A Novel Technique for Hybrid Aortic Arch Reconstruction: The Deployment Cuff Technique

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Extensive thoracic aortic aneurysmal disease involving the arch and descending aorta has been a difficult problem. The “frozen elephant trunk” single-stage procedure combining open arch repair under circulatory arrest with a deployment of a stented thoracic endograft has shown good results in recent reports, but it can be technically challenging to deploy the endovascular device in the exact location. In patients with aortic dissection, back bleeding through the false lumen necessitates obliteration of the false lumen proximally. We describe a technique that allows for precise deployment and obliteration of false lumen flow at the proximal end of the stent graft.

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Technique

After sternotomy and before full anticoagulation, femoral artery access is obtained and a 5-French sheath is placed. The patient is heparinized, and a 0.035 Glidewire (Terumo Medical Corporation, Somerset, NJ) is advanced under transesophageal echocardiography guidance to confirm that it is in the true lumen of the descending thoracic aorta and distal arch (Fig 1). If visualization is not adequate using transesophageal echocardiography, a 9-French sheath is placed to allow intravascular ultrasound using a Visions PV 8.5-French digital intravascular ultrasound catheter (Volcano Corporation, San Diego, CA) to confirm placement in the true lumen. The guidewire is exchanged for a VERT catheter (Cook Medical, Bloomington, IN), which is left in the transverse arch of the aorta. Cannulation strategies include femoral vessel access or central aortic access and a left ventricular vent placed through the right superior pulmonary vein. The patient is cooled to 18°C or for 30 min to electroencephalographic silence, and circulatory arrest is begun. The

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The innominate and left carotid arteries are revascularized using a 14 × 10-mm Dacron graft. Antegrade cerebral perfusion is commenced, and the left subclavian artery is either revascularized or ligated at this point, depending on surgeon’s preference and need.

A 28- or 30-mm Dacron graft (Terumo Medical Corporation, Somerset, NJ) is sutured in running fashion with 3-0 Prolene suture to the open distal arch–proximal descending aortic segment incorporating all layers of the aortic wall, and with the VERT catheter brought through the lumen of the graft. The previously placed catheter should be inside this graft, which we call the “deployment cuff.” A Lunderquist wire (Cook Medical, Bloomington, IN) is advanced over the catheter and brought out through the femoral artery access site, providing through-and-through wire access across the aorta. This ensures true lumen deployment distally and allows for a smooth delivery of the endograft into the aorta (Fig 3). Any commercially available endograft can be used, but our preference has been the Cook Zenith TX2 device (Cook Medical, Bloomington, IN). The device is delivered antegrade over the wire and deployed so that the most proximal portion of the stent is within the deployment cuff. The cuff is then cut flush to the thoracic stent graft (Fig 4). A 30- or 32-mm (one size larger than the deployment cuff mentioned previously, ie, 28-30 mm) Dacron graft with a side arm is then sewn with a running 3-0 Prolene suture, taking bites of both the deployment cuff and endograft and using felt reinforcement and Bioglue (Cryolife, Kennesaw, GA). This anastomosis is much more accessible in the operative field and easier to visualize than deployment into the aorta without the cuff. In addition, the suture line securing the endograft to the Dacron graft in the arch ensures no possibility of endoleak or distal migration of the device (Fig 5).

The Dacron graft can now be clamped and the side arm or femoral cannula used to perfuse the body. Any root or aortic valve procedure can be performed during rewarming, and the 30–32-mm Dacron graft can be used to reconstruct the ascending aorta with the 14 × 10-mm branch implanted directly to it to complete the arch (Fig 6).
Comment

For challenging thoracic aortic disease, open aortic surgery combined with endograft techniques continue to develop and improve. We believe that this deployment cuff technique provides an easier and more accurate method of performing the frozen elephant trunk procedure. We use this method routinely to facilitate repair of complex aortic pathologies.

References