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Subvalvular Left Ventricular Pseudoaneurysm After Mitral Valve Replacement: Two-Dimensional Echocardiographic Findings

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Disruption of the posterior mitral anulus is a rare complication of mitral valve replacement that may result in subvalvular left ventricular pseudoaneurysm formation. Such pseudoaneurysm formation was easily recognized by two-dimensional echocardiography in a 54 year old man 3 years after his second mitral valve replacement. The finding was confirmed by cineangiography and direct surgical inspection. Recognition of this rare complication of mitral valve replacement has therapeutic importance because surgical correction is necessary.

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A rare complication of mitral valve replacement is mitral anular disruption (1–6), which may result in pseudoaneurysm formation. We report on the first patient in whom the two-dimensional echocardiographic diagnosis of subvalvular pseudoaneurysm after mitral valve replacement was established and ultimately confirmed by cineangiography and direct surgical inspection. Recognition of this rare complication of mitral valve replacement has clinical and therapeutic importance because its prognosis without surgical correction is poor.

Case Report

Clinical history. A 54 year old white man was admitted to the Duke University Medical Center with a history of a transient ischemic attack and a recently noted mitral regurgitation murmur, 3 years after his second mitral valve replacement. Seven years before admission, he underwent his first mitral valve replacement with a no. 31 Carpentier-Edwards prosthesis because of severe mitral regurgitation due to mitral valve prolapse. Three years before admission, he underwent a second mitral valve replacement with a no. 29 Carpentier-Edwards prosthesis because of a torn leaflet on the first prosthetic valve. The patient had no clinical or electrocardiographic evidence of prior myocardial infarction and no history suggestive of bacterial endocarditis.

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Physical examination revealed the patient to be in no acute distress with a pulse rate of 70 beats/min and a blood pressure of 110/70 mm Hg. Cardiac findings were limited to a hyperdynamic apical impulse and a murmur characteristic of mitral insufficiency. The chest X-ray film was remarkable only for left atrial enlargement.

Echocardiographic findings (Fig. 1). A two-dimensional echocardiogram obtained shortly after admission revealed a large extraventricular cavity along the posterolateral left ventricular free wall that was seen best in the apical views. This cavity appeared to communicate with the left ventricle by means of a broad orifice just below the posterior sewing ring of the mitral valve prosthesis. There also was a prominent supraanular displacement of the posterior sewing ring cephalad and into the left atrium. These echocardiographic findings were thought to represent a mitral subvalvular pseudoaneurysm that probably resulted from mitral anular disruption at the time of the patient's second mitral valve replacement.

Angiographic findings (Fig. 2). On the basis of the echocardiographic findings, left ventricular cineangiography was performed, which confirmed the echocardiographic findings and also demonstrated severe mitral regurgitation. In fact, the cross-sectional portrayal of the anatomy provided by the echocardiogram detailed the abnormality better than the angiogram, which displays the anatomy in silhouette.

Surgical management. During a third mitral valve replacement, the patient's second heterograft was found to have a partially torn cusp. The area of mitral anular disruption was readily identified, and the communication with the left ventricle closed with interrupted 2-0 pledgetted sutures. A no. 5 Starr-Edwards mitral valve prosthesis was implanted and the patient successfully recovered.

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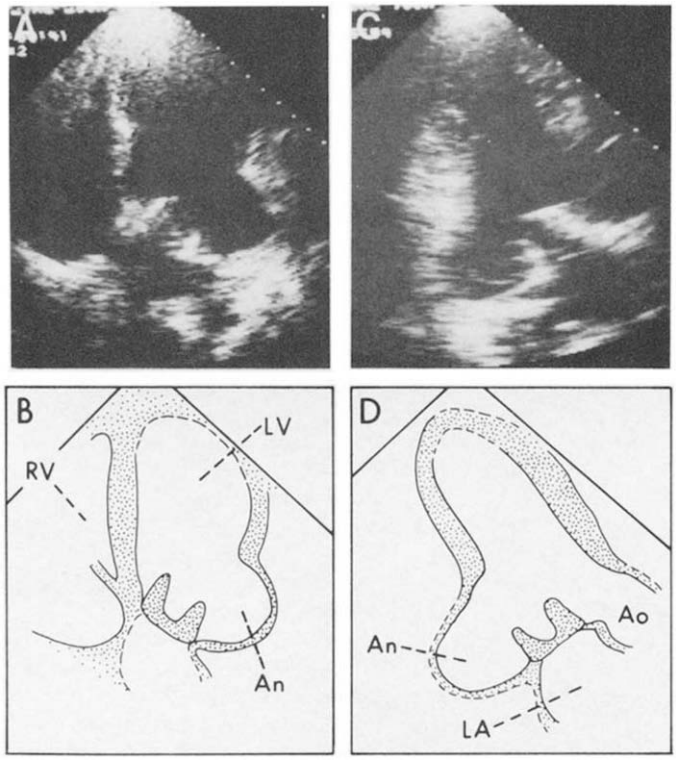

Figure 1. Stop frame video images and schematic diagrams of the left ventricle (LV) and pseudoaneurysm (An) in the apical four chamber view (**A** and **B**) and apical two chamber view (**C** and **D**). Note that the aneurysm connects to the ventricle with a wide mouth and has displaced the prosthesis superiorly and posteriorly. Ao = aortic root; LA = left atrium; RV = right ventricle.

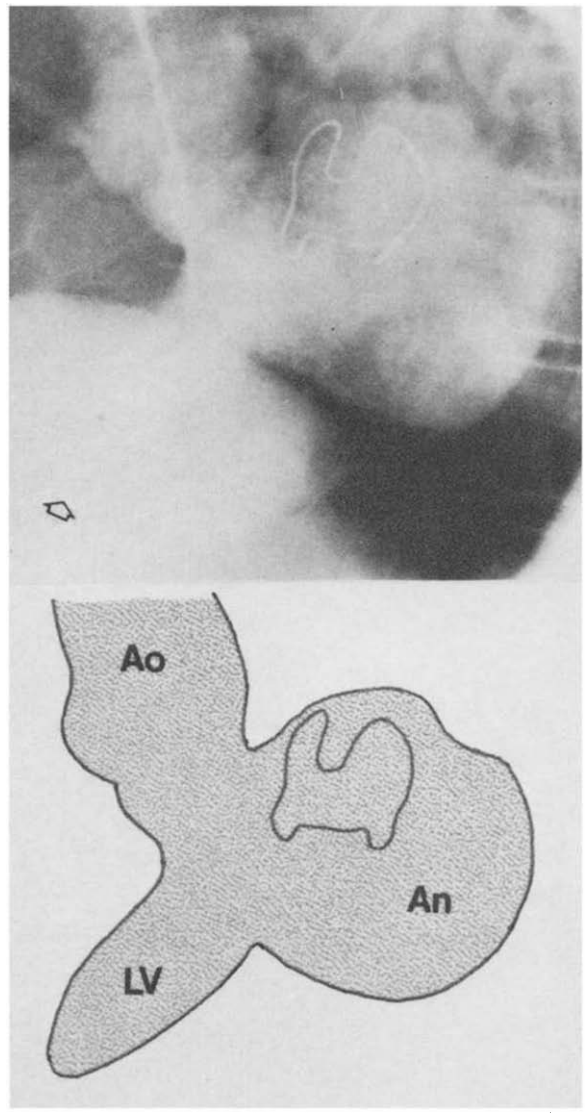

Figure 2. Left anterior oblique view of the left ventricular (LV) angiogram (**top**) and schematic drawing (**bottom**) at end-systole showing the large pseudoaneurysm (An). Because the angiogram is a silhouette, the communication of the pseudoaneurysm with the ventricle is obscured and not as well seen as in the echocardiogram. The anulus is located near the sewing ring and is displaced superiorly, further distorting the anatomic interpretation. The **open arrow** points to the apex of the left ventricle obscured by the diaphragm. Ao = aortic root.

Discussion

Pseudoaneurysm formation. Disruption of the posterior mitral anulus occurs in 0.02 to 2.0% of mitral valve replacement operations (6). Major factors that may predispose to mitral anular disruption include removal of excess leaflet and anular tissue, previous mitral valve replacement, selection of a valve prosthesis that is too large and suture technique. These subvalvular left ventricular pseudoaneurysms occur when pericardial adhesions are present to contain the bleeding and, thus, a fibrous capsule forms. In our patient, the most likely reason was thought to be the previous history of two valve replacements.

Such occurrences are rare, and this is only the 10th reported case (6–13) of subvalvular left ventricular pseudoaneurysm and the 1st in which two-dimensional echocardiography established the diagnosis. The location of the pseudoaneurysm posterior to the mitral anulus was similar in our patient to that in previously reported cases. In our case, echocardiography showed the abnormal supraanular displacement of the posterior sewing ring of the mitral valve prosthesis.

Patient management. The presence of a subvalvular left ventricular pseudoaneurysm is important to recognize because surgical repair is indicated. Seven of the 10 patients reported on underwent surgical repair. Five of the 10 died of direct or possible complications of the pseudoaneurysm. The five who survived, including our patient, all had surgical repair.

Differential diagnosis. Other entities might be confused with this disorder echocardiographically. We have encountered one patient with a history of multiple mitral valve replacements that resulted in intentional surgical insertion of the most recent prosthesis in a high supraanular position.

This led to ventricularization and weakening of the subvalvular atrial tissue that exhibited paradoxical systolic expansion. In that case, however, the clearly supraanular position of the prosthesis could be seen and the ventricularized atrium was not as circumscribed as in the present case.

Entities less likely to be confused with this disorder by echocardiography are the presence of a pericardial cyst or the descending aorta when located somewhat inferiorly and just below the mitral anulus. In each case, no communication with the left ventricle would be recognized. It would also be possible to have partial herniation of the left ventricle through a congenitally absent left pericardium. Such a condition would be likely to lead to a remarkably distorted left ventricle if the patient survived.

Clinical significance. The current case demonstrates the value of two-dimensional echocardiography in the detection of subvalvular left ventricular pseudoaneurysm after mitral valve replacement. Because surgical correction is invariably indicated, early diagnosis is important. Left ventricular cineangiography has been the diagnostic procedure of choice; but two-dimensional echocardiography may obviate the need for catheterization to establish this diagnosis.

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