



# How to use Doppler in stroke management

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# DISCLOSURE STATEMENT OF FINANCIAL INTEREST

I, Saman Perera DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.



# Indications for carotid Doppler

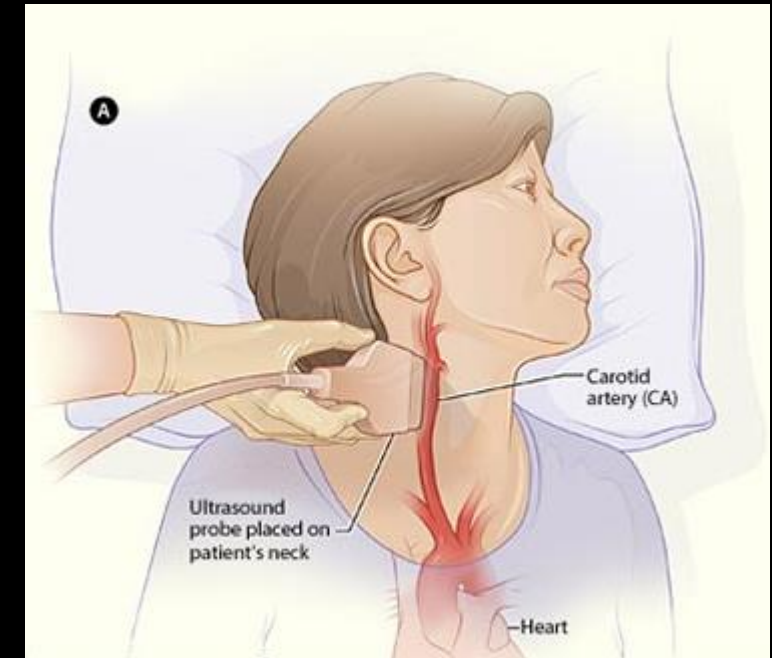
- Work up of ischaemic stroke and TIA – triaging
- Evaluation of extracranial and intracranial arterial disease (TCD)
  - plaque characterisation
  - evaluating patency of vessels
  - Extent of any stenosis
  - type of arterial disease – atherosclerosis
    - fibromuscular hyperplasia
    - arteritis
- Intracranial arterial spasm following SAH (TCD)
- Silent emboli (TCD)
- Steal phenomena (subclavian artery stenosis/ occlusion)
- Dissection
- Stent surveillance



# Technique

## Carotid Doppler

- Ultrasound machine with vascular package
  - Colour /power/PW Doppler
  - measure peak systolic & peak diastolic velocities
- 5-12 MHz linear array transducer
- Patient supine on couch – neck supported & turned
- Good scanning technique – optimise settings
- Angle down to visualise vert. artery origin
- Doppler angle 60 deg. or less  
(angle of transmitted beam to direction of blood flow)



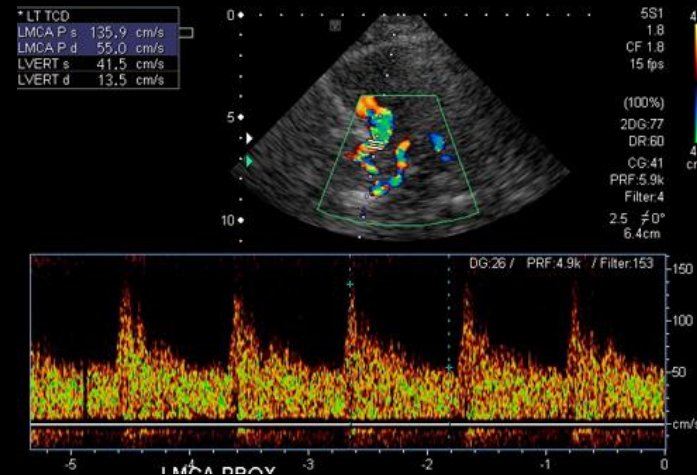




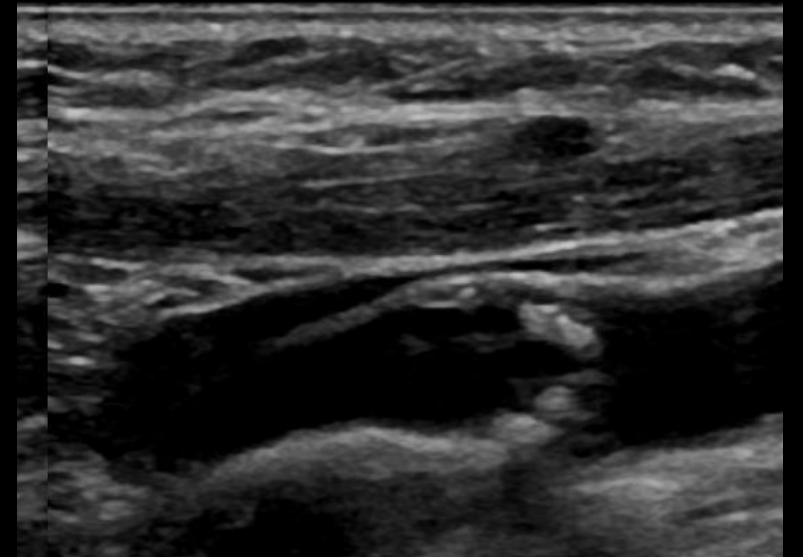
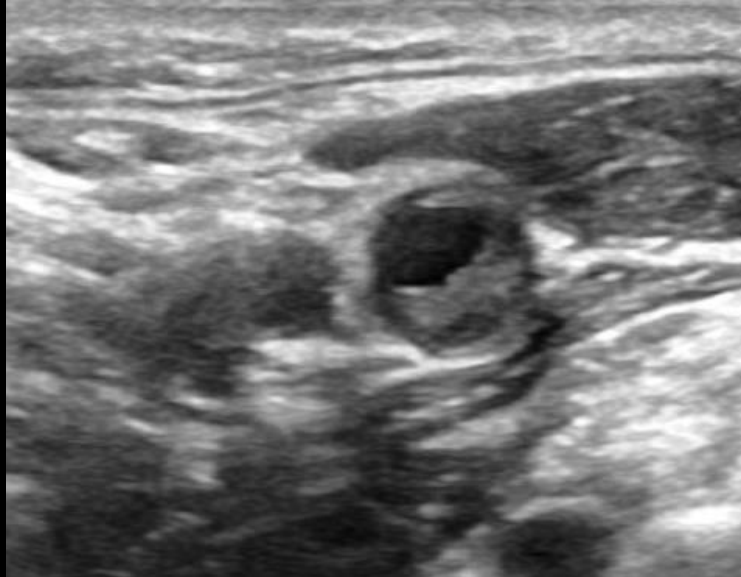
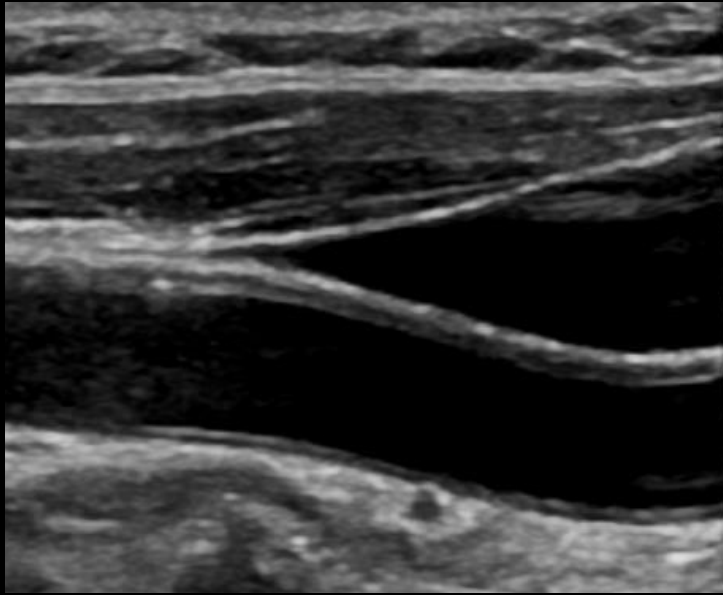
# Technique

## Trans cranial Doppler (TCD)

- 2MHz transducer
- 3 main windows
  - Trans temporal
  - Trans orbital
  - Trans foraminal

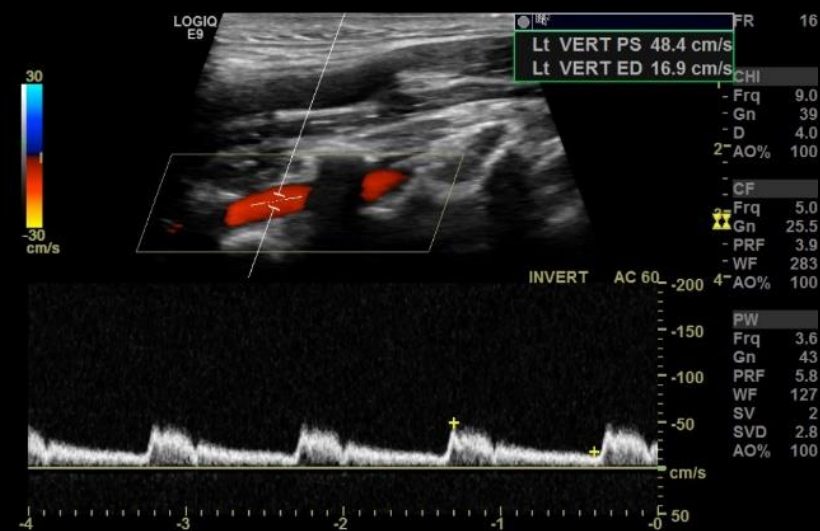
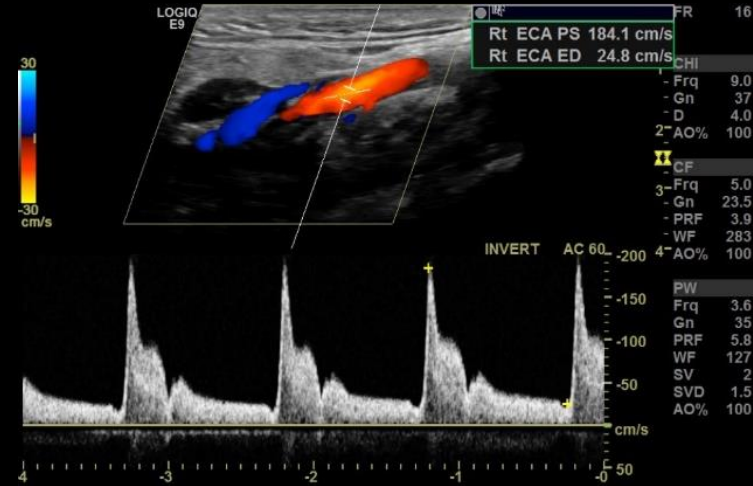
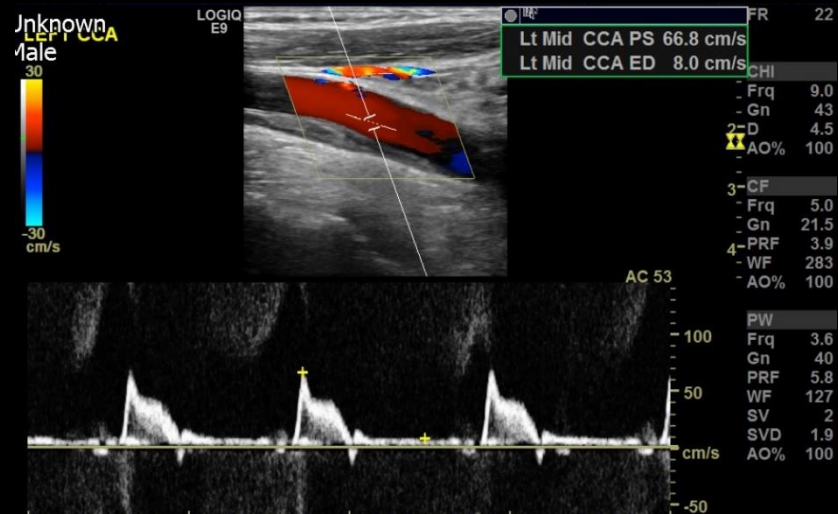


# Plaque morphology





# Normal carotid Doppler

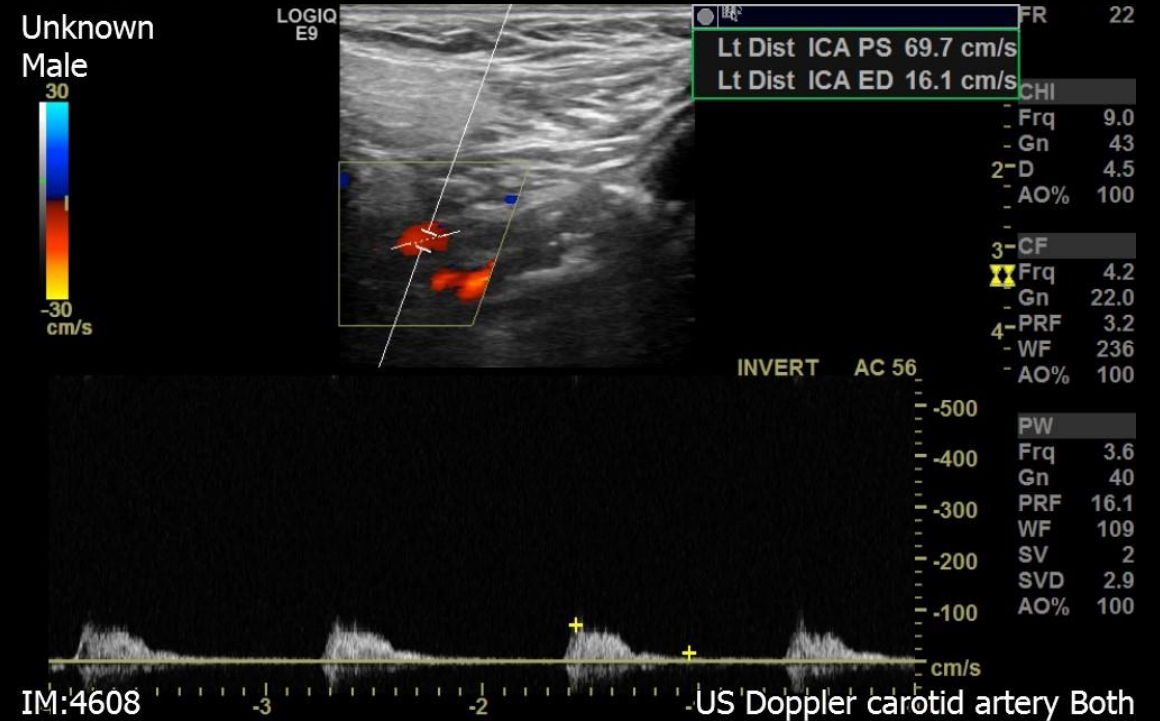
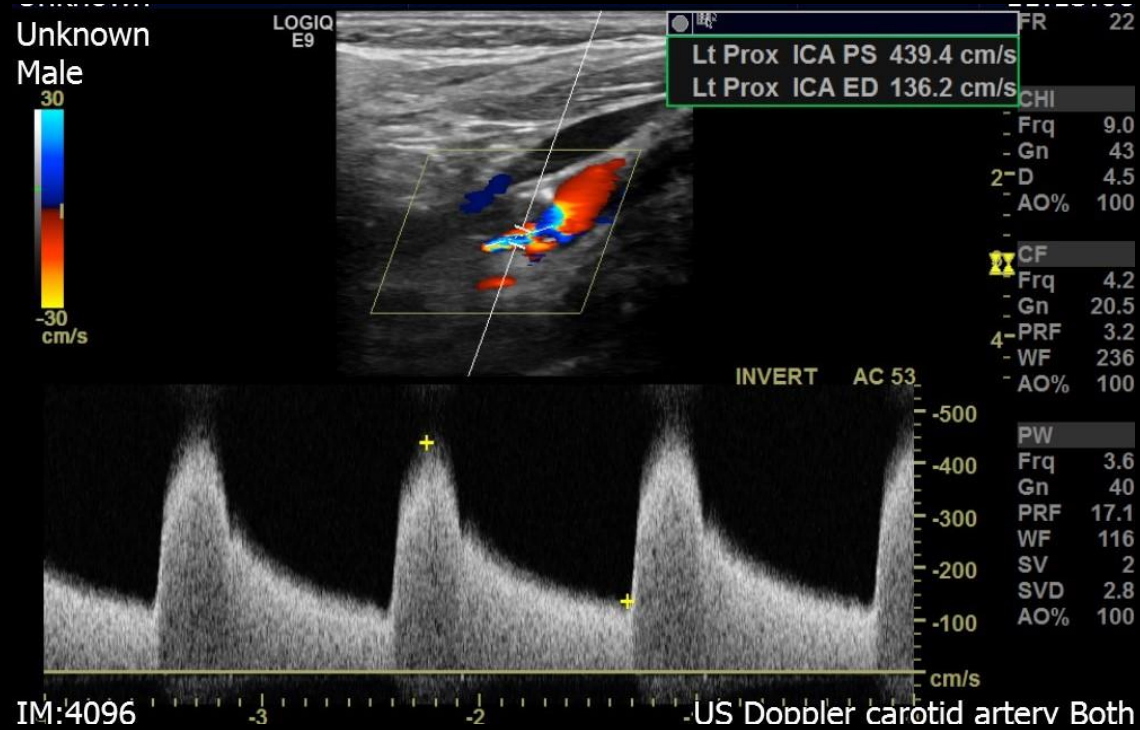






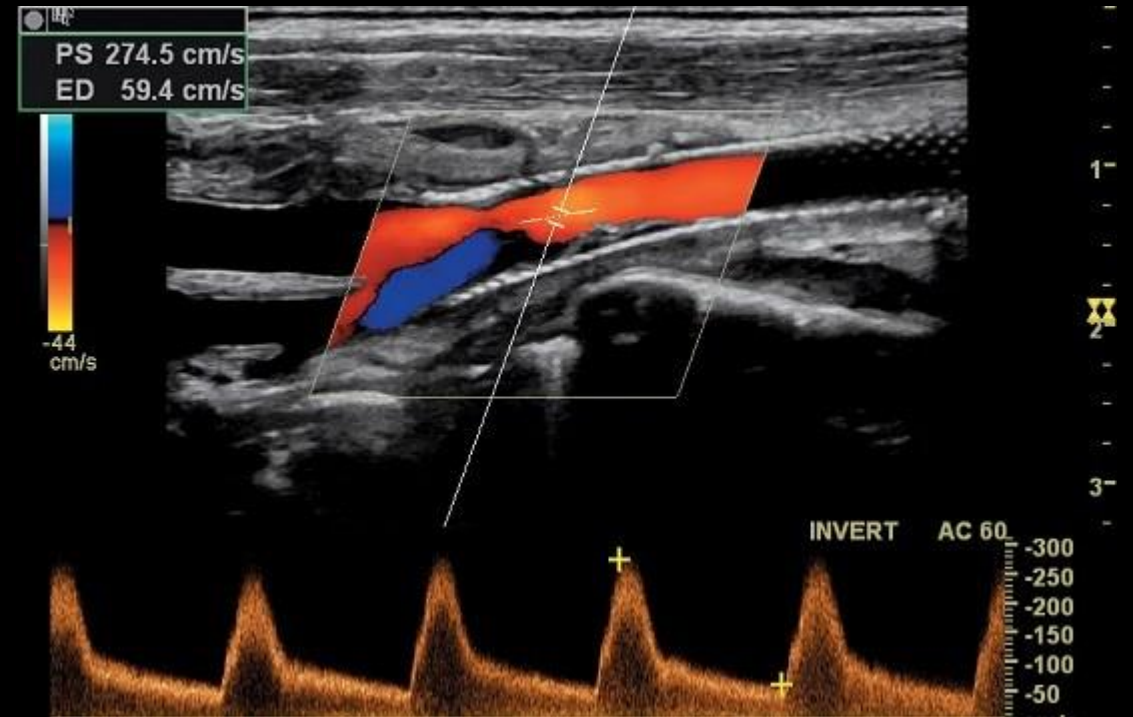
| Degree of Stenosis (%)              | Primary Parameters         |                                      | Additional Parameters* |                     |
|-------------------------------------|----------------------------|--------------------------------------|------------------------|---------------------|
|                                     | ICA PSV<br>(cm/sec)        | Degree of<br>Plaque <sup>†</sup> (%) | ICA/CCA<br>PSV Ratio   | ICA EDV<br>(cm/sec) |
| Normal                              | <125                       | None                                 | <2.0                   | <40                 |
| <50                                 | <125                       | <50                                  | <2.0                   | <40                 |
| 50–69                               | 125–230                    | ≥50                                  | 2.0–4.0                | 40–100              |
| ≥70 but less than near<br>occlusion | >230                       | ≥50                                  | >4.0                   | >100                |
| Near occlusion                      | High, low, or undetectable |                                      | Variable               | Variable            |
| Total occlusion                     | Undetectable               | Visible, no detectable<br>lumen      | NA                     | NA                  |

# High grade stenosis ICA



# Stent surveillance

- The stent will expand over time  
(days to weeks)
- Grey scale & colour flow assessment  
Pre & post stent - may need a sector probe
- Consider re stenosis only when  
systolic velocity > 200cm/sec



# Conclusion

## Carotid Doppler

- A powerful modality for evaluating the carotid and vertebral arteries
- Detecting and characterising atherosclerotic plaques
- High specificity for high grade stenosis.
- Low cost
- Non invasive
- Low sensitivity esp. to moderate grade stenosis
- Incomplete imaging of a complete vessel esp. vertebral
- Difficult access in some patients





Thank you for your attention