

CAROTID ARTERY US PROTOCOL

Purpose:

- To evaluate the extracranial carotid and vertebral arteries to characterize plaque location, morphology and severity.

INDICATIONS:

- Cerebrovascular disease.
- Transient ischemic attack.
- Cerebral infarct.
- Stroke symptoms.
- Unilateral weakness/paralysis (hemiparesis/hemiplegia).
- Slurred speech.
- Syncope.
- Vision changes.
- Carotid bruit.
- Status post carotid endarterectomy.
- Stenosis follow-up.
- Vertebro-basilar syndrome/insufficiency.
- Preoperative evaluation.
- Trauma.
- Retinal artery emboli.
- Giant cell arteritis.
- Head or neck mass.

CONTRAINDICATIONS:

- Patients with bandages, casts or other hardware that precludes adequate assessment of an artery or arterial segment.
- Patients who are unable to cooperate due to mental status changes or involuntary movements.

EQUIPMENT:

- 5-7 MHz linear probe

PATIENT PREPARATION & ASSESSMENT:

- Introduce yourself to the patient.
- Verify patient identity via two patient identifiers (name and date of birth) per hospital policy.
- Explain the examination, its purpose and how long it will take.
- Answer any questions the patient may have regarding the examination.
- Obtain patient history including symptoms, signs, risk factors and other relevant history.

GENERAL GUIDELINES:

- Optimize equipment gain and display settings with respect to depth, dynamic range and focal zones while imaging vessels.
- Add color Doppler to supplement grayscale images with proper color scale to demonstrate areas of high flow and color aliasing.
- Use power Doppler to validate low flow states or occlusions.
- Set spectral Doppler gains to allow a spectral window and optimized to reduce artifacts.
- Cursor sample size will be small and positioned parallel to the vessel wall and/or direction of blood flow.
- A spectral Doppler angle of 45-60 degrees or less will be used to measure velocities. Note exceptions to these angles on the technologist worksheet.
- The ICA/CCA ratio is calculated using the normal CCA PSV and the highest ICA PSV.
- Areas of suspected stenosis or occlusion will include spectral Doppler waveforms and velocity measurements recorded at and distal to the stenosis or occlusion.
- Sites of intervention (stents and bypass grafts) will include spectral Doppler waveforms and velocity measurements from the proximal, mid and distal aspects of the stent/graft, as well as, in the native artery just proximal to the stent/graft and in the native vessel just distal to the stent/graft.
- Plaque should be assessed for severity and characterized (i.e. hypoechoic, echogenic, shadowing, mixed).
- Send the measurements screenshot page if your machine is capable.
- For focal lesions (masses, cysts, nodules, lymph nodes, fibroids) obtain split-screen images of the lesion without calipers, with calipers and with Color Doppler.
- Any deviations from the standard protocol and any limitations to the examination should be documented on the technologist worksheet for future reference and for repeatability in follow-up studies.
- Report preliminary critical findings to the referring clinician when appropriate (i.e. immediate medical attention may be warranted) and according to hospital policy.

DOCUMENTATION:

Brachial Blood Pressures

- Obtain blood pressures from both arms.

Grayscale Imaging

- Document longitudinal grayscale images of the following:
 - Common carotid artery (CCA) proximal
 - Common carotid artery (CCA) distal (with IMT measurement on backwall just proximal to bulb, normal thickness is ≤ 0.9 mm)
 - Internal carotid artery (ICA)/bulb (also document Color Doppler image here)
 - External carotid artery (ECA)/bulb
- Document transverse grayscale images of the following:
 - Common carotid artery (CCA) proximal
 - Carotid bulb
 - ICA/ECA bifurcation

Spectral Doppler Waveforms

- Document longitudinal spectral Doppler waveforms with PSV and EDV measurements of the following:
 - Common carotid artery (CCA) proximal

- Common carotid artery (CCA) distal
- Internal carotid artery (ICA) proximal
- Internal carotid artery (ICA) mid
- Internal carotid artery (ICA) distal
- External carotid artery (with temporal tap if needed to identify)
- Vertebral artery (noting direction of flow)

SPECIAL CIRCUMSTANCES:

- Carotid Stents – In variation to the normal protocol described above, document grayscale and color Doppler images and spectral Doppler waveforms with PSV and EDV measurements in the proximal and distal aspects of the CCA, the proximal, mid, and distal aspects of the ICA stent and in the distal unstented aspect of the ICA.

DISEASE GRADING:

- Unstented ICA stenosis grading:

Stenosis	Primary Parameters		Secondary Parameters	
	ICA PSV	Plaque Estimate	PSV Ratio	ICA EDV
None	<180 cm/sec	None	<2.0	<40 cm/sec
Mild (<50%)	<180 cm/sec	≤50%	<2.0	<40 cm/sec
Moderate (50-69%)	180-230 cm/sec	≥50%	2.0-4.0	40-100 cm/sec
Severe (≥70%)	>230 cm/sec	≥50%	>4.0	>100 cm/sec
Near Occlusion	variable	visible	variable	variable
Total Occlusion	no flow	visible	NA	NA

- Stented ICA stenosis grading:

Stenosis	In Stent PSV	Stent:CCA Ratio
None	<150 cm/sec	<2.15
Mild (20-49%)	150-219 cm/sec	2.15-2.69
Moderate (50-79%)	220-339 cm/sec	2.70-4.14
Severe (≥80%)	≥340 cm/sec	≥4.15

- ECA stenosis grading:

Stenosis	ECA PSV	ECA/CCA	Caveat
>50%	>148 cm/sec	≥1.45	if ICA <50% stenosis
>50%	>179 cm/sec	≥1.89	if ICA >50% stenosis

- Vertebral stenosis grading:

Stenosis	PSV	PSV Ratio	EDV
None	<85 cm/sec	<1.3	<27 cm/sec
Mild (<50%)	85-139 cm/sec	1.3-2.0	27-34 cm/sec
Moderate (50-69%)	140-209 cm/sec	2.1-3.9	35-49 cm/sec
Severe (≥70%)	≥210 cm/sec	≥4.0	≥50 cm/sec

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