More common than you think

Bilateral Carotid Artery Dissection

SYDNEY VASCULAR

www.sydneyvascular.net.au

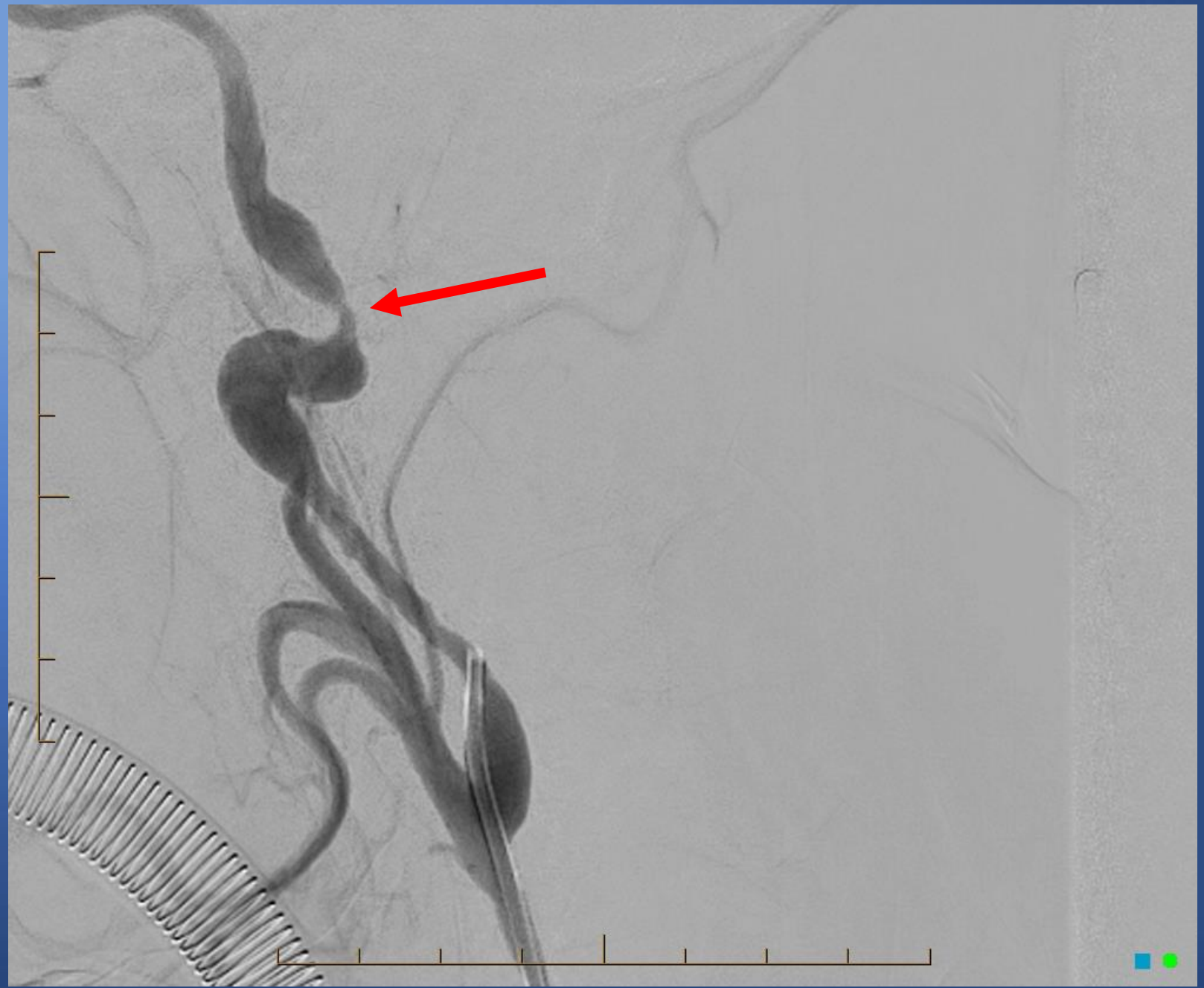
Presentation

- 45 yo female presents for surveillance of known bilateral internal carotid artery dissection
- Currently asymptomatic

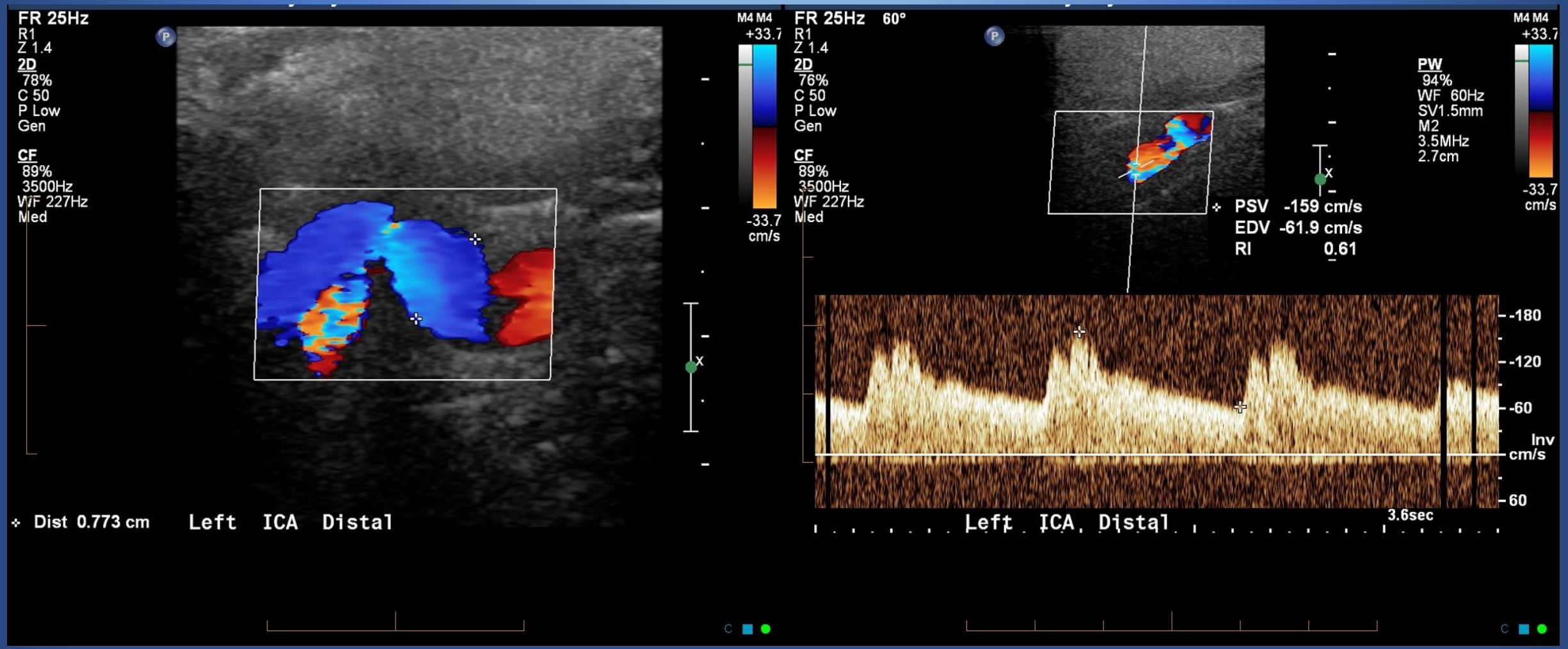
Relevant Past History

- 2017 Lt hemisphere stroke following chiropractic neck manipulation, Horner's Syndrome
- Left ICA occlusion secondary to spontaneous dissection
- Subsequent clot retrieval then lysis, ICA patency achieved
- 2018 CTA identifies >80% stenosis of Left ICA just inferior to skull and concomitant Right ICA dissection
- Morphology suggestive of FMD on left
- Dissection on right might be post procedural (Angiography performed initially)
- Doppler performed Distal ICA doppler data 270/140 cm/sec PSV/EDV; 8.2:1 ICA_d:ICA_p PSV ratio
- Crossover flow from right to left ACA shown on angiography and transcranial doppler
- Decision to intervene to prevent recurrent occlusion
- 1/2019 Balloon angioplasty without stenting performed

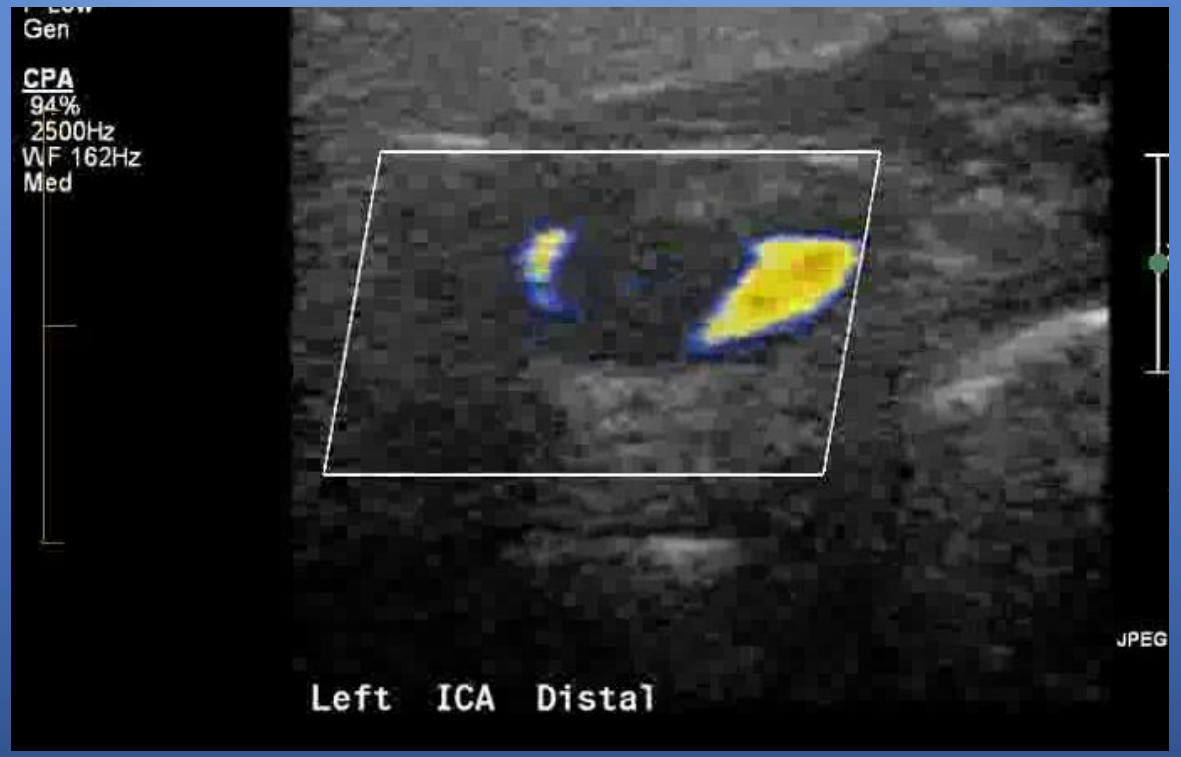
Angiography
Left ICA



Left Side


FR 25Hz
R1
Z 1.4
2D
78%
C 50
P Low
Gen
CF
89%
3500Hz
WF 227Hz
Med
M4 M4
+33.7
-33.7
cm/s
Dist 0.773 cm
Left ICA Distal
FR 25Hz 60°
R1
Z 1.4
2D
76%
C 50
P Low
Gen
CF
89%
3500Hz
WF 227Hz
Med
PW
94%
WF 60Hz
SV1.5mm
M2
3.5MHz
2.7cm
PSV -159 cm/s
EDV -61.9 cm/s
RI 0.61
-180
-120
-60
Inv
cm/s
60
3.6sec
Left ICA Distal

Left Side



Subsequent Imaging Left Side

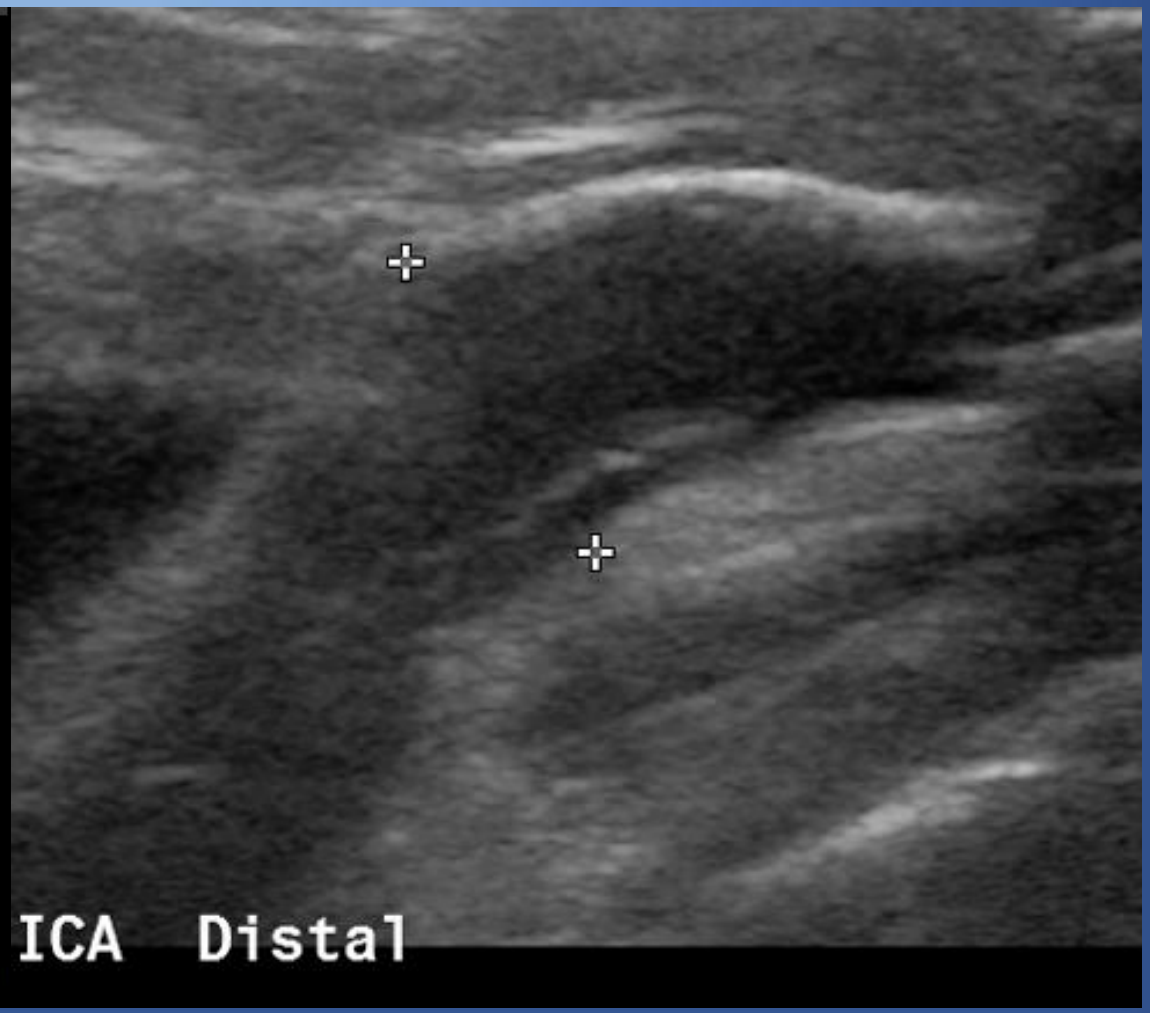
- Pre op 270/140cm/sec PSV/EDV; 8.2:1 ICA_d:ICA_p PSV ratio
- 4 weeks post angioplasty 234/97cm/sec PSV/EDV; 2.6:1 ICA_d:ICA_p PSV ratio
- 6 months post angioplasty 164/75cm/sec PSV/EDV; 2.0:1 ICA_d:ICA_p PSV ratio
- 24 months post (this scan) 159/62cm/sec PSV/EDV; 1.8:1 ICA_d:ICA_p PSV ratio
- Maximum Diameter Left ICA 7.7mm vs 4.5mm proximal ICA

Interpretation

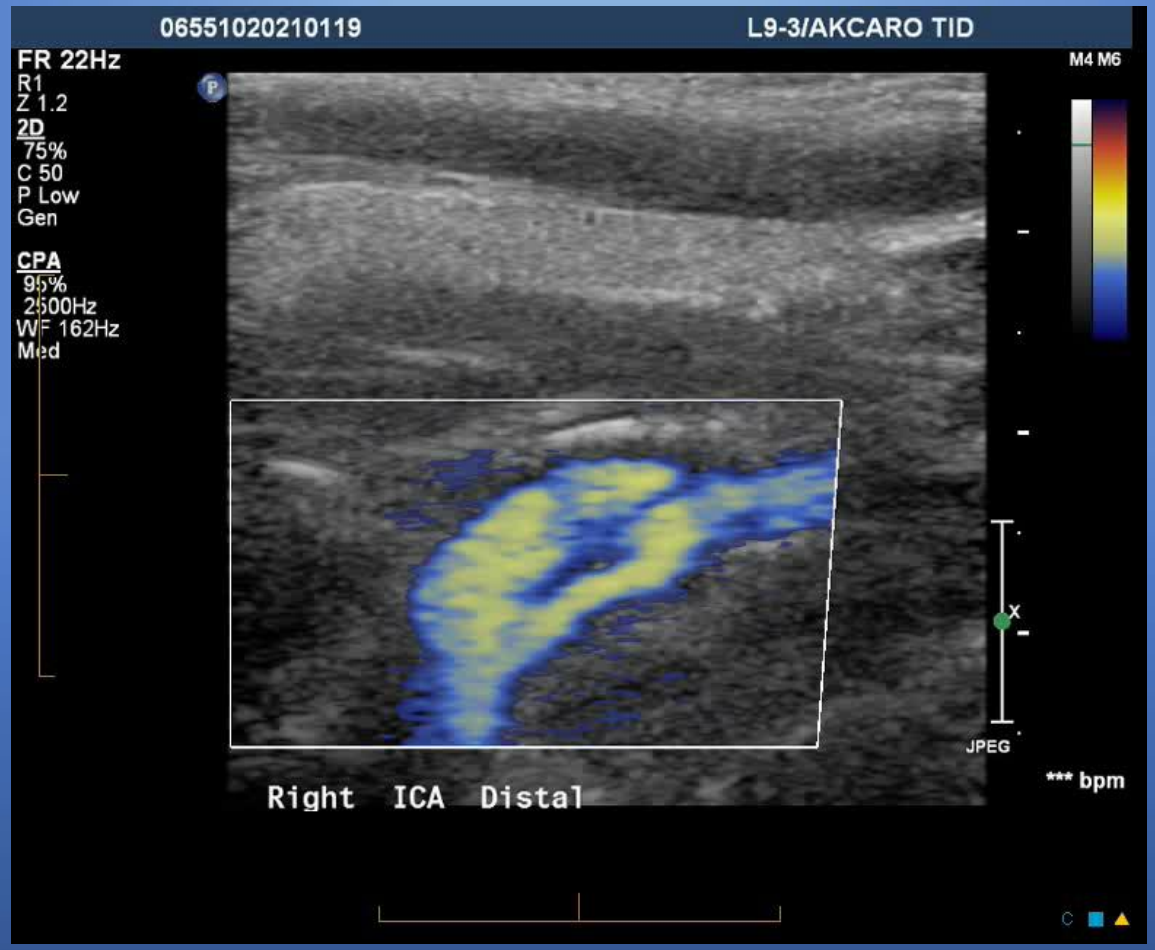
- Not an "on label" use for modified Strandness criteria because of distance from the bulb
- Data suggests much improved degree of stenosis and has been stable for 18 months
- Repeat transcranial doppler imaging to investigate direction of ACA flow has not been performed but is planned
- Dilation is consistent with earlier imaging, should be monitored
- Cineloop strongly suggests residual false lumen just proximal to angioplasty site, transverse imaging and pulsed doppler with small SV in both candidates may increase confidence

Right Side

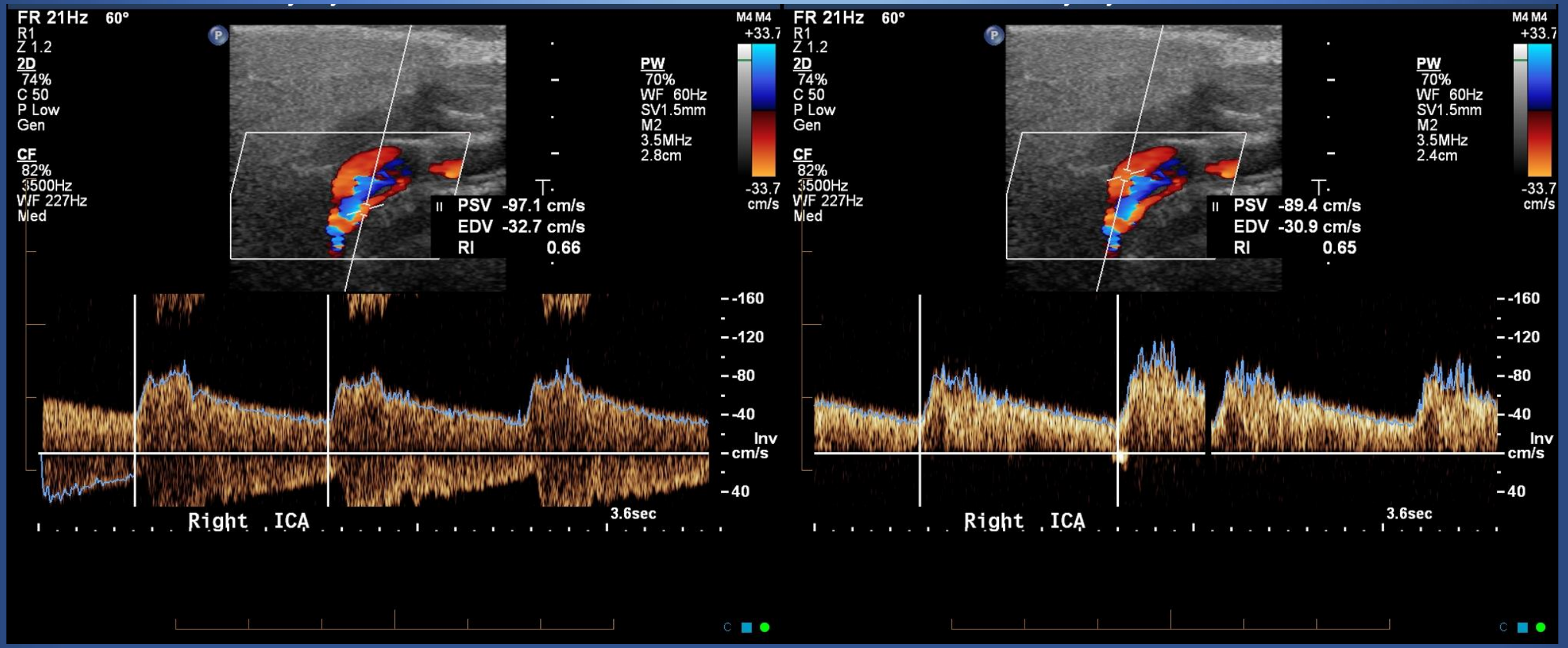

FR 28Hz
RS
Z 1.2
2D
59%
C 58
P Low
HGen
M4
Dist 0.909 cm
Right ICA Distal
4.0


ICA Distal

Right Side


06551020210119
L9-3/AKCARO TID
FR 22Hz
R1
Z 1.2
2D
75%
C 50
P Low
Gen
CPA
95%
2500Hz
WF 162Hz
Med
M4 M6
JPEG
*** bpm
Right ICA Distal

Right Side


FR 21Hz 60°
R1
Z 1.2
2D
74%
C 50
P Low
Gen
CF
82%
3500Hz
WF 227Hz
Med
PW
70%
WF 60Hz
SV1.5mm
M2
3.5MHz
2.8cm
M4 M4
+33.7
-33.7
cm/s
PSV -97.1 cm/s
EDV -32.7 cm/s
RI 0.66
-160
-120
-80
-40
Inv
cm/s
-40
Right ICA
3.6sec
FR 21Hz 60°
R1
Z 1.2
2D
74%
C 50
P Low
Gen
CF
82%
3500Hz
WF 227Hz
Med
PW
70%
WF 60Hz
SV1.5mm
M2
3.5MHz
2.4cm
M4 M4
+33.7
-33.7
cm/s
PSV -89.4 cm/s
EDV -30.9 cm/s
RI 0.65
-160
-120
-80
-40
Inv
cm/s
-40
Right ICA
3.6sec

Subsequent Imaging Right Side

Localised ICA dilation to 9.1mm vs 5.6mm. Late 2018 8.6mm vs 6.2mm

Interpretation

- Two diameter measurements only -separated by 2 year interval. Possible slight increase.
- Diameter should be assessed at each visit
- False lumen in dilated segment with fenestration (re entry)
- Length of dilated segment should be acquired if practical and also assessed at each visit.
- Impression of two flow lumens can occur due to rotation of the flow column. Caution should be observed. Sampling with pulsed doppler with small sample volume can be of benefit to confirm. Optimised 2 plane B-Mode and occasionally M-Mode can be useful.
- Waveforms can vary a lot

  Thump waveform suggests a blind false lumen

Dissection

Spontaneous Cervical Artery Dissection

- ~2% of all first strokes
- Prevalence of 20-25% within the population of young (<45yo) stroke victims
- Extracranial more common than intracranial
- When carotids involved Internal carotid most common 2-3cm above the bifurcation
- Vertebral can also occur (V3 segment most common)

Traumatic

- MVA
- Sporting injuries

Idiopathic

- Post procedure
- Usually related to puncture site

Spontaneous Cervical Artery Dissection

Associated with-

Hypertension

Arterial Wall weakness

- up to 5% have recognizable disorder such as
  - Marfan's Ehlers-Danlos Loey-Dietz syndromes
  - Osteogenesis Imperfecta
- 20% have an unnamed but clinically apparent connective tissue disorder
- Fibromuscular Dysplasia (FMD) (15%)

Minor trauma

- chiropractic neck manipulation (est. 1:20000)
- coughing/sneezing
- long telephone calls, toothbrushing, "Bottoms- up dissection"

Hyperhomocysteinemia

Recent respiratory infection (independent to coughing)

Seasonal (Autumn more likely)

Interestingly Hypercholesterolemia may make dissection less likely

Spontaneous Cervical Artery Dissection

Clinical Presentation

Carotid

Initial Sx

only 1/3 have all the features, 2 should suggest the diagnosis

Ipsilateral head face or neck pain

Headache is usually frontoparietal

Partial Horners Syndrome (us. Miosis (small pupil) Ptosis (eyelid droop))

Subsequent (hours or days later)

CVA or retinal ischaemia

Vertebral

Pain at back of head or neck

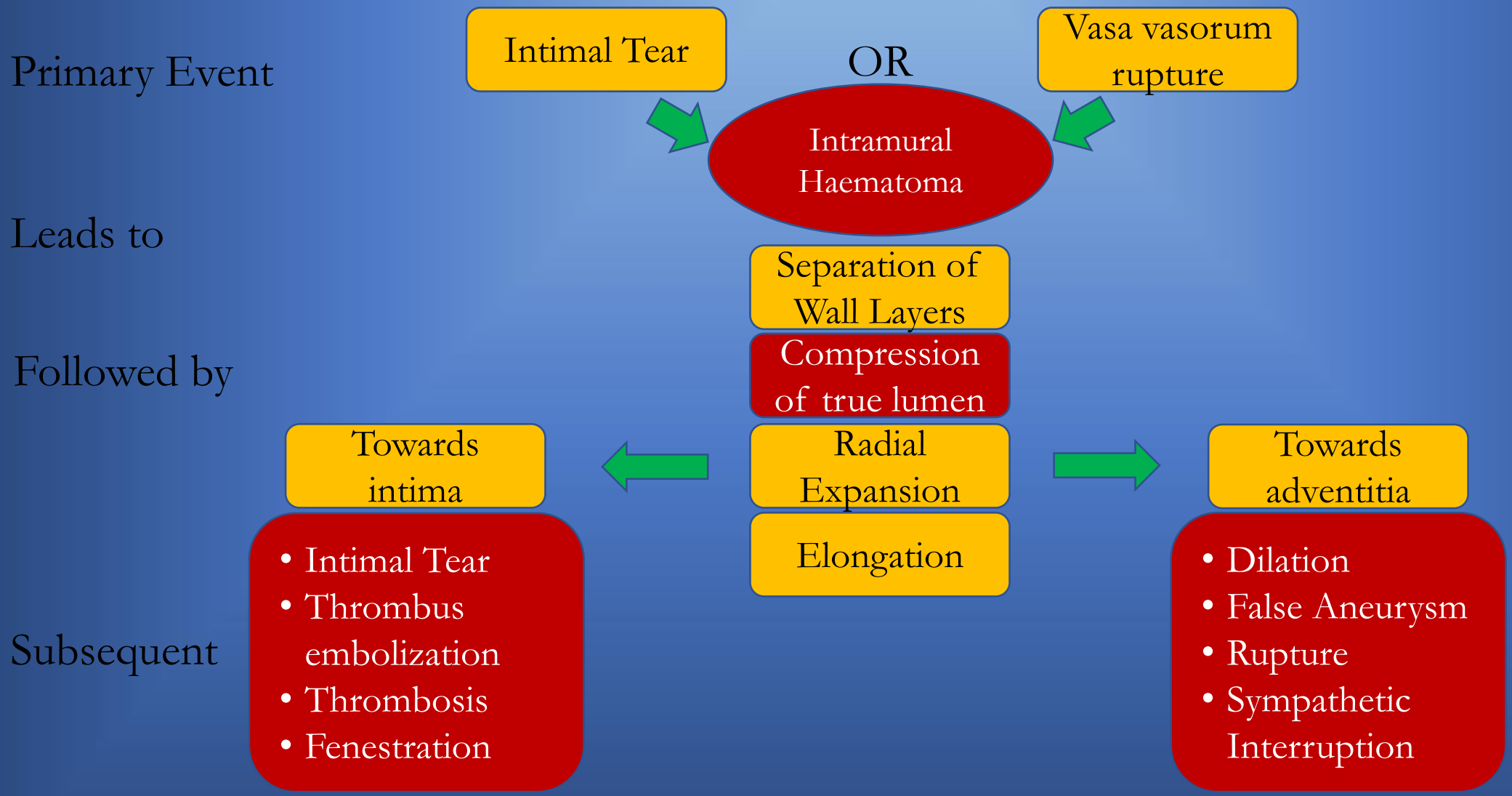
Posterior Circulation Ischaemia (vertigo bilateral visual disturbance ataxia dysarthria nausea/vomiting)

Often misinterpreted as a musculoskeletal problem

Horners Syndrome

- Miosis (small pupil)
- Ptosis (eyelid droop)
- Anhydrosis (lack of sweating on that side of face)
- Flushed skin
- Due to interruption of sympathetic nerve fibres in carotid adventitia

Dissection


Primary Event
Intimal Tear
OR
Vasa vasorum rupture
Intramural Haematoma
Leads to
Separation of Wall Layers
Followed by
Compression of true lumen
Radial Expansion
Elongation
Towards intima
Towards adventitia
Subsequent
• Intimal Tear
• Thrombus embolization
• Thrombosis
• Fenestration
• Dilation
• False Aneurysm
• Rupture
• Sympathetic Interruption

References

https://radiopaedia.org/articles/internal-carotid-artery-dissection-1

Blum C A, Yaghi S. Cervical Artery Dissection: A Review of the Epidemiology, Pathophysiology, Treatment, and Outcome, Arch Neurosci. 2015 ; 2(4):e26670. doi: 10.5812/archneurosci.26670.

Wouter I. Schievink, M.D. Spontaneous Dissection of the Carotid and Vertebral Arteries
N Engl J Med 2001; 344:898-906 DOI: 10.1056/NEJM200103223441206

Touzé E, Oppenheim C, Trystram D, et al. Fibromuscular Dysplasia of Cervical and Intracranial Arteries. International Journal of Stroke. 2010;5(4):296-305. doi:10.1111/j.1747-4949.2010.00445.x