Cambridge City Publishers

Case Reports in Clinical Cardiology Journal

Case Report | Vol 5 Iss 2

Double Trouble: Mitral Stenosis Complicated by a Giant Left Atrial Thrombus and a Patent Foramen Ovale

Rim Zerhoudi[1*], Joumana Elmasrioui[1,2], Kawtar Bennejma[1], Mohamed Eljamili[1], Saloua El Karimi[1] and Mustapha Elhattaoui[1]

[1]Cardiology Department, Errazi Hospital, Mohammed VI University Hospital, Marrakech, Morocco

[2]Physiology Department, Errazi Hospital, Mohammed VI University Hospital, Marrakech, Morocco

[*]**Corresponding author:** Rim Zerhoudi, Cardiology Department, Errazi Hospital, Mohammed VI University Hospital, Marrakech, Morocco. E-mail: zerhoudi.rim@gmail.com

Received: January 02, 2025; **Accepted:** January 19, 2025; **Published:** February 15, 2025

Abstract

Background: Tight mitral stenosis is a valvular pathology frequently associated with thrombus formation in the left atrium due to blood stasis. When a patent foramen ovale (PFO) is also present, this can allow thrombus to pass from the venous circulation into the systemic circulation, leading to paradoxical embolism. Although rare, this association carries a high risk of serious complications. We report here a case of paradoxical embolism in a patient with a giant thrombus in the left atrium and a PFO, on a background of tight mitral stenosis.

Case Summary: A 62-year-old male patient, with no cardiovascular risk factors besides age and sex, was admitted for worsening chronic dyspnea (NYHA class IV) and lower limb edema. Examination revealed signs of right and left heart failure. Echocardiography showed severe rheumatic valve disease, multiple thrombi in the left atrium, and a patent foramen ovale with thrombi. Chest CT revealed a pulmonary embolism in the right lower lobe. Urgent surgery including mitral valve replacement, tricuspid plasty, PFO closure, thrombectomy and embolectomy was indicated. Unfortunately, preoperative obstructive shock due to thrombus migration to the mitral valve led to the patient's immediate death.

Discussion: This case illustrates the complexity of managing patients with mitral stenosis associated with PFO. The increased risk of thrombus formation in the left atrium and the possibility of systemic migration via the PFO underscore the need for careful ultrasound screening in these patients. Optimal treatment includes anticoagulation, PFO closure and mitral valve repair to prevent thromboembolic recurrence and improve long-term prognosis.

Keywords: Mitral stenosis; Patent foramen ovale; Paradoxical embolism; Giant thrombus; Obstructive shock

Introduction

Tight mitral stenosis is a valvular pathology frequently associated with thrombus formation in the left atrium due to blood stasis. When a patent foramen ovale (PFO) is also present, this can allow thrombus to pass from the venous circulation into the systemic circulation, leading to paradoxical embolism. Although rare, this association carries a high risk of serious complications.

We report here a case of paradoxical embolism in a patient with a giant thrombus in the left atrium and a PFO, on a background of tight mitral stenosis.

Case Presentation

A 62-year-old patient, a former smoker who quit 6 years ago, with no notable pathological history, was admitted for worsening chronic dyspnea, classified as NYHA stage IV, associated with lower limb swelling. Clinical examination revealed a diastolic murmur at the mitral focus (grade 3/6), signs of right heart failure (jugular vein distension, hepatojugular reflux, bilateral soft white edema of the lower limbs extending to mid-calf, positive Harzer and Carvallo signs), as well as signs of left heart failure (bilateral left basal lung crackles).

The ECG showed atrial fibrillation at 100 bpm with T-wave inversion in the anterosepto-apical and inferior regions.

Transthoracic echocardiography (TTE) revealed rheumatic multivalvular disease, including severe mitral stenosis, moderate mitral regurgitation, severe tricuspid regurgitation, left ventricular size and systolic function preserved (LVEF 65%), an enlarged and dilated left atrium with multiple thrombi adherent to the posterior wall (the largest measuring 91×60 mm) (Figure 1), and a dilated right ventricle with borderline longitudinal systolic function. The right ventricle-to-right atrium pressure gradient was 94 mmHg. Additionally, a non-dilated, compliant inferior vena cava was noted, along with a 7 mm patent foramen ovale containing two thrombi measuring 6 × 7 mm and 10 × 7 mm, respectively (Figure 2 and 3).

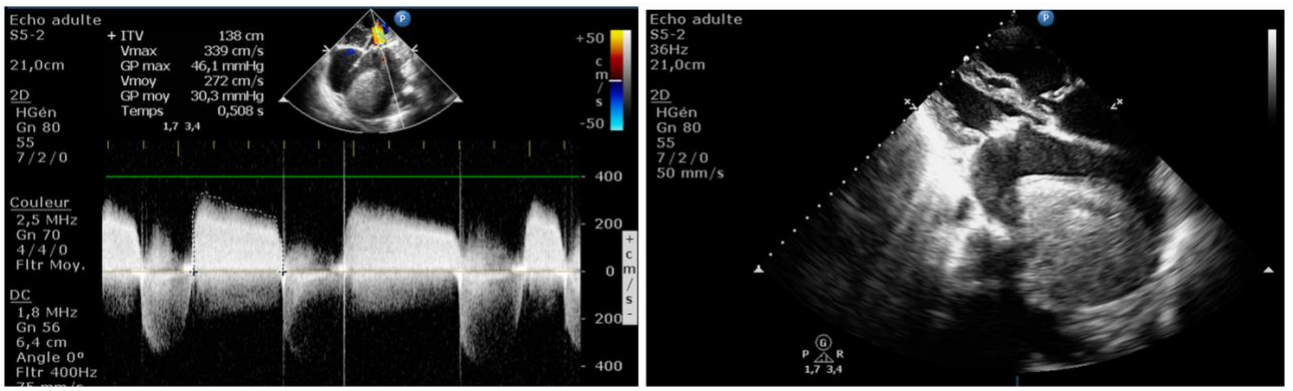

Figure 1: Parasternal long axis echocardiographic image showing a reworked mitral valve, calcification magma with shrunken cords, calcified, agglutinated, bi-commissural fusion, site of a very tight mitral stenosis with an average gradient calculated at 30 mmhg, surface by planimetry at 0.3 cm^2, with an ectatic left atrium (surface LA at 93.8 cm^2 seat of multiple thrombi adhering to the posterior wall, the largest of which measuring 91 X 60 mm.

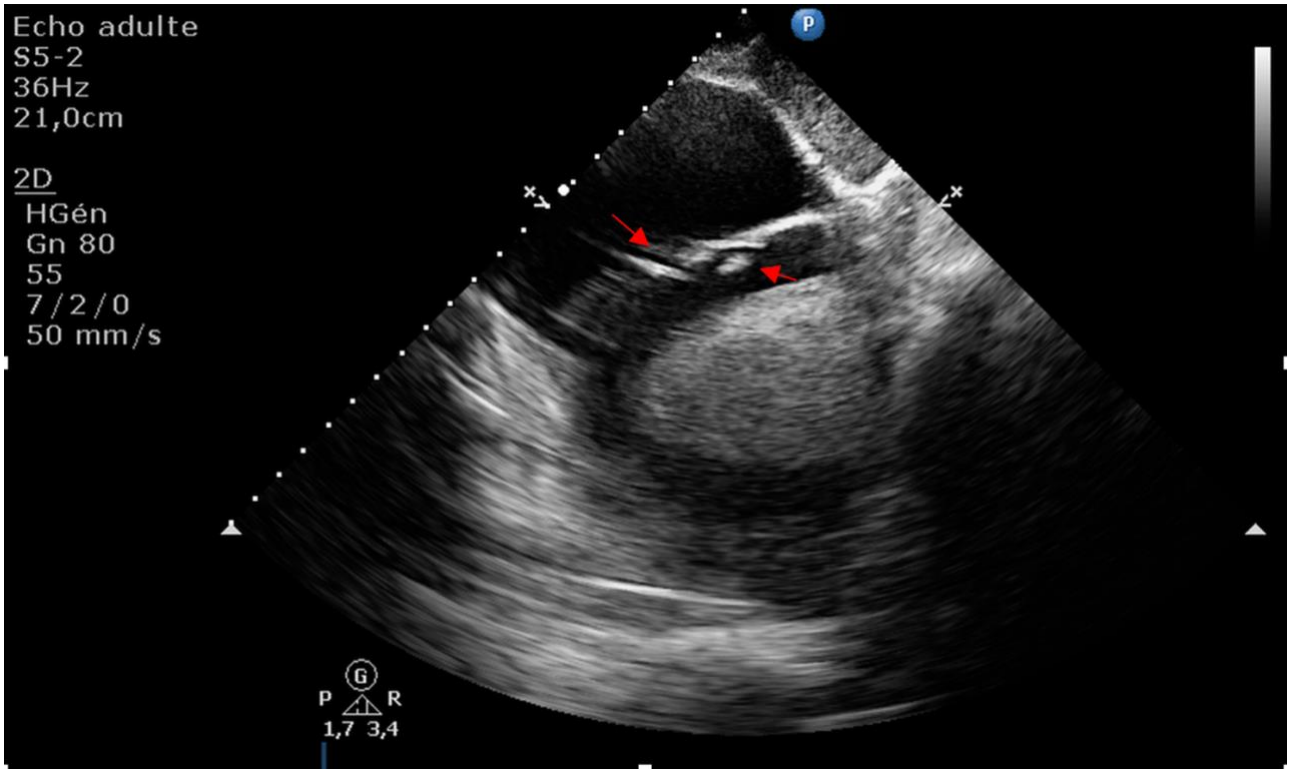

Figure 2: Subcostal bicaval echocardiographic image showing an interatrial septum containing a PFO of 07mm, enclosing two thrombi measuring 06 X 07mm and 10 X 07mm respectively.

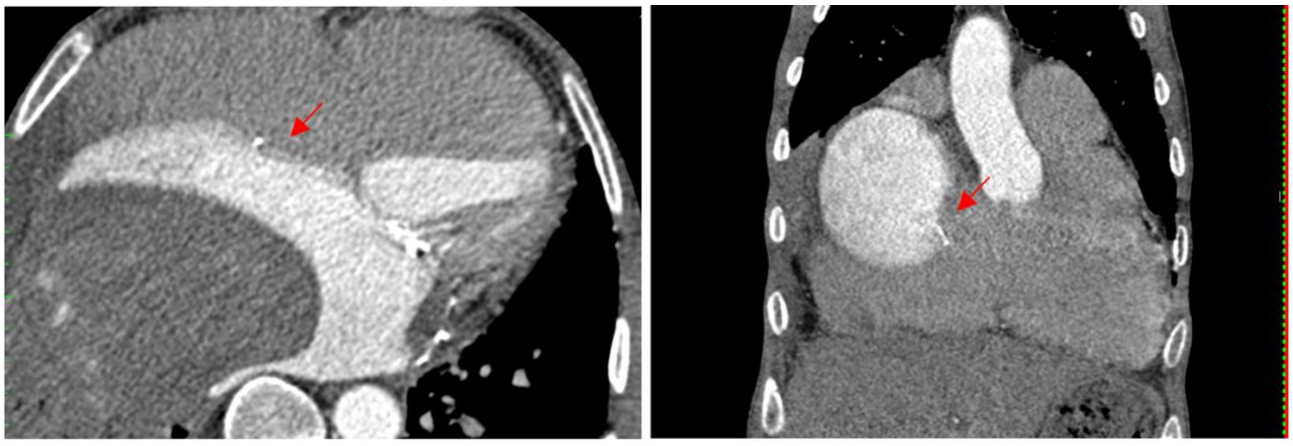

Figure 3: Axial and coronal sections with contrast injection: presence of a large thrombus occupying almost the entire left atrium, with no enhancement by the contrast agent, associated with a patent foramen ovale (PFO) also containing a small marginal thrombus with some calcifications.

A chest CT angiogram was performed revealing a right lower lobar pulmonary embolism (Figure 4).

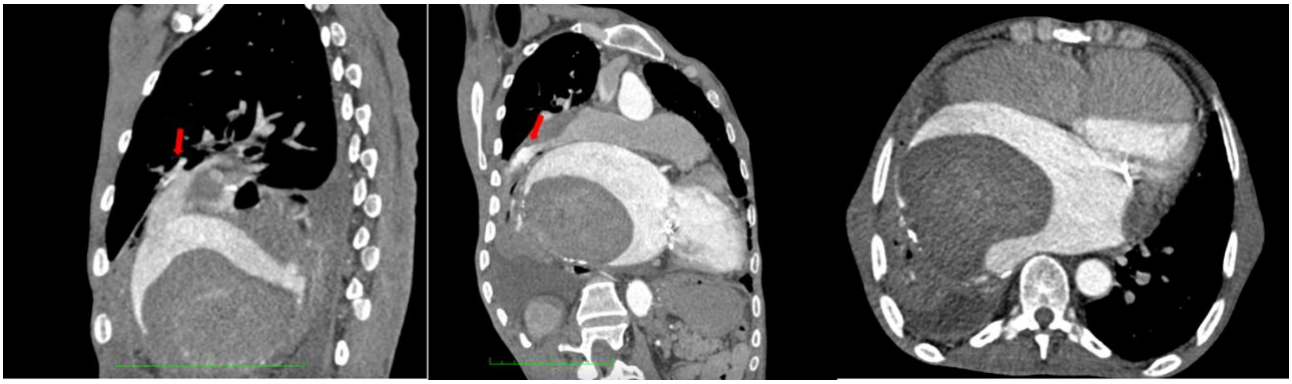

Figure 4: Sagittal and coronal CT section showing a voluminous endoluminal defect in the left atrium, associated with an endoluminal defect in the right pulmonary artery and right inferior lobar branch.

The patient was initiated on curative anticoagulation, and urgent surgical intervention was planned, including mitral valve replacement with a mechanical prosthesis, tricuspid valve repair, PFO closure, left atrial thrombectomy and plication, and embolectomy after surgical risk assessment.

Unfortunately, the clinical course was complicated by obstructive shock due to thrombus migration to the mitral valve, resulting in immediate death.

Discussion

Mitral stenosis remains prevalent in many developing countries, often manifesting 5 to 10 years after acute rheumatic fever. The occurrence of a giant thrombus in the left atrium, defined as larger than the mitral orifice and adherent to the atrial wall, is rare in rheumatic mitral stenosis. Symptoms depend on the degree of mitral valve occlusion and may include syncope, pulmonary congestion, or sudden cardiac death, with a risk of peripheral embolization due to thrombus fragmentation, as was the case with our patient [1,2].

Mitral stenosis and left atrial dilation promote blood stasis, increasing thrombus formation, which can also occur post-mitral valve replacement if anticoagulation is inadequate [3-5). Diagnosis requires rigorous evaluation, with transthoracic echocardiography as the initial tool, while transesophageal echocardiography remains the gold standard for precise assessment of thrombus size, location, and associated PFO. In our case, transthoracic echocardiography not only visualized a thrombus occupying a large portion of the left atrium but also confirmed the paradoxical passage of the thrombus through the PFO, which was a fortuitous discovery.

The foramen ovale facilitates the passage of oxygenated blood from the right to the left heart during embryonic life, acting as a window formed by the partial fusion of the septum primum and septum secundum. At birth, oxygenation of the pulmonary alveoli and the opening of pulmonary arterioles lower right heart pressure, while increased pulmonary venous return elevates left heart pressure. These changes cause the flap to close against the septum secundum.

Right-to-left shunts through a patent foramen ovale (PFO) can be detected using transesophageal echocardiography (TEE), intracardiac echocardiography (ICE), or MRI, with TEE being the gold standard. The 'bubble test,' involving venous injection of saline contrast, confirms interatrial communication by visualizing microbubbles in the left atrium, with a positive result defined as over five bubbles appearing rapidly. Maneuvers like coughing or the Valsalva maneuver may enhance the shunt. However, this test was not performed in the present case due to the high thromboembolic risk associated with entrapped thrombi in the PFO.

The foramen ovale closes fully in 75% of individuals by age two but remains patent in 25%, with potential genetic or familial influences [6,7]. PFO, the most common structural cardiac defect, is often asymptomatic but can lead to paradoxical embolism or cryptogenic stroke. According to guidelines from the French Society of Cardiology (SFC), the French Neurovascular Society (SFNV) (2019), and the European Society of Cardiology (ESC) (2020), closure is recommended for patients aged 16-60 years with a recent embolic event (within 6 months) and severe PFO, defined by interatrial septal aneurysm (>10 mm), >20 bubbles, or a diameter >2 mm [11].

Treatment options include anticoagulation, antiplatelet therapy, percutaneous closure, or surgical repair. Surgery, endorsed for complex cases such as large PFOs (>25 mm) or coexisting conditions like interatrial septal aneurysm or atrial myxoma, can involve patch closure or manual suturing for small defects. Hygienic and dietary measures, including diet, exercise, statin use, and blood pressure control, also play an essential role in managing symptomatic patients [8,9].
The frequency of paradoxical embolism due to a PFO accounts for less than 2% of all arterial embolisms. Certain conditions, such as pulmonary embolism (PE), can increase right atrial pressure, leading to significant right-to-left shunting, which promotes the occurrence of paradoxical embolism. Rarely, a thrombus in transit can be trapped in a PFO and, even more rarely, visualized by CT imaging [10].

The presence of a saddle thrombus straddling the interatrial septum through a PFO is rare but represents a high-risk embolic situation with significant mortality, estimated at 11.5% within 24 hours in such cases [10,12]. This condition indicates the need for surgical embolectomy combined with PFO closure [13]. While anticoagulation is recommended for patients with mitral stenosis and atrial thrombus [14], surgery is preferred in cases like this, allowing removal of the thrombus, closure of the PFO, and reduction of systemic embolic risk. In this patient, surgery was indicated due to clinically significant severe rheumatic mitral stenosis (valve area ≤ 1.5 cm²) complicated by a thromboembolic event [15].

Clinicians must be aware of this rare but serious association, as it represents a significant risk of systemic embolic complications. Screening for PFO in patients with mitral valve disease and intracardiac thrombus formation should be systematically considered, and early surgical management should be discussed to minimize the risk of catastrophic thromboembolic events.

Conclusion

This case illustrates the complexity of managing patients with mitral stenosis associated with PFO. The increased risk of thrombus formation in the left atrium and the possibility of systemic migration via the PFO underscore the need for careful ultrasound screening in these patients. Optimal treatment includes anticoagulation, PFO closure and mitral valve repair to prevent thromboembolic recurrence and improve long-term prognosis.

REFERENCES

1. Wrisley D, Giambartolomei A, Lee I, et al. Left atrial ball thrombus: review of clinical and echocardiographic manifestations with suggestions for management. Am Heart J. 1991; 121: 1784-1790.
2. Raoui J, Ugoani EO, Mesmoudi B, et al. Paintball thrombus in the left atrium complicating severe mitral stenosis. ARC J Cardiol. 2019; 5: 19-22.
3. Toshio Kaneda, Junzo Iemura, Iwao Michihata. Two cases of free-floatting ball thrombus in the left atrium. Circulation Journal. 2002; 66: 869-871.
4. Arani Raghavendrarao Raghuram, Subbiah Kumar, Kathamuthu Balamurugan. Left atrial ball thrombus. Ind J Thorac Cardiovasc Surg. 2007; 23: 34-35.
5. Oryoji A, Kawara T, Hara H. Left atrial free-floating ball thrombus in a patient without mitral valve disease. Nippon Kyobu Geka Gakkai Zasshi. 1993; 41: 699-703.
6. Arziquan C, Coste J, Touboul PJ, et al. Is patent foramen ovale a family trait? A transcranial Doppler sonographic study. Stroke. 2001; 32: 1563-1566.
7. Hagen PT, Scholz DG, Edwards DW. Incidence and size of patent foramen ovale during the first 10 decades of life: an autopsy study of 965 normal hearts. Mayo Clin Proc. 1984; 59: 17-20.
8. Hopkins RA, Bert AA, Buchholz B, et al. Surgical patch closure of atrial septal defects. Ann Thorac Surg. 2004; 77: 2144-2149.
9. Krumsdorf U, Ostermayer S, Billinger K, et al. Incidence and clinical course of thrombus formation on atrial septal defect and patent foramen ovale closure devices in 1,000 consecutive patients. J Am Coll Cardiol. 2004; 43: 302-309.
10. Rousselle M, Ennezat PV, Aubert JM, et al. Momentarily stuck in the foramen ovale. Eur J Echocardiog. 2007; 8: 223-226.
11. Messé SR, Gronseth GS, Kent DM et al. Practice advisory update summary: Patent foramen ovale and secondary stroke prevention: Report of the Guideline Subcommittee of the American Academy of Neurology. Neurology. 2020; 94: 876-885.
12. Chartier L, Béra J, Delomez M, et al. Free-floating thrombi in the right heart: diagnosis, management, and prognostic indexes in 38 consecutive patients. Circulation. 1999; 99: 2779-2783.
13. Can I, Altunkeser BB, Yavas O, et al. Transit thrombus entrapped in patent foramen ovale resolved without clinical embolic events. J Am Soc Echocardiogr. 2006; 19: 1-2.
14. Bonow RO, Carabello BA, Chatterjee K, et al. 2008 Focused update incorporated into the ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1998 Guidelines for the Management of Patients With Valvular Heart Disease): endorsed by the Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. Circulation. 2008; 118: e523-661.
15. Vahanian F, Beyersdorf F, Praz M, et al. ESC/EACTS Guidelines for the management of valvular heart disease: Developed by the Task Force for the management of valvular heart disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS), European Heart Journal. 2022; 43: 561-632.