Intervention in internal carotid artery dissection

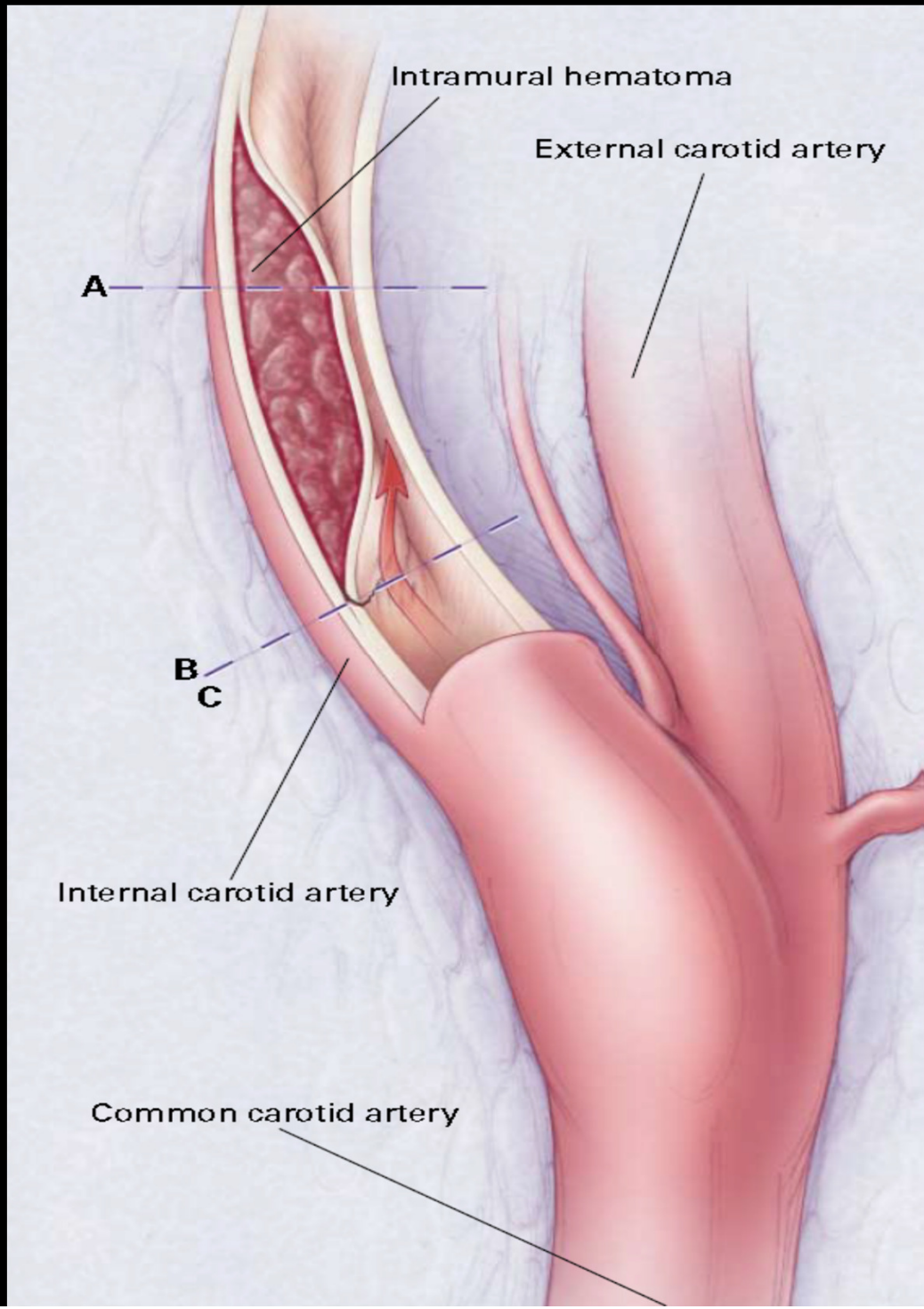
Dr.P.N Sylaja MD,DM,FRCP,FESO
Professor of Neurology
Sree Chitra Thirunal Institute for Medical Sciences and Technology

Dissection – Definition

A tear in arteries, which allows blood to enter the wall of the artery and split its layers.

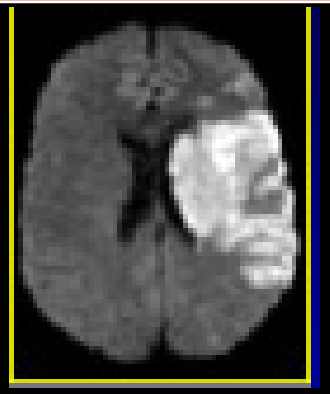
Can result in

- Thrombo-embolic phenomenon from tear site due to endothelial breach (Intimal flap)
- Stenosis or aneurysmal dilatation of the vessel.

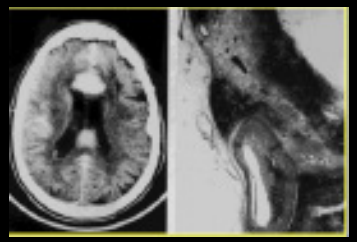


Dissections –diverse consequences

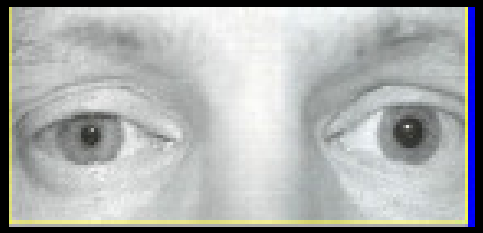
- Stenosis or occlusion –
  thromboembolism, haemodynamic



- Vessel wall rupture –
  bleeding/subarachnoid haemorrhage



- Stretching/and or compression
  pain and local signs



Diagnostic imaging :State of art –DSA

Angiographic features of cervical artery dissection

- Irregular tapered stenosis
- Types of occlusion-Flame shaped occlusion and rat tail shaped tapered occlusion
- False or double lumen
- Fusiform or saccular aneurysmal dilatation(pseudo aneurysm)
- Intimal flap
- Irregular dilatation

Flame shaped occlusion

Irregular tapered stenosis

Double lumen

Pseudoaneurysm

Imaging modality	Pros	Cons
Vascular ultrasound	Good sensitivity for extracranial carotid dissections (80-96%) Inexpensive Performed quickly	Variable sensitivity for vertebral artery dissection (60-90%) No use for intracranial and dissecting aneurysm
MRI/MRA	High sensitivity for extracranial carotid dissection (87-100%) Can detect intramural haematoma despite occlusion	Variable sensivity for vertebral artery dissection (60-100%) Low sensitivity for dissecting pseudoaneurysm (30%)
Multislice CTA	High sensitivity for extracranial carotid and vertebral artery dissection (92-100%) Can be done quickly	Unknown sensitivity for intracranial dissection and dissecting aneurysm High radiation dose
DSA	Gold standard for diagnosing supraaortic arterial dissections Gold standard for diagnosing pseudoaneurysms and intracranial dissecting aneurysms	Invasive procedure Radiation dose

Diagnosis of CAD

Imaging diagnosis of dissection is a challenge

There is no gold standard. Each modality has its pros and cons

Many a time more than one imaging modality may be required for diagnosis

MRA/CTA is sensitive in extracranial VA and Carotid dissection

DSA is a must in patients presenting as SAH and also in aneurysmal dilatation

High resolution VWMRI is a very useful technique in intracranial dissection

Clinical situations for treatment after dissection

Treatment of patients with stroke due to CAD – acute stroke and secondary prevention

Treatment of patients with subarachnoid haemorrhage due to dissection

Treatment of patients with local signs/symptoms due to dissection

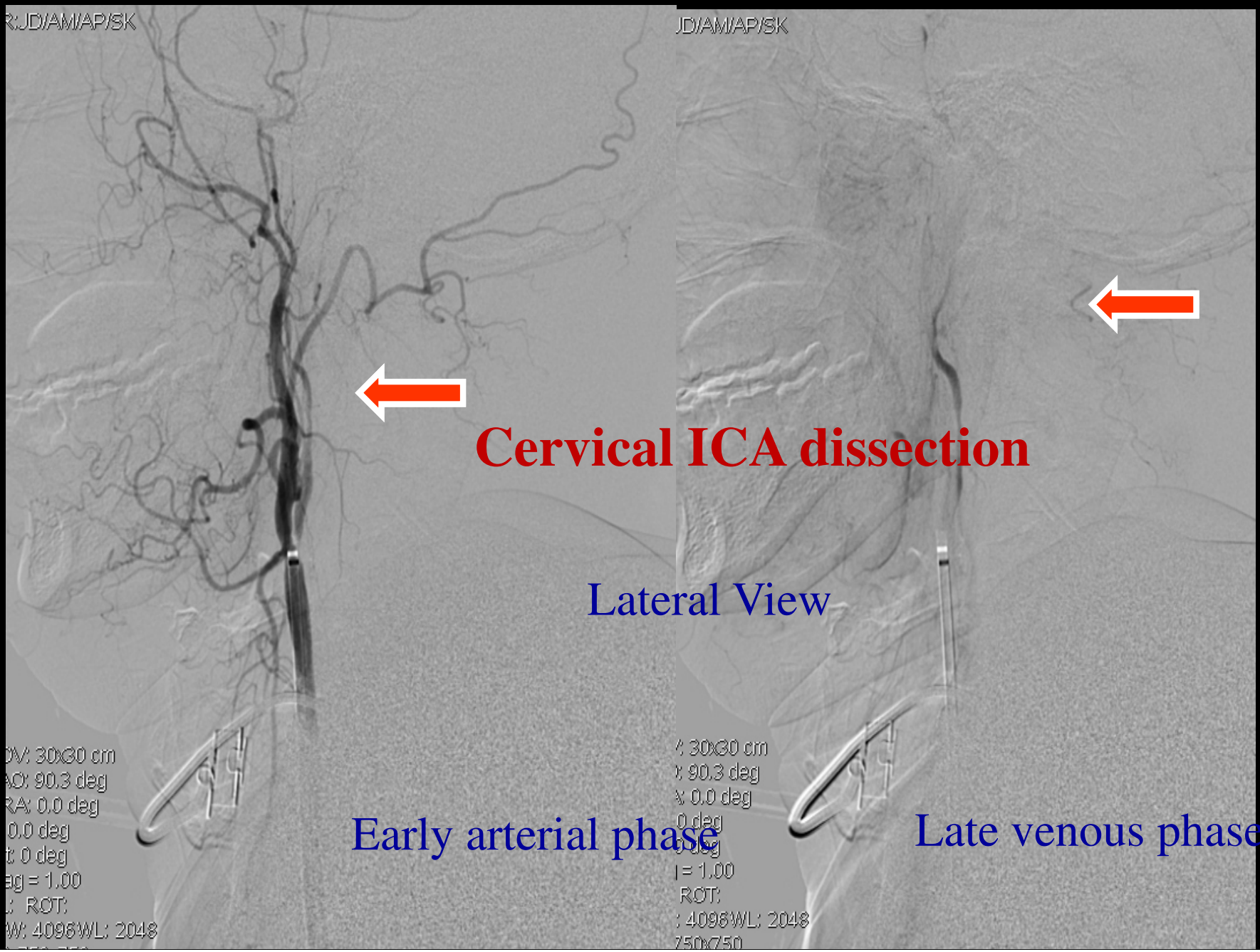
Treatment of extracranial arterial dissection

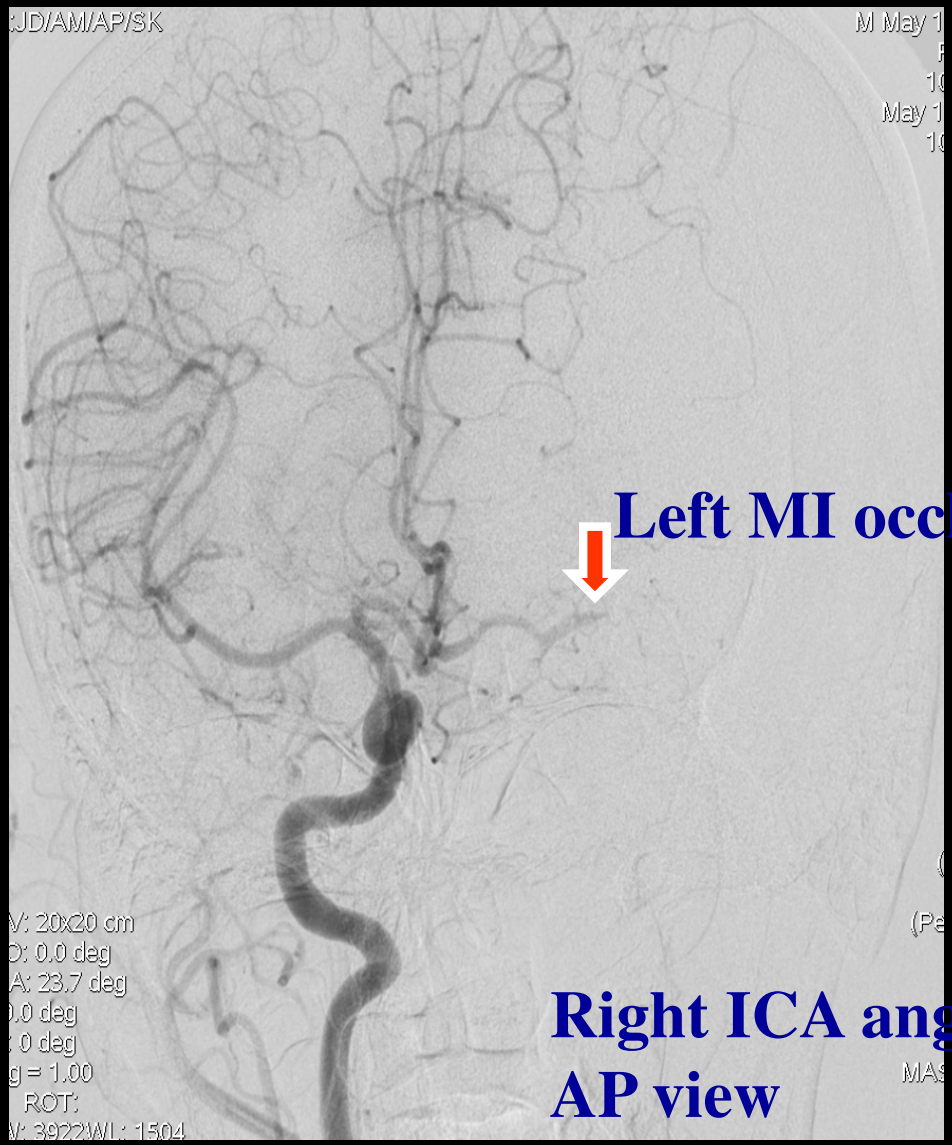
Thrombolysis and Mechanical thrombectomy

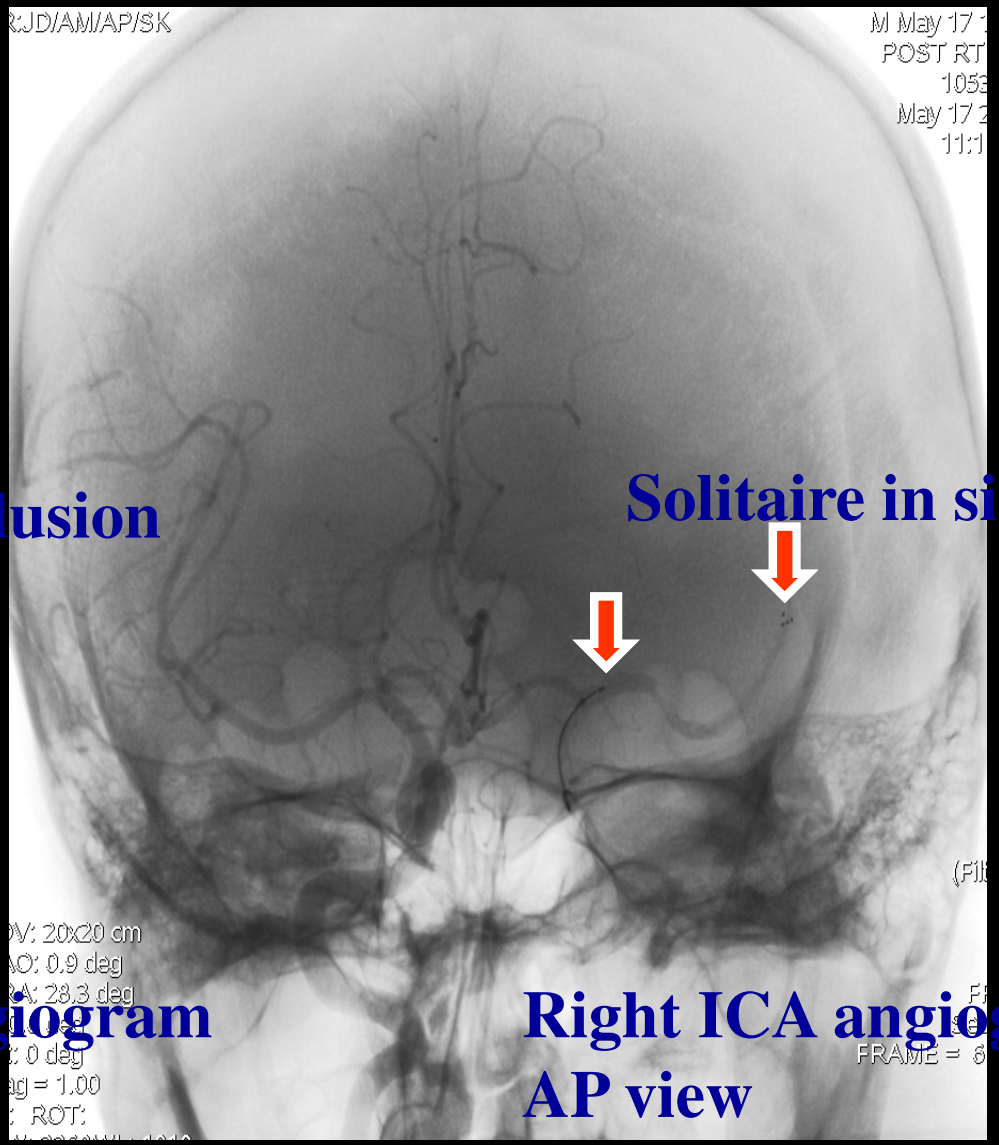
Aspirin vs anticoagulation

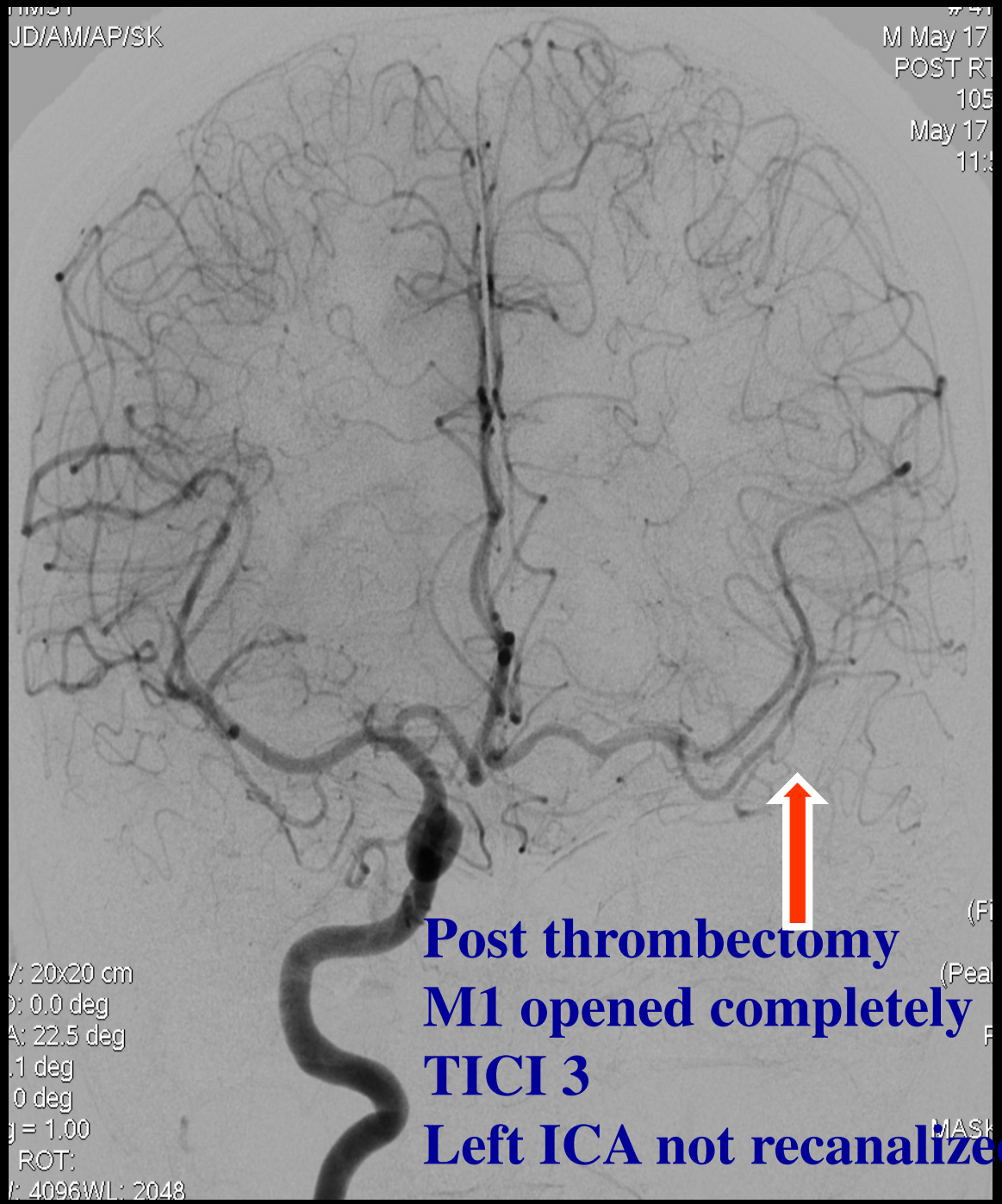
Endovascular treatment

55 year old with left MCA stroke --2hrs 50 minutes from onset –NIHSS - 23




Left MI occlusion
Right ICA angiogram
AP view


Solitaire in situ
Right ICA angiogram
AP view



NIHSS at discharge -10
NIHSS at 3 months – 6
mRS- 3

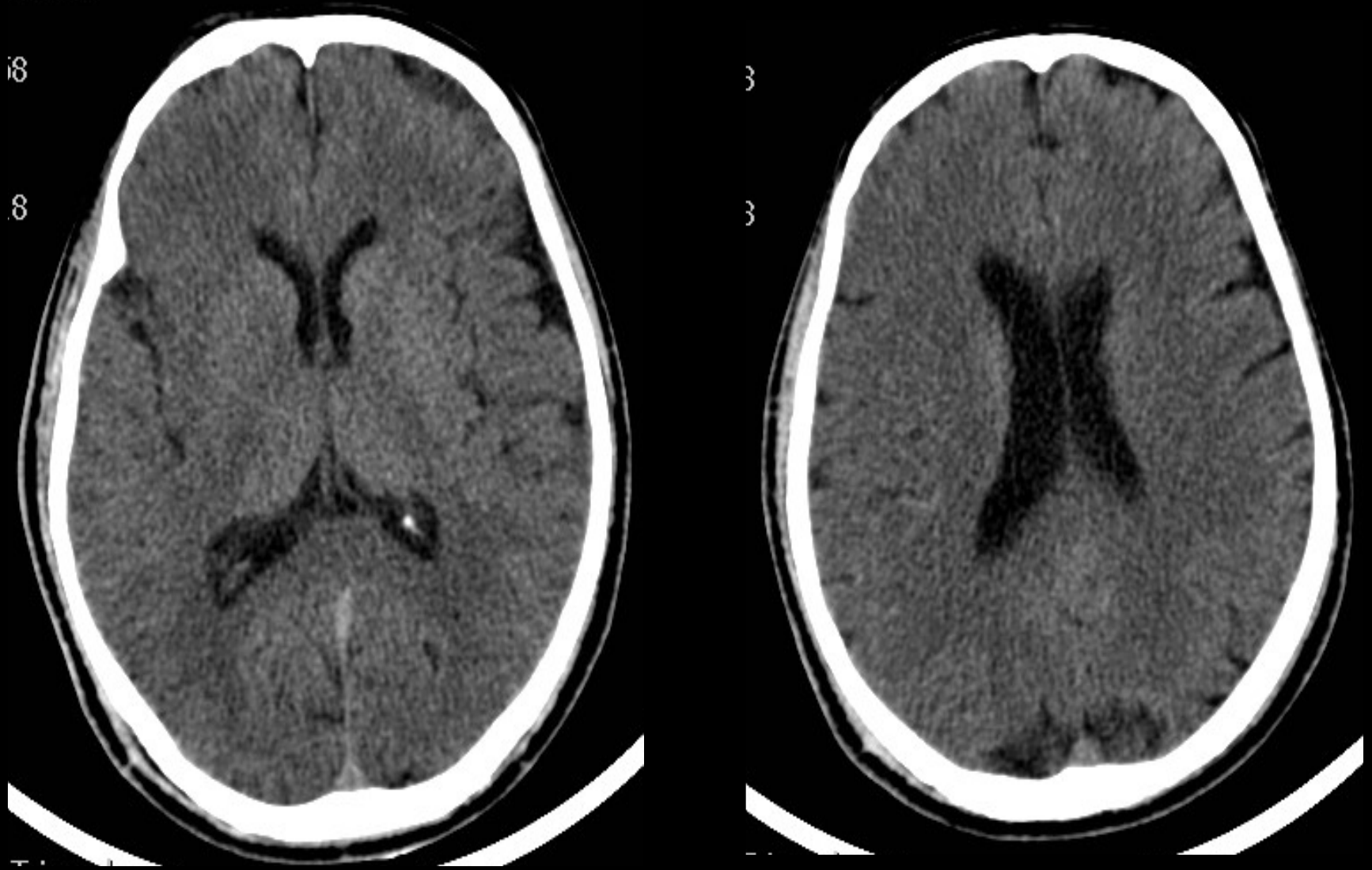
60 year old male,Hypertensive and Dyslipidemic for 5 years

6/2/18-11.30AM –Acute onset weakness of left UL/LL along with slurring dysarthria and facial deviation.

Reached SCT at 1.20pm, 1hour 50minutes of stroke onset

On examn- E3V5 M6 , NIHSS -16

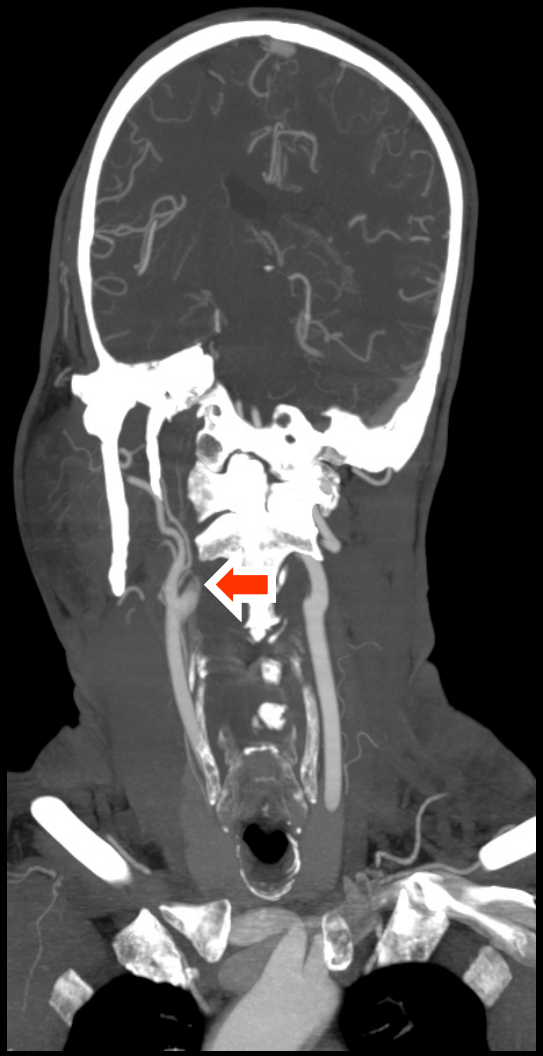
ASPECTS 7



CT angiogram

Tapered occlusion

Right ICA dissection



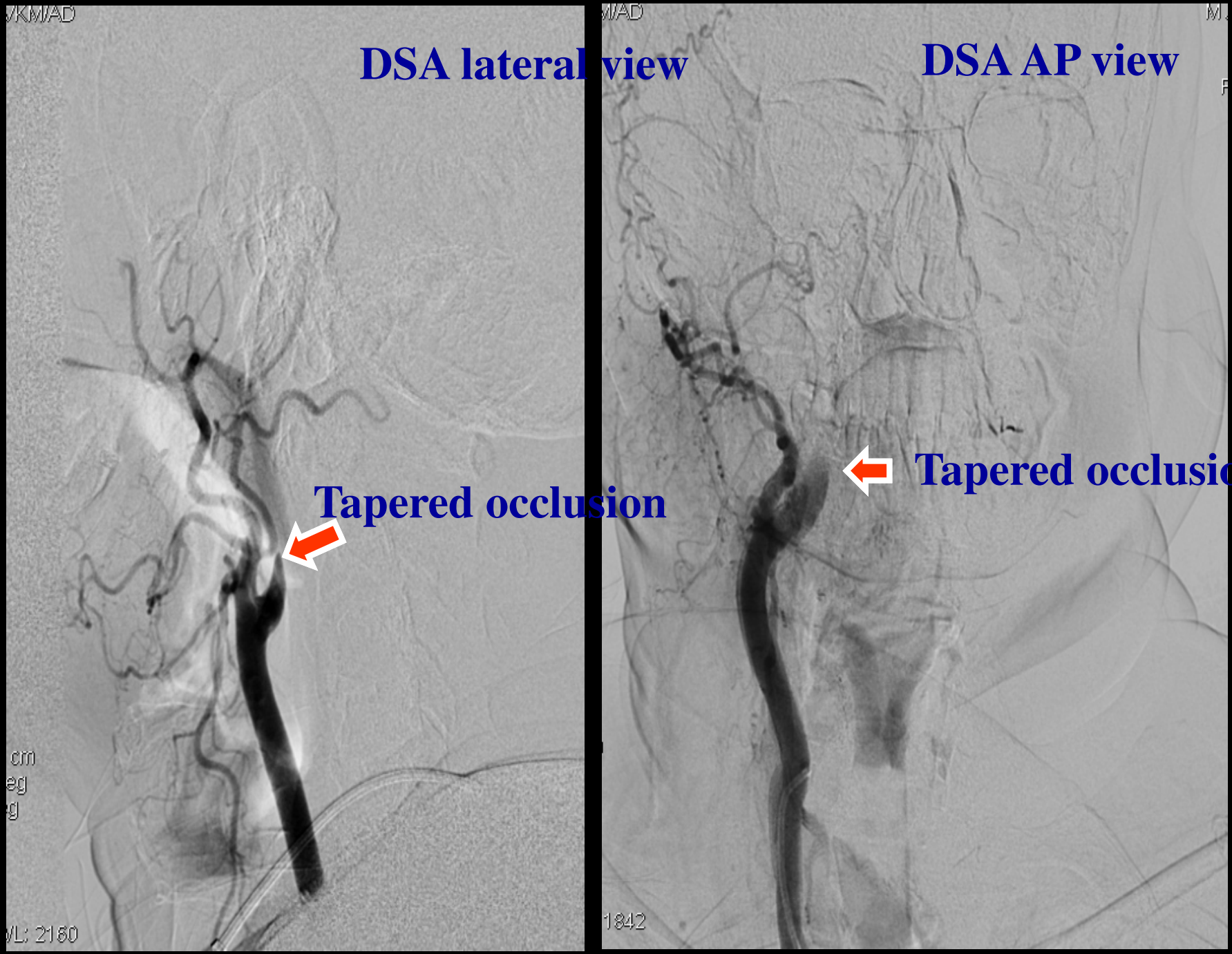
Intramural thrombus

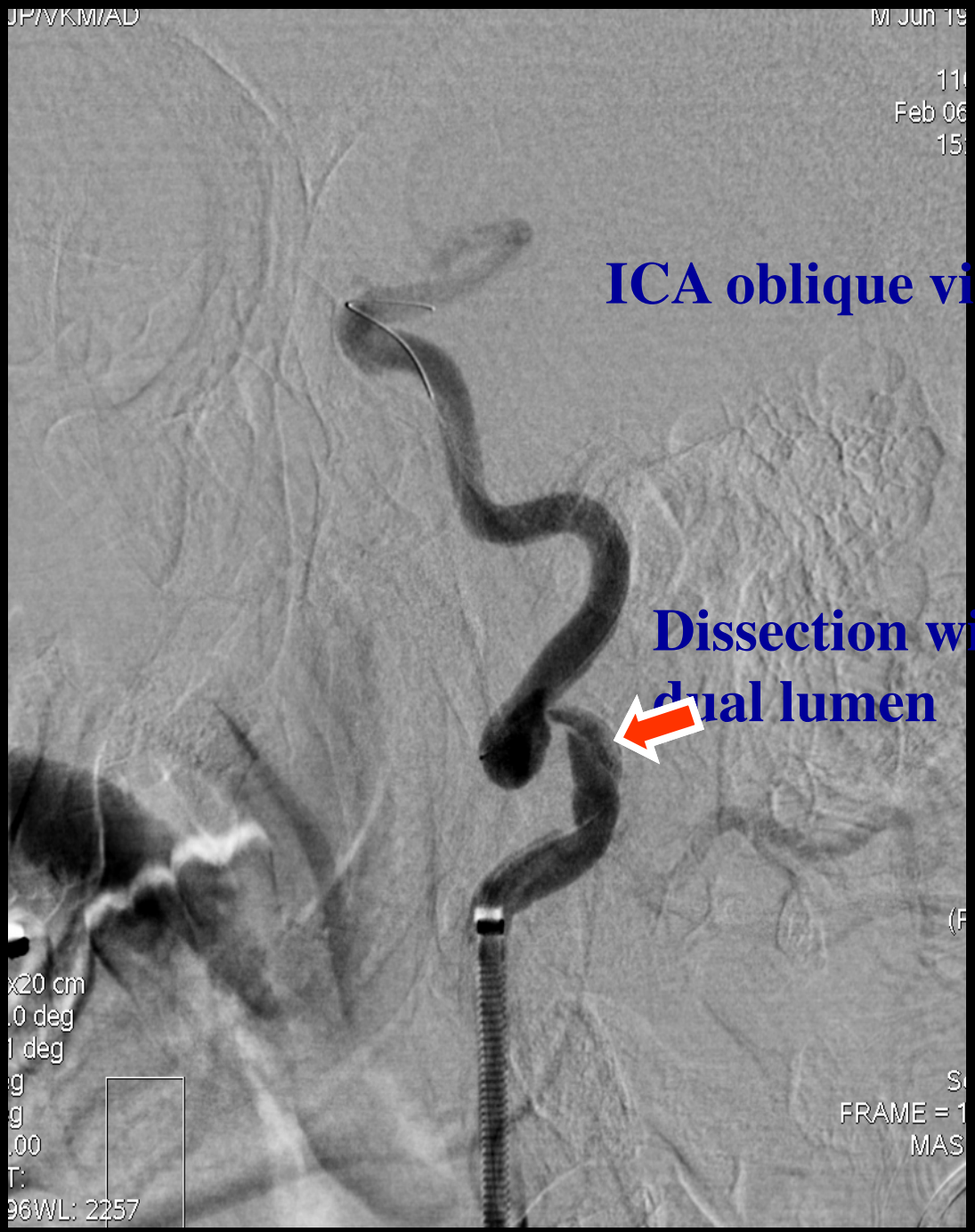
Management ?

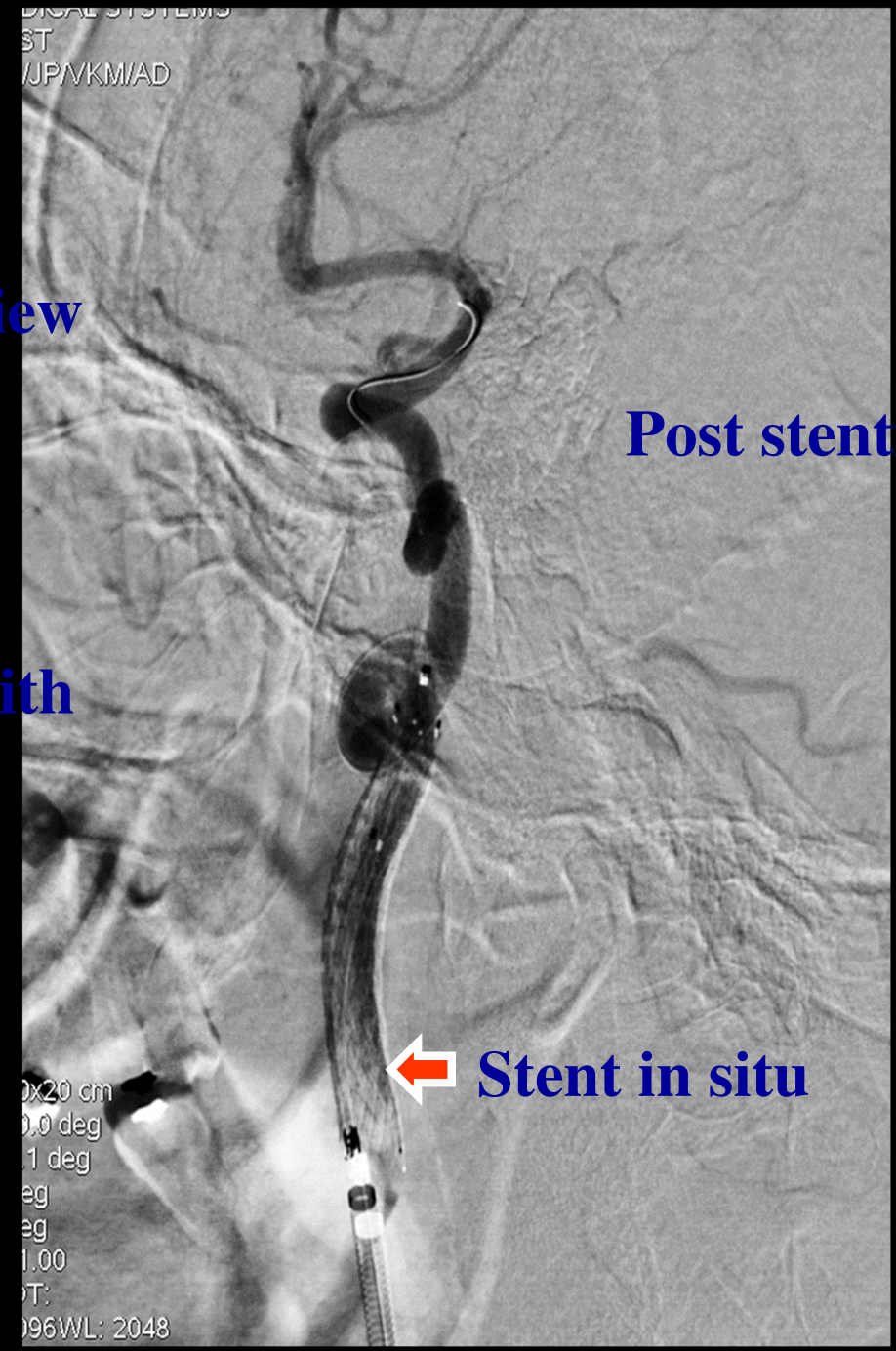
Intravenous tPA

Bridging IVtPA and mechanical thrombectomy

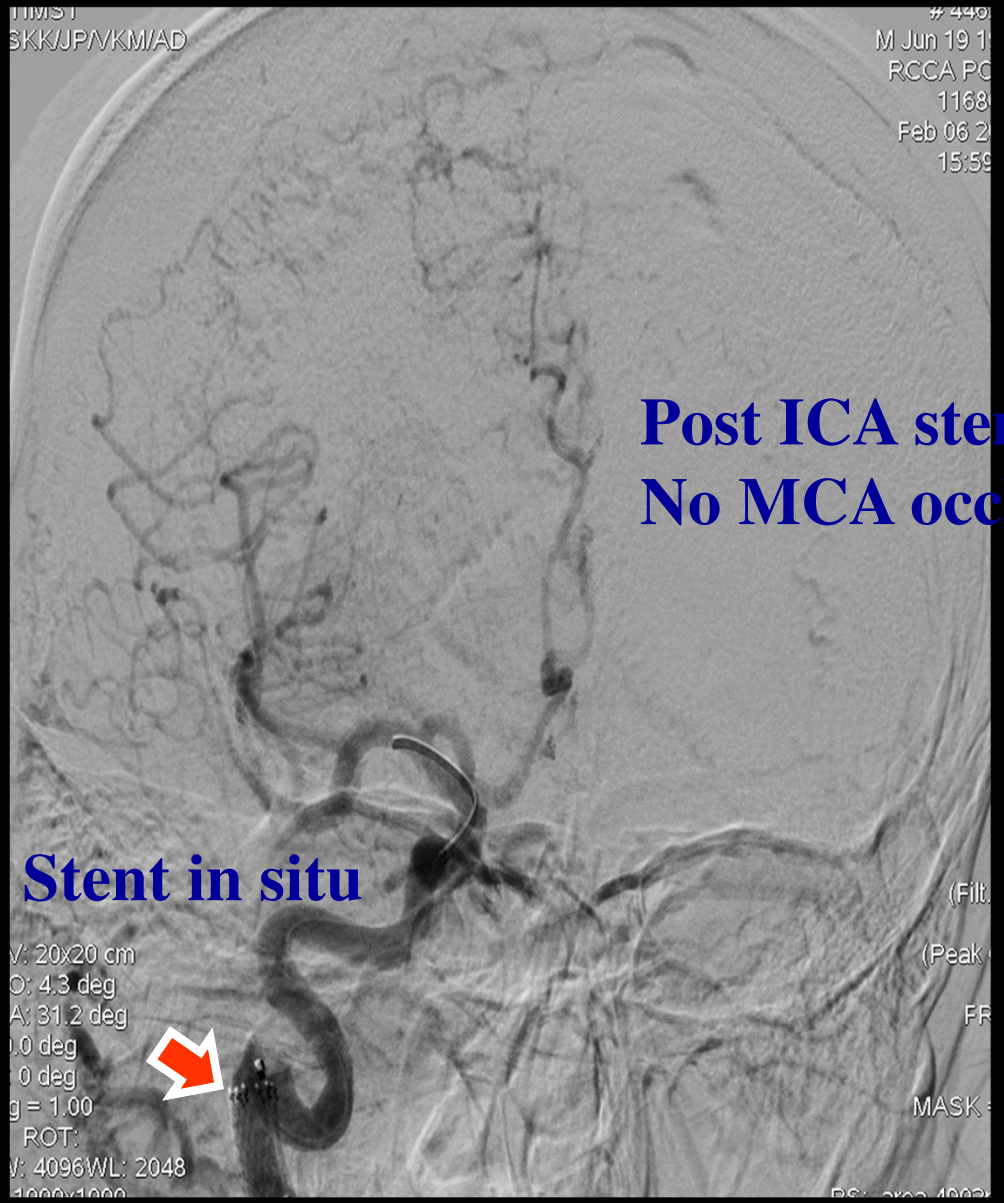
Mechanical thrombectomy


DSA lateral view
Tapered occlusion
DSA AP view
Tapered occlusion


ICA oblique view
Dissection with
dual lumen


Post stenting
Stent in situ

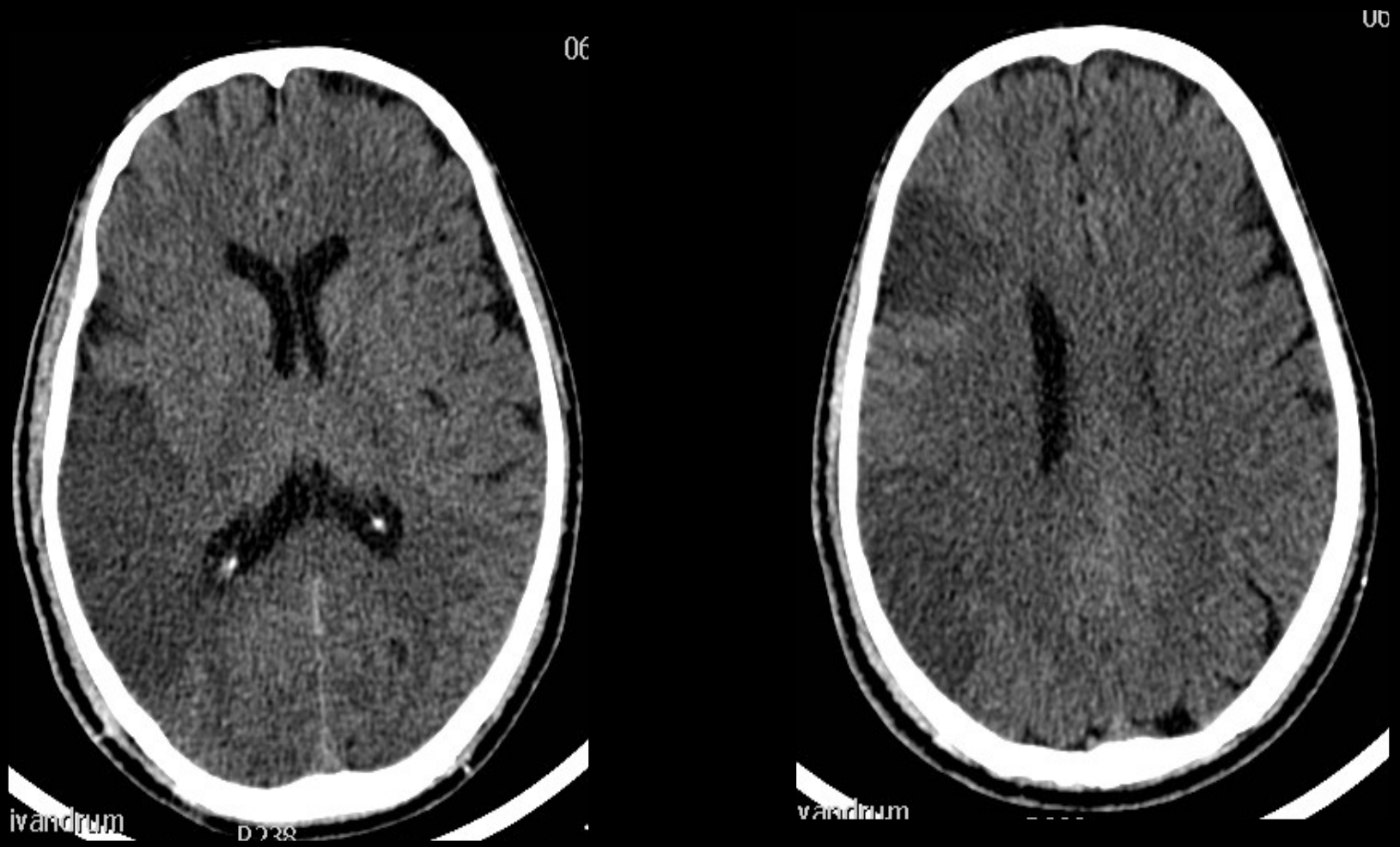

Stent in situ
FRAME


Post ICA stenting
No MCA occlusion
Stent in situ

IV TPA given-Door to needle time-40minutes

Taken for mechanical thrombectomy- Door to groin puncture time- 1 hour 5 minutes

24Hr NIHSS-6



Endovascular Management vs Intravenous Thrombolysis for Acute Stroke Secondary to Carotid Artery Dissection: Local Experience and Systematic Review

RESULTS: Of 1112 patients treated with endovascular interventions within the study period, 21 met the inclusion criteria. Mean age was 52.0 ± 10.9 years, 76% were male, NIHSS was 17.4 ± 5.8, 52% received IVT before intervention, and 90% had tandem occlusions. Mean time from last-known-normal to puncture was 4.8 ± 2.1 hours and procedure length 1.8 ± 1.0 hours. Stents were used in 52% of cases, and reperfusion (modified Treatment in Cerebral Ischemia 2b-3) achieved in 95%. No parenchymal hemorrhages were observed and 71% achieved good outcome (90-day modified Rankin Scale 0-2). The literature review identified 8 studies concerning thrombolysis in the CAD setting fitting inclusion criteria (n = 133). Our endovascular experience compared with the pooled IVT reports indicated that, despite presenting with higher NIHSS (17 vs 14; $P = .04$) and experiencing a longer time to definitive therapy (287 vs 162 minutes; $P < .01$), patients treated intra-arterially had similar rates of symptomatic cerebral/European Cooperative Acute Stroke Study-parenchymal hematoma 2 hemorrhage (0% vs 6%; $P = .43$) and good outcomes (71% vs 52%; $P = .05$).
CONCLUSION: Our study provides evidence that the endovascular management of AIS in the setting of CAD is a feasible, safe, and promising strategy.

Haussen DC et al Neurosurgery 2016

Anticoagulation or Aspirin?

No evidence to suggest heparin better than aspirin

Heparin (FOR)

- Embolic risk
- Risk of occlusion
- Floating thrombus

Heparin (AGAINST)

- Efficacy not seen in AIS
- Risk of intracranial extension and SAH

Aspirin

- Efficacy seen in acute ischemic stroke in RCT
- Easier to use

Engeltar et alCADISP study group Stroke 2007

Antiplatelets vs anticoagulation in extracranial carotid and vertebral artery dissection

Vineetha et al Neurol India (in press)

VARIABLE	ANTIPLATELET (n=136)	ANTICOAGULANT (n=64)	P value
MEAN AGE	43.44±13.16	43.56 ±12.98	0.951
MALES	103 (75.7%)	50 (78.1%)	0.710
HYPERTENSION	60 (44.1%)	32 (50%)	0.436
DIABETES	31 (22.8%)	20 (31.3%)	0.201
HYPERLIPIDEMIA	41 (30.1%)	22 (34.4%)	0.548
SMOKING	48 (35.3%)	20 (31.3%)	0.573
CAD	8 (5.9%)	3 (4.7%)	1.000
MIGRAINE	11 (8.1%)	5 (7.8%)	0.947
NECK MANIPULATION	8 (5.9%)	4 (6.3%)	1.000
PRIOR STROKE	17 (12.5%)	4 (6.3%)	0.179
PRIOR TIA	8 (5.9%)	4 (6.3%)	1.000
PRIOR TREATMENT	15 (11%)	4 (6.3%)	0.282
PRESENTING SYMPTOM LOCAL SYMPTOM TIA STROKE	 9 (6.6%) 23 (16.9%) 104 (76.5%)	 5 (7.8%) 14 (21.9%) 45 (70.3%)	0.641
MEAN NIHSS AT ADMSN	8.18±7.03	6.25±5.77	0.058
MEAN MRS AT ADMSN	3.09±1.57	2.61±1.71	0.052
ARTERY INVOLVED CAROTID VERTEBRAL	 93 (68.4%) 43 (31.6%)	 39 (60.9%) 25 (39.1%)	0.300

Antiplatelet vs anticoagulation in extracranial carotid and vertebral artery dissection

Table 3: Comparison of the recurrent events at 3 months between the antiplatelet and anticoagulant group

EVENTS	ANTIPLATELET n = 136	ANTICOAGULANT n = 64	OR	P VALUE
TIA	3 (2.2%)	1 (1.6%)	1.42	1.000
STROKE	3 (2.2%)	0	-	0.553
TIA / STROKE	6 (4.4%)	1 (1.6%)	2.91	0.434
SICH	5 (3.7%)	6 (9.4%)	0.39	0.185
DEATH *	1 (0.7%)	1 (1.6%)	0.47	0.539

Antiplatelet treatment compared with anticoagulation treatment for cervical artery dissection (CADISS): a randomised trial

*The CADISS trial investigators**

Lancet 2015

Findings We enrolled 250 participants (118 carotid, 132 vertebral). Mean time to randomisation was 3·65 days (SD 1·91). The major presenting symptoms were stroke or transient ischaemic attack (n=224) and local symptoms (headache, neck pain, or Horner's syndrome; n=26). 126 participants were assigned to antiplatelet treatment versus 124 to anticoagulant treatment. Overall, four (2%) of 250 patients had stroke recurrence (all ipsilateral). Stroke or death occurred in three (2%) of 126 patients versus one (1%) of 124 (odds ratio [OR] 0·335, 95% CI 0·006–4·233; p=0·63). There were no deaths, but one major bleeding (subarachnoid haemorrhage) in the anticoagulant group. Central review of imaging failed to confirm dissection in 52 patients. Preplanned per-protocol analysis excluding these patients showed stroke or death in three (3%) of 101 patients in the antiplatelet group versus one (1%) of 96 patients in the anticoagulant group (OR 0·346, 95% CI 0·006–4·390; p=0·66).

Interpretation We found no difference in efficacy of antiplatelet and anticoagulant drugs at preventing stroke and death in patients with symptomatic carotid and vertebral artery dissection but stroke was rare in both groups, and much rarer than reported in some observational studies. Diagnosis of dissection was not confirmed after review in many cases, suggesting that radiographic criteria are not always correctly applied in routine clinical practice.

Endovascular Stenting of Extracranial Carotid and Vertebral Artery Dissections: A Systematic Review of the Literature

Pham MH et al Neurosurgery 2011;68:856-866

Carotid dissections - 31 reports
140 patients

- Stenting success rate – 99%
- Complication – 1.3 %
- Mean Followup -17 months
- Neurological events – 1.4 %

Vertebral dissections-8 reports
10 patients

- Technical success rate – 100%
- Mean followup -26 months
- No events

- Acute stroke
- Failure of medical treatment
- Haemodynamic instability
- Enlarging pseudo aneurysm

SAH due to intracranial dissection

- Less than 5% of all dissection
- Of all intracranial dissection – 40-60% has SAH
- V4 segment of vertebral artery
- Intracranial extension of extracranial dissection

- Antithrombotic treatment is contraindicated

- Treatment same as SAH

Management of intracranial dissection

Depends on type of presentation

Cerebral ischemic event or SAH presentation

No randomized trials exist

Management of intracranial dissection

Surgical or endovascular treatment in patients with SAH since 40 % rebleed in next few days

In patients with ischemic event, medical treatment

Endovascular treatment

- Recurrent events on medical treatment
- Increasing size of the dissecting aneurysm
- Brain stem compression

Take home messages

Extremely heterogenous condition

CTA and MRI/MRA have good sensitivity and specificity in the diagnosis of dissection ,but DSA is required in SAH presentation and intracranial dissection

Individual treatment of dissection depends on the

Acute stroke presentation

Extracranial vs intracranial dissection

Symptomatology


Thankyou for your attention