Case Report

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Radiology Section

Multimodality Imaging of a Rare Case of Cardiac Calcified Amorphous Tumour in an Asymptomatic Patient

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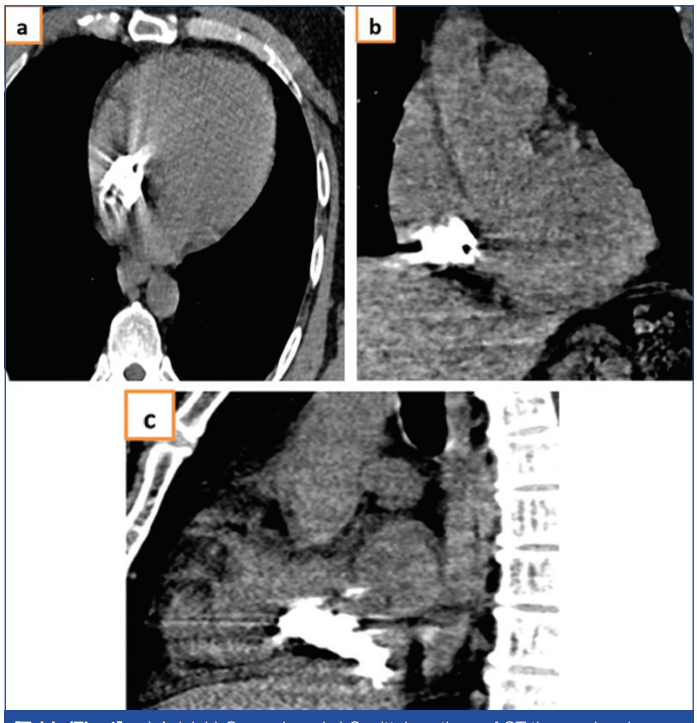
ABSTRACT

Calcified Amorphous Tumour (CAT) of the heart (cardiac CAT) is a rare non-neoplastic cardiac mass that mimics malignancy on imaging and can cause symptoms due to flow obstruction or embolisation of calcific fragments. However, most of the time, the tumour may remain asymptomatic and is incidentally detected on transthoracic echocardiograms and Computed Tomography (CT) thorax. Cardiac CT and/or cardiac Magnetic Resonance Imaging (MRI) are used as problem-solving tools to support the diagnosis made by echocardiography. We report a unique case of a cardiac CAT in a completely asymptomatic 52-year-old male patient who came for a routine annual health check-up. Under the panel of investigations, the patient underwent a CT chest. Although the lung fields were unremarkable, a calcified lesion was detected in the mediastinum, which, after applying the volume rendering technique, was localised in the Right Atrium (RA). Following this incidental finding, the patient underwent a battery of investigations, including an echocardiogram and a cardiac MRI, after which the calcified amorphous and benign nature of the tumour was finally identified. Although benign, such tumours can have catastrophic effects if they produce mass effects, resulting in abnormal sinus rhythm or deranged filling of heart chambers. Therefore, the detection, work-up, and follow-up of such tumours is mandatory, and if symptomatic, surgical resection is indicated.

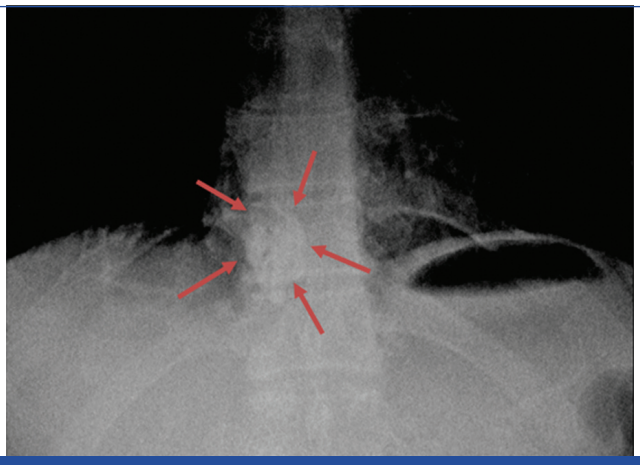
Keywords: Cardiac magnetic resonance imaging, Computed tomography scan, Echocardiogram

CASE REPORT

A 52-year-old male patient came to the hospital for a routine annual health check-up. All routine laboratory investigations were within normal limits. During the check-up, the patient underwent a High-Resolution Computed Tomography (HRCT) thorax in the department of radiodiagnosis. Although the lung fields revealed no significant abnormalities, a peculiar finding was noted in the RA. A well-defined, diffusely calcified polypoidal mass was incidentally discovered in the RA [Table/Fig-1]. Retrospectively, the chest X-ray of the patient revealed a similar calcified mass lesion [Table/Fig-2].



[Table/Fig-1]: a) Axial; b) Coronal; and c) Sagittal sections of CT thorax showing a well-defined polypoidal completely calcific mass lesion in the RA. The high Hounsfield value of the mass is causing blooming artefact on CT scan.

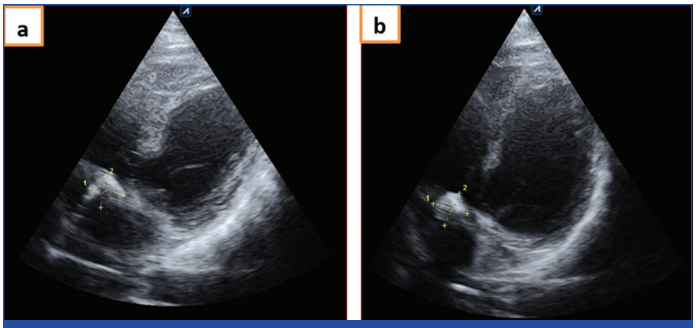


[Table/Fig-2]: X-ray AP view of chest revealed a well-defined polypoidal calcific mass (Red arrows) which was completely overlooked during X-ray reporting. Retrospective evaluation of the chest X-ray highlighted the lesion.

However, the patient was completely asymptomatic. Neurological and cardiovascular examinations revealed no abnormalities, and the electrocardiogram was also unremarkable.

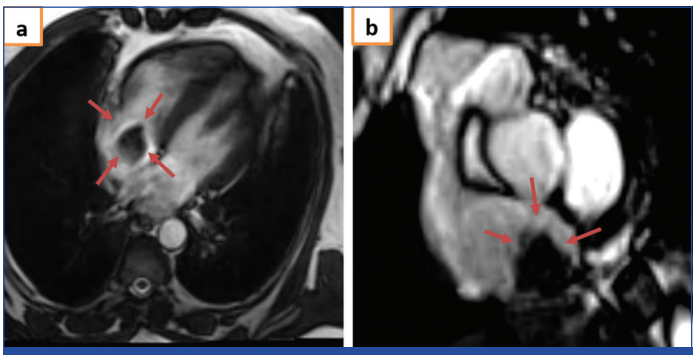
The patient underwent a transthoracic echocardiogram. The four-chamber view revealed a well-defined, mobile, completely calcified mass with posterior acoustic shadowing in the RA [Table/Fig-3]. No internal vascularity was observed. The rest of the chambers of the heart were normal. Systolic and diastolic functions, as well as the ejection fraction, were within normal limits. The mitral valve was freely mobile, suggesting that the mass was not attached to or in the vicinity of the mitral valve leaflets. No evidence of valvular calcifications or vegetations was present.

To properly characterise the mass, a cardiac MRI was performed. The cardiac MRI revealed a well-defined, signal-altered solid mass seen in the floor of the RA, measuring approximately 2.67 cm × 2.11 cm. It appeared as a homogeneous low signal intensity lesion on spin echo T1 and T2 sequences (dark blood imaging) and Steady State Free Precession (SSFP) sequence (white blood imaging). No



[Table/Fig-3]: a and b) Transthoracic echocardiogram of the patient; 4-chamber view revealed a well-defined hyperechoic mass lesion in the Right Atrium (RA). The lesion is not attached to the tricuspid leaflets. Posterior acoustic shadow can be appreciated, suggesting calcific nature of the mass lesion.

extension into the tricuspid valve and no obvious stalk was identified. No other abnormalities were detected [Table/Fig-4].



[Table/Fig-4]: Cardiac MRI of the patient; a) 4-chamber; and b) Short-axis Steady State Free Precision (SSSP) sequence revealed a well-defined, homogeneous low-signal broad-based mass lesion (red arrows) seen in the floor of Right Atrium (RA) with extension into the RA. The mass appears signal-void suggesting a diffusely calcified mass. No extension into the tricuspid valve and no obvious stalk was identified.

Based on the transthoracic echocardiogram and the radiological investigations (CT thorax and cardiac MRI), a diagnosis of 'Cardiac CAT' was made. Since the patient was asymptomatic and the lesion was discovered incidentally, the cardiovascular surgeon advised the patient to have a follow-up every six months. During the first follow-up, the patient had not developed any symptoms, and a repeat echocardiogram performed by the cardiovascular department revealed no change in the size of the mass. The patient was again advised to follow up after another six months.

DISCUSSION

Primary cardiac tumours are indeed rare, with atrial myxomas being the most common among them [1]. CAT is a recently described, very rare non-neoplastic intra-cardiac lesion characterised by nodules of calcium embedded in an amorphous fibrinous material [2].

A similar case of a 72-year-old female was reported by Formelli B et al., who presented with multiple episodes of transient ischaemic attacks that resolved spontaneously. A transesophageal echocardiogram revealed the presence of a 15×18×22 mm diameter spheroid-shaped, non-mobile mass attached to the atrial septum, composed of a hypoechogenic core surrounded by calcium. As MRI was not feasible for the patient due to the presence of previous metallic implants, a diagnosis of calcified cardiac amorphous tumour was made by exclusion [3].

Another case involved a 70-year-old Korean female who presented with acute onset dysarthria and right-sided weakness. She underwent echocardiography and chest CT, revealing a left atrial mass that originated from the interatrial septum. The patient underwent surgical resection, and pathological examination demonstrated cardiac CAT. The postoperative course was uneventful, and she was followed up without recurrence [4].

CAT can be found in all cardiac chambers, with the mitral annulus being the most common site, followed by the right atrium, right ventricle, left ventricle, left atrium, and tricuspid annulus [5]. The most common symptoms in affected patients are dyspnoea (45%) and syncope (21%). Pulmonary or systemic embolisation has been reported in 31% of cases. Associated conditions often include valve disease (31%), concomitant Mycobacterium Avium Complex (MAC) infection (14%), End-Stage Renal Disease (ESRD) (21%), diabetes (14%), and coronary artery disease (12%). However, CAT is discovered incidentally in approximately 17% of cases [5].

The clinical presentation of cardiac CAT typically mirrors that of other cardiac masses, often manifesting with symptoms such as dyspnoea, syncope, or those related to embolism. Consequently, it is frequently initially mistaken for a cardiac myxoma. Other clinical differentials include thrombi, emboli, vegetations, and various benign and malignant cardiac tumours [6].

Although current cardiac imaging techniques lack specificity in differentiating CAT from other masses, certain features may aid in the diagnosis. Echocardiography is the primary diagnostic modality, but histopathological examination is considered the gold standard. On echocardiography, CAT typically presents as a calcified endocavitary mass, potentially located in any cardiac chamber, valve, or valvular annulus. Sizes can vary from small punctate lesions to larger masses [7].

CT scans or MRI imaging may reveal irregular, ovoid, triangular, spherical, or tubular shapes. The configuration of the mass can be either polypoid or infiltrative, with calcifications distributed partially or diffusely [8]. Cardiac MRI typically shows a homogeneous appearance with low signal intensity on T1- and T2-weighted spin-echo sequences, without post-gadolinium contrast enhancement in early and delayed sequences [8].

The exact pathogenesis of cardiac CAT remains uncertain, although some suggest it may originate from organised and calcified mural thrombi [9]. However, the absence of predisposing conditions like thrombosis in certain patients raises questions about alternative pathogenetic mechanisms [9,10].

Given the lack of distinctive clinical and imaging features for differentiation, a definitive diagnosis often relies on histological examination, which typically reveals nodular calcium deposits surrounded by amorphous hyalinised material [11]. Surgical resection remains the standard for both diagnosis and treatment [12].

CONCLUSION(S)

Cardiac CATs are rare intra-cardiac non-neoplastic masses with a presumed thrombotic origin. The uniqueness of such cases lies in their indolent and asymptomatic course. Even when symptomatic, the clinical symptoms are vague, resulting in delayed diagnosis and management. More case reporting and pathological work-up are required to delineate the exact pathogenesis of cardiac CATs.

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