Distinguishing Between Arterial and Venous Disease

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Peripheral Vascular Disease (PVD)

- Includes disorders that alter natural flow of blood through the arteries & veins outside the brain & heart - peripheral circulation
- 10 Million Americans
- 50% Asymptomatic
- 1 in 3 Diabetics over age 50
- Biblical Times - King Asa 867-906 BC

http://www.emedicinehealth.com/peripheral_vascular_disease/article_em.htm
PVD Risk Factors

- Hypertension - 2 to 3X risk of claudication
- Hyperlipidemia
- Smoking - ↑ risk PAD by 400%
  - 2X incident amputation
- Diabetes Mellitus - 20% PAD
- Obesity - Abdominal
- Kidney Disease
- Transplant recipient
- Familial Predisposition
- Advancing Age
- Gender
- Stress
- Sedentary Lifestyle
**Peripheral Arterial Disease**

- **PAD** is a chronic condition in which partial or total arterial occlusion deprives the lower extremities of oxygen and nutrients.

- Sources of blockage include: Atherosclerosis – 90%, Atheromatous plaques, Thrombus, Emboli or Arterial Spasm.
Atherosclerosis

Normal artery

Atherosclerotic artery
Atherosclerosis - Aorta
Arterial Vasospasm
**PAD Epidemiology**

- 8 to 12 Million Americans
  - 19 Million by 2050
  - 12 - 20% Over age 60
  - 60 - 90% Asymptomatic
  - 25% Public Awareness
- Onset in Teen Years ~ 33%
  - 2/3 of Americans age 20-30
- Men & Women - Equal
  - African Americans higher risk
  - Hispanics higher risk

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2733014/
Ancient Egyptian Princess
(Ahmose Meyret-Anon 1585-1550 BC)
PAD - Systemic & Progressive

Atherosclerosis: A Progressive Process

- Normal
- Fatty Streak
- Fibrous Plaque
- Occlusive Atherosclerotic Plaque
- Plaque Rupture/Fissure & Thrombosis

- Clinically Silent
- Effort Angina
- Claudication
- Increasing Age

- Unstable Angina
- MI
- Coronary Death
- Stroke
- Critical Leg Ischemia

Courtesy of P Ganz
PAD Mortality

- 30% from MI or CVA within 5 years
- 50% in 10 years; 70% at 15 years
- Highest mortality among Women with Diabetes
- 4-7X risk of CAD, MI, Stroke/TIA
- 1 in 3 chance of PAD in legs with diagnosis of Heart Disease
Four Stages of PAD

75% of the vessel occluded before onset S/S

- **Stage I - Asymptomatic**
  - Bruit, aneurysm on physical exam

- **Stage II - Claudication “to limp”**
  - Reproducible muscle pain with exercise

- **Stage III - Rest Pain**
  - Wakes Up- dependent position relieves

- **Stage IV - Necrosis & Gangrene**
Inflow Obstructions

**Inflow**- Distal aorta & common, internal & external iliac arteries

- Buttock & Hip – Aortoiliac artery disease
- Impotence – Bilateral aortoiliac artery disease
- Gradual obstructions may not cause significant tissue damage
- Pain is key indicator- Hip, Thigh, Buttock
Inflow Obstruction Procedures

- Stent & Endovascular procedures
- Aortoiliac
- Aortofemoral- extra-cavity bypass grafts
- Abdominal Aortic Aneurysm Repair
- Axillofemoral Synthetics
- Less chance re-occlusion/ischemia
**Outflow Obstructions**

**Outflow** - Femoral, Popliteal & Tibial arteries or infrainguinal arterial segments below superficial femoral artery (SFA)

- Thigh – Common femoral or Aortoiliac Artery
- Upper two-thirds of calf – Superficial Femoral Artery
- Lower one-third of the calf – Popliteal Artery
- Foot claudication – Tibial or Peroneal Artery
- Rest Pain- Pain key indicator
- Gradual- May cause significant tissue damage

Outflow Obstruction Procedures

Lower Extremity Occlusion Interventions
- Stent procedures
- Femoropopliteal, Femorotibial, or Femoroperoneal Bypass Grafts
  - Synthetic & Autogenic (vein) materials
- Higher incidence of re-occlusion
- More common with Diabetes
Critical Limb Ischemia or Acute Arterial Occlusion “6 Ps”

- Pain: Earliest & Major sign - Rapid Peak
  - Sharp, distal to or below obstruction
- Paresthesia: Sensory - touch, pressure, numbness; Motor - can’t move - not recover
- Pallor: Mottled, No edema
- Pulse Changes: Diminished to absent
- Poikilothermia: Adapt to air temperature
- Paralysis: Muscle rigidity
Critical Limb Ischemia
Acute Arterial Occlusion

Characteristics - Bilateral Comparison
- Acute, dramatic changes & sudden - Usually thrombus or embolus
- Asymmetrical - Usually one extremity
- Pain unrelenting - Distal to or Below obstruction
- Absent or Diminishing pulse - Below occlusion
- Blanching/refill times increase; No edema
- Neurologic Changes:
  - Sensory - Diminished response to touch pressure - Need to apply nail bed compression; Numbness; Tingling; Pins & Needles
  - Assess peroneal vessel - Touch lateral side of great toe & medial aspect 2nd toe
  - Assess tibial vessel - Touch medial & lateral side of the soles of feet
  - Motor - Inability to move; Foot drop
    - May or may not recover nerve function post ischemic event
  - Six hour window from onset of neurologic changes before irreversible damage
Chronic Limb Ischemia
Initial Onset

- Intermittent Claudication
  - Muscle ischemia from activity - lactic acid
  - Pain in muscle groups not joints
- Major & Earliest Sign of PAD
- Cramping, numbness, accompanied by burning - Reproducible with exercise & relived by Rest (2-5 minutes)
Chronic Limb Ischemia
Advanced or Severe

- Pain - Severe at rest - moving relieves
  - Numbness, Burning, "Toothache"
  - Distal portion of extremities
  - Toes, foot arches, fore-feet and heels
  - Rarely in calves & ankles
  - Greater risk - Ulcers, Gangrene & Limb loss
  - Worse at night
  - Prefer dependent "A" position
Chronic Limb Ischemia Inspection

Bilateral Comparison

- Gait & Posture unaffected
- Pale feet, rubor red, red to bluish color
- Elevation pallor & Dependent rubor
- Trophic Changes - Malnutrition, Poor perfusion
  - Skin - thin, scaly, dry
  - Hair loss over calf, ankle, foot
  - Thick nails
  - Little or no edema
Chronic Limb Ischemia
Dry Gangrene
Chronic Limb Ischemia Palpation

- Feel cool even in warm ambient air
  - Coolness or coldness- Use back of hand

- Pulses
  - Use distal pads of index & middle fingers
    - Changes distal to or below obstruction
  - Low amplitude, diminished to absent
  - Indicate palpable or doppler method
Chronic Limb Ischemia
Pulse Detection

- Bilateral Comparison
  - Exaggerated with aneurysm, trauma or infection
- Use distal pads of index & middle fingers
- Gentle, varying pressure
- Palpate a Thrill- fine, rushing vibration
- Auscultate (hear) Bruit- blowing, purring
Locating Pulses
Arterial & Venous Sounds
Chronic Limb Ischemia or Arterial Ulcers

- End of the toes, between toes or dorsum of the foot, heel, nail, bony or pressure sites
- Initially irregular edges- Progress to “punched out” even, concentric lesion
- Pale, yellow, brown, grey or black ulcer bed
- Little to no granulation
- Swelling, redness surrounding tissues
- Prone to infection
- Healing- Poor to non-healing
- Painful- Especially at night
Complete smoking cessation
Supervised walking exercise program
Weight loss- Target BMI, 18.5-24.9 kg/m2
Healthy diet; Foot & Skin care
Optimize diabetes management
Hyperlipidemia—Use high dose statin - If low HDL, high TG, add fibrate or niacin; if high Lp(a), add niacin
HTN— ACEIs, ARBs, diuretics; Achieve target BP < 140/90 mm Hg; Diabetes or renal insufficiency <130/80 mm Hg
Uncontrolled HTN- beta blocker especially with coexistent CAD; Low-dose ACEI when normotensive
Antiplatelet therapy—Use ASA (75-325 mg/day) or clopidogrel Plavix (75 mg/day)
Claudication- cilostazol or Pletal; superior to Trental
Percutaneous or surgery- Indicated for acute limb ischemia, critical limb ischemia, or lifestyle-limiting claudication

http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/cardiology/peripheral-arterial-disease/
Venous Disorders

- Peripheral Venous Disease
  - Includes disorders that result from increased venous pressure or valve damage of a vein wall
  - Veins must be patent with competent valves
"Has anyone seen my other elastic stocking?"
Peripheral Venous Disorders

- Sources of damage include:
  - Inflammation - Recurrent phlebitis
  - Diminished blood flow through stretching
  - Dilation from defective vein walls

- Predisposition or Preexisting Condition
  - Systemic conditions - Obesity, CHF result in bilateral disease

- Chronic edema with an accumulation of catabolic wastes & tissue malnutrition
Chronic Venous Insufficiency

History

- Votive tablet at base of the Acropolis in Athens, Greece
Peripheral Venous Disorders

Venous Insufficiency

- Varicose Veins
  - Result of defective valves
    - Overstretched due to excessive or persistent pressure
  - Inability to drain blood from the extremity
  - Not life threatening
  - Problematic & painful
Varicose Veins
Chronic Venous Insufficiency
Varicose Veins

http://www.emedicinehealth.com/peripheral_vascular_disease/article_em.htm
Chronic Venous Insufficiency

- Causes
  - Heredity or family history of varicose veins
  - Working on feet all day
  - Airline travel
  - Obesity
  - Pregnancy
  - Heart Disease
Chronic Venous Insufficiency

- Advancing age
- Hormonal influences during pregnancy
- Oral contraception
- Post-menopausal hormonal replacement therapy
- Prolonged sitting with legs crossed
- Wearing tight undergarments or clothing
- History of blood clots
- Injury to veins
- Conditions that cause increased pressure in the abdomen, including liver disease, fluid in the abdomen, previous groin surgery
- Other- Topical steroids, trauma or injury to the skin, previous venous surgery & exposure to ultra-violet rays
Chronic Venous Insufficiency
Varicose Veins
Chronic Venous Insufficiency

Varicose Veins

Varicose veins

- Dilated blood vessels - weakening in the vessel wall
- Swollen, twisted clusters of blue or purple veins
- Spider Veins or Telangiectasias - Tiny blood vessels close to skin surface & surrounded by thin, red capillaries
Chronic Venous Insufficiency Characteristics

- Dull ache
- Cramping not reproducible consistently with activity
- Unilateral or bilateral
- No neurological changes or deficits
- Pain relieved by elevation—worse later in the day, less at night
Chronic Venous Insufficiency Characteristics

- Thick, tough, woody, brawny, brown pigmented skin
- Veins full when leg slightly dependent
- Scarring from recurrence of ulcers
- Pulses intact
  - May be difficult to locate due to edema
Chronic Venous Insufficiency Characteristics

- “V” position
- Edema present
- Ankle or leg edema increases throughout the day
- Decreases when lying down
- Paresthesias - burning, itching
- Premenstrual, salt & water retention exacerbate symptoms
Chronic Venous Insufficiency Ulcers

- Venous ulcers - 500,000 to 600,000 Americans per year
- Comprise 80 to 90% of all leg ulcers
- Below the knee - inner aspect of the leg; just above the ankle
- Ulcers - Unilateral or bilateral
- Wound Base: Red in color, yellow fibrous tissue
- Significant drainage - Serous, straw, yellow color
  - Green discharge or foul odor - suspect infectious process
- Irregular edges
- Surrounding skin - discolored & swollen
- Skin may feel warm or hot; Skin - shiny & tight
- Granulation tissue; Take up to one year to heal; high recurrence
- History of leg edema, varicose veins, DVT in either the superficial or the deep veins
Chronic Venous Insufficiency Ulcers
Deep Vein Thrombosis

Acute

- Virchow’s Triad
  - Thrombus from endothelial lining damage
  - Venous stasis
  - Hypercoagulability
Deep Vein Thrombosis Pathophysiology

- Venous Thrombus - Life Threatening
  - Endothelial injury-Clot-Venous stasis and/or Hypercoagulability
  - Thrombophlebitis - inflammatory process
  - Phlebothrombosis - without inflammation
- *Deep veins of lower extremities
  - Most frequently- Above knee- Emboli
  - Occur in superficial veins as well
Deep Vein Thrombosis
Acute

- Warm to hot
- Cool to cyanotic with severe edema
- Red to red-blue color
- +/- Edema
  - Localized or Unilateral
  - Depends on Site
  - Calf vein thrombosis- None
  - Femoral vein thrombosis- Mild to Moderate
  - Ileofemoral vein thrombosis- Severe
Deep Vein Thrombosis
Acute

- 50% Asymptomatic
- Pain - Most reliable sign
  - Squeeze from front to back (anteroposteriorly)
  - Squeeze from side to side (laterally)
  - Squeeze quickly, Avoid rubbing calf
    - Minimize dislodging clot
  - Pain on dorsiflexion-Homan’s = Less reliable
Deep Vein Thrombosis Acute

- Nodules, Lumps, Cords
  - Reflect inflammation of walls of vein
- Low grade fever
- Fatigue
- Malaise
- Extremity may feel- Tense, Full, Heavy
Deep Vein Thrombosis
Risk Factors

Risk Factors (DVT)

* Hip Surgery & * Prostate Surgery
  * Greatest Risk General Surgery over age 40

* Immobility - Bed rest, CHF, MI,

* Leg trauma - especially fractures, casts

* Blood dyscrasias, Polycythemia vera

* Malignancies/Neoplastic disease

* Ulcerative colitis

* Pregnancy
Deep Vein Thrombosis Risk Factors

- History of venous disease
- Infection
- Systemic Lupus Erythematosus
- Obesity
- Oral Contraceptives
- Phlebitis - Intravenous therapy, Invasive procedures, Trauma

- Thrombus - Inflammation - Vein wall thickening - Embolus formation - Emboli to Pulmonary Artery
### Critical Limb Ischemia
- **Pain** - Early onset
- Rapidly Peaks
- **Pallor** - Mottled
- Capillary refill time lengthens
- **Paresthesia** - Sensory touch, pressure, numbness; Motor function impaired/lost
- **Pulse Changes** - Diminished to absent
- **Poikilothermia** - Adapt to air temperature
- Cool to Cold
- **Paralysis** - Muscle rigidity
- No edema

### Acute DVT
- 50% Asymptomatic
- Pain most reliable sign
- Red to red-blue color
- Quick refill, engorged veins
- Motor function intact
- Tense, heavy, full
- Pulses intact - Diminished due to edema
- Fatigue
- Malaise, Low grade fever
- Warm to Hot
- Unilateral
- +/- Edema - Localized, site
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Thank You