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## IMAGE

# Insights into functional mitral regurgitation despite preserved LVEF

Insuffisance mitrale fonctionnelle malgré une fraction d'éjection préservée

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## KEYWORDS

Functional mitral regurgitation;  
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 Echocardiography

## MOTS CLÉS

Insuffisance mitrale fonctionnelle ;  
 Insuffisance cardiaque ;  
 Pression atriale gauche ;  
 Écho-doppler cardiaque

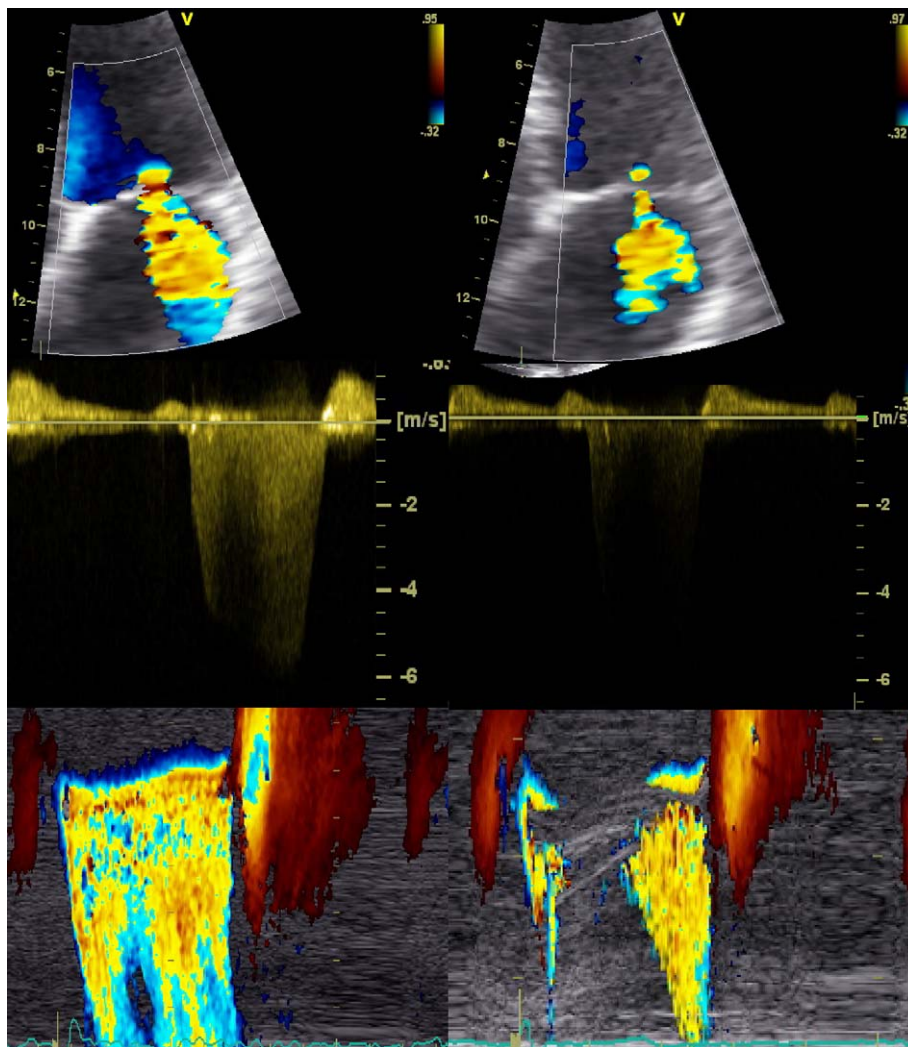
A 65-year-old woman with a history of hypertension and diabetes was evaluated for progressive dyspnoea. Her blood pressure was 150/90 mmHg. Examination revealed pulmonary crackles and leg oedema. The results of the electrocardiogram were normal. Echocardiography displayed a non-hypertrophied and non-dilated left ventricle (end-diastolic volume, 40 mL/m<sup>2</sup>) with left ventricular ejection fraction at 55%. Neither segmental wall-motion abnormality nor asynchrony was found. The left atrium was enlarged (area, 30 cm<sup>2</sup>) with a moderate MR (effective regurgitant orifice area, 9 mm<sup>2</sup>; regurgitant volume, 20 mL) (Fig. 1, Supplementary data, Loop 1, left panel). The valvular and subvalvular mitral apparatus were normal, but with increased valvular tenting (Fig. 1, Supplementary data, Loop 2). Pulsed-wave Doppler showed a restrictive mitral-inflow pattern and an increased E/Ea ratio of 18 (Fig. 2, left panel). Transtricuspid gradient was 38 mmHg. Loop diuretics improved the patient's symptoms, while MR severity (Fig. 1, right panel), E/Ea ratio (Fig. 2, right panel) and mitral tenting (3.6–2.5 cm<sup>2</sup>) decreased, without changes in leaflet tethering and global longitudinal strain (–17%).

Functional MR has been seldom studied in patients with preserved left ventricular geometry and function. Increased left atrial pressure that characterizes HFpEF may generate pushing forces upon the mitral valve leaflets, leading to tenting and MR. This further contributes to left atrial pressure augmentation, thereby creating a vicious circle (Fig. 3). This case underlines the importance of optimizing unloading medication in HFpEF patients, who are sometimes referred for severe functional MR. Cardiac surgery is likely to be harmful in these latter patients, who respond dramatically to diuretics and nitrates. Whether the decreased global longitudinal strain observed frequently in HFpEF contributes to MR merits further study.

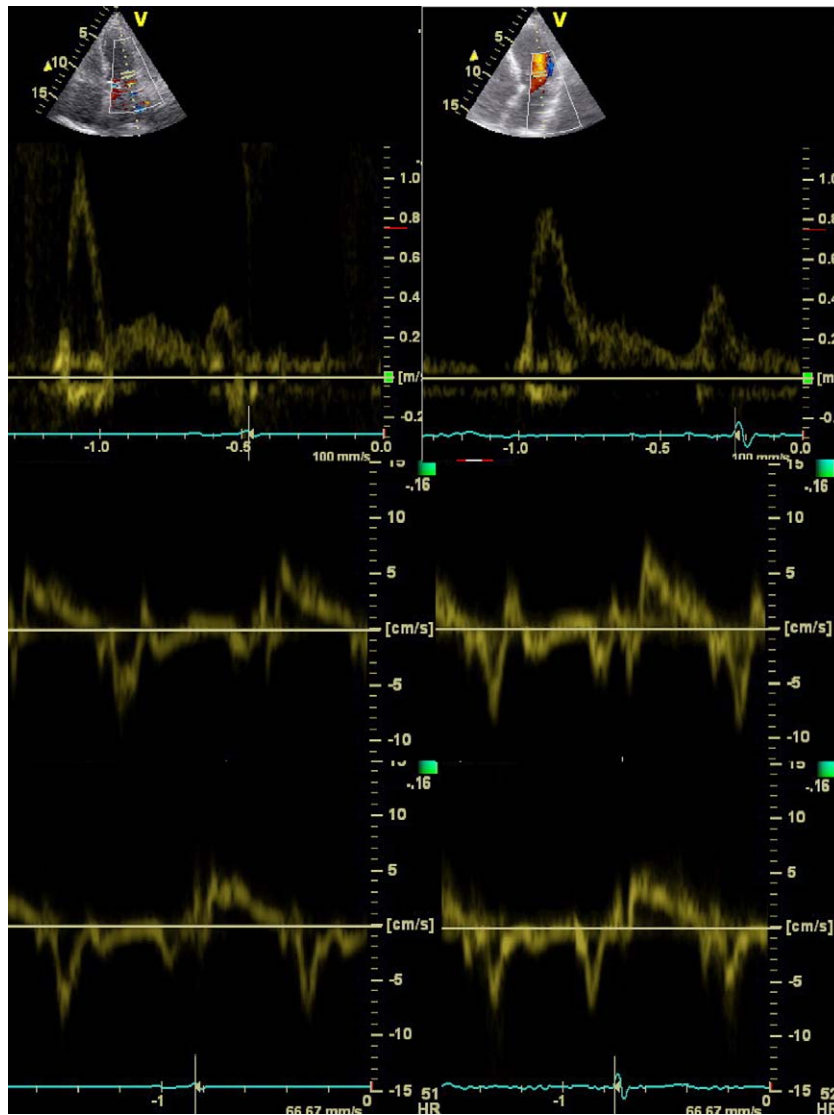
*Abbreviations:* HFpEF, Heart failure with preserved ejection fraction; MR, Mitral regurgitation.

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**Figure 1.** Quantification of the degree of functional mitral regurgitation (MR) in a patient with preserved left ventricular ejection fraction before (left panel) and after (right panel) unloading therapy. The reduction in MR severity is obvious. Note the increase in continuous wave Doppler signal and in proximal flow convergence radius in early and late systole, as encountered frequently in left ventricular systolic dysfunction.



**Figure 2.** Assessment of left ventricular filling pressure by the E/Ea ratio before (left panel) and after (right panel) unloading therapy. The E/Ea ratio decreased from 18 to 11.



**Figure 3.** Apical long-axis view, showing that mitral pushing forces (arrows) may increase mitral valve tenting and thereby facilitate functional mitral regurgitation (MR).

### Conflict of interest statement

None.

### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.acvd.2010.04.010](https://doi.org/10.1016/j.acvd.2010.04.010).