



From Aneurysm to Ulcers:

Best strategies for management and treatment of aortic diseases

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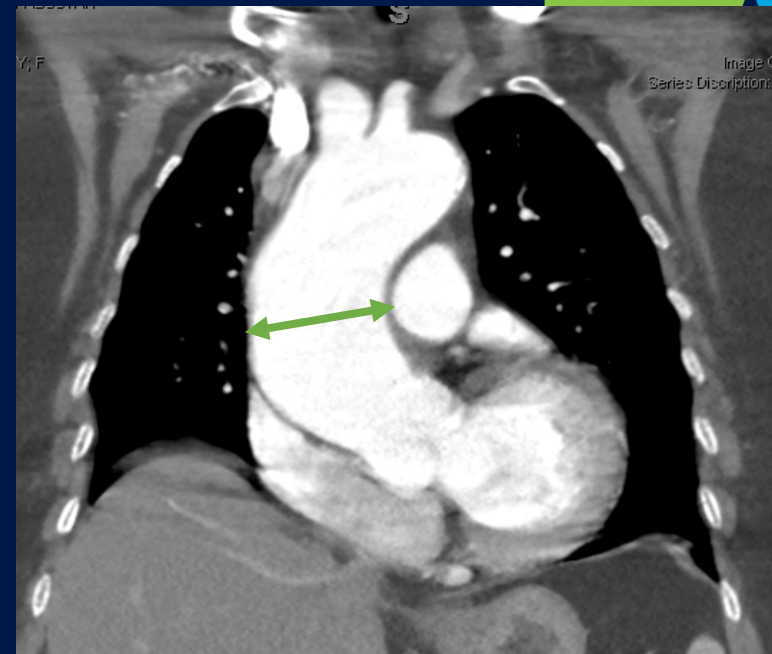
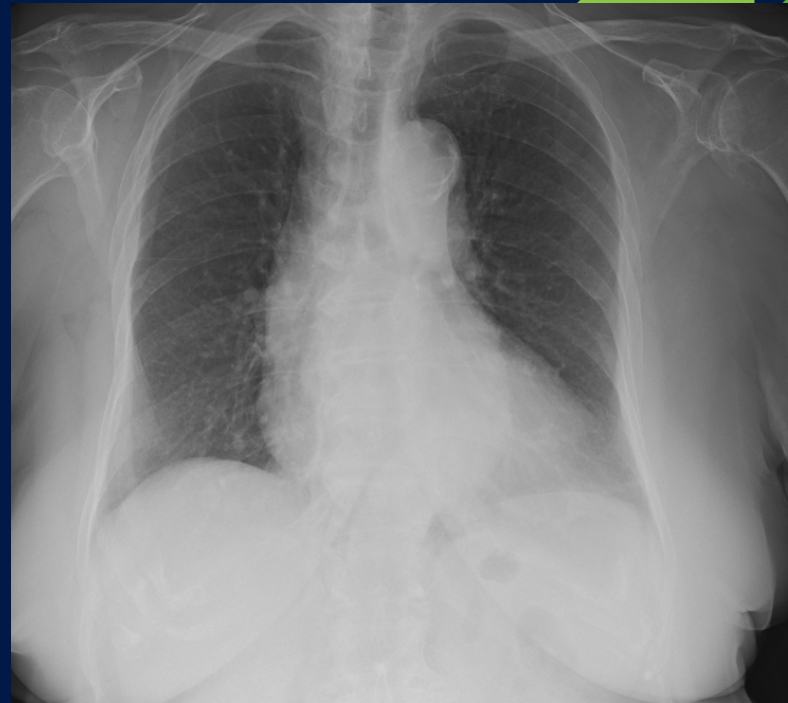
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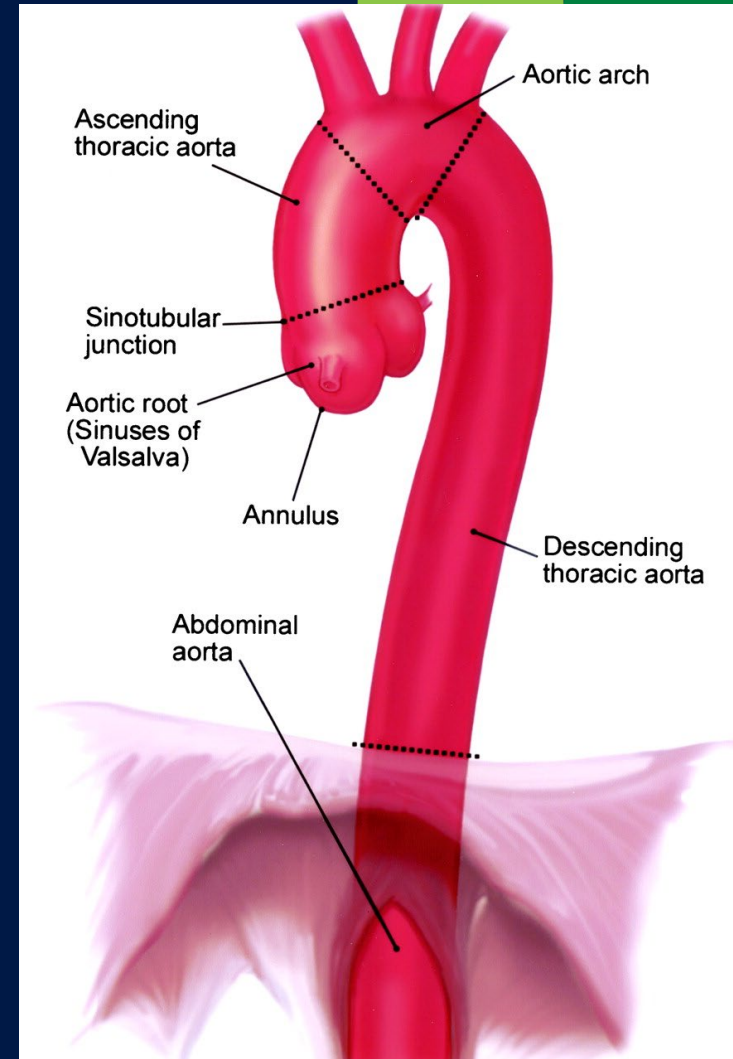
63F with SOB and cough

- CXR shows stable mild cardiomegaly**
- CT chest shows 4.3cm ascending aortic aneurysm**



Classifications

- Aneurysms 4 general anatomic categories
 - Ascending aortic aneurysms 60%
 - the aortic valve to the brachiocephalic trunk (ie, innominate artery)
 - Aortic arch aneurysms 10%
 - involves the brachiocephalic vessels
 - Descending aneurysms 40%
 - distal to the left subclavian artery
 - Thoracoabdominal 10%



Clinical presentations

- Usually **silent** unless a complication occurs (eg, dissection, rupture)
- Risk factors associated with TAA
 - Risk factors for atherosclerosis (eg, smoking, HTN, HPL)
 - Known aneurysm in the thoracic aorta or at other sites
 - (eg, abdominal aortic aneurysm)
 - Prior aortic dissection
 - Connective tissue disease—
 - Marfan, Loeys-Dietz, Ehlers-Danlos, Turner
 - Known aortic valve disease (eg, bicuspid aortic valve, aortic valve replacement, or aortic stenosis)
 - Family history of aortic dissection or thoracic aortic aneurysm
 - Cerebral aneurysm
 - man >60yo, woman >70

Prevalance

- 60% of all thoracic aortic aneurysms affect ascending aorta
- 10 out of 100,000 people each year
- 79% w/ elective surgery survive for at least 10 years after treatment
- 50% with acute untreated ascending aortic dissection die within 48 hours
- Emergency surgery 15-26% mortality
- Elective surgery lower mortality to 3-5%

Incidental TAA

- Widening of the mediastinal silhouette
- Enlargement of the aortic knob
- Displacement of the trachea from midline
- Other features include:
 - displaced aortic calcification
 - aortic kinking
 - opacification of the aortopulmonary window



Aneurysm – normal sizes

Structure	Diameter (cm), Men	Diameter (cm), Women
Aortic Sinuses	3.6 ± 0.3	3.6 ± 0.2
Ascending Aorta	2.8 ± 0.3	2.8 ± 0.2
Mid-descending Aorta	2.6 ± 0.3	2.5 ± 0.2
At Diaphragm	2.5 ± 0.3	2.4 ± 0.3



Determining TAA Etiology

- Degenerative versus genetically mediated
- Syndromic versus nonsyndromic
- Prior aortic dissection
- Imaging characteristics of underlying disorders

Pillars of Medical Management of Aortic Disease

Optimal BP control

- Target SBP < 130 and DBP < 80 mm Hg
- Consider target SBP of < 120 mm HG in high-risk patients
- Use beta blockers and ARBs

Long-term imaging surveillance and genetic evaluation

Optimal control of ASCVD and its risk factors

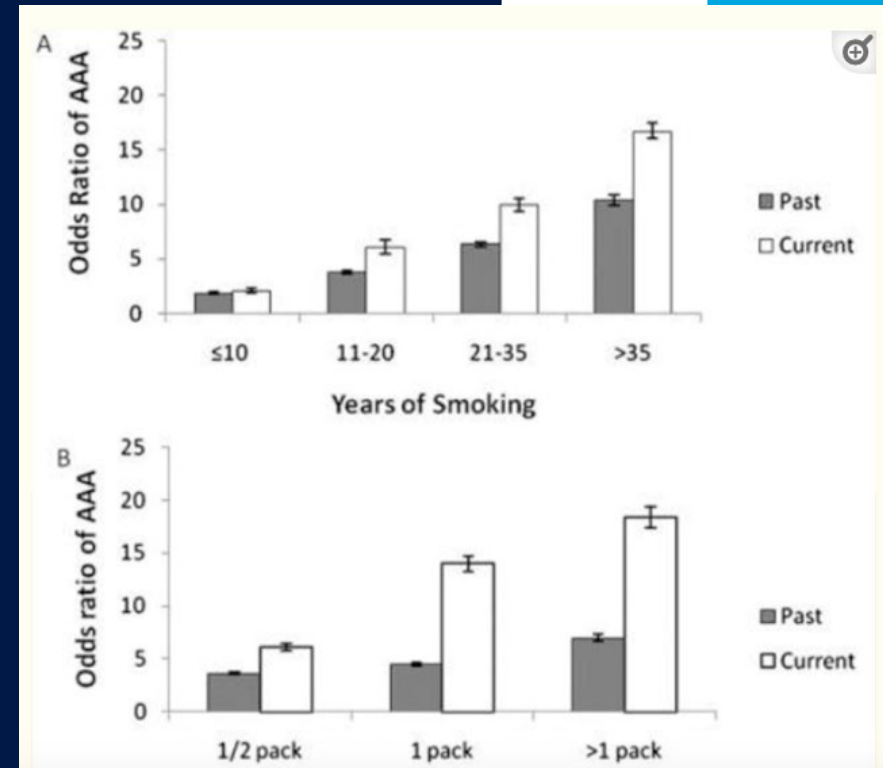
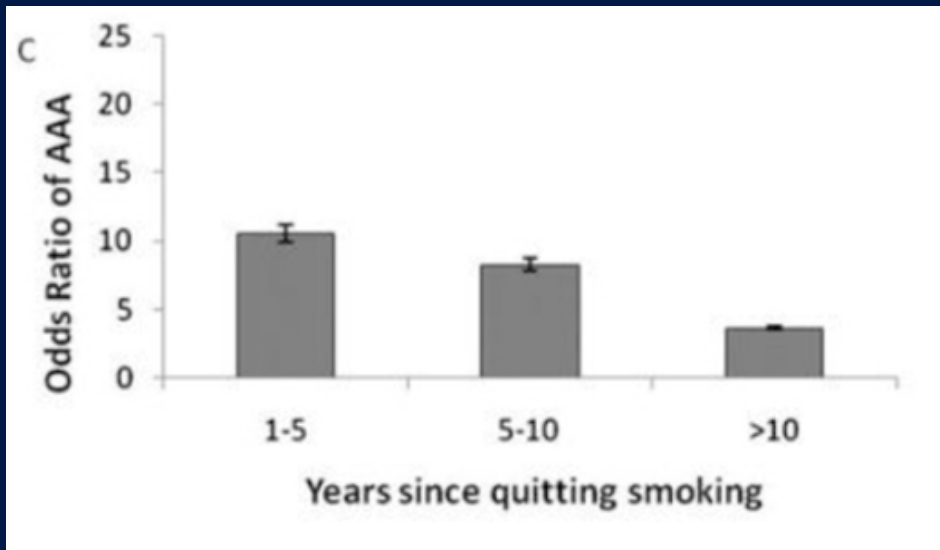
Lifestyle modifications

- Smoking cessation
- Avoiding heavy weight-lifting

Recognition of aortitis and initiation of anti-inflammatory therapies

Smoking effect on aneurysm

magnitude of risk with smoking eclipses all other modifiable risk factors



Blood pressure effect on aneurysm

- Laplace's Law:
- wall tension is proportional to the vessel radius for a given blood pressure
 - Larger diameter requires less pressure to overcome surface tension



Blood pressure control

Beta blockers

- lower blood pressure
- reduce peak left ventricular ejection rate
 - By decreasing left ventricular dP/dt and decreasing shear stress, beta blockers decrease the rate of aortic dilatation
- decrease dP/dt and shear stress in the aorta

ACEi/ARB

- Matrix metalloproteinases (MMPs) implicated pathogenesis of aortic aneurysm
 - histology characterized by the loss of smooth muscle cells in the aortic media and the destruction of extracellular matrix (ECM)

Blood pressure control

Goals

- less than 140/90 mm Hg, or 130/80 mm Hg in those with diabetes or chronic kidney disease (evidence level B)
- Heart rate goal of 70 beats per minute or less, as tolerated

Lifting/Activity restrictions



Graded approach based on aortic diameter:

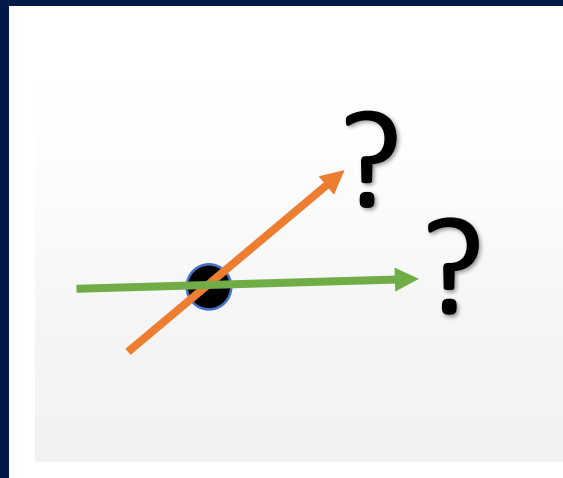
- 0 to 4.4 cm — lift no more than 75 to 100 lbs
- 5 to 5 cm — lift no more than 50 to 60 lbs
- 5 cm — lift no more than 25 to 40 lbs

*not lifting anything heavier than half of one's body weight

- avoid breath-holding or performing the Valsalva maneuver while lifting

Surveillance

- CTA chest
- Transthoracic echo
- MRA
- CT chest without contrast vs with contrast



Management of thoracic aortic aneurysm in adults - surveillance

Degenerative aortic root or ascending aortic aneurysm:

- 3.5 to 4.4 cm: Annual CT or MR angiography, TTE to follow valvular disease (if needed)
- 4.5 or greater: Biannual (every six months) CT or MRA
TTE to follow valvular disease (if needed)

Genetically mediated aortic root or ascending aortic aneurysm:

- 3.5 to 4.4 cm: Annual echocardiogram, CT, MRA
- 4.5 to 5.0 cm: Biannual (every six months) TTE, CTA/MRA

Descending aortic aneurysm:

- 4.0 to 4.9 cm: Annual CT or MR angiography
- 5.0 to 6.0 cm: Biannual (every six months) CT or MR angiography



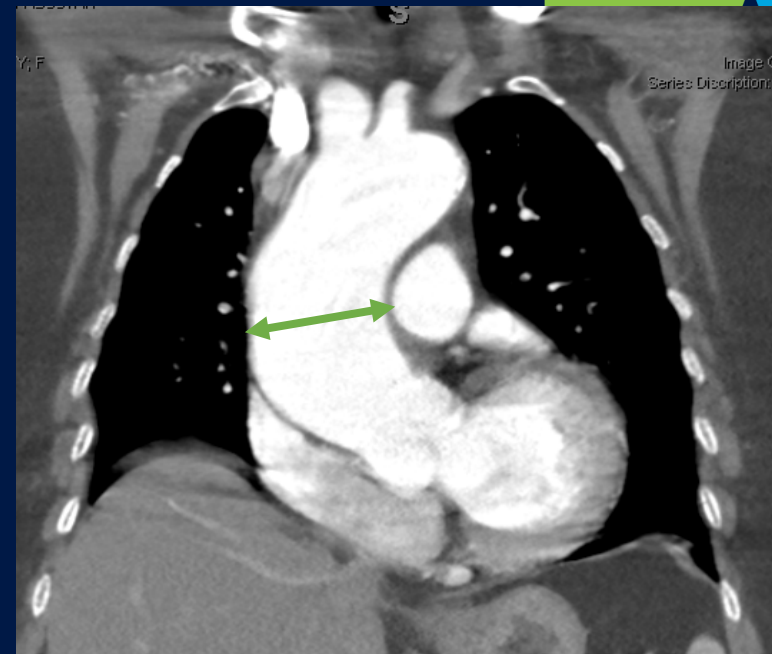
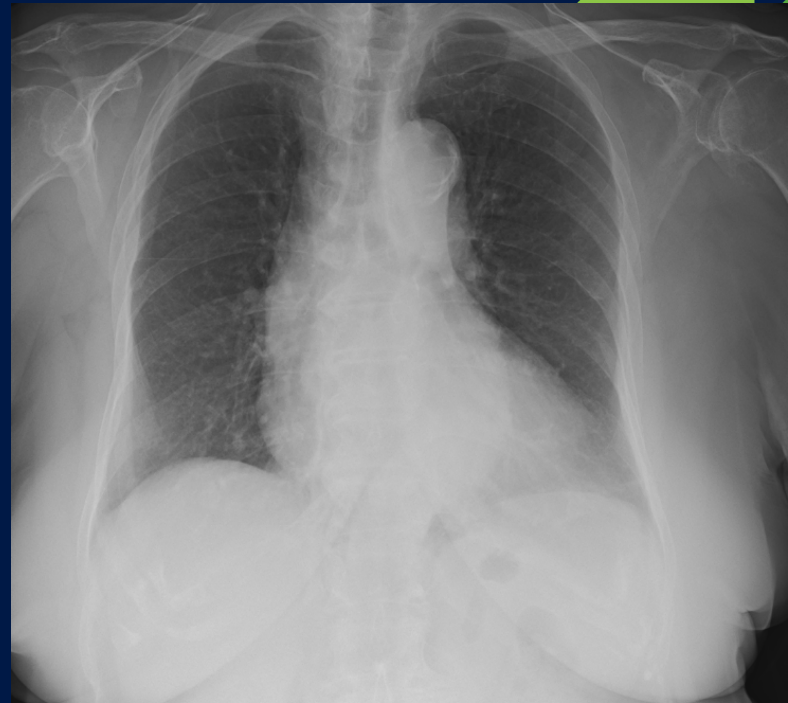
Growth

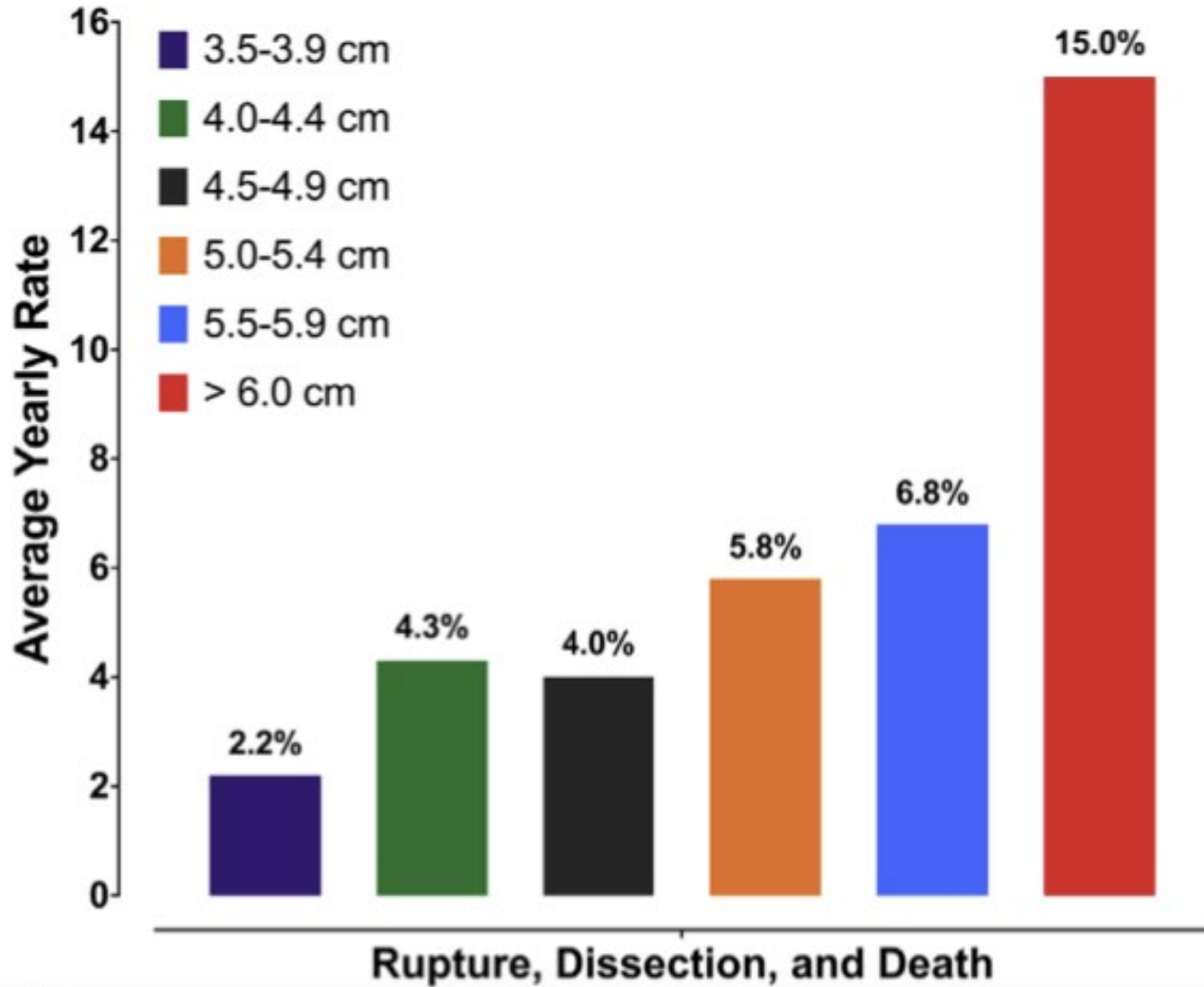
- Annual growth varied from 0.10 cm/yr for small (4.0 cm) aneurysms to 0.19 cm/yr for large (8.0 cm) aneurysms
- growth rate faster for:
 - BAV
 - connective tissue
 - larger aneurysms
 - chronic dissections

Indications for surgical repair

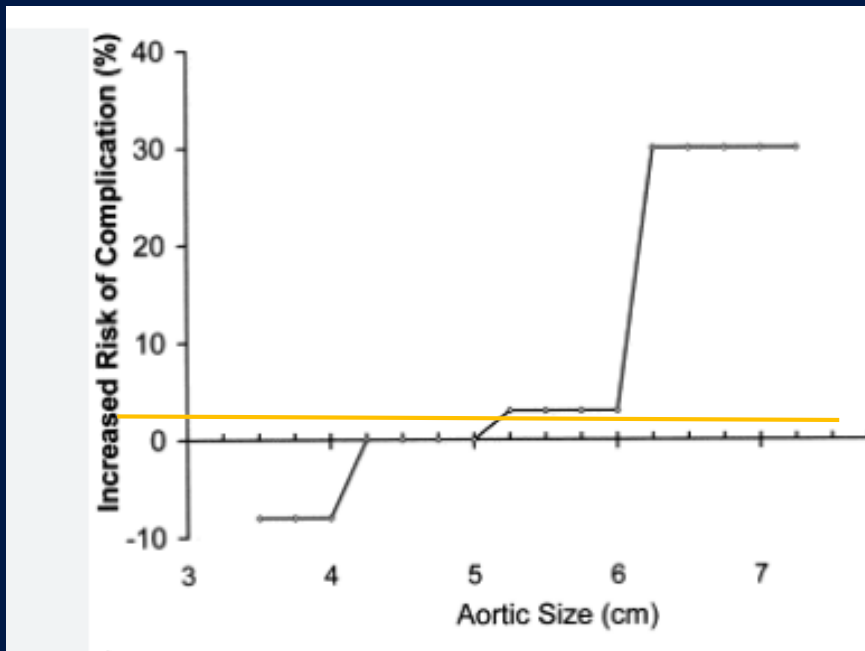
1. Asymptomatic >5.0 cm (or Index)
2. Symptomatic aneurysm irrespective of size
3. Asymptomatic >4.5 cm (with Marfan's syndrome)
4. Complication
 - Acute dissection or rupture
5. Pseudoaneurysm or traumatic aneurysm in the ascending aorta
6. >4.5 cm concomitant surgery
7. Growth rate of >0.5 cm/yr
8. Descending >5.5 cm

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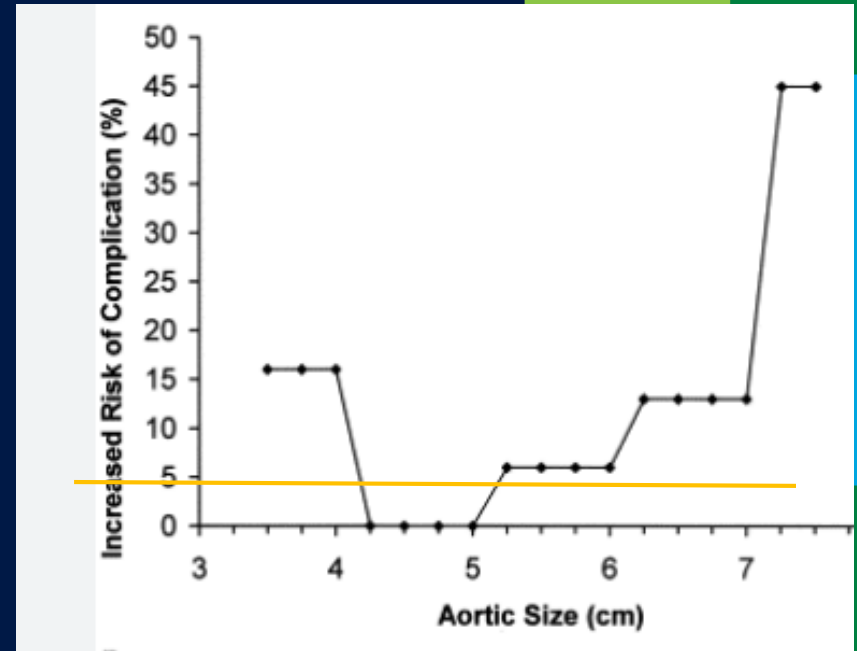




Why not fix now?



Ascending Ao



Descending Ao

AI and BAV

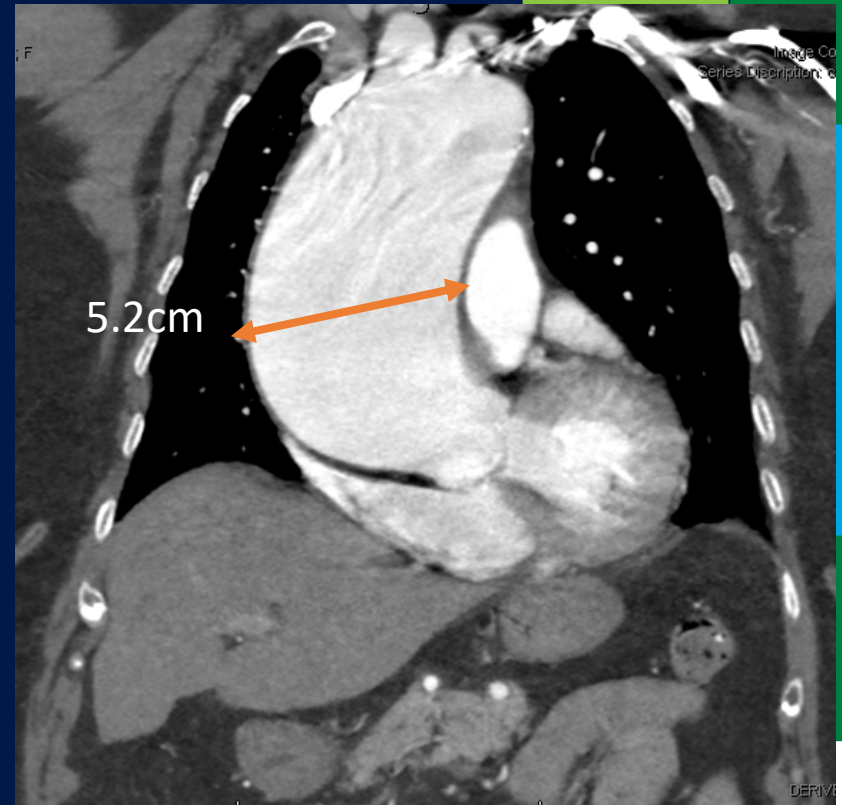
Aneurysms of the ascending aorta are frequently associated with aortic insufficiency (AI) despite normal aortic valve leaflets

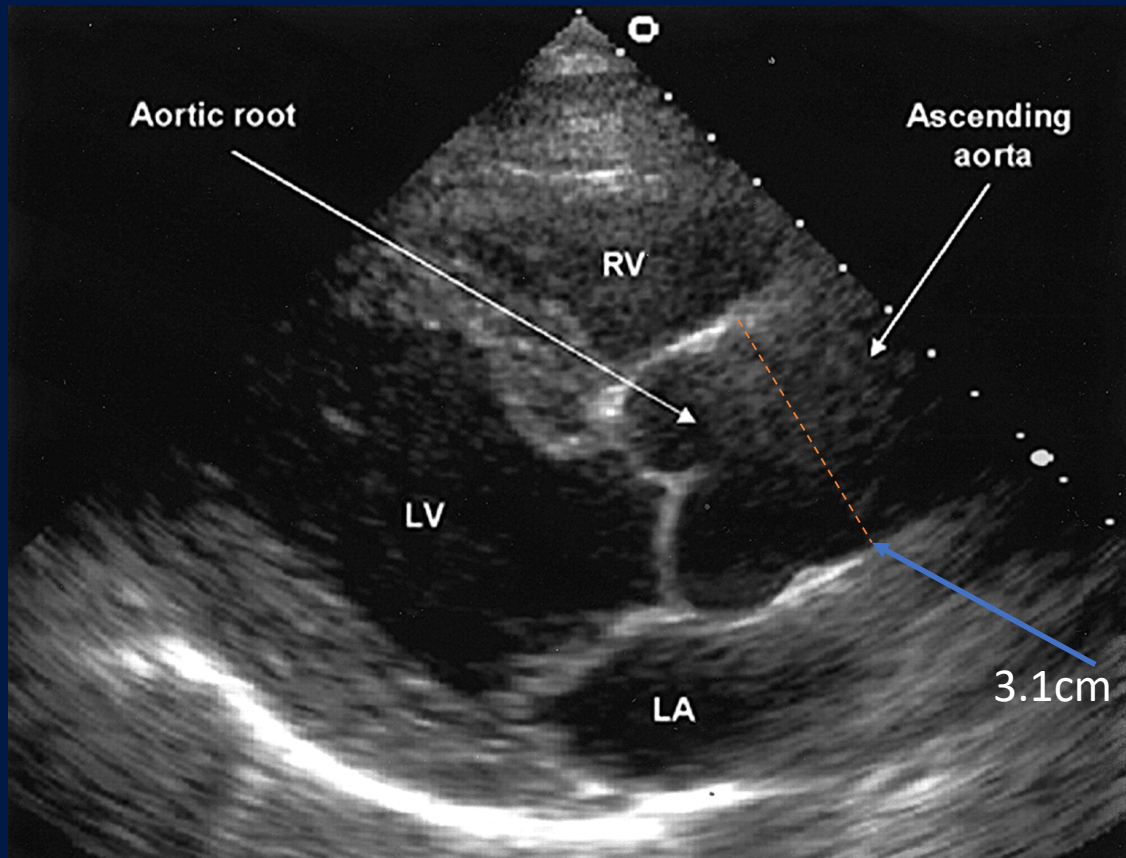
Prevalence of aortic dilation and bicuspid aortic valve disease ranges from 20 to 84% depending

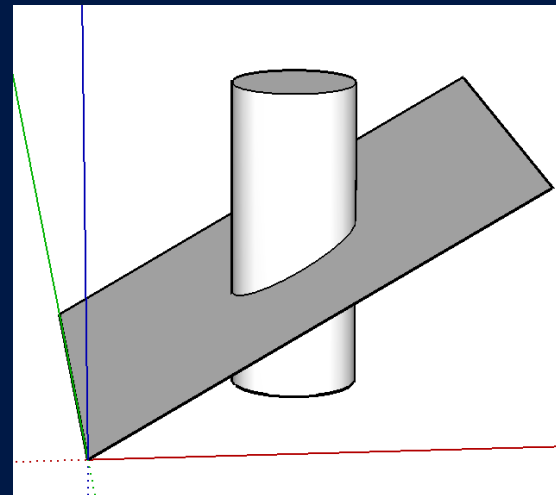
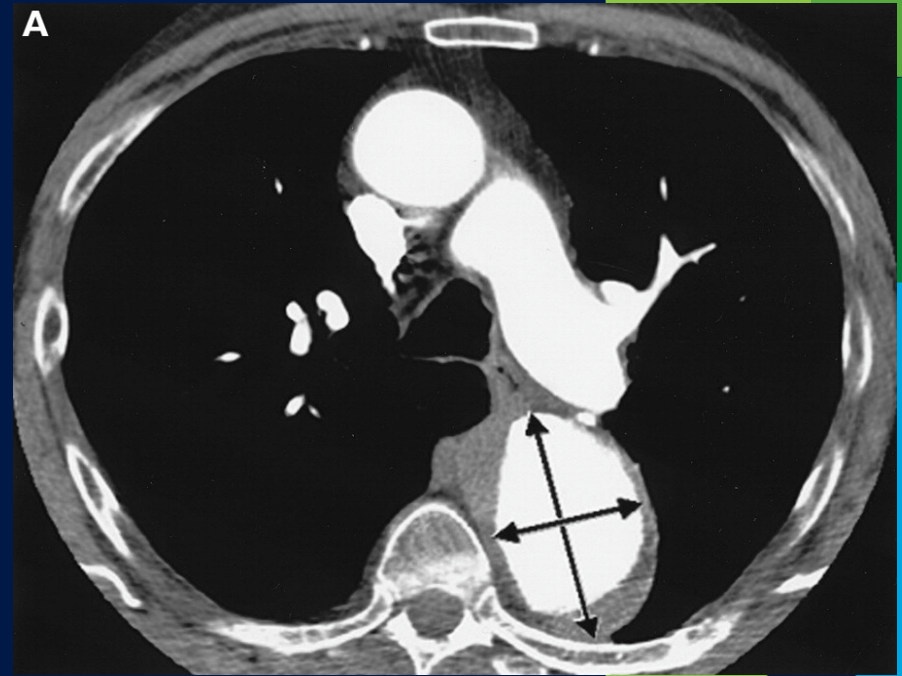
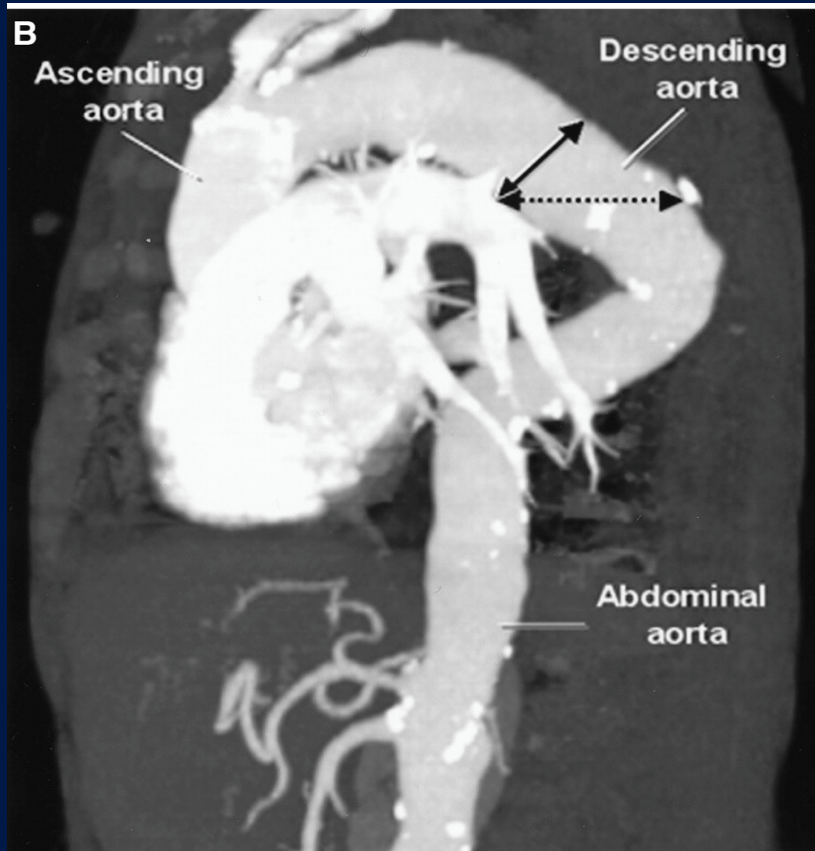


1 yr later...

63F now with 5.2cm ascending aortic aneurysm







When to refer to surgeon?

- Size thresholds for surgical intervention
- Should not wait until these thresholds are reached however
 - beneficial to the state of mind of a potential surgical candidate to have early discussions pertaining to the area of concern and the types of operations available, their outcomes, and associated risks and benefits



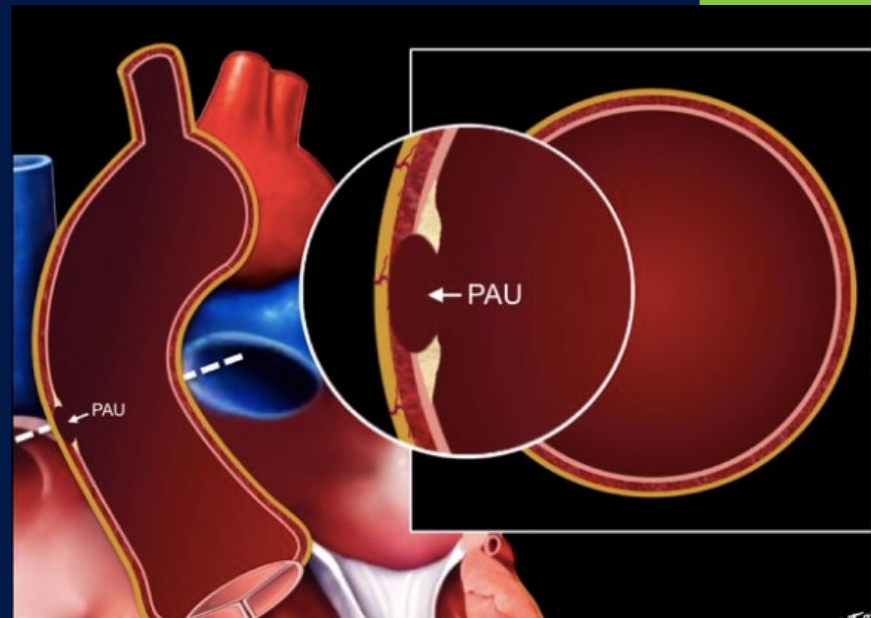
When to refer to geneticist

one or more first-degree relatives
of a patient with thoracic aortic
aneurysm or dissection are found
to have aneurysmal disease



Atherosclerosis of Aorta

- Nearly 2-2.5 cm above the aortic root (the most common site)
- Just distal to the origin of the left subclavian artery
- In the aortic arch



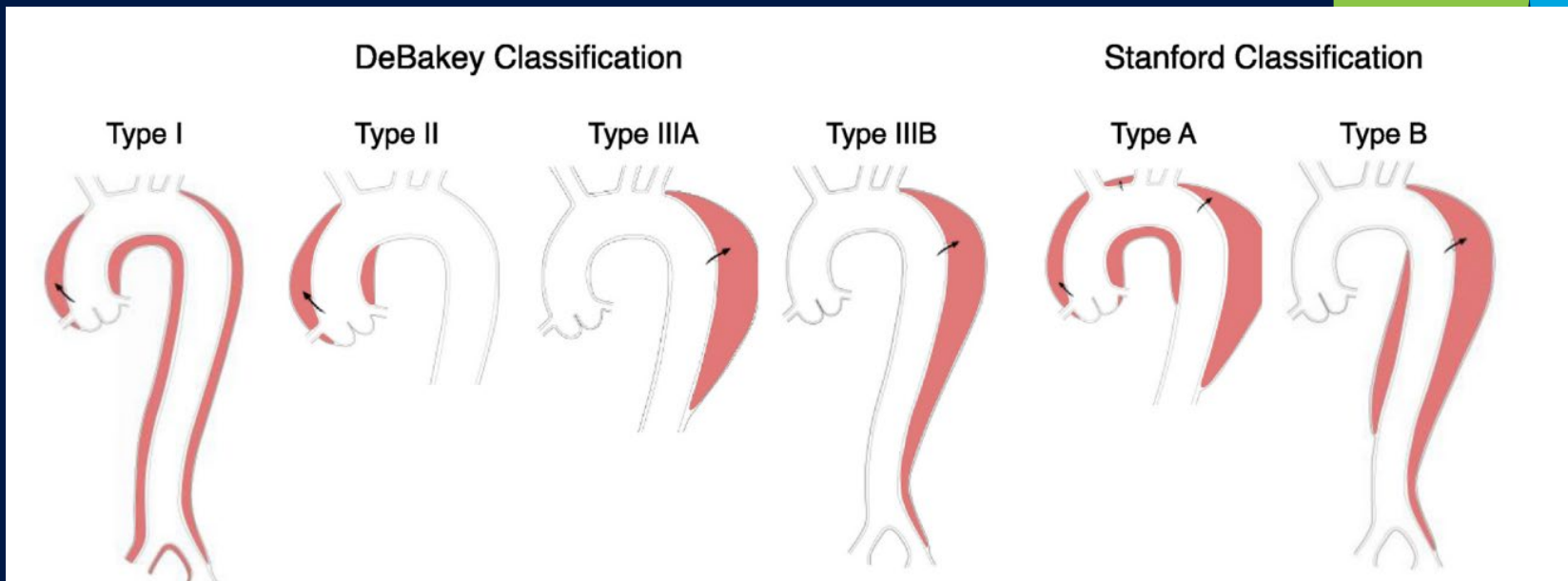
Dissections

Hyperacute – <24 hours

Acute – 1 to 14 days

Subacute – 15 to 90 days

Chronic – >90 days





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Surgical repair

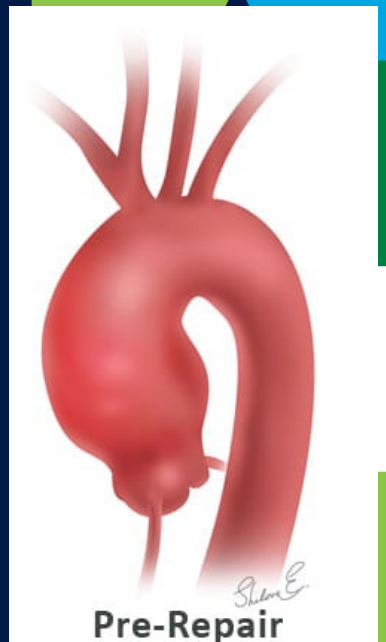
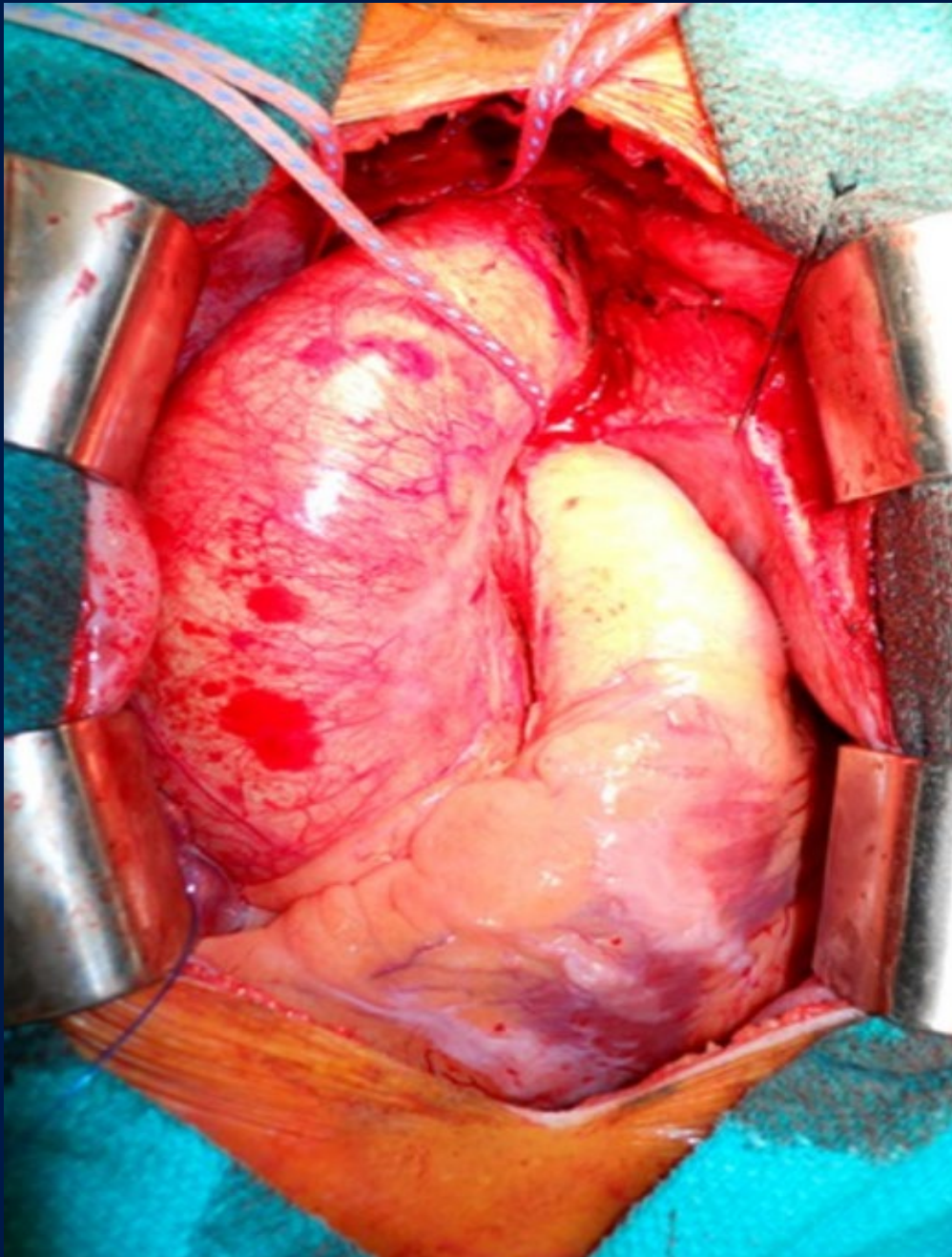
- **Approach to repair**
 - Open
 - Endovascular
 - hybrid+



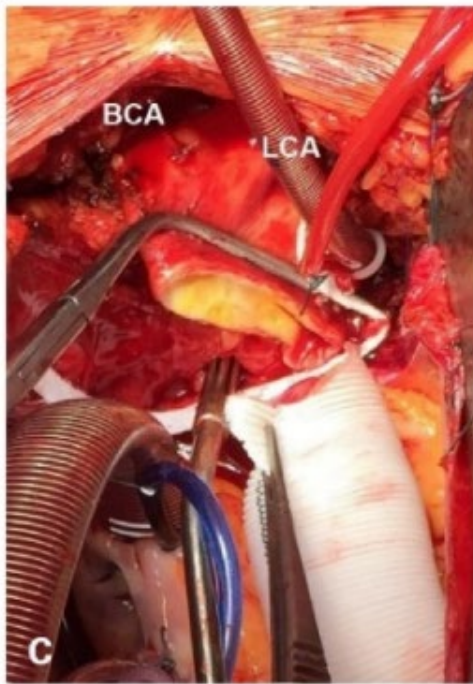
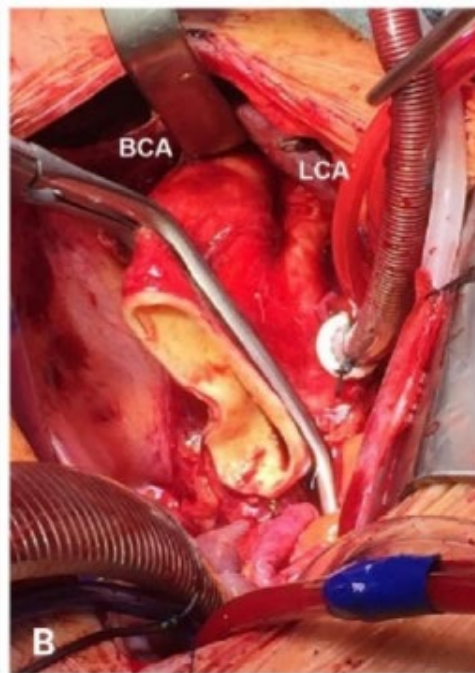
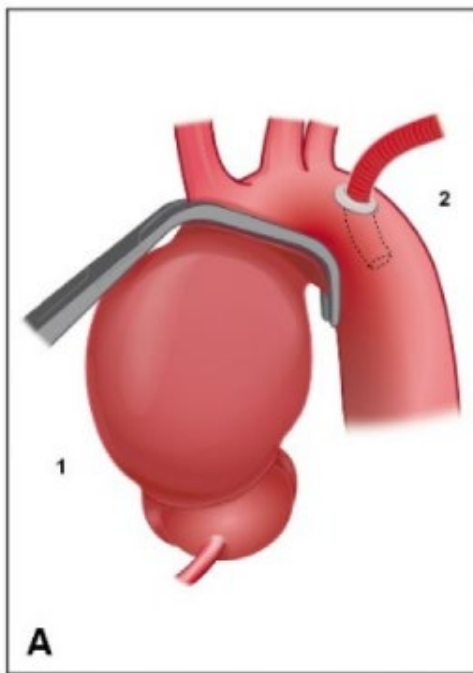
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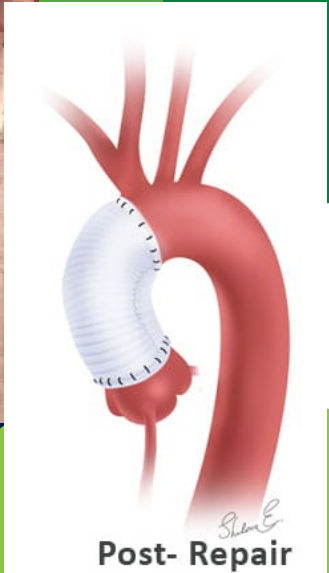
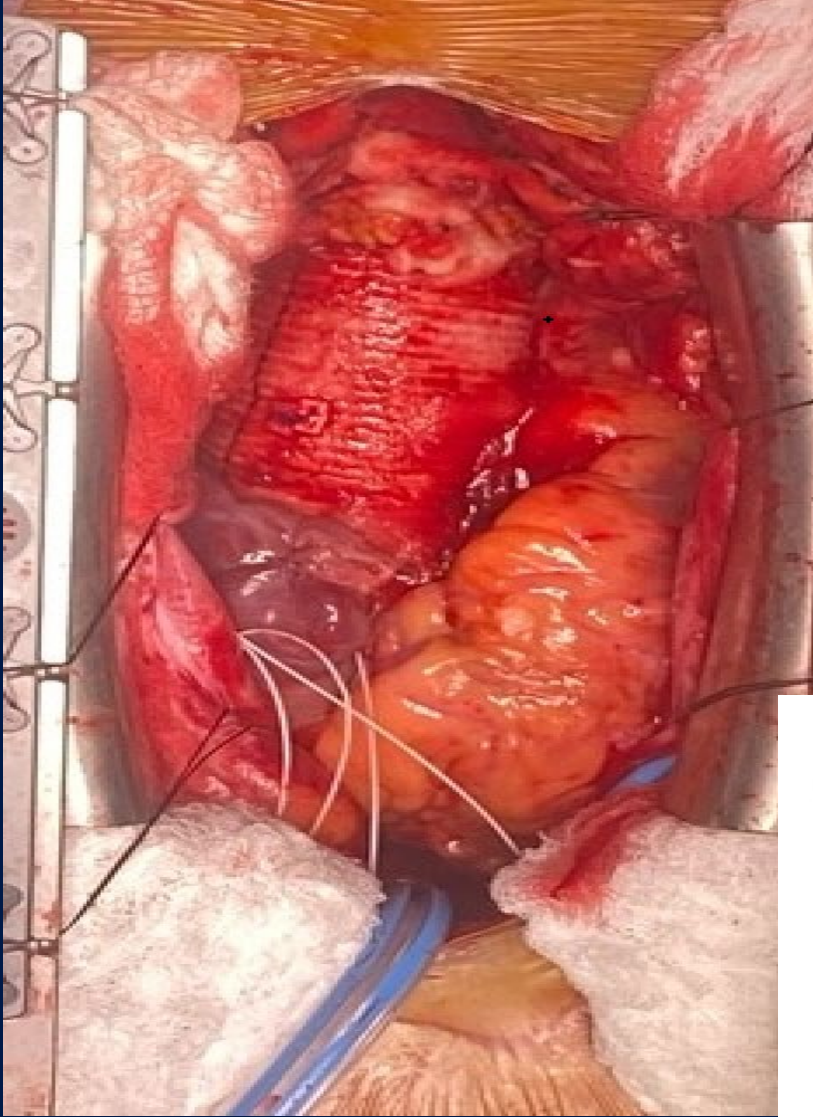
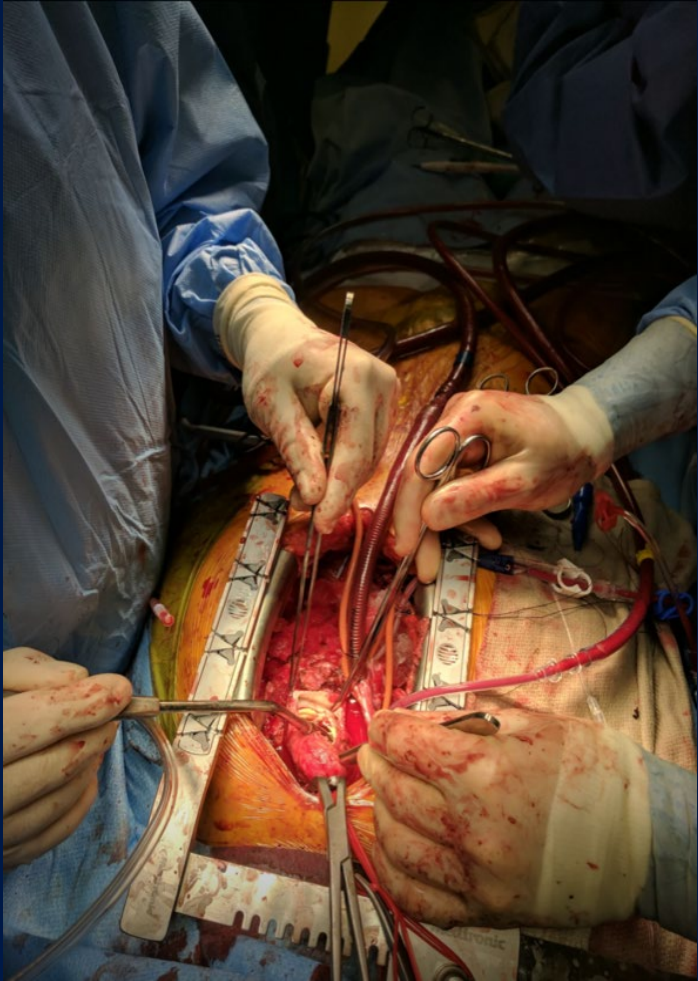
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Pre-Repair





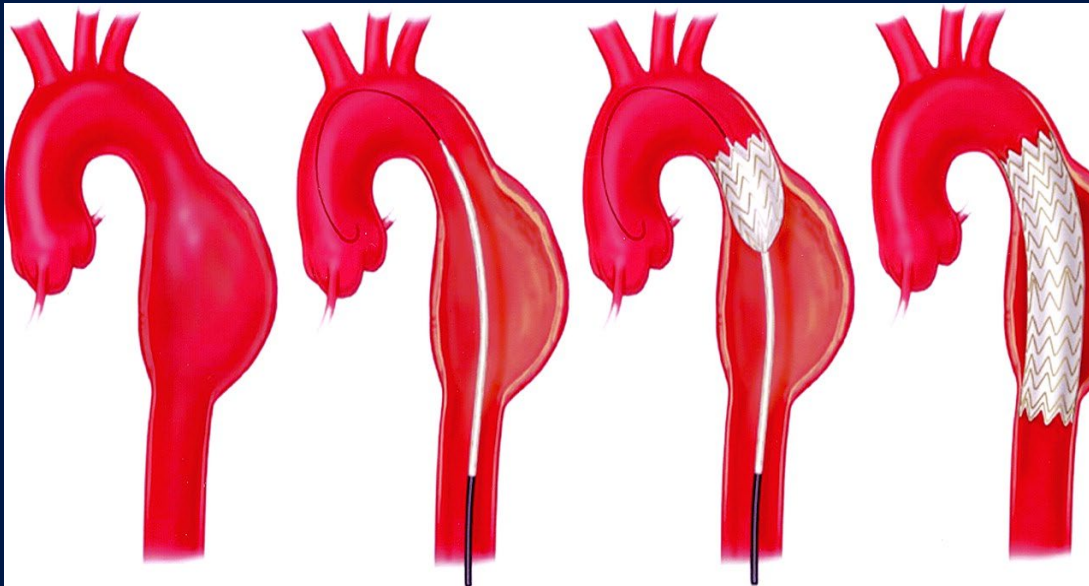
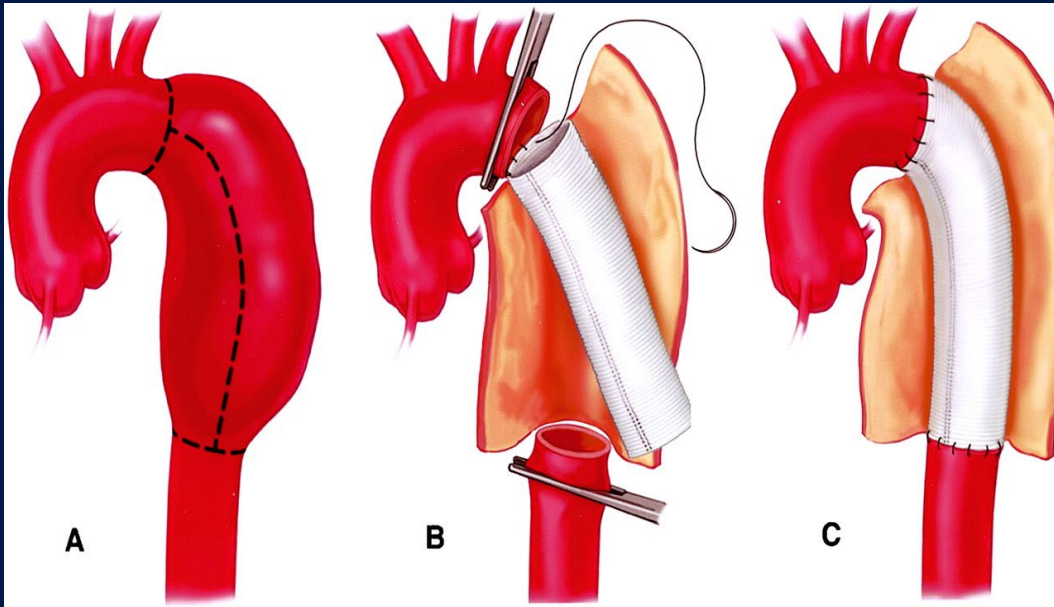


Descending Aortic repair

- **Degenerative descending TAA**
(asymptomatic, symptomatic) - does not involve the visceral segment
 - endovascular rather than open
- **Syndromic descending TAA**
 - open surgical approach
- **Nonsyndromic TAA** still unknown



Open



TEVAR





Questions?

