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Epicardial fat pad within the transverse sinus mimicking a left atrial appendage thrombus

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ABSTRACT

The presence of left atrial thrombus is a contraindication to cardioversion or catheter ablation in patients with atrial fibrillation, due to the increased risk of systemic thromboembolism. Management of this situation includes changes in the anticoagulation regimen and repeat imaging tests. Accurate diagnosis of left atrial appendage thrombus is therefore essential but can sometimes be challenging. Multiple imaging modalities may sometimes be required in the setting of anatomical variations of the left atrial appendage and surrounding structures.

We present the case of a patient awaiting ablation for atypical atrial flutter, who underwent a transthoracic echocardiogram that showed an echodense, mobile structure within the vicinity of the left atrial appendage, suggesting a possible thrombus. A cardiac CT demonstrated the image to correlate with an epicardial fat pad within the transverse sinus.

1. Introduction

Systemic thromboembolism is a rare but well described complication from cardioversion (CV) or catheter ablation (CA) for atrial fibrillation (AF). The presence of a left atrial thrombus significantly increases this embolic risk and is therefore a contraindication to these procedures [1]. Despite adequate anticoagulation, left atrial thrombus are visualized in up to 5% of patients undergoing a pre-procedural transoesophageal echocardiogram (TOE) [2]. The left atrial appendage (LAA) is the predominant source of thrombi in this setting [3].

With considerable variations in the size and shape of the LAA along with adjacent cardiac and extra-cardiac structures and certain normal variants of the LAA, such as thick pectinate muscles, the exclusion of a LAA thrombus may be challenging and require multiple imaging modalities. We present a case of an epicardial fat pad within the transverse sinus mimicking a LAA thrombus on a transthoracic echocardiogram in a patient awaiting ablation for an atypical atrial flutter.

2. Case presentation

A 71-year-old woman with two previous ablations for AF presented with symptomatic palpitations and her ECG demonstrated an atypical atrial flutter (Fig. 1A). A decision was made to proceed with an urgent ablation. Prior to her procedure, a transthoracic echocardiogram (TTE) showed a mobile echogenic structure within the vicinity of the LAA, best seen in the parasternal short axis view (Fig. 2 & video clip in online publication). Differential diagnosis of the mass included a LAA thrombus and therefore ablation was temporarily postponed.

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Since the patient had been adequately anticoagulated on Rivaroxaban, a decision was made to commence treatment with subcutaneous low molecular weight heparin and to undergo a cardiac-gated CT scan to confirm or exclude the LAA thrombus. The decision to undertake a CT rather than TOE or cardiac MRI (CMR) was based on the availability of CT at the weekend allowing a prompt diagnosis and decision on treatment.

The CT demonstrated no evidence of thrombus within the LAA (Fig. 3). Measuring the radio-density of the mass in the transverse sinus allowed us to correlate the echogenic structure seen on TTE with a prominent epicardial fat pad (Fig. 4). The patient was

Abbreviations: AF, atrial fibrillation; CA, catheter ablation; CMR, cardiac MRI; CV, cardioversion; LAA, Left atrial appendage; TOE, transoesophageal echocardiography; TTE, transthoracic echocardiography.

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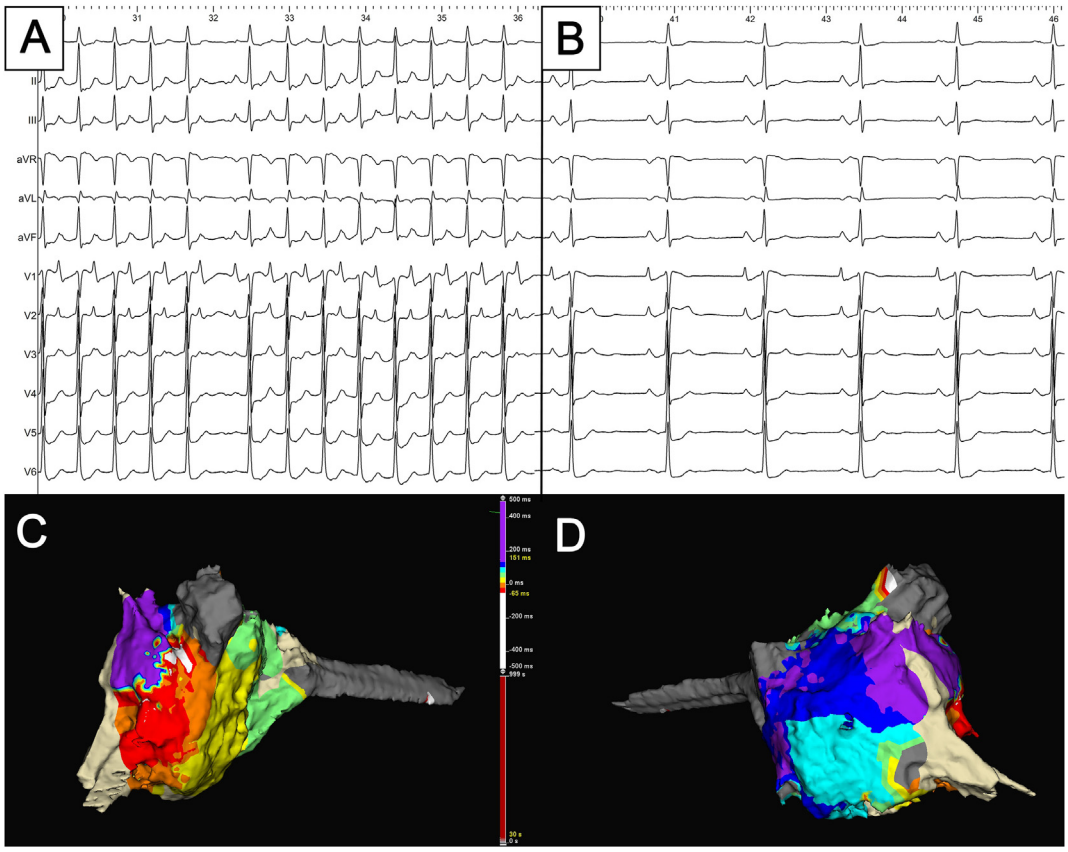

Fig. 1. 12-lead ECG on admission showing an atypical atrial flutter **(A)** and sinus rhythm following successful ablation **(B)**. Activation maps of the LA **(C and D)** showing an activation pattern suggestive of a clockwise perimitral reentry, with evidence of block through a previous roof line.

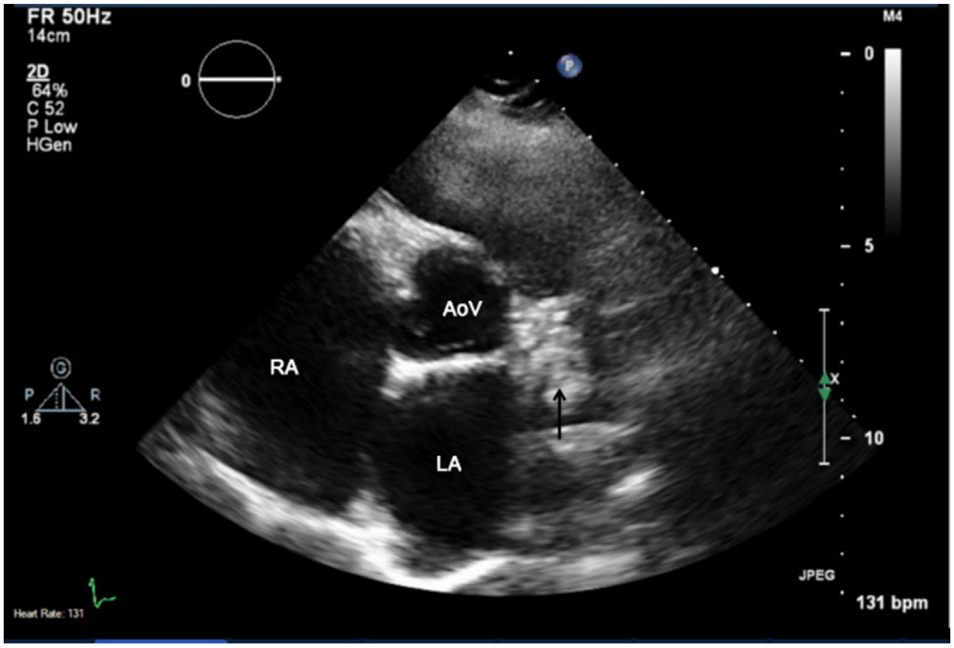

Fig. 2. TTE parasternal short axis view at the aortic valve level. An echogenic mass (arrow) can be seen in the vicinity of the LAA. See *online video*, showing the echogenic mass to be highly mobile and mimicking a thrombus within the LAA. RA = right atrium; LA = left atrium; AoV = aortic valve; PA= Pulmonary artery.

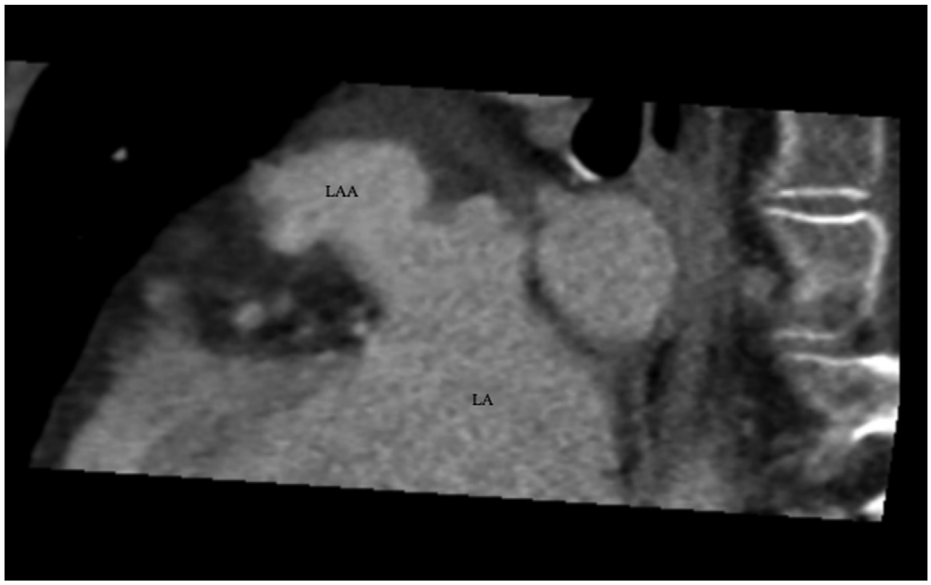

Fig. 3. Cardiac-gated CT sagittal plane demonstrating the left atrium and LAA appendage clear of thrombus. LA = left atrium, LAA = left atrial appendage.

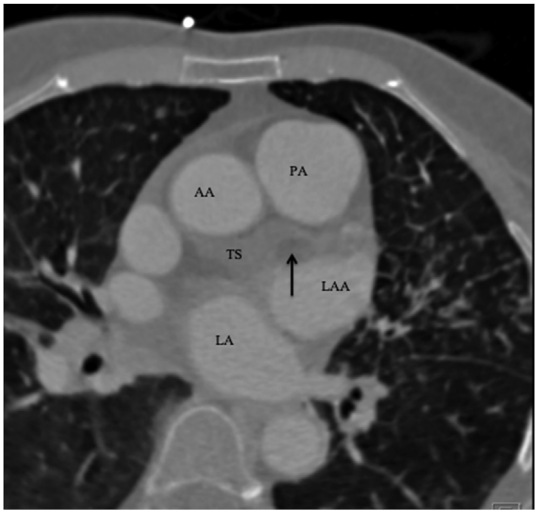

Fig. 4. Cardiac-gated CT axial plane showing the transverse sinus with a mass (arrow) consistent with an epicardial fat pad corresponding to the position of the echogenic mobile mass seen on TTE. AA = ascending aorta; PA = pulmonary artery; LA = left atrium; LAA = left atrial appendage; TS = transverse sinus.

subsequently switched back to Rivaroxaban and underwent a successful ablation for a perimitral atrial flutter (Fig. 1B, C and D).

3. Discussion

Detection of a LAA thrombus is a contraindication to CV and CA in patients with AF. Management of this condition requires a minimum of 3 weeks of optimized anticoagulation and pre-procedural repeat imaging to confirm thrombus resolution.[1] Given the clinical repercussions of this finding, leading to procedural cancelation and treatment delay, an accurate diagnosis is paramount.

During TTE, the left atrium lies in the far field of the ultrasound beam. Visualization of the LAA is therefore challenging with this imaging modality, making it inappropriate for the diagnosis of LAA thrombus or masses [4].

TOE has, on the other hand, demonstrated a very high diagnostic accuracy and is considered the gold standard modality in this setting [5,6]. Different left atrial anatomical variations and certain extracardiac structures can however resemble a LAA thrombus and may require different imaging modalities.

The LAA endocardial surface is comprised of pectinate muscles that provoke its trabeculated appearance. These muscles can be mistaken for thrombi or intra-atrial masses. Careful examination on TOE using different angles will demonstrate a parallel configuration of the pectinate muscles as opposed to the LAA thrombus, which will appear as a focal echodensity in different views [7].

The Coumadin ridge is an anatomical variant that can also mimic a LAA thrombus. It is formed following the coalition of the left superior pulmonary vein with the roof of the LAA resulting in a ridge of atrial wall tissue that contains the ligament of Marshall. Comprising of a thin proximal part and bulbous distal part it can be misinterpreted as a pedunculated mass or thrombus [8].

The left atrium has a discontinuous pericardial covering due to the fusing of the parietal and visceral pericardium. These structures are called pericardial reflections. The transverse sinus is the pericardial reflection superior to the pulmonary veins and posterior to the arterial trunk (Fig. 3) [9]. The tip of LAA is usually directed antero-superiorly but in a small proportion of individuals it can lie within the transverse sinus [10]. Echo-bright masses may be seen in this location and can be misinterpreted as LAA thrombi. Careful imaging with alternative modalities usually demonstrates that these masses correspond to either fat or fibrin. In fact, the presence of epicardial fat between the aorta and the transverse sinus is a normal variant, with a prevalence of up to 9% on cardiac CT [11–14].

Cardiac-gated CT is a reliable imaging alternative in the evaluation of LAA thrombi. A recent metanalysis showed a remarkably high diagnostic accuracy when compared with TOE in this setting. Sensitivity, specificity, positive and negative predictive values were >92% when delayed CT imaging was used· [15] In addition, CT provides excellent resolution of intra and extra-cardiac structures and can better differentiate adipose tissue from thrombus when compared to TOE, due to its different radio-density.

CMR has also been shown to reliably image the LAA in detecting

or ruling out thrombi. A recent meta-analysis comparing CMR to TOE for the detection of left atrium/LAA thrombus found that delayed-enhancement CMR had a 100% sensitivity and 99% specificity [16]. Like cardiac-gated CT, CMR offers excellent resolution of intra and extra cardiac structures.

All three modalities -CMR, CT and TOE-have their role in assessing for a LAA thrombus. TOE has excellent sensitivity and allows real time assessment of left atrium & LAA function; however, distinguishing structures with similar echogenicity can be a challenge. CT provides radio-density assessment and, along with CMR, allows for excellent resolution of intra and extra cardiac structures. As opposed to the other two modalities, CT carries radiation exposure. Access to CMR can be limited in some centres and may lead to significant diagnostic and therapeutic delay.

4. Conclusion

The LAA is the primary source of thrombi leading to systemic thromboembolism in patients with atrial arrhythmias. Detection of a LAA thrombus represents a contraindication to CV and CA procedures, leading to delays whilst anticoagulation is optimized and repeat imaging confirms clearance of the thrombus. With anatomical variants of the LAA and adjacent structures possibly mimicking thrombi, our case highlights the importance of using alternative imaging modalities to ensure a correct and prompt diagnosis.

Declaration of competing interest

There are no conflicts of interests to declare.

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