regurgitation (FMR) is, by nature, dynamic and its evaluation by echocardiography may require a stress evaluation, which can also expose latent mechanical dyssynchrony in failing hearts.^{2,3} Through these attributes, stress echocardiography can assist in clarifying puzzling clinical scenarios as well as in defining the therapeutic strategy for the individual patient with relapsing acute heart failure symptoms.

Case report

A 69-year-old woman with known idiopathic dilated cardiomyopathy and chronic heart failure (CHF) was admitted after an episode of decompensation presenting as acute pulmonary edema. Over the previous four years since the diagnosis was first established, she had been admitted on several occasions for decompensated heart failure for which known precipitating factors were identified: hypertensive crisis, paroxysmal atrial fibrillation and poor compliance with medication. In the three months preceding the current admission, she experienced four successive episodes of pulmonary edema, all with no recognizable precipitating factor.

Her medical history revealed a long history of treated hypertension and dyslipidemia, and she had been followed in NYHA class II, under optimal medical therapy including beta-blockers, ACE inhibitors, furosemide, spironolactone, nitrates and warfarin, in addition to amiodarone and a statin. Eighteen months before the current admission, she received an implantable cardioverter-defibrillator (ICD) for primary prevention. Left ventricular ejection fraction was 30%.

Her ECG showed sinus rhythm with an intraventricular conduction delay (QRS duration 143 ms) with no obvious left bundle branch block (Figure 1). The echocardiogram showed a spherical dilated left ventricle with 32% ejection fraction (sphericity index 0.83; end-diastolic volume 117 ml; end-systolic volume 79 ml) and a moderately dilated left atrium (indexed end-systolic volume 37 ml/m²). The left ventricular filling pattern was consistent with delayed relaxation (E/A <1) and an E/e' ratio of 12. The mitral valve presented a tenting pattern, causing mild regurgitation at rest; effective regurgitant orifice area (EROA) was 9 mm² and regurgitant

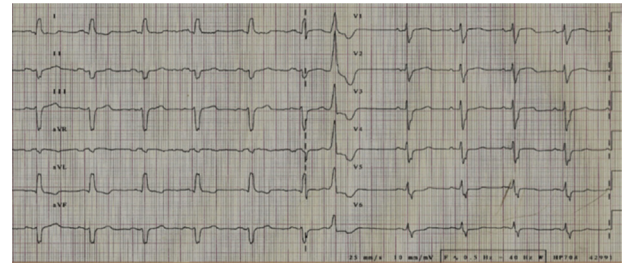


Figure 1 Electrocardiogram: sinus rhythm, intraventricular conduction delay (QRS duration 143 ms) and no obvious left bundle branch block.

volume (RV) was 13 ml by the PISA method. Atrioventricular dyssynchrony was absent, but there was interventricular dyssynchrony, with (Q-Ao) – (Q-Pulm) = 62 ms, and borderline intraventricular dyssynchrony (130 ms delay between septal and posterior walls by two-dimensional speckle tracking radial strain), with a faint septal flash. After clinical stabilization, a symptom-limited bicycle stress test was performed under full therapy on an echo tilt table. The patient exercised for six minutes at a low workload (20–50 W), interrupted due to severe dyspnea. Her blood pressure rose from 120/67 mmHg to 160/84 mmHg and her heart rate from 68 to 96 beats per minute. No left ventricular segmental dyssynchronies, arrhythmias or ST-segment changes were induced. Nevertheless, an obvious increase in mitral regurgitation during exercise was observed, with an increase of 15 mm² (from 9 to 24 mm²) in EROA and an increase of 23 ml (from 13 to 36 ml) in RV (Figure 2). However, this worsening was not considered sufficient to justify surgical correction, especially in view of several echocardiographic morphological parameters predicting unsuccessful repair. Furthermore, the indication for cardiac resynchronization therapy (CRT) was questionable, given the non-LBBB QRS morphology and the QRS duration of <150 ms.

Taking all this into account, we decided to pursue our investigation through a low-dose dobutamine stress echo (5–20 µg/kg/min). At peak dobutamine dose, intraventricular dyssynchrony became evident with an obvious septal flash, despite an improvement in global contractility, attesting the presence of contractile reserve. At this point, the resynchronization option seemed the most appropriate and the patient's ICD was upgraded to a cardiac resynchronization therapy device with defibrillator function. Three months later echocardiography showed no significant change in LV volume, ejection fraction, or mitral regurgitation at rest, but there was a clear improvement in cardiac output (from 2.9 to 4.6 l/min) and in ventricular synchronicity

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