
Mechanical Mitral Valve Failure after 40 Years: A Case Study in Timing and Decision-Making

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Abstract

The longevity of mechanical mitral valves has enabled many patients to live normal lives for decades following replacement. This case illustrates the complex decision-making process when a long-functioning mechanical valve begins to fail, highlighting the importance of optimal timing for reintervention.

Introduction

Mrs. Sarah Dinah, a 74-year-old woman, was diagnosed with rheumatic mitral disease in 1980. Due to progressive symptoms, her native valve was replaced with a mechanical valve in 1984, after which she maintained a normal life until 2022. Her condition then began to deteriorate progressively, with increasingly severe exertional dyspnea even with minimal effort. She developed chronic atrial fibrillation with subtherapeutic INR due to intestinal bleeding when her coumadin dose was increased. Despite oral and parenteral diuretics providing temporary relief, echocardiographic monitoring revealed preserved left ventricular function but gradually increasing pulmonary pressure.

In April 2024, she experienced sudden pulmonary edema requiring urgent cardiac intensive care admission. Following aggressive diuretic treatment, her condition improved. Echocardiography showed preserved left ventricular function but moderate decrease in right ventricular function, with pulmonary pressure at 62 mmHg, severe valve and paramitral leak, and mean transmitral gradient of 10 mmHg. She could no longer lie flat and required sleeping in a semi-upright position. An injection of low molecular weight heparin unfortunately caused abdominal wall bleeding with hemoglobin drop, requiring embolization in the seated position. The patient refused any further invasive therapeutic procedures.

She returned home but was readmitted one month later with an even more severe pulmonary edema episode. Chest X-ray raised concerns about the mechanical valve opening, prompting cardiac CT scanning. After extensive specialist discussion, sudden valve blockage requiring urgent surgery was ruled out. Transthoracic echocardiography showed worsening transmitral mean gradient of 15 mmHg with pulmonary pressure at 80 mmHg. While transesophageal echocardiography could have provided more precise diagnosis of the valvular degradation mechanism, this would have required intubation and ventilation, which was declined. Catheterization in the seated position confirmed echocardiographic findings, with calculated mitral surface area of 0.5 cm² indicating severe mitral stenosis and V-wave greater than 40 mmHg confirming severe mitral regurgitation, though right ventricular function remained preserved.

As her condition deteriorated daily, the patient eventually accepted surgical intervention. The initial surgical team declined the case due to her bleeding tendency and low weight of 30 kg, but another team accepted the challenge. Surgery revealed extensive clots and pannus formation on the mechanical mitral valve, preventing complete opening. The valve had also detached from the mitral ring, causing paravalvular leak. This failing valve was replaced with a biological valve. The postoperative course was complicated by persistently elevated pulmonary pressure and recurrent heart failure episodes. She ultimately died from intractable heart failure. This case demonstrates that mitral valve replacement is possible after 40 years; however, optimal surgical timing is before the development of elevated pulmonary pressure.

Case Presentation

Mrs. Dina O., a 76-year-old woman, underwent mitral valve replacement with a mechanical valve in 1984. She was maintained on Coumadin therapy for 40 years but was never adequately anticoagulated due to gastrointestinal bleeding that occurred when the dosage was increased.

She remained asymptomatic until 2022, when she began experiencing shortness of breath during regular exercise. Concurrent echocardiography showed progressive elevation of pulmonary artery pressure. She had atrial fibrillation with good rate control. In 2024, she presented with two episodes of acute heart failure and was hospitalized in the intensive care unit, where she received high-dose intravenous diuretics. Although she improved rapidly, she quickly became unable to lie flat (orthopnea). The status of this patient was not a contra-indication to perform the necessary tests to assess her cardiac condition. So, all cardiac examinations were performed in the sitting position due to her orthopnea.

Diagnostic Findings

- Echocardiography showed progressive increase in mitral diastolic gradient to a mean gradient of 15 mmHg
- Systolic pulmonary pressure increased to 80 mmHg
- Left ventricular function remained normal
- Both atria were severely dilated
- Right ventricular function was mildly decreased with moderate tricuspid regurgitation (Figure 1,2)
- Fluoroscopy revealed incomplete opening of the mitral valve (Figure 3)
- Right heart catheterization (performed in sitting position) estimated systolic pulmonary arterial pressure at 71 mmHg, mean wedge pressure at 40 mmHg, and mitral valve area at 0.5 cm² (Figure 4,5)

Transesophageal echocardiography would have helped determine the mechanism of mitral valve dysfunction, but this procedure required general anesthesia, which was contraindicated by anesthesiology. CT scan showed no signs of stuck valve leaflets. The combined data from echocardiography, fluoroscopy, CT scan, and right heart catheterization confirmed mechanical valve dysfunction and the need for valve replacement with a bioprosthetic valve.

Complications and Treatment: During preparation for surgery, Coumadin was replaced with low molecular weight heparin. Improper injection led to an abdominal hematoma diagnosed by CT scan (Figure 6). The resulting hemorrhage caused a rapid decrease in hemoglobin levels that was poorly tolerated. The left abdominal epigastric artery was successfully closed with a coil in the sitting position, after which hemoglobin levels improved immediately (Figure 7).

Surgical Intervention: The first surgical team declined the intervention due to patient frailty, but a second team accepted the challenging operation. The surgeon found the mechanical valve nearly detached from the annulus, making extraction straightforward without cutting the annular attachments. The operation was uneventful.

Post-operative Course

- Transmitral gradient decreased to a mean of 5 mmHg and the wedge pressure decreased to a mean of 17 mm Hg (Figure 8).
- Systolic pulmonary pressure remained elevated at 70 mmHg which is of bad prognosis according to reference 1 and 2.
- Clinical status improved, but orthopnea persisted
- Right ventricular function remained stable with moderate tricuspid regurgitation.

Another gastrointestinal hemorrhage occurred under low molecular weight heparin therapy. Left atrial appendage closure was considered but deemed contraindicated due to the massively enlarged left atrium and wide appendage neck. The patient was treated with aspirin without further bleeding episodes. Despite intensive medical treatment, cardiac decompensation recurred. The patient survived several months before dying of intractable heart failure.

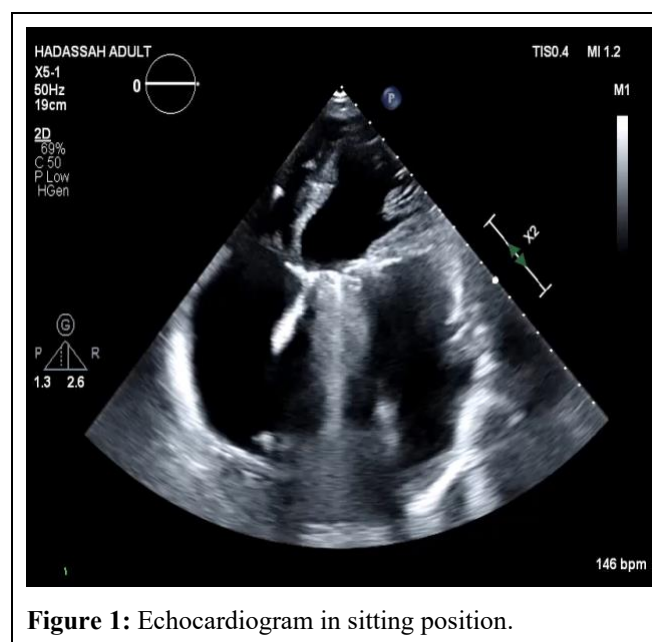
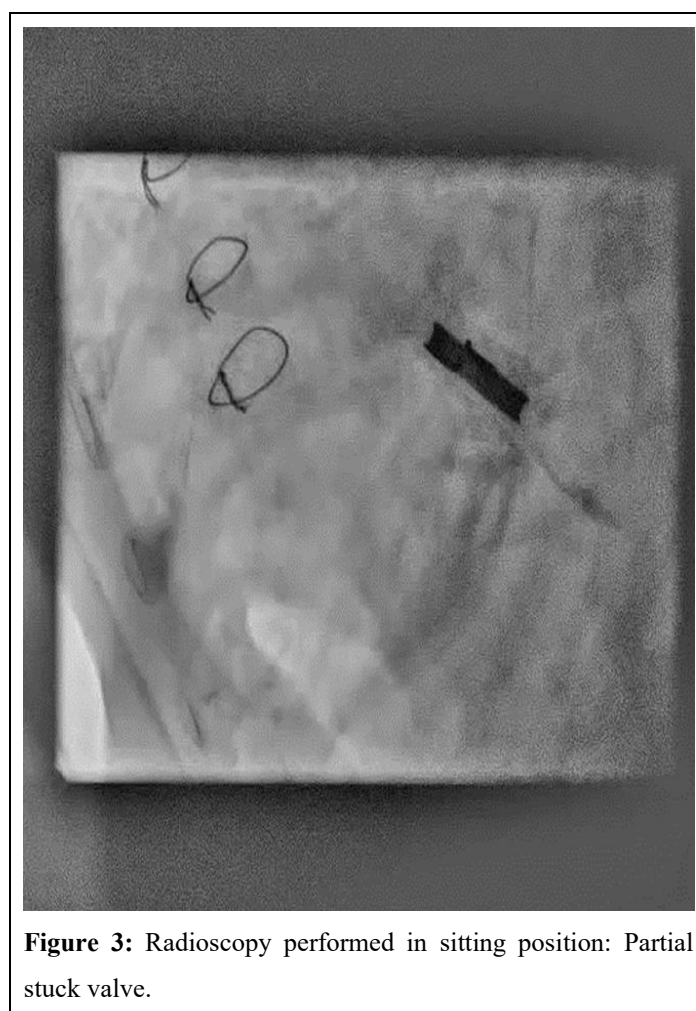
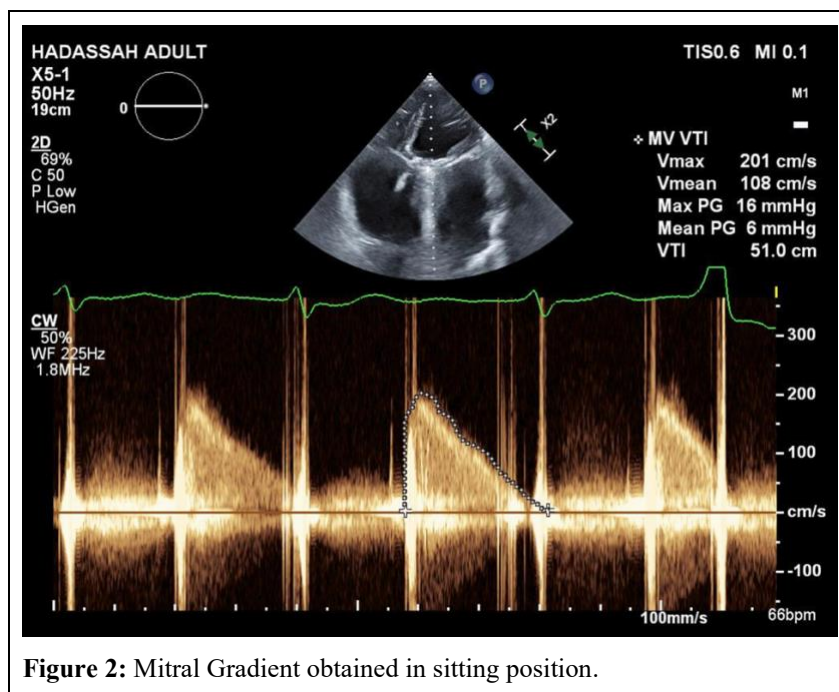
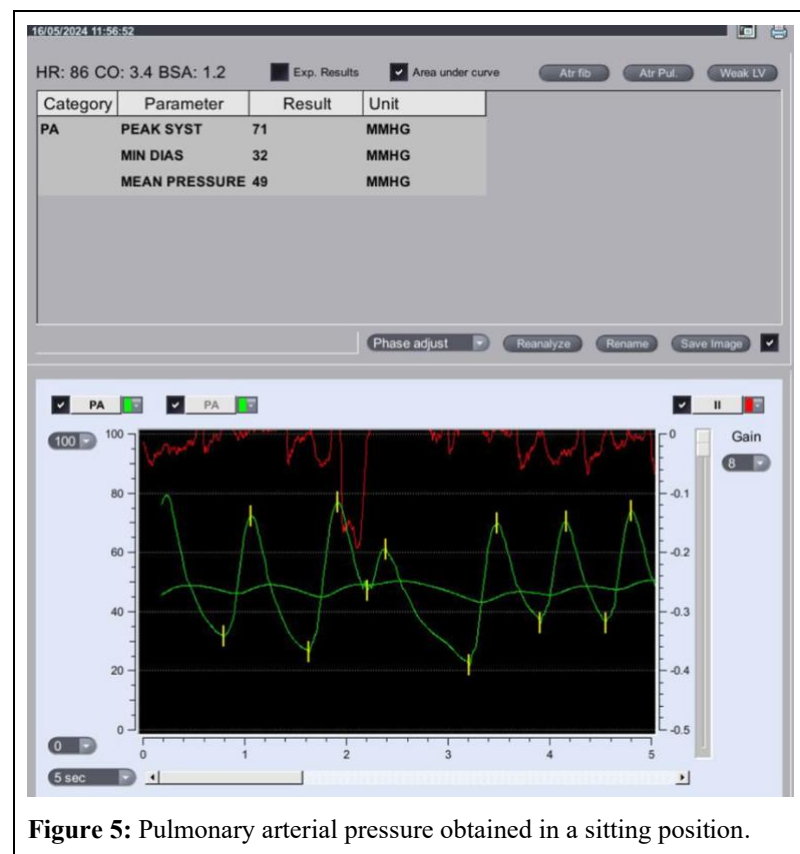
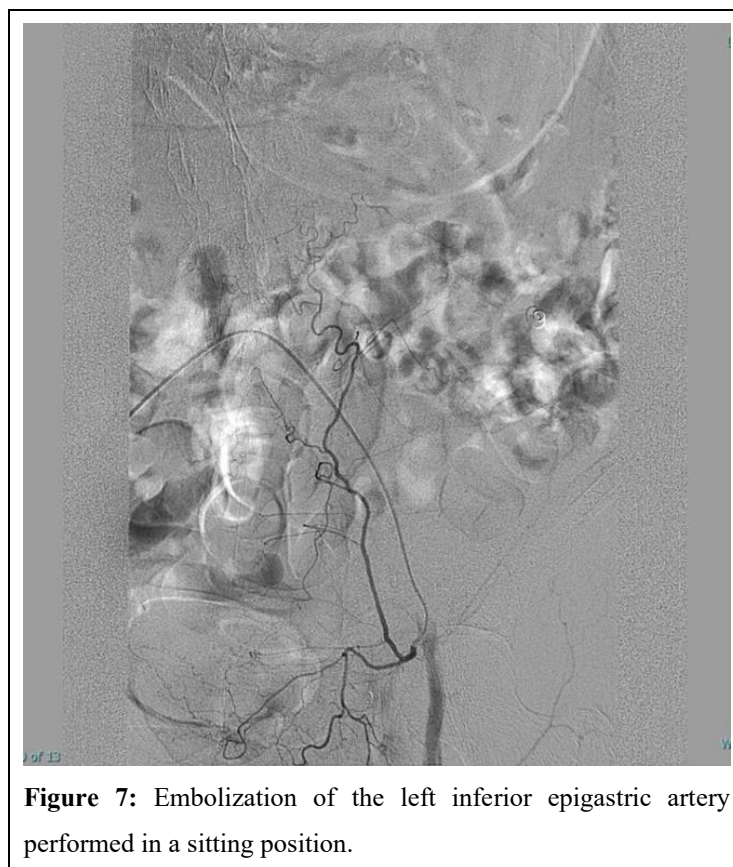
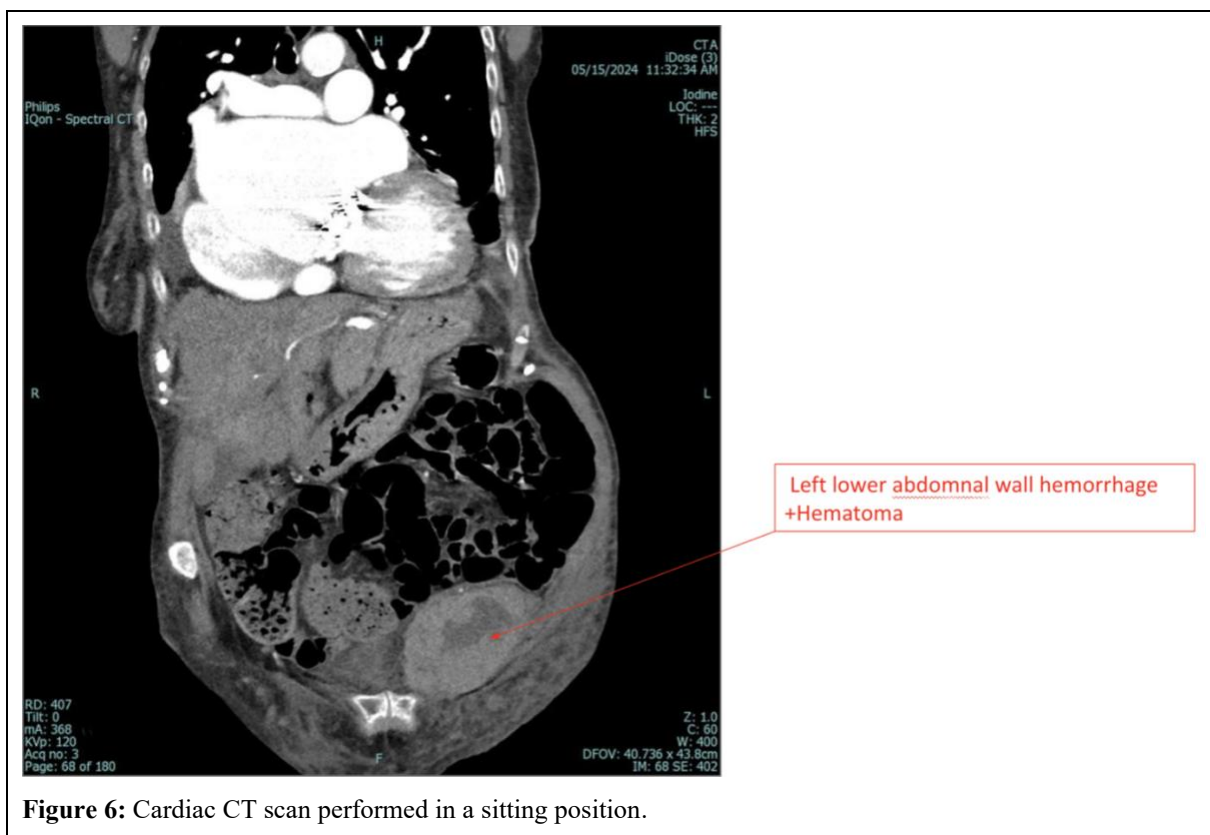


Figure 1: Echocardiogram in sitting position.







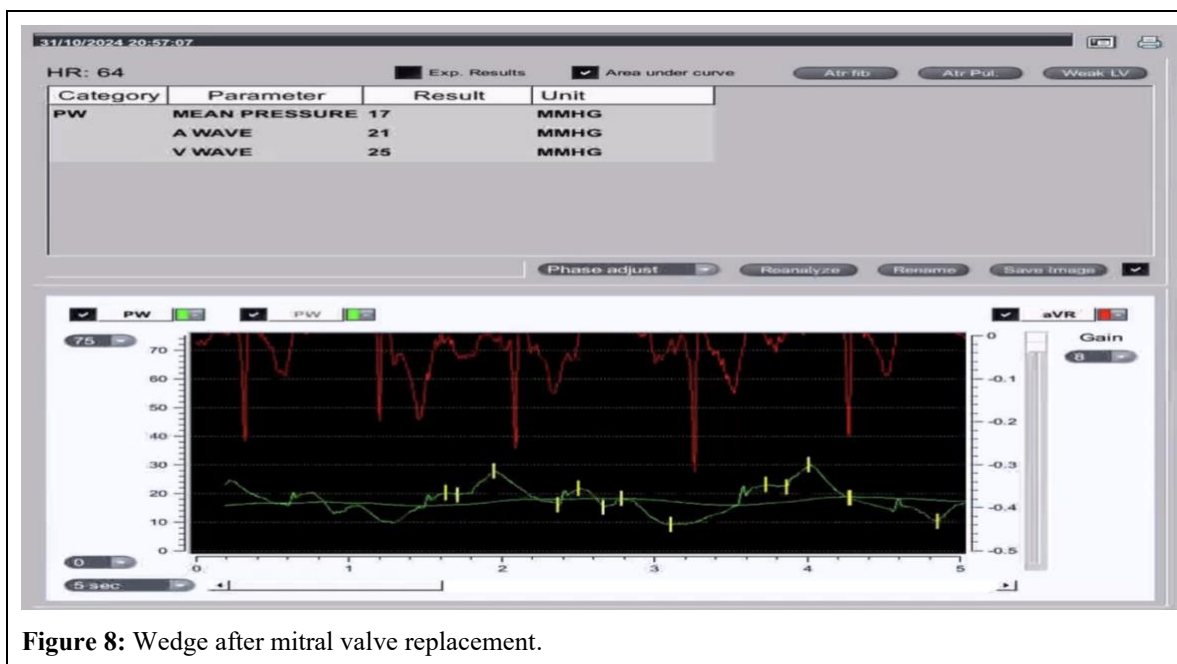


Figure 8: Wedge after mitral valve replacement.

Conclusion

When a mechanical mitral valve shows signs of deterioration, valve replacement is feasible even when cardiac testing is challenging and could be performed in sitting position. The optimal approach is early surgical intervention rather than waiting for extreme valve degradation.

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