AORTIC DISSECTION

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Seminar content

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- Epidemiology

Step 2

- Patho_physiology
- Risk_Factor

Step 3

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- Clinical features
- Hx
- phx

Step 4

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Step 5

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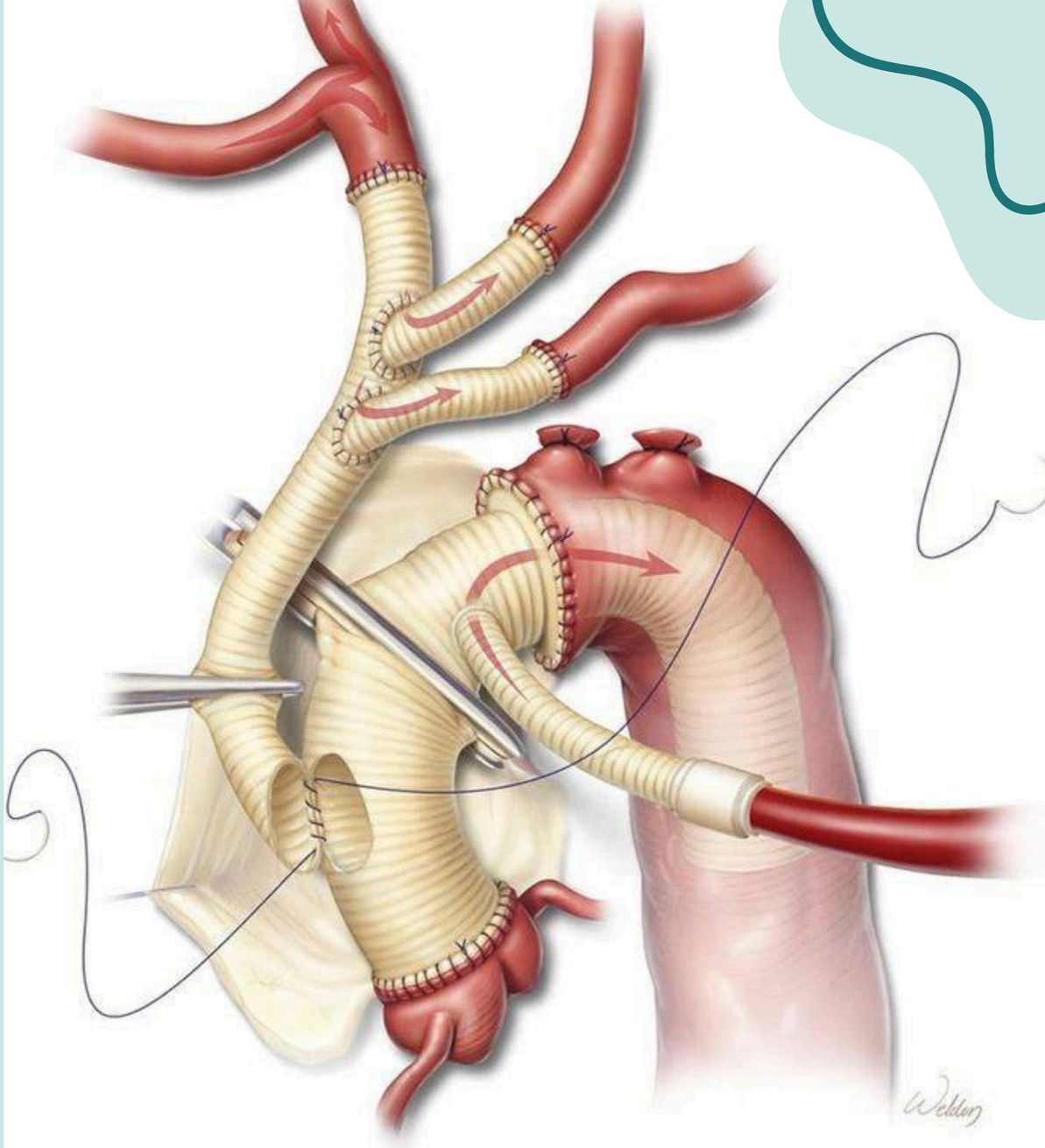
Step 6

- Management

DEFINITION:

- An aortic dissection is a tear in the inner layer of the aorta that causing the inner and middle layers of the aorta to separate (dissect), creating a 'false lumen' alongside the existing or 'true lumen



EPIDEMIOLOGY ANALYSIS

INCIDENCE

- Peak incidence: 60-80years of age
- In patients with connective tissue disease: peak incidence 30-50years of age

SEX

male>female

2:1

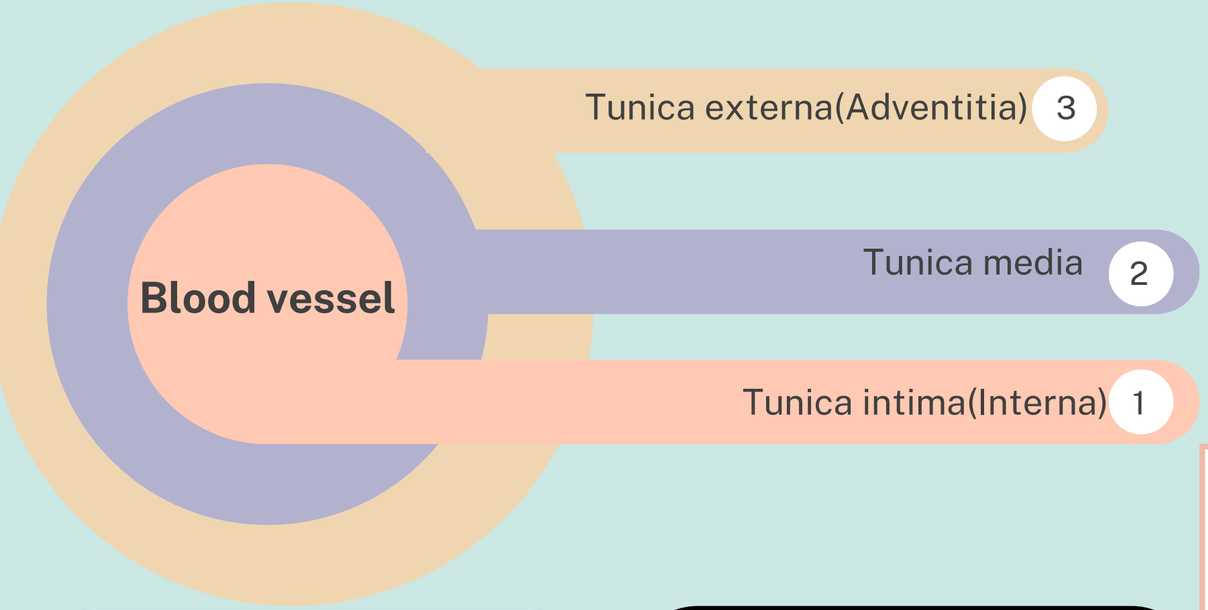
LOCALIZATION

- Ascending aorta: ~ 75% of cases
- Descending aorta, distal to the left subclavian artery: 20% of cases Aortic arch: 10% of cases
- Abdominal aorta: 5% of cases

OTHER

- dissection can occur in younger patients, usually in association with Marfan syndrome, pregnancy or trauma.

Blood vessel layer



[from the lumen outward]

1)Tunica intima:

- **endothelium**
- **subendothelial**
- **internal elastic lamina**

2)Tunica Media:

- **smooth muscle**
- **External elastic lamina**

3)Tunica Adventitia:

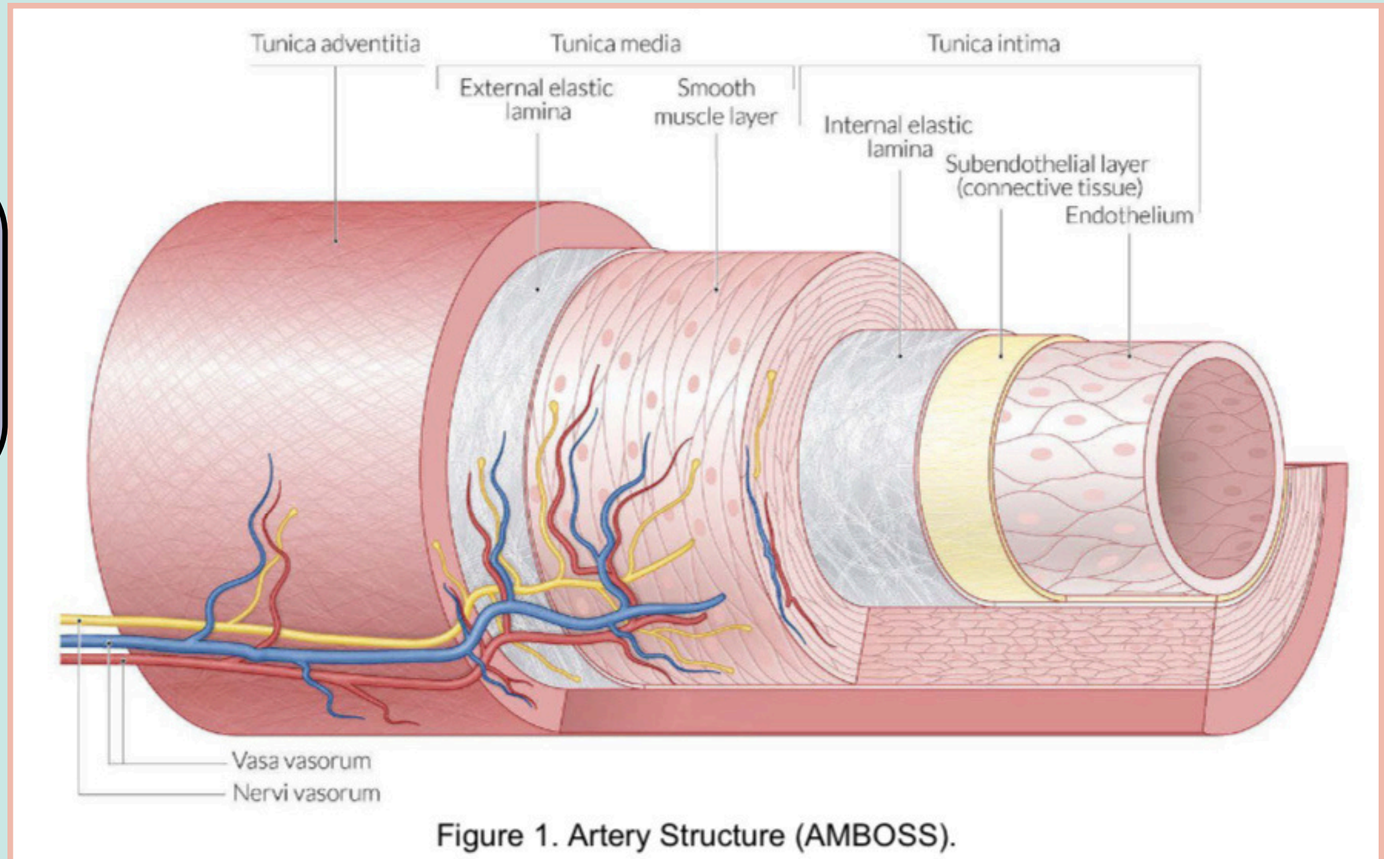
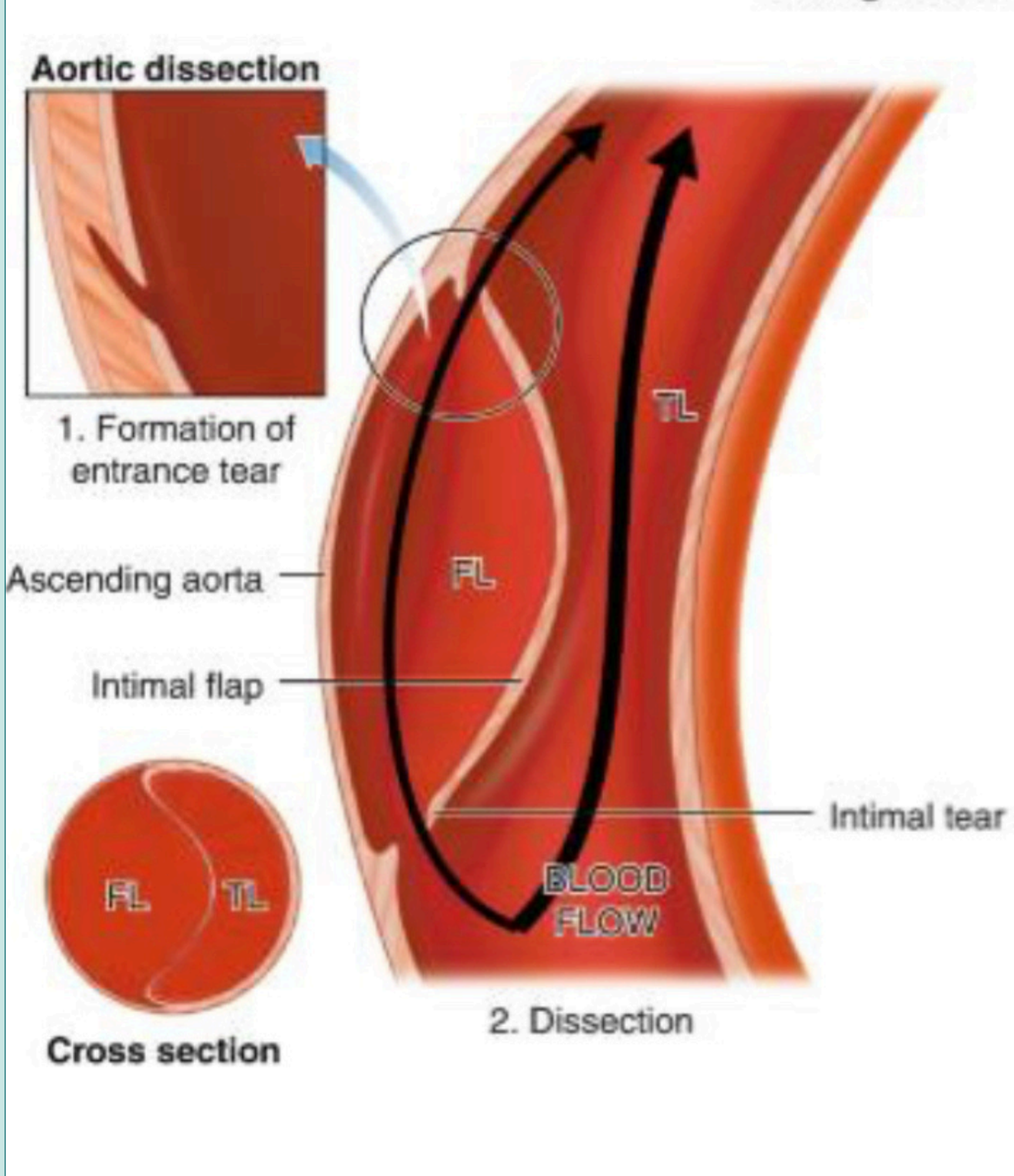


Figure 1. Artery Structure (AMBOSS).

PATHOPHYSIOLOGY

Transverse tear in the aortic intima ("entry") →blood enters the media of the aorta and forms a false lumen in the intima-media space downwards.



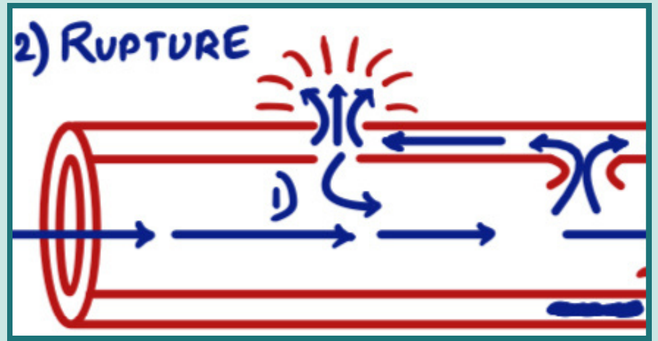
PATHOPYSIOLOGY

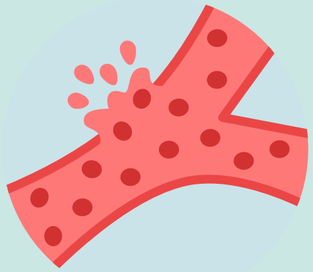
2

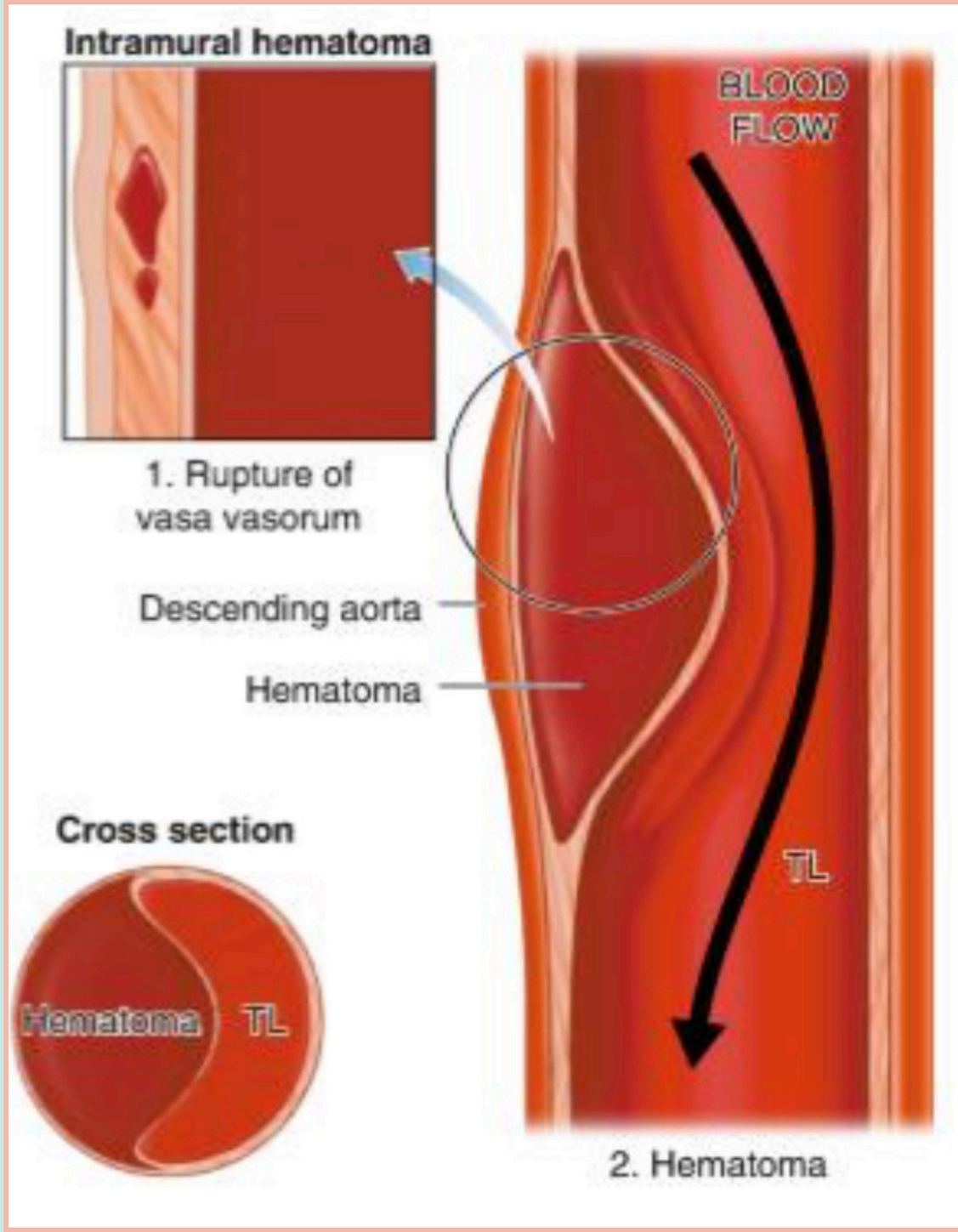
► hematoma forms and propagates longitudinally

► Rising pressure within the aortic wall

RUPTURE





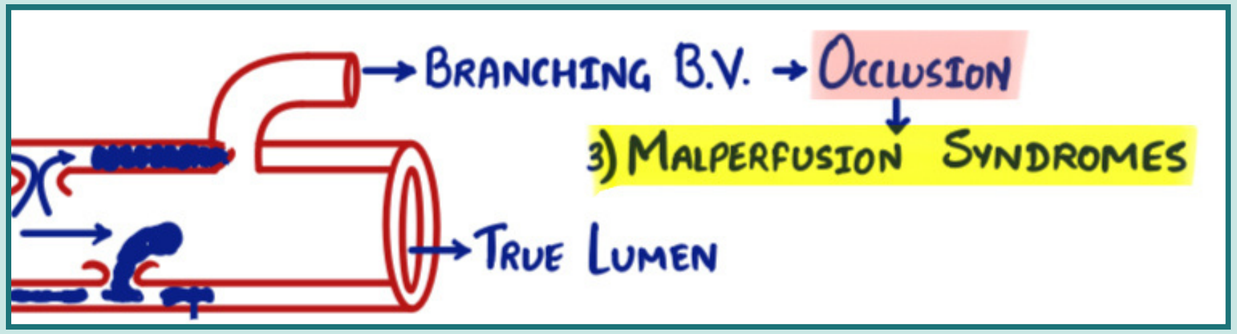


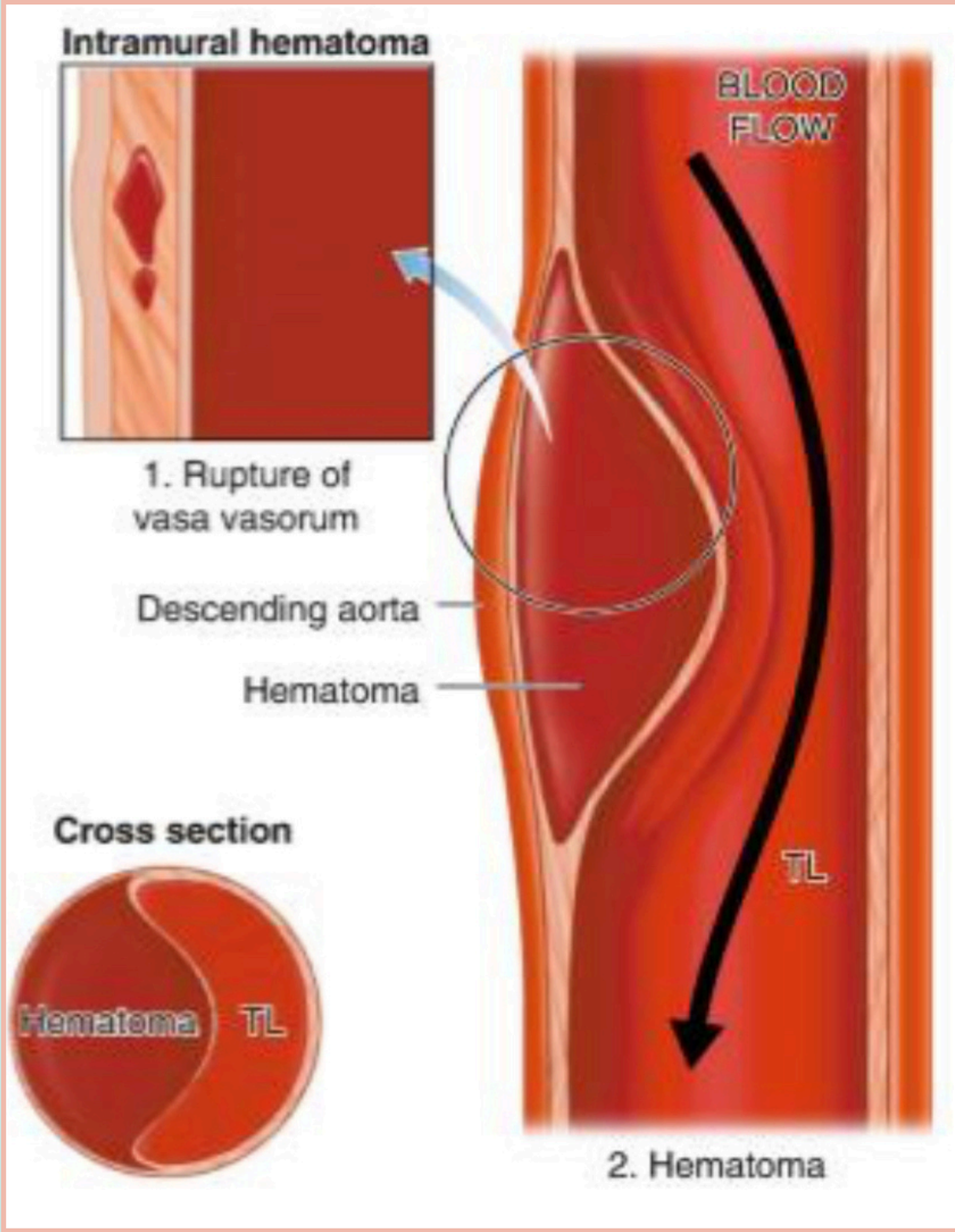
PATHOPYSIOLOGY

►Narrowing /Occlusion of a branching vessel (due to forming Hematoma) →

►e.g., coronary arteries, arteries supplying the brain, renal arteries, arteries supplying the lower limbs) →ischemia in the affected areas.

MALPERFUSION SYNDROMES

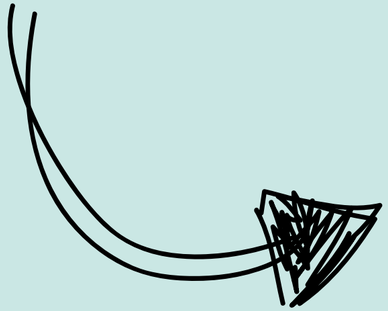




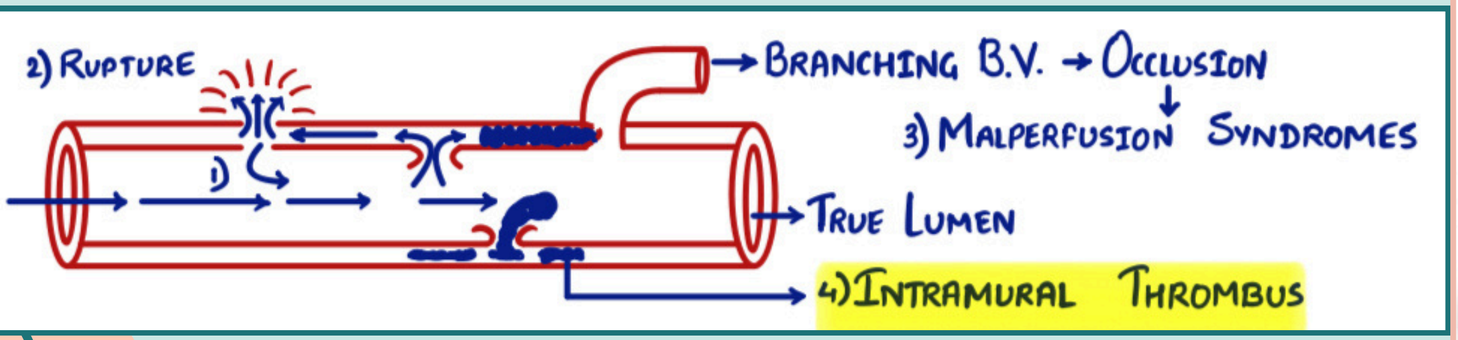
PATHOPYSIOLOGY

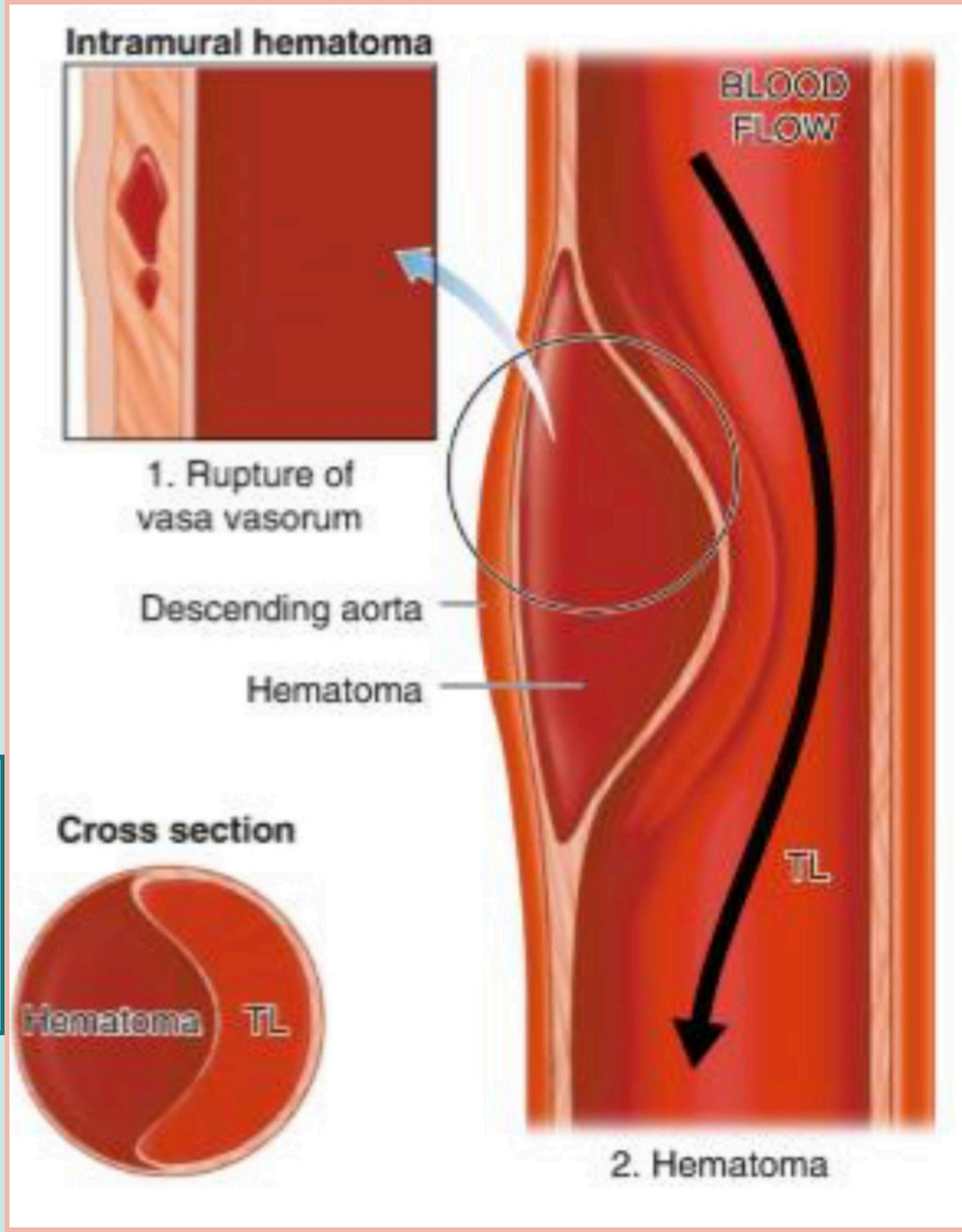
4

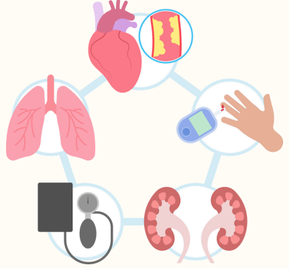
► Intramural (Intraluminal) Thrombosis → Forming hematoma at the tear site



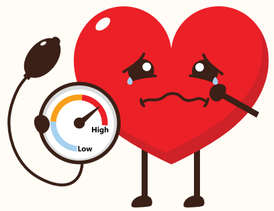
THROMBOSIS

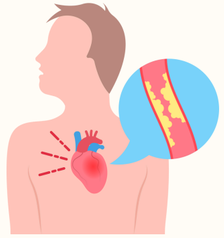


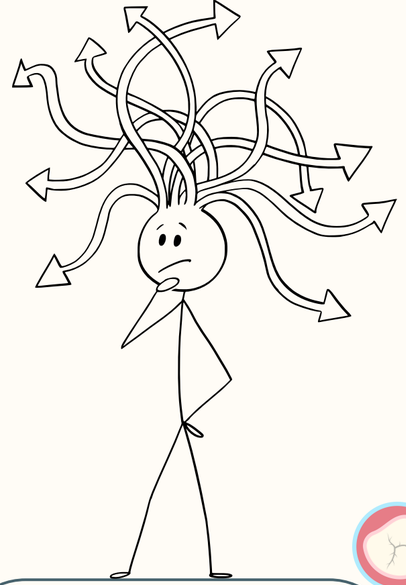




Risk Factor







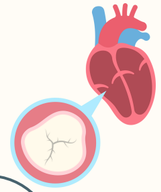
Hypertension

Atherosclerosis

Coarctation

Genetic:

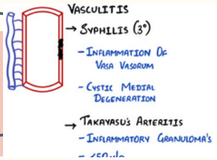
- Previous cardiac surgery:
  - ~CABG
  - ~AVR



1)Marfan syndrome

16.63 Risk factors for aortic dissection
Davidson box.p.g444

Vasculitis



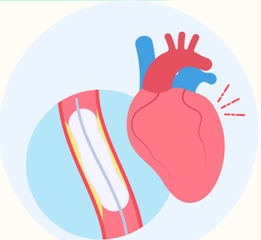
2)Ehlers-Danlos syndrome

- Iatrogenic:
  - ~Cardiac catheterisation
  - ~Intra-aortic balloon pumping

Fibromuscular dysplasia

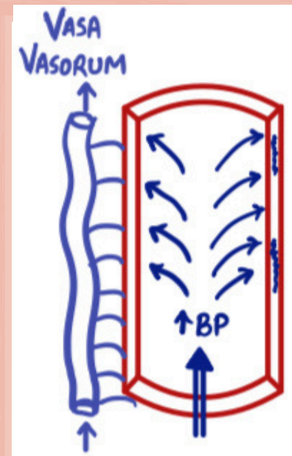
Pregnancy (usually third trimester)

- Trauma



(CABG = coronary artery bypass grafting)
(AVR= Aortic valve replacement)

EXPLAIN RISK FACTOR



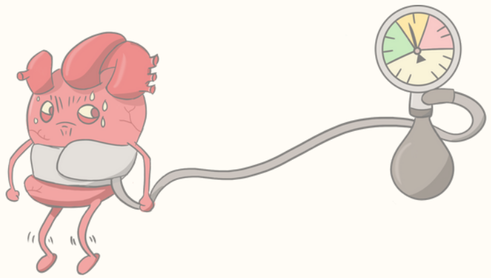
2/2→ COCCAINE
→ AMPHETAMINE

- HYPERTENSION (M/C)
  - ->40-60 y/o
  - TOBACCO USE +
  - HLD +
- SHEAR FORCES
- ARTERIOSCLEROSIS OF VASA VASORUM

(1)Hypertension

- **Most Common cause**
  - **High risk** Hypertensive patients for Aortic Dissection are patients with:

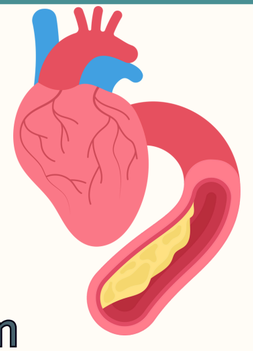
o Age > 40-60
o Tobacco Use
o Hyperlipidemia



- **Mechanism:**

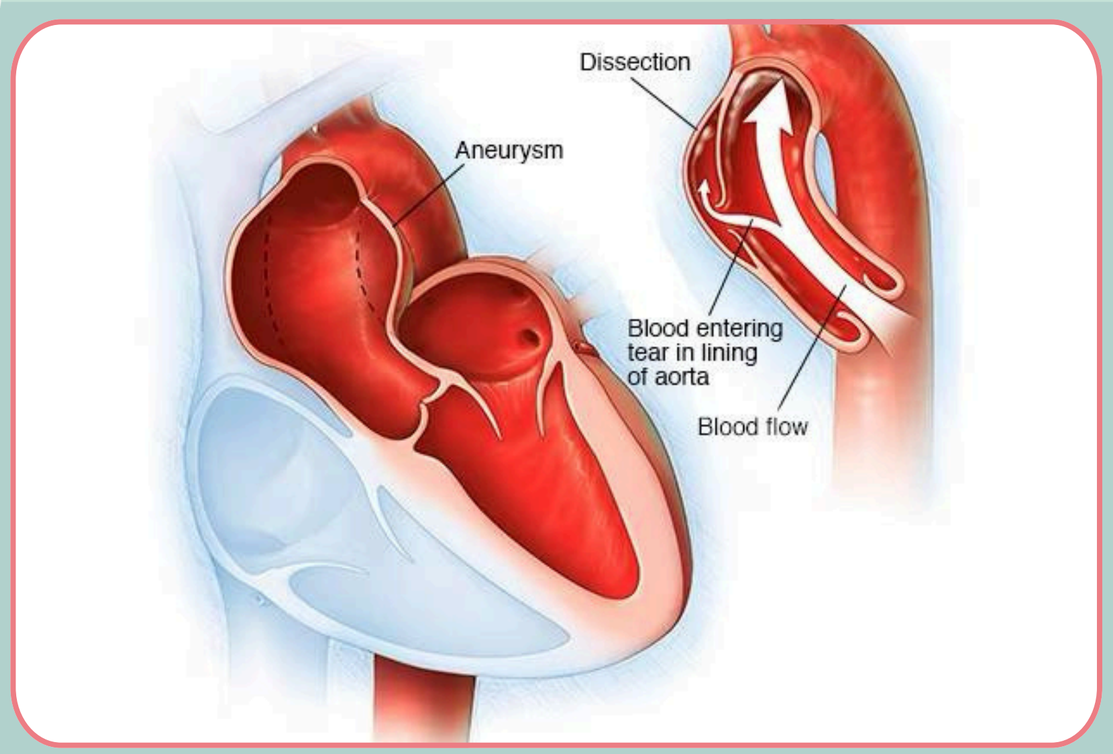
↑Sheer Forces on the vessel wall → Tear in the Tunica Intima→ Blood tracks in between Tunica Intima and Tunica Media Layer

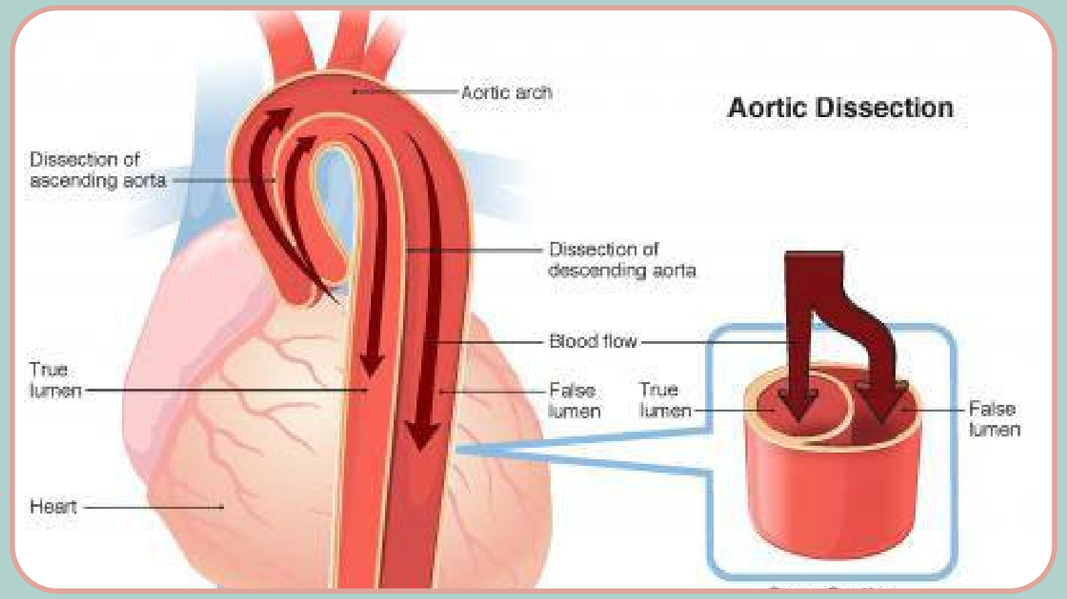
(2)Atherosclerosis

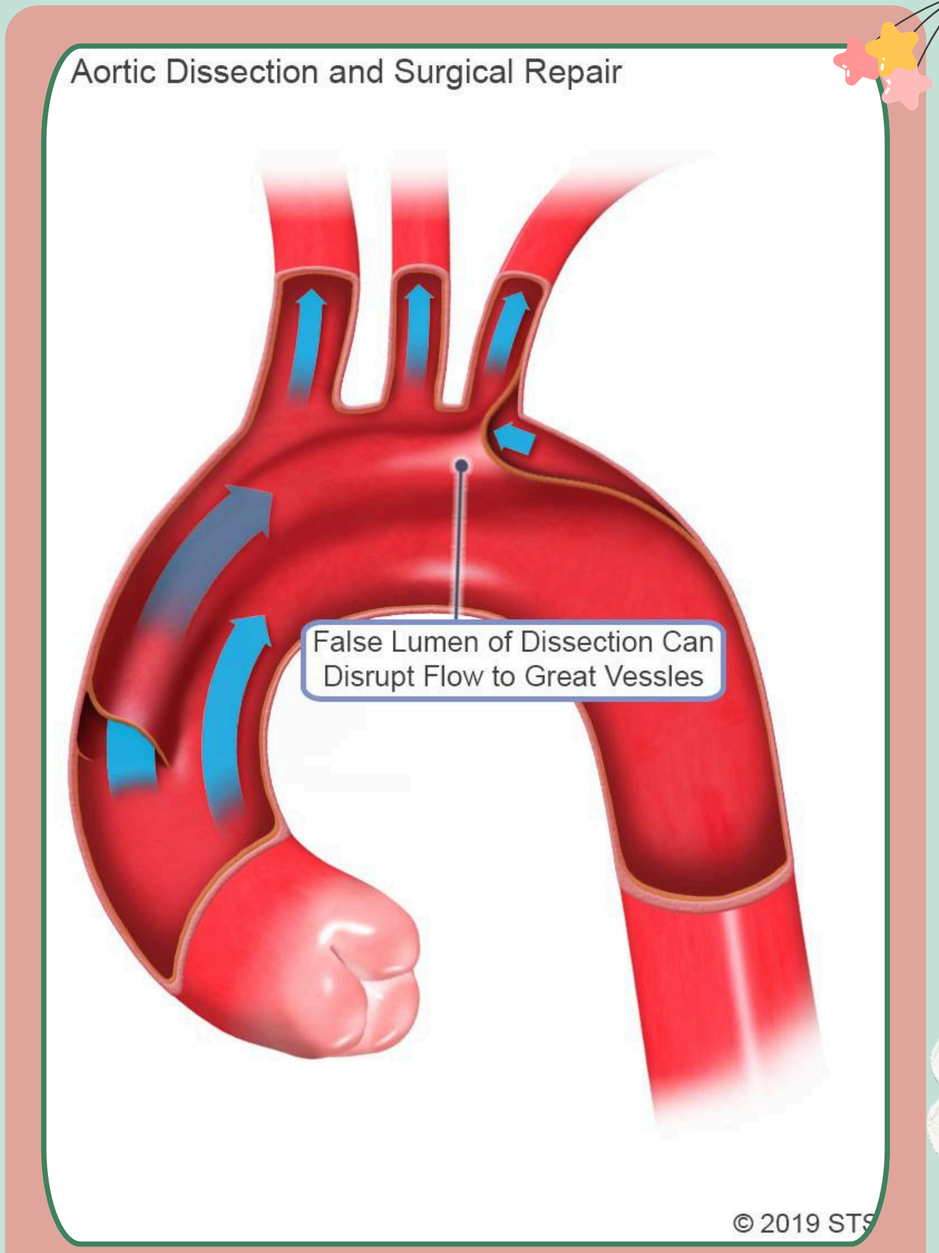


- **Mechanism:**

Arteriosclerosis of the Vasa Vasorum
 In HTN patients → Atherosclerosis of the Vasa Vasorum → ↓Blood Flow to the Tunica Media→ necrotic processes → Weak Vessel walls → ↑ Risk of having a tear → ↑ Risk of Dissection


Dissection
Aneurysm
Blood entering tear in lining of aorta
Blood flow


Aortic Dissection
Aortic arch
Dissection of ascending aorta
Dissection of descending aorta
Blood flow
True lumen
False lumen
True lumen
False lumen
Heart

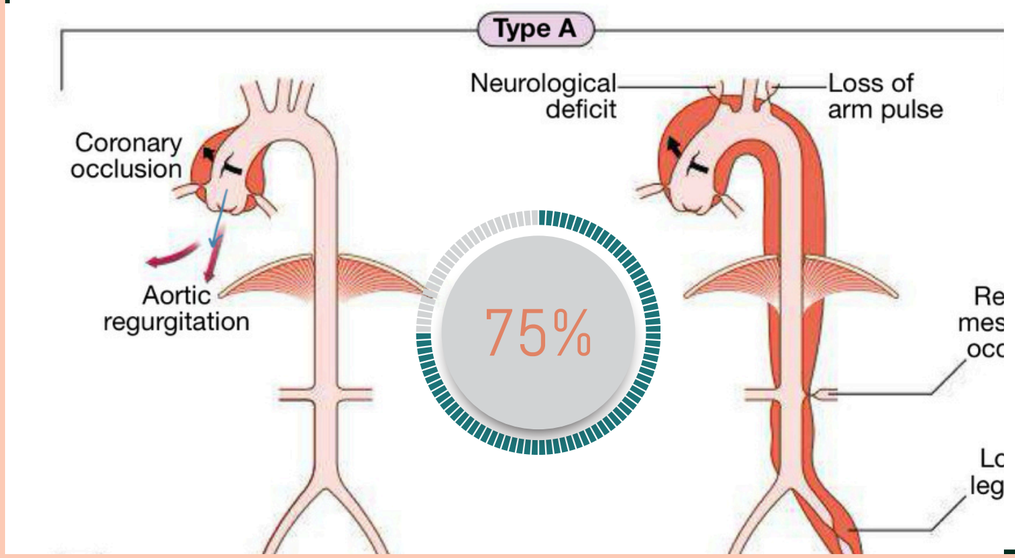

Aortic Dissection and Surgical Repair
False Lumen of Dissection Can Disrupt Flow to Great Vessles
© 2019 STS

STANFORD CLASSIFICATION

Stanford classification groups dissections by whether the ascending or descending aorta is involved.

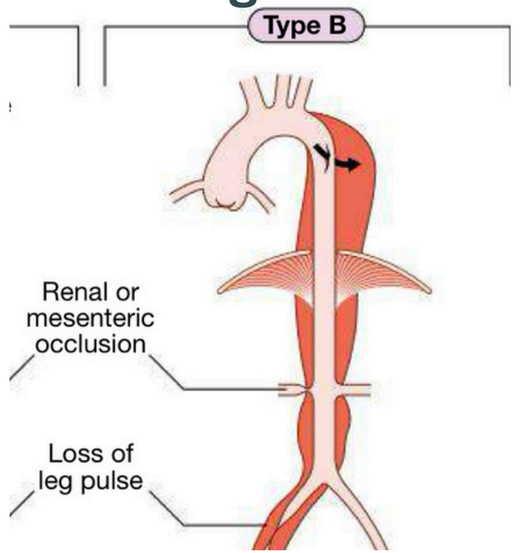
STANFORD TYPE A AORTIC DISSECTION:

- affects the ascending aorta, before (proximal to the)brachiocephalic artery
- •Type A = ascending; treatment is surgical



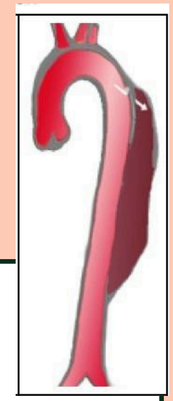
STANFORD TYPE B AORTIC DISSECTION:

- affects the descending aorta, after the left subclavian artery
- any dissection not involving the ascending aorta
- Type B = descending; treatment is medical



DEBAKEY CLASSIFICATION

DeBakey classification categorizes dissections according to their origin and extent.

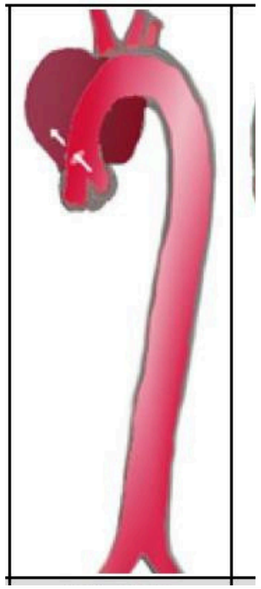


TYPE I

- **begins in the ascending aorta and involves at least the aortic arch, if not the whole aorta**

TYPE II

- **Dissections originate in, and are restricted to, the ascending aorta.**
- **[isolated to the ascending aorta]**



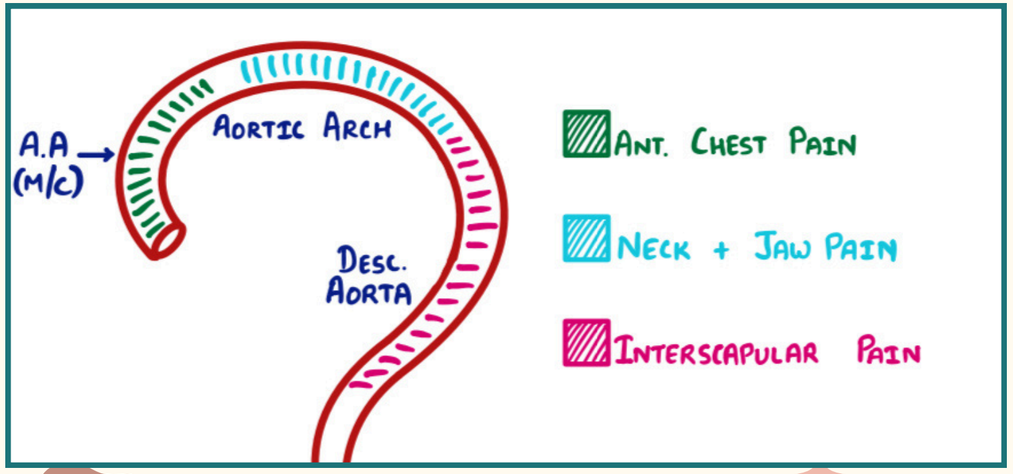
TYPE III

- **Dissections originate in the descending aorta and most often extend distally.**
- **Classically in elderly patients with atherosclerotic disease and hypertension Can be further subdivided into:**

►Type IIIa:begins in the descending aorta and involves only the section above the diaphragm

►Type IIIb: begins in the descending aorta and involves the aorta below the diaphragm

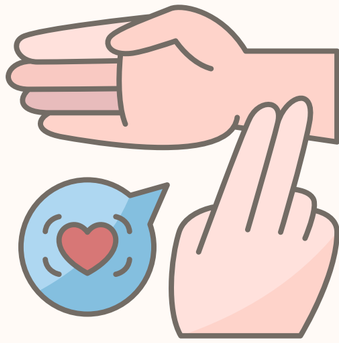
• Clinical Features



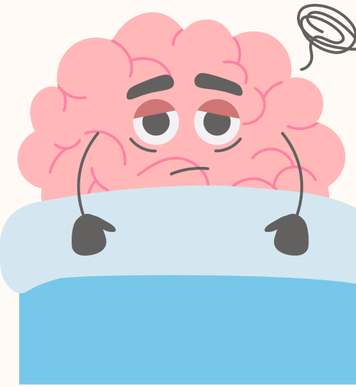
- Severe,tearing/ripping/stabbing pain,typically abrupt in onset,
- either in the anterior or back of the chest (often the inters capularr egion)
  - Anterior chest pain is more common with proximal dissection (type A).
  - Inter_scapular back pain is more common with distal dissection (typeB).
- Abdomen or periumbilical ,colicky pain (abdominal dissection).
- • Neck and jaw (Aortic arch affected; dissection extends into the great vessels).

• Clinical Features

- Syncope, diaphoresis, confusion, or agitation
- Most are hypertensive, but some may be hypotensive due to shock from blood loss or cardiac tamponade
- Asymmetrical blood pressure and pulse readings between limbs
- Wide pulse pressure



- Aortic regurgitation (especially type A aortic dissection)



- Neurologic manifestations (hemiplegia, hemianesthesia) due to obstruction of carotid artery
- Type A dissection can progress to coronaries (causing MI) or pericardium (causing cardiactamponad

SOCRATES

We can describe the problem by asking some questions

Site: interscapular/retrosternal

Onset: very sudden

Character: tearing/ripping

Radiation: Back ,between shoulder

Associated features: Sweating ,syncope,sign of limb ischemia

Timing:Acute presentation /prolonged duration

Exacerbating/relieving: spontaneous,No manoeuver relieve pain

Severity:Very sever

PHYSICAL EXAMINATION

1

1. Asymmetrical blood pressure reading or pulse (right more than left or verse versa) and may be hypertensive or hypotensive

2

Diastolic murmur (aortic regurgitation)

3

Distant heart sounds

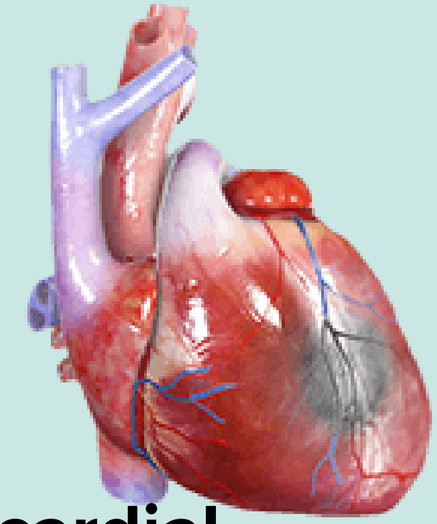
4

Hemiplegia due to carotid artery involvement

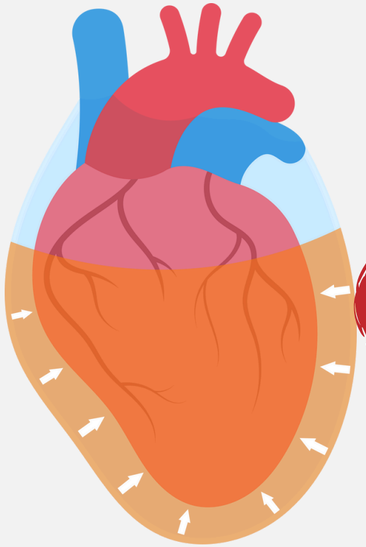
COMPLICATIONS

Stroke

Death



Myocardial infarction



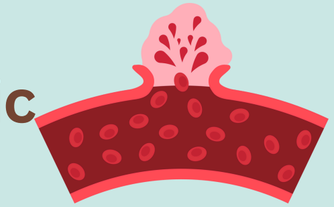
Cardiac tamponade

Pericarditis

Aortic regurgitation

SHOCK

a) Hemorrhagic Shock from Aortic Rupture:

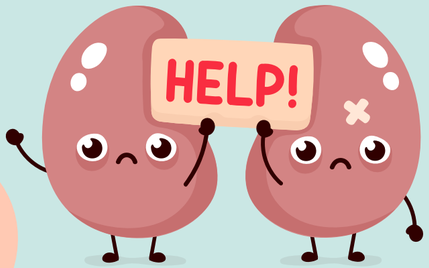


Pathophysiology of Hemorrhagic shock:

Blood travels through false lumen → Blood can then track through the vessel wall and break through tunica externa → Blood can then leak out of the vascular system (rupture) → ↑Blood loss → ↓BP → Hemorrhagic Shock.

Hemorrhagic Shock Presents with:

- o Hypotension/Shock
- o Tachycardia
- o Multisystem organ failure (e.g. AKI or AMS)



SHOCK

b)Obstructive Shock from Cardiac Tamponade:

Pathophysiology of Cardiac tamponade:

Blood travels through false lumen → Blood can then track through the vessel wall and break through tunica externa →

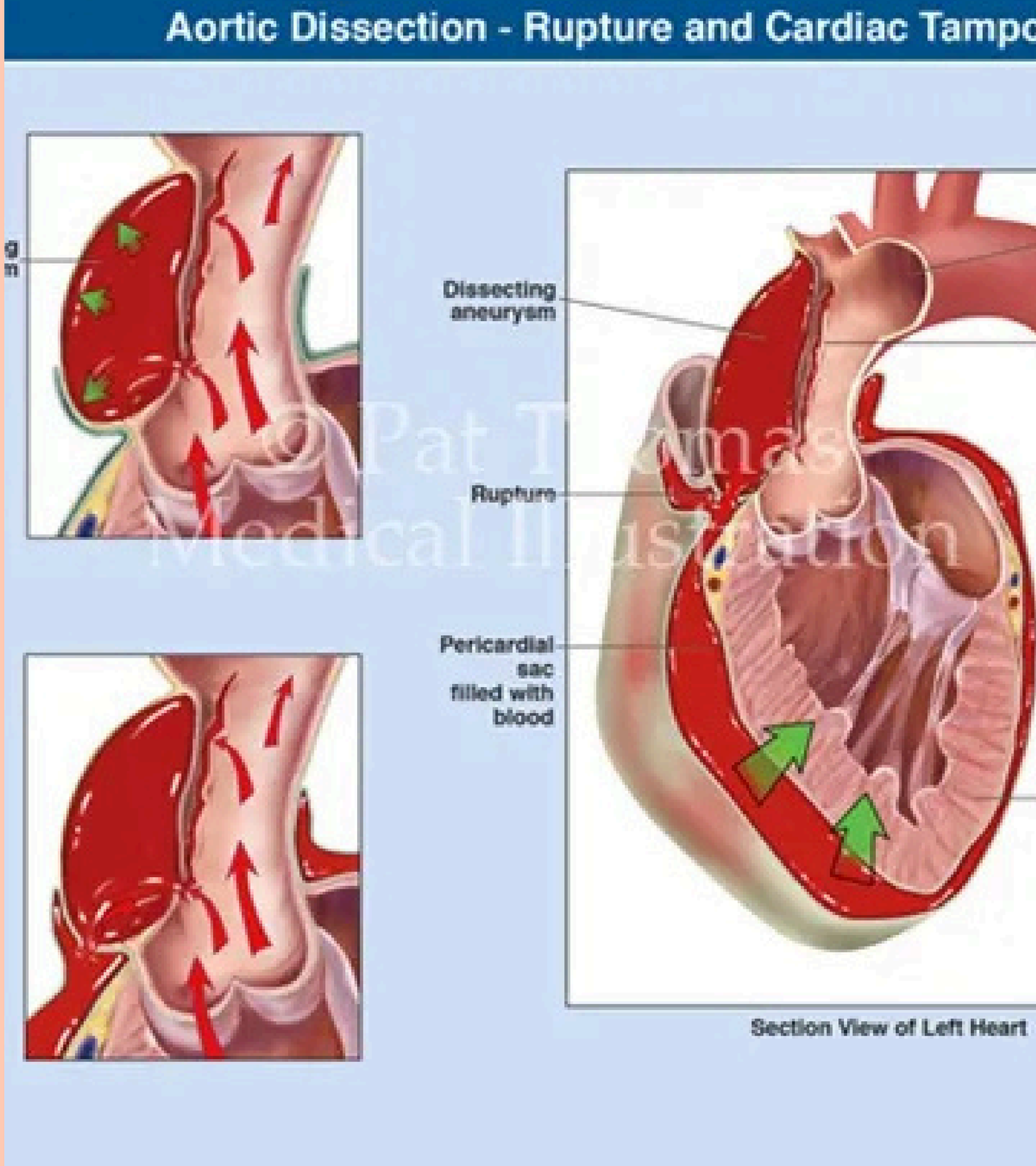
Blood can then leak out of the vascular system (rupture through pericardium) →

Hemopericardium →

Cardiac tamponade → Obstructive Shock.

Cardiac Tamponade Presents with:

- o Hypotension/Shock
- o JVD
- o Muffled Heart sounds



BLOOD CAN CONTINUE FLOWING INTO THE FALSE LUMEN, WHICH MAY LEAD TO THE OCCLUSION OF AORTIC BRANCHES, CAUSING:

-Coronary—>MI (type1 and2).
-Common carotid—>stroke, neurological deficits (e.g. weakness, dysarthria, sensory loss).
-Spinal—>paraplegia.
-renal—>renal failure.
-Coeliac and superior mesenteric—> mesenteric infarction with abdominal pain.
-Subclavian—>unequal pulse and blood pressure(BP will be less in the affected side by 20mmHg.)
-There may be asymmetry of the brachial, carotid or femoral pulses.
-Acute limb ischemia (usually leg).

HORNER'S SYNDROME

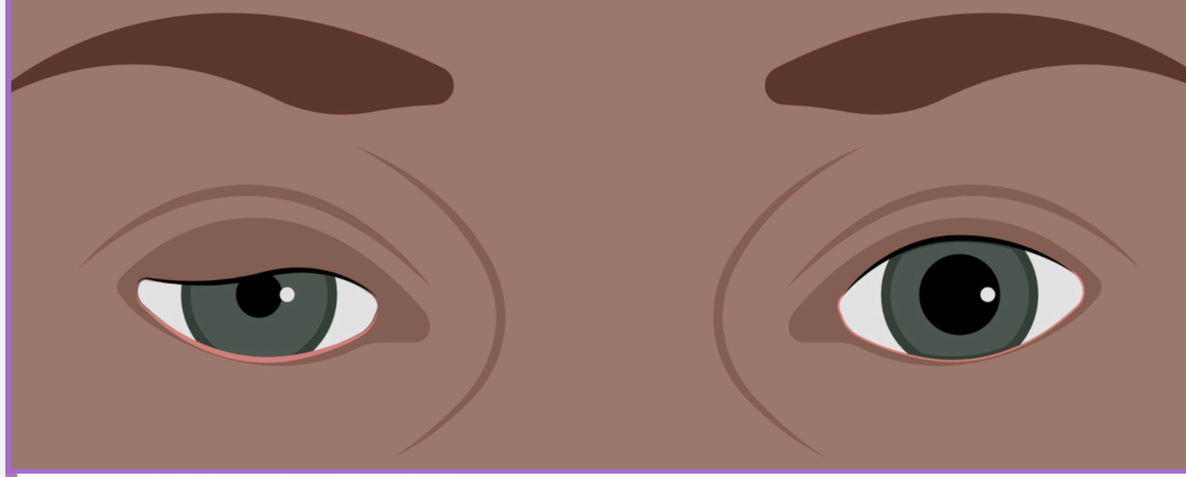
o Blood travels through false lumen → Blood can then track through the vessel wall towards the base of Common carotid arteries (CCA) near the sympathetic plexus→ Sympathetic plexus compression → ↓SNS supply to the ipsilateral face.

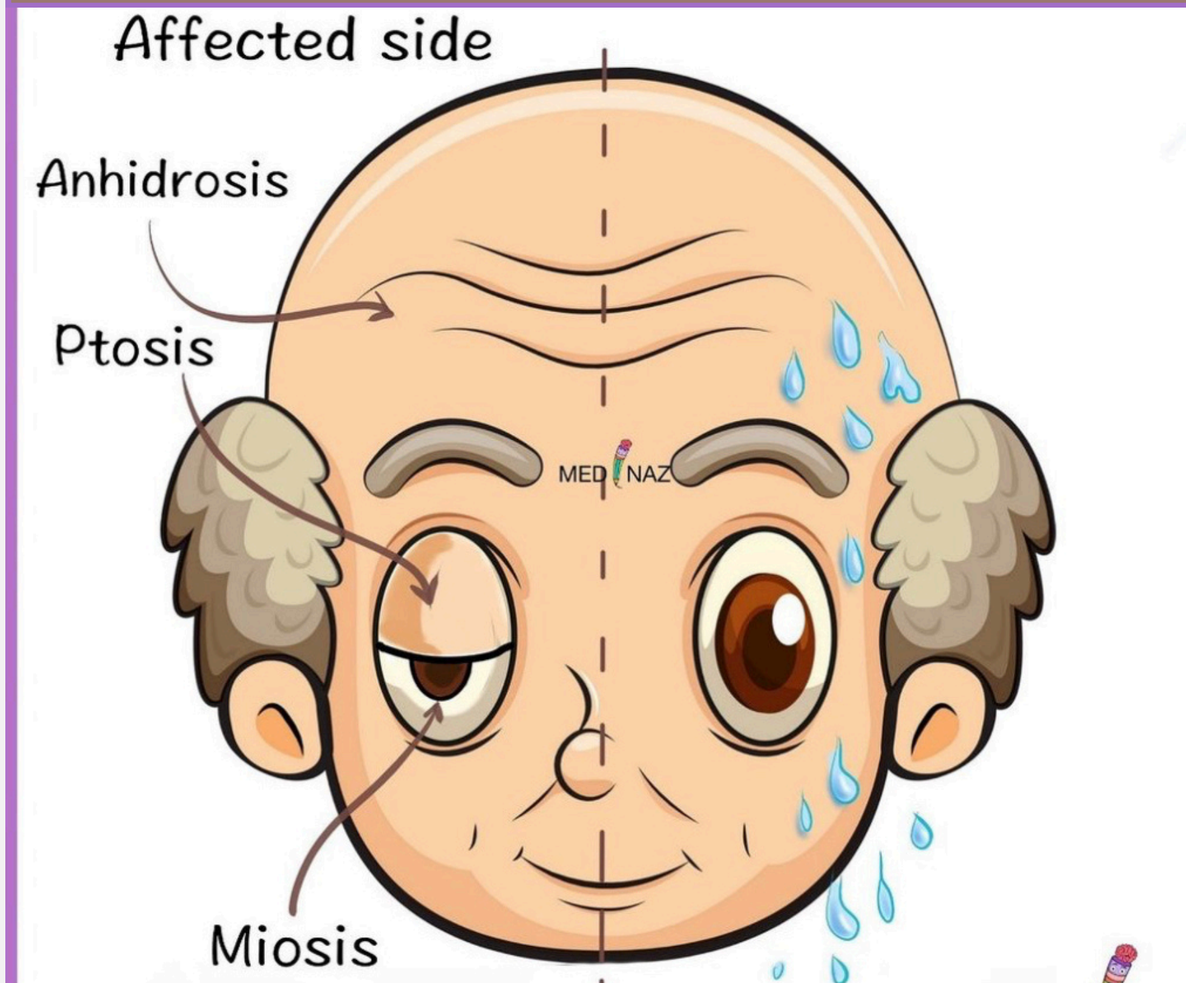
Horners Syndrome Presents with:

o Ptosis: Drooping of eyelid

o Miosis: Pupillary constriction

o Anhidrosis: Lack of facial sweating

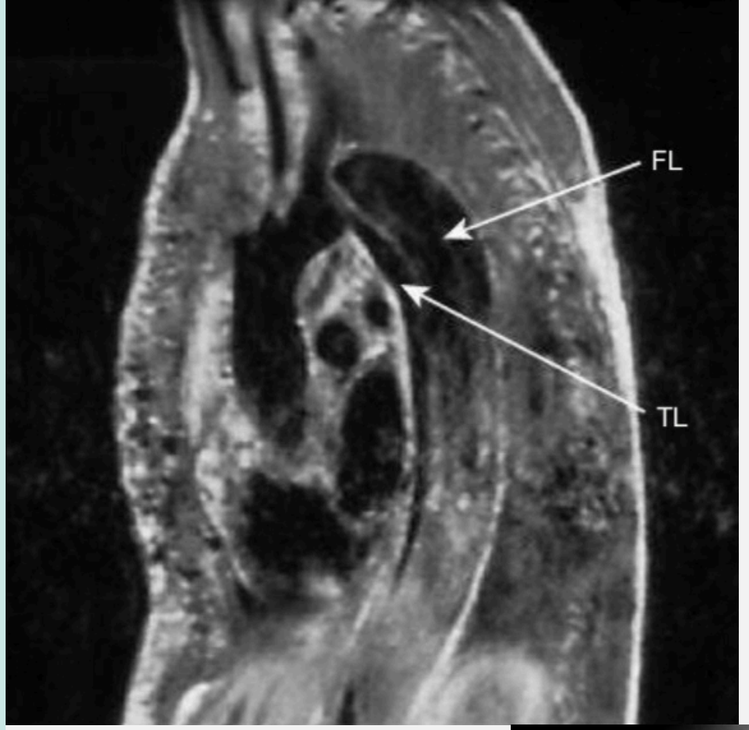




INVESTIGATION:

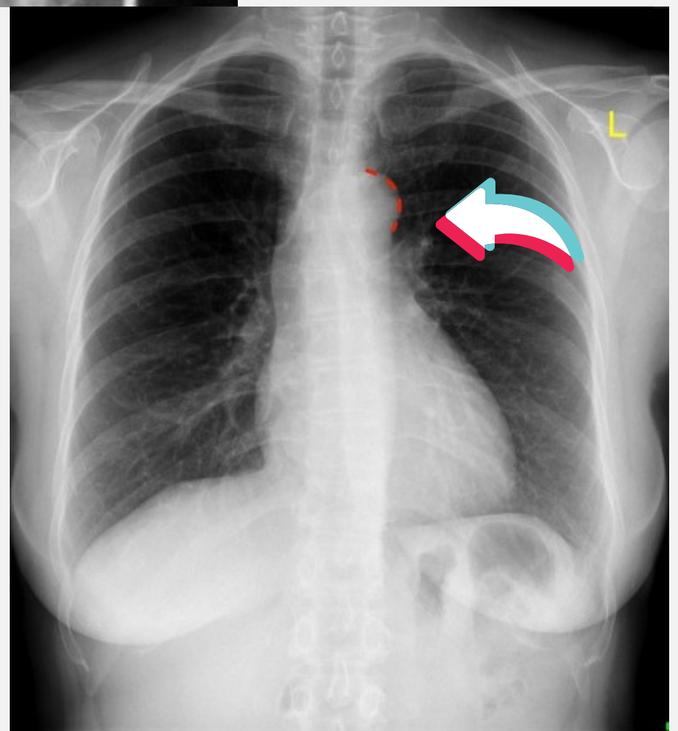
The investigations of choice are CT or MR angiography , both of which are highly specific and sensitive. A chest X-ray should be performed. It characteristically shows broadening of the upper mediastinum and distortion of the aortic ‘knuckle’ but these findings are absent in 10% of cases. A left-sided pleural effusion is common.

-Doppler echocardiography may show aortic regurgitation, a dilated aortic root and, occasionally, the flap of the dissection.



MRI (SAGITTAL VIEW)

AORTIC KNUCKLE (X-RAY)



X-RAY

INVESTIGATION:

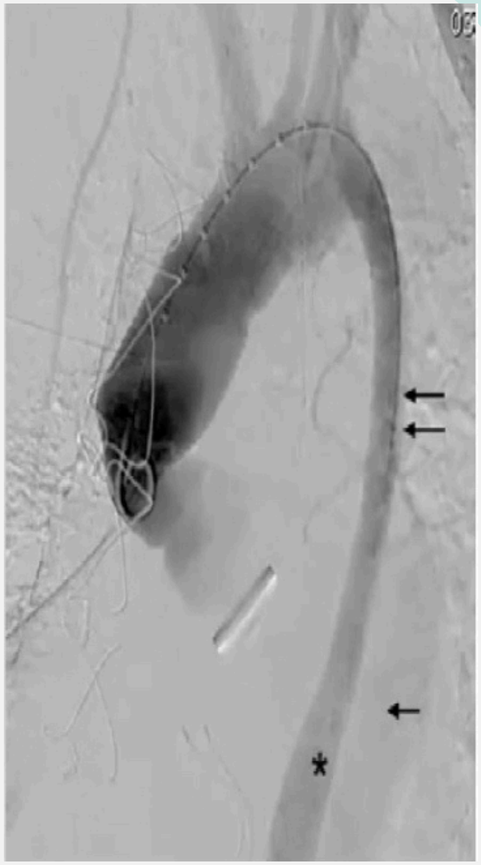
-Transthoracic echo: is diagnostic in 75% in type A(ascending) and 40% in type B (descending).

-CT Scan with contrast is investigation of choice.
-CT angio is a fast non-invasive test that will give accurate three-dimensional view of the aorta.

-MRI angiogram provides greater detail and can help plan management but often takes longer to get.(the gold standard).

Aortography

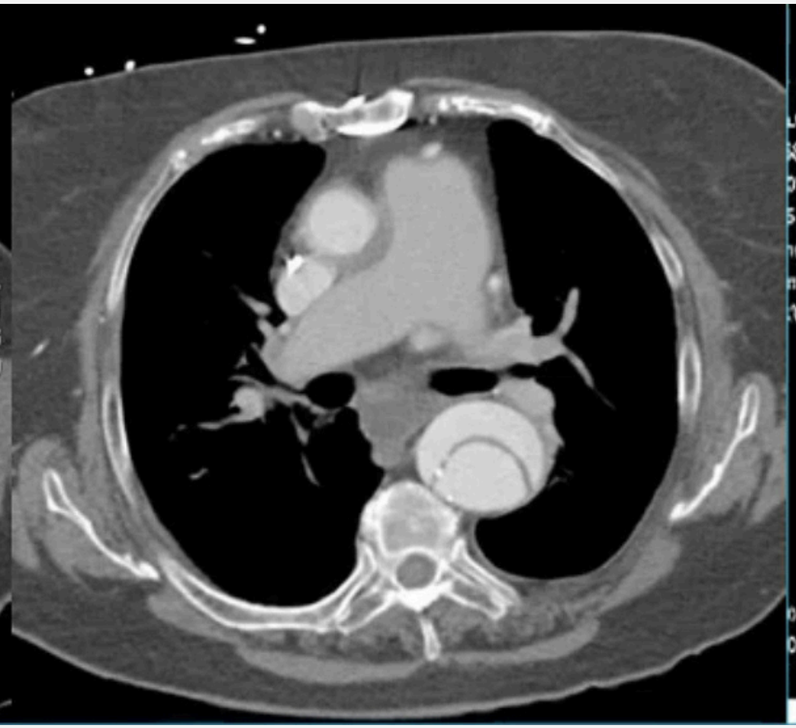
NORMAL



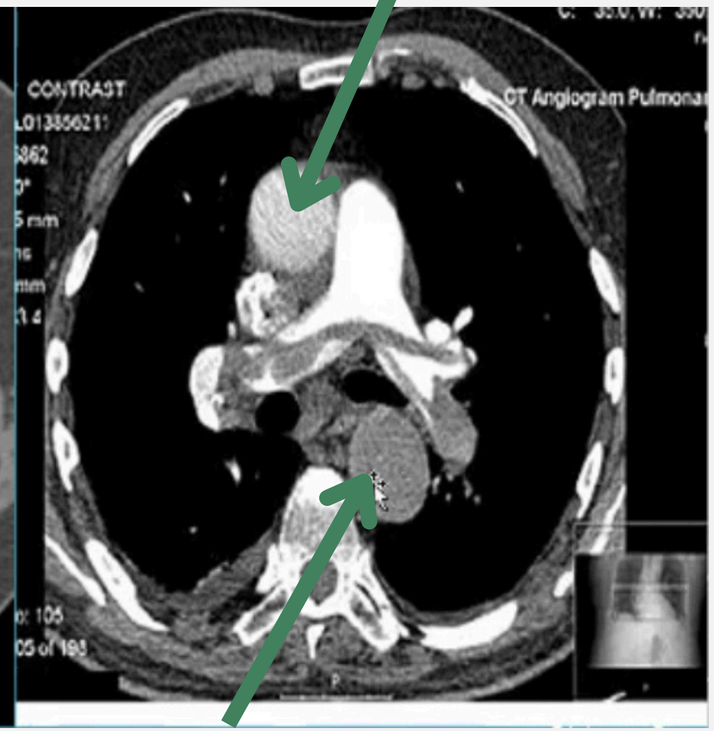
AORTIC DISSECTION

CT ANGIOGRAPHY

DISSECTION IN THE ASCENDI AORTA



DISSECTION IN THE DESCENDIN AORTA



Ascending aorta

Descending aorta

INVESTIGATION:

ECG may show left ventricular hypertrophy in patients with hypertension or, rarely, changes of acute MI (usually inferior).
It may be normal and falsely reassuring.

!! **Myocardial infarction can occur in combination with aortic dissection, and treatment of the myocardial infarction (e.g., thrombolysis) can cause fatal progression of the aortic dissection.**

MANAGMENT:

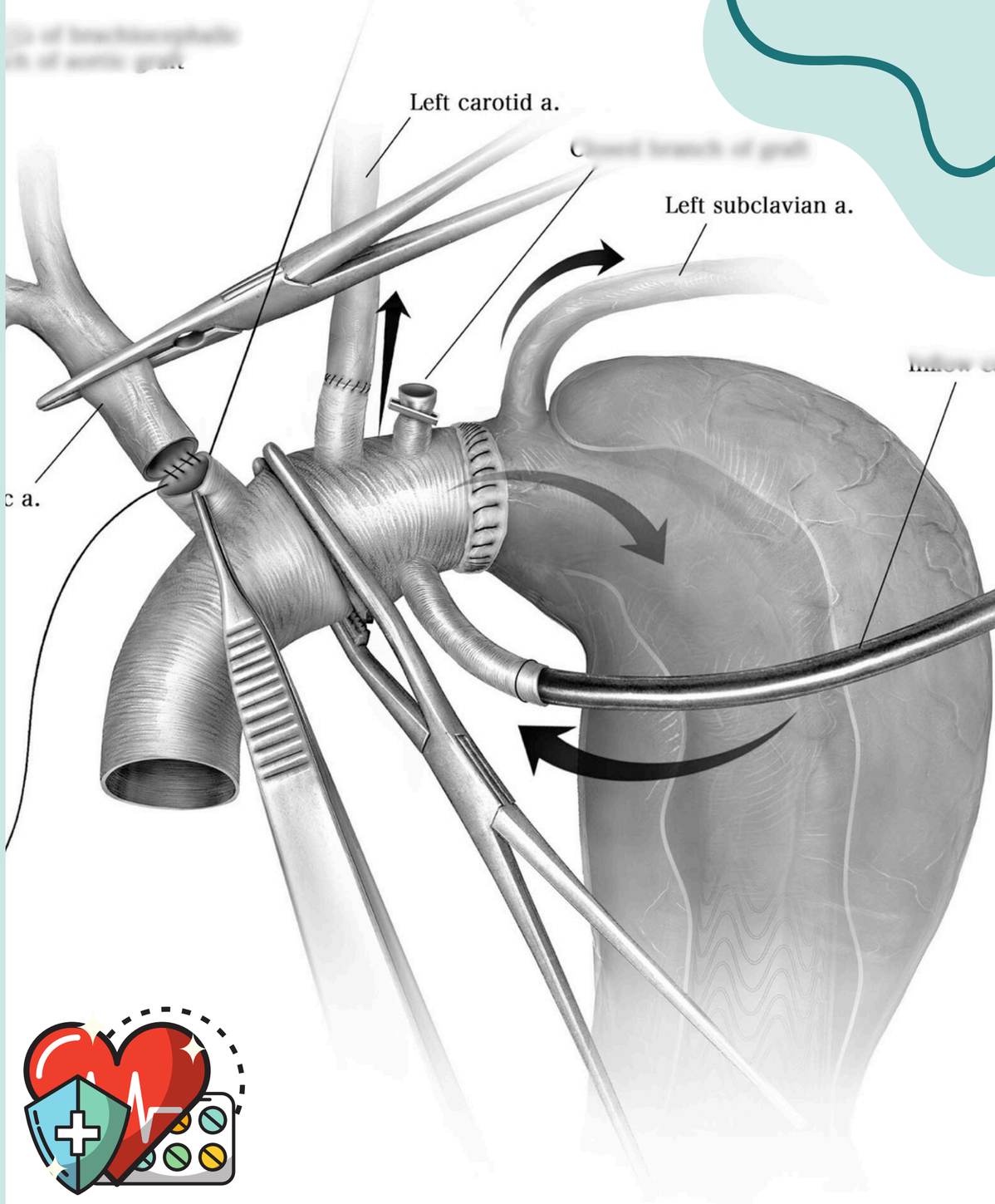
Initial management comprises pain control and antihypertensive treatment. Type A dissections require emergency surgery to replace the ascending aorta. Type B dissections are treated medically unless there is actual or impending external rupture, or vital organ (gut, kidneys) or limb ischaemia, as the morbidity and mortality associated with surgery are very high.

MANAGMENT:

The aim of medical management is to maintain a mean arterial pressure (MAP) of 60–75 mmHg to reduce the force of the ejection of blood from the LV.

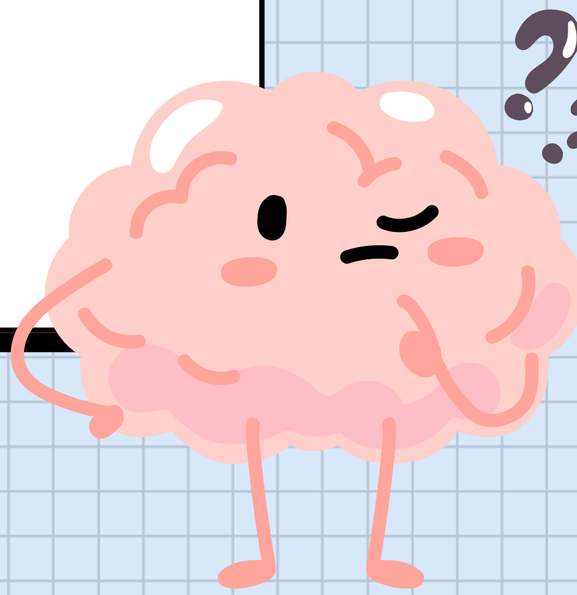
First-line therapy is with β-blockers; the additional α-blocking properties of labetalol make it especially useful. Rate-limiting calcium chan- nel blockers, such as verapamil or diltiazem, are used if β-blockers are contraindicated. Sodium nitroprusside may be considered if these fail to control BP adequately.

Percutaneous or minimal access endoluminal repair is sometimes possible and involves either ‘fenestrating’ (perforating) the intimal flap so that blood can return from the false to the true lumen (so decompressing the former), or implanting a stent graft placed from the femoral artery.



1 Discussion

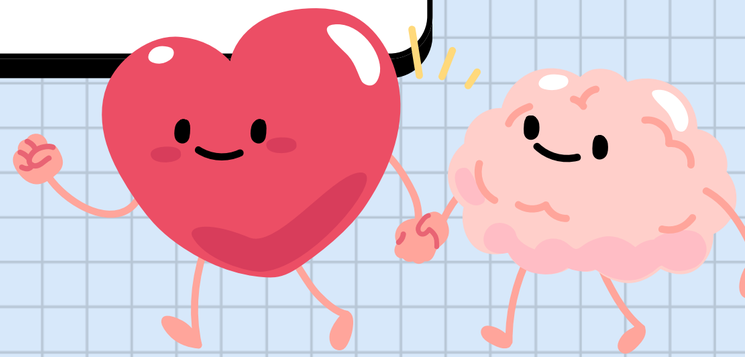
Why do you treat dissection of the carotid artery with an anticoagulant in the acute management of stroke secondary to dissection?



1 Discussion

ANSWER

Patients with a carotid artery dissection are often treated with anticoagulants despite the underlying bleeding into the vessel wall. As the blood enters the wall of the artery the lumen becomes progressively narrowed and thrombosed. It is to try to prevent further thrombosis and emboli occurring that anticoagulants are given.



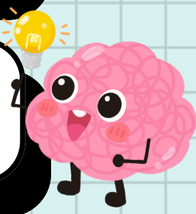
Question 2

16.61. A 65 year old man with known hypertension presents with severe central chest pain that radiates between his shoulder blades. He is sweaty with a BP of 200/100 mmHg in his right arm, a pale left arm and an ECG showing sinus tachycardia. His chest X-ray shows mediastinal widening and a computed tomography scan shows a type A aortic dissection. Which of the following is known to reduce mortality?

a) Anticoagulation

b) Control of the blood pressure

c) Emergency repair of the ascending aorta



d) Intravenous ß-blockade

e) Prevention of limb or renal ischaemia

Question 3

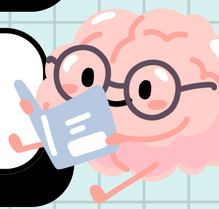
16.62. A short young woman presents with severe chest pain, vomiting and a sinus tachycardia. She is in the last trimester of pregnancy and has had normal blood pressure and observations at antenatal care. She is admitted for observation but is later found collapsed and in cardiac arrest. Despite attempts at resuscitation, mother and child die. Postmortem reveals an aortic dissection. What is the most likely underlying cause for the dissection?

a) Coarctation of the aorta

b) Intramural haematoma

c) Marfan's syndrome

d) Pregnancy



e) Undiagnosed hypertension

Question 4

16.6. Which of the following pathologies can be associated with an early diastolic murmur?

a) Long QT syndrome type 1

b) Maran's syndrome

c) Mitral valve prolapse

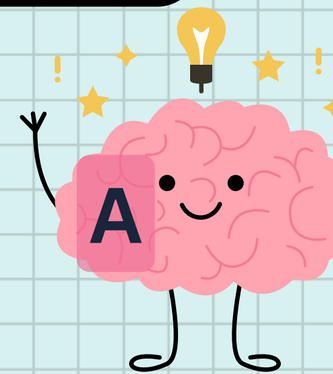
d) Myotonic dystrophy

e) Wolff-Parkinson-White syndrome

Question 5

V-157. Which of the following patients with aortic dissection or hematoma is best managed without surgical therapy?

A. A 45-year-old female with a dissection involving the aorta distal to the great vessel origin but cephalad to the renal arteries
B. A 74-year-old male with a dissection involving the root of the aorta
C. A 58-year-old male with aortic dissection involving the distal aorta and the bilateral renal arteries
D. A 69-year-old male with an intramural hematoma within the aortic root
E. All of the above patients require surgical management of their aortic disease.



Thank you

HEADING

Subheading

Body