ILLUSTRATIVE ECHOCARDIOGRAM

Diagnosis of Aortic Valvular Prolapse by Echocardiography*

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Echocardiography is a useful technique in the study of intracardiac structures. Its application in the recognition and diagnosis of various aortic valvular abnormalities has been rewarding.1-10

The purpose of this report is to describe the case of a young man with aortic regurgitation in whom the diagnosis of aortic valvular prolapse was made preoperatively by echocardiographic studies. To the best of our knowledge at the time of this diagnosis (April 1975), this entity had not been previously diagnosed by echocardiography.

CASE REPORT

The patient is a 32-year-old black man admitted in April 1975 with complaints of fatiguability, dyspnea on exertion, and vague substernal pain evolving over a two-year period. Murmurs of aortic regurgitation and stenosis were first noted during hospitalization following an auto accident in 1967. Injuries included sternal contusion and fractures of the left clavicle and first rib. Routine physical examinations from 1960 to 1966 revealed no cardiac abnormalities. In 1971 the patient had a-hemolytic streptococcal endocarditis.

Physical examination revealed a healthy-appearing man with a blood pressure of 150/50 mm Hg and bounding peripheral pulses. A diffuse and active point of maximum impulse was palpated in the sixth left intercostal space 2 cm lateral to the midclavicular line. A grade 2/6 systolic ejection murmur radiated into the neck. A grade 2/6 decrescendo diastolic murmur was heard along the left sternal border. A systolic ejection click and S2 were auscultated. Findings from the remainder of the examination were unremarkable. Pertinent laboratory findings included mild cardiomegaly with a left ventricular configuration. An electrocardiogram revealed evidence for left ventricular hypertrophy with strain.

A preoperative echocardiogram, utilizing an ultrasonic scope (Smith-Kline 20A Ultrasonoscope) with a 2.25-MHz, 1.9-cm internally focused transducer interfaced with a strip chart recorder (Cambridge), was obtained by the technique reported by Feigenbaum1 and others and by Gramiak and Shah.6 Particular attention was paid, however, to the scan of the area from the mitral to aortic valves.

In diastole only, a strikingly abnormal echo appeared in the left ventricle, anterior to the mitral valvular echo and in close relation to the interventricular septum (Fig 1), and was repeatedly recorded regardless of patient position. On scanning from the aortic valve inferiorly, the aortic valvular leaflets appeared to merge with the abnormal echo in the left ventricle during diastole. As the beam was directed toward the apex, the abnormal echo always disappeared at a consistent level below the aortoventricular junction.

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FIGURE 2. Aortic valvular surgical specimens. Remnant of left cusp was specimen encountered by surgeon upon opening aorta. Two fenestrations of right cusp are clearly visible. Fenestration of non-coronary cusp is not well seen in this illustration.

Additional abnormalities shown by preoperative echocardiographic studies included slight thickening of the aortic valvular cusps, which never coapted properly during diastole, diastolic fluttering of the right and non-coronary aortic cusps, and diastolic flutter of the anterior mitral leaflet.

Although the patient was not acutely ill, the progression of symptoms during the past two years and the echocardiographic findings suggesting prolapsed aortic valve warranted further evaluation. Cardiac catheterization studies, including aortic angiography, revealed aortic insufficiency (4+) and possible prolapse of right or left aortic valvular cusp. Left ventricular pressure was 124/18 mm Hg, aortic pressure was 122/60 mm Hg, and pulmonary arterial pressure was 26/14 mm Hg. There were no significant systolic or diastolic pressure gradients or shunts by oximetric or dye-curve analytic data. Effective cardiac output was 6.2 L/min (3.5 L/min/sqm) with an angiographic ejection fraction of 55 percent.

Because of the progressive symptomatic course, surgical intervention was recommended, and the aortic valve was replaced (Hancock 27 heterograft). At surgery, marked left and right cardiac enlargement was evident. Systolic and diastolic thrills were palpated. Each of the aortic valvular cusps was abnormal. The posteromedial half of the left cusp was absent at its margin with the noncoronary cusp. The remnant of the left cusp was poorly supported and appeared to be the only structure capable of prolapse into the left ventricle (Fig 2). Two 1.5-mm fenestrations were present in the right cusp. The noncoronary cusp contained a solitary 1.5-mm fenestration.

Following aortic valvular replacement, the abnormal diastolic echo in the left ventricular cavity disappeared completely (Fig 3).

**Discussion**

Echocardiographic features of the normal aortic valve, as well as many abnormalities of the aortic valve, have been reported. This report describes prolapse of the left aortic valvular leaflet into the left ventricle and fenestration and laceration of the right aortic cusp, all of which were suspected preoperatively. The echocardiographic hallmarks were (1) abnormal diastolic echoes protruding into the left ventricular outflow tract and disappearing in systole, (2) the location of abnormal echoes anterior to the anterior mitral leaflet and in close relationship to the interventricular septum, (3) the ability to trace abnormal left ventricular echoes into the aorta in continuity with the aortic valve, (4) the disappearance of abnormal echoes seen at the base of the heart when the transducer was directed toward the cardiac apex, and (5) the presence of diastolic fluttering of the right and noncoronary cusps, suggesting fenestrated aortic leaflets.

The echocardiographic observations in this patient point out the usefulness of echocardiography in the diagnosis of aortic valvular prolapse. The demonstration of a prolapsed leaflet was much more
impressive by echocardiographic than by angiographic studies. The importance of this case is its clear preoperative echocardiographic documentation of the finding of aortic valvular prolapse in a sick patient whose valvular abnormalities were confirmed at surgery. Hopefully, this report will stimulate more interest in the use of echocardiography in the preoperative evaluation of patients suspected of having similar conditions.

REFERENCES
3 Feigenbaum H: Clinical applications of echocardiography. Prog Cardiovasc Dis 14:531-538, 1974

ANNOUNCEMENT
Industrial Hygiene Training Course

The Industrial Health Foundation and the Pittsburgh Section of the American Industrial Hygiene Association offer a three-day training course on The Fundamentals and Needs of Industrial Hygiene at the Holiday Inn of Pittsburgh-Sewickley, April 6-8.

Additional information is available from Mr. George Reilly, Director of Safety and Training, Industrial Health Foundation, 5231 Centre Avenue, Pittsburgh 15232.