

Case Report

# Calcified Amorphous Tumor of the Left Ventricle with Paroxysmal Atrial Fibrillation

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Cardiac calcified amorphous tumor (CAT) is a rare, benign non-neoplastic mass of the heart that is sometimes found due to embolic events. Most cases of CAT are treated with surgical removal to prevent future embolic events. However, the treatment strategy for CAT complicated by atrial fibrillation has remained to be determined. Here we report a case of left ventricular CAT complicated by paroxysmal atrial fibrillation (PAF) that was successfully treated with surgical removal and pulmonary vein isolation. Pulmonary vein isolation can be a simple and effective procedure for PAF, even during surgical removal of CAT.

**Key words:** calcified amorphous tumor, surgical removal, embolic stroke, paroxysmal atrial fibrillation, pulmonary vein isolation

Cardiac calcified amorphous tumor (CAT) was first reported in 1997 [1]. Cardiac CAT is a rare, benign non-neoplastic mass of the heart that sometimes causes embolic stroke [2]. In most cases of CAT, surgical removal has been performed to prevent further embolic stroke [3,4]. On the other hand, atrial fibrillation (AF) is a significant cause of embolic stroke and is often treated with catheter ablation and/or anticoagulation therapy. The treatment strategy for CAT complicated by AF has remained unclear. Here we report a case of CAT in the left ventricle (LV) complicated by paroxysmal AF (PAF) that was successfully treated with surgical removal of the CAT combined with pulmonary vein isolation and exclusion of the left atrial appendage.

## Case Report

A 76-year-old woman who presented with severe chest discomfort was brought in by ambulance. Because the electrocardiogram showed AF, she was hospitalized. After admission, she was treated with intravenous administration of propranolol and verapamil, and her symptoms disappeared with the return to sinus rhythm. Computed tomographic coronary angiography demonstrated no significant stenosis. However, echocardiography revealed a calcified, string-like, mobile LV mass attached to the anterior leaflet of the mitral valve (Fig. 1A), suggesting a cardiac CAT. The echocardiography also demonstrated an enlargement of the left atrium (48 mm in diameter) and a mild mitral regurgitation (Fig. 1B). The transmitral flow velocity pattern showed normal LV diastolic function (Fig. 1C). Magnetic resonance imaging (MRI) demonstrated an

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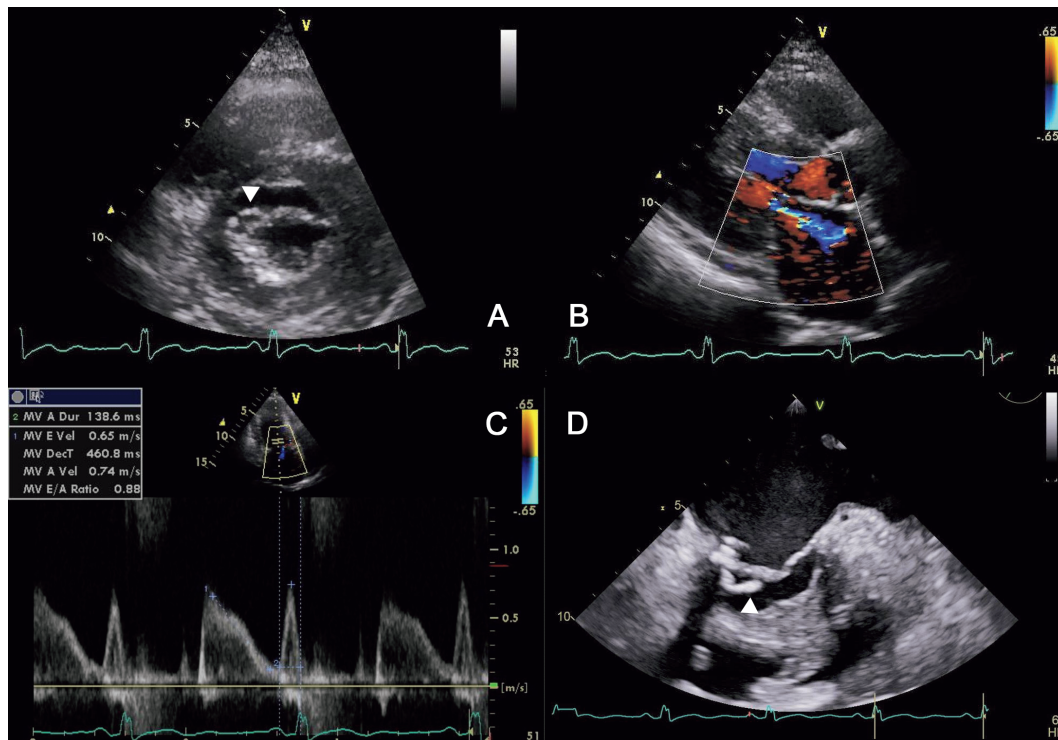


Fig. 1 A, Transthoracic echocardiography demonstrated a calcified, string-like, mobile left ventricular (LV) mass attached to the anterior leaflet of the mitral valve (arrowhead); B, The echocardiography demonstrated a mild mitral regurgitation; C, The transmittal flow velocity pattern showed normal LV diastolic function; D, Transesophageal echocardiography revealed a 1 cm long calcified rod-shaped LV mass at the left side of the posterior commissure of the mitral valve (arrowhead).

old cerebral infarction in the right parietal lobe (Fig. 2). She was once discharged 13 days after admission with a direct oral anticoagulant (DOAC), apixaban.

She was readmitted 70 days after her initial discharge because transthoracic echocardiography revealed an enlarged cardiac mass. Transesophageal echocardiography showed a 1 cm long calcified rod-shaped mass at the left side of the posterior commissure of the mitral valve (Fig. 1D). Because the risk of embolic events seemed high, we decided to perform surgical removal. We also decided to perform the pulmonary vein isolation during the operation as PAF-induced chest discomfort was her main symptom on first admission.

Median sternotomy was performed under general anesthesia, and a cardiopulmonary bypass was established between the ascending aorta and both the inferior and superior vena cava. The right pulmonary veins were isolated using the AtriCure RF ablation system (AtriCure Inc., Mason, OH, USA). Cardiac arrest was induced by antegrade cardioplegia and maintained by retrograde cardioplegia. After cardiac arrest, isola-

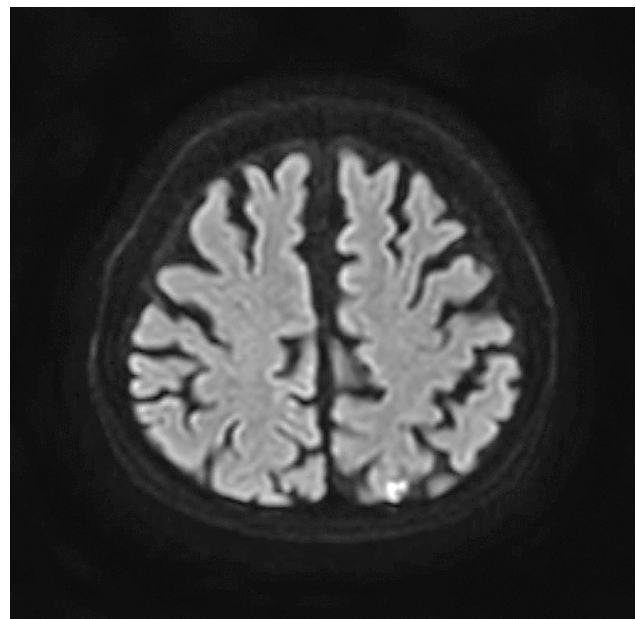


Fig. 2 Magnetic resonance imaging demonstrated an old infarction in the right parietal lobe.

tion of the left pulmonary veins was performed, and the left atrial appendage was excluded using an AtriClip device (AtriCure Inc.). The right atrium was opened, and the LV cavity and mitral annulus were observed through the atrial septal incision. However, the mass could not be identified around the mitral annulus. Thus, the ascending aortic incision was added, and the LV cavity was observed through the aortic valve. We found a white tumor arising from the papillary muscle of the mitral valve. A tumor resection was performed through the septal incision. The weaning from cardiopulmonary bypass was uneventful. The aortic cross-clamp and cardiopulmonary bypass times were 107 and 155 minutes, respectively. Her postoperative course was uneventful, and she was discharged 30 days after operation without DOAC. Histologic examination revealed fibrous connective tissue with nodular calcifications (Fig. 3A and B), consistent with the diagnosis of

CAT. There have been no recurrences of CAT and PAF over 3.5 years of follow-up.

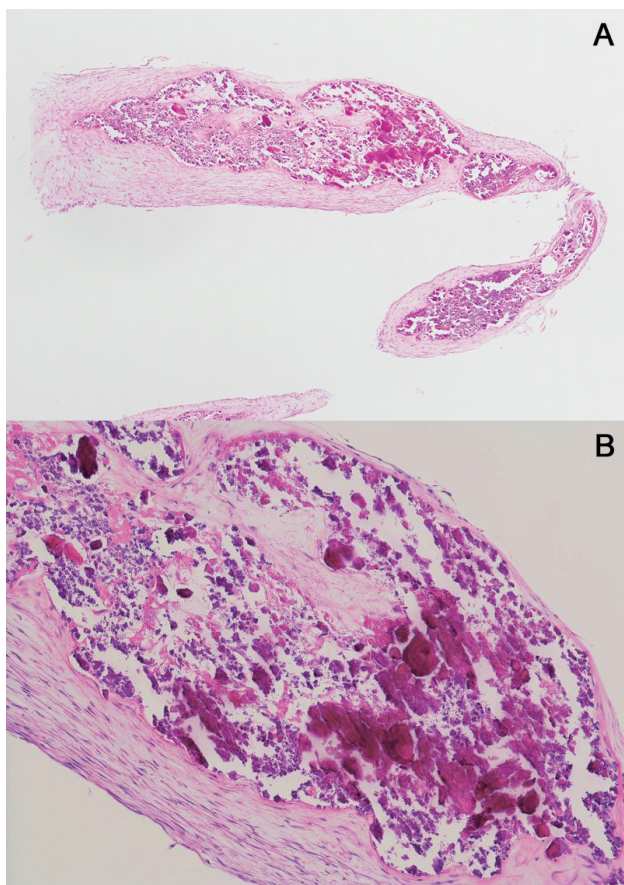
Written informed consent for the publication and the use of images was obtained from the patient.

## Discussion

Cardiac CAT is a rare intracardiac tumor that is sometimes found in patients who undergo hemodialysis [5]. One of the most critical complications of cardiac CAT is systemic embolization, such as embolic stroke. Most cases of cardiac CAT with a history of embolic events have been treated with surgical removal [2]. In our case, although her brain MRI showed an old cerebral infarction, her symptoms were mainly due to PAF and were alleviated by the return to sinus rhythm. Therefore, we initially postponed the surgical removal of the CAT. However, since echocardiography demonstrated an enlargement of the CAT in the follow-up period, we decided to proceed with surgical removal.

Compared to CAT, AF and PAF are more frequent causes of embolic stroke, which is usually treated with catheter ablation and/or anticoagulation therapy using DOAC or warfarin. Although the Cox-Maze IV procedure has been reported to be an effective surgical treatment for AF [6], many surgeons do not routinely perform the Cox-Maze procedure in patients with PAF undergoing other cardiac surgery. Recently, a simpler method, pulmonary vein isolation, has been reported to be as effective for PAF as the Cox-Maze procedure [7]. Furthermore, developments in medical devices allow us to perform pulmonary vein isolation easily from the surface of the heart without a left atriotomy or a septectomy [8]. In our case, we could not distinguish whether the cerebral infarction was due to CAT or PAF. In addition, her symptoms on first admission were caused by PAF. Therefore, we added pulmonary vein isolation for PAF during surgical removal of the CAT. Because there has been only one case report of CAT complicated by AF [9], the incidence of AF or PAF in patients with CAT is unknown, and the treatment strategy remains to be determined. As an alternative to the Cox-Maze procedure, pulmonary vein isolation may also be an effective surgical option in patients with CAT complicated by AF or PAF. In our case, the patient was able to discontinue the DOAC because there was no incidence of PAF after the surgery.

In conclusion, we reported the case of a patient with



**Fig. 3** Hematoxylin and eosin staining showed fibrous connective tissue with nodular calcifications, consistent with the diagnosis of calcified amorphous tumor.

CAT complicated by PAF, who was successfully treated by surgical removal combined with pulmonary vein isolation and exclusion of the left atrial appendage. Pulmonary vein isolation can be a simple and effective procedure for PAF during other cardiac surgery.

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## References

1. Reynolds C, Tazelaar HD and Edwards WD: Calcified amorphous tumor of the heart (cardiac CAT). *Hum Pathol* (1997) 28: 601–606.
2. Nishiguchi Y, Matsuyama H, Shindo A, Matsuura K, Niwa A, Hirota Y, Fukuma T, Ito H, Kozuka Y and Tomimoto H: Cerebral Embolism Associated with Calcified Amorphous Tumor: A Review of Cerebral Infarction Cases. *Intern Med* (2021) 60: 2315–2319.
3. Sano M, Yoshida K, Tsubota H, Hara S and Koyama T: Surgical Excision of Calcified Amorphous Tumors on Mitral and Aortic Valves: Report of a Case. *Kyobu Geka* (2021) 74: 134–137.
4. Aizawa Y, Nakai T, Saito Y, Monno K, Morikawa T, Kogawa R, Hatta T, Tamaki T, Kato M, Arimoto M, Osaka S, Sunagawa K, Tang XY, Tanaka M, Hao H and Hirayama A: Calcified Amorphous Tumor-Induced Acute Cerebral Infarction. *Int Heart J* (2018) 59: 240–242.
5. Morishima A, Sasahashi N and Ueyama K: Calcified amorphous tumors with excision in hemodialysis patients: report of 2 cases. *Kyobu Geka* (2006) 59: 851–854.
6. Gerdisch M, Lehr E, Dunnington G, Johnkoski J, Barksdale A, Parikshak M, Ryan P, Youssef S, Fletcher R and Barnhart G: Mid-term outcomes of concomitant Cox-Maze IV: Results from a multicenter prospective registry. *J Card Surg* (2022) 37: 3006–3013.
7. Yildirim Y, Petersen J, Aydin A, Alassar Y, Reichenspurner H and Pecha S: Complete Left-Atrial Lesion Set versus Pulmonary Vein Isolation Only in Patients with Paroxysmal AF Undergoing CABG or AVR. *Medicina (Kaunas)* (2022) 58: 1607.
8. Gillinov AM and McCarthy PM: Atricure bipolar radiofrequency clamp for intraoperative ablation of atrial fibrillation. *Ann Thorac Surg* (2002) 74: 2165–2168.
9. Singu T, Inatomi Y, Yonehara T and Ando Y: Calcified Amorphous Tumor Causing Shower Embolism to the Brain: A Case Report with Serial Echocardiographic and Neuroradiologic Images and a Review of the Literature. *J Stroke Cerebrovasc Dis* (2017) 26: e85–e89.