‘Coumadin ridge’ in the left atrium demonstrated on three dimensional transthoracic echocardiography

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An echogenic band like structure was seen in the left atrium on two dimensional transthoracic echocardiography (2D TTE). Full volume three dimensional (3D) TTE and colour Doppler established the surrounding anatomical landmarks, and demonstrated the absence of obstruction related to this band. 3D TTE confirmed that this band like structure was consistent with the ridge between the left atrial appendage and left superior pulmonary vein (‘warfarin/coumadin ridge’).

KEYWORDS
Warfarin ridge; Coumadin ridge; 3D transthoracic echocardiography

Case presentation

A routine TTE was performed on a 39-year-old patient for the investigation of a new murmur. The TTE was normal except for the finding of a linear band like structure within the left atrium (LA), in the parasternal long axis view (Figure 1). This structure could be reproduced in multiple views (the parasternal short axis and apical four chamber views). A full volume 3D TTE loop and 3D images with colour Doppler wedge were acquired and analysed using a TomTech/Philips QLab offline analysis system.

In the parasternal long axis 3D view (Figures 1 and 2), the structure appeared as a band possibly dividing the left atrium such as in cor triatriatum sinister.¹ However using the short axis 3D view (Figure 3) it was demonstrated that the structure was a ridge continuous with the roof of the left atrial appendage (LAA) that extended into the body of the left atrium with a rounded end.

2D colour Doppler demonstrated that colour flow was present on either side of the structure (Figure 4). With 3D

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Figure 1 Parasternal long axis view. Structure in the left atrium appears as a band. MV – mitral valve, LA – left atrium, LV – left ventricle.

Figure 2 Full volume 3D reconstruction of the parasternal long axis cut. The structure in the left atrium still appears as a band.
Colour Doppler the structure could be viewed both from the original parasternal long axis cut (Figure 5, left) and from a 180° rotation in the parasternal long axis view along a craniocaudal axis. This cut permits one to view the LA from the posterior wall towards the anterior atrial wall by cropping through the data set (Figure 5, right). From this 180° rotated view, which could not be obtained from a 2D TTE image, colour flow could be seen to move through the atrium without any aliasing to suggest flow obstruction. Thus the structure was seen as consistent with the ridge between the LAA and the left superior pulmonary vein (LSPV) often described as the ‘warfarin or coumadin ridge’.2

Figure 6 is a diagrammatic representation of the anatomy of the lateral left atrium.3

Discussion

3D TTE is being increasingly utilised in the clinical setting to identify cardiac pathology more accurately. However, its role is in contributing additional information but not replacing 2D TTE. Improved technologies in 2D imaging have resulted in physiological structures becoming more readily visualised and 3D TTE has enabled these ‘normal variants’ to be identified. We have previously observed a prominent crista terminalis, identified on 2D TTE as a ‘band’ in the right atrium, utilising a 3D full volume data set.4

Pathological findings of a fibromuscular membrane dividing the left atrium into two chambers is called cor triatriatum sinister and can mimic the findings of mitral stenosis.1 Spectral Doppler information excluded a gradient within the left atrium and across the mitral valve. Full volume 3D TTE and colour Doppler mapping demonstrated the ‘coumadin ridge’ between the LAA and LSPV. In previous studies the ‘coumadin ridge’ has been utilised as a site for catheter ablation of AF.2 The 3D echocardiographic views obtained were a sagittal section (traditionally named the long axis), from the parasternal window (Figures 1 and 2) and a transverse section (Figure 3) at the level of the aortic valve (the parasternal short axis on 2D TTE).

Figure 3. Left: 2D parasternal short axis view. Right: 3D reconstruction; the structure is seen to be continuous with the wall of the left atrial appendage and left superior pulmonary vein. LA — left atrium, LAA — left atrial appendage, LSP — left superior pulmonary vein.

Figure 4. 2D parasternal long axis with colour Doppler. Arrows point to the colour which can be seen to move on either side of the structure located on the anterolateral wall.

Figure 5. Left: 3D full volume reconstruction with colour Doppler. Colour Doppler can be seen to move either side of the structure. Right: The same wedge rotated 180°. Colour Doppler is now seen to move freely within the left atrial chamber behind the structure. No aliasing is seen. LA — left atrium, MVA — mitral valve annulus.
In conclusion, we have demonstrated that a linear band noted in the LA on 2D TTE, was a normal variant of the ridge between the LAA and LSPV often referred to as the 'warfarin/coumadin ridge'.

**References**


**Figure 6** Drawing of the anterolateral wall of the left atrium adapted from Sra et al. Red dashed line — warfarin ridge, MV — mitral valve, LAA — left atrial appendage, LIPV — left inferior pulmonary vein, LSPV — left superior pulmonary vein.