A hole in the heart

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We present the case of a 91-year-old male whose percutaneous aortic valve replacement was complicated by perforation of the left ventricular (LV) apex caused by an extra-stiff guidewire. Although two-dimensional echocardiography was able to demonstrate a small hole at the LV apex and the presence of an LV pseudo-aneurysm, the exact size and shape of the hole could not be readily appreciated. Thus, three-dimensional (3D) echocardiography was performed and an oval-shaped hole of roughly 0.8 cm² could be clearly visualized. This case illustrates the unique value of 3D echocardiography in visualizing geometry and flow across LV rupture sites.

Keywords
Left ventricular perforation • Three-dimensional echocardiography

A 91-year-old man underwent percutaneous aortic valve replacement for severe symptomatic aortic valve stenosis. The procedure was complicated by left ventricular (LV) perforation caused by an extra-stiff guidewire that had been passed across the aortic valve into the LV. Subxiphoid pericardiostomy was performed immediately and a large haematoma was removed from the pericardial space. The patient had an uneventful recovery. Ten days later, he underwent transthoracic echocardiography for routine follow-up. The two-dimensional colour Doppler echocardiogram demonstrated a loculated pericardial fluid collection at the LV apex (Figure 1A). There was systolic flow from the LV to the pericardial space and diastolic flow from the pericardial space to the LV (Figure 1B and C). This Doppler flow pattern has previously been shown to be specific for blood flow between LV pseudo-aneurysm and the LV cavity.1

Two-dimensional echocardiography also revealed a small hole at the LV apex. However, the size and shape of the defect could not be readily appreciated. Thus, three-dimensional (3D) colour Doppler echocardiography was performed. Image reconstruction provided clear images of the size (~0.8 cm²) and shape of the apical defect (Figure 1D–F). As the patient initially refused to undergo surgical repair of the pseudo-aneurysm, interventional closure of the defect was considered. However, after seeing the actual magnitude of the defect through 3D echocardiography, this idea was discarded and the patient could be convinced to undergo surgery. He had an uneventful recovery.

In conclusion, although in this case, 3D echocardiography was not necessarily required to reach to a diagnosis, it turned out to be a valuable tool for better definition of geometry and flow across the LV rupture site.

Reference

Figure 1  (A) Two-dimensional image demonstrating loculated pericardial fluid (white arrow) at the left ventricular apex. (B) Two-dimensional colour Doppler image depicting systolic flow from the left ventricle to the pericardial space. (C) Pulsed wave Doppler with the sample volume located at the site of perforation. (D and E) Three-dimensional colour images allowing en face view and area measurement of the apical defect. (F) En face view of the perforation site as seen from the pericardial space. LV, left ventricle.