ULTRASOUND VENOGRAPHY
SCAN PROTOCOL

• Linear array transducer for thigh and calf veins
  • 5MHz-9MHz
• Curvilinear transducer for pelvic and abdominal veins
  • 2MHz-6MHz
SCAN PROTOCOL
ILIO-FEMORAL SEGMENT

• Patient supine - trunk slightly elevated
• Common femoral vein - Valsalva response
  • abnormal: scan iliac veins
  • normal: proceed distally
• Femoral veins
  • scan both in longitudinal and transverse planes
  • look for complete colour “fill-in” of the vessels
  • compression (look out for incompressible segments!)
SCAN PROTOCOL
POPLITEAL SEGMENT

• Lateral decubitus with slight knee bend
  • scan both in longitudinal and transverse planes
  • look for complete colour “fill-in”
  • compression
SCAN PROTOCOL
THE CALF VEINS

• Most easily visualised with leg dependant
• Scan in sitting position
• Starting in mid calf scan proximally and distally
• Scan predominantly in longitudinal plane but transverse can also be useful
THE CALF VEINS
SCANNING TIPS

• Positive anatomical identification
  • Deep veins
    • lie deep to the facia between the muscle fascia
    • accompanied by an artery and are paired distal to the knee
  • Muscular veins
    • lie within the muscle and do not run in the facial planes
    • accompanied by a small artery and are paired
  • Superficial veins
    • usually lie between the deep and superficial fascia
    • not accompanied by an artery
  • Perforating veins
    • connect deep to superficial system
    • do not run in the fascial planes
NORMAL VEINS
B-MODE APPEARANCE

• Vein lumen is echo free
• Interior surface of the vein wall is smooth
• The wall itself should be thin with no structure
• Valves when seen should be free to move
NORMAL VEINS COMPRESSIBILITY

- Uniform compressibility
- Complete apposition of anterior & posterior wall
- Minimal probe pressure
- Note - Incompressible segments
NORMAL VEINS
RESPIRATORY CHANGES

• Diameter of large veins increase with deep inspiration or valsalva

• Venous system proximal to point of examination is patent
NORMAL VEINS
FLOW PARAMETERS

• Spontaneous flow with respiration
• Phasic flow with respiration
NORMAL VEINS AUGMENTATION

• Manual compression of the extremity distal to site of examination should increase venous flow

• Confirms patency between examination and compression site

• Absent or delayed & weak response suggest a substantial obstruction distal to examination site

• Partial obstruction or minor clot may not alter the augmentation response
NORMAL VEINS
VALSALVA MANOEUVRE

• Valsalva should result in abrupt cessation in flow
• Demonstrates the patency of the venous system from the point of examination to the thorax
• Useful in documenting the patency of the iliac veins
• Abnormal response to valsalva occurs only in MAJOR obstructions
RECENT (ACUTE) THROMBUS

- Low echogenicity intraluminal material producing flow and colour void
  - very recent clot may be almost completely anechoic

- Venous distention
  - most important criterion of acute clot

- Loss of compressibility
  - not so important with CDI
ACUTE DVT
ACUTE DVT
ACUTE DVT
ACUTE DVT

ACUTE PROX FEM VEIN DVT

LEFT ACUTE PROX FEM DVT

PROFUNDA
ACUTE DVT

L POP V DVT

DUPlicated POP V
ACUTE DVT
PROBLEMATIC AREAS

• Isolated iliac DVT
• Isolated calf vein DVT
• Duplication of femoral & popliteal veins
• Partially occlusive clot
• Chronic vs. acute DVT
ISOLATED ILIAC DVT

- Isolated iliac DVT occurs in <1% of general DVT population
- High risk groups
  - pregnancy
  - malignancy
  - pelvic surgery
ISOLATED ILIAC DVT

- Indirect assessment
  - flow pattern (phasicity)
  - response to Valsalva

- Direct imaging
HOW SHOULD WE DIAGNOSE ISOLATED ILIAC DVT?

• Look for phasicity of femoral waveform
• Perform a Valsalva manoeuvre if unsure
• Remember
  • indirect assessment suggestive but not definitive
  • spontaneous flow pattern may still persist in the presence of clot - particularly partially occlusive clot
  • can still maintain normal response to valsalva in the presence of clot - again particularly partially occlusive clot
• Iliac veins should be scanned, especially in high risk patients
• Scanning of iliac veins should be possible in majority of cases
ISOLATED CALF VEIN DVT

- Isolated calf vein DVT only occurs in 15% of positive DVT studies
- Calf vein DVT important because
  - potential to propagate (~20% of cases within 72hr)
  - potential to embolise and cause PE (low risk)
  - post thrombotic syndrome
ISOLATED CALF VEIN DVT
ISOLATED CALF VEIN DVT
DUPLICATIONS

• Duplication of the femoral vein occurs in ~20% of the population
• Duplication of the popliteal vein higher
• DVT can occur in one or both branches of the vein
• Duplication best seen in transverse plane
DUPLICATIONS
PARTIALLY OCCLUSIVE CLOT

- Isolated partially occlusive DVT is a rare occurrence (high risk cases)
- Problematic because it does not necessarily change the flow pattern
- Best seen in transverse plane and on colour flow
PARTIALLY OCCLUSIVE CLOT

- Adhere to the wall or appear as free floating
- Best demonstrated on colour image
ACUTE VS CHRONIC DVT

- Acute DVT
  - venous distension (probably the most important diagnostic criterion for acute DVT)
  - low echogenicity intraluminal material producing flow and colour void (very recent clot may be completely anechoic)
  - compressibility - non discriminatory
ACUTE VS CHRONIC DVT

- Chronic DVT
  - eccentric linear recanalisation of vessel
  - collateralisation
  - venous reflux
  - “tatty” vessels (vein wall thickening)
  - no venous distention (for occlusive clot)
  - compressibility - non discriminatory
  - more echoic clot (non-specific)
ACUTE VS CHRONIC
(SUMMARY)

• Acute
  • venous distention

• Chronic
  • venous reflux
  • eccentric linear recanalisation
  • collateralisation

• Non-specific
  • echogenicity
    • completely echolucent - acute
  • vein wall thickening
MUSCULAR VEIN THROMBOSIS

- Thrombosis of muscular veins not uncommon
  - Gastrocnemius most common
  - Soleal also possible
- Paired with a small artery
  - Confused for paired deep veins
  - Can propagate into deep system
SUPERFICIAL THROMBO-PHLEBITIS

- Superficial thrombo-phlebitis common
- cause of pain and swelling
- raises D-dimer value
- can propagate into deep system
SUPERFICIAL THROMBO-PHLEBITIS
OTHER PATHOLOGIES

BAKERS CYSTI

SUPERFICIAL OEDEMA
CHALLENGES OF COLOUR DOPPLER VENOGRAPHY

Practical

• Oedema
• Obesity
• Pain
• Wounds/dressings
• Immobility
• Scanner setting
• Chronic venous disease
COMPLICATIONS – A WORD OF CAUTION

• Venous duplex ultrasonography causing acute pulmonary embolism: a brief report
  • Schroder et al; J. Vasc. Surg. 15; 1082; 1992

• I prefer using CDI
  • less likely to break of clot
  • better diagnostic accuracy
    • see partial filling
    • don’t have to worry about incompressible segments
THANK YOU FOR YOUR ATTENTION