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Multimodality imaging for the differential diagnosis of a cardiac pseudotumor: the mazy case of Coumadin Ridge

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Abstract

The Coumadin/Warfarin ridge (CWR), also known as "Q-tip" sign in cardiac magnetic resonance (CMR) imaging, consists in a prominent muscle ridge lying in the left atrium, in-between the left atrial appendage and the insertion of left upper pulmonary vein; due to its

shape and position it is often misdiagnosed as a left atrial myxoma or a thrombus, without regression despite anticoagulation therapy with warfarin (Coumadin). We present here, a particularly rare condition in which an extraordinary prominent ridge was firstly misdiagnosed as a cardiac mass and secondly as a *Cor Triatriatum Sinister*. Awareness of CWR location, and both echocardiographic and CMR features, can help avoiding misdiagnosis and overtreatments, even if particularly prominent as in our case.

Keywords: Cardiac masses; Pseudotumors; Cor triatriatum; Coumadin ridge; Multimodality imaging.

Introduction

The incidental finding of a cardiac mass can be an occasional but not uncommon event. In this setting, thrombi, cysts, the moderator band and embryonic residues such as the network of Chiari, the Eustachian valve and the *crista terminalis* are considered cardiac pseudotumors. While it is easy to recognize some of these well-known structures and differentiate them from tumors, it can be challenging to distinguish those uncommon [1]. We report an unusual condition in which the final diagnosis required a multimodality imaging approach.

Case report

A 59-year-old man with history of mitral prolapse and arterial hypertension underwent a routine cardiac examination for new onset of palpitations and dyspnea. The patient was in sinus rhythm (**Figure 1**) with meso-systolic click followed by a murmur. Ultrasound examination confirmed the diagnosis of mitral valve prolapse with mild mitral regurgitation, preserved global left ventricular function and no left atrial enlargement. Unexpectedly, parasternal long and short axis views showed a left atrial mass (**Figure 2**), lying adjacent to the aortic root and also visible in apical four and two chambers view. Off-axis apical-three-chambers view revealed a thick echogenic linear mass protruding into the left atrium with no significant gradient on Doppler analysis (**Figure 3**). The patient was so referred to cardiac magnetic resonance (CMR) with a high suspicious of *cor triatriatum* (CT) *sinister*.

CMR is considered nowadays the gold-standard technique of imaging for the characterization of soft tissues. The combination of fast spin echo (FSE) T1- and T2-weighted, steady state

free precession (SSFP) and contrast-enhanced technique, with gadolinium chelates, improve the morphological and functional cardiac assessment along with the possibility of ruling out lesions, masses and congenital defects involving the heart [2]. In facts, CT is a rare and congenital anomaly, accounting for 0.1% of congenital heart disease, in which the left or right atrium is divided into 2 separate chambers by a membrane or thick fibromuscular band.

This anomaly is frequently associated with left atrial enlargement, *ostium secundum* atrial septal defect, anomalous pulmonary vein return and the development of atrial fibrillation. Natural history, severity of the symptoms and treatment options depend on size of the communication between atrial chambers, the gradient across the membrane and the position of pulmonary veins [3]. On the contrary, intracavitary masses such as thrombi are usually localizable in the left ventricle, close to an ischemic scar or a hypo-akinetic area, or into the left atrium and the left atrial appendage, either during atrial fibrillation and mitral stenosis. The T1 and T2 signal is correlated to the age of thrombus, but the distinctive feature is the absence of the signal enhancement in early and late gadolinium enhancement acquisitions, during first-pass perfusion.

Left atrial myxomas are usually, but not always, originating from atrial *septum* and demonstrate high signal intensity on T2-weighted images. They also classically present heterogeneous contrast enhancement following gadolinium injection.

In our case, CMR proved a particularly prominent ridge, appearing as a dark *mass* protruding into the bright left atrial cavity in SSFP (bright blood) images, adjacent to the left upper pulmonary vein (**Figure 4**). FSE (black blood) images, that highlight fat (i.e., lipomas) or excessive water content (i.e., cysts), were particularly useful to demonstrate the muscular nature of the ridge. The latter presented the same signal intensity of adjacent myocardial tissues on both T1 and T2 weighted images (**Figure 4**). The technique of late gadolinium enhancement (LGE) after the intravenous injection of gadolinium chelates can further enhance tissue characterization and a muscular ridge typically does not show late enhancement [2].

Discussion

The Coumadin/Warfarin ridge (CWR), also known as “Q-tip” sign, is a prominent muscle ridge lying in the left atrium, in-between the left atrial appendage and the insertion of left upper pulmonary vein [4]. Due to its shape and location, it is often misdiagnosed as a myxoma

or a left atrial thrombus, without regression despite the anticoagulation therapy with warfarin (Coumadin) [5].

In this case, the particularly prominent ridge matched the CWR diagnosis criteria due to its location, tissue characteristics and clinical features.

In summary, CWR is occasionally observed but seldom reported in cardiac imaging exams. If particularly prominent, it can easily be mistaken for atrial myxoma, thrombus and even mimic a CT, as in our case. Awareness of the location and both echocardiographic and CMR imaging features of this structure will help to prevent misdiagnosis and overtreatments.

Disclosures

The authors declare no conflicts of interest as to the content of this manuscript.

Legend for figures:

Figure 1. Basal ECG shows sinus rhythm with mild bradycardia and no significant abnormalities**.**

Figure 2. Panel A: long axis parasternal view, off-axis. Aortic root (AR), Left atrium (LA)**.** The mass lying adjacent the aortic root (Arrow) **Panel B:** Parasternal long axis view. Left ventricle (LV), Right ventricle (RV)**.** The mass (arrow) floating in the left atrium. **Panel C:** short axis view, off-axis. Right ventricle (RV), Aortic root (Ao), Left atrium (LA), the mass (arrow). **Panel D:** M-mode echo-imaging from parasternal long axis view.

Figure 3. Panel A: Three-chamber view, off-axis. Left ventricle (LV), left atrium (LA), the ridge (arrow). **Panel B:** zoomed view from Panel A. **Panel C:** Two-chambers view. Left ventricle (LV), Left atrium (LA), The ridge (arrow). **Panel D:** Doppler analysis across the ridge.

Figure 4. Cine-SSFP (steady state free precession - bright blood) sequences demonstrate the close proximity of the structure (arrow) to the left upper pulmonary vein, with signal characteristics similar to adjacent myocardium. (Left Atrium, LA; Left Ventricle, LV; Right Atrium, RA; Right Ventricle, RV; Aortic root, Ao).

Figure 5. Panel A: Cine-SSFP (steady state free precession - bright blood) sequence shows the ridge (arrow) dividing left atrium into two non-separate chambers. **Panel B:** T2-weighted

FSE (fast spin echo - black blood) “four chambers” view demonstrates the signal characteristics of the ridge to be similar to adjacent myocardium. (Left Atrium, LA; Left Ventricle, LV; Right Atrium, RA; Right Ventricle, RV; Aortic root, Ao).

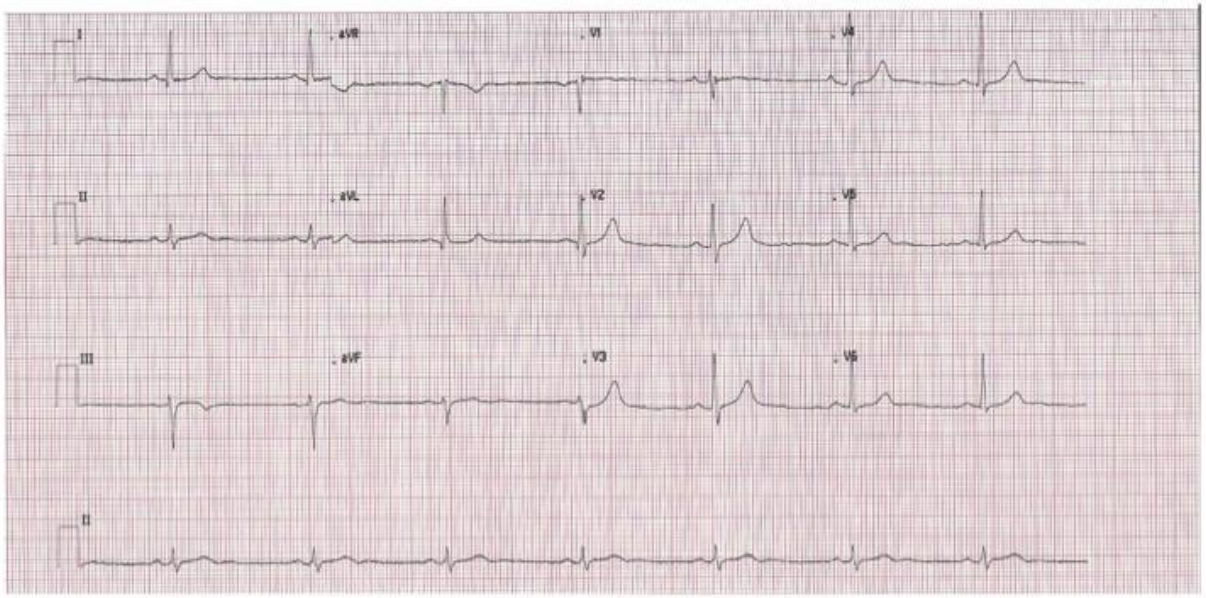

Figure 1

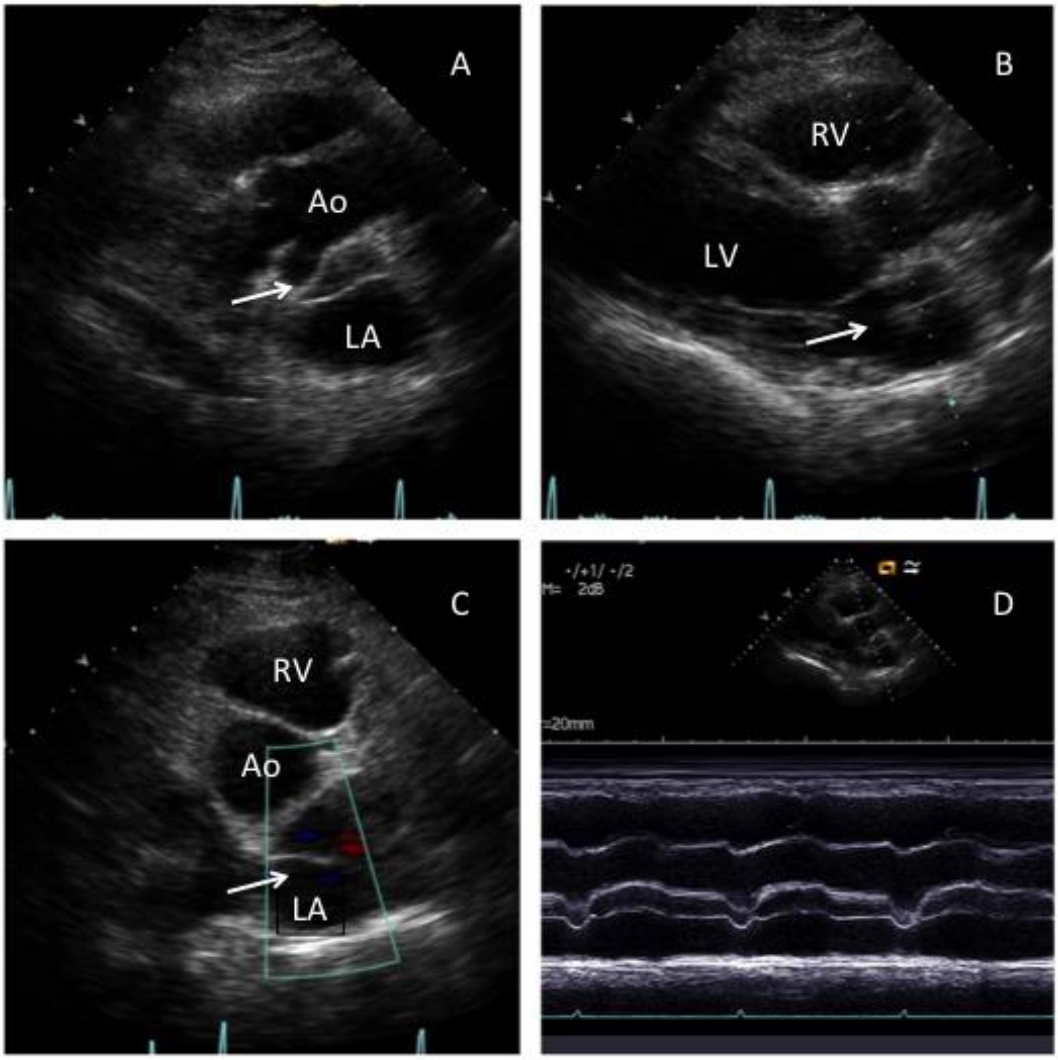

Figure 2

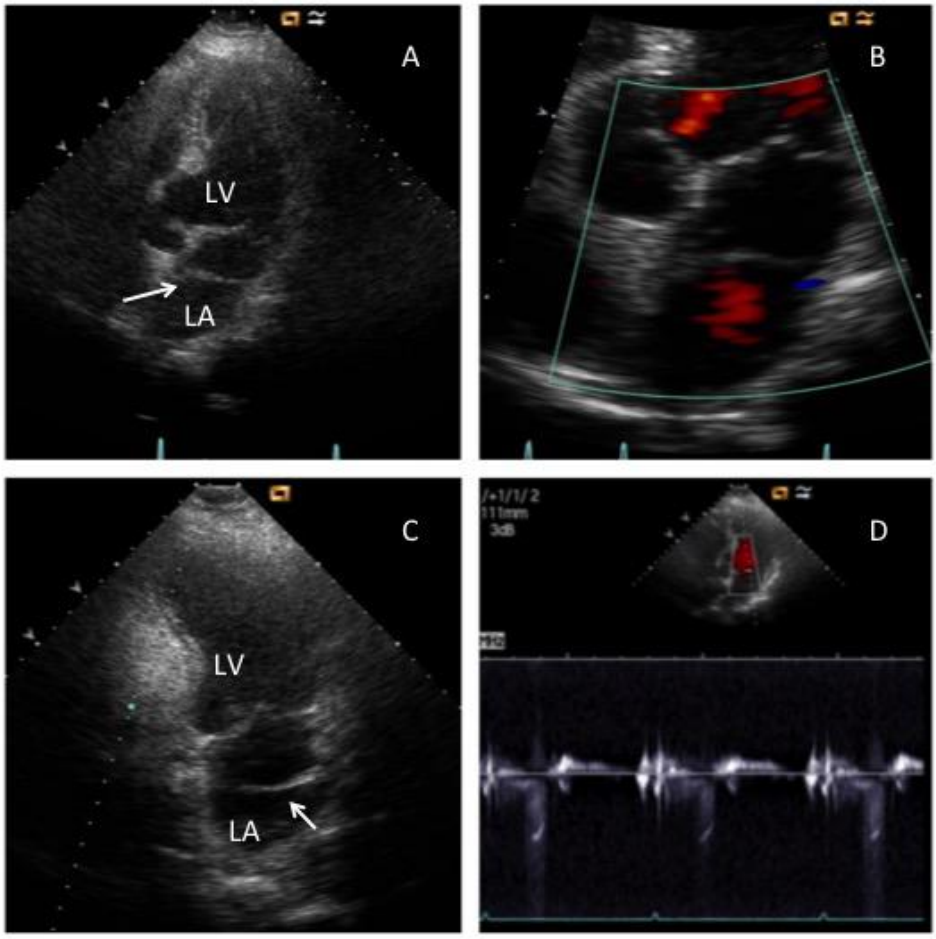

Figure 3

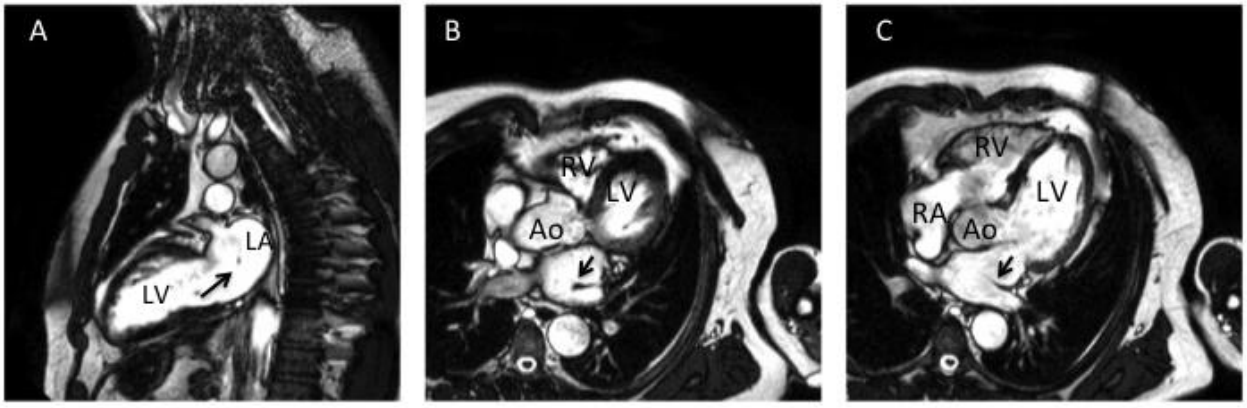

Figure 4

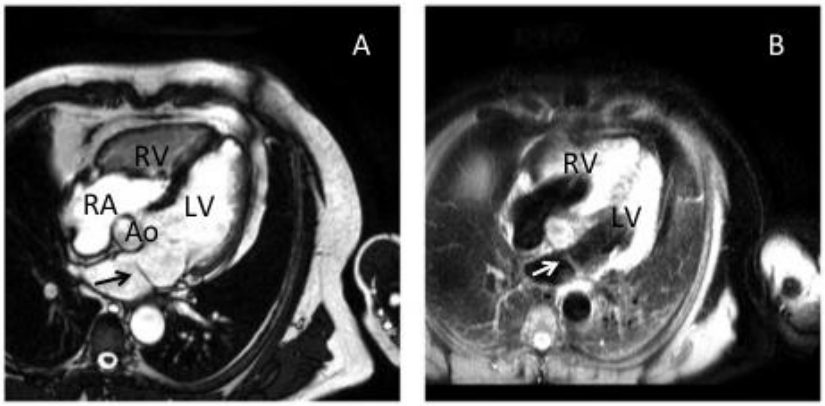

Figure 5

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