Circulatory Needs
Vascular system
NSG 4037 Adult Nursing III

Anatomy and Physiology Review

• Structures of the vascular system
  - Systemic Circulation
  - Pulmonary Circulation

Blood vessel structure

• Tunica intima
• Tunica media
• Tunica adventitia

Vascular segments

• Arteries
• Arterioles

Vascular Segments

• Microcirculation
  - Small arterioles
  - Capillary beds
  - Small venules
  - Precapillary sphincters
  - Metarterioles

Capillary
Vascular segments

• Venules
• Veins

Vascular segments

• Lymphatics
  - Propelled by
    • Massaging from adjacent muscle
    • Tissue pressure
    • Contraction of the lymph vessels

Function of the Vascular System

• Pressure, Flow and Resistance

• Flow = Pressure gradient/ resistance

Function of the vascular system

• Pressure- arterial pressure regulated by sympathetic nervous system activity.

Function of the Vascular System

• Flow- capillary bed flow is regulated by the arterioles
  - Decreased flow- arteriole dilation occurs
    • Resulting in decrease in resistance, thus flow increases
Function of vascular system

- Resistance-affected by
  - The radius of the vessel
  - Fluid viscosity
  - Length of the vessel

Capillary Exchange

- Primary purpose- exchange of nutrients and wastes between the blood and tissues

Capillary Exchange

- Diffusion
  - Rate enhanced by
    » Increasing the surface area available for exchange
    » Increasing the concentration gradient
    » Decreasing the distance that a compound must travel.

Capillary Exchange

- Filtration - occurs at the arteriole end of the capillary bed.
- Reabsorption- occurs at the venule end of the capillary bed.
- Edema- occurs
  - Due to increased filtration
  - Decreased reabsorption
  - Impaired lymph drainage

Capillary Exchange

- Pinocytosis
  - Movement of vesicles from outside the cell to inside
  - Important as a route for large proteins to cross the capillary wall

Cardiovascular Control

- Regulation of arterial pressure
- Local regulation of tissue blood flow
Cardiovascular Control

- **Regulation of Arterial Pressure**
  - Baroreceptor reflex
    - Decreased BP activates sympathetic NS
      -Increases cardiac output
      -Increases peripheral resistance

Cardiovascular Control

- **Baroreceptor Control**
  - Augmented by volume-sensitive receptors in the low-pressure atria and veins
  These control renal fluid balance and vasoconstriction agents

Cardiovascular Control

- **Chemoreceptors**
  - Drop in arterial O2
  - Increase in arterial CO2
  - Drop in arterial pH
    - Elicit a sympathetic response similar to drop in BP

Cardiovascular Control

- **Local regulation of blood flow**
  - Inadequate flow causes accumulation of metabolites
  - Act as vasodilators of the arteriolar smooth muscle to increase flow only in that local area
  - Increase in blood flow washes out the metabolites and diminishes vasodilation

Cardiovascular Control

- **Cutaneous blood flow**
  - Responds primarily to neural control

- **Kidney and splanchnic circulation**
  - Respond to sympathetic and local control

Cardiovascular adjustment to exercise

- **Exercise**
  - Increased cardiac output comes from cerebral cortical stimulation of the medullary cardiovascular center
    - Activation of the sympathetic nervous system
    - Increased cardiac output requires increased venous return
    - Aided by arteriolar dilation of the skeletal muscle beds and venous constriction
    - Sympathetic-mediated venous constriction
Cardiovascular adjustment to exercise

• Rhythmic activity- causes compression of the veins by the contracting skeletal muscle

• Negative intrathoracic pressure from breathing assists the flow of venous blood toward the heart

Cardiovascular adjustment to exercise

• Increased cardiac output is directed to the exercising muscles (heart)

• Local factors cause a vasodilation of those vascular beds.
• Sympathetic activity constricts the arteriolar smooth muscle of the nonexercising vascular beds

Assessment of the Vascular System

Peripheral Vascular Disease

Older clients

Diabetic clients

- blood flow disturbance thru peripheral vessels.
- damage tissue due to ischemia, exc. waste/fluid or both

History

• Risk factors for atherosclerosis
• Diabetes
• Cardiac
• Arterial, venous and lymphatic disorders
• Assess quality of life
• Assess functional changes
• Assess symptom manifestations

History

• Seven themes of effects of PAD
  - PAD diagnosis and management
  - Symptom experience
  - Limitations in physical functioning
  - Limitations in social functioning
  - Compromise of self
  - Uncertainty and fear
  - Adaptation

History

• Biographical and Demographic Data
  - Client’s age
  - Occupation
• Current Health
  - Clinical manifestations
• Chief complaint
Chief complaint

- **Arterial disorders**
  - Intermittent claudication
    - Cramping leg pain during ambulation that disappears after 1-2 minutes of rest.

- Rest pain - pain that wakes them at night
- Distal forefoot burning, numbness or tingling
  - cause for urgent attention

Arterial bifurcation and cholesterol

Fibrous cap with inner cholesterol core

Atherosclerosis

Atherosclerosis formation

Formation of fibrous cap

- Microscopically, plaques are present in the intima and very superficial media; they have a central core (C) of necrotic debris that contains cholesterol crystals, macrophages and giant cells. They are covered by a fibrous cap (F) that contains smooth muscle cells, monocytes, lymphocytes, foam-cells and connective tissue components and which walls off the lesion from the vessel lumen. There is an overlying layer of endothelial cells on the lesion surface.
Rupture of fibrous cap

- Plaques expand at their shoulders through continued leukocyte adhesion and entry and sustained release of inflammatory cytokines, mediators and growth factors by injured and activated endothelial cells and macrophages.

Venous disorders

- Venous disorders
  - Insidious onset
  - Possible positive family history for v.d.
  - Job history involving long hours standing
  - Multiple pregnancies
  - Obesity
  - Pain of slow onset not assoc. with exercise or rest
  - Varicose veins or phlebitis history

Chief Complaint

• Symptoms
  - Heaviness in legs
  - Nighttime cramping
  - Edema- that worsens toward the end of day
  - Erythema (redness)
  - Thick, darkly pigmented skin
  - Dry, flaky skin
  - Ulceration-stasis

Venous vs. arterial insufficiency

- Venous
  - Edema
  - Dependent cyanosis
  - Brown discoloration at the ankle
  - Ulcers
  - Pruritus
  - Normal skin temp
  - Pulses present

- Arterial
  - Decrease or absence of arterial pulses
  - Thin, shiny, hairless skin
  - Thick, rigid toenails
  - Cool skin temp
  - Pain w/ ambulation (claudication)
  - Pain with leg elevation or at night
  - Dependent rubor (red)

Past Health History

• Any impairment in vascular system
• Changes in color or temp
• Hx of HTN, stroke, vision changes, pain in legs
• Hx of clotting problems
• Hx of leg ulcers
• Hx of previous frostbite
• Medications, herbal remedies

Family Health History

• Risk factors
• Provides clues about reported symptoms
• Note family hx of diabetes, HTN, CAD, collagen dz, and PVD.
Psychosocial History

- Occupational history
- Smoking history
- Nicotine products
- Nutrient and fluid intake
- Activity, rest, and sleep habits
- Stress level, emotional state and coping mechanisms

Review of symptoms

- Each body system
- Headaches
- Dizziness
- TIs
- Strokes
- Leg pain and cramps
- Phlebitis
- Varicose veins
- Cold hands or feet

Physical Examination

- Inspection
  - Natural lighting is best for skin color.
  - Warm room
  - Quiet room
  - Observe the extremities
    - skin color
    - hair distribution
    - nail beds
    - capillary refill
    - muscle atrophy
  - edema
  - venous patterns
  - ulcers
  - compare sides
  - dependent rubor

Pitting edema

- <>

Inspection

- Skin color
  - Compare with contra lateral limb
  - Arterial disorders- pale extremities
  - Venous disorders- red extremities, cyanosis

Inspection

- Hair Distribution
- Capillary Refill- evaluation of peripheral perfusion and cardiac output
- Muscle atrophy
- Edema
- Venous pattern-telangiectasias, spider veins
- Ulcers
Palpation

- Temperature
- Pulses
- Allen's Test
- Homan's sign (only + in 35% of DVT cases and 50% of + cases do not have DVT - not reliable.)

Auscultation

- Limb blood pressure - may be best single indicator of arterial perfusion
  - Check both arms - variation should be less than 20 mmHg
  - Use correct cuff size
  - Take repeat readings in the arm with the higher pressure
  - Can use thigh or calf cuff if necessary
  - If you cannot auscultate, use a doppler

Auscultation

- Document orthostatic vital signs as follows
  - Lying: BP 140/80, P 80
  - Sitting: BP 124/76, P 86
  - Standing: BP 104/68, P 98
  - Note pulse with each reading
- Auscultate carotid, renal femoral and popliteal arteries and aorta for bruits
  - Best heard with bell

Diagnostic Tests

- Noninvasive Vascular Lab Techniques
  - Doppler ultrasonography
  - Ankle-brachial index
  - Ultrasonic duplex scanning - localizes obstruction, evaluates degree of stenosis and presence of reflux
  - Air plethysmography
  - Impedance plethysmography
    - Evaluates volume changes in extremities demonstrating venous blood flow
  - Exercise testing
    - Evaluates extent to which intermittent claudication interferes with lifestyle
    - MRI, CT

Invasive Techniques

- Angiography
  - Procedure-invasive
  - Pre-procedure care
    - NPO, informed consent, allergies to contrast
  - Post-procedure care
    - Monitor vital signs, neuro function and distal pulses esp. of punctured extremity
    - Monitor puncture site for bleeding or hematoma
    - Keep extremity immobile for 6-8 hours
    - IV fluids and oral intake to promote excretion of contrast
    - Check BUN and creatinine the next day
Invasive techniques

- Venography
  - Similar to angiography for veins
- Vascular endoscopy
  - Visualization of vessel lumen with fiberoptic scope
  - Care is similar to that of angiography

Clients with Hypertensive Disorders

- Hypertension
  - Defined as BP>140/90
  - If patient has diabetes, renal disease, or heart failure > 135/85

- Classification by type, cause, severity
  - Primary hypertension-essential HTN or idiopathic
    - Causes are multifactorial and often unidentifiable
  - Secondary HTN- related to a specific disease state like renal failure (5-8% of cases)

- Epidemiology

- Risk factors

Hypertension

- Nonmodifiable risk factors
  - Polygenetic and multifactorial
  - Maybe r/’t an elevation in intracellular sodium levels and to lowered K+ to Na+ ratios
  - Age (M>F until age 55, then equal until 74 then F>M)
  - Gender
  - Ethnicity

- Modifiable Risk Factors
  - Stress
  - Obesity (esp. upper body, apple vs. pear)
  - Nutrients
    - Sodium is a factor for some people
    - Low dietary potassium, magnesium and calcium may be a factor for some
  - Substance abuse
    - Cigarette smoking, heavy alcohol use and illicit drug use
    - Caffeine causes a transient rise but not sustained effects.
Hypertension

• Pathophysiology
  - Primary (Essential) Hypertension
  - Four control systems
    - Arterial baroreceptor/chemoreceptors: found in carotid sinus, aorta and wall of the left ventricle, sensitive to stretch leading to vasodilation and decreased HR.
    - Chemoreceptors regulate blood pressure based on oxygen, carbon dioxide and hydrogen ion concentration
    - Regulation of body fluid volume: changes in volume affect systemic pressure leading the kidneys to regulate excretion or retention of fluid
    - Renin-angiotensin system: acts to increase BP thru vasoconstriction and inhibition of sodium excretion
    - Vascular autoregulation: in response to pressure changes

• Secondary Hypertension
  - Chronic renal disease
  - Adrenal glands: disorders resulting in increased production of aldosterone, cortisol or catecholamines
  - Benign adenomas
  - Pheochromocytoma
  - Cushing's syndrome
  - Chronic stress

• Vessel Changes
  - Pathologic changes in large and small blood vessels in heart, kidneys, and brain
  - Net result:
    - A decreased blood supply to tissues of heart, brain, kidneys and brain
    - Progressive functional impairment of these organs
    - Chronic ischemia results in infarction of the tissue

• Clinical Manifestations
  - None in early stages
  - Persistent headaches
  - Fatigue
  - Dizziness
  - Palpitations
  - Flushing
  - Blurred or double vision
  - Epistaxis

• Risk stratification
  - Normal
  - Pre-hypertension
  - Stage 1 HTN
  - Stage 2 HTN
  - Note target organ damage

• Outcome management
  - Normalizing arterial pressure
    - Lifestyle modifications
    - Weight reduction: have the greatest, quickest impact
    - Sodium restriction
    - Dietary fat modification
    - Exercise
    - Alcohol restriction
    - Caffeine restriction
    - Relaxation techniques
    - Smoking cessation
    - Potassium supplementation
    - Pharmacologic intervention
**Hypertension**

- Pharmacological therapy
  - Diuretics: monitor K+
  - Beta blockers: watch heart rate and bronchospasm
  - ACE inhibitors: dry cough
  - Calcium channel blockers: edema
  - Alpha 2 antagonists: passing out
  - Vasodilators: elevated HR, postural hypotension
  - Angiotensin II receptor blocker: photosensitivity and cough, orthostatic hypotension,

- Provider responsibilities
  - Nursing assessment
  - Nursing diagnosis
    - Ineffective therapeutic regimen management (individual)
  - Outcomes
    - Describing HTN and risk factors
    - Discussing importance of lifelong medical F/U
    - Listing the prescribed meds
    - Demonstrating the proper technique for BP taking at home

**Hypertension**

- Interventions
  - Information about HTN and management
  - Measure BP at home weekly and record
  - Clear, practical, and realistic guidelines
  - Use written materials with clear illustrations

- Nursing management
  - Ineffective health maintenance r/t lack of regular exercise
    - Patient will begin and maintain appropriate exercise program
    - Teach patient that exercise improves sense of well being and may act as an outlet for tension as well as raise HDL.
    - Avoid heavy lifting and isometric exercises
    - Avoid activities inappropriate to physical limitations
    - Moderate consistent program is better than alternating periods of inactivity with periods of strenuous activity.

**Hypertension**

- Stepped Care Approach
  - Step one- implement lifestyle modifications
  - Step two- continue above and make pharmacologic selection: diuretics and/or beta blockers.
  - Step three- increase drug dose OR substitute another drug
  - Step four- add second or third drug; continue to add meds from other classes.

**Hypertension**

- Hypertensive crises: urgency vs. emergency
  - Urgency- reduce BP in 4 to 24 hours
    - Oral medication with close follow up outpatient setting
  - Malignant hypertension-known now as persistent severe hypertension- true emergency
  - Clinical manifestations of PSH-
    - Restlessness, changes in LOC, blurred vision, seizures, N & V,
    - Renal insufficiency, proteinuria, pulmonary edema
**Hypertension**

- **Outcome management**
  - Reduce mean arterial pressure by no more than 25% within the first minutes to 2 hour
  - Then reduce to 160/100 over 2-6 hours
  - Monitor BP q 5-15 minutes
  - Titrate meds to manage reducing BP

**JNC VII Report**

- In patients over 50, SBP is higher risk factor for CVD DBP
- Risk for CVD doubles for every increment of 20/10 mm hg beginning at 115/75
- Pre-hypertensive individuals need health promoting lifestyle modifications
- Thiazide diuretics should be initial treatment for uncomplicated HTN either alone or in combination with other meds.

**JNC VII Report**

- Most patients require 2 or more medications to achieve target levels
- If BP is >20/10 mm hg greater than target level, consider starting with 2 agents, one of which should be thiazide diuretic
- Therapy only works if patient is motivated.

**Hypertension**

- Community screening and self care
  - Public health initiative
  - Managed care and community screening
  - Self-measurement of blood pressure

**Congestive Heart Failure**

- This is the failure of the heart to pump enough blood to meet the body's needs. This results in pulmonary and venous congestion.
- Etiology: Increased preload over long term results in lessened force and efficiency of the heart muscle. Increased afterload over a long period of time causes the left ventricle to fail. Any condition that directly affects the pumping ability of the heart will result in Congestive Heart Failure (CHF)

**S &S of Left Ventricular Failure**

- Pulmonary congestion: dyspnea, coughing, orthopnea, paroxysmal nocturnal dyspnea, blood-tinged sputum (frothy), bilateral crackles.
- S3 Gallop
- Anxiety, irritability, restlessness, confusion, impaired memory, bad dreams, and insomnia, disturbed sleep patterns
- Fatigue and muscle weakness, nocturia
- Activation of renin-angiotensin-aldosterone feedback system
Fluid overload in left ventricle causes fluid to back up into lungs

Note the fluid in the dependent areas of lungs

S&S of Right Ventricular Heart Failure

• Peripheral edema and venous congestion – causing blood to back up into abdomen and lower extremities. Abdomen becomes tender and painful
• Anorexia, N&V, bloating, “cardiac cirrhosis” – ascites jaundice
• Wasting of body tissue mass, cardiac cachexia

S&S of Right Sided CHF Cont’d

• Dependent edema of feet and legs if ambulatory – and pre sacral area, genitals and thighs if bed ridden
• Cyanosis of nail beds
• Anxious, frightened, and depressed

Pitting edema

Blood backs up into venous circulation
Chronic venous congestion with cellulitis and venous ulcers

Medical Management

- Hi Fowler’s position with O2 – Keep feet and legs in a dependent position
- Lanoxin to slow and strengthen the heart beat – helpful in LVHF, but watch for interactions with quinidine, verapamil, and amiodarone
- Dopamine/ Dobutamine – inotropic agent enhances stroke volume
- Diuretics – reduce preload
- Vasodilators – to reduce afterload

Med Mgt cont’d

- Ace inhibitors – suppress renin system, increase survival
- Replace K loss if diuretics
- Decrease physical and emotional stress

Nursing Management

- Vital signs and monitor heart rhythm
- Check breath sounds q2-4 hrs (listen for crackles)
- Check heart sounds (listen for S3 Gallop)
- O2 per nasal cannula and prop up on pillows if orthopneic
- I&O
- Daily weights – to determine effectiveness of diuretics or worsening of heart failure

Nursing Mgt. Cont’d

- Assess mental status
- Nutrition - avoid large meals, avoid effects of caffeine

Chapter 55 Vascular Disorders

- Peripheral Artery Disorders
  - Etiology and risk factors
    - Atherosclerosis
    - Diabetes
    - Smoking
    - Elevated blood lipid levels
    - Phlebitis, surgery and autoimmune disease
Peripheral Arterial Disorders

- Pathophysiology
  - Progressive nature
  - Tissues starve of oxygenated blood
  - Slow collateral development
  - Waste products of anaerobic metabolism build up
  - Pain-interrmttent claudication and rest pain

Peripheral Arterial Disorders

- Clinical Manifestations
  - Intermittent claudication
  - Rest pain
  - Impotence
  - Dependent rubor
  - Weak or absent peripheral pulses
  - Shiny skin, hairless
  - Slow wound healing
  - Hypertrophy to toenails

Arterial ulcer

- Diagnostic evaluation
  - Noninvasive
    - Doppler studies of ankle brachial blood flow. ABI - ankle brachial index. Normal > than 1, ischemia < 0.5.
    - Doppler ultrasound-quality of blood flow.
    - Transcutaneous oximetry - measures tissue levels of oxygen
    - Treadmill examination - a form of lower extremity stress testing
  - Invasive
    - Arteriography-reveals the lumen of the vessels

Arteriogram

- Medical management
  - Reduce risk - smoking cessation
    - Skin care
    - Exercise
    - Dietary changes
    - Promote arterial flow
Peripheral arterial disorders

- **Nursing management of the Medical client**
  - **Assessment**
    - History of arterial disease
    - Psychosocial assessment
    - All types of pain-leg, chest, SOB, fatigue
    - Physical exam-peripheral pulses, Doppler, skin color, temp,
      - Level of hair on leg, skin integrity, CRT, venous filling

Peripheral arterial disorders

- **Diagnosis, outcomes, interventions**
  - **Diagnosis:** Ineffective Tissue Perfusion related to interruption of blood flow secondary to arterial occlusion.
  - **Outcomes:** The client will maintain adequate peripheral tissue perfusion to affected extremities as evidenced by improvement from baseline of skin color, skin temperature, pulses, and level of pain.

Peripheral arterial disorders

- **Interventions**
  - Promote arterial flow.
    - Position clients with arterial disease so that blood flows toward the legs and feet.
  - Prevent vasoconstriction
    - Discourage smoking
    - Encourage client to avoid stressful situations and to relax
    - Prevent client from becoming chilled.

Peripheral arterial disorders

- **Diagnosis:** Acute Pain
  - Acute Pain related to inadequate arterial blood supply to the legs.

 Peripheral arterial disorders

- **Outcomes**
  - The client will experience increased comfort, as evidenced by self-report and demonstrated knowledge of pain reduction measures, both pharmacologic and nonpharmacologic.

Peripheral arterial disorders

- **Interventions**
  - Avoid standing in one position for more than a few minutes
  - Avoid crossing the legs at the knees
  - In general, seek the most comfortable position
  - Watch for and report edema.

Peripheral arterial disorders

- **Surgical management**
  - **Revascularization**
    - Endovascular interventions- angioplasty, atherectomy, stent placement
    - Arterial bypass- used to revascularize limbs.
Peripheral arterial disease

- Preoperative care
  - Baseline vital signs
  - Document character of pulses
  - Know exactly which pulses are palpable and which can be assessed only with a Doppler.
  - Mark with ink the sites pulse palpable.
  - Report any BP readings well above client’s normal.

Peripheral arterial disorders

- Postoperative care
  - Complications
    - Bleeding
    - Reclotting
    - Infection
    - Compartment syndrome

Peripheral arterial disorders

- Amputation
  - Oldest operation known to man
  - 2 million have undergone amputation
  - Large emotional component
  - Diabetes mellitus is major cause of arterial occlusion

Peripheral arterial disorders

- Preoperative assessment
  - Client’s physical condition will play a part in successful rehabilitation
    - Age
    - Ability to become ambulatory
    - Comprehension level
    - Willingness of client
    - Condition of preexisting conditions
  - Type of amputation
  - Level of amputation
  - Client’s general attitude toward amputation

Peripheral arterial disorders

- Phantom limb sensation
  - Caused by intact peripheral nerves proximal to the amputation site.

- Phantom pain- form of central pain.

Peripheral arterial disorders

- Preoperative Care
  - Support client and family through their pain, suffering and decision-making.
  - Administer antibiotics as ordered.
  - Monitor for sepsis
  - Monitor for ulcers on heels, heels should be removed from pressure with elevation
  - Maintain, promote upper arm strength
  - Monitor blood sugar closely
Peripheral arterial disorders

• **Diagnosis**
  - Risk for Delayed Surgical Recovery related to preexisting health conditions

• **Outcomes**
  - Risk for delayed surgical recovery will be minimized

• **Interventions**
  - Frequent assessment of blood sugar levels
  - Nourish with foods high in protein and calories

Peripheral arterial disorders

• **Diagnosis cont.**
  - Acute Pain r/t ischemia of the limb.
  - Anxiety r/t impending loss of limb, change in mobility, loss of independence, changes in body image, fear about feeling after amputation.
  - Deficient knowledge r/t expectations after surgery.

Peripheral arterial disorders

• **Postoperative care**
  - Rigid dressing (usually a cast) is applied, distributing even pressure over the end of the stump.
    - Provides protection
    - Reduces swelling by gently compressing the tissues
  - Elevate stump for first 24 hours only.
    - Place flat on bed after 24 hrs. to prevent hip contracture.
    - Stump wrapping techniques also reduce swelling

Peripheral arterial disorders

• **Assessment**
  - Bleeding, oozing
  - Pain
  - Infection

Peripheral arterial disorders

• **Diagnosis**
  - Acute pain, deficient knowledge and ineffective coping

• **Interventions**
  - Reaction/ response to change in body image, fear over loss of independence.

Peripheral arterial disease

• **Intervention**
  - Prosthesis
    - Client who is ambulatory pre-op should be fitted with temporary prosthesis ASAP after surgery.
  - Gait training
### Peripheral arterial disorders

#### Self-care
- Clients need lots of information on what to expect and look for.
- Schedule home visits from home health nurse and physical therapy.

#### Acute Arterial Occlusion
- Causes: trauma, embolism or thrombosis
- 90% in lower limbs
- Embolism: usually arises from within heart
- Etiologies: atrial fibrillation, myocardial infarction, prosthetic heart valves, and rheumatic heart disease.
- Symptoms: the six P's

#### Symptoms of arterial occlusion
- The six P's
  - Pain or loss of sensory nerves due to ischemia
  - Pulselessness
  - Poikilothermia (coldness)
  - Pallor: due to empty superficial veins
  - Paresthesias
  - Paralysis

#### Thrombosis surgery involves revascularization of leg.
- Anticoagulation used to reduce risk of further occlusion if surgery not done immediately.

### Peripheral arterial disorders

#### Arterial Ulcers

#### Aneurysms
- True: contain all three layers of the wall
- Saccular: have a neck or mouth
- Fusiform: involve the entire circumference of the vessel.

#### Abdominal aortic aneurysm
- Most common
- Men 40-70 years of age
- Asymptomatic
- Palpated at 5 cm in diameter
- Pulsating mass leads to discovery
- Then abdominal pain and back pain
- US and CT scan are the most accurate diagnostic tools.
### Peripheral arterial disorders

- **Aneurysm repair**
  - Recommended for all >6cm wide

**Complications**
- Usually result of preexisting conditions, COPD, CAD.
- Increase the risk of post-op atelectasis
- Emboli

### Peripheral arterial disease

- **Diagnosis**
  - Risk for Hemorrhage
  - Risk for Deficient Fluid Volume

- **Outcome**
  - Monitor for manifestations of hemorrhage and notify the MD if any occur.

- **Interventions**
  - Monitor the client for increase in pulse rate, decrease in BP, decrease in LOC, pallor

### Peripheral arterial disorders

- **Rupture of abdominal aortic aneurysm**
  - Catastrophic
  - 6cm or more has a 20% chance of rupture within one year.
  - Less than 50% chance of survival of rupture
  - Surgery is only intervention, still there is 50% mortality rate.

### Peripheral arterial disorders

- **Aortic dissection**
  - Longitudinal splitting of the medial (muscle) layer of the aorta by blood flowing through it.
  - Most common catastrophe of aorta.
  - Blunt trauma
  - Men between 50 and 70.

- **Complications**
  - Cardiac tamponade
  - Ischemic changes in organs

### Peripheral arterial disorders

- **Raynaud’s syndrome**
  - Small arteries and arterioles constrict in response to various stimulus.
  - Classified as either vasospastic or obstructive

- **Manifestations of vasospastic Raynaud’s**
  - Induced by cold, nicotine, caffeine and stress

- **Manifestations of obstructive Raynaud’s**
  - Autoimmune disorders such as SLE, scleroderma, or rheumatoid arthritis
Peripheral arterial disorders

- Clinical manifestations
  - Color changes to hands
  - Spasm of the digital arteries, causing pallor
  - Cyanotic fingers
  - Rubor after cyanosis when arterial spasms stop completely

- Buerger’s disease (thromboangitis obliterans)
  - Inflammatory disease of the small and medium sized arteries and veins of the extremities.
- Outcome
  - Goals include arresting progress of the disease, producing vasodilation, relieving pain and providing emotional support.

Peripheral venous disorders

- Acute venous disorders
  - Caused by thrombus (clot) formation that obstructs venous flow.
  - Thrombophlebitis - superficial and deep vein
    - DVT is common disorder.
    - Etiology - attributed to Virchow’s triad:
      - Venous stasis
      - Hypercoagulability
      - Injury to the venous wall.
      - At least two of the three conditions must be present for thrombi to form.

- Pathophysiology
  - Inactivity allows blood to pool in the veins
  - Thrombus development is a local process
  - Platelets adhere to endothelium
  - Factors that promote platelet aggregation
    - Thrombin, fibrin, activated factor X, catecholamines
    - 24-48 hours after formation, thrombi undergo lysis or become adhered to the wall.

- Prevention
  - Geared toward reversing the three risk factors by
    - Promoting venous return
    - Treating hypercoagulability
    - Reducing risk of injury to the venous wall.

- Superficial thrombophlebitis
  - Redness
  - Induration
  - Warmth
  - Tenderness

- Deep vein thrombophlebitis (DVT)
  - Unilateral leg swelling
  - Pain, redness, warmth, dilated veins, low grade fever
### Peripheral venous disorders

**Medical management**
- Detect thrombus early
- Prevent extension or embolization
- Prevent further thrombus formation
- Anticoagulation helps in preventing new clots from forming.

**Nursing management**
- Promote venous return
- Reduce discomfort
- Monitor anticoagulant therapy
- Monitor for pulmonary embolism

### Chronic Venous Disorders

- Varicose veins - permanently distended veins
  - Primary varicose veins - result from congenital to familial dispositions
  - Secondary varicosities - result from trauma, obstruction, DVT, inflammation

### Medical management
- Reduce venous pooling
- Prevent complications
- Improve comfort levels
- Treatment - application of below-the-knee compression stockings or elastic wraps.

### Surgical management
- Sclerotherapy
- Vein ligation and stripping
- Saphenofemoral ligation

### Nursing management
- Taught that it is a chronic problem
- Avoid standing still in one position
- Elevate legs when seated
- If swelling present elevate higher than heart level
- Stockings should be fitted
Peripheral venous disorders

- Chronic venous insufficiency
  - AKA post-phlebitis syndrome
  - Results from dysfunctional valves that reduce venous return
  - Causing increased venous pressure and stasis

Peripheral venous disease

- Chronic venous insufficiency
  - Characteristics
    - Chronically swollen legs
    - Thick, coarse, brownish skin around the ankles
    - Venous stasis ulceration (Fig. 55-14)
    - Itchy, scaly skin

Venous stasis ulcer

Lymphatic Disorders

- Lymphedema
  - Accumulation of lymphatic fluid in the interstitial tissue that causes swelling
- Primary lymphedema- depends on age at onset, lymphedema praecox.
- Secondary lymphedema-due to damage, most often neoplasm
Lymphedema

- Lymphatic transport ability is not sufficient to handle lymphatic fluid
- Protein rich fluid accumulates in tissue
- Stagnant, protein filled fluid caused tissue channels to increase in size and number and reduces oxygen available to tissue
- Wound healing is impaired and this is an excellent medium for bacterial growth

Lymphedema

- Manifestations
  - Primary
    - Mild bilateral edema of ankles or legs around puberty in women
    - Unilateral edema of entire leg in men or women
    - Bilateral edema at birth
    - Dull heavy sensation
    - Not painful
    - Edema that resolves with elevation

Lymphedema

- Manifestations
  - Smooth skin becomes rough
  - Edema is non-pitting
  - Limb becomes greatly enlarged, uncomfortable and unsightly.

Lymphatic Disorders

- Management
  - No known cure for lymphedema
  - Goal is to remove as much fluid as possible
  - Physical therapy
  - Pneumatic pumping devices
  - Diuretics
  - Elevation of extremity
  - Meticulous skin care

Lymphedema

- Patients at high risk for infection
- Meticulous skin care
  - Keep skin clean and dry
  - Nails are kept short
  - Avoid products with alcohol, dye, perfume, talc, mineral oil, petroleum or lanolin
  - Avoid chemical hair removers and regular razors, use an electric razor
  - Avoid hot water
- Emotional support