

Case Report

Free-floating Ball Thrombus in the Left Atrium after Mitral Valve Replacement

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ABSTRACT

A 69-year-old woman was admitted to our hospital with abdominal pain and melena. The patient had a history of mitral valve replacement and chronic atrial fibrillation. A computed tomographic scan revealed acute embolic superior mesenteric ischemia. Transthoracic echocardiography to find the embolic source revealed a free-floating ball thrombus in the left atrium. The thrombus was successfully removed by means of open-heart surgery after thrombolytic therapy for the superior mesenteric artery. (Jikeikai Med J 2009 ; 56 : 43-6)

Key words : free-floating ball thrombus, mitral valve replacement, atrial fibrillation, superior mesenteric ischemia, anticoagulation

INTRODUCTION

A free-floating ball thrombus in the left atrium is rare but can have the fatal consequences of total obstruction of the mitral valve ("hole-in-one" sudden death) and systemic embolization¹. Because of these risks, prompt surgical removal of the free-floating thrombus is the first choice of treatment. In the case described here, the thrombus was thought to be the embolic source of thrombosis of the superior mesenteric artery (SMA). This report describes the clinical features of a free-floating ball thrombus in the left atrium after mitral valve replacement.

CASE REPORT

A 69-year-old woman, who had undergone mitral valve replacement for severe mitral regurgitation 21 years earlier, was admitted to our hospital because of abdominal pain and melena. She had chronic atrial fibrillation, and on admission the prothrombin time-

international normalized ratio (PT-INR) was 1.29, which indicated ineffective anticoagulation. A computed tomographic (CT) scan and angiography revealed acute embolic superior mesenteric ischemia, and thrombolytic therapy with urokinase was immediately started for the obstructed SMA. A brain CT scan demonstrated multiple small old cerebral infarctions. Transthoracic echocardiography to find the embolic source and subsequent transesophageal echocardiography revealed a free-floating ball thrombus in the left atrium, with no apparent pedicle. The thrombus was spherical, approximately 3 cm in diameter, and moved randomly within the left atrium (Fig. 1). A free-floating left atrial ball thrombus was diagnosed, and an urgent open-heart procedure was performed to remove the thrombus. Before cardiac surgery, disappearance of the SMA thrombus and arterial patency were confirmed with angiography.

Cardiopulmonary bypass was instituted with bicaval and ascending aortic cannulation. After aortic cross-clamping, cardioplegia was achieved with

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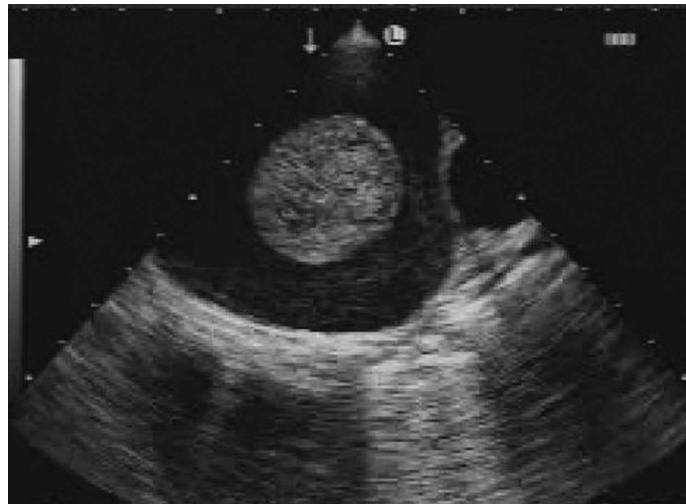


Fig. 1. Transesophageal echocardiography reveals a free-floating ball thrombus in the left atrium (LA). Thrombus demonstrates random mobility in the left atrium.



Fig. 2. Operative view showing the complete, free, spherical, smooth mass removed from the left atrium.

antegrade infusion of a hyperkalemic cold-blood solution. A longitudinal right-sided left atriotomy was made, and the round table tennis ball-like thrombus was removed. No mural thrombus was present in the left atrium (Fig. 2). The left atrium was closed, and cardiopulmonary bypass was discontinued. The thrombus was spherical and 3 cm in diameter with a homogenous dark-orange color (Fig. 3). Histological examination revealed that the thrombus was old. Although the patient tolerated surgery well, she died of gastrointestinal bleeding 42 days after the opera-

tion.

DISCUSSION

A free-floating ball thrombus is rare in patients who have undergone mitral valve replacement but can have potentially fatal complications, such as systemic emboli and total occlusion of the prosthetic valve. A free-floating ball thrombus in left atrial cavity was first reported in 1814 by Wood et al., who described autopsy findings in a 15-year-old girl with rheumatic

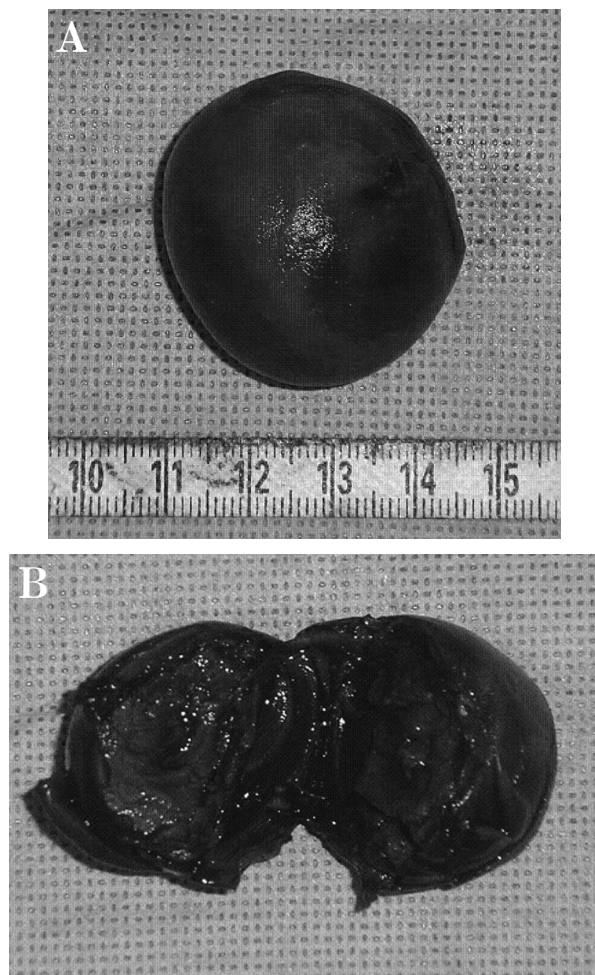


Fig. 3. (A) Gross appearance of the free-floating ball thrombus. The thrombus was spherical with a diameter of 3 cm, a smooth surface, and a homogenous dark orange color. (B) The cut surface of the free-floating ball thrombus was layered.

mitral stenosis and syncope². The estimated incidence of free-floating ball thrombi at autopsy is 1 in 2,000 to 3,000 cases³. In recent years, several cases of free-floating thrombi have been reported because of the routine and widespread use of echocardiography⁴⁻⁹.

Several studies have suggested that free-floating ball thrombi may form from a pre-existing mural thrombus in the left atrium. Lee and colleagues have suggested that ball thrombi originate as a small mural thrombus that gradually enlarges and forms a projecting mass that remains attached by a pedicle to the atrial wall. As the thrombus continues to enlarge,

the pedicle lengthens and thins until the thrombus eventually separates or fragments⁴. Another possible mechanism is that a small clot drops off from the atrial wall and develops into a congested atrial blood pool because of mitral valve stenosis, mitral valve replacement, or atrial fibrillation^{1,5}. In the present case, stagnation of blood in the left atrium had increased because of mitral valve replacement and atrial fibrillation, and an increase in blood coagulability induced by poor anticoagulation therapy might have been responsible for the formation of such a thrombus. Regarding anticoagulation after mitral valve replacement, maintaining the PT-INR at 2.0 to 3.0 is recommended. In our patient, the PT-INR on admission was 1.29, which indicated ineffective anticoagulation. Ineffective anticoagulation might contribute to the development of a free-floating ball thrombus. To prevent such a potentially fatal complication, strict warfarin control is essential.

Reported symptoms of free-floating ball thrombus include paroxysmal dyspnea, syncope, and peripheral arterial embolism. Systemic emboli or total occlusion of the prosthetic valve ("hole-in-one" sudden death) are potentially fatal complications. Symptomatic presentation is variable: fragmentation of the thrombus followed by peripheral embolization can cause ischemia or infarction of the myocardium, brain, viscera, or extremities, and random, intermittent, partial, or total occlusion of the mitral valve orifice may cause syncope, pulmonary congestion, and, occasionally, sudden death¹. On admission, our patient had acute embolic superior mesenteric ischemia caused by an atrial free-floating ball thrombus.

Echocardiography, particularly transesophageal echocardiography, is useful for detecting left atrial free-floating ball thrombi. However, differentiating between a thrombus and myxoma was difficult with transthoracic echocardiography alone. With transesophageal echocardiography, the mass in the left atrium was found to be smooth, unattached to the interatrial septum, and moving randomly in the left atrium and was, therefore, most likely to be a free-floating ball thrombus⁷.

Once a free-floating ball embolism in the left

atrium had been diagnosed, prompt surgical removal is necessary to avoid complications¹. The presence of a free-floating thrombus is expected to indicate higher embolic potential. Furthermore, fatal complications often occur shortly thereafter, because several reports have suggested that a left atrial ball thrombus can grow quickly^{6,8,9}. Leung and colleagues have used transesophageal echocardiography to estimate the thromboembolic risks of left atrial thrombus and have estimated the embolic event rate to be 10.4% per year and the all-cause mortality rate to be 15.8% per year⁷. Therefore, echocardiography is recommended in patients with atrial fibrillation who experience thromboembolic events.

CONCLUSION

Here, we have reported a free-floating ball thrombus in the left atrium after mitral valve replacement in a 69-year-old woman. Because this condition was potentially fatal, prompt surgical treatment was mandatory. The left atrial free-floating ball thrombus was removed surgically after thrombolytic therapy for concomitant acute embolism of the SMA.

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