



Hybrid Procedures and Debranching of the Arch

When to do it and how

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Disclosure

- I have the following potential conflicts of interest to report:
- x Consulting PQ Bypass, Intact Vascular, Philips Medtronic, Boston Scientific, Endologix, Shockwave, VIVA Physicians



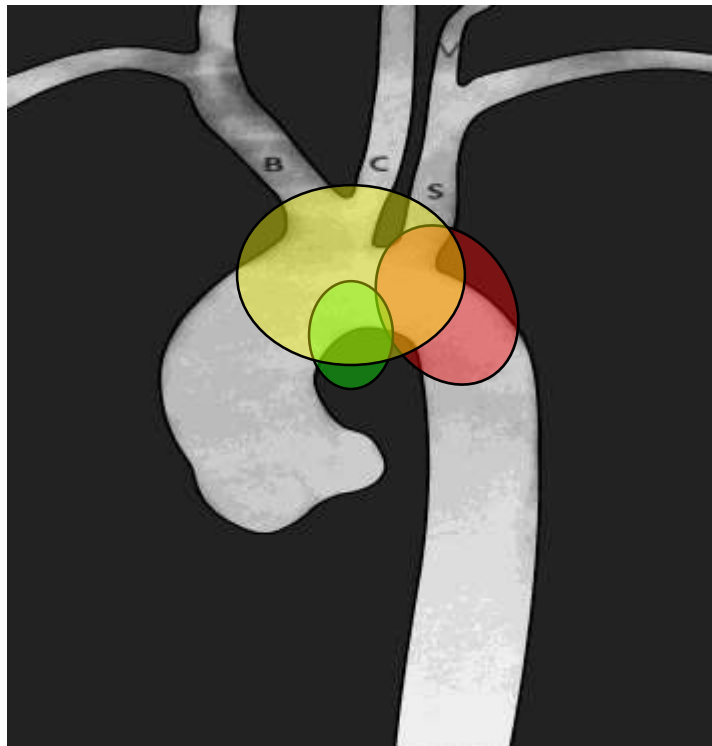
Conventional Surgery Involving the Arch

- 394 patients over 10 years
- Mean duration 40 min
- Complications
 - Mortality: 6.5%
 - Stroke: 4.8%
 - Seizure: 3.1%
- For extended (40 min) 13.1% embolic, flow related
- 13.1% of poor outcome:
 - Emergency procedures
 - Descending aortic involvement

We can do better !

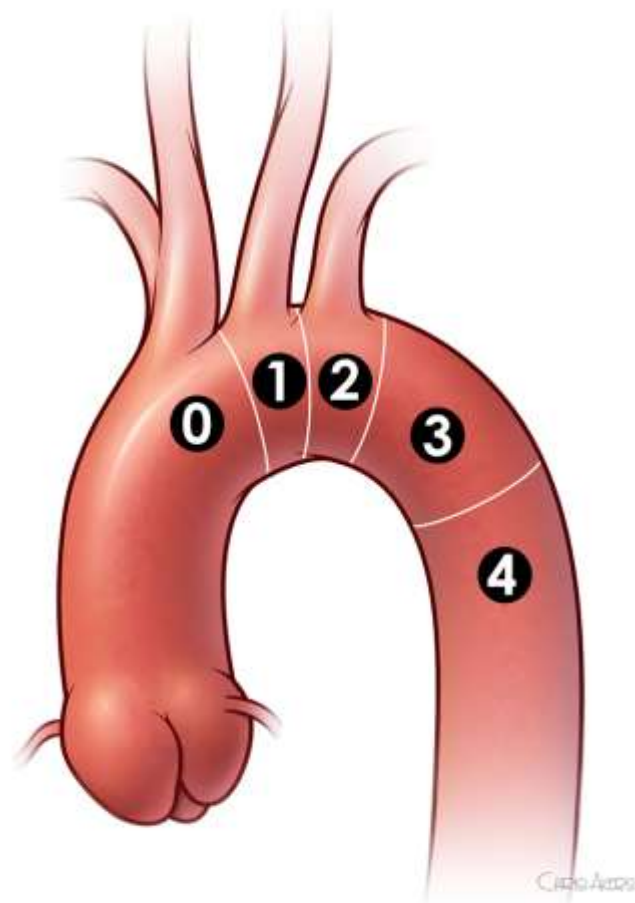


Why Is Endo A Challenge?



- Involving SCA
 - Distance between the SCA and LCCA
 - Arch angulation
- Inferior aspect of the arch
 - Arch angulation
 - Ascending – descending aortic size discrepancy
- Arch and descending aortic aneurysms

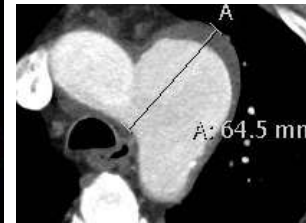
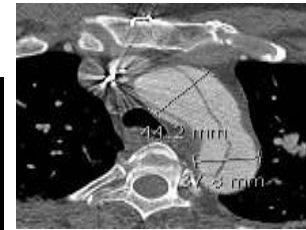
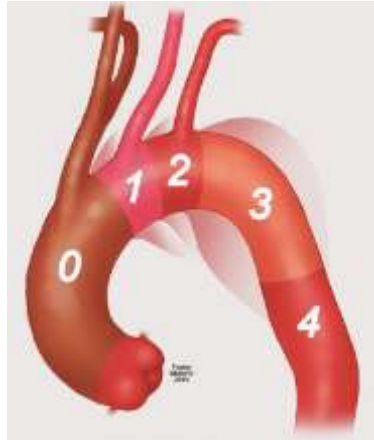
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Arch Debranching: Background

Up to 50% of TEVAR will require deployment in zones 0, 1, or 2

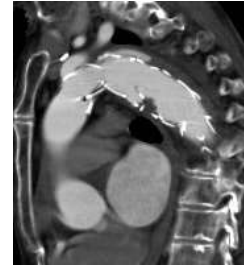


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Arch Debranching: When

Landing zone

- Landing zone has a dual purpose:
 - Obtain a seal between the endograft and a healthy aortic wall
 - Provide secure fixation of the endograft to the aorta
- What is a good proximal landing zone?
 - Normal aortic wall without thrombus or IMH
 - Parallel aortic walls with a maximal diameter of 38-40 mm
 - Length of 20 mm before the aneurysm or the primary entry tear



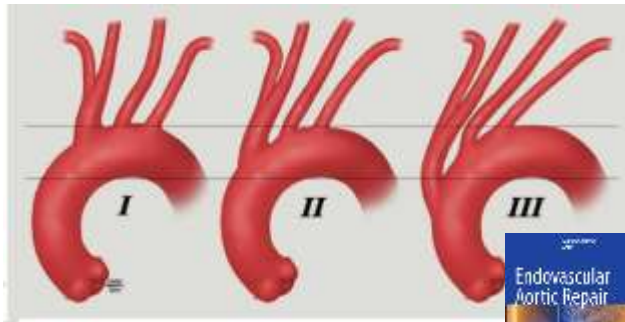
But does this apply for a landing zone in the arch?



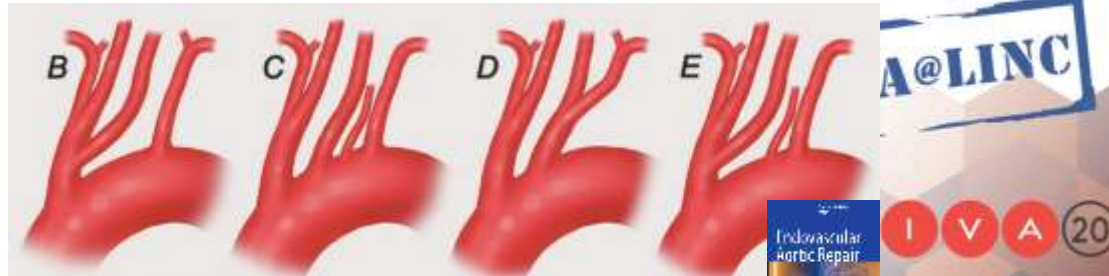
Arch Debranching: When

Anatomical arch features affecting the landing zone

Arch type and angulation



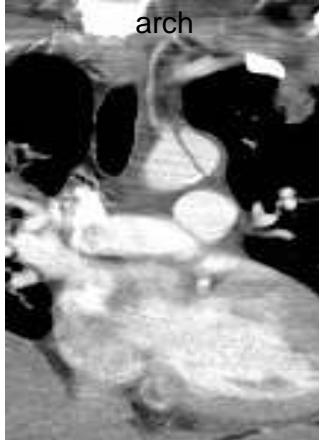
Supra aortic trunk variations



Arch Debranching: When

Anatomical arch features affecting the landing zone

Left vertebral artery
take off from the
arch



PICA anomaly



Right-sided arch with aberrant LSA with
Kommerell diverticulum



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Arch Debranching: When

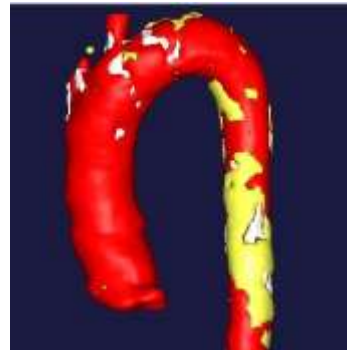
Anatomical arch features affecting the landing zone

Ascending aorta diameter

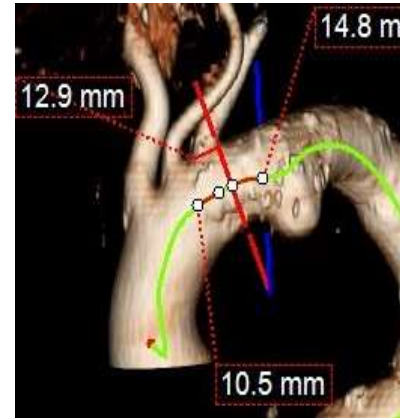


Narrow

Radius of curvature



Outer & inner curvature length



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Arch Debranching: When

Anatomical arch features affecting the landing zone

Gothic arch



Distal arch angulation



Aortic buckle treated with branch graft to LSA



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Arch Debranching: When

Trying to seal with zone 3 TEVAR

When wishful thinking is not going to work it's time to create a landing zone

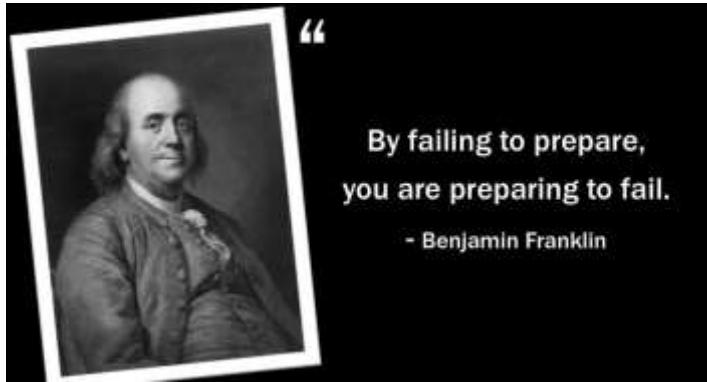


Type Ia endoleak requiring redo TEVAR

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Arch Debranching: When

Preoperative planning



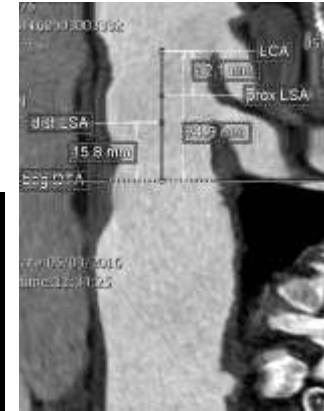
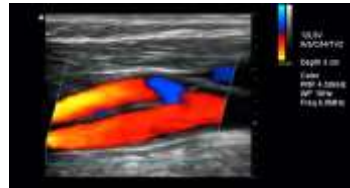
1. Imaging
2. Patient selection
3. Preparation
4. Timing with TEVAR



Arch Debranching: When

Preoperative imaging

1. Gated chest CTA
2. 3D reconstruction software with CLL
3. CTA of abdomen / pelvis
4. Carotid duplex
5. CTA head & neck
6. Circle of Willis Study



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Arch Debranching: When to Go to Zone 2

When the aorta in zone 3 is not healthy, landing zone is too short, the entry tear is too close

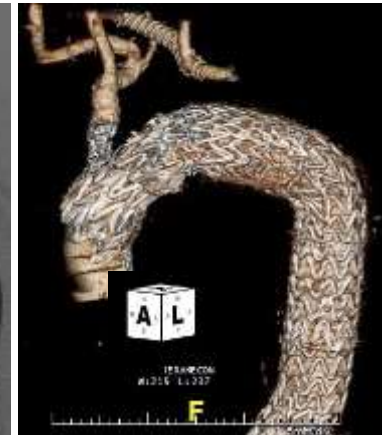
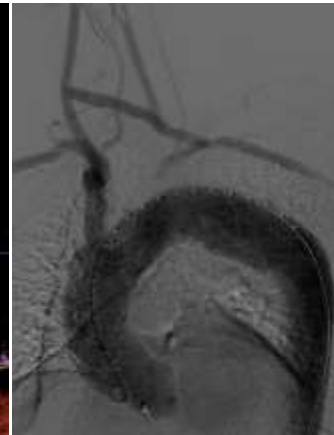


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Arch Debranching: When to Go to Zone 0

Choosing from a 10 mm seal in zone 1 to 40 mm seal zone with a zone 0 branch graft

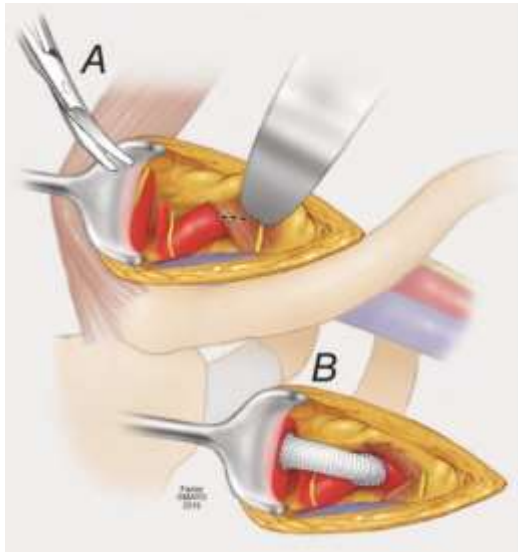


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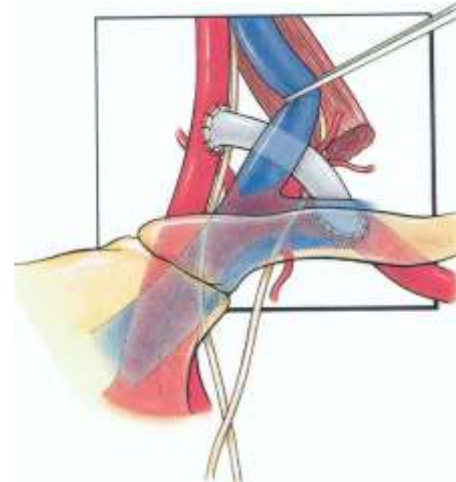
Arch Debranching: How

Zone 2: LSA

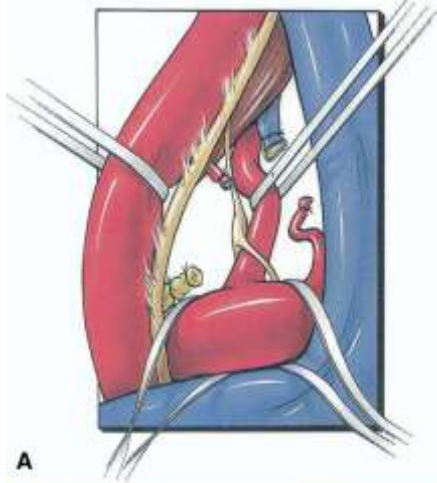
Left subclavian artery is debranched through a supraclavicular approach



LCA to LSA bypass



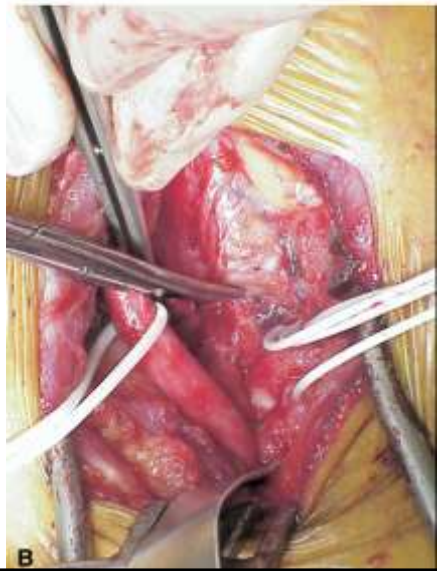
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A



LSA to LCA transposition



B



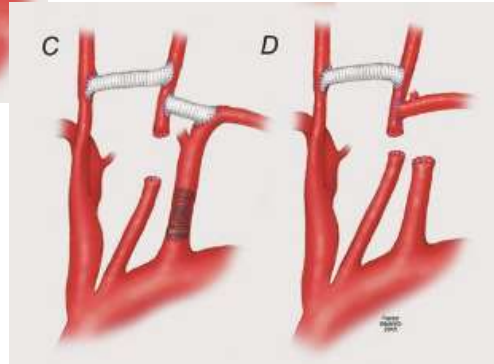
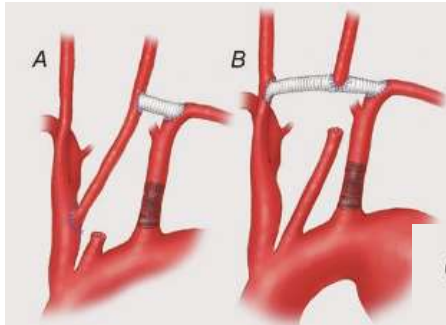
A

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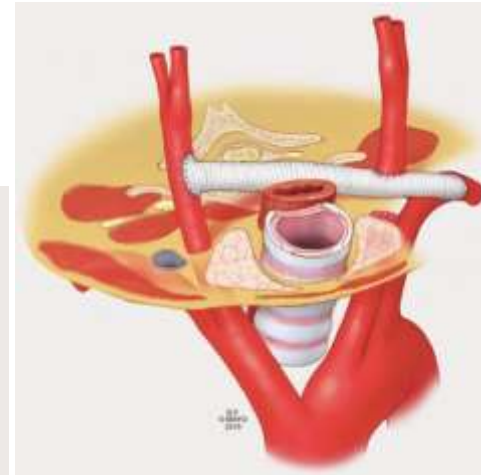
Arch Debranching: How

Zone 1: LCA & LSA

Debranching of the LCA & LSA require bilateral cervical incisions with multiple revascularization and routing options



Preferred option:
RCA to LSA bypass with LCA
transposition
through retropharyngeal
tunnel



Arch Debranching: How

Zone 0

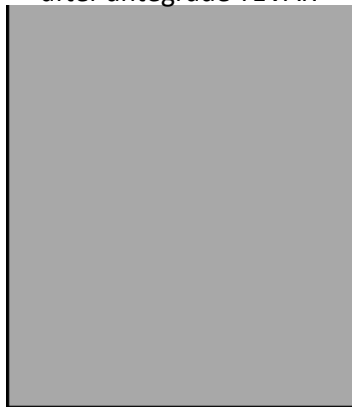
Total arch
debranching



Median sternotomy
Graft off the side of the
ascending aorta



Gold marker distal to the
debranching graft
after antegrade TEVAR



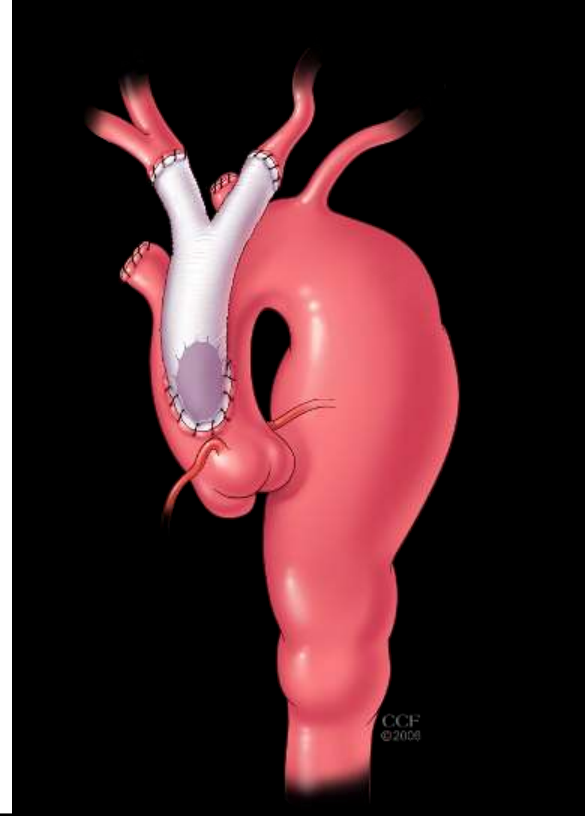
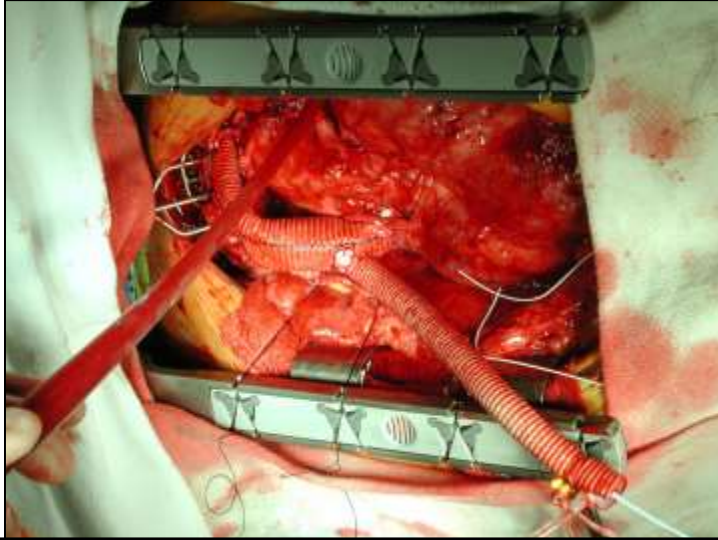
CTA @ 6 months



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Ascending Aorta Bypass

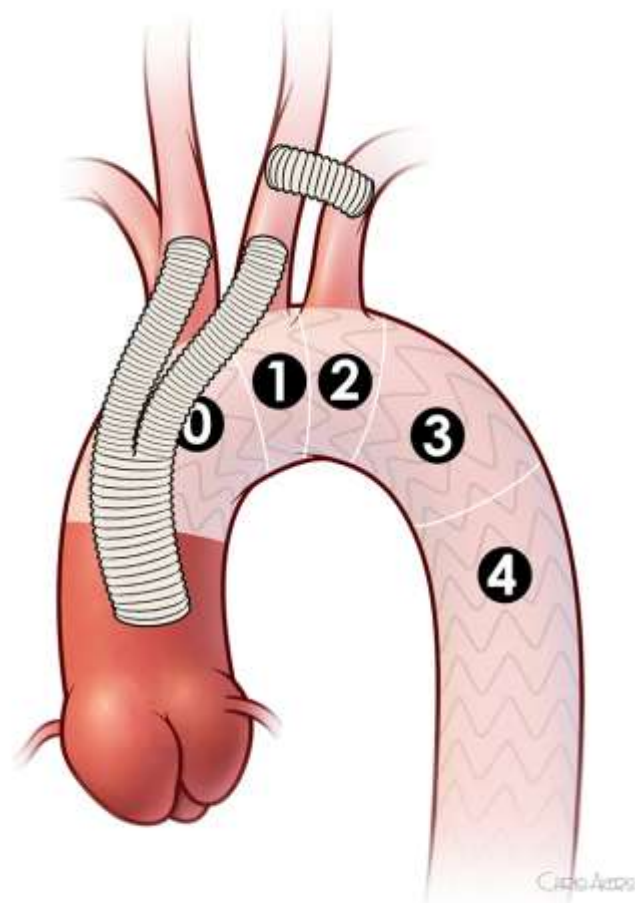
- Debranching
 - Anatomic
 - Via sternotomy



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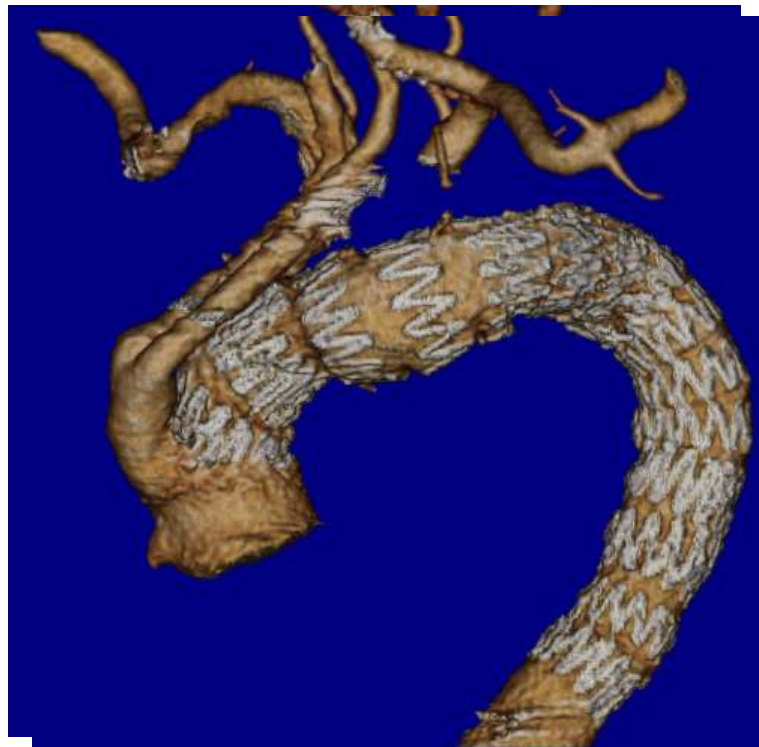
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Endovascular Completion



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Hybrid Arch Repair Meta-Analysis



- Up to Dec 2012
- 26 Studies, 956 pts
- Mortality: 11.9%
- Stroke: 7.6%
- SCI: 3.6%
- RF: 5.7%
- Cardiac Cx 6%



Hybrid Arch Repair Dissection



- Systematic review
- 2002-2011
- 50 studies, 1886 patients
- Mortality 10.8% (1.6-25%)
- Stroke 6.9% (0.8% -25%)
- SCI 6.8% (1-25%)



Hybrid vs. Open Arch Repair



- Risk adjusted comparisons using propensity score
- 143 open, 50 hybrid
- 2008-2013
- Mortality 3% vs. 2% (NS)
- Morbidity equivalent
- ICU stay 4.7 vs. 1.6 days
 - $p=0.018$

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Arch Debranching: How

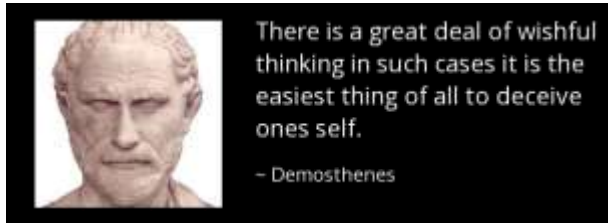
Operative principles & technical tips

- Stage the debranching (few days before TEVAR)
- Debranch the right number of vessels
- Transposition has better patency than bypass
- Keep bypass grafts short
- Use transient hypertension during clamping
- Use Tisseal at the anastomosis
- Assess degree of anticoagulation and use protamine reversal



Arch Debranching: Summary

- Wishful thinking does not create a landing zone
- Careful case planning with high-quality imaging will help determine which arch zone is appropriate and how many vessels need to be debranched
- Arch debranching can be achieved safely and meticulous execution will help avoid most complications



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DATE



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