Systemic Conditions

Arterial Disease

Arteriosclerosis:

Definition: A group of diseases characterized by thickening and loss of elasticity of the arterial walls. Aka- hardening of the arteries.

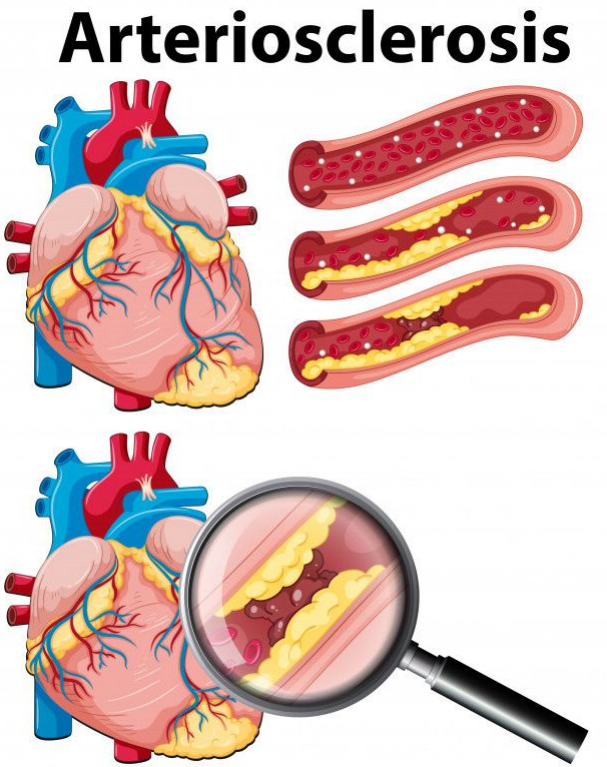
Types:

1: Atherosclerosis (most common form)

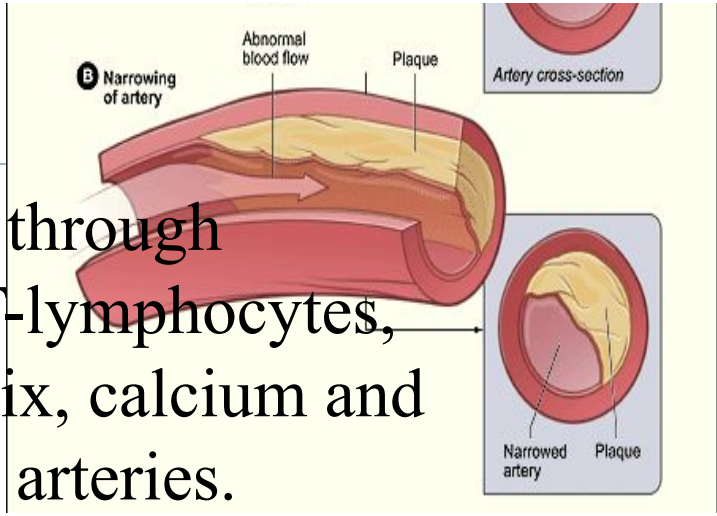
2: Monckeberg's Arteriosclerosis

3: Arteriolosclerosis

- All 3 maybe present in same person but in different blood vessels.



Atherosclerosis:



Definition: Thickening of arterial wall through accumulation of lipids, macrophages, T-lymphocytes, smooth muscle cells, extracellular matrix, calcium and necrotic debris. It can affect any of the arteries.

- In arteries of the heart= Coronary artery disease (CAD) or Coronary heart disease (CHD)
- In brain = Cerebrovascular disease
- In other blood vessels to other part of the body= peripheral vascular disease (PVD), aneurysm and intestinal infarction.

Risk factors: (studied in America only)

Non-modifiable:

- Age: women>55, men >45
- Gender: men > women
- Family history/genetics
- Ethnicity (African American or Mexican women, African American men)
- Infection (viral or bacterial)

Risk factors: (studied in America only)

Modifiable:

- Smoking
- Cholesterol levels, high LDL and low HDL (some debate still exists about this)
- Hypertension
- Obesity
- Physical inactivity
- Diabetes or impaired glucose tolerance
- Hormonal status (contraceptives, hysterectomy, menopause without HRT)
- Thrombogenic factor
- Stress
- Meds
- Excess alcohol consumption or possibly complete abstinence
- High triglycerides
- Sleep disordered-breathing
- Poor nutrition

Pathogenesis: (most recent theory)

- Wall damage permits infiltration of macromolecules (cholesterol). The naked collagen acts like flypaper for platelets, causing them to aggregate at the site of injury and plug the wound.
- Can take decades to form, sitting in artery wall for years.
- Keep in mind that prevention is the best way to "treat" this condition. Atherosclerosis is NOT a disease of old age, it often begins in adolescence and young adulthood and develops slowly but progressively through the body.

Symptoms:

- Initially asymptomatic
- Only when a critical deficit in blood supply to affected structures do the signs start appearing. Ex: In CAD, no symptoms until 75% of the lumen is obstructed, then pain and dysfunction occur.
- Angina pectoris
- MI or heart attack
- Sudden death

Thromboangiitis Obliterans (AKA. Buerger's Disease)

Definition: Vasculitis (inflammatory and thrombotic process) of peripheral blood system, arteries and veins, primarily affecting the extremities.

- Causes are unknown
- Affects men <40 years who smoke

- Recent (last 10 years) studies show an increase in occurrence with women

Symptoms:

- Pain and tenderness of affected area
- Episodic and segmental, i.e. come and go intermittently over time and appears in different asymmetric anatomical locations.
- Pulse loss, most commonly posterior tibial and dorsal pedis
- Intermittent claudication in arch of the foot and palm of hand
- Pain at rest
- Persistent ischemia of digits
- Edema
- Cold sensitivity
- Rubor
- Cyanosis with thin, shiny hairless skin
- All leading to painful ulceration and eventual gangrene

Raynaud's Disease and Phenomenon

- (65% of cases fall under the disease category)

Definition: Intermittent episodes of small artery or arteriole constriction of the extremities causing temporary pallor and cyanosis of the digits with a change of temperature. Usually occur in response to cold temperature or strong emotions such as anxiety or excitement.

Raynaud's Disease:

Primary vasospastic disorder

- 80% are women 20>49 years old
- Unknown etiology
- May be caused by hypersensitivity of digital arteries to cold and release of serotonin
- Considered more of an annoying condition then medically serious

Raynaud's Phenomenon:

- Secondary to disease or underlying cause
  - 10 to 20% of general population
  - Women 20 times more common than men
  - Risk factors differ from men to women:
    - Men: age and smoking
    - Women: marital status and alcohol consumption
  - Often associated with Buerger's or connective tissue disorder (e.g. Scleroderma)
  - Occurs with difference in temperature, ex. going from warm outdoors to air conditioned room
  - TOS
  - Injuries to small vessels of the hand. Ex: use of sledgehammer.

- Most cases the skin progresses from blue to white to red in color (Tabers states “white to blue to red”), but individual cases vary
  - 1st there is ischemia from vasospastic attacks cause cyanosis, numbness and the sensation of cold in the digits (thumb is usually unaffected)
  - Tissues then become numb or painful
  - Unknown mechanism cause the vessels to relax and blood flow returns
  - Skin becomes white then red, warm and flushed
  - Throbbing, paresthesia and slight swelling can be present during this last phase

Complications:

- In severe chronic Raynaud's phenomenon, scars can occur in the vessels, reducing the vessels diameter and therefore blood flow.
- Attacks often become more severe and prolonged loss of blood flow to fingers and toes can produce ulcers and, rarely, gangrene can develop.
- Bilateral, progressing distally to proximally along digits

When unilateral, involving only 1 or 2 fingers, please refer back to MD, can be a possible sign of cancer.

Assessment:

- Pulses of the arms and legs
  - Brachial, radial, ulnar, femoral, popliteal, posterior tibial, dorsal pedis
- Palpate for temperature
- Observe skin integrity, hair loss, ulcerations, dryness
- Palpate muscle tone, tenderness
- If there is parasthesia, check dermatomes, myotomes

Special Tests:

- The therapist is reminded of the importance of taking **blood pressure** and **pulse** with every initial patient. Continue to take BP and pulse with patients who have cardiovascular dysfunction, diabetes, pregnancy and those who are elderly or obese.
  - Allen test
  - Capillary refill test or digit blood flow
  - Buerger's test (Rubor test)

Specific Treatment Goals:

- Determine triggers/aggravating factors and remove if possible
- Increase general circulation
- Increase local circulation
- Prevent tissue damage, ulcers, gangrene
- Decrease fascial adhesions and hypertonicity proximal to occlusion in order to prevent compression syndromes
- Increase or maintain ROM of affected joints
- Patient education
- Increase exercise tolerance

Specific Techniques to Achieve Tx Goals:

- Warm hydrotherapy to trunk or proximal limb (reflex heating)
- Encourage ingestion of warm beverages if cold is a triggering factor
- Swedish massage to neck, shoulders, trunk, hip, thighs
- Local work to hands and feet if not contraindicated
- AROM, PROM of all joints of affected region
- Attachment release, trigger point release
- Myofascial release proximal to occlusion
- Passive stretching, contract-relax stretching
- Joint mobilizations
- Diaphragmatic breathing
- Graded ambulatory exercises

Precautions & Contraindications:

- Do not work locally if acute (proximal work only)
- Gentle work, no drag if tissue fragility is present
- Do not use extremes of temperature, especially cold
- Avoid heavy, compressive techniques
- Elevation of limbs will further hinder circulation
- Do not work distal to line of demarcation with Buerger's disease
- Local, direct heat is contraindicated

Venous Disease

Thrombophlebitis:

A partial or complete occlusion of a vein by a thrombus, with a secondary inflammatory reaction in the wall of the vein. Occurs most often in the lower extremities. There are two forms of venous thrombosis:

Superficial: most commonly of the saphenous vein in the lower extremity, usually the result of varicose veins and is self-limiting (not a serious condition). In the upper extremity this condition does not generally cause pulmonary embolism as the blood flow to deeper veins is via small perforating venous channels. This can be secondary to prolonged IV catheter use.

Deep: usually of the femoral, iliac veins of the lower extremity, calf veins or more proximally from the trifurcation of the popliteal vein caudally. Calf vein thromboses are usually clinically silent and benign without complications, although in 30% of the cases they can extend into more proximal veins. Proximal DVTs are much more likely to result in Pulmonary Embolus

Superficial venous thrombosis of the upper extremity can occur, although it is much less common and is usually seen in people with systemic illness in the presence of an indwelling catheter, such as in the treatment of cancer, malignancy, or hemodialysis.

Deep Vein Thrombosis:

- 3rd most common cardiovascular disease, up to 2 million of Americans annually.
- Trauma to endothelium of the vein wall exposes sub-endothelial tissues to platelets and clotting factors, initializing thrombosis.
- Adhered platelets the attract fibrin, leukocytes and erythrocytes forming a thrombus.

Two types of thrombus:

- Mural: attached to the wall of the vein and does not occlude the lumen
- Occlusive: begins by attachment to vessel wall and progresses to completely occlude the lumen.

Evolution/resolution:

- Lysis, dissolution or recanalization: thrombus is dissolved and away and blood flow through vein returns
- Organization, potential for removal of thrombus and vein
- Extension: thrombus enlarges either proximally or distally.
- Release of thrombus to form a pulmonary embolism

(Embolus travels through the enlarging vessels and through the right side of the heart to the progressively narrowing pulmonary artery, where it may become lodged and occlude pulmonary circulation.)

If thrombus occludes major vein, the venous pressure and volume rise distally. However, if it occludes a deep small vein, collateral vessels develop and relieve the increased pressure and volume

Risk Factors:

- Immobility: bed rest, air travel, neurological disorders, cardiac failure, absence of ankle muscle pump
- Trauma: varicose veins, surgery, local trauma, IV, fractures or dislocations, childbirth and delivery, sclerosing agent
- Lifestyle: oral contraceptives, HRT, hormonal medications, pregnancy, IVF, smoking
- Hypercoagulation: hereditary thrombotic factor, neoplasm, other: diabetes, genetics, obesity, previous DVT, Buerger's disease, age >60

Symptoms:

Early stages are asymptomatic

90% are in the lower extremity

Upper extremity DVTs present with edema of the involved extremity and pain.

- Dull pain and local tenderness
- Superficial induration (firm or hard cord)
- Redness

Lower extremity presents with dull ache, tight feeling or pain, often misdiagnosed.

- Signs are often absent, and when present and taken alone, they may be variable and unreliable.
- Leg or calf swelling
- Pain or tenderness
- Dilation of superficial veins
- Pitting edema
- Skin may be warmer than the unaffected side
- If obstruction is severe, skin may be cyanotic

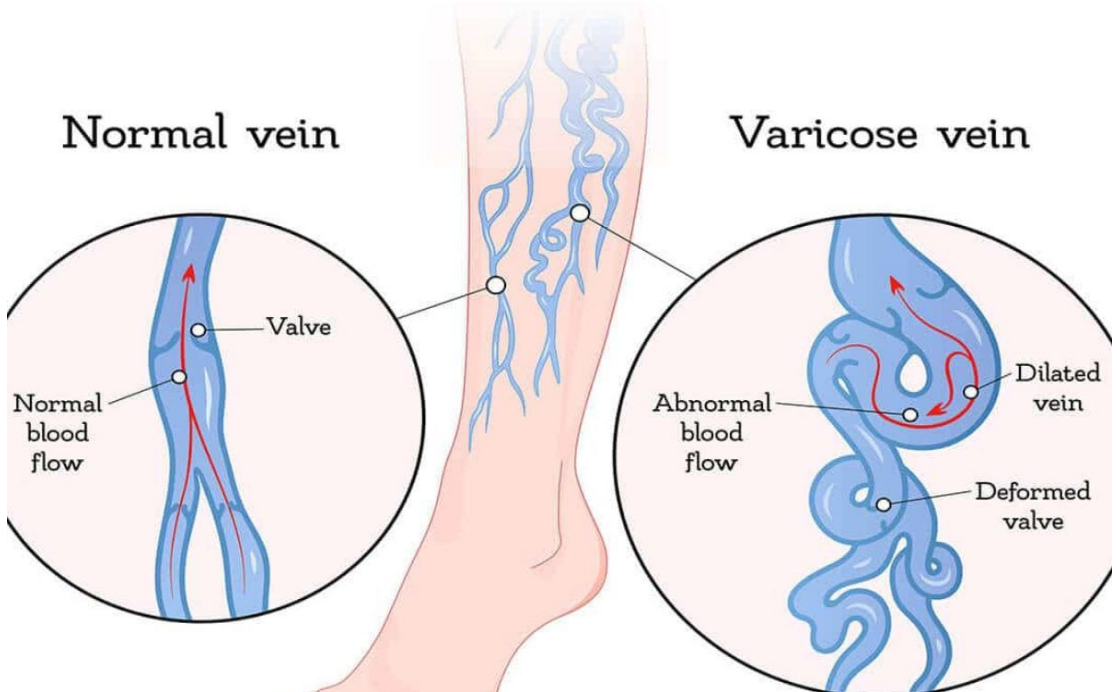
(Any of these symptoms can occur without DVTs, possibly associated with other vascular, inflammatory, musculoskeletal or lymphatic conditions.)

- **Pulmonary embolism**: most devastating complication of DVTs and can occur without apparent warning, signs and symptoms depend on the size and location and may include:
  - Possible sudden death
  - Pleuritic chest pain
  - Diffuse chest discomfort
  - Tachypnea
  - Tachycardia
  - Hemoptysis
  - Anxiety, restlessness, apprehension
  - Dyspnea
  - Persistent cough

Varicose veins:

- Abnormal dilation of vein, usually the saphenous veins, leading to tortuosity (twisting and turning) of the vessels, incompetence of the valves and a propensity to thrombosis. Women are more affected then men, often secondary to pregnancy. As of age 70, the occurrence in men and women is closer to equal.
- 41 % of women ages 40 to 50 and 72% of women ages 60 to 70 have varicose veins.

- (Spider veins, or **telangiectasia**, are a separate but similar condition in which broken capillaries result in fine-lined networks of red, blue or purple veins, usually on the thighs, calves and ankles. Can also appear as short, unconnected or parallel lines.)


Normal vein
Varicose vein
Valve
Normal blood flow
Abnormal blood flow
Dilated vein
Deformed valve

- Vessels most commonly affected are located just beneath the skin superficial to the deep fascia.
- One-way valves become incompetent or the veins become more elastic, the veins engorge with stagnant blood and become pooled.
- Any condition causing pressure changes place a strain on the veins
- Lack of pumping action of the lower leg muscles causes blood to pool
- Weight of the blood pressing down on the closed valves, causes the veins to distend and eventually lose their elasticity.
- As more and more valves lose their ability to function properly, veins become more distended and swollen

Risk factors:

- Maybe inherited
- High venous pressure associated with heavy lifting
- Prolonged sitting or standing
- Hormonal changes, pregnancy, menopause, HRT
- Obesity
- Heart failure
- Haemorrhoids
- Constipation
- Esophageal varices
- Hepatic cirrhosis

Signs and symptoms:

- Dull, aching heaviness, tension or fatigue brought on by periods of standing.
- Cramps in lower leg, especially at night, elevation of leg provides relief
- Itching from associated dermatitis may occur above the ankle
- Dilated, tortuous, elongated veins, readily visible when person standing
- Long standing varicosities may be accompanied by secondary tissue changes, i.e.: brownish pigmentation, thinning of skin
- Swelling around ankle
- Untreated veins become thick and hard
- Impaired circulation and skin changes may lead to ulcers in lower leg
- May result in thrombosis and phlebitis or venous insufficiency ulcers

Treatment:

- Elevation of the limb may be indicated depending on systemic health of patient.
- Encouraging circulatory return to the heart with all massage strokes
- Reducing any restrictions or tightness in structures that could compromise the path of blood flow
- Reducing edema via lymphatic drainage techniques when the systemic circulatory system is NOT compromised
- Decreasing pain in order to return the client to graded activity. This will improve circulation far more effectively than any modality.

Hydrotherapy:

- Based on client presentation and treatment environment.
- Heat or possibly contrasts used if sensation and tissue health is appropriate.
- Paraffin wax could be applied as a more aggressive modality if client responds well to deep moist heat.
- AROM is used after hydro modalities to encourage residual edema to return to the circulatory system.

Remex:

- Based on client presentation and treatment environment.
- Progressively increasing activity from AAROM to AROM to RROM to cardiovascular activities to dynamic activities.
- Swimming is suggested as the hydrostatic pressure of the water environment helps gently mobilize edema back into the circulatory system.

Chronic venous insufficiency:

Inadequate venous return over a long period of time follows most severe cases of DVT. Also may occur as a result of leg trauma, varicose veins and neoplastic obstruction of the pelvic veins.

- Damage or destroyed valves in the veins result in ↓ venous return, thereby ↑venous pressure and producing venous stasis
- Inadequate valve function and absence of calf muscle pump, blood flows bidirectional, causing venous hypertension.
- Superficial veins and capillaries dilate
- Red blood cells and fluids leak out into interstitial spaces
- Edema and reddish brown pigmentation
- Chronic pooling of blood prevents adequate cellular oxygenation and removal of waste products
- Cell death occurs, necrotic tissue develops into venous stasis ulcer
- Delayed healing and persistent ulceration
- Poor circulation impairs immune and inflammatory responses, leaving venous stasis ulcers susceptible to infection

Risk Factors:

- Leg trauma
- Varicose veins
- Neoplastic obstruction of the pelvic veins
- Poor nutrition
- Immobility
- Local trauma (past or present)
- Previous history of burns requiring skin graft

Signs and symptoms:

- Progressive edema of the leg
- Thickening, coarsening and brownish pigmentation of skin around ankles
- Venous stasis ulceration (approximately 80% of all lower extremity ulcers, most often above medial malleolus, where venous hypertension is greatest)
- In long standing CVI, edema becomes hardened to a dense woody like texture
- Skin is think, shiny, dry and cyanotic
- Dermatitis and cellulitis may develop later in this condition

Case History Questions for all previous vein conditions

- Do you have a history of cardiovascular disease?
- Any recent surgeries, illness, bed rest, trauma?
- Medications (anticoagulants)
- Are you pregnant? Taking oral contraceptives?
- Do you smoke?
- History of varicose veins in the family?
- Occupation?
- Activity level?

Associated Structures:

All muscles, ligaments, tendons, skin of primarily the lower extremity. Greater saphenous vein is most often affected (varicose veins).

Special Tests:

- **Girth Measurements**: take circumference measurements every 8-10cm along the entire length of the affected limb to establish a baseline. Compare over time, as well as comparing with the correlating measurements of the unaffected limb to detect edema and/or atrophy.
- **Greater Saphenous Vein Competency Test (Percussion Test):**
- **Homan's Sign:** For Deep Vein Thrombosis
- **Retrograde filling (Trendelenburg) Test**

Specific Treatment Goals:

- Prevention
- Relieve pain if present
- Assist with venous return
- Regain functional mobility
- Prevent venous stasis
- Prevent skin ulcerations and wound infections
- Assist muscle pump activity
- Maintain muscle and joint health

Specific Treatment Techniques:

- MD referral is necessary for treating patients with thrombophlebitis / DVT
- Elevate limbs to 30-45°
- Begin ambulation a.s.a.p. after surgery
- Ankle pumps, AROM/PROM of lower extremity
- Compression stockings
- Elevate limbs when sitting for prolonged periods
- Swedish massage

Precautions & Contraindications:

- Thrombosis is a local/regional CI
- MD referral necessary if thrombus suspected
- Do not work distal to a thrombus
- Do not use heat distal to a thrombus
- Do not use AROM/PROM distal to a thrombus
- Do not work directly over a varicose vein
- No aggressive or deep techniques if patient is on blood thinners
- No use of heat if patient is on blood thinners

Therapeutic Exercise:

- Active ankle pumps done throughout the day while immobilized
- Isometric exercises
- AROM/PROM of all the joints of the extremities
- A graded exercise program with support stockings

Hydrotherapy:

- No deep heat to involved extremity unless with MD consultation
- Mild contrast foot baths (VV)
- Mild contrast affusions (VV)