Clinical Considerations for Revascularization Therapy in Acute Ischemic Stroke

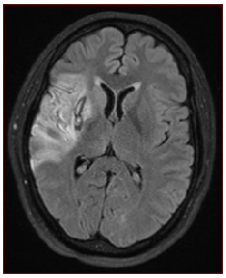
3RD ANNUAL PVHMC CEREBROVASCULAR SYMPOSIUM

28.10.18

POMONA VALLEY HOSPITAL MEDICAL CENTER
Expert care with a personal touch

Case 1

- 38 F w/L HP. LKW >12 hours prior
- CTA=R M1 occlusion
- Stroke 1 month prior
- Revascularization Tx (Thrombectomy)? Yes/no

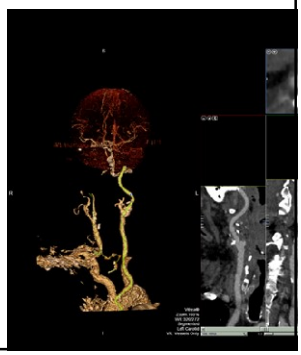


Case 2:

- 44 M "not feeling well" since 2 days PTA
- Slurred speech
- ?R leg weakness
- Urinary incontinece
- Revasc. Therapy? Yes/no

Case 3

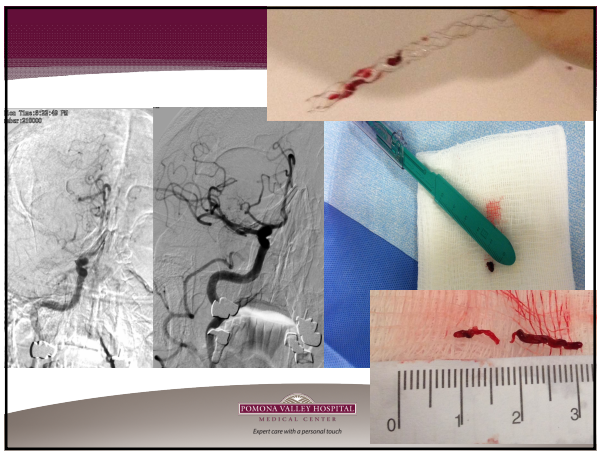
- 78 M< 3 hours L HP, gaze deviation to R
- CTA distal ICA occlusion, normal intracranial vasculature
- Revascularization? Yes/no



TO TREAT OR NOT TO TREAT

- MCA reocclusions
- proximal basilar/distal vertebral/VB junction occlusions
- isolated extracranial ICA disease

- No Treatment: improved/stable
- No Treatment: worse
- Treatment: worse
- Treatment: better



"HERMES" TRIALS FOR ENDOVASCULAR STROKE TREATMENT

- Trials: MR CLEAN, REVASCAT, SWIFT PRIME, EXTEND-IA, ESCAPE, *NEJM* 2014-15
- 50-80% recanalization rates
- Less infarct growth
- **30-50%** greater odds of functional independence w/thrombectomy + standard care
- Similar risk of ICH as w/ IV tPA alone (0-6%)

Updated AHA 2018 guidelines for care of acute ischemic stroke patients

- Level IA Evaluation for mechanical thrombectomy
  - w/in 6 hours
    - mRS 0-1, ICA/M1, NIHSSS>/=6, ASPECTS >/=6
  - 6-24 hours
    - Also must meet other eligibility criteria
- Mechanical thrombectomy evaluation is simultaneous with IV tPA
- Level IIA recommendation for M2/distal MCA occl.

Additional eligibility criteria for patients presenting b/w 6-24 hours

- DAWN 6-24 hours
- Clinical-core mismatch
  - Minimum NIHSSS 10
  - Core volume through DWI MRI, CTP (CBF/CBV)
  - RAPID software
- DEFUSE 3 6-16 hours
- Core-penumbral mismatch
  - No minimum NIHSSS
  - Core infarct < 70 mL and penumbra 1.8x larger

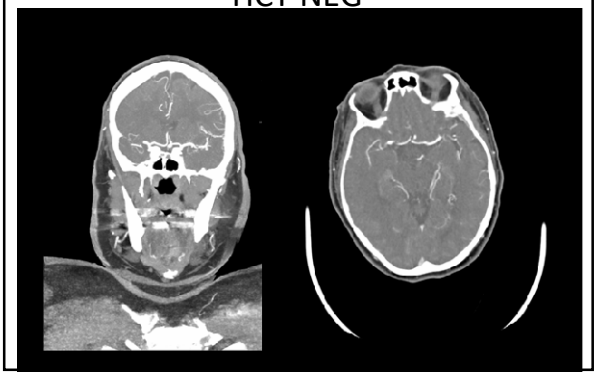
MCA REOCCLUSION

NO TREATMENT BETTER
NO TREATMENT WORSE
TREATMENT WORSE
TREATMENT BETTER

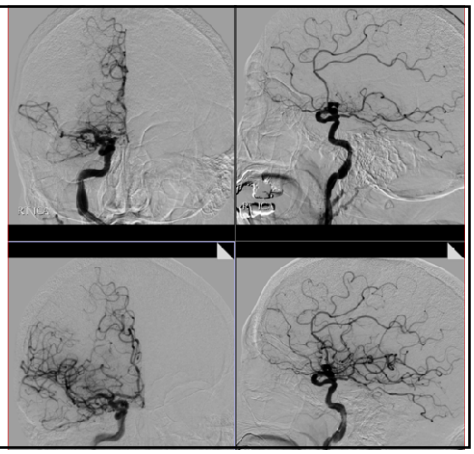
No Treatment: better, example???

- Overall risk: ?increased risk of ICH
- EVT risk w/stentriever-endothelial damage?
- Hernandez-Perez et al, *J Neuroimaging*, 2014. natural history of MCA/intracranial ICA occlusions: poor outcome among 74% of 120 patients
  - Intracran. ICA, n=13 (11%), poor outcome 92%
  - Prox MCA, n=69 (56%), poor outcome 87%
  - Distal MCA, n=38 (32%), poor outcome 47%

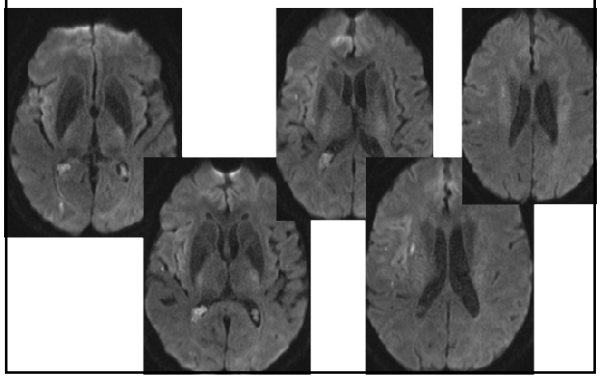
Case 1: 72 F w/L HP. NIHSSS 18 HCT NEG



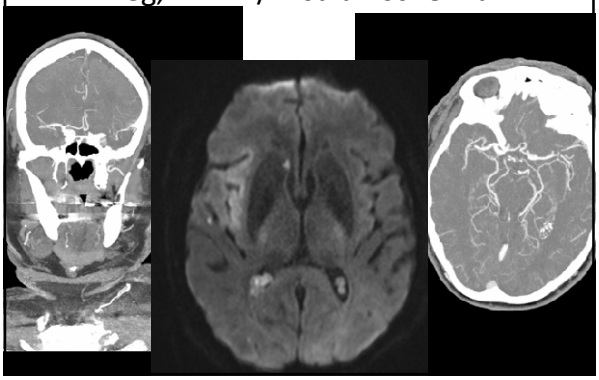
EVT (asp.), TICI 3, <48 hours later NIHSS 0



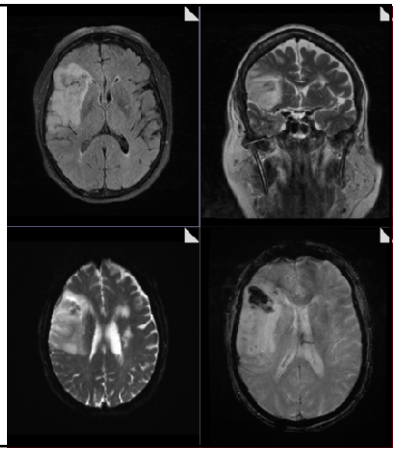
Post EVT MRI



50 hours later NIHSSS 7: (Repeat CT neg, MRI w/ insular ischemia



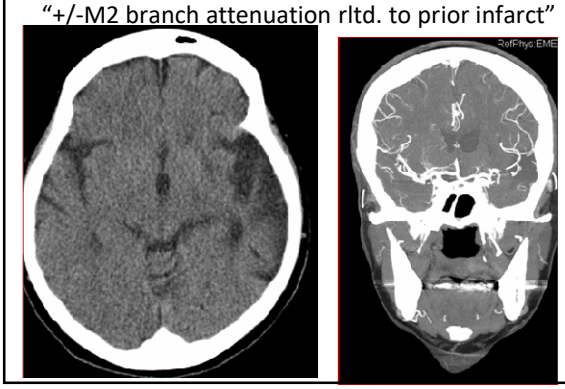
Decision: no EVT
Additional comorbid. (obesity, sleep apnea)
Outcome NIHSSS 16
Death



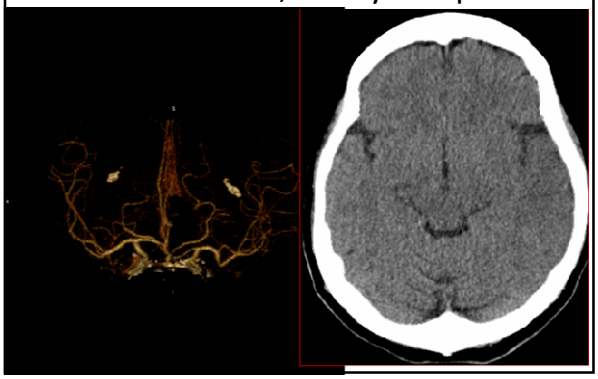
Updated IV tPA guidelines

- REMOVED: caution/exclusion for 'minor stroke' or NIHSSS>22, rapidly improving symptoms, major surgery w/in 14 days, previous ischemic stroke w/in 3 months, prior ICH
- May be considered in pregnancy if benefit outweighs increased risk uterine hemorrhage

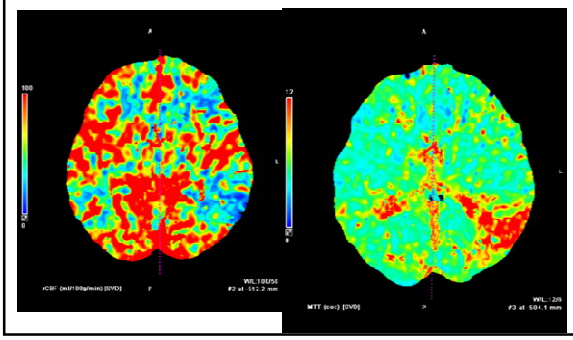
Pt 2: 52 F, hypertrophic CMP, AFIB, defib., aphasia, therapeutic warfarin,NIHSSS 10, CTA, "+/-M2 branch attenuation rltd. to prior infarct"



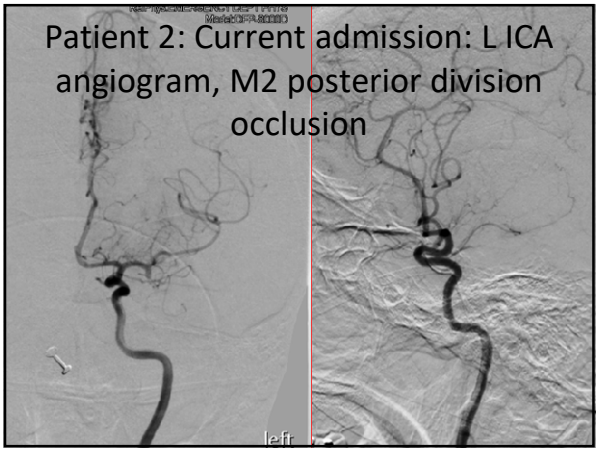
Patient 2: CTA, CT 3 years prior



Patient 2, CTP 3 years prior

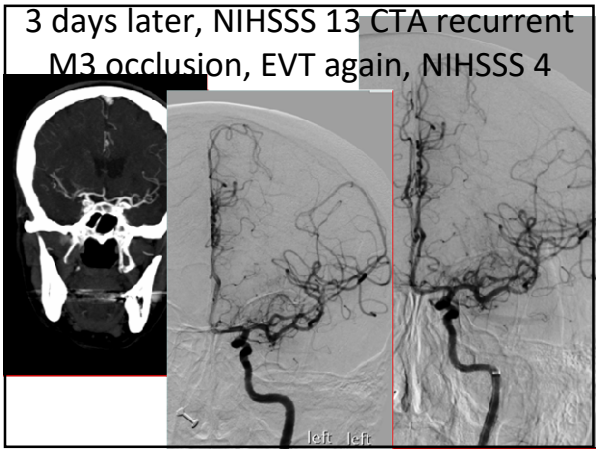


Patient 2: Current admission: L ICA angiogram, M2 posterior division occlusion



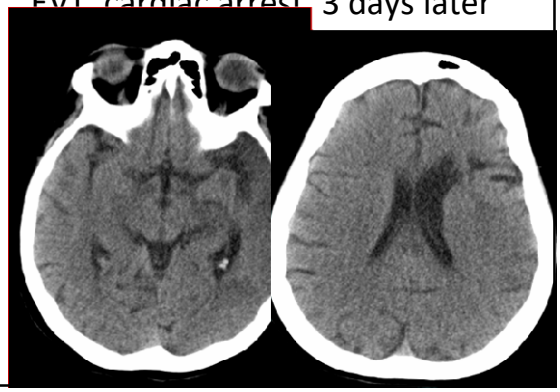
Angiogram post EVT, 1st and 2nd pass, 24 hr NIHSSS 1

3 days later, NIHSSS 13 CTA recurrent M3 occlusion, EVT again, NIHSSS 4



CT post 2nd EVT

5 days later recurrent sx, reoccl, no EVT, cardiac arrest, 3 days later



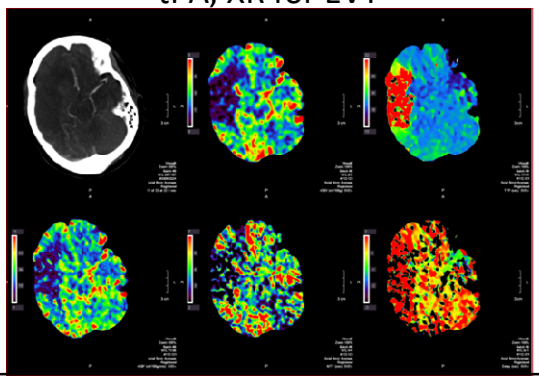
Repeated IV tPA for early recurrent Stroke

- Kahles et al, Stroke, 2016; 47:2133-5.
- 19 patients. Mean age 68 years, median inter-tPA interval 30 days.
- Functional independence achieved in 79% post tPA 1 and 47% post tPA 2. NO Sx ICH

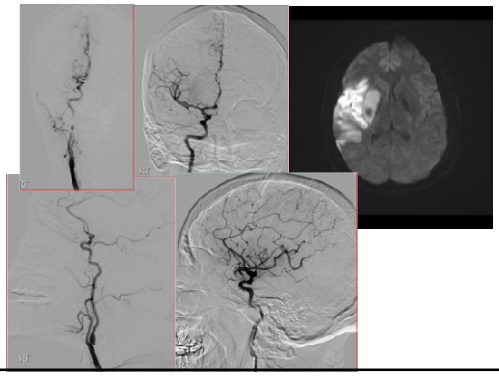
Repeat EVT

- Fandler et al, *Front Neurol*, 2018: repeat R MCA, etiology ulcerated non stenosing plaque prox ispilateral ICA, good outcome
- Bouslama et al, *Interv Neurol*, 2018, 15/697 (2%) pts, median time b/w EVT 18 days. Cardioembolism (66%) most common cause, 60% w/mRS 0-2 post last thrombectomy
- Laible et al, *Case Reports Vasc Med*, 2015. recurrent L MCA w/3 IA TPA Txs w/in 72 hrs. 2 days later R MCA. Poor prog (adenoCA), no Tx. Outcome=death

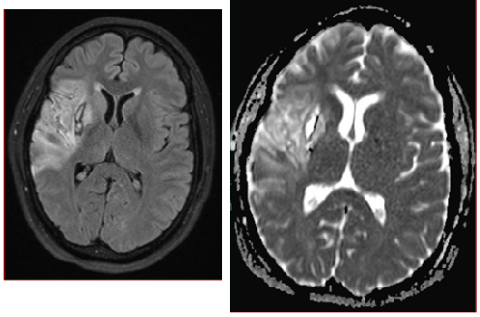
Patient 3, 38 F L HP, NIHSSS 11, IV tPA, XR for EVT

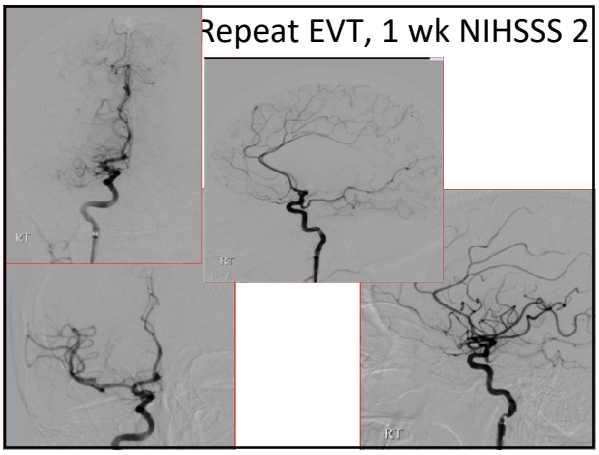


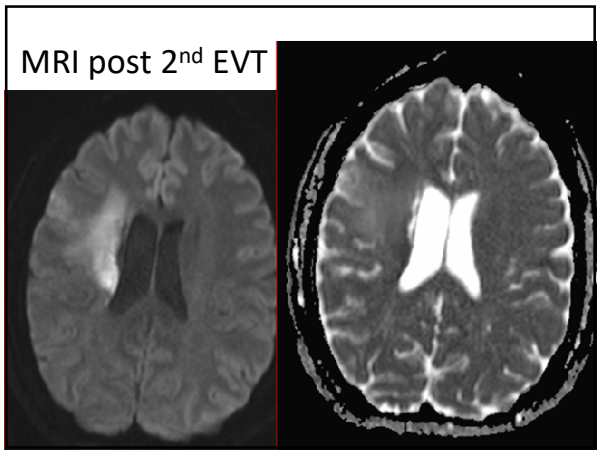
EVT, NIHSS 1 wk. later=2

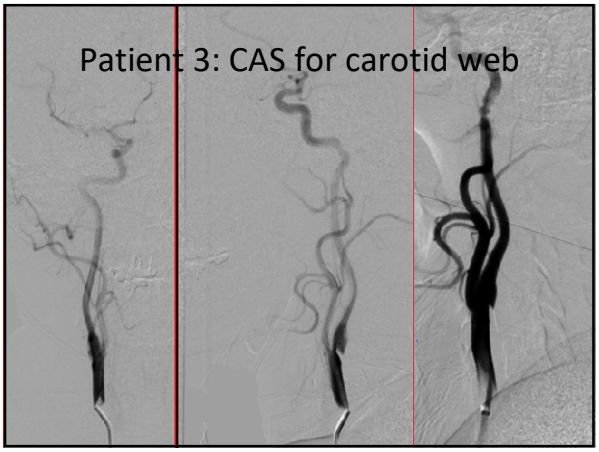


~ 1 month later, recurrent Sx, NIHSSS 10, outside hosp CT "subacute R MCA stroke", R M1 occlusion









MCA Reocclusion

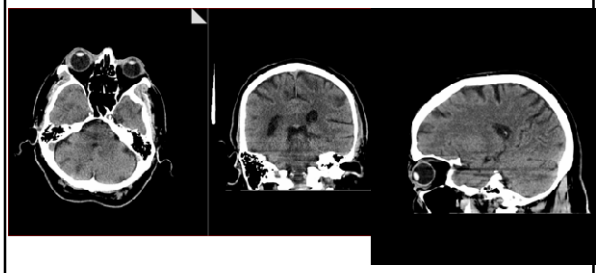
- High LOE for benefit of EVT for MCA occlusion
- Main consideration is reperfusion ICH risk and benefit likelihood
- Predicated on clinical recovery from first stroke and ultimate infarct size
- Rebello et al, JAMA Neur. 56 matched controls, = Sx ICH, ns benefit EVT
- Logan et al, *World Neurosurg*. 2018: 34/355 (10%)pts w/ASPECT </=6. Good clinical outcome 37 vs 46%, Sx ICH/mortality = (9&20%)

Intradural Vertebral Artery/VB Junction/Proximal Basilar Artery Occlusions

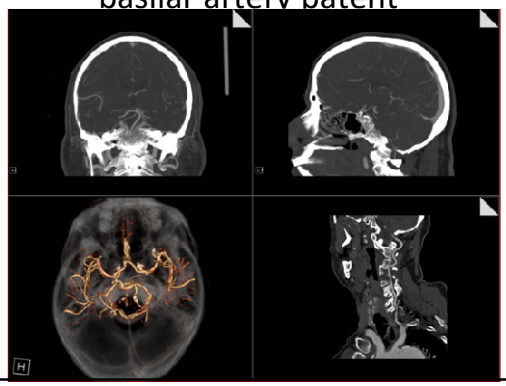
BAO not routinely included in recent RCTs

- Endostroke registry, 129 pts.
  - Good outcome 34%, moderate 42%, mortality 35%
- BASICS registry data, 619 pts, med. NIHSS 22 68% poor outcome irresp. Tx (AT/IVT/EVT)
  - 202 (33%) distal 1/3rd
  - 143 (23%) middle 1/3rd
  - 274 (44%), proximal 3rd

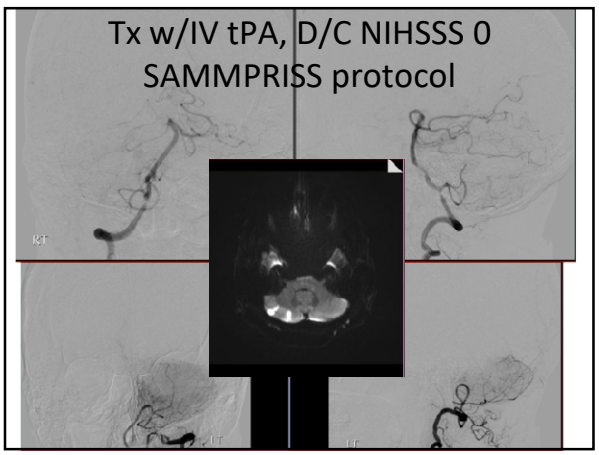
Patient 4: 70 M, vertigo few days, now acute L HP, NIHSSS 6



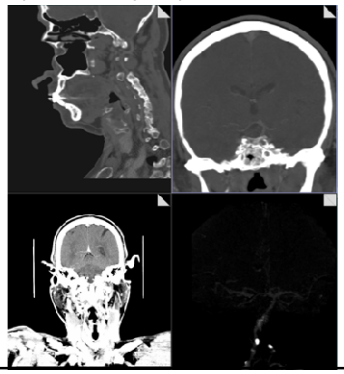
CTA, absent distal occl. L VA, basilar artery patent



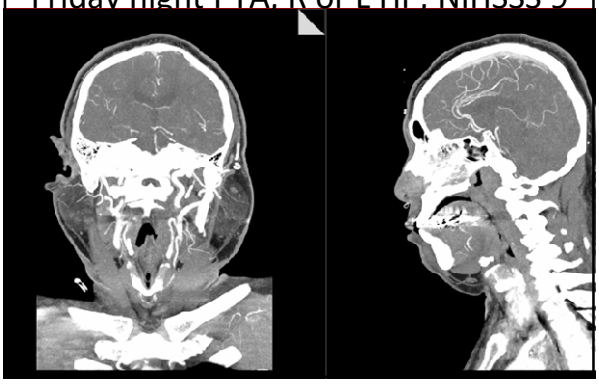
Tx w/IV tPA, D/C NIHSSS 0 SAMMPRISS protocol



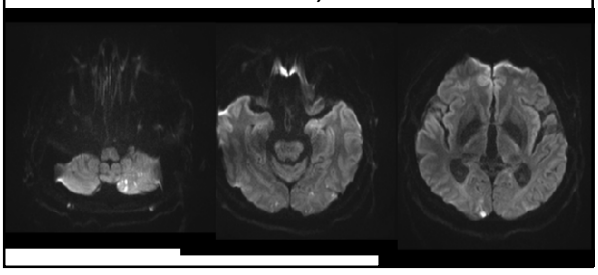
6 mo. F/U CTA HEAD, no recurrence up to 1.5 yrs post stroke



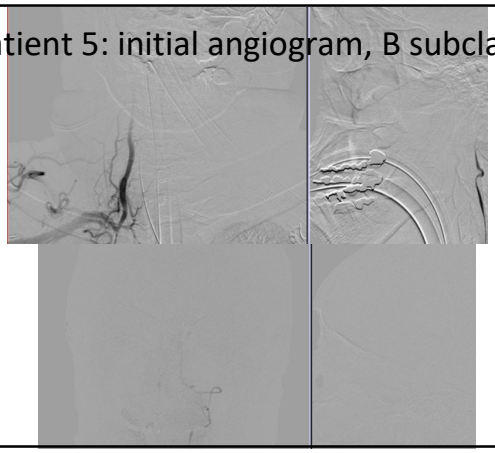
Patient 5: 44 M, 'not feeling well' Friday night PTA, R or L HP, NIHSSS 9



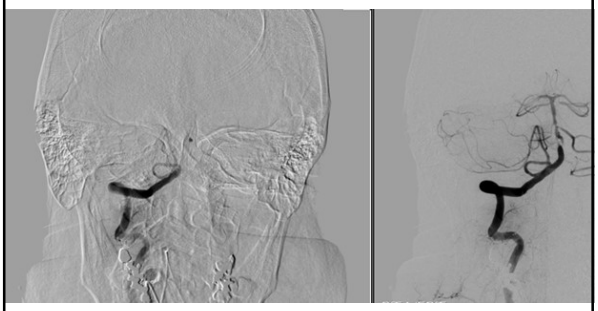
CTA (retrospectively) read as partial basilar thrombus, MRI with scattered cerebellar/PO ischemic foci. Post MRI, NIHSSS 20



Patient 5: initial angiogram, B subclav.



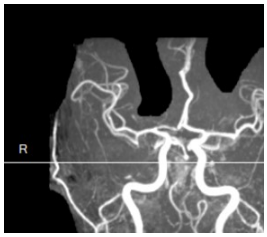
Patient 5, pre post EVT
1 wk NIHSSS=0, 3 mo mRS 0



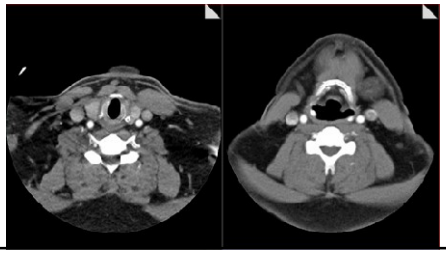
Variation in Posterior Circulation Supply

- Codominant vertebral arteries, 77%
- Left dominant, ,19%
- Right dominant, 3%
- Fetal PCA 8-10%
- Basilar hypoplasia

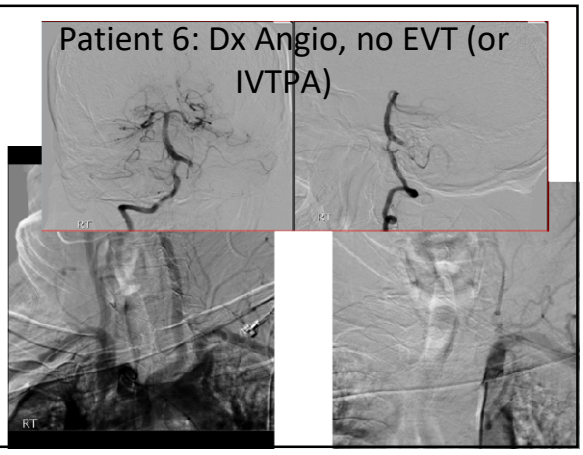
- 41 F w/ H/A



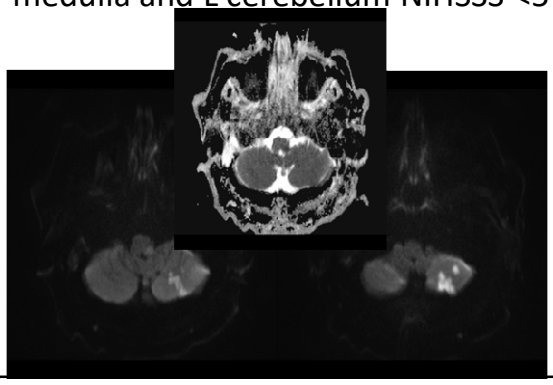
Patient 6: 53 M vertigo&ataxia x 24-48 hrs PTA, CTA L vertebral artery occlusion



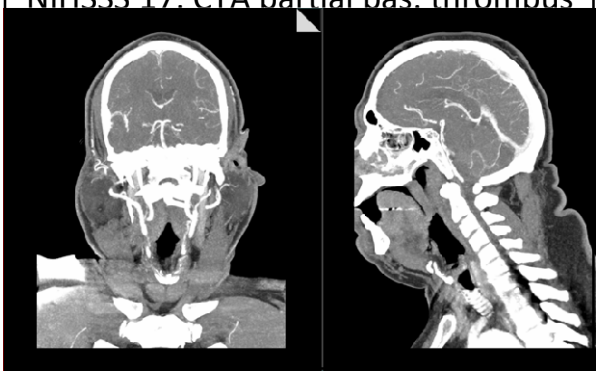
Patient 6: Dx Angio, no EVT (or IVTPA)



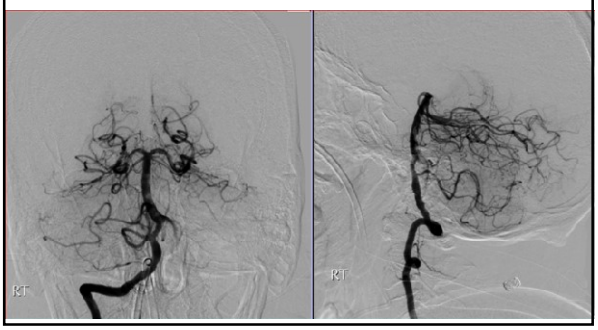
Patient 6: MRI stroke day 1, ? L postlat medulla and L cerebellum NIHSSS <5



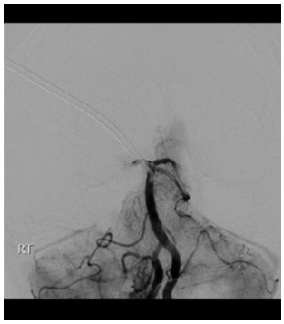
Patient 6: next day worsened R HP, NIHSSS 17. CTA partial bas. thrombus



Patient 6: repeat angio, filling defect mid basilar artery

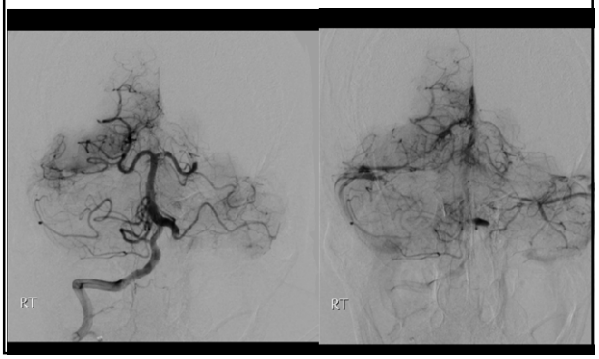


Pt. 6: POST IA LYTIC

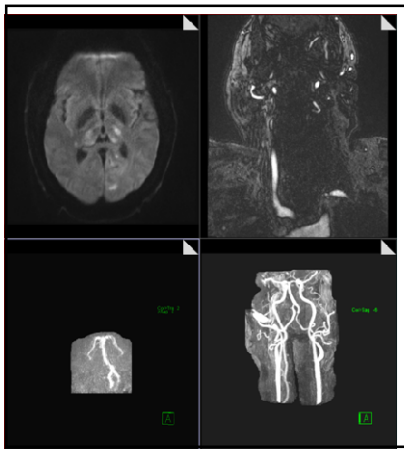


- Improvement in filling defect mid basilar
- New filling defect distal basilar
- Occlusion R PCA, SCA, distal L PCA

Patient 6: final R VA angio



Patient 6: L SUBCLAV

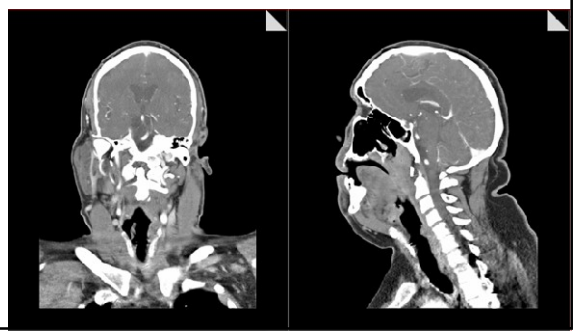


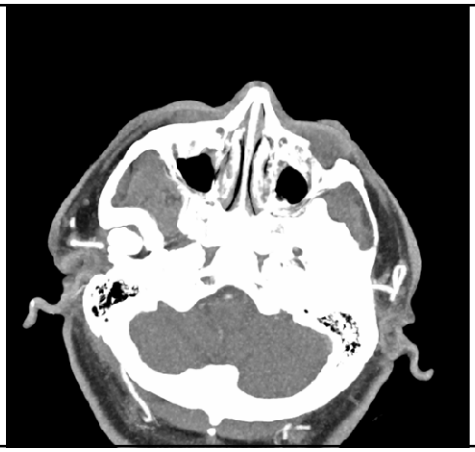
- MRI brain 1 week later w/bithalamic stroke, L PCA stroke
- Patient basilar & B PCAs
- D/C NIHSSS 19
- 6 wk. F/U cortically blind, R HP 3/5, L dense hemiplegia

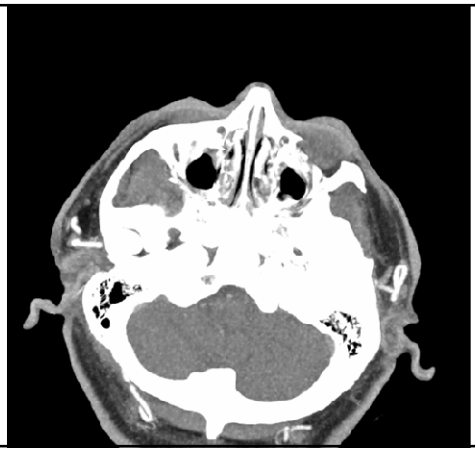
Anticoagulation for post. Circ. stroke

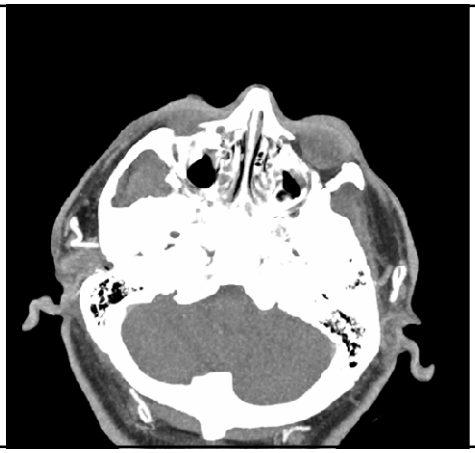
- WARRS subgroup, post hoc. Better outcome post. circ. stroke sparing brainstem
- Acute studies of IV heparin negative
  - van Merwijk et al. *Cerebrovasc Dis*, 1991, 61 pts, no difference
  - Kunze et al, *Nervenarzt*, 1991. 25/28 BAO Tx w/heparin. 22 deaths
  - Martin-Polo et al, *Revista de Neurologia*. Case report recan BAO on MRA w/IV AC

Patient 7: 46 M R HP, vertical gaze palsy, anarthria, CTA mid basilar occl.

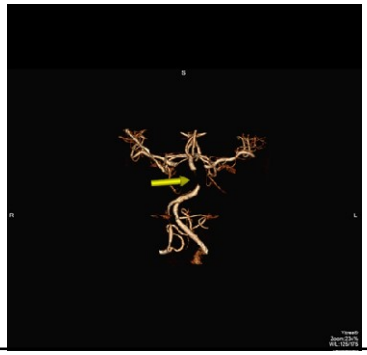




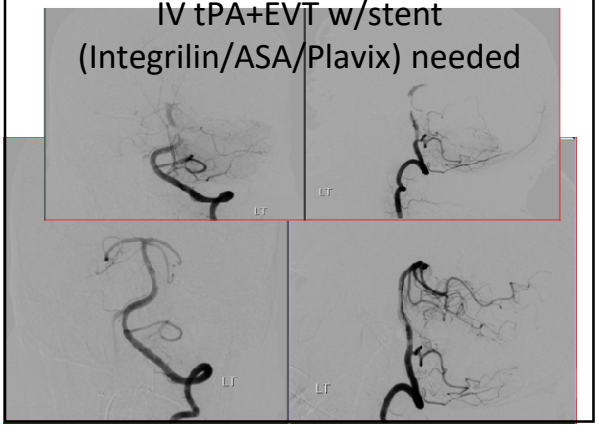




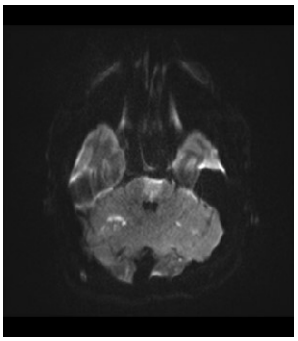
Patient 7: 3D recon of CTA



IV tPA+EVT w/stent (Integrilin/ASA/Plavix) needed



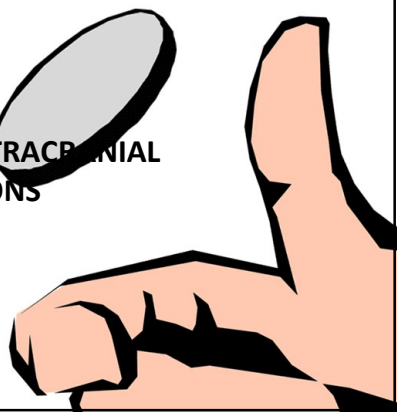
Patient 7: d/c NIHSSS 1



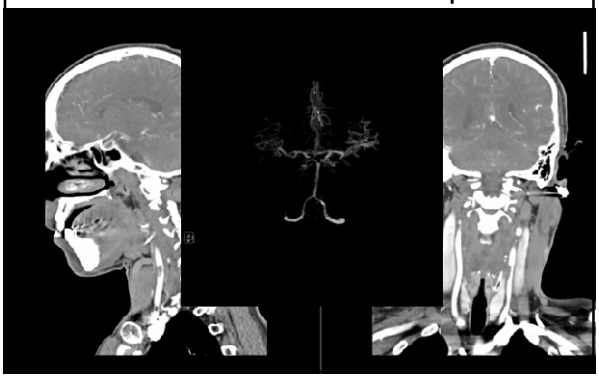
Basilar Artery International Cooperative Study (BASICS)

- 268 pts randomized
- Inclusion: 18+ yrs BAO by CTA or MRA
- Initiation of IAT w/in 6 hours est.BAO
- Exclusion: mRS>2, pregnant/lactating, terminal illness, in another research drug study, hemorrhage, significant cerebellar mass effect/acute hydrocephalus, B extended brainstem ischemia

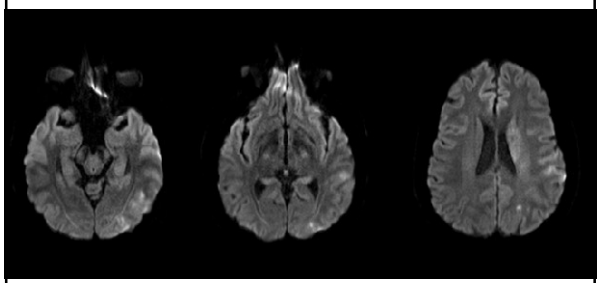
ISOLATED EXTRACRANIAL ICA OCCLUSIONS



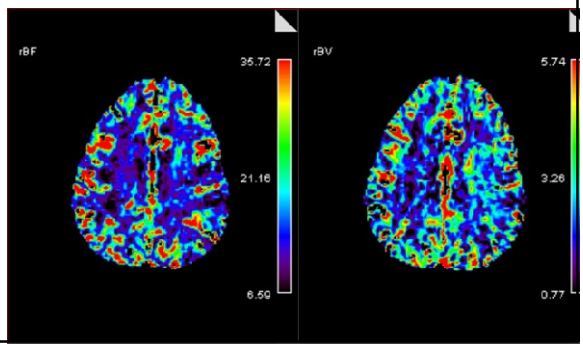
Patient 8: 54 M R HP and aphasia



Patient 8: initial brain MRI

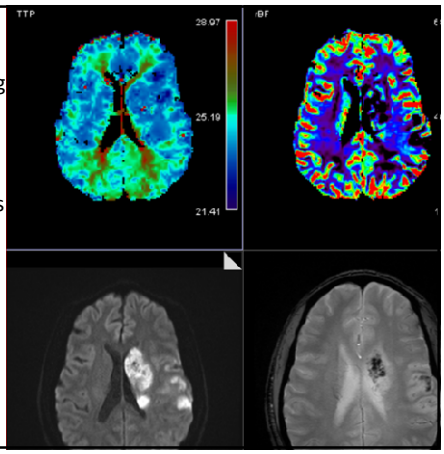


Patient 8, initial CTP (next day)



Patient 8: planned for elective stenting

F/U brain MRI brain and MR perfusion shows extension of stroke to BG w/ ICH so no acute Tx done



Patient 8: final HCT, improving R HP and aphasia

ICA occlusion in AIS

- In MR CLEAN, 108/476 (23%) w/prox ICA occls (pICAO). DSA in 46: 13 (38%) athero, 16 (35%), dsxn, 17 (37%) pseudooccl.
- variable practice for ICA or MCA intervention first and primary PTA vs CAS. CAS, 12.9%
- OR for benefit 1.85 vs 1.43 w/ or w/o pICAO
- ESCAPE: OR 9.6 vs 2.2 benefit
- EXTEND-IA pICAO 31%, CAS 8.6%
- REVASCAT, CAS 8.7%, OR 4.3

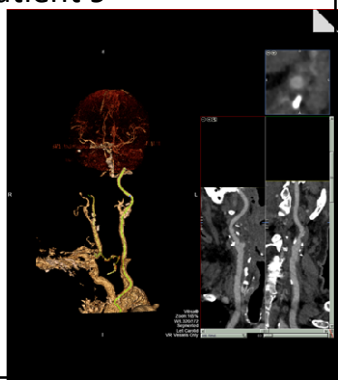
ICA occlusion in AIS, ctd

- Tandem occlusion (pICAO and intracranial ICA or MCA), Tx as per prox intracranial anterior circulation occlusion
- Sole extracranial ICA occlusion included in DEFUSE

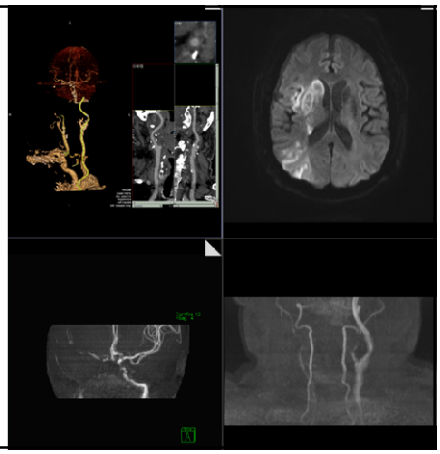
Patient 9: 78 M R HP, CTA axial shows no R ICA at skull base and sag shows fetal R PCA

Patient 9

- intracranial CTA, no occlusion
- Initial NIHSSS 17
- s/p IV tPA NIHSSS improved to 13
- No EVT performed

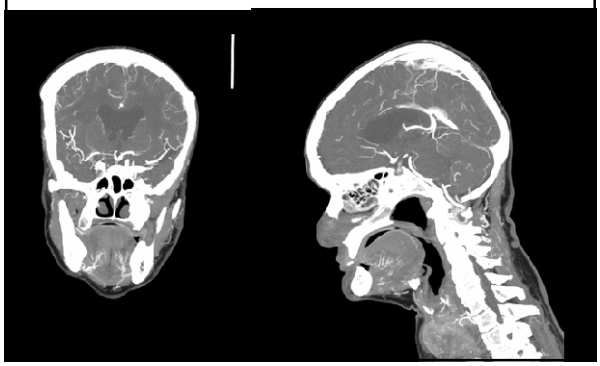


- Patient 9, MRI next day
- Non STEMI, DVT, intubated, hospice referral

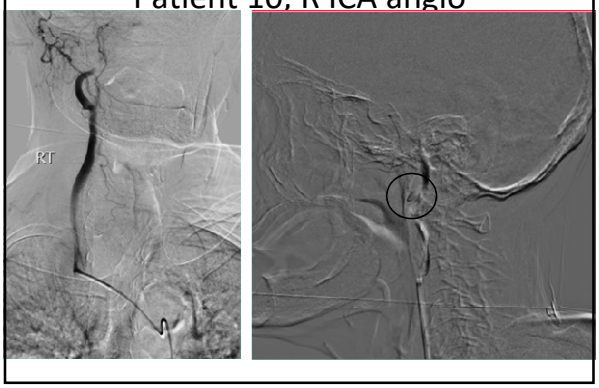


Patient 10: 81 F, L HP, NIHSSS 21. CTA extranial R ICA occlusion

Patient 10: COW

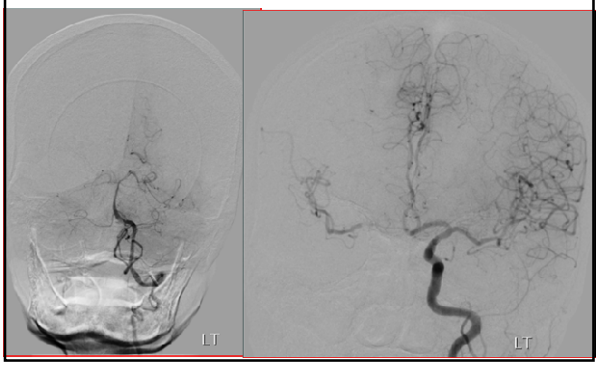


Patient 10, R ICA angio



Patient 10, redundant R ICA, ? dissection

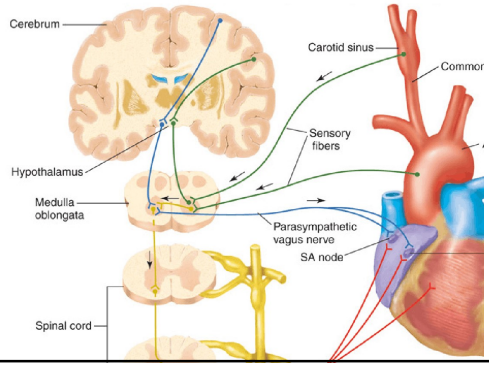
Patient 10: COW ON ANGIO



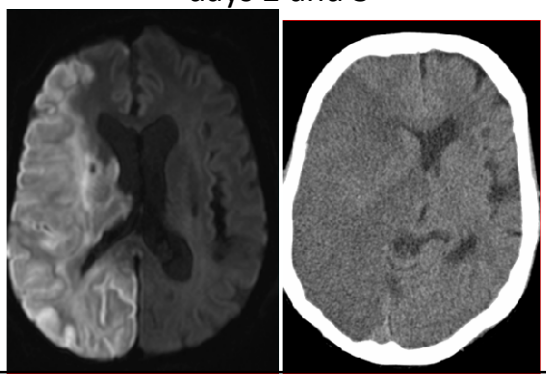
patient 10

- Unsuccesful attempt EVT
- 3.5 hours
- Hypotension
- intubated

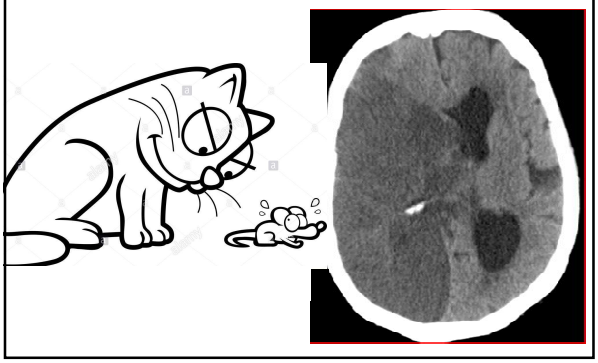
Carotid baroreceptor reflex



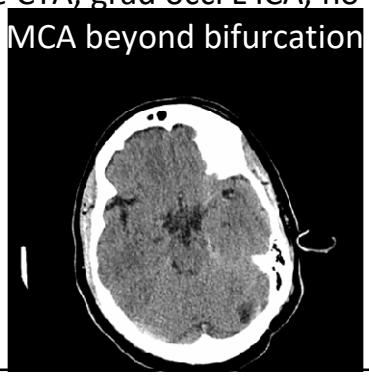
Patient 10: F/U MRI and CT, stroke days 2 and 3



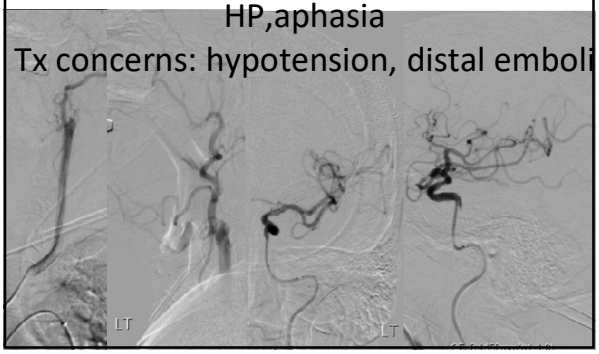
Patient 10: CT, stroke day 4



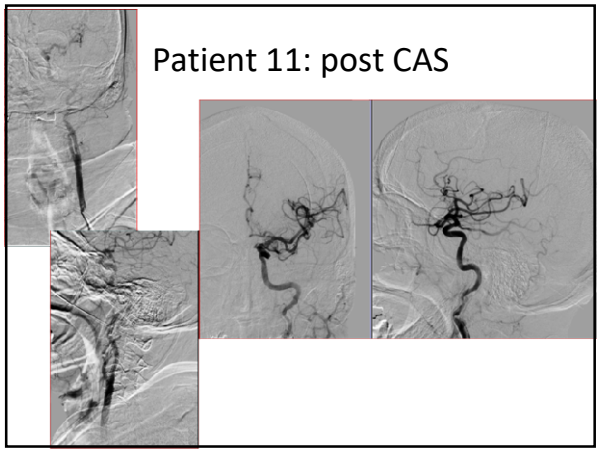
Patient 11: 65 F w/ acute R HP, aphasia outside CTA, grad occl L ICA, no filling L MCA beyond bifurcation



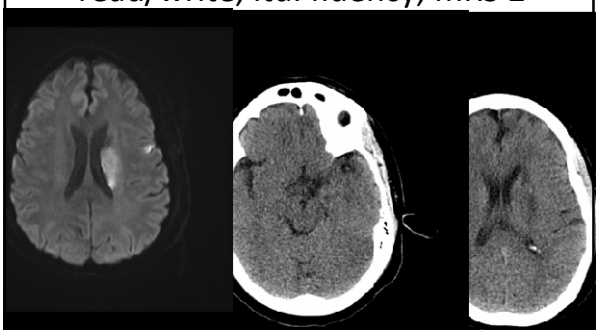
Patient 11:IV tPA at OSH, Tx for EVT, repeat HCT neg, persistent R HP,aphasia
Tx concerns: hypotension, distal emboli



Patient 11: post CAS



Patient 11: improved motor, residual aphasia. 2 month F/U, 4/5 R HP, able to read/write, ltd. fluency, mRS 2



Conclusion

- Proximal MCA/intracranial ICA per guidelines unequivocal data to treat
- Reocclusion of MCA may occur in about 1-2%, Tx decision based on clinical recovery/stroke size
- IV TPA also a consideration
- Basilar artery: no clear data, ongoing trials
- Isolated extracranial ICA occlusion: mixed outcomes