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Case Report

Take a look at the heart: Incidental detection of a right atrial thrombus during abdominal MR[☆]

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ABSTRACT

Cardiac masses include a wide range of lesions whose nature could be both neoplastic (primary and secondary) or not.

Here we report the case of a 53-year-old woman referred to our center for pancreatic lesion follow up by magnetic resonance. The collateral finding of a rounded-shaped lesion in the right heart atrium, during the abdomen examination, led to further diagnostic investigation. Cardiovascular magnetic resonance by nonparametric and parametric sequences was performed to settle the differential diagnosis, allowing for the definition of right atrial thrombus. At the best of our knowledge no data are available in literature about the incidental diagnosis of cardiac thrombi through abdominal magnetic resonance.

This case underlines the importance of image evaluation for incidental findings, further demonstrating the feasibility of initiating an image-guided therapy after a characterization by CMR.

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Introduction

Atrial heart thrombi can be incidental findings detected by ultrasound (US), Computed Tomography (CT) or, less frequently, Magnetic Resonance (MR) examinations. The wide use of cross-sectional imaging examinations, the improvement of diagnostic techniques and the expansion of tertiary prevention programs has led to a marked rise in the number of incidentalomas detected in the recent decades.

Atrial fibrillation (AF) promotes thrombi formation in the atria by the interaction among local, systemic, and hemodynamic factors, leading to an increased risk for cerebral and systemic thromboembolic events. AF is a supraventricular tachyarrhythmia causing uncoordinated atrial electrical activation and ineffective atrial contraction. It arises in the presence of predisposing conditions such as previous myocardial infarction, heart failure, valve defects, arterial hypertension, thyroid dysfunction, or pulmonary diseases [1].

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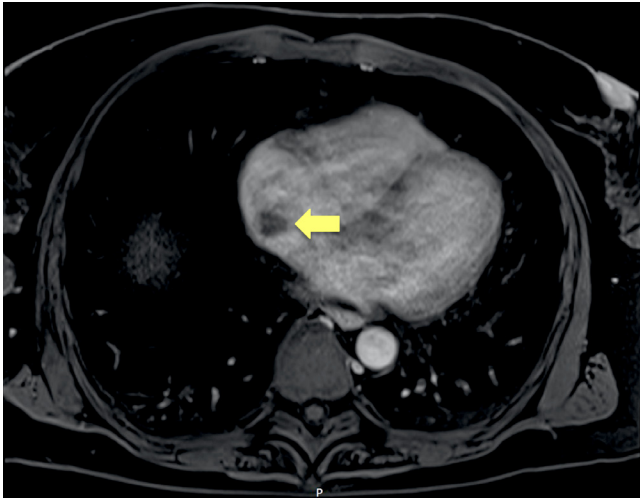


Fig. 1 – Upper scan of abdominal MR. VIBE (Volumetric interpolated breath-hold examination) sequence acquired during venous phase after contrast administration. A rounded-shaped filling defect is noticeable close to the inferior-posterior wall of the right atrium.

According to the data reported in the literature, the main localization of incidental thrombi is the left ventricle, followed by the left atrium, where the incidence increases in case of mitral valve disease [2].

Here we describe the incidental discovery of a thrombus in the right atrium during an abdomen MR examination and discuss the clinical implications of such finding in patient management.

Case presentation

We present the case of a 53-year-old Caucasian female referred to our Institute for a recently discovered benign pancre-

atic lesion, who underwent a 3-months abdominal MR follow up exam.

An upper scan performed by Volumetric Interpolated Breath-hold Examination (VIBE) sequence, acquired during venous phase after contrast administration, showed a rounded-shaped 17 mm filling defect close to the inferior-posterior wall of the right atrium (Fig. 1).

The patient's past medical history included: AF at high ventricular frequency, anticoagulant-free for CHADS-VASc=1 and surgical closure of an Ostium Secundum atrial septal defect by suture, after a first failed attempt of percutaneous closure through Amplatzer Septal Occluder, subsequently removed; breast fibroadenoma and multiple uterine myomas, all surgically removed; hyperparathyroidism; Hashimoto's thyroiditis.

At clinical examination, the patient reported sporadic palpitations and was hemodynamically stable. Based on the MR finding, an ECG was performed, showing sinus rhythm with numerous atrial extrasystoles and rSr' appearance in V1. A trans-thoracic echocardiography (TTE) confirmed the presence of an isoechoic polylobed atrial mass adherent to the interatrial septum (Fig. 2A).

The patient was then admitted to the Coronary Intensive Care Unit (CICU) and put under anticoagulant therapy (enoxaparin 6000 U x 2/die). For further characterization, she also underwent a contrast-TTE, that confirmed the moveable and noncontrasting isoechoic atrial mass (Fig. 2B); moreover, normal biventricular size and function, as well as no significant valvopathies or pericardial effusion, were documented. Except for aPTT ratio 1.21 (normal values 0.84-1.16), the patient showed a normal laboratory profile including Antitrombin III, Prothrombin Time (PT) Ratio, International Normalized Ratio (INR), activated Prothrombin Time (aPTT) Ratio, fibrinogen, D-dimer, Troponin, and Brain Natriuretic Peptide (BNP)

The diagnostic work-up was completed with a Cardiovascular MR (CMR) scan, in order to characterize the mass, by using Steady State Free Precession (SSFP), Turbo Inversion Recovery Magnitude T2 weighted (TIRM T2w) for oedema detection, and Fast Spin Echo Black Blood Proton Density (FSE BB PD) sequences for adipose component evaluation, Modified Look Locker Inversion recovery (MOLLI) and T2 prepared Steady

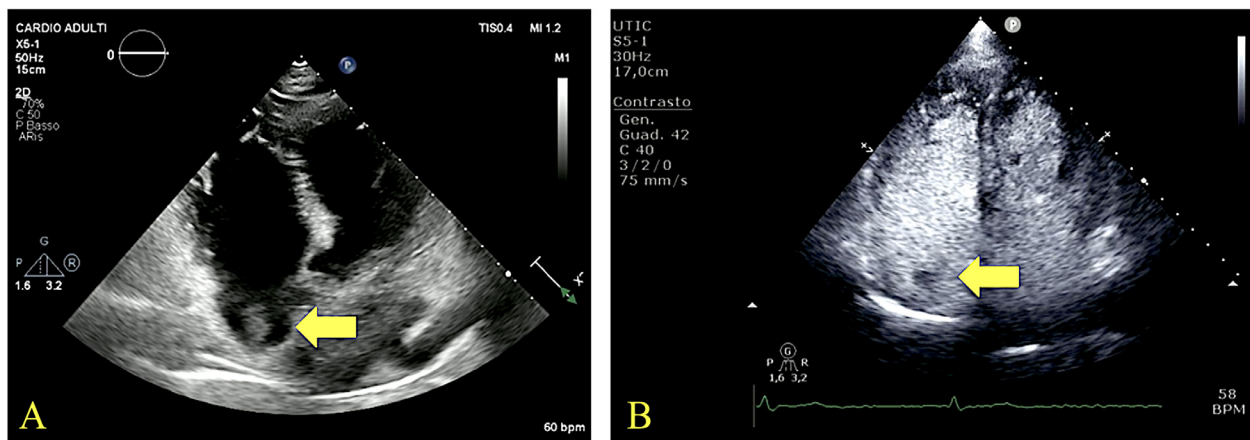


Fig. 2 – Trans-thoracic echocardiography (TTE). TTE showed a solid round formation near the posterior wall of the right atrium. (A) before, and (B) after contrast administration.

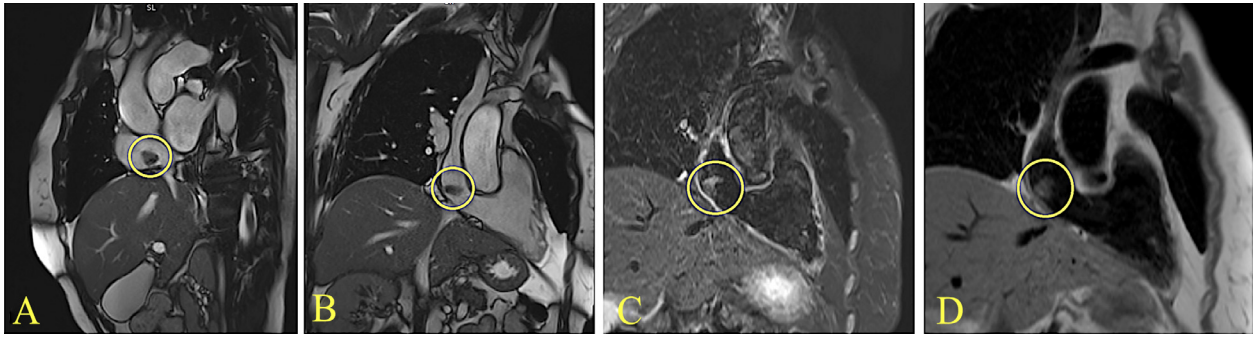


Fig. 3 – Cardiovascular magnetic resonance (CMR). (A and B) right atrium (RA)-specific SSFP cine images showing an hypointense rounded-shaped formation adherent to the inferior-posterior wall of the RA (circle), T2w-TIRM sequence and BB PD sequence in the same projection (C and D).

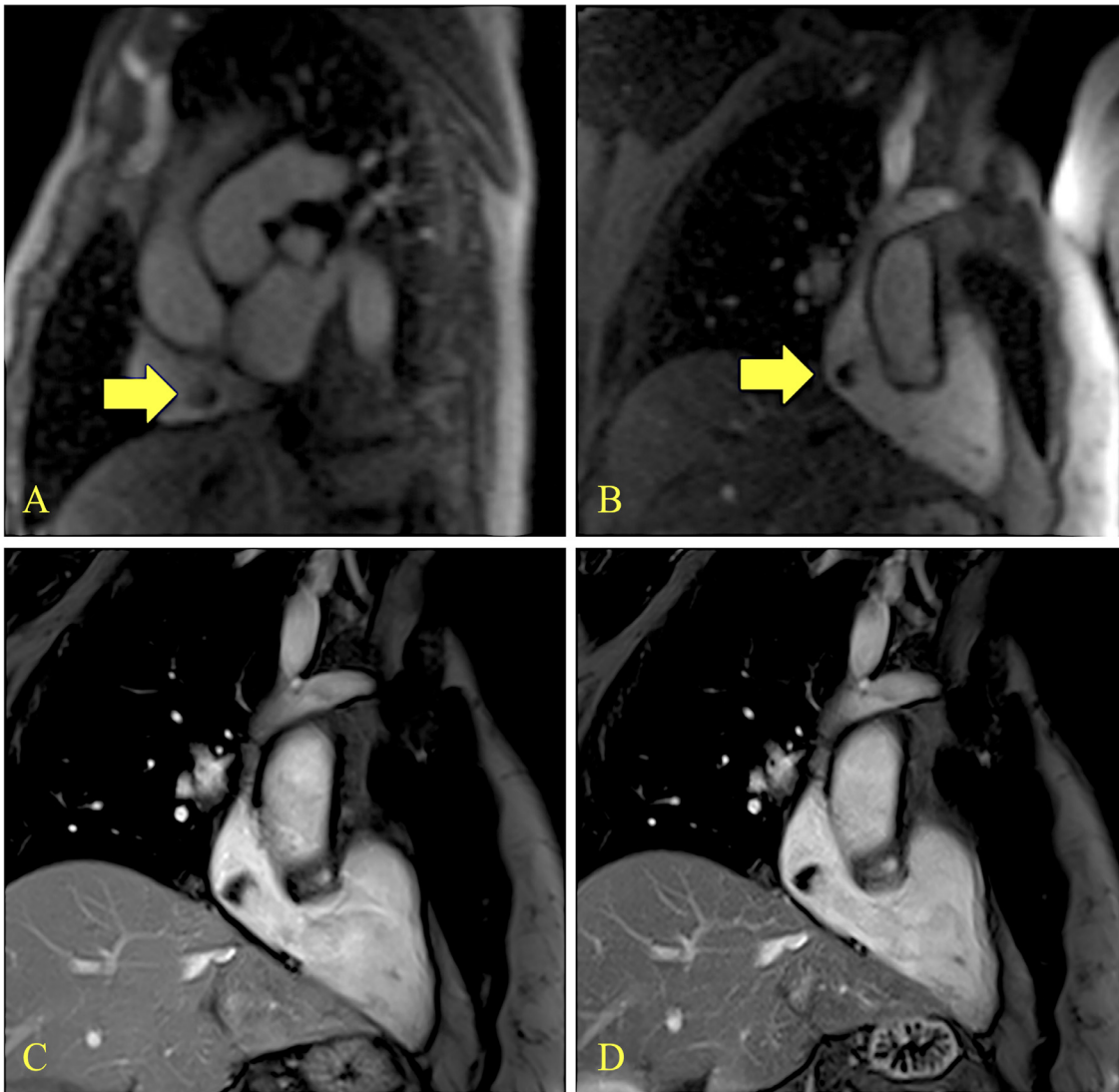


Fig. 4 – CMR after gadolinium administration. Perfusion sequence in RA-specific views demonstrating no enhancement of the lesion at first pass perfusion (arrow in A and B) and in early (C) and late (D) gadolinium enhancement evaluation.

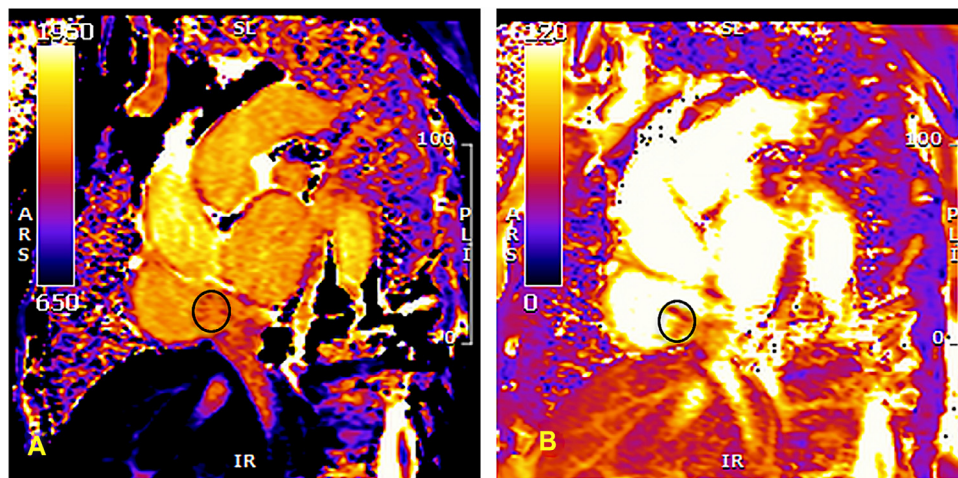


Fig. 5 – CMR mapping sequences. Thrombus T1 (A) and T2 (B) mapping look-up tables (LUT). T1 and T2 values were compatible with an old thrombus (1300 and 60 ms, respectively).

State Free Precession (T2p-bSSFP) sequences for T1- and T2-mapping, respectively, fast Gradient Echo (GRE) T1w myocardial sequences for perfusion and Phase Sensitive Inversion Recovery (PSIR) sequence for early and late gadolinium enhancement evaluation. As a contrast agent, 15 mL of gadobutrol (0.2 mL/kg) were administered at a 2.5 mL/s flowrate.

The lesion appeared hypointense in SSFP sequences (Figs. 3A and B), hyperintense in T2w-TIRM sequence (Fig. 3C) and isointense in FSE BB PD sequence (Fig. 3) and showed no enhancement after contrast administration at first pass (Fig. 4A and B) and in early and late enhancement (Figs. 4C and D). Moreover, mapping techniques assessment allowed to establish T1 and T2 mapping relaxometry for a better diagnosis (Figs. 5A and B) [3].

The CMR report concluded for “moveable pedunculated neof ormation in the right atrium with morphological and signal characteristics compatible with thrombus”.

Thus, therapy with warfarin was immediately started.

The patient’s clinical course was unremarkable. One month later, a TTE was performed still detecting the known atrial thrombotic formation, with no significant variation regarding size and morphology, compared to previous exams. She underwent further TTE control evaluations until, five months after the first finding, the thrombus was no longer recognizable.

Discussion

Thrombus is the most common filling defect observed in cardiac chambers, with a preference for the left atrial appendage, especially in cases of mitral valve disease and AF, and for the left ventricular apex, more frequent in patients with coronary artery disease, left ventricular aneurysm or wall motion abnormality [2].

Right atrium thrombosis is less frequent, but not uncommon: a Swedish study based upon over 23,000 autop-

sies reports a prevalence of 3.2% among all in-hospital deaths [4].

Similarly, right atrial appendage thrombi are less common than the contralateral, but they can reach large dimensions [5] and a prevalence of up to 6.7% of patients with AF [6].

Thus, it must always be taken into account that a patient could have an intracardiac thrombi. Nonetheless, at the best of our knowledge while incidental diagnosis through abdominal CT is documented in the literature [7–10], no data are reported concerning the same topic in abdominal MR. In fact, Jost et al. [11] described an incidental diagnosis of intracardiac thrombus but during a CMR acquisition.

In our knowledge, this is the first case reporting the unique finding of a thrombus in the right atrium during MRI of the abdomen. Therefore, this allows us to highlight the potential role of routine imaging practices in the diagnosis of serious collateral conditions.

It is important to point out that not all abdominal sequences are equally sensitive in detecting intracardiac lesions: in our case, the RA mass was clearly visible after contrast administration in VIBE sequences, while it was unnoticeable in opposition-phase, water-only, and fat-only VIBE sequences, as well as in Half Fourier Acquisition Single Shot Turbo Spin Echo (HASTE) ones; it turned out to be also barely noticeable in the in-phase VIBE sequences and in the arterial phase after contrast administration.

In this case, the incidental finding of an RA mass prompted a series of clinical decisions to confirm the diagnosis and determine the appropriate treatment. Initially, the identification of the thrombus in VIBE sequences after contrast administration suggested the need for further imaging to differentiate between thrombus and other masses, such as atrial myxoma. The patient was then admitted to CICU for diagnostic workup: as a first level exam, a contrast-TTE was performed and confirmed the MR finding but, considering the non-contrasting behavior and the unusual location, the patient underwent CMR for a comprehensive tissue characterization of the mass. A differential diagnosis primarily with atrial myxoma was

pointed out, and the absence of enhancement at first pass perfusion, as well as at early and late-gadolinium enhancement evaluation, allowed to formulate the final diagnosis of thrombus.

Given the wide variety of possible cardiac masses, a careful inspection of scans passing through the heart during abdominal MR should always be carried out, and this is especially advisable in cases of known underlying conditions increasing the risk for developing heart diseases, being AF one of many examples that can be found in literature.

Moreover, considering that CMR is the primary imaging modality for myocardial tissue characterization, it could be considered the first-choice examination for characterizing most incidental masses findings, and modern-day mapping techniques can be a useful tool in diagnostic work up [3,12].

Even more, our experience highlights the importance of image evaluation for incidental findings, further demonstrating the feasibility of initiating an image-guided therapy after adequate tissue characterization and diagnosis.

Patient consent

The authors have obtained written informed consent for publication from the patient.

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