

Vascular surgery

Vascular tree can be divided into three main components

:

1..VEINS:which drain blood toward the heart ,they carry deoxygenated blood except the pulmonary veins which carry bright blood from the lungs to left artium.

Venous side of low pressure and some times reach negative value e.g, neck vein .the veins consider as capacitant vesseles.

2.ATERIESthey distibute the blood from the heart to all body components theycarry oxygenated blood except the pulminary artery.

3..MICRO CICULATION;small sized vesselles less than 0.1 mm diameter responsible for distribution and collection of blood including the vascular tree themselves.

The arteries can be divided into 2 main types from functional point of view ,transporting arteries (elastic arteries)in which the intema and media composed of mutiple layers of elastin ,second type is disributive arteries (muscular arteries)those contain only single layer of elastin the third layer of the vessel called adventitia .

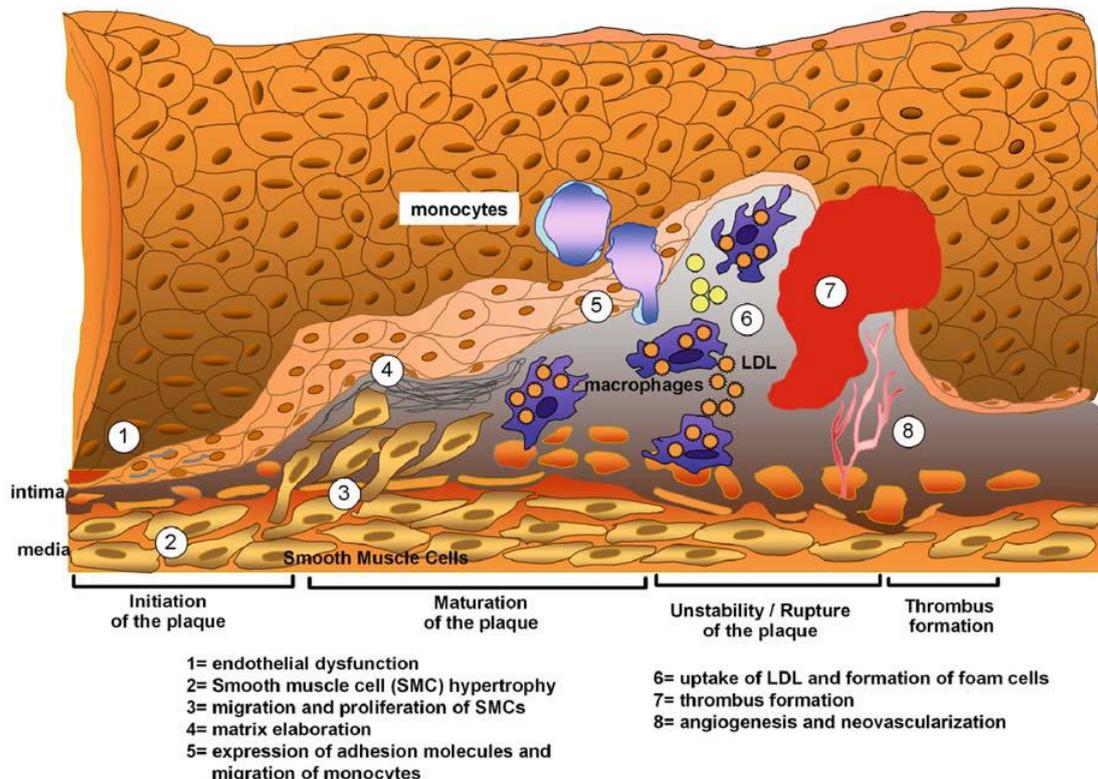
Some capillaries controlled by pre-cappilary sphincter while some lack such sphincter and considered as arerio-venous shunt.

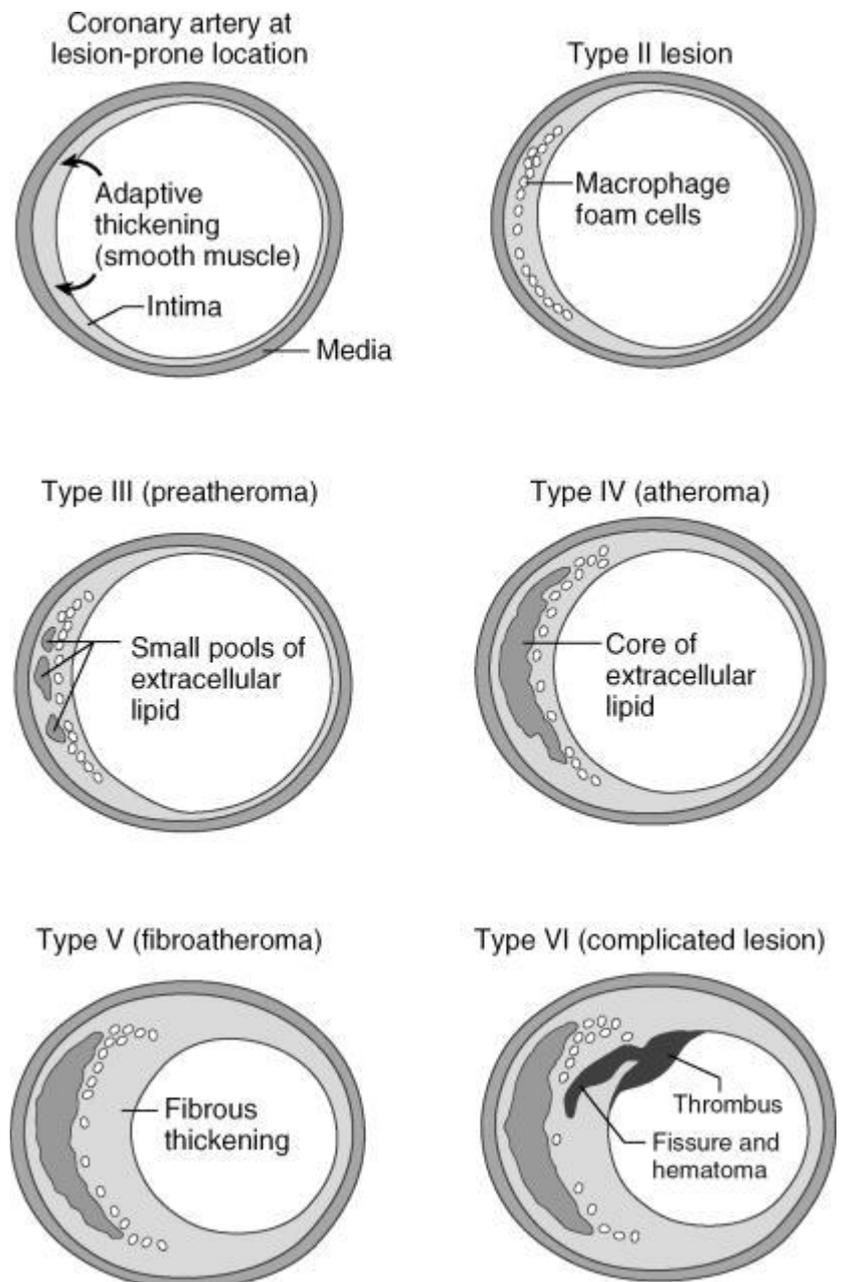
because of thier ability for huge dilatation to take more bloodthe viens are called capacitant vesselstheir intima composed of only single layer of endothelium,small and medium sized vesseles semilunar valves that permit only unidirectional flow.

AUTOREGULATION:

It is the ability of vascular bed to provide constant blood flow regardless oerfusion pressure.for skeletal muscles 20-40mm hg ,,50-60mmhg for the brain is the lower limits for auto regulation.

ATHEROGENESIS: IT IS THE FORMATIONOF ATHEROMATOUSPLAQUE LEADING TO THROMBUS AND VASCULAR INJURY





Recognized here:

- a..type I functional alteration of endothelial cells without morphological changes. that might occur due to flow disturbance lipid accumulated within macrophages and (FOAM CELLS) are the earliest sign of atherosclerosis.
 - b..type 2 the foam cells may rupture and release their toxic products lead to proliferation and migration of smooth muscle cells causing fibro-intimal lesion lead to formation of (after a time) smooth plaque.
 - c..type 3 the smooth plaque will undergo disruption and fissuring reaching to the media this will increase the platelets adhesion and extensive proliferation of smooth muscle cells, this is called mural thrombus which involve the whole wall of the vessel.
- Peripheral arterial blood flow follows the physical principles of fluid dynamics i.e. diameter and pressure.

CRITICAL



STENOSIS

Nomenclature and main histology	Sequences in progression	Main growth mechanism	Earliest onset	Clinical correlation
Type I (initial) lesion isolated macrophage foam cells		growth mainly by lipid accumulation	from first decade	clinically silent
Type II (fatty streak) lesion mainly intracellular lipid accumulation			from third decade	
Type III (intermediate) lesion Type II changes & small extracellular lipid pools				
Type IV (atheroma) lesion Type II changes & core of extracellular lipid		accelerated smooth muscle and collagen increase	from fourth decade	clinically silent or overt
Type V (fibroatheroma) lesion lipid core & fibrotic layer, or multiple lipid cores & fibrotic layers, or mainly calcific, or mainly fibrotic				
Type VI (complicated) lesion surface defect, hematoma-hemorrhage, thrombus		thrombosis, hematoma		

Is defined as the degree of stenosis sufficient to produce significant drop in the pressure. This pressure gradient results in energy loss and do not become evident until cross-sectional area of the vessels is reduced by more than 75% of the original lumen. The length of stenosis is less important than the diameter of stenosis ($l \propto r^4$).

COLLATERAL CIRCULATION: group of pre-existing pathways that enlarges as stenosis develops in the main arterial supply. collateral pathway may provide flow distal to the occlusion which is sufficient to preserve the viability BUT it is never efficient as patent artery, because the collateral resistance always exceeds the major artery.

Peripheral vascular disease

Causes:

- 1.. atherosclerosis.*
- 2.. embolic phenomena.*
- 3..traumatic injuries to the vessels.*

Atheroma tend to occur in certain locations like proximal internal carotid artery ,infra renal aorta,common and external iliac arteries.

Atheroma also tends to form at branching points.

RISK FACTORS;

- 1.smoking*
- 2.D.M*
- 3.hypertension*
- 4.hyperlipidaemia.*

CLINICAL PRESENTATIONS::

A; claudication:-pain in major muscles distal to the stenosis during walking .the 10 years prognosis is good only 10%progress to severe ischemia and may end by limb loss.

B; Ischemic rest pain :-when severe compromise to blood supply occur during even rest i.e the blood not sufficient to keep the limb viable at rest.this means that rest pain regards as limb threatening condition,85%loss their limb in the next 5 years if revascularisation not achieved.

C; Ulceration &Gangrene; this most severe condition in which circulation is not enough to maintain tissue viability leading to tissue death and dry gangrene which can be complicated by infection causing wet gangrene.

Evaluation of patient

- 1; history.*
- 2; physical examination.*
- 3;Non invasive tests doppler u.s , duplex .*
- 4; arteriography.*
- 5;Magnetic resonant angiography.*

Treatment

Medical treatment

- A,stop smoking.*
- B,exercise programs to induce collateral circulation.*
- C, anti-coagulant.*
- D, anti-platelets.*

Interventional treatment

This is done by catheterisation of the vessel and expanding new techniques developed through (PTA) per cutaneous transluminal angioplasty and balloon dilatation of the vessel can be achieved or placement of stents or mesh can be done and we can also remove the clots from the vessels

Surgical treatment; include different types of surgery to maintain blood supply to the organs;-

1; endarterectomy means removal of the atheromatous material with the intima and part of the media.

2; resection of the stenosed part and end to end anastomosis.

3; resection and interposition graft from the same patient, we used commonly saphenous vein grafts.

4; use of synthetic grafts like Gortex, Dacron.

5; AMPUTATION of gangrenous limb.

Acute arterial embolism

ONE of the most common emergencies of the vascular surgery department.

It occurs due to translocation and dislodgment of material within the arterial blood stream to more distal sites, resulting in interruption of blood supply.

It occurs commonly at bifurcation of the arteries especially the lower limbs like iliac and femoral vessels.

Some times small micro-emboli cause more distal injury (blue toe syndrome).

The commonest cause of acute arterial emboli is cardiac origin due to atrial fibrillation, ventricular source from M.I., ventricular aneurysm.

Rheumatic heart disease is another cause.

The next cause after cardiac is proximal arterial pathology either atherosclerotic plaque separation or aneurysmal area that become source for such thrombosis.

Clinical evaluation:

In acute embolism the symptoms are of sudden onset.....

The cardinal signs of ischemia described as 5 P's;

Pain, pulseless, pallor, paresthesia, paralysis, poikilothermia.

Rapid assessment to detect the level of occlusion by physical examination, compare with the other side, check the pulse level, color changes.

Nerves are the most vulnerable to ischemia motor and sensory loss mandate urgent intervention.

Doppler study to assess the level of obstruction and collateral state.

Treatment:-

This condition is emergency surgical condition. After correction of hydration by I.V fluids to protect the kidneys from toxic material (myoglobinuria) that cause acute tubular necrosis and acute renal failure, bolus dose of heparin 5000 i.u followed by 1000 i.u per hour till the time of surgery.

Time factor for surgery is important (golden hours) are 6-8 hours before serious irreversible tissue damage (nerve and muscle).

Surgical procedure including incision on the groin and open the femoral artery, passing embolectomy catheter to remove the clot from the artery.

Some times bypass graft surgery needed in cases of adequate thrombo-embolectomy.

The thrombogenic agents are materials can dissolve the clot completely or partialy may be used to dissolve the rest emboli which are small or un accessable for surgery e.e streptokinase or uro kinase..