Decision-making in aortic aneurysm

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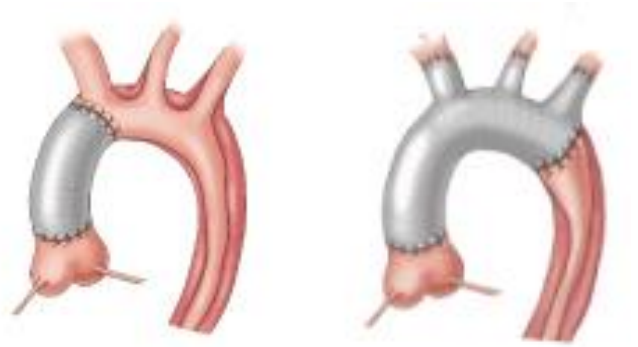
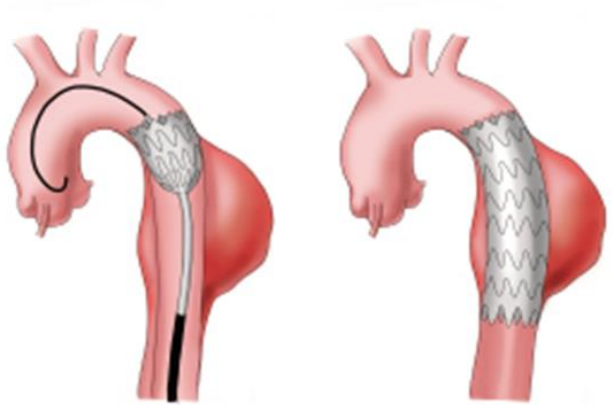
Contents

- Open surgery
  - Techniques
  - CPB strategy
  - Organ protection



- (T)EVAR
  - Indication
  - Embolization
  - Endoleak



Definition

- **Aneurysm**

  Diameter > 50%, all 3 layers (intima, media, adventitia)

- **Pseudoaneurysm**

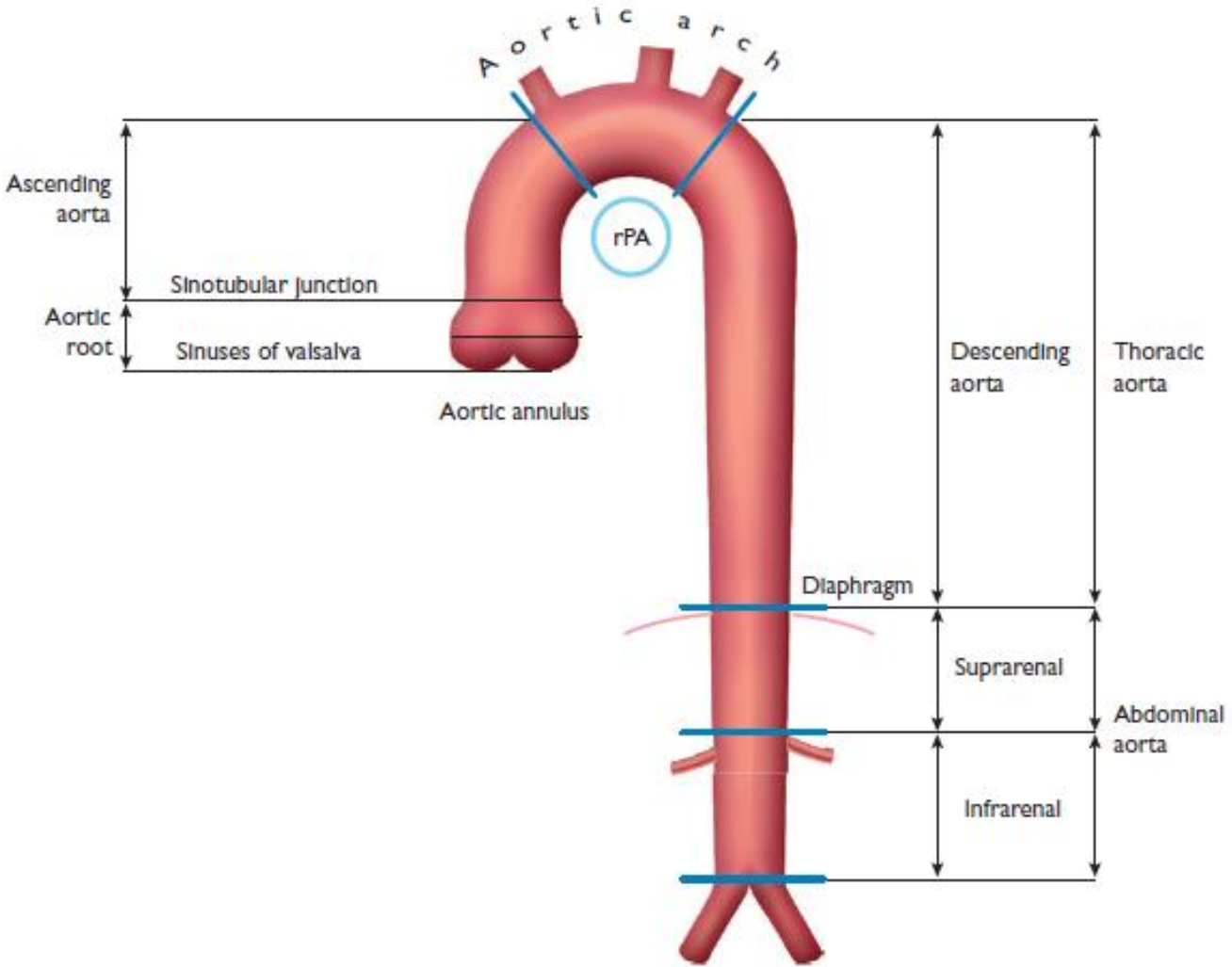
  Disruption of arterial wall with extravasation
  Blood contained by periarterial connective tissue
  (not by the arterial wall)

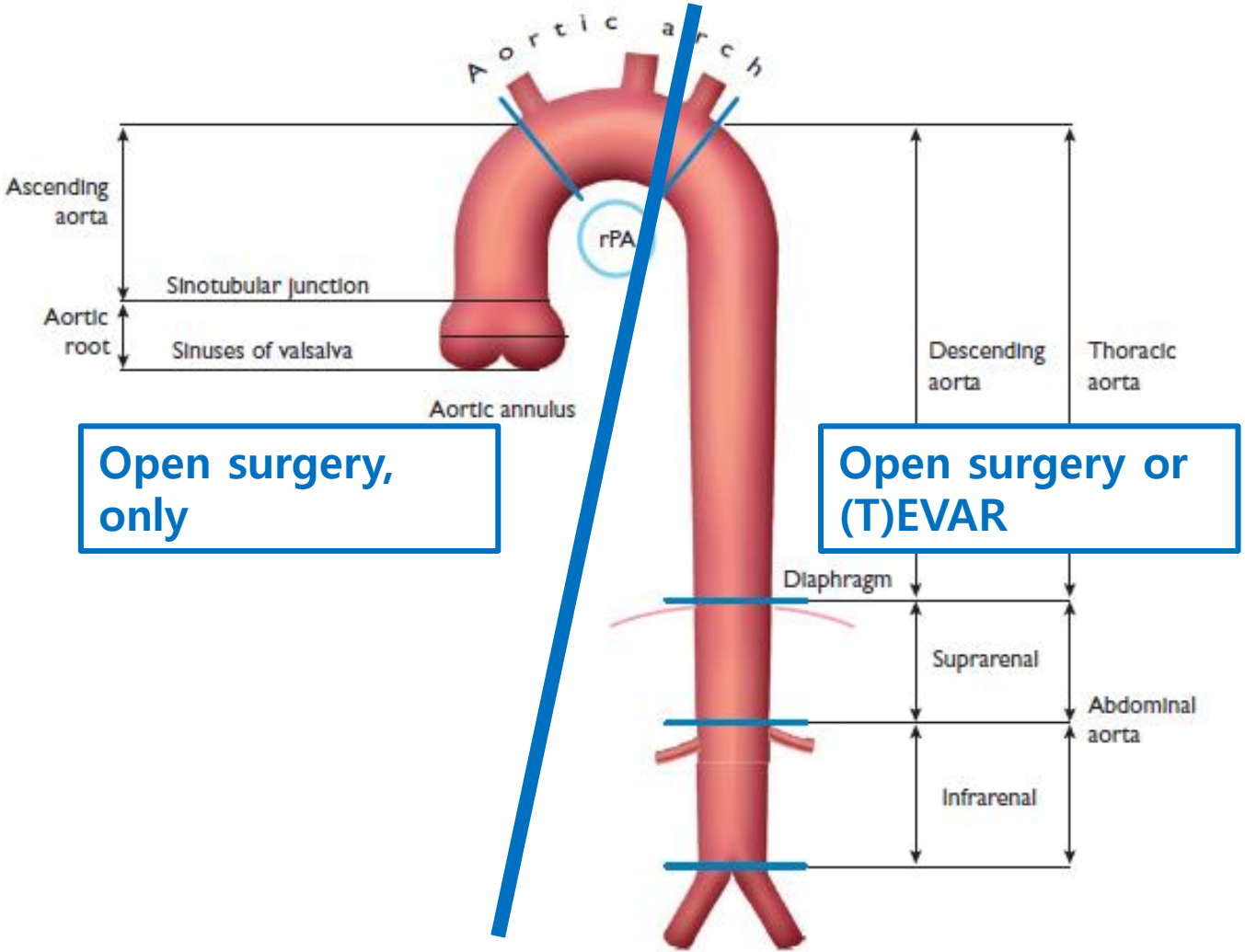
- **Ectasia**

  Arterial dilatation < 150%

- **Dissection**

  Disruption of the media layer
  Bleeding within and along the wall of the aorta


Aortic arch
Ascending aorta
rPA
Sinotubular junction
Aortic root
Sinuses of valsalva
Aortic annulus
Descending aorta
Thoracic aorta
Diaphragm
Suprarenal
Abdominal aorta
Infrarenal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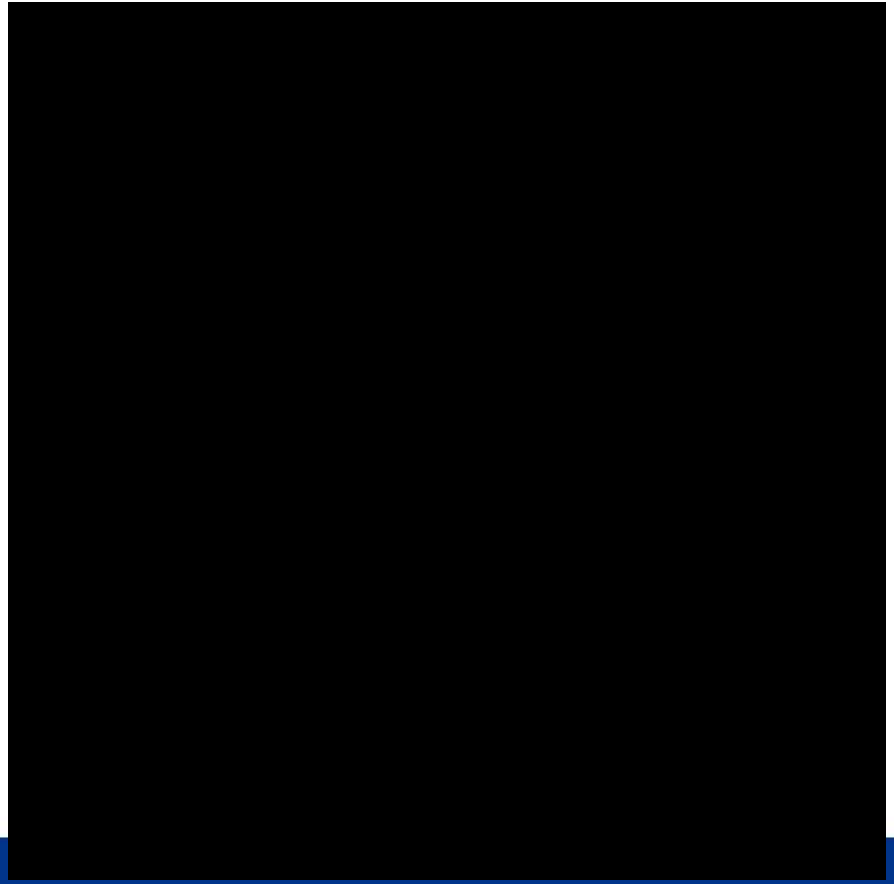
Thoracic aorta
Diaphragm
Suprarenal
Abdominal aorta
Infrarenal
Open surgery, only
Open surgery or (T)EVAR

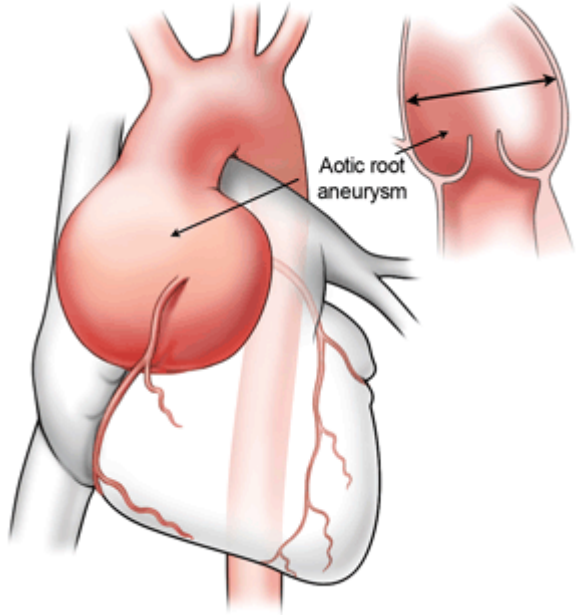
Aortic root aneurysm



Aortic root aneurysm

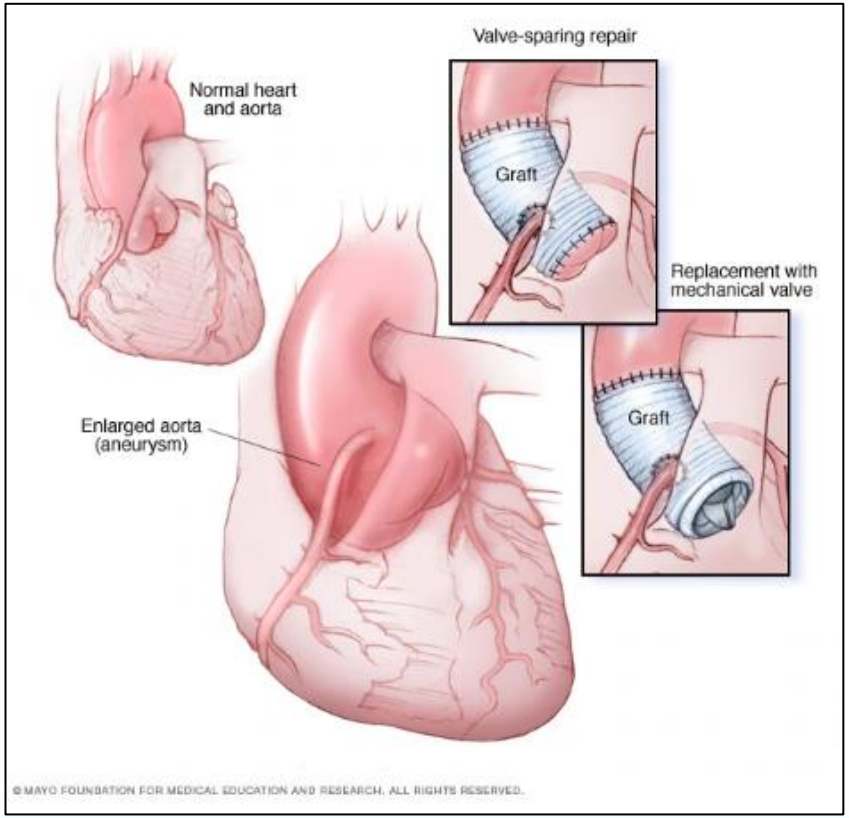
- Connective tissue disorder
  - Marfan syndrome
  - Ehles-Danlos syndrome
  - Loeys-Dietz syndrome

- Autoimmune or inflammatory disease
  - Kawasaki disease
  - Takayasu arteritis
  - Bechet disease
  - Giant cell arteritis



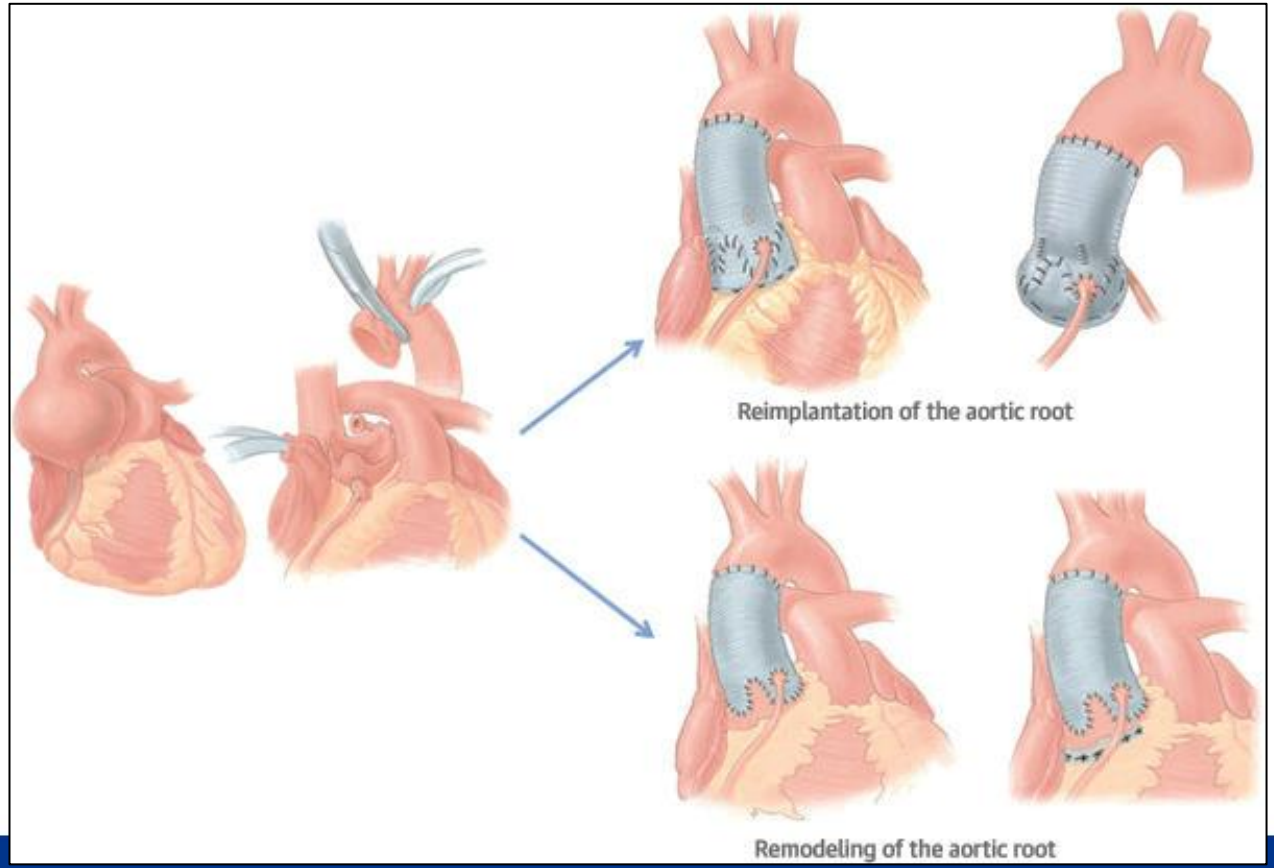
Aortic root surgery

- **Bentall op**
  - **Mechanical / Bioprosthetic**
- **Aortic valve sparing operation**
  - **Remodeling / Reimplantation**

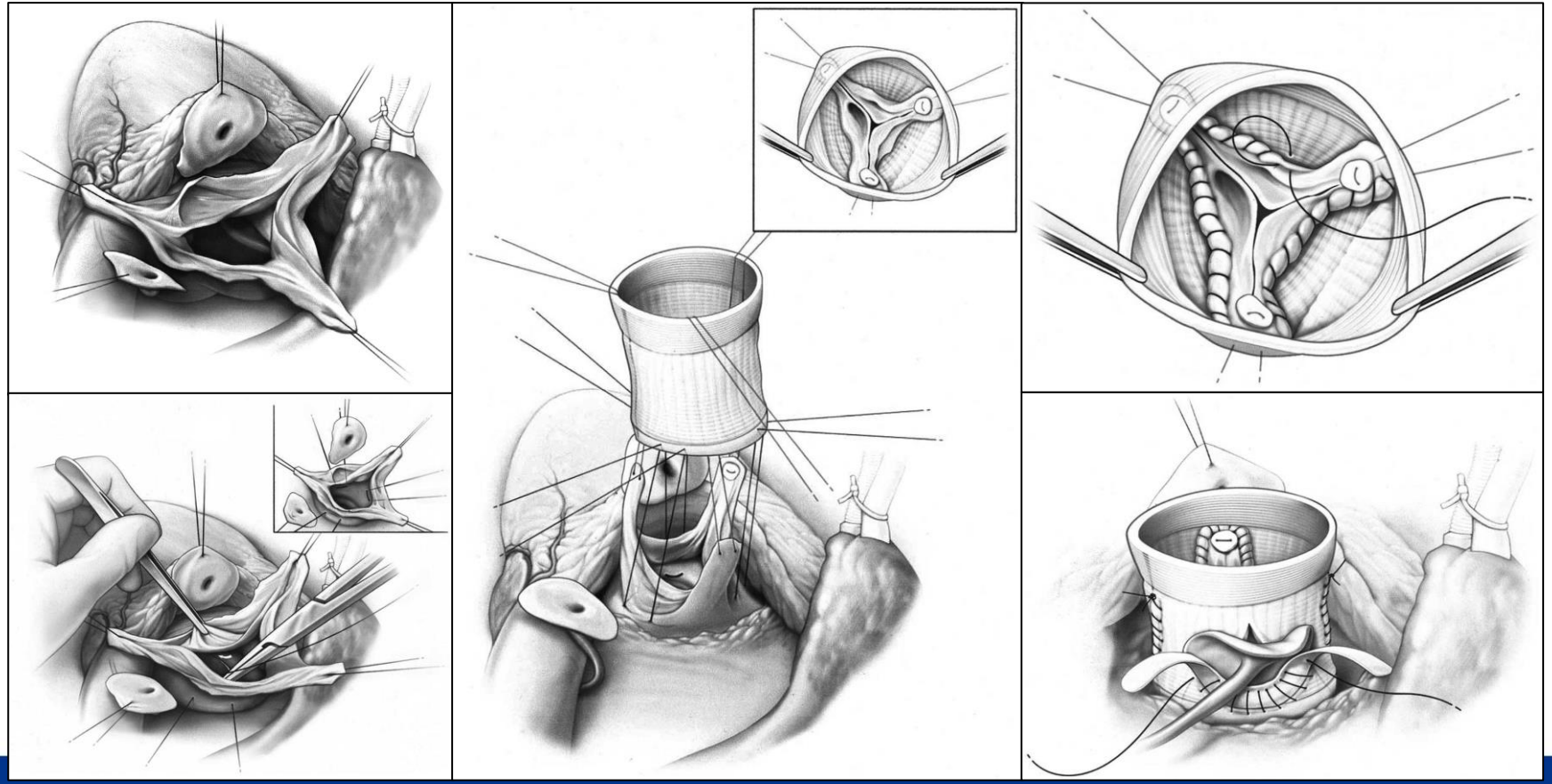


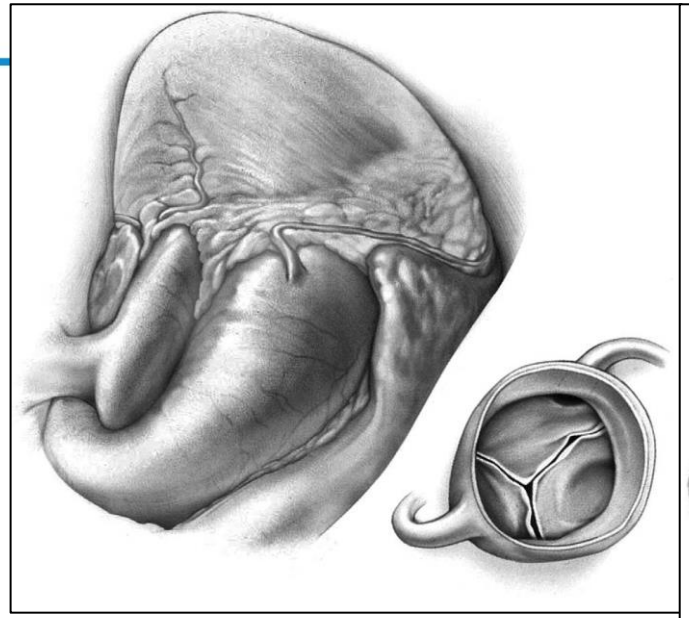
Bentall operation

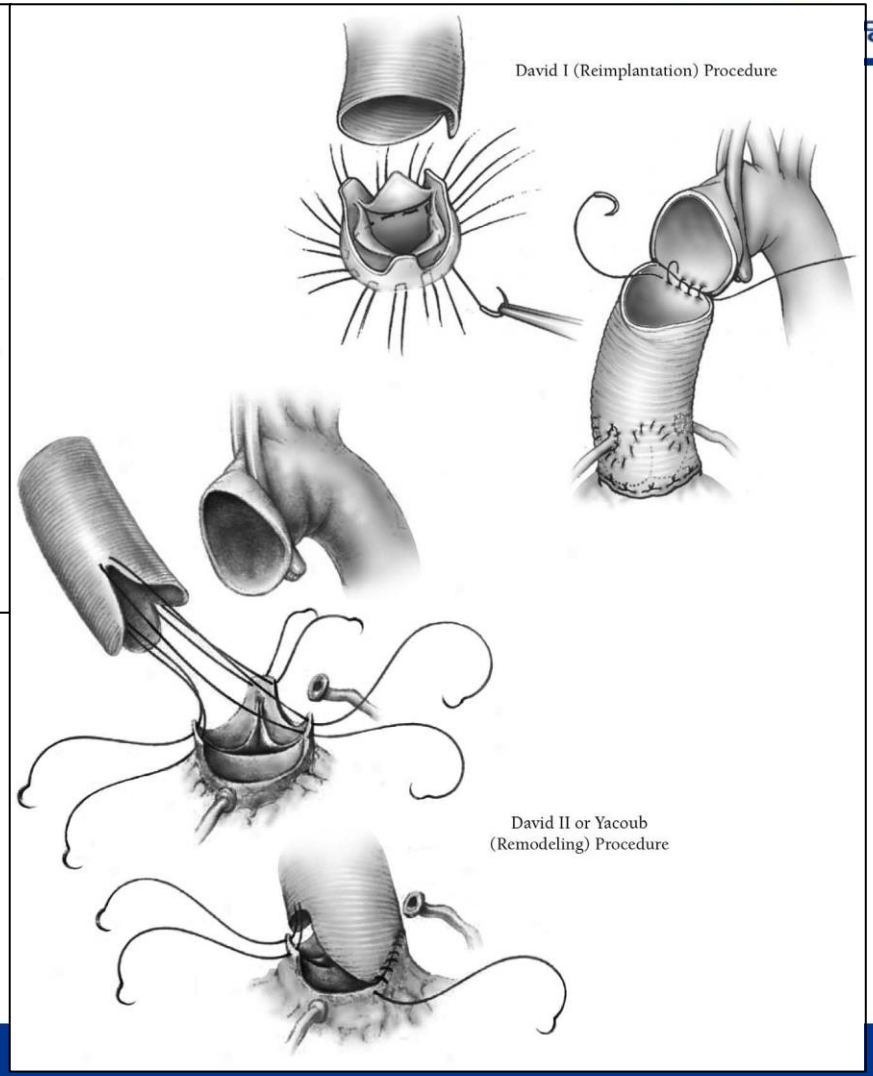
Aortic valve sparing operation



Aortic root reimplantation operation (David op)

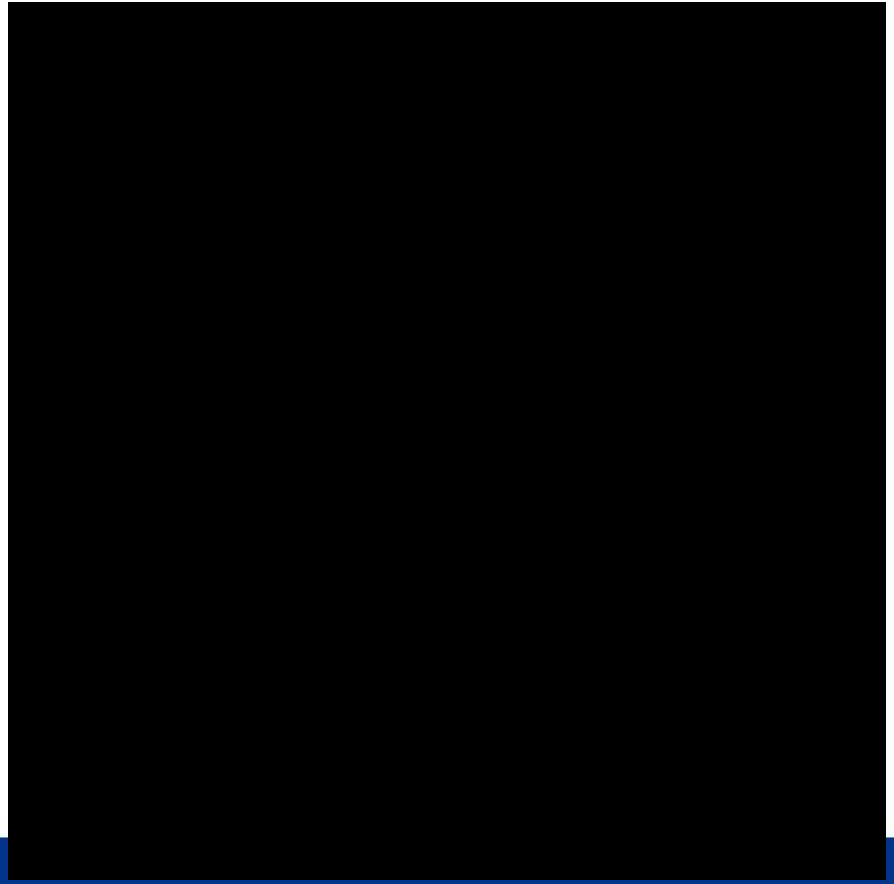




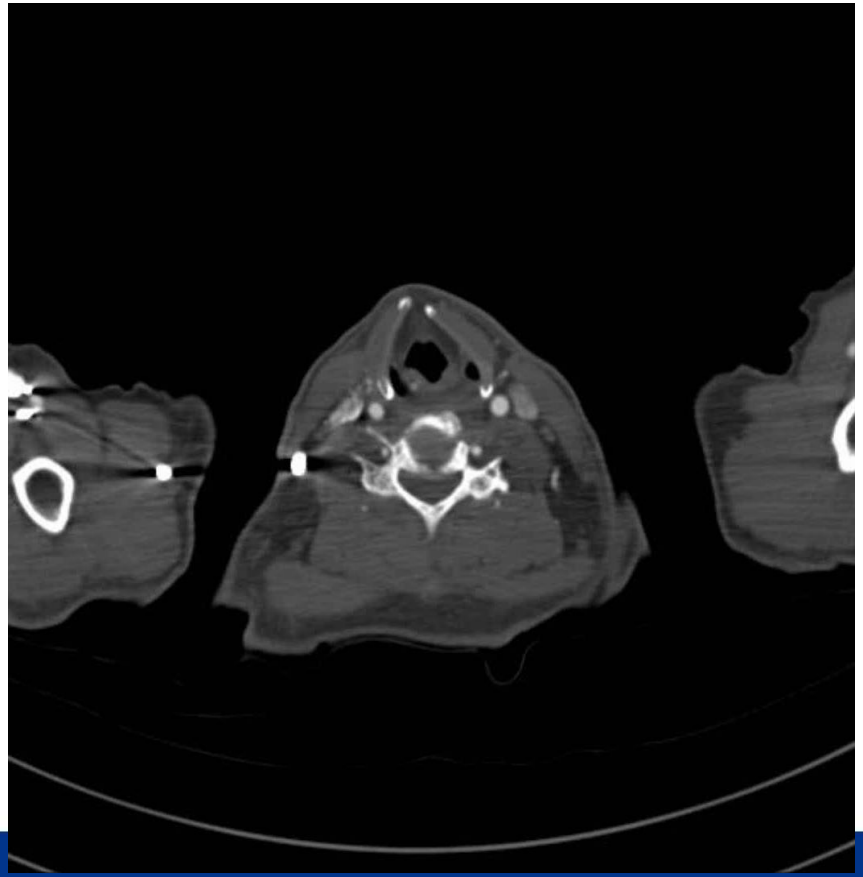


Cameron D, Vricella L.
Valve-Sparing Aortic Root Replacement with the Valsalva Graft.
Operative techniques in thoracic and cardiovascular surgery. 2005;10:259-71.

Ascending aortic aneurysm



Aortic arch aneurysm



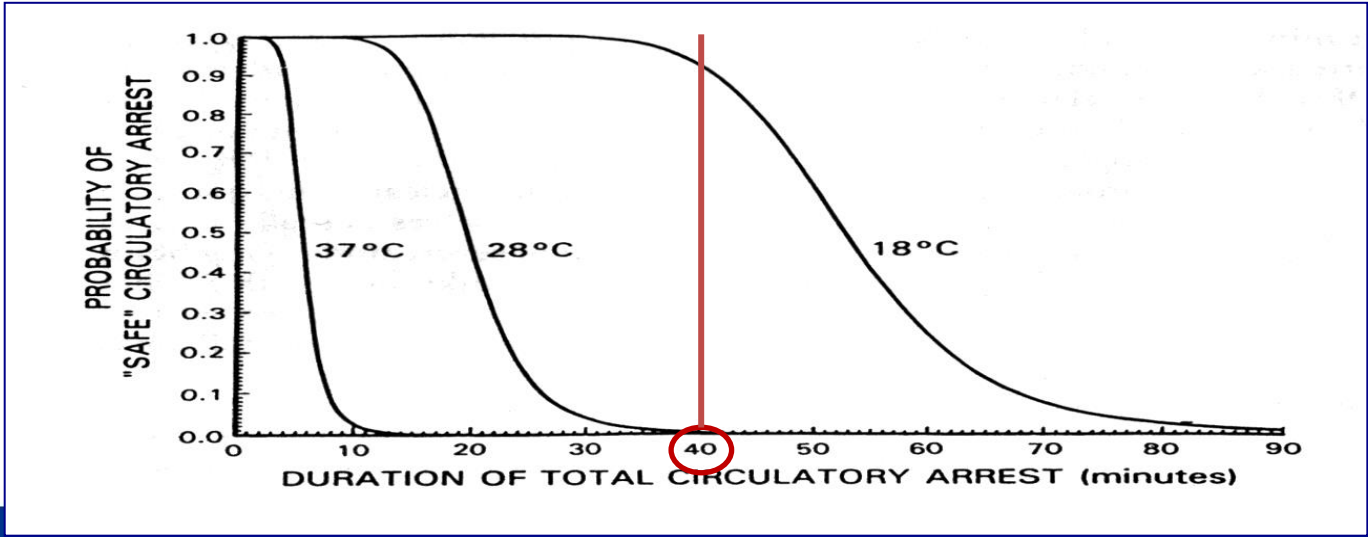
Ascending aorta or arch surgery

- Cerebral protection strategy
  - Deep hypothermic circulatory arrest (DHCA)
  - Antegrade cerebral perfusion (ACP)
  - Retrograde cerebral perfusion (RCP)

- Tecniques
  - Kazui's technique (4-branched graft used)
  - Spielvogel technique (trifurcated graft used)

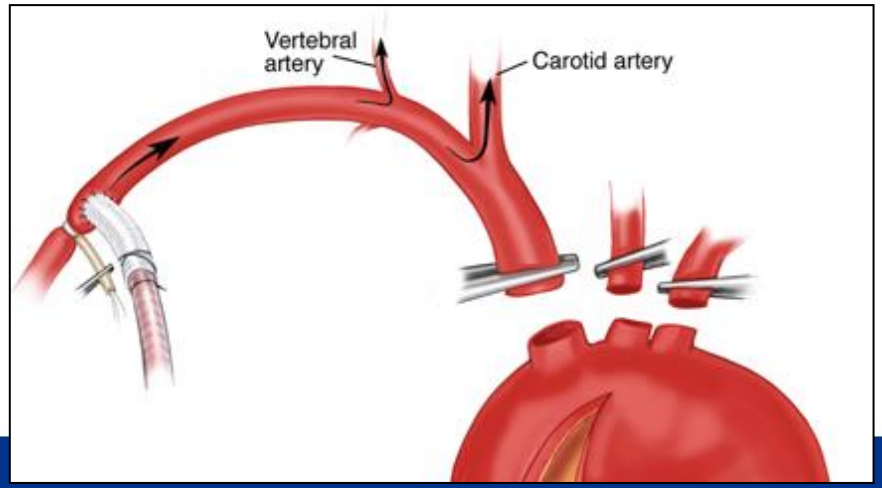
Cerebral protection strategy

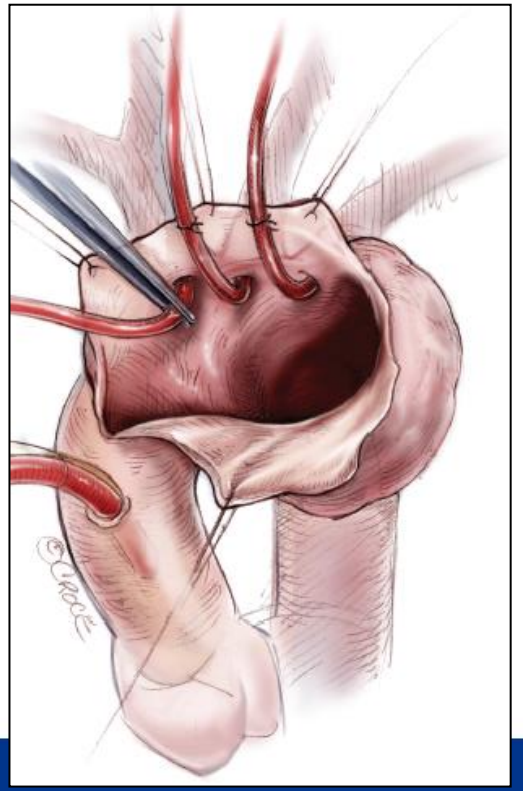
- **Deep hypothermic circulatory arrest (DHCA)**
  - **Clean & bloodless surgical field**
  - **Limitation of safe duration : 35-40min (under 18℃)**
  - **Increase CPB time, coagulopathy**



Cerebral protection strategy

- **Antegrade cerebral perfusion (ACP)**
  - **Unilateral ACP via Rt. Axillary cannulation**
    - **Circle of Willis does not guarantee**
  - **Bilateral ACP via direct cannulation**
  - **More physiologic**

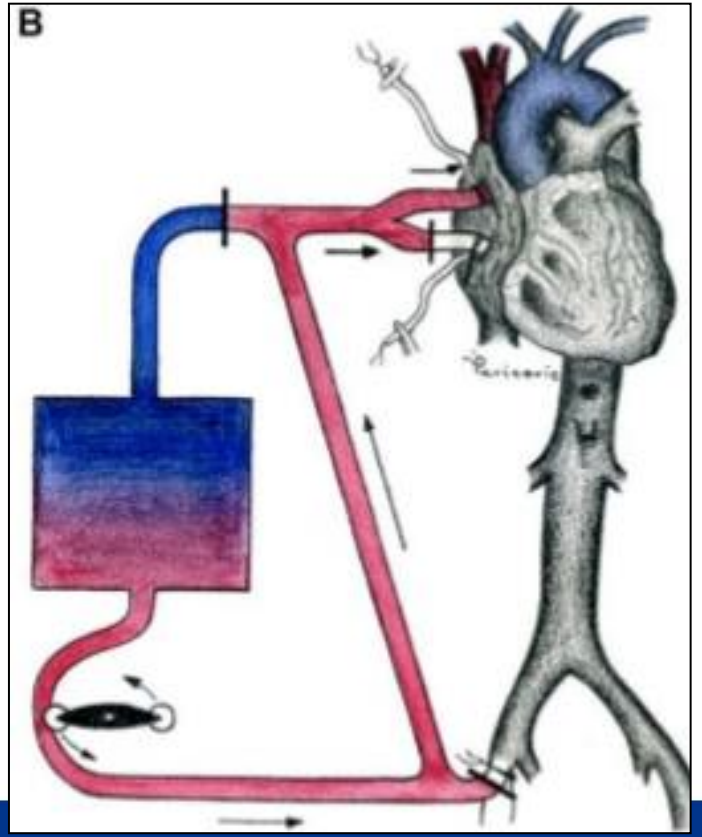




Cerebral protection strategy

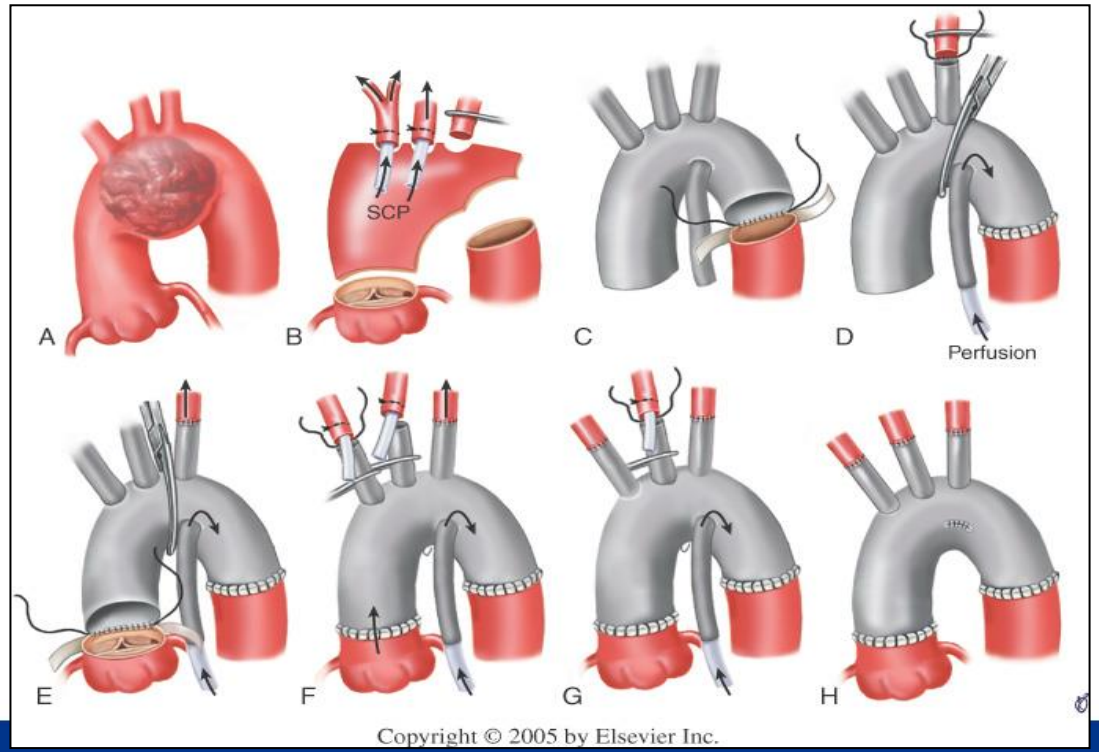
- **Retrograde cerebral perfusion (RCP)**
  - **Cerebral embolic washout**
  - **Maintenance of cerebral hypothermia**
  - **Cerebral edema (CVP < 25mmHg)**

- ***DHCA + RCP + ACP combination***



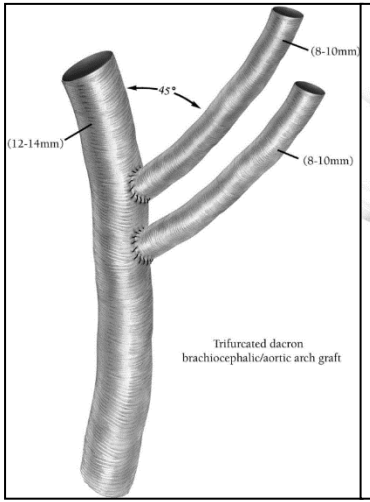
Surgery for aortic arch aneurysm

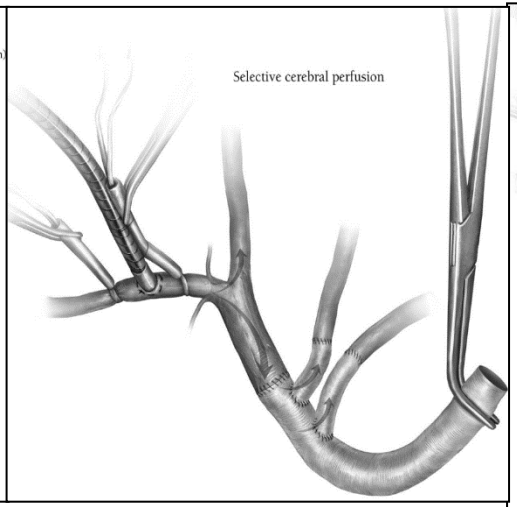
- **Kazui's technique (4-branched graft used)**

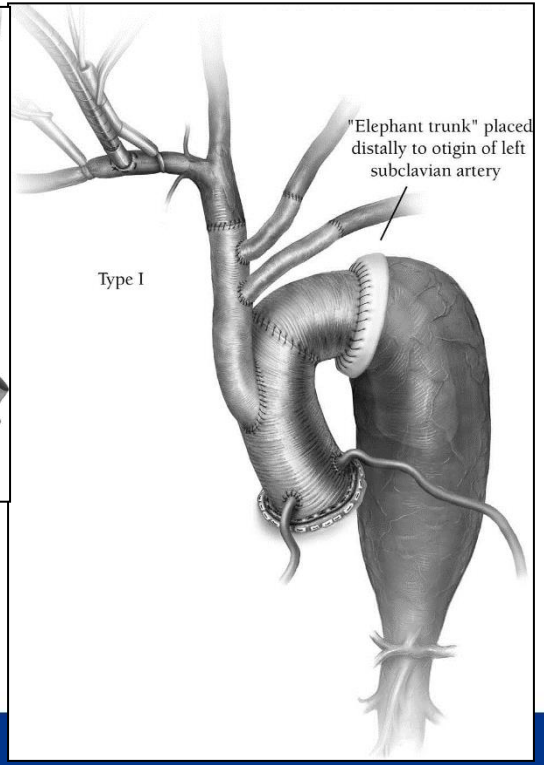


Surgery for aortic arch aneurysm

- **Spielvogel technique (trifurcated graft used)**







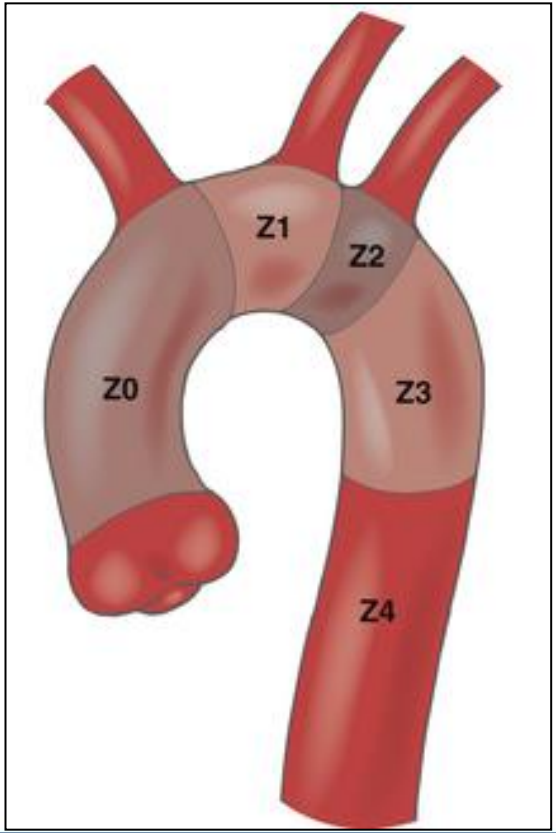
TEVAR

- **Anatomical indication**
  - **Iliac/femoral access vessel morphology that is compatible with vascular access techniques, devices, and/or accessories**
  - **Non-aneurysmal aortic diameter in the range of 18 - 42 mm**
  - **Non-aneurysmal aortic proximal and distal neck lengths ≥ 15 - 20 mm**

- **Proximal landing zone : zone 0~4**
- **LSCA revascularization or coverage**

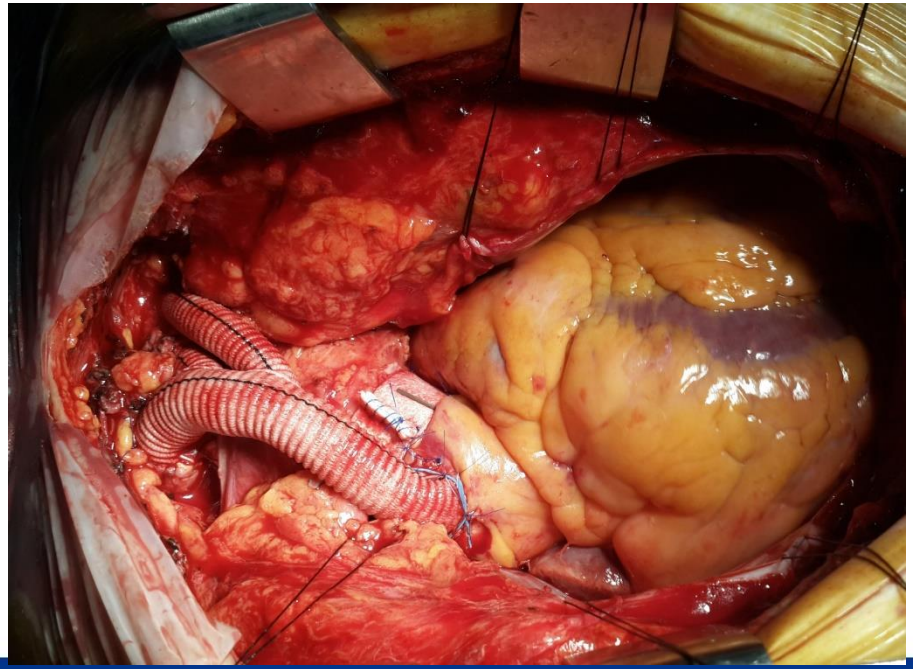
TEVAR for aortic arch aneurysm

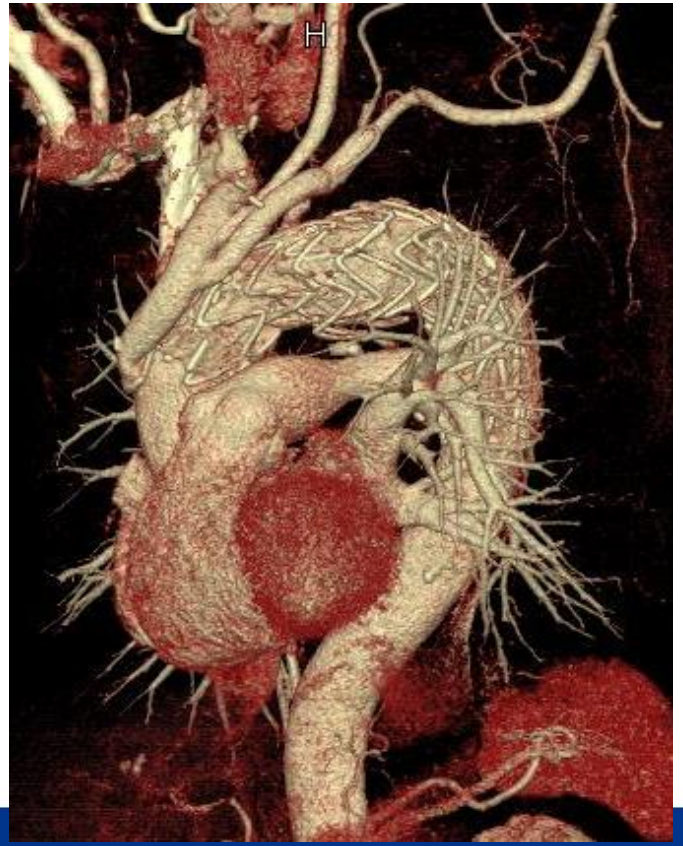
- *Zone 0:* ascending aorta and proximal arch to innominate artery
- *Zone 1:* segment between innominate artery and left common carotid artery
- *Zone 2:* segment between left common carotid and left subclavian arteries
- *Zone 3:* segment beyond left subclavian along curved portion of distal arch
- *Zone 4:* straight portion of descending thoracic aorta starting at level of the 4th thoracic vertebra



Hybrid TEVAR (debranching TEVAR)

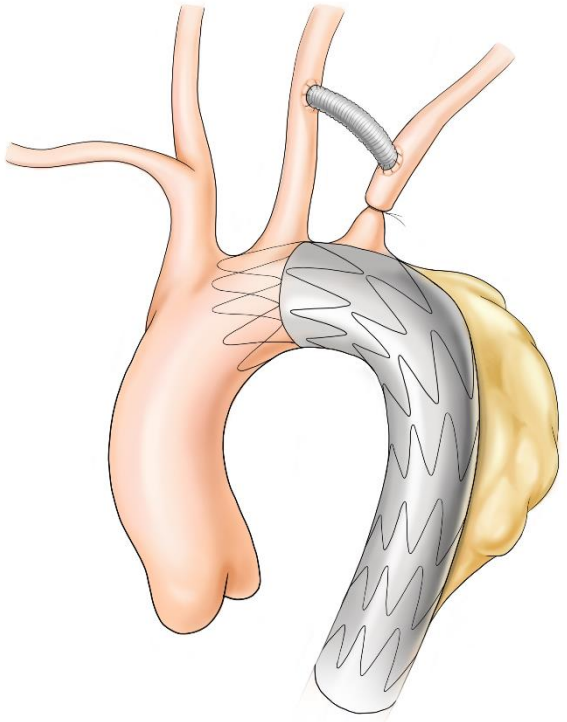
- Zone 0 or zone 1 TEVAR
  - *Not recommended..!!*



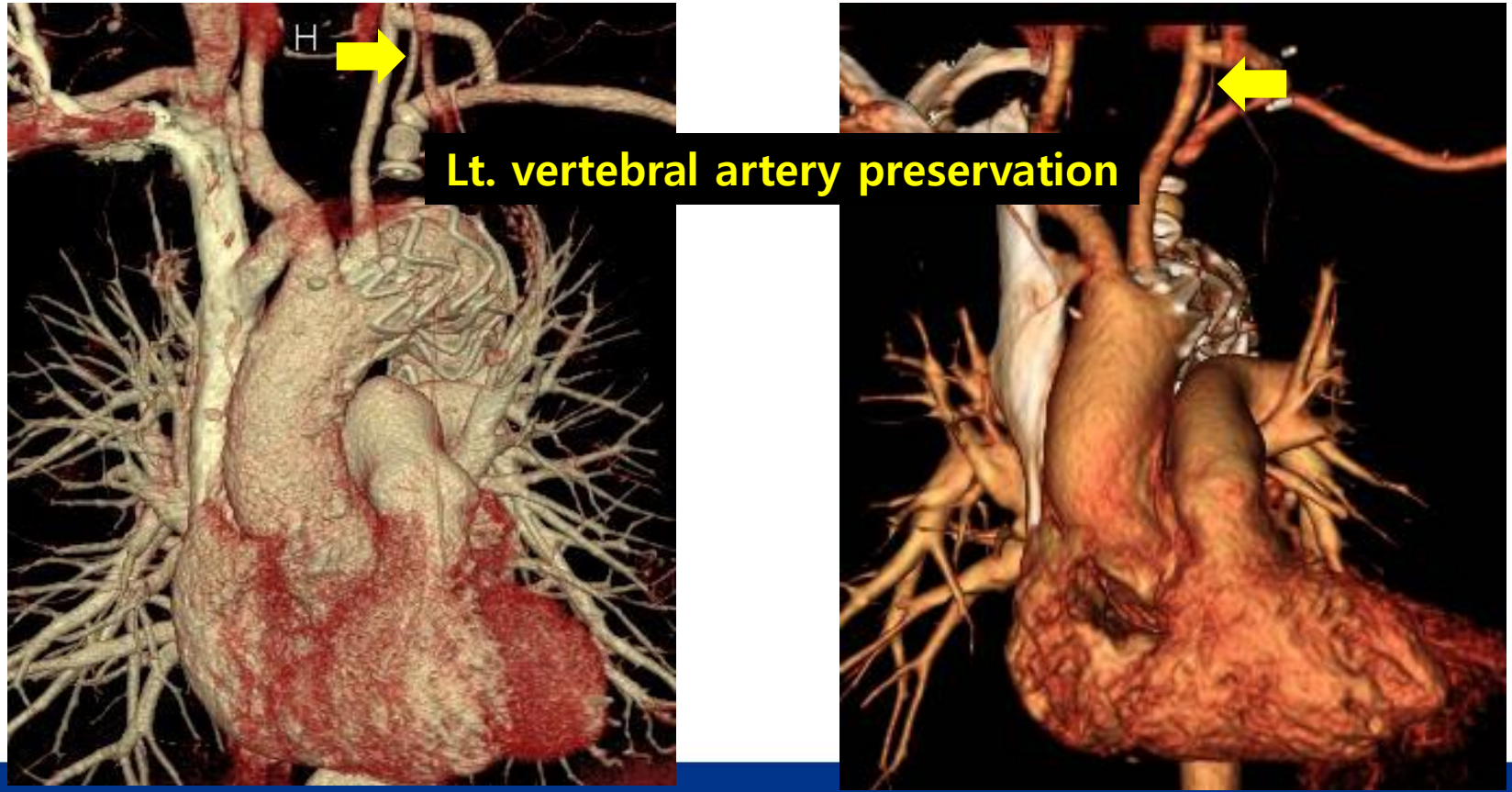


Hybrid TEVAR (debranching TEVAR)

- **Consideration for zone 2 TEVAR**
  - **Absolute indication of LCCA-LSCA bypass**
    - **CABG w/ LITA graft**
    - **Lt. vertebral dominance**
    - **Isolated left brain hemisphere**
    - **Previous AAA repair**
    - **left upper extremity dialysis access**



Hybrid TEVAR (debranching TEVAR, zone 2)



Descending or thoracoabdominal aortic aneurysm

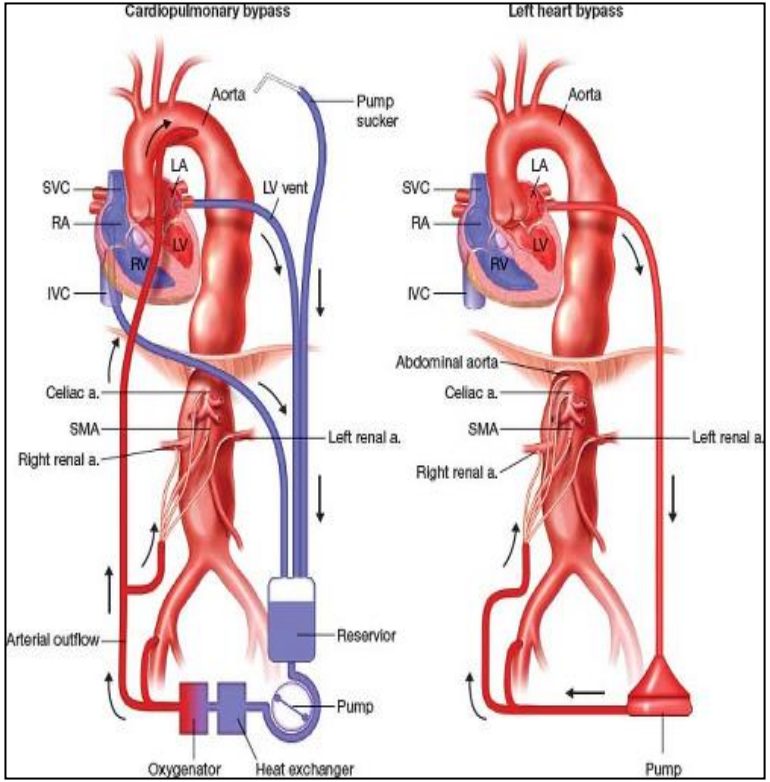
Descending or thoracoabdominal aortic aneurysm

- Perfusion strategy
  - Left heart bypass (LA - fem bypass)
  - Cardiopulmonary bypass (Fem - fem bypass)

- Spinal cord protection

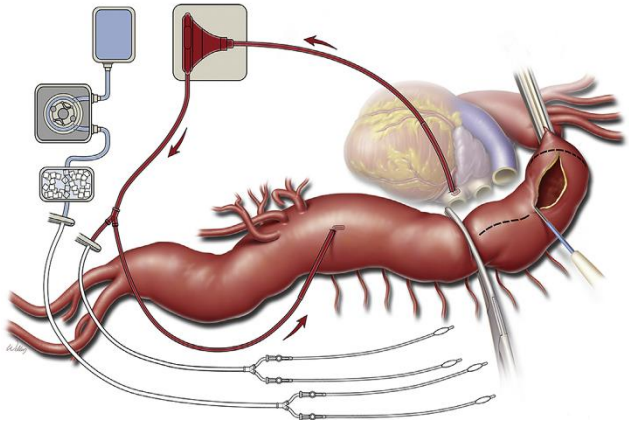
Consideration for TAAA or DTAA – perfusion strategy

- **Left heart bypass (LA-fem bypass)**
  - ***Without oxygenator..!!!***
  - **Lower ACT**
  - **Unload left ventricle**
  - **Avoidance of a systemic inflammatory response**
- **Cardiopulmonary bypass (fem-fem bypass)**
  - ***Use of oxygenator..!!!***
  - **Allows DHCA**
  - **Use of cardiotomy suction**
  - **Allows reliable oxygenation**

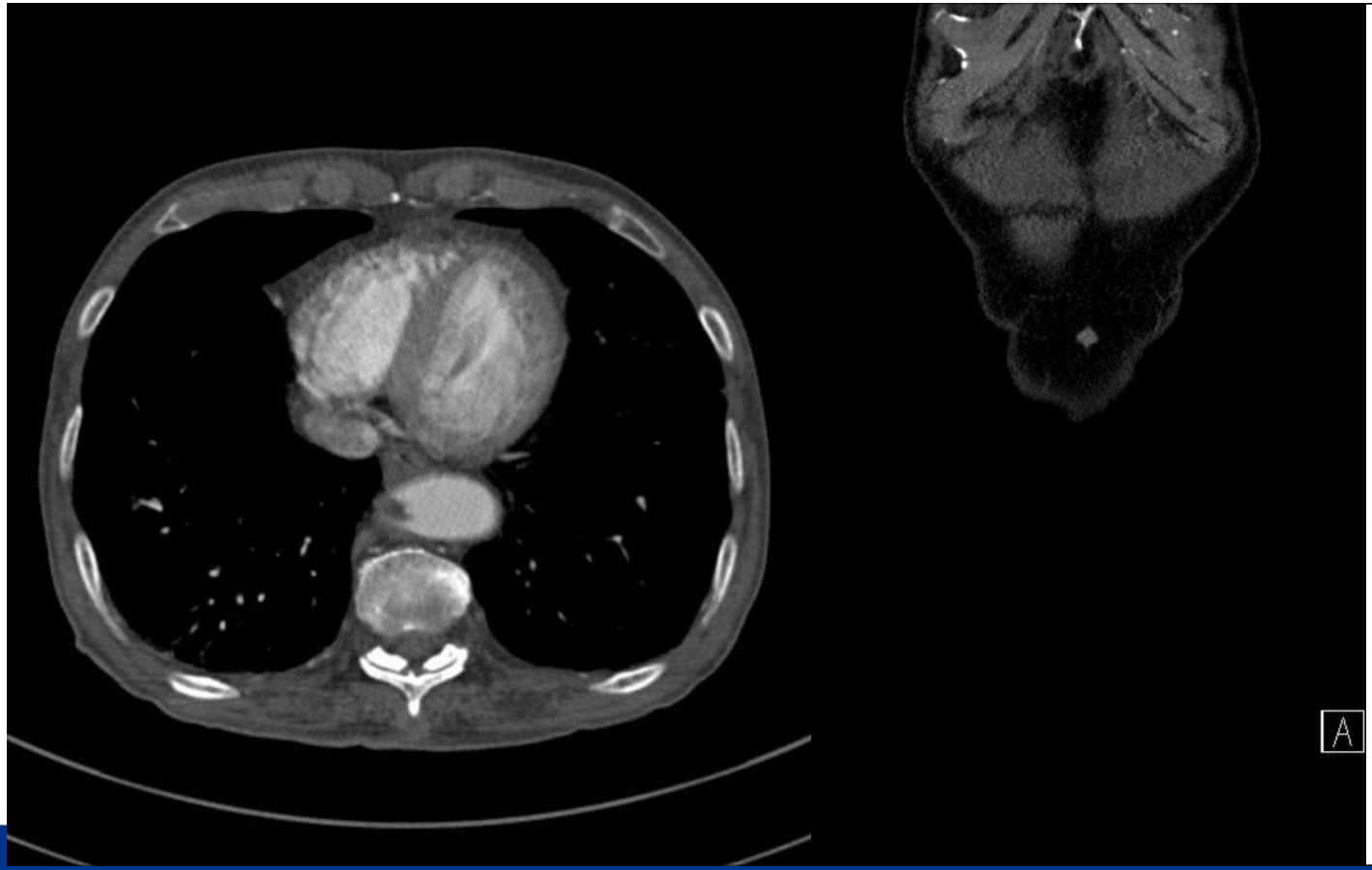


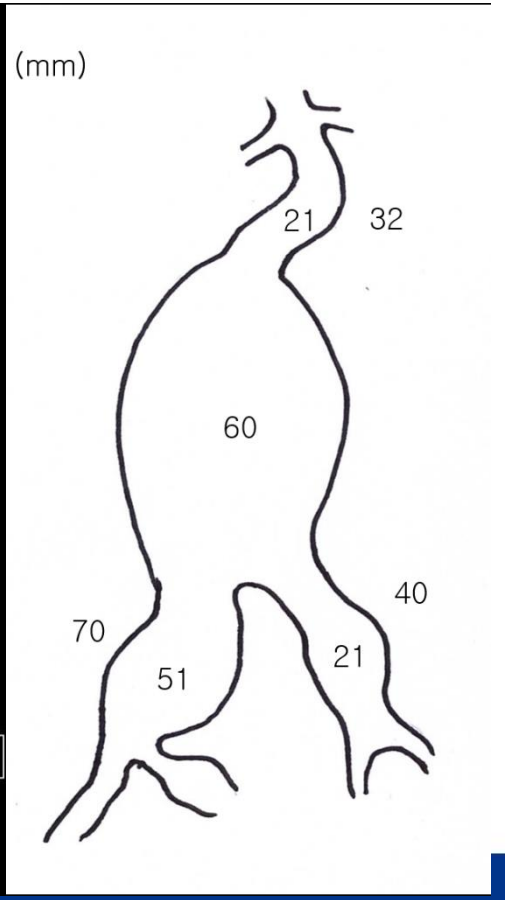
Consideration for TAAA or DTAA – spinal cord protection

- **Spinal cord protection**
  - **Reduction of the duration of ischemia**
    - **Sequential clamping**
  - **Reduction of the severity of ischemia**
    - **CSF drainage**
    - **Hypothermia**
  - **Reestablishment of spinal cord blood flow**
    - **Reattatchment of segmental arteries between T6~L2**
    - **Revascularization of the left subclavian artery**
    - **Preservation of blood flow in at least one internal iliac artery**



Abdominal aortic aneurysm – open surgery

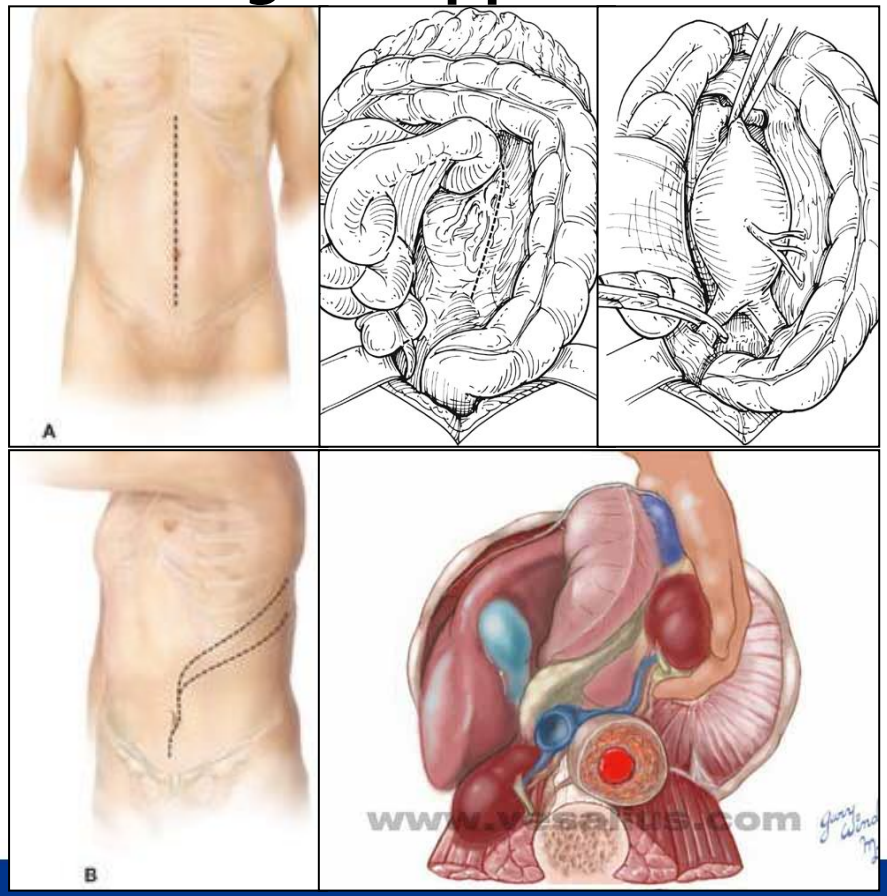




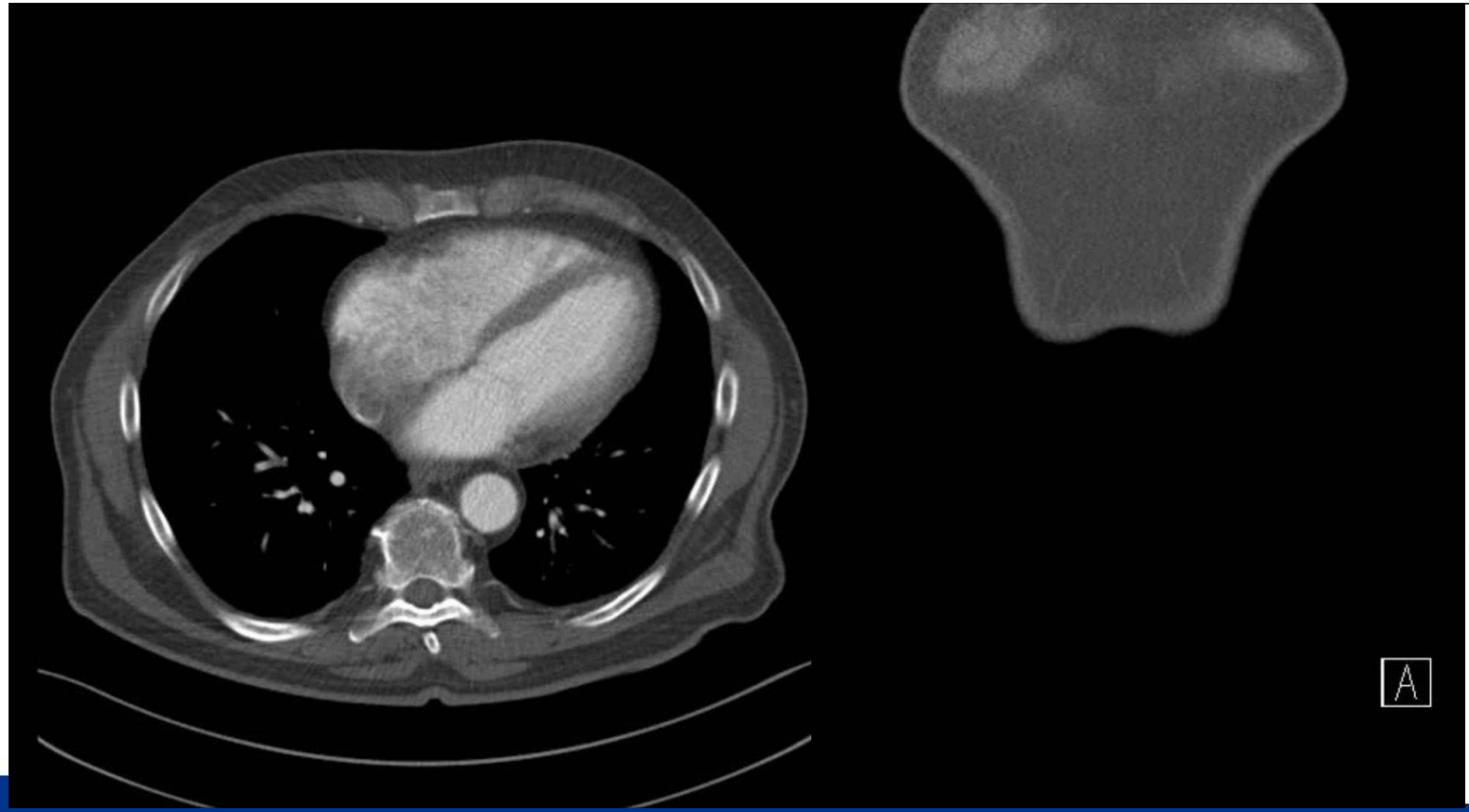
Abdominal aortic aneurysm – surgical approach

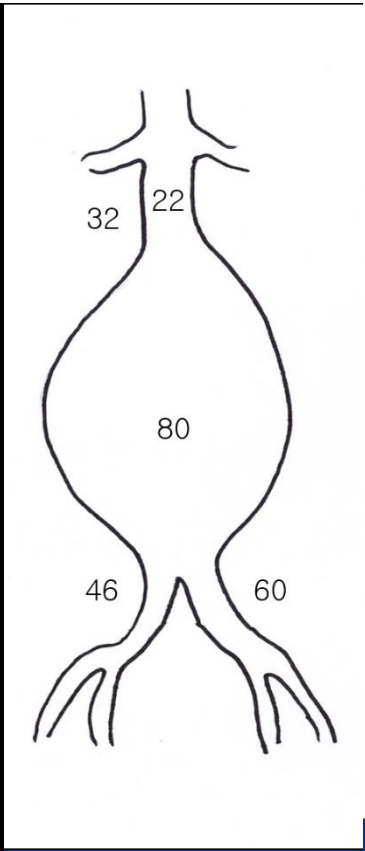
- **Transperitoneal exposure**
  - Exposure of right renal artery
  - Access to intra-abdominal organ
  - Access to right iliac system

- **Retroperitoneal**
  - **Need for suprarenal exposure**
  - Extensive peritoneal adhesions
  - Short duration of ileus / ICU stay
  - Less pulmonary complications



Abdominal aortic aneurysm – EVAR

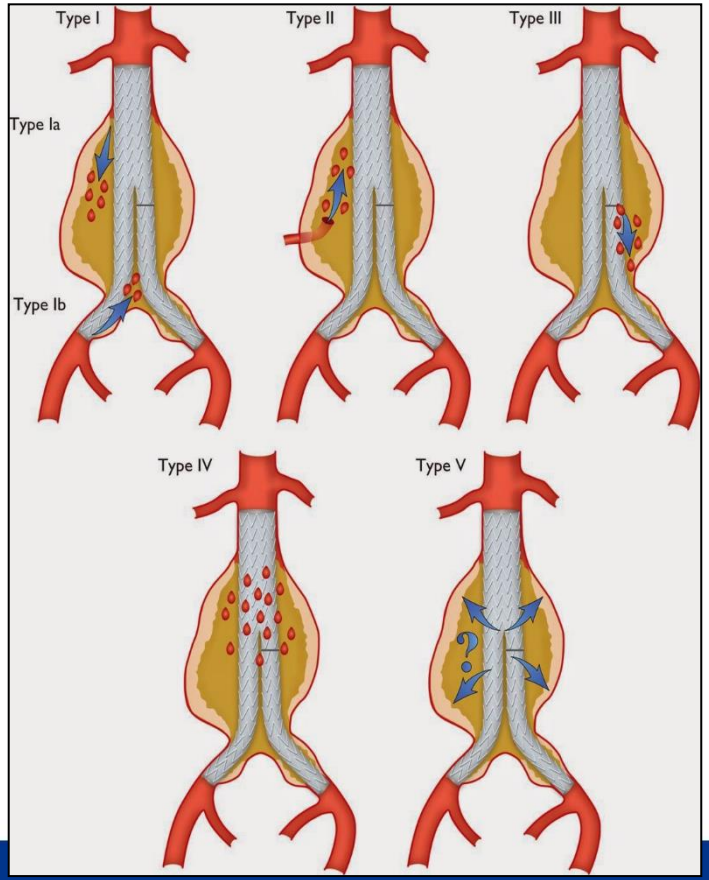




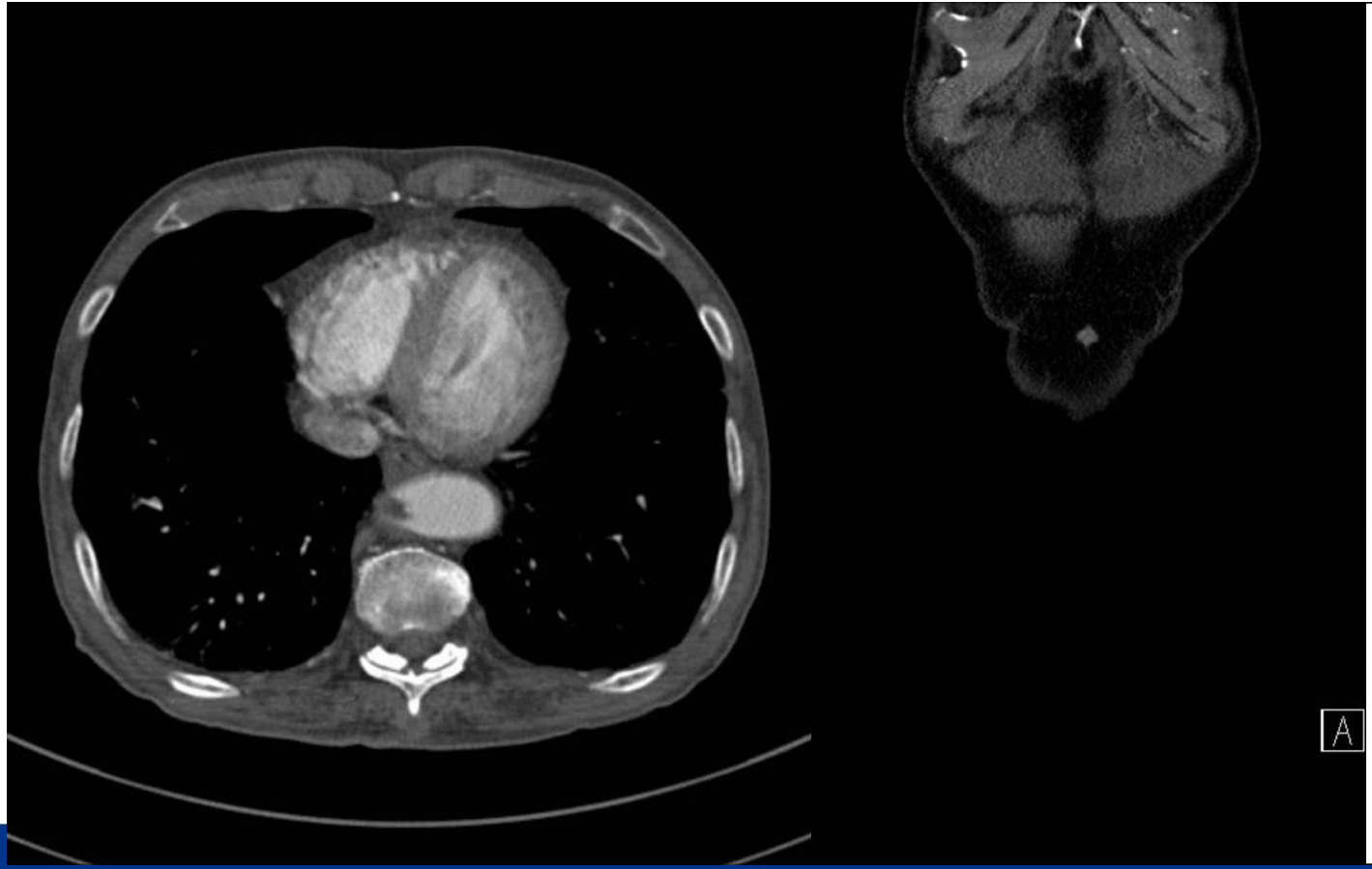
Abdominal aortic aneurysm – EVAR

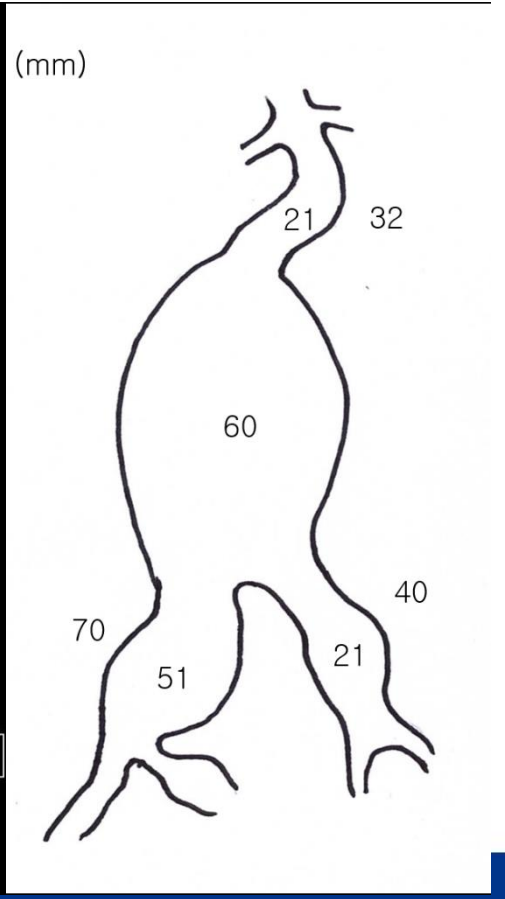
- **Endoleak**

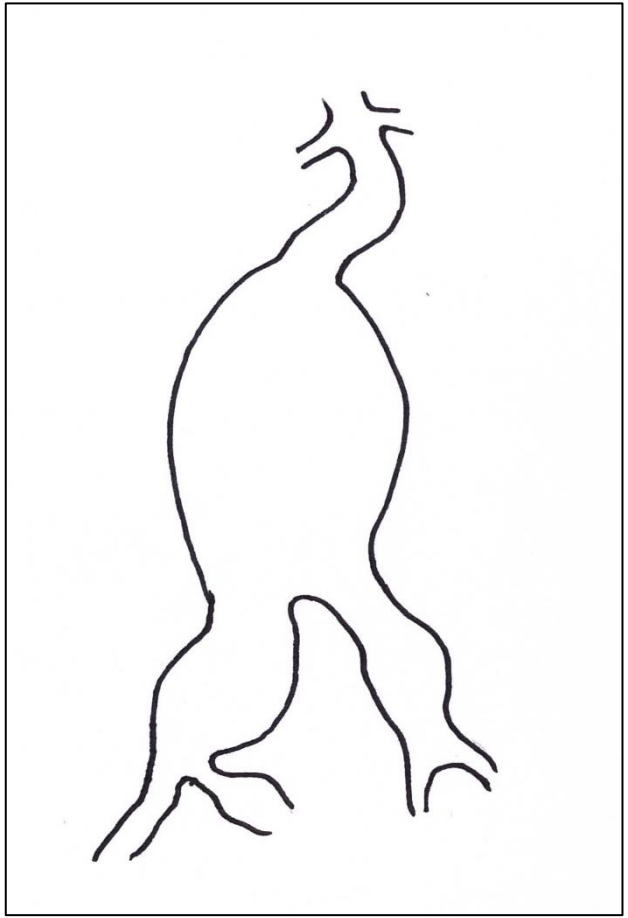
Type	Definition
Type I	Persistent filling of the aneurysm sac due to incomplete seal or ineffective seal at the proximal (type IA) or distal (type IB) end of the stent graft
Type II	Persistent filling of the aneurysm sac due to retrograde branch flow from collateral vessels
Type III	Blood flow into the aneurysm sac due to inadequate or ineffective sealing of overlapping graft joints or rupture of the graft fabric
Type IV	Blood flow into the aneurysm sac due to the porosity of the graft fabric, causing blood to pass through from the graft and into the aneurysm sac
Type V	Aneurysm sac expansion without clear evidence of endoleak origin

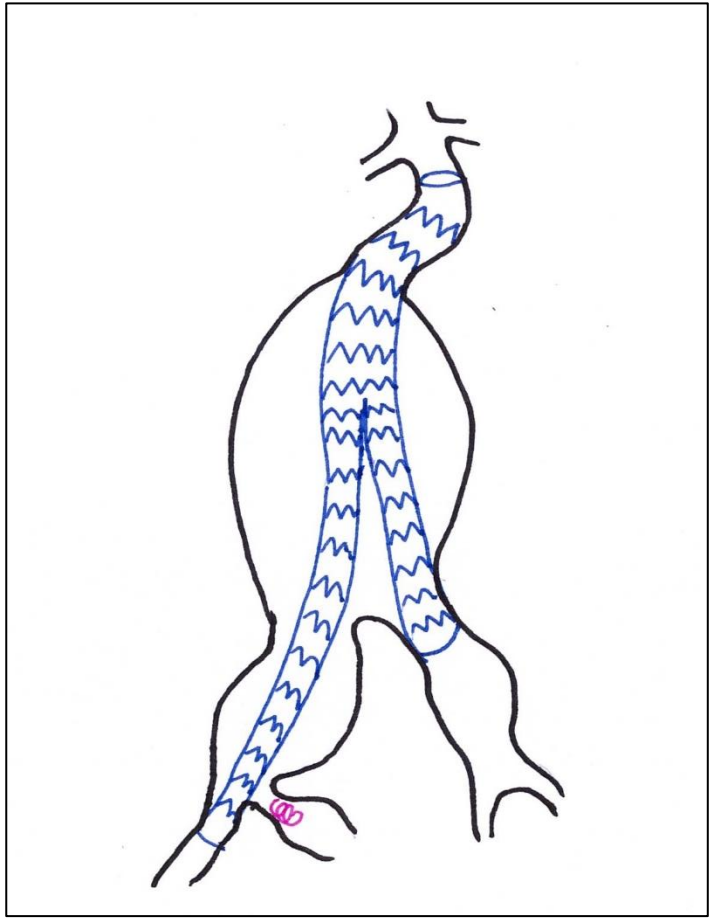


Abdominal aortic aneurysm – EVAR w/ IIA embolization



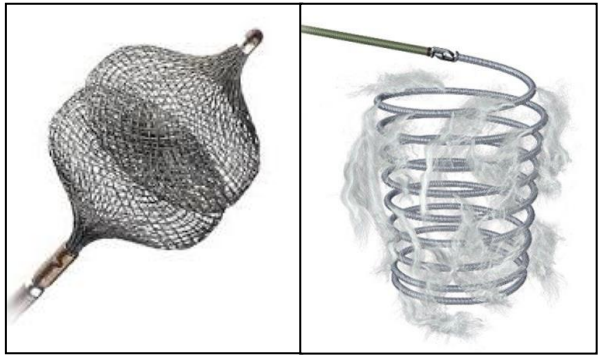






Abdominal aortic aneurysm – EVAR

- Internal iliac artery embolization
  - Vascular plug / coils



- Buttock or thigh claudication
- Sexual dysfunction (impotence)
- Bowel ischemia
- Spinal cord ischemia

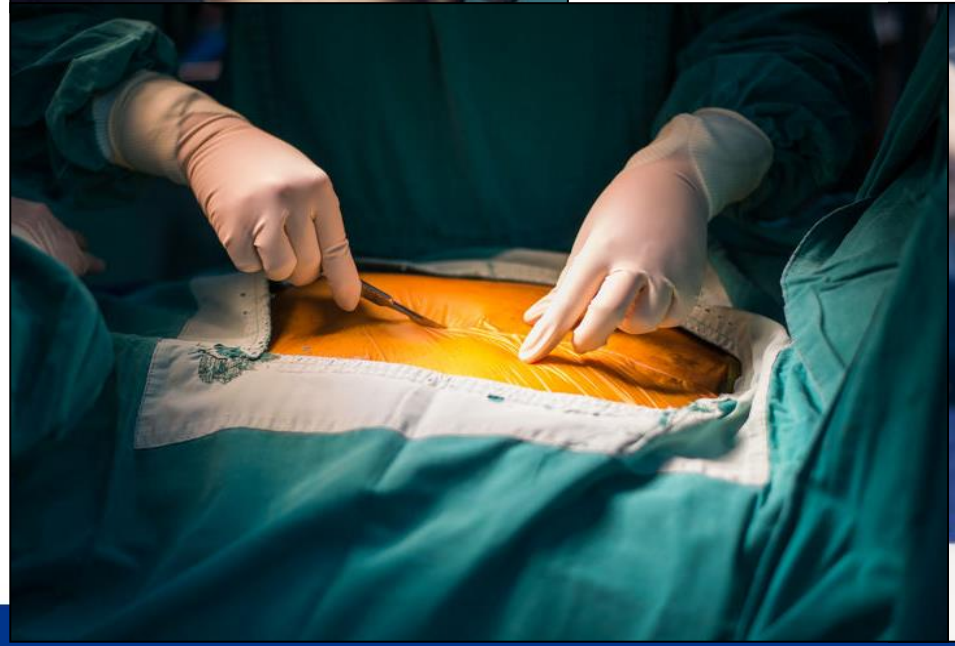
- Avoid simultaneous embolization of bilateral internal iliac artery..!

What approach..?

- (T)EVAR
  - Minimal incision
  - No aortic cross clamping
  - No extracorporeal circulation
  - Lower operative mortality rate
  - Lower morbidity rate
  - Lower hospital stay
  - Good choice for patients with important comobidities
  - *.. But not for everyone..*
  - *.. Long term results..??*
- Open surgery
  - No suitable proximal and distal landing zones
  - No suitable stent-grafts
  - Lack of vascular access
  - Connective tissue disorders
  - Young patients

vs.

with



Thank you for your attention~!

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