Case 1: 48 y/o male morbidly obese (400 lbs) with known history of aortic dissection now with chest and back pain

Thoracic Endovascular Aneurysm Repair (TEVAR)
Cook Zenith 40-217mm Proximal/66-179mm Distal

Surgical Procedure: TEVAR Explantation

- Preparation
  - Spinal drain
  - Double lumen endotracheal intubation
  - Right common femoral artery (CFA) and radial artery lines
  - Right lateral decubitus position
- Incision
  - Thoraco-abdominal through 5th intercostal space
  - Shingled two ribs
  - Radial take-down of the diaphragm
- Cardiopulmonary Bypass
  - Left femoral cut-down, CFA and Vein cannulation
  - Left ventricular vent
  - Cardiopulmonary bypass started and patient cooled over 50 minutes
  - Arch cannulation connected to arterial inflow of heart-lung machine
- Procedure
  - Clamped aortic arch between left common carotid and subclavian
  - Aortic tube graft (28 mm) from just distal to takeoff of subclavian to just proximal to celiac artery
- Closure
  - Changes making-off bypass unable to support with single lung ventilation
  - Changes making-off bypass unable to support with two lung ventilation

Case 2: 61 y/o male with history of aortic dissection and TEVAR repair one year ago, CTA 6 months ago showed 3.7 cm maximum diameter

Thoracic Endovascular Aneurysm Repair (TEVAR)
Cook Zenith 40-217mm Proximal/66-179mm Distal

Conversion and Explanation After Failed TEVAR: Indications, Technical Tips, and Precautions
Robyn A. Macsata, MD
Chief, Vascular Surgery
Associate Professor of Surgery
George Washington University

No disclosures
RM1 The first patient is a 48 y/o morbidly obese male with a known history of aortic dissection being treated medically, admitted through ER with chest and back pain. As you can see here his dissection began just distal to subclavian artery and ended just above celiac, he now had a 7.1 cm aneurysm.

Robyn Macsata, 11/16/2018

RM2 Our cardiac colleagues placed a two Zenith thoracic device beginning just distal to the left common carotid, as you can see here, there is a persistent type I endoleak, the patient continued to have pain, given the lack of any further proximal landing zone, we decided to proceed with explantation.

Robyn Macsata, 11/16/2018

RM3 This was done with standard preparatory techniques including spinal drain, fem fem cardiopulmonary bypass was used, pt was cooled, and placed in deep hypothermic arrest, this allowed us to remove the TEVAR without a proximal clamp, we then placed a clamp between the common carotid and subclavian and sewed our Dacron graft just distal to the subclavian, our distal anastomosis was just proximal to the celiac. Unfortunately coming off of bypass we were unable to oxygenate him, he was placed on ECMO on OR table, and eventually died from failure to wean from the ECMO.

Robyn Macsata, 11/16/2018

RM4 The second case is a 61 y/o male with a known history of aortic dissection and TEVAR repair who 6 months prior had a 3.7 cm persistent aneurysm, presented with this CT scan now showing a 5.4 cm aneurysm, but here it is from a type IB endoleak originating above the mesenterics.

Robyn Macsata, 11/16/2018
Surgical Procedure: Explantation

**Preparation**
- Spinal drain
- Double lumen endotracheal intubation
- Right radial artery line
- Right lateral decubitus position
- Neuro-monitoring of sensory and motor evoked potentials
- Thoraco-abdominal through 5th intercostal space
- Shingled single rib
- Radial take-down of the diaphragm

**Procedure**
- Dissected proximal aortic arch and left subclavian artery
- Clamped aortic arch between left common carotid and subclavian arteries
- Cut wire and fabric just distal to the subclavian artery
- Large inflammatory component with small amount of pus
- Incorporate endograft cuff into proximal anastomosis
- Aortic tube graft (28 mm) from just distal to subclavian to just proximal to celiac artery
- Two layer reinforced proximal anastomosis

**Post-op**
- Re-presented 2 months later with aorto-esophageal fistula
- Replacement of aortic arch with esophageal stent and interposition pericardial flap
- Recurrent mediastinitis and ascending aortic esophageal fistula

Indications

- Failed TEVAR
- Thoraco-abdominal aneurysm
- Type B Aortic Dissection
- Type 1A Endoleak with subsequent dilation around the stent
- Type 1B Endoleak with subsequent dilation around the stent
- Infected TEVAR

Technical Tips

**Preparation**
- Prepare for extensive anesthesia time and be available for assistance

**Incision**
- Proximal arch is higher than expected; enter the chest at a higher enough level to reach, usually 5th intercostal space

**Bypass**
- Arterial cannulation of bypass lines may be made difficult due to aortic dissection, assure you have appropriate wires and fluoroscopy to cannulate correctly
- Circulatory arrest allows for complete graft removal but at consequence of difficult hemodynamics and ventilation afterward

**Procedure**
- Open repair allows for use of smaller grafts and smaller landing zone, often can sew distal to subclavian without sacrifice, where endografts require coverage
- Wire cutters
- Due to bleeding consequences of bypass use...

**Post-operative**
- Prepare for oxygenation problems
- ECMO option
- Course is going to be rocky at best

Precautions

- Extremely high level of morbidity and mortality
- Patient selection
- Make sure patient and family understand

- Prevention is best precaution
- Initial TEVAR procedure needs appropriate proximal and distal landing zone that will provide seal
- If not, consider open repair as primary procedure (patient selection)
- May also consider hybrid approach, aortic debranching with TEVAR
Again we used standard preparatory techniques and fem fem bypass, do not use circulatory arrest, clamped between the subclavian and common carotid, and cut the endograft leaving a proximal cuff, unfortunately when cutting into the endograft we noted pus and patient became unstable including short cardiac arrest, because of this proceeded with repair without removing proximal cuff, sewing to the proximal cuff instead and sewing the distal above the mesenterics. Pt did well from surgery but presented two month later with aorto-esophageal fistula and ultimately died from mediastinitis and rupture.

Pre-operative preparation is extremely important and time consuming, start case as early as possible and be available for line assistance.

The proximal aortic arch is always higher than expected so assure you are entering the chest at the right level, best in 5th intercostal space.

If patient has a previous dissection, arterial cannulation for bypass may be difficult, assure you have correct wires and fluoroscopic ability in the operating room.

Circulatory arrest is extremely helpful with graft removal, allowing it to be done without clamping the aorta, however, must realize the hemodynamic and ventilatory consequences.

Open repair always allows for a shorter landing zone, often can sew just distal to subclavian artery, and use a much smaller dacron graft than endograft, in our case we used 28 mm grafts after 46 mm endograft were used.

If not completely removing have a good pair of wire cutter

Because of bypass use, bleeding always more severe, reinforce proximal anastomosis.

Prepare for oxygenation problems when coming off of cardiopulmonary bypass, ECMO ability.

And lastly, be prepared for post operative course to be rocky.

As demonstrated on these cases, there is an extremely high level of morbidity and mortality, important to have a good discussion.