

Multiple Cardioembolic Strokes Caused by Caseous Calcification of the Mitral Annulus



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INTRODUCTION

Mitral annular calcification (MAC) is a result of degenerative changes occurring in the cardiac fibrous skeleton, and it mainly involves the posterior annulus.¹ MAC is a common finding; in fact, in the Framingham Heart Study, the prevalence of MAC was estimated at around 14%.² Within this cohort, MAC predominates in the elderly and particularly in women.¹ Caseous calcification of the mitral annulus (CCMA) occurs as the result of MAC that has undergone central liquefaction. It is a rare variant of MAC, with an echocardiographic prevalence of 0.6% and necropsy prevalence of about 2.3%.^{1,3} CCMA is frequently confused with more common and/or dangerous lesions like vegetations, tumors, or cysts. Familiarity with the echocardiographic appearance of this masquerader is important to avoid misdiagnosis.

CASE PRESENTATION

A 69-year-old female with a history of coronary artery disease and severely stenotic aortic valve, which had been replaced with a bioprosthetic valve two years earlier, presented to our hospital with generalized fatigue and an amnesic episode. These symptoms had been ongoing for days-weeks and were sudden in onset. History, physical exam, and microbiology were not suggestive of infective endocarditis (IE). No fevers were documented, and serial blood cultures were negative.

A brain magnetic resonance imaging revealed multifocal areas of acute infarcts consistent with emboli. Transesophageal echocardiography (TEE) showed a highly mobile mass, measuring 25 mm × 10.9 mm at the subvalvular apparatus, below the anterior leaflet of the mitral valve. The mobile component of this mass was protruding into the left ventricular outflow tract (LVOT). There was a second large papillary mass, measuring 14.2 mm × 4.4 mm, on the posterior leaflet in the area of P2/P3 on the atrial aspect.

The patient was seen by the neurology service, and the strokes were thought to be embolic in nature. This prompted a cardiac surgery consult for excision of the valvular masses.

Surgery revealed that there was an elongated white excrescence, which had a very loose attachment to the P2 segment of the posterior mitral leaflet. The material's consistency was similar to toothpaste, as has been described in CCMA (Figure 1).¹ Microbiology of the excrescence was negative, and there was no granulation tissue associated with the lesion.

In addition, beneath the A3 segment, another excrescence was identified. Both masses that were found intraoperatively correlated exactly with the TEE findings. The second lesion was also white and tan in appearance, sterile, and without any granulation tissue. At the base of this lesion was a calcified nipple on the endocardium and adjacent to the origin of the cords on the distal septum near the posteromedial papillary muscle. We believe that this material represents extruded calcium from her extensive MAC (Figures 2 and 3 and Videos 1-3). The patient was not started on anticoagulation due to recent stroke and the mobility/size of the multiple masses requiring immediate surgical intervention.

DISCUSSION

With a bioprosthetic valve in place and multiple embolic strokes on magnetic resonance imaging, IE initially seemed most likely. IE was ruled out with multiple negative blood cultures and sterile intraoperative specimen. The lesions in our case were highly mobile and without significant acoustic shadowing, which might suggest dense calcification, as seen in MAC. In addition, the associated MAC, in our case, was not significant, most likely secondary to the eruptive nature of the CCMA with subsequent attachment to the leaflets and very little residual attachment to the annulus itself. Considering the highly mobile nature of the lesion, which was noted to be moving in and out of the LVOT, surgical excision was chosen to reduce the risk of recurrent stroke. Surgery confirmed the location and absence of granular tissue as noted on TEE.

CCMA is rarely associated with mitral regurgitation, mitral stenosis, stroke, and AV block.³ Surgical indications and methods are not well described. The decision for surgery is based on clinical judgment, with factors such as valvular dysfunction or propensity for stroke playing a key role. Operative experience with CCMA is limited to case reports/series that describe wide debridement and excision of the mass(es). However, an alternative surgical approach to the management of CCMA that emphasizes incision and drainage of the cavity, and subsequent suture obliteration, has been described.⁴ Obliteration of the cavity avoids embolization of the caseous material.

CCMA, just like MAC, has been associated with derangements in the parathyroid hormone, vitamin D, phosphorus, and calcium axis.⁵ Interestingly, the patient has had persistently elevated serum calcium (max 10.8 mg/dL) and parathyroid hormone (max 170.1 pg/mL) levels. She is currently being followed by endocrinology with a watch and wait approach.

While other cases of embolic CCMA have been described,^{4,6} this case is unique in that the patient's recent bioprosthesis heightened the concern for IE and there was absence of significant associated MAC. The misdiagnosis of IE would have resulted in weeks of unnecessary antibiotic therapy, increased risk for subsequent strokes, and delay in appropriate management. The combination

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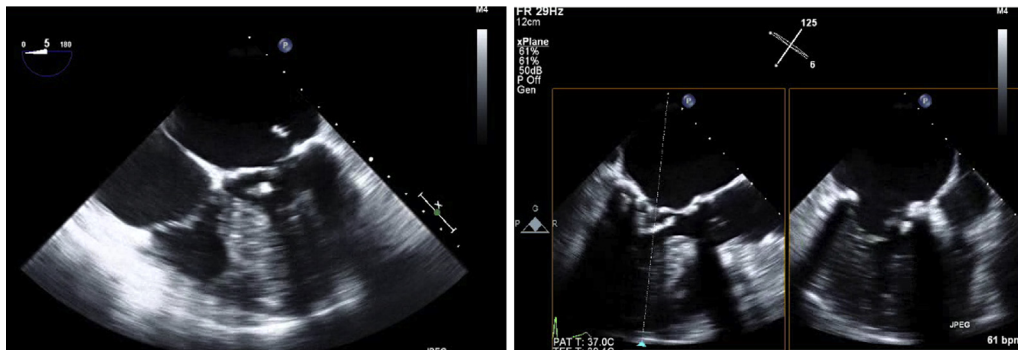


Figure 1 Two-dimensional TEE images of the mitral valve and annulus seen in the four-chamber and long-axis biplane views demonstrating the subvalvular and atrial-sided lesions. The absence of acoustic shadowing, which would be expected with the dense calcification of MAC, supports the diagnosis of CCMA. See [Video 1](#) demonstrating the mobility of the masses.

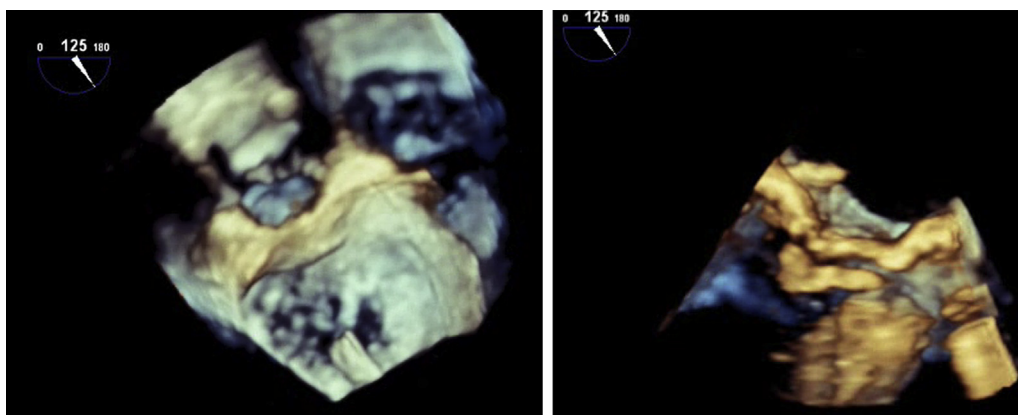


Figure 2 (Left panel) Three-dimensional TEE image of the atrial-sided lesion in the surgeon's view displaying the caseous material near the P2 segment. (Right panel) Three-dimensional TEE image in the long-axis view displaying the subvalvular lesion protruding into the left ventricular outflow tract.



Figure 3 The first image (left panel) shows the debris attached to the chordae and papillary muscle beneath the A3 segment. The latter was removed through the prosthetic aortic valve. The image labeled "P2" (right panel) represents the material debried from the atrial surface of the P2 segment.

of excellent two-dimensional (2D) and three-dimensional (3D) echocardiograms and a high clinical suspicion led to the appropriate surgical intervention in a timely fashion. In addition, the pre-operative 2D and 3D echocardiography findings corresponded exactly with the patient's intraoperative gross pathology findings

of CCMA (see [Figures 1-3](#) and [Videos 1-6](#)). Routine use of chest computed tomography has been proposed to help differentiate MAC from CCMA.⁷ This case clearly demonstrates that quality transthoracic echocardiography and TEE studies combined with heightened clinical awareness and suspicion may provide sufficient

diagnostic information to diagnose CCMA while limiting exposure to unnecessary radiation and reducing cost.

CONCLUSIONS

Echocardiographers, cardiologists, and cardio-thoracic surgeons should be familiar with the echocardiographic appearance of CCMA as this can help to avoid unnecessary use of lengthy courses of antibiotics, help direct surgical intervention, and expedite appropriate treatment. As transcatheter valvular procedures such as MitraClip and TAVR become more prevalent, the understanding of CCMA and its potential complications, especially embolic strokes, holds even greater significance.⁷

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.case.2017.01.002>.

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