

VALVULAR HEART DISEASE

CASE REPORT: CLINICAL CASE

Rheumatic Mitral Restenosis Following Surgical Commissurotomy



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ABSTRACT

Because corrective procedures extended life expectancy of the population with rheumatic heart disease, reintervention has become a contemporary challenge. This paper presents a case of a 54-year-old woman with exertional dyspnea and palpitations 26 years after undergoing surgical commissurotomy due to mitral stenosis, with remarkable clinical-echocardiographic divergence on valvular disease severity. (JACC Case Rep. 2024;29:102617) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

HISTORY OF PRESENTATION

A 54-year-old woman with known rheumatic mitral stenosis (MS) corrected with surgical commissurotomy in 1997 was admitted due to progressive dyspnea (NYHA functional class IV) and palpitations. Symptoms have been present intermittently for 4 years and difficult to control with medication. Initial electrocardiogram showed atrial flutter rhythm with 250 beats/min heart rate and 1:1 atrioventricular

conduction (**Figure 1**). After successful chemical cardioversion and with persisting dyspnea (NYHA functional class III), she was referred to our institute for clinical and interventional evaluation regarding MS. On cardiac auscultation, a grade II mid-diastolic rumbling murmur on apex was accompanied by presystolic accentuation, opening snap near the second heart sound, and loud first heart sound.

PAST MEDICAL HISTORY

The patient was unaware of rheumatic fever diagnosis in childhood; however, she reports recurrent pharyngotonsillitis episodes. During pregnancy in 1997, she presented remarkable dyspnea and lower limb edema, and 2-dimensional transthoracic echocardiography (2D-TTE) revealed severe rheumatic MS. After premature delivery, she maintained symptoms and underwent surgical commissurotomy via right inframammary access, without complications. Thereafter, she remained asymptomatic, used to do hiking regularly, and had several 2D-TTE showing

LEARNING OBJECTIVES

- To outline the impact of a prior procedure on current evaluation and decision making on rheumatic MS.
- To develop critical interpretation on MS severity assessment in a clinical-echocardiographic divergence scenario.
- To restate the role of 3D echocardiography and stress test on challenging MS cases at which intervention benefit is uncertain.

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**ABBREVIATIONS
AND ACRONYMS****2D-TTE** = 2-dimensional
transthoracic echocardiography**3D-TTE** = 3-dimensional
transthoracic echocardiography**MS** = mitral stenosis**MTG** = mean transmitral
gradient**MVA** = mitral valve area**PASP** = pulmonary artery
systolic pressure

mitral valve area (MVA) of approximately 2.0 cm² without significant gradient. Use of prophylactic benzathine penicillin was interrupted in 2000.

DIFFERENTIAL DIAGNOSIS

It is necessary to establish whether symptoms are attributable solely to the arrhythmia or also to rheumatic MS severity progression.

INVESTIGATIONS

Repeated electrocardiogram during hospital stay showed sinus rhythm, 60 beats/min heart rate, and left atrial overload. Chest radiograph revealed left atrial enlargement with left main bronchus angle elevation (Figure 2). On 2D-TTE, preserved biventricular function, mild biatrial enlargement, and pulmonary artery systolic pressure (PASP) of 27 mm Hg were observed. The mitral valve had a doming anterior leaflet, but without commissural fusion. MVA was estimated at 1.7 cm² by planimetry and 1.6 cm² by pressure half-time, with mean transmitral gradient (MTG) of 4 mm Hg (Figure 3, Videos 1 and 2). The Wilkins score was 7, with predominant subvalvular involvement. 2D-TTE data are consistent with moderate MS, but 2 points must be highlighted: 1) the technical challenge in measuring MVA imposed by a difficult leaflet alignment due to previous commissurotomy; and 2) the inconsistency with clinical presentation.

It was decided to perform a stress test associated with 3-dimensional transthoracic echocardiography (3D-TTE) aimed at diagnostic clarification. After treadmill exercise testing, the patient reached a 105 beats/min heart rate, achieved 4.5 METs, and interrupted physical stress prematurely due to dyspnea. She presented MTG of 9 mm Hg and PASP of

41 mm Hg. MVA was measured by 3D-TTE planimetry at 1.2 cm², with mild mitral regurgitation (Figure 4). Thus, there are symptomatic limitation at low exertion, MVA compatible with severe stenosis (<1.5 cm²), and maintenance of MTG <10 mm Hg, but with rapid 5 mm Hg increase compared to rest. PASP after stress also does not reach the severity threshold, but minimal tricuspid regurgitation limits its estimation.

Left heart catheterization was performed, ruling out obstructive coronary artery disease.

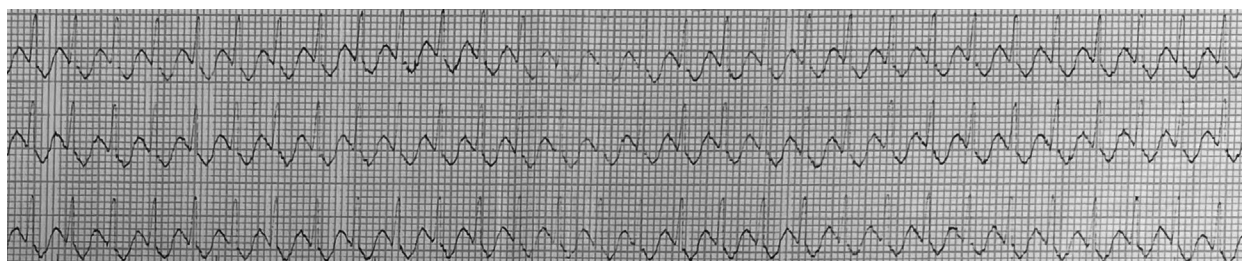
MANAGEMENT

The case was taken to the institute's heart team. Considering exercise capacity deterioration, physical examination, and MVA evolutionary reduction, MS was reclassified as severe despite inexpressive MTG. In conjunction with the patient, surgical mechanical mitral valve replacement associated with atrial flutter ablation was the chosen procedure, which proceeded without complications. Intraoperative transesophageal echocardiography confirmed 1.2 cm² MVA by 3-dimensional planimetry, consistent with 3D-TTE (Figure 5, Videos 3 and 4).

DISCUSSION

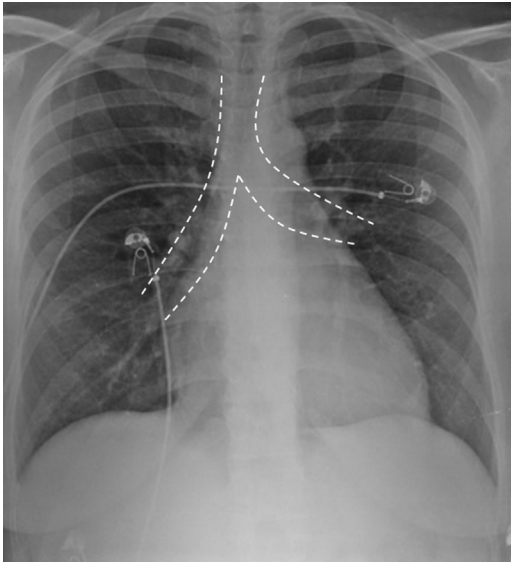
MS remains a prevalent valvular pathology in underdeveloped countries, as rheumatic fever also remains its leading etiology worldwide.^{1,2} Correctly assessing MS clinical, anatomic, and hemodynamic severity is crucial for determining intervention benefit, either percutaneous or surgical. Physical examination is an accurate information source regarding MS stage; findings (eg, earlier opening snap, presystolic accentuation) are signs of more severe valvular disease.¹

Traditionally, 2D-TTE is sufficient for anatomic severity grading; however, certain scenarios may

FIGURE 1 Electrocardiogram Obtained on Presentation

Atrial flutter with 1:1 atrioventricular conduction.

FIGURE 2 Chest Radiograph

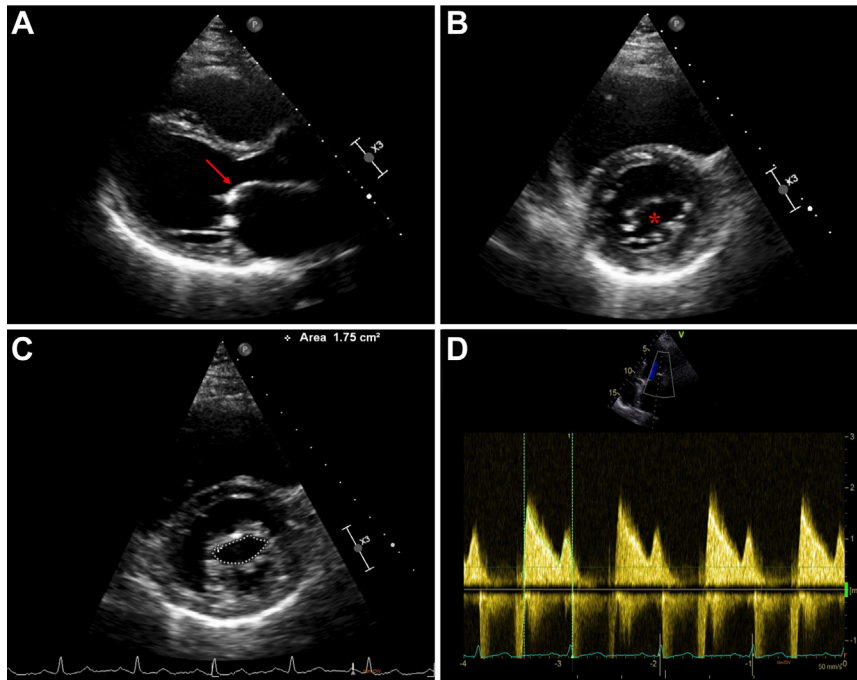


Left main bronchus angle elevation (dotted outline).

limit its accuracy (eg, those involving prior corrective procedures).³ This limitation arises from mitral valve echocardiographic analysis being heavily reliant on correct leaflet alignment, degree of atrioventricular dilation, patient volume status, and a regular and controlled heart rate. Prior commissurotomy particularly affects the former of those factors, potentially leading to MVA overestimation. In the light of the most modern knowledge, 3-dimensional analysis with planimetry-measured MVA is considered the gold standard method, being even more useful in technically challenging scenarios. The 3-dimensional multiplanar image reconstruction provides a more reliable intersection of valve orifice, resulting in significantly smaller MVA.⁴

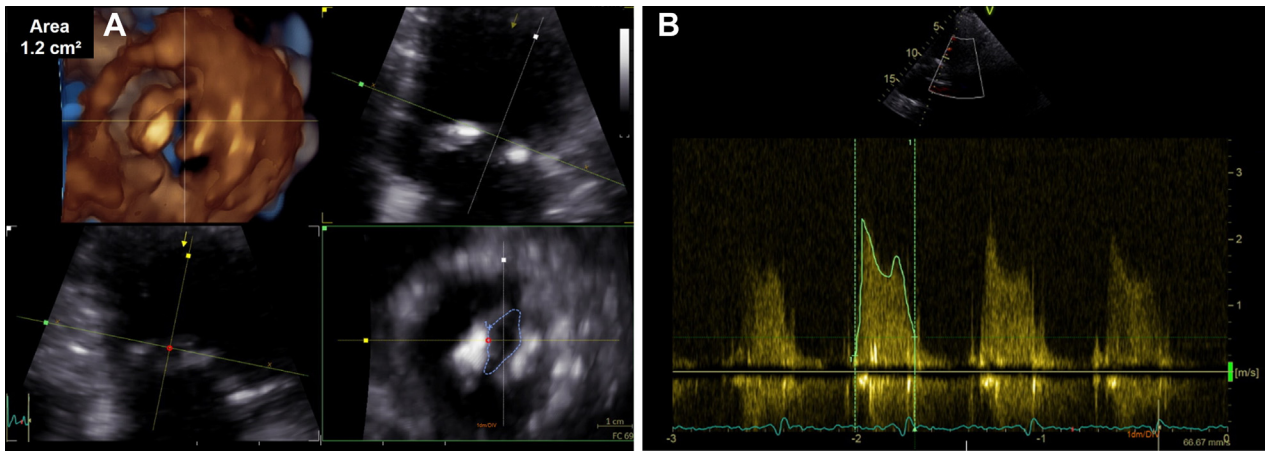
MS is presently deemed as severe when MVA is ≤ 1.5 cm² and resting MTG is ≥ 10 mm Hg.¹ Intervention nonetheless is warranted only in the presence of symptoms, particularly dyspnea, or complicating factors, namely recent-onset atrial fibrillation and pulmonary hypertension (resting PASP >50 mm Hg or >60 mm Hg on exertion). It is important to emphasize that echocardiographic variables should be analyzed collectively because

FIGURE 3 2-Dimensional Transthoracic Echocardiography



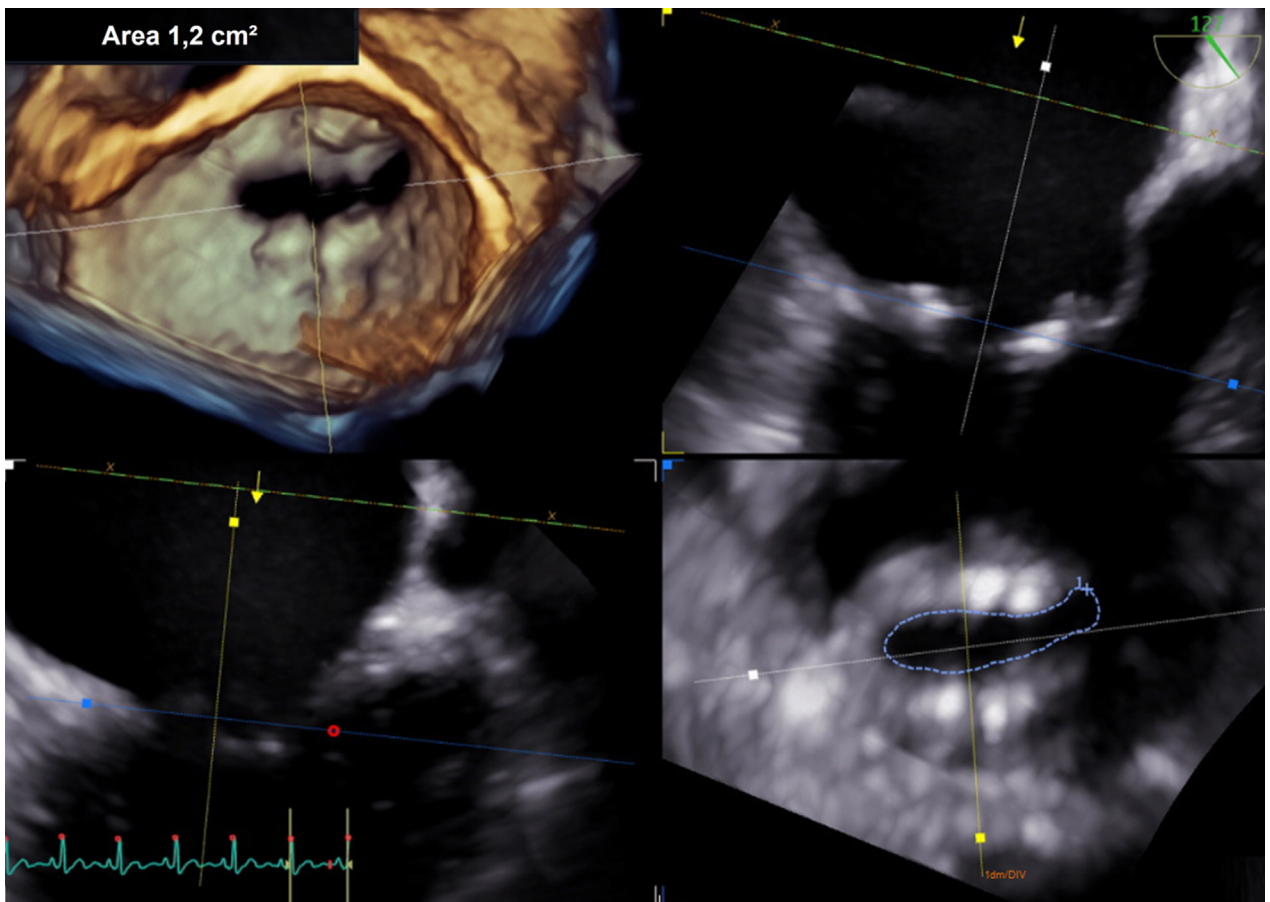
(A) Anterior leaflet hockey-stick shape (arrow). (B) Opened mitral commissures (asterisk). (C) Mitral valve area measured at 1.7 cm² by planimetry (dotted outline). (D) Mean transmittal gradient of 4 mm Hg.

FIGURE 4 3-Dimensional Transthoracic Echocardiography



(A) Mitral valve area of 1.2 cm² measured by planimetry (dotted outline). (B) Mean transmitral gradient of 9 mm Hg after stress test.

FIGURE 5 Intraoperative 3-Dimensional Transesophageal Echocardiography



Mitral valve area of 1.2 cm² (dotted outline).

isolated assessments may lead to inaccurate grading.³ The MTG is highly vulnerable to hemodynamic variation and may not always coincide with MVA-based severity classification, but in fact correlates strongly with MS clinical tolerance.⁵ Therefore, absence of an MTG >10 mm Hg should not change severity grading, whereas its presence indeed raises awareness of worse clinical presentations.

In the presence of clinical-echocardiographic discordance, stress test is highly recommended because physical exertion increases heart rate, preload, and afterload, all of which hinder mitral valve hemodynamics.^{2,3} MTG >15 mm Hg and PASP >60 mm Hg during exercise indicate severity.^{1,2} Although cutoff values serve as guidance for clinical practice, they should not preclude medical critical interpretation. In this case, both thresholds were not reached, but symptoms were limiting at a low grade of exertion, incompatible with her previous day-to-day activities and exercise capacity. Being the uncertainty of hemodynamic improvement by an invasive treatment a considerable concern, the importance of an experienced heart team and shared decision-making in challenging scenarios should be reinforced.

FOLLOW-UP

There was satisfactory postoperative evolution and she remained asymptomatic after discharge. New stress test associated with 2D-TTE was performed 3 months later. Patient reached 148 beats/min heart

rate, achieved 7.0 METS, and completed treadmill-exercise without dyspnea. Controversially, 2D-TTE revealed resting MTG of 6 mm Hg, and 14 mm Hg after exertion. Although higher gradients were observed compared to preoperative echocardiography, there was evident exercise capacity improvement, emphasizing the need for collective and critical data interpretation.

CONCLUSIONS

This case illustrates the complexity to assess MS severity in a prior intervention scenario, which tends to have become more frequent in clinical practice. Surgical commissurotomy enabled more than 20 years of asymptomatic life for this patient, demonstrating sparing valve procedures potential success. Stress and 3-dimensional imaging assume a fundamental role when clinical-echocardiographic discordance hinders correct evaluation. Even though cutoff values clearly represent an important guide, they should not be assessed separately, and clinical critical analysis must be encouraged.

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KEY WORDS 3-dimensional atrial flutter, echocardiography, mitral valve imaging, rheumatic heart disease

APPENDIX For supplemental videos, please see the online version of this paper.