Intermittent Claudication

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2/15/12
History

- Claudius, Roman emperor (41-54 AD) was said to walk with a limp.

- Bouley (1831) in Paris – vet who first described IC; identified aneurysmal & chronically thrombosed femoral a. in horse with progressive limping.

- Charcot (1858) – first to describe in humans
  - Vasospasm vs. insufficiency.
History (cont.)

- **1960s** – Debakey, Haemometakinesia; “borrowing-lending phenomenon”
  - Shunting based on vasodil. metabolites prod by exercise
  - Vicious cycle causes less blood capillaries prox. to occlusion

- **1970s** – Dormandy and Hess, Viscosity and Poiseuille’s Law
  - PAD pts with higher blood viscosity than age-matched controls
    - Hematocrit, plasma fibrinogen, and blood cell deformability
  - Pentoxifyline
    - Decreases whole blood viscosity (dec. fibrinogen levels, inc. RBC flexibility, etc.)
    - Efficacy prob overestimated
Case Presentation

• 64 yoM presents with complaints of pain with walking...

• HPI:
  – Distance to onset of symptoms / cessation of activity
  – Relief with rest?
  – Consistent vs. occasionally
  – Description of pain? crampy, dull, wrenching, etc.
  – Location of pain – gives idea of location of occlusive disease
  – Associated symptoms? chest pain, DOE, etc.
Case Presentation

- **PMH:**
  - CAD
  - HTN
  - COPD
  - DM II
  - CKD

- **PSH:**
  - Inguinal Hernia x2
  - L2 Laminectomy
  - PCI x1 in ‘09

- **FH:**
  - Mother with DM II and HTN
  - Father died of MI at age of 61
  - Brother with HTN

- **SH:**
  - 1-2 beers per day
  - 80 pack yrs. (2ppd)
PE

- T 37.0, P 82, R 16, BP 148/93, O2 94% (RA)
- Gen: Thin, appears older than stated age
- HEENT: normal
- CV: normal
- Pulm: normal
- Abd: normal, no pulsatile masses
- Ext: muscle wasting, thinning skin, thickened nails, hair loss in extremities
- Vascular: palpable radials, carotids, and femorals, no palpable popliteals, DP or PTs; monophasic DP and PT signals bilaterally
Additional Studies

- **ABI**
  - Ratio of BP in legs to BP in arms
    \[ ABPI_{Leg} = \frac{P_{Leg}}{P_{Arm}} \]
  - Can be performed at rest or with exercise induction

- **Interpretation?**
  - 0.9 – 1.25: Normal
  - > 1.3: non-compressible vessels (DM, CKD)
  - 0.4 – 0.9: mild/moderate PVD
  - < 0.4: severe PVD
Additional Studies

- TBI – used for pts with non-compressible vessels
  - Interpretation:
    - 0.65: normal
    - 0.3-0.6: claudication in extremity
    - < 0.3: poor healing potential

- Exercise ABI – used for patients with claudication symptoms but normal ABIs at rest
  - Interpretation: essentially the same as resting ABIs

- CTA, MRI/MRA, etc.
Risk Factors for PVD

- Essentially same for atherosclerotic dz in rest of the body (coronaries, carotids, etc.)
  - Hypertension
  - Hyperlipidemia
  - Diabetes
  - Tobacco abuse
  - Male sex

- Risk for cardiovascular mortality & limb loss:
  - Annual risk?
    - 5% and 1% respectively
  - Improvement/stability of symptoms with non-operative measures?
    - 50%
  - Will progress to needing an operation within 5 years of diagnosis?
    - 20-30%
Non-operative management

- Optimization of modifiable risk factor profile:
  - Smoking cessation
  - Control of DM and BP
  - ASA and statin therapy

- Exercise regimen:
  - Increases muscle’s ability to adapt to anaerobic metabolism and overall increase in mitochondria
    - Walking is preferred mode of exercise
    - 3x per week
    - At least 30 minutes per session
    - Near-maximal claudication pain is indication for stopping
    - Continue regimen for 6 months
Operative Management

• Indications for operative intervention:
  – Disabling / Lifestyle Limiting Claudication
  – Limb-threatening Ischemia
    • Rest pain or Tissue ulceration

• Arteriography - Gold standard
  – Allows for simultaneous diagnosis & intervention
  – Limits exposure to contrast dye
  – MAC sedation vs. general anesthesia
  – Address inflow issues even if more distal bypass indicated
Percutaneous Angioplasty

- Gen more indicated for more prox. aortoiliac segments rather than distal tibioperoneal dz.
- Most useful for short-segment occlusions or multi-segmental dz,
  - especially if large distance between lesions
- Can be used alone or in conjunction with stent deployment.
Bypasses

- Aorto-Bifemoral Bypass
- Aorto-Iliac Bypass
- Femoral-Femoral Bypass
- Extra-anatomic Bypass (Axillofemoral, etc.)
- Femoral-Popliteal Bypass
- Synthetic vs. Autologous vein conduits based on bypass location, length, and availability of suitable native conduits.
Non-Atherosclerotic Claudication

- Congenital – metabolic
  - Ehlers-Danlos Syn
  - Pseudoxanthoma Elasticum
- Congenital – anatomic
  - Popliteal Entrapment Syn
  - Persistent Sciatic Artery
  - Abdominal Aortic Coarctation
  - Cystic adventitial Dz
- Behcet’s
- Radiation Arteritis
- Ergot Intoxication
- Neurogenic Claudication
Non-Atherosclerotic Claudication

- **Ehlers-Danlos Syn**
  - 9 types; biochemical defects leading to disorder of collagen synthesis
  - Present with spontaneous rupture or arteries, aneurysms, etc. – friable arteries
  - Avoid arteriogram; high operative M&M

- **Popliteal A. Entrapment Syn**
  - Congenital anomaly in popliteal fossa resulting in arterial compression or occlusion (65% have popliteal a. medial to medial head of gastroc)
  - Dx with dynamic duplex or arteriogram
  - Operate early to avoid occlusion or embolization; divide entrapping structure
Popliteal Entrapment Syndrome Variants

**Type I**
- Popliteal Artery
- Popliteal Vein
- Medial Head of the Gastrocnemius

**Type II**
- Popliteal Artery
- Popliteal Vein
- Medial Head of the Gastrocnemius

**Type III**
- Popliteal Artery
- Accessory slip of the Gastrocnemius
- Medial Head of the Gastrocnemius

**Type IV**
- Compressed Popliteal Artery
- Popliteus Muscle
Non-Atherosclerotic C.

• Cystic Adventitial Dz
  – Intramural cyst b/w media and adventitia
  – Intermittent claudication exacerbated by knee flexion
  – “Scimitar sign” on arteriogram

• Radiation Arteritis
  – Radiation to pelvic or LE structures; results in endothelial injury, going to fibrosis of adventitia > media > intima, progressing on to occlusion

• Neurogenic Claudication
  – Intrinsic process vs. extrinsic spinal cord compression
  – See pain, paresthesias, and/or weakness, usu in dermatomal distribution
  – Usu have relief with spinal flexion or recumbancy
  – Tx. conservative vs. surgical decompression