

A Case with Recurrent Free-Floating Ball Thrombi in Left Atrium

Department of Cardiovascular Medicine, Kobe Rosai Hospital, Kobe, Hyogo, Japan

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEF **Takayuki Yoshioka**
DEF **Takehige Mori**
DEF **Yayoi Taniguchi**
DEF **Sonoko Hirayama**
DEF **Toru Ozawa**
DEF **Sachiyo Iwata**
DEF **Asumi Takei**
ABCDEF **Nobutaka Inoue**

Corresponding Author: Takayuki Yoshioka, e-mail: yosh1@kobe.hirofuku.go.jp
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Patient: Female, 74
Final Diagnosis: Left atrial ball thrombus
Symptoms: Abdominal discomfort • dyspnea
Medication: —
Clinical Procedure: —
Specialty: Cardiology

Objective: Rare disease

Background: A free-floating ball thrombus in the left atrium is a rare clinical condition. However, the diagnosis of this condition has been facilitated by the advent and development of echocardiography and multi-detector row computed tomography (MDCT) and several cases have been reported.





Case Report: We report a case of a 75-year-old woman who had recurrent giant spherical thrombi in the left atrium. She was diagnosed with chronic atrial fibrillation at 52 years of age. A pacemaker implantation was performed at 54 years of age because of a complete atrioventricular block; and mitral valve replacement was performed for severe mitral regurgitation at 62 years of age. She had a history of cerebral infarction and she was under treatment for chronic heart failure.

Despite intensive anticoagulant therapy, she developed ball thrombi in the left atrium three times in six months. During hospitalization for acute myocardial infarction treated with percutaneous catheter intervention, transthoracic echocardiography and computed tomography (CT) revealed a free-floating giant spherical thrombus in the left atrium. She was treated with intensive anticoagulation therapy and the left atrial ball thrombus disappeared; however, two ball thrombi in the left atrium and left atrial appendage recurred after three months. Surgical removal of the thrombi and closure of the left atrial appendage were performed. Unfortunately, a ball thrombus in the left atrium recurred again after a further three months.

Conclusions: The present case highlights the difficulty of treating refractory thrombi in the left atrium.

MeSH Keywords: Anticoagulants • Embolism and Thrombosis • Heart Atria

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Background

Formation of a left atrial thrombus is a complicated process with causative factors including alterations in blood flow, dysfunction of endocardium, or alterations in the constitutions of the blood making up Virchow's triad [1]. The incidence of systemic emboli is reported to considerably increase in patients with mitral valve disease with atrial fibrillation (AF) compared to those with normal sinus rhythm (NSR) [2,3]. It is well known that the patients with mitral valve replacement (MVR) still are at elevated risk of thrombosis and embolism. For example, Khan et al. reported that the thrombosis and embolism rate in patients undergoing MVR was 3.0% per year for mechanical valves and 2.5% per year for tissue valves [4].

A free-floating ball thrombus in the left atrium is a rare clinical condition. However, the diagnosis of this condition has been facilitated by the advent and development of echocardiography and multi-detector row computed tomography (MDCT), and several cases have been reported [5–19]. Here, we present a case of recurrent ball thrombi in the left atrium.

Case Report

A 75-year-old woman was under treatment for chronic atrial fibrillation (AF), chronic heart failure (CHF), and chronic kidney disease. A pacemaker implantation was performed at age 53 years for a complete atrioventricular block, and MVR for severe mitral regurgitation (MR) was previously performed. Transthoracic echocardiography (TTE) revealed that her left ventricular end-diastolic dimension was 56 mm and left atrial dimension was 70 mm. She had previously been hospitalized for these diseases several times. She had no coagulation disorder. Despite intensive anticoagulant therapy, she developed ball thrombi in the left atrium three times in six months.

First, she experienced acute myocardial infarction with the culprit lesion in the right coronary artery. Percutaneous catheter intervention for this lesion was successful, and the peak level of CPK was 1317 IU/L. However, symptoms of heart failure were worsened 26 days after admission. A 40×30 mm free-floating ball thrombus was detected in the left atrium with TTE and computed tomography (CT) (Figure 1). Because it was diagnosed shortly after myocardial infarction, nonsurgical treatment was selected. Heparin (12,000 U/day) was started along with warfarin (2 mg). The thrombus disappeared in six days after intensive anticoagulant therapy. However, she developed systemic embolization, including left cerebellar infarction, splenic infarction, and right renal infarction. We speculated that these disorders were due to embolization of the resolving thrombi in the left atrium. She recovered with only mild sequelae and she was able to leave our hospital.

Approximately one month after discharge, she presented to our hospital with abdominal pain. A CT scan revealed a recurrent 27×27 mm ball thrombus in the left atrium and an 18×14 mm ball thrombus left atrial appendage (Figure 2). Because her general condition was relatively better than at the previous hospitalization, we recommended surgical treatment and the patient and her family agreed to our proposal. These thrombi in the left atrium and the left atrial appendage were surgically removed (Figure 3) and closure of the left atrial appendage was performed.

After two months, the patient again presented to our hospital with abdominal pain, and an 8×7 mm ball thrombus in the left atrium was detected by CT scan. It was attached to the posterior wall of the left atrium (Figure 4A). Reinforcement of the treatment with warfarin was selected. Two months later, unfortunately, the thrombus grew larger (Figure 4B) and the size was 34×29 mm. The patient and her family preferred conservative treatment and we added to use heparin again. However, progression of serious anemia ensued with subcutaneous bleeding of the right femoral lesion, forcing the cessation of anticoagulant therapy. Her CHF worsened, and she died shortly thereafter.

Discussion

It was extremely difficult to prevent the formation of thrombi in the left atrium in the present case. Several clinical states prone to left atrial thrombi include mitral stenosis, atrial fibrillation, severe left atrial dilatation, status of post mitral valve replacement, congestive heart failure, bradycardia, exogenous material in the left atrium, dysfunction of coagulating system, low cardiac output, myocarditis, hypertrophic cardiomyopathy, and infectious endocarditis [13–16]. In the present case, the patient's coagulating system was normal; however, she had a past history of severe MR after MVR and was under treatment for chronic AF. The dimension of the left atrium was enlarged (70 mm). In addition, she developed acute myocardial infarction with an ejection fraction of only 28% by TTE. Thus, these factors might have contributed to the repeated formation of the ball thrombi.

The mechanism by which a free-floating ball thrombus forms in the left atrium remains to be elucidated. It is generally thought that, if a small size thrombus is generated, it should flow away from the mitral valve orifice and cause systemic embolization. A thrombus adhering to the wall of the left atrium or left atrial appendage may serve as the nidus for a free-floating ball thrombus. Lee et al. assumed that, after originating from a smaller mural thrombus created secondary to abnormal flow dynamics with focal blood stasis, the thrombus gradually grows until becoming detached under its own

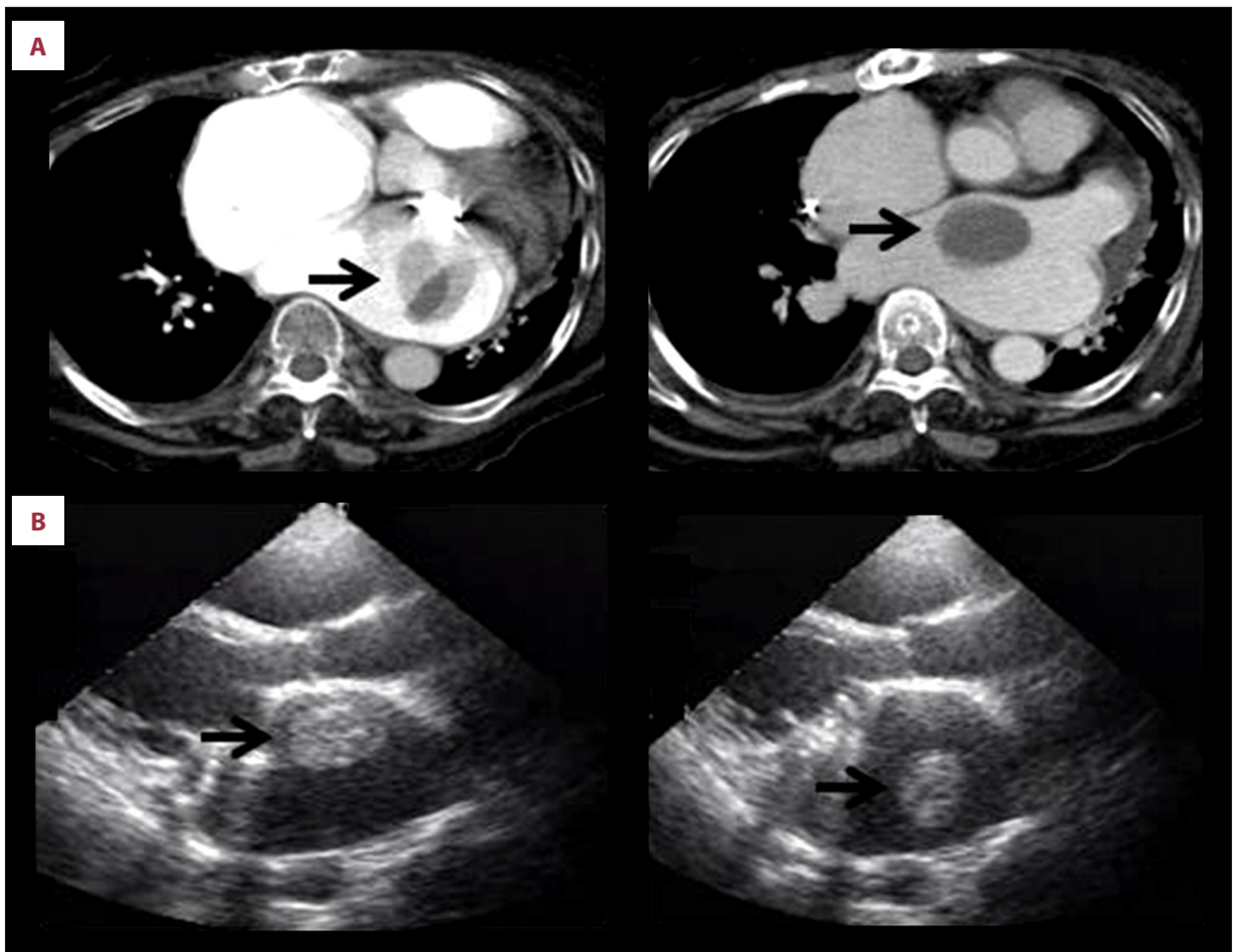
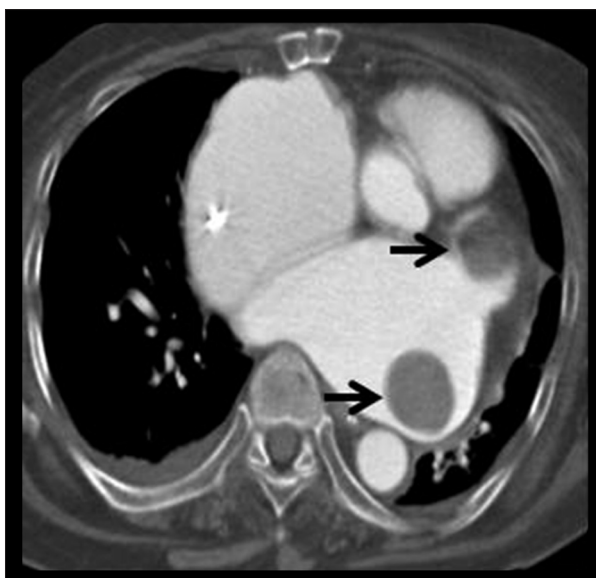


Figure 1. (A) Computed tomography (CT) scan of the heart showing free-floating thrombus with contrast (left panel, arrow). Because the ball thrombus was moving in the left atrium, it looked blurred by CT scan. The same thrombus detected by CT scan without contrast (right panel, arrow) showing its change of position in the left atrium. (B) Transthoracic echocardiography (TTE) showing that the ball thrombus (arrow) was moving freely.



weight. Its round shape and smooth surface are attributed to the sculpting effect of the numerous multifaceted collisions with the atrial wall [17]. Yoshida et al. speculated that a fixed thrombus in the left atrium is formed initially, then grows into the left atrial cavity and forms a spherical shape, with final disconnection of the pedicle between the thrombus and the atrial wall [18]. However, Yamaguchi et al. succeeded in observing the transformation of a free-floating ball thrombus by TTE and reported that it alternated between free floating and adhesion to the wall of left atrium or left atrial appendage during a process of the growth [19]. In our case, the first ball thrombus was freely moving in the left atrium when it was detected by TTE, where the second two ball thrombi were adherent to the walls of left atrium and left atrial appendage, respectively.

Figure 2. Computed tomography (CT) scan of the heart with contrast showing the ball thrombi generated in the left atrium and the left atrial appendage (arrow).

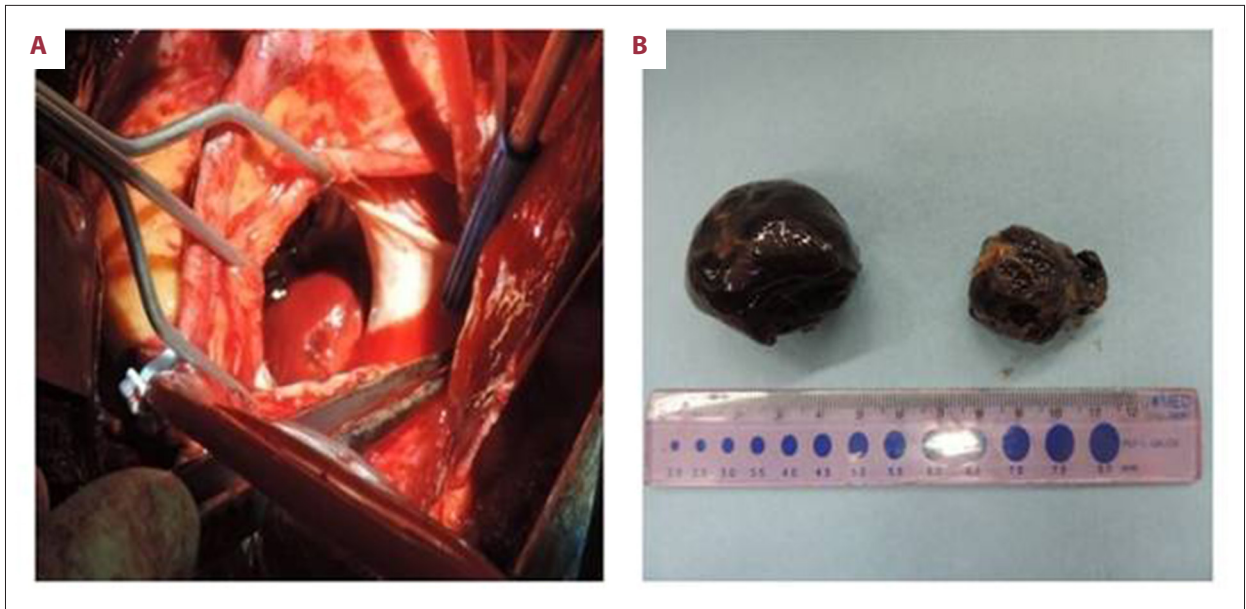


Figure 3. The ball thrombus in the left atrium (A) at surgery, and the two thrombi (B) after removal.

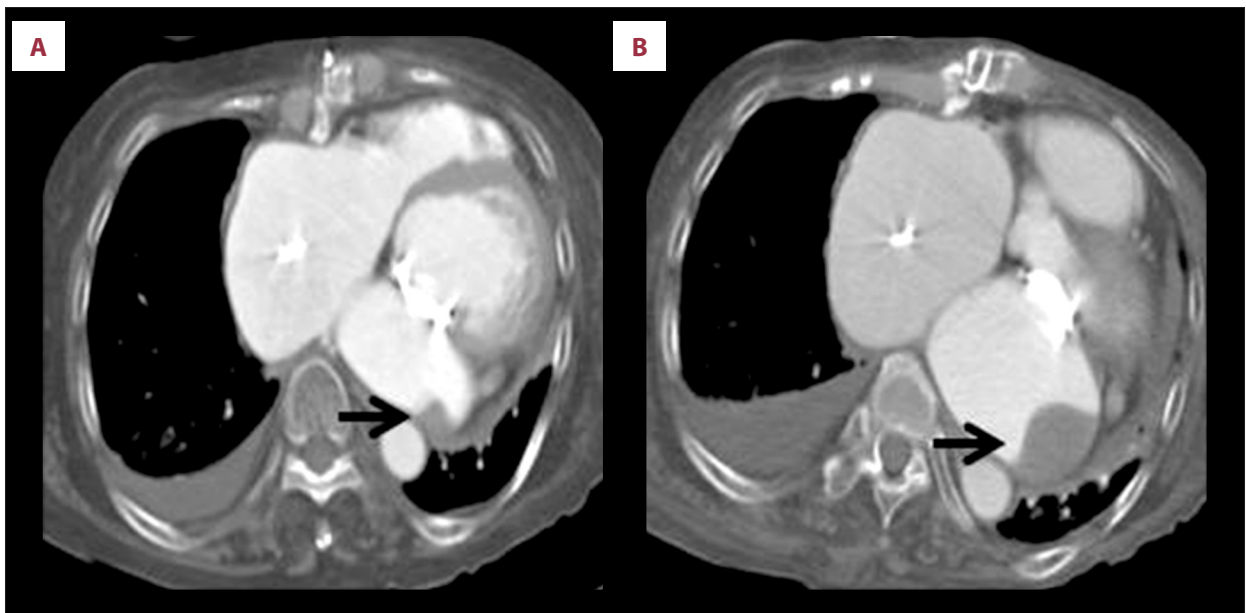


Figure 4. Computed tomography (CT) scan showing a recurrent smaller thrombus (arrow) arising from the posterior wall of the left atrium (A) and its subsequent expansion (B).

From this finding suggested that the ball-like thrombus in the present case might be formed in left atrial appendage and released into the left atrium, or the reverse might also be true.

A free-floating ball thrombus in the left atrium may cause fatal systemic embolization or sudden circulatory dysfunction due to left ventricular inflow obstruction. Prompt surgical removal is therefore generally recommended to prevent these complications. In the present case, when we detected a ball thrombus in the left atrium by TTE the first time, the ball thrombus

was freely moving. However, we were forced to treat this with anticoagulation therapy and not surgical removal because of the patient's severely poor general condition. Afterward, although she was treated with adequate anticoagulant therapy by warfarin, she developed ball thrombi in the left atrium repeatedly. Prevention of the recurrence of the ball thrombus in this patient with several risk factors was markedly difficult.

Recently, novel vitamin K antagonist oral anticoagulants (NOAC) for use in patients with non valvular atrial fibrillation (NVAf)

have appeared. Several reports have suggested that, in the NOAC treatment of NVAF patients with intra-cardiac thrombi, the thrombi reduced in size and disappeared, suggesting some thrombolytic effects [20–22]. On the other hand, Eikelboom et al. evaluated the use of the NOAC dabigatran in patients with mechanical heart valves and reported that the use of dabigatran in these patients was associated with increased rates of thromboembolism and bleeding complications compared with warfarin [23].

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Conclusions

We have presented a case of recurrent ball thrombi in the left atrium. A ball thrombus in the left atrium can be fatal mainly by embolization and left ventricular inflow obstruction, and demands prompt and effective treatment. However, because our patient had several risk factors, even surgical treatment left her at high risk of recurrence.

Conflict of interest

None declared.