Mitral repair: Does this patient have SAM?  
What can be done?

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Objectives:  
At the end of this presentation the participant will be able to:  
1. Identify the mechanism of mitral SAM after valve repair.  
2. Describe techniques used to avoid SAM after repair.  
3. Discuss the management of mitral SAM after valve repair.

Dynamic left ventricular outflow tract (LVOT) obstruction after mitral valve repair is due to systolic anterior motion (SAM) of the mitral valve (see figure). It is an uncommon problem, but an important cause of acute failure of mitral valve repair when it does occur. It is usually associated with repair of a myxomatous mitral valve with redundant leaflets when a large segment of the posterior leaflet has been resected necessitating a large decrease in the size of the mitral valve annulus. Careful measurements of the mitral valve in these patients has shown that mitral SAM is likely to occur when the point of coaptation of the anterior and posterior leaflets is displaced too far towards the base of the leaflet due to reduction in annulus size. The extra leaflet tissue distal to the point of coaptation is prone to anterior displacement leading to significant mitral SAM. A surgical technique called the sliding leaflet repair has been developed an attempt to avoid mitral SAM. It permits resection of a large portion of the posterior MV leaflet with less reduction in the size of the annulus.

Another important point is to remember that mitral SAM is most likely to occur with a hyperdynamic, relatively empty LV, conditions often present immediately after CPB. Many patients with mitral SAM immediately after CPB for mitral repair improve with appropriate medical management in the operating room such as increasing intravascular volume, avoidance of vasodilators and inotropic drugs, and administration of pure alpha agonists such as phenylephrine. In 2007 the Mayo Clinic group reported a retrospective series of 174 cases of mitral SAM after 2076 mitral valve repairs. Only four were revised at the initial operation, and three were revised within four weeks of the initial operation. Of the remaining 167 patients, only four had SAM with LVOT obstruction of long term follow up. Persistent, severe mitral SAM, however, may require reinstitution of CPB for revision of the repair or prosthetic valve replacement.

There are two adverse hemodynamic consequences of mitral SAM: 1) LVOT obstruction producing functional aortic stenosis, and 2) mitral regurgitation, both of which are a result of the abnormal motion of the mitral valve. Hemodynamic changes that decrease the end systolic volume of the LV increase mitral SAM and its adverse effects. These include hypovolemia, increased myocardial contractility, and decreased afterload. Measures which enlarge the LV will decrease SAM and include volume administration,
decreasing myocardial contractility (beta-antagonist drugs, e.g. esmolol), and increasing afterload (alpha-agonist drugs, e.g. phenylephrine). Atrioventricular pacing has also been used effectively in patients with HOCM, and theoretically could be used to treat SAM in other clinical settings, such as cardiac surgery, where artificial pacing is easily accomplished. Mitral SAM following mitral valve repair, if persistent despite optimization of hemodynamics, should lead to consideration of revision of the repair or valve replacement.

It is important to realize that the hemodynamic picture caused by mitral SAM, high pulmonary artery pressure and low cardiac output, may be confused with impaired myocardial contractility, leading one to begin afterload reduction or inotropic therapy, both of which will aggravate SAM and its hemodynamic consequences. This may lead to a downward spiral wherein as the patient's hemodynamics worsen, treatment is increased, further worsening SAM and its adverse effects, prompting even further increase of inappropriate treatment. One should consider the possibility of mitral SAM in patients with apparent impairment of myocardial contractility as assessed by hemodynamic data, especially if unexpected or not responding appropriately to therapy. Mitral SAM is easily diagnosed by echocardiography, which can also be used to monitor the response to therapy.

TEE mid esophageal LAX view after MV repair showing marked SAM of the anterior mitral leaflet (arrow) obstructing the LVOT and rendering the MV incompetent.


