Echocardiographic Manifestations of Flail Aortic Valve Leaflets in Bacterial Endocarditis

By Taylor M. Wray, M.D.

SUMMARY
This report describes the echocardiographic features seen in a case of bacterial endocarditis in which the aortic valve leaflets had been partially destroyed. The echocardiogram demonstrated unusual, disorganized echo patterns in the outflow tract of the left ventricle near the anterior leaflet of the mitral valve in diastole. These were shown to be continuous with similar disorganized echo patterns demonstrated in the aortic root in diastole. These echocardiographic abnormalities were no longer present after aortic valve replacement.

Additional Indexing Words:
Aortic regurgitation

The aortic valve appears to have distinctive echocardiographic features in valvular aortic stenosis,1 bicuspid aortic valve,2 discrete3 and hypertrophic subaortic stenosis,4 sinus of Valsalva aneurysm5 and bacterial endocarditis.6 A case of bacterial endocarditis is reported in which the aortic leaflets were partially destroyed by the infection. The echocardiographic characteristics of the flail aortic leaflets are described. The echocardiogram taken after aortic valve replacement demonstrated disappearance of the preoperative abnormalities.

Case Report
A 28-year-old man was admitted to the Nashville VA Hospital on 9/7/74 with an illness of six weeks’ duration, manifested by weight loss, fever, weakness and dyspnea. He admitted to having been a heroin addict and had used contaminated needles. There was no prior known history of heart disease, heart murmur, rheumatic fever or chest trauma.

On physical examination the patient appeared acutely ill and was in respiratory distress. His blood pressure was 140/60/0, pulse 140/min, respirations 50/min and oral temperature 101° F. The peripheral pulses were bounding and collapsed rapidly. The precordium was active, the first heart sound was decreased in intensity and a very loud mid-diastolic murmur was present near the apex. Bibasilar rales were heard in the lungs. There was no splenomegaly and no other peripheral stigmata of endocarditis except for a small hemorrhage in the left optic fundus. The chest film showed mild cardiomegaly and early pulmonary edema. Left ventricular hypertrophy was present on the electrocardiogram. The initial hematocrit was 24% and the white blood cell count was 21,900/mm³.

After blood cultures had been obtained, treatment was initiated with high-dose penicillin and gentamicin, digitalis, diuretics and transfusion of packed red cells. Multiple blood cultures were subsequently positive for Streplococcus fecalis and antibiotic therapy was changed to high-dose ampicillin and gentamicin. On 9/11/74 cardiac catheterization was performed. The pressure data are recorded in table 1. Aortography demonstrated a normal sized aortic root and massive aortic regurgitation. The left ventricle was moderately enlarged. Echocardiography demonstrated irregular echo patterns in diastole in the left ventricular outflow tract which were shown to be continuous with the aortic leaflets as the transducer was angled upward toward the aortic root (figs. 1 and 2). These echo patterns were shown to be quite separate from the anterior mitral leaflet as the transducer was angled downward into the left ventricle (fig. 3). (A 2.25 MHz, 13 mm diameter, 7.5 cm focused transducer was used, and the echocardiograms were recorded using a Honeywell model 1858 fiberoptic system.) The patient was thought to have severe acute aortic regurgitation secondary to destruction of one or more aortic valve leaflets by the endocarditis. He underwent aortic valve replacement on 9/19/74.

At the time of surgery all three of the aortic valve leaflets were found to have been almost totally destroyed. Multiple small flaps of valve tissue were present which were attached only to the aortic annulus. The noncoronary sinus of Valsalva was roughened, and the intima and part of the media appeared to have been destroyed by the infection. The aortic valve fragments were excised, and a #21 Bjork-Shiley prosthetic aortic valve was inserted. Microscopic examination of the valve fragments showed acute and chronic inflammation with foci of suppuration containing gram-positive diplococci. Bacterial cultures of the valve were negative. The postoperative echocardiogram demonstrated disappearance of the abnormal echo patterns in the aortic root and outflow tract of the left ventricle (figs. 4 and 5).

Discussion
Echocardiography has been useful in the evaluation of aortic regurgitation. Two echocardiographic abnormalities of the mitral valve which have been felt to be specific for aortic regurgitation are fine fluttering of
the anterior mitral leaflet in diastole and premature closure of the mitral valve. The latter finding (which was present in this patient) is particularly helpful since this is present only in severe acute aortic regurgitation and indicates a poor prognosis without surgical intervention.

Echocardiographic studies of the aortic valve in aortic regurgitation have generally not provided useful information regarding aortic valve anatomy or func-

Figure 1
Preoperative echocardiogram of M-mode scan of the left ventricular outflow tract from the anterior mitral leaflet (AMV) to the mitral annulus (MA). Disorganized echoes (arrows) are noted between the anterior mitral leaflet and the interventricular septum (IVS). These echoes become denser as the transducer is directed toward the mitral annulus and aortic root.

Figure 2
Preoperative echocardiogram of the aortic root (AO). Aortic valve opening is indicated by the smaller arrow. Dense disorganized echoes are seen in diastole (larger arrow) which arise from the flail fragments of the aortic valve leaflets.

Figure 3
Preoperative echocardiogram of the mitral valve with the transducer angled into the left ventricle. Fine diastolic fluttering of the anterior mitral leaflet (AMV) is indicated by the arrow. This is quite distinct from the abnormal echoes seen in the left ventricular outflow tract in figure 1. No echo patterns are seen between the anterior mitral leaflet (AMV) and the interventricular septum (IVS) in this view. PMV = posterior mitral leaflet; PW = posterior left ventricular wall.
tion. Possible exceptions to this are the echocardiographic findings in aortic dissection\(^6\) and the congenital bicuspid aortic valve.\(^2\) The echocardiographic features in the present case, specifically the presence of disorganized echo patterns in the outflow tract of the left ventricle seen above the anterior mitral leaflet in diastole and continuous with identical patterns in the aortic root in diastole, strongly suggested that one or more of the aortic leaflets has been partially destroyed and were flailing freely between the aortic root and left ventricular outflow tract. The operative findings and the disappearance of these echoes in the postoperative echocardiogram were confirmatory.

Whether these echocardiographic patterns will prove to be specific for a flail aortic valve remains to be determined. It seems quite unlikely that they would be confused with certain other echo patterns recorded from the outflow tract of the left ventricle as recently reported in discrete subvalvular aortic stenosis\(^3\) and in a sinus of Valsalva aneurysm.\(^5\) Prior
descriptions of aortic valvar vegetations studied echocardiographically have commented only on the nonuniform thickening of the leaflets.\(^6\) In the case reported herein, echocardiography provided useful preoperative information about the anatomy of the severely damaged aortic valve.

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<td><strong>Cardiac Catheterization Data</strong></td>
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**Figure 4**

*Postoperative echocardiogram of M-mode scan of the left ventricular outflow tract from the aorta (AO) to the anterior mitral leaflet (AMV). The disorganized echoes which were seen preoperatively between the anterior mitral leaflet and the interventricular septum (IVS) are no longer present. Echoes from the tilting disc of the Bjork-Shiley valve are seen at the left (arrow).*
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References

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