**Peripheral Arterial Duplex**
George L. Berdejo, BA, RVT, FSVU

2021 Leading Edge in Diagnostic Ultrasound Conference
MAY 11-13, 2021

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**Objective**

- To discuss our philosophy regarding the practical use of duplex ultrasound for the evaluation of the PAD patient

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**Lower extremity arterial evaluation**

**Outline**

- Thoughtful/Strategic approach
  - Screening
  - Definitive diagnosis
  - Pre-intervention mapping
    - Claudication
    - Limb salvage

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**Lower extremity duplex evaluation**

**Technology**

- B-mode and color flow image
  - Quickly identify and distinguish patent from occluded vessels

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**Lower extremity duplex evaluation**

**Technology**

- Doppler derived velocities/waveforms:
  - Doppler derived velocity measurements guided by imaging
  - Triphasic is "normal"
  - 2-3x increase of the velocity at suspected stenosis
    - Only for the most proximal lesion
  - Problems with multilevel disease
    - Complicated secondary to the loss of energy through a stenosis

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**Peripheral Arterial Duplex Mapping**

- Role of the duplex ultrasound has evolved
  - Pre-intervention imaging/mapping: endovascular vs open interventional approach
  - Stenosis severity, location and length of lesion, status of distal runoff
  - Intra-op arteriogram

*Detect and localize disease and eliminate the need for routine diagnostic arteriography*
Etiologies for LE Ischemia

- Luminal narrowing
  - Atherosclerotic plaque
  - Extraneous compression
- Vascular trauma
  - Bleeding
  - Dissection
  - Thrombosis
  - A-V fistula
- Tumors
  - Benign
  - Malignant

Thromboses
- Embolism
- Acute occlusion

Aneurysms
- Rupture
- Thrombosis
- Embolism
- Occlusion

Inflammation
- Vasoc旅途onsction
- Wall thickening
- Occlusion

Approach and strategy varies
- Claudication
- Gangrene / ulceration
- Trauma / iatrogenic injury
- Emboli
- Rest pain
- Acutely ischemic leg

Screening
- Anterior and posterior tibial artery waveforms (peroneal not necessary)
- Ankle brachial index
  - Diabetics especially long term insulin users
  - High risk of calibration and falsely elevated ABI

Doppler waveforms
- CFA, mid SFA, AT and PT at the proximal calf and ankles
- ABI <0.7; multilevel disease
- Better idea about location

Not a one size fit all deal
- Unilateral vs bilateral
- Complete versus limited exam
  - Iliacs or not; full leg or not
  - assess every patient as an individual and perform the test/s that are most appropriate given the patient’s history, physical examination, clinical presentation and the question at hand.

Screening - Definitive diagnosis
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Conversation with the referring physician to elucidate the rationale for the examination
- History and physical; what are the symptoms
- Determines which test/s is best in that patient

How to start

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Strategic Use of Duplex Ultrasound

Arterial mapping – intention to treat only
- Expands on the definitive diagnosis
- Claudicants – chronic condition
  - Color flow scan (femoro-popliteal evaluation)
  - Quick scan in groin & thigh through the PopA
  - DFA IMPORTANT vessel!
  - Extensive imaging of the infrapopliteal vessels

Lower extremity duplex evaluation

- Aorta and iliac arteries (NPO+)
  - Low threshold - fem pulse or thigh PVRs, symptoms, duplex finding
  - Low frequency transducer for the proximal segment of examination
  - Aortic bifurcation is best seen with the patient turned to the left side w/ txd just in front of right iliac crest
  - Or…start at the groin level and follow the arteries proximally

Tibial arteries (to the ankle)
- TPT, anterior/posterior tibial and peroneal arteries
- Most “difficult” & time consuming
- Low PRF and narrow color box
- Bottom-up technique
- Assess for patency
  - Difficult to quantify stenosis
  - Absence of elevated velocity does not exclude stenosis

Pedal vessels
- Distal anterior tibial / dorsalis pedis and posterior tibial artery
- Superficial / low pressure
- High frequency transducers
- Mark area that is best for anastomosis
- Attention to flow direction
• PTA low flow – three level disease
• Could not obtain ABI – planned for an amputation
• Vein mapping at same time

Lower extremity duplex evaluation
• Helpful hints!
  – Make patient comfortable
  – Observe proper body mechanics; Get comfortable

Create The Map As You Go Along

Sample Report
• The common and deep femoral arteries are patent and without stenosis.
• The deep femoral artery is a large vessel (6.8 mm) with multiple large branches noted.
• The superficial femoral artery is occluded 1 mm beyond its origin for a length of 17 cms.
• The popliteal artery is reconstituted 6 cms above the knee. It is diffusely diseased but without stenosis through the tibio-peroneal trunk.
• There is 2 vessel runoff to the foot via the peroneal and the anterior tibial arteries.
• There is no flow seen in the posterior tibial artery in the mid and distal calf to the ankle.

Report
• Patent or not
• Calcifications/limitations
• Less or greater than 50% stenosis or occluded
• Location of lesion (flush SFA occlusion)
• Length of lesion
• Anatomic landmarks
• Status of runoff
• No velocities / no waveform descriptors
• Like an arteriogram

Lower extremity duplex evaluation
• Problem areas/challenges
  – Pelvic vessels
  – Adductor hiatus
  – Popliteal trifurcation
  – PerA
  – ATA
  – DP at the extensor crease
Strategic Use of Duplex Ultrasound

Conclusion

• Thoughtful planned, intentional approach
  – Eliminate extensive protocols that ignore clinical conditions and treatment preference options
  – Eliminate unnecessary arteriography
  – Allows use of simplified protocol driven US imaging that is patient/treatment relevant
  – More efficient and more effective