Echocardiographic Oscillating Flap in Aortic Root Dissecting Aneurysm

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A patient had a history, physical findings, and chest x-ray film suggesting type 1 aortic dissection. This diagnosis could not be confirmed angiographically. Echocardiographic studies predicted both the presence of dissection and the anatomic findings at surgery. A regularly oscillating echo corresponding to the intimal flap was found in the false lumen. This is suggested as a new echocardiographic finding in dissecting aneurysm.

Echocardiography has been shown to be a useful, noninvasivc, clinical diagnostic tool in examining internal structures of the heart.¹ ² Published echocardiographic evidence of aortic dissection³ includes enlargement of the aortic root, widening of the components of the aortic wall, aortic leaflets opening to the inner aortic wall, and maintenance of parallelism between the separated components. Other echocardiographic findings consistent with the diagnosis of aortic dissection are evidence of pericardial effusion and aortic insufficiency. We recently encountered a patient suspected of having chronic type 1 aortic dissection, a diagnosis not confirmed at angiographic studies but suggested by echocardiographic examination and confirmed at surgery. The new echocardiographic finding of an oscillating echo present in the false lumen was noted.

**CASE REPORT**

A 58-year-old white man was transferred to Emory University Hospital on April 15, 1975, for implantation of a permanent epicardial pacemaker as treatment for syncopal episodes associated with complete heart block for two weeks. There was a past history of intermittent hypertension controlled with diuretic therapy. In 1969, the patient experienced an episode of "hatchet-like" precordial pain. He had noted progressive dyspnea and hoarseness for one year.

Physical examination revealed a hoarse, mildly dyspneic, acutely ill white man with respiratory rate of 32/min. The blood pressure was 145/85 mm Hg in both arms. Jugular venous pulsations were flat at 30°. The carotid arteries had brisk upstroke and equal pulses bilaterally. The anterior right hemithorax was noted to be prominent and pulsating with a diffuse right parasternal heave and a systolic thrill. The apical impulse was diffuse at 3 cm lateral to the midclavicular line, fifth intercostal space. The normal first heart sound was followed by a grade 4/6 systolic ejection-type murmur heard maximally along the right sternal border. The second heart sound had two components and was split physiologically. There was a grade 3, long, diastolic, decrescendo blowing murmur heard maximally at both the right and left lower sternal borders. All peripheral pulses were present.

The electrocardiogram revealed regular pacing at a rate of 72 beats per minute with a conduction pattern of left bundle-branch block. A chest x-ray film taken at the time of admission revealed moderate cardiomegaly with massive enlargement of the ascending aorta and a normal-sized aortic knob, suggesting type-1 aortic dissection, and a pacing catheter at the right ventricular apex. An aortogram of the ascending aorta and supravalvular cineangiographic studies showed swirling dye in a massively dilated ascending aorta and moderate aortic insufficiency but could not confirm the impression of dissecting aneurysm, since no thickening of the aortic wall or false lumen could be identified.

Echocardiographic examination was carried out on April 17, 1975, using a commercially available echocardiograph (Unirad) and a 2.25 MHz, 10 cm focused transducer. Continuous recordings were made by means of a recorder (Tektronix). A mitral valvular echocardiogram (Fig 1 and 2) was obtained with the transducer placed at the fourth intercostal space adjacent to the sternum. An aortic valvular echocardiogram (Fig 3 and 4) was obtained by medial and cephalad rotation of the transducer from the mitral valvular position to the level of the aortic root.

On April 17, 1975, the patient underwent placement of permanent sutureless epicardial pacing leads, at which time the presence of 500 ml of serous pericardial effusion was confirmed. The patient progressively worsened, with severe
dyspnea secondary to impingement on the tracheal bronchial tree by the huge thoracic aneurysm. He consequently underwent cardiopulmonary bypass on April 30 for attempted repair of his ascending aorta. Surgery revealed type I dissecting thoracic-aortic aneurysm extending beyond the arch vessels. The aortic root measured approximately 3 cm in internal diameter with a one-component anterior aortic wall and a two-component posterior wall. There was a large posterior communication between the true and false lumina approximately 3 cm above the level of the aortic valve. The maximum diameter of the aneurysm was approximately 25 cm. The patient died during surgery. Permission for autopsy was not granted.

RESULTS

Figure 5 is a schematic diagram of the anatomic findings in the ascending aorta, with the probable pathway traversed by the ultrasonic beams (Fig 3 and 4) indicated by the dotted lines. An echocardiogram at the level of the low mitral valve (Fig 1) demonstrated evidence of anterior and posterior pericardial effusion, which was confirmed at the first operation. Also evident is the increased ventricular diameter with an increased septal and posterior wall excursion and velocity consistent with the volume overload state of aortic insufficiency confirmed at angiographic study. At the level of the mitral valve (Fig 2), the diastolic flutter of the anterior leaflet is not well demonstrated, but the diastolic flutter of the septal echoes recently described in aortic insufficiency is well demonstrated.

We believe that the echocardiogram of the aortic root (Fig 3 and 4) demonstrates the criteria suggested by Nanda and associates. The widened aortic root measured 70 mm (normal mean, 35 ± 4.2 mm²). The anterior aortic wall is one echocardiographic structure, as confirmed at surgery. Wide separation of the components of the posterior aortic wall is echocardiographically evident, measuring 21 mm (normal mean, 5.7 ± 1.2 mm²). These dimensions were consistent with the anatomic dimensions noted at surgery. Echocardiographic evidence of parallelism between both components of the posterior aortic wall is suggested in Figure 3 and is best demonstrated in the third and fourth cardiac cycles of that echocardiogram. Early closure of the anterior aortic cusp was noted incidentally.

One remarkable finding at the time of echocardiographic study was an echo between the two components of the posterior aortic wall, oscillating regularly at a rate of six per second (Fig 3 and 4). Our impression was that this was an oscillating flap of the intimal tear of the aortic dissection. This oscillated throughout the cardiac cycle.
cycle and may be related to the swirling nonphasic flow observed in the aortogram. The location of this flap was confirmed at surgery and is schematically indicated in Figure 5.

**Discussion**

The constellation of hypertension preceding "hatchet-like" chest pain, aortic insufficiency, and a markedly dilated ascending aorta indicated type 1 aortic dissecting aneurysm as the most probable diagnosis in this patient. This diagnosis could not be confirmed at angiographic examination, most likely because of simultaneous opacification of both the true and false lumina of the aneurysm, a pitfall previously described in the angiographic diagnosis of dissecting aneurysm. It is clear that the anatomic characteristics seen at surgery were predicted by the echocardiogram. There was significant pericardial effusion, evidence of aortic insufficiency, and a type 1 dissecting aortic aneurysm with a single-component anterior wall and two-component posterior wall delineating a posterior false lumen. Furthermore, an echocardiographic density was noted to be oscillating in the false lumen; and at surgery, this was shown to correspond to a flap of the anterior component of the posterior aortic wall. In the past, this echocardiographic space representing the false lumen has been noted on echocardiograms to contain solid lines, mottling, speckling, or an absence of echoes. To our knowledge, a regular oscillating echo has not been previously noted in this position. We suggest that this represents an oscillation of the intimal flap and may be a specific echocardiographic finding in some cases of aortic dissection.

**References**