

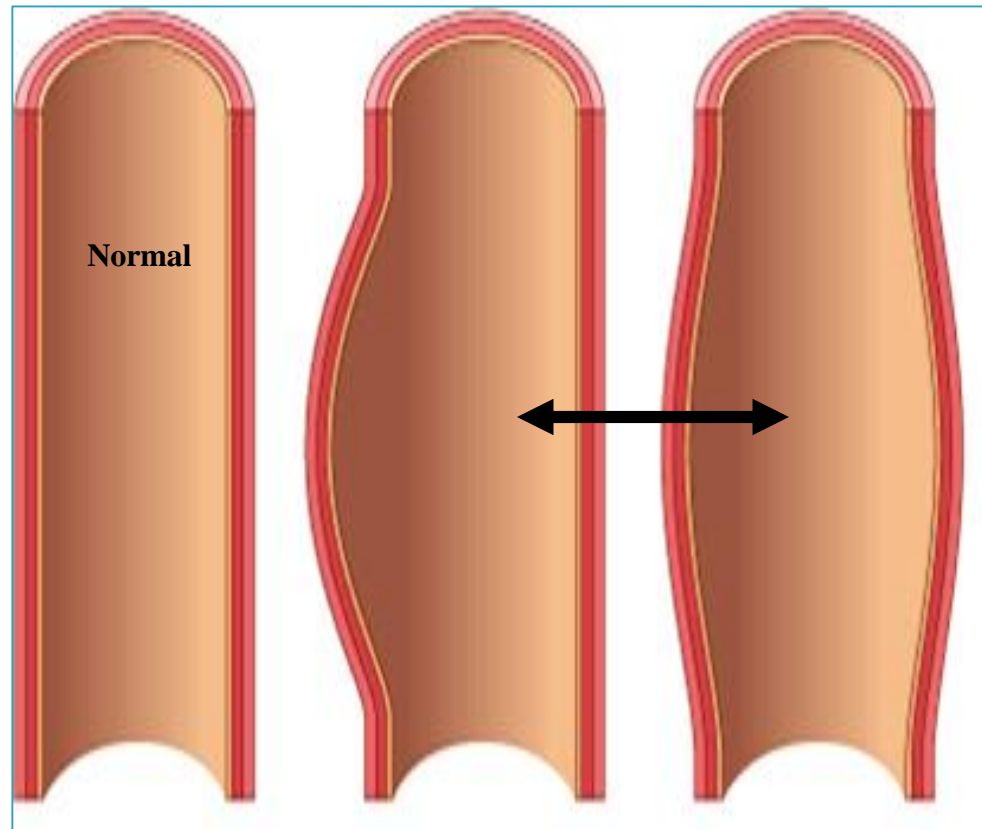


ANEURYSMS AND DISSECTIONS

Dr. Nisreen Abu Shahin
Associate Professor of Pathology
Pathology Department
University of Jordan

Aneurysm

- ▶ localized abnormal dilation of artery or heart

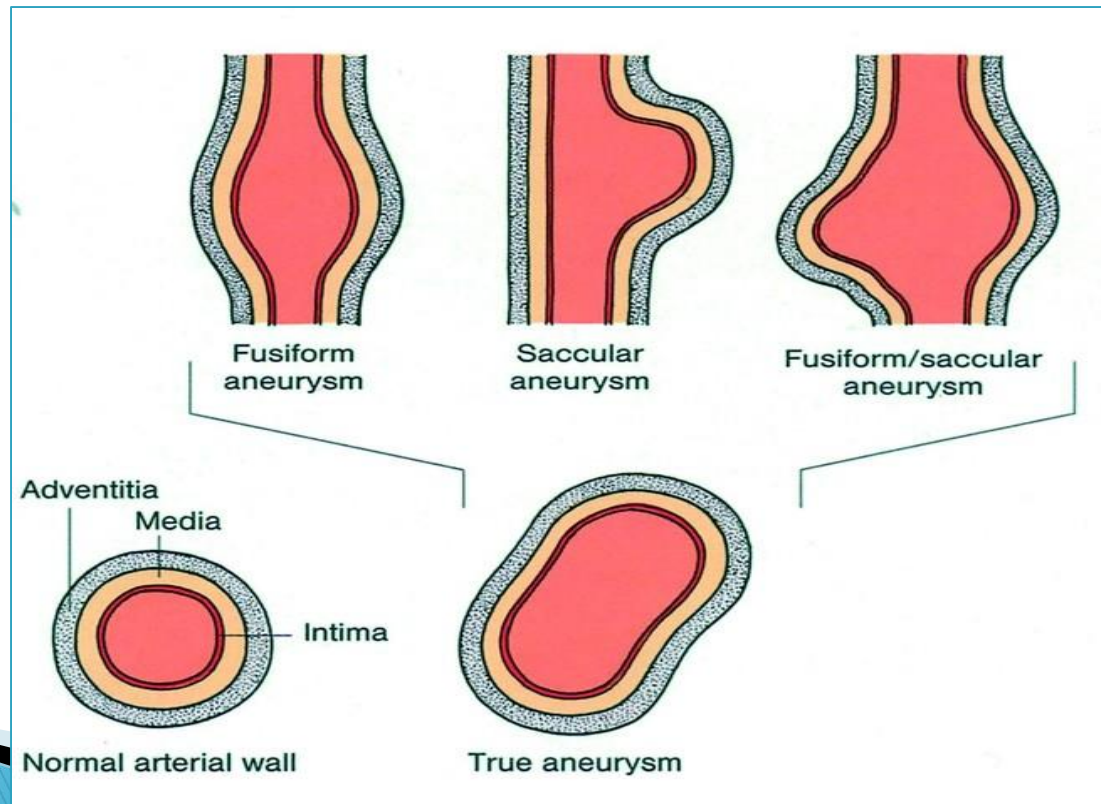


► **Types:**

1-"true" aneurysm

- **all three layers of arterial wall or heart**

→ e.g. Atherosclerotic, syphilitic, congenital aneurysms, ventricular aneurysms following transmural MI



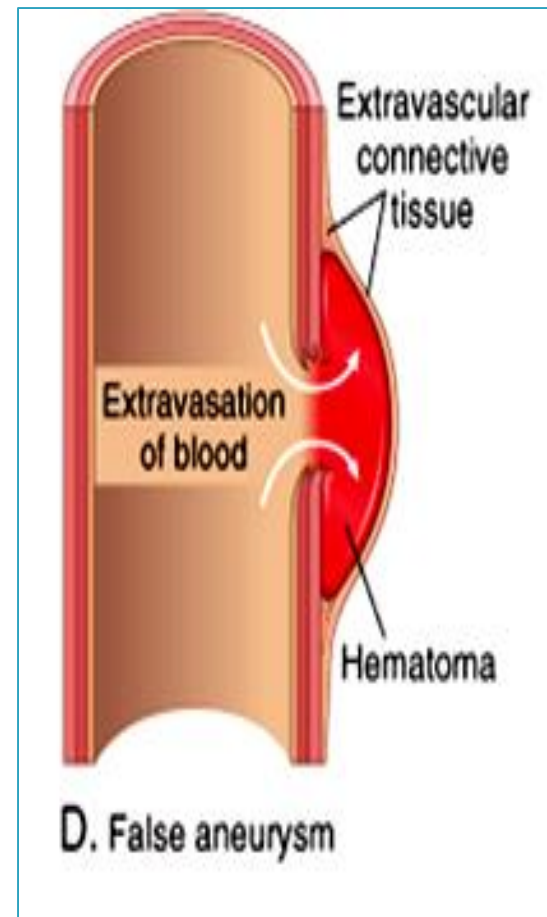
2- “false” aneurysm

- (a.k.a. pseudo-aneurysm)

→ a breach in vascular wall leading to hematoma communicating with intravascular space ("pulsating hematoma")

→ E.g. ventricular rupture after MI contained by pericardial adhesion

→ E.g. a leak at the junction of a vascular graft with a natural artery.



▶ **aneurysms are classified according to macroscopic shape and size into:**

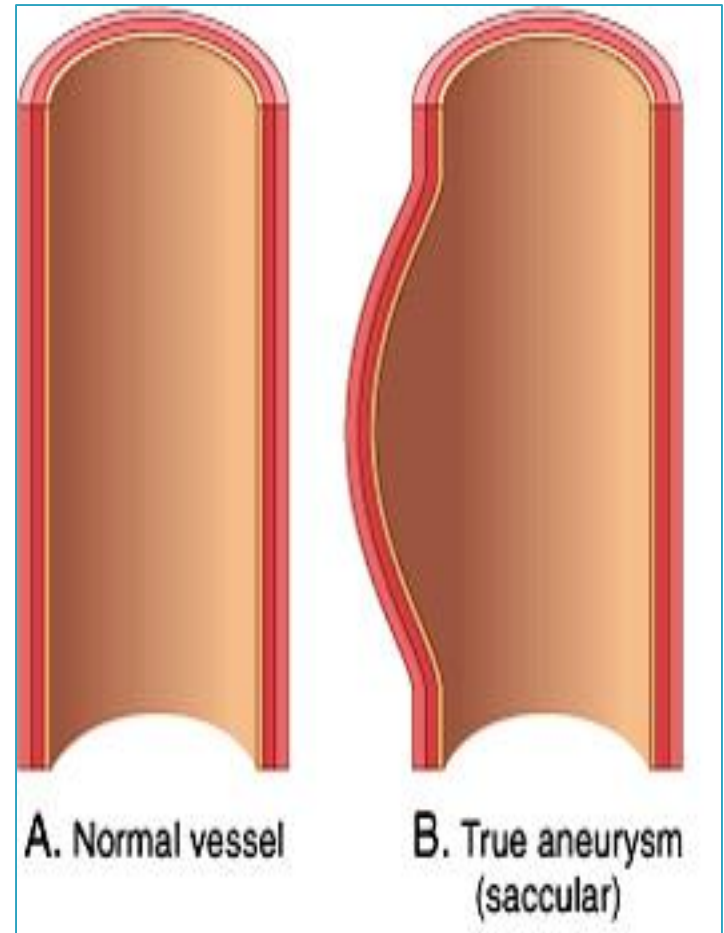
1- saccular

2- fusiform

▶ Note: shape and size are not specific for any disease or clinical manifestations

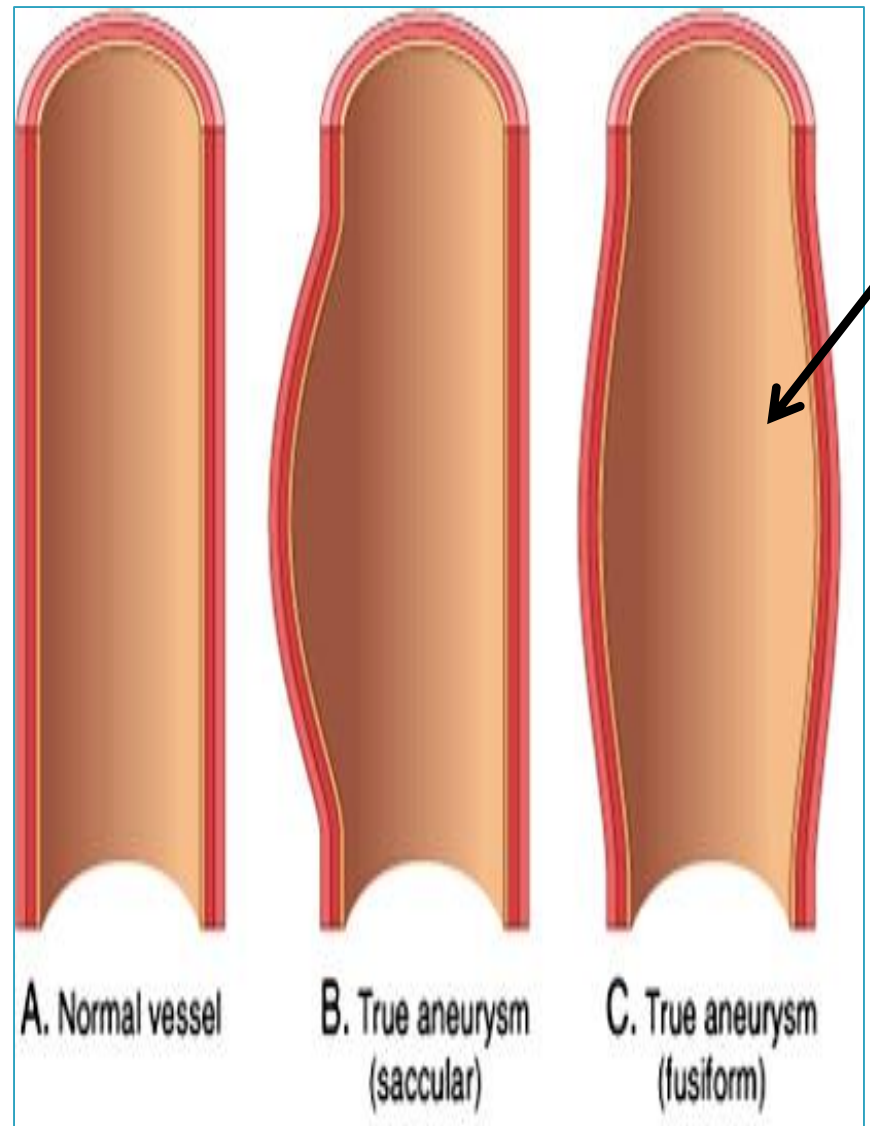
1- Sacular aneurysms

- spherical outpouchings
- involving only a portion of vessel wall
- may contain thrombi

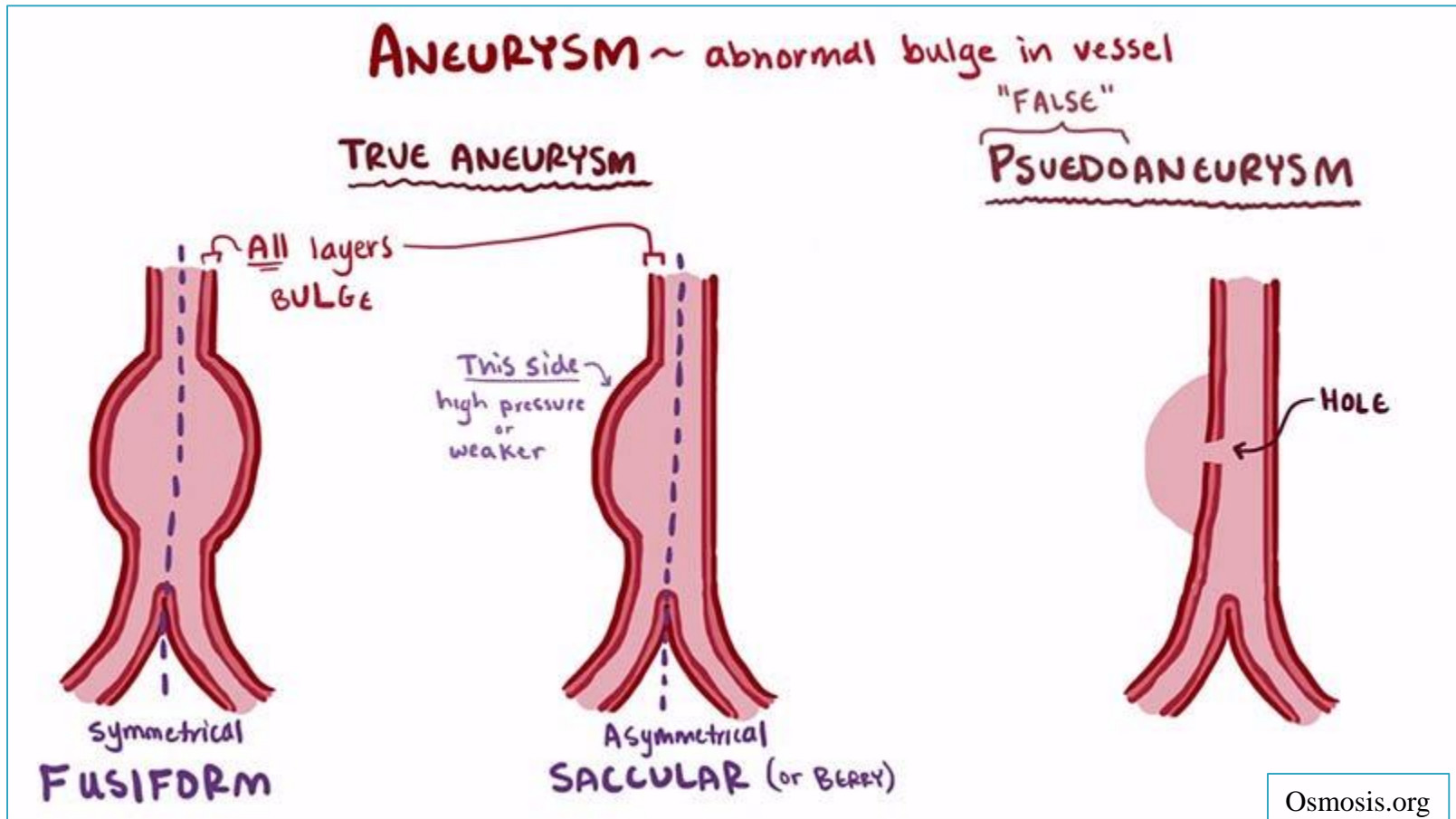


2- Fusiform aneurysms

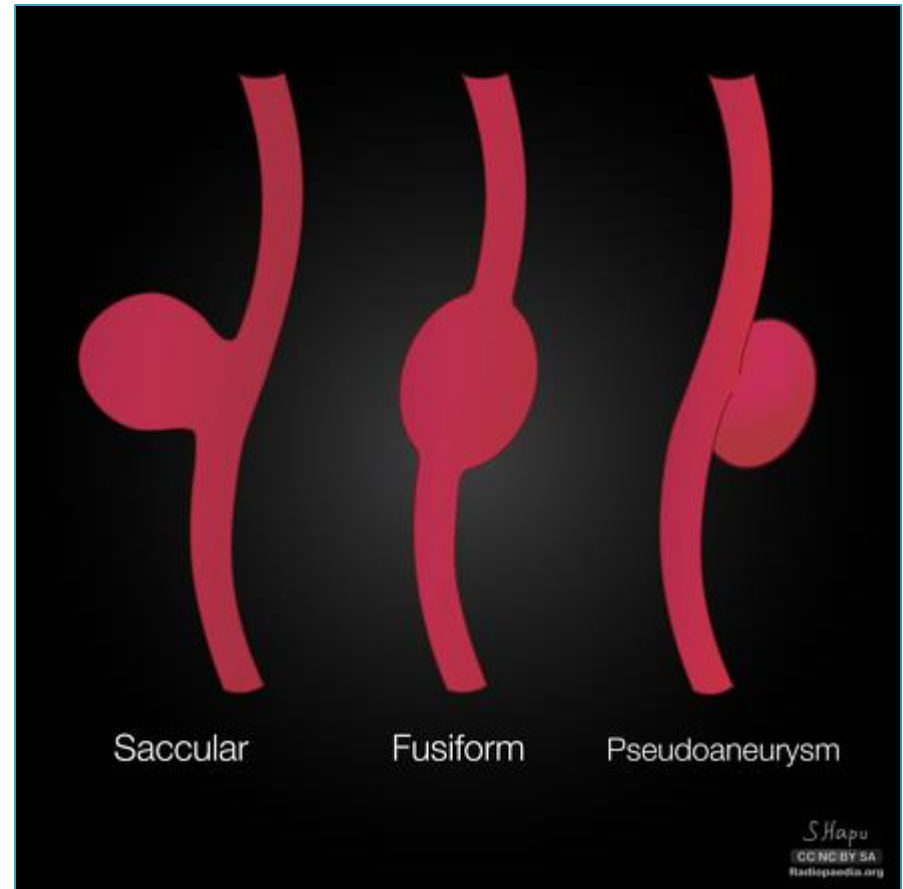
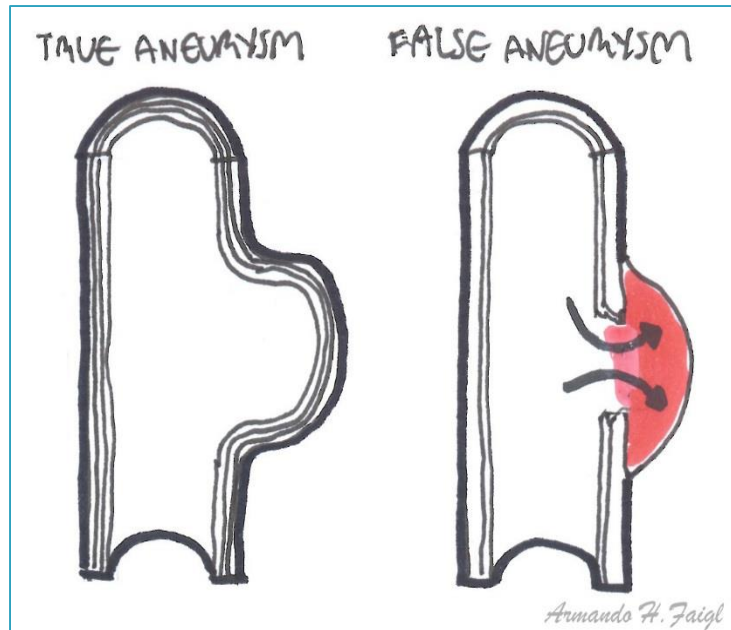
- ▶ **diffuse, circumferential dilation of a long vascular segment**
- ▶ **they vary in diameter and length and can involve extensive portions of artery**



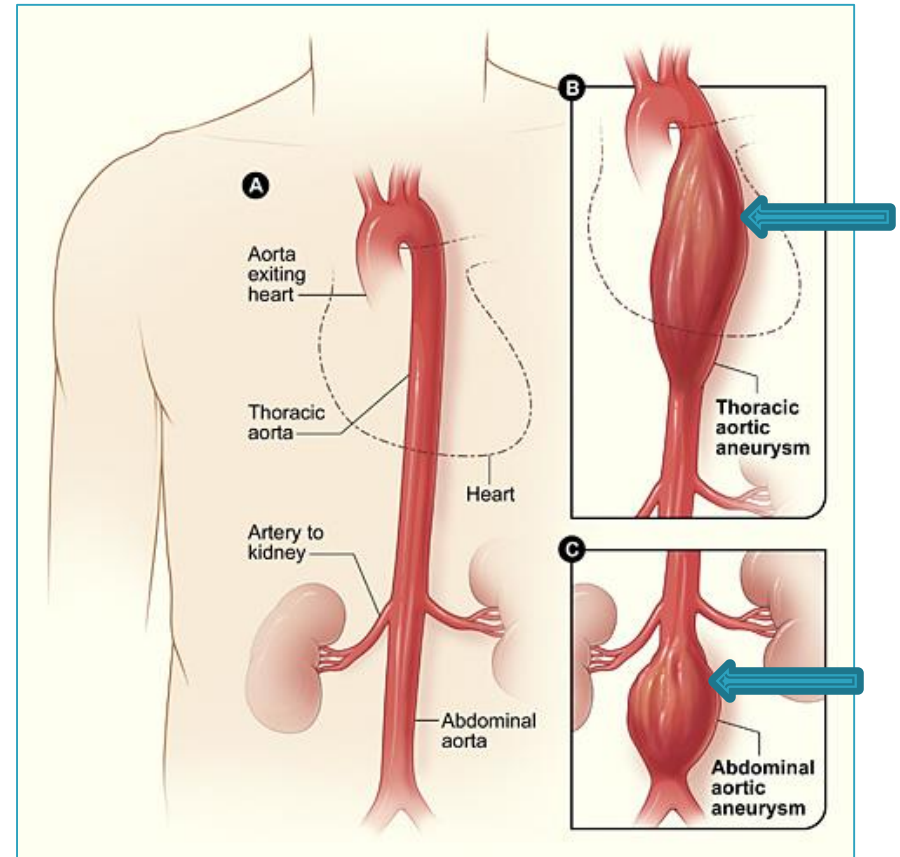
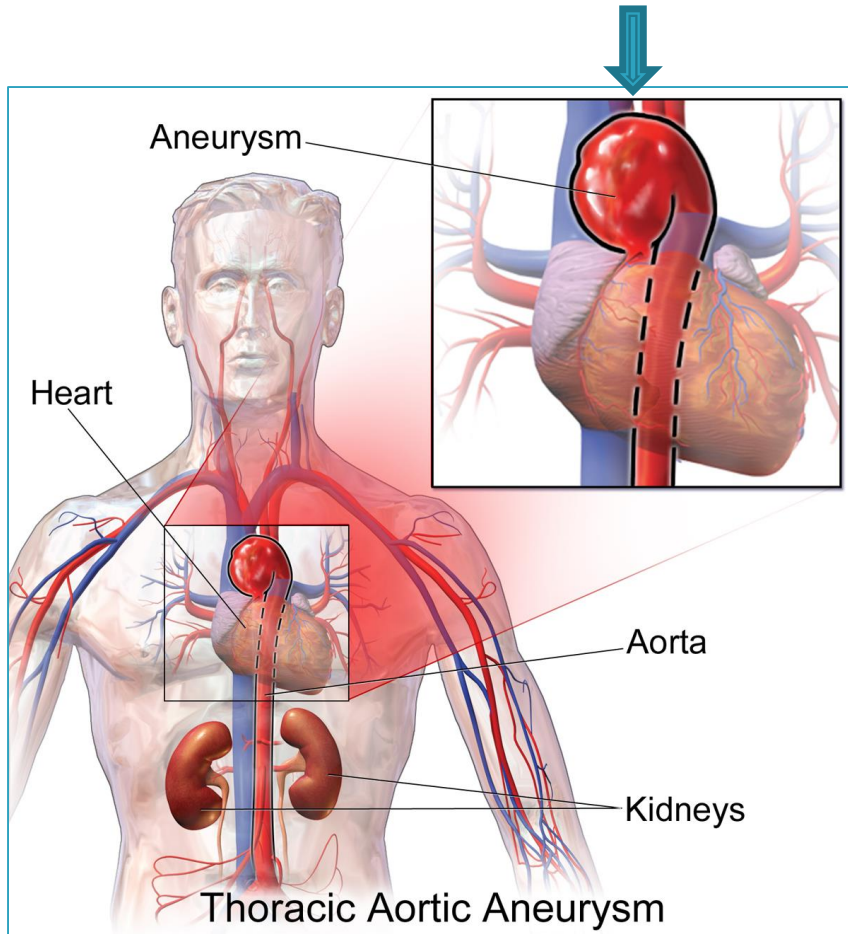
To summarize...



To summarize...



Aortic aneurysms



Aortic aneurysms

▶ ***The two most important causes are:***

1- Atherosclerosis :

- most common cause

→ intimal plaques compress underlying media

→ compromise nutrient and waste diffusion into arterial wall

→ media degeneration and necrosis

→ thinning and weakening of media

→ dilation of vessel

2- Cystic medial degeneration of arterial media

- ▶ causes include: trauma; congenital defects (e.g., *berry* aneurysms); hereditary defects in structural components (Marfan); infections (*mycotic* aneurysms); vasculitis.

Abdominal Aortic Aneurysm

- ▶ Atherosclerotic aneurysms occur most frequently in **abdominal** aorta (= AAA)
- ▶ common iliacs, arch, and descending parts of thoracic aorta can also be involved
- ▶ **Pathogenesis**
- ▶ m/c in men
- ▶ rarely < age 50
- ▶ **Atherosclerosis is a major cause of AAA**

▶ other contributors include:

1- Hereditary defects in structural components of the aorta:

(e.g., **Marfan disease** by defective fibrillin production affects elastic tissue synthesis)

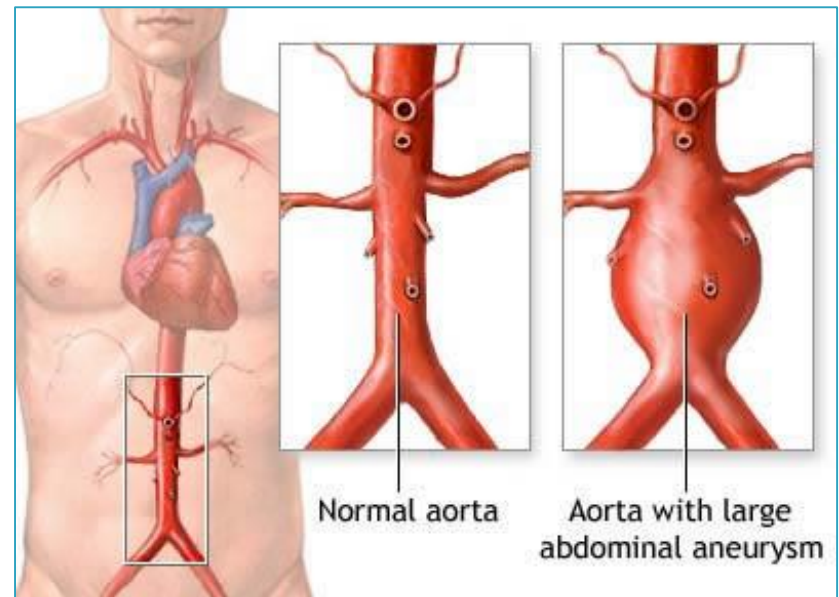
2- An altered balance of collagen degradation and synthesis mediated by local inflammatory infiltrates and the destructive proteolytic enzymes

- (e.g. **vasculitis**)



AAA- Morphology

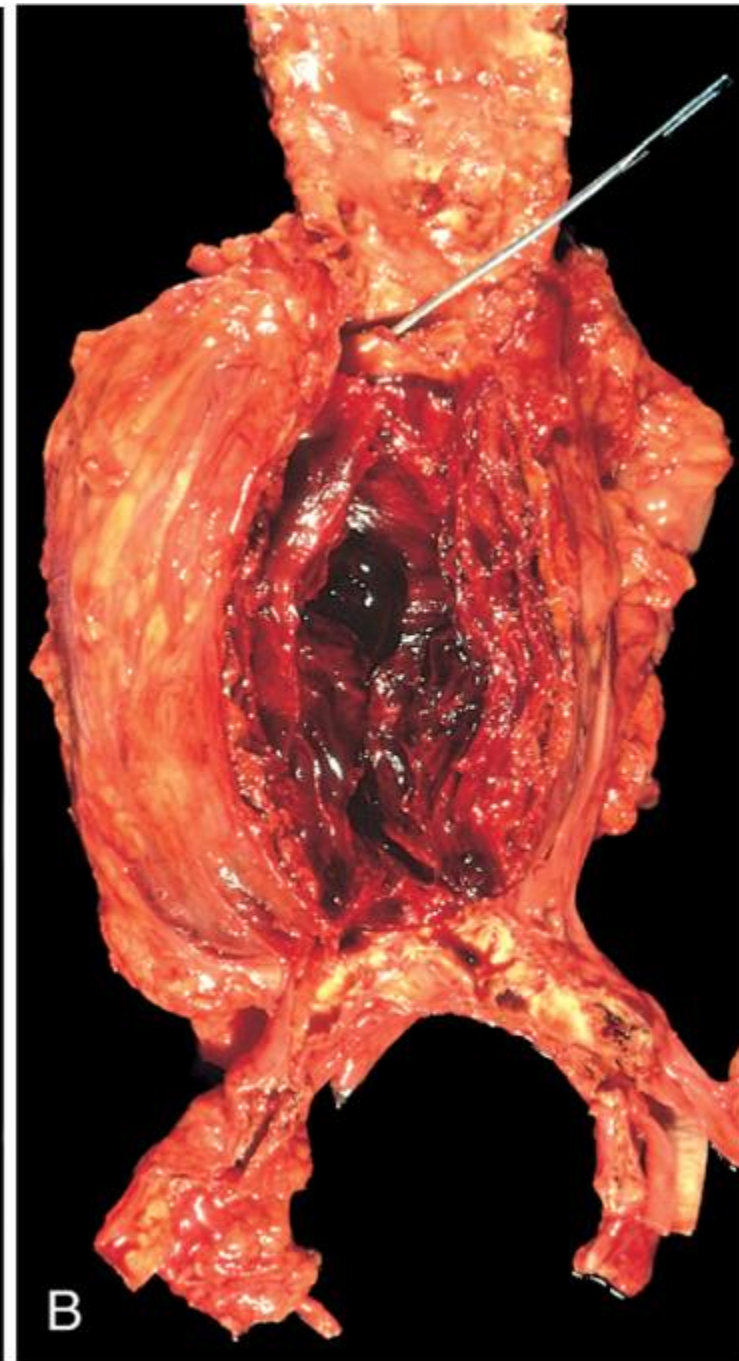
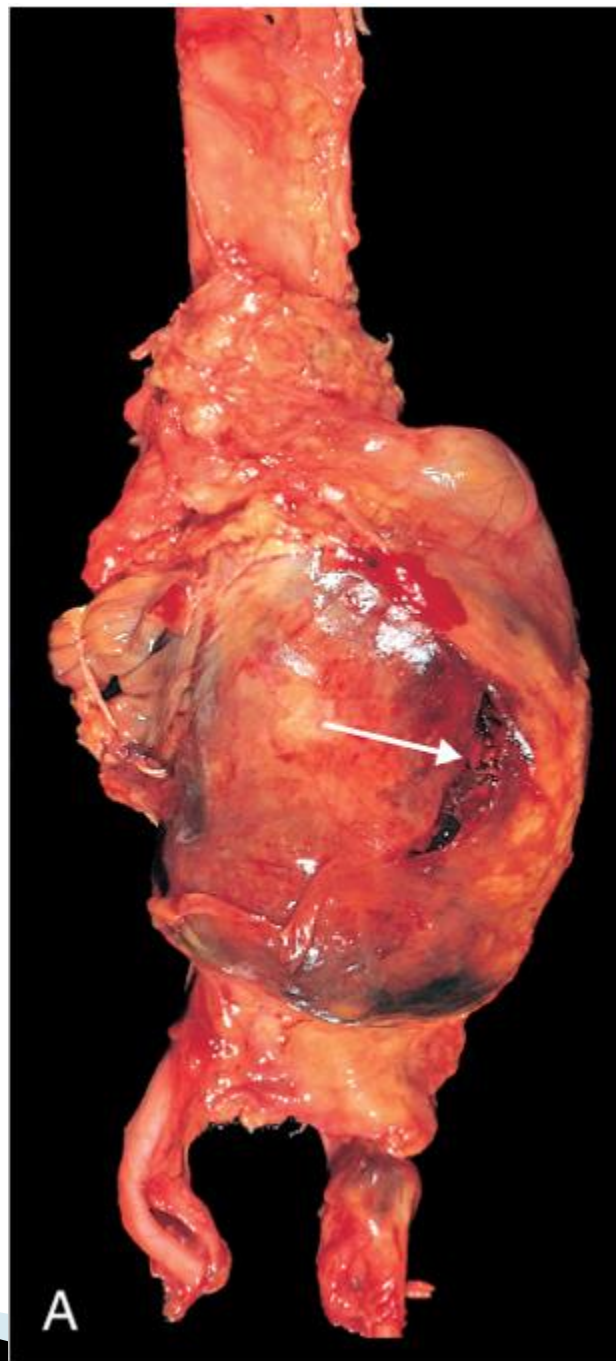
- ▶ Usually below renal arteries and above bifurcation of aorta
- ▶ can be saccular or fusiform
- ▶ may be as large as 15 cm in diameter, and as long as 25 cm
- ▶ Microscopically: atherosclerosis; thinning of media
- ▶ frequently contains a laminated mural thrombus



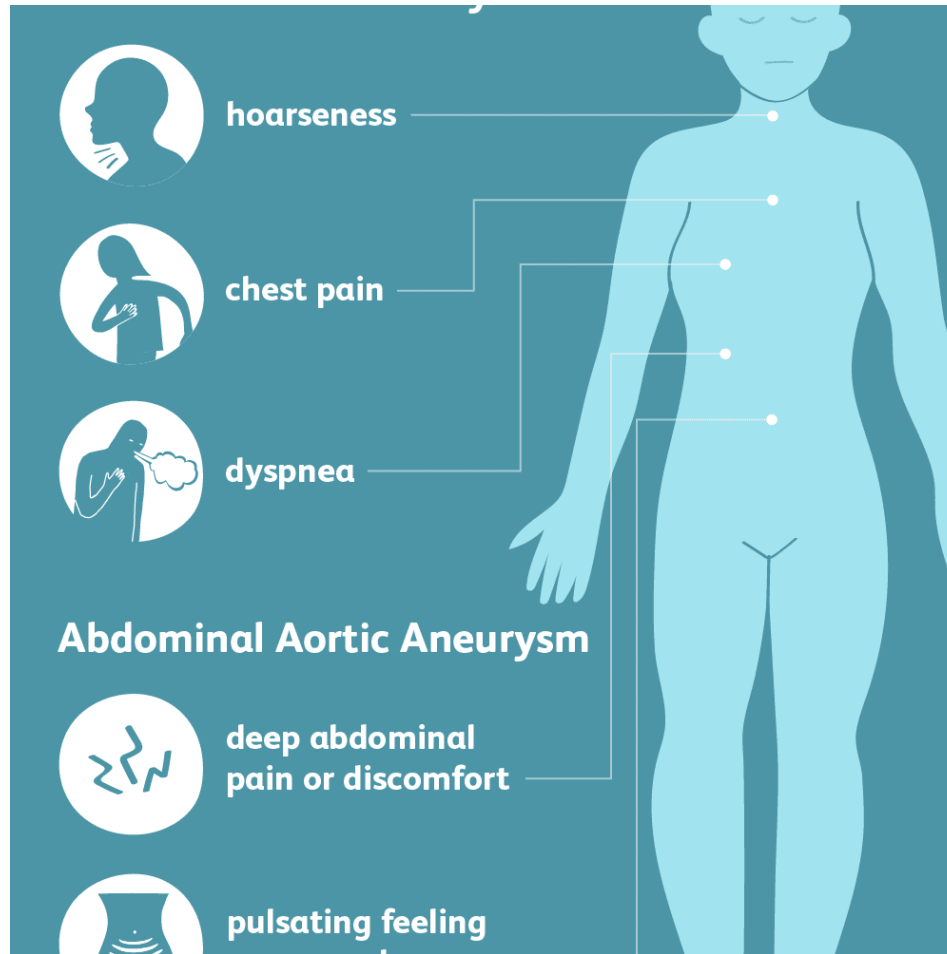
Abdominal aortic aneurysm and complications

A: rupture

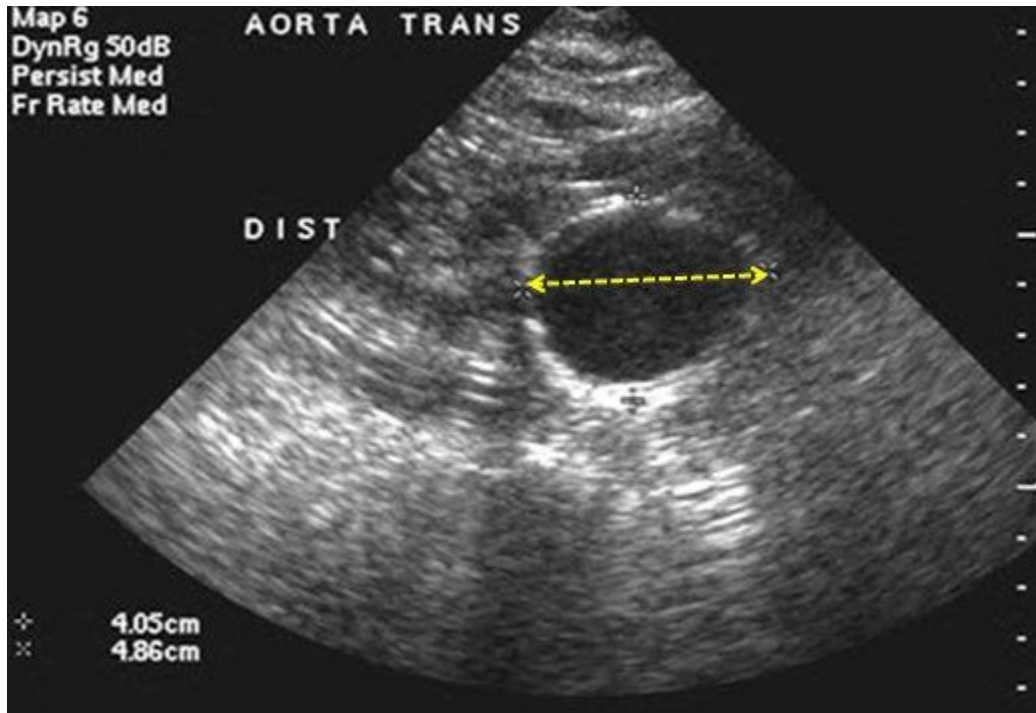
B: thrombosis



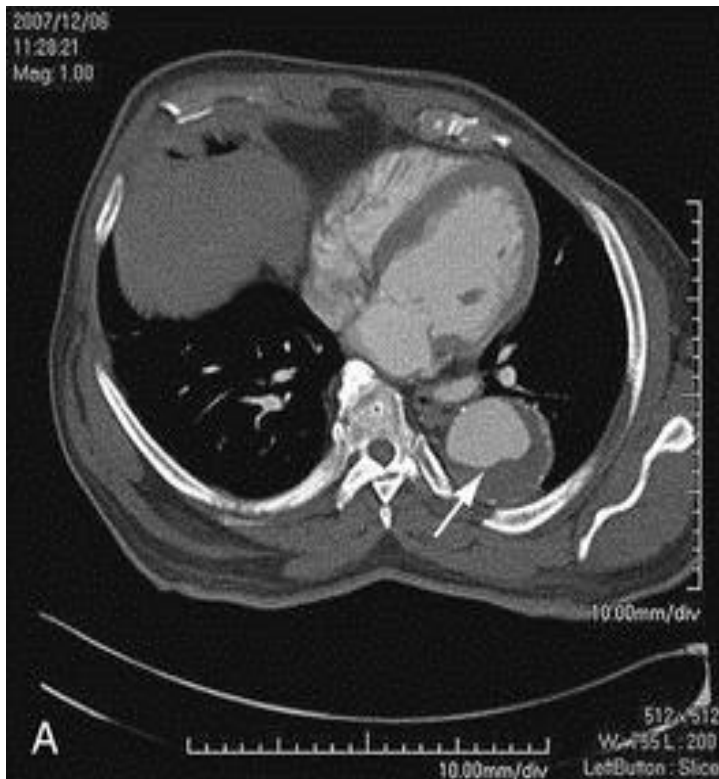
Symptoms of aortic aneurysm



Clinical assessment of AAA

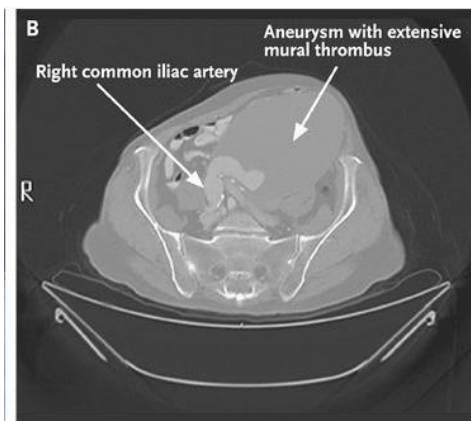
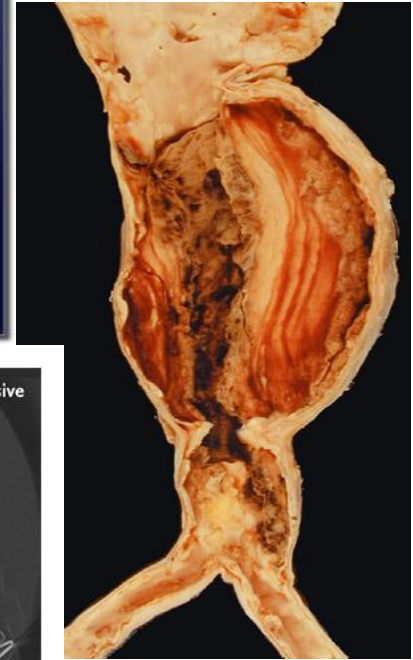


Maximum intensity projection CT angiographic images show an aneurysmal descending thoracic aorta with considerable mural thrombus (*arrow*)



The clinical consequences of AAA

- ▶ **Rupture** → massive hemorrhage
 - risk is directly related to size (≥ 5 cm)
 - mortality for unruptured aneurysms = 5%
 - if rupture mortality rate $> 50\%$
- ▶ **Obstruction** of downstream vessel → **ischemic injury**
- ▶ **Embolism** → mural thrombus
- ▶ **compression** on adjacent structures (e.g. ureter or vertebrae)
- ▶ **abdominal mass** (often pulsating)



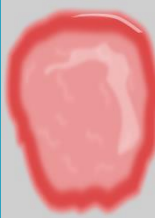
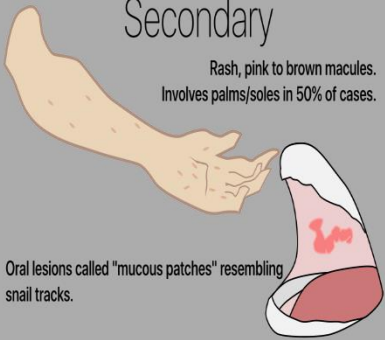
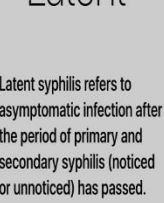
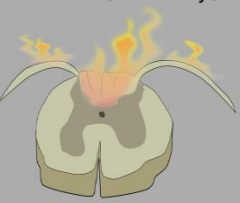

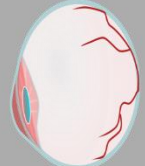
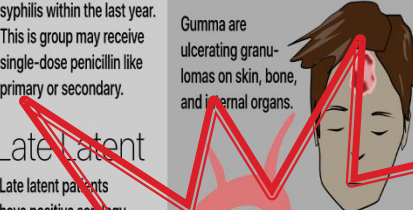
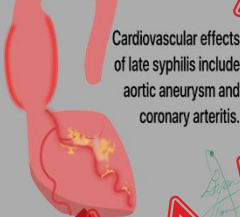
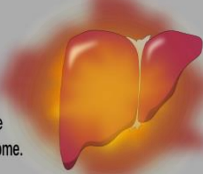
Mycotic aneurysms

- ▶ **Infection of a major artery that weakens its wall is called a *mycotic aneurysm***
- ▶ **can originate from:**
 - (1) embolization of a septic thrombus (infective endocarditis)**
 - (2) extension of adjacent suppurative process**
 - (3) circulating organisms infecting arterial wall**

Syphilitic Aneurysm

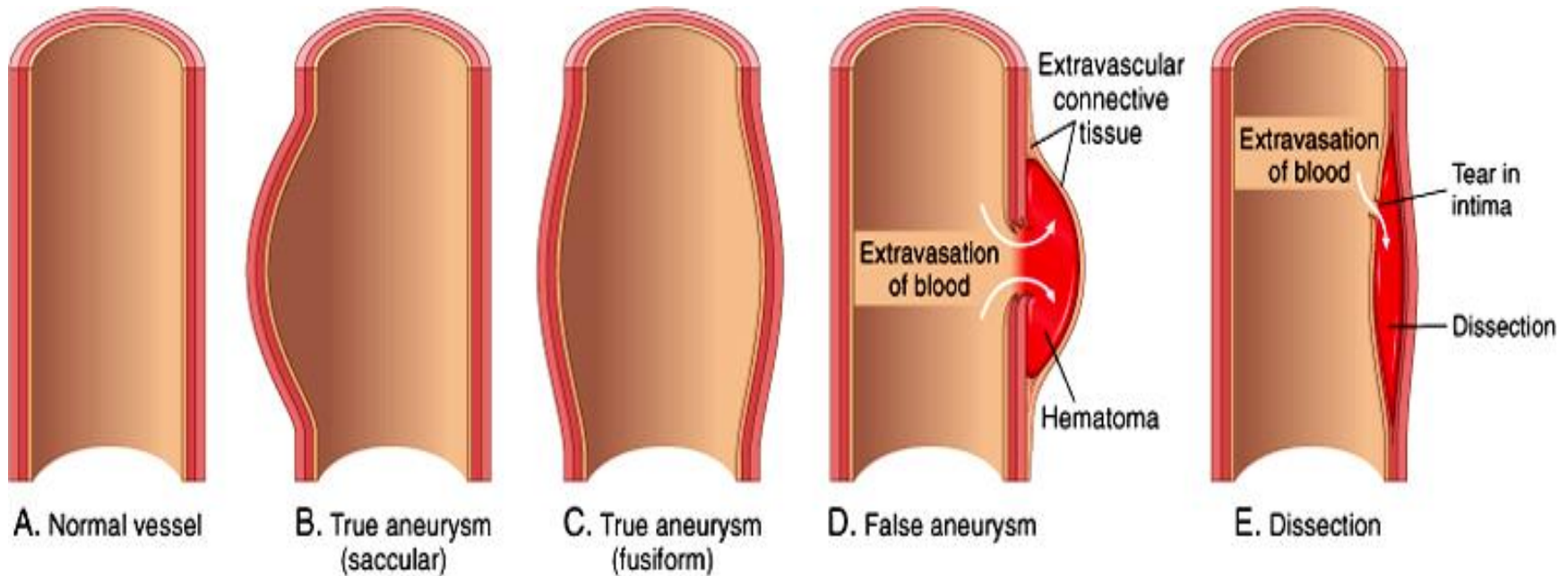
- ▶ *Caused by* The spirochetes *T. pallidum*
- ▶ A rare complication (early recognition and treatment of syphilis)
- ▶ **Tertiary** stage of syphilis can cause *obliterative endarteritis* of vasa vasorum of aorta
- ▶ ischemic medial injury
- ▶ aneurysmal dilation of aorta and aortic annulus
- ▶ eventually valvular insufficiency

The Stages of Syphilis

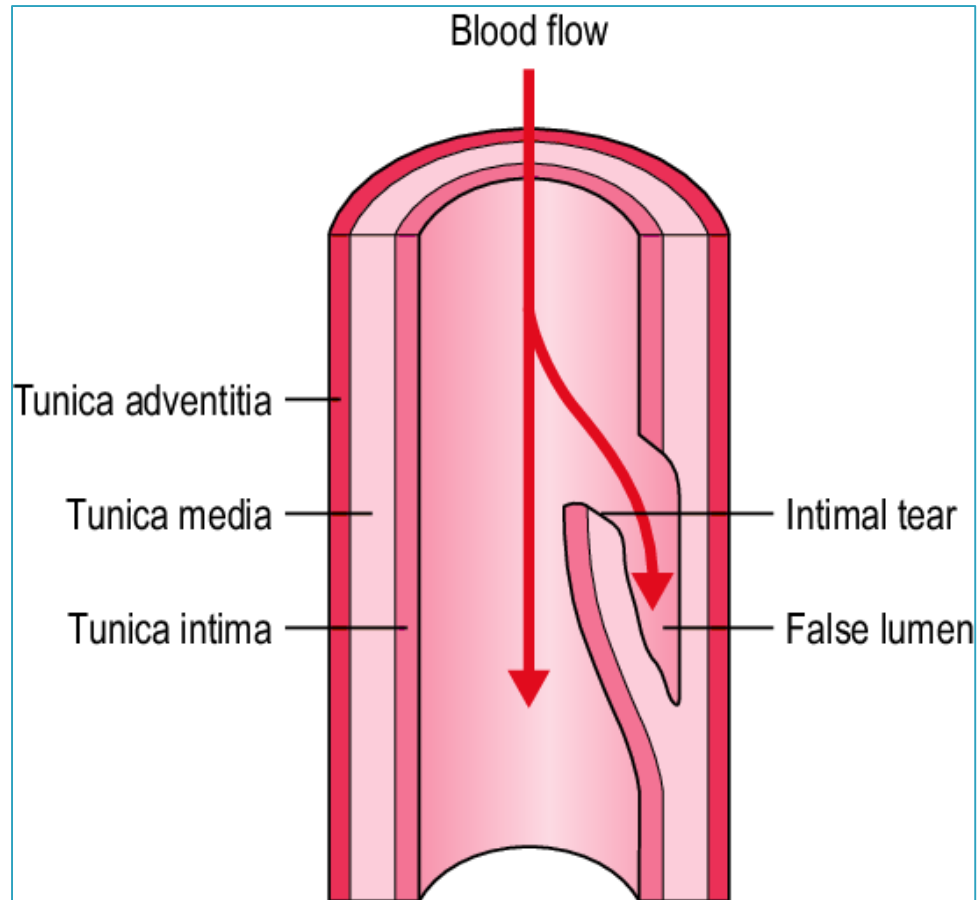
| Primary | Secondary | Latent | Late (Tertiary) |
|---|--|--|--|
|  <p>The chancre lesion is the hallmark of primary syphilis. It may appear 10-90 days after exposure. Common sites include penis and labia. Other sites include anus, oral mucosa. Without treatment, chancre disappears in 2-8 weeks.</p> |  <p>Rash, pink to brown macules. Involves palms/soles in 50% of cases.</p> <p>Oral lesions called "mucous patches" resembling snail tracks.</p> |  <p>Latent syphilis refers to asymptomatic infection after the period of primary and secondary syphilis (noticed or unnoticed) has passed.</p> <p>Early Latent Early latent refers to asymptomatic patients with positive testing, in whom history can confirm exposure to or symptoms of primary or secondary syphilis within the last year. This is group may receive single-dose penicillin like primary or secondary.</p> |  <p>Late Neurosyphilis, including tabes dorsalis, gait impairments, and dementia. Tabes dorsalis damages the dorsal columns and sensory nerve roots, causing a syndrome of pain and sensory deficits similar to those of B12 deficiency.</p> <p>Gumma are ulcerating granulomas on skin, bone, and internal organs.</p> |
|  <p>Ocular syphilis manifestations including anterior or posterior uveitis.</p> |  <p>Genito-inguinal rashes, including tinea-mimicker or heaped-up wart-like lesions called condyroma lata.</p> |  <p>Late Latent Late latent patients have positive serology but do not meet criteria for early. Thus, multiple doses of penicillin.</p> |  <p>Cardiovascular effects of late syphilis include aortic aneurysm and coronary arteritis.</p> |
|  <p>Less common internal organ manifestations including acute hepatitis and nephrotic syndrome.</p> | | | |

THE CURB SIDERS INTERNAL MEDICINE

Aneurysm versus dissection ...



Arterial dissection

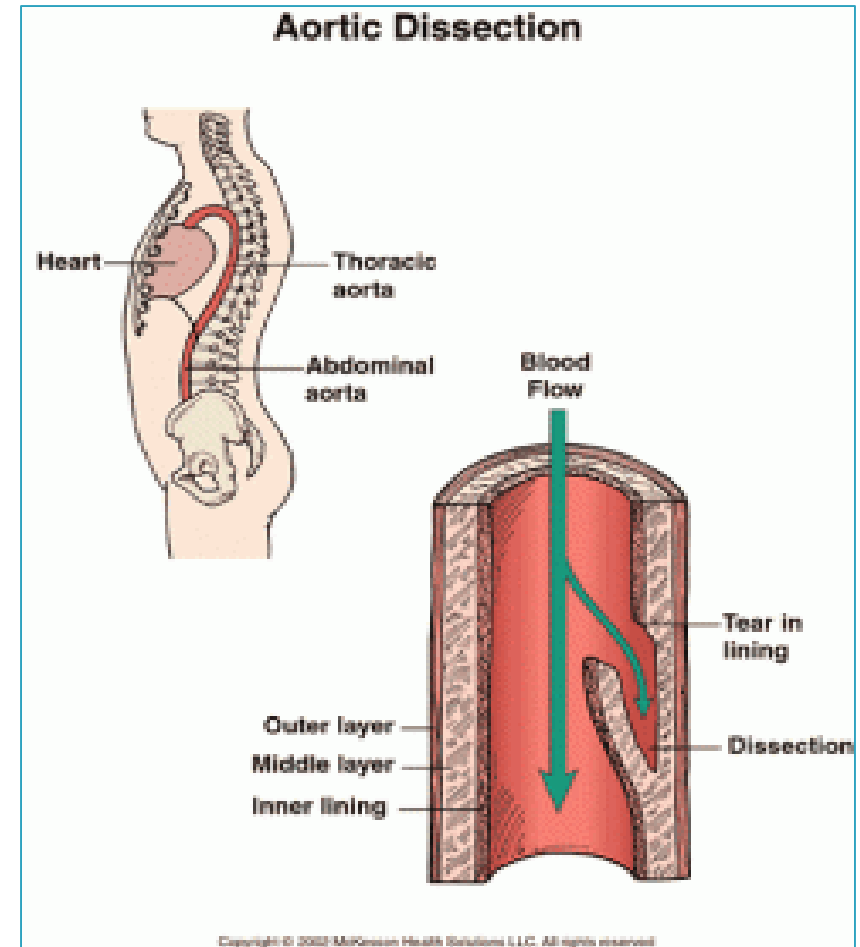


Arterial *dissection*

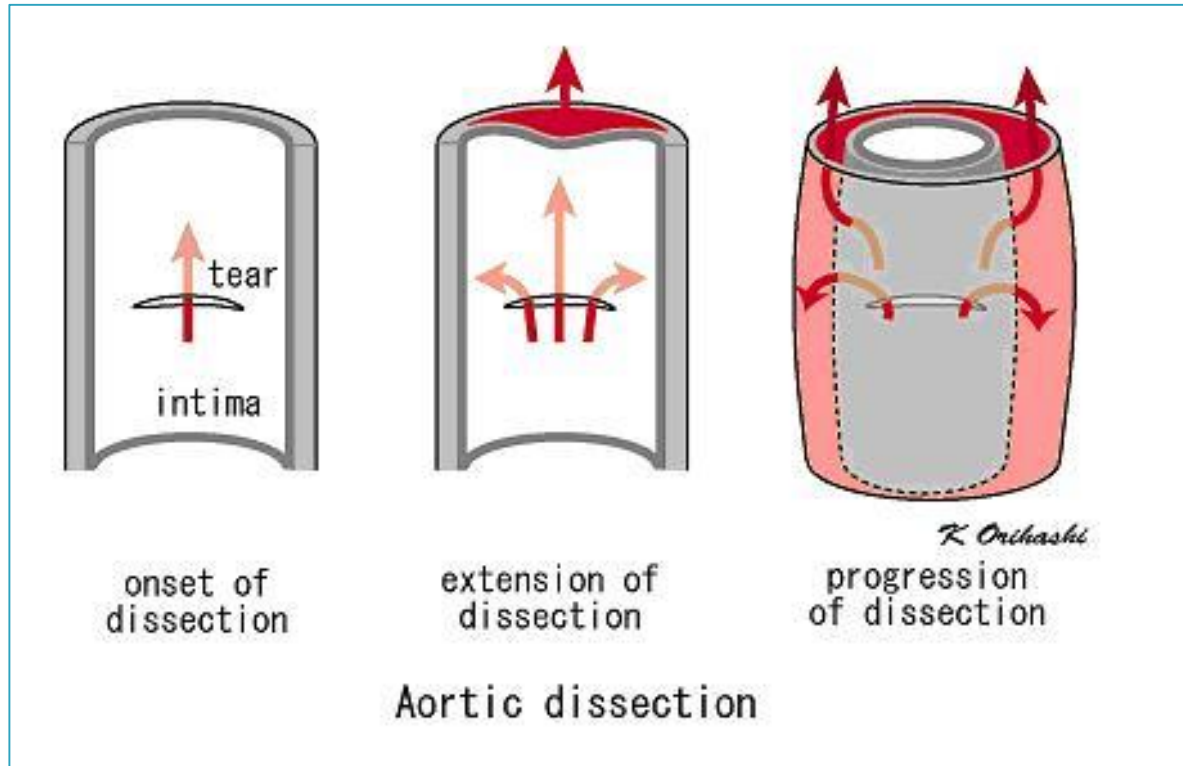
- ▶ Extravasation of blood that enters the wall of artery through an intimal tear, as a hematoma dissecting between its layers.
- ▶ often but not always aneurysmal
- ▶ Both true and false aneurysms as well as dissections can rupture, often with catastrophic consequences

Aortic dissection

- ▶ A catastrophic event whereby blood dissects apart the media to form a blood-filled channel within aortic wall
- ▶ Complications are :
 - massive hemorrhage
 - cardiac tamponade (hemorrhage into the pericardial sac)



Consequences...



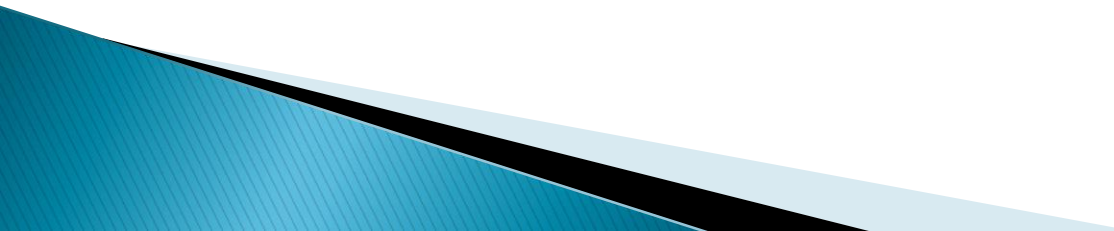
Pathogenesis of Aortic dissection

- ▶ 1- Hypertension is *the* major risk factor
- ▶ pressure-related mechanical injury and/or ischemic injury.
- ▶ 2- inherited or acquired connective tissue disorders causing abnormal vascular ECM
- ▶ (e.g., Marfan syndrome, Ehlers-Danlos syndrome, vitamin C deficiency, copper metabolic defects)

Marfan syndrome

- ▶ The most common among inherited or acquired connective tissue disorders associated with aortic dissection
- ▶ Autosomal dominant disease of **fibrillin**, an ECM scaffolding protein required for normal elastic tissue synthesis
- ▶ Manifestations include:
 - ▶ skeletal abnormalities (elongated axial bones)
 - ▶ ocular findings (lens subluxation)
 - ▶ cardiovascular manifestations

Manifestations of aortic dissection

- ▶ Sharp chest/ back pain
 - ▶ Weak pulses in downstream arteries
 - ▶ If ruptures into pericardium → cardiac tamponade
 - ▶ Blood pressure difference between Rt & Lt arms
 - ▶ Hypotension
 - ▶ shock
- 

Diagnosis & clinical assessment

CHEST X-RAY



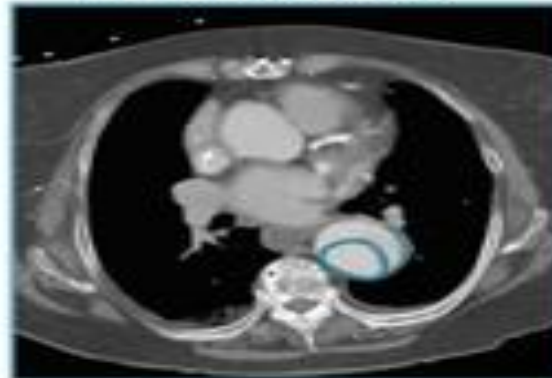
TRANSESOPHAGEAL
ECHOCARDIOGRAM



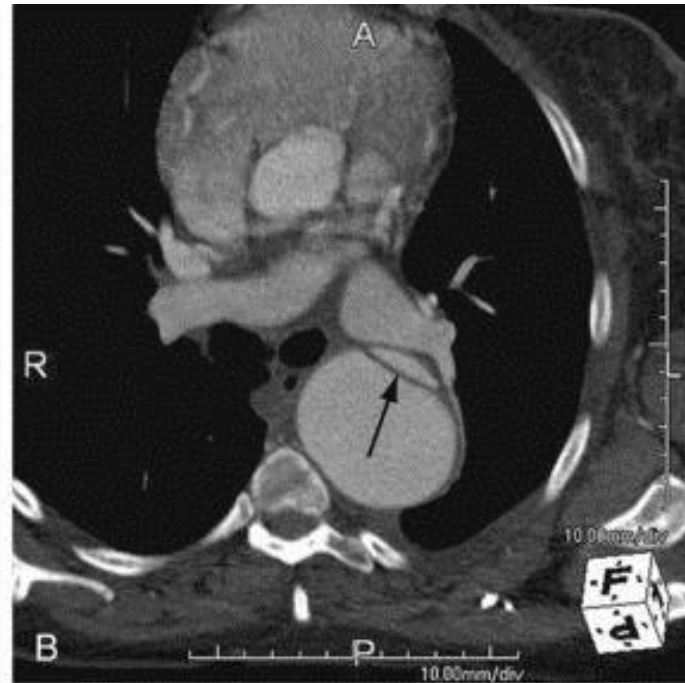
MAGNETIC RESONANCE
ANGIOGRAPHY



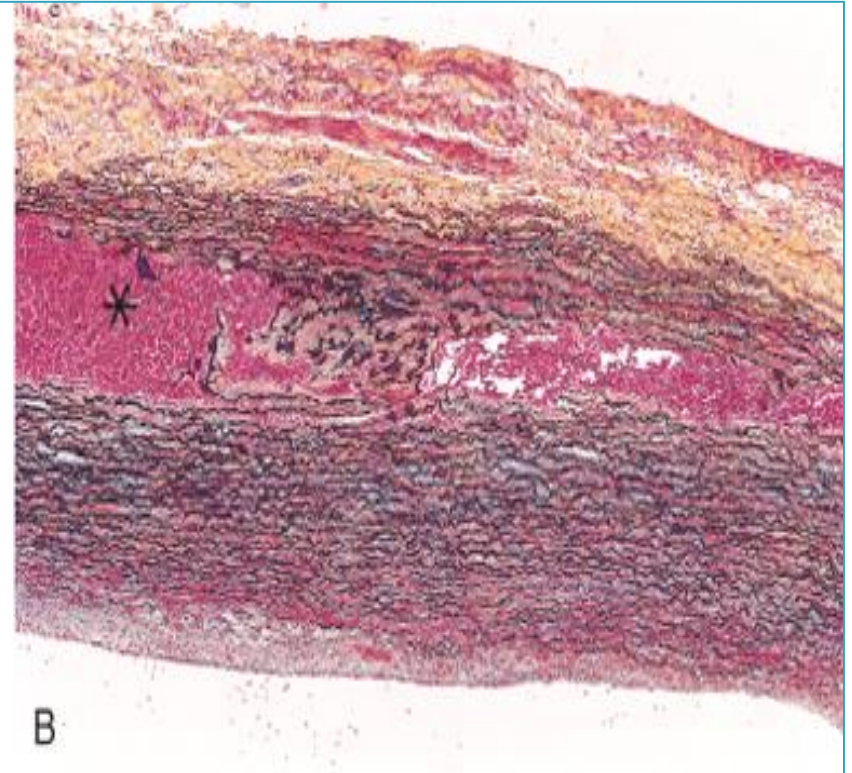
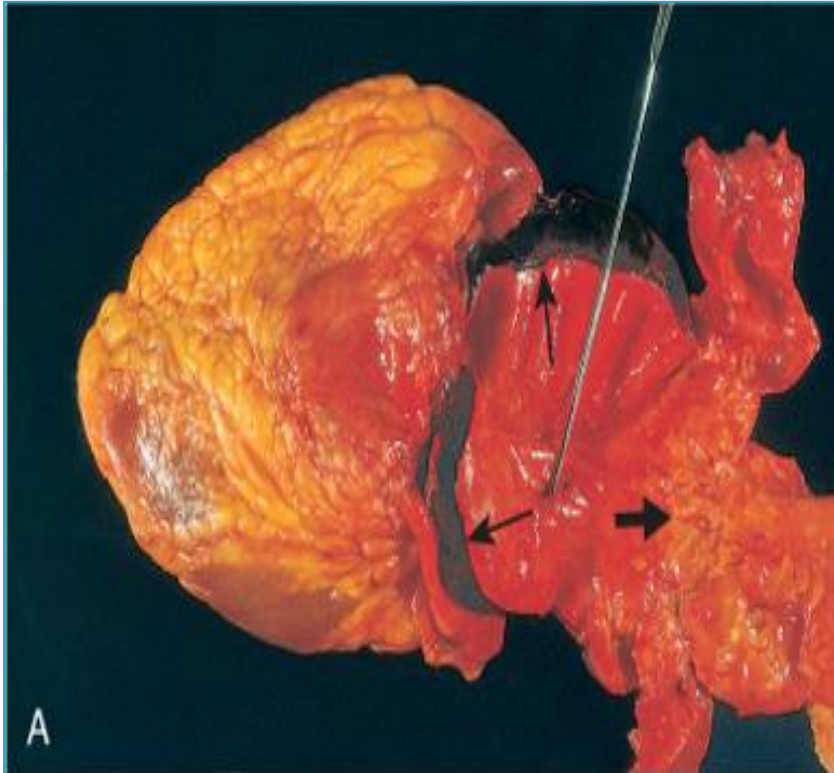
CT ANGIOGRAPHY



Sagittal (A) and axial (B) contrast-enhanced CT images show a type B dissection (*arrow*) and aneurysm of the descending aorta



Aortic dissection



© Elsevier. Kumar et al: Robbins Basic Pathology 8e - www.studentconsult.com

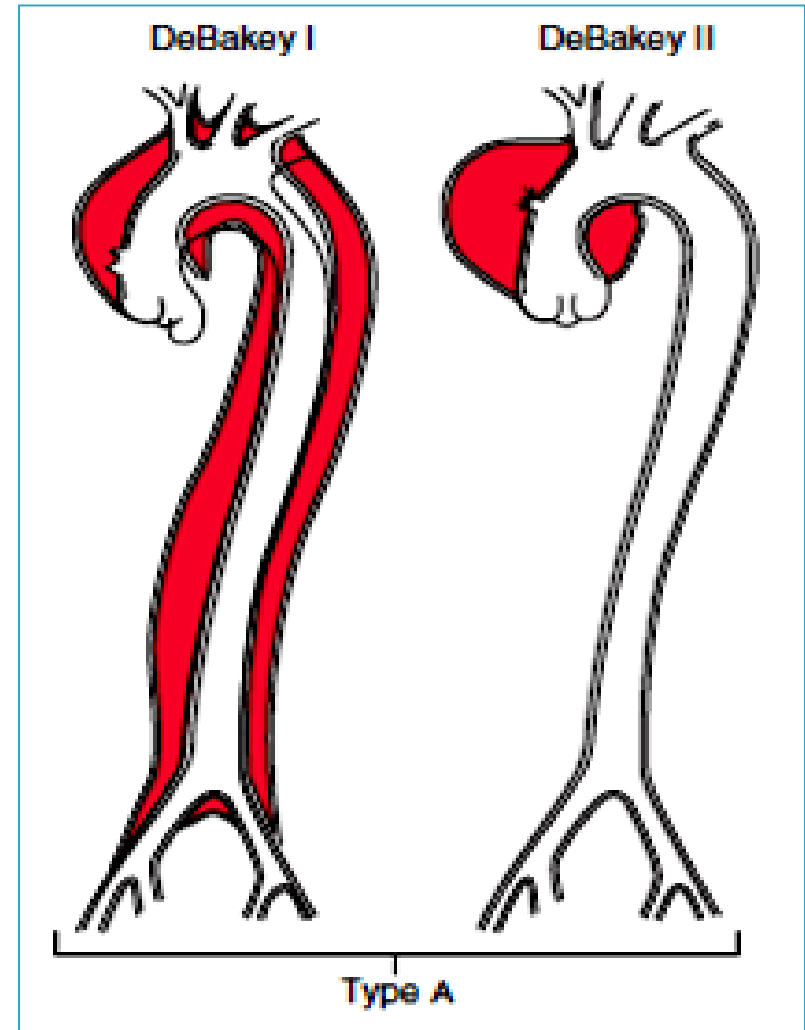


Silver stain: display elastic fibers in black color

Aortic dissections are generally classified into two types:

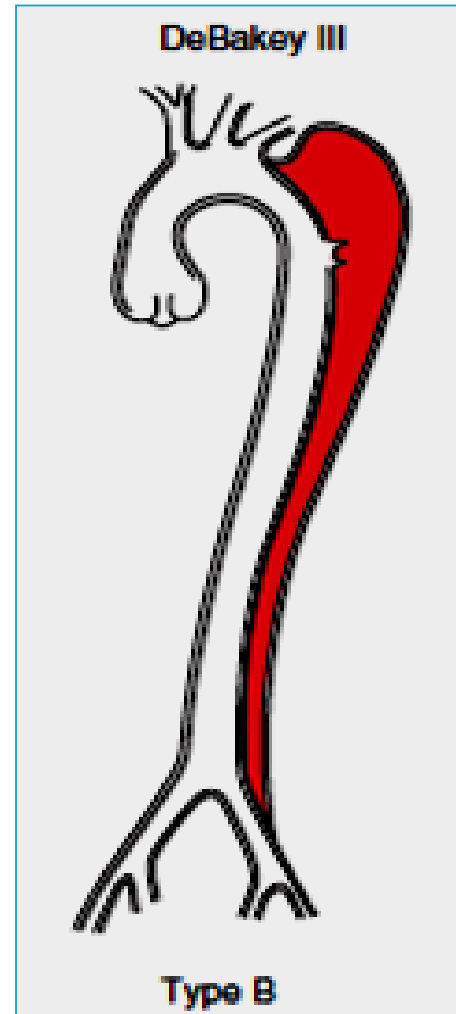
1- *Type A dissections:*

- ▶ More common
- ▶ More dangerous
- ▶ Proximal to takeoff of major aortic branches
- ▶ involve either ascending aorta only or both ascending and descending aorta (types I and II of the DeBakey classification)



2- type B dissections:

- ▶ *Distal to take off of major aortic branches*
- ▶ *Does not involve ascending aorta*
- ▶ usually beginning distal to subclavian artery
- ▶ Also called **DeBakey type III**



Clinical course

- ▶ Previously, aortic dissection was typically fatal, but prognosis has markedly improved
Rapid diagnosis and institution of:

1- antihypertensive therapy

2 - surgical procedures involving plication of aorta, wall reconstruction with synthetic graft

