The Scope of Venous Disease: Who Should Be Evaluated and How

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Disclosures

None
Venous Disease

• There is no accurate central database and very little awareness amongst health care providers and the public.

• Because of this venous disease remains a major cause pf preventable morbidity and mortality

• “Circulation” means circle of blood and VEINS ARE CRUCIAL TOO.
Scope of Venous Disease

- Venous varicosities
  - 40 mil Americans
  - Cosmetic and medical
- Venous ulcers
  - 2% of elderly population
- DVT
  - 2 mil Americans
- Pulmonary Embolism
  - 650,000 Americans
  - Second leading cause of sudden death
Scope of Venous disease

- Superficial thrombophlebitis
- Occlusive venous disease
  - External compression
    - May-Thurner syndrome (left common iliac vein is compressed by right common iliac artery)
    - Malignant / benign tumors
    - First rib
  - Stricture or blockage
    - Pacemaker and ICD leads
    - Infusion catheters
- Dialysis access issues
DVT’s and PE’s – Background

• Deep Venous Thrombosis (DVT)
  • Incidence 600,000 to 2 mil
  • 250,000 cases treated or hospitalized
  • Up to 1/3 will have a PE if untreated and 1/3 of those will die
Types of Deep Venous Thrombosis

• Proximal (much higher risk and long-term sequale)

• Distal
DVT’s and PE’s – Who’s at Risk?

• Deep Venous Thrombosis (DVT)
  • Risk Factors
    • Major risk factors (odds ratio >10)
      • Fracture (Hip or Leg)
      • Hip or Knee Replacement
      • Major General Surgery
      • Major Trauma
      • Spinal Cord Injury
DVT’s and PE’s – Who’s at Risk?

• Deep Venous Thrombosis (DVT)
  • Risk factors
    • Moderate Risk (odds ratio 2 – 9)
      • Arthroscopic Knee Surgery
      • Central Venous Lines
      • CHF or Respiratory Disease
      • Chemotherapy
      • Hormone Replacement Therapy
      • Malignancy
      • Oral Contraceptive Therapy
      • Patients with stroke
      • Thrombophilia
DVT’s and PE’s – Who’s at Risk?

• Deep Venous Thrombosis (DVT)
  • Risk factors
    • Minor Risk Factors
      • Bed rest >3 days
      • Immobility due to sitting or prolonged travel
      • Increasing age
      • Laparoscopic surgery
      • Obesity
      • Pregnancy
      • Varicose Veins
Making the Diagnosis

- Clinical suspicion
- Venous duplex
- Venography
- CT Venography
Prophylaxis of High Risk Patients

- Compression Stockings
- Compression Boots
- Low Molecular Weight Heparin
- Warfarin
- New factor Xa inhibitors
- Vena Cava Filters
Deaths from PE

• Second leading cause of sudden death

• Incidence of fatal PE ranges in the literature from 60,000 to 300,000 annually in the U.S.
PE Therapy

• IVC Filter – to prevent residual clot migration
• Thrombolytics
• Clot removal (aspiration or surgical)
• Extracorporeal circulation (for hemodynamic collapse)
Natural History of Central DVT

• Up to 60% may have post-phlebitic syndrome within two years
  • This is the cause of venous ulceration which carries tremendous morbidity and is the cause of multiple recurrent hospitalizations

• Incidence of recurrent DVT is very high
Therapy of DVT

- Anticoagulants (only prevent new thrombus)
- Thrombolysis
- Thrombectomy – mechanical or surgical
- Vena Cava filter
Anticoagulant Therapy

• Typically Heparin followed by Coumadin for six weeks to six months

• New oral anticoagulants

• If hypercoagulable state or recurrent Pes – anticoagulate indefinitely

• Two percent treated experience PE
Proximal Thrombus

- Clot removal and therapy of venous stenosis (when present) is essential
  - Lytic infusion
  - Mechanical lysis
  - Combination of mechanical and chemical lysis
Lytic Infusion

• Selective versus non-selective

• Advantages
  • Very effective in removing thrombus

• Disadvantages
  • Very expensive
  • Time consuming
  • Complications (bleeding)
Mechanical Lysis or Thromboembolectomy

• Less time consuming
• Doesn’t always remove all thrombus
• May have embolic complications
Therapy for Central Venous Occlusion

- Remove thrombus

- Open vessel
  - High-pressure balloons
  - Stents
  - Consider lead removal when caused by indwelling pacer or AICD leads
  - Removal of first rib
May Thurner Syndrome
A-V fistulas

• Occlusion is a recurrent problem
• May become occluded from
  - Thrombus
  - Stricture

• Treatment involves
  - Thrombectomy
  - Dilation – Risk of embolization causing PE or arterial occlusion
Often overlooked by care providers due to underappreciation of the magnitude and impact of the problem

Most common manifestations – dilated cutaneous veins (telangiectases, reticular veins, varicose veins)

Advanced disease – venous ulcers
Risk factors for varicose veins

- Genetic disposition - h/o varicose veins in family
- Gender - 1:3 women and 1:5 men affected
- Pregnancy - 30% develop vv\textsubscript{s} during 1\textsuperscript{st}, 55% during 2\textsuperscript{nd} trimester
- Prolonged standing or sitting
- Age – people > 50
- Obesity
- Tall people (increased hydrostatic pressure)
History

• Aching
• Heaviness
• Pain
• Tightness
• Tingling
• Skin irritation
• Pruritus
• Muscle cramps
• Varicose veins
History

- Age of onset of varicosities
- Family h/o varicose veins – present in 1/3rd of patients
- Personal h/o DVT, PE
- Ask specific questions – leg swelling
  - prolonged bed rest/travel
  - lower extremity injuries
  - chest pain, hemoptysis
  - anticoagulant use
  - past treatments for CVI
Who to evaluate

- Dull aching pain in legs
- Heaviness or cramping in legs
- Pain worse at end of day or prolonged standing
- Pain improves in am or with raising legs
- Leg edema
- Redness of legs and ankles
- Skin color changes around ankles
- Varicose veins
- Lipodermatosclerosis (thickening and hardening of skin on legs)
- Ulcers on legs and ankles
- Slow healing wounds
How to evaluate - Physical Exam

• General exam
• Detailed exam of lower extremities
• Standing position
• Groins to toes
• Inspect and palpate varicosities
• Record all major subcutaneous varicosities
• Varicosities of main saphenous trunk and spider veins
• Outline drawings of each limb – anterior and posterior views
• Presence of edema, angiomatous malformations
Physical exam - Palpation

• May detect additional varicosities not seen

• Terminal segments of the GSV and SSV before the SFJ and SPJ

• Also to detect temperature differences

• Areas of induration

• Firm subcutaneous cords (sequelae of prior thrombophlebitis)
Initial Evaluation – Cough Impulse Test

• Palpation of thigh at fossa ovalis over SFJ
• Standing position
• Patient asked to cough
• Palpable thrill at SFJ
• Due to turbulent retrograde flow
• Difficult in obese pts or with vigorous cough
Tap Test / Percussion Test

- Performed while palpating the SFJ
- Standing position
- GSV tapped at knee – Palpable transmitted impulse at SFJ suggests distended GSV with blood.
- SFJ is then tapped while GSV is palpated at knee – palpable transmitted pulse at knee indicates incompetent GSV valves between SFJ and knee
- High incidence of false negatives
- Historical interest
Brodie-Trendelenburg test

- To detect venous incompetence
- And to Differentiate between perforator and GSV incompetence
- Elevate legs to 45 degrees and squeeze from foot along course of vein to empty it
- Tourniquet is applied close to groin tight enough to prevent superficial vein reflux
- Patient asked to stand
- If distal veins collapsed for 15-20 seconds after standing – tourniquet released
- SFJ incompetence – if distal veins fill rapidly after tourniquet released
- Perforator incompetence – if distal veins fill with tourniquet in place
Brodie-Trendelenburg test

• Location of the incompetent perforator determined by varying the position of tourniquet
  
• Rapid filling when tourniquet in suprapatellar position – mid thigh perf.
  
• Rapid filling when tourniquet below the knee – lower leg perf.
  
• B-T test highly sensitive to identify superficial and perforator reflux

• Sensitivity – 91%

• Specificity – 15%
Perthes test

- Patient standing
- Tourniquet below knee
- Activate calf pump with 10 heel raises
- Emptying of varicose veins – site of reflux cranial to tourniquet
- Persistence of distended varicose veins – reflux caudal to tourniquet ie. Calf perforators
- Highly sensitive
- Poorly specific
Hand held continuous-wave Doppler

• Most commonly used in office setting
• Patient standing
• Probe over the SFJ
• Assistant performs calf compression
• GSV incompetent if there is reflux with release of calf compression
• Likewise for SPJ to elicit SSV incompetence
• Sensitivity – 97%
• Specificity – 73%
Venography

• Historical gold standard to diagnose VI
• Both for anatomic localization and hemodynamic quantification
• Invasive
• Complications – Chemical cellulitis, phlebitis
• False-positive results due to pressurized injection
• Severity of reflux does not correlate with severity of disease
Ascending venography

- To assess degree of patency of the deep system
- To identify perforators
- Butterfly needle in vein on dorsum of foot
- Tourniquet above ankle to occlude superficial veins and fill deep system
- Slow injection of 50 – 100 ml of contrast
- Calf, popliteal, femoral and iliac veins imaged sequentially
- Opacification of more cranial veins by raising calf
Descending venography

• To document presence of reflux
• To define valvular anatomy
• To identify specific incompetent valves
• In reverse Trendelenburg
• Catheter in CFV
• Slow hand injection
• Patient instructed to breathe normally – if reflux identified, individual incompetent valves in the CFV, profunda femoris vein, superficial femoral vein, and GSV are noted
• Patient asked to perform Valsalva – this increases resistance to prograde flow and causes valve closure and incompetent valves cause retrograde flow
• Was a historical gold standard along with venography for CVI
• 21-guage needle into dorsal foot vein connected to a transducer
• Baseline pressure while standing with weight on contralateral limb
• 10 heel raises one per second
• AVP is the lowest pressure achieved at the end of exercise
• Recovery time – time required for pressure to rise to 90% of baseline
• In normal limbs – calf pump forces blood up and competent valves prevent retrograde flow and pressure falls
• If valves incompetent – reflux occurs and pressure remains high
AVP

• AVP correlates with clinical severity of disease

• Incidence of ulceration increases with increase in AVP in linear fashion

• AVP < 30 mm Hg – ulceration never occurs

• AVP > 90 mm Hg – ulceration always occurs
Duplex Scanning

- Most useful initial diagnostic test
- Non-invasive
- Results are reproducible
- Allows anatomic, physiologic, and hemodynamic evaluation
- Performed with both B-mode imaging and spectral Doppler analysis
- Can identify underlying pathophysiology (reflux, obstruction, both)
- Localize disease to specific venous segments
Patient position for scanning GSV

- STANDING on floor or platform
- Facing the examiner
- Open stance
- External rotation of hip
- Knee slightly bent with heel flat
- Weight on contralateral limb
Patient position for scanning SSV

- STANDING on floor or platform
- Turned around facing away from examiner
- Open stance
- Step forward, knee slightly bent and heel flat
- Weight on contralateral limb
US – Tips and Tricks

• GSV – start at mid-thigh and then move to groin
• SSV – start at mid-calf and move to popliteal fossa
• Do not concern yourself with every tributary; concentrate on tributaries that are same size or larger than the truncal vein it is connecting with
• If a vein is < 2mm – no need for spectral doppler
• Do not waste time on perforators < 3mm
• Document normal and abnormal findings in main truncal veins
• Diameter measured in SAX (ant. to post. walls)
• Spectral doppler waveforms done in LAX
US - Conclusions

• Reflux is not STATIC

• Look for the source – does it match the clinical picture?

• Exam is very operator dependent

• Failure to identify and treat all sources may lead to early recurrence
Conclusions

- Venous diseases are underdiagnosed
- Accurate database lacking
- Need more awareness research to better understand problem and improvement
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