

COUMADIN RIDGE – A LEFT ATRIAL CAMOUFLAGE

Patel Nikhilkumar P¹ Ravat Shreyas² George Rupesh³ Jayakumar T.G.⁴

¹Senior Professor, Department of cardiology, Amala Institute of medical sciences, Thrissur, Kerala

²Senior Professor, Department of cardiology, MGM medical college and hospital, Navi Mumbai, Maharashtra

³Associate Professor, Department of cardiology, Amala Institute of medical sciences, Thrissur, Kerala

⁴Professor and HOD, Department of cardiology, Amala Institute of medical sciences, Thrissur, Kerala

ABSTRACT

A Coumadin ridge, also called warfarin ridge is a normal anatomic variant that is occasionally found in the left atrium. It is a band-like embryological remnant in the left atrium formed by the coalition of the left superior pulmonary vein and left atrial appendage, which results in a lateral fold of left atrial wall tissue. The ligament of Marshall, autonomic nerve bundle, and small atrial or sinoatrial node artery are all located in this ridge. It can appear as a linear or nodular mass which can undulate with cardiac motion and can quickly be mistaken for a tumor or thrombus if it is particularly apparent. Misdiagnosis, as well as unnecessary workup and treatment, can be reduced by carefully evaluating and considering the common variants addressed in this report.

CASE REPORT

A 66-year-old male, known case of hypertension & dyslipidemia, presented with complaints of low grade fever, loss of appetite for 3 days along with generalized weakness. Patient also had a history of severe calcified aortic stenosis for which he underwent surgical aortic valve replacement with Bioprosthetic valve 1 year back. He was worked up for the fever, but no source of infection could be found (Leptospira IgM, Dengue NS1, Covid RT PCR were negative and chest X-ray was within normal limits). Given the history of aortic valve replacement Transthoracic echocardiography was done to rule out infective endocarditis. His Transthoracic echo showed Good left ventricular systolic function with normally functioning prosthetic valve in situ and no vegetations. His blood cultures were also negative. But patient had persistent fever and subsequently developed hypotension, hence he underwent Transesophageal Echocardiography which showed no evidence of any vegetations but showed band-like structure with a thin proximal part and a bulbous distal part between left atrial appendage and left pulmonary vein, mimicking clot or myxoma. Considering its location and echo features, diagnosis of left atrial ridge was made, and continued general supportive measures. His fever subsided, blood pressure improved and was discharged on 7 the day.

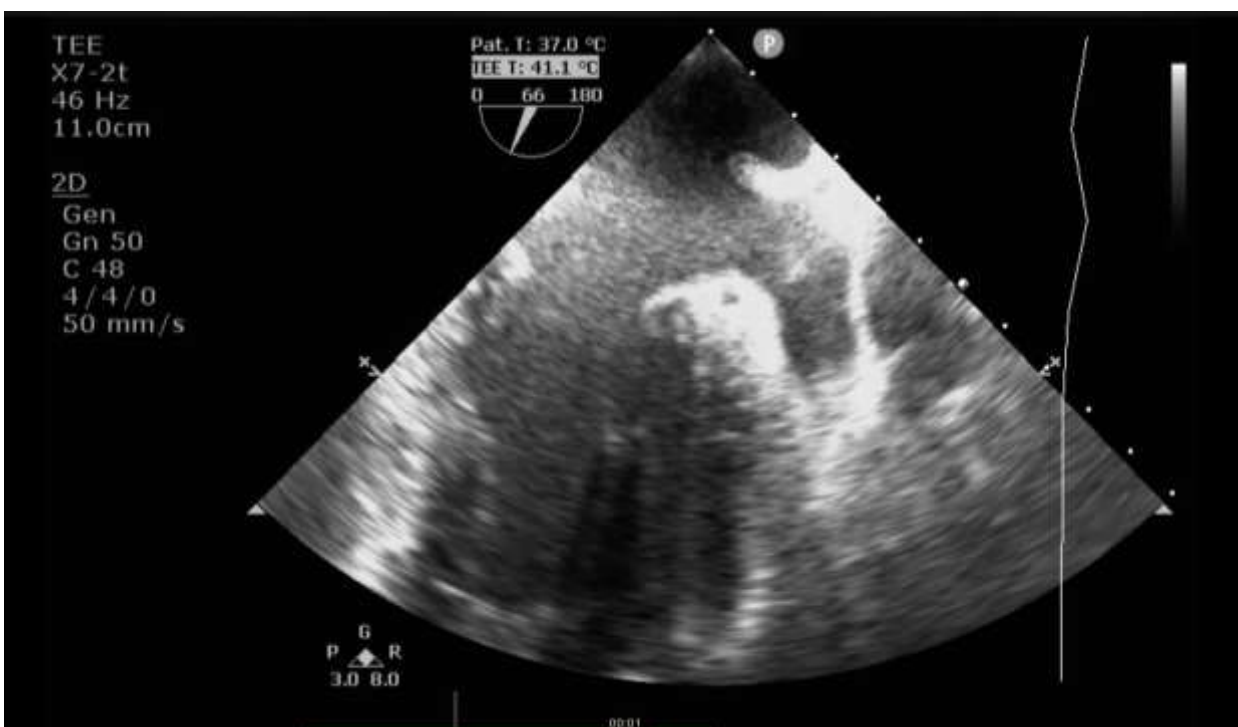


Figure 1 and Figure 2 shows 2 chamber TEE view which shows Coumadin ridge as “Q” tip sign between the Left atrial appendage and Pulmonary Vein.

DISCUSSION

Echocardiography has become a more popular method for assessing cardiac anatomy and function in recent decades. With the ease of bedside imaging modalities, we are more likely to encounter

across normal anatomic variants of the heart which includes the eustachian valve, chiari network, and crista terminalis of the right atrium, interatrial aneurysms, lipomatous hypertrophy of the interatrial septum, pectinate muscles of the right and left atriums, moderator band of the right ventricle, transverse sinus of the pericardium and coumadin ridge of the left atrium(1).

Also known as 'left atrial ridge', Coumadin ridge is a normal variant of the cardiac structure. Situated between the left atrial appendage (LAA) and the emptying part of the left superior pulmonary vein (LSPV), it is thought to be a pseudo-tumor.

Although the actual myocardial layer contained within the ridge is thinner at this position, the ridge is substantially wider and thicker at its inferior sector.(3) In the majority of patients, the narrow coumadin ridge between the LSPV and LAA is less than 5 mm (4).The cross section of its narrowest part shows a round contour in the majority (75%), flat in 15% and pointed in 10% of cardiac specimens.(5)The ligament of Marshall or the vein, the autonomic nerve bundle, and the small atrial artery or perhaps a sinoatrial nodal artery are the structural components of the coumadin ridge (5).

Coumadin ridge may be misdiagnosed as a thrombus or a cardiac tumor. In fact, the ridge is named so as it was commonly misdiagnosed as a thrombus which used to result in unnecessary treatment of the patient with anticoagulants (coumadin/ warfarin). It may also be mistaken for a myxoma, leading to inappropriate surgeries (5,6). Correct identification of these variants on cardiac imaging is crucial and will help prevent unnecessary workup and treatment.

Cardiac Magnetic Resonance (CMR), Transthoracic Echocardiography (TTE) and Transesophageal Echocardiography (TEE) and are common tools for left atrial mass screening.

Cardiac Magnetic Resonance (CMR) may help to provide clarity to the diagnosis (6,7) in cases where it is difficult to differentiate coumadin ridge from a thrombus or tumor. On both T1 and T2-weighted imaging, the coumadin ridge should have the same signal strength as adjacent cardiac tissue (7). In addition, late gadolinium enhancement on CMR may assist in clarifying the diagnosis, wherein, the coumadin ridge is unlikely to exhibit late enhancement (7). Thrombus, however, will typically have low signal-strength surrounded by structures with higher signal strength on late gadolinium enhancement (7).

Two-dimensional Transthoracic Echocardiography (TTE) can provide adequate clarity of the coumadin ridge. Furthermore, fast spin echocardiography techniques with contrast can aid to clarify the diagnosis (7). If coumadin ridge is seen using TTE and question still remains about the diagnosis, full volume three-dimensional TTE with color Doppler can also provide additional clarity of the surrounding structures (8).

Transesophageal echocardiography using color flow and pulse wave Doppler. Midesophageal four-chamber view on Transesophageal Echocardiogram (TEE) gives accurate delineation regarding the structural characteristics and location of left atrial masses (1). On TEE, left atrial ridge appears as a band-like structure with a thin proximal part and a bulbous distal part that resembles a cotton-tip applicator. This is known as the "Q-tip sign" on TEE (8).

Left atrial thrombus is commonly located in the left atrial appendage (LAA) and are often associated with atrial fibrillation. More than 90% of left atrial thrombi are detected in the LAA (9). Similarly, 75% of the atrial myxoma occurs in the left atrium. Atrial myxomas are almost always single and may be sessile or pedunculated and attached to the inter-atrial septum in the region of fossa ovalis (10). It has smooth surface and uniform consistency, and it can grow to be quite huge (1).

Despite the numerous direct and indirect indicators for TAPVC identification, the rate of prenatal TAPVC detection remains low. Coumadin ridge may provide a simple and easily detectable tool in screening fetal echo as its presence indicates normal opening of left upper pulmonary vein into left atrium, thus ruling out TAPVC (13).

While it's possible that the coumadin ridge will be misunderstood as a thrombus or tumor, it's also important to keep an eye out for lesions that are close to or contiguous to the coumadin ridge, as there have been cases of myxomas and fibroelastomas attached to the tip of the coumadin ridge (11). These abnormalities can be differentiated on imaging from the coumadin ridge by their different sizes, shapes, echogenic features, and mobility (11).

Coumadin ridge is considered as a potential source of arrhythmias. The ridge has muscular connections with the left pulmonary vein and these connections can be a triggering substrate of focal atrial fibrillation (12). Previously, the coumadin ridge has been used as a catheter ablation site(11). The size and contour of the coumadin ridge can determine the effectiveness and safety of AF catheter ablation. Accidental harm to PV during AF ablation must be considered in the scenario of the pointed coumadin ridge. Therefore, it is recommended to stay on the LAA side of the ridge during ablation.

In our case, we used TEE to show the coumadin ridge in its rounded and flattened shape. In Figure 1 and 2, the similarity in the echogenicity of the ridge with the surrounding cardiac tissues can be appreciated, suggesting that this is a normal structure of the heart and not a thrombus or myxoma. It's positioning in the left atrium, as well as its morphology, are comparable with other examples documented. In these images, the coumadin ridge can be seen as a rounded "Q-tip" shape.

To summarize, the coumadin ridge is natural variation structure in the left atrium, not a pathologic disease. The existence of the coumadin ridge, must be identified to avoid misinterpretation as a

thrombus or tumor. We present this case in which coumadin ridge was incidentally found on Transesophageal Echocardiography during work up for infective endocarditis. Awareness of its typical location and features on various imaging modalities are crucial to avoid unnecessary interventions which may potentially put patients through risky treatments and surgeries.

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