Cardiovascular Unit

Associate Degree Program in Nursing
NURS 142
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Vascular System
- Arteries
  - arterioles
  - Capillaries
  - venules
- Veins
- Lymphatics

Vascular Pressure Regulation
- Vasomotor nerve fibers
  - Norepinephrine
  - Acetylcholine
- Vasomotor center
  - Pons & medulla oblongata
  - Response to $pco_2$
- Baroreceptors
  - Sympathetic stimulation
    - $\uparrow$Pressure $\downarrow$dilation $\downarrow$HR & contractility $\downarrow$BP
Vascular Pressure Regulation

- Aortic & Carotid bodies
  - Response to PaCO₂, O₂, H⁺
- Chemicals & Hormones
  - Vasodilation
    - Epinephrine
      - with small doses vasodilation of muscle, brain, heart vessels
    - Histamine, Bradykinin, Serotonin (capillaries)
  - Vasoconstriction
    - Norepinephrine
    - Angiotensin II
    - Serotonin (arterioles)
  - Vasopressin (ADH)
    - Volume

Blood Flow

- Velocity
  - Vessel diameter
- Resistance
  - Viscosity of blood
  - Vasoconstriction
  - Vasodilation

Venous Return

- Muscle contraction
- Pressure gradient
  - Venous vs. Right atrium
- Thoracic cavity pressures
  - Inhalation → ↓ pressure ↑ diameter of vena cava → ↑ blood flow
- Valves
Vascular Alterations – Risk Factors

- Age
- Sex
- Ethnicity/HTN*
- Smoking*
- Occupation
- Nutritional status/Hyperlipidemia*
- Diabetes*
- Sedentary lifestyle
- Obesity
- Medication
- Stress
- Familial history

Assessment Findings

- Pain
  - Location
  - Influence of elevation?
  - Quality, characteristics
  - Predisposing factors

Assessment Findings

- Skin
  - Texture
  - Color
  - Sensation
  - Toenails
  - Hair distribution
  - Temperature
  - Ulcers
- Pulses
- Edema
- Muscle mass
- Capillary refill
Compare & Contrast
Manifestations of Arterial & Venous Disorders

- vascular disease can be arterial or venous or a combination of both
- presenting manifestations related to pathophysiology

Pain

**Arterial**
- intermittent claudication
- cramping
- worsens with elevation

**Venous**
- aching/heaviness
- exercise decreases pain
- lessens with elevation
- nocturnal cramping
- pruritis, paresthesia

Skin

**Arterial**
- absence of hair
- painful ulcers @ pressure points - especially lateral malleolus
- thin, shiny skin
- pale & cool with dependent cyanosis
- thick toenails
- sensation decreased

**Venous**
- broad, shallow, slightly painful ulcers at ankle & lower leg - surrounding skin affected
- brown discoloration
- warm & dependent cyanosis
- normal toenails
- pruritis
Comparison of Pulses - Edema - Muscle Mass

**Arterial**
- Pulses decreased to absent
- Check for systolic bruit
- May have edema
- Muscle mass reduced

**Venous**
- Pulses usually normal - edema may interfere with palpation.
- Edema present - worsens as day progresses - elevation decreases edema
- Muscle mass unaffected

Arterial Disorders

**Etiology**
- Atherosclerosis – plaque formation – cholesterol, lipids, cellular debris
- Inflammation – fibrinogen & platelets
- Thrombosis
- Embolism
- Trauma
- Vasospasm

Signs & Symptoms of Chronic Peripheral Arterial Disease (PAD)

- Intermittent claudication
  - Provocation
  - Distance/Duration
  - Relief with rest
- Rest pain
- Dependent rubor
- Decreased or absent pulses
- Pain/ Paresthesia
- Ulcers
  - Metatarsal heads
  - Heel
  - Pain -varies
  - “punched out” look
PAD  Ankle-brachial index (ABI)

- Ankle systolic BP divided by brachial systolic BP
- Normal = 0.91 - 1.30
- Use handheld Doppler ultrasound
- Mild PAD = 0.71 – 0.90
- Moderate PAD = 0.41 – 0.70
- Severe PAD =< 0.40

Signs & Symptoms of Acute Arterial Occlusion

- Pallor
- Pulselessness
- Poikilothermia

Circulation

- Pain
- Paresthesia

Sensation

- Paralysis

Motion

Buergers Disease
Thromboangiitis Obliterans
Vasculitis of small veins/arteries

- Intermittent claudication
- Paresthesia

- Abnormally red or cyanotic
- Ulceration/gangrene
- Disability
  - Pain
  - Amputation

- Disability

- Pain

- Amputation
Raynaud’s Syndrome

- **Vasospasm of small arteries and arterioles**
- **Exposure to causative agents**
  - Cold
  - Nicotine
  - Caffeine
  - Stress
- **Pallor – cyanosis – rubor**
- **Management**
  - Avoid causative factors
  - Nifedipine – smooth muscle relaxant

Kawasaki Disease

- **Acute systemic inflammatory disease**
- **Children**
  - Age
  - Ethnicity
- **Course – 3 stages**
  - Acute: fever, rash, red throat, joint pain, enlarged cervical nodes
  - Subacute: cracking lips, fissures, joint pain, desquamation of skin, thrombocytosis
  - Convalescence: resolution with possible signs of inflammation

Kawasaki Disease

- **Treatment**
  - ASA
  - Immune Globulin
- **Nursing Care**
  - Comfort
  - Monitoring
  - Support
  - Passive ROM
Venous Disorders/Thrombosis

- Acute
  - Virchow’s triad
    - Venous stasis
    - Hypercoagulability
    - Injury to venous wall
- Chronic
  - Postphlebitic syndrome
  - End stage insufficiency/ulcers

Venous disorders

- Varicosities
  - Primary – congenital/familial
  - Secondary – damage
    - Trauma
    - Obstruction
    - DVT

DVT/ Phlebitis

Platelets adhere to the endothelium

Platelet plug/thrombus

Increase in length and diameter

Obstructed flow

Inflammation – Valvular destruction
DVT/phlebitis – Clinical Signs
- Pain
- Unilateral swelling
- Warmth, redness = erythema
- Homan’s sign
- Ulceration – malleolar area
- Infection
- Aching/heaviness
- Venous tortuosity
- Complications

Medical Management – PVD
- Exercise
- Smoking Cessation
- Weight reduction
- Diet
- Angioplasty
- Artherectomy
- Venous stripping/Ligation
- Stents
- Thrombolytic Therapy
- Bypass
- Amputation
- Support devices
- Sclerotherapy
- Debridement

Nursing Diagnosis
- Altered tissue perfusion
- Impaired mobility
- Impaired skin integrity
- Activity intolerance
- High risk for infection
- Altered comfort: Pain
- Body image disturbance
Outcomes/goals

- Adequate peripheral tissue perfusion
- Intact skin
- Tolerates appropriate activities without pain/discomfort
- Understands activities allowed
- Understands therapy regimen
- Maintains motor function

Plan of Care

Teaching
- Activities
- Fluids
- Diet management
- Stress reduction
- Smoking cessation
- Foot care
- Nutrition

Plan of care

- Safety
  - Anticoagulants
    - Soft toothbrush
    - Electric razor
    - Avoid cuts, etc.
    - Report abnormal bruising, blood in urine
    - Medic Alert bracelet
  - Preventive measure
    - Avoid sunburn, scratching, heating pads
    - Adequate lighting
    - Support devices
    - Avoid constrictive clothing
Implementation
- Moist heat
- Positioning of extremity
- External compression
- Monitor CSM’s – 5 P’s
- Interpret clotting studies
- Medications

Anticoagulants

<table>
<thead>
<tr>
<th>Drug</th>
<th>Heparin</th>
<th>Onset – 20-60 min SQ</th>
<th>Half-life – 30-180 min</th>
<th>Duration – I.V. 2-6 h SQ 8-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Inhibits prothrombin to thrombin &amp; thrombin to fibrinogen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route</td>
<td>SQ, I.V. push &amp;/or infusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab</td>
<td>PTT Platelets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antidote</td>
<td>Protamine Sulfate</td>
<td></td>
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<table>
<thead>
<tr>
<th>Drug</th>
<th>Enoxaparin (Lovenox)</th>
</tr>
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<tbody>
<tr>
<td>Onset</td>
<td>1-2 hr</td>
</tr>
<tr>
<td>Half-life</td>
<td>4.5 hours</td>
</tr>
<tr>
<td>Duration</td>
<td>12 hr.</td>
</tr>
<tr>
<td>Action</td>
<td>Binds to antithrombin III</td>
</tr>
<tr>
<td>Route</td>
<td>SQ</td>
</tr>
</tbody>
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Anticoagulants – prevent thrombus formation

<table>
<thead>
<tr>
<th>Drug</th>
<th>Warfarin (Coumadin)</th>
</tr>
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<tbody>
<tr>
<td>Onset</td>
<td>hrs.</td>
</tr>
<tr>
<td>Peak</td>
<td>0.5 – 3 days</td>
</tr>
<tr>
<td>Duration</td>
<td>2-5 days</td>
</tr>
<tr>
<td>Action</td>
<td>Interferes with synthesis of clotting factors II, VII, IX, &amp; X – all dependent upon Vitamin K</td>
</tr>
<tr>
<td>Route</td>
<td>Oral – usually follows Heparin therapy</td>
</tr>
<tr>
<td>Lab</td>
<td>INR (2-3X normal)</td>
</tr>
</tbody>
</table>

Antidote: AquaMephyton –(Vitamin K)
### Antiplatelet Agents – inhibit thrombus formation

<table>
<thead>
<tr>
<th>DRUG</th>
<th>Action</th>
<th>#Ticlopidine (Ticlid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA</td>
<td>Low dose 81-325 mg QD</td>
<td>Half-life 12h – 4-5 days</td>
</tr>
<tr>
<td></td>
<td>Decreases platelet aggregation</td>
<td>*Diprydamole (Persantine)</td>
</tr>
<tr>
<td></td>
<td>Inhibits platelet aggregation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td>*I.V. – produces coronary artery dilation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Possible increased bleeding times</td>
<td>Bleeding time – expect 2-5 X normal</td>
</tr>
</tbody>
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**Antidote:** I.V. methylprednisolone

**Evaluation**

- Adequate peripheral tissue perfusion
- Intact skin
- Tolerates appropriate activities without pain/discomfort
- Understands activities allowed
- Understands therapy regimen
- Maintains motor function