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CASE REPORT
Cardiac imaging

A rapidly growing cardiac calcified amorphous tumour diagnosed after coronary artery bypass graft surgery: a case report

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Background A cardiac calcified amorphous tumour (CAT) is a non-neoplastic intracavitary cardiac mass. The most serious complication is systemic embolism. Cardiac CATs tend to be surgically resected immediately after detection; therefore, its progress of growth is rarely reported.

Case summary An 83-year-old Japanese woman received on-pump beating coronary artery bypass graft surgery (CABG) for angina pectoris. Transthoracic echocardiography (TTE) performed preoperatively and 1 month postoperatively revealed the presence of mitral annular calcification, with no other abnormal findings. However, follow-up TTE performed 5 months after CABG revealed a mobile nodular mass (5.0×8.2 mm) in the left ventricular outflow tract. At 1 month after detection, the mass had enlarged to 5.0×13.0 mm. Transoesophageal echocardiography revealed that the pedunculated high-echoic mass was adhered to the posterior commissure of the mitral valve and was dynamically swinging towards the non-coronary cusp in the systolic phase. As the mass had grown rapidly in less than 6 months, it was surgically resected to prevent systemic embolism. The histological specimen consisted mainly of fibrin, including calcification and hemosiderin deposition, which lead to a diagnosis of cardiac CAT. The patient had an uneventful postoperative course during her hospital stay and had no evidence of recurrence for 1 year after discharge.

Discussion This was a rare case in which a rapidly growing cardiac CAT was detected following on-pump CABG. Cardiac CATs may grow very rapidly and therefore early surgery should be considered after initial diagnosis.

Keywords Calcified amorphous tumour • Case report • On-pump coronary artery bypass graft • Left ventricular outflow tract

Learning points

- A cardiac calcified amorphous tumour (CAT) may grow rapidly in less than 6 months.
- Echocardiography is the most preferable imaging modality for identifying the progression of a cardiac CAT.

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Introduction

A cardiac calcified amorphous tumour (CAT) is a non-neoplastic intracavitary cardiac mass composed of nodular calcium deposits within degenerating blood elements and fibrinous material.[1] The conditions most frequently associated with a CAT are valvular disease, mitral annular calcification (MAC), end-stage renal disease, diabetes, and coronary disease.[2] The mean age at presentation was 54 years, with a female predominance.[2] The most frequent presenting symptom was dyspnoea followed by syncope, leading to detection of pulmonary and systemic embolization in 31% of the cases.[2] A cardiac CAT is generally surgically removed immediately after its detection; therefore, little has been reported about the progress of this tumour. Herein, we report a case of a cardiac CAT that showed rapid growth on serial echocardiographic imaging following on-pump coronary artery graft surgery (CABG).

Timeline

October 2019	On-pump coronary artery bypass graft surgery was performed.
November 2019	There were no remarkable findings on follow-up transthoracic echocardiography (TTE).
March 2020	A mobile cardiac mass (5.0 × 8.2 mm) was detected incidentally on follow-up TTE.
April 2020	The mass was 5.0 × 13.0 mm and its mobility had increased. Therefore, it was surgically resected. The mass was diagnosed as a cardiac calcified amorphous tumour based on pathological findings.
April 2021	The patient is clinically well without evidence of recurrence.

Case presentation

An 83-year-old Japanese woman with a history of hypertension and dyslipidaemia underwent on-pump CABG for angina pectoris with multi-vessel coronary artery disease. Transthoracic echocardiography (TTE) performed preoperatively and 1 month postoperatively revealed normal wall motion of the left ventricle and the presence of MAC, with no other abnormal findings (*Figure 1A*). However, follow-up TTE performed 5 months after CABG revealed a mobile nodular mass (5.0 × 8.2 mm) in the left ventricular outflow tract (LVOT) (*Figure 1B*). Considering the risks of non-bacterial thrombotic endocarditis or thrombus, the patient was prescribed apixaban 5 mg/day in addition to the aspirin 100 mg/day that she was taking for known ischaemic heart disease. A further 1 month later, the mass had enlarged to 5.0 × 13.0 mm (*Figure 1C*), and the patient was referred to our hospital for further investigation.

Physical examination on admission showed a Levine 2/6 systolic murmur at the left sternal border, a regular heart rhythm of 61 b.p.m., and blood pressure of 117/71 mmHg. No remarkable symptoms were observed. The results of the laboratory study were as follows: white blood cell count 4200/μL, C-reactive protein 0.04 mg/dL, serum creatinine 0.63 mg/dL, haemoglobin A1c 6.0% (42 mmol/mol), and brain natriuretic peptide 317 pg/mL. Blood tests including thrombotic and autoimmunological parameters were unremarkable, and blood cultures were negative. Electrocardiography and chest radiography revealed no abnormalities. TTE showed no significant valvular dysfunction or wall-motion asynergy in the left ventricle, though a mobile cardiac mass was observed in the LVOT. Transoesophageal echocardiography revealed a pedunculated high-echoic mass that was adhered to the posterior commissure of the mitral valve and was dynamically swinging towards the non-coronary cusp of the aortic valve in the systolic phase (*Video 1*).

Contrast computed tomography (CT) revealed MAC along almost the entire posterior leaflet of the mitral valve and a low-density string-shaped structure at the same site as the mass shown on TTE (*Figure 2A* and *B*). There were no space-occupying lesions suggestive of metastatic cardiac tumours in the thoracoabdominal CT. Cardiac cine magnetic resonance imaging (MRI) showed a low-signal intensity structure between the non-coronary cusp of the aortic valve and the posterior commissure of the mitral valve (*Figure 2C* and *D*).

As the mass had grown rapidly in less than 6 months, surgical resection was performed to prevent systemic embolism. The pedunculated mass was vulnerable and was resected successfully (*Figure 3*). On gross examination of the resected mass before formalin fixation, it was yellowish in colour and measured 13.0 × 5.0 mm (*Figure 4A*). The histological specimen which was stained with haematoxylin and eosin consisted mainly of fibrin, including calcification and hemosiderin deposition (*Figure 4B*). There were no malignant findings and no bacterial mass detected. Characteristic histologic findings lead to a diagnosis of cardiac CAT. The patient had an uneventful postoperative course during her hospital stay and had no evidence of recurrence for 1 year after discharge.

Discussion

This was a rare case in which a cardiac CAT grew rapidly in less than 6 months. Cardiac CAT was first reported as a non-neoplastic cardiac mass in 1997.[1] Histologically, a cardiac CAT is composed of nodular deposits of calcium in a background of amorphous degenerated fibrin and focal inflammation.[1] In a review of 42 patients with cardiac CAT, the most frequently associated conditions were valvular disease (31%), MAC (14%), end-stage renal disease (21%), diabetes (14%), and coronary artery disease (12%).[2] Cardiac CAT occasionally leads to systemic embolisms of varying sizes, potentially causing visual loss due to retinal arterial occlusion, acute cerebral infarction, iliac artery occlusion, and pulmonary embolism.[3–6] A vast majority of patients underwent surgery had favourable outcomes, with 5% of postoperative mortality and 2% of recurrence of CAT.[2] There are several differential diagnoses including thrombus, infective endocarditis, non-bacterial thrombotic endocarditis, papillary fibroelastoma, or cardiac tumour such as myxoma.[7–11]

The present patient underwent on-pump beating CABG without any intracardiac invasion. There were no remarkable findings on TTE performed 1 month after surgery; therefore, the relationship between the

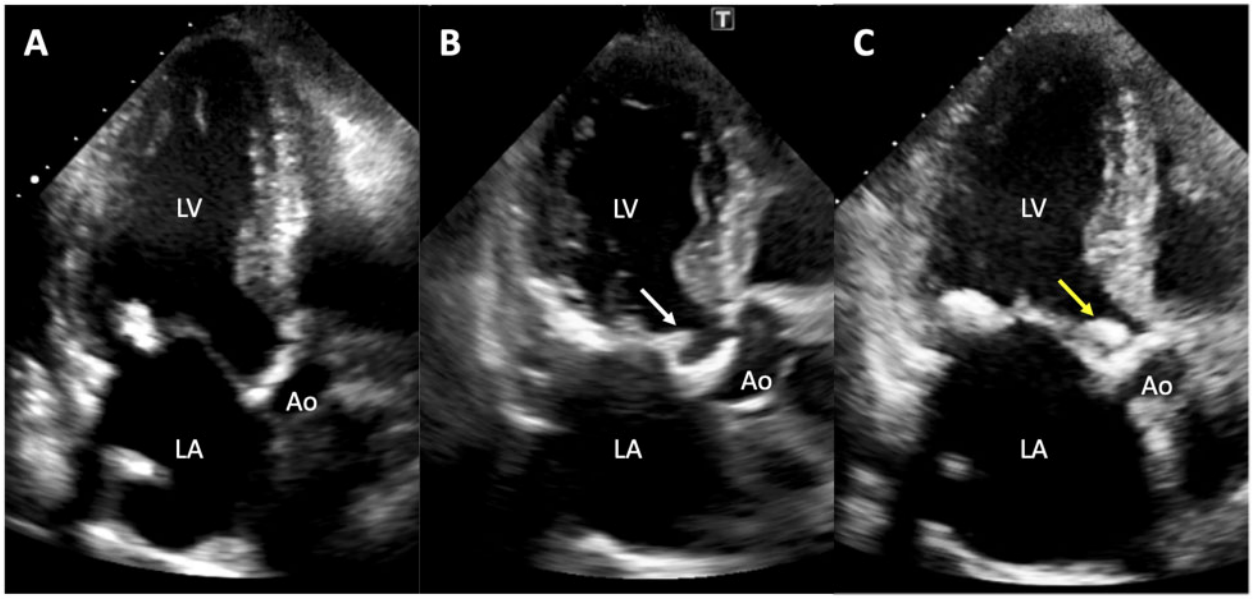
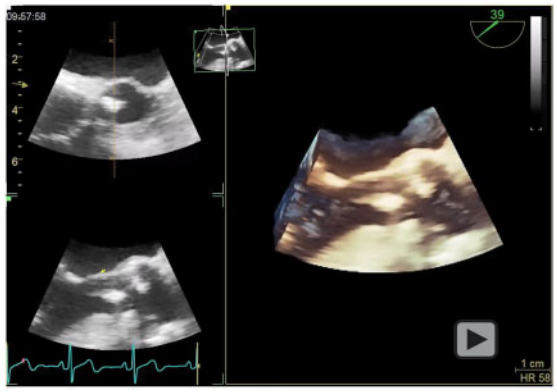


Figure 1 Postoperative transthoracic echocardiography studies. Transthoracic echocardiography findings at the following three points in time. (*A*) Normal wall motion of the left ventricle and the presence of mitral annular calcification, with no other remarkable findings at 1 month after surgery. (*B*) The 5.0 × 8.2-mm mass (white arrow) newly detected 5 months after surgery, which was formed in the left ventricular outflow tract and was swinging towards the aortic valve in the systolic phase. (*C*) One month later, the mass had enlarged to 5.0 × 13.0 mm (yellow arrow). Ao, ascending aorta; LA, left atrium; LV, left ventricular.



Video 1 Transoesophageal echocardiography showing a nodular mass swinging towards the non-coronary cusp in the systolic phase.

occurrence of the cardiac CAT and the surgery itself remains unclear. Little is known about the growth rate of cardiac CAT, as the mass in most reported cases is surgically resected immediately after detection. In previous reports, patients accompanied with MAC experienced the rapid development of the cardiac CATs in 6 weeks to 1 year.[12,13] Hence, the growth rate of MAC-related cardiac CAT may be relatively faster than that of CAT in patients without MAC.

The lesions of cardiac CAT were mostly seen as partially calcified hypodense masses on CT findings.[14] In the present case, low-density mass was observed on contrast CT, which was less clear than that seen by echocardiography. In the MRI examination, the mass could be confirmed only by cardiac cine MRI. Given these findings, cardiac CAT with high mobility might not be reliably assessed by CT or MRI.

In the present case, the cardiac CAT grew rapidly in the last 1 month before resection. Although the best treatment strategy for a cardiac CAT remains unclarified, we propose the early-stage surgery after initial diagnosis considering the potential for rapid tumour growth.

Lead author biography

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Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

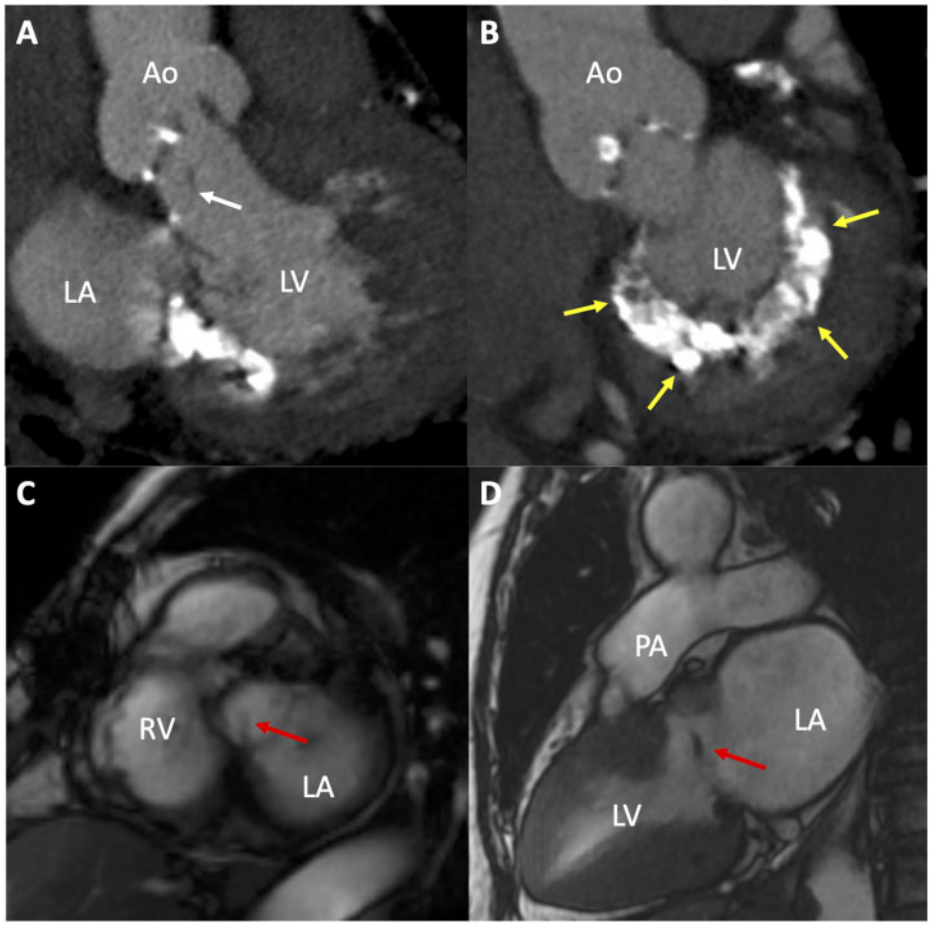

Figure 2 Imaging of the cardiac mass. (*A* and *B*) Contrast computed tomography (reformatted three-chamber view during the early contrast phase) showing a low-density string-shaped structure (white arrow) and mitral annular calcification (yellow arrow) in the posterior region of the mitral valve. (*C* and *D*) Cardiac cine magnetic resonance imaging showing a low-signal intensity structure (red arrows) between the non-coronary cusp of the aortic valve and the posterior commissure of the mitral valve. Ao, ascending aorta; LA, left atrium; LV, left ventricular; PA, pulmonary artery; RV, right ventricular.

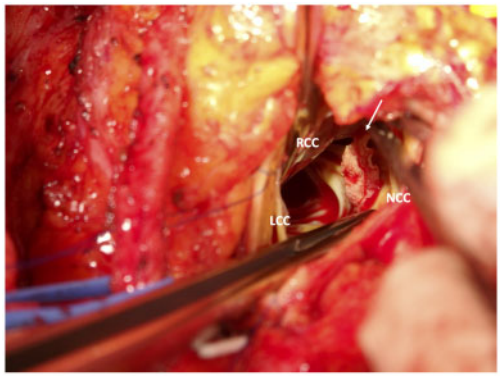

Figure 3 Intraoperative findings. The mass is confirmed through the aortic valve. The pedunculated mass (white arrow) is vulnerable and adhered at the left ventricular outflow tract. LCC, left coronary cusp; NCC, non-coronary cusp; RCC, right coronary cusp.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

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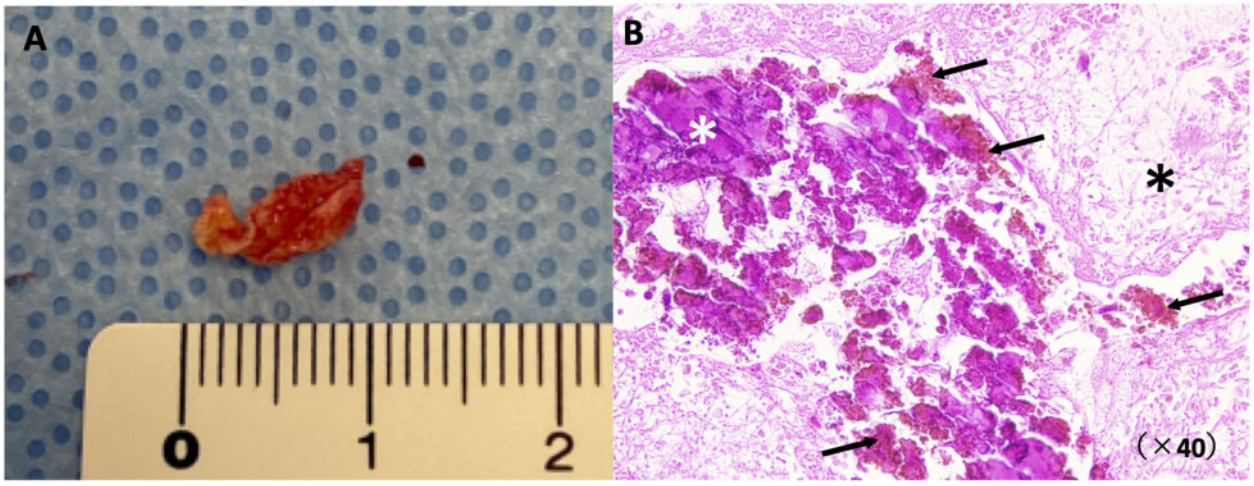

Figure 4 Examination of the resected specimen. (*A*) Gross appearance of the resected mass before formalin fixation (13 × 5 mm). (*B*) The histological specimen *which was stained with haematoxylin and eosin* consists mainly of fibrin (black asterisk), including calcification (white asterisk) and hemosiderin deposition (black arrow).

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