Carotid Scan Protocol

Clinical Application Team

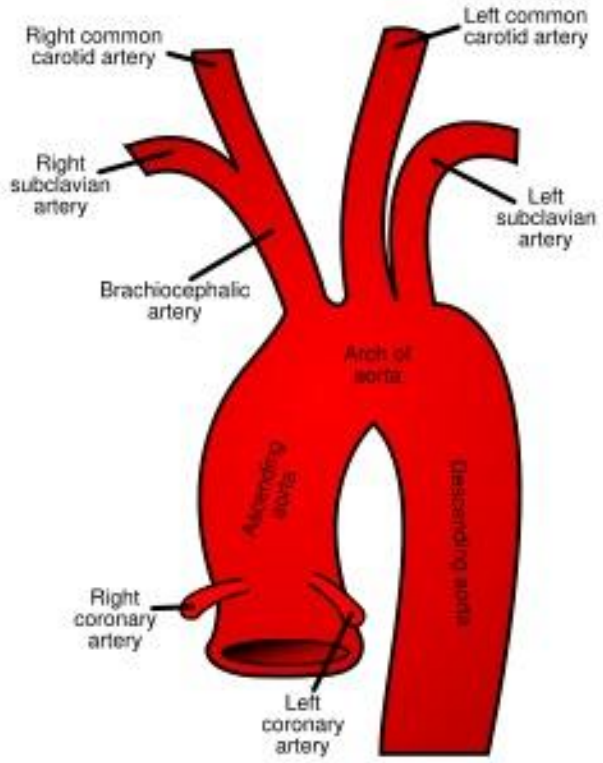
ALPINION
MEDICAL SYSTEMS

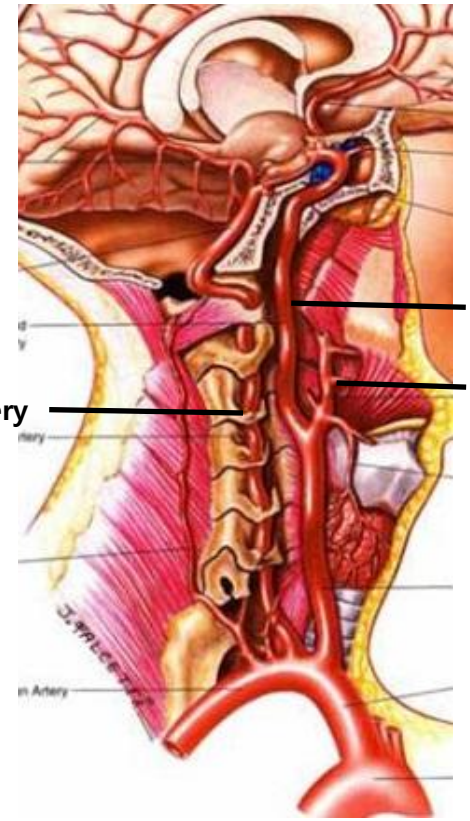
PROBE

- ✓ Superficial organ
- ✓ High Frequency : 7~12MHz
  - L3-12
  - L3-12H(High performance)

Linear Probe

Carotid Anatomy





Exam Purpose

- ✓ Atherosclerosis
- ✓ Diabetes
- ✓ Hypertension
- ✓ STROKE
- ✓ Risk Factor (History, obesity..)

→ Stenosis %
Thrombosis
Anatomy, Vascular morphology

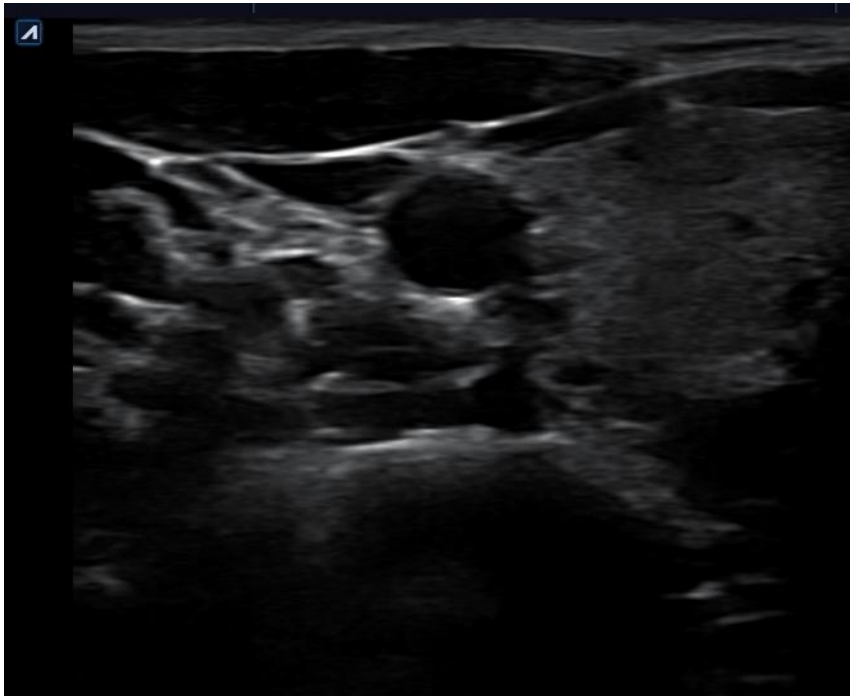
Scan Protocol

- ✓ CCA& ICA - B mode Transverse & Longitudinal scan
- ✓ IMT Measurement
- ✓ Color Flow Mode – Plaque, Stenosis
- ✓ PW Mode – Velocity
- ✓ Plaque location, Stenosis(%)
- ➢ High Frequency Linear 7~12MHz

Brightness Mode

Check point

- ✓ Anatomical orientation & size
- ✓ Presence or absence of plaque
- ✓ Characteristics of plaque
- ✓ severity of stenosis



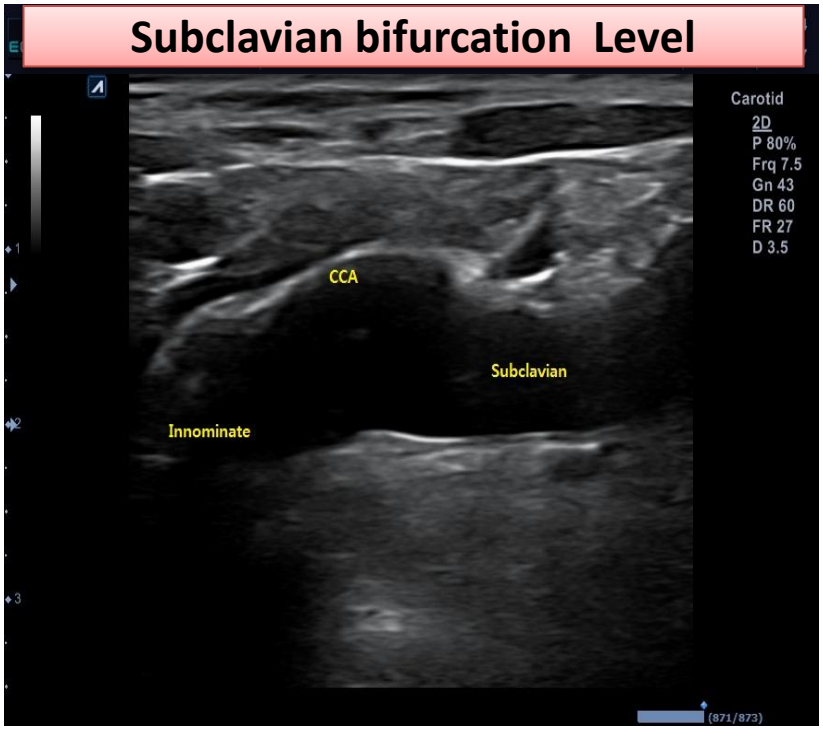
Carotid Artery Scan

Position

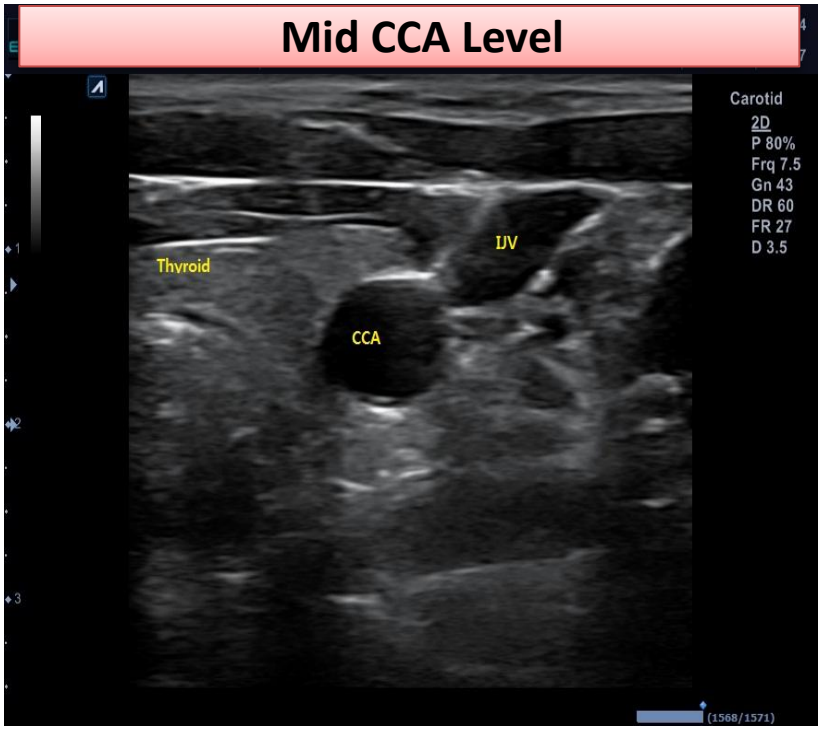
- ✓ Turn one's head the opposite direction, Lift one's chin
- ✓ Anterolateral , Posterolateral Transducer Position
- ✓ Subclavian Artery → CCA →Bifurcation(C4 level) → ICA, ECA

Transverse Scan

Subclavian bifurcation Level

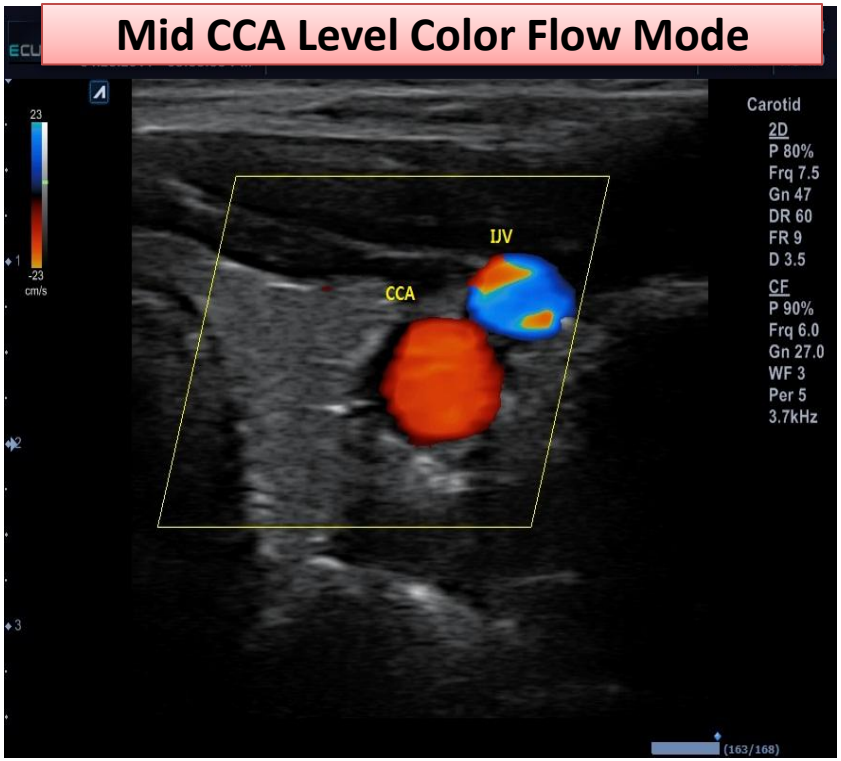


Mid CCA Level

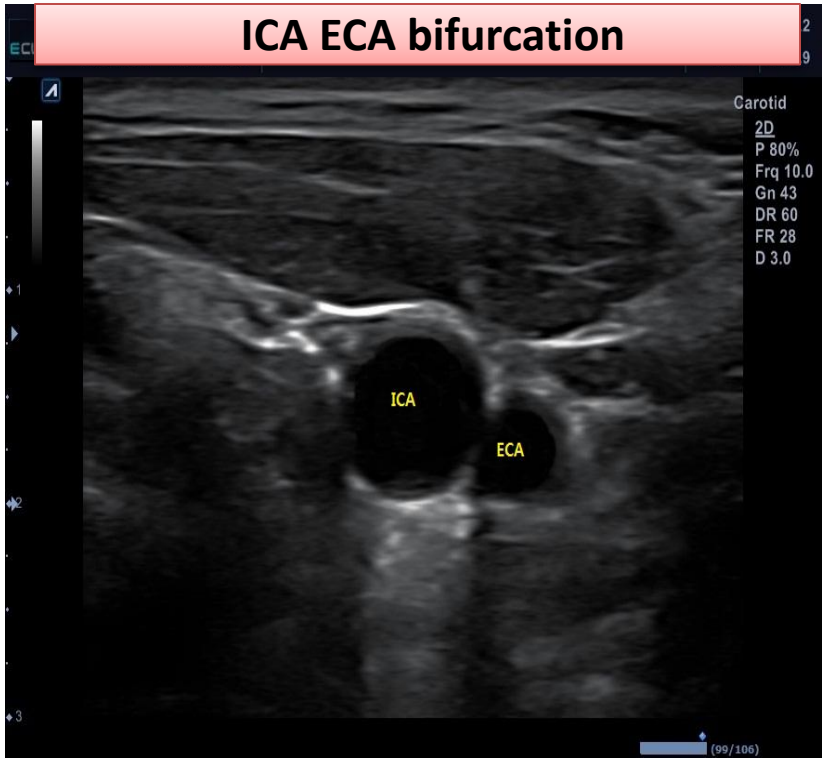


Transverse Scan

Mid CCA Level Color Flow Mode



ICA ECA bifurcation

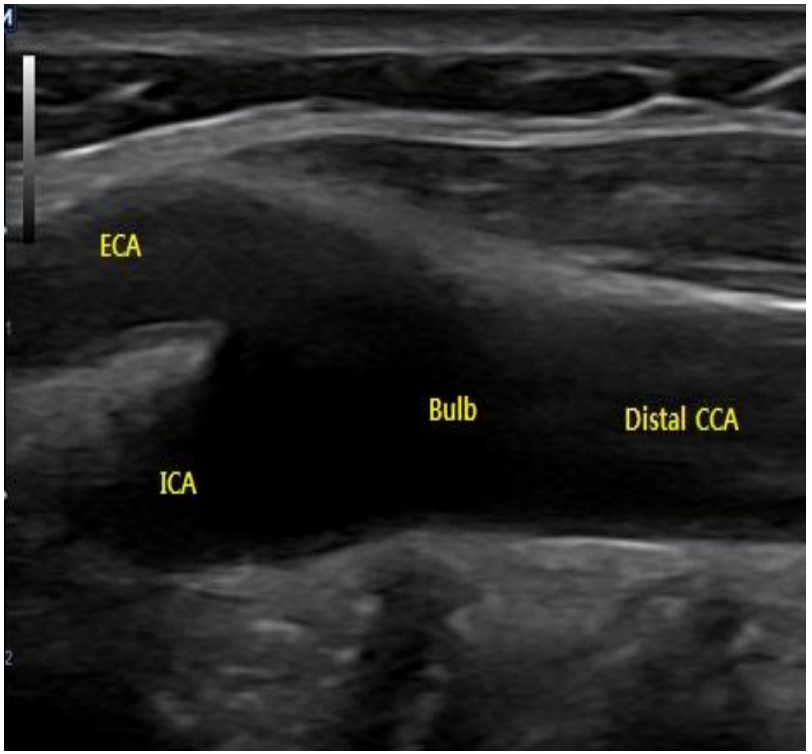


Longitudinal Scan

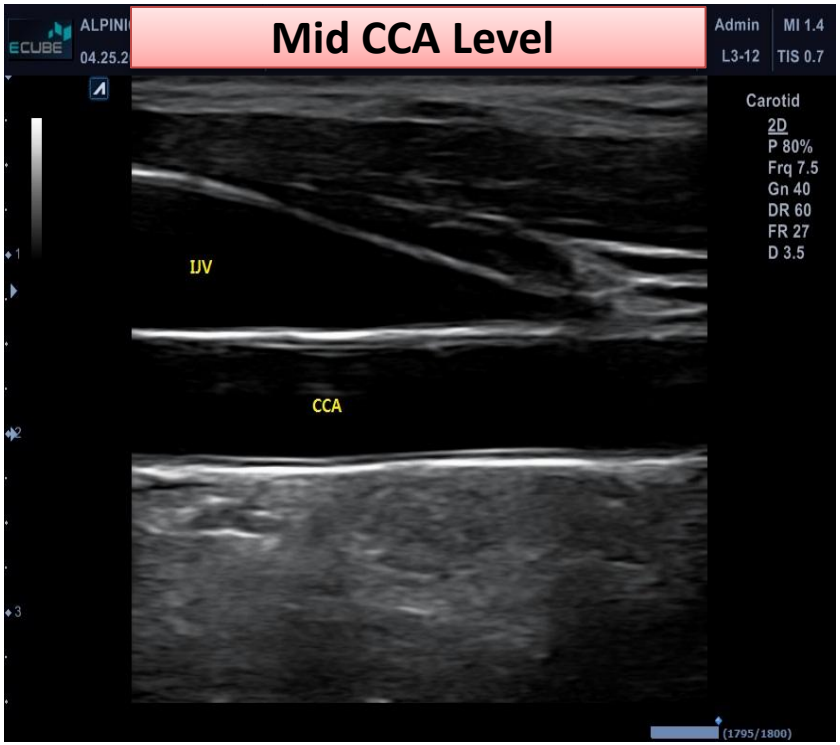
Bifurcation

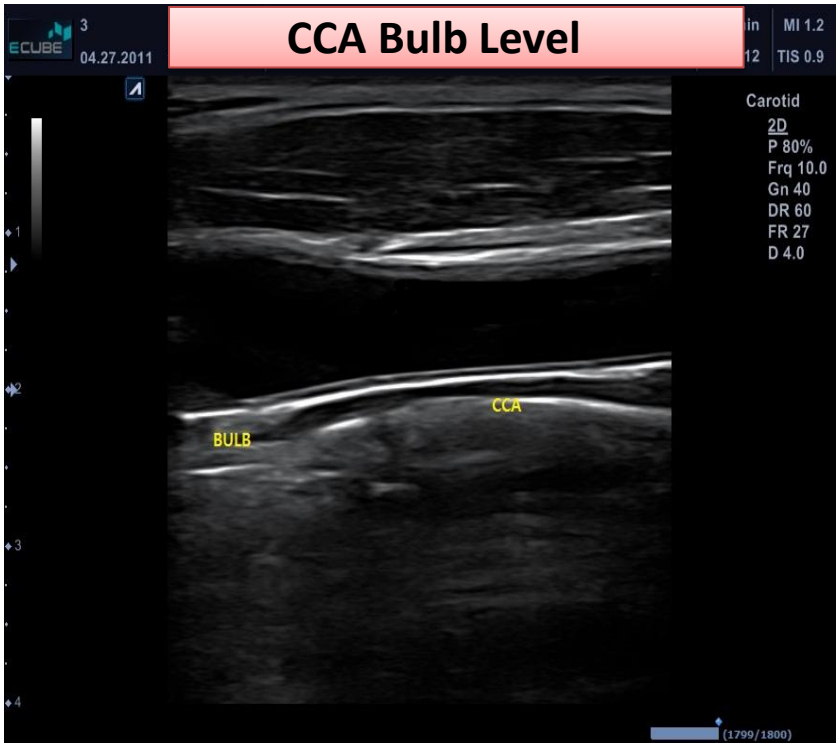
-CCA Width is wider in bifurcation
And then

It is divided into the ECA and ICA.

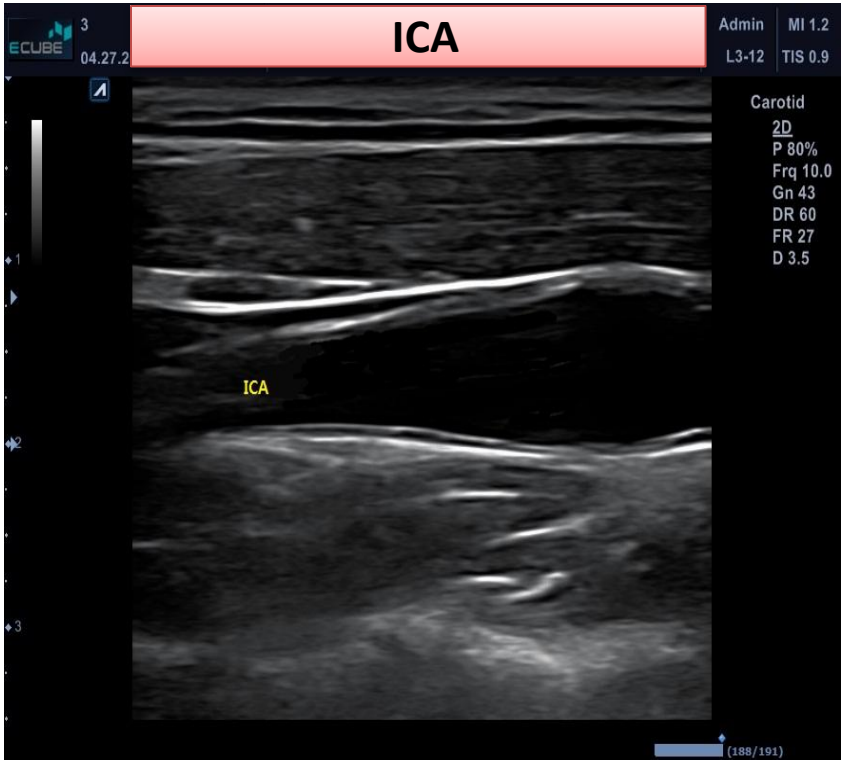


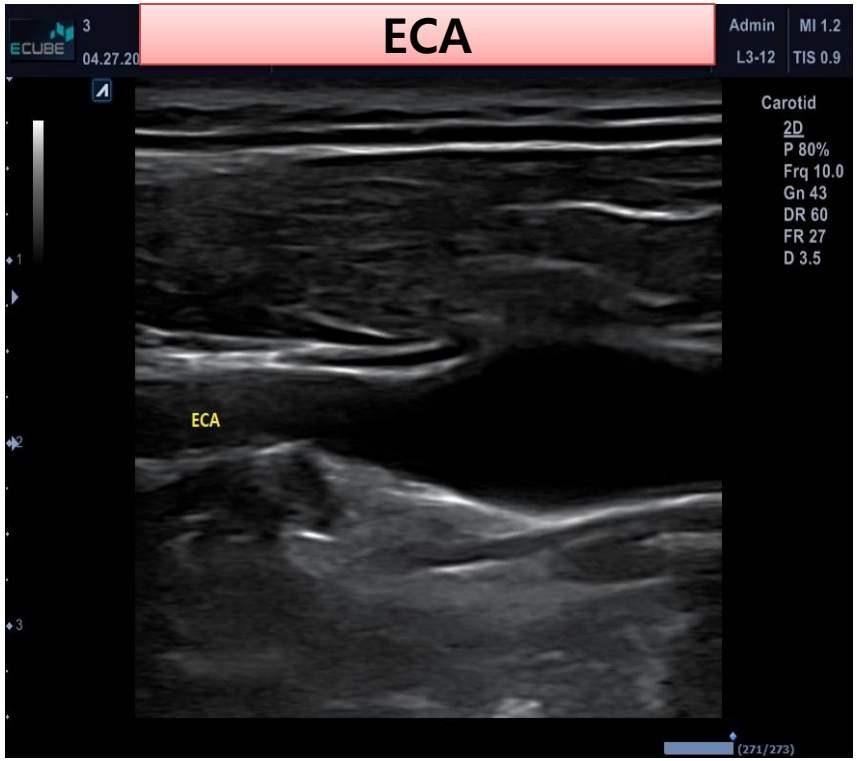
Longitudinal Scan



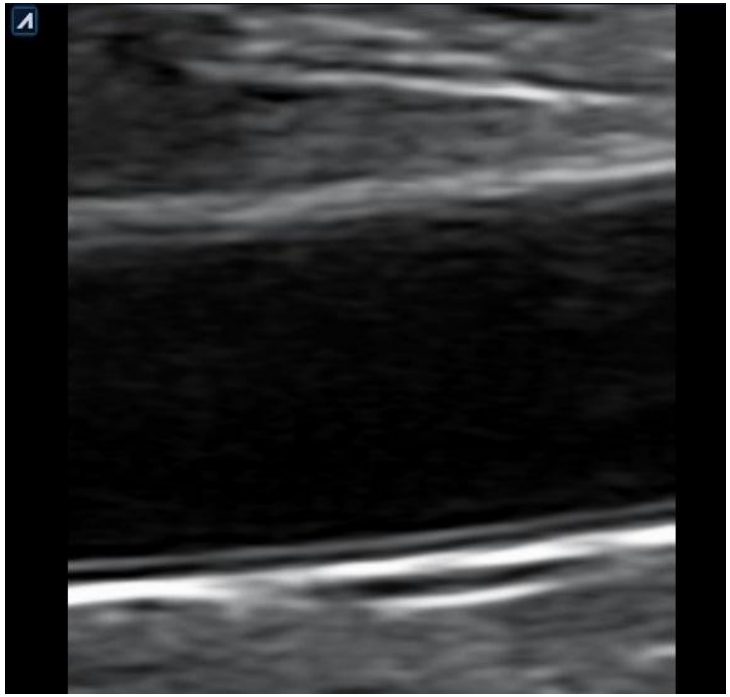


Longitudinal Scan





IMT – Intima - Media Thickness



Auto IMT

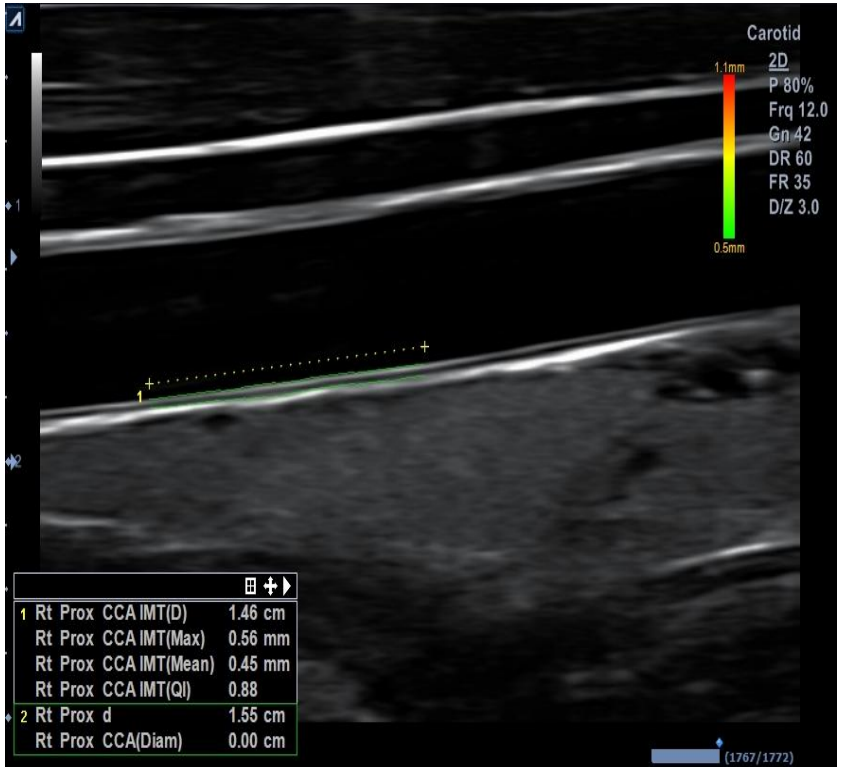
Check Point

-**Normal range**

✓ CCA : < 0.8 mm

✓ CCA bifurcation : < 1.2mm

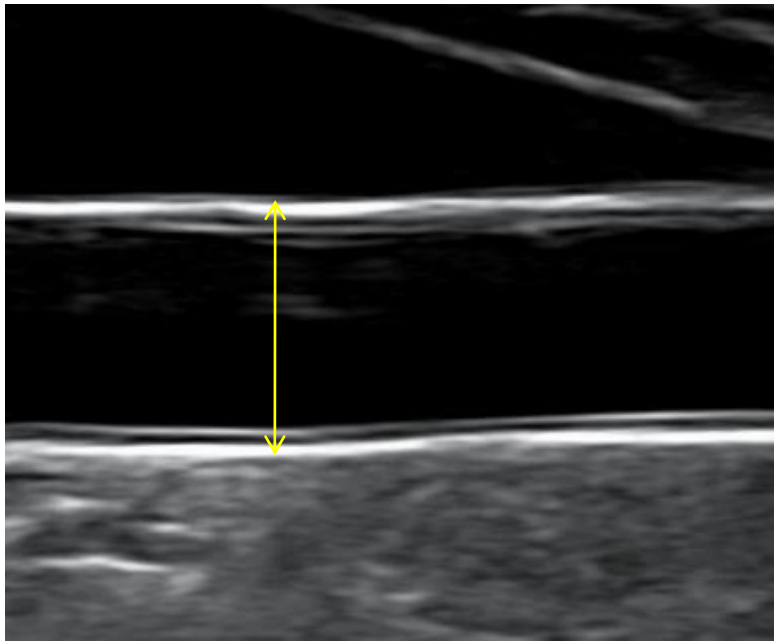
✓Use the zoom function



Diameter measure

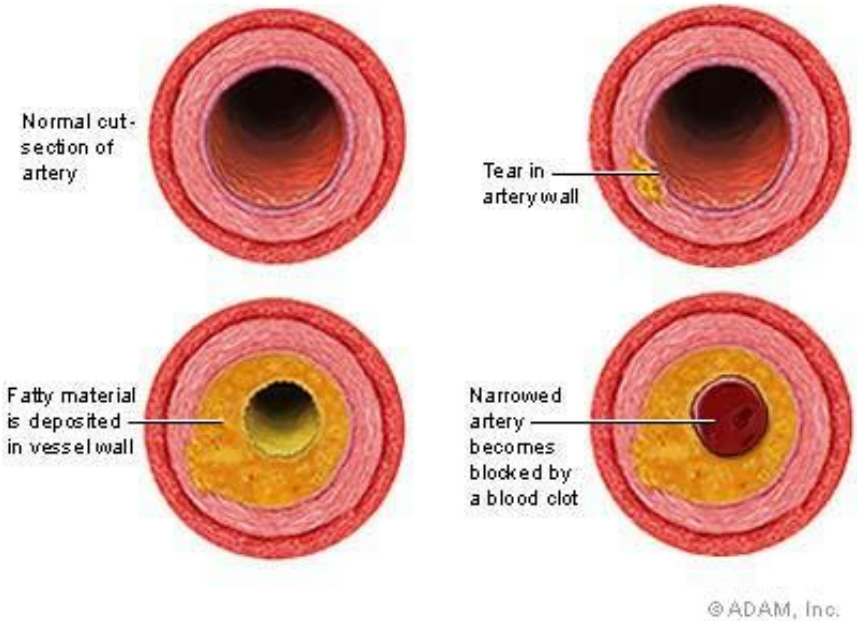
CCA	7.0 ± 0.9 mm
ICA	5.4 ± 1.0 mm

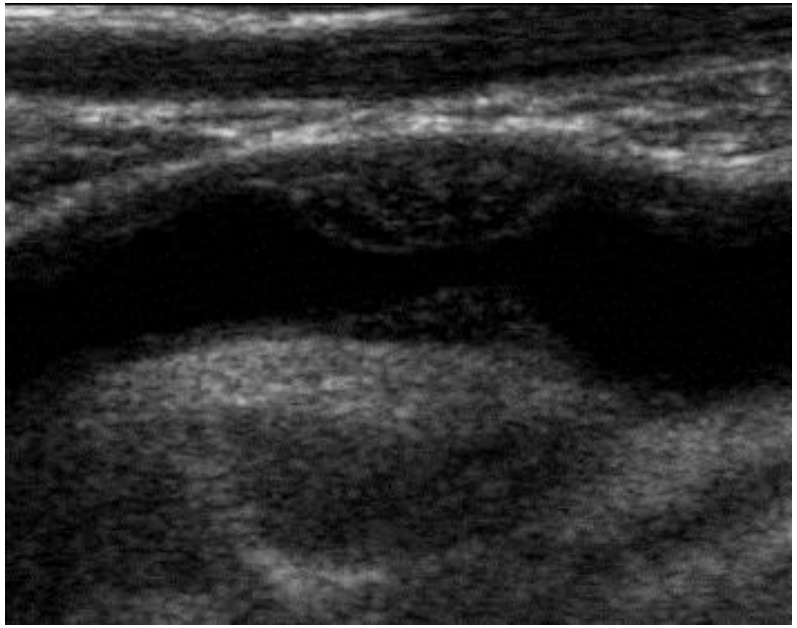
✓ Adventitia - Adventitia



Plaque

- Lesion locally projecting of intra vessel (1.1mm<)





Carotid Stenosis

- ✓ **Clinical stenosis :** > 50%

- ✓ **Spectral doppler change**
- 50% < PSV Increase, 80% < EDV Increase
- Spectral broadening
- Aliasing of Color Flow mode

Stenosis %	ICA PSV (Cm/s)	ICA PSV/CCA PSV
Normal	< 125	< 2.0
< 50%	< 125	< 2.0
50~69%	125~230	2.0~4.0
70% <	> 230	> 4.0

Carotid Stenosis

Spectral doppler analysis

✓ **PI (Pulsatility index)**

$$PI = \frac{Vmax - Vmin}{Vmax}$$

✓ **RI (Resistance index)**

$$RI = \frac{Vmax - Vmin}{Vmean}$$

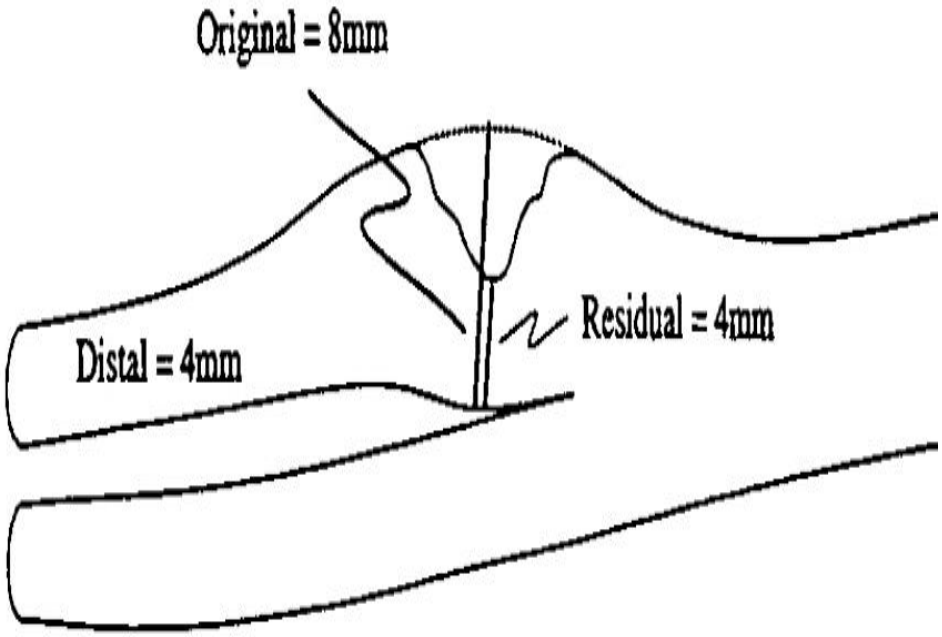
Vmax : Peak systolic velocity

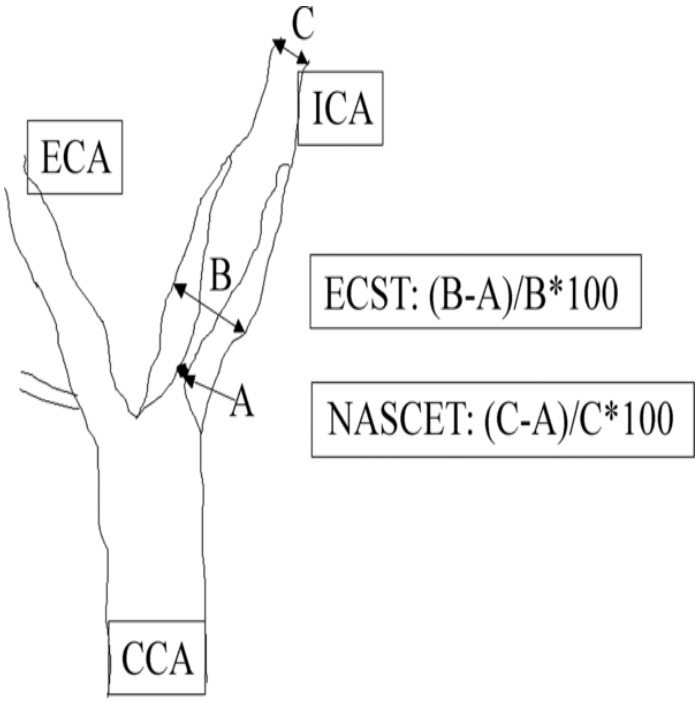
Vmin : End diastolic velocity

Vmean : Mean velocity

Diameter stenosis

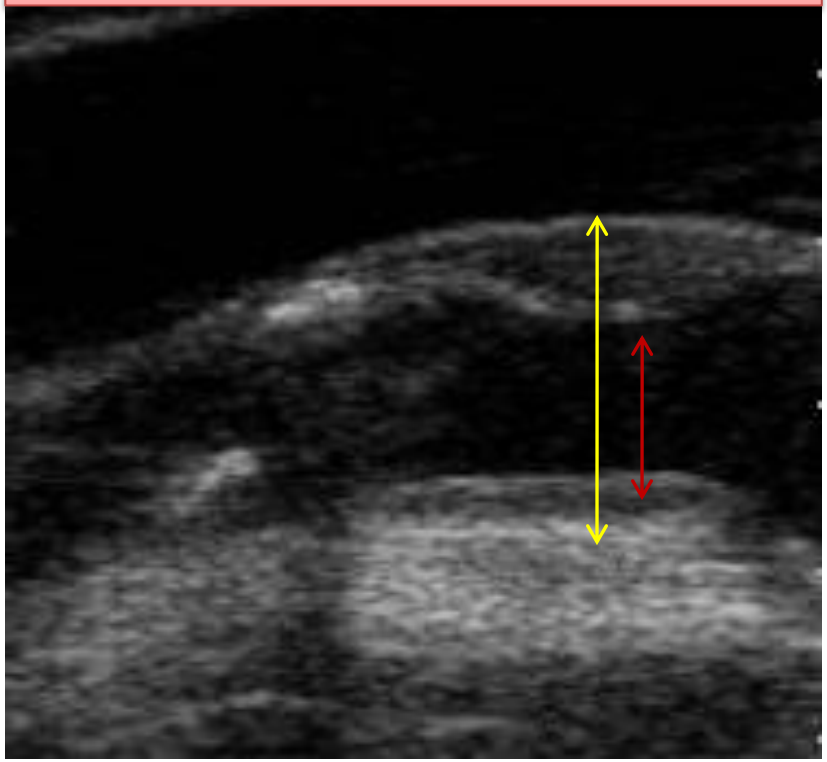
- ✓ ECST: European Carotid Surgery Trial
- ✓ NASCET: North American Symptomatic Carotid Endarterectomy Trial



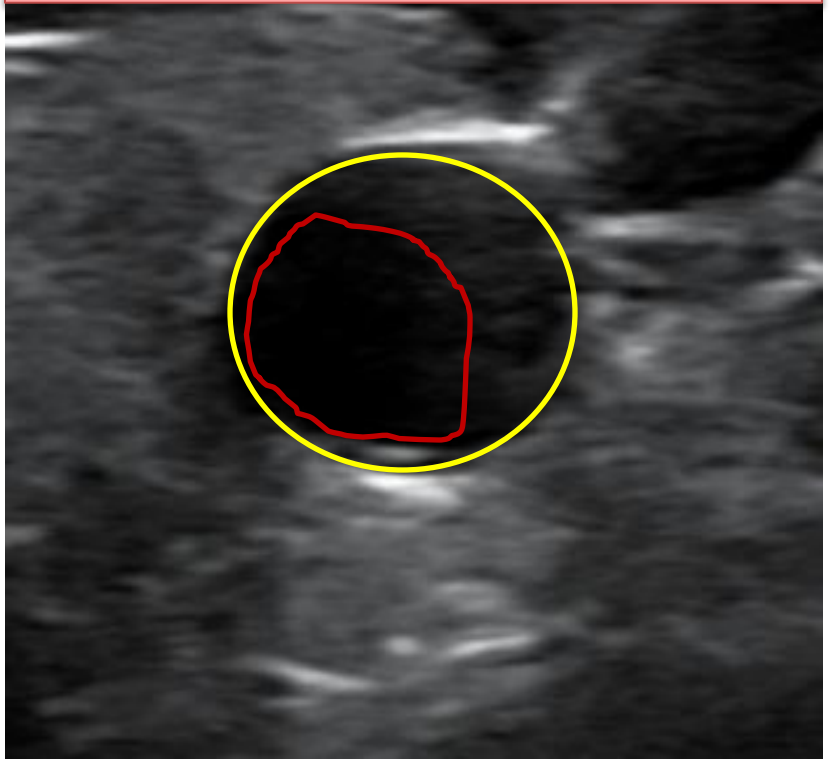


Stenosis Measure

Stenosis measurement - Diameter

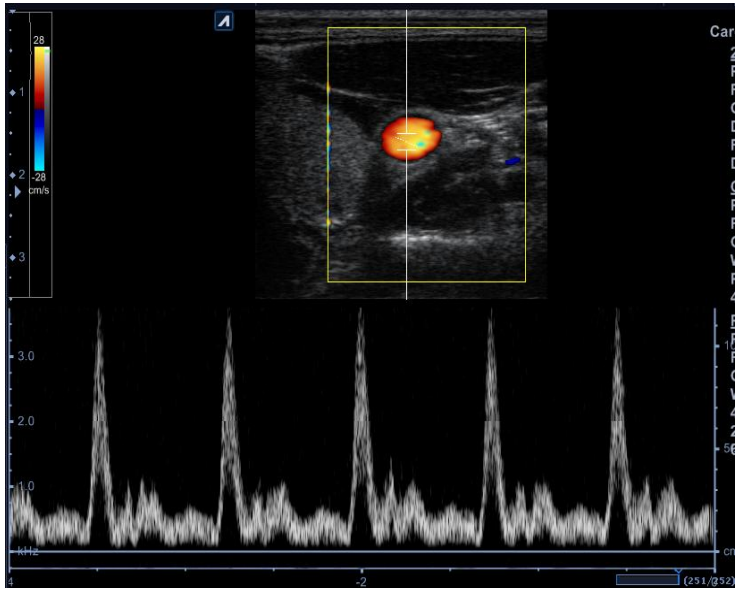


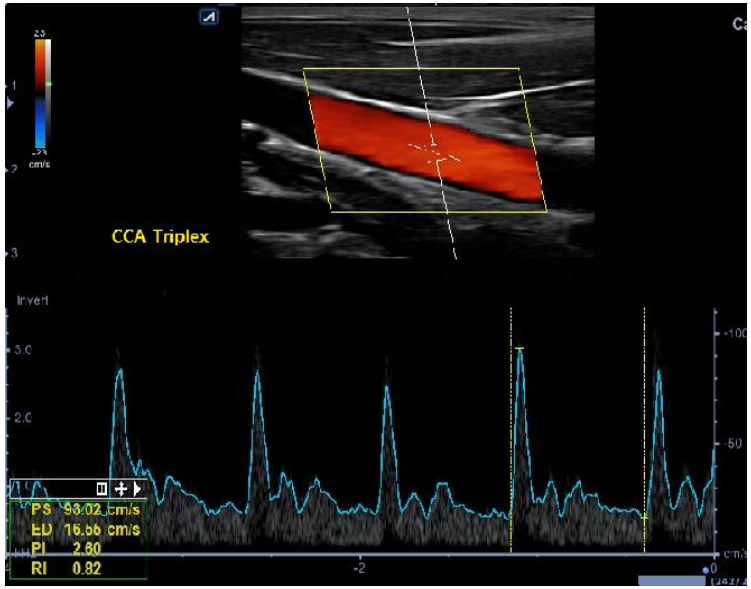
Stenosis measurement - Area



Doppler Mode

- Presence or absence of flow
- Character of flow
- Direction of flow
- Velocity of flow (PSV,EDV,PI, RI)

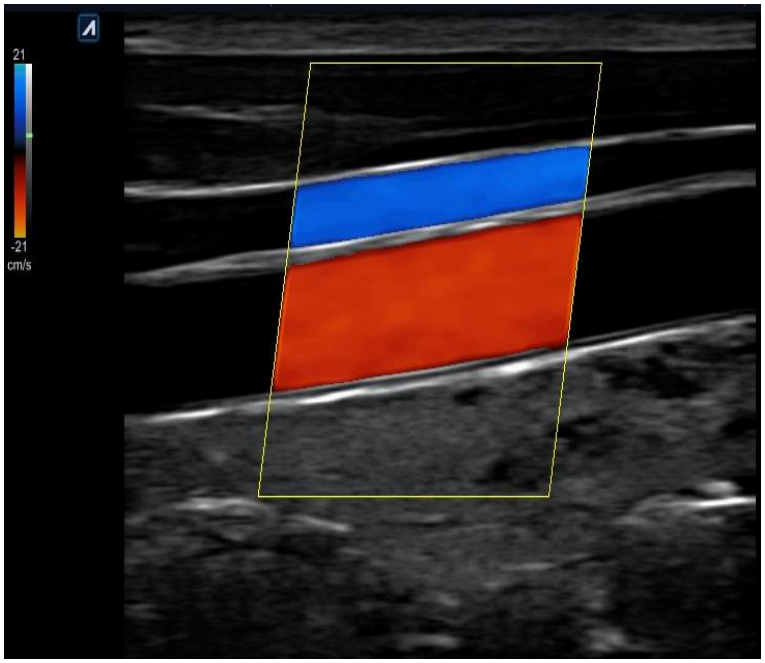


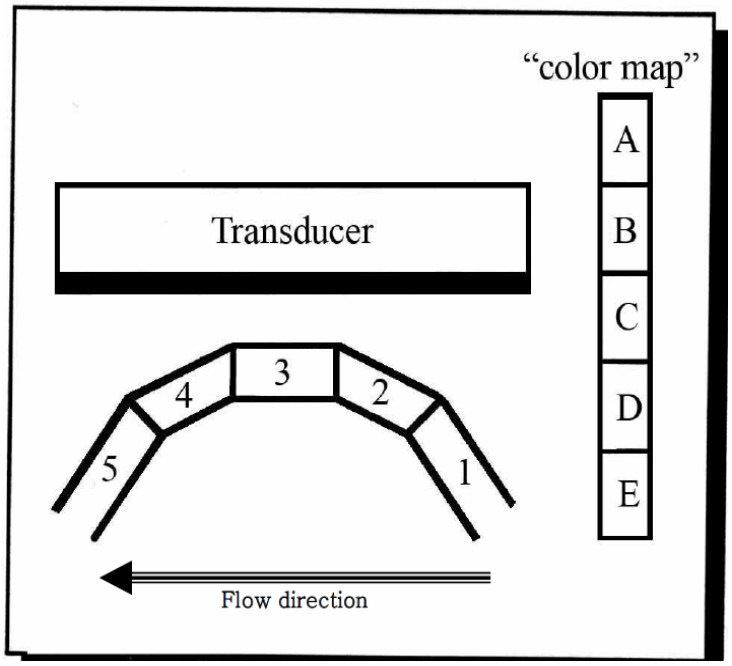


Color Flow Mode

Check point

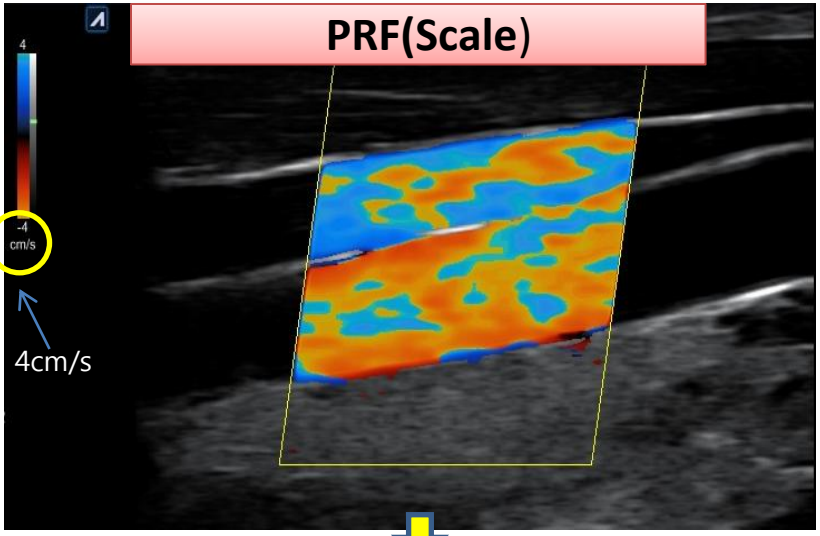
- Flow direction , stenosis, plaque

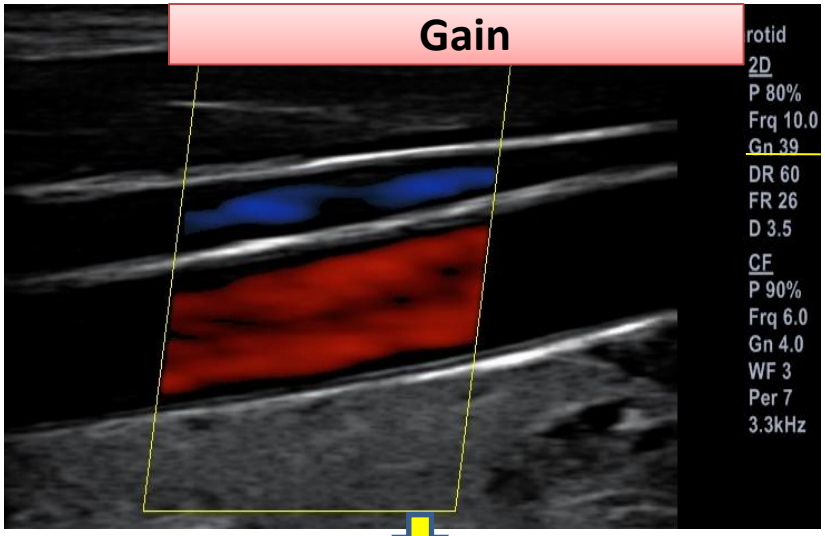


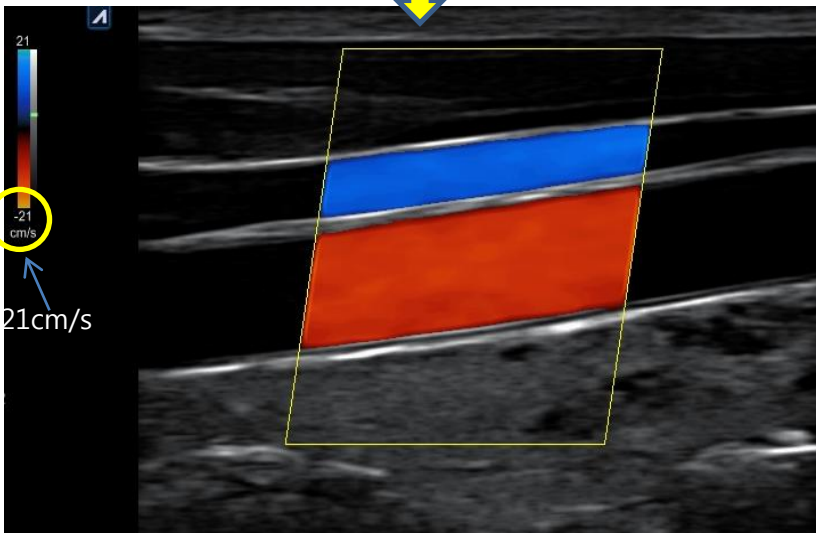


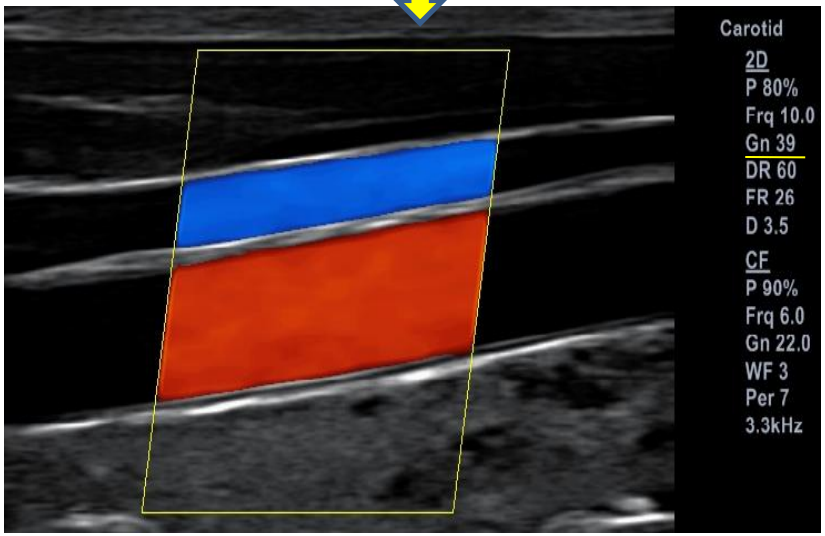
<Doppler shift equation>

Technical consideration





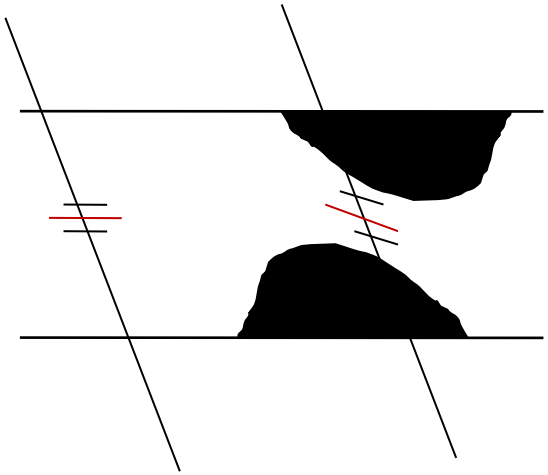


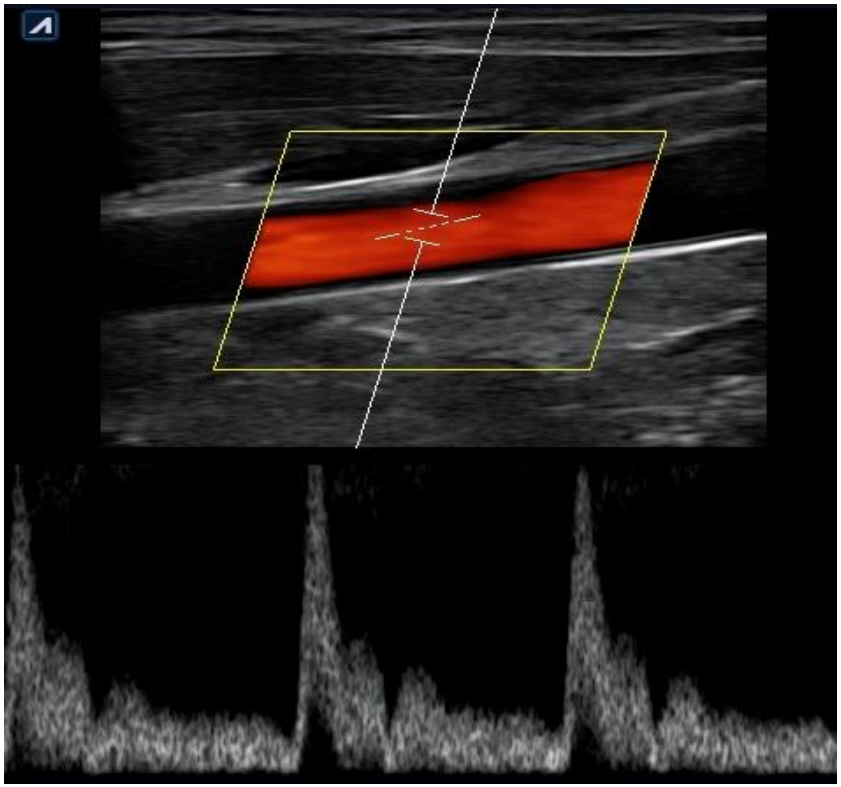


Pulsed Wave Doppler

Check point

- Angle Correction < 60°
- Cursor Location
: Parallel to vessel axis





Identification of carotid artery doppler

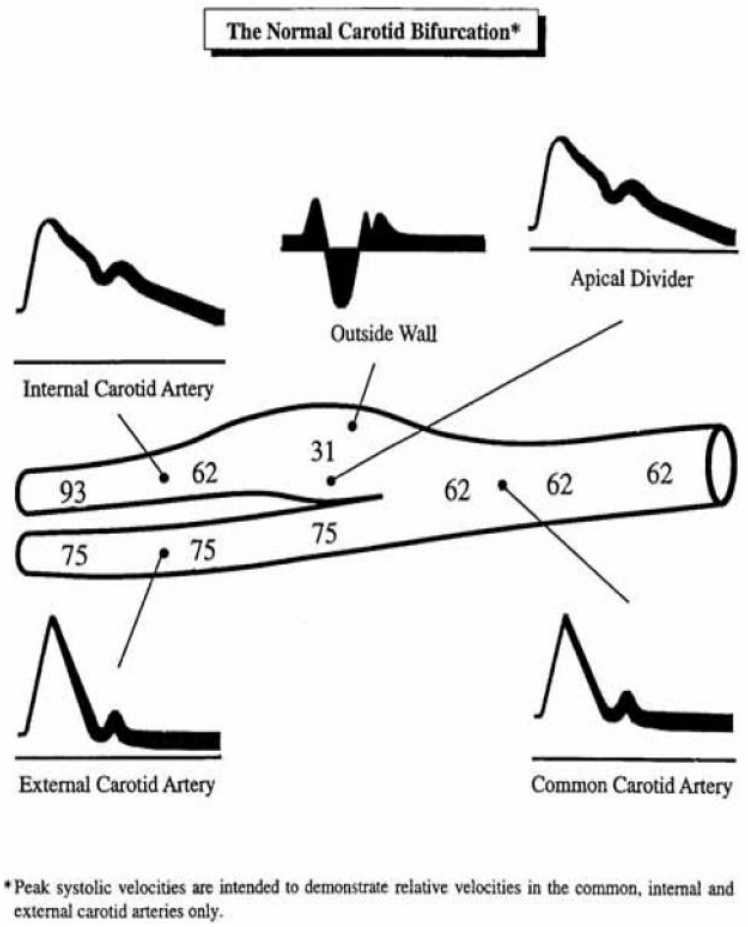
Check point

✓**1.CCA:**
Mixed pattern

✓**2.Proximal ICA**:
Spectral broadening and reflux

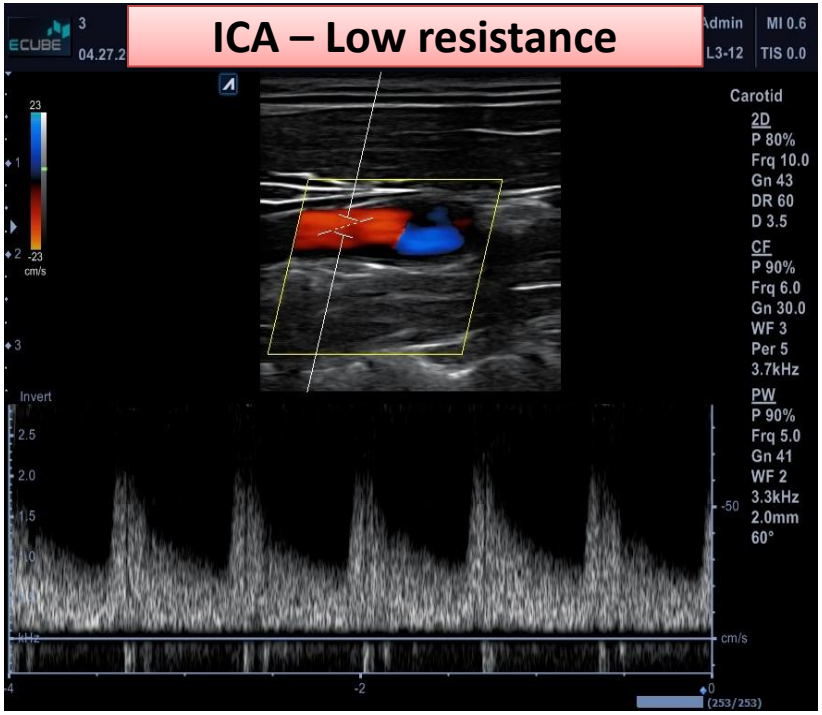
✓**3.Distal ICA:**
Anterior circulation
for systole and diastole

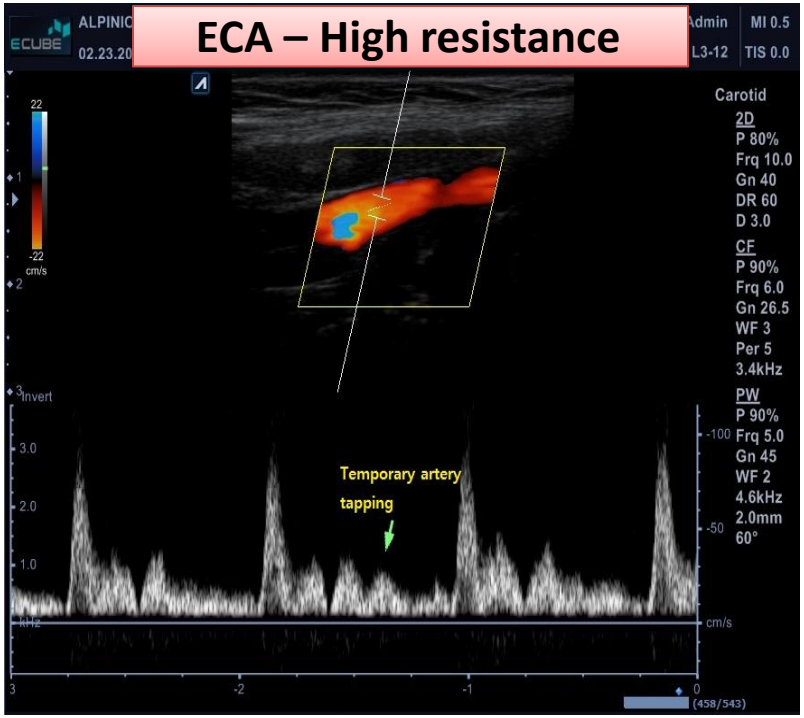
✓**4.ECA**:
triphasic



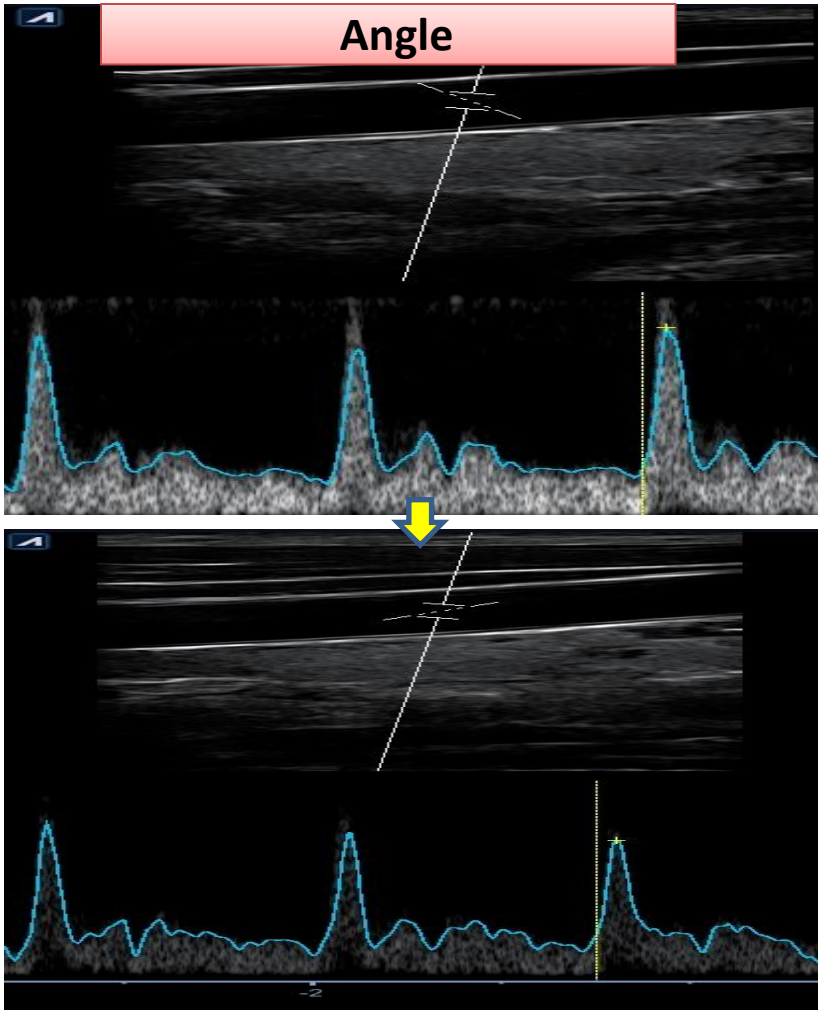
*Peak systolic velocities are intended to demonstrate relative velocities in the common, internal and external carotid arteries only.

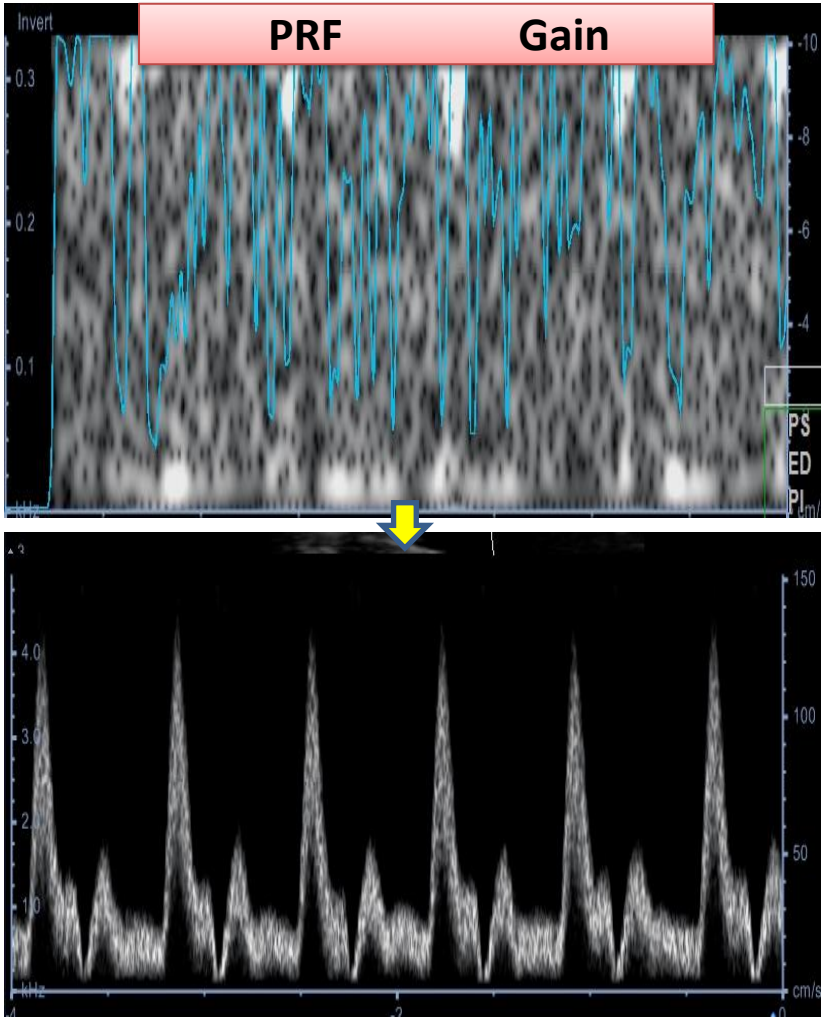
Pulsed Wave Doppler





Technical consideration





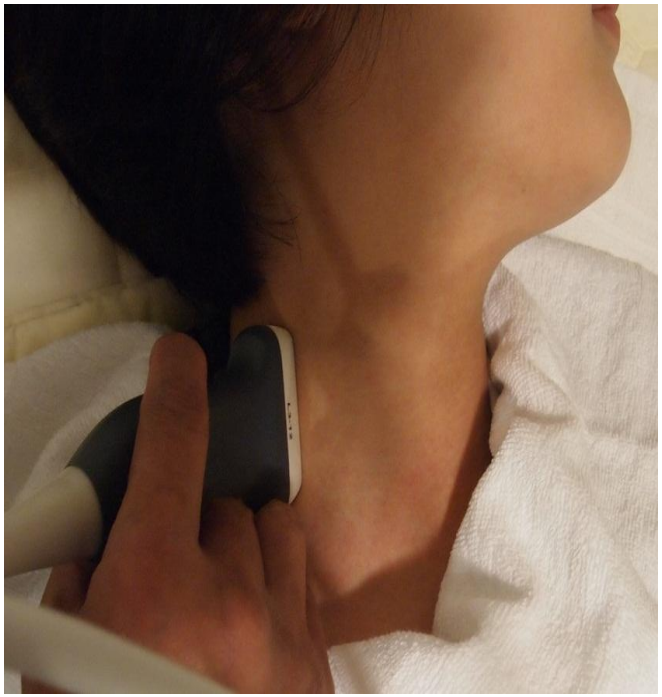
ICA vs ECA

	ICA	ECA
Location	Postero-lateral	Antero-lateral
Diameter	Usually Larger	Usually Smaller than ICA
Resistance	Low	High
Peak Systole	Blunt	Sharp
End Diastole	High	Low
Branches	Absent	Present
Temporal tap	No change	Serrated wave form

Vertebra Artery

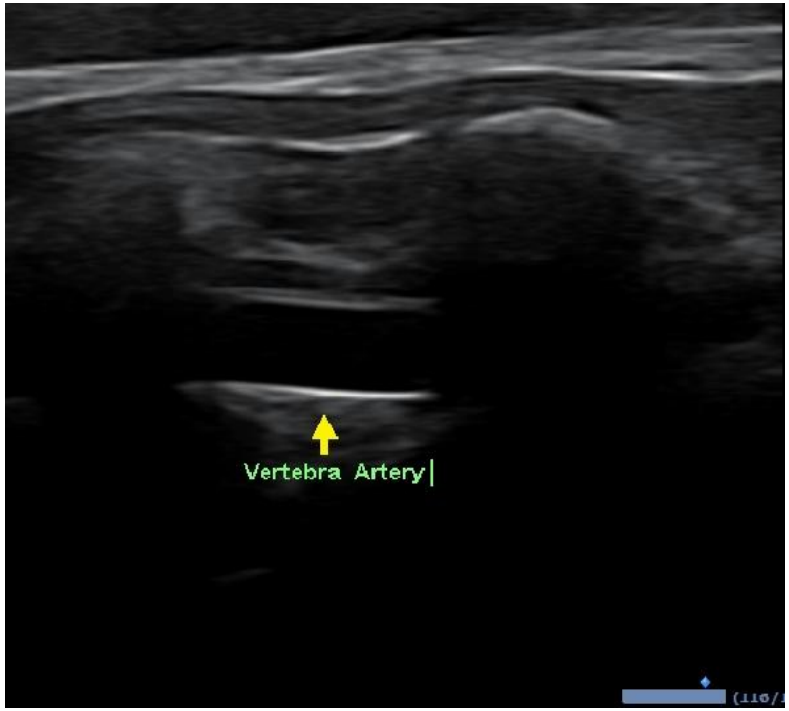
Position

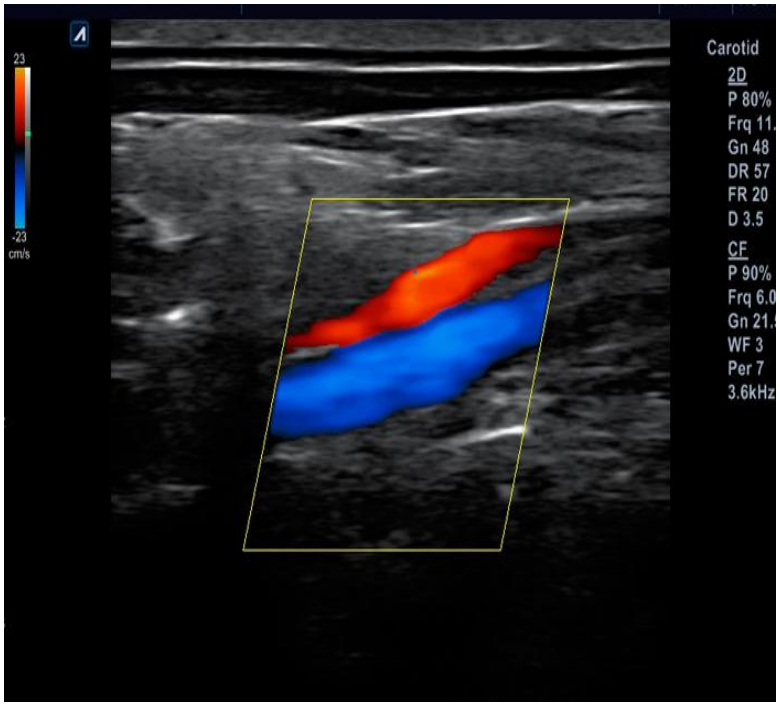
- ✓ Turn one's head the opposite direction, Lift one's chin.
- ✓ Longitudinal scan
- ✓ Posterolateral transducer position
- ✓ Observe the blood vessel between the transverse process



Vertebra Artery B-mode & CFM

- ✓ Confirm Vertebra Artery's structure & Blood flow





Vertebra Artery triplex

Check point

✓ **2D**

- normal range : 3.1±0.6mm

✓ **PW**

- low residence

  PS : 0.56±0.17 m/s

  ED : 0.15±0.17 m/s

✓**Check the Atherosclerosis**

(*Atherosclerosis

-common disease of Vertebra artery**)**