Noninvasive evaluation of left circumflex coronary aneurysm by real-time three-dimensional echocardiography

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Abstract  The diagnosis of coronary aneurysms has already been described using transthoracic and transesophageal echocardiography. In the present report we demonstrated the use of real-time three-dimensional echocardiography for the diagnosis of a large left circumflex coronary aneurysm. The improved spatial resolution of this new imaging technique provided valuable information for anatomic characterization of the coronary aneurysm, allowing for distinction between the lumen and lining thrombus. The findings were confirmed by magnetic resonance imaging and coronary angiography.

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Case report

A 57-year-old man with history of hypertension presented with symptoms of congestive heart failure functional class II (New York Heart Association) and isolated episodes of atypical chest pain. Transthoracic echocardiography performed one year ago revealed severe left ventricular dysfunction and an echogenic image in the left atrium that was interpreted as an intracavitary thrombus. The patient was managed with a regimen of warfarin, angiotensin-converting enzyme inhibitor, and diuretics and referred for further assessment of the left atrial thrombus.

Real-time three-dimensional echocardiography (RT-3D) was performed using commercially available equipment (Sonos 7500, Philips Medical Systems, Andover, MA) equipped with matrix array transducer. The different cardiac structures were evaluated using multiple slices of 60° × 30° three-dimensional pyramid of data and the full-volume mode containing a larger single pyramid of data.
(120° × 60°) acquired during four consecutive cardiac cycles. RT-3D demonstrated enlargement of left cardiac cavities with left ventricular global dysfunction. Instead of left atrial thrombus, a large hypoechogenic cavity was visualized in the atrioventricular groove, measuring 5.2 × 5.0 cm, and compressing the left atrium. The mass had an echo-free center and an echogenic layer lining the perimeter (Fig. 1). Color Doppler revealed low-velocity blood flow in the lumen suggestive of aneurismal dilatation of left circumflex coronary artery (LCX). Tilting the cutting planes in the full-volume image and rotating in different positions revealed differences in luminal diameter and presence of endoluminal thrombus in some extension the LCX aneurysm (Fig. 2).

The patient underwent magnetic resonance imaging, which confirmed the presence of a well-circumscribed mass in the left atrioventricular groove consistent with a vascular structure lined with thrombus (Fig. 3). Selective coronary angiography of the left coronary artery confirmed a large ectatic LCX with aneurysm arising from the proximal portion of the artery and extending to the mid-portion (Fig. 4). The proximal portion of left anterior descending coronary artery also presented some degree of dilatation. Surgical resection of the aneurysm was indicated.

**Discussion**

Coronary artery ectasia including aneurysmal dilatation is an uncommon abnormality, occurring in 0.2–4.9% of patients undergoing coronary angiography.\(^1,^2\) It is defined as dilatation of a portion of the coronary artery to more than 1.5 times the diameter of the adjacent normal segment. A review of the cases from the Coronary Artery Surgery Study (CASS) demonstrated that aneurysmal coronary disease appears to be a variant of occlusive coronary atherosclerosis, and both lesions frequently coexist in the same vessel.\(^1\) Besides the atherosclerosis, which is the most common cause in patients > 45 years old, other causes of coronary aneurysm include Kawasaki’s disease, mycotic aneurysm, syphilis, connective tissue diseases, arteritis, complication post coronary angioplasty, and congenital causes. The right coronary and the proximal left anterior descending artery are the most frequently reported sites, and the left main involvement is rare.\(^3\)

Although coronary angiography is considered the gold standard, both two-dimensional and transesophageal echocardiography have been used for the diagnosis of coronary artery aneurysms.\(^4–^7\) A variety of echogenic structures can be detected in the left atrioventricular groove making the

![Figure 1](image1.png)

**Figure 1**  (A) Real-time three-dimensional echocardiography imaging in apical view showing a large left circumflex coronary aneurysm in the atrioventricular groove compressing the left atrium. (B) A slight rotation of the three-dimensional plane allowed for a better delineation of the echo-free lumen and the echogenic layer suggestive of thrombus lining the aneurysm. AO, Aorta; L, lumen; LA, left atrium; LCX, left circumflex coronary artery; LV, left ventricle; TR, thrombus.
differential diagnosis by two-dimensional echocardiography sometimes challenging. These include variants of normal structures such as dilated coronary sinus and lipomatous tissue, or pathologic structures such as mitral annular abscess, aneurysm of the LCX, aneurysm of the descending aorta, and tumors. Furthermore, thrombosed coronary aneurysms can mimic intracardiac masses.
as probably occurred in this case, in which the coronary aneurysm was misdiagnosed as a left atrial thrombus.4,6,8 Although transthoracic echocardiogram can identify large aneurysms, transesophageal echocardiography may have greater sensitivity and is usually required for the diagnosis of coronary aneurysms and fistulas in adult patients. This technique yields higher resolution images and allows for more precise visualization of the proximal right and left coronary arteries.

This is the first report of anatomic characterization of a partially thrombosed LCX aneurysm using RT-3D. This new technique provides unique information on spatial geometry in real time, and has been validated for estimation of left ventricular volumes and function, as well as for the evaluation of valvar structures.9–11 Furthermore, the visualization of proximal and mid-portion of coronary arteries has recently shown to be possible using this technique.12 In the present case, the ability to evaluate the low-velocity blood flow by color Doppler and to make different cutting planes was helpful for the diagnosis of a vascular structure. Although the aneurysm was visualized in a restricted portion of the left atrioventricular groove, we clearly demonstrated differences in the vessel diameter and distinction between the lumen and the lining thrombus. Thrombosis is a common finding in large aneurysms, and was confirmed by magnetic resonance imaging. Coronary angiography confirmed the ectatic LCX with a larger dilatation in the proximal to mid-portion of the artery, corresponding to the region visualized by RT-3D.

This case illustrates the potential use of RT-3D for the noninvasive anatomical characterization of coronary arteries aneurysms.

References