The Clinically Relevant Carotid Examination: Protocol and Documentation

Phillip J Bendick, PhD RVT FSDMS
Vascular Sonography Education

Carotid Duplex Ultrasound

Where should one begin?

Standardize the testing protocol

Carotid Duplex Ultrasound

CCA

RIGHT or LEFT ??
Carotid Duplex Ultrasound

- Cross-sectional imaging views from feet toward head

Carotid Duplex Ultrasound

- Carotid survey through the system
- Determine relevant anatomy

Carotid Duplex Ultrasound

- CCA - Anatomy
  - Survey through vessel – Proximal Mid Distal
  - Dz location

Carotid Duplex Ultrasound

- Longitudinal imaging of carotid places heart to the Right and head to the Left – Normal carotid flow direction is Right-to-Left

Carotid Duplex Ultrasound

- Document the examination

What’s next?

Document the examination
Carotid Duplex Ultrasound

Documentation:
- Imaging
- Velocity measurements

Carotid Duplex Ultrasound

CCA - Anatomy
- Survey through vessel – Proximal, Mid, Distal
- Dz location
- CDI as needed

Carotid Duplex Ultrasound

CCA - Doppler
- Survey through vessel
- Spectral waveform morphology
- Dz location

If flow abnormality on Right, evaluate Innominate Art

Carotid Duplex Ultrasound

CCA - Doppler
- Survey through vessel
- Spectral waveform morphology
- Dz location
- Standardize site for ICA/CCA ratio

Slovut J Vasc Surg 2010
Carotid Duplex Ultrasound

- Bifurcation
- ICA versus ECA

Carotid Duplex Ultrasound

- ECA – Anatomy
  - Antero-medial
  - Smaller vessel
  - Branches
  - CDI as needed

Carotid Duplex Ultrasound

- ECA – Anatomy
  - Evaluate origin and proximal segment

Carotid Duplex Ultrasound

- ECA - Doppler
  - Origin / Prox
  - Spectral waveform morphology
  - Dz presence and severity (Kim JUM 2010, PSV > 200)

Carotid Duplex Ultrasound

- ECA - Doppler
  - Origin / Prox
  - Spectral waveform morphology
  - Presence and severity of disease
  - Source of bruit?
Carotid Duplex Ultrasound

- ICA – Anatomy
  - Postero-lateral
  - Larger vessel

- Evaluate entire extent of vessel:
  - Orig / Prox
  - Mid
  - Distal
  - CDI as needed
Carotid Duplex Ultrasound

- ICA - Doppler
  - Survey through vessel:
    - Orig / Prox
    - Mid
    - Distal
  - PSV, EDV
  - Spectral waveform morphology
  - Dz location

Documentation:

- Imaging

Carotid Duplex Ultrasound

Documentation:

- Imaging
  - Additional:
    - Long axis – Prox/Mid CCA, Mid/Dst CCA, Bif, Orig/Prox ICA
    - Mid/Dst ICA, Orig/Prox ECA, Mid Vertebral
    - Xverse – Mid/Dst CCA, Bif/Bulb, Prox ICA/ECA

Carotid Duplex Ultrasound

Documentation:

- Imaging
  - Color Doppler imaging is complementary to gray scale

Carotid Duplex Ultrasound

Documentation:

- Velocity measurements
  - CCA: Prox, Mid/Dst
  - ECA: Origin/Prox
  - ICA: Orig/Prox, Mid, Dst
  - Vertebral: Mid
Carotid Duplex Ultrasound Documentation:
- Velocity measurements
- Throughout entire stenotic region

Diagnosis?

New Diagnosis?

Correct Diagnosis!!

Correct Diagnosis!!
Make sure there is adequate sampling throughout the region of interest.

If velocity data is to be of value –
Sample volume placement
Doppler scale / gain

If velocity data is to be of value –

Documentation:
“The degree of stenosis estimated by using ICA PSV and the degree of narrowing of the ICA lumen on gray scale and color Doppler images should be similar.”

SRU Consensus Statement - Grant et al, Radiology 2003

Vertebral - Anatomy
- From mid CCA, rock probe posterior
- Identify spinal transverse processes
Carotid Duplex Ultrasound

- Vertebral - Anatomy
  - From mid CCA, rock probe posterior
  - Identify spinal transverse processes
  - Place sample volume between bony processes
  - Nl PSV 20-60
  - CDI as needed

- Vertebral - Doppler
  - Sample proximal if suspect disease
  - Right ~ 80%
  - Left ~ 70%

5-10% of patients with VA disease (Kock J Neuroimaging 2009)
PSV > 150 (Hua AJR 2009)
Carotid Duplex Ultrasound

- Vertebral - Doppler
  - Sample mid-vessel
  - Determine flow direction
  - Spectral waveform morphology
  - Sample proximal if suspect disease
  - If flow abnormality, check subclavians

- Vertebral - Doppler
  - Sample mid-vessel
  - Determine flow direction
  - Spectral waveform morphology
  - Sample proximal if suspect disease
  - Watch for vertebral vein