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District Health Board
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Carotid Artery Ultrasound

Image interpretation and reporting

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Why do we do it?

- To look for carotid artery stenosis, occlusion, dissection, aneurysm, carotid body tumour.
- To prevent stroke/death.

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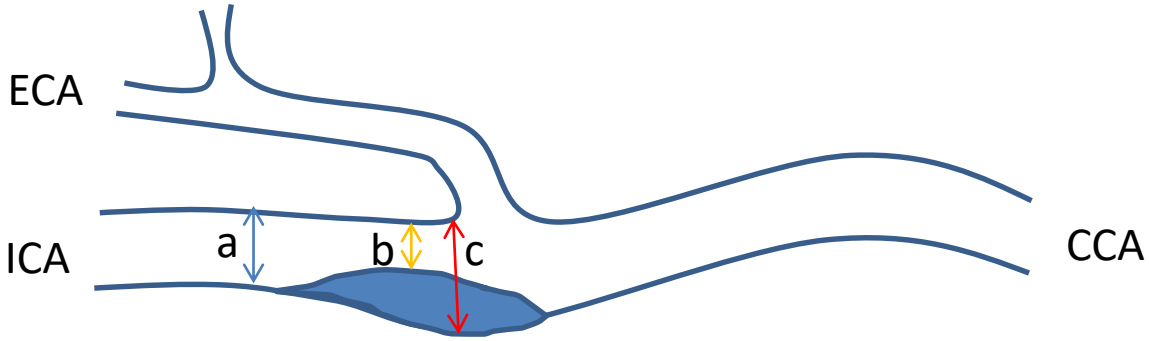
Why do we do it?

- Early surgical intervention for symptomatic carotid artery stenosis has been shown to significantly reduce the risk of stroke following TIA/minor stroke.
- UK NICE guidelines suggest high risk patient's should therefore be imaged within 24 hours, and surgery be performed within 48 hours.
- New Zealand guidelines just say "urgent" carotid imaging. Dependant on hospital resources.

Quantifying a stenosis

- NASCET and ECST methods of measuring stenosis. NEARLY everyone now uses NASCET.



$$\text{NASCET} = \frac{(a-b)}{a}$$

$$\text{ECST} = \frac{(c-b)}{c}$$

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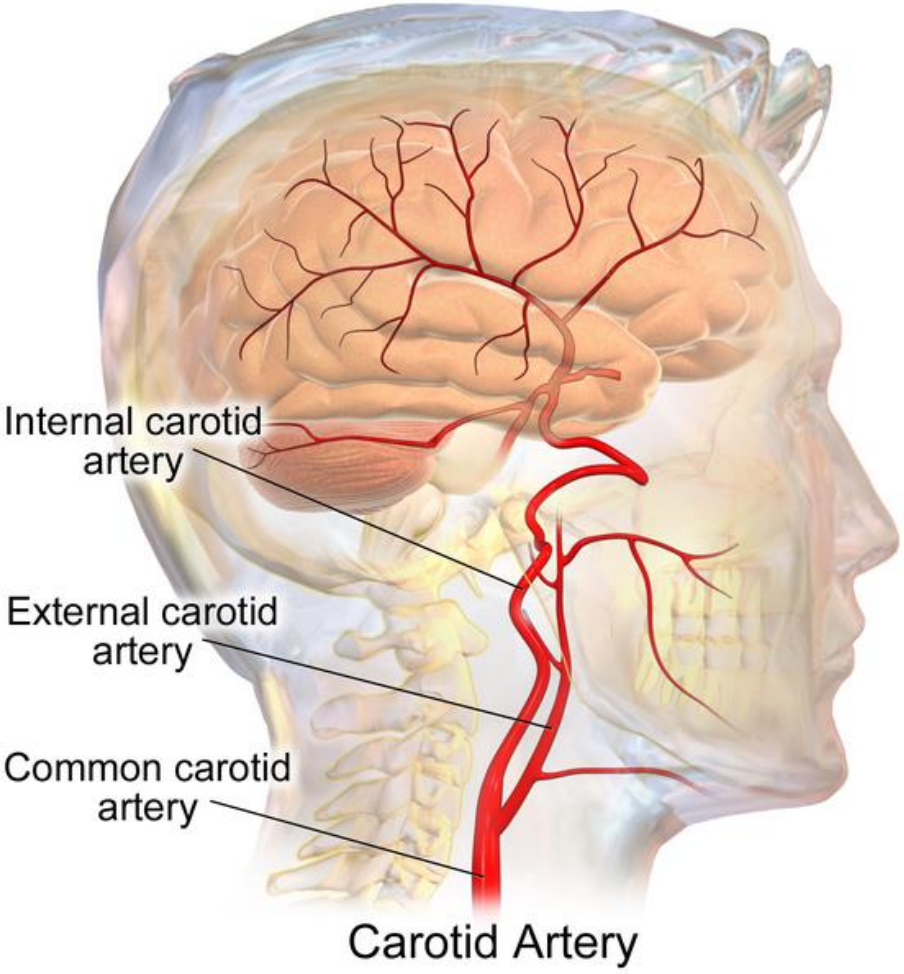
Quantifying a stenosis

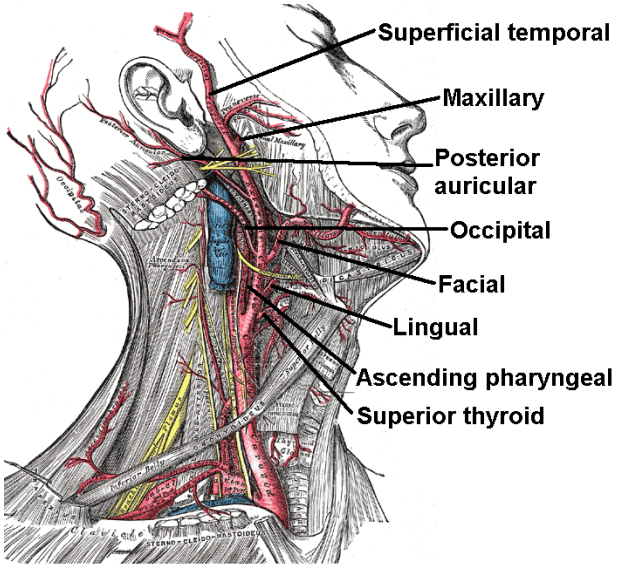
- Over the years ultrasound velocity and ratio criteria have been developed. The below criteria are now used recommended by ASUM, ARDMS and SVTGBI.

Percentage stenosis (NASCET)	ICA psv (cm/s)	EDV (cm/s)	PSV ratio ICApsv/CCApsv	St Mary's ratio ICApsv/CCAedv
<50	< 125	<100	<2	<8
50-59	>125		2-4	8-10
60-69				11-13
70-79	>230	>100	>4	14-21
80-89				22-29
>90 -near occlusion	Hi, low-string flow		Variable	Variable
Occlusion	No flow		Not applicable	Not applicable

Extracranial Anatomy

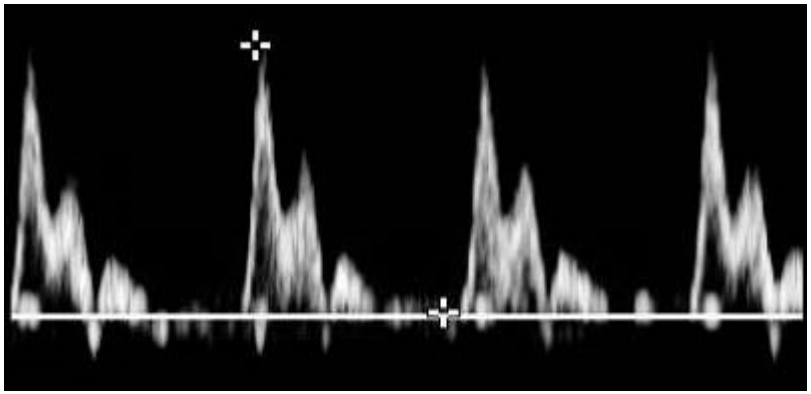


- ICA has no branches
- ECA has branches
- ECA generally but not always lies medially and anterior to the ICA.

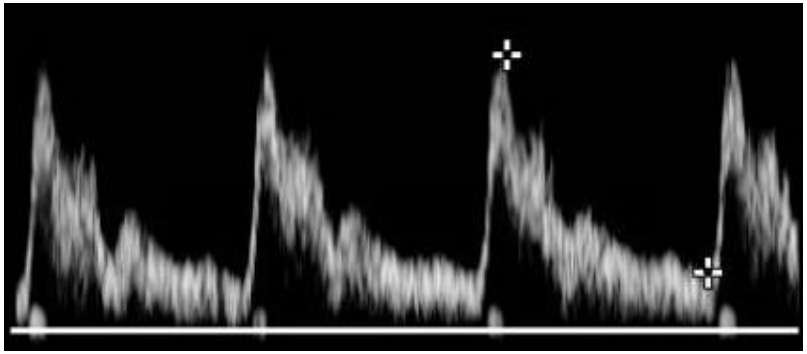


Haemodynamics

- ECA waveform is higher resistance than the ICA – what does this mean?



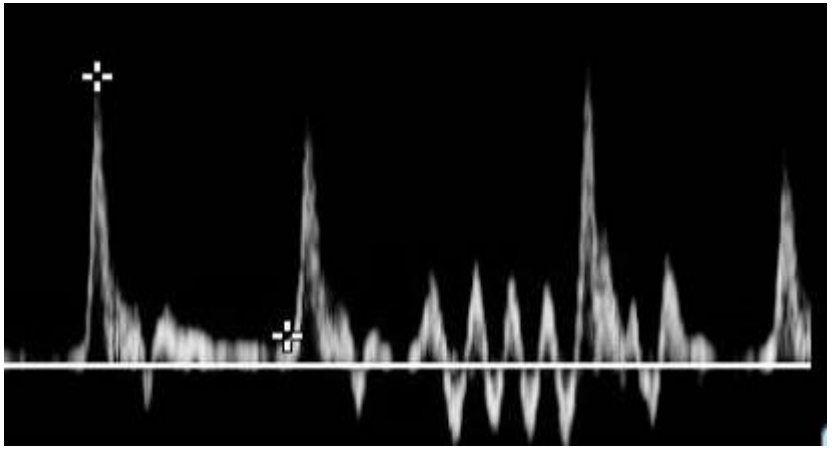
ECA – The blood is moving forwards but does not continue to flow.



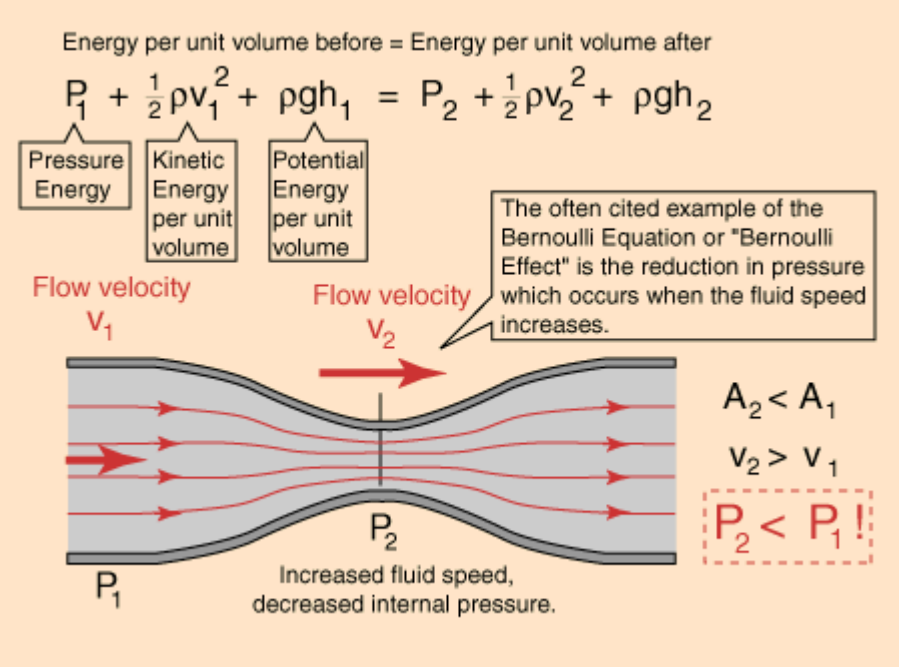
ICA – The blood is moving forwards and continues to flow till the next heart beat.

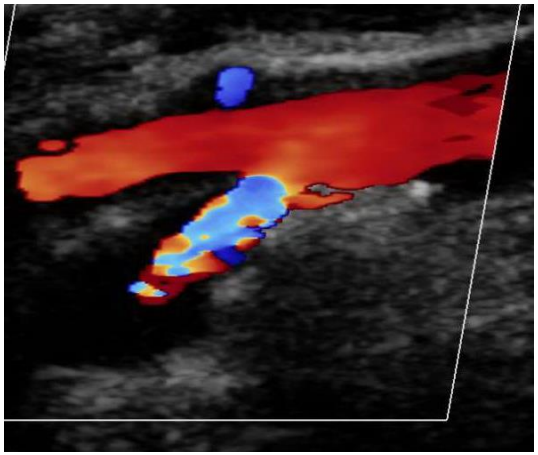
Haemodynamics

- A temporal tap is also used to identify the ECA.
- A tap on the head just in front of the ear should be seen in the pulsed-wave waveform in the ECA, as below, but not in the ICA.



Haemodynamics





The increase in velocity is used to quantify the stenosis.

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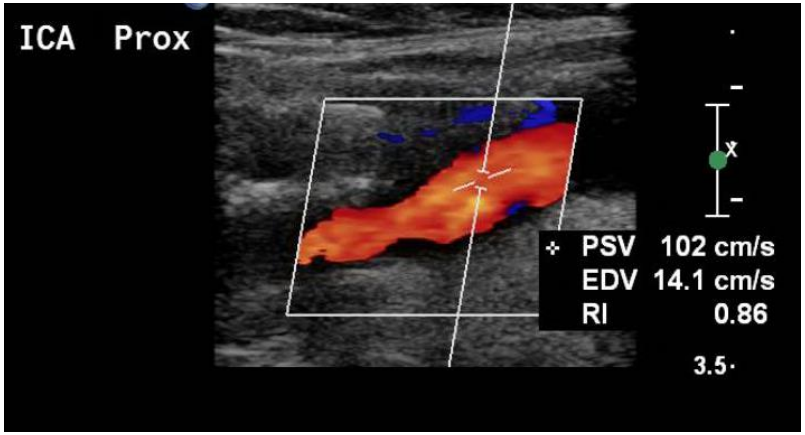
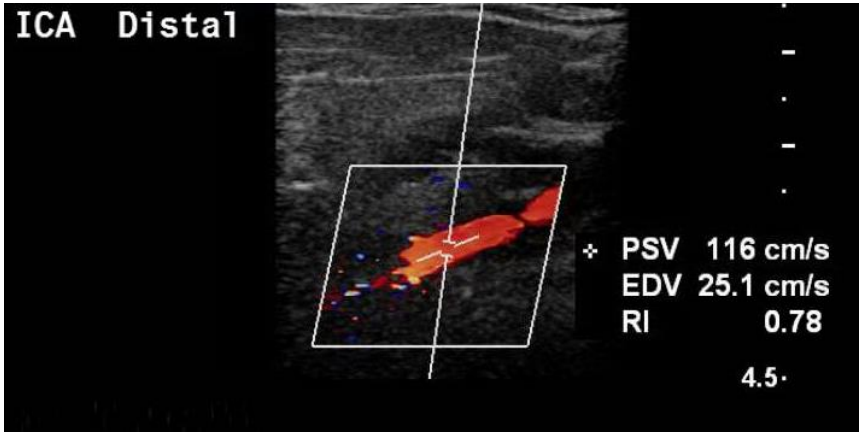
Haemodynamics

- The velocity used to calculate the degree of stenosis should be the highest velocity which is **relevant to the stenosis**.
- So if there is no stenosis, the velocity from the proximal ICA should be used for ratios.

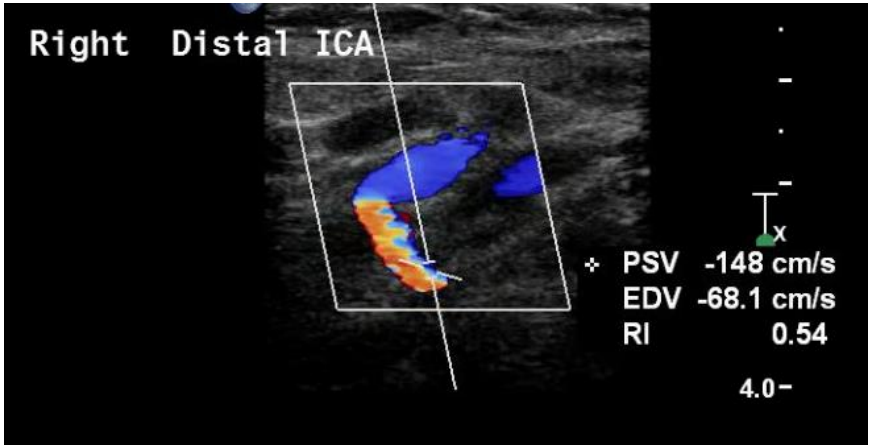
Haemodynamics

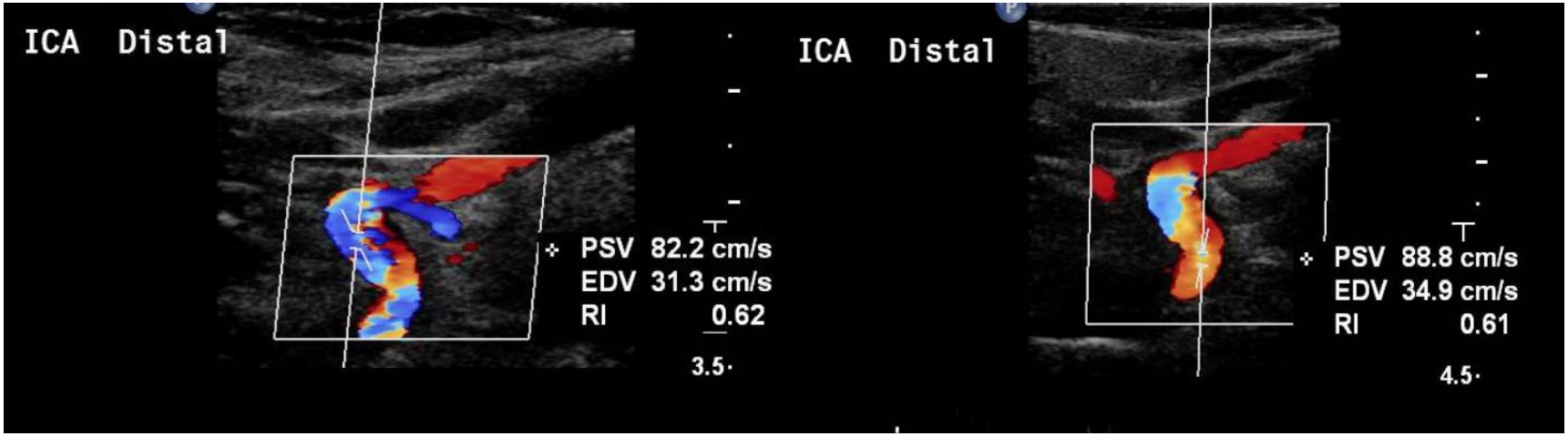
- The ICA can also be tortuous and taper in size slightly, which can increase the velocity, even when there is no stenosis.





Watch the angle!

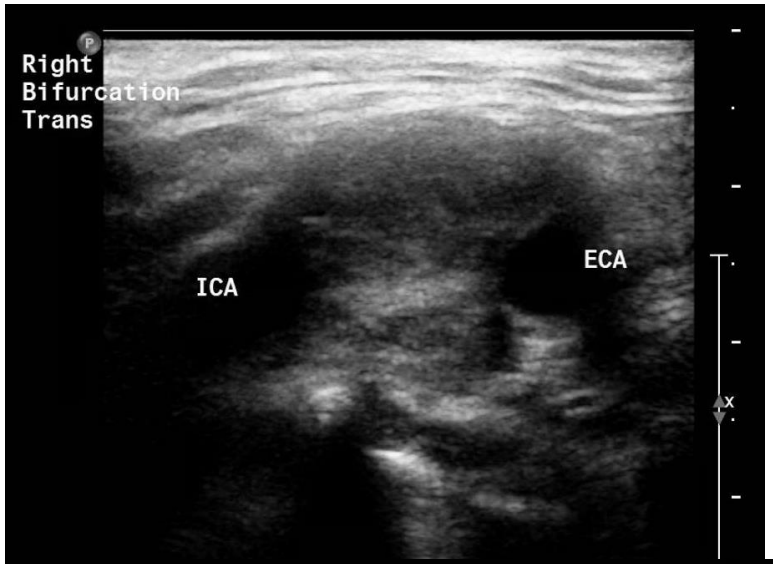


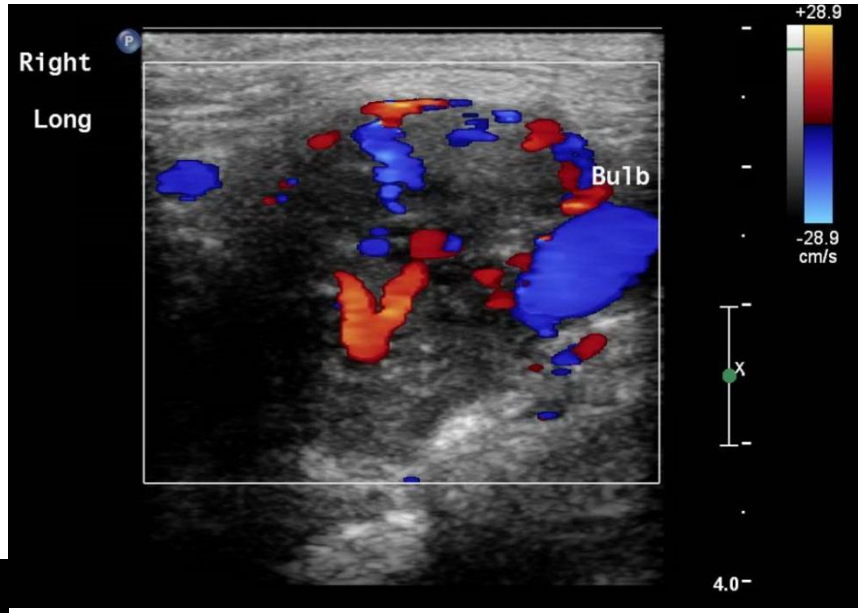


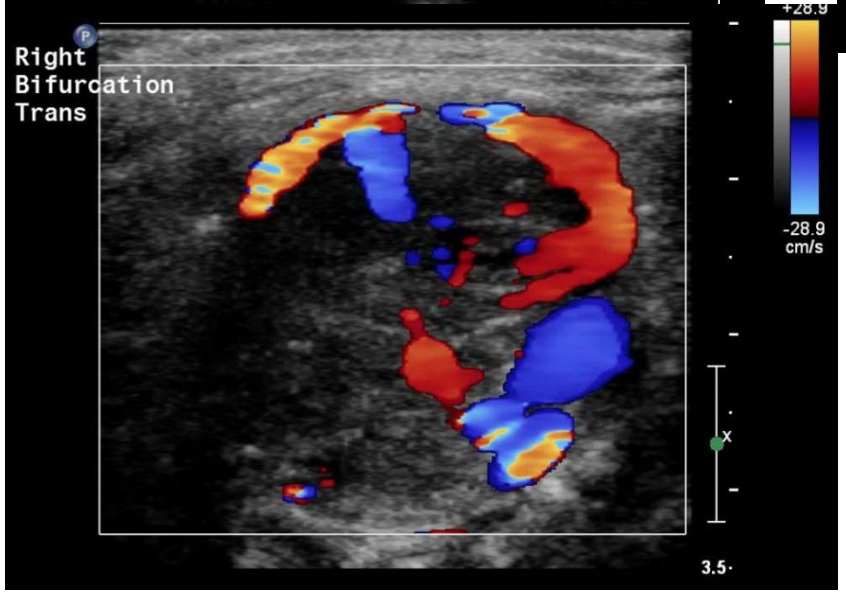
Carotid body tumour

- Carotid body sits between the ECA and ICA at the carotid bifurcation.
- Tumour presents as highly vascularised mass which splays the ICA and ECA.

Carotid body tumour



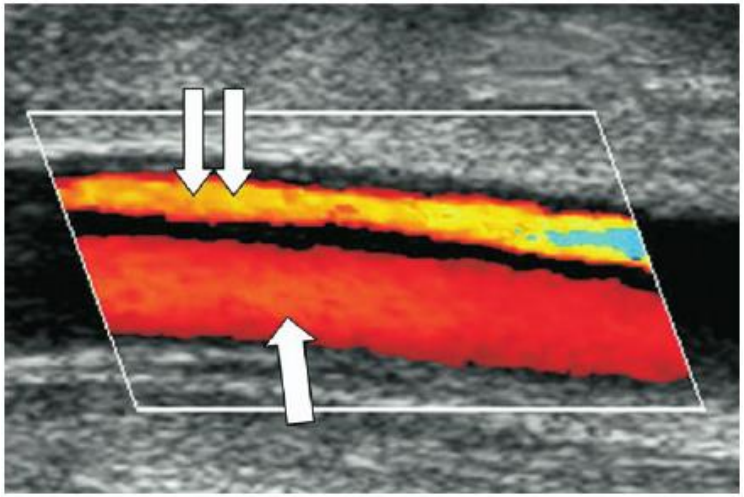


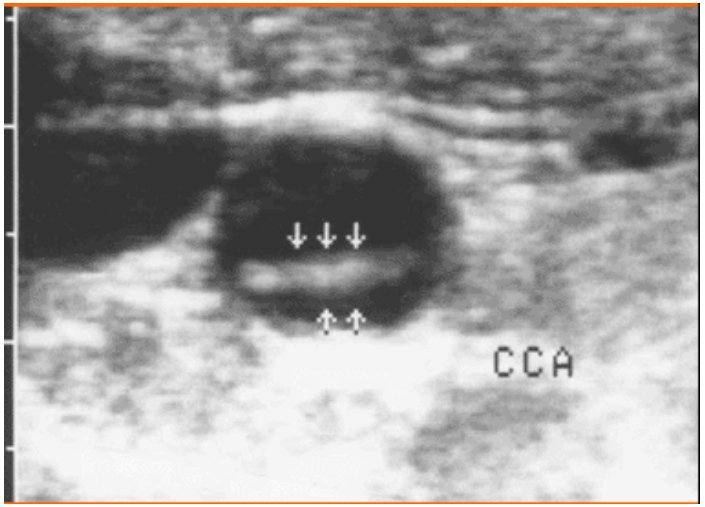


Dissection.

Dissection.

- The intima becomes detached from the media and adventitia of the vessel. This can be mobile with flow on both sides, or stationary and thrombosed on one side.



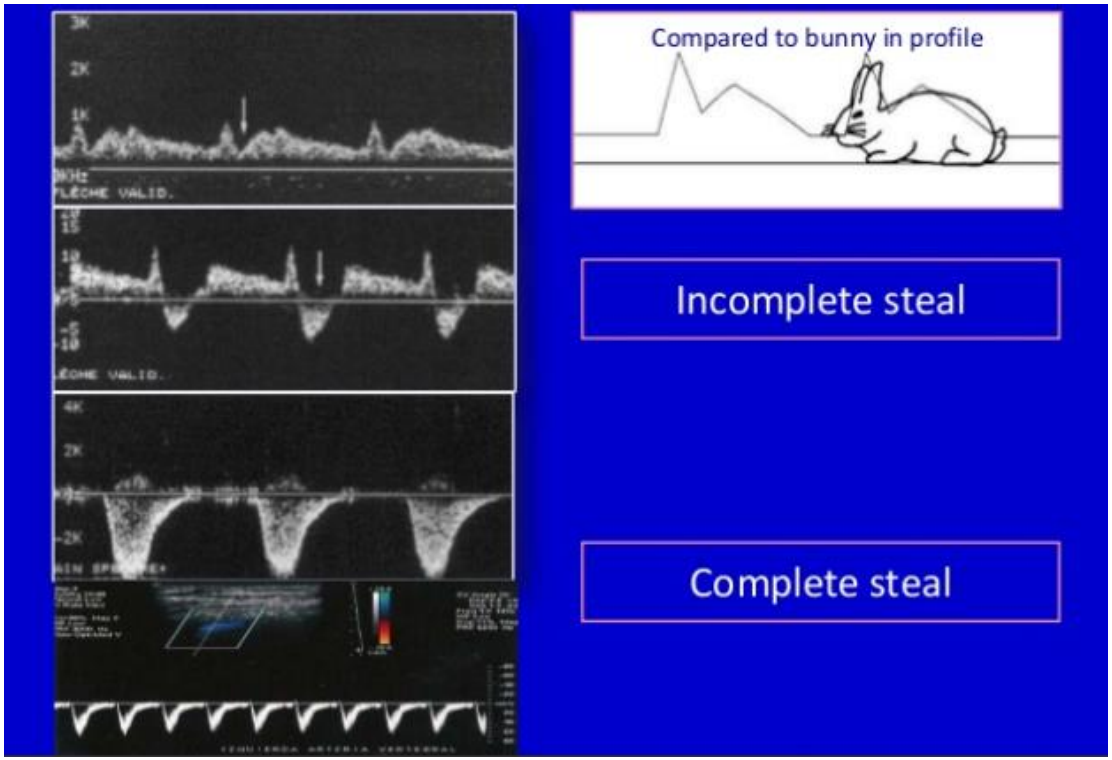


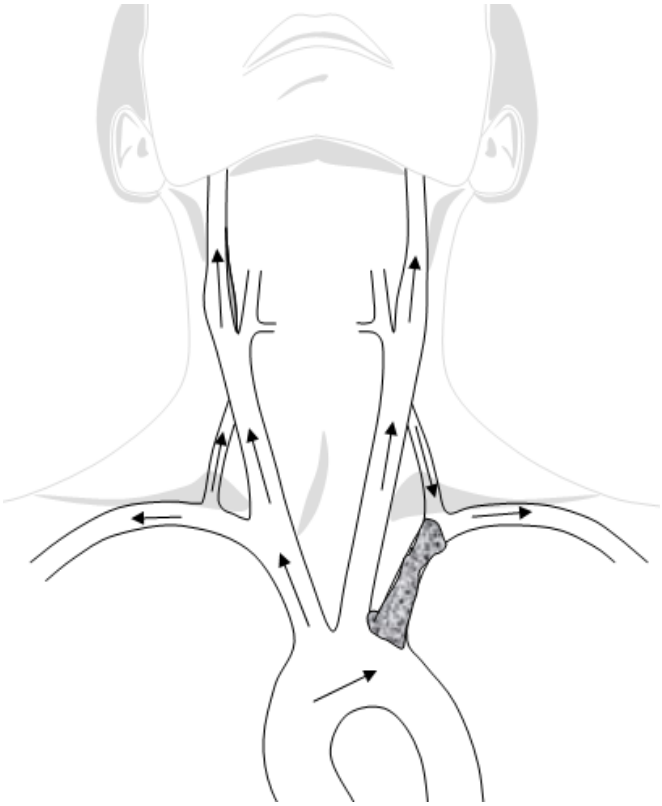
Aneurysm

- Defined by a 50% increase in size of the vessel compared to the artery immediately proximal.
- May or may not contain thrombus.

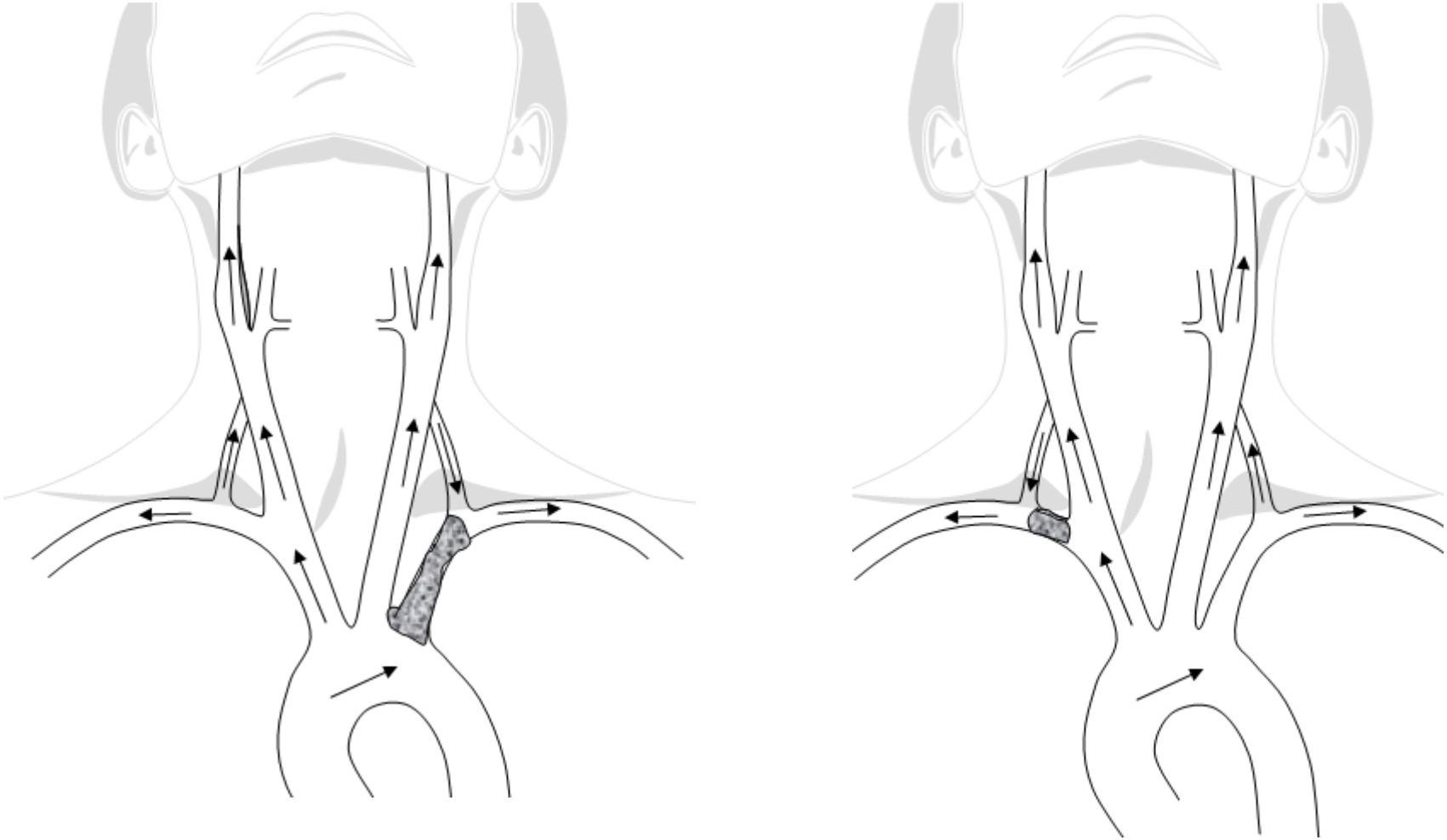
Subclavian steal syndrome

- Characterised by partial or full retrograde flow in the vertebral artery.

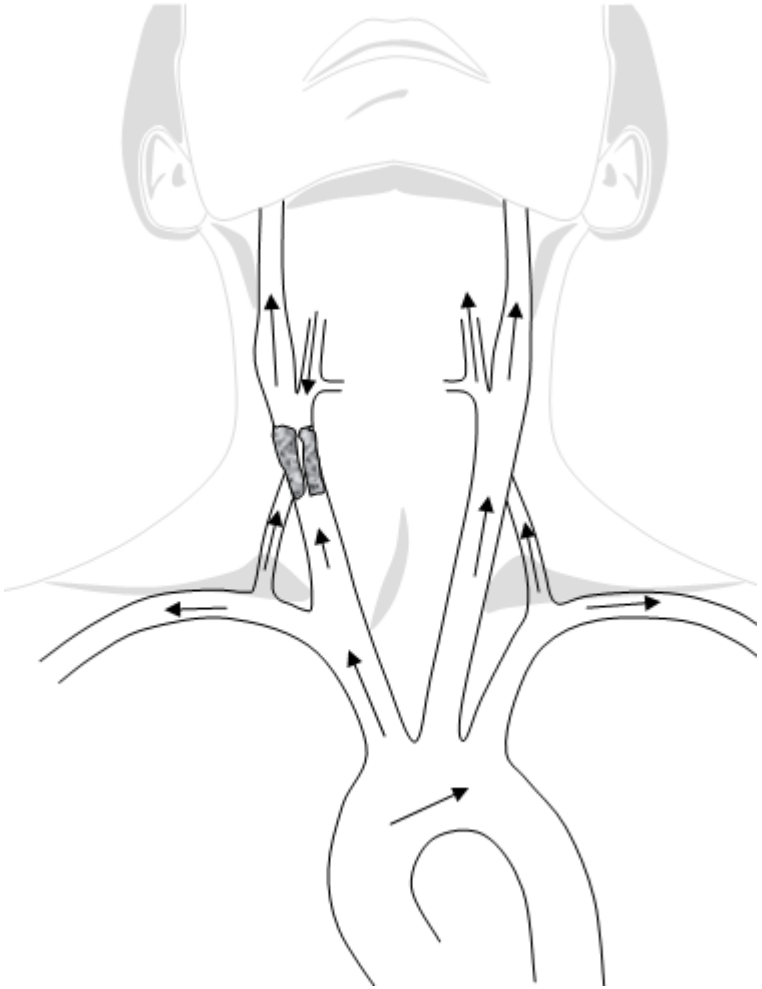


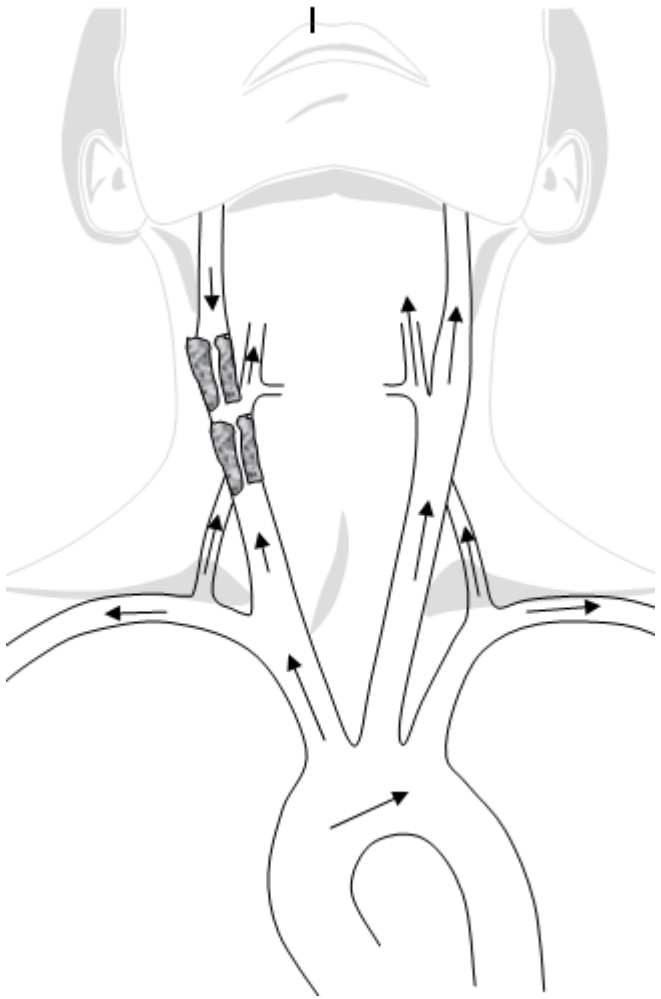


Subclavian steal



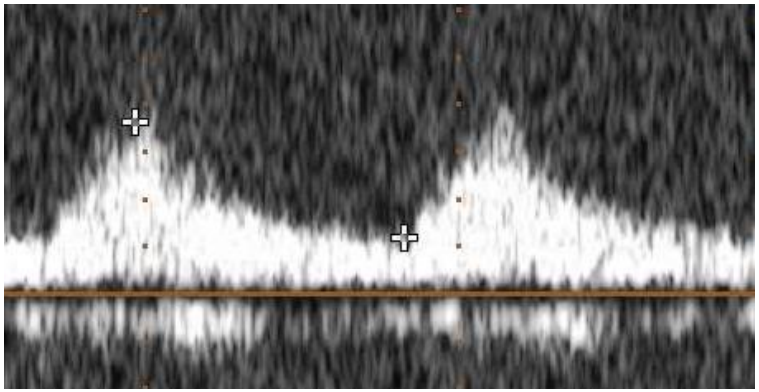
Other steals





CCA waveforms

- Slow rise to PSV time (Tardus parvus) can indicate proximal disease e.g. at the brachiocephalic origin or aorta.



- High resistance flow, similar to the ECA, can be an indicator for significant ICA disease.

CCA waveforms

- Unusual waveforms that are appears in all arteries e.g. carotid, subclavian, vertebral etc. are likely due to cardiac issues, such as aortic regurgitation.