ILLUSTRATIVE ECHOCARDIOGRAM

Superiority of Echocardiography over Angiocardiography in Diagnosing a Left Ventricular Thrombus

Hilde van Meurs-van Woerk, M.D.; Richard S. Meltzer, M.D.;†
Marcel van den Brand, M.D.; Catharina E. Essed, M.D.;
Rolf H.M. Michels, M.D.; and Jos Roelandt, M.D.

Analysis of the left ventricular apex is difficult or impossible with M-mode echocardiography because of the lack of spatial orientation: since there are no consistent internal landmarks in the M-mode examination of the left ventricular apex, local wall motion abnormalities cannot be reliably diagnosed. In this paper, an apical left ventricular thrombus with equivocal findings on the M-mode echo is diagnosed with two-dimensional technique. The large thrombus was not diagnosed by biplane left ventricular angiography but was confirmed at autopsy.

CASE REPORT

A 67-year-old man had an extensive anterior myocardial infarction. Two months later, he was hospitalized because of recurrence of retrosternal pain and increased dyspnea. He was a pale man and had weak pulses. The heart rate was 128 beats per minute. The blood pressure was 100/70 mm Hg.

A chest x-ray film showed cardiomegaly.

Analysis of the left ventricular apex is difficult or impossible with M-mode echocardiography because of the lack of spatial orientation: since there are no consistent internal landmarks in the M-mode examination of the left ventricular apex, local wall motion abnormalities cannot be reliably diagnosed. In this paper, an apical left ventricular thrombus with equivocal findings on the M-mode echo is diagnosed with two-dimensional technique. The large thrombus was not diagnosed by biplane left ventricular angiography but was confirmed at autopsy.

CASE REPORT

A 67-year-old man had an extensive anterior myocardial infarction. Two months later, he was hospitalized because of recurrence of retrosternal pain and increased dyspnea. He was a pale man and had weak pulses. The heart rate was 128 beats per minute. The blood pressure was 100/70 mm Hg.

A chest x-ray film showed cardiomegaly.
and pulmonary edema. A Swan-Ganz thermodilution catheter was inserted. The right atrial mean pressure was found to be 1 mm Hg, the mean pulmonary capillary wedge pressure 25 mm Hg, and the cardiac index, 1.69 L/min/sq m. Repeat myocardial infarction with cardiogenic shock was diagnosed. The M-mode and two-dimensional echocardiograms were obtained at the bedside. On the M-mode study, the presence of an apical thrombus was suggested. (Fig 1).

It was readily diagnosed on the two-dimensional study, which also showed a large apical aneurysm. The cross-sectional dimension of the thrombus was estimated to be 4 X 8 cm (Fig 2).

One week later, the patient underwent cardiac catheterization and angiography. Proximal occlusion of the left anterior descending coronary artery and greater than 75 percent stenosis of both the circumflex and right coronary arteries were found. The biplane left ventricular angiogram demonstrated apical dyskinesia. Despite prior knowledge of the echo findings, two experienced angiographers thought that no thrombus was present. Further hemodynamic deterioration occurred, and the patient died on the 16th hospital day. At autopsy, an apical left ventricular aneurysm and thrombus were confirmed (Fig 3).

Figure 2. Stop-frame photograph (left) and diagram (right) from the two-dimensional echocardiographic study performed at the patient’s bedside. Top panel, parasternal long axis view. Cursors line (large arrow) shows level of thrombus. T, on M-mode study in Figure 1. Stippled area in left ventricular apex in diagram represents thrombus. Basal boundary of thrombus is shown by small arrows. Bottom panel, stop-frame photograph (left) and diagram (right) from two-dimensional echocardiographic study in apical four-chamber view. Stippled area in left ventricular apex in diagram represents thrombus. Arrows indicate basal boundary of thrombus.

Figure 3. Post-mortem photograph of longitudinally sectioned heart. Cardiac base is to right and apex to left. There is an extensive, thin-walled apical left ventricular aneurysm with a large mural thrombus within the aneurysm. T is thrombus, and LV, left ventricle.
Mural thrombi of the left ventricle are common in patients with acute and healed anterior infarction. However, there has been no convenient technique available for making the diagnosis of left ventricular thrombi. Even left ventricular angiography has limitations in diagnosing thrombi: there are many false negatives though few false positive diagnoses. Despite some efforts, M-mode echocardiography has been somewhat disappointing in its ability to detect left ventricular thrombi, and only a few reports deal with successful detection of left ventricular thrombi by M-mode echocardiography. The major limitation of M-mode echocardiography is undoubtedly the inability to adequately examine the apical area in which most of the left ventricular thrombi are found. Even in our present case, where the echo beam clearly traversed a large section of the thrombus (Fig 1), we suspected the diagnosis but could not rule out artifactual echoes in the left ventricular cavity due to lateral resolution artifacts from nearby walls. Two-dimensional echocardiography identified a large apical mass with a laminated texture distinct from the myocardium. The well circumscribed mass was located within a thin-walled dyskinetic apical aneurysm (Fig 2). This illustrates the superiority of two-dimensional echocardiography to M-mode echo in the detection of left ventricular thrombi located in the apical area. Other recent studies also suggest that two-dimensional echocardiography is superior for making this diagnosis.

Despite prior knowledge of the echo findings, the apical thrombus was not identified from biplane left ventricular cineangiogram. This is because an angiogram only silhouettes the inner contour of the ventricular cavity while a two-dimensional echocardiogram displays a tomographic slice through the soft tissues allowing differentiation between the left ventricular wall and masses in the ventricular cavity on the basis of position, shape, motion, and texture. Limitations of two-dimensional echocardiography should also be realized. False-positive and false-negative echocardiographic diagnosis of the left ventricular thrombi are possible. To rule out artifacts, a mass should be visualized in more than one echocardiographic view. The “transducer artifact” in the near field of some two-dimensional echocardiographic systems may mimic a thrombus particularly when apical views are used. The success rate in imaging left atrial thrombi is considerably less than that of left ventricular thrombi, which may be partly due to our inability to adequately examine the atrial appendage.

Two-dimensional echocardiography offers a convenient and safe method for the diagnosis of left ventricular thrombi. Serial follow-up studies can be performed. Thus, the method may allow a better characterization of the prevalence and of the natural history. This eventually might allow more definite statements about its prevention and therapy (anticoagulation). Improved two-dimensional echocardiographic imaging systems may also help to elucidate the clinical course of this common condition.

REFERENCES
1. Hellerstein HK, Martin JW. Incidence of thromboembolic lesions accompanying myocardial infarction. Am Heart J 1946; 33:443-52
2. Garvin CF. Mural thrombi in the heart. Am Heart J 1944; 21:713-20