Carotid Duplex Protocol

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SOCIETY FOR VASCULAR ULTRASOUND
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No disclosures

Policy and Procedure

Policy and Procedure

These documents cover the big picture of how an area of testing is approached including:

- Indications
- Patient history
- Physical exam
- Risk factors
- Patient positioning
- Exam technique considerations

Protocol: image sequence

Sequence	Location	Level	Orientation	Mode	Label
1.	Common carotid artery		Trans/Long Split	B	CCA
2.	Bifurcation		Trans/Long Split	B	Bif (Label ICA/ECA)
3.	Internal carotid artery	Proximal	Trans/Long Split	B	ICA Proximal
4.	Internal carotid artery	Mid	Trans/Long Split	B	ICA Mid
5.	Common carotid artery	Proximal	Long	C/D	Calcs Package
6.	Common carotid artery	Mid	Long	C/D	Calcs Package
7.	Common carotid artery	Distal	Long	C/D	Calcs Package
8.	External carotid artery		Long	C/D	Calcs Package
9.	Internal carotid artery	Proximal	Long	C/D	Calcs Package
10.	Internal carotid artery	Mid	Long	C/D	Calcs Package
11.	Internal carotid artery	Distal	Long	C/D	Calcs Package
12.	Vertebral Artery	Mid	Long	C/D	Calcs Package
13.	Subclavian Artery	Proximal	Long	B	SCA
14.	Subclavian Artery	Proximal	Long	C/D	Calcs Package

Evaluate fully

B-mode Imaging

1. Transverse from clavicle to mandible

a. Proximal common carotid artery (CCA)

b. Mid CCA

c. Distal CCA

d. Bifurcation

e. Proximal internal carotid artery (ICA)

f. Mid/distal ICA

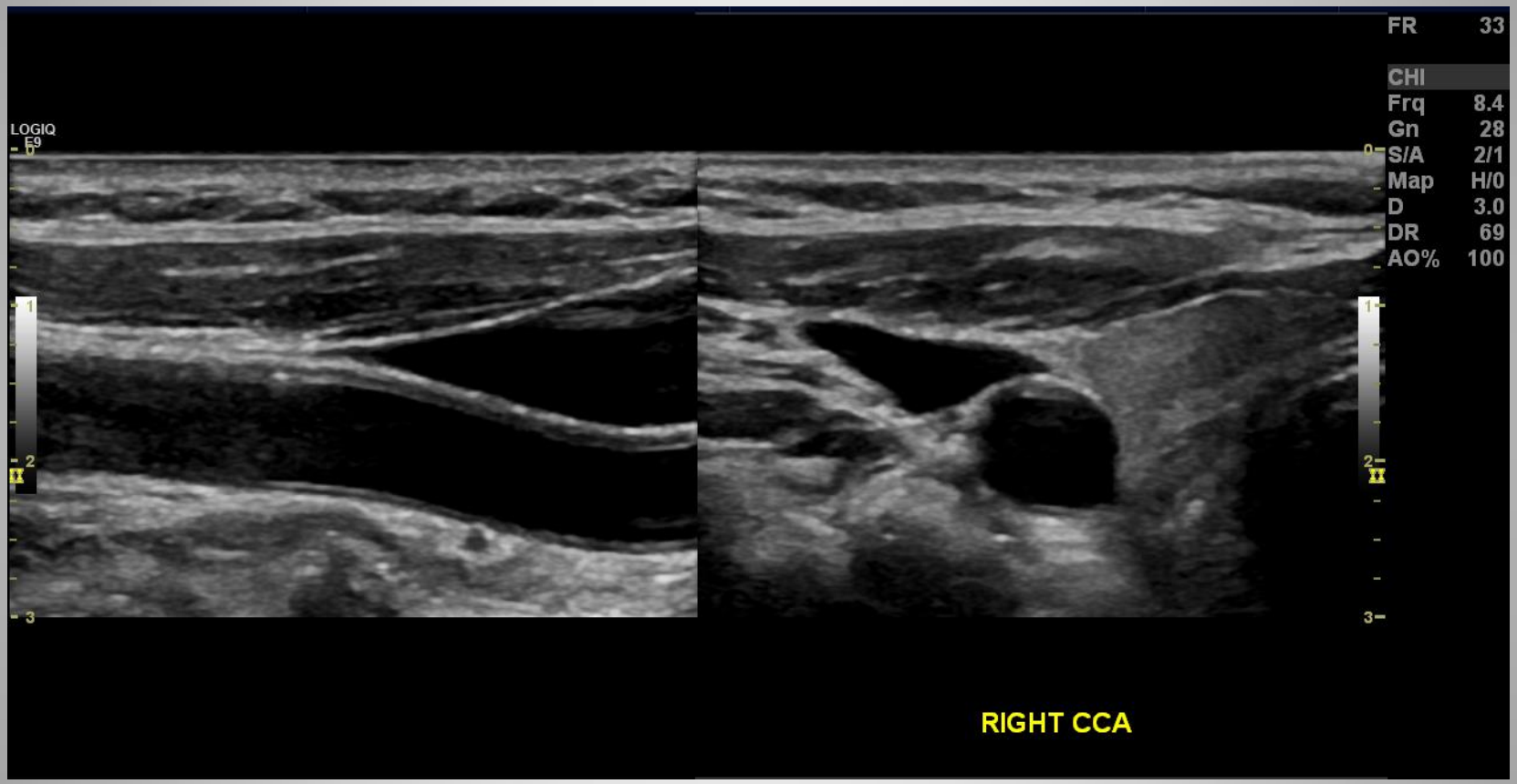
Evaluate fully

2. Longitudinal plane from clavicle to mandible
   a. Proximal common carotid artery (CCA)
   b. Mid CCA
   c. Distal CCA
   d. External carotid artery (ECA)
   e. Proximal internal carotid artery (ICA)
   f. Mid ICA
   g. Distal ICA

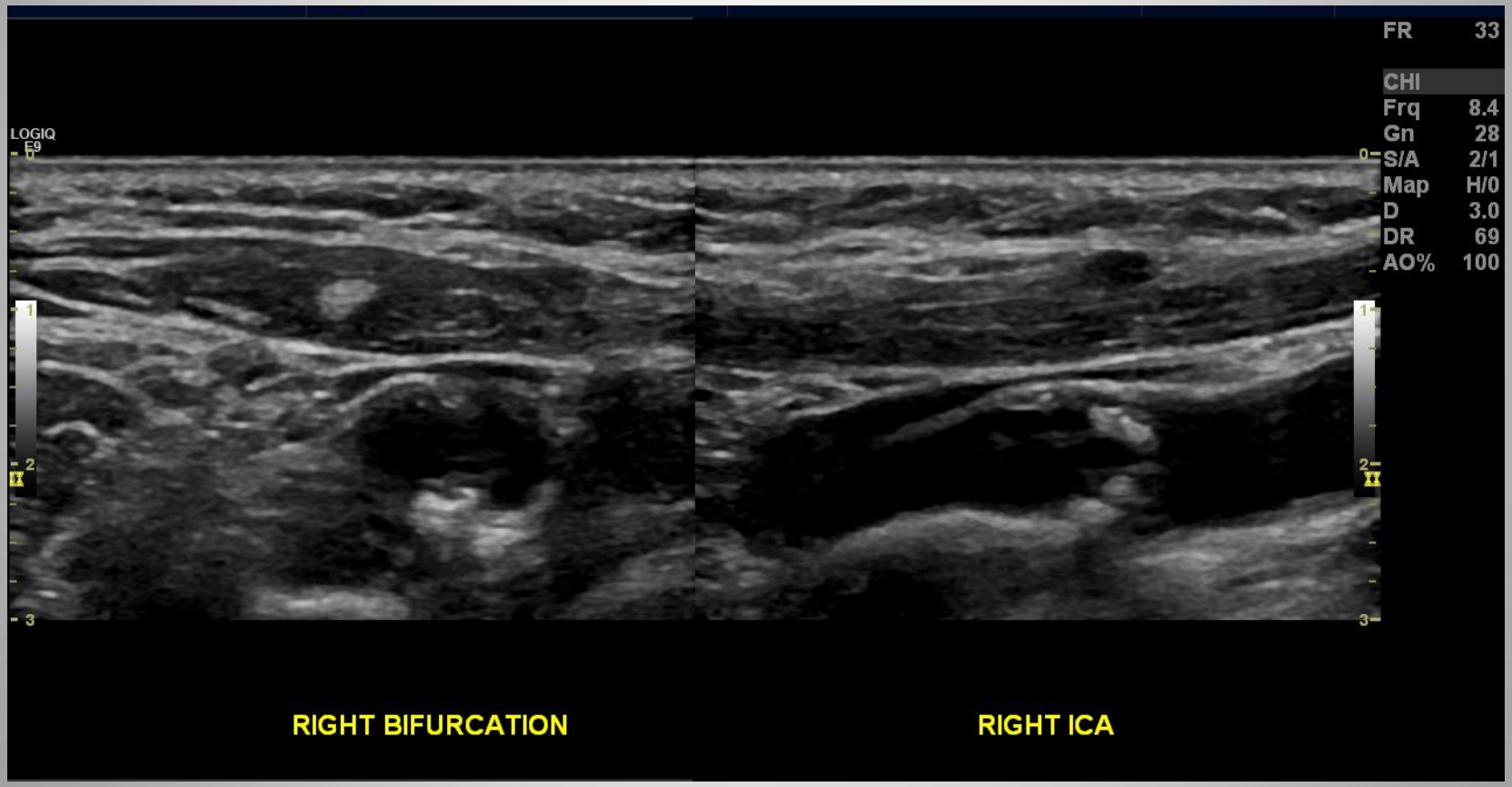
Identify the location in the CCA where velocity is uses to calculate ICA/CCA ratio

- Mid CCA velocity to be used in the ratio should be obtained about 2 cm proximal to the flow divider
- Do not say “bulb” as this is not a region but an anatomic widening that occurs in the distal CCA to proximal ICA
- Watch angle correction: align to vessel walls

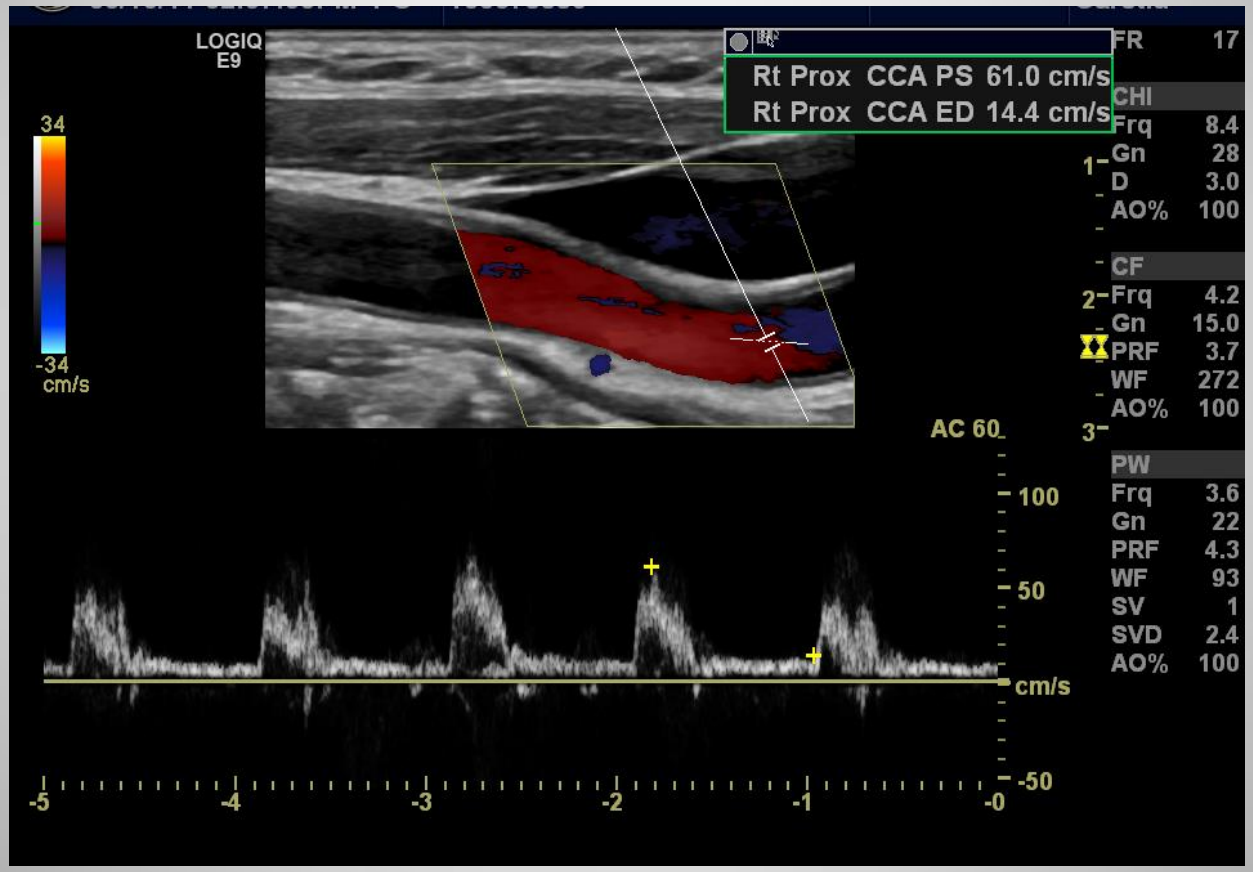
Protocol


LOGIQ
E9
FR 33
CHI
Frq 8.4
Gn 28
S/A 2/1
Map H/0
D 3.0
DR 69
AO% 100
RIGHT CCA

Protocol


LOGIQ
E9
FR 33
CHI
Frq 8.4
Gn 28
S/A 2/1
Map H/0
D 3.0
DR 69
AO% 100
RIGHT BIFURCATION
RIGHT ICA

Protocol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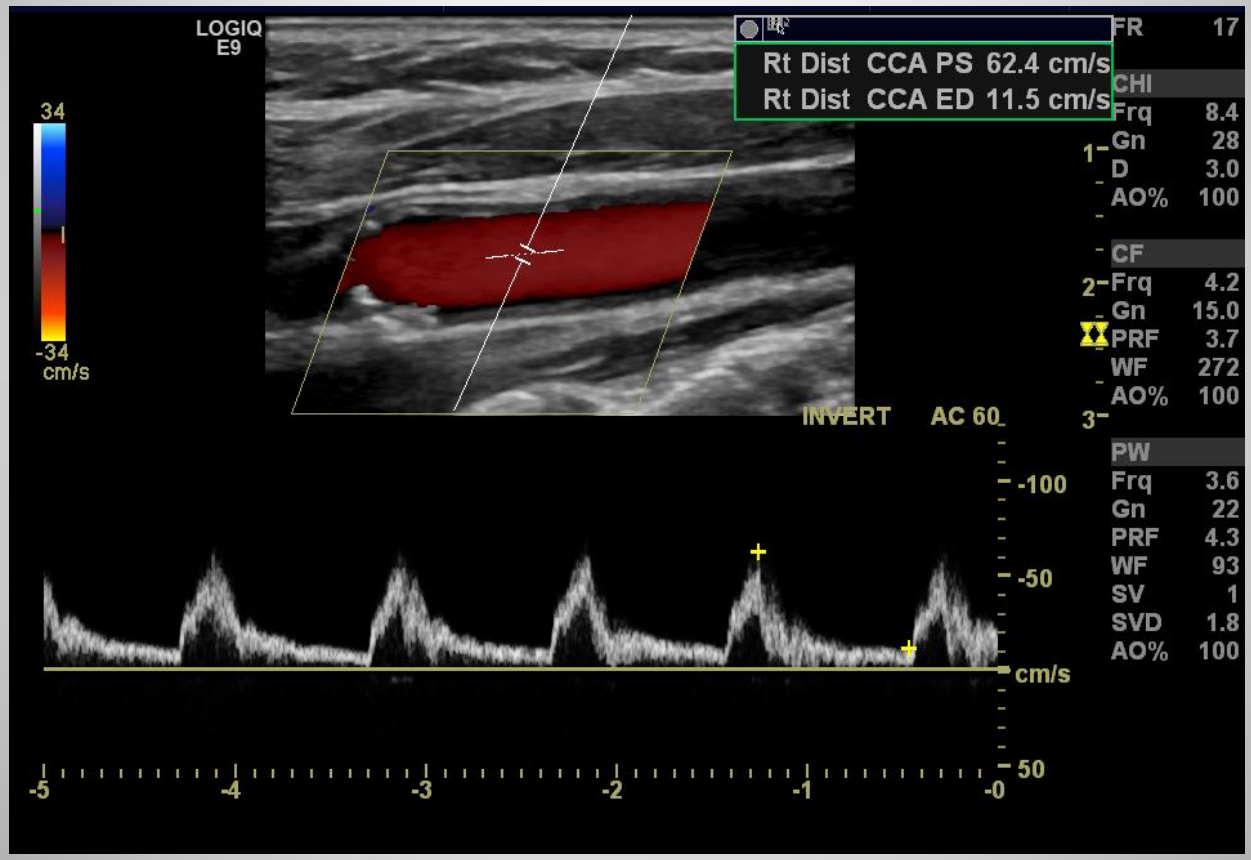
Rt Prox CCA PS 61.0 cm/s
Rt Prox CCA ED 14.4 cm/s
34
-34
cm/s
AC 60
100
50
cm/s
-50
-5
-4
-3
-2
-1
-0
FR 17
CHI
Frq 8.4
Gn 28
D 3.0
AO% 100
CF
Frq 4.2
Gn 15.0
PRF 3.7
WF 272
AO% 100
PW
Frq 3.6
Gn 22
PRF 4.3
WF 93
SV 1
SVD 2.4
AO% 100

Protocol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Rt Dist CCA ED 11.5 cm/s
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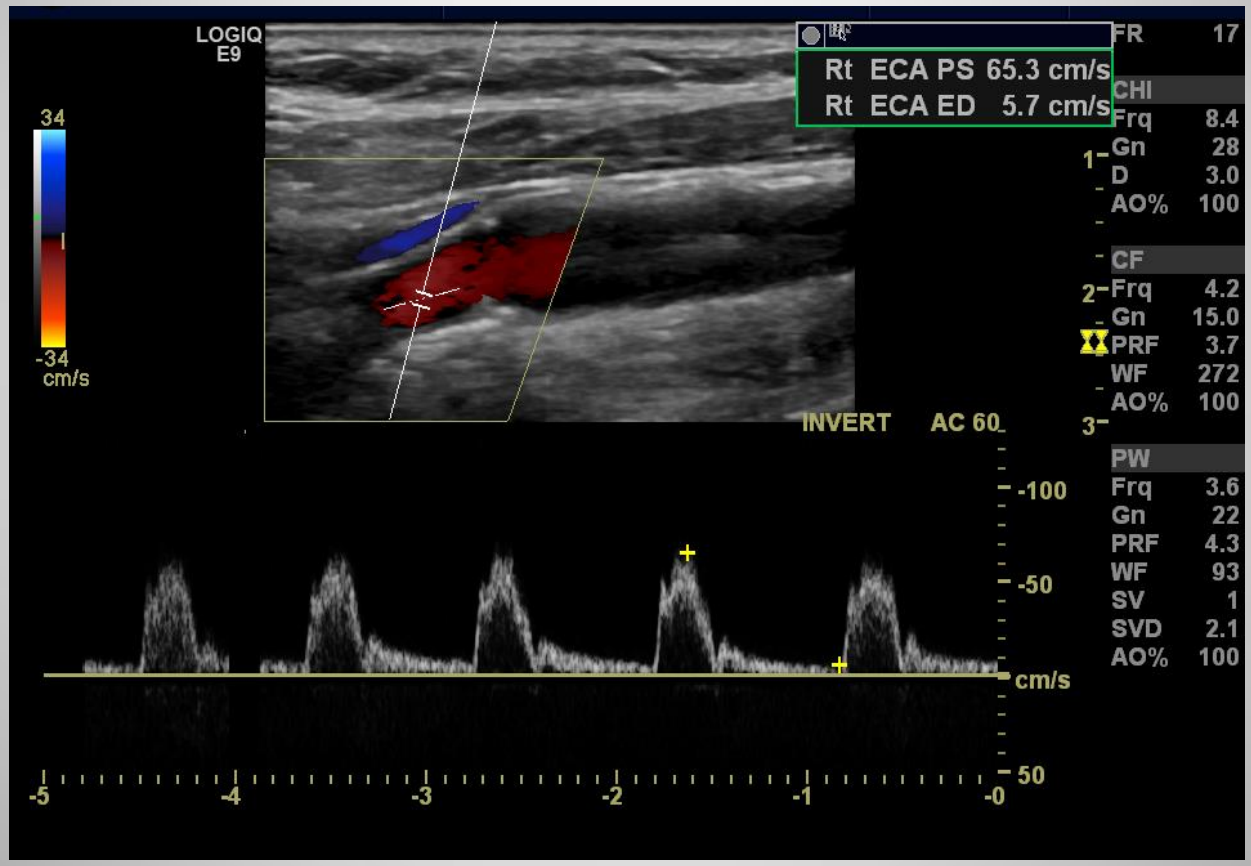
-34
cm/s
INVERT
AC 60
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0
FR 17
CHI
Frq 8.4
Gn 28
D 3.0
AO% 100
CF
Frq 4.2
Gn 15.0
PRF 3.7
WF 272
AO% 100
PW
Frq 3.6
Gn 22
PRF 4.3
WF 93
SV 1
SVD 1.8
AO% 100

Protocol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Rt ECA ED 5.7 cm/s
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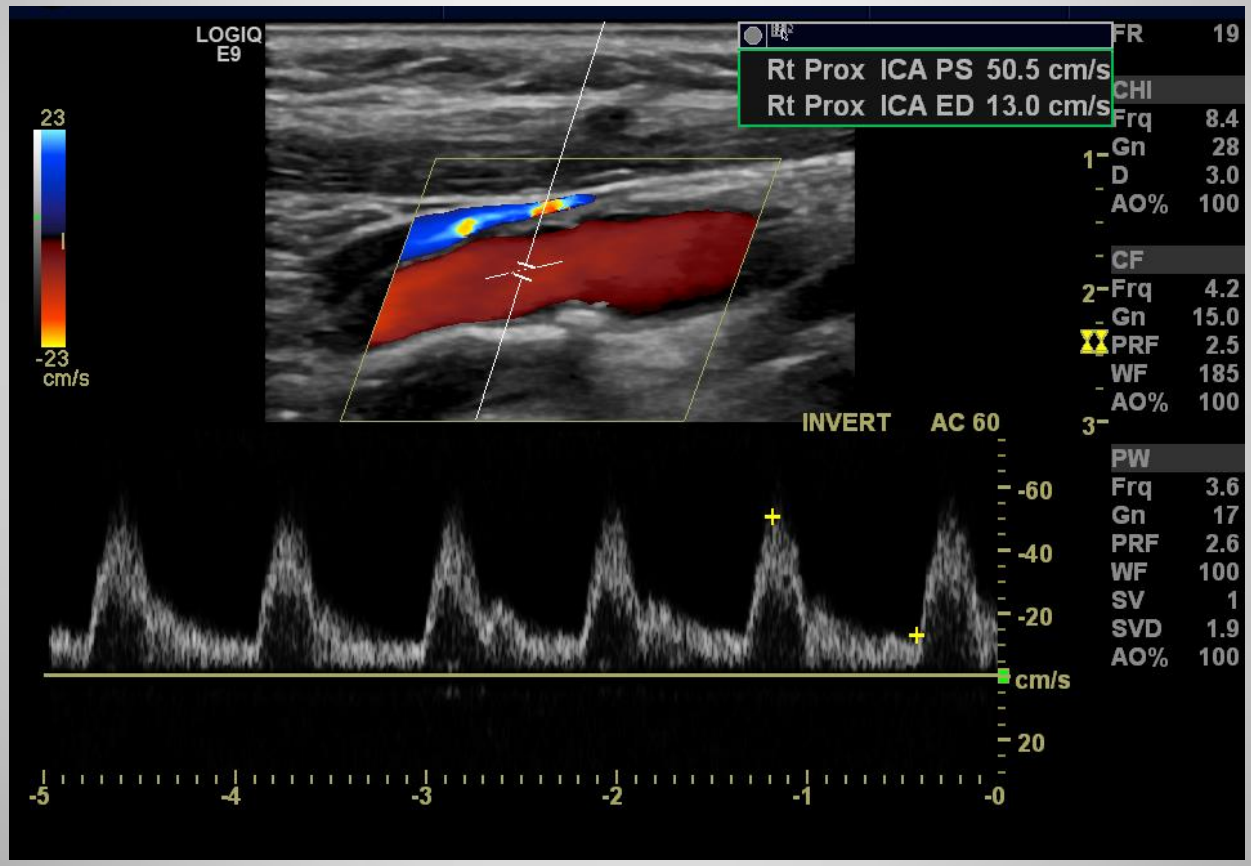
-34
cm/s
INVERT
AC 60
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0
FR 17
CHI
Frq 8.4
Gn 28
D 3.0
AO% 100
CF
Frq 4.2
Gn 15.0
PRF 3.7
WF 272
AO% 100
PW
Frq 3.6
Gn 22
PRF 4.3
WF 93
SV 1
SVD 2.1
AO% 100

Protocol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Rt Prox ICA ED 13.0 cm/s
23
-23
cm/s
INVERT
AC 60
-60
-40
-20
cm/s
20
-5
-4
-3
-2
-1
-0
FR 19
CHI
Frq 8.4
Gn 28
D 3.0
AO% 100
CF
Frq 4.2
Gn 15.0
PRF 2.5
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PW
Frq 3.6
Gn 17
PRF 2.6
WF 100
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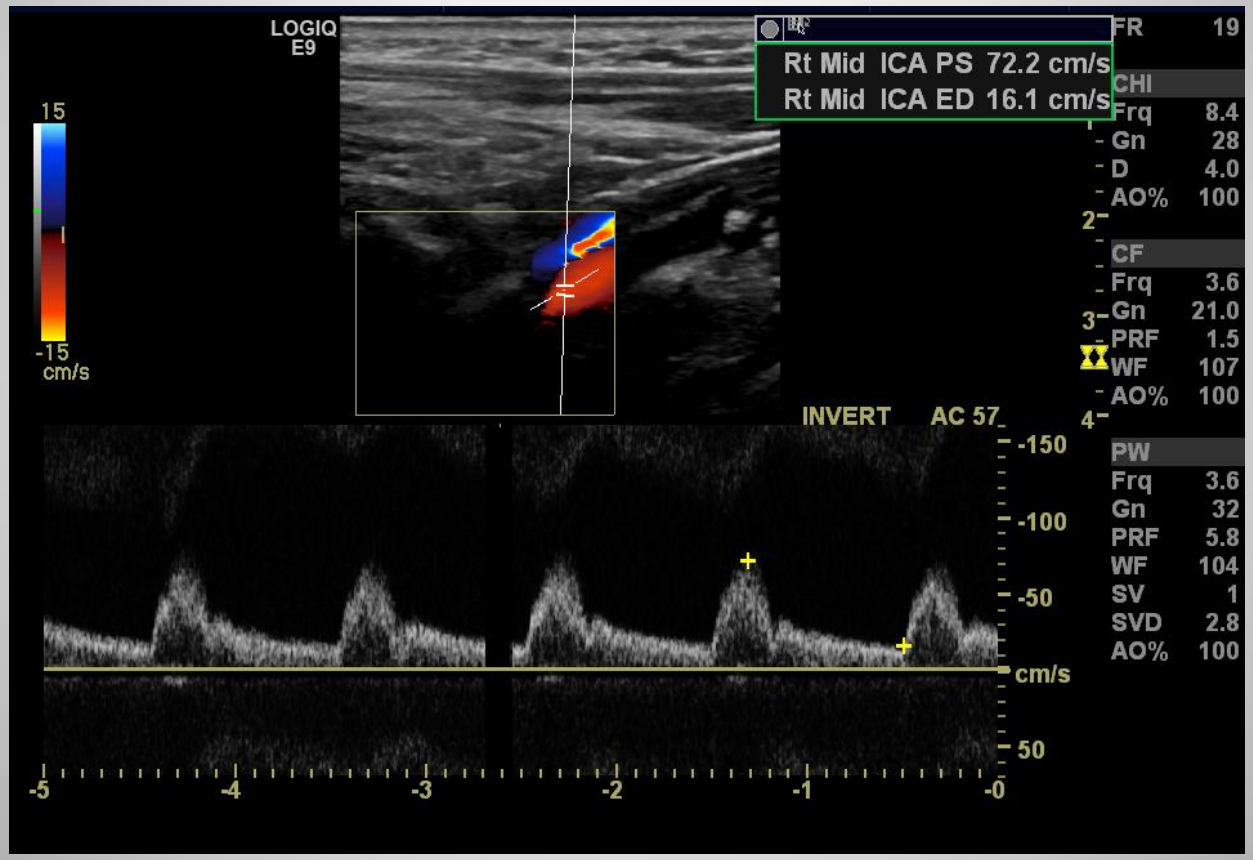
SVD 1.9
AO% 100

Protocol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Rt Mid ICA ED 16.1 cm/s
15
-15
cm/s
INVERT
AC 57
-150
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0
FR 19
CHI
Frq 8.4
Gn 28
D 4.0
AO% 100
CF
Frq 3.6
Gn 21.0
PRF 1.5
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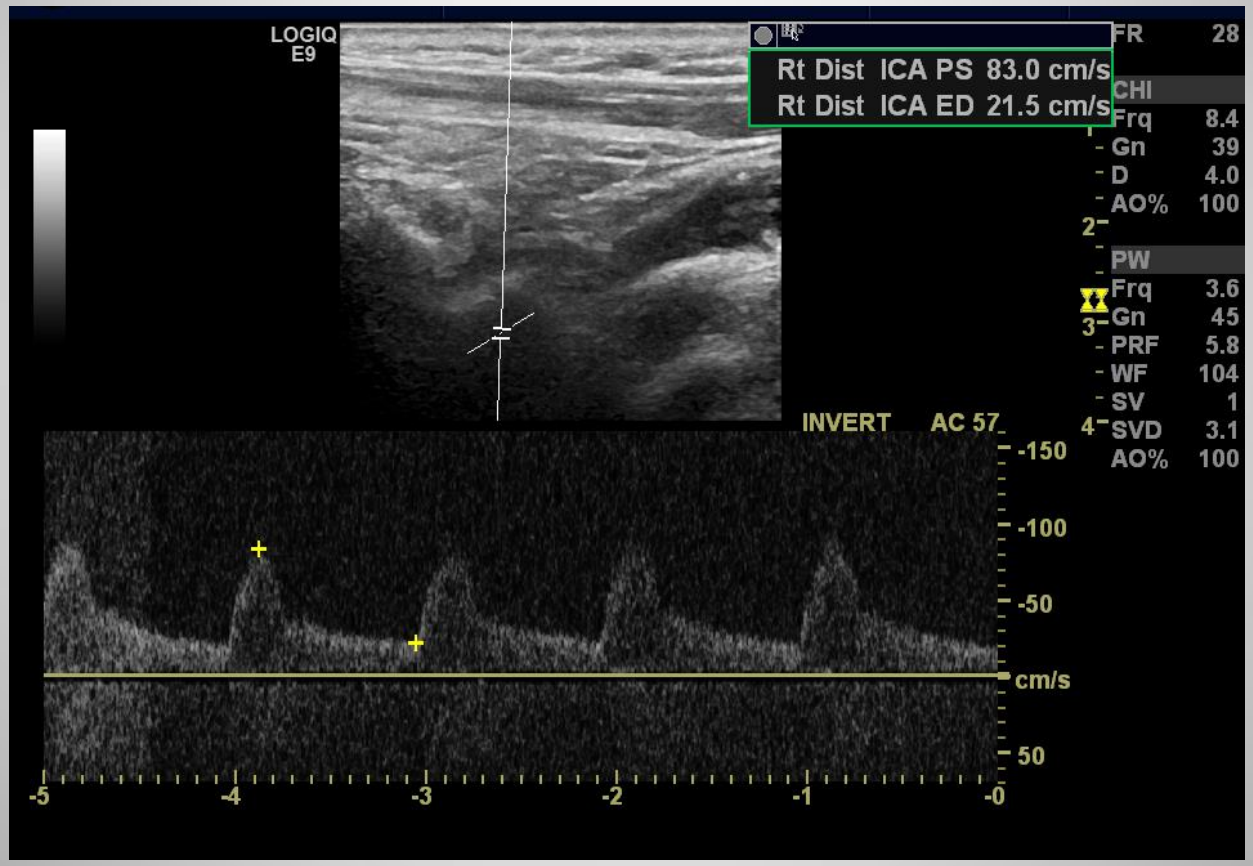
AO% 100
PW
Frq 3.6
Gn 32
PRF 5.8
WF 104
SV 1
SVD 2.8
AO% 100

Protocol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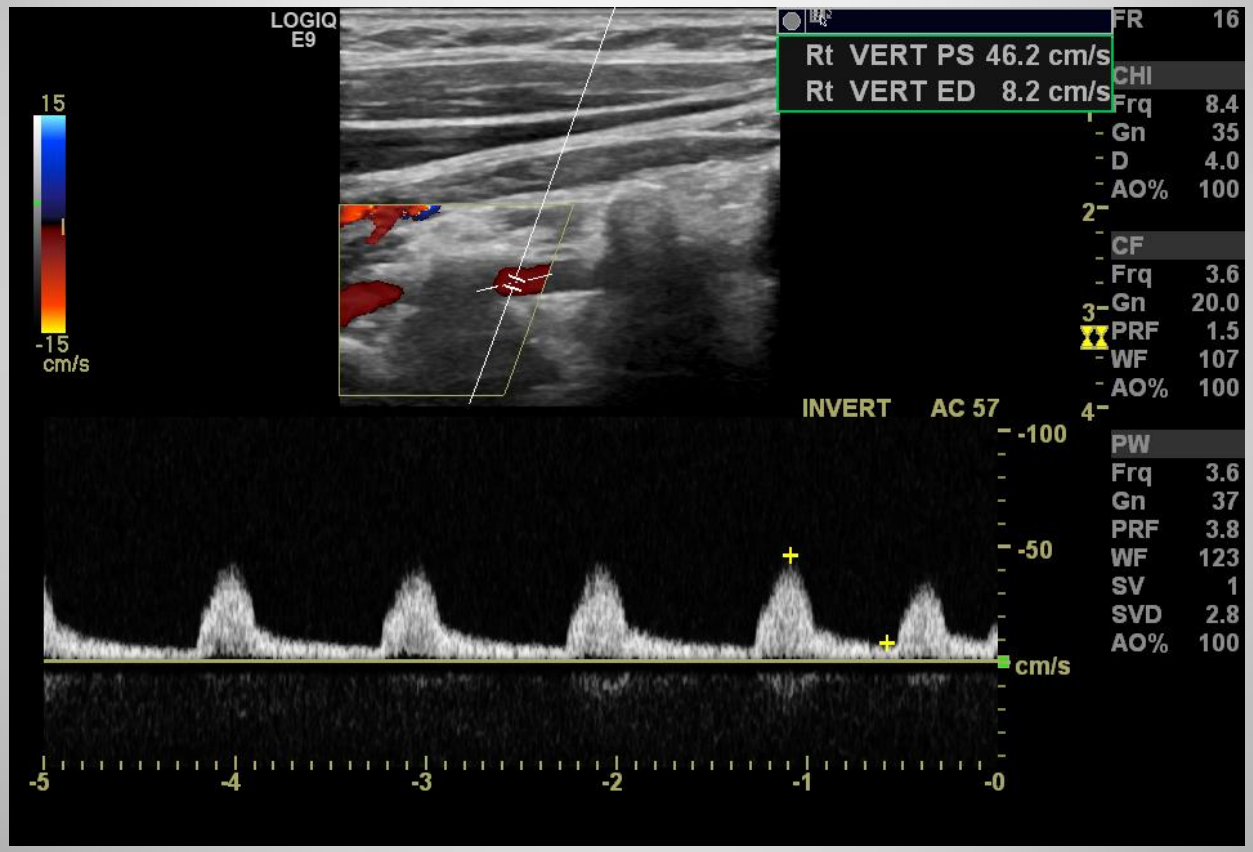
Rt Dist ICA ED 21.5 cm/s
INVERT
AC 57
FR 28
CHI
Frq 8.4
Gn 39
D 4.0
AO% 100
PW
Frq 3.6
Gn 45
PRF 5.8
WF 104
SV 1
SVD 3.1
AO% 100
-150
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0

Protocol


LOGIQ
E9
15
-15
cm/s
Rt VERT PS 46.2 cm/s
Rt VERT ED 8.2 cm/s
INVERT AC 57
-100
-50
cm/s
-5
-4
-3
-2
-1
-0
FR 16
CHI
Frq 8.4
Gn 35
D 4.0
AO% 100
CF
Frq 3.6
Gn 20.0
PRF 1.5
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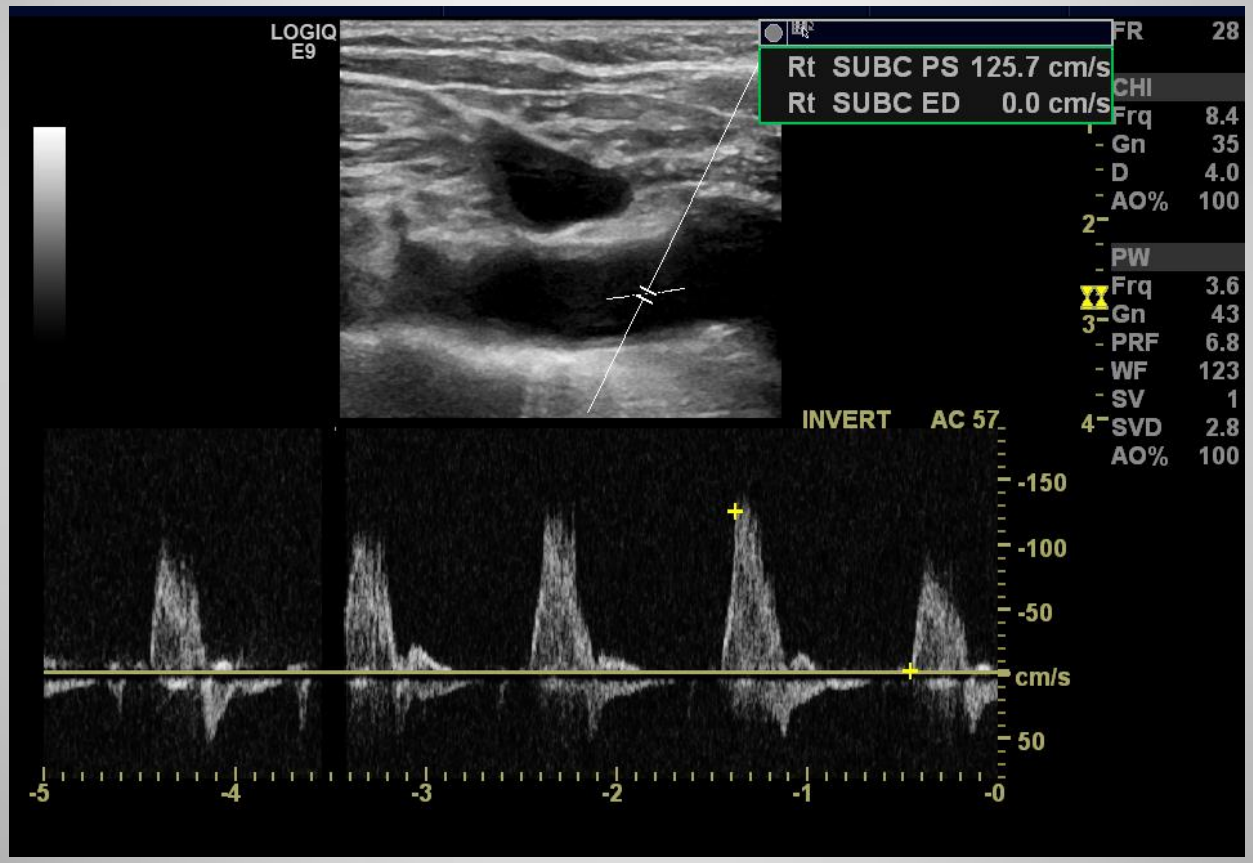
AO% 100
PW
Frq 3.6
Gn 37
PRF 3.8
WF 123
SV 1
SVD 2.8
AO% 100

Protocol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CHI
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Gn 35
D 4.0
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PW
Frq 3.6
Gn 43
PRF 6.8
WF 123
SV 1
SVD 2.8
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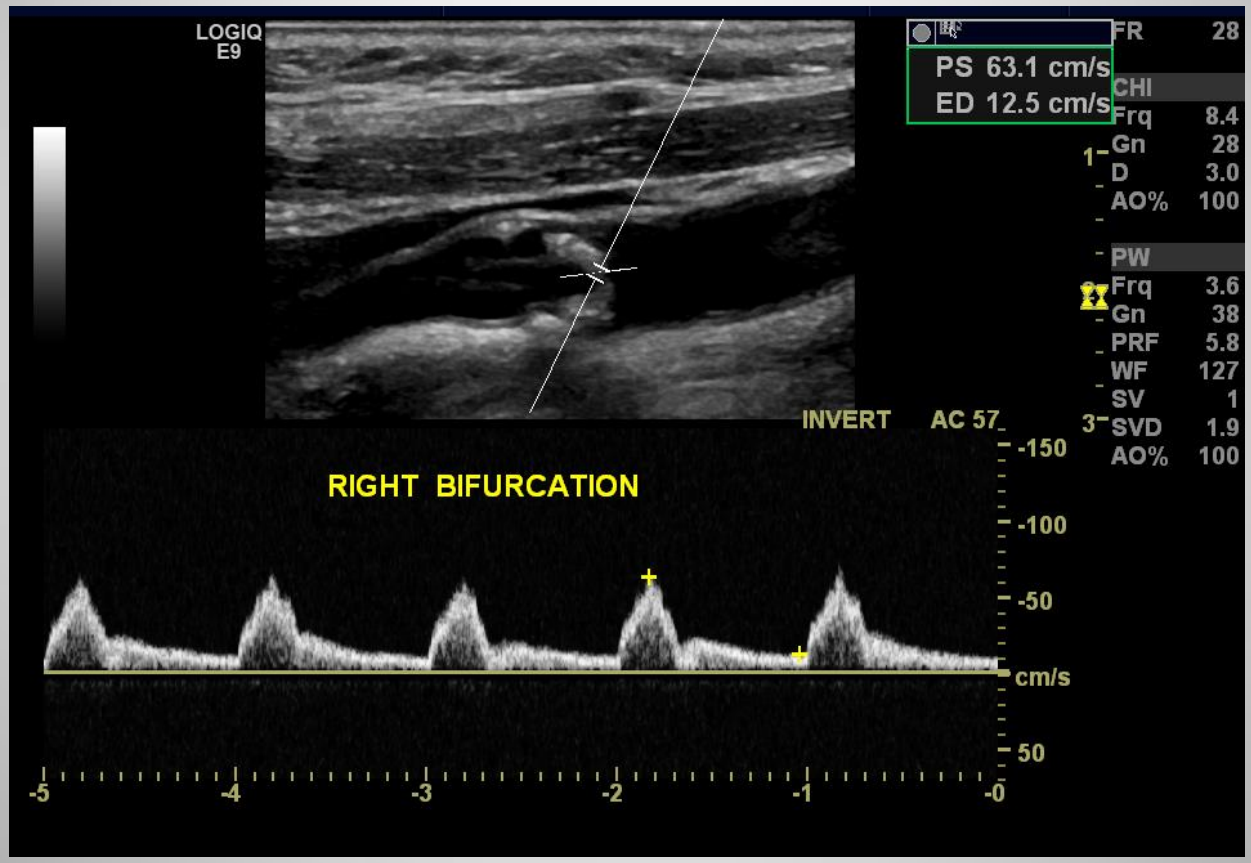
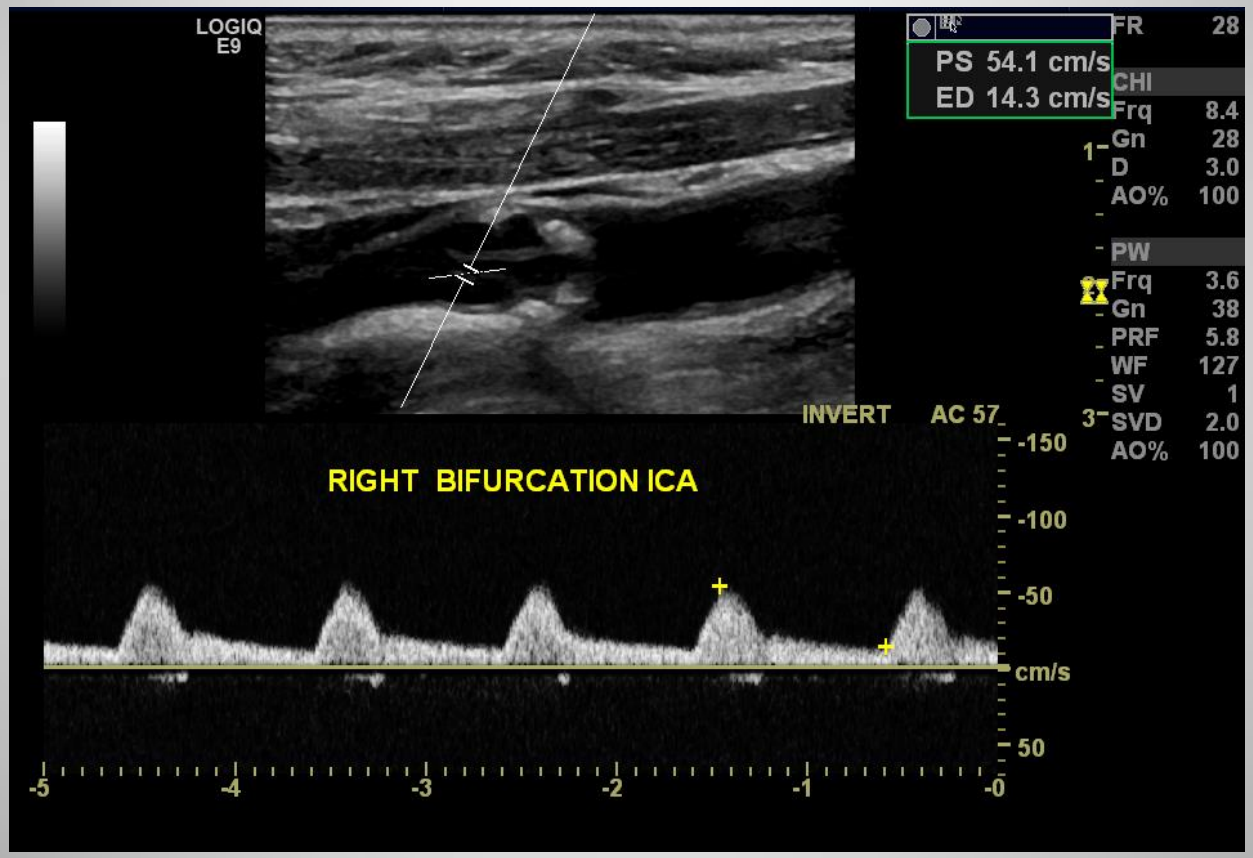
-150
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0

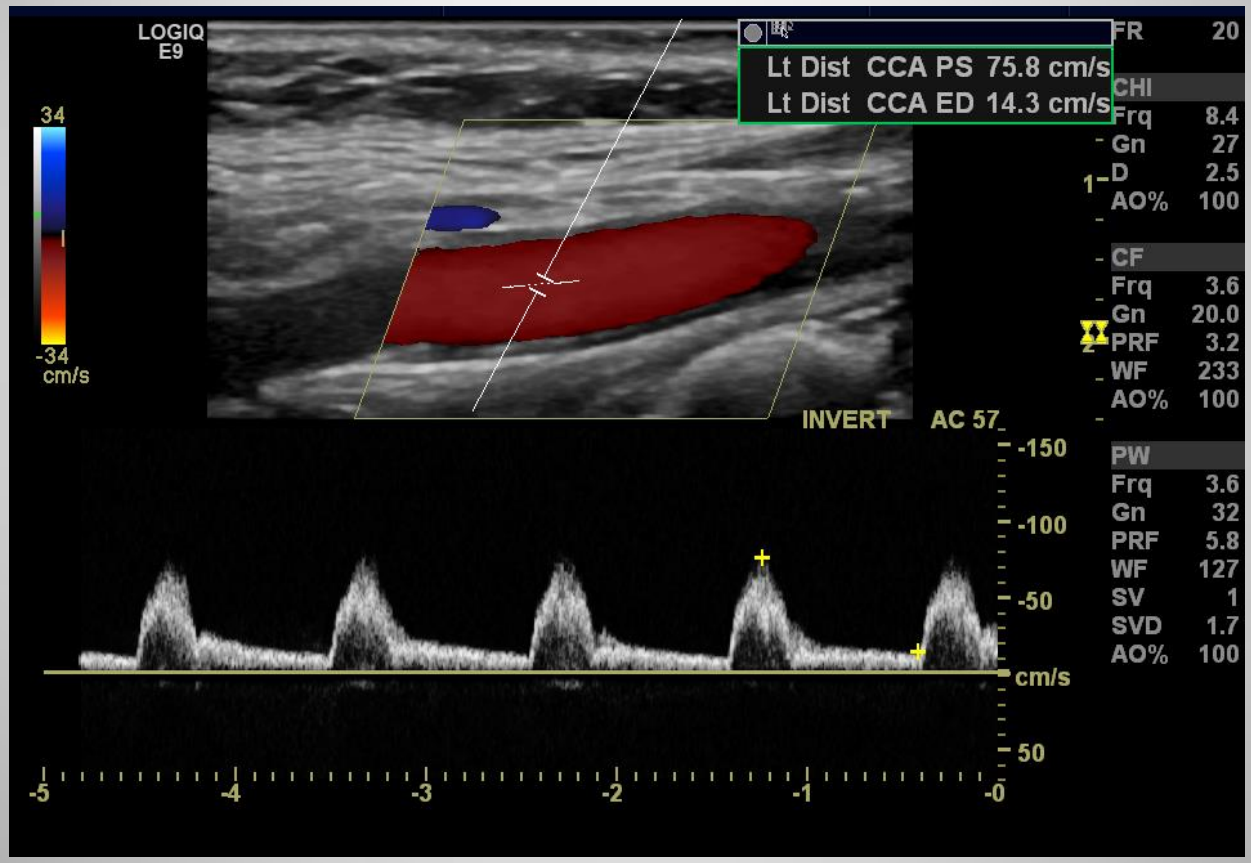
Protocol


LOGIQ
E9
PS 63.1 cm/s
ED 12.5 cm/s
FR 28
CHI
Frq 8.4
Gn 28
D 3.0
AO% 100
PW
Frq 3.6
Gn 38
PRF 5.8
WF 127
SV 1
SVD 1.9
AO% 100
INVERT
AC 57
RIGHT BIFURCATION
-150
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0

Protocol


LOGIQ
E9
PS 54.1 cm/s
ED 14.3 cm/s
FR 28
CHI
Frq 8.4
Gn 28
D 3.0
AO% 100
PW
Frq 3.6
Gn 38
PRF 5.8
WF 127
SV 1
SVD 2.0
AO% 100
INVERT
AC 57
RIGHT BIFURCATION ICA
-150
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0

Protocol


LOGIQ
E9
34
-34
cm/s
Lt Dist CCA PS 75.8 cm/s
Lt Dist CCA ED 14.3 cm/s
INVERT
AC 57
-150
-100
-50
cm/s
50
-5
-4
-3
-2
-1
-0
FR 20
CHI
Frq 8.4
Gn 27
D 2.5
AO% 100
CF
Frq 3.6
Gn 20.0
PRF 3.2
WF 233
AO% 100
PW
Frq 3.6
Gn 32
PRF 5.8
WF 127
SV 1
SVD 1.7
AO% 100

Protocol

What is missing from our protocol for the image sequence on the right?

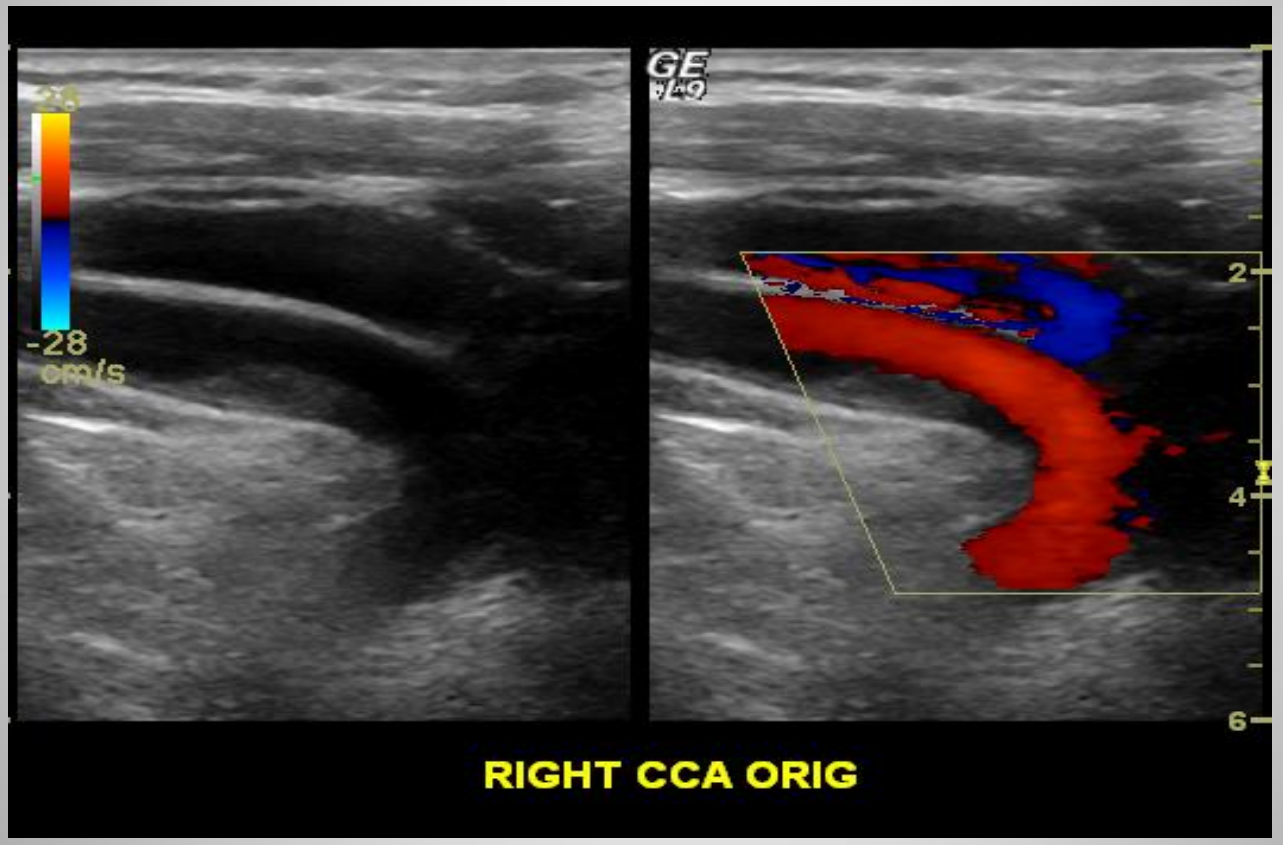
Common carotid artery, Mid, Long, C/D

Protocol

Did you notice anything unusual about the systolic upstroke in the study?

Patient has aortic stenosis, delaying the upstroke bilaterally.

Obtain data as far proximally as possible



Subclavian artery evaluation

Obtain and document bilateral brachial blood pressures **prior** to performing cerebrovascular examinations.

Blood pressure symmetry is important in determining the presence and severity of subclavian artery stenosis.

If you find a pressure gradient of ≥20 mmHg, this may be indicative of a significant pressure reducing lesion in the upper extremity arteries.

- Bilateral subclavian artery stenosis may be present creating lowered BP bilaterally.

Subclavian Artery

The proximal subclavian artery is evaluated in all patients, with additional images added when stenosis is identified. The following signs, symptoms, or conditions increase suspicion for hemodynamically significant subclavian artery disease:

- Discrepancy in brachial blood pressures ≥20 mmHg
- Abnormal flow in the extracranial vertebral artery
- Bruit of unknown origin
- Velocity increase in the proximal subclavian artery

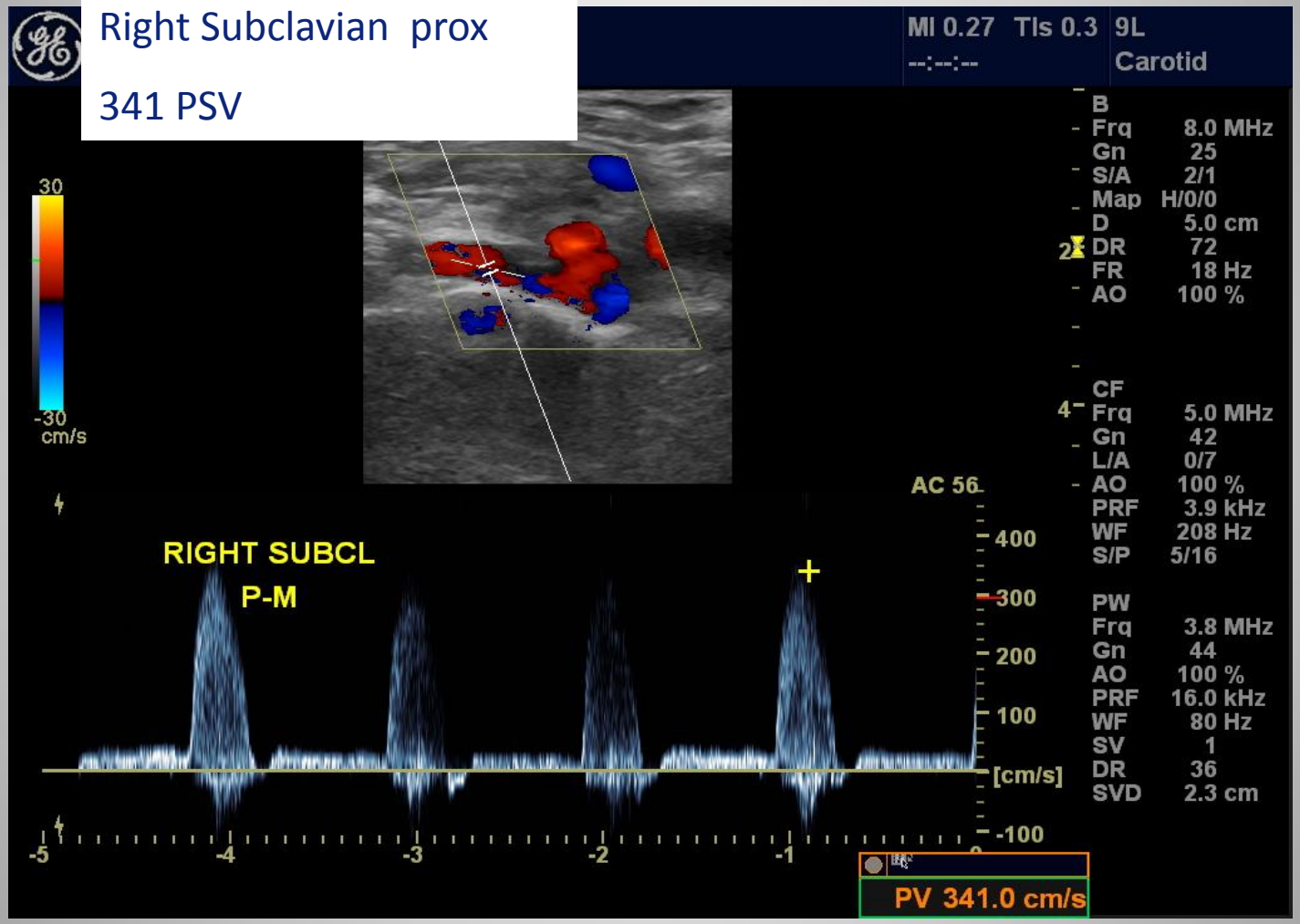
Subclavian Artery

- There are no firm velocity criteria for the subclavian or brachiocephalic (innominate) arteries
- Considering that the normal velocity range in the adult aorta, carotid and femoral arteries is 60-100 cm/sec, velocities over 200 cm/sec are ***suspicious*** for >50% stenosis
- Proceed as far proximally as possible and include waveforms more distally to look for turbulence or delayed upstroke

Carotid Duplex Cases: Case 5

Right Subclavian prox

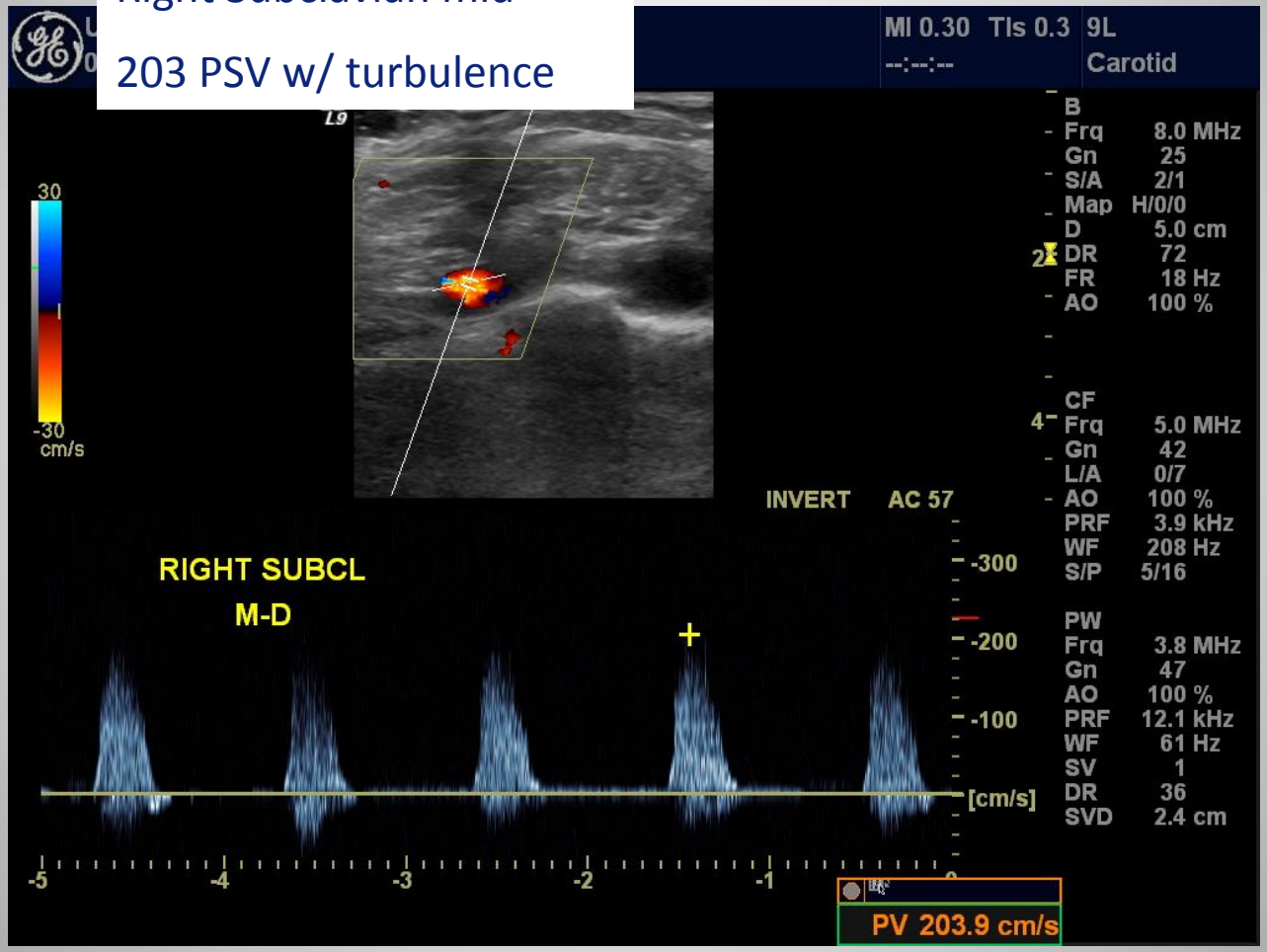
341 PSV



Carotid Duplex Cases: Case 5

Right Subclavian mid

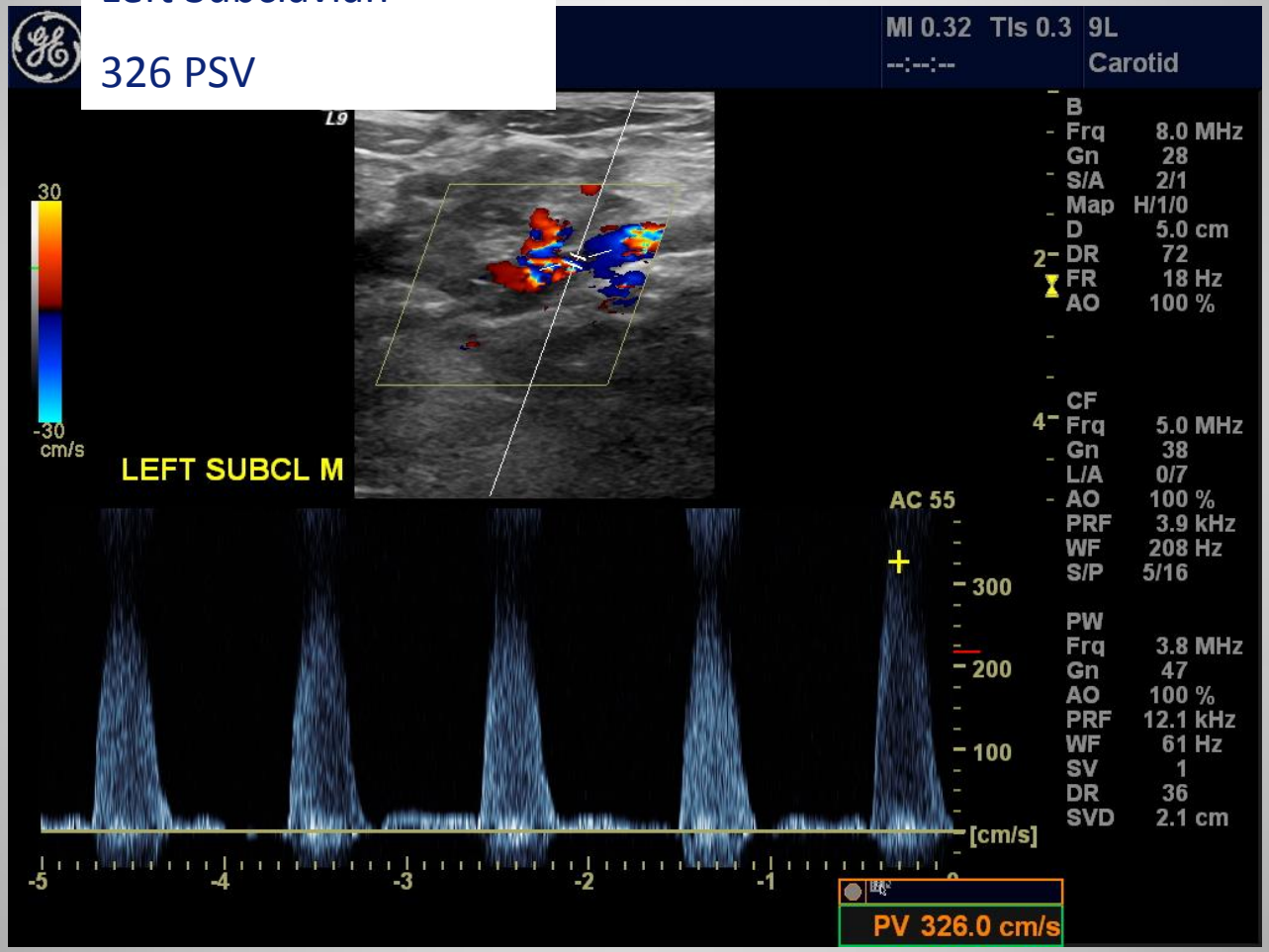
203 PSV w/ turbulence



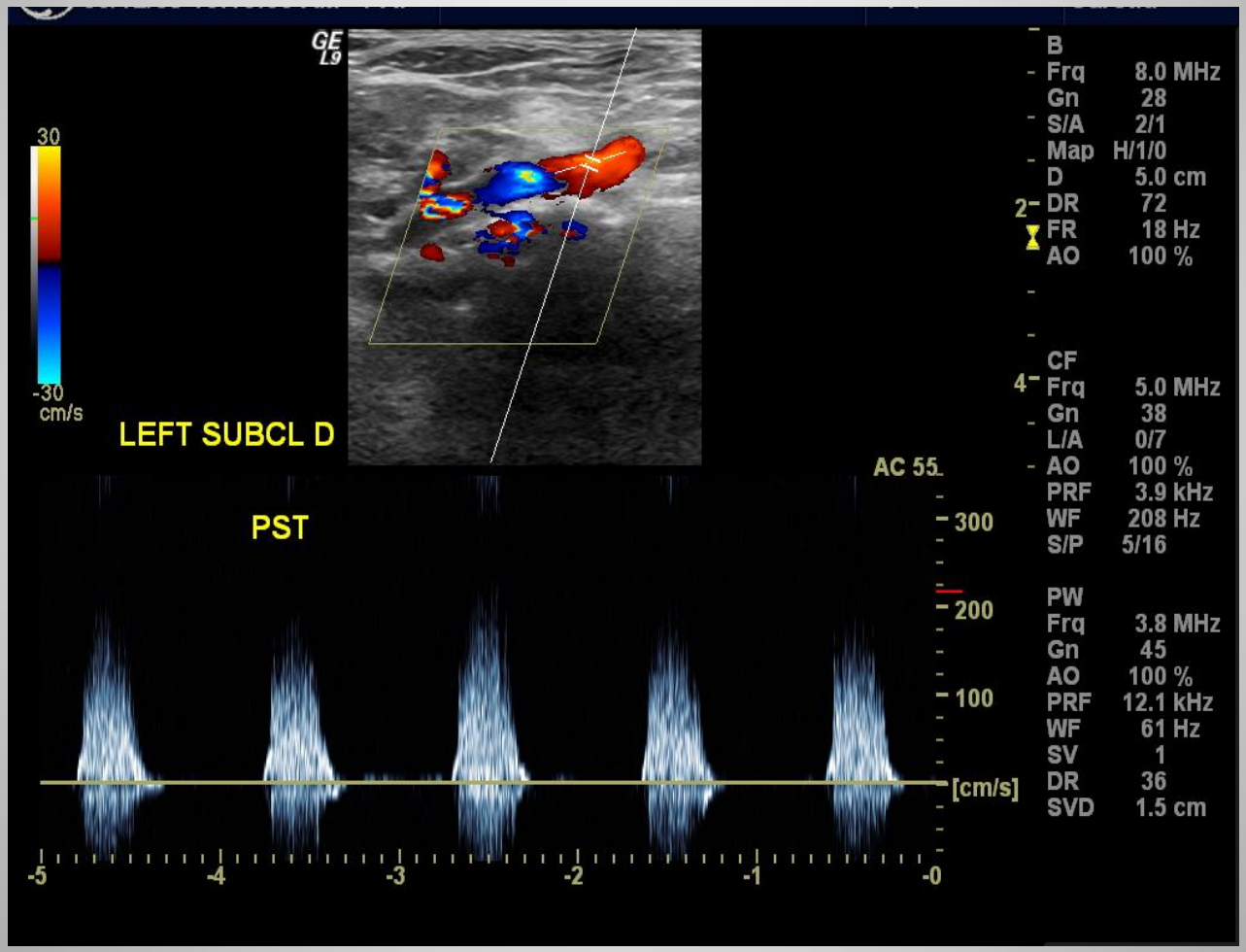
Carotid Duplex Cases: Case 5

Left Subclavian

326 PSV

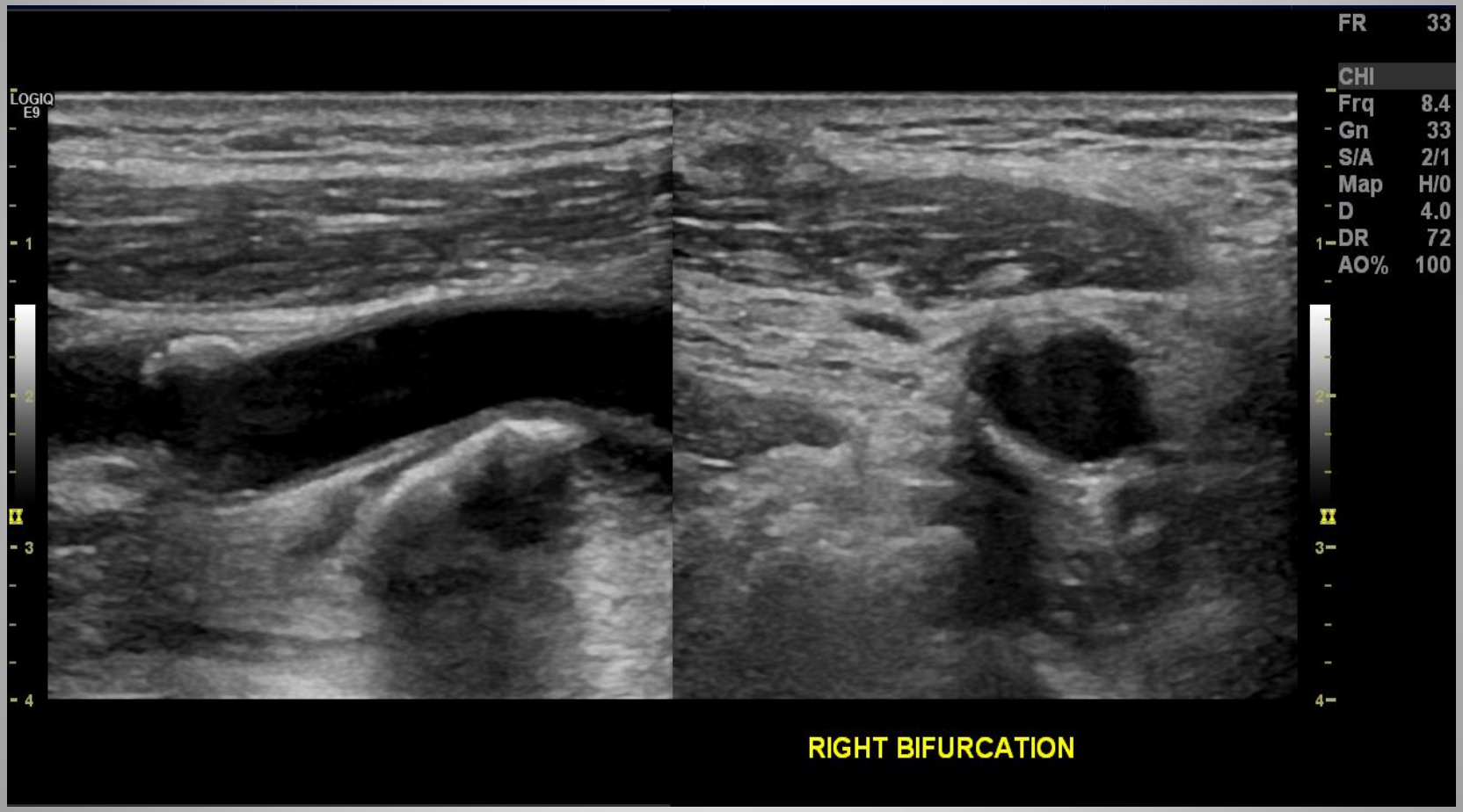


Carotid Duplex Cases: Case 5

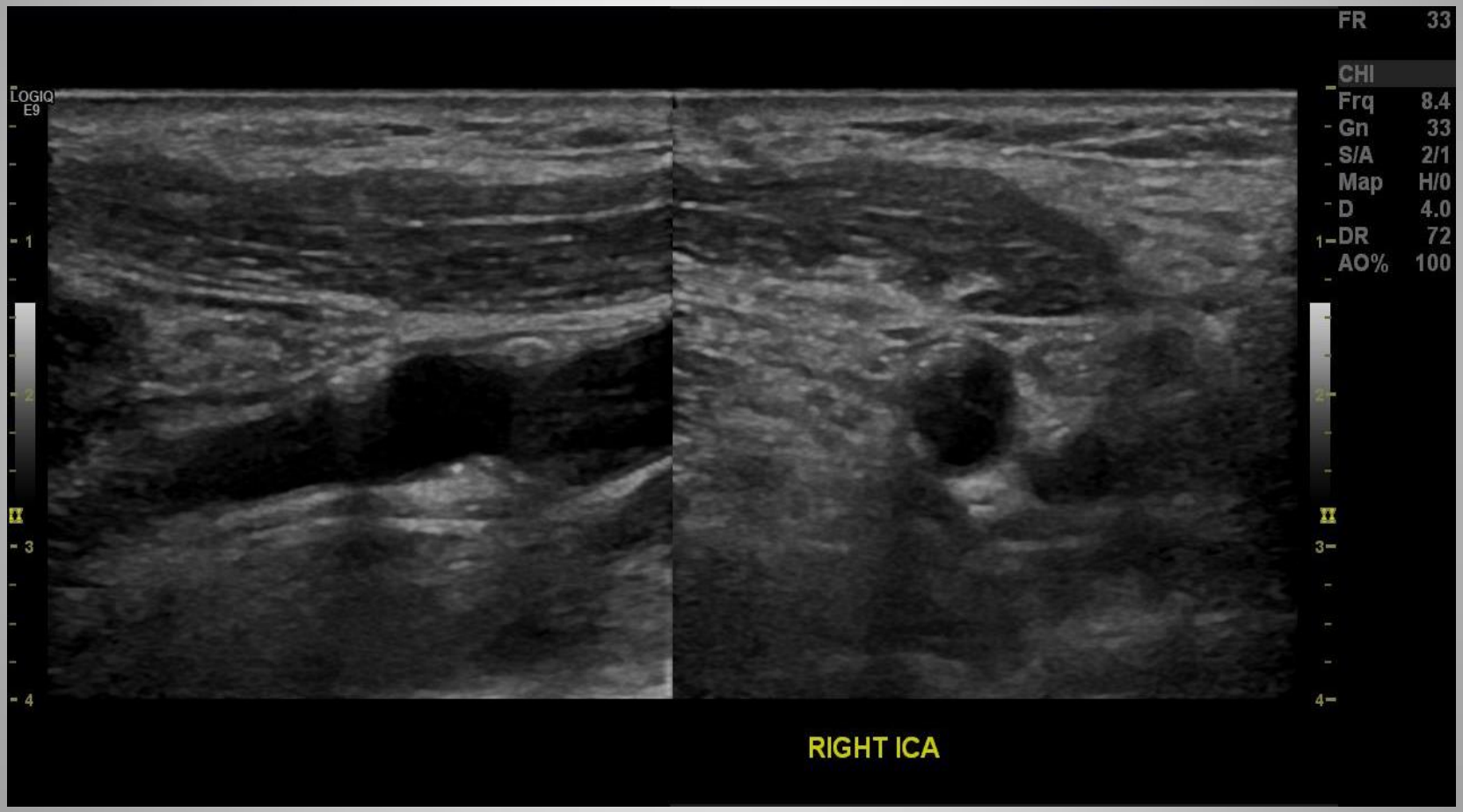


Optimize B-mode

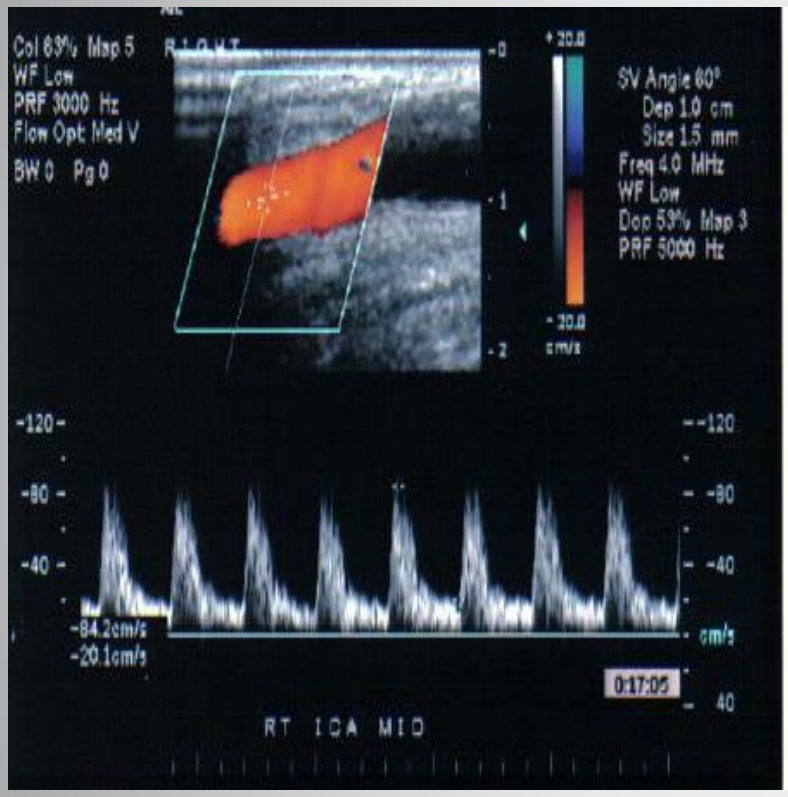
Optimize B-mode



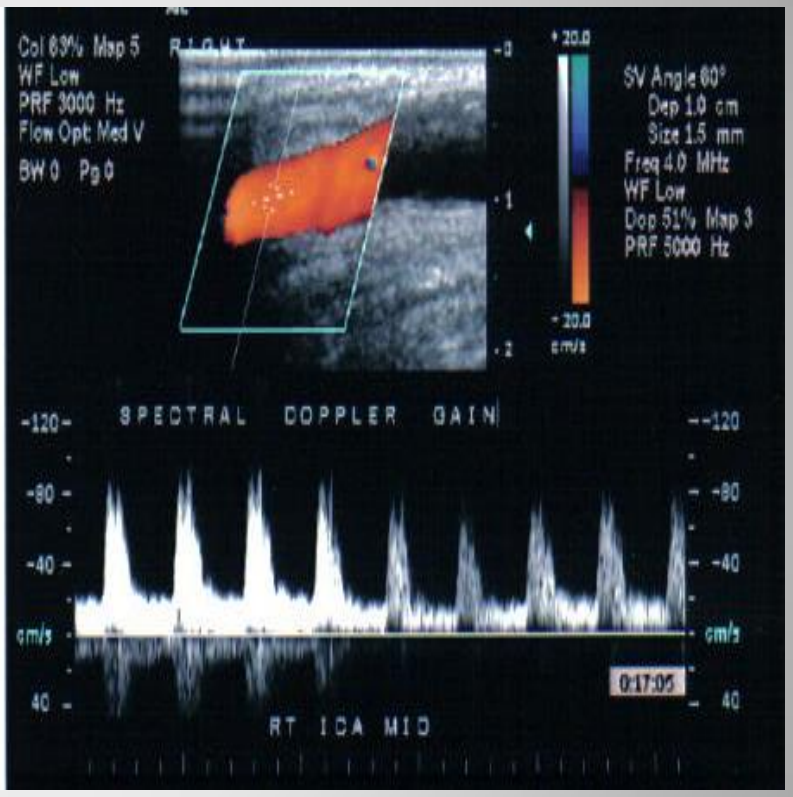
Optimize B-mode



Optimize gain settings

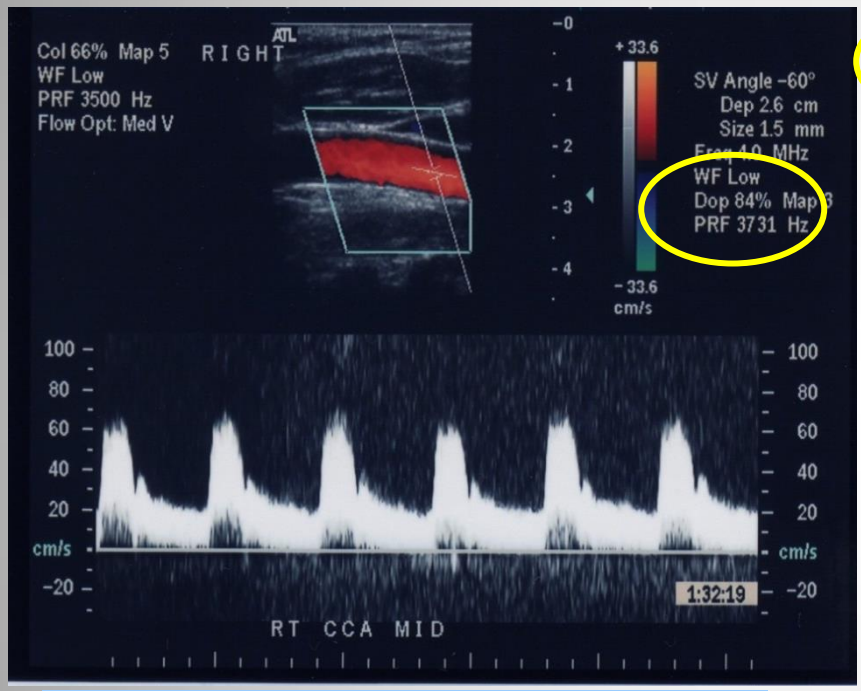


Spectral Doppler gain appropriate

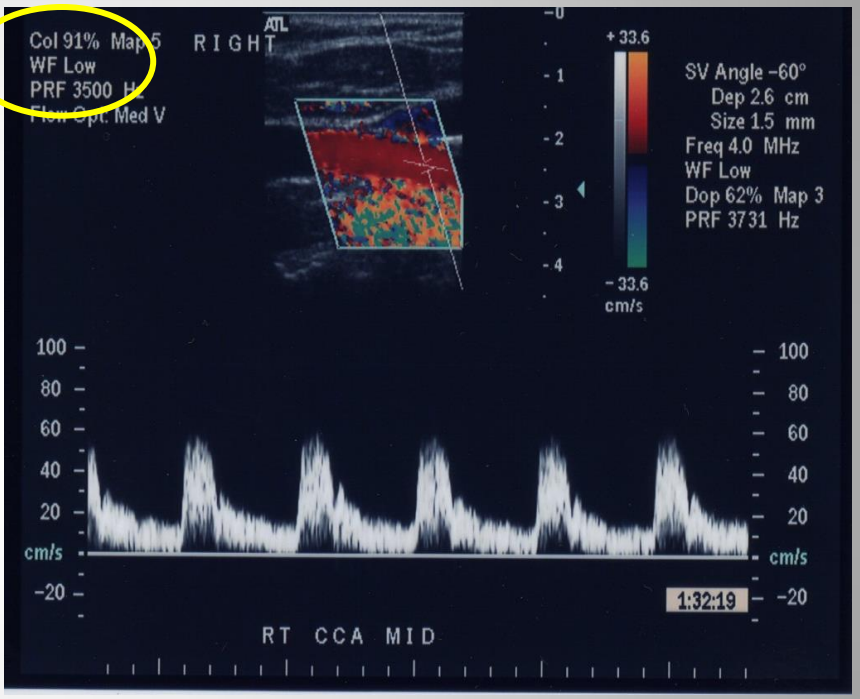


Spectral Doppler gain too high and then decreased

Color and spectral Gain

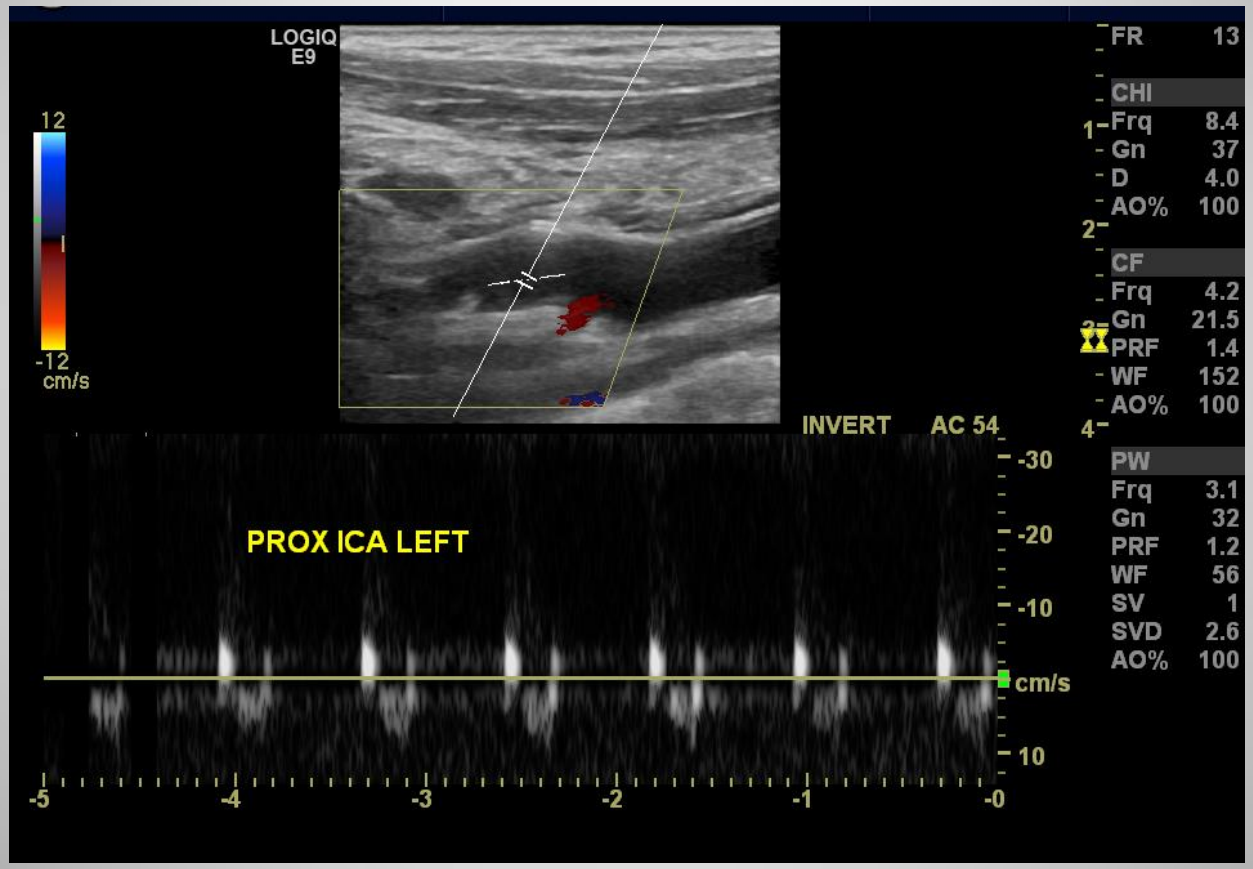


Spectral Doppler gain too high

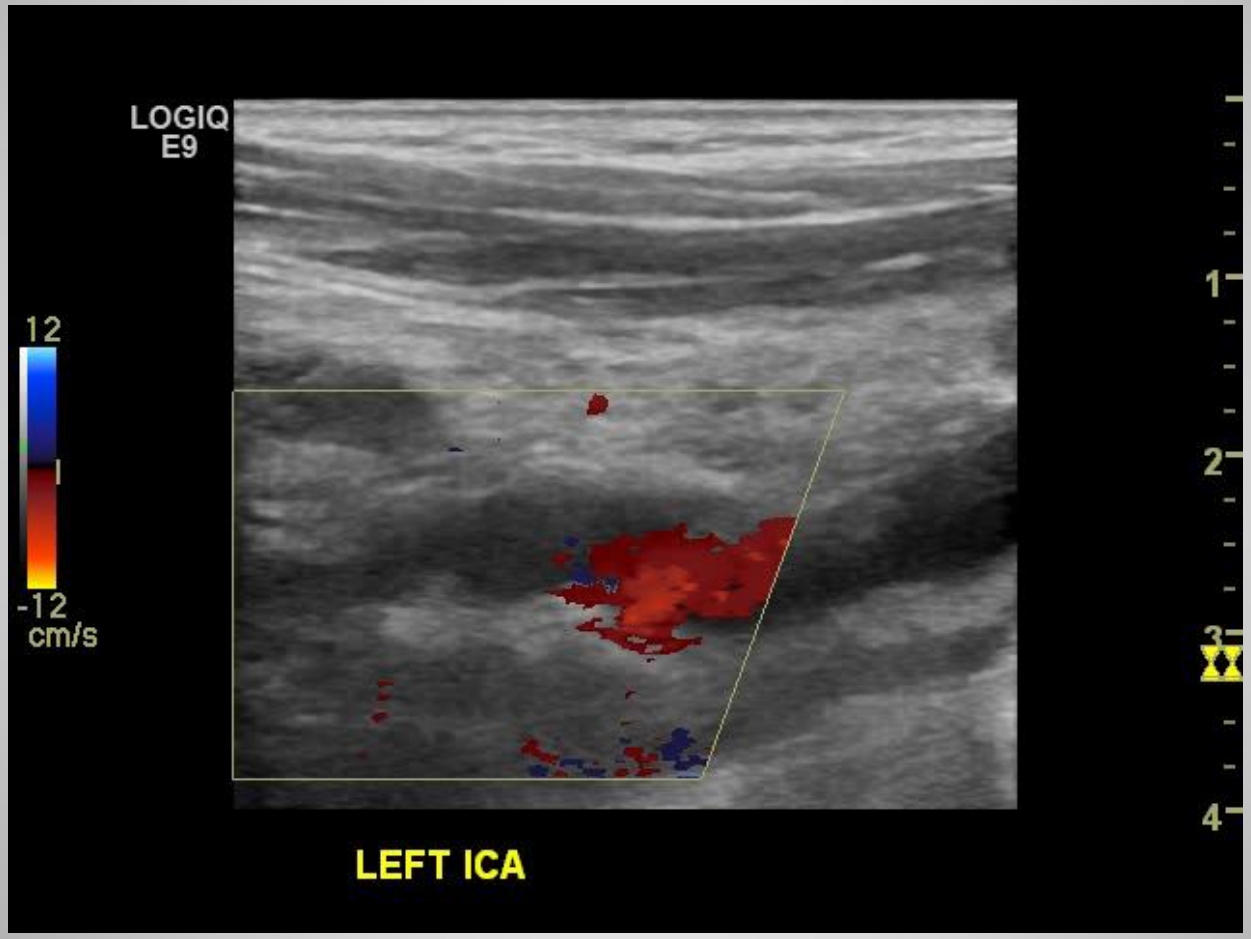


Color Doppler gain too high

Fully document occlusion

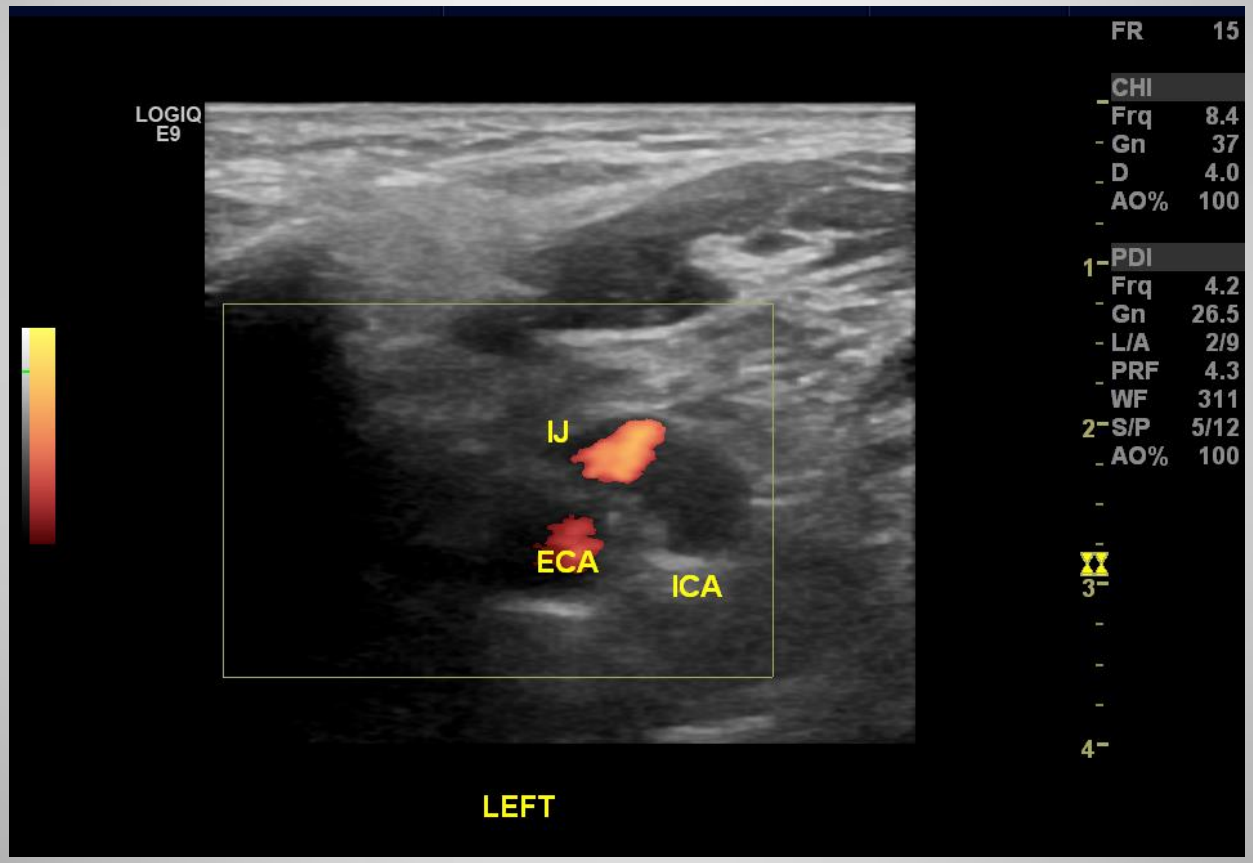


Fully document occlusion



Fully document occlusion

Power Doppler



Reporting basics

The technologist should get the following information from each patient about the indications/symptoms for which he/she is complaining and document the answers in the patient record:

Onset

Duration

Methods of relief

Frequency

Radiation

Associated symptoms

Reporting basics

Identification of physical findings must be evaluated and documented in the patient record, noting location and severity.

These physical signs include, but are not limited to:

Gait

Strength of grip

Facial drooping

Speech patterns or slurring

Identify when to add TCD: always of in view of findings or symptoms

In NAVIX:

Complete TCD added

- ≥50% ICA stenosis

- Symptoms of TIA, CVA or VBI with no significant extracranial carotid disease

Identify when to add TCD: always of in view of findings or symptoms

In NAVIX:

Limited TCD (OA and Siphon) added:

- Plaque noted during the Extracranial evaluation

Carotid Duplex Examination: Quality

- Consistency in examination and interpretation methodology
- Optimization of B-mode and Doppler
- Recognize when your standard criteria don’t fit the case
- Comparison to prior studies
- Review of cases produced in your laboratory

Thank you for your attention and for this beautiful meeting location!