

# Episodic Circulatory Collapse Caused by Intermittent Prosthetic Aortic Valve Dysfunction

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## ABSTRACT

An 80-year-old woman with a 20-mm Medtronic Hall (tilting-disc) aortic prosthesis presented with episodes of chest pain associated with circulatory collapse and subsequent rapid spontaneous recovery. A computed tomography angiogram demonstrated no evidence of aortic dissection, pulmonary embolus, or coronary artery disease. A transthoracic echocardiogram demonstrated a well-functioning prosthetic aortic valve. After another inpatient episode, auscultation demonstrated an intermittent absence of the prosthetic second heart sound. A transesophageal echocardiography examination revealed that the aortic valve was intermittently sticking in the open position. During the emergency replacement, the existing valve was noted to have pannus and overlying thrombus, which are rare in this type of valve but can lead to dramatic circulatory collapse when present. This case demonstrates how a diagnosis of intermittent valve dysfunction can prove elusive. It is important, as part of the assessment of mechanical valves, to perform regular, careful auscultation and echocardiographic examination, with emphasis on recording in Doppler or M-mode through the valve at slow sweep speeds for a prolonged period in order to maximize the chance of diagnosing episodic valve dysfunction.

## INTRODUCTION

An 80-year-old woman presented to the hospital with complaints of central chest pain. Her aortic valve had been replaced 20 years previously with a 20-mm Medtronic Hall (tilting-disc) prosthesis (Medtronic, Minneapolis, MN, USA). She was in good health after having made a complete recovery from left-sided hemiparesis in 2003. She was maintaining therapeutic levels of warfarin.

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## CASE REPORT

On admission, a clinical examination revealed a normal prosthetic second heart sound and no evidence of cardiac failure. Her admission electrocardiogram showed no ischemic changes, and her cardiac troponin I concentration was elevated at 25 µg/L. She was treated for acute coronary syndrome, and a coronary angiogram was planned.

On entry into the catheterization laboratory, the patient developed another episode of chest pain and became profoundly hypotensive. The episode resolved spontaneously within minutes. An aortic dissection was suspected, and therefore a computed tomography angiogram was performed. The results demonstrated no evidence of aortic dissection, pulmonary embolus, or significant coronary artery disease. An initial transthoracic echocardiogram (TTE) demonstrated moderate left ventricular dysfunction and a well-functioning prosthetic aortic valve.

Over the subsequent 2 days, the patient experienced 2 additional episodes of reduced consciousness and loss of cardiac output before rapidly recovering normotension and her normal alert conscious state. Only after the second episode did the clinical examination demonstrate an intermittent absence

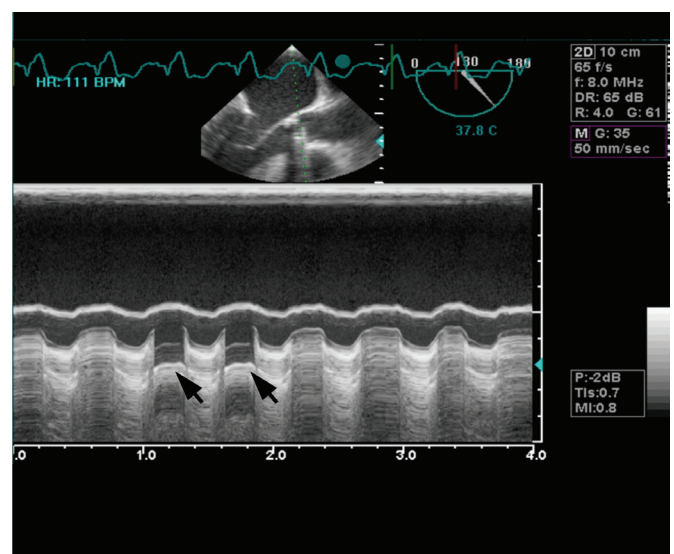


Figure 1. M-Mode transesophageal echocardiogram across the aortic prosthesis. Arrows indicate when the tilting disc is held in the open position.

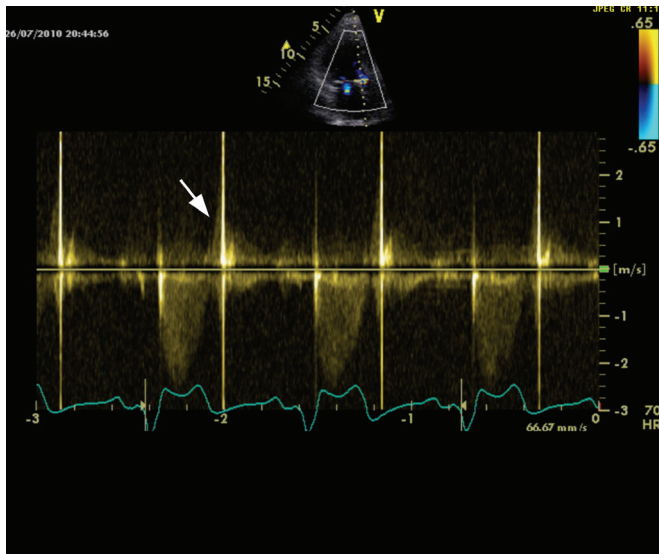


Figure 2. Initial continuous wave Doppler transthoracic echocardiogram demonstrating delayed closure of the aortic valve prosthesis (arrow)..

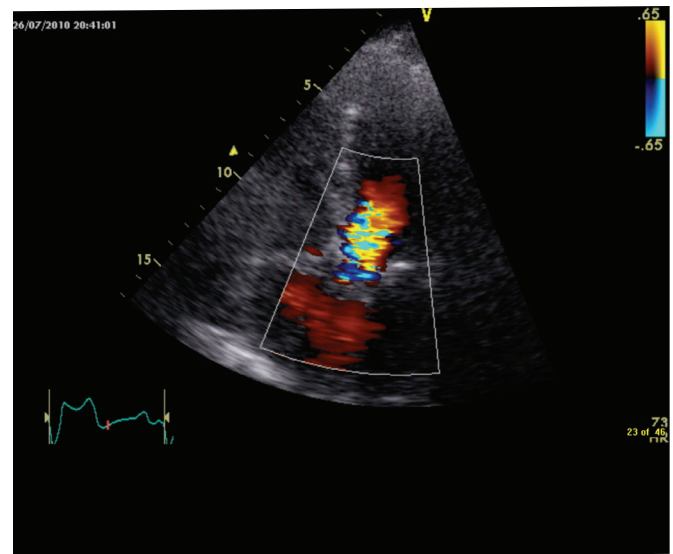


Figure 3. Initial color Doppler transthoracic echocardiogram demonstrating aortic regurgitation in early diastole

of the prosthetic second heart sound. An immediate TTE evaluation and a subsequent transesophageal echocardiogram revealed that the aortic valve was intermittently sticking in the open position (Figure 1, Video Clips 1 and 2 online).

The patient was referred for emergency cardiac surgery. The operative report stated: "Aortic valve: Disc obstructed by subvalvar organized thrombus (had partially begun to break free) and pannus near everting mattress sutures. Valve excised, annulus debrided, and where possible excess annular tissue removed. 21 mm Mosaic porcine prosthesis implanted."

The patient made an uncomplicated recovery and was well at clinic follow-up.

## DISCUSSION

The Medtronic Hall valve has demonstrated good long-term performance in 20 years of follow-up, with low rates (0.04%/year) of thrombosis [Butchart 2001]. Pannus is a recognized cause of late prosthetic valve dysfunction, although it is reportedly rare in this type of tilting-disc valve [Svennevig 2007]. Pannus is a substrate for the development of thrombus and can lead to dramatic circulatory collapse. The diagnosis of pannus is extremely difficult, both with TTE and transesophageal echocardiography, and is often found only at the time of surgery.

The initial clinical and echocardiographic examinations apparently revealed no obvious problem with the prosthetic valve and therefore drew attention toward other diagnostic possibilities. On a repeat TTE examination, we noted that the aortic valve closure lines were not occurring at end-systole (Figure 2), resulting in a very brief period of aortic regurgitation (Figure 3, Video Clip 3 online). This finding of early diastolic aortic regurgitation was also noted retrospectively in a previous report of Medtronic Hall prosthesis dysfunction [Fan

2008]. In that case, however, the patient presented with pulmonary edema rather than with profound circulatory collapse.

This case demonstrates how a diagnosis of intermittent valve dysfunction can prove elusive, and such cases require careful and thorough clinical and echocardiographic examinations. Recent joint guidelines of the American Society of Echocardiography, the European Association of Echocardiography, the Japanese Society of Echocardiography, and the Canadian Society of Echocardiography recommend cinefluoroscopy as a complementary technique in evaluating mechanical valves, and this method can prove helpful in assessing valve mobility [Zoghbi 2009]. However, prolonged fluoroscopy to identify intermittent valve dysfunction can lead to increased radiation exposure times [Horiguchi 2008]. When performing echocardiographic evaluation of prosthetic valves, it is important for one to record in Doppler or M-mode through the valve at slow sweep speeds for a prolonged period in order to maximize the chance of making the diagnosis of intermittent valve dysfunction. This examination should be performed as part of the routine assessment during analysis of mechanical valves, even in patients who are clinically well.

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