- Aneurysms& Dissections
- **Aneurysm & Dissection- Objectives**

- **Aneurysms:**
  - **Definition & classification.**

2. **Abdominal aortic aneurysm (AAA):**
   - **Pathogenesis, morphology & clinical course**
3. **Aortic dissection:**
   - **Pathogenesis , morphology & clinical course**

Robbins Basic Pathology, 8th ed. p. 357 – 362.

- **Aneurysms- definition**
- **Aneurysm: is, permanent, localized, abnormal dilatation**

"blood-filled sac" of a blood vessel (arteries) or the heart.

- **Aneurysm:** considered as leading cause of death.
- **Aneurysm-site:** small, medium, large BV+HRT.
- **Male : Female ratio (5:1).**
- **Age group** > 5th decade, high incidence in the West..
- **Risk group:** DM, obesity, HTN, tobacco, alcoholism, high cholesterol, copper deficiency, syphilis infection

- **Aneurysm classification-1**

Descriptively, are classified base on:
(I) Type (II) Morphology (III) Location

- **I. Types:**

- **II. Morphology:**

- **III. Location: (a) Arterial origin. (b) Venous origin**
  - **Examples: Heart, Brain, Leg, Kidneys.**

Etiological issue:

- **II. Macrosscopic shape:**

- **Types of aneurysms:**
  - **(a) A true aneurysm:**

- Dilatation due to weakness that involves all 3 layers of the vascular wall, e.g. *Atherosclerotic, syphilits*
  - **<u>(b) False aneurysm (pseudo-aneurysm):</u>**
- Peri-vascular **hematoma**, over tear in the **intima** and **media** confined next to the vessel, surrounded by fibrous tissue.
  - **Types of false aneurysm:**
    (1)Pulsating hematoma (Simple Aneurysm)
    (2) Arterio-venous fistula.

-

Abdominal Aorta Aneurysm (AAA)

Pathogenesis
Morphology
Clinical Feature

- **AAA- introduction**
- **AAA is localized abnormal ballooning dilatation of AA exceeding normal diameter- >3 cm (normal 2 cm).**
- **Occur frequently in men and in smokers**

- **Age group: commonly in elderly over 60 yrs.**
- **Etiology: commonly – Atherosclerosis + others causes**
- **Location: commonly infra-renal, a few para& supra-renal**
- **Risk group: DM, obesity, HTN, tobacco, alcoholism, high cholesterol, copper deficiency, syphilis infection**
- **Enlist the commonest etiological factors of AAA?**
- **Acquired etiological factors:**
  - **Degenerative diseases (Atherosclerosis) +HTN.**
  - **Trauma.**
  - **Infection (**Mycotic aneurysm) :
    - **Infective endocarditis**

- **Adjacent suppuration, circulating organism, syphilis.**
- **Autoimmune disease** (Vasculitis)
- **Copper Deficiency: which results in a decreased activity of the lysyl oxidase enzyme, affecting elastin.**

- **<u>Genetic& Congenital etiological factors:</u> "Marfan syndrome-AD", possible hereditary + Berry aneurysms.**
- **Pathogenesis**
- **<u>Weakening of blood vessel walls</u>:**
- **Inherited defects:**
- **→ like in connective tissue disease (Marfan syndrome-AD):where there is a defective synthesis of scaffolding protein fibrillin → weakening of elastic fibers.**

- **Acquired defects:**
  - **→ like in degenerative disease (Atherosclerosis& HTN):**
  - **Inflammatory infiltrates &destructive proteolytic enzymes, lead to Loss or Inappropriate synthesis of SM cells or the of non-collagenous or non-elastic ECM→ imbalance & weakening.**
- **AAA–Morphology**
- **<u>Position</u>: Infra-renal arteries& above bifurcation of aorta.**
- **<u>Shape</u>: may be of Saccular or fusiform type.**
- **<u>Size</u>; 15cm to 25cm.**
- **<u>Two general variants of AAA:</u>**
  (1)Inflammatory type: chronic inflammation, macrophages+ Fibrosis.

(2) Mycotic type: infection, e.g. Salmonella, Mycoses, Syphilis infection.

➢ Morphology

- ❑ **Dilatation.**
- ❑ **Intimal surface shows severe atherosclerosis with destruction of the media.**
- ❑ **Poorly organized mural thrombus.**
- ❑ **Narrowing or occlusion- of the renal and superior or inferior mesenteric arteries.**

➢ AAA clinical features

- ❑ **Pressure symptoms& signs (compression of ureter- flank pain , HTN or erosion of vertebrae, CNS complications).**
- ❑ **Obstruction of a branch vessel resulting in ischemic injury.**
- ❑ **Fistulation, rare**

- Embolism from Atheroma or mural thrombus.
- Rupture into the peritoneal cavity or retroperitoneal tissues → Fatal hemorrhage, lower limb ischemia. (may safely observed if asymptomatic and <5.5cm in diameter).

➢ Aortic dissection (AD)- introduction

- AD- is medical emergency.
- AD- blood perforate the intima& splays apart the laminar planes of the media to form a blood-filled channel.
- This is precipitated by high forceful pressure(shear stress), e.g. HTN.
- The intra-mural hematoma found in different level.

- **Dissecting aneurysm "old name" : may or may not associate with dilatation.**

➢ Aortic dissection- Risk group

- **Chronic Hypertension- usually in Adult aged 40-60 (>90%)**
- **Inherited connective tissue defect- younger patients (e.g., MARFAN SYNDROME).**
- **Iatrogenic causes, after CARDIAC CATHETERIZATION.**
- **History of trauma or Vasculitis.**
- **Unknown etiology– after pregnancy (rare) .**

➢ Aortic dissection- pathogenesis

⑩ **Pressure-related mechanical injury in Hypertensive patients have:**

- **(a) Medial hypertrophy of the vasa vasorum → lead to reduced blood flow.**
- **(b)Degenerative change with medial loss of smooth muscle**

2) Genetic defect (familial) or acquired connective tissue structural abnormality lead to abnormal vascular wall

- **Genetic defect = Marfan syndrome, Ehlers-Danlos.**
- **Acquired causes = vitamin C deficiency, copper metabolic defects.**

3) UNKNOWN- Large groups.

➢ Aortic dissection- morphology

- ❖ **Location: Ascending aorta**
- ❖ **Intimal tear - typically transverse or oblique, with sharp, jagged edges, not going retrograde towards the heart.**
- ❖ **Hematomas "Thrombus".**
- ❖ **Double-barreled aorta** = false channel, with time endothelialized**.**
- ❖ **Cystic medial degeneration**: mucoid degeneration and elastic fibres fragmentation.
- ❖ **No significant inflammation.**

➢ **Cystic medial degeneration- cross-section of aortic media from a patient with Marfan syndrome**

showing marked elastic fragmentation (A), comparison to normal media (B)

➢ Aortic Dissection- clinical features

- **<u>Symptoms</u>:** sudden onset of **anterior chest pain**, radiating to the back, moving downward ”earing or stabbing” as the dissection progresses; **confused as MI.**
- **Asymptomatic cases also noted.**

- **<u>The common clinical manifestation:</u>**
  - ❑ **Common cause of death if rupture.**
  - ❑ **Aortic insufficiency, syncope & Shock.**
  - ❑ **Myocardial infarction.**

- **Critical vascular obstruction- (renal, iliac, mesentric,etc.)**
- **Compression of spinal arteries →transverse myelitis.**

- **Clinical classification of Aorta dissections**
  Dr. Michael DeBakey (vascular surgeon)
- **DeBkey's Classification of dissections**
  Type I Type II Type III