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Case Report

Diagnostic challenge presented by right atrial mass: A report of two cases [☆]

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ABSTRACT

Right atrial masses raised pose 3 major possibilities including tumors, thrombi, or vegetations. We present 2 cases: first, a 34-year-old male with no medical history, who presented with dyspnea, pleuritic pain, and fever; and the second, 65-year-old male with similar symptoms and a history of a left renal carcinoma. Both patients had right atrial masses found on a transthoracic echocardiogram. Cardiac magnetic resonance imaging and an 18 FDG-PET were necessary finding thrombi in the first patient; and tumoral thrombi in the second one. A multimodality imaging approach to right atrial masses is essential for proper diagnosis and therapeutic decision-making.

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Introduction

Right atrial (RA) masses are a diagnostic challenge. Differential diagnoses include primary tumors, metastases, vegetations, thrombi, and in some cases, artifacts [1,2]. Thrombi in RA have a high risk of embolism and increased mortality. Anticoagulation treatment for RA thrombi will not be enough, and other

treatments such as thrombolysis or surgery should be considered. It is always necessary to rule out the possibility of tumoral thrombus, since its treatment and approach is very different.

We present 2 clinical cases with similar clinical and echocardiographic findings in which clinical history and multimodality imaging were very important for diagnosis and therapeutic decision.

[☆] Competing Interests: The authors declare that there is no conflict of interest.

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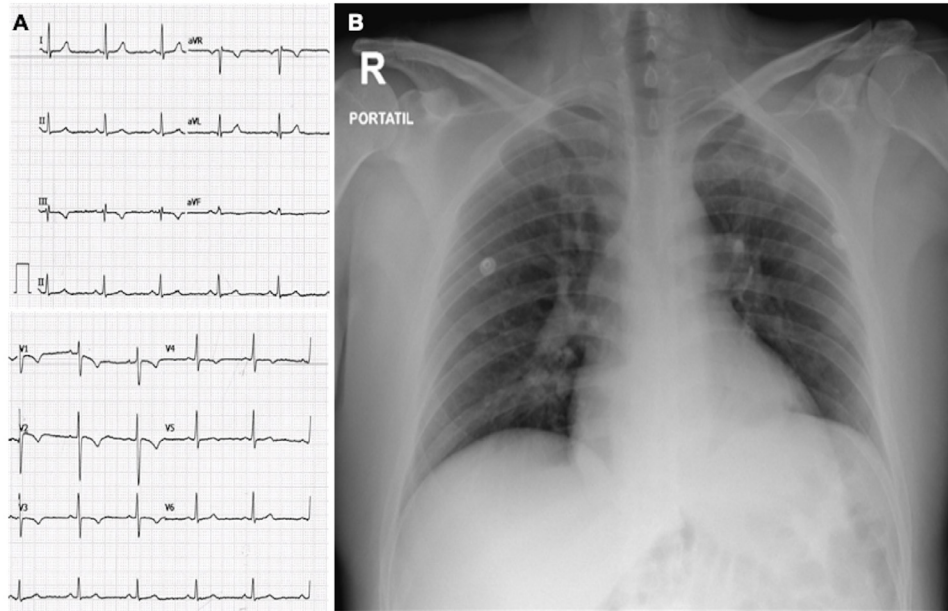


Fig. 1 – Case 1 – ECG and chest X-Ray. (A) ECG: sinus rhythm with T wave inversion in precordial leads (V1-V4). (B) Chest X-ray showing prominent pulmonary arteries and ascending left hemidiaphragm due to atelectasis.

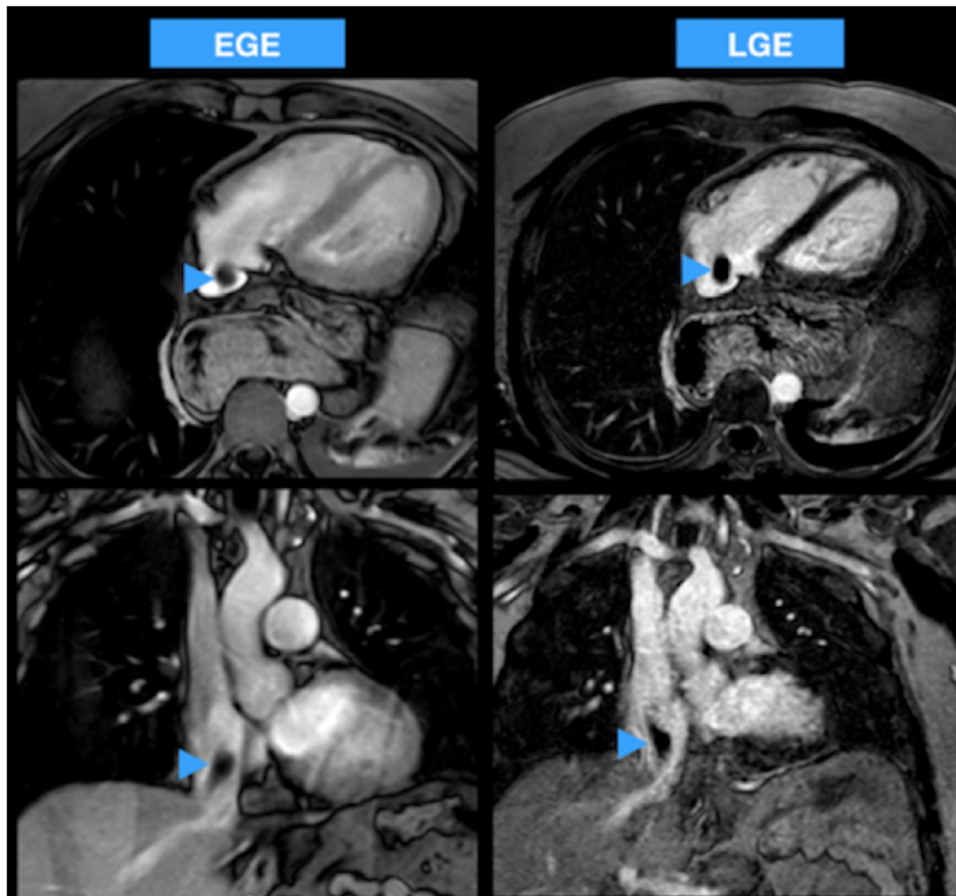


Fig. 2 – Case 1 – Cardiac Magnetic Resonance (CMR). Hypointense lesion entering the right atrium from the inferior vena cava without EGE or LGE (Blue arrowhead). EGE, early gadolinium enhancement; LGE: late gadolinium enhancement.

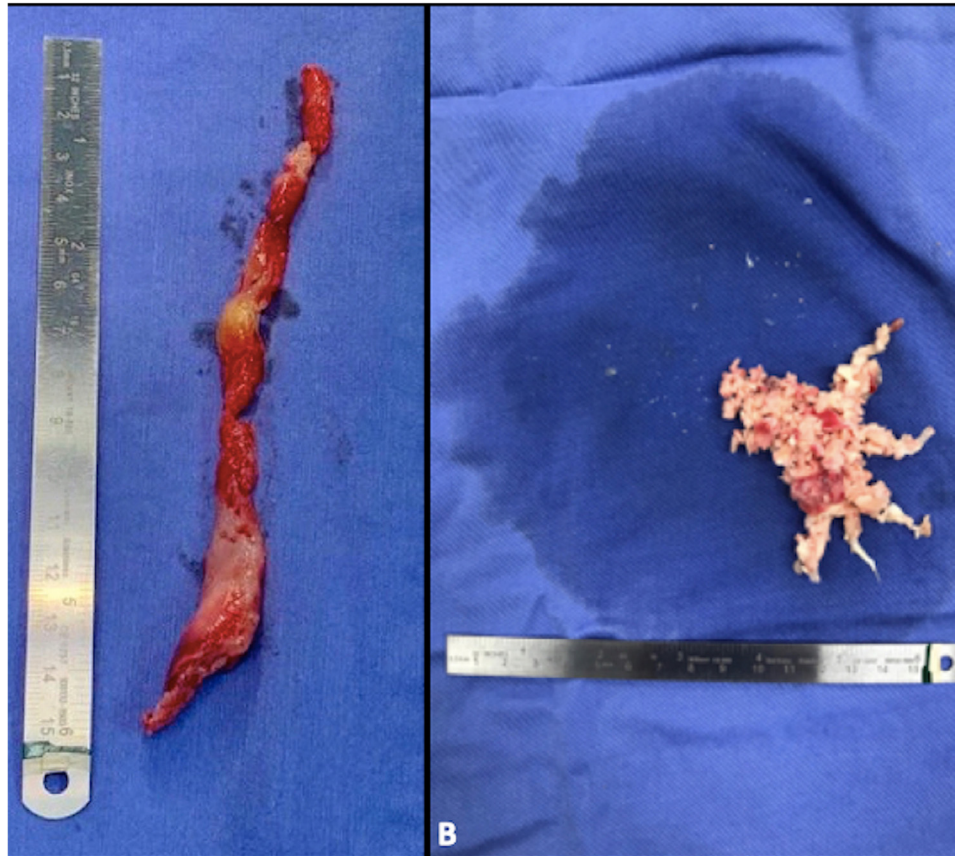


Fig. 3 – Case 1 – Intraoperative findings. (A) Digitiform mass was removed from the inferior vena cava corresponding to a thrombus originating from the right renal vein. (B) Thrombus resected from the left pulmonary artery.

Case 1

A 34-year-old male without past medical history admitted to the emergency room (ER) due to 3 days of fever, dyspnea, cough, and left pleuritic chest pain. Vital signs were: BP: 100/85 mm Hg, HR: 60 beats/min, RR: 25 breaths/min, and O₂SAT:85% on room air. Physical examination revealed reduced breath sounds at the mid and lower left hemithorax.

Hemogram and chemical blood tests were normal. ECG showed sinus rhythm with T-wave inversion in precordial leads (V1-V4). Chest X-ray revealed prominence of pulmonary arteries and ascending left hemidiaphragm due to atelectasis (Fig. 1); findings that were interpreted as indirect signs of pulmonary hypertension.

Based on symptoms and findings described above, clinical suspicion of pulmonary embolism (PE) was established with a low pretest probability (Wells-score <4 points). D-Dimer test was positive at 3500 ng/mL (Reference <500 ng/mL). CT pulmonary angiography confirmed the PE diagnosis with left pulmonary artery occlusion. Transthoracic echocardiogram showed a large mobile mass in the right atrium (R.A.) arising from the inferior vena cava (IVC) (Video 1). For better mass characterization, transesophageal echocardiogram (Video 2) and cardiac magnetic resonance (CMR) imaging were performed. The mass was hypointense on T1W and T2W se-

quences without contrast uptake on the first-pass perfusion sequence, without any late gadolinium enhancement (Fig. 2). These findings suggested the possibility of R.A. thrombi. Abdominal scan revealed the origin of the mass in the right renal vein, reaching the R.A., through the IVC (Video 3). No other masses were found. Enoxaparin was started at a dose of 1 mg/kg twice daily.

The size and characteristics of the mass led us to suspect neoplastic disease vs thrombus. The heart team decided to remove the mass for diagnostic and therapeutic purposes (Fig. 3). Histopathological findings confirmed thrombus without tumoral cells.

The patient was discharged on anticoagulation therapy. To date, clinical follow-up has been satisfactory and he has remained asymptomatic, without bleeding or new thrombotic events.

Case 2

A 65-year-old male who presented to the ER with a 2-month history of right hypochondrium pain and progressive dyspnea on minimal efforts. His medical history includes hypertension, diabetes, and PE diagnosed the previous year. Due to an unprovoked PE, extension studies revealed a left renal

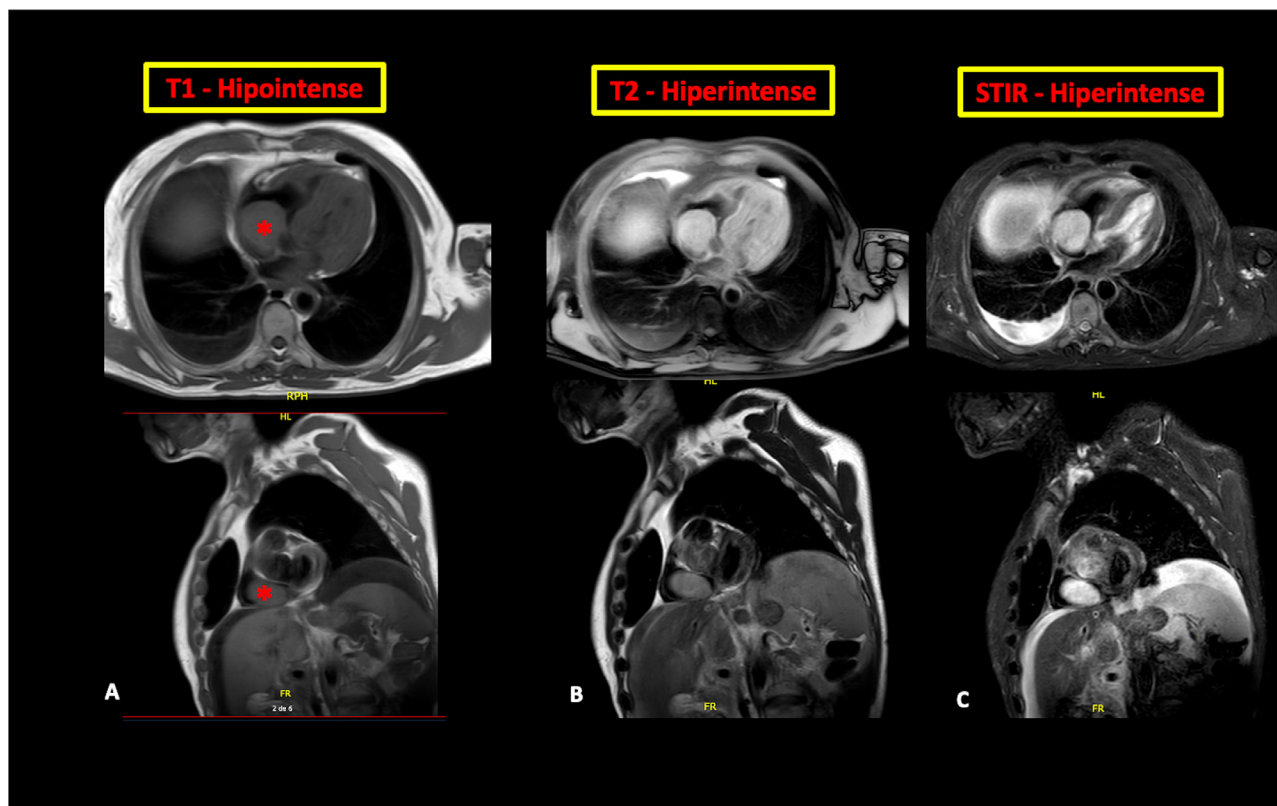


Fig. 4 – Case 2 – Tissue characterization by cardiac magnetic resonance (CMR). (A) HLA and short-axis T1W sequence. Hypointense RA large mass. (B) HLA and short-axis T2W sequence. Hyperintense RA mass. (C) HLA and short-axis T2W STIR sequence. RA mass with a hyperintense signal. HLA, horizontal long axis; RA, right atrium.

carcinoma (T3bN0M0) and left nephrectomy was performed. Medications included telmisartan 40 mg daily, metformin 850 mg twice daily, and enoxaparin 1 mg/kg twice daily. Vital signs were: BP: 120/70 mm Hg, HR: 120 beats/min, RR: 23 breaths/min, and O₂ SAT: 80% on room air. On physical examination, reduced breath sounds on auscultation, with no other relevant findings.

Transthoracic echocardiogram revealed a right atrial mass arising from the IVC similar to case 1. CMR and abdominal MRI were also performed. A large RA mass (50 × 41 × 39 mm), with regular borders was found, arising from the renal veins (Video 4). The mass was isointense on T1W, and hyperintense on T2W sequences (Fig. 4). First-pass perfusion imaging showed early contrast uptake, and late gadolinium enhancement in the periphery of the mass (Video 5).

Suspecting recurrence of renal carcinoma, PET-CT Scan was performed showing an abnormal 18F-FDG uptake, with heterogeneous distribution, maximum SUV (Standardized Uptake Value) of 3.64, and late of 3.31. No other radiotracer uptake areas were identified (Fig. 5).

All findings suggested tumoral thrombus related to probable recurrence of renal carcinoma. A lesion biopsy was performed confirming the presence of clear cell renal carcinoma. Due to metastatic involvement, the lesion was considered unresectable.

Treatment with pembrolizumab and axitinib was recommended. Currently, he has completed 1 year since his last hos-

pitalization, and remains stable with outpatient follow-up by the oncology department.

Discussion

RA masses are a diagnostic challenge and its differential diagnoses include several lesions (Fig. 6). Differentiation between tumors and thrombotic masses is important for predicting survival and making treatment decisions.

The most frequent cardiac tumors are secondary (metastases) and often come from malignant neoplasms of the lung, breast, hematological, esophagus, and melanomas [3] that mainly affect the right heart chambers, due to hematogenous and/or lymphatic spread; and should be rule-out in patients with history of malignancy [4].

As in Case 2, there are other authors that have reported, metastatic involvement from renal carcinoma in cardiac chambers [5], with similar imaging findings

Primary tumors are unusual, with a secondary/primary ratio of 20:1 [6]. Only 10% of primary heart tumors are malignant and some of them could affect R.A. including: myxoma (25% in RA), lipomatous septal hypertrophy, paraganglioma, schwannoma, and angiosarcoma [7].

Thrombi can also arise from the R.A., some of them related to implantable devices, morphologic abnormalities (Chamber

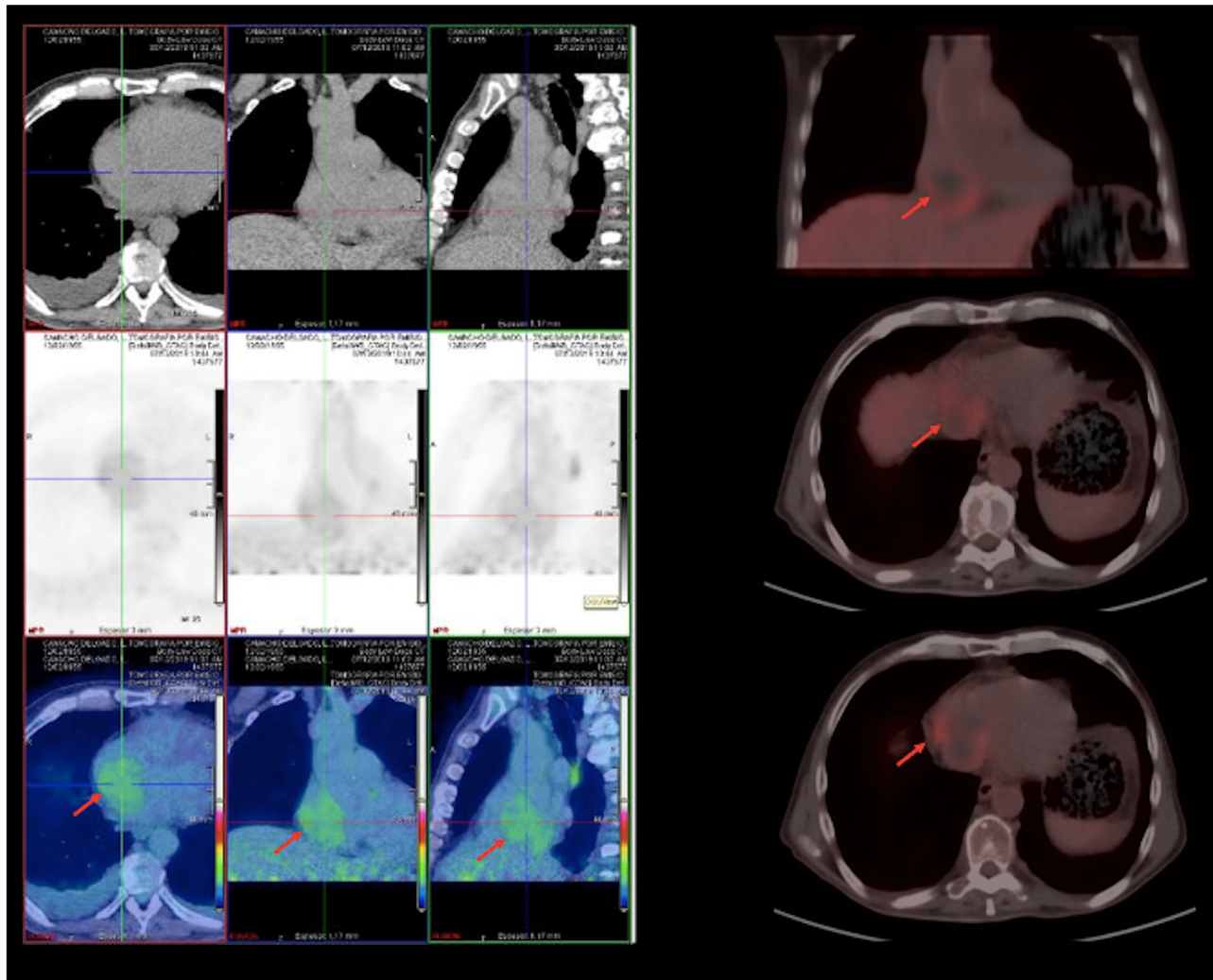


Fig. 5 – Case 2-PET-CT scan. Abnormal 18F-FDG uptake with heterogeneous distribution at the RA. RA, Right Atrium.

dilation with blood stasis, etc.), hypercoagulability states, embolic phenomena, or present as tumoral thrombi.

Thrombotic lesions are masses of intermediate echogenicity which may change over time, with the presence of calcifications in older thrombi. Accurate evaluation of thrombotic R.A lesions usually requires multimodal imaging. CMR is especially useful because it allows tissue characterization helping with the differential diagnosis between thrombotic lesions and other types of masses. Soft thrombi are usually hypointense in T1W and T2W sequences. Because soft thrombi are nonvascularized masses, they do not have contrast uptake in the first pass sequence, and appear hypointense in both early and late enhancement sequences, like in the first case [4].

Tumoral thrombi are a cluster of tumoral cells associated with thrombi, which are usually related to advanced renal cell carcinomas, seen in 12%-19% of those patients [8], with findings similar to those of thrombi and tumoral masses. Other malignancies that can cause tumoral thrombus formation include, hepatocellular carcinoma, Wilms tumor, adrenocortical

carcinoma, and retroperitoneal tumors. These masses usually affect the renal veins and reach the RA through the IVC in 40% of patients [9].

Multimodality imaging approach is always necessary in these cases. Soft thrombi are highly mobile, have a worm-like shape, but not late gadolinium enhancement. Tumoral thrombi are larger, less mobile, have late gadolinium enhancement, and are sometimes seen in association with a tumoral mass. Additionally, tumoral thrombi are metabolically active, which allows their identification through the uptake of 18F-FDG, as in patient 2 [10].

The association of right heart thrombus and PE confers a higher risk of hemodynamic compromise and death [11]. Clinical trials comparing anticoagulation, thrombectomy, and thrombolysis have shown mortality of 28.6%, 23.8%, and 11.3%, respectively [12]. Surgical results depend on the experience of the surgical team. For decision making morphologic characteristics and the possibility of other diagnoses should be considered. Surgery in these cases, is not only the therapeutic tool, but also an important diagnostic tool.

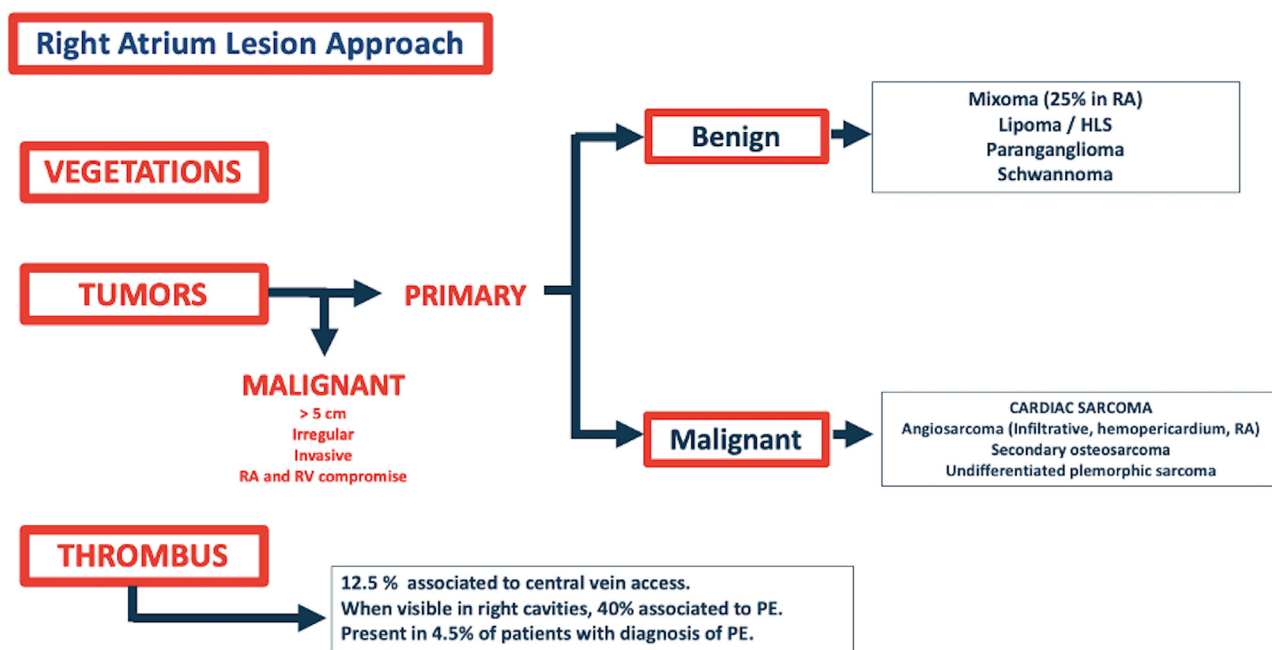


Fig. 6 – Right atrial masses approach. LHAS, lipomatous hypertrophy of the atrial septum; RA, right atrium; RV, right ventricle. Adapted from: Maleszewski et al. [13].

For tumoral thrombi, treatment is surgical resection; however, in our case the heart team considered it was a tumor relapse with cardiac metastasis, which made the patient ineligible for surgery, with palliative treatment being the best second option for that patient.

Conclusions

Right atrial masses are a diagnostic challenge with 3 major possibilities including tumors, thrombus, or vegetations. Right chambers lesions, particularly the large, irregular, and invasive-looking ones, usually correspond to metastatic or malignant primary tumors.

Multimodality imaging including echocardiography, CMR and, sometimes 18 FDG-PET is require.

Patient consent

A written informed consent for publication of these cases was obtained from the patients. The privacy was guaranteed.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2022.07.045.

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