Arterial Manifestations in Young People

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Objectives

- Describe arterial pathology encountered in young people
- Discuss criteria used to diagnose nonatherosclerotic disease entities
- Present cases which illustrate ultrasound findings of arterial disease in young people

Arterial Disease in Young People

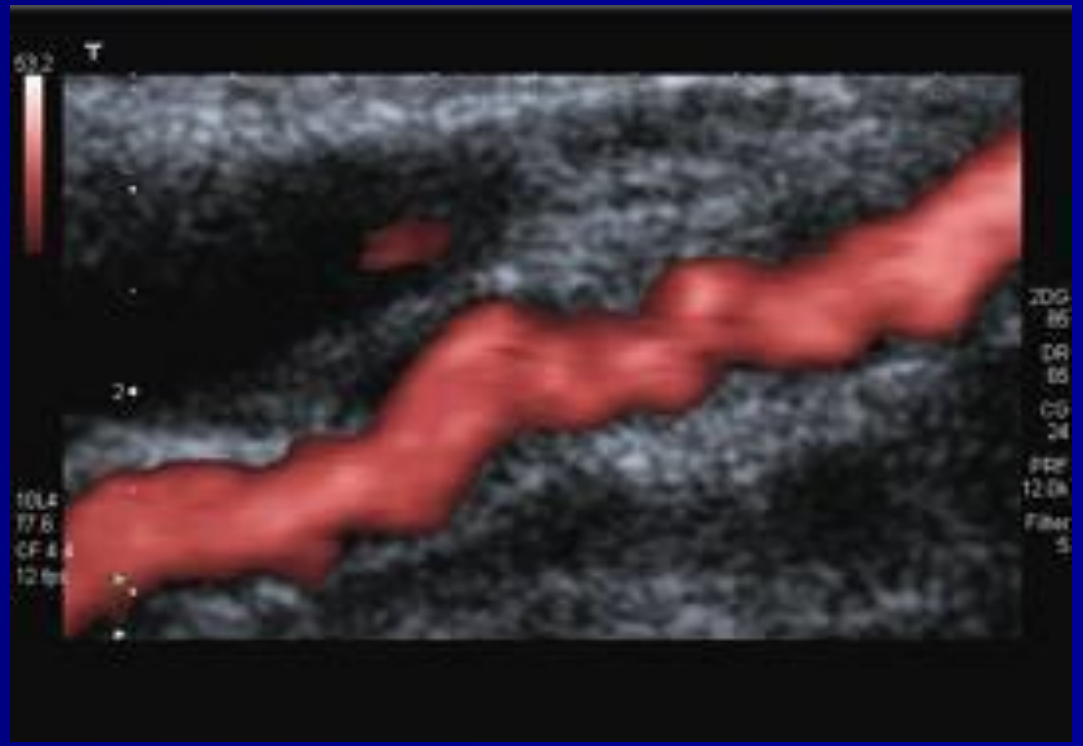
- Approx. 90% of PAD and extracranial arterial disease is due to atherosclerosis
- Nonatherosclerotic diseases can include:
  - Inflammatory diseases
  - Non-inflammatory diseases (FMD)
  - Congenital abnormalities
  - Acquired diseases
  - Injuries

Testing Options

- Ultrasound
  - Useful with large vessel disease
  - Giant Cell, Takayasu's, Radiation arteritis
  - Injury/Trauma
- Physiologic testing (PVR, PPG, pressures)
  - Useful with small vessel disease
    - Buerger's Disease (Thromboangiitis obliterans)
    - Vasospastic Disease

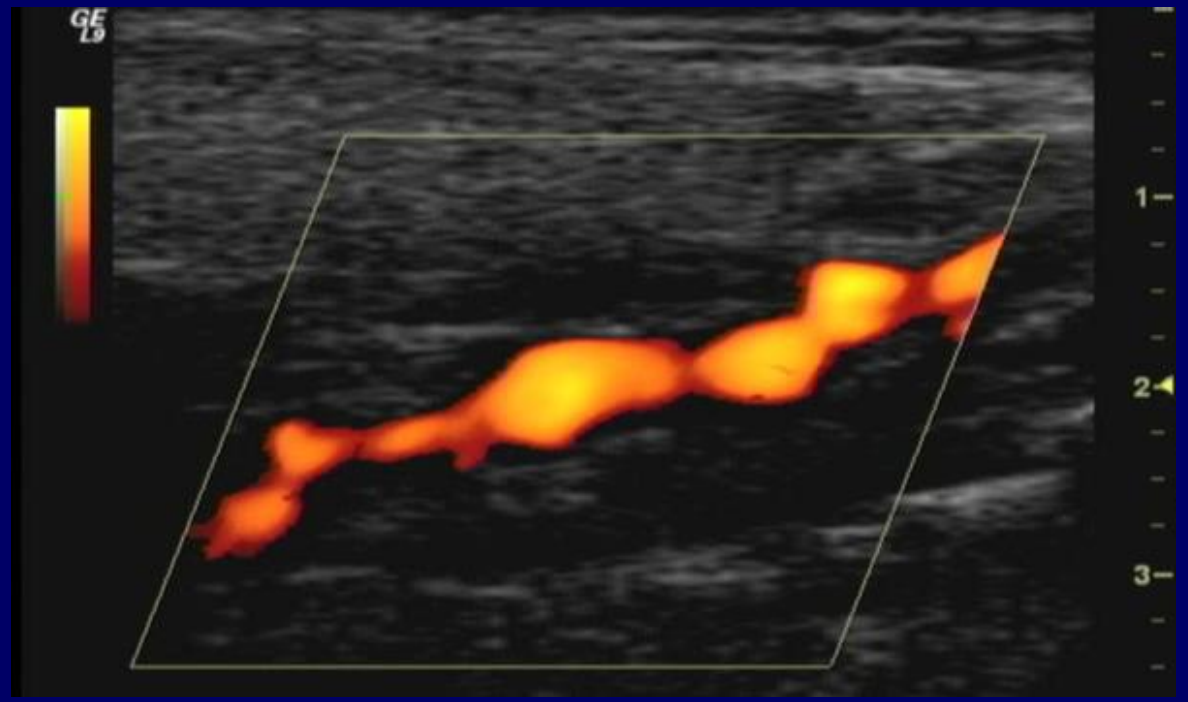
Fibromuscular dysplasia FMD

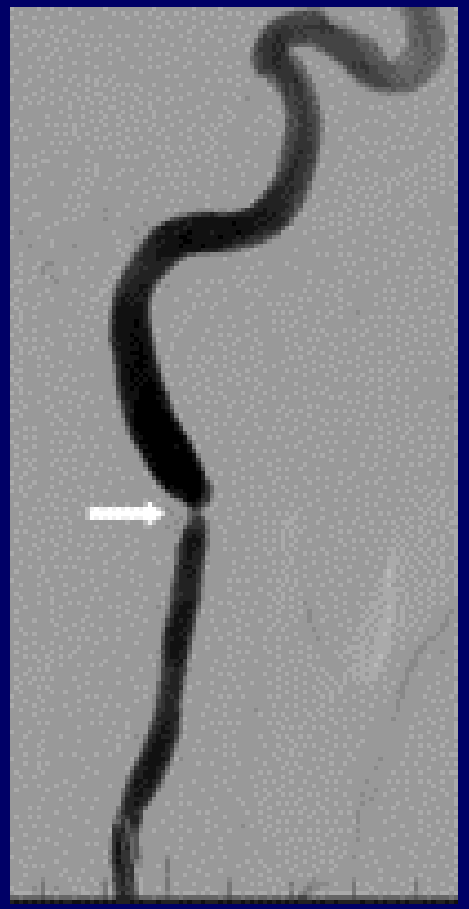
- Noninflammatory
- Nonatherosclerotic
- Young individuals (mean onset 48 yrs)
- Women (3:1)
- Affects small to medium-sized arteries
- Intima, media or adventitia



FMD Distribution

- Renal 60-75%
- Cerebrovascular 25-30%
- Visceral 9%
- Extremity Arteries 5%
- Has also been observed in coronary arteries, pulmonary arteries and the aorta
- 28% of patients have at least two vascular beds involved





Intimal fibroplasia

- Smooth focal stenosis with a concentric band
- Long smooth tubular stenosis

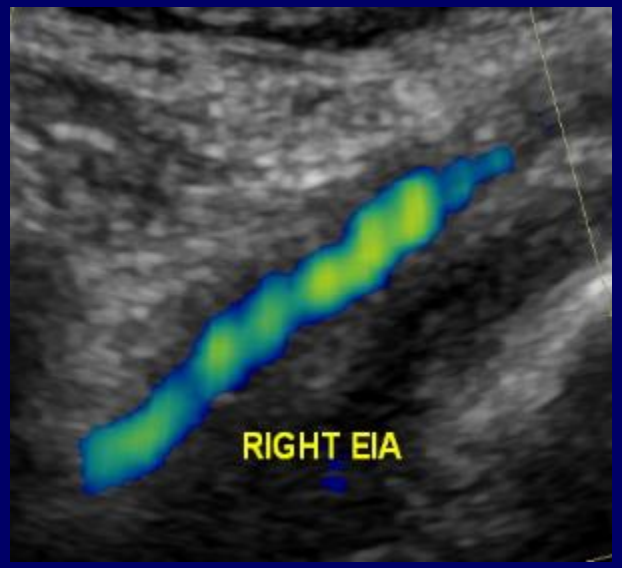
Poloskey, et al. Circulation 2012;125

Medial fibroplasia

- Alternating areas of thinned media and thickened fibromuscular ridges
- "string of beads" appearance

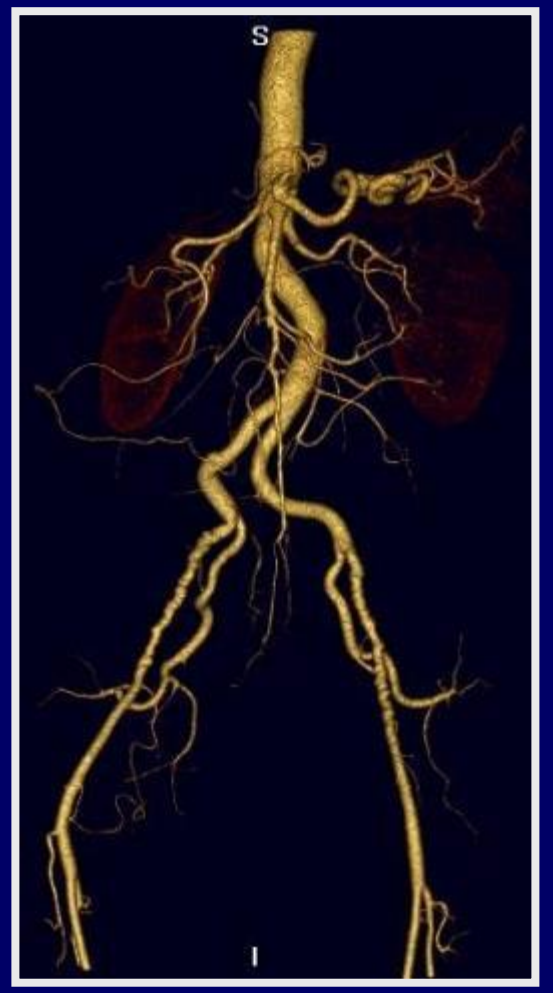
Poloskey, et al. Circulation 2012;125

Lower Extremity FMD



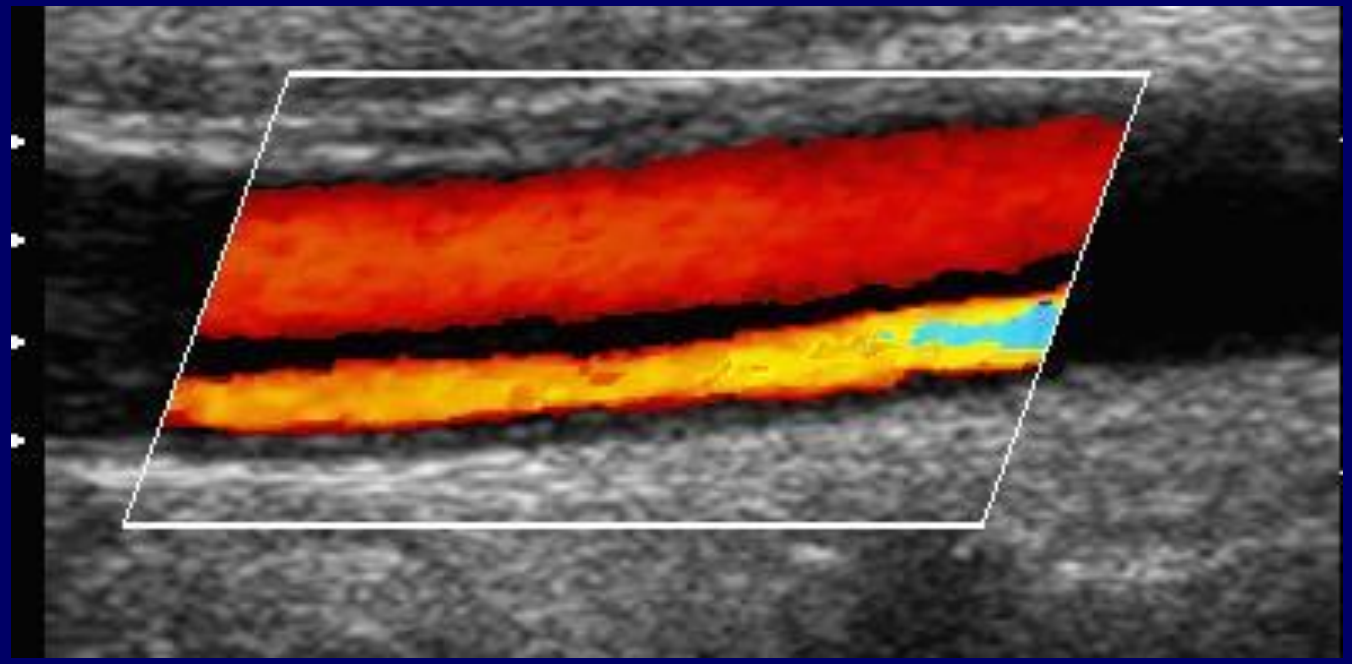
Courtesy of H. Gornik, MD

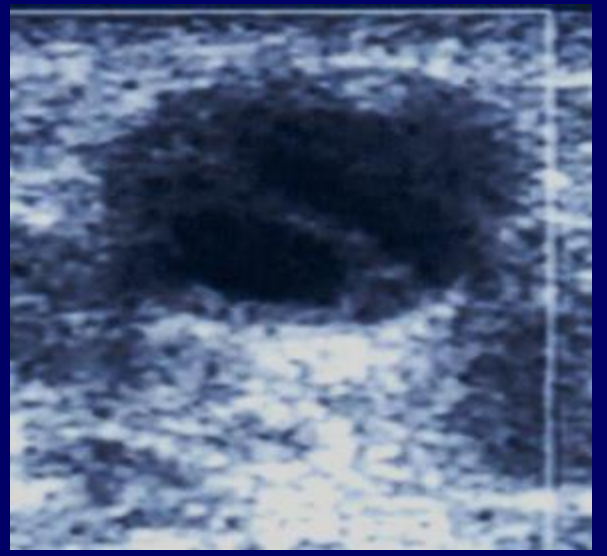
- EIA is most often involved
  - Occasionally CIA or CFA
  - Not seen distal to inguinal ligament
- Generally bilateral
- Generally multi-vessel

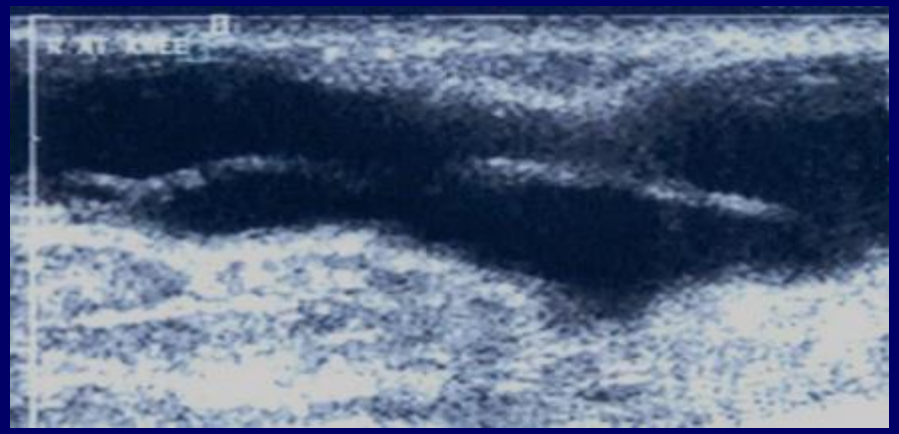


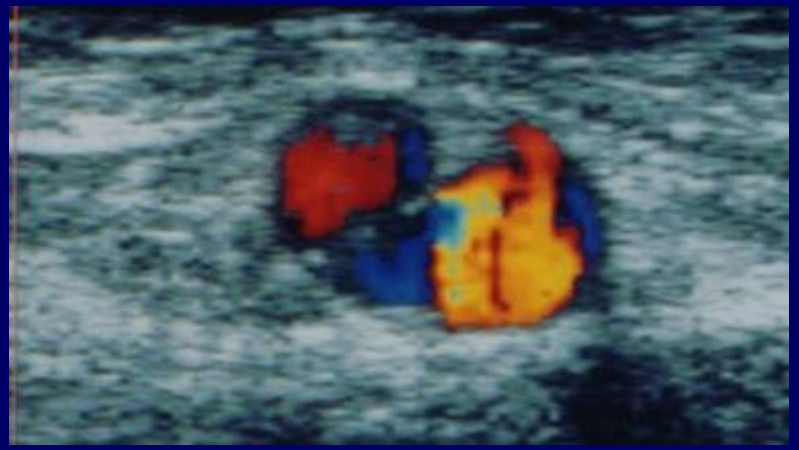
Sharma A, Gornik H. Circ Cardiovasc Interv. 2012.

Arterial dissections







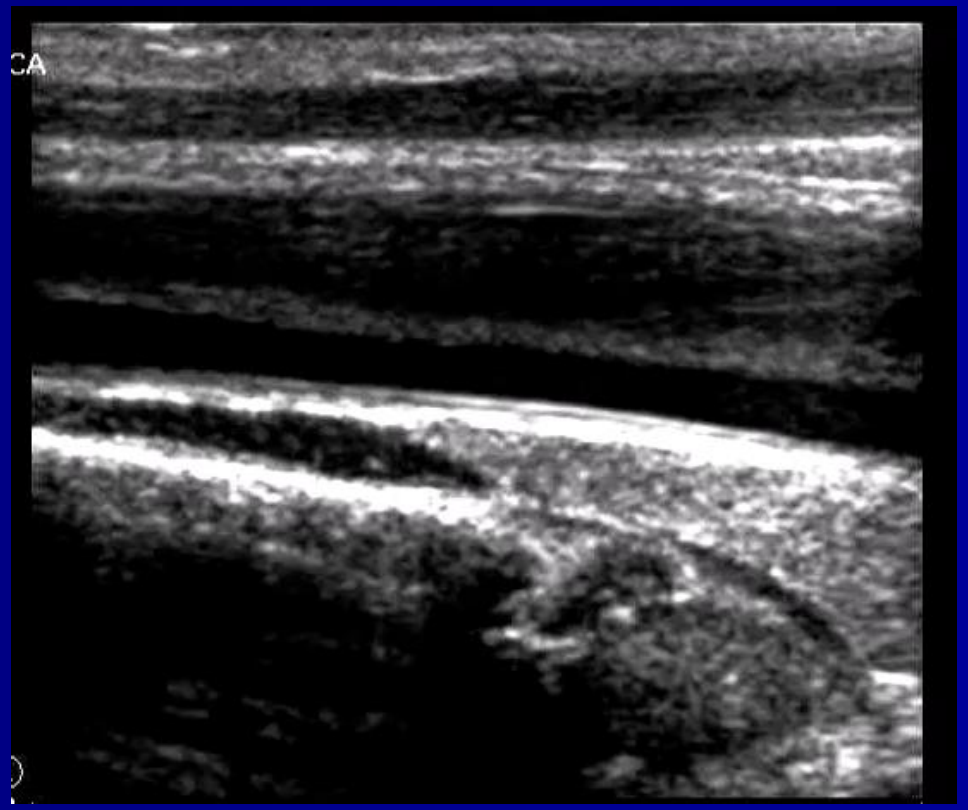


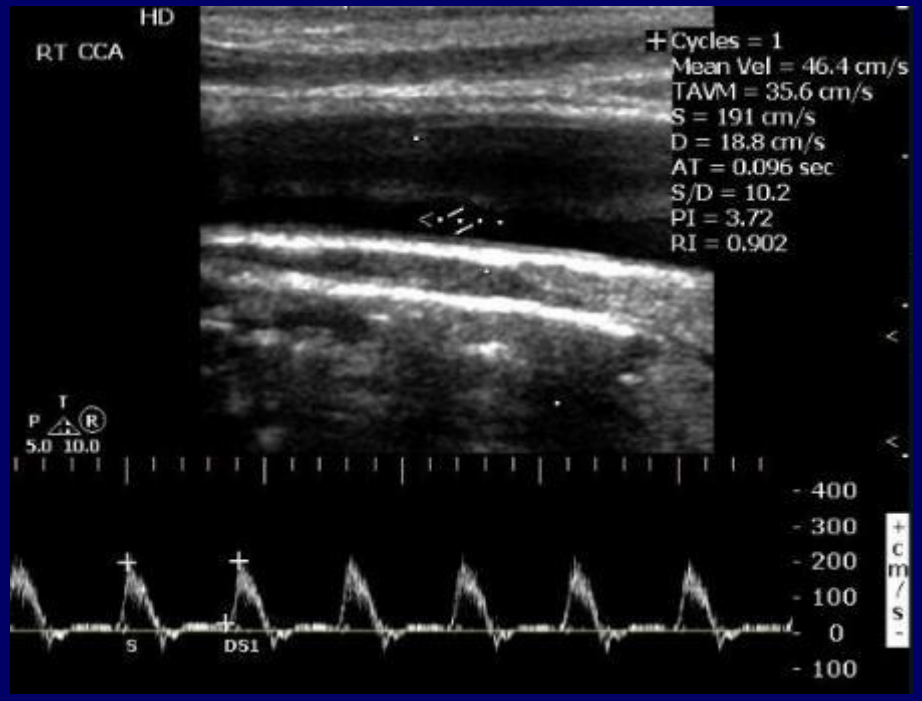
Dissection

- Disruption of the intima allowing blood to extravasate between the layers of the arterial wall
- Can produce
  - Stenosis/occlusion
  - Aneurysmal changes
  - Thromboembolic events
- Can be spontaneous or due to mechanical event (either traumatic or iatrogenic)

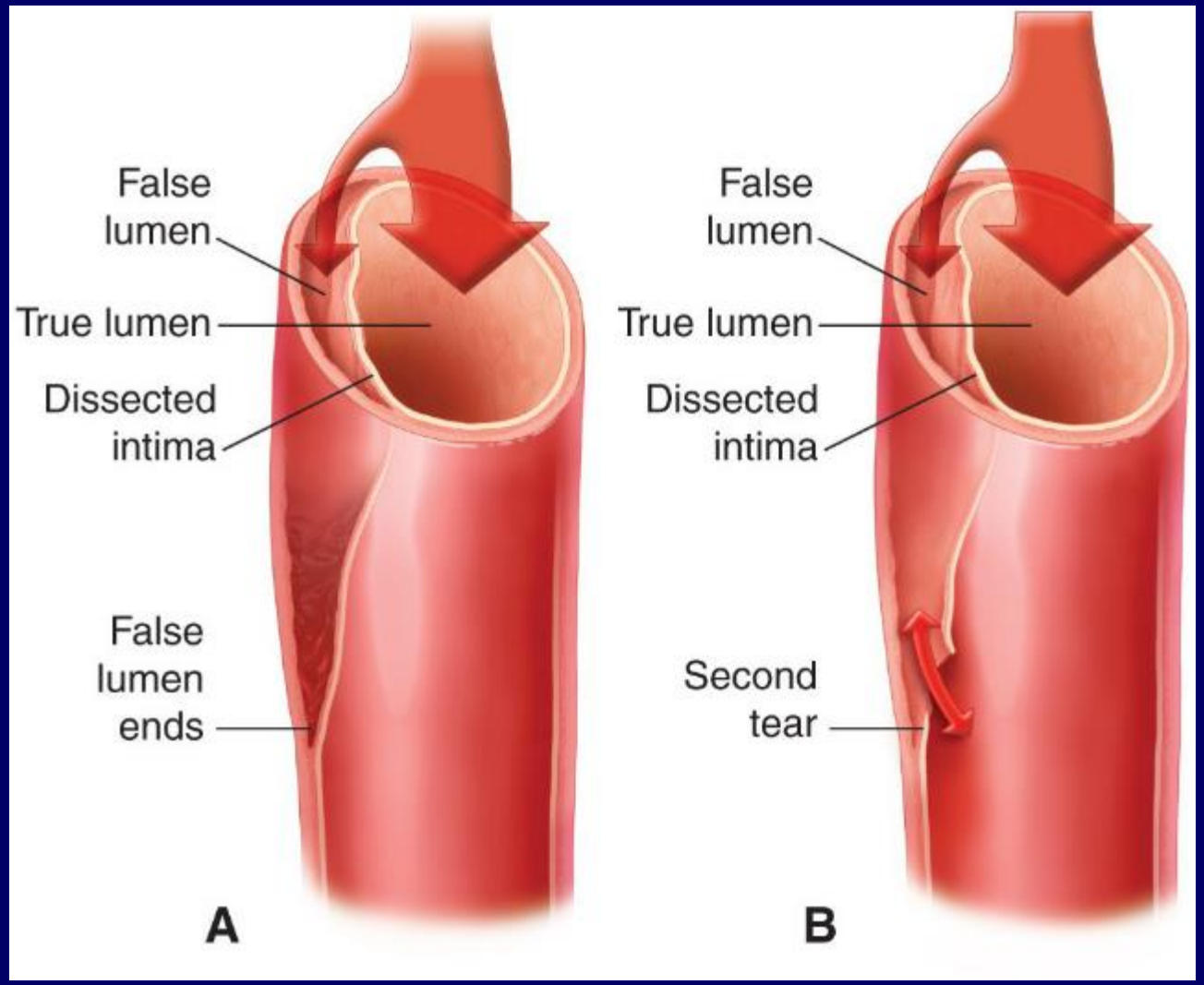
Carotid Dissections

- Account for 10-20% of stokes in young & middle-aged patients
- 25% have associated connective tissue disorders
- Higher incidence of HTN




HD
RT CCA
Cycles = 1
Mean Vel = 46.4 cm/s
TAVM = 35.6 cm/s
S = 191 cm/s
D = 18.8 cm/s
AT = 0.096 sec
S/D = 10.2
PI = 3.72
RI = 0.902
5.0 10.0
400
300
200
100
0
100
cm/s
S
D51

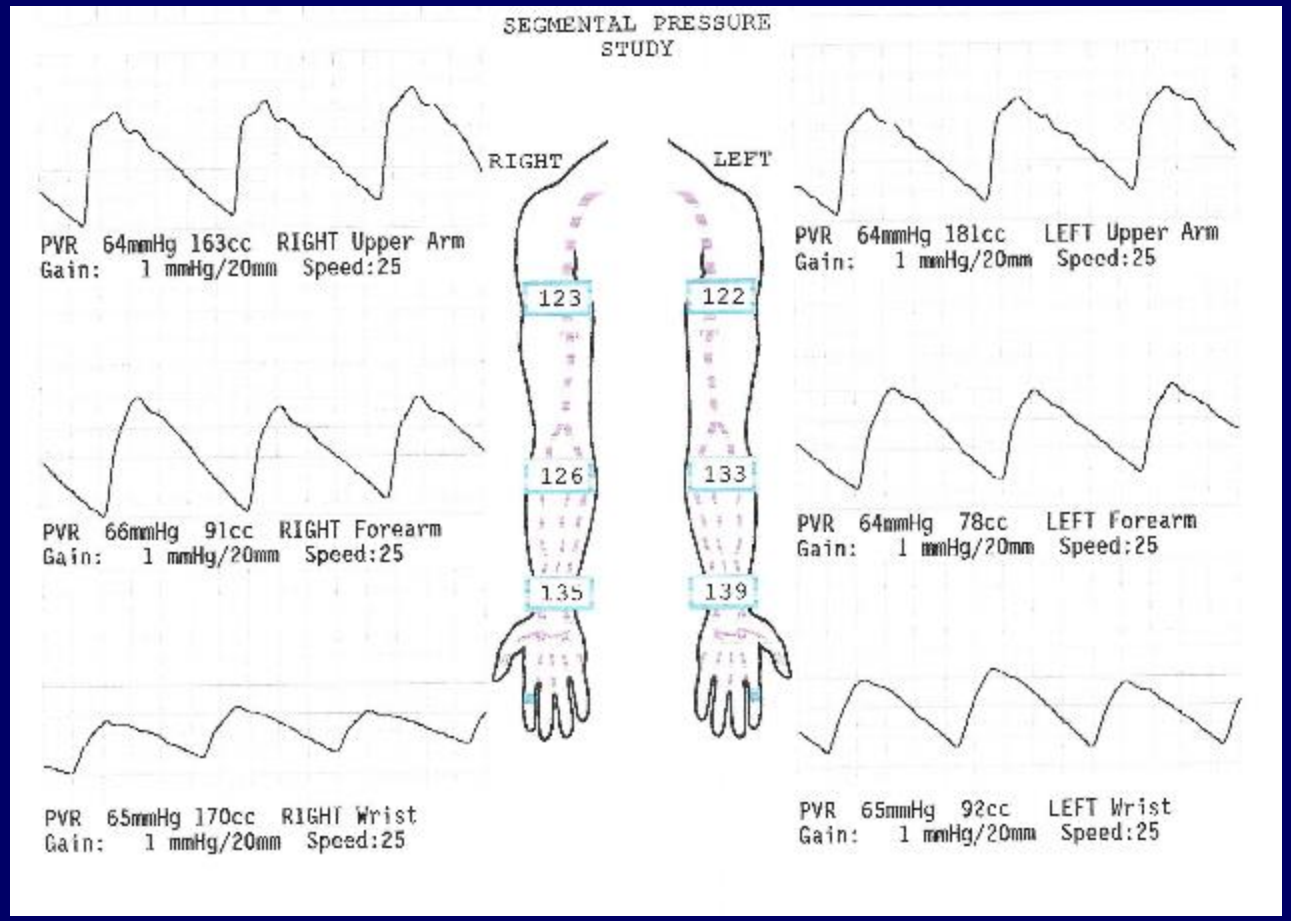

HD
RT CCA
S = 86.5 cm/s
D = 17.3 cm/s
S/D = 5.00
RI = 1.20
Time = 0.598 sec
5.0 10.0
200
100
0
100
cm/s

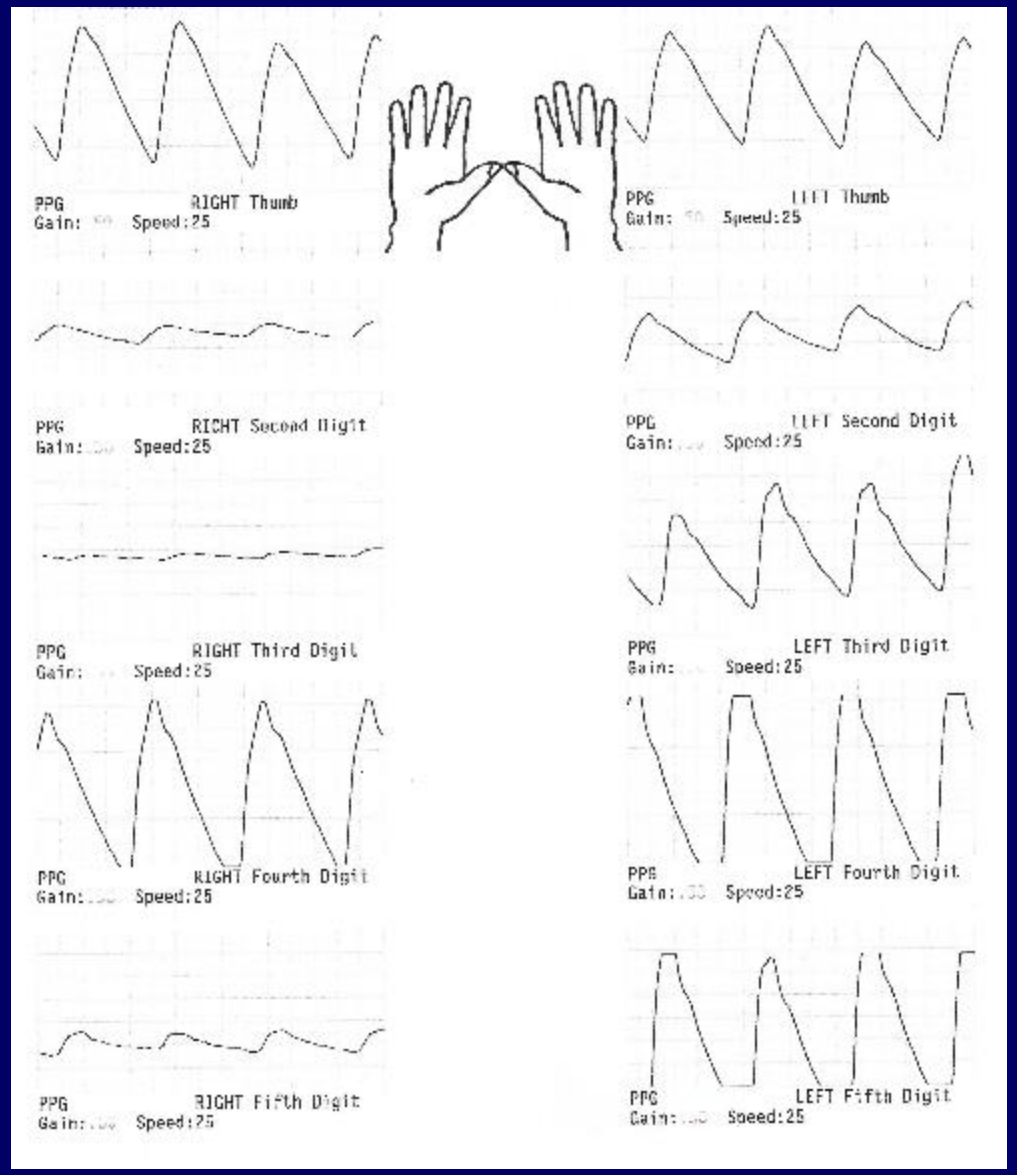

False lumen
True lumen
Dissected intima
False lumen ends
A
False lumen
True lumen
Dissected intima
Second tear
B

Buerger's Disease

- Manifest in patients under 45 yrs old
- 3 to 1 male to female distribution
- Presents with ischemia digital ulcers
- There is always tobacco abuse

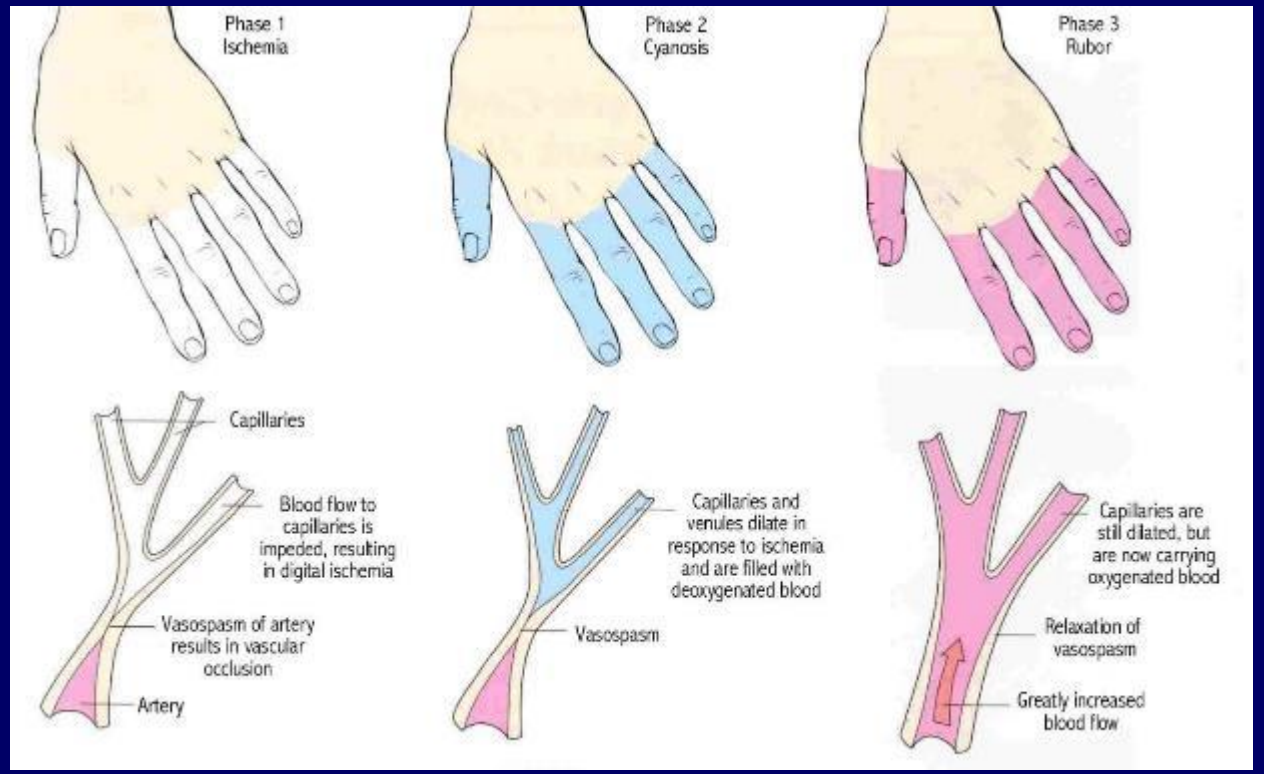
Buerger's Disease





Raynaud's Phenomenon

- Primary Raynaud's
  - Idiopathic
  - Raynaud's Disease
- Secondary Raynaud's
  - Presence of underlying cause
  - Raynaud's Syndrome

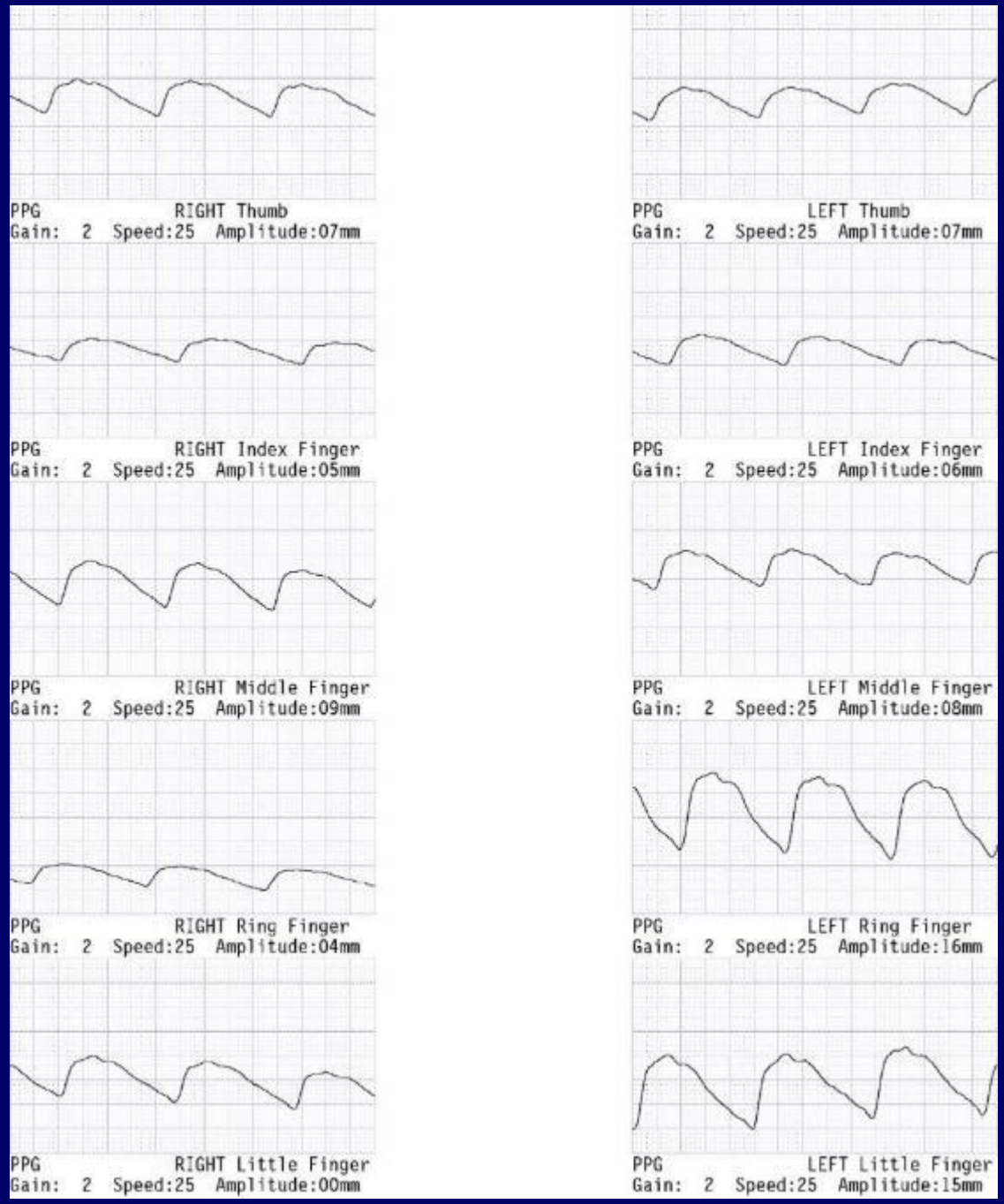


Raynaud's Phenomenon

- More common in women
- Onset age 20's -30's
- Secondary Raynaud's in US study
  - 11% women
  - 8% men
- 12% of patients with Rheumatoid arthritis

Cold Challenge

- Digital PPG waveforms normal or near normal at rest
- Flatten or severely diminished in response to cold
- Waveforms that take longer than 10 minutes post-cold challenge to return to normal are indicative of disease

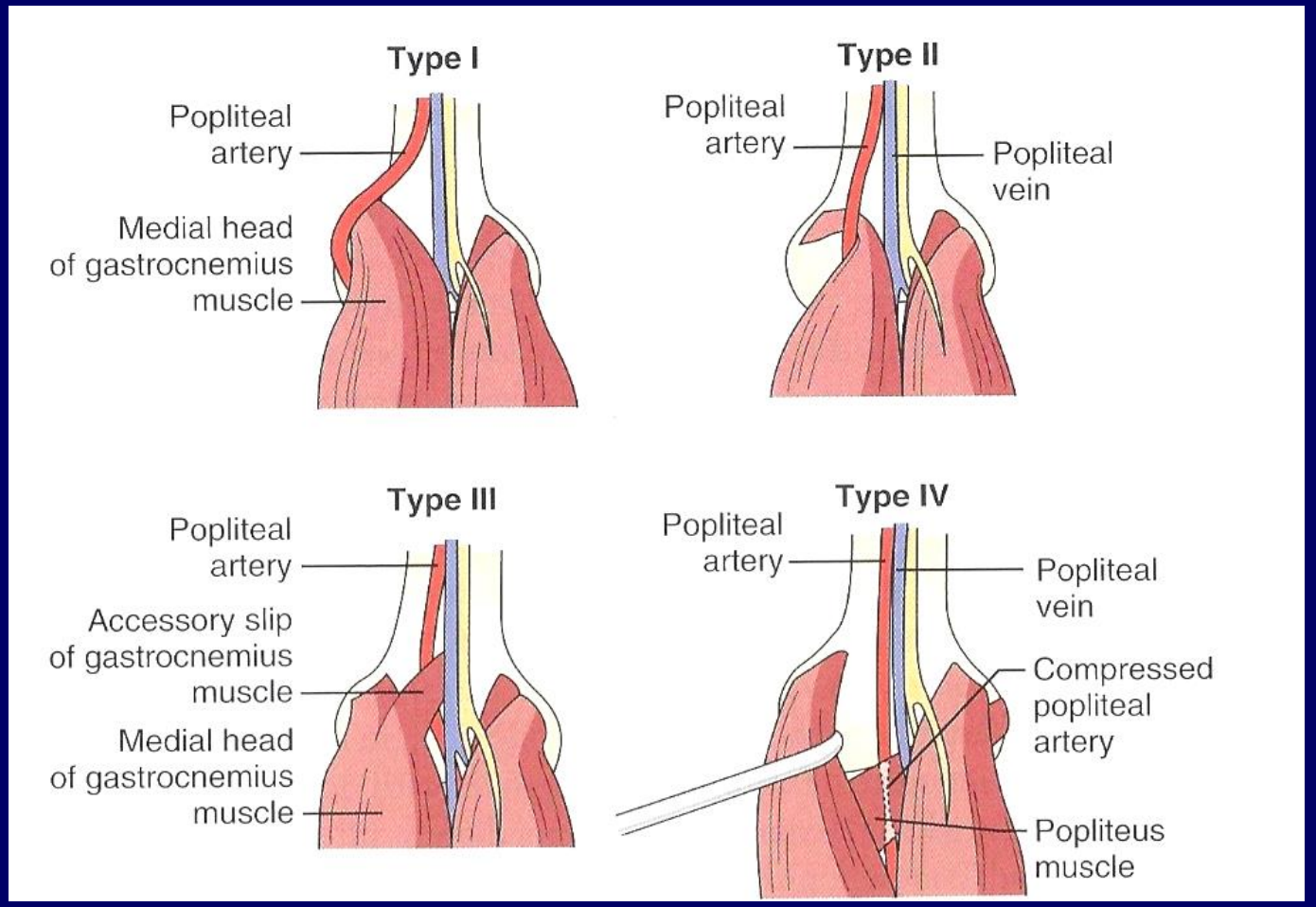


Popliteal Artery Entrapment

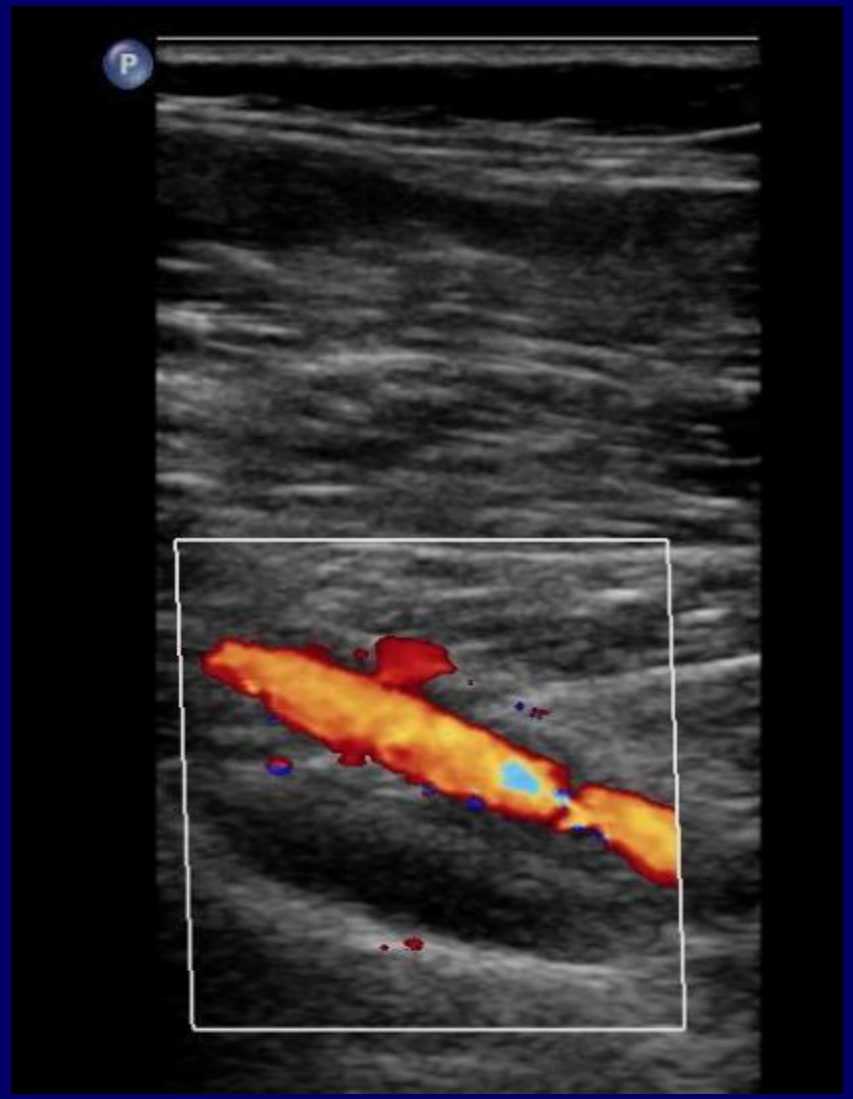
- Congenital anatomic abnormality
- Distribution 15:1 males to females
- Symptoms:
  - 46% pain, paresthesia, cold feet after running or heavy work
  - 70-90% intermittent calf claudication
- Diagnose with positional (passive dorsiflexion or active plantar flexion) using ultrasound or physiologic testing

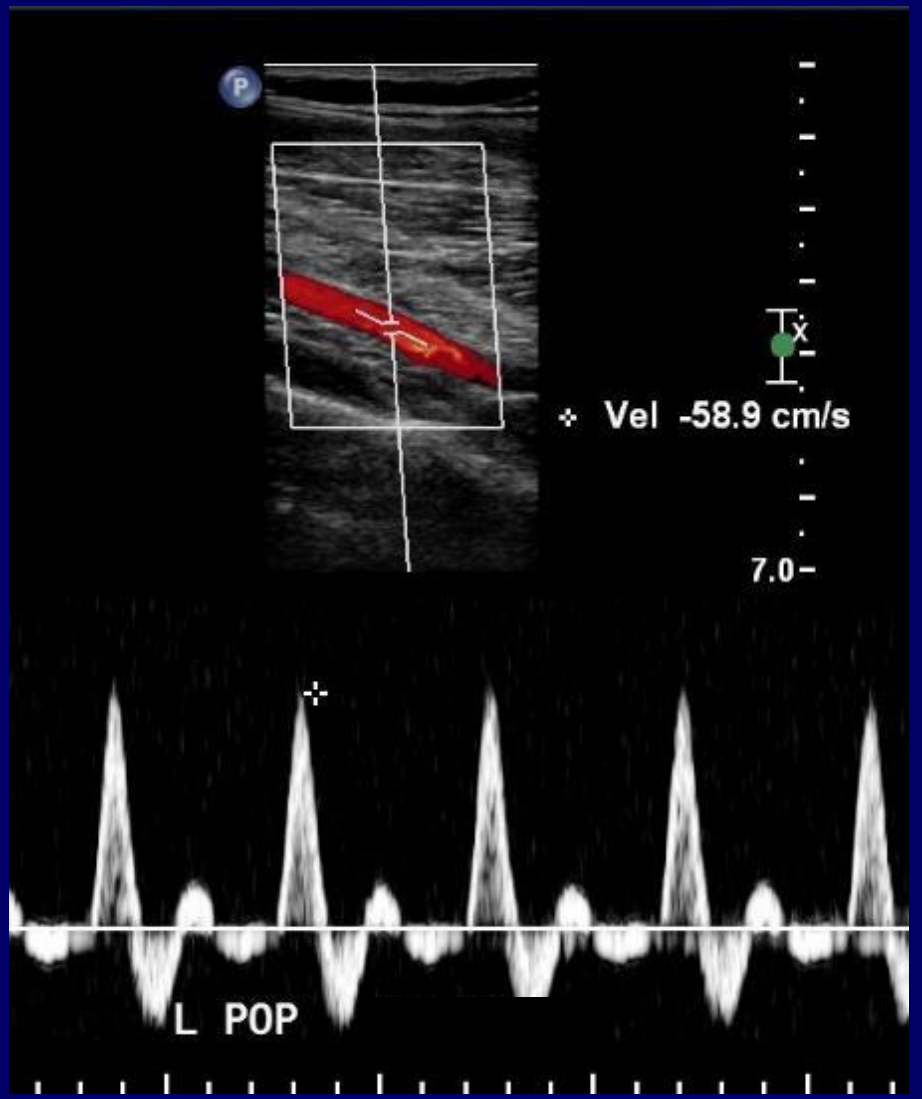
Classification of Popliteal Artery Entrapment Syndrome

- I Medial head of gastrocnemius muscle is normal; popliteal artery is deviated medially and has an aberrant course
- II Medial head of gastrocnemius muscle is located laterally; no deviation of popliteal artery
- III Abnormal muscle bundle from medial head of gastrocnemius muscle surrounding the popliteal artery
- IV Popliteal artery is located deeply and entrapped by the popliteus muscle or a fibrous band
- V Popliteal vein is also entrapped with any type of popliteal artery
- VI Popliteal artery is normally positioned and entrapped by a normally positioned, hypertrophied gastrocnemius muscle

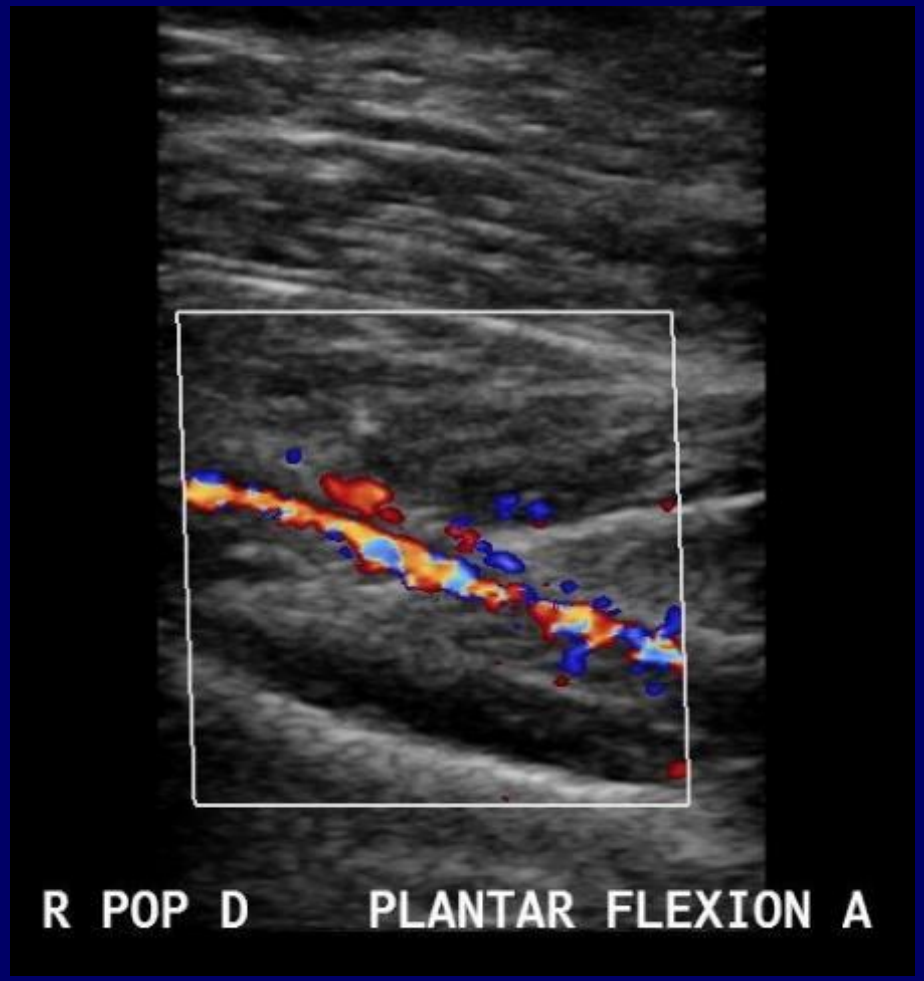


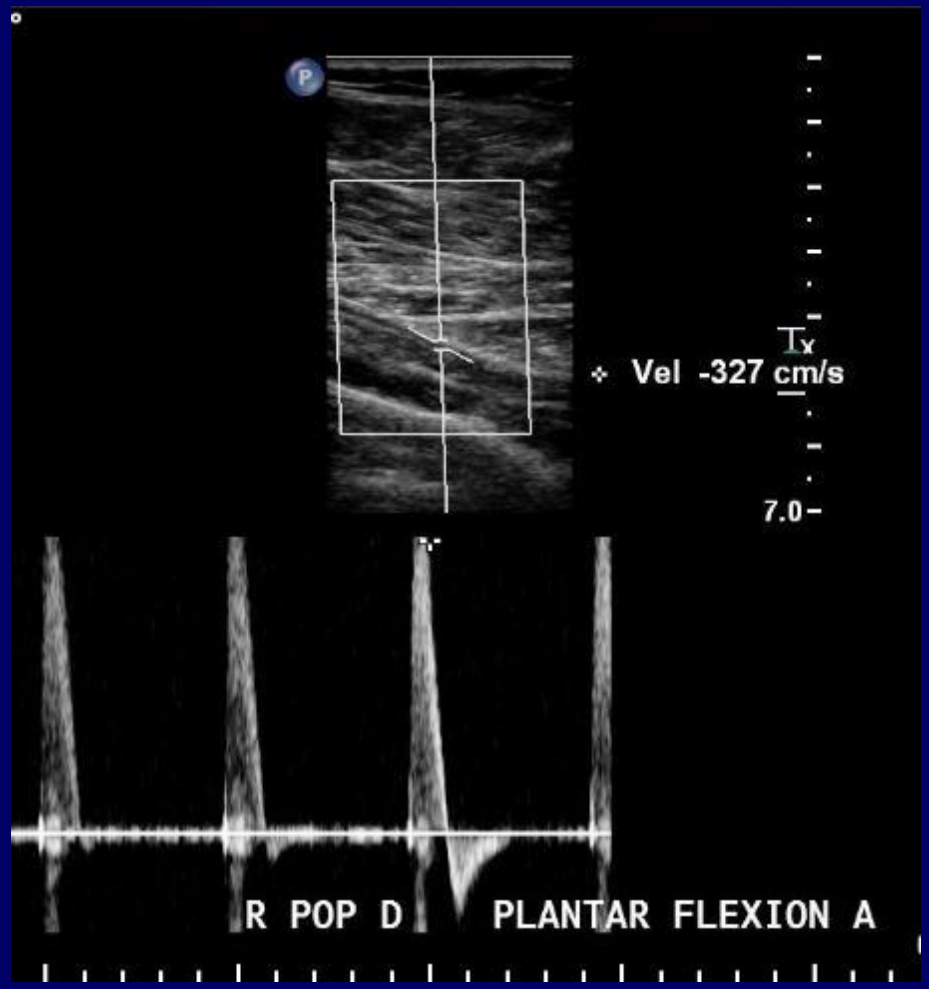
Rutherford's Vascular Surgery 8th ed., p 1809.





Right ABI = 1.1, Left ABI = 1.0

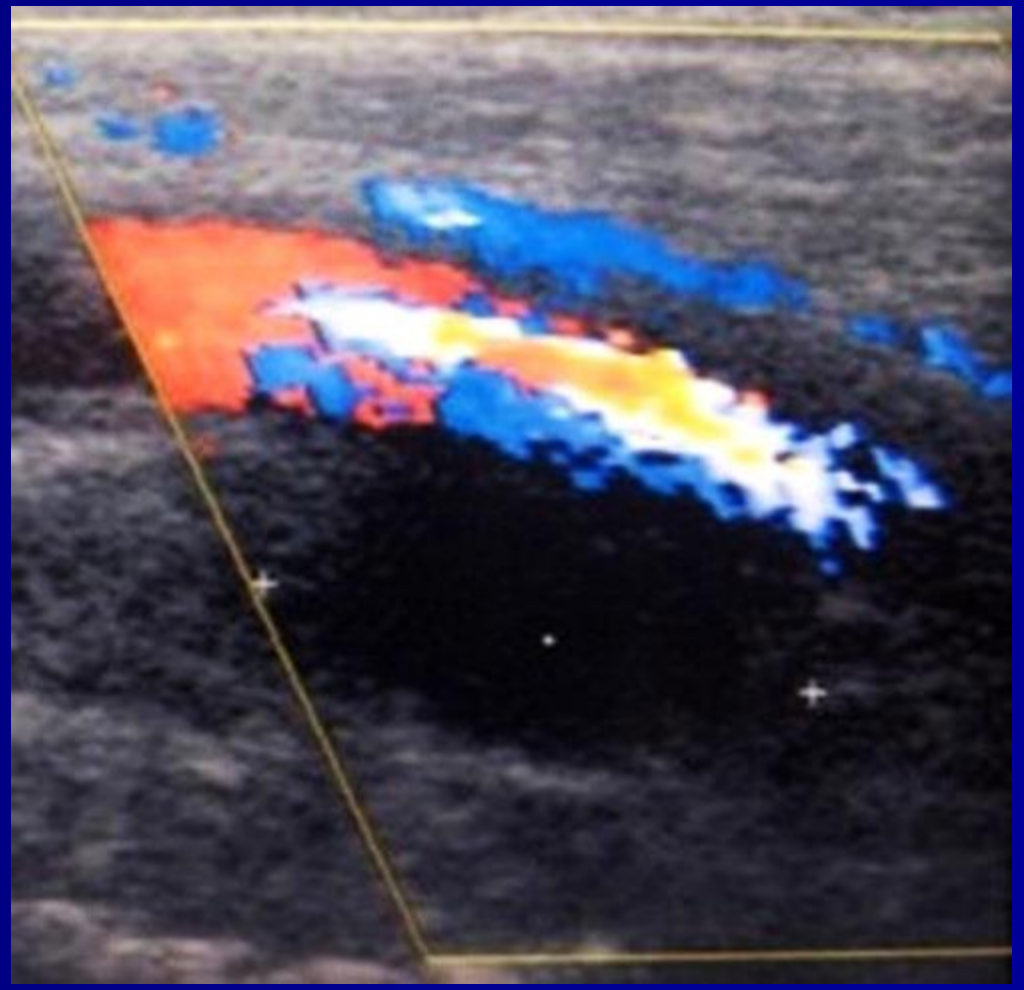




Exercise or provocative maneuvers to elicit symptoms

Adventitial Cystic Disease

- Rare cause of intermittent claudication
- Male-female ratio 5:1
- Age at diagnosis: mid 30's
- Most often impacts the popliteal artery (85%)

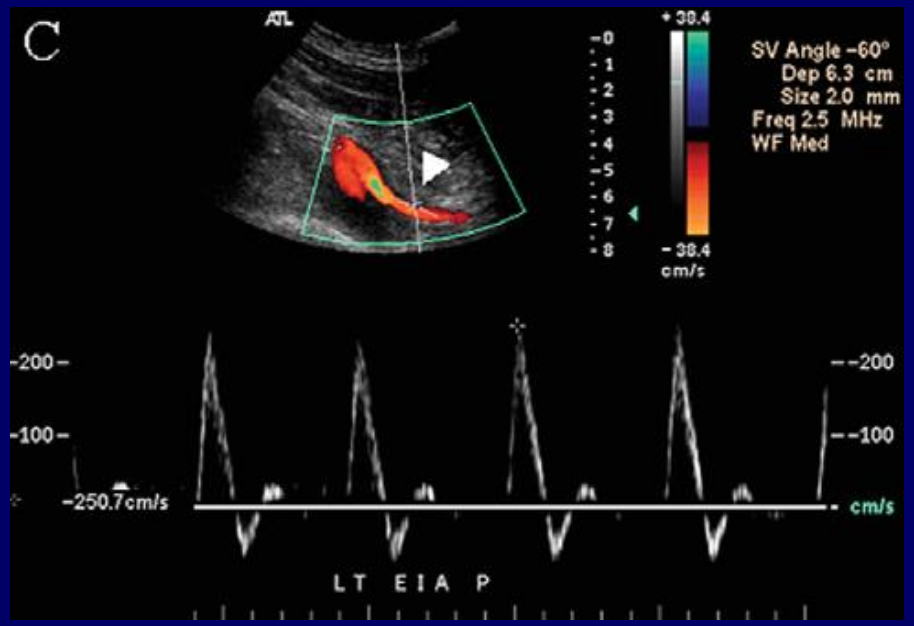


Exercise-induced iliac endofibrosis

- Reported in competitive cyclists and runners
- Results from repetitive trauma of EIA
- Symptoms include intermittent claudication and paresthesia
- Normal resting physical exam; occasional bruit over pelvic fossa or inguinal region

Exercise-induced iliac endofibrosis

- Pre and post exercise ABIs
- Maximal, symptom-limiting treadmill exercise
- Iliac artery ultrasound reveals stenosis at EIA occasionally at CIA and IIA



Images from Maree AO, et al *Vascular Medicine* 2007; 12:203-206.

Conclusion

- Young patients affected by various nonatherosclerotic diseases
- Vascular lab diagnostic tools:
  - Ultrasound for large vessel diseases
  - Physiologic testing for small vessel diseases
- Remember exercise stress may be need to be more extreme in order to induce symptoms