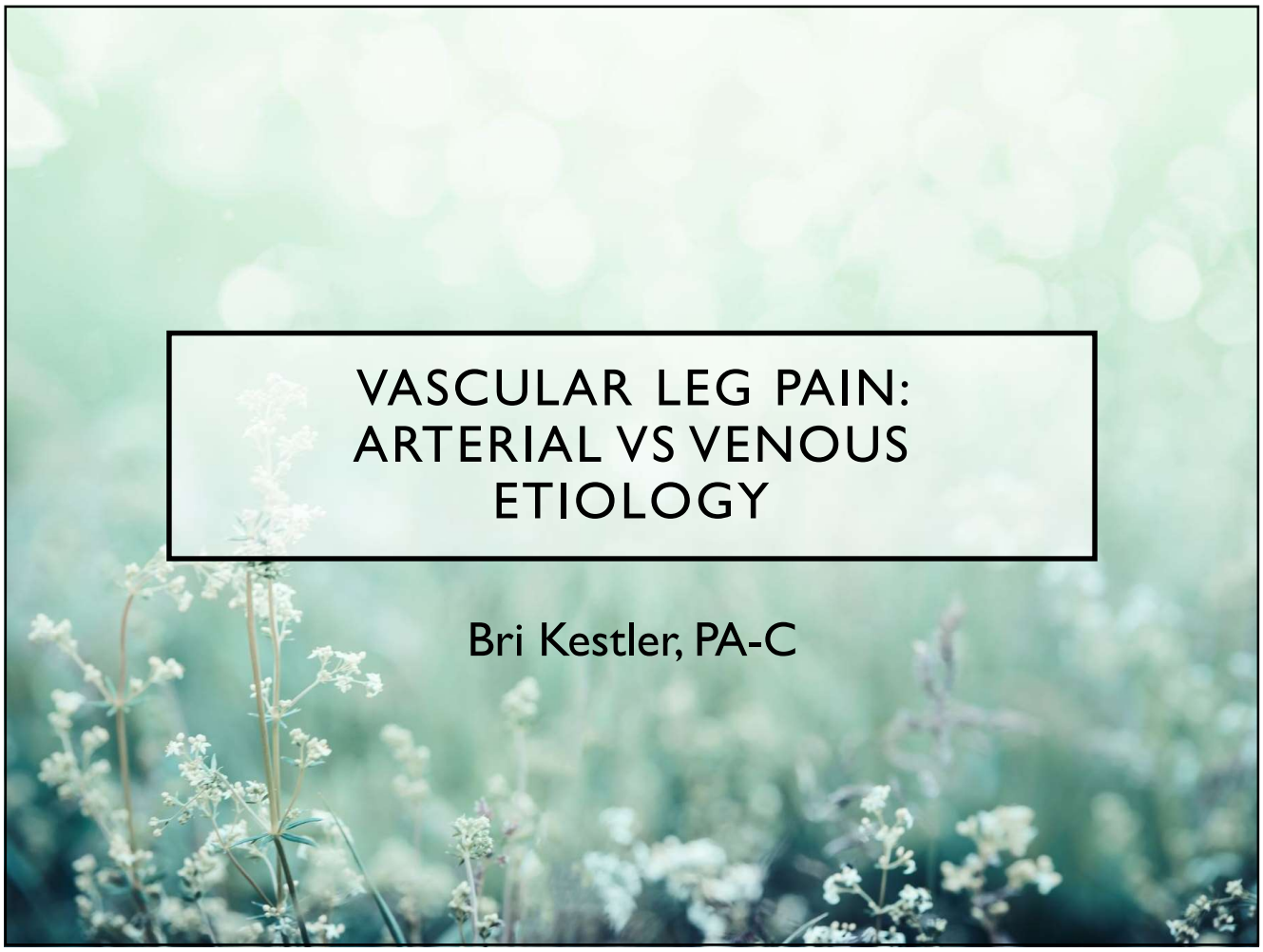
VASCULAR LEG PAIN:
ARTERIAL VS VENOUS
ETIOLOGY
Bri Kestler, PA-C

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DISCLOSURES

- None to report

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OBJECTIVES

- Examine the pathogenesis of the most common vascular causes of lower extremity pain.
- Distinguish between the presenting symptoms of arterial and venous leg disease.
- Recognize the difference in appearance of a lower extremity with arterial versus venous disease.
- Outline the different diagnostic studies available to differentiate between vascular diseases.
- Formulate appropriate treatment plans for arterial and venous leg disease.

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BLOOD FLOW

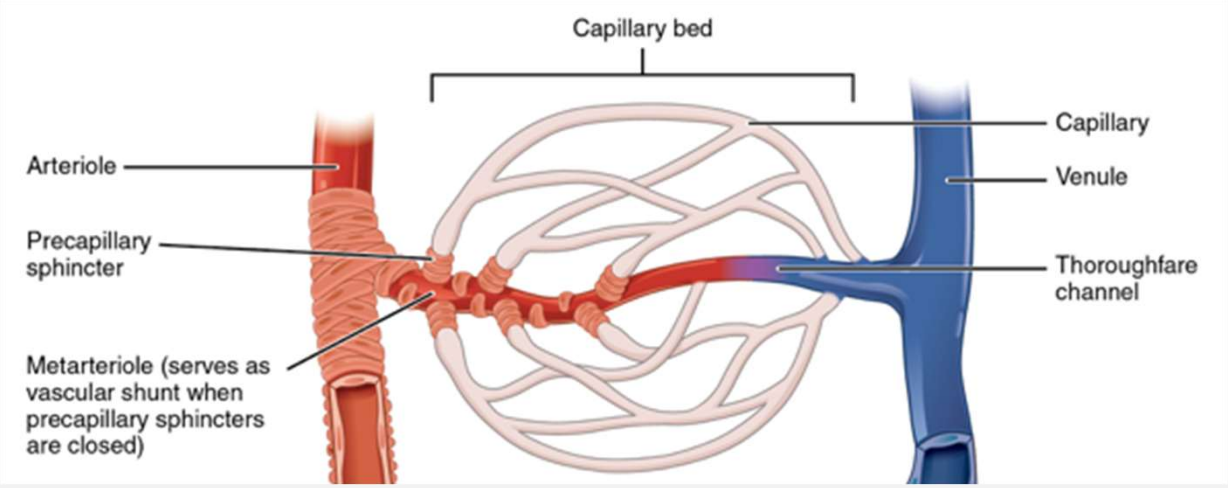

Figure 20.15-Capillary Bed. Anatomy & Physiology. Lindsay M. Biga, Sierra Dawson, Amy Harwell, Robin Hopkins, Joel Kaufmann, Mike LeMaster, Philip Matern, Katie Morrison-Graham, Devon Quick, and Jon Runyeon. https://open.oregonstate.education/aandp/. CC SA

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ARTERIAL BLOOD FLOW

Elastic Arteries

- Larger caliber arteries with a high percentage of elastic fibers
- Allows arteries to expand and recoil to maintain the pressure gradient that drives blood flow

Muscular Arteries

- More smooth muscle and less elastic fibers
- Branch to distribute blood to a network of arterioles

Arterioles

- Critical in providing resistance and regulating blood flow to capillaries for tissue demand

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MICROCIRCULATION BLOOD FLOW

Metarterioles

- Vessel that has structural characteristics of an arteriole and capillary

Pre-capillary sphincter

- Circular smooth muscle cells that surround the capillary at its origin with the metarteriole, tightly regulating the flow of blood into the capillary bed.

Capillary bed

- Exchange of gases and other substances occurs in the capillaries between the blood and the surrounding cells and their interstitial fluid

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PHYSIOLOGY

- Acute blood flow control
  - Tissue blood flow regulators
    - Oxygen demand / cellular metabolism
    - Endothelial derived factors
    - Myogenic response
- Long-term blood flow control
  - Increase in the physical size and number of blood vessels supplying the tissue
  - Regulated by oxygen concentrations and angiogenic factors

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VENOUS BLOOD FLOW

Postcapillary venules

- Join multiple capillaries exiting from a capillary bed

Veins

- Multiple venules join to form a vein
- Extremity veins contain valves to assist in the unidirectional flow of blood back to the heart

Venous pump

- Contraction of leg muscles increases subfascial pressure above intramuscular vein pressures and propels venous blood into the deep system.

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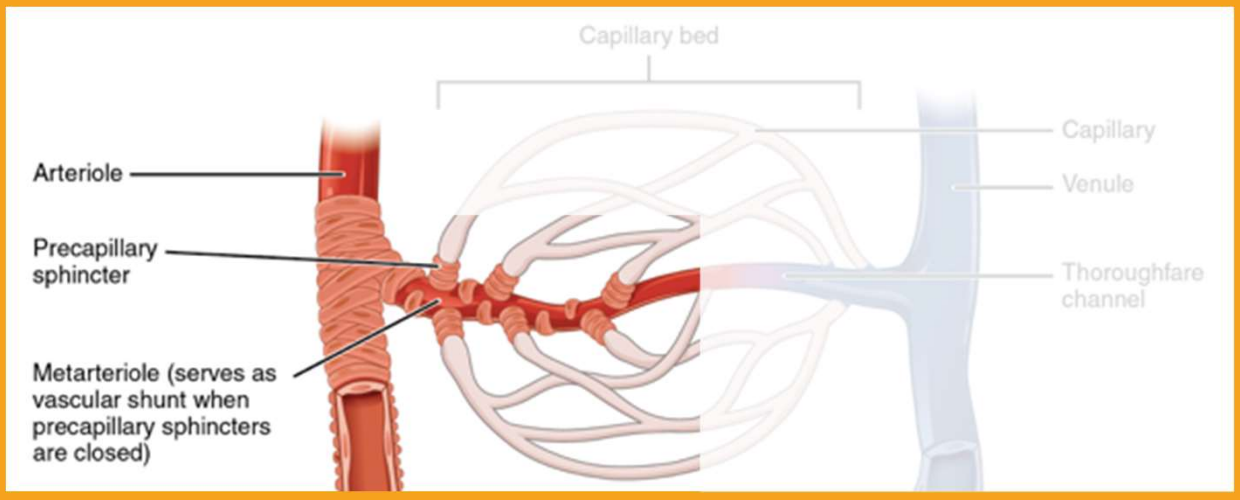

PERIPHERAL ARTERIAL DISEASE

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PATHOGENESIS

- Endothelial dysfunction initiates a loss of endothelial-derived factors. Endothelial dysfunction leads to loss of autoregulatory mechanisms
- Vascular remodeling makes blood vessels stiffer.
- Plaque formation increases resistance across the stenotic lesion, decreases luminal diameter and lowers arterial perfusion.
- Oxidative damage causes myofiber damage and impairs mitochondrial metabolism leading to decreased tissue oxygen extraction.

RISK FACTORS

- Tobacco use
- Diabetes mellitus
- Over 60 years of age
- Hypertension
- Hyperlipidemia
- Male gender
- Coronary artery disease

SIGNS & SYMPTOMS

- Claudication
  - Most patients with PAD are asymptomatic
  - Hypoperfusion causes pain
  - Less than 20% of patients report typical claudication symptoms of the lower extremities that is relieved by rest.
  - Atypical symptoms include leg fatigue, difficulty walking, and non-specific leg pain or sensations
  - Timing and location of claudication can relate to the degree of stenosis and artery involved

PHYSICAL EXAM

- Diminished or absent pulses; increased cap refill time
- Skin changes
  - Pallor, coolness
  - Dry, shiny atrophic skin
  - Loss of hair in the affected extremity
- Positional color change of the distal extremity
- Ulcers, gangrene and rest pain for > 2 weeks are indicators of critical limb ischemia (CLI)

DIAGNOSTICS

- Ankle-brachial index
  - ABI of 0.9 or less with presence of correlating symptoms to make diagnosis
  - If ABI is normal with suspicious symptoms, an ABI after exercise should be performed
- Arterial Doppler
  - Estimates degree, length, and location of stenosis based on phasic and velocity changes in blood flow

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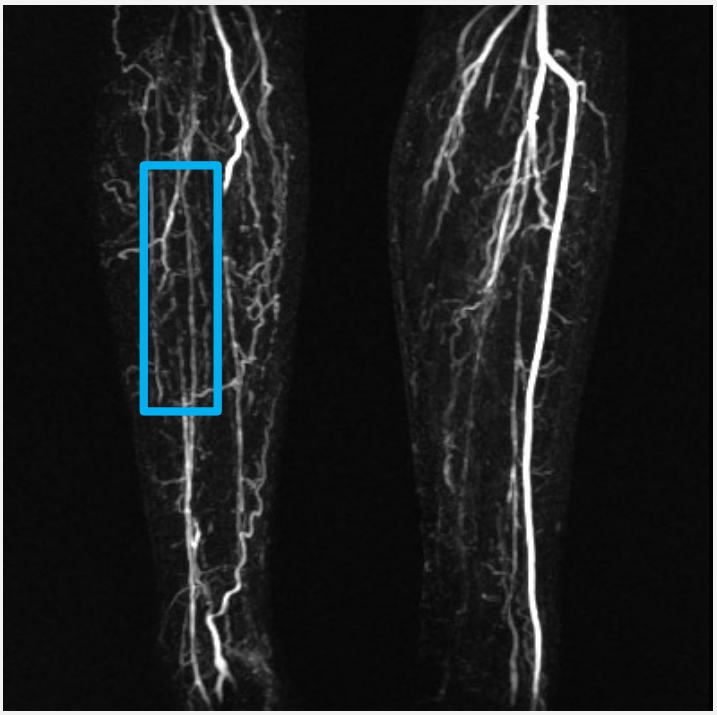
DIAGNOSTICS



Case courtesy of Dr Roberto Schubert, Radiopaedia.org, rID: 14922

- Angiograms

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CLASSIFICATION SYSTEMS

- Rutherford
  - Stages 1-6; based on symptoms and CLI exam findings
- Fontaine
  - Stages I-IV; based on symptoms and CLI exam findings
- TASC II (for femoral and popliteal lesions)
  - Classifies lesions based on location, length, degree of stenosis and time frame of treatment
  - Types A-D

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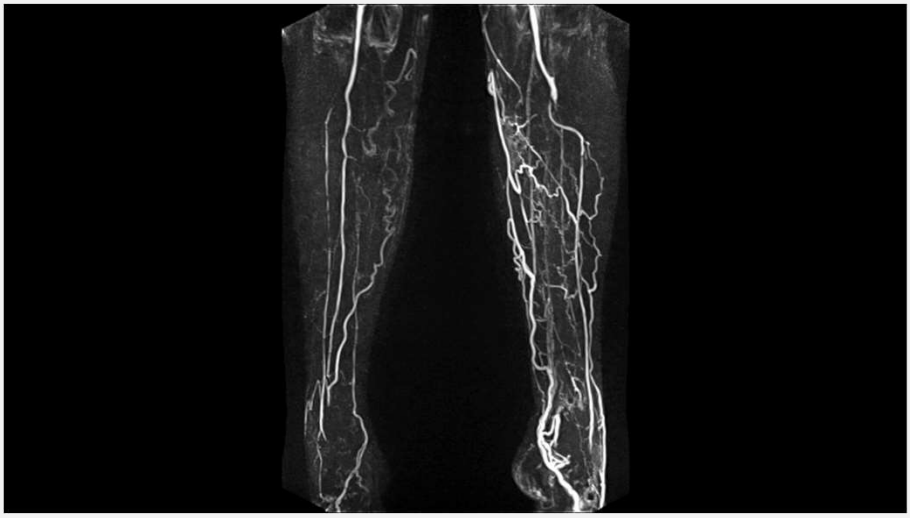
TREATMENT

- Aimed at SLOWING disease progression
- Supervised exercise program



Courtesy of Allen D. Elster, MD; MRIquestions.com

TREATMENT

- Risk factor modifications
- Pharmacological therapies
  - Anti-platelet therapy – aspirin, cilostazol (Pletal)
  - Pentoxifylline (Trental)
- Revascularization
  - Percutaneous transluminal angioplasty (PTA)
  - Bypass grafting

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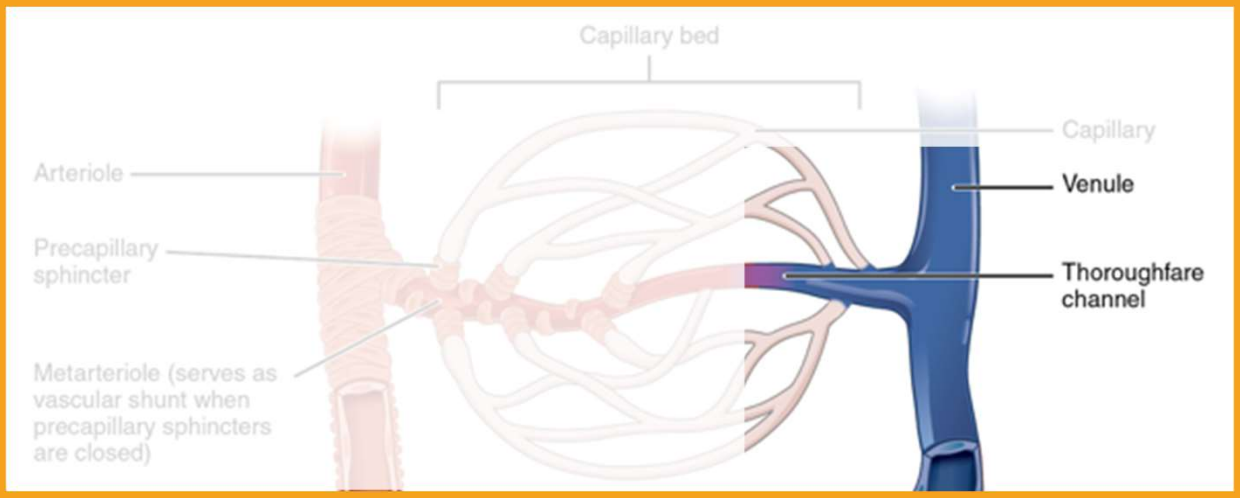

CHRONIC VENOUS INSUFFICIENCY

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PATHOGENESIS

- Valvular incompetence and/or loss of the venous pump leads to venous hypertension and can increase ambulatory venous pressures pressures to 60-90 mmHg.
- Cellular changes result in a weakened vessel wall
  - As venous and capillary pressures become high, degradation of extracellular matrix leads to vascular permeability.
  - Decreased number of smooth muscle cells and changes to collagen ratio results in veins that are prone to dilation and tortuosity.

RISK FACTORS

- Female predominance
- Heritable pattern
- Occupational risk
- Tobacco use
- Obesity
- Venous thrombi
- Trauma

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SIGNS & SYMPTOMS

- Aching or tight feeling pain
  - Heavy sensation; especially after long periods of standing
- Lower extremity swelling
- Fatigued legs
- Paresthesia

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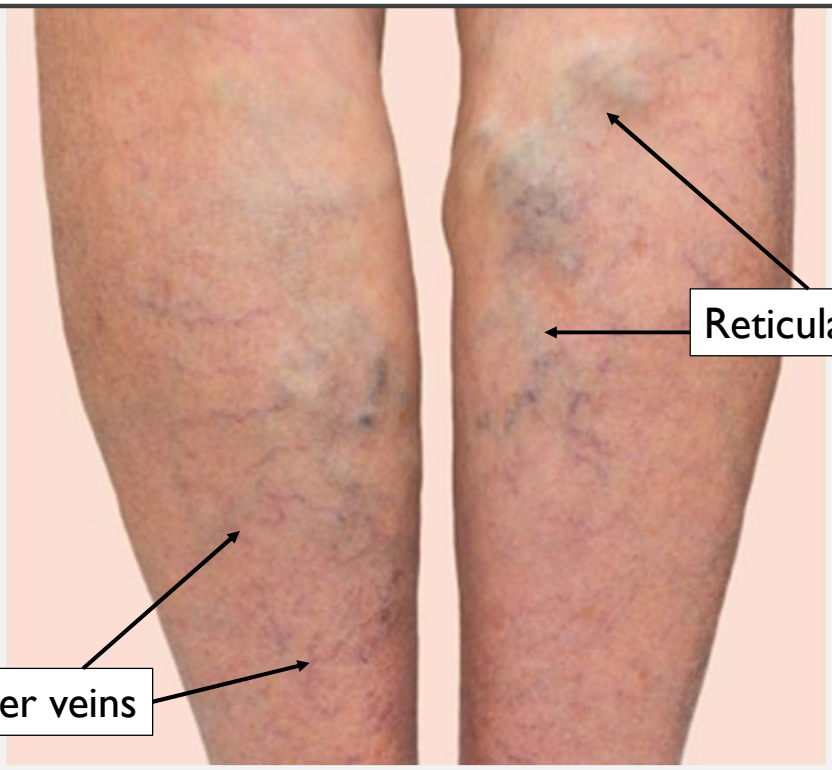
PHYSICAL EXAM



Courtesy of Ronald B. O'Gorman, MD; O'Gorman Vein and Vascular

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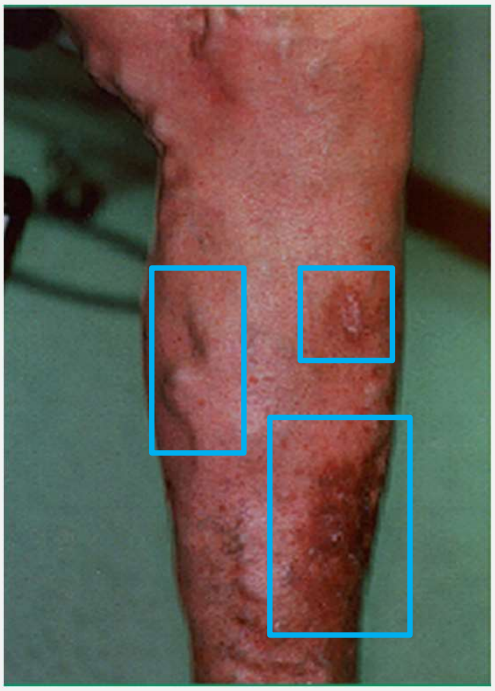
PHYSICAL EXAM

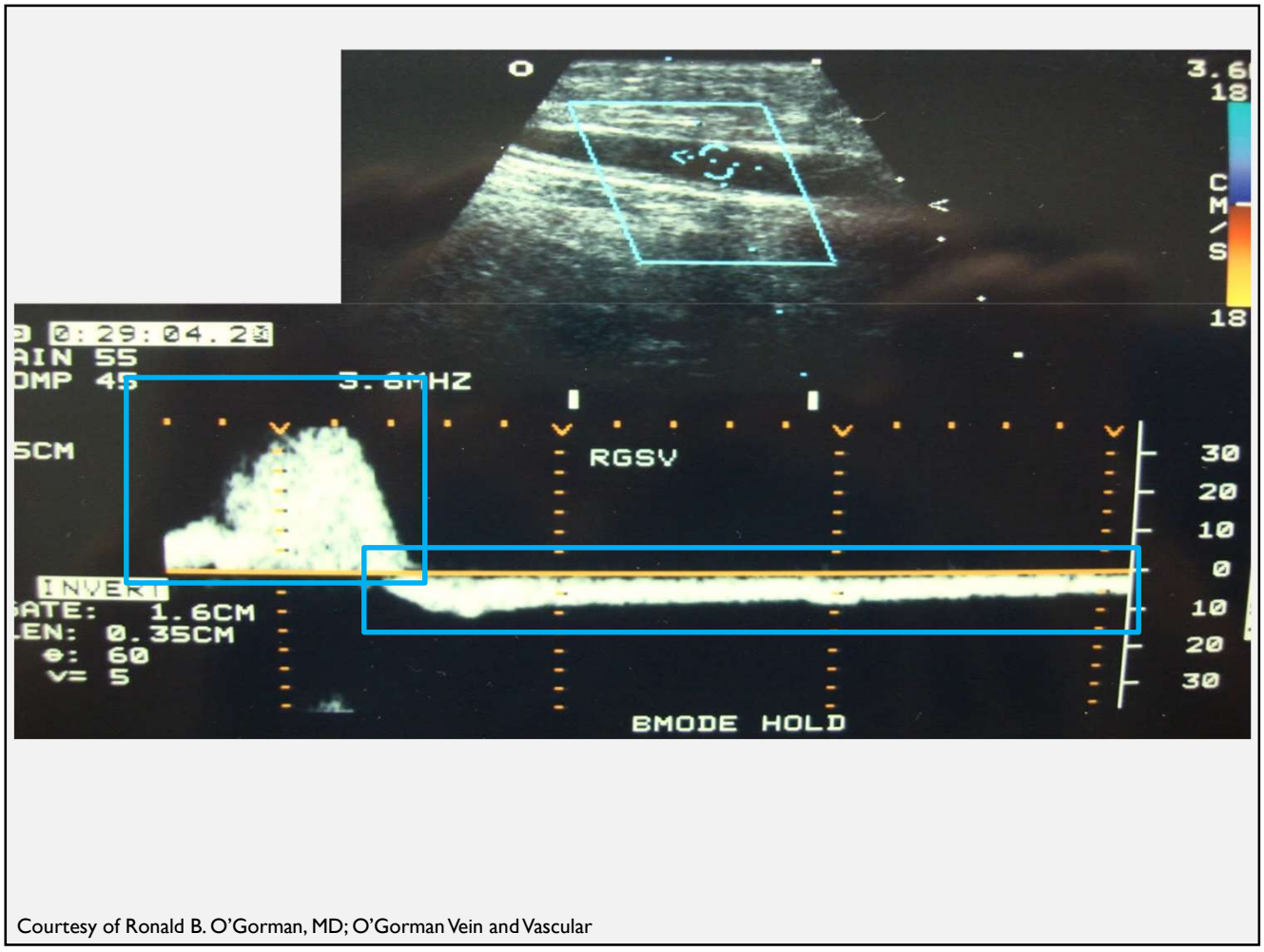


Courtesy of Ronald B. O'Gorman, MD; O'Gorman Vein and Vascular

- Dependent distal edema
- Varicose veins
- Skin changes
  - Hyperpigmentation
  - Fibrotic remodeling
  - Cutaneous ulcers

DIAGNOSTICS

- Venous duplex
  - Identifies duration and location of reflux
    - Reflux is detected on duplex screening and is defined as:
      - > 0.5 secs of reverse flow in superficial vein and/or
      - > 1 sec of reverse flow in deep veins
    - May be present in isolated segments or entire course of a vein
  - Measures size of dilated veins



Courtesy of Ronald B. O'Gorman, MD; O'Gorman Vein and Vascular

CLASSIFICATION SYSTEMS

- CEAP
  - Classifies venous disease based on clinical, etiological, anatomical, and pathophysiological identifiers
  - A patient with varicose veins of a superficial vein with reflux, due to multiple pregnancies would be classified as $C_2E_PA_SP_R$
- Venous disability score
  - 1 - symptomatic; able to carry out usual activities without compression therapy
  - 2 - symptomatic; able to carry out usual activities with compression therapy
  - 3 - symptomatic; unable to carry out usual activities even with compression therapy

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TREATMENT

- Lifestyle changes
  - Leg elevation and increased lower extremity activity
- Compression hose
  - OTC – constant pressure gradient (< 20 mmHg)
  - Prescription strength – variable pressure gradient (20-30, 30-40, 40-50, > 50 mmHg)
  - Multi-layer compression wraps

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TREATMENT

- Venous procedures
  - Spider, reticular, or superficial veins without reflux
    - Sclerotherapy
  - Superficial venous reflux
    - Endovenous laser ablation (EVLA), endovenous radio frequency ablation (EVRA)
    - Injectables - vein glue (VenaSeal), polidocanol foam(Varithena)

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