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# Postinfarction Papillary Muscle Rupture: A New M-Mode Echocardiographic Sign

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*A 58-year-old man with acute inferior wall infarction developed a loud systolic murmur, hypotension, and pulmonary edema four days after onset of infarction. M-mode echocardiography demonstrated an unusual diastolic echo that appeared between the mitral valve leaflets. Complete rupture of the posterior papillary muscle was confirmed at surgery for mitral valve replacement. (Henry Ford Hosp Med J 1986;34:70-2)*

Papillary muscle rupture is an important cause of cardiogenic shock after myocardial infarction. It is usually fatal yet potentially correctable if promptly diagnosed (1-3). In this report we call attention to a hitherto unreported M-mode echocardiographic appearance in a patient with complete rupture of the posterior papillary muscle.

## Case Report

The patient was a 58-year-old man with a history of long-standing hypertension. On admission for retrosternal chest pain, nausea, and diaphoresis, the ECG showed an acute inferodorsal myocardial infarction. His heart rate was 76/min, respiratory rate 14, and blood pressure 150/90 mm Hg. A fourth heart sound was present, but no murmurs were initially audible upon admission. His hospital course was uncomplicated until the fourth day, when severe retrosternal pain recurred. It was associated with respiratory distress which progressed rapidly, culminating in frank pulmonary edema. His blood pressure fell to 80/66. A loud, harsh holosystolic murmur was now heard, maximum at the apex but audible all over the precordium and in the left axilla. M-mode echocardiography showed normal motion of the mitral valve leaflets, but intermittently an abnormal echo appeared within the mitral valve orifice in diastole (Fig 1). Pressures (mm Hg) obtained through a Swan-Ganz catheter were: right atrium 15 (mean); right ventricle 60/15; pulmonary artery 60/30; pulmonary capillary wedge,  $a = 32$ ,  $v = 78$ , mean = 40. There was no evidence of a left to right shunt.

Percutaneous intraaortic balloon counterpulsation was begun, followed by left heart catheterization, during which the left ventricular end-diastolic pressure was recorded at 26 mm Hg. Angiocardiology revealed severe mitral regurgitation and an inferior wall aneurysm (Fig 2). The left atrial and left ventricular cavity sizes were small with high intracavitary diastolic pressures indicating acute regurgitation of recent onset. The right coronary artery was completely obstructed. The left coronary system was normal except for mild narrowing of the midleft anterior descending artery. Emergency surgery for (Bjork-Shiley) mitral valve replacement was undertaken immediately. A large inferior wall aneurysm and rupture of the posterior papillary muscle were confirmed at surgery (Fig 3). The patient died soon after the surgical procedure, all attempts at resuscitation being unsuccessful.

## Discussion

Rapid flutter of the mitral leaflets, on M-mode echocardiography, has been described as a manifestation of papillary muscle rupture (4). However, such flutter can also occur when the leaflet is flail due to ruptured chordae tendineae (5). Neither diastolic nor systolic mitral flutter was evident in our patient. Our finding of a solid echo "mass" appearing within the mitral valve orifice in diastole constitutes an additional sign that may facilitate the diagnosis of papillary muscle rupture in a patient who develops a loud pansystolic murmur during the first week after the onset of inferior wall infarction.

Erbel and associates (6) have reported two-dimensional echocardiographic visualization of a severed papillary muscle tip with attached chordae, moving erratically within the left ventricle. Neither their group nor others have reported a corresponding M-mode echocardiographic mass identifiable in diastole within the mitral orifice. The tip of the ruptured posterior papillary muscle as demonstrated in Fig 3 was a freely mobile solid echogenic mass, whose clinical presence on M-mode echo fits the subsequent angiographic and postmortem demonstration of the disrupted mitral apparatus in our patient. It is also compatible with the published 2-D echocardiographic reports of ruptured papillary muscle anatomy in the literature. Presumably the diastolic flow vortices in the left ventricular chamber carry the loose papillary muscle tip to the mitral valve orifice area, at least in some beats.

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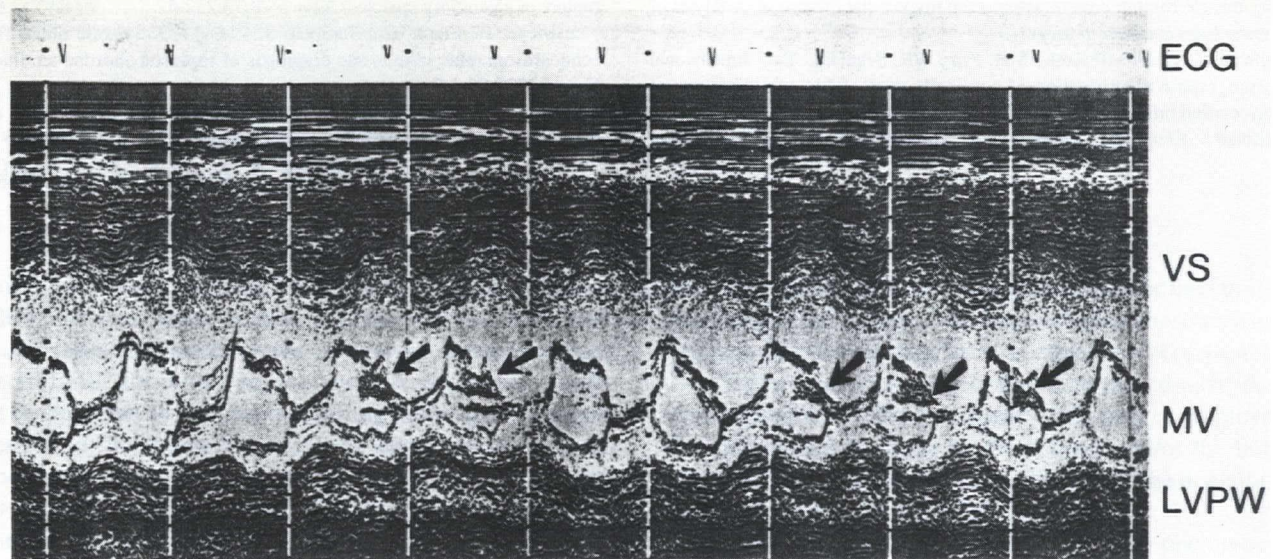


Fig 1—M-mode echocardiogram showing mitral valve. Abnormal echo (arrows) representing severed papillary muscle tip is seen only in some beats but not consistently in others. ECG tracing has been cropped except for nadir of S waves.

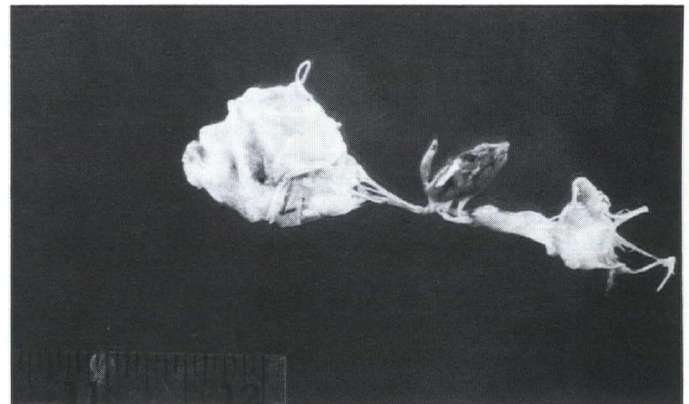
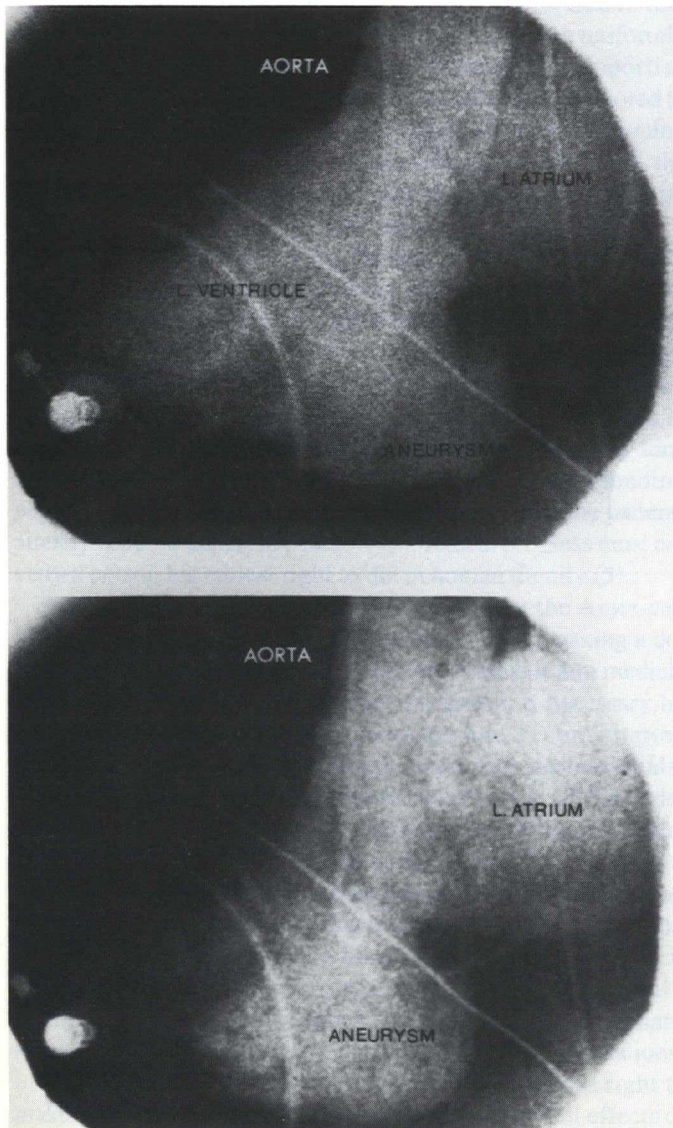


Fig 3 (above)—At surgery, ruptured papillary muscle head was discovered, attached to severed portions of two separate leaflets, flapping within left ventricular cavity.

The abnormal echo representing the ruptured papillary muscle tip could possibly be mistaken for a vegetation on the mitral valve. However, a mitral vegetation could be expected to appear unchanged from beat to beat, whereas in our patient the abnormal echo made a variable or phasic appearance within the mitral valve orifice.

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Fig 2 (left)—Diastolic and systolic frames of patient's left ventricular angiogram indicating acute mitral regurgitation and inferior aneurysm. Small left atrium was densely opacified immediately upon injection of contrast material into ventricle.

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