

VASCULAR DISORDERS

- Depends on the pump of the heart
- Responsiveness of blood vessels
- Adequate circulating blood volume
- *High viscosity blood = high RBC, high sugar*
- **Vasa vasorum** = blood supplying the blood vessels

Hemoglobin F is what is normally present

- In sickle cell (autosomal recessive disorder), hemophilia (sex-linked)
- In sickle cell it could cause clumping in capillaries

Albumin = oncotic pressure for water reabsorption

If not from albumin, lymphatic system will reabsorb it back to vena cava

Veins = **Valves** (not found in artery) for pushing blood back

Valves are activated by contraction of skeletal muscles

Lymphatic system drains excess water and for immunity (**spleen** = filtering microorganism; **thymus** = differentiate T cells; **lymph nodes** = filtering lymph)

Artery = *higher pressure*, **Vein** = *lower pressure*

IF NOT -> affected tissue perfusion

Flow = gradient pressure / Resistance

Laminar = pressure in the middle of the artery

Turbulent = happens with high blood flow, constriction

Lactic acid = *fail, toxic* -> *pain*

Arterial insufficiency due to obstruction -> **intermittent obstructions** (*increase demand and decrease supply aka ischemia*)

Pain is dull, boring, cramping, aching

Ask how far and how severe before the pain appears to estimate the obstruction

Rest pain: **critical limb ischemia** (100%, surgical emergency) -> tissue necrosis -> amputation

At night due to temperature (**Raynaud's phenomenon**) -> vasoconstriction

Pain is felt if extremities is elevated

Calf -> femoral/popliteal

Hip/Buttock -> aorta, iliac arteries

Cyanotic, hair loss, arterial ulcerations = severe arterial insufficiency

Gangrene = necrosis

Edema = Venous

Palpate pulse for rate, rhythm, quality (0-4)

Palpate simultaneously (**EXPECT carotid**)

Femoral, popliteal, tibial, dorsalis

20-30 higher systolic

Duplex Ultrasound: determines blood flow and image of blood vessel

Stenosis narrowing vs **atherosclerosis**, severity and chronicity, determine the appropriate treatment

For **abdominal aorta**, NPO for 6 hours

Ankle-Brachial Index (ABI)

Supine position

Get the pressure of the highest

Use doppler

Ankle BP / Brachial BP = ABI

1.0-1.3 is NORMAL; 0.9 or LOWER = **PAD**

>1.40 noncompressible arteries (**calcification**)

1.00-1.40 **Normal**

0.50-0.90 **Claudication**

<0.50 **Ischemic rest pain**

<0.40 **Ischemic critical limb**

No alcohol, smoking

Exercise Testing

5 mins; AFTER get BP in lower extremities

Normal: *minimal BP changes*; Arterial disease: ankle BP drops post-exercise

Visualization of blood vessels = **Angiography**

CT scan or MRI

Atherosclerosis

HTN and increase blood viscosity

Reduce BP, sugar, Lipid, weight

Fibric acid inhibitor ALTERNATIVE to **statin**

Collateral circulation = at rest

Pain DISTAL to obstruction

Intermittent claudication - persistent and pain relievers not working

Cool skin, pale

Bruits auscultated

Atrophy with chronic ischemia

Cilostazol: vasodilator + antiplatelet

CONTRAINDICATED in **Heart Failure**

DUAT

Ballon -> Stent -> **Atherectomy**

Thru cardiac catheterization

Manage bleeding, flat position, direct pressure

Drag eluting stent is preferred

Endarterectomy -> cutting vessel open to remove clot

Bypass grafting

Aneurysm: localized dilation due to weakness of arterial wall

PROGRESSIVE

True or False aneurysm

TRUE: involves 1-3 layers

FALSE: usually ONLY adventitia, pulsating hematoma in arterial wall

Fusiform: symmetric dilation

Saccular (berry): bulging on one side

Mycotic: balloon outwards

MAJOR CAUSE of aneurysm is atherosclerosis

DANGEROUS if **aorta** (**abdominal *more common*** and **thoracic**) or **cerebral artery**

TAA (Thoracic aortic dissection): common site for dissection

Constant, boring chest/back pain

Worse when SUPINE

Dyspnea and cough

Signs of compression syndrome

Do CT angiography (**GOLD STANDARD**), 2D echo (TEE)

Cannot be reversed, prevent rupture

BP control

AAA (Abdominal aortic dissection): infrarenal

elderly

Smoking, HTN, genetics

Pain radiating to back = impending rupture

CT-A, Duplex Ultrasound

Aortic Dissection

SUDDEN onset

Chest -> back -> abdomen

LEFT HIGHER than 10 in BP

VENOUS DISORDERS

Deep Vein Thrombosis (DVT)

Thrombus formation

Virchow's triad: endothelial damage, venous stasis, hypercoagulable state

MAPAS: *metabolic hypercoaguable state*

Thrombophlebitis -> clot -> inflammation

Phlebothrombosis -> clot without inflammation

Femoral veins

Effort thrombosis due to repetitive movement ->

PICC (Peripheral Inserted Central Catheter)

Lower chance of infection

Cancer px is at RISK for DVT

Phlegmasia cerulea dolens

Swelling, pain, cyanosis

HIGH RISK of venous gangrene

Can lead to **Pulmonary Embolism**

Diagnostics: **D-dimer, CBC, PT, aPTT, INR** (*levels should go DOWN*)

Checks coagulation

Duplex ultrasound: incompressible vein, visible thrombus

Prevent DVT

Correct venous stasis (Passive leg exercise)

Compression stocking (CONTRAINDICATED for **arterial insufficiencies** tho)

Anticoagulants (heparin, warfarin, DOAC) **-saban**

Clotting number 10 for **COMMON PATHWAY**

Intrinsic factors (clotting #7, clotting #12 -> clotting #10, fibrinogen)

Thrombolytics -> dissolve clots (**-plase**)

Hemophilia, Heparin **induced** Thrombocytopenia (bone marrow to many platelet),
CONTRAINDICATED for **anticoagulants**

IVC filter ALTERNATIVE for anticoagulants

Taking anticoagulation

Maintain medication until advised

Check for bleeding

No contact sports

Follow **INR monitor** for warfarin (avoid intake of Vitamin K)

ELEVATE lower extremities

PULMONARY EMBOLISM

Minimum **10-20 ml air**

Unprimed tubing

Fat from long bones

Amniotic embolism

Perfusion -> alveoli closing -> **V/Q mismatch** -> hypoxemia

SUDDEN onset

Hemoptysis (pink frothy sputum)

Pulmonary angiography, Perfusion scan (V/Q scan, a PET scan for perfusion)

Unstable:

Intubate and mechanical ventilation

Hypovolemia (fluids and vasopressor)

Thrombolytic therapy (tPA)

Embolectomy **if needed**

Stable:

Anticoagulation

Possible outpatient management

CHRONIC VENOUS INSUFFICIENCY/POST-THROMBOTIC SYNDROME

Valve damage

20-50% post-DVT

CHRONIC edema

Brownish color (**increase hemosiderine staining**)

Venous Leg ulcer: greater gaiter area

Large but shallow, exudative

Higher recurrence **without** compression

Arterial ulcers:

Small, dry, painful, toe tips, pale, cold limb

BOTH ARE CHRONIC

Use topical antiseptics (short-term use)

Povidone-iodine, Cadexomer Iodine, Silver-based agents

Broad spectrum, low resistance risk

NARROW SPECTRUM IS BETTER

Granulating tissues, **very red**

Compression Therapy

IF **arterial** is confirmed

Ankle > 60 mmHg

ABI > 0.80

Compression **up to 40 mmHg**

DONT use **if severe arterial disease**

Slough for yellowish and black exudate in compression

Necrotic tissue

Debridement: removal of nonviable tissue

Mechanical: manual removal

Give analgesics **BEFORE** treatment (**30 mins**)

Wet to Dry dressing: no longer indicated

Chemical: **nadoximer Iodine**; breaks down slough

Hydrocolloid dressing: **does not allow air to wound** -> moist -> moist will breakdown slough

Moisture should be **ADEQUATE**

Water Jet: **DOES NOT** cause harm to **VIABLE** tissue

Negative pressure wound therapy (NPWT)

Vacuum

Highly absorbent

Surgical Debridement: if wound is way too big

Hyperbaric Oxygen Therapy (HBOT)

HIGH AMOUNT of concentrated oxygen

Diabetic wound; Diving syndrome

Varicose Veins

Tortuous superficial vein; Dilated

Valve incompetence

AVOID venous stasis

Elevated extremities

AVOID High heels

Use compression stocking

Thermal Ablation

Heat -> lessen dilation

Painful

Anesthesia and analgesia DURING and AFTER

Microphlebectomy

Remove superficial and remove the vein

sclerotherapy

Inject **sclerotic agents** -> vein fibrosis and closure

Lesser pain, itching, and edema

FASTER chance for varicose to RETURN

Ligation and Stripping

Vein stripped using wire

Comfort and safety

NSAID and cold compress

AVOID strenuous exercises

Monitor **bleeding**

Pins and needles = nerve injury

Sunscreen to prevent hyperpigmentation

Lymphedema

Progressive, irreversible swelling

Initially pitting -> **LATER non-pitting**

Severe form: **elephantiasis (Filariasis)**

Compression therapy

Manual lymphatic drainage

Exercise, skin care

Pneumatic compression device (can be done multiple times a day)

Surgery (refractory cases)

Radical mastectomy

Post = NO BP at that arm, NO IV, NO phlebotomy

Cellulitis

Skin infection

S. Aureus and streptococcus

PUT PX IN CONTACT ISOLATION PRECAUTION for possible **MRSA**

Wear **full PPE**

Diarrhea contact until **ESBL test**

Antibiotic

Venous stasis

Cool and warm compress

Proper skin and foot care (**nail cutting straight across**)