

# DISORDERS OF BLOOD VESSELS

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# Learning outcomes

- List the causes of aneurysms and define, describe the mechanism of formation.
- Describe the morphology, sites involved and complications of atheromatous aneurysms
- Describe syphilitic, Berry, mycotic and capillary micro aneurysms
- Describe mechanism of formation, clinical effects and complications of aortic dissection

- Classify vasculitides according to the size of the vessel, anatomical location and histological characteristics.
- Identify the clinical features and morphological features of some common vasculitides.
- Describe the vascular changes associated with diabetes mellitus.
- Outline the pathologies of veins.
- Briefly classify the tumours of blood vessels.

# Disorders of blood vessels

- ❖ Atherosclerosis
- ❖ Infections
- ❖ Aneurysms
- ❖ Dissections
- ❖ Inflammation-Vasculitis
  
- ❖ Vascular diseases associated with
  - Hypertension
  - Diabetes
  
- ❖ Diseases affecting veins
  - Varicose veins
  - Thrombophlebitis
  
- ❖ Tumours

# Aneurysm

- **A localized abnormal dilation of a blood vessel or the heart.**
- May be congenital or acquired.
- These can be true aneurysms or false/pseudoaneurysms.

# Mechanisms

- **Reduced wall strength**
  - Atheroma
  - Cystic medial degeneration
  - Infections-Syphilis
  - Trauma
  - Congenital defects
- **Increased luminal pressure**
  - Eg HTN

# True aneurysm

Involves an **attenuated but intact arterial wall** or thinned ventricular wall of the heart.

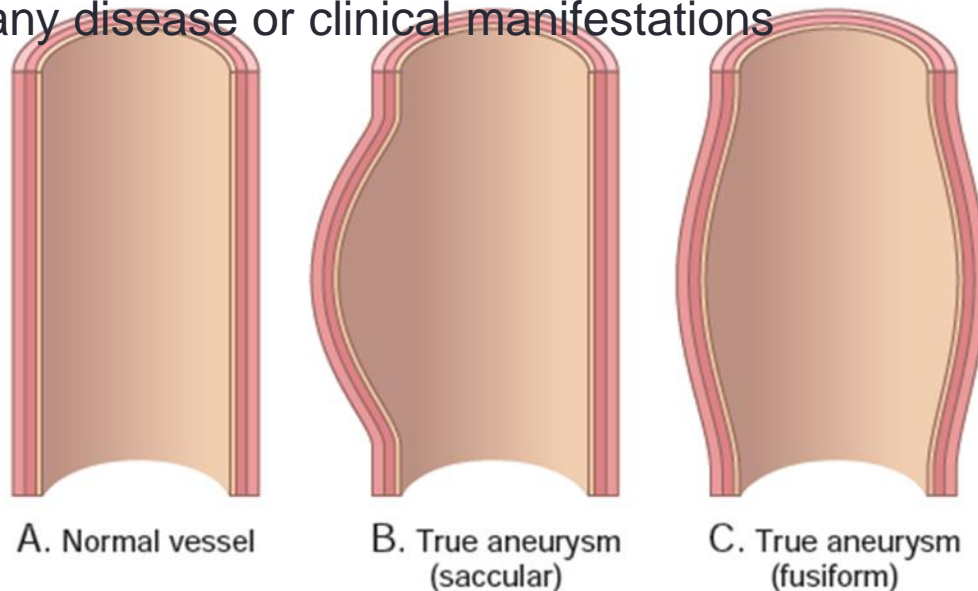
- Atherosclerotic
- Syphilitic,
- Congenital vascular aneurysms
- Ventricular aneurysms that follow transmural myocardial infarctions

## **True aneurysm- saccular type**

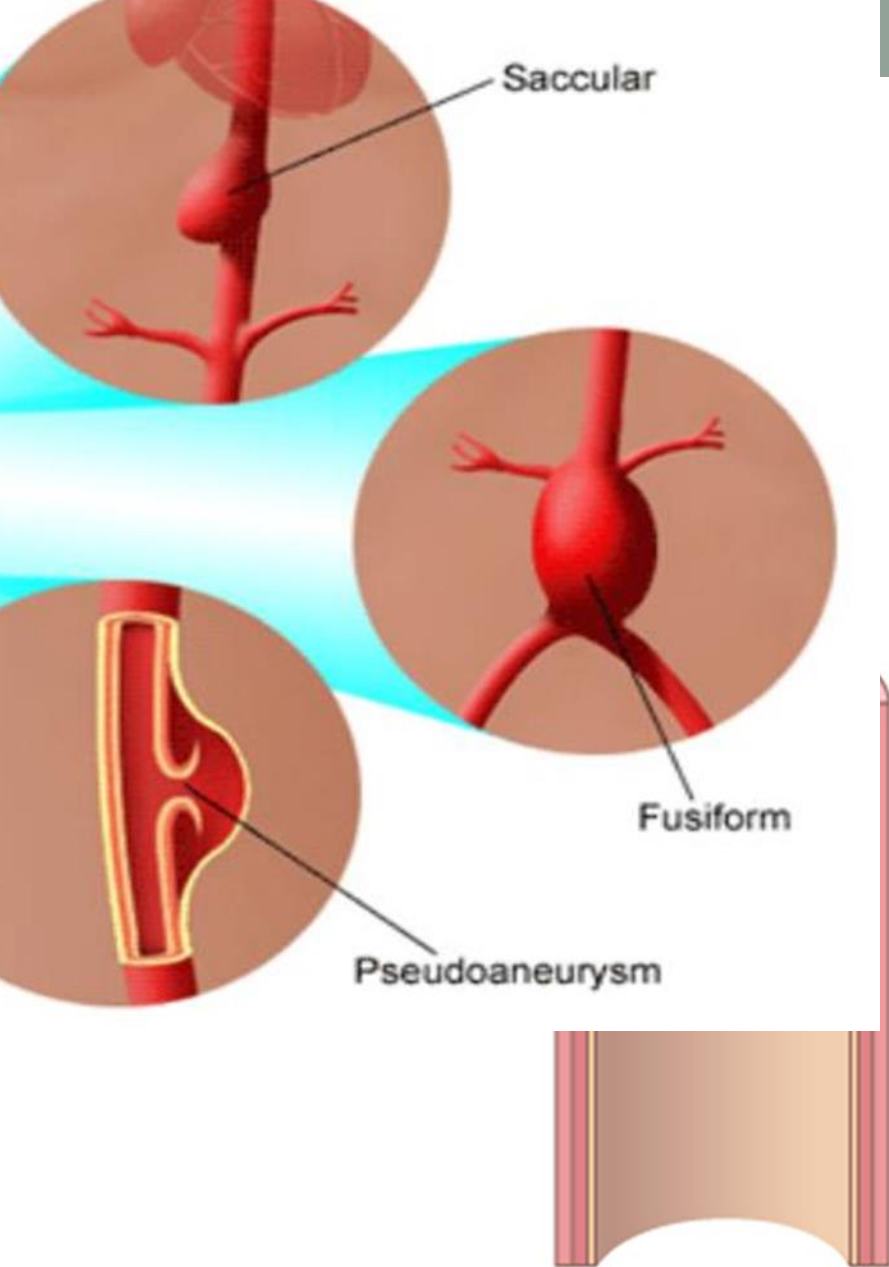
The wall focally bulges outward and may be attenuated but is otherwise intact.  
Spherical outpouchings involving only a portion of the vessel wall.  
Size vary from 5 to 20 cm in diameter, often contain thrombus.

## **True aneurysm- fusiform type**

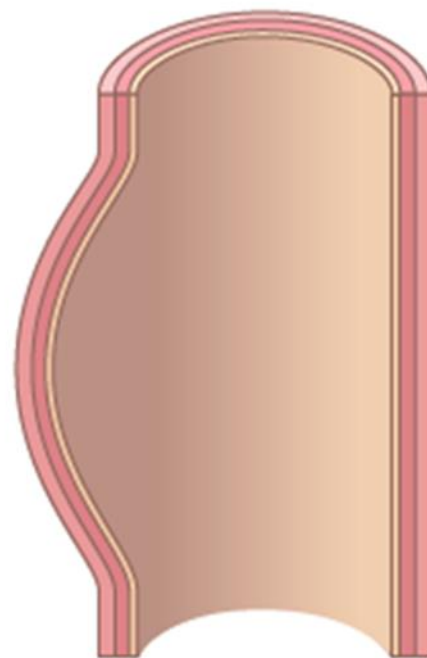
Diffuse, circumferential dilations of a long vascular segment  
Vary in diameter (up to 20 cm) and in length  
can involve extensive portions of the aortic arch, abdominal aorta, or even the iliacs.  
Not specific for any disease or clinical manifestations



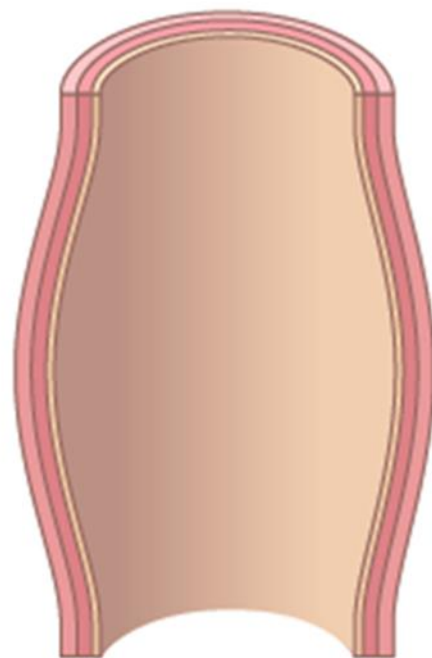




A. Normal vessel



B. True aneurysm  
(saccular)



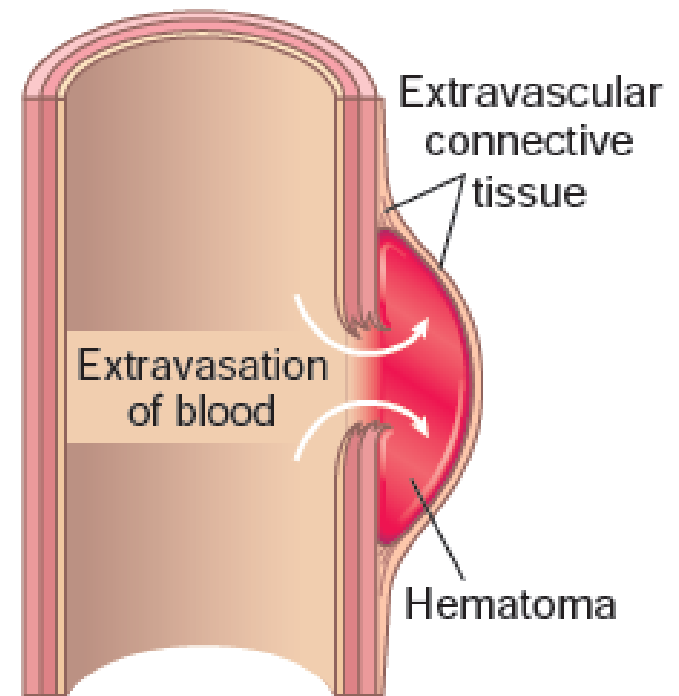
C. True aneurysm  
(fusiform)

# False aneurysm

- Defect in the vascular wall leading to an extravascular hematoma that freely communicates with the intravascular space (“pulsating hematoma”).

## Examples

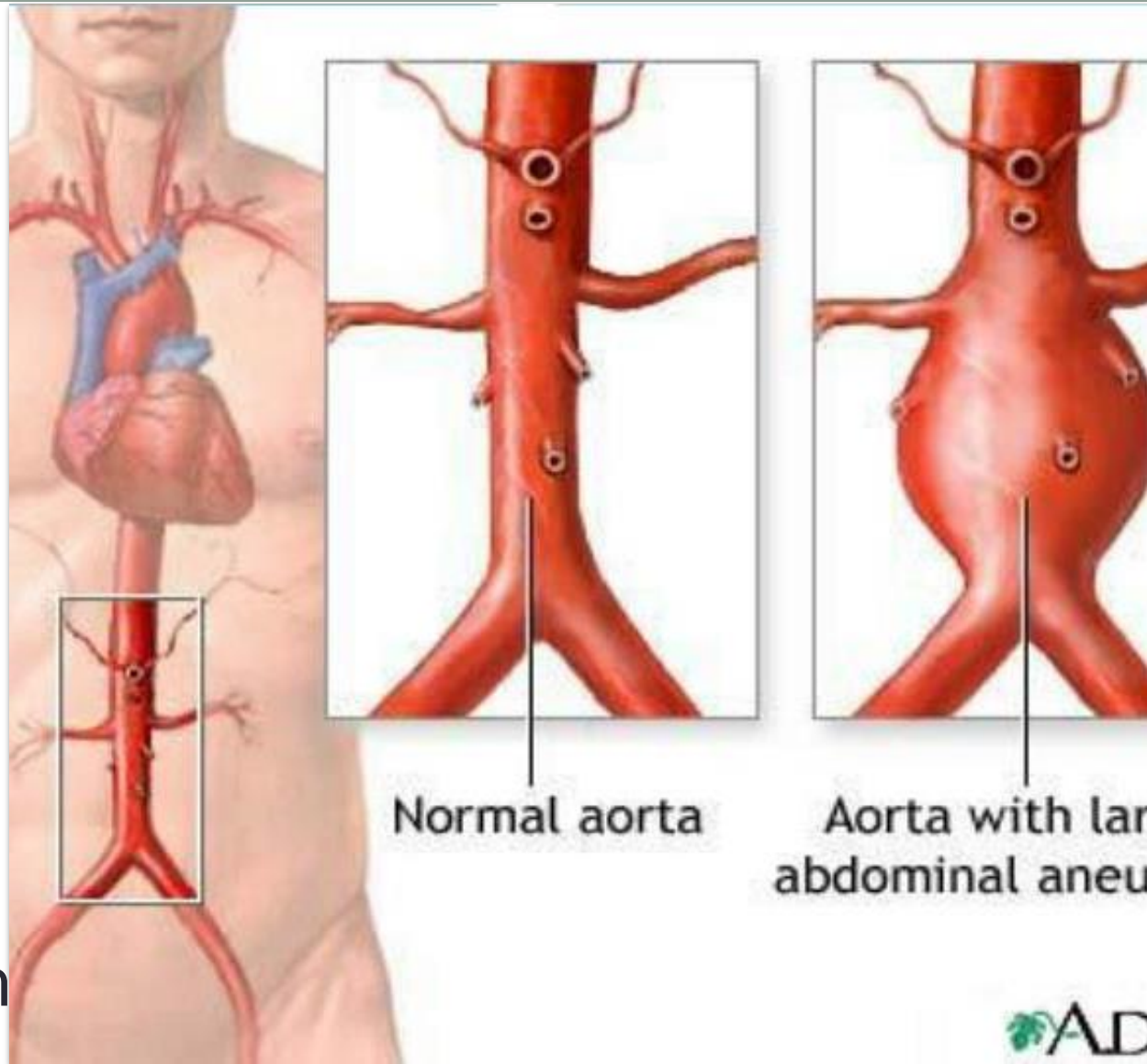
- Ventricular rupture after MI that is contained by a pericardial adhesion,
- Leak at the sutured junction of a vascular graft with a natural artery



D. False aneurysm

# AAA (Abdominal aortic aneurysm)

- Localized dilatation (ballooning) of the abdominal aorta more than 50% of normal.
- Most common form of aortic aneurysm.
- About 90% occur infrarenally (below the kidneys) above the bifurcation of aorta.
- Common in old, male, smokers.
- Complication –Rupture (Death)

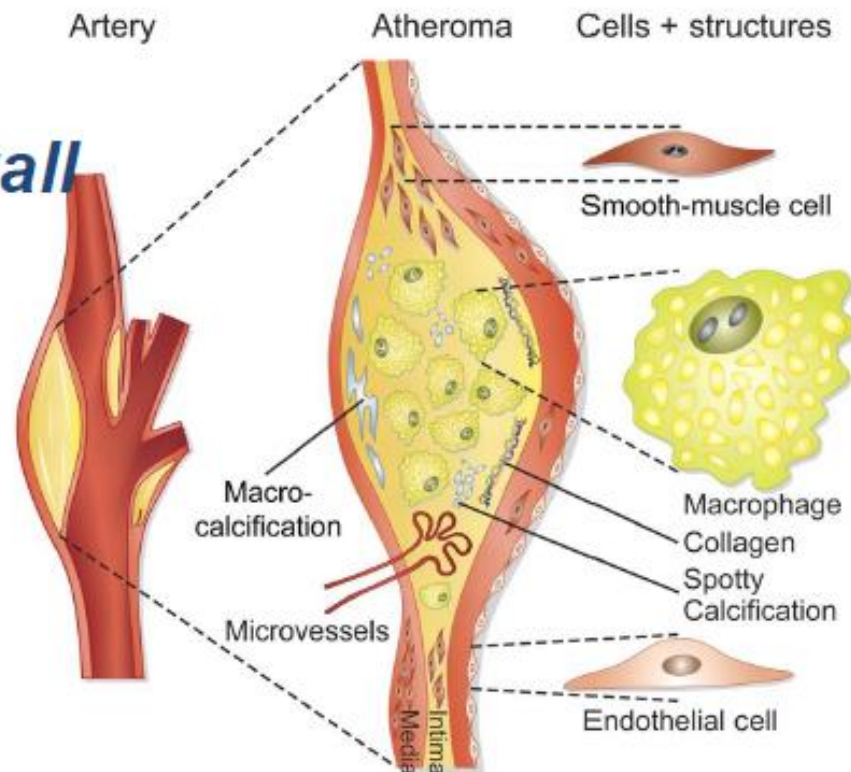


Saccular or fusiform  
May reach 15cm  
Length variable

# Atheroma is the most frequent cause

- Plaque in intima with medial destruction
- Loss of elastic tissue
- Fibrosis in media

## *Weak aortic wall*



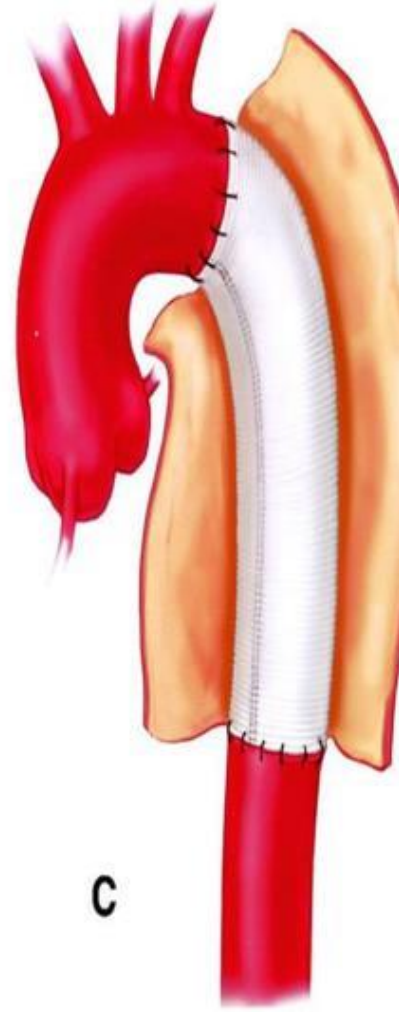
# Complications

- Rupture into abdominal cavity
- Occlusion of a branch vessel(vertebral, renal, mesenteric)
- Thromboembolism
- Compression of adjacent structures

# Thoracic aortic aneurysm

- Presents primarily in the thorax.
- Less common than AAA.
- In young , usually associated with connective tissue disorders like the Marfan and Ehler-Danlos syndromes.
- "Ballooning" of the upper aspect of the aorta.
- Untreated/unrecognized can be fatal.



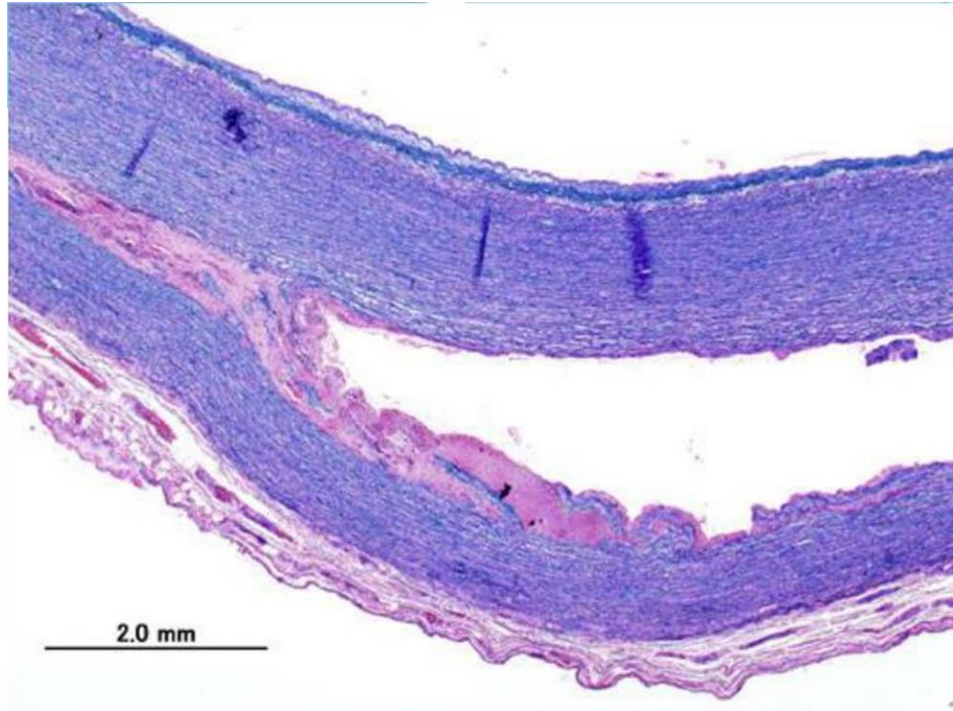




## Cystic medial necrosis

- Typical for Marfan's syndrome
- Causes the connective tissue weakness
- Due to mucin deposition

Pink elastic fibers, instead of running in parallel arrays, are disrupted by pools of blue mucinous ground substance.



# Assignment 1

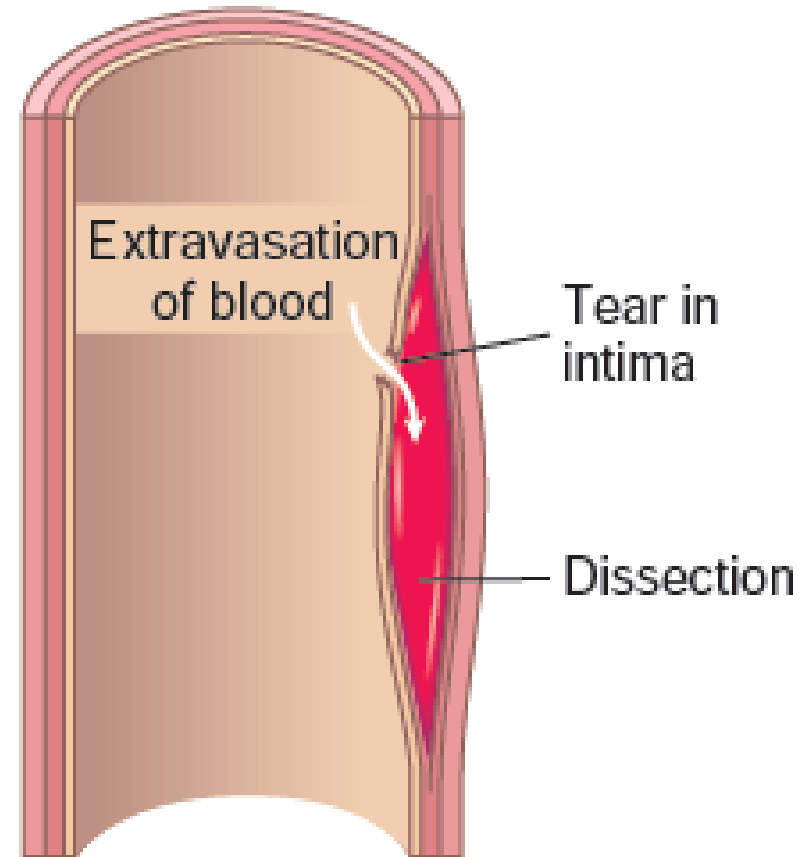
Read other types of aneurysms

- Mycotic aneurysm
- Berry aneurysm
- Syphilitic aneurysm

# Aortic dissection

when blood enters a defect in the arterial wall and tunnels between its layers.

- Dissections are **often but not always** aneurysmal.



E. Dissection

- Aortic dissection occurs when a tear in the inner wall of the aorta causes blood to flow between the layers of the wall of the aorta, forcing the layers apart.
- Usually due to **hypertension in older** people and caused by **CT disorders in younger people.**
- P/C- Tearing/excruciating chest pain that usually begins in the anterior chest wall and radiates to the back and downwards as the dissection continues.
- A medical emergency.

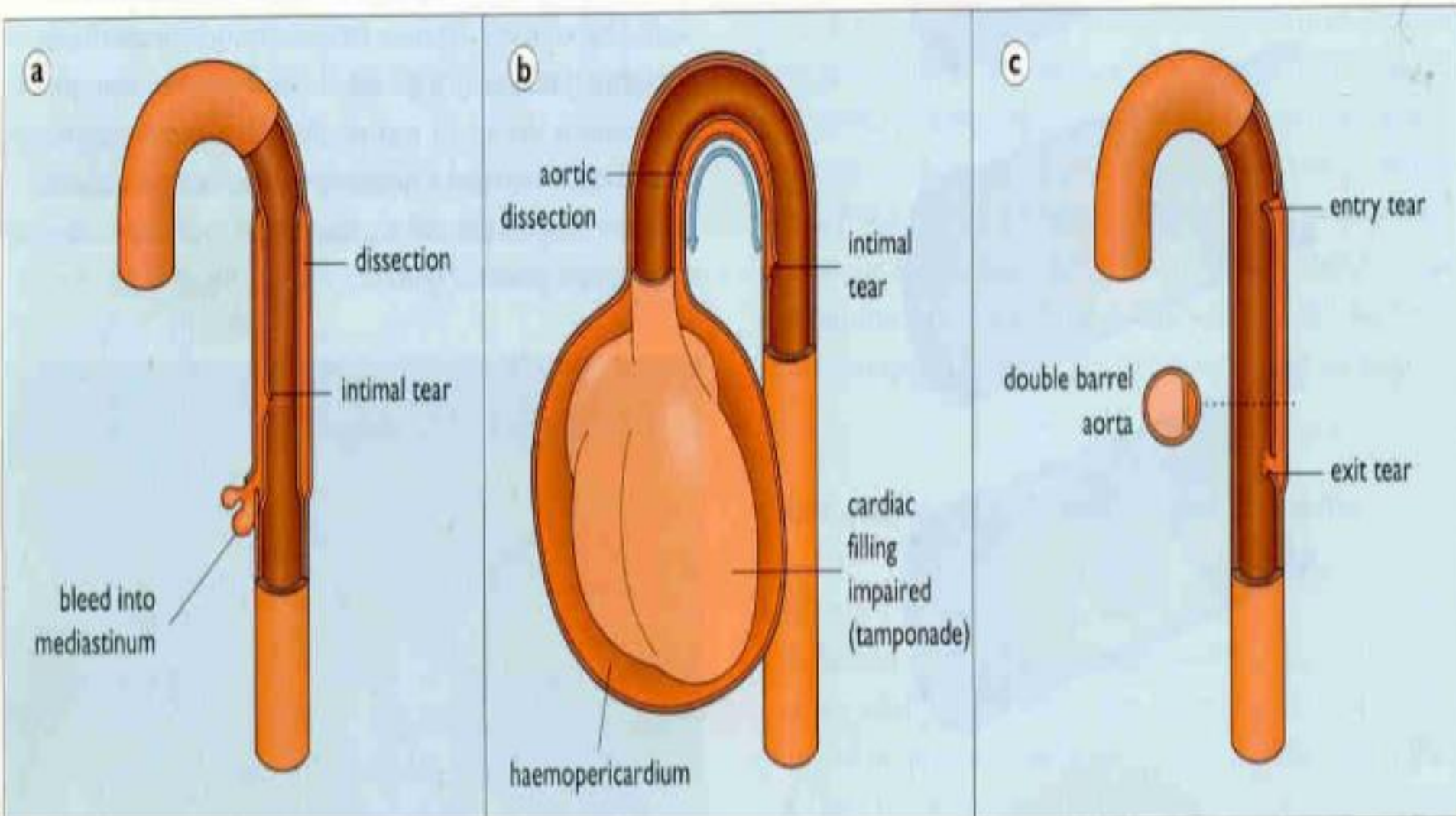
# Aortic dissection-Predisposing factors

- Hypertension
- Cystic medial degeneration
- Connective tissue disorders
- Complications associated with cannulation

# How does it happen?

- Friction force thrust the intima during ventricular systole
- Leads in intimal tearing
- Tear extends to media
- Blood tracts along inner 2/3 and outer 1/3 of wall
- Sometimes blood will reflow into the aortic lumen “double barrel aorta”
- Ascending aorta is the commonest site involved

# Aortic dissection







# Vasculitis

- **Inflammation of vessel walls.**
- Any vessel can be involved.  
(Arteries, arterioles, Veins, venules, capillaries).
- Vessel of any organ can be involved.
- Frequently associated with systemic manifestations and organ dysfunction that depends on the pattern of vascular involvement.

# Causes of vasculitis

- Immune mediated mechanisms.  
Most important
- Direct invasion of the vessel wall by micro-organisms  
Fungi, Bacteria, Rickettsia
- Chemical, physical injury  
Irradiation, trauma, toxins

# Pathogenesis of vasculitis

## Immune complex mediated

- SLE
- HSP
- Infections: Hep B

## Anti neutrophilic cytoplasmic antibody(ANCA) mediated

- Wegeners granulomatosis
- Microscopic polyangitis
- Churg strauss

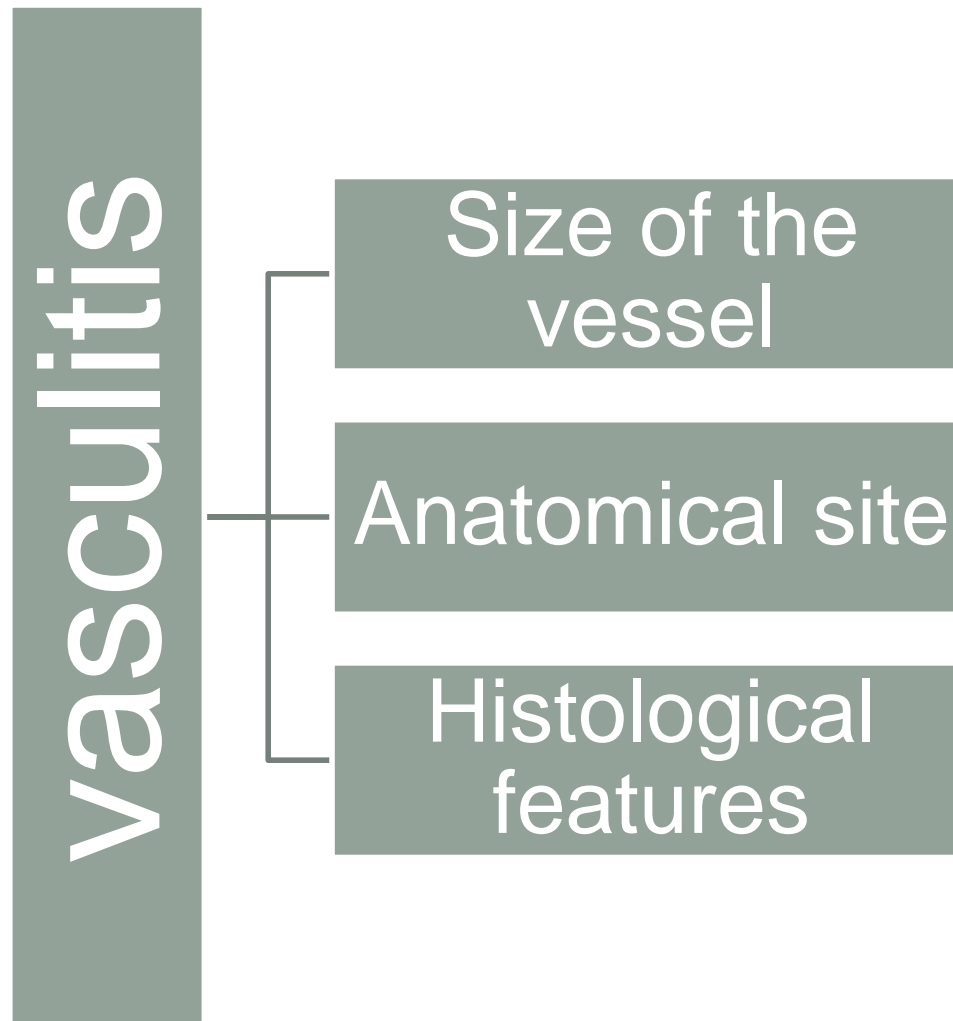
## Direct antibody attack mediated

- Good pasture disease: Anti basement membrane antibody
- Kawasaki disease: Anti endothelial antibody

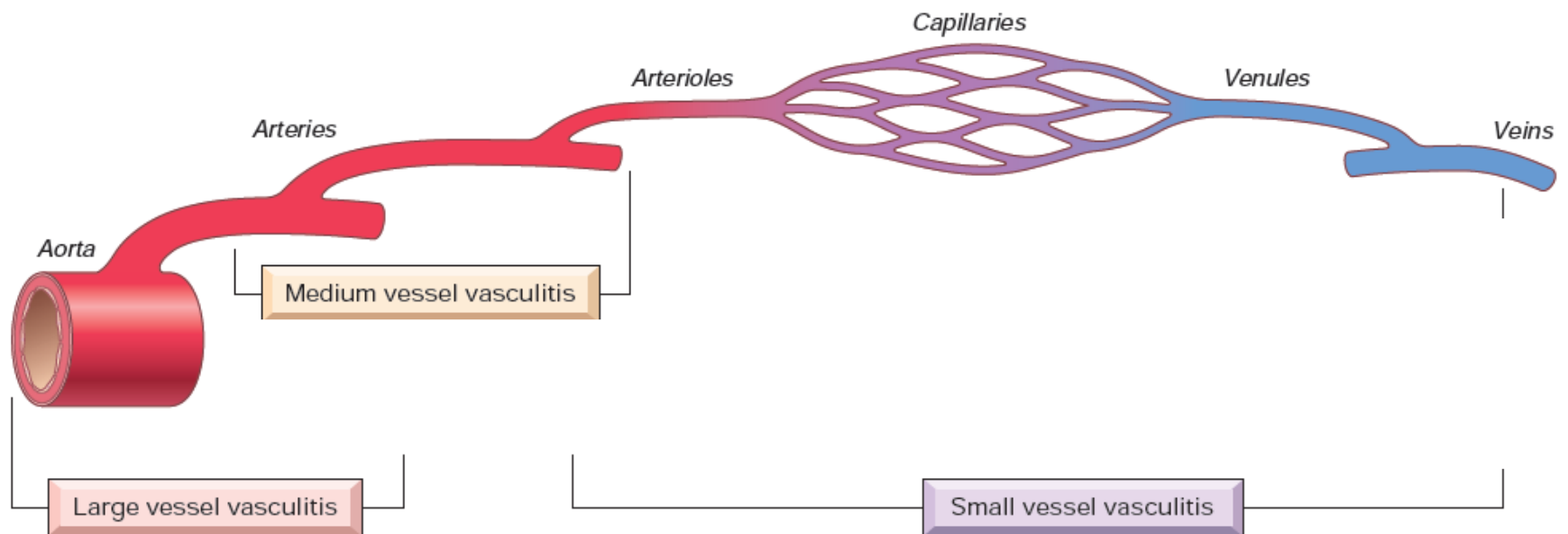
## Cell mediated

- Allograft rejection

# Classification of vasculitis



# Classification on size of the involved vessel



## Large vessel vasculitis

- Temporal arteritis
- Takayasu arteritis

## Medium vessel vasculitis

- Polyarteritis nodosa
- Kawasaki disease

## Small vessel vasculitis

- Wegener's granulomatosis
- Microscopic polyangitis
- Churg strauss
- HSP

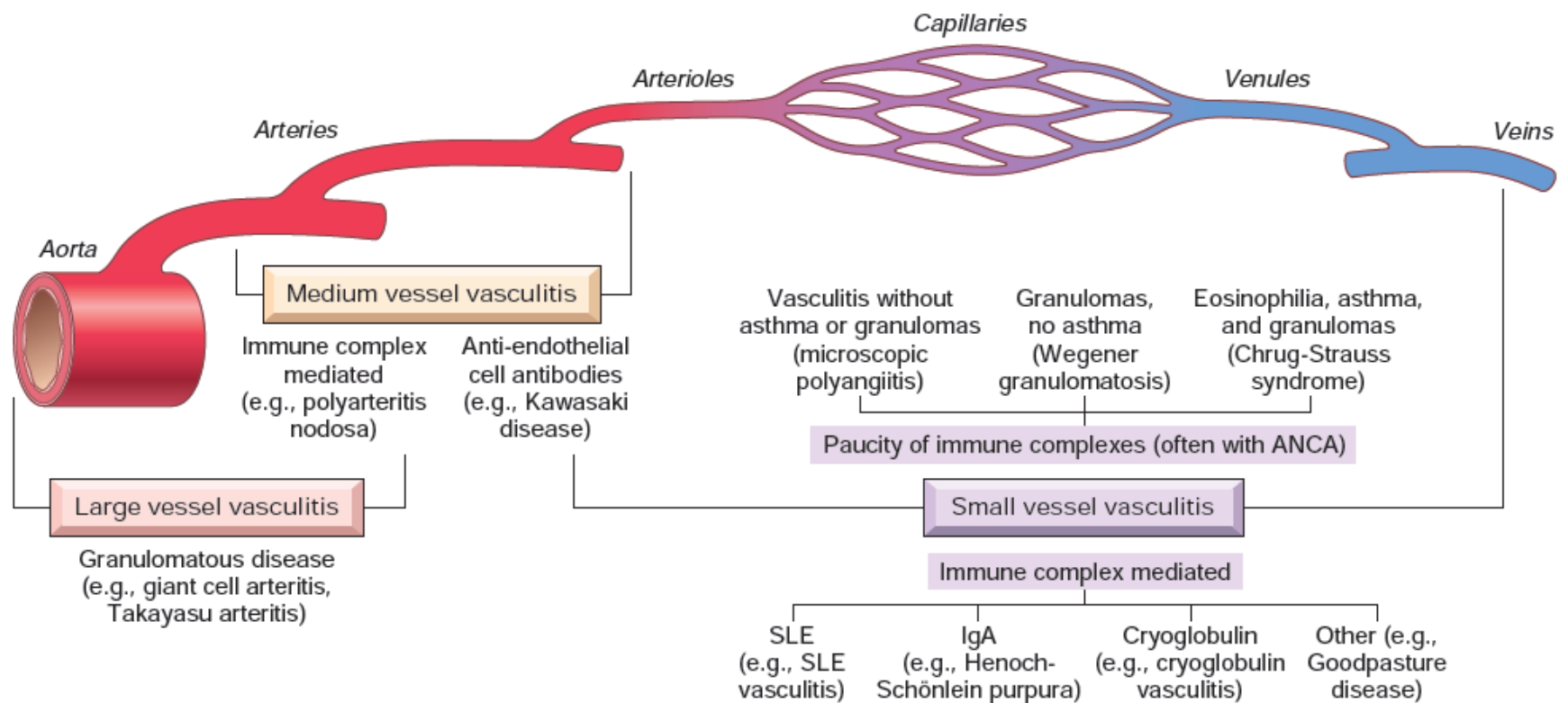
# Classification on the anatomical site of vessel involved

- Temporal arteritis- head
- Kawasaki disease- Coronary arteries
- Wegener's granulomatosis- Kidney, Upper AW
- Buerger's Disease- Legs

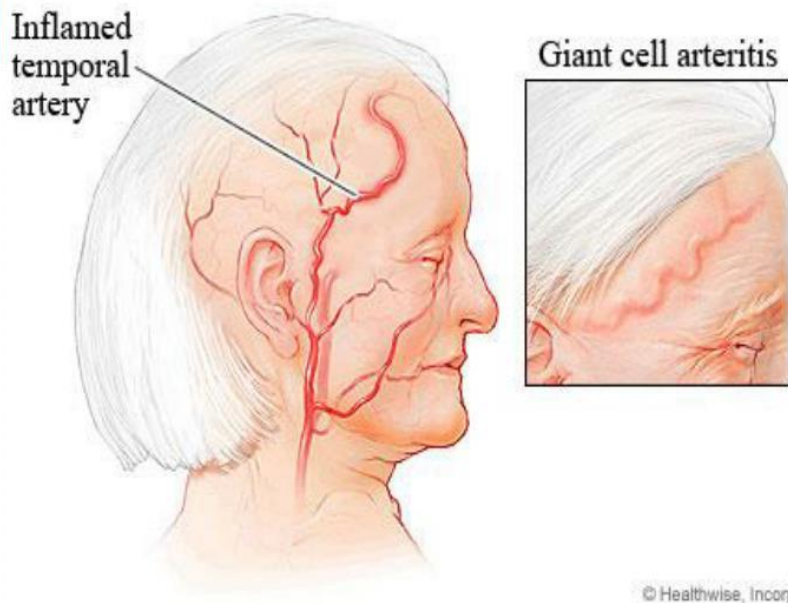
# Classification on histological features

- Granulomatous inflammation
  - Temporal
  - Giant cell/takayasu
  - Wegener's
  - Churg -straus
- Necrotizing inflammation
  - PAN
  - Microscopic polyangitis



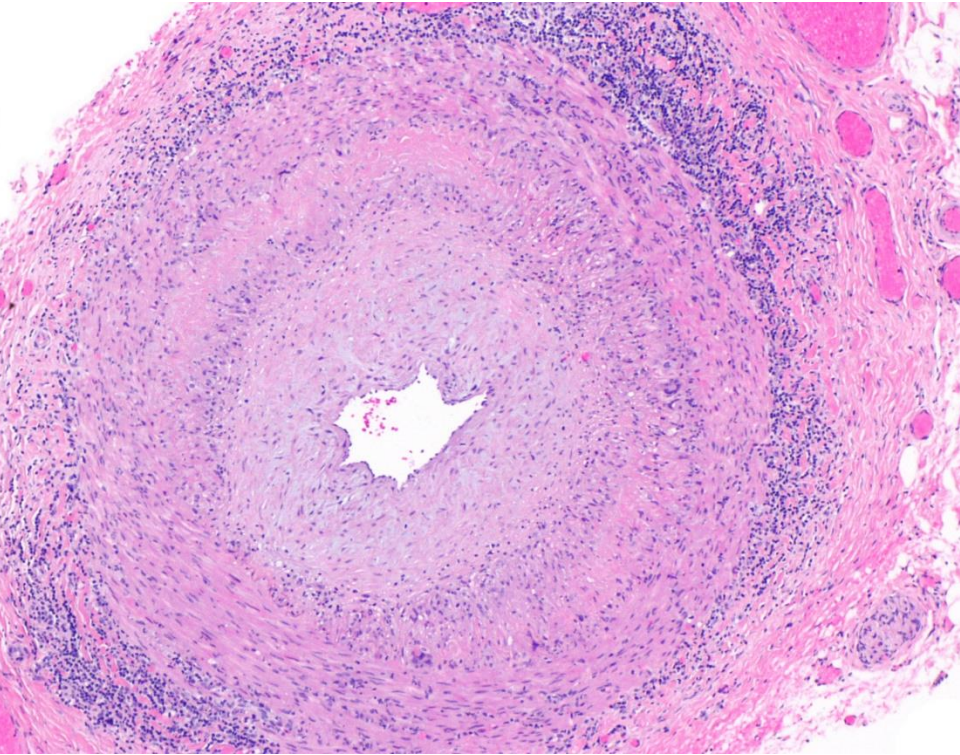


# Large vessel vasculitis



- A chronic inflammatory disorder
- principally affects arteries in the head (temporal arteries—also vertebral and ophthalmic arteries)
- **>50years old**
- Constitutional symptoms
- Ophthalmic involvement-Blindness
- Diagnosis depends on biopsy and histologic confirmation.

# Giant cell arteritis



- Segmental involvement
- Intimal thickening that reduces the luminal diameter.
- Medial granulomatous inflammation
- Internal elastic lamina fragmentation

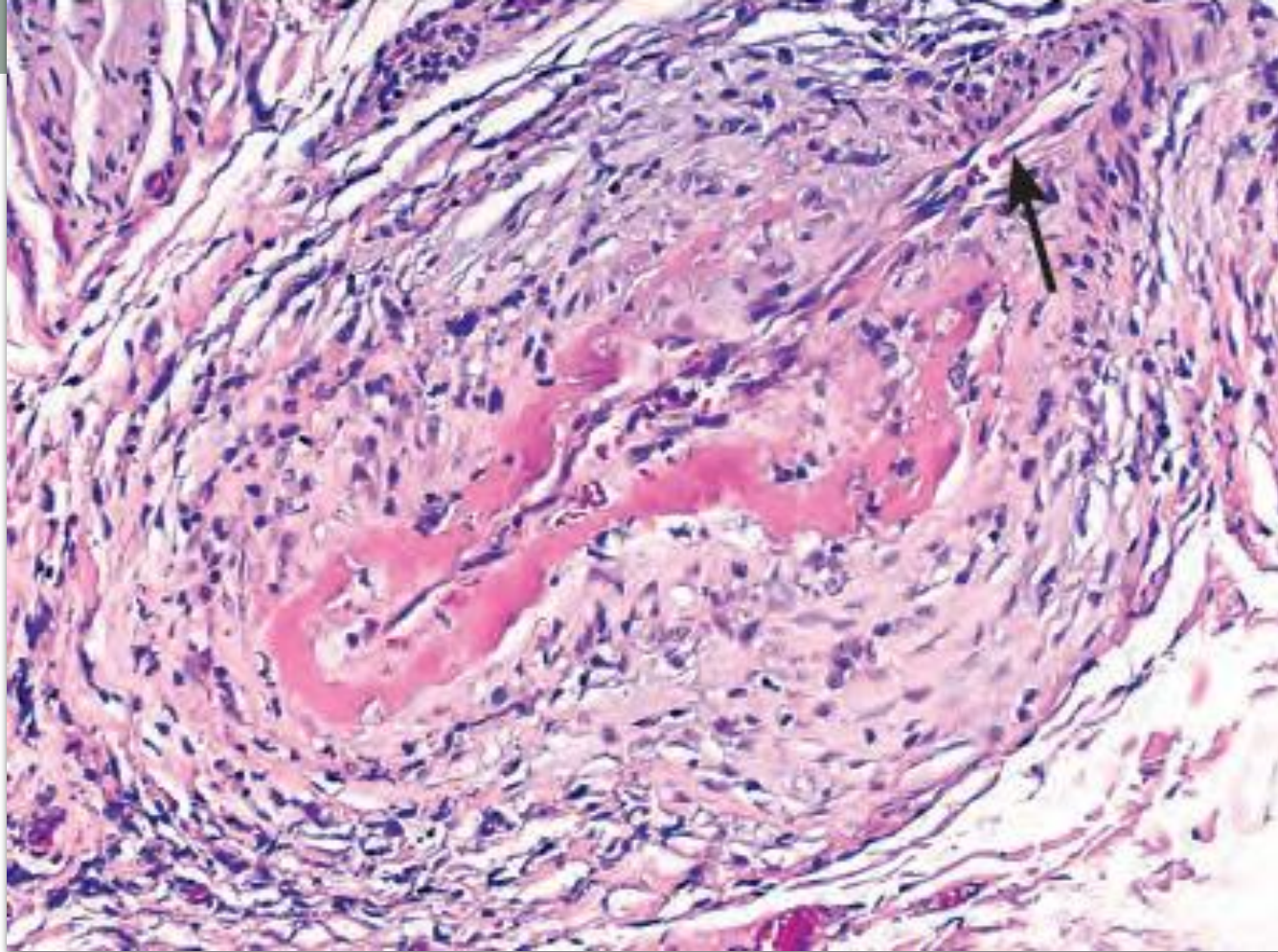
# Takayasu Arteritis

- Granulomatous vasculitis
- characterized by ocular disturbances and marked weakening of the pulses in the upper extremities(pulseless disease).
- **<50 years old**
- Transmural fibrous thickening of the aorta
- severe luminal narrowing of the major branch vessels
- Shares many attributes with giant cell aortitis, including clinical features and histology.

# Polyarteritis Nodosa

- Typically involving renal and visceral vessels
- Sparing the pulmonary circulation.
- A disorder among young
- Clinical course
  - Acute, subacute, chronic relapse





### **acute phase-**

Transmural inflammation of the arterial wall with mixed inflammatory cells. frequently accompanied by **fibrinoid necrosis** luminal thrombosis.

**Later,**

- Acute inflammatory infiltrate is replaced by fibrous (occasionally nodular) thickening of the vessel wall that can extend into the adventitia.
- Characteristically, **all stages of activity** (from early to late) may **coexist** in different vessels or even within the same vessel.
- This suggest ongoing and recurrent insults.

# Assignment 2

Read other types of vasculitis

- Kawasaki disease
- Churg Strauss
- Wegener's granulomatosis
- Buerger's disease/Thromboangiitis obliterans





# Vascular changes associated with diabetes mellitus.

- Premature atherosclerosis
- Hypertensive vascular disease
- Capillary microangiopathy :Microvascular disease
  - principal clinical effects are retinopathy, glomerulosclerosis, peripheral neuropathy

# Diabetic Microvascular Disease:

- Responsible for Many of the Complications of Diabetes.
- Arteriosclerosis and capillary basement membrane thickening are characteristic vascular changes.
- The frequent occurrence of hypertension contributes to the development of the arteriolar lesions.
- Deposition of BM proteins, which may also become glycosylated, increases in diabetes.
- Aggregation of platelets in smaller blood vessels and impaired fibrinolytic mechanisms may also play a role in the pathogenesis of diabetic microvascular disease.



# Diseases affecting veins

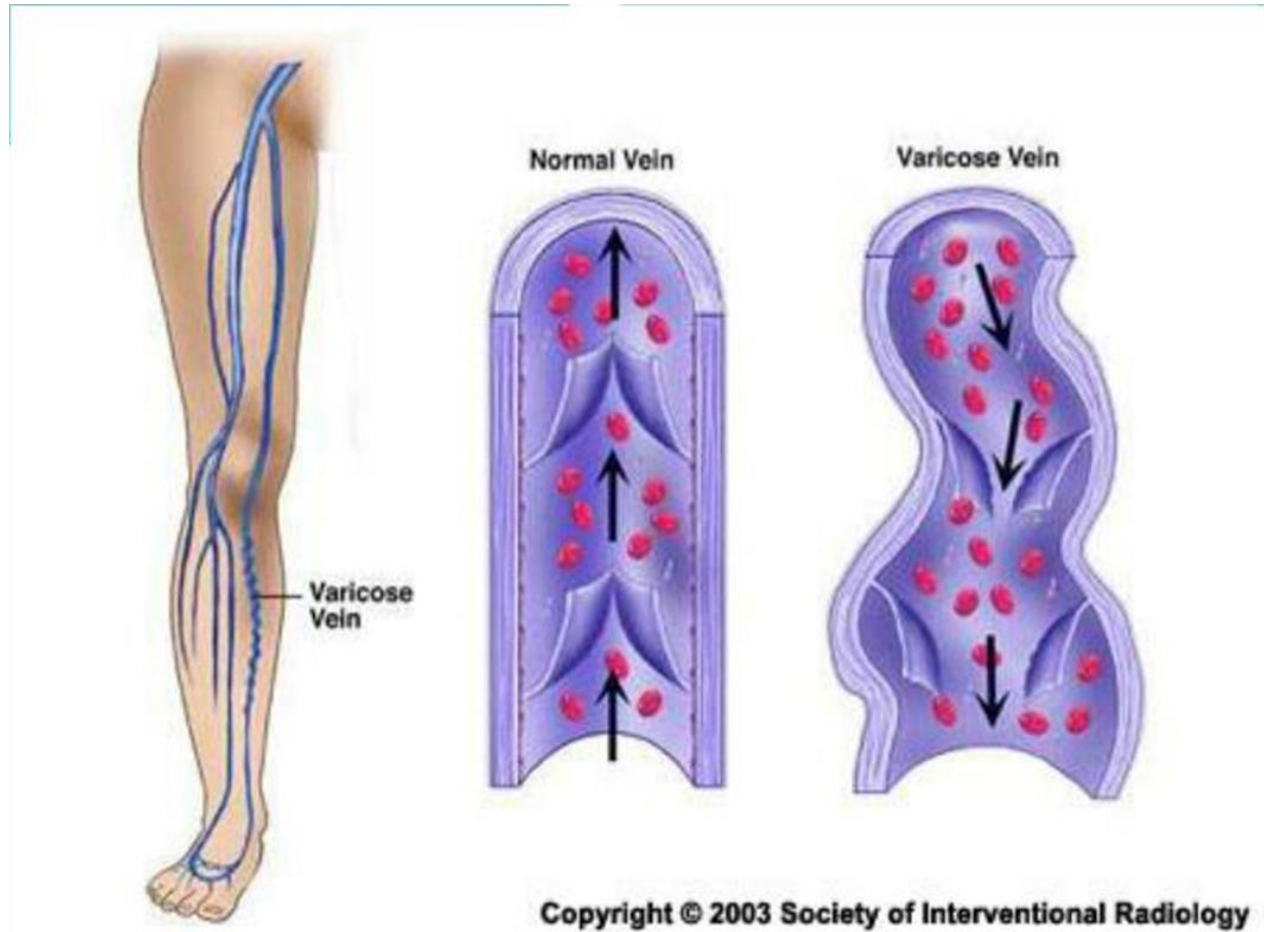
- Varicose veins
- Plebothrombosis/thrombophlebitis (Read)
- Superficial vena caval syndrome, inferior vena caval syndrome (Read)

# Varicose veins



- Abnormally dilated, tortuous veins
- Produced by prolonged, increased intraluminal pressure.
- The superficial veins of the upper and lower leg commonly involved.

- Valves of the perforating veins become incompetent.
- Blood forced from the deep to superficial veins
- Veins become tortuous and dilated
- Result stasis of blood, oedema, fibrin deposition and ulceration.







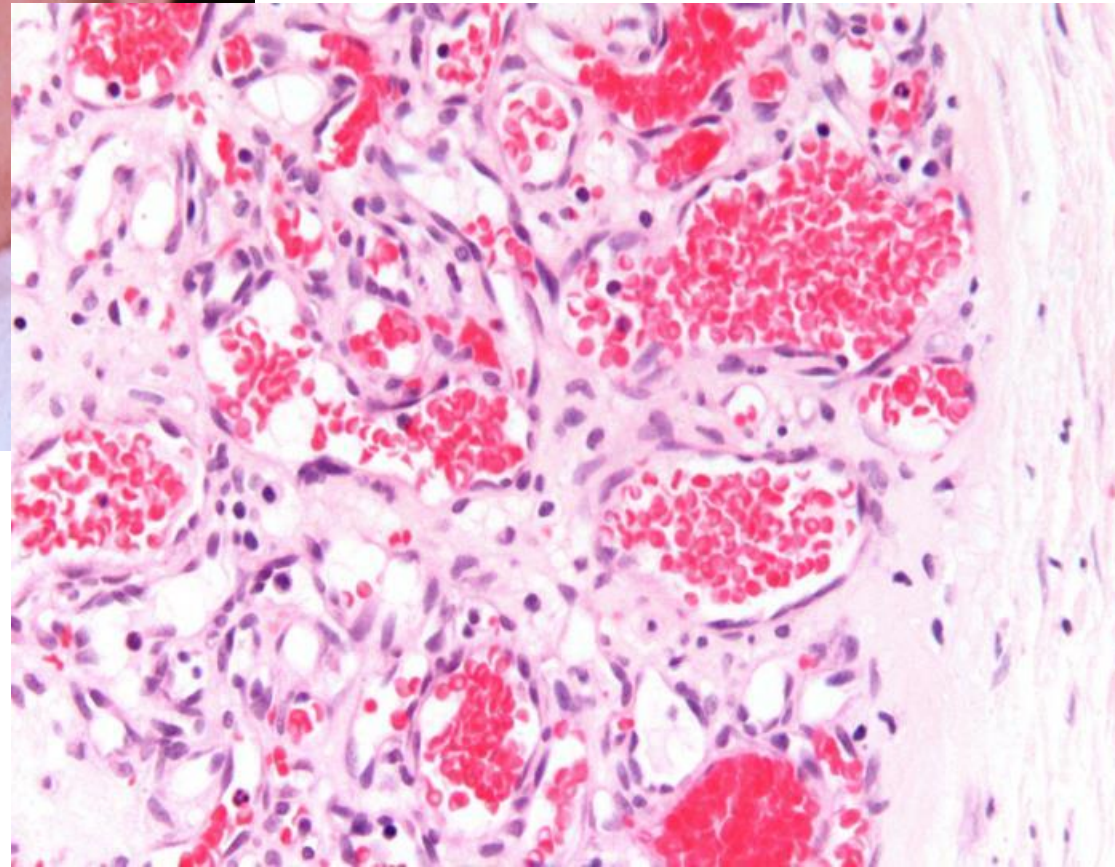
# Vascular neoplasms

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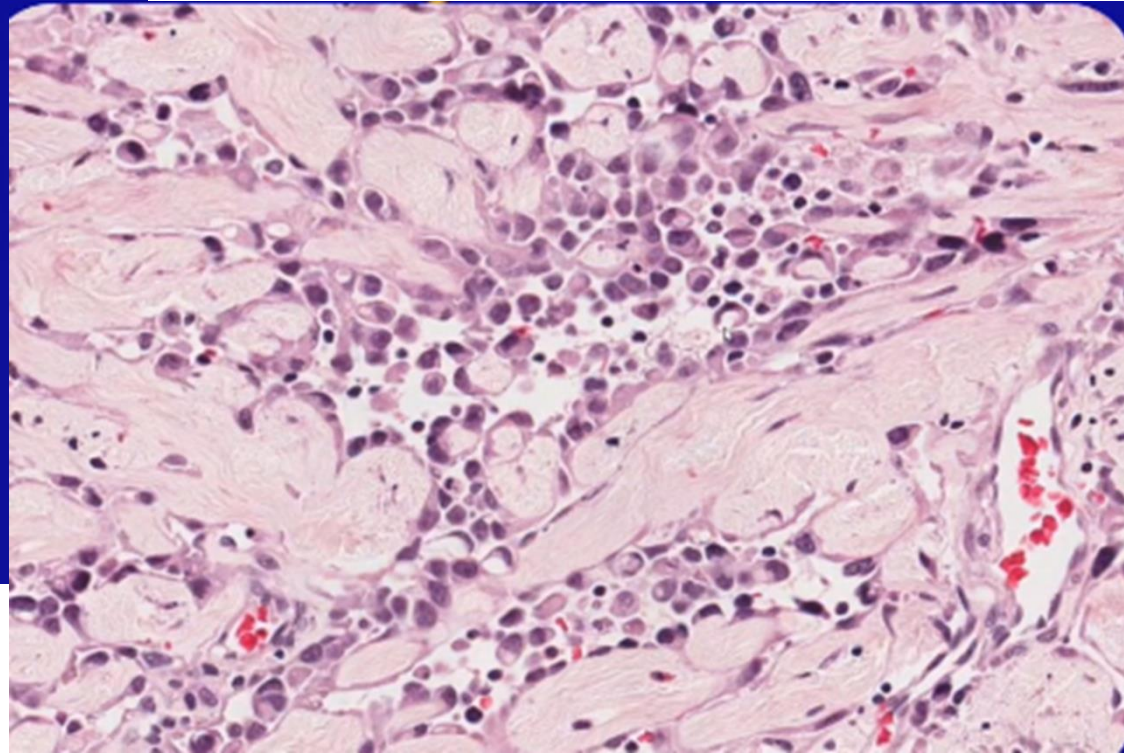
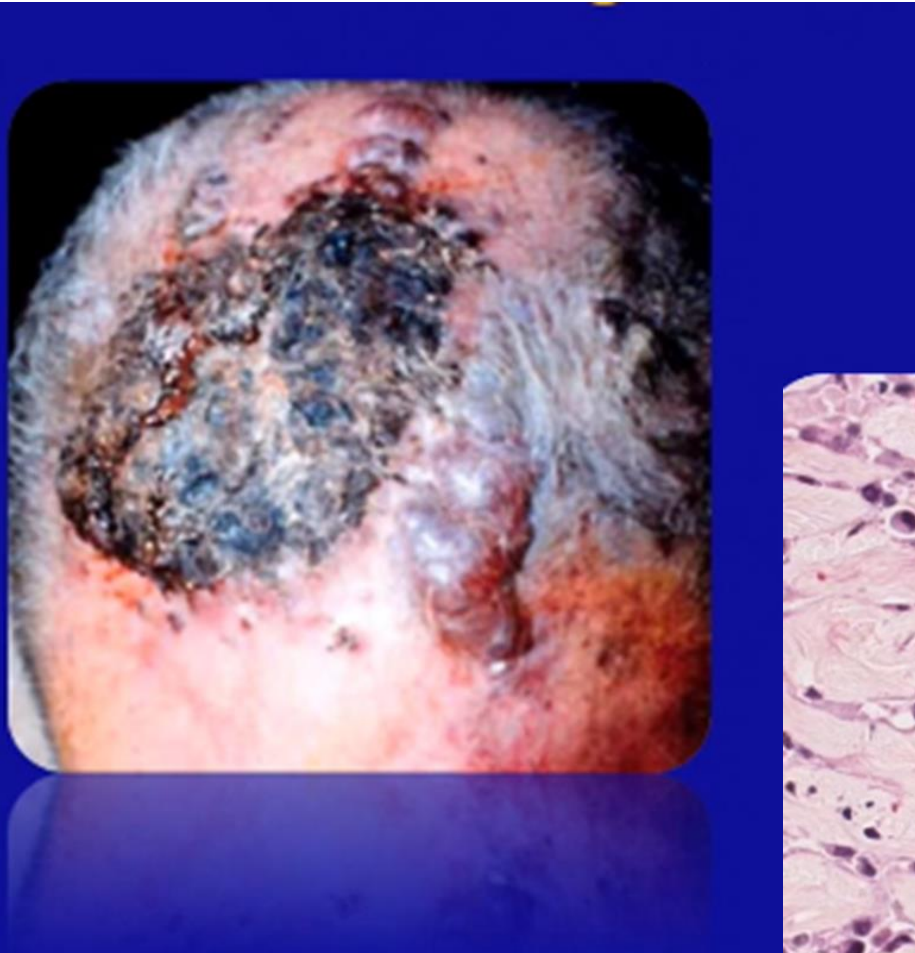
- Endothelial-cells:  
(hemangioma, lymphangioma, angiosarcoma)
- Cells that support or surround blood vessels :  
(glomus tumor, hemangiopericytoma).
- Primary tumors of large vessels (aorta, pulmonary artery, and vena cava) -mostly connective tissue sarcomas

- Benign tumours
  - Haemangioma
  - pyogenic granuloma
  - Glomus tumour
- Intermediate
  - Kaposi sarcoma
  - Haemangioendothelioma
- Malignant
  - Angiosarcoma
  - haemangiopericytoma

# Haemangioma



# Angiosarcoma





# Summary

- Aneurysms
- Aortic dissection
- Vasculitis
- Vascular changes in diabetes
- Diseases of veins
- Vascular tumours