

**SAMEH M.** Hello. My name is Sameh Said, and I'm a cardiovascular surgeon at the Mayo Clinic in Rochester, Minnesota.

**SAID:** Today, I will be discussing a challenging surgical problem regarding mitral valve surgery and the presence of severe annular calcifications and our approach at Mayo.

Severe mitral annular calcification is a pathologic entity that's frequently associated with degenerative valvular disease. The calcification process remains localized to the annulus in the majority of the cases. However, it may extend to the underlying myocardium.

According to echocardiographic studies, it's about 2.8% of patients who will have extensive annular calcifications, and it seems that it's more extensive in women compared to men. This can be associated with both mitral stenosis or mitral regurgitation. This differs from rheumatic heart disease in which the calcification process usually involve the commissures, and the leaflet tissue was only late extension to the annulus.

Extensive mitral annular calcification represents a real challenge to the surgeon doing a mitral valve replacement, and several techniques have been described for mitral valve replacement in the presence of severe mitral annular calcifications. This is an example of a pre-operative coronary angiography, which shows an extensive mitral annular calcification, and also note the close relationship of the circumflex coronary artery through the mitral annulus.

The issues with leaving the calcium behind is a risk of particulate embolization and the risk of peri prosthetic regurgitation from poor coaptation of the valve so engrained through the uneven mitral annulus. Carpentier established more or less a classification for the mitral annular calcification and in about 88%, this calcification is limited to the posterior third of the annulus.

However, it can extend almost to the entire annulus and even to the anterior or posterior mitral leaflets. In about 12% of the patients, the calcification can extend to the underlying myocardium as well. There are several surgical options to deal with the mitral annular calcification that traditional surgical debridement and calcification have been associated with risk of atrial ventricular groove disruption, in addition to the prolonged bypass time and cardiopulmonary bypass and aortic cross clamp time.

The use of ultrasound pulverization or the Kuza device has been described in some of these cases. There are some surgeons who will place their prosthesis in an inter atrial position, which can be associated with a risk of left atrial hypertension from transferring that area of high ventricular pressure into the left atrium and can result in left atrial dissection as well as.

The placement of deep annular sutures have been described just to go around the calcium bar, but this had been associated with increased risk of circumflex artery injury. And the Achilles heel of the operation really is the possibility of rupture of the atrial ventricular groove where removal of that calcific bar leaves the mitral valve, left atrium and left ventricle each disconnected from the other.

This is a picture that shows after debridement of the annular calcification and the posterior annulus, we can use the anterior leaflet of the mitral valve to reconstruct the posterior annulus prior to placement of the prosthesis. However, we recently, at Mayo Clinic, start a new approach, which is mitral valve bypass in some of the high-risk patients that has severe annular calcification.

And the idea behind the mitral valve bypass is not new. This has been used in the congenital and pediatric population in the presence of congenital mitral stenosis. The figure that we see shows one of the techniques that can be used to place a valve with conduit from the left atrial appendage to apex of the left ventricle. This can be done using a mechanical or a bioprosthetic valve.

And in this intraoperative pictures, we see clearly the conduit from the left atrial appendage to the left ventricular apex. And as you notice, the valve is closely placed to the left ventricular apex in this picture. This is a different patient with post-operative CT scan.

This is a 77-year-old male who had extensive mitral annular calcification, and a conduit was placed from the left atrial appendage through the apex of the left ventricle, thus relieving the mitral valve stenosis. In these cases, we leave the native mitral valve alone, and the patient will have a flow across both the native valve as well as the conduit.

This is another example of performing the left atrial to the left ventricular conduit, not from the left atrial appendage side, but from the left atriotomy incision. The situations where we use this, if the left atrial appendage is friable or does not exist. The valve with conduit from the left atrium itself will be a longer distance away compared to the left atrial appendage to left ventricular apex.

This is a different patient with a post-operative CT scan that shows the valve with conduit from the left atrial incision to the apex of the left ventricle. The mitral valve replacement with annular debridement still is the gold standard for mitral stenosis with extensive mitral annular calcification. However, mitral valve bypass, by using left atrial to left atrioventricular valve with conduit represents a safe and a more practical option in high-risk patients and avoids the major morbidities as associated with extended mitral valve replacement in this group of patients.

Thank you for listening.