Aortic Disease: Evaluation, Management, and Long-Term Follow-Up in an APP-Led Clinic

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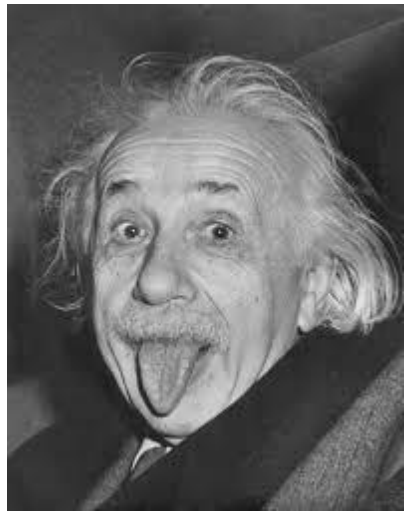
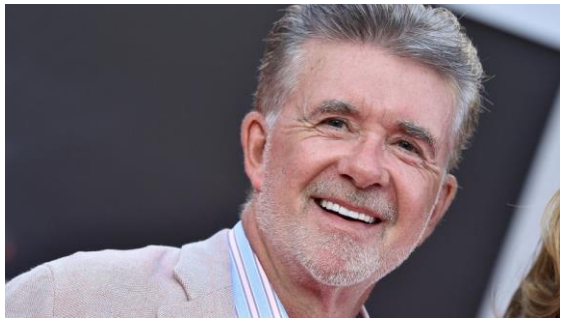
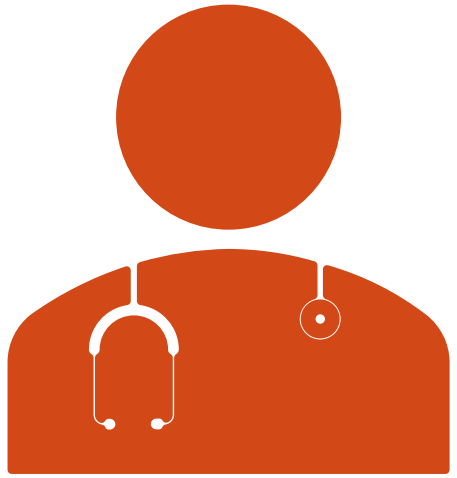
What do all of these people have in common?





By the end of this presentation, you will be able to:

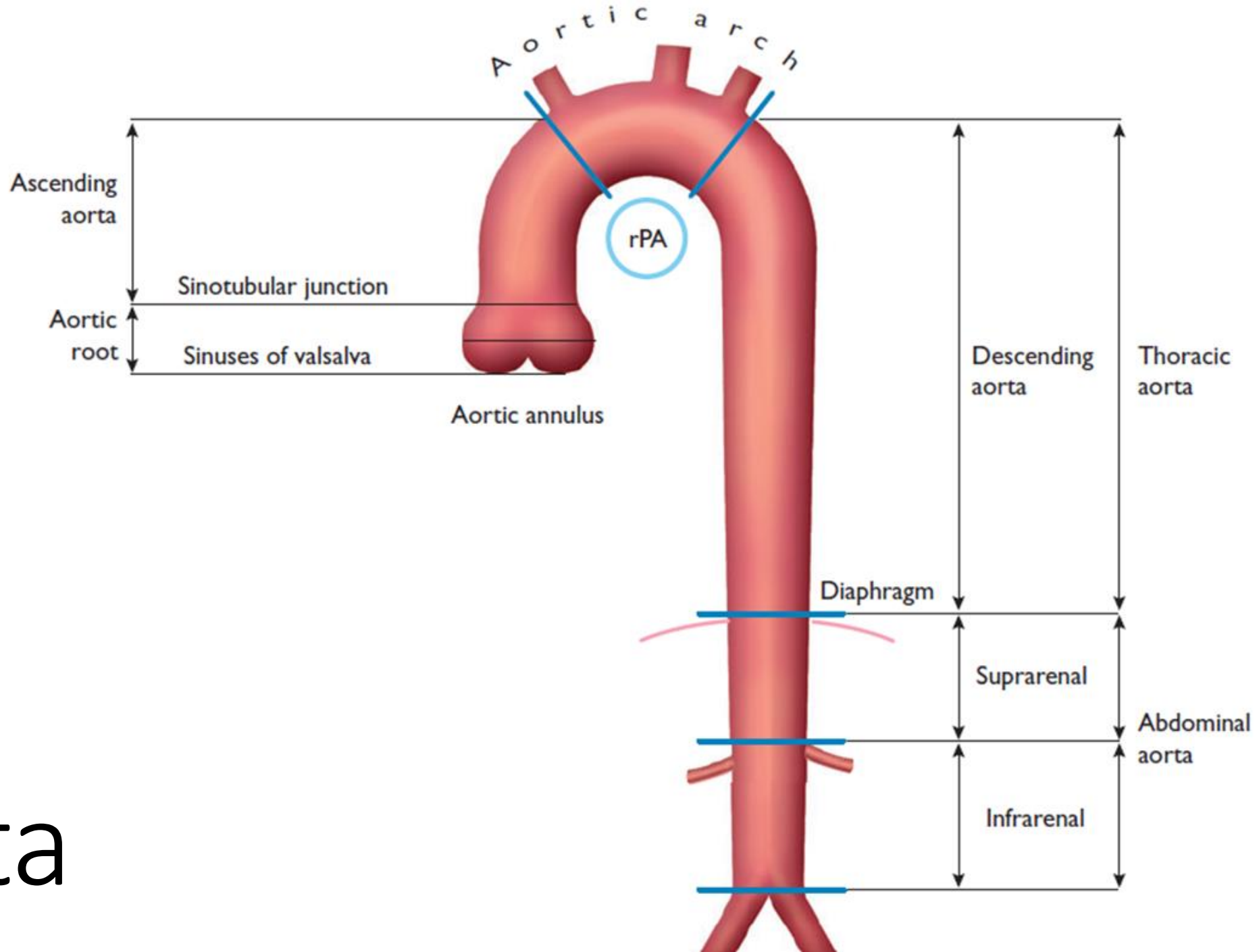
- Define what aortic aneurysm and acute aortic syndromes are
- Recognize clinical presentation and risk factors of aortic disease
- Explain management of aortic disease, conservative versus surgical



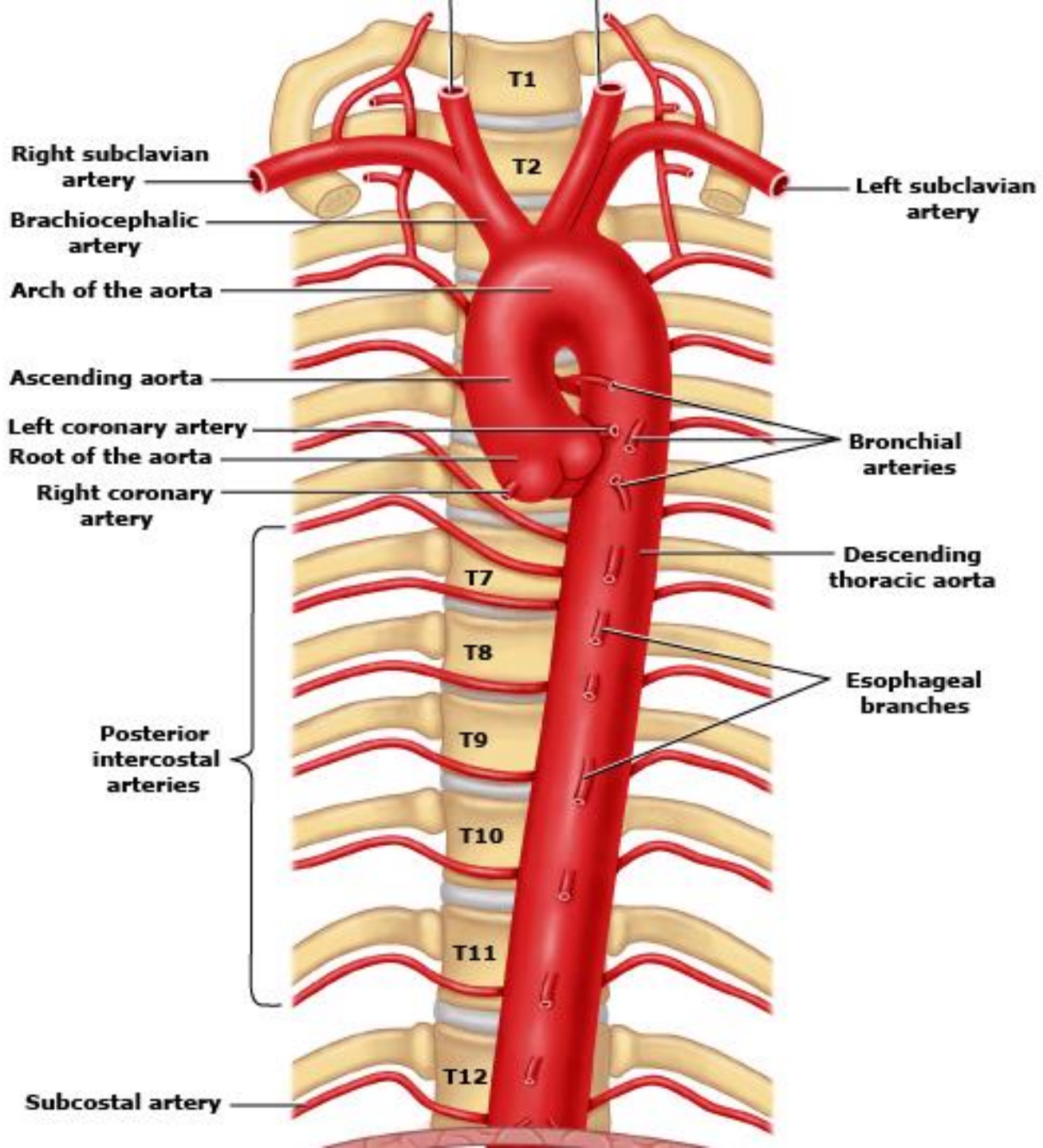
Importance of Aortic Health

- Aortic aneurysm and dissection accounted for 9,317 deaths in 2020
- In 2019, about 59% of deaths due to aortic aneurysm or aortic dissection happened among men
- A history of smoking accounts for about 75% of all abdominal aortic aneurysms
- The U.S. Preventive Services Task Force recommends that men 65 to 75 years old who have ever smoked should get an ultrasound screening for abdominal aortic aneurysms, even if they have no symptoms
- Acute aortic dissection of the ascending aorta is highly lethal, early mortality of 1% to 2% per hour after symptom onset.
- It is difficult to assess the prevalence and incidence of TAA because TAA is a clinically silent disease
- The cumulative expenses for long-term specialty care, rehabilitation, surveillance, and preop and postop imaging, combined with frequent readmissions for elective or emergency surgical or endovascular repair, are likely to further escalate over time

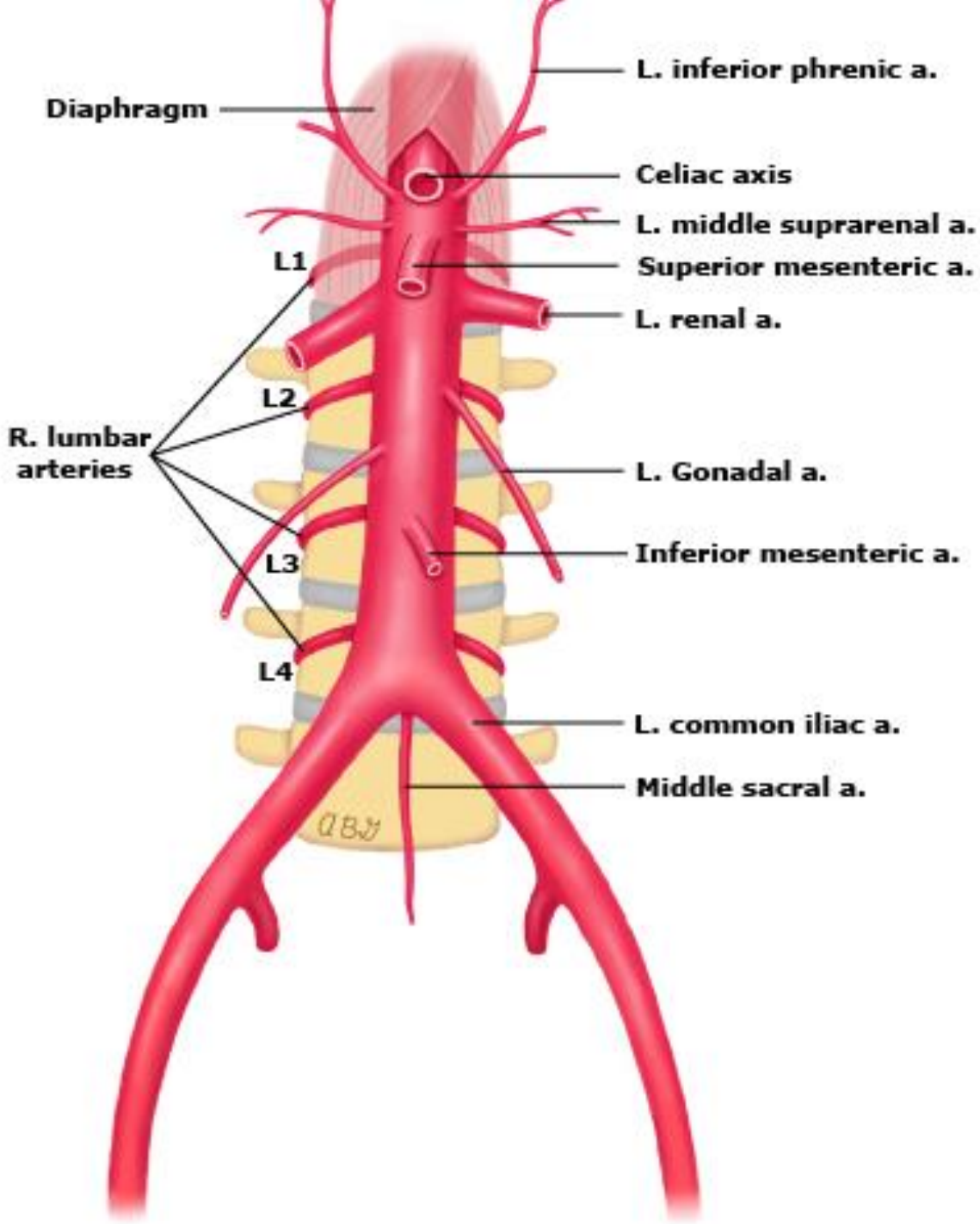
Aorta

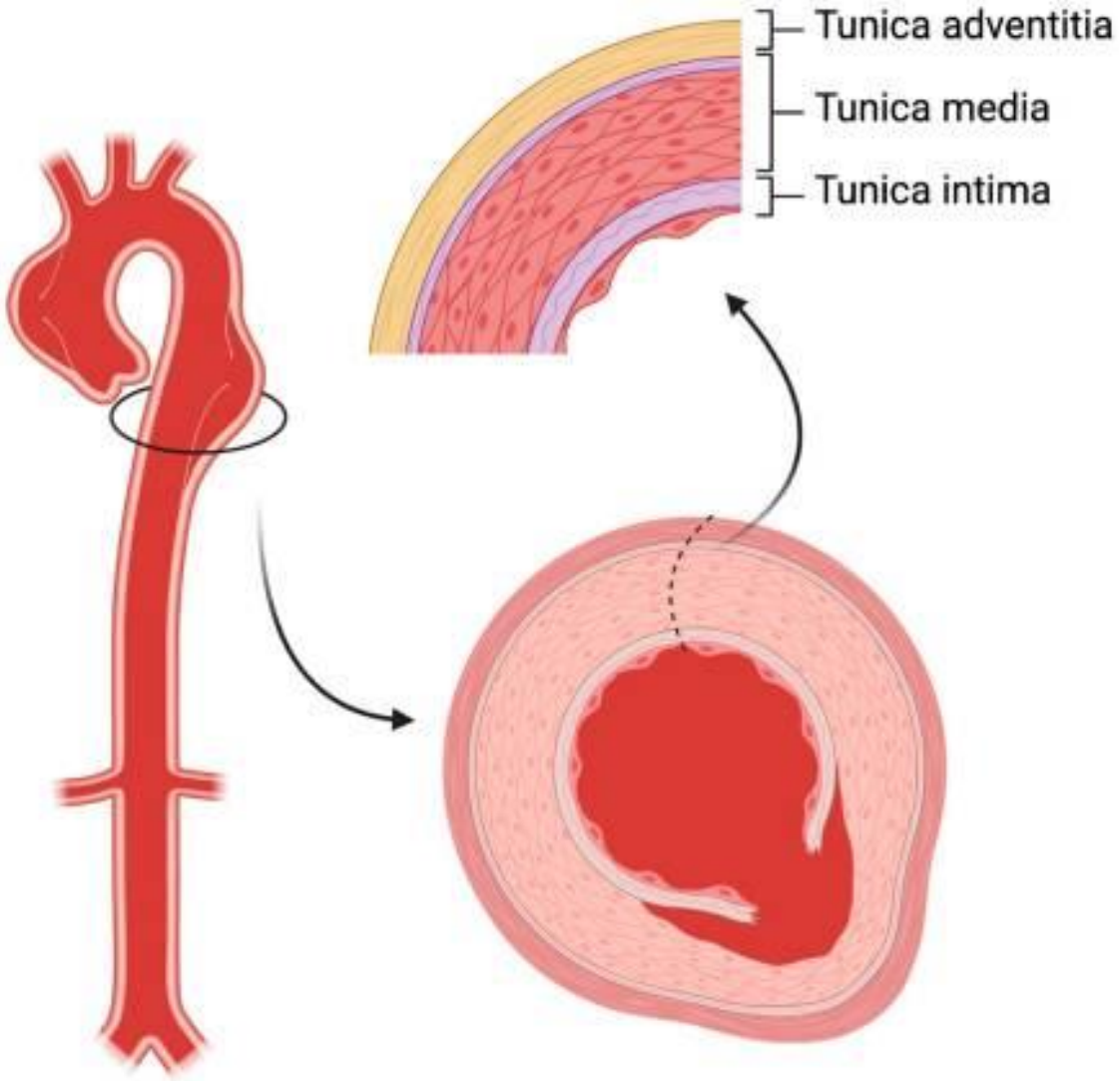

Aortic arch
Ascending aorta
rPA
Sinotubular junction
Aortic root
Sinuses of valsalva
Aortic annulus
Descending aorta
Thoracic aorta
Diaphragm
Suprarenal
Abdominal aorta
Infrarenal

Aortic Branches: Thoracic Aorta



Aortic Branches: Abdominal Aorta





Histology of the aortic wall

- tunica intima
- tunica media
- tunica adventitia

Normal Aortic Dimensions

- Normal aortic diameter varies with age, gender, and body habitus
- An aortic scaling index (ASI), calculated as diameter (cm)/body surface area (m2), is more predictive of clinical events than absolute aortic diameter (ex: women dissect at smaller diameter)
- In healthy adults, aorta tapers gradually downstream
- Thoracic aortic diameters do not usually exceed 40 mm; and abdominal diameter is less than 30 mm
- The rate of normal aortic expansion is about 0.9 mm in men and 0.7 mm in women for each decade of life

Case study: E.Z.

51Y female who presents for her annual physical. She reports feeling well with no changes to her health.

PMH significant for HTN, HLD, former smoker 1 PPD x 20Y, cholecystectomy

Both parents alive/well, no major health issues besides HTN

VS: 150/92, HR 80, RR 16, O2 sat 99% RA.

PE: RRR, 2+ diastolic murmur, lungs CTAB, no edema

Aortic Aneurysm (AA): Definition

- Aneurysm - a *permanent* localized dilation of a blood vessel having at least a 50 percent increase in diameter compared with the expected normal diameter for that aortic segment
- Ectasia- arterial dilatation less than 50% of normal arterial diameter
- Arteriomegaly - diffuse arterial dilatation involving several arterial segments with an increase in diameter greater than 50% by comparison to the expected normal arterial diameter

Histopathology & Pathogenesis

Medial degeneration - smooth muscle cell necrosis and elastic fiber degeneration with increased deposition of proteoglycans

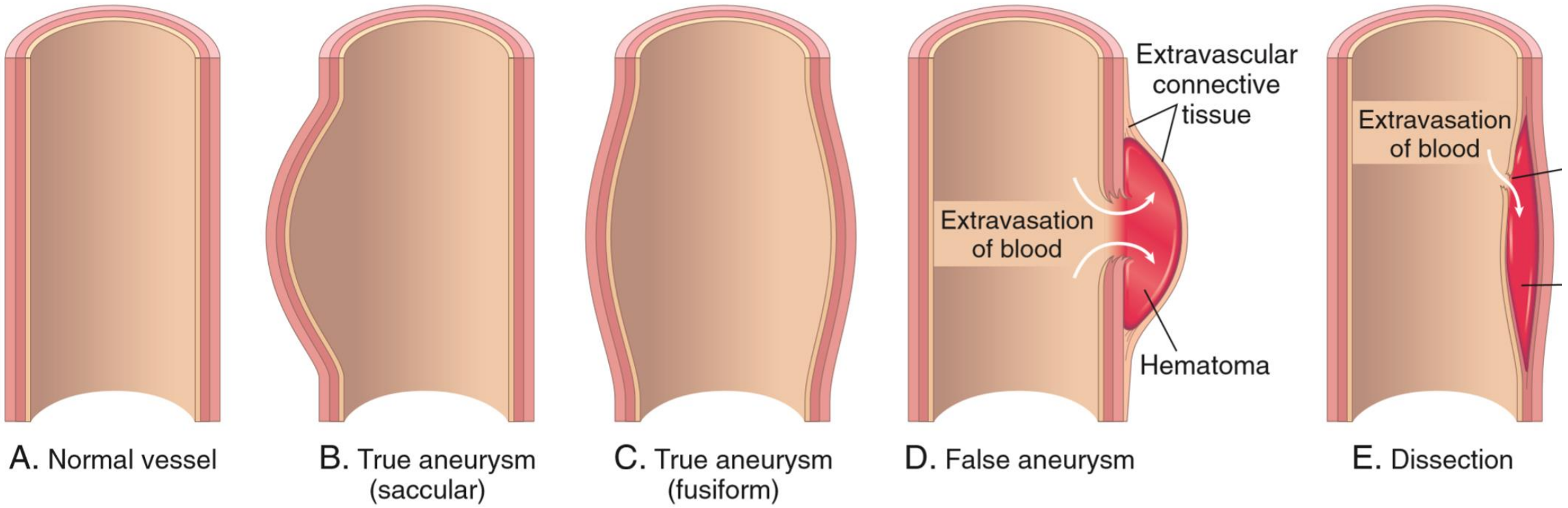
Atherosclerosis (atheromata formation)

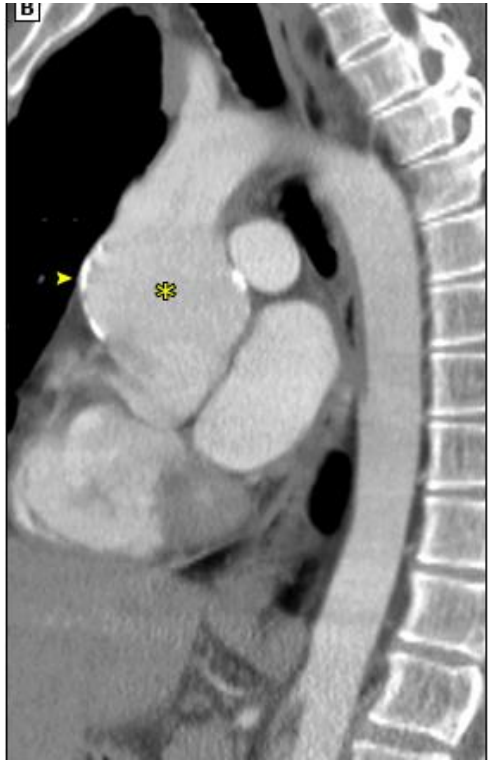
Vasculitis (Inflammatory process)

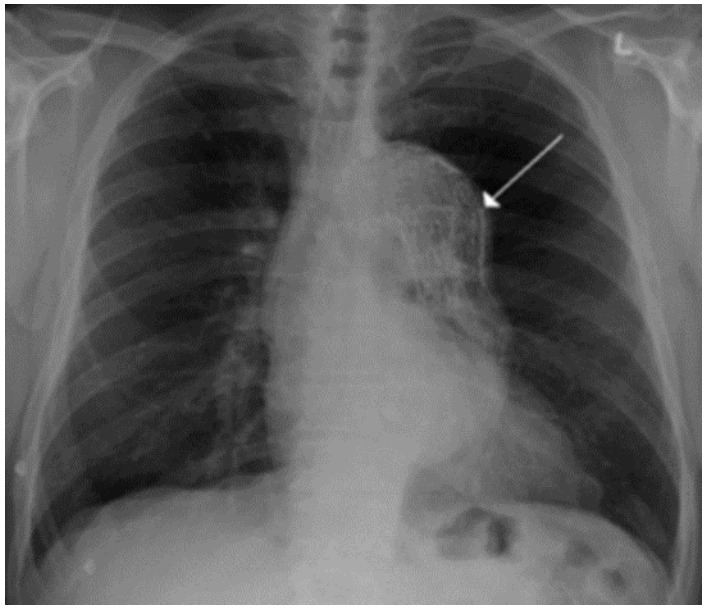
These processes cause loss of structural integrity and weakening of the aortic wall that lead to formation of aneurysms

Aortic Aneurysm: Types

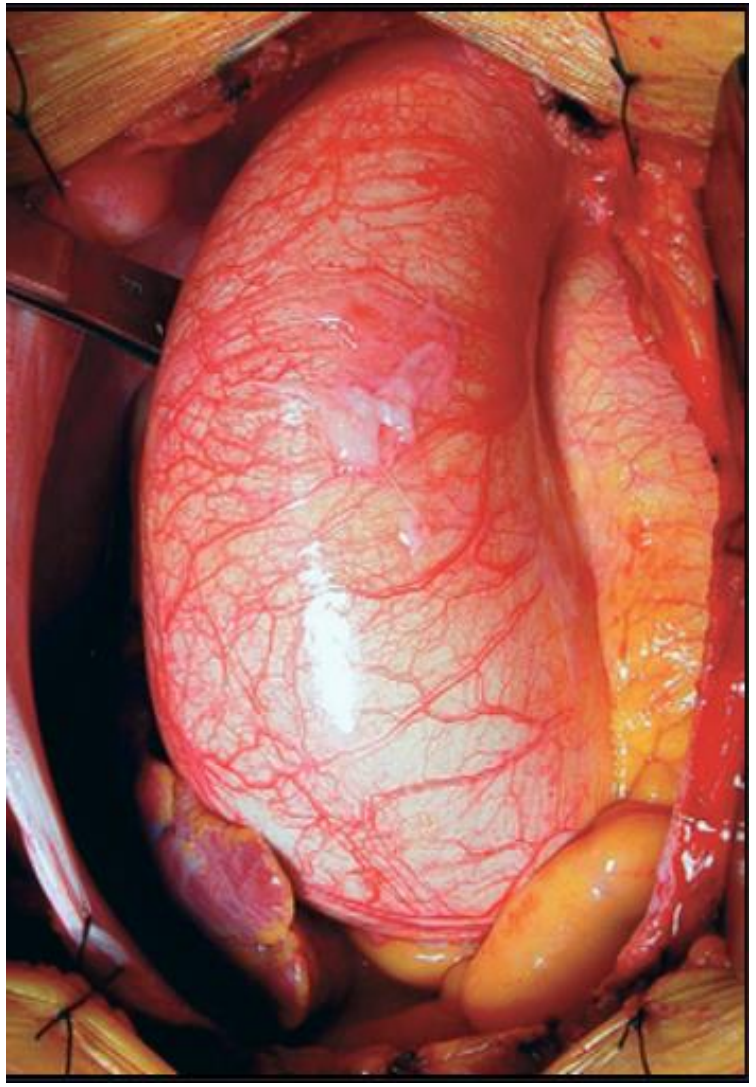
- True aneurysm - a segmental full-thickness dilation of intact arterial wall that *involve all three layers* of the arterial wall (intima, media, adventitia). Can be fusiform and saccular
- Pseudoaneurysm *(false aneurysm)* - defect in the vascular wall leading to a collection of blood and connective tissue outside the aortic wall, that freely communicates with the intravascular space. The result of a contained (aortic) rupture. The wall of the pseudoaneurysm is a clot or surrounding tissue

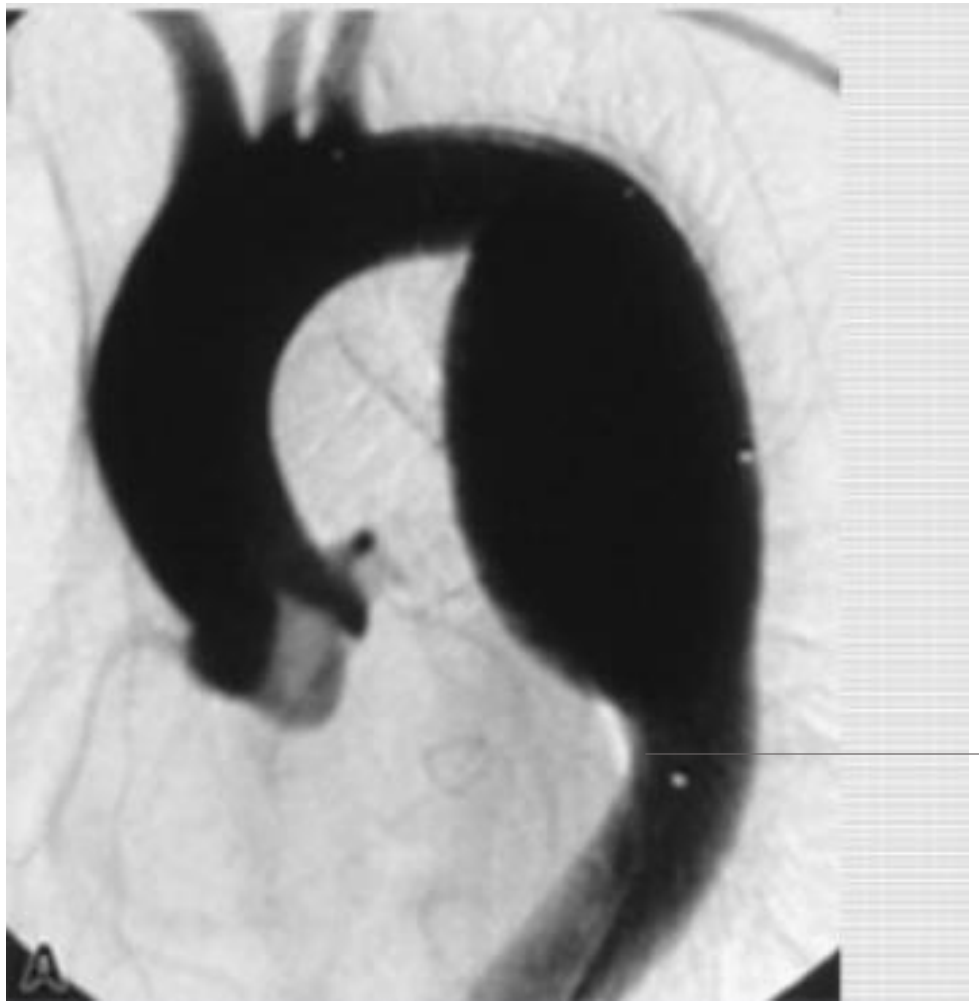

Extravascular connective tissue
Extravasation of blood
Hematoma
Extravasation of blood
A. Normal vessel
B. True aneurysm (saccular)
C. True aneurysm (fusiform)
D. False aneurysm
E. Dissection



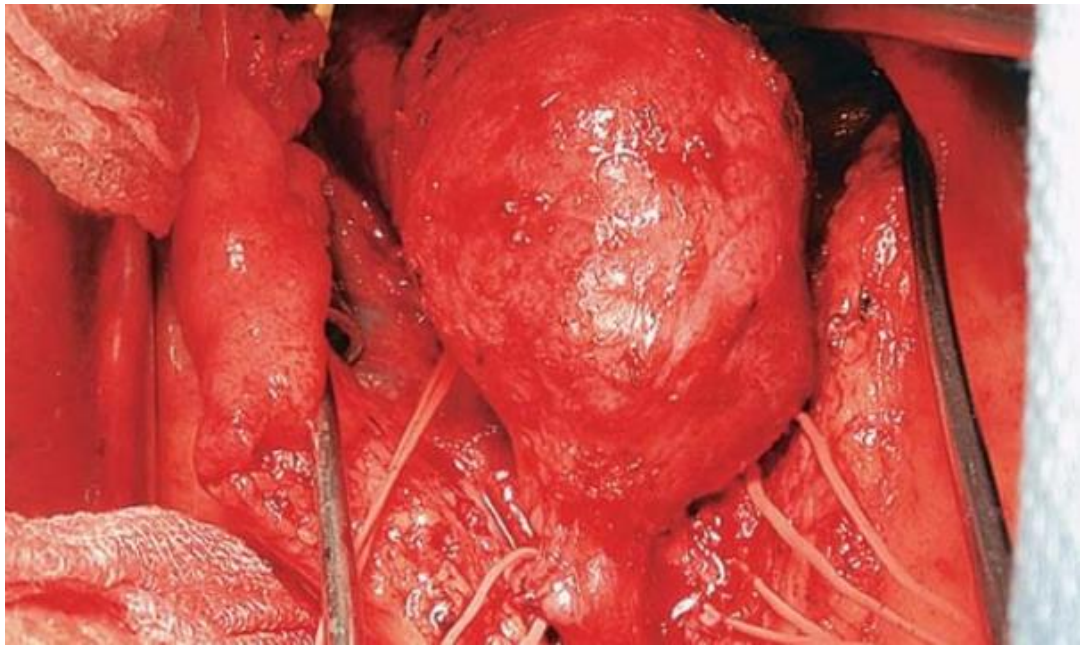


Fusiform Aneurysm

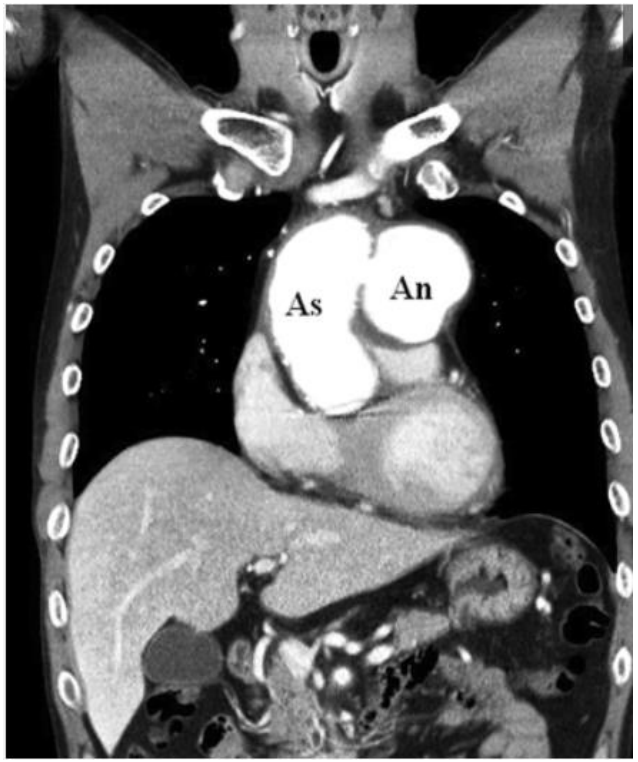


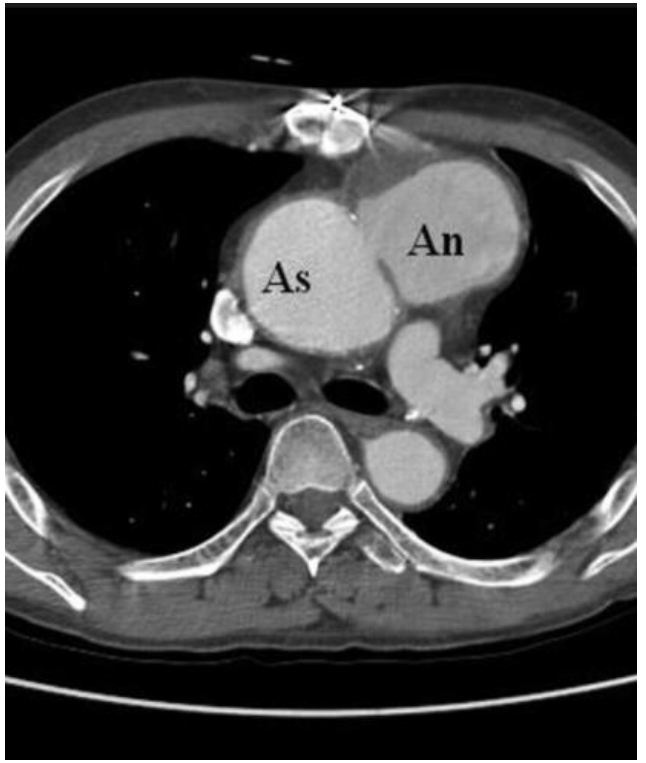


Fusiform aneurysm



Saccular aneurysms





Pseudoaneurysm

Classification by location

Thoracic aortic aneurysm (TAA) – 1/3 of AA admissions

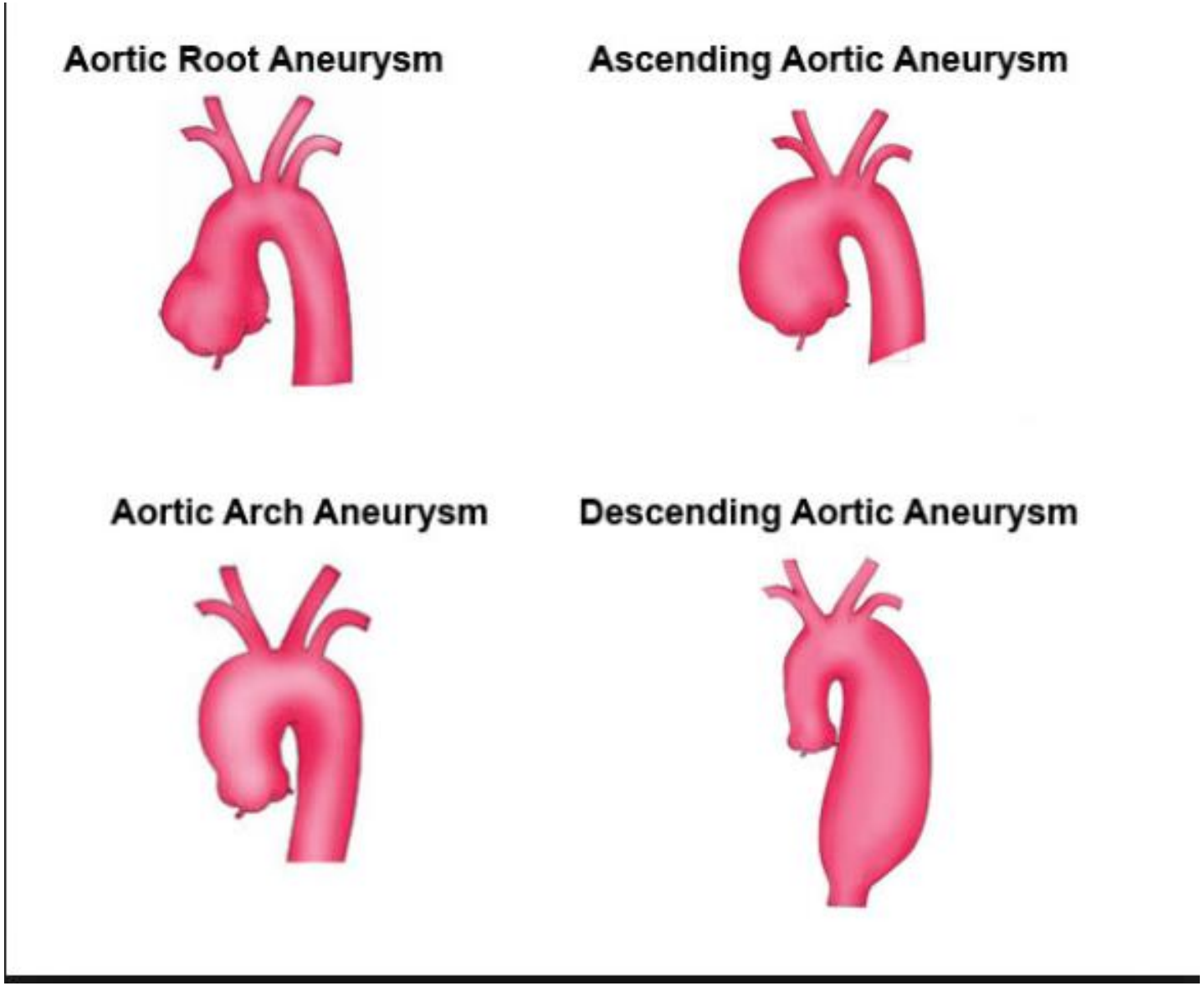
- ascending (root)
- aortic arch
- descending thoracic aneurysm

Abdominal aortic aneurysm (AAA) -2/3 of admissions

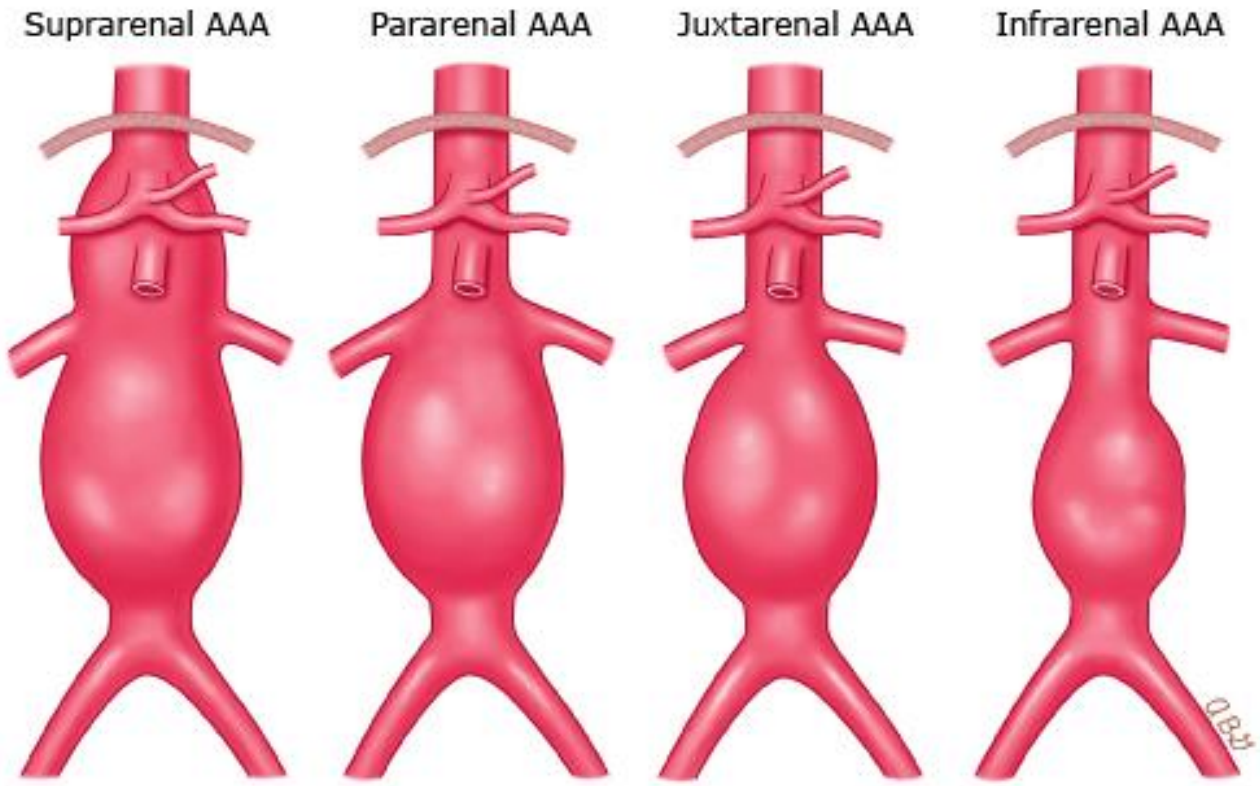
- AAA classified further by size and location

Thoracoabdominal Aortic Aneurysm

Thoracic Aortic Aneurysm (TAA) locations



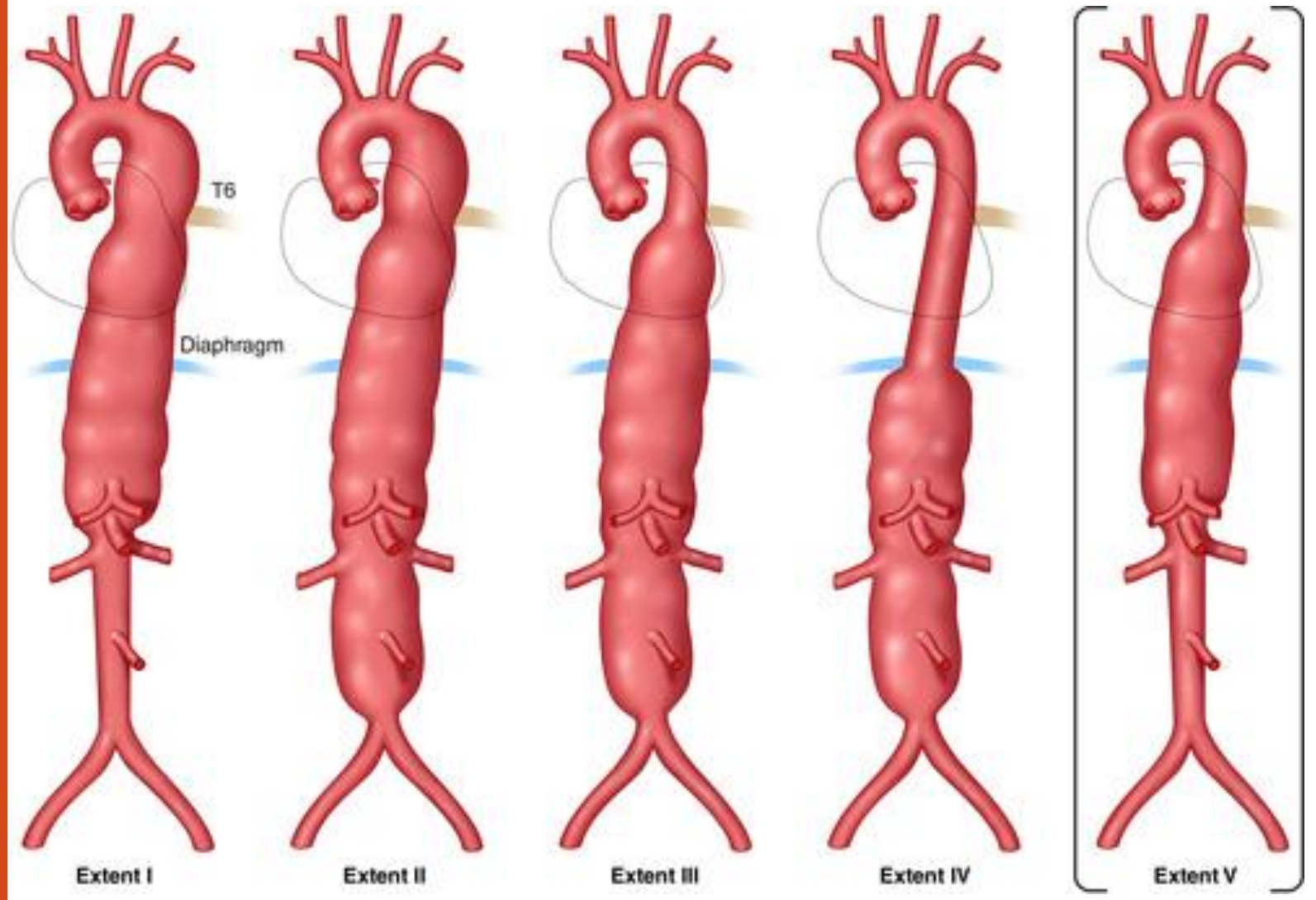
AAA classification by location



AAA classification by size

- The average diameter of the adult human infrarenal aorta is approximately 2.0 cm
- In most adults, an aortic diameter >3.0 cm is generally considered aneurysmal
- Small aneurysms have a diameter <4.0 cm
- Medium aneurysms have a diameter between 4.0 and 5.5 cm
- Large aneurysms have a diameter >5.5 cm
- Very large aneurysms have a diameter ≥6.0 cm

Thoracoabdominal aneurysms – Safi modification of Crawford TAA classification

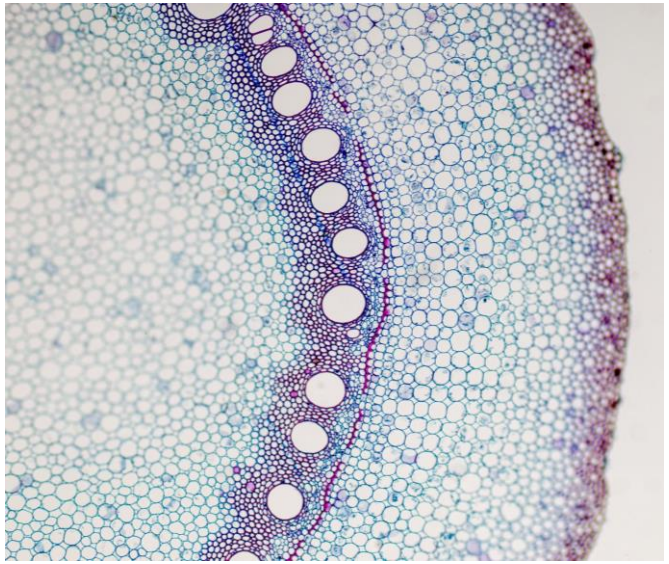


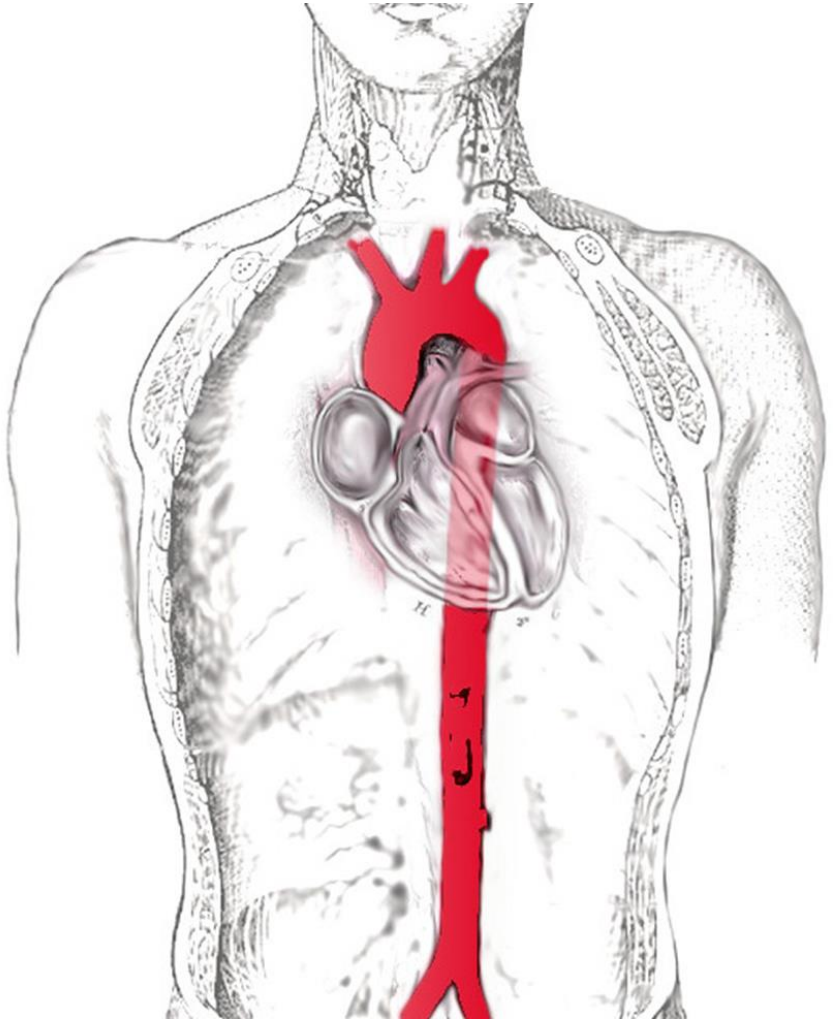
Aortic Aneurysm: Risk factors

Hypertension
Smoking
Hyperlipidemia
Age (> 65 y.o.)
Sex (male)
Sedentary lifestyle
Stimulants

Aortic Aneurysm: Causes

- Genetics
  - Syndromic heritable thoracic aortic disease (HTAD): Marfan syndrome (MFS), Loeys-Dietz syndrome, and vascular Ehlers-Danlos syndrome.
  - Non syndromic TAA: Familial TAA
- Congenital: bicuspid aortic valve (BAV), Turner syndrome, aortic coarctation
- Inflammatory aortitis: arteritis and aortitis (GCA, Takayasu, Kawasaki disease and Behcet syndrome)
- Prior aortic dissection
- Trauma
- Infectious aortitis: bacterial, fungal and syphilitic





Natural history

- Slow expansion with a progressive increase in the risk of aortic dissection or rupture at larger aortic sizes
- Slow expansion of AA means that most patients with AA are asymptomatic and not aware that AA is present. Most AA are found **incidentally**.
- TAA – on imaging
- AAA – pulsatile abdominal mass, abdominal bruit
- AA that **do** produce symptoms are typically very large and at risk for rupture, which is associated with high rates of morbidity and mortality

Clinical presentation of AA based on affected structures

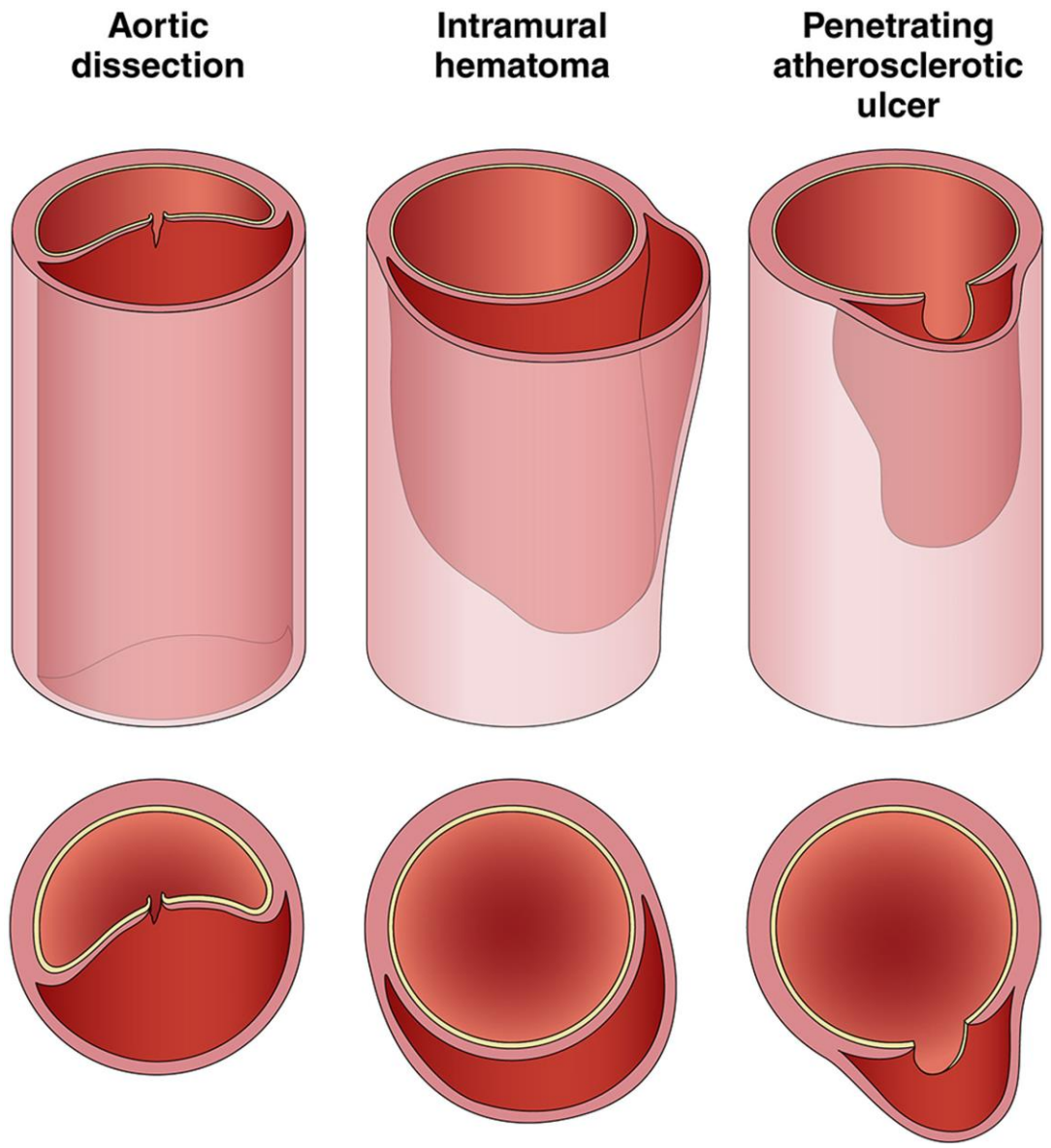
Etiology	Symptoms
Due to compression of adjacent structures	Chest, back, flank, or abdominal pain
Erosion of the vertebrae	Back pain
Compression of any branch vessel of aorta	Ischemic injury to the supplied organ
Bronchial or tracheal compression	Pulmonary symptoms
Signs of nerve compression	Hoarseness, diaphragm paralysis
Compression of ureter	Voiding difficulties

AA: Recognizing Symptoms

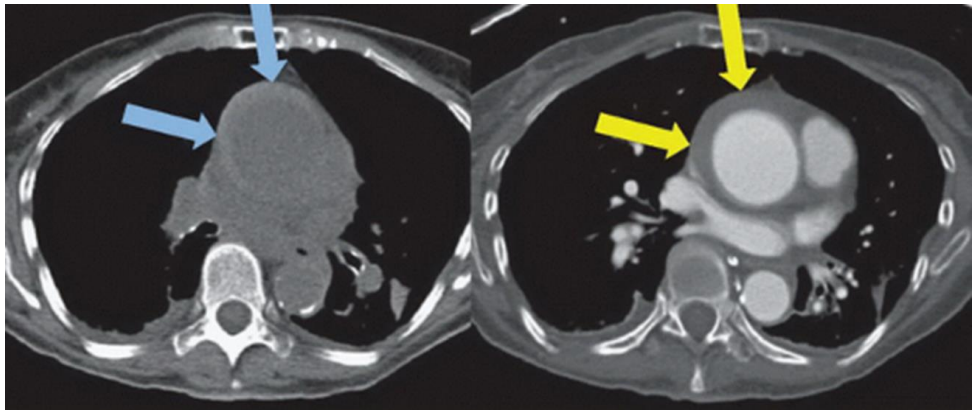
- Symptoms are not usually apparent, and people are not aware they have an AA until it ruptures. Some symptoms people with AA may have are:
  - Difficulty breathing or shortness of breath
  - Chest, abdominal, or back pain (most common)
  - Feeling full even after a small meal
  - Pain wherever the aneurysm is growing (could be in your neck, back, chest or abdomen)
  - Painful or difficult swallowing
  - Swelling of your arms, neck or face

Acute Aortic Syndromes

- Aortic dissection that includes 3 interrelated conditions with similar clinical characteristics
  - Aortic dissection (AoD) - most common
  - Intramural hematoma (IMH) - 10% to 20%
  - Penetrating Atherosclerotic Ulcer (PAU)
- Rupture
  - As a complication of the above (AoD, IMH, PAU) or of the aneurysm
- Rupture of the aorta without dissection or aneurysm (Ex: traumatic rupture of the aorta -TRA)

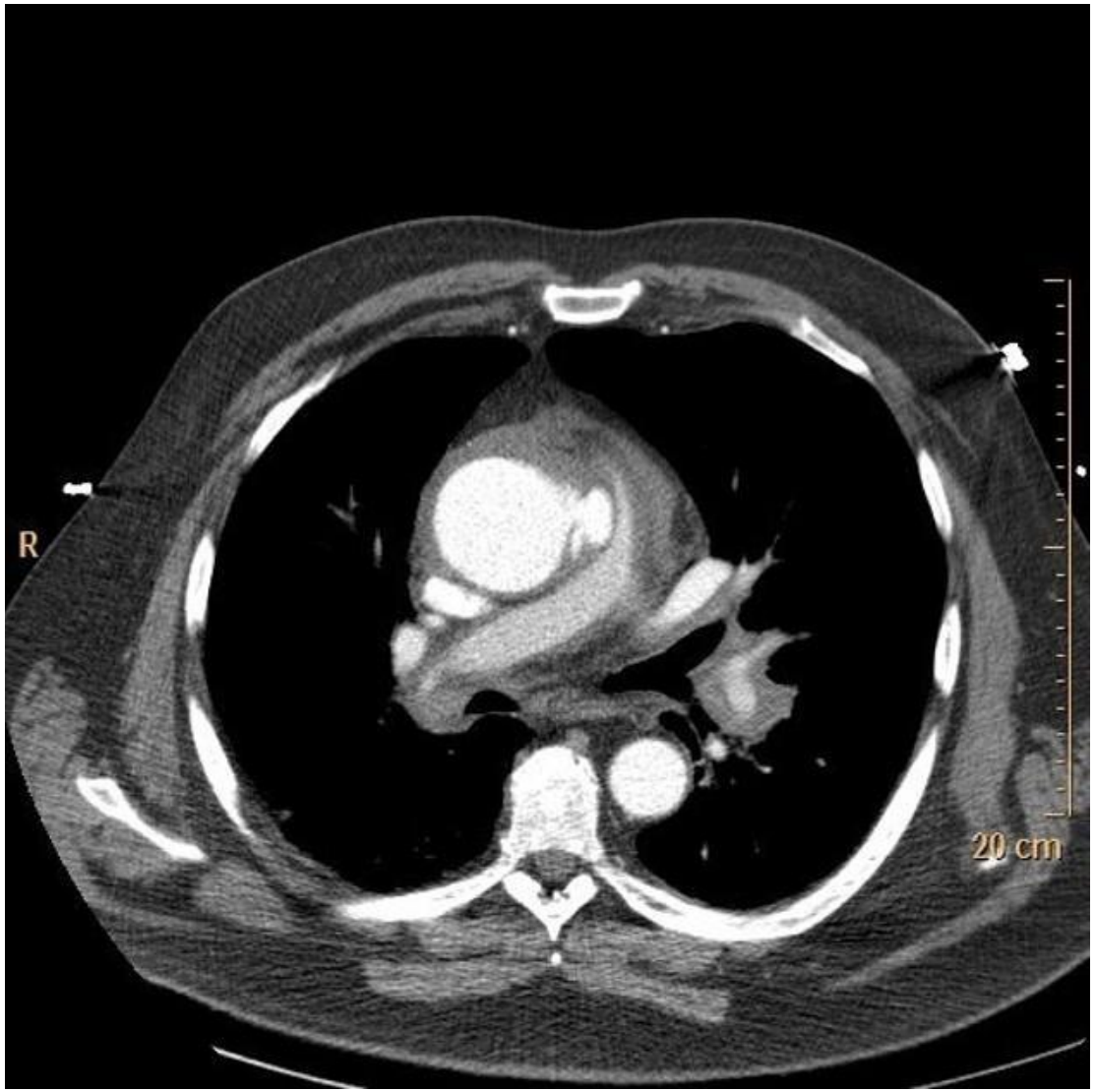


Acute Aortic Syndromes



Intramural Hematoma (IMH)

- No intimal defect such as a tear or an ulcer is present
- No flow present within the lumen of the IMH
- Appearance of crescentic or circular thickening of the aortic wall (fresh thrombus)
- Symptoms similar to classic AoD (Pain is characteristic of IMH, whereas malperfusion and pulse deficit are much less likely than with classic AoD)



Penetrating Aortic Ulcer (PAU)

- Atherosclerotic lesion with ulceration that penetrates the internal elastic lamina and allows hematoma formation within the media of the aortic wall.
- This lesion sets the stage for development of IMH or rupture

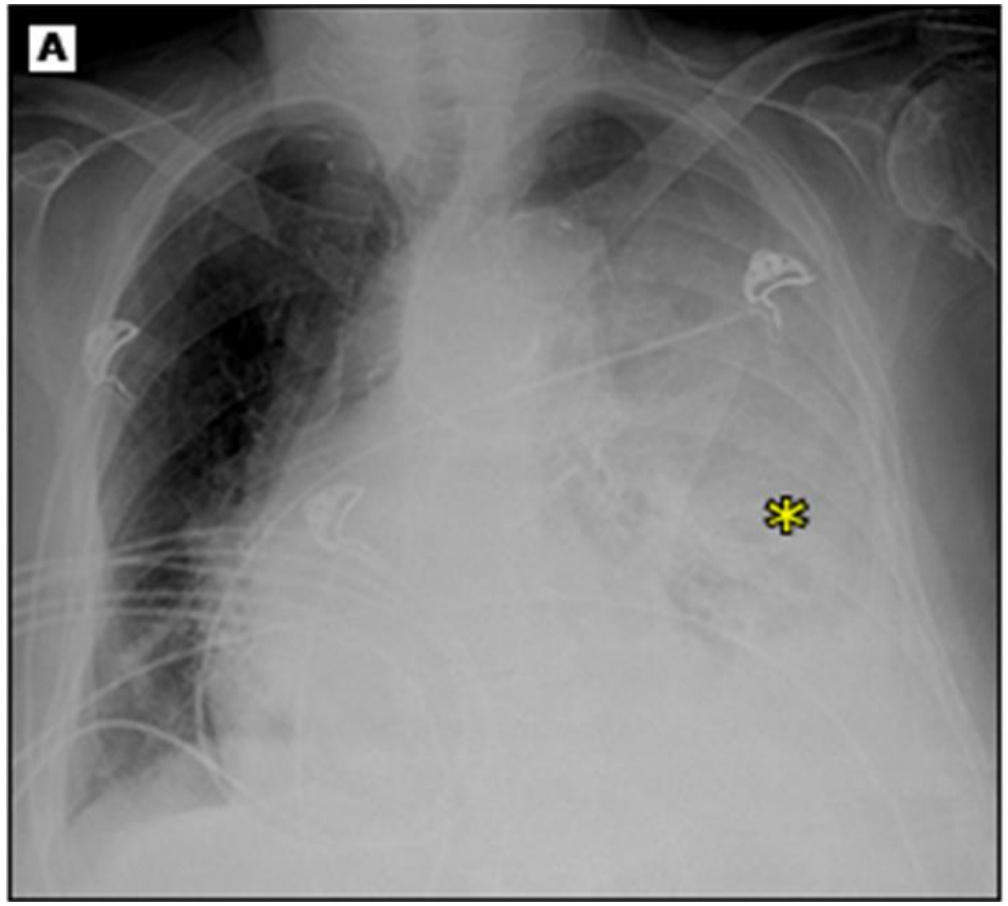


Aortic Dissection (AoD)

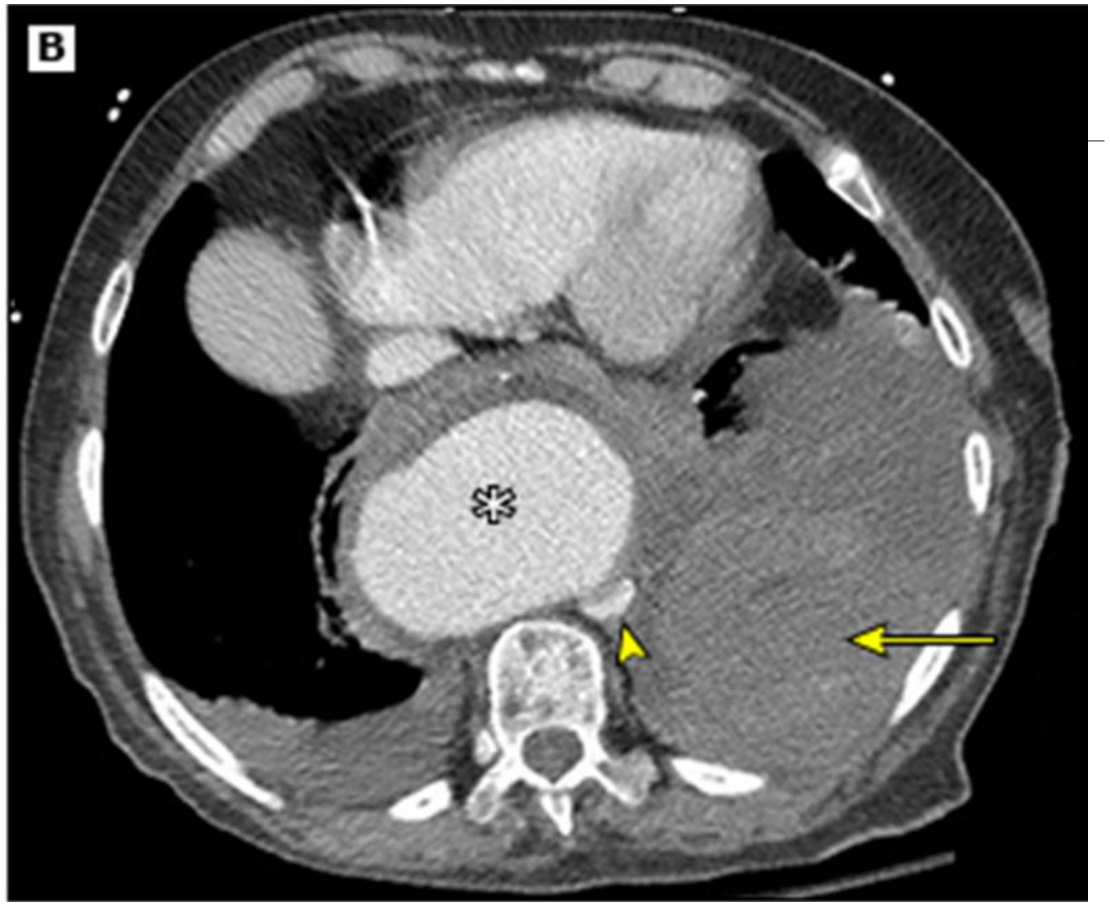
Aortic Rupture

- **Rupture -** severe pain, hypotension or shock
  - most often into the left pleural or pericardial space
  - Only 1/2 of patients live long enough to get to the ED
  - Without repair - nearly uniformly fatal
  - Even with emergency repair, a large portion of patients with ruptured AA still do not survive
- **The most important determinants of rupture is the diameter of the aneurysm and the underlying cause**
  - The risk increases with larger aortic diameter
  - Familial AA and AA associated with genetic syndromes rupture/dissect at **smaller diameters**

Rupture of aorta into pleural space



White out of the left hemithorax in a hypotensive patient



Distal thoracic aneurysm with a small pseudoaneurysm and a pleural space filled with high density clot

Aortic Dissections: Pathophysiology

Definition – A separation of the layers of the aortic wall by an inciting intimal injury

First, intimal tear occurs (AKA primary tear)

Blood passes into the aortic media through the tear, separating the intima from the surrounding media and/or adventitia and creating a false lumen

Can propagate proximally or distally from the initial tear to involve the aortic valve, coronary arteries, or branches of the thoracic or abdominal aorta

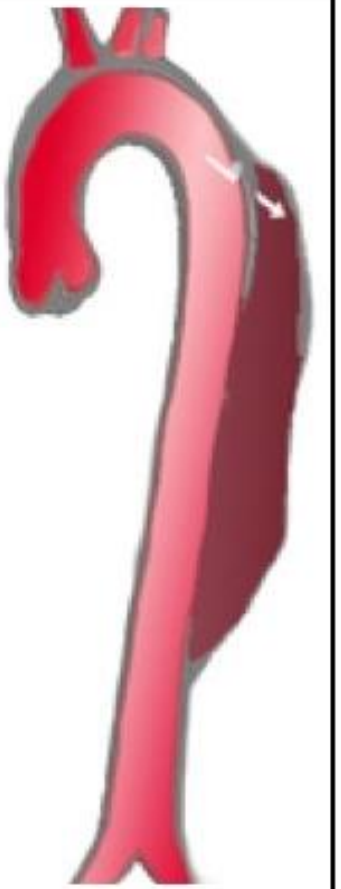
A higher pressure in the false lumen can cause compression and occlusion of the true lumen with malperfusion

Aortic Dissections: Classification

- Classified upon duration
  - hyperacute: <24 hours
  - acute: 1 to 14 days
  - subacute: >14 to 90 days
  - chronic - >90 days
- Anatomic classification – important for timing of repair

Anatomic Classification

Classification of aortic dissection

			
Percentage	60%	10–15%	25–30%
Type	DeBakey I	DeBakey II	DeBakey III
	Stanford A (Proximal)		Stanford B (Distal)

Acute Aortic Syndrome: Identifying Causes & Risk Factors

- Conditions associated with increased aortic wall stress
  - Hypertension - (72% of patients with AAD)
- Cocaine or other stimulant use
- Weight-lifting or other Valsalva maneuver
- Trauma (ex. MVA, fall)
- Coarctation of the aorta
- Atherosclerosis – 31%
- Presence of aortic aneurysm
- Fluoroquinolones seem to promote loss of extracellular matrix integrity (Cipro, Levaquin) **Black Box warning*

Acute Aortic Syndromes: Clinical presentation

- Often presents acutely as a catastrophic illness
- Chest, back or abdominal pain (80-90 % of patients)
- Severe, sharp, or "tearing" located in the anterior chest pain for Type A dissection and in the posterior chest, abdomen or back pain for Type B aortic dissection.
- Pain spreading along the aorta (from Type A to Type B distribution)
- Acute hemodynamic compromise: shock, syncope, acute congestive heart failure

Acute Aortic Syndromes: Clinical presentation

- **Rupture**:
  - Into the pericardium (cardiac tamponade)- Type A
  - Into thoracic or abdominal cavity – for Type B or Type A
  - Dissection into aortic valvular annulus - severe aortic regurgitation (Type A)
  - Obstruction of the coronary artery ostia or extension of the dissection into the coronary artery - myocardial ischemia, MI (Type A)
  - End-organ failure due to aortic branch vessel obstruction: stroke, paraplegia, extremity ischemia, mesenteric, renal ischemia

Presentations of aortic dissection based on affected structures

Clinical findings	Artery or structure involved
Aortic insufficiency or heart failure	Aortic valve
Myocardial infarction	Coronary artery (often right)
Cardiac tamponade	Pericardium
Hemothorax	Thorax
Horner syndrome (ptosis, miosis, anhidrosis)	Superior cervical sympathetic ganglion
Stroke or syncope	Brachiocephalic, common carotid, or left subclavian arteries
Upper extremity pulselessness, hypotension pain	Subclavian artery
Paraplegia	Intercostal arteries (give off spinal and vertebral arteries)
Back or flank pain; renal failure	Renal artery
Abdominal pain; mesenteric ischemia	Celiac or mesenteric arteries
Lower extremity pain, pulselessness, weakness	Common iliac artery

Acute Aortic Syndrome Management

- Early and accurate diagnosis and treatment are crucial for survival
- Acute Type A – emergency repair due to risk of life-threatening compilations (70% mortality rate)
  - cardiac tamponade
  - acute severe aortic regurgitation
  - myocardial ischemia due to coronary artery involvement
- Type B can be managed conservatively (75% survival rate) in most cases (if uncomplicated)

Case study: E.Z.

51Y female who presents for her annual physical. She reports feeling well with no changes to her health.

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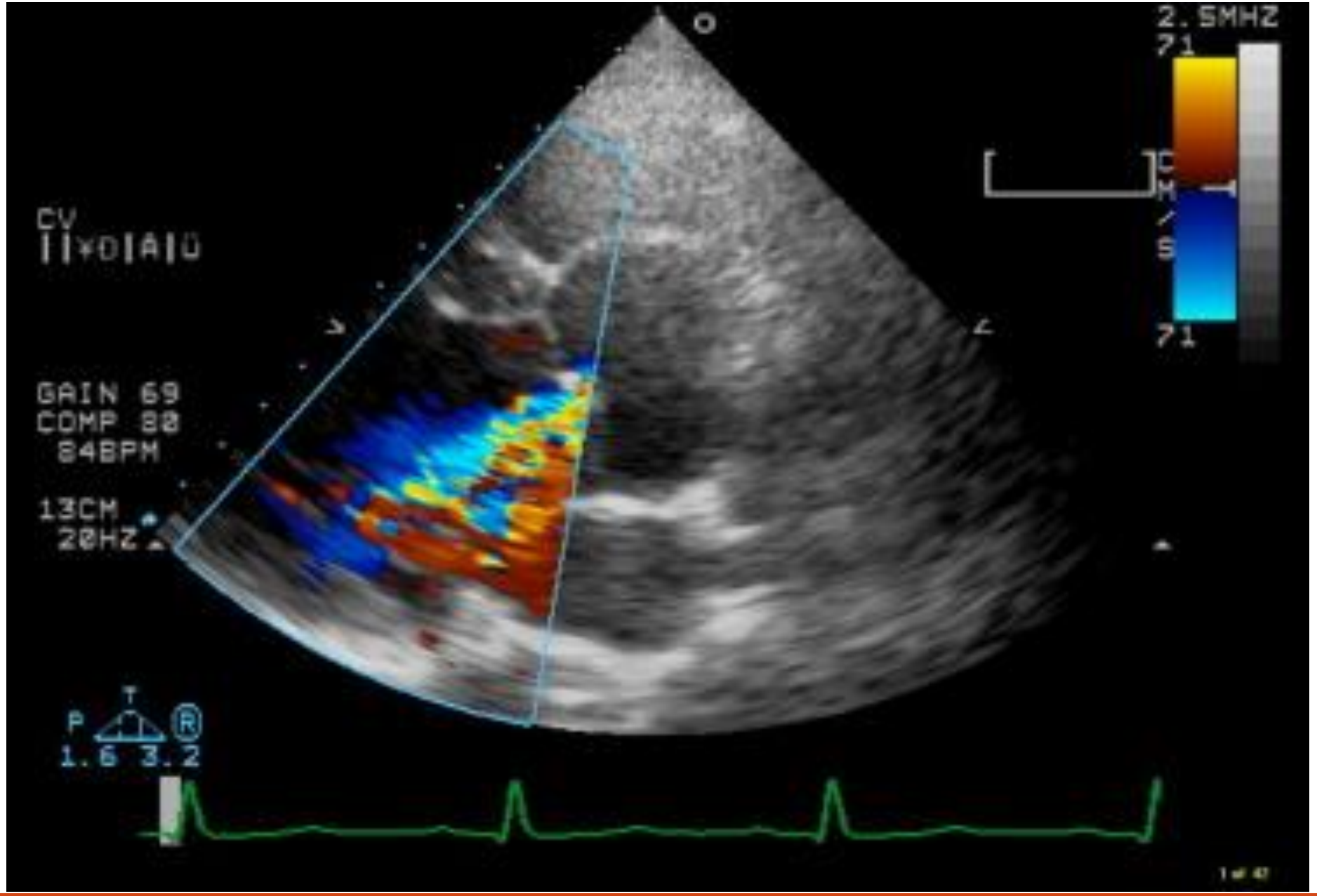
Both parents alive/well, no major health issues besides HTN

VS: 150/92, HR 80, RR 16, O2 sat 99% RA.

PE: RRR, 2+ diastolic murmur, lungs CTAB, no edema

What are some **risk factors** for TAA for this pt?

What **clinical finding** suggests possible TAA?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64BPM
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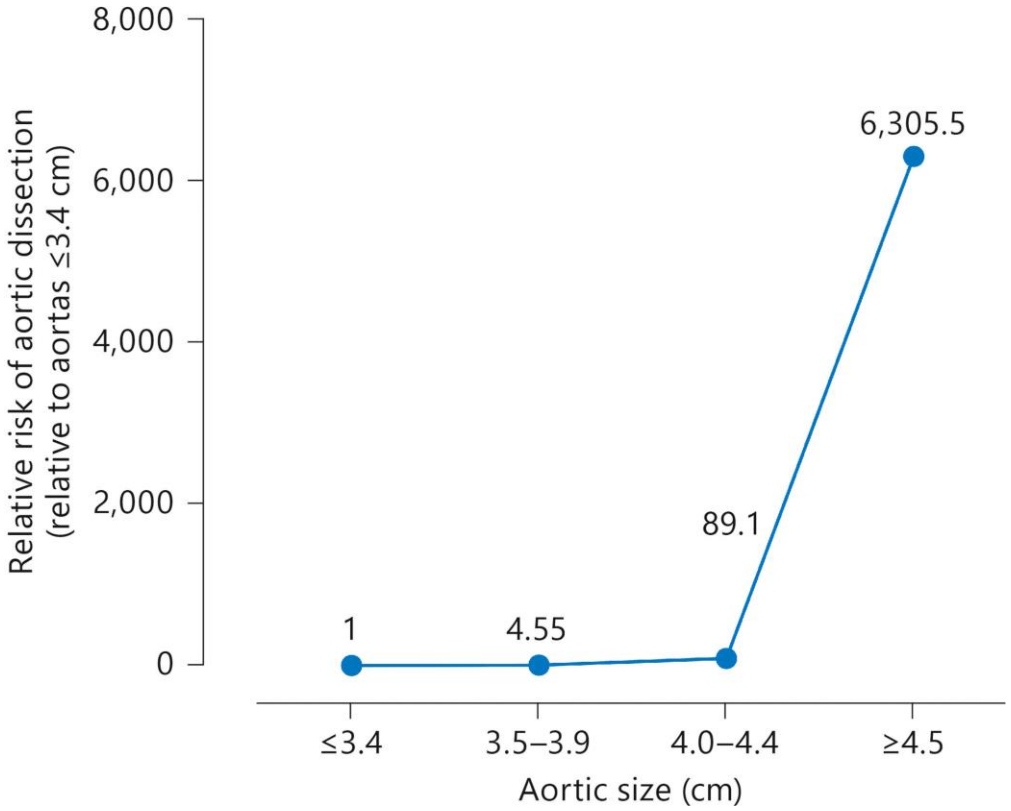
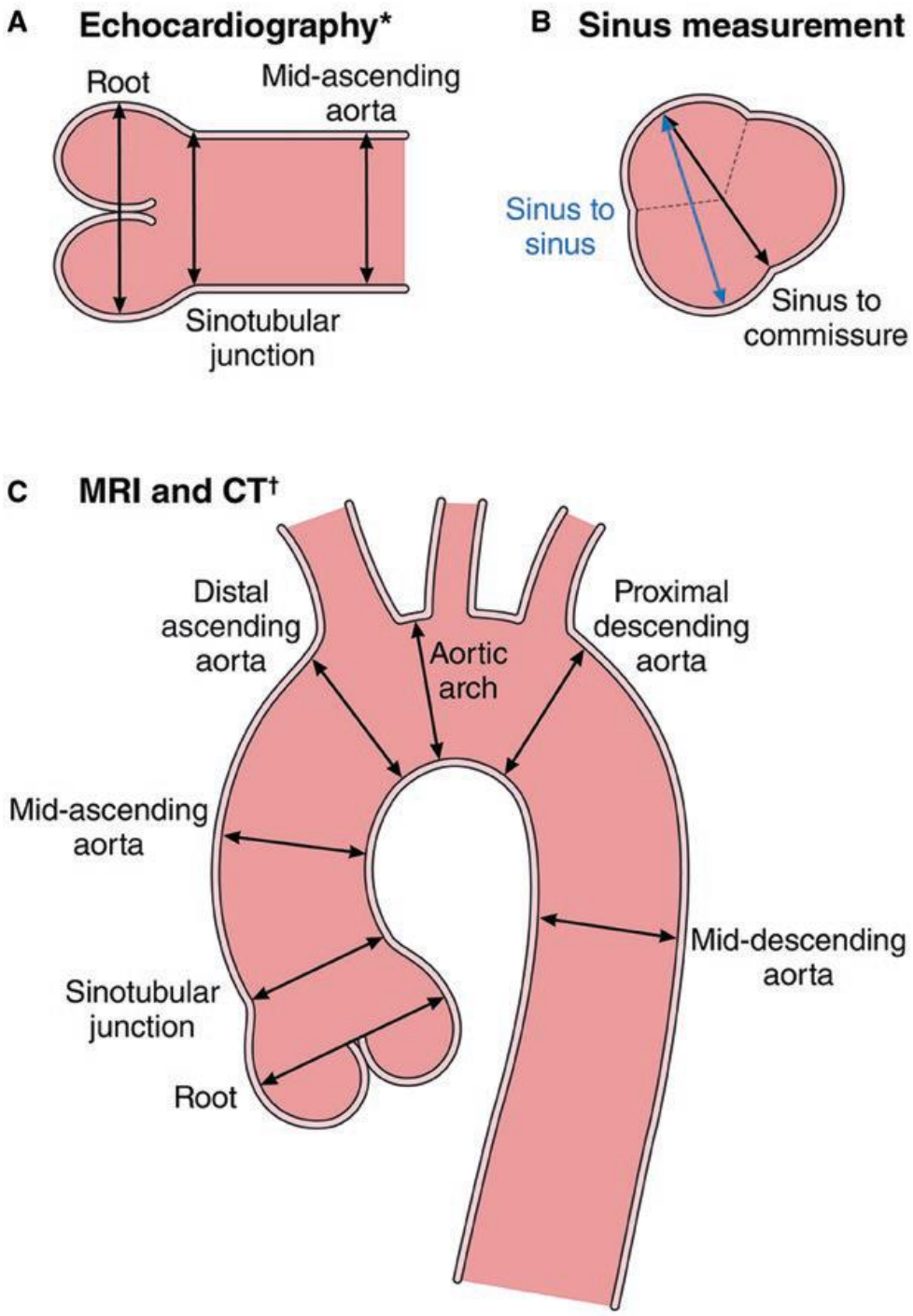


Eric M. Isselbacher. Circulation. 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines, Volume: 146, Issue: 24, Pages: e334-e482, DOI: (10.1161/CIR.0000000000001106)

Thoracic Aortic Aneurysm & Dissections: Imaging Techniques

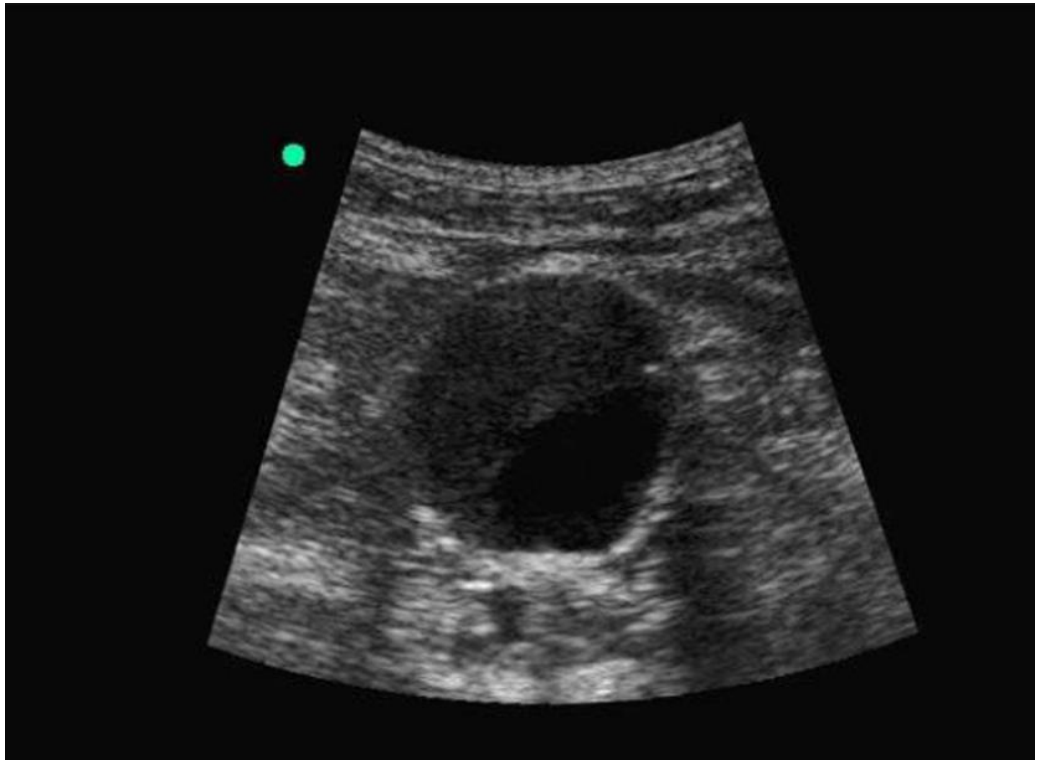
- Computed tomographic (CT) angiography - the modality of choice in *hemodynamically stable* pts
- Transthoracic echocardiography (TTE) or transesophageal echocardiography (TEE) may be useful in hemodynamically unstable patients but cannot image the entire aorta
- Magnetic resonance (MR) imaging is seldom used due to the wider availability of CT in the emergency department and its lower cost
- Catheter-based arteriography is rarely necessary for diagnosis but used for endovascular repair

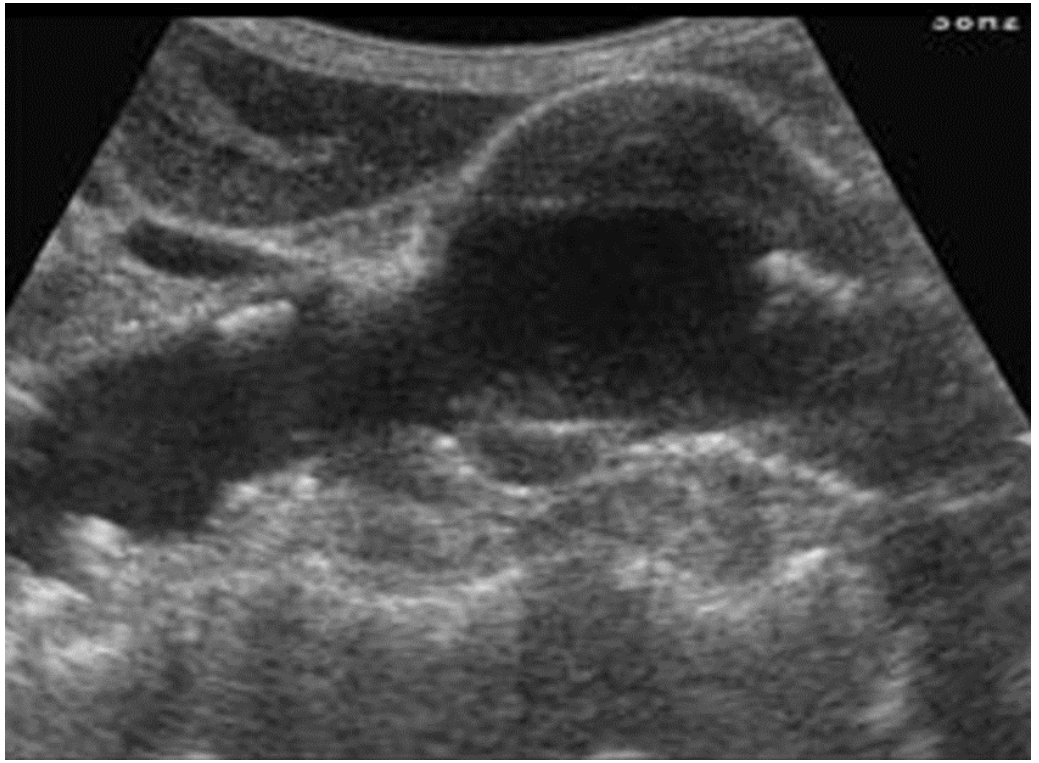
Aortic Imaging Techniques



Abdominal Aortic Aneurysm & Dissections: Imaging Techniques

- Physical exam
  - abdominal palpation – pulsatile mass can reliably diagnose a large AAA (>5.5 cm) but < 50% AAA diagnosed on PE
- For asymptomatic AAA, the imaging test of choice is abdominal ultrasonography which has sensitivity and specificity approaching 100 percent for an aortic diameter >3.0 cm
- Computed tomography (CT) is the imaging test of choice for symptomatic AAA (treatment planning)





AAA ultrasound

Aortic Aneurysm: Management

- AAs are managed according to the presence or absence of symptoms and estimated risk of rupture
- Patients whose symptoms can be attributed to the aneurysm should undergo repair
- Asymptomatic AA - repair not recommended until the risk of rupture or other complications exceeds the risks associated with repair
- Risk of rupture is estimated based on diameter, location, and expansion rate
- Special considerations depending on the presence of underlying contributing etiologies (i.e. Marfan syndrome, bicuspid aortic valve) – earlier repair

Indications for ascending and arch aortic aneurysm repair

Aneurysm type/associated condition	Aneurysm diameter*
Sporadic (not associated with disease below)	
Ascending	≥5.5 cm >5.0 cm (ACOE and low operative risk)
Isolated arch aneurysm	≥5.5 cm
Marfan syndrome (MFS), familial thoracic aortic aneurysm/dissection (FTAAD), others¶	
Without risk factors[Δ◇]	≥5.0 cm
With risk factors[Δ◇]	≥4.5 cm
Loeys-Dietz syndrome (LDS)	
Without risk factors[Δ◇]	≥4.5 cm
With risk factors[Δ◇]	≥4.0 cm
Bicuspid aortic valve (BAV)	
Without risk factors[Δ◇]	≥5.5 cm >5.0 cm (ACOE and low operative risk)
With risk factors[Δ◇]	≥5.0 cm
Concomitant aortic valve surgery	≥4.5 cm

The aortic diameter values provided in the table are those suggested by expert consensus. Determining the optimal timing for elective TAA repair can be challenging and requires clinical judgment taking into account the patient's age, comorbidities, the rate of aortic expansion, other indications for surgery (eg, aortic valve pathology), and body habitus, among others. In addition, not every syndrome has been identified or characterized genetically, so there may be young individuals who do not obviously have degenerative TAA and will require an individualized approach. Refer to the discussion in the UpToDate topics discussing TAA.

ACOE: aortic center of excellence; EDS: Ehlers-Danlos syndrome; TAA: thoracic aortic aneurysm; TGFBR2: transforming growth factor beta receptor 2.

* A threshold cross-sectional area of the ascending aorta area or aortic root adjusted for the patient's height of ≥10 cm^2/m may be helpful for identifying candidates for prophylactic aortic repair among individuals with taller or shorter than average stature (ie, >1 standard deviation above or below the mean).

¶ Others include Turner syndrome and other non-BAV congenital conditions. It is unclear when to intervene for EDS; some suggest surgery for acute events only.

Δ Risk factors for aortic complications include family history of dissection, progressive aortic regurgitation, and aortic expansion by 0.3 cm or more per year. For LDS, additional risk factors include female sex and TGFBR2 mutations. For BAV, additional risk factors include aortic coarctation and "root phenotype" aortopathy. For Turner syndrome, an additional risk factor is aortic coarctation. For Marfan syndrome, patient preference may inform a decision for aortic surgery before pregnancy when the aortic diameter is <4.5 cm.

◇ For those with rapid expansion (increase by 0.5 cm or more per year), a lower diameter may be warranted (eg, 5.0 cm for sporadic TAA).

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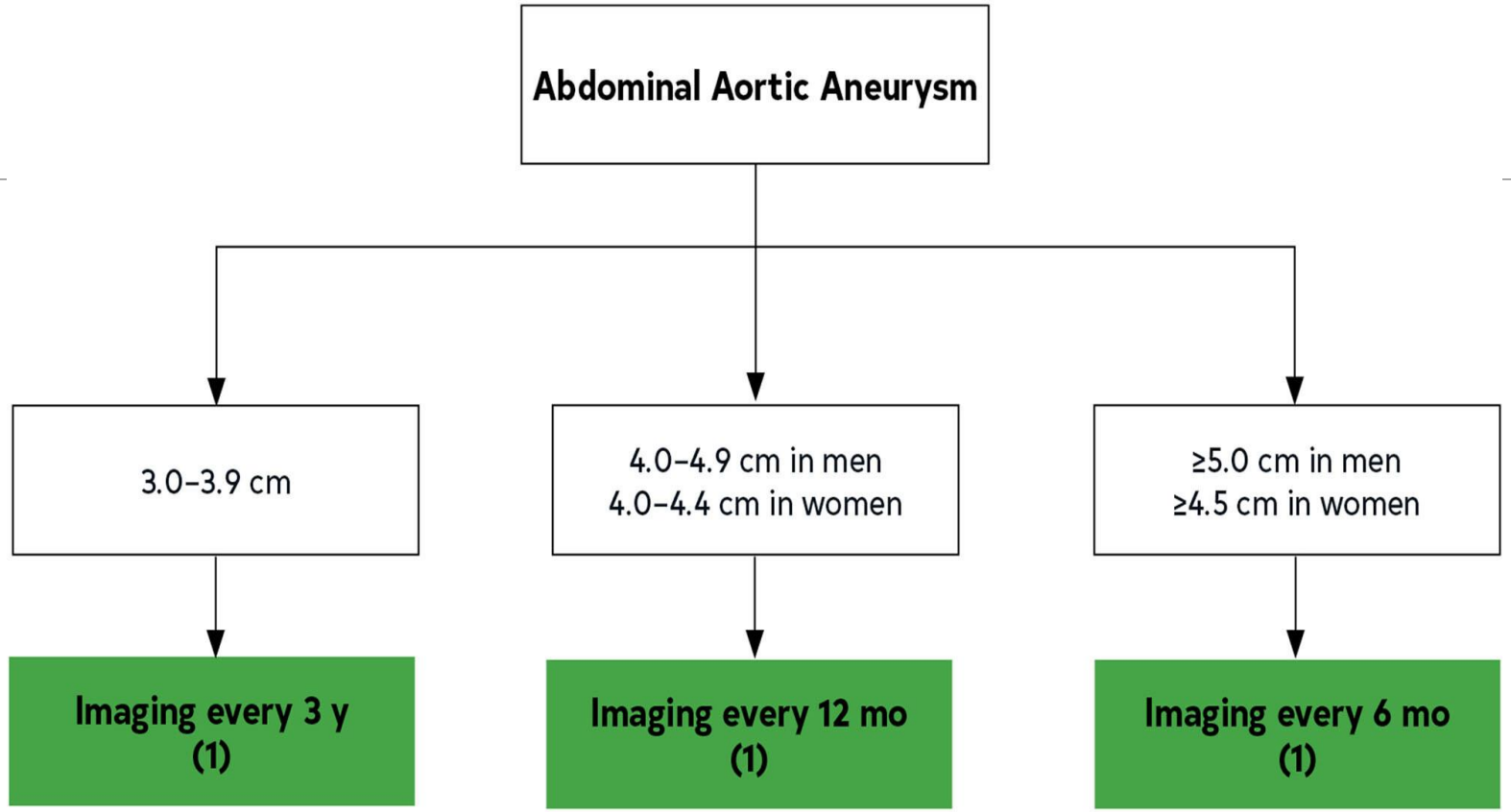


Eric M. Isselbacher. Circulation. 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines, Volume: 146, Issue: 24, Pages: e334-e482, DOI: (10.1161/CIR.0000000000001106)

Conservative Management: Aneurysms and Chronic Aortic Dissections

- Antihypertensive therapy, including anti-impulse
- Therapy with β-blockade and afterload reduction (ACEI, ARB)
- Lifelong surveillance with imaging at regular intervals (CTA, MRA, ECHO, abdominal u/s for AAA)
- Timely repair once the aorta reaches the size that is considered a high risk of rupture/dissection
- Genetic analysis if suspicion of CTD, screening of 1st degree relative)

Surveillance Imaging

- Imaging is individualized
  - Aneurysm vs dissection
  - Other factors such as genetics, BAV, co-morbidities
  - Rate of growth
  - Overall size
  - Symptoms
- Acute aortic dissection: First year frequent surveillance imaging

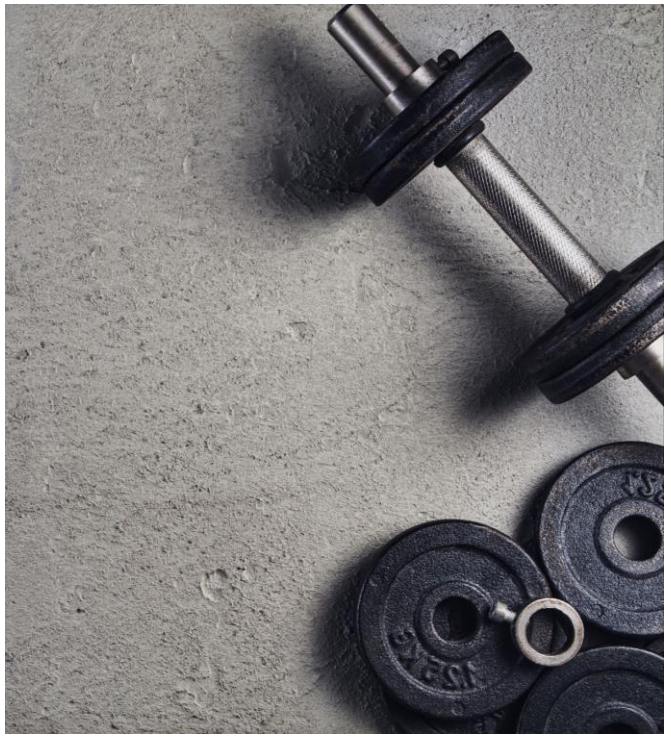
  1 month → 3 month → 6 month → 12 month, then yearly if residual dissection

Medical Therapy

- Antihypertensive therapies -the goal systolic pressure is 110 to 120 mmHg, if tolerated
  - Beta blockers and angiotensin receptor blocker (ARB) – proven benefit for patients with connective tissue disease
  - Angiotensin-converting enzyme (ACE) inhibitor and CCBs
  - Statin therapy – some studies showed reduction of complications
- No medical therapy, other than smoking cessation, has proven effective at reducing the rate of AAA enlargement

Lifestyle Modifications

- Heart-healthy eating helps lower high blood pressure or high blood cholesterol
- Manage stress to help control high blood pressure, especially for thoracic aortic aneurysms
- Exercise and weight-lifting restrictions: “Light weights, more reps”. Avoid Valsalva-like maneuvers
- Avoid stimulants
- Engage in 150 minutes of moderate physical activity weekly
- Tobacco cessation



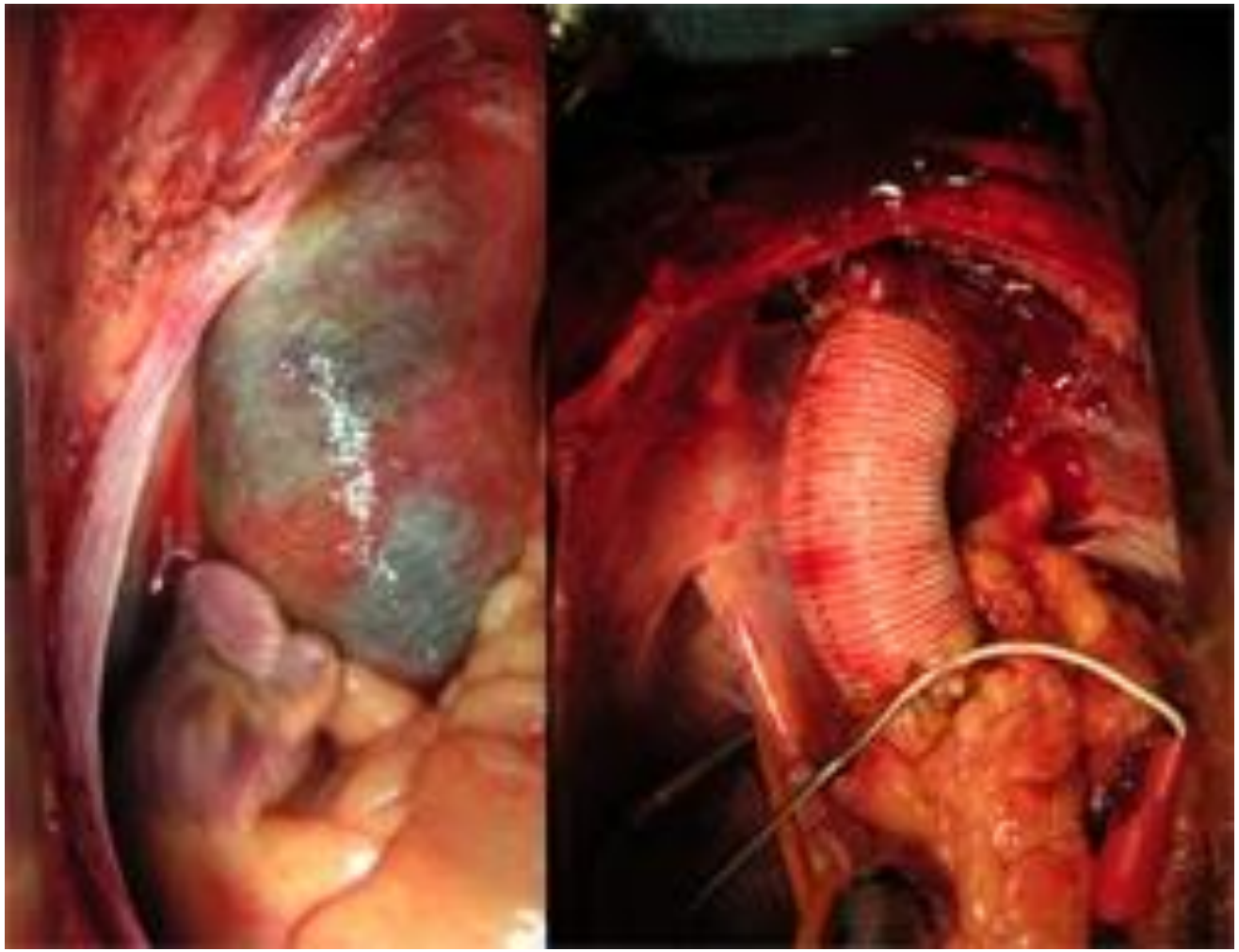
Aortic Aneurysm (AA): Interventions

- Prophylactic repair recommended for AA since emergency surgery for AA complications has much worse outcomes (5 yr survival 85% for elective open repair and 37% for emergency repair)
- Open surgery – approach depends upon the location and extent of the aneurysm
  - Median sternotomy with hypothermic arrest and cardiopulmonary bypass for ascending, root, arch
  - Thoracotomy - descending TAA - spinal cord protection, end-organ revascularization (visceral, intercostal, renal arteries reimplantation)
  - AAA - midline abdominal or retroperitoneal incision

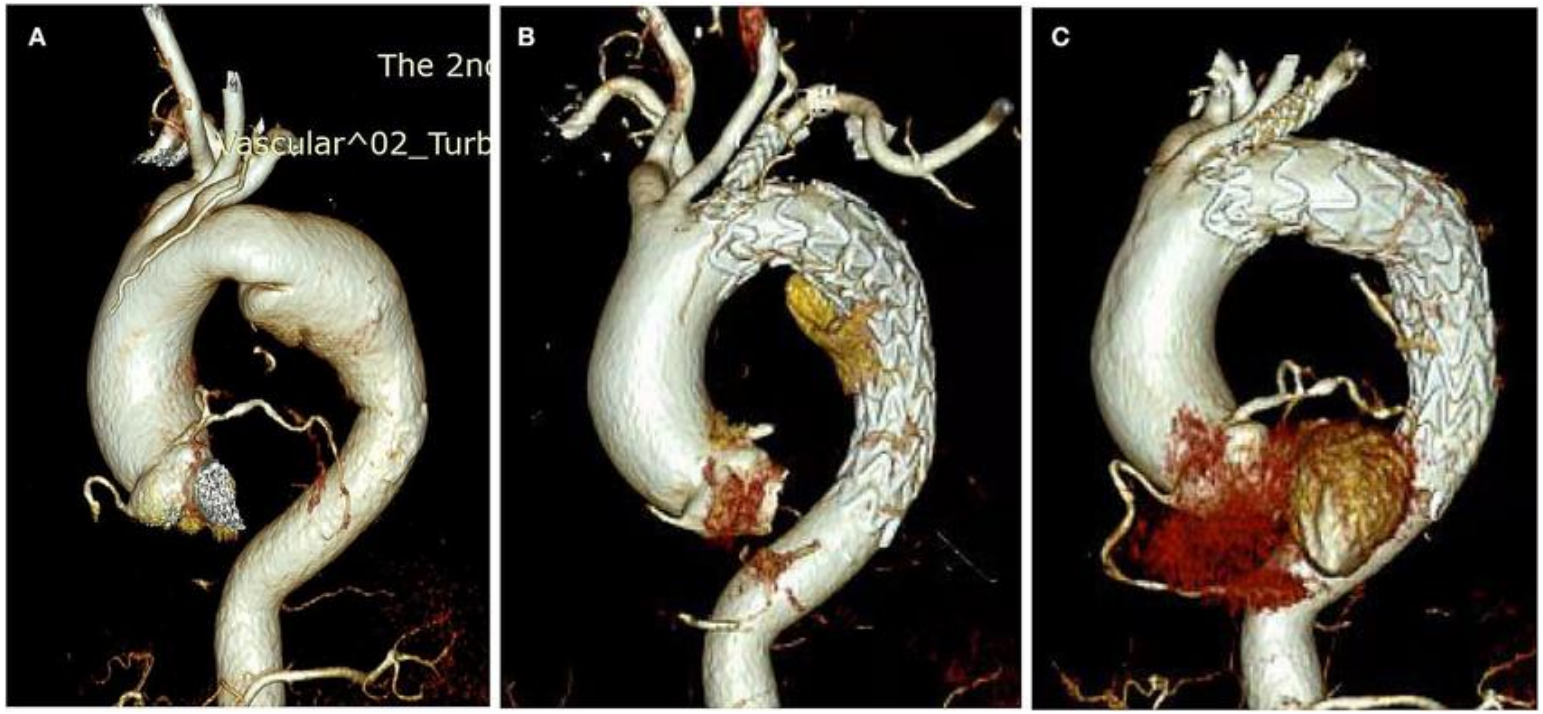
Endovascular Repair

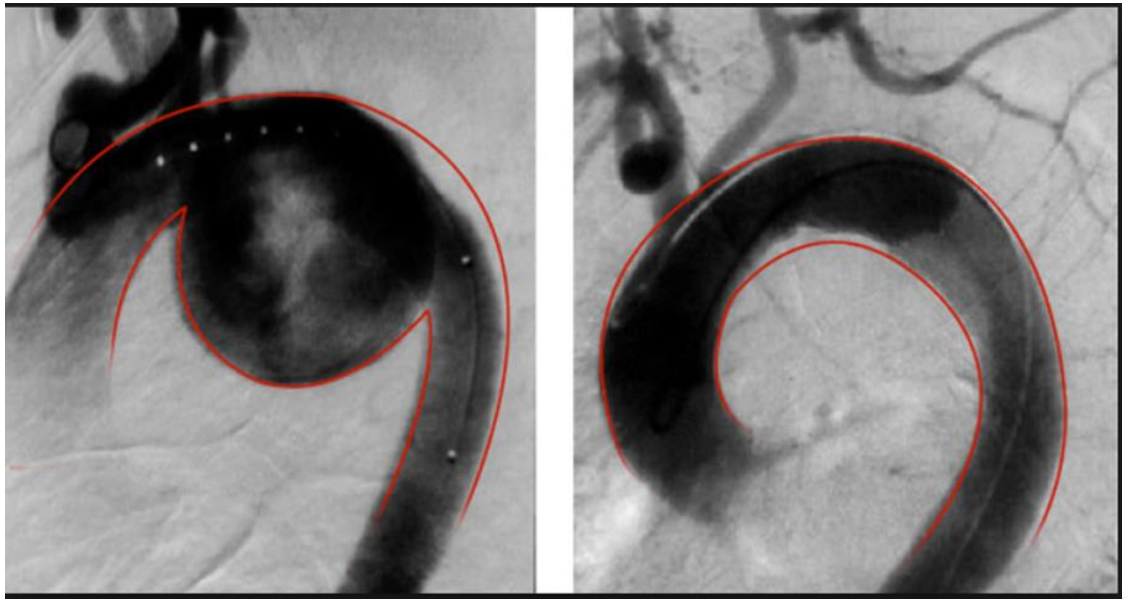
- TEVAR, EVAR - placement of stent graft delivered via the iliac or femoral arteries to line the descending aorta and exclude the aneurysm sac from the circulation
- Requires fulfillment of specific anatomic criteria (access, landing zones, away from important branches)
- Hybrid repair – an open approach for proximal aorta with an endovascular approach for the distal aorta (including elephant trunk)

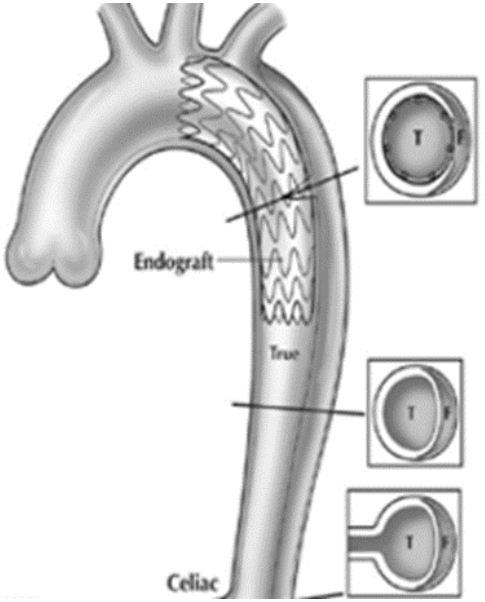
Open Aortic Repair



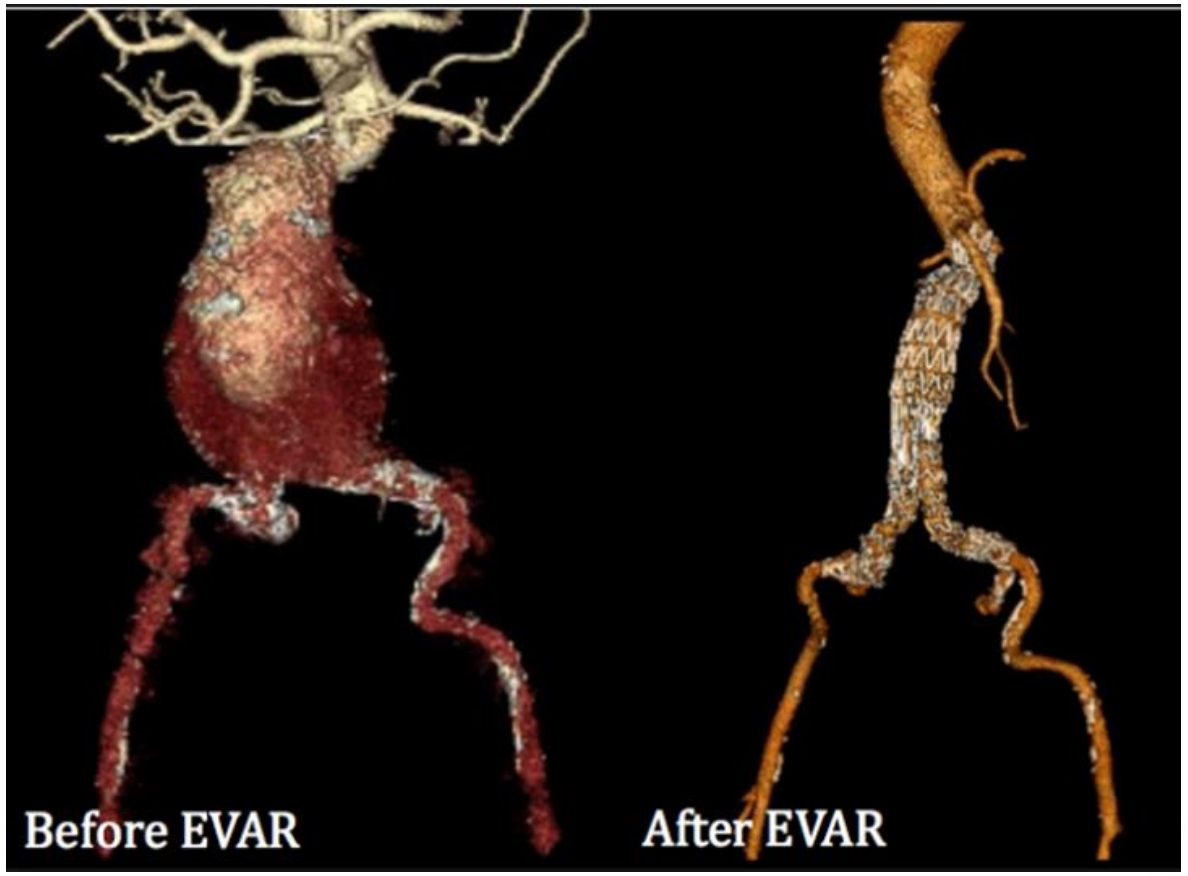
Thoracic Endovascular Repair

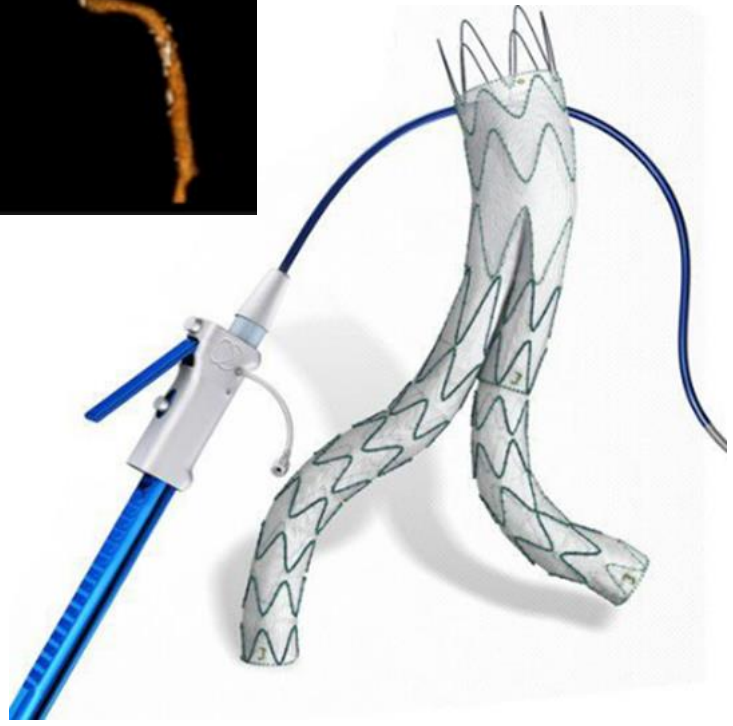






Endovascular Repair





Open vs. Endovascular Repair

- Long-term mortality following elective AA repair is *not significantly* different between the techniques
- Perioperative mortality is lower with endovascular repair
- Postoperative morbidity and recovery time is much shorter with endovascular repair
- Higher risk of late complications with endovascular repair (graft migration, endoleaks, aortic rupture, component separation, stent fracture, limb thrombosis, and endograft infection) -> requires lifelong surveillance

Management for Acute Aortic Syndrome

- Type A aortic dissection is a surgical emergency
  - About 20% of patients with acute aortic dissection die before reaching the hospital
  - Mortality for an untreated dissection is about 25% at 6 hours and 50% by 24 hours
- The treatment for Type A is surgical, with ongoing medical management of Type A lesions reserved for patients who would not survive surgery
- Type B acute aortic syndromes are generally managed medically, with intervention reserved for those experiencing complications or progressive symptoms

Management for Acute Type B aortic dissections

- Controlling pain
- Anti-impulse therapy by controlling the blood pressure to minimize the likelihood of rupture or progression, unless hypotension is present
- Lumbar drain for spinal cord ischemia if the patient is not a surgical candidate
- Intervention:
  - Initial endovascular approach is appropriate for most type B aortic pathologies provided the patient's anatomy is suitable for endograft placement
  - Open repair

Case study: E.Z.

51Y female with h/o HTN, HLD, former smoker with a 4.6 cm aortic root aneurysm, moderate AR.

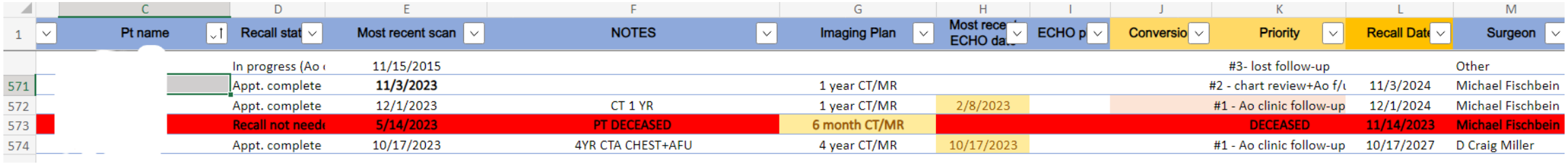
She returns for a 6-month follow up visit at the aortic surveillance clinic, where she was asymptomatic. BP 145/80, HR 78

CT scan revealed her aortic root diameter increased to 4.9 cm.

What would be her follow up plan?

Stanford Healthcare Aortic Disease Program

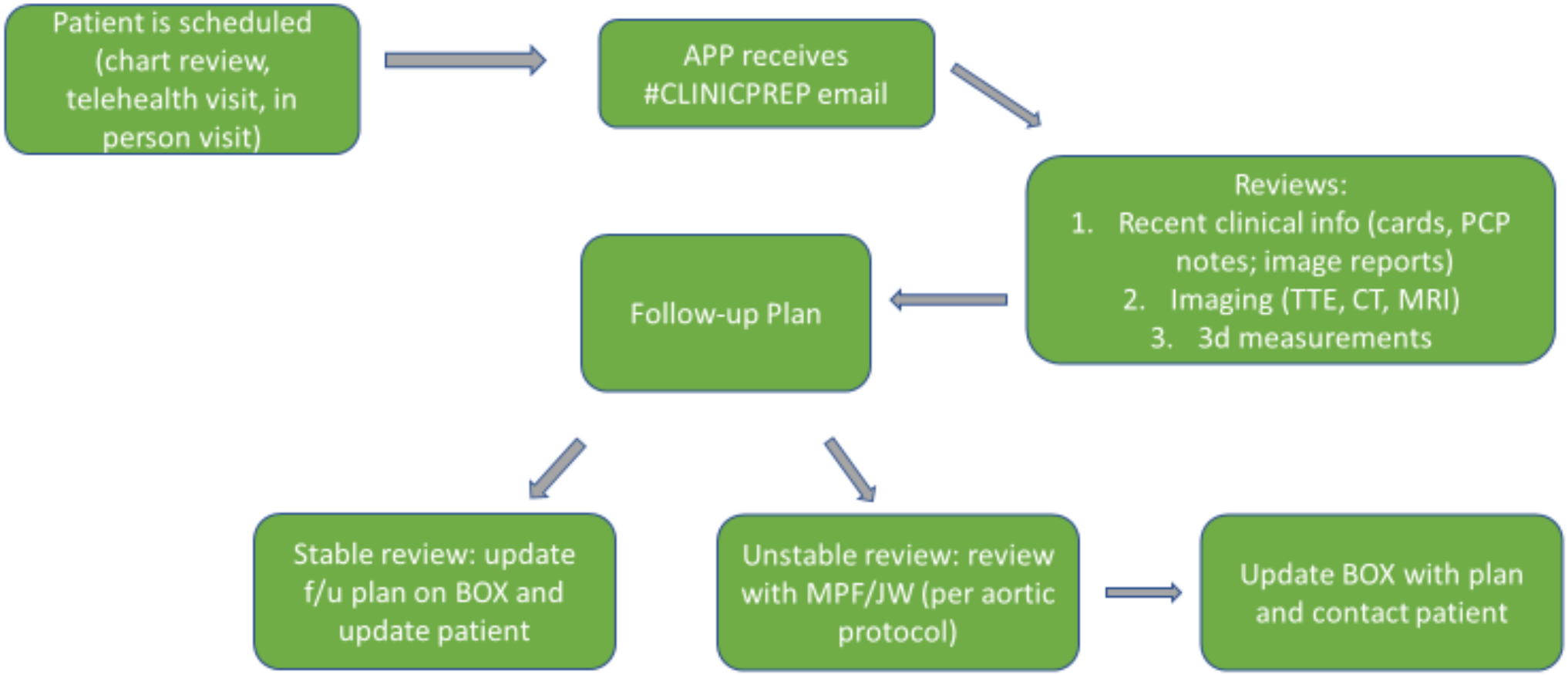
- A multidisciplinary approach to patient care and treatment, connecting with cardiology, genetic counselors, vascular surgeons, cardiothoracic surgeons, and radiologists to provide the best and most advanced treatment options
- APP-Led Aortic Surveillance Clinic
  - Long term follow up for aortic pts treated at SHC
  - Team composed of APP's, schedule coordinators, and cardiothoracic surgeons
  - 3D laboratory
  - AFU database



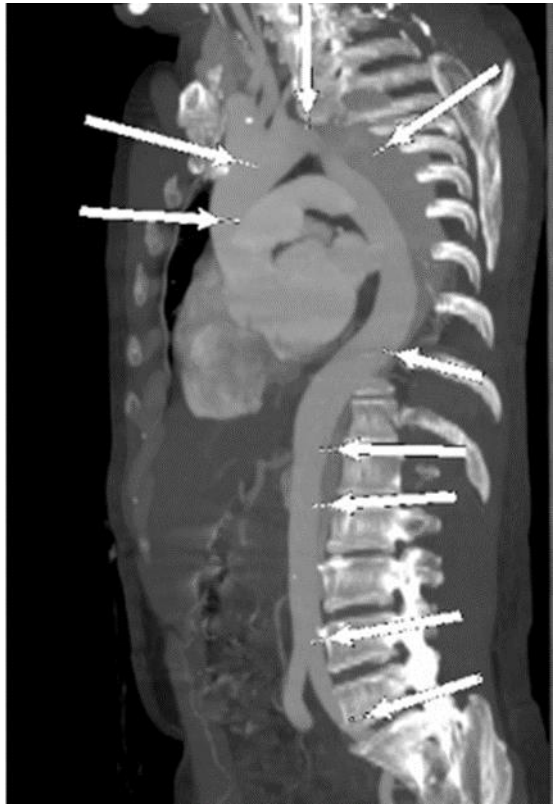
	C	D	E	F	G	H	I	J	K	L	M
1	Pt name	Recall stat	Most recent scan	NOTES	Imaging Plan	Most rece ECHO da	ECHO p	Conversio	Priority	Recall Date	Surgeon
		In progress (Ao	11/15/2015						#3- lost follow-up		Other
571		Appt. complete	**11/3/2023**		1 year CT/MR				#2 - chart review+Ao f/	11/3/2024	Michael Fischbein
572		Appt. complete	12/1/2023	CT 1 YR	1 year CT/MR	2/8/2023			#1 - Ao clinic follow-up	12/1/2024	Michael Fischbein
573		Recall not need	5/14/2023	PT DECEASED	6 month CT/MR				DECEASED	11/14/2023	Michael Fischbein
574		Appt. complete	10/17/2023	4YR CTA CHEST+AFU	4 year CT/MR	10/17/2023			#1 - Ao clinic follow-up	10/17/2027	D Craig Miller

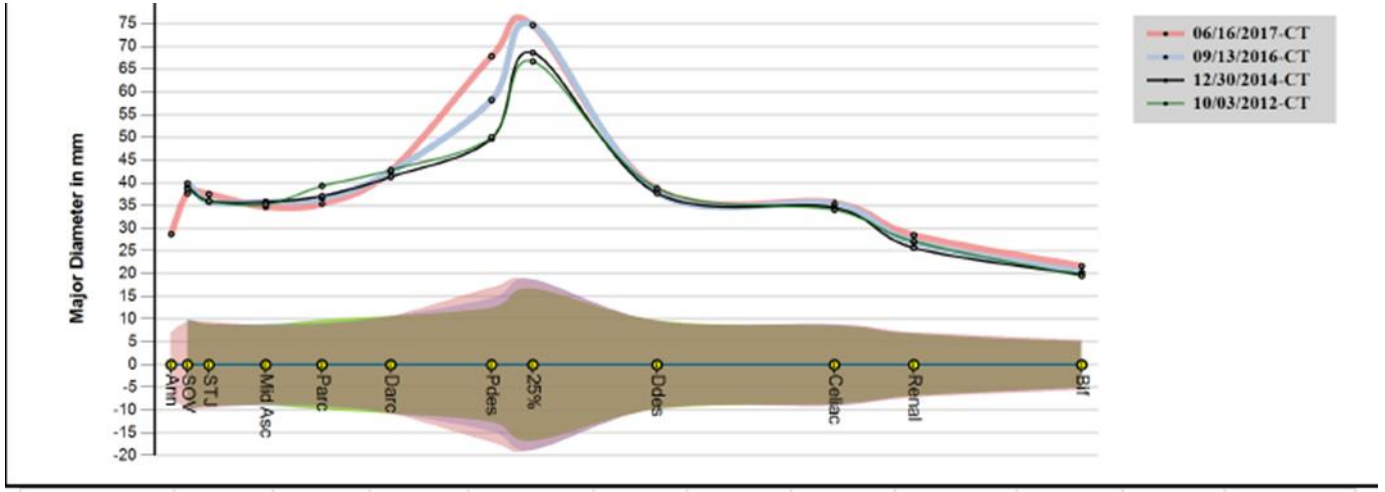
Aortic Follow-up Database

SHC Aortic Surveillance Clinic:
APP workflow



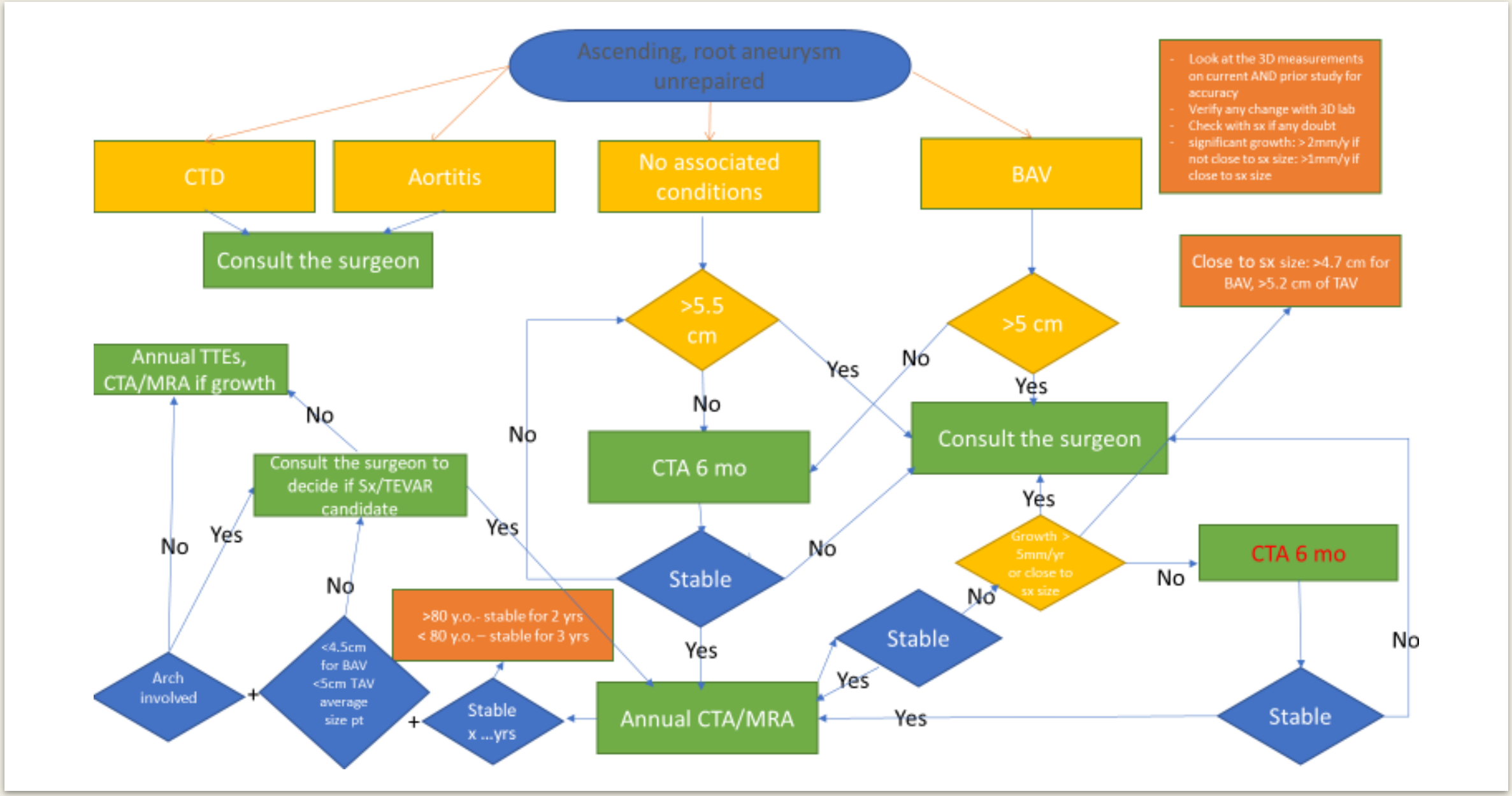
Surveillance Imaging: 3d measurements





Dt	Ann	SOV	STJ	MidAsc	Parc	Darc	Pdes	Ddes	Celiac	Renal	Bif
6/16/17	28.7	37.7	37.5	34.7	35.4	42.6	67.8	38.5	35.6	28.5	21.7
9/13/16		39.9	35.8	35.8	36.6	42.4	58.2	37.9	35.3	27.0	20.3
12/30/14		39.0	36.0	35.8	37.1	41.3	49.7	37.7	34.5	25.7	19.8
10/3/12		38.6	36.0	35.2	39.3	42.8	50.0	38.8	34.0	27.1	19.5

	STJ To MAA			MAA To Parc			Parc To Darc			Darc To Pdes			Pdes To Ddes			Ddes To Celiac			Celiac To Renal			Renal To Bif		
Dt	25%	50%	75%	25%	50%	75%	25%	50%	75%	25%	50%	75%	25%	50%	75%	25%	50%	75%	25%	50%	75%	25%	50%	75%
6/16/17													74.6											
9/13/16													74.7											
12/30/14													68.6											
10/3/12													66.7											


Ascending, root aneurysm unrepaired
CTD
Aortitis
No associated conditions
BAV
- Look at the 3D measurements on current AND prior study for accuracy
- Verify any change with 3D lab
- Check with sx if any doubt
- significant growth: > 2mm/y if not close to sx size: >1mm/y if close to sx size
Consult the surgeon
>5.5 cm
>5 cm
Close to sx size: >4.7 cm for BAV, >5.2 cm of TAV
Annual TTEs, CTA/MRA if growth
No
Yes
No
Yes
No
Consult the surgeon
CTA 6 mo
Consult the surgeon to decide if Sx/TEVAR candidate
Yes
Yes
Growth > 5mm/yr or close to sx size
No
CTA 6 mo
No
Stable
No
Yes
No
Stable
>80 y.o.- stable for 2 yrs
< 80 y.o. – stable for 3 yrs
Arch involved
+
<4.5cm for BAV
<5cm TAV
average size pt
+
Stable x ...yrs
Annual CTA/MRA
Yes
Yes
Stable
No

Take Home Messages

- Although aortic disease is far less prevalent than many types of heart disease, a ruptured aortic aneurysm is often life-threatening
- Aortic dissection typically presents as an *acute* event with high mortality, but AoD is inherently a *chronic* disease
- Early detection, monitoring, and treatment of aortic disease is vital to reduce risk of acute aortic event
- In patients who are significantly smaller or taller than average, surgical thresholds may incorporate indexing of the aortic root or ascending aortic diameter to either patient body surface area or height, or aortic cross-sectional area to patient height
- In patients with aneurysms of the aortic root or ascending aorta, or those with aortic dissection, screening of first-degree relatives with aortic imaging is now recommended
- Because outcomes for patients with aortic disease are enhanced at programs with higher volumes, experienced practitioners, and extensive management capabilities, Multidisciplinary Aortic Team care is considered in determining the appropriate timing of intervention

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Questions?

Thank you!