Aneurysms:

Dilations of localized segments of the arterial system are called aneurysms.

Classification:

- According to Wall:
  1. True aneurysms: containing the three layers of the arterial wall (intima, media, and adventitia) in the aneurysm sac.
  2. False aneurysms: having a single layer of fibrous tissue as the wall of the sac, e.g. aneurysm following trauma.

- According to their shape:
  1. Fusiform: involve total circumference of artery & diffuse dilatation.
  2. Saccular: arise from distinct portion of wall & got a mouth.
  3. Dissecting.

- According to etiology:
  1. Atheromatous.
  2. Traumatic.
  3. Anastomotic.
  4. Post stenotic.
  5. Collagen disease.
  6. Syphilitic. Mycotic. etc. The term mycotic is a misnomer because, although it indicates infection as a causal element in the formation of the aneurysm, this is due to bacteria, not fungi.

Aneurysms occur all over the body in major vessels, including the aorta, and the iliac, femoral, popliteal, subclavian, axillary and carotid arteries. They may also occur in cerebral, mesenteric, splenic and renal arteries and their branches. The majority are true fusiform atherosclerotic aneurysms.

Clinical features:

The symptoms relate to the vessel affected and the tissues it supplies. All aneurysms can cause symptoms. Most aneurysms of clinical significance can be palpated and, typically, an expansible pulsation is felt. Transmitted pulsation through a mass lesion as a result of (Expansion. Thrombosis. Rupture. Release of emboli.)

Intrinsic features:- (Swelling exhibiting expansile pulsation. Compressible sac. Thrill. Bruit.)

Extrinsic features:- (pressure over - Vein → edema. Nerve → altered sensation. Bone & joints or tubes likes esophagus & trachea.

AAA

AAA: Abdominal Aortic Aneurysm.

- Abdominal aortic aneurysm is by far the commonest of large vessel aneurysm.
- Is found in 2% of the population at autopsy.
- > 95% has associated atheromatous degeneration.
- > 95% occur below the renal arteries.
- More common in male.

Etiology:

1. Atherosclerosis.
2. Syphilis.
3. Marfan syndrome.
4. Trauma.
5. Mycotic.
6. Inflammatory.
Symptomatic AAA:-

Patients most commonly present with:-

- Back &/or abdominal discomfort.
- Pain may also occur in the thigh & groin because of nerve compression.
- Gastrointestinal, urinary and venous symptoms can also be caused by pressure from an abdominal aneurysm.
- About 3% of all aneurysms cause pain as a result of inflammation of the aneurysm itself.
- Few cause symptoms from distal embolization of fragments of their intraluminal thrombus.
- Sometimes by a brief loss of conscious.
- Femoral pulsation in one or both sides may be diminished or absent.
- A pulsatile mass is palpable in the abdomen & there are signs of shock (leaking or ruptured aneurysm).

It said without surgery →80% of those with a symptomatic AAA will be dead in a year. 
With surgery →80% will be alive.
Therefore the operation is indicated in patients who are otherwise reasonably fit.

Asymptomatic AAA:

* An aneurysm found incidentally on clinical examination, radiography or ultrasonography.
* In otherwise fit patients should be considered for repair if > 55 mm in diameter (measured by UlS).
* Annual incidence of rupture rises from 1% or less in aneurysms that are < 55 mm in diameter to as high as 20%, in those that are 70 mm in diameter.
* Assuming elective surgery carries a 5% mortality rate, the balance is in favour of elective operation once the Diameter is > 55 mm, provided there is no major comorbidity.
* Regular ultrasonographic assessment is indicated for asymptomatic aneurysms < 55 mm in diameter.

Investigations:-

1- Plain XR - can see the calcification in aneurysmal wall.
2- U/S - diagnosis, size, site, follow up a small AAA. Evaluate blood flow in renal & visceral arteries.
3- CT scan: - character & thickness of the wall, delineation aortic lumen & intra-aortic thrombus, renal & iliac vessels, neck of aneurysm.
4- MRI: - lumen, neck, surface anatomy, renal artery, relationship to other periaortic structures.
5- Angiography. Accurate diagnosis. Additional information about PVD, renal ... & important in suprarenal extension of aneurysm, presence of thrombus, stenotic lesion in renal a., EIA., SMA.

Indication for operation in AAA:-

Asymptomatic AAA:-

* Aneurysm > 55 mm in anteroposterior diameter.
* Patient fit for surgery (expected mortality rate < 5%)
* Indications for endoluminal operation are the same as for open operation.

Symptomatic AAA:

* Aneurysm of any size that is painful or tender.
* Aneurysm of any size that is causing distal embolisation
* Indications are wider than for an asymptomatic lesion (expected mortality rate 5-20%)

Ruptured abdominal aortic aneurysm

* Anteriorly into the peritoneal cavity (20 %), results in free bleeding in peritoneal cavity; very few patients reach hospital alive
* Posterolaterally into the retroperitoneal space (80%). produces a retroperitoneal hematoma
* Less than 50% of patients with rupture survive to reach hospital

A brief period ensues when a combination of moderate hypotension and the resistance of the retroperitoneal tissues arrests further haemorrhage. The patient may remain conscious but in severe pain. If no operation is performed, death is virtually inevitable. Operation results in a better than 50% survival rate.
To achieve the best results, diagnosis and treatment must be rapid.
Management of ruptured AAA.

- Early diagnosis (abdominal/back pain, pulsatile mass, shock)
- Immediate resuscitation (oxygen, intravenous replacement therapy, central line)
- Maintain systolic pressure, but not > 100 mmHg.
- Urinary catheter
- Cross-match six units of blood
- Rapid transfer to the operating room

Surgical procedure:

A- Open procedure:

* Under general anesthesia, with the patient lying supine, a full-length midline or supra-umbilical transverse incision is made.
* The small intestine is lifted to the patient's right and the aorta identified the post. Peritoneum overlying the aorta is opened the aorta above the limit of the aneurysm identified. The aorta immediately above the dilatation is exposed inferior to left renal vein and renal arteries.
* The arteries are then exposed, heparin given and clamps applied above and below the lesion. The aneurysm is opened longitudinally and back-bleeding from lumbar and mesenteric vessels controlled by sutures placed from within the sac.
* Upper and lower aortic necks are prepared to which an aortic prosthesis is then sutured end to end inside the sac with a monofilament non-absorbable suture. Clamps are released slowly to prevent sudden hypotension.
* If haemostasis is satisfactory at this point, the aneurysm sac is closed round the prosthesis to exclude both it and the suture lines from the bowel to reduce the risk of adherence and potential fistula formation.
* The abdomen is then closed. Occasionally, when the iliac vessels are also involved with dilatation or severe atheroma, it is necessary to construct an aorto-bi-iliac or aorto-bifemoral bypass, rather than use a simple aorto-aortic tube.

B- Endoluminal procedure

This has gained in popularity over the last decade and most centres now routinely offer this minimally invasive treatment to elderly patients with suitable aortic morphology, generally on an elective or semi-elective basis.

* The aorta is accessed via the common femoral arteries, which are exposed surgically. Under radiological control, a delivery system is guided up into the aorta and an endovascular prosthesis (often termed a 'stent graft') placed within the aortic sac.
* The prosthesis is made from Dacron or PTFE with an integral metallic stent for support and to allow firm attachment to the vessels above and below the sac; most are modular, one part being an aortic body with one iliac attached and the other a separate single iliac stent graft. The larger component is inserted via one groin and the other via the opposite groin, such modular stent-graft systems must be able to produce a blood tight seal at the uppermost (infra renal aortic) level of the graft, at both iliac levels distally and at the junction between the aorto-uni-iliac stent-graft module and its contralateral iliac partner.

Benefits of Interventional Repair

- No abdominal surgical incision
- No sutures, or sutures only at the groins
- Faster recovery, shorter time in the hospital
- No general anesthesia in some cases
- Less pain
- Reduced complications

Disadvantages of Interventional Repair

- Possible movement of the graft after treatment, with blood flow into the aneurysm and resumption of risk of growth/rupture of the aneurysm
- Concerns remain about prosthetic fragmentation with the passage of time, displacement and leakage (endoleak) at the interface of vessel and stent graft or from patient lumbar arteries.
So, these concerns mean that all patients require lifelong follow up and regular imaging, and there is a tendency to offer the endoluminal procedure to the older patient. Long-term prosthetic integrity is less probable life-time requirement for follow-up studies to be sure the stent graft is continuing to function.

Iliac aneurysm
* Occurs in conjunction with aortic aneurysm and only rarely on its own.
* Probably degenerative & atherosclerotic.
* Difficult to diagnose clinically so about half present already ruptured.
* Operation is indicated when exceeds 3cm diameter. With bypass and exclusion of the aneurysm by ligation above and below the dilatation.

Femoral aneurysm

True aneurysm:
* Uncommon. Caused by degeneration & atherosclerosis
* 70%-95% associated with AAA. 50% bilateral.
* If symptomatic → ischemia (simple to severe). Local compression on nerve, vein. Or groin pain.
* Complications occur in less than 3%.
* Conservative treatment is generally indicated, but it is important to look for aneurysms elsewhere.
* Surgery indicated if diameter exceeds 2-2.5 cm. by interposition grafts.

False aneurysm
* Occurs in 2% of patients after arterial surgery at this site (Iatrogenic / Anastomotic)
* Usually symptomatic & grow rapidly. Causing → {pulsatile groin mass, ischemic symptoms, local compression, may thromboses spontaneously, finally rupture may occur.}
* Non-surgical treatment is by US compression to induced thrombosis.
* Some are infective in origin and rupture is possible; these require surgical correction.
* Local repair with reanastomosis at the groin under suitable antibiotic cover may be successful.
* But bypass, clear of the infected area, with subsequent excision of the infected graft is often the only way of preventing further problems.

Popliteal Aneurysm:-
* Popliteal A. aneurysm accounts for 70% of all peripheral aneurysms.
* 2/3 are bilateral.
* 1/3 accompanied by aortic dilatation.
* More common in male.
* Caused by atherosclerosis, bacterial infection. Trauma, popliteal A. entrapment syndrome & collagen disease.
* Clinically: -swelling behind the knee, or sever ischemia following thrombosis or distal ischaemic ulceration as a result of emboli. Rupture is less than 5%.
* Urgent surgery, possible with intra-arterial thrombolysis, is indicated in acute situation.
* An asymptomatic aneurysm should be consired for elective repair to prevent future complications, especially if it exceeds 25 mm in diameter. Ultrasonography and CT or magnetic resonance imaging can be helpful in confirming the diagnosis.
* Treatment is either a bypass with ligation of the aneurysm or an inlay graft

HOW CAN AN ANEURYSM BE PREVENTED?
The best way to prevent an aneurysm is to avoid the risk factors that increase the changes of developing one. To do this, you can:
* Quit smoking.
* Eat a low-fat, low-cholesterol diet to reduce the buildup of plaque in the arteries.
* Control high blood pressure (eating a low-salt diet helps).
* Control high cholesterol.
* Get regular physical activity.