SPEAKER 1: Aortic valve bypass surgery, also known apicoaortic conduit surgery, provides an alternative method for treating valvular aortic stenosis. Aortic valve bypass surgery works by shunting blood from the apex of the left ventricle to the descending thoracic aorta through a valved conduit.

Aortic valve bypass surgery offers several advantages compared to conventional aortic valve replacement. Cross-clamping of the ascending thoracic aorta is not necessary. Debridement of the native calcific valve is not required. Cardiopulmonary bypass is not necessary to carry out aortic valve bypass surgery. And the patient does not require cardioplegic cardiac arrest.

In the situation where the patient has patent cardiac bypass grafts, a redo sternotomy is avoided, as aortic valve bypass surgery is performed through the left chest. Patient-prosthesis mismatch cannot occur after aortic valve bypass surgery, as the effective orifice area is the sum of the conduit valve and the native valve.

This video will demonstrate an aortic valve bypass operation on an 83-year-old gentleman who presented with symptomatic critical aortic stenosis. The mean aortic valve gradient by echocardiography was 60. The patient has undergone previous coronary bypass surgery 18 years prior to presentation. All grafts were patent, including this internal mammary artery, which was adherent to the mid-portion of the sternum. We offered the patient aortic valve bypass as an alternative to conventional aortic valve replacement.

This intraoperative transesophageal echocardiogram demonstrates the severe aortic stenosis. He had trileaflet calcific AS. The ejection fraction was significantly depressed at approximately 25% to 30%. There was mild aortic insufficiency. We have felt comfortable performing aortic valve bypass surgery in the presence of up to moderate aortic insufficiency or mitral regurgitation.

The conduit is constructed on the back table while the patient is being positioned. The conduit consists of three components. The apical connector is made of polypropylene and is in a rigid stented connector. It's commercially available.

It has a silicon sewing ring. And it, in turn, is connected to a replacement heart valve. Any type of heart valve can be used. We have generally chosen to use a stentless porcine bioprosthesis.

Finally, the final component of the aortic valve bypass conduit is a standard Dacron graft with an eight-millimeter side-branch. We have used this side-branch for direct inflow from the cardiopulmonary bypass machine.

The patient is position with the left chest up. The first step is to place a venous cannula in the left groin. Once this is complete a sixth intercostal space thoracotomy is performed.

The apex of the heart is exposed, as is the descending thoracic aorta. We have found it helpful to tack the diaphragm in a caudad direction. We have generally shingled a rib in the medial aspect of the incision.

The first step in the operation is to carry out the distal anastomosis. A partial-occlusion clamp is placed on the descending thoracic aorta in the appropriate position. It's critically important to size the graft appropriately, as well as to orient the graft in such a direction that the apical connector is pointed directly toward the heart. We prefer to perform this anastomosis using running 4-0 monofilament suture.

At this point the partial-occlusion clamp is removed. And hemostasis is assured. This demonstrates that the stentless valve is completely competent.

Next, the pericardium is incised, tacked up, and the apex of the ventricle is completely exposed. At this point we mark our target zone where we plan to insert the apical connector in the ventricle. Rather than inserting it in the true apex of the left ventricle, we have found it helpful to choose a spot approximately 1 to 2 centimeters directly lateral to the true apex of the ventricle.

Sutures are then placed in a circumferential fashion about the planned insertion site. We use 2-0 monofilament sutures with large pledgets, and use a total of approximately eight sutures.

We have found that it is critically important to take deep bites in the ventricular myocardium. Superficial bites will result in tearing of the fat on the myocardium. These bites, again, need to be deep and nearly full thickness of the myocardium. The sutures are then placed through the sewing ring, much as one would place sutures through the sewing ring of a prosthetic valve.

At this point we have connected the eight-millimeter side-branch to the inflow from the cardiopulmonary bypass machine. And a cross-clamp is placed on the graft to avoid air embolism.

The ventricle is sharply incised, and a standard 14-French Foley catheter is inserted into the ventricle. The Foley balloon is inserted such that it is slightly larger than the circular coring knife chosen to carry out the coring of the ventricle. Tension is placed on the Foley catheter and a plug of apical myocardium is cored out. Any oozing can be controlled with digitally, and the apical connector is inserted into the apex of the ventricle.

We have found that it is important to choose an apical coring knife that is approximately 85% the diameter of the apical connector. This achieves a snug fit in the ventricle and minimizes blood loss. At this point the sutures are tied down to secure the apical connector in the apex.

The graft is de-aired and the clamp removed. At this point, the left ventricular outflow tract obstruction of aortic stenosis has been relieved.

This demonstrates the plug of apical myocardium, which has been removed. We use an ultrasound flow probe to demonstrate flow through the graft. The side-branch is stapled off and oversewn.

And this video demonstrates the final result. We have generally chosen to cover the stentless valve with a segment of Dacron graft in order to avoid abrasion injury against the chest wall.

This is the postoperative TEE demonstrating that the apical connector is nicely situated in the apex of the left ventricle. There continues to be flow through the native aortic valve. And this postoperative study demonstrates excellent flow through the conduit.

This is the patient's postoperative CT scan demonstrating the conduit in good position. One can easily see the conduit valve. This postoperative MRI demonstrates flow into the descending thoracic aorta through the aortic valve bypass conduit. There was a small area of retrograde flow just above its insertion point.

We have done quantitative echocardiographic evaluation of flow after aortic valve bypass surgery, and found that approximately one third of cardiac output traverses the native stenotic aortic valve and 2/3 is carried by the conduit. Aortic valve bypass surgery is highly efficacious at dropping the native aortic valve gradient. In our experience, the mean gradient has dropped from 43 to 10.

In conclusion, aortic valve bypass surgery is a valuable option for the high-risk aortic stenosis patient. Aortic valve bypass surgery uses established prosthetic valves, and is associated with a greater than 30-year clinical experience. There are currently patients that are now more than 25 years out from aortic valve bypass surgery and doing well, clinically. It offers the opportunity to treat aortic stenosis without the cardiopulmonary bypass machine, without aortic cross-clamping, and without a sternotomy.

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