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CASE REPORT
Cardiac imaging

Left atrial dissection associated with disruption of mitral annular calcification: a case report

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Background Left atrial dissection is an uncommon entity associated with cardiac surgery, catheter interventional procedures, or cardiac trauma. Spontaneous cases have also been reported. The entry of left atrial dissection often occurs in the posterior annulus of the mitral valve, which is also a favourable site for mitral annular calcification (MAC). We herein report a rare case of spontaneous left atrial dissection caused by a disruption of MAC.

Case summary An 84-year-old woman was admitted to our hospital for chest discomfort. Transthoracic echocardiography showed severe calcification of the posterior mitral annulus and a heterogeneous mass in the posterior wall of the left atrium adjacent to MAC. Transoesophageal echocardiography showed blood flow through MAC from the left ventricle into the mass. Cardiac computed tomography showed the disruption of MAC, which was the entry for left atrial dissection and haematoma. The conservative approach was continued, as the haemodynamic state was stable and because of her frailty and many complications. No further events occurred during 6 months follow-up, although the false cavity did not regress.

Discussion The diagnosis of an intracardiac mass can be challenging. In our case, a detailed anatomical evaluation with multiple imaging modalities allowed us to understand the disease and manage it appropriately.

Keywords Case report • Left atrial dissection • Mitral annular calcification • Left atrial mass • Transthoracic and transoesophageal echocardiography • Computed tomography

ESC Curriculum 2.1 Imaging modalities • 2.2 Echocardiography • 2.4 Cardiac computed tomography

Learning points

- Left atrial dissection is a rare cause of the intracardiac mass.
- The findings of multiple imaging modalities led to the diagnosis of left atrial dissection and further revealed that the entry was located in a disruption of mitral annular calcification (MAC).
- Although MAC is known to be a risk factor for mitral valve disease and cerebral infarction, there have been no reports of left atrial dissection caused by disruption of MAC.

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Introduction

Left atrial dissection is a rare entity,[1] commonly associated with cardiac surgery,[2] catheter interventional procedures,[3] or cardiac trauma.[4] In the literature, there are a few reports of spontaneous cases.[5] We herein report a case of left atrial dissection caused by spontaneous disruption of mitral annular calcification (MAC). The combination of diagnostic imaging including transthoracic echocardiogram (TTE) and transoesophageal echocardiogram and cardiac computed tomography (CT) provided information about the characteristics and possible aetiology of the mass.

Timeline

14 years previously	Percutaneous coronary intervention (PCI) to the right coronary artery (RCA) #3 for unstable angina pectoris (uAP) was performed.
3 years previously	PCI to the RCA #2 for uAP, and staged PCI to the left anterior descending artery #6–7 were performed.
6 months previously	A transthoracic echocardiogram (TTE) showed severe mitral annular calcification and no other abnormal findings in the left atrium.
3 days previously	Onset of chest discomfort.
Initial presentation	Suspicion of left ventricular rupture and localized cardiac effusion by valuation with TTE and transoesophageal echocardiogram. The diagnosis of left atrial dissection was eventually made by computed tomography.
1 month later	A TTE showed that the size of the dissected cavity remained unchanged, and blood flow from the left ventricle remained.
6 months later	No change in echo findings and no further events occurred.

Case presentation

An 84-year-old woman presented to our hospital complaining of chest discomfort lasting 3 days. Her medical history comprised coronary artery disease (percutaneous coronary intervention to the right coronary artery and left anterior descending artery was performed), arteriosclerosis obliterans of the lower extremities, end-stage renal disease just before starting haemodialysis, and type 2 diabetes mellitus. There was no previous history of cardiac surgery or chest trauma.

A physical examination showed a pan-systolic murmur heard best at the cardiac apex and mild pitting oedema of lower limbs. An electrocardiogram was unremarkable. A chest radiograph (*Figure 1*) revealed an enlarged cardiac silhouette and pulmonary vein congestion. Laboratory tests showed a serum creatinine level of 4.45 mg/dL (normal range < 1.04 mg/dL) (estimated Glomerular Filtration Rate 7.9 mL/min/1.73 m^2), D-dimer level of 14.6 mcg/mL (normal range < 0.35 mcg/mL), brain natriuretic peptide level of 570.3 pg/mL (normal range < 40 pg/mL), and troponin-I level of 0.466 ng/mL (normal range <0.04 ng/mL), respectively. A TTE (*Figure 2*) revealed severe MAC and a mass (size: 61 mm × 32 mm) located on the left atrial posterior wall that was not seen in the echocardiogram obtained 6 months previously. The mass was adjacent to the mitral valve, and there was a mild restriction of mitral valve opening. However, the mean pressure gradient of the mitral valve was within the normal limits at 3.3 mmHg. A transoesophageal echocardiogram (*Figure 3*) showed the mass to contain a heterogeneous solid component and a cavity divided into two chambers by a flap. The mass appeared to be in close proximity to MAC, and colour flow mapping showed blood flow into the cavity of the mass from the left ventricle through MAC during the systolic period (*Video 1*). At this time, the diagnosis was left ventricular rupture with localized pericardial effusion. Therefore, we discussed an option of surgical repair. A cardiac CT (*Figure 4*) was performed and revealed that the running of the atrial branch of the coronary artery was located in the pericardial side of the mass, meaning that the mass was located in intra-atrial wall. Moreover, it showed contrast filling into the cavity of the mass, and there was a communicating orifice between the left ventricle and the cavity which was located in disruption of MAC of the posterior mitral annulus. A coronary angiography showed no significant stenosis in coronary arteries, and a left ventriculography (*Video 2*) demonstrated a contrast filling into the cavity. These findings suggested the diagnosis of left atrial dissection caused by disruption of MAC. Her operative risk was considered to be very high (STS score: risk of mortality, 54.8%; morbidity and mortality, 69.7%). Fortunately, because her haemodynamic status was stable, we decided to manage her conservatively without an operative

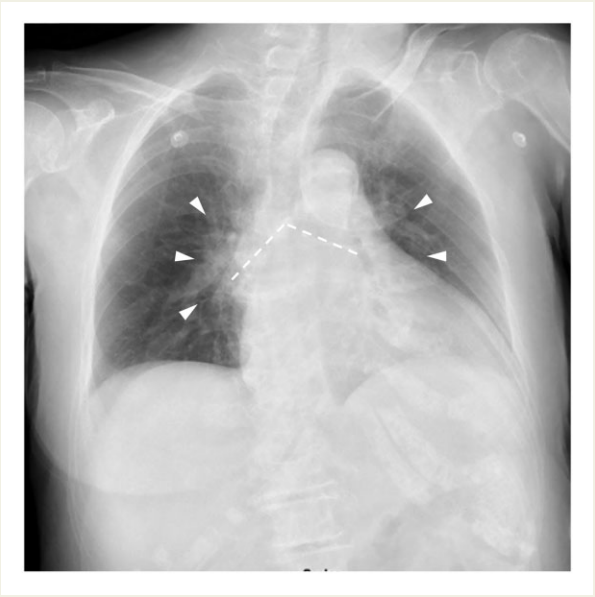


Figure 1 A semi-erect chest radiograph (AP view) showing an enlarged cardiac silhouette (cardiothoracic ratio 0.65), splayed carina (carinal angle 115°), and mild perihilar congestion (arrow heads).

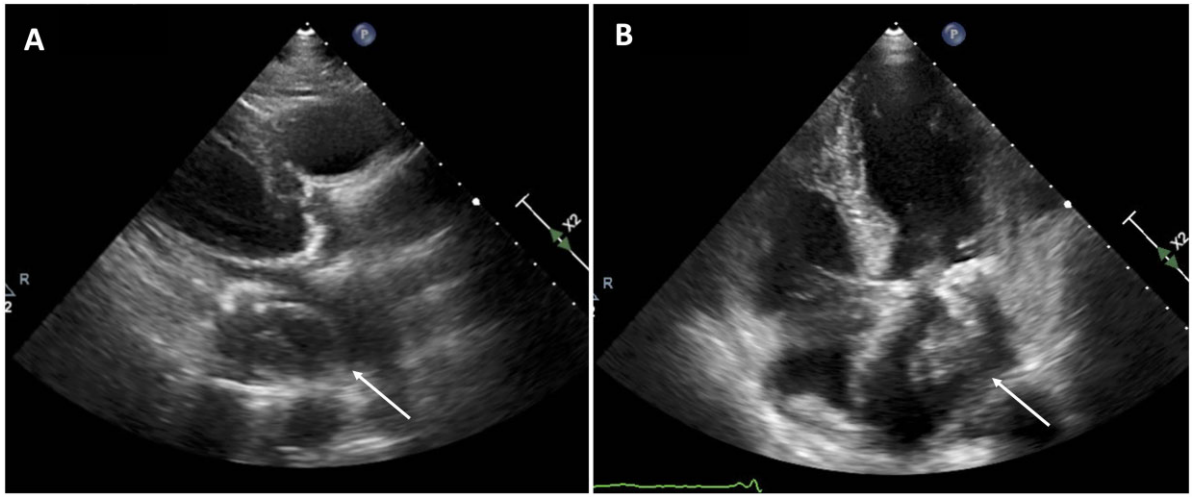


Figure 2 A transthoracic echocardiogram showing severe mitral annular calcification along with a mass located in the left atrial posterior wall (*A*: parasternal long axis and *B* apical four-chambers view, arrows).

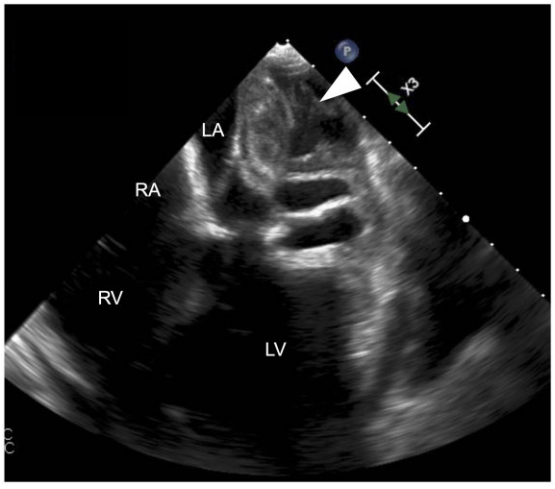
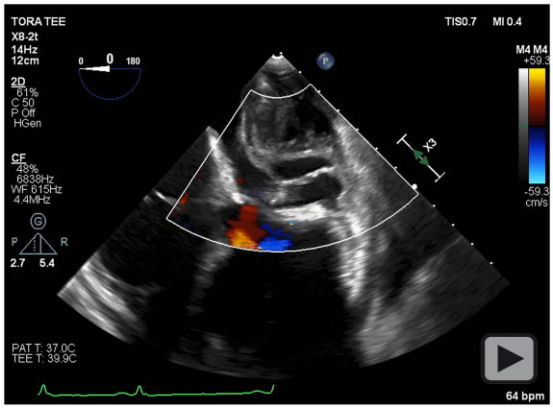


Figure 3 A transoesophageal echocardiogram. A four-chamber view demonstrating a mass in the left atrial posterior wall (arrow head). LA, left atrium; LV, left ventricle; RA, right atrium, RV, right ventricle.



Video 1 A transoesophageal echocardiogram (four-chambers view with colour Doppler) showing blood flow into the cavity of the mass from the left ventricle through the mitral annular calcification.

approach. She required an oral diuretic (azosemide 30 mg daily) for mild congestion, and she was discharged given her clinical stability.

One month later, her clinical condition was stable, and TTE image did not change. Six months later, the size of haematoma did not change in TTE and no further events occurred.

Discussion

Left atrial dissection is a very uncommon cause of the left atrial mass. It is characterized by a partial separation between the atrioventricular valve annular area and the left atrial wall or interatrial septum.[1] Left atrial dissection has been described as a consequence of cardiac intervention including surgical[2] and catheter[3] procedures, chest trauma,[4] myocardial infarction,[6] infective endocarditis,[7] and tumours.[8] It has also been reported to occur spontaneously.[5] Although our patient had a history of PCI 3 and 14 years previously (specific treatment details are provided in *Timeline*), left atrial dissection associated with catheter interventional procedures is generally considered to be a perioperative complication. In addition, since TTE performed 6 months previously showed no abnormal findings in the left atrium and there was no other cause of left atrial dissection, we assumed that this was a spontaneous case caused by the disruption of MAC.

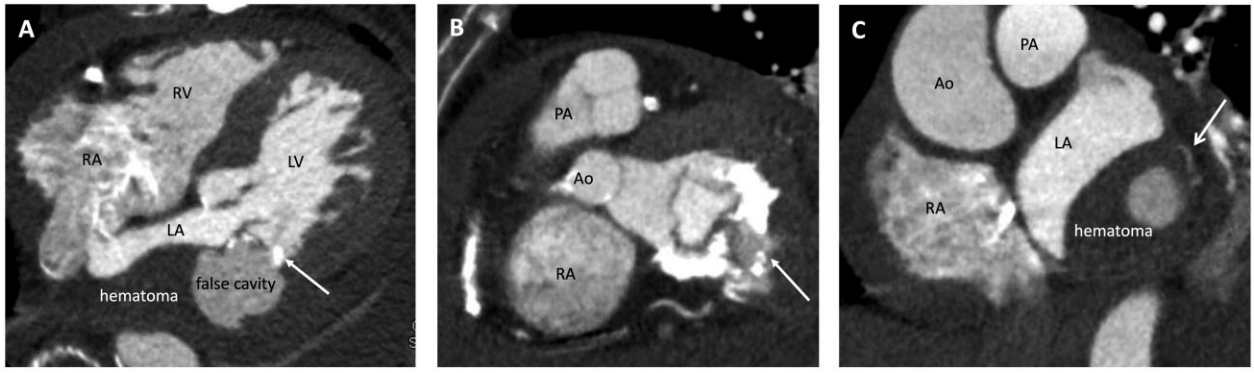
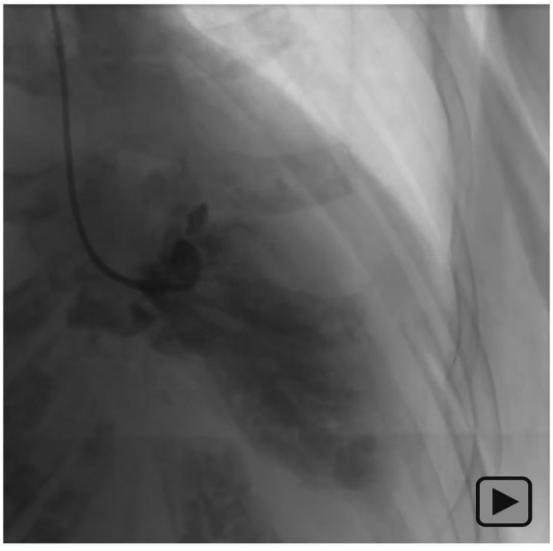


Figure 4 A contrast enhanced cardiac computed tomography (delayed phase) showing the orifice located in the disruption of mitral annular calcification (*A*: four-chamber view and *B*: short-axis view at the level of mitral leaflet, arrows), and the atrial branch of the coronary artery located at the pericardial side of the mass (*C*: short-axis view at the level of left atrium, arrow). Ao, Aorta.



Video 2 Left ventriculography (Right anterior oblique 30°) revealing a contrast-filling cavity in the left atrium.

Left atrial dissection is most commonly seen on the left atrial posterior wall.[9] The attachment between the posterior mitral leaflet and annulus is relatively fragile, as the attachment has little to no fibrous tissue, unlike the anterior leaflet.[10]

There is no established guideline for the management of the left atrial dissection. Although surgery is performed in many cases, there are several reports of successful conservative management in patients with stable haemodynamics.[11] In a previous review of 89 cases of left atrial dissection,[9] 61 (68.5%) patients received surgical treatment. Of the 48 (78.7%) patients who survived after surgery, 6 (9.8%) died, and 9 (10.1%) had no information available. Of 25 patients who underwent conservative management, 22 (88.0%) survived and 3 (12.0%) died. Thus, in patients without haemodynamic instability, the prognosis seems to be favourable with conservative management. A previous report showed that left atrial dissection was associated with thromboembolism.[12] However, the indication for anticoagulation has not been established. On the other hand, the use of anticoagulant therapy for left atrial dissection is associated with the risk of causing enlargement of the dissection.[9] In our case, no thrombus outside the dissection cavity was detected by any imaging modality and the dissection cavity was partially thrombosed; thus, anticoagulation was not administered due to fear of causing further expansion of the dissection.

Mitral annular calcification is a chronic, degenerative process in the fibrous support structure of the mitral valve.[13] In previous reports, the prevalence of MAC was between 8% and 15%, and it was associated with age, cardiovascular risk factors, and chronic kidney disease.[14] There have been two previous reports of left atrial dissection associated with MAC. One case was caused by an infected annular abscess in close proximity to the MAC,[15] and the other was a case of left atrial intra-mural haematoma adjacent to the MAC.[16] However, MAC was not directly related to the development of left atrial dissection in either of those cases. Therefore, to our knowledge, this is the first case of left atrial dissection caused by MAC disruption as the entry of the dissection.

The differential diagnoses of a left atrial mass include tumours, thrombi, vegetation, and ultrasound artefacts. Atrial dissection or haematoma should be considered as differential diagnoses of atrial mass. In the present case, the combination of multiple imaging modalities provided information about the location, tissue characterization, and relationship with other structures of the mass, allowing us to achieve the proper diagnosis.

Lead author biography

Yuhei Isonaga studied medicine at Okayama University, Japan. He started his medical training at the Toranomon hospital – Tokyo. His research interests include cardiac imaging and electrophysiological study.

Supplementary material

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

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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