Stroke Case Scenarios : How Anatomy and Imaging Tells the Story

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Hamilton (Virtual)
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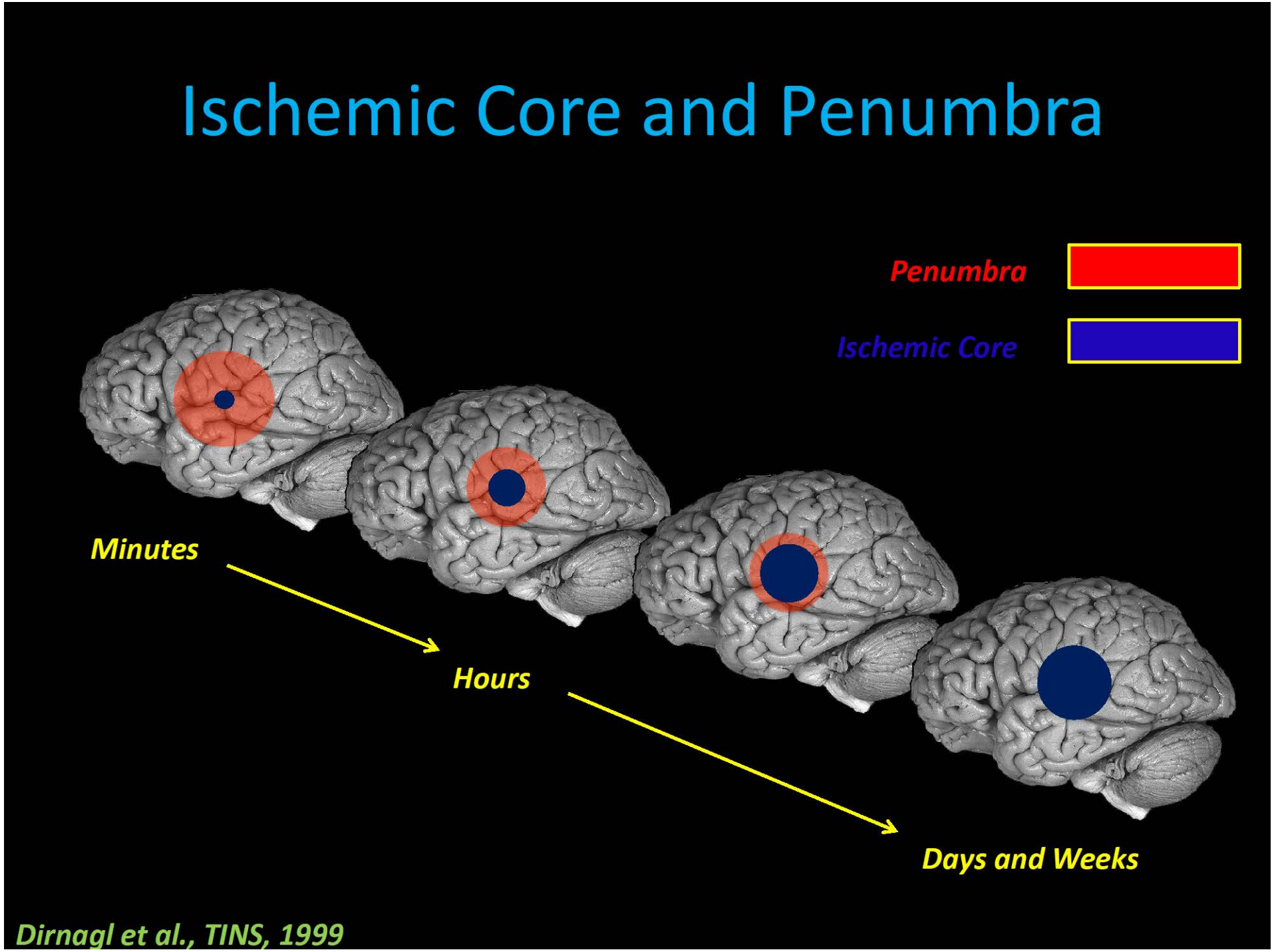
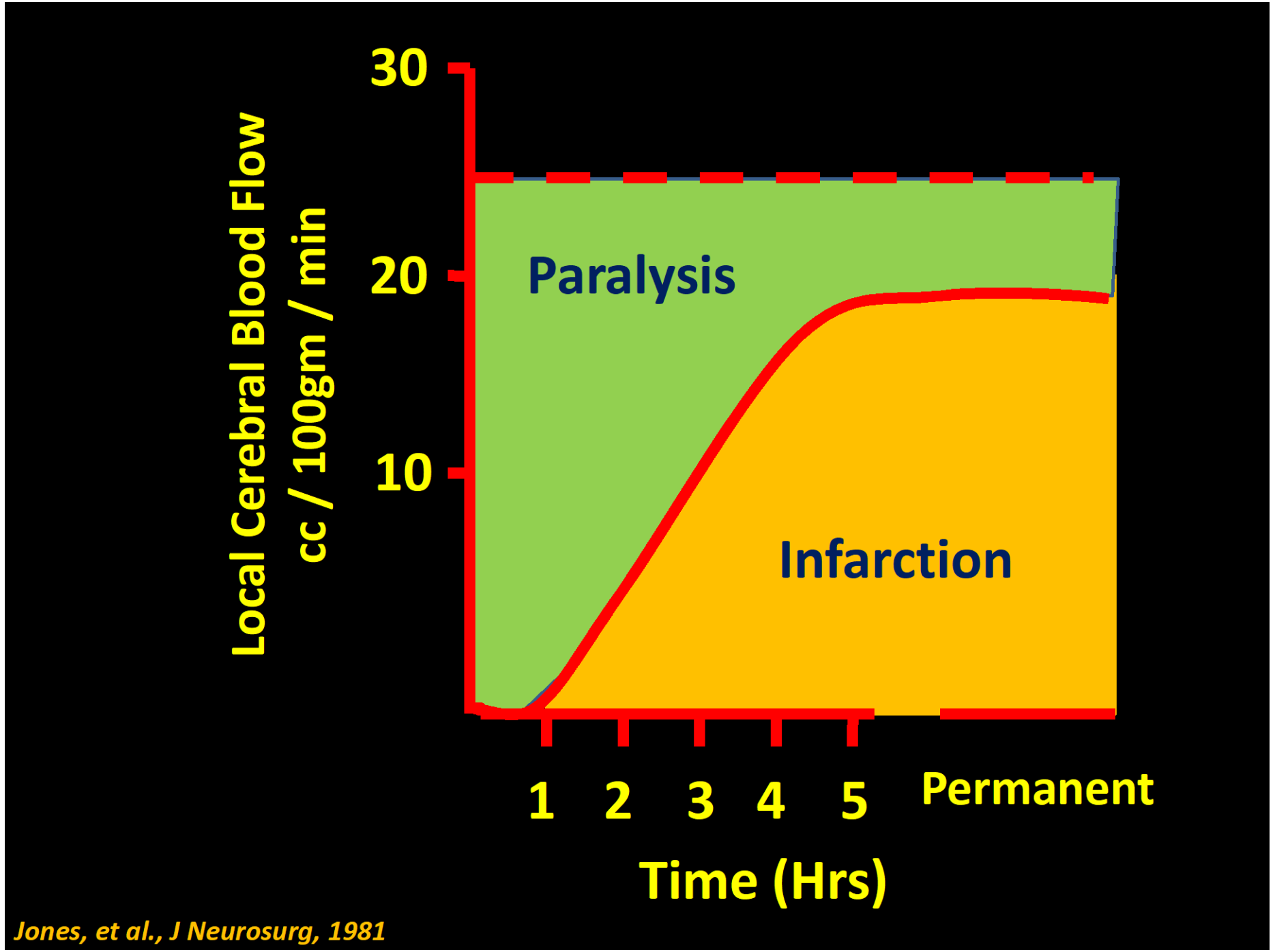
Content

- Critical initial clinical information for treatment decisions
  - What really helps when you hit the ED
- Large vessel occlusion ?
  - A critical branch point in therapy
- Getting to the base
  - The basilar artery

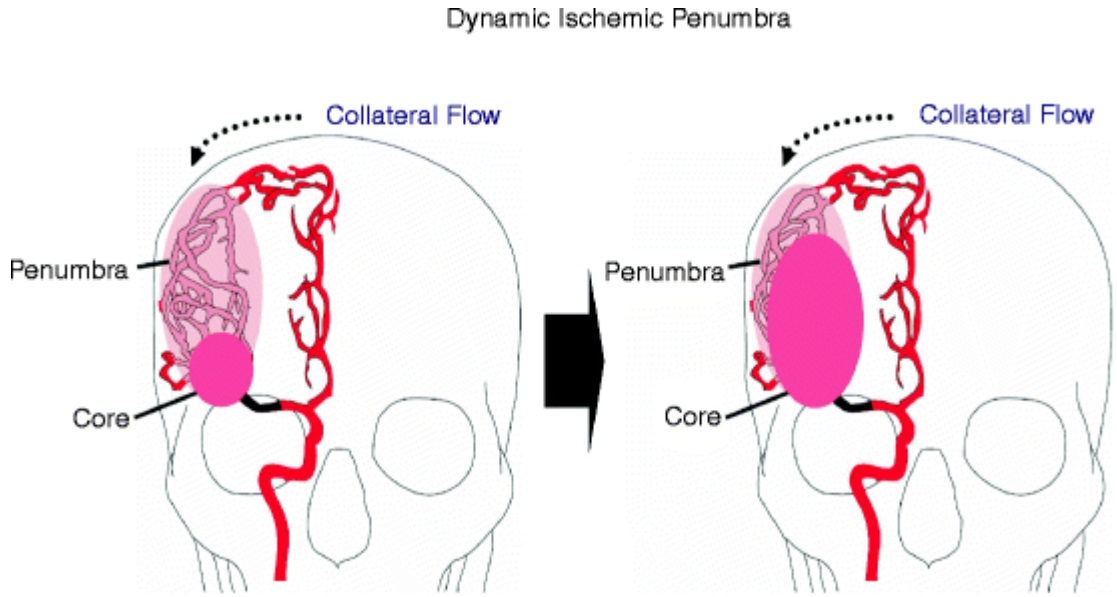
Ischemic Core and Penumbra

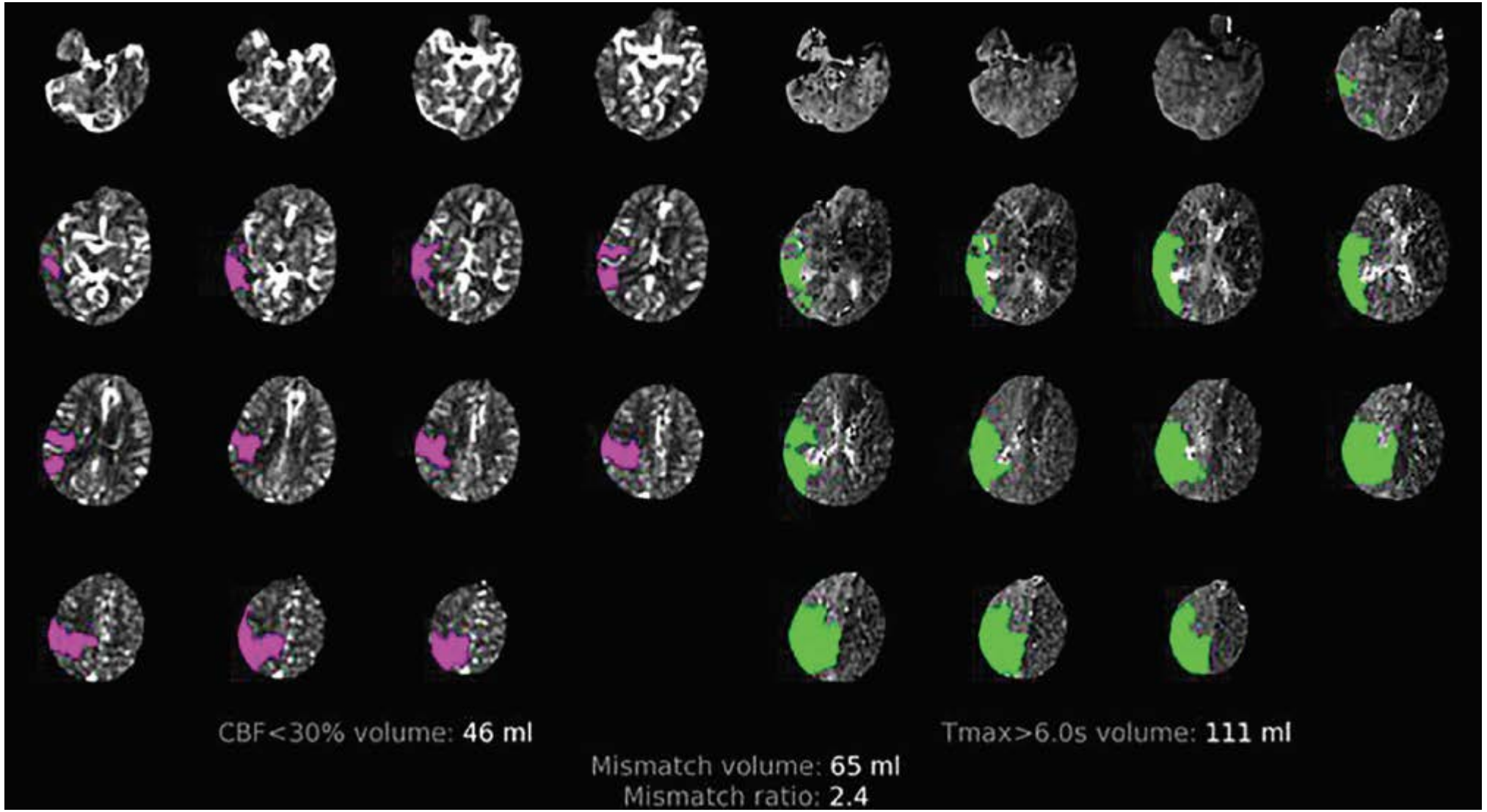


Dirnagl et al., TINS, 1999

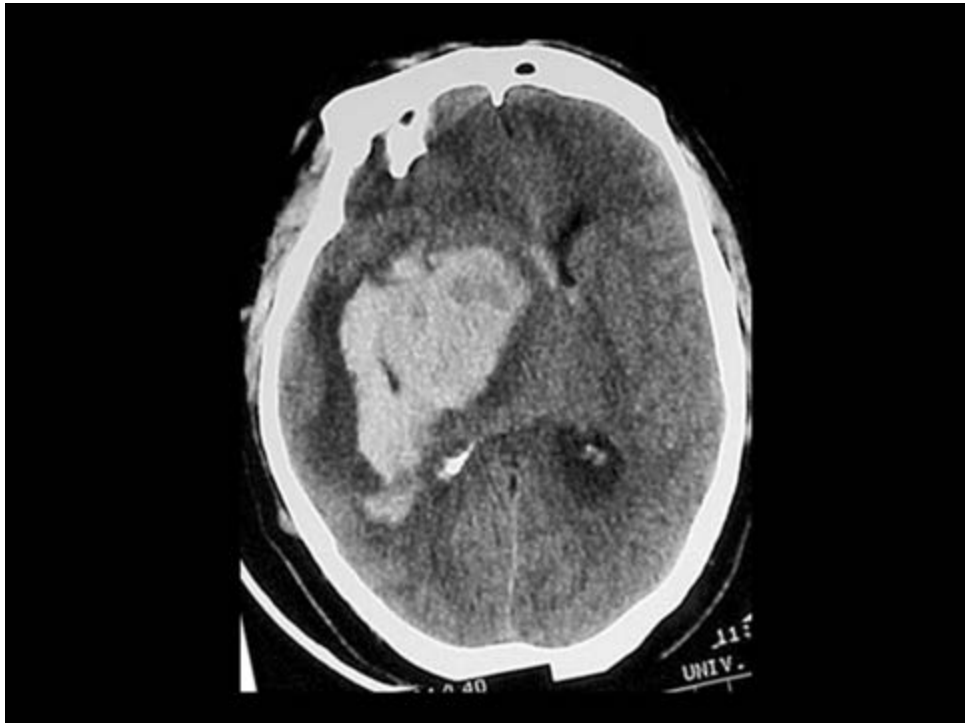

30
20
10
Local Cerebral Blood Flow
cc / 100gm / min
Paralysis
Infarction
1
2
3
4
5
Permanent
Time (Hrs)
Jones, et al., J Neurosurg, 1981

The Ischemic Penumbra



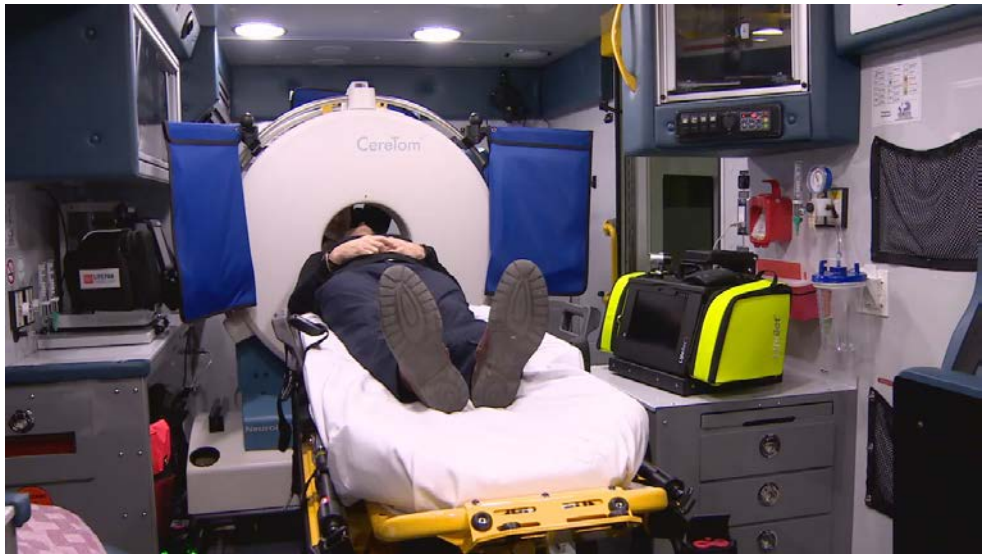

CBF<30% volume: 46 ml
Mismatch volume: 65 ml
Mismatch ratio: 2.4
Tmax>6.0s volume: 111 ml

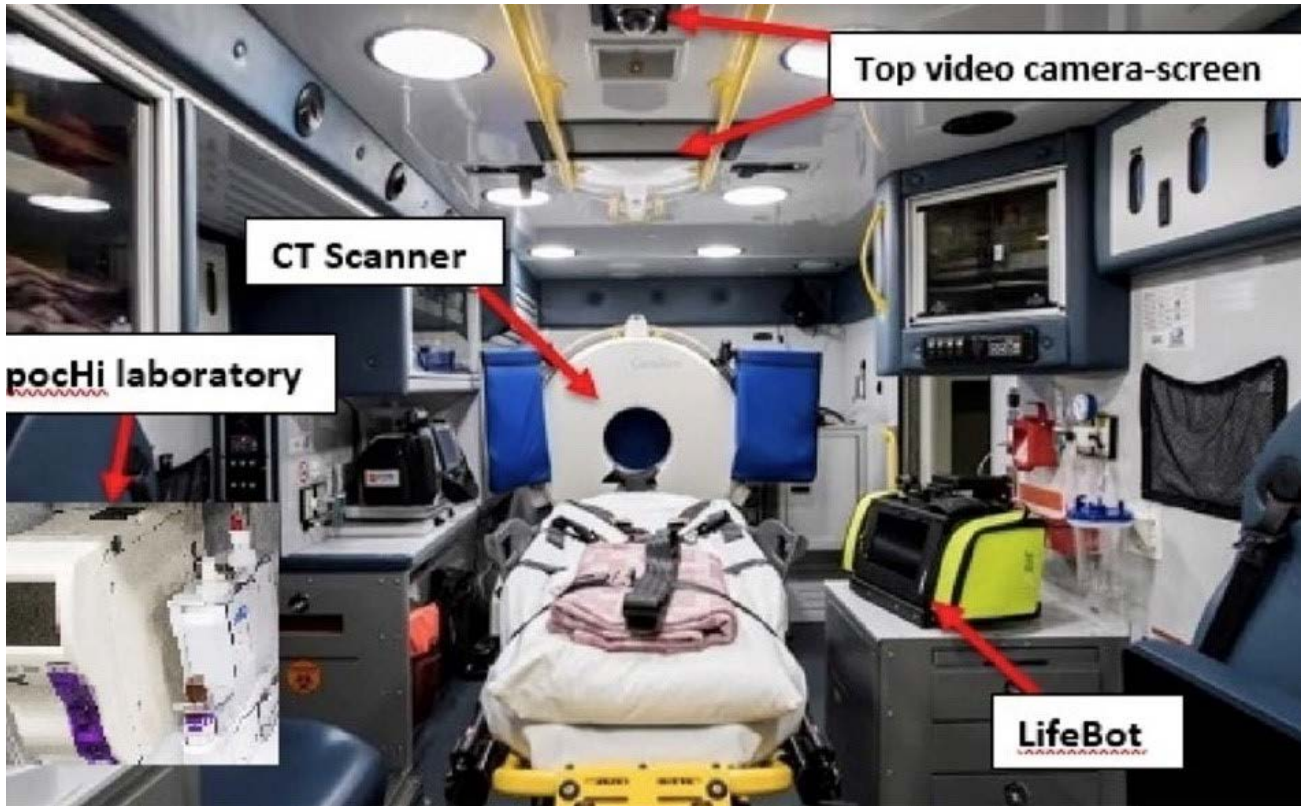
Intracerebral Hemorrhage



What Helps When You Hit The ED

- Parallel Processing
  - Ideal to know as much as possible before arrival





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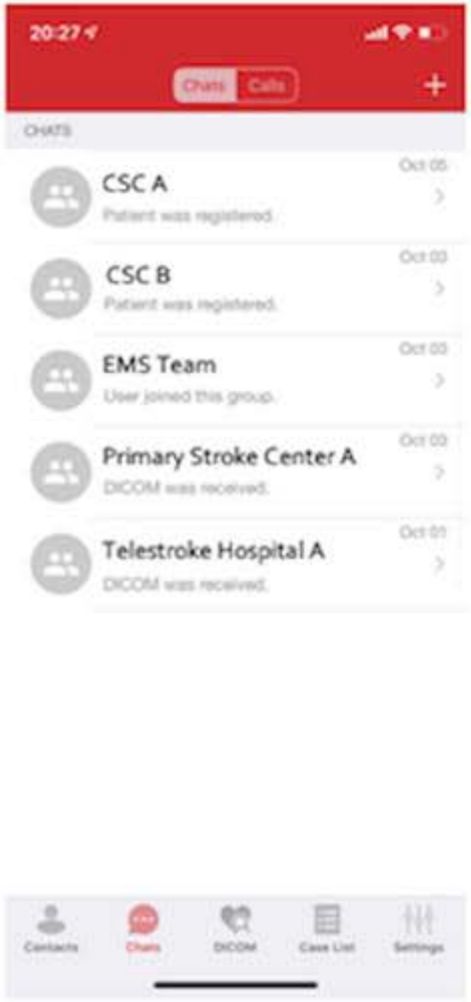
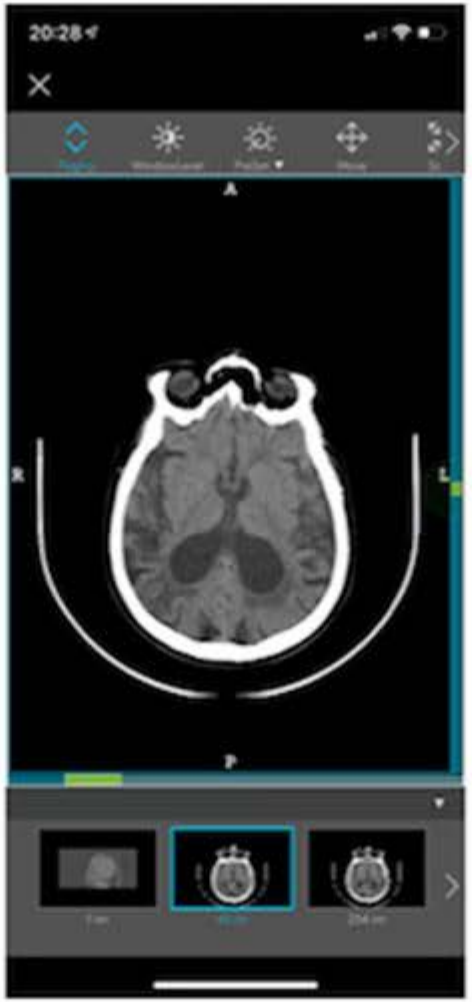
Chat Groups



Real-Time Case Sharing

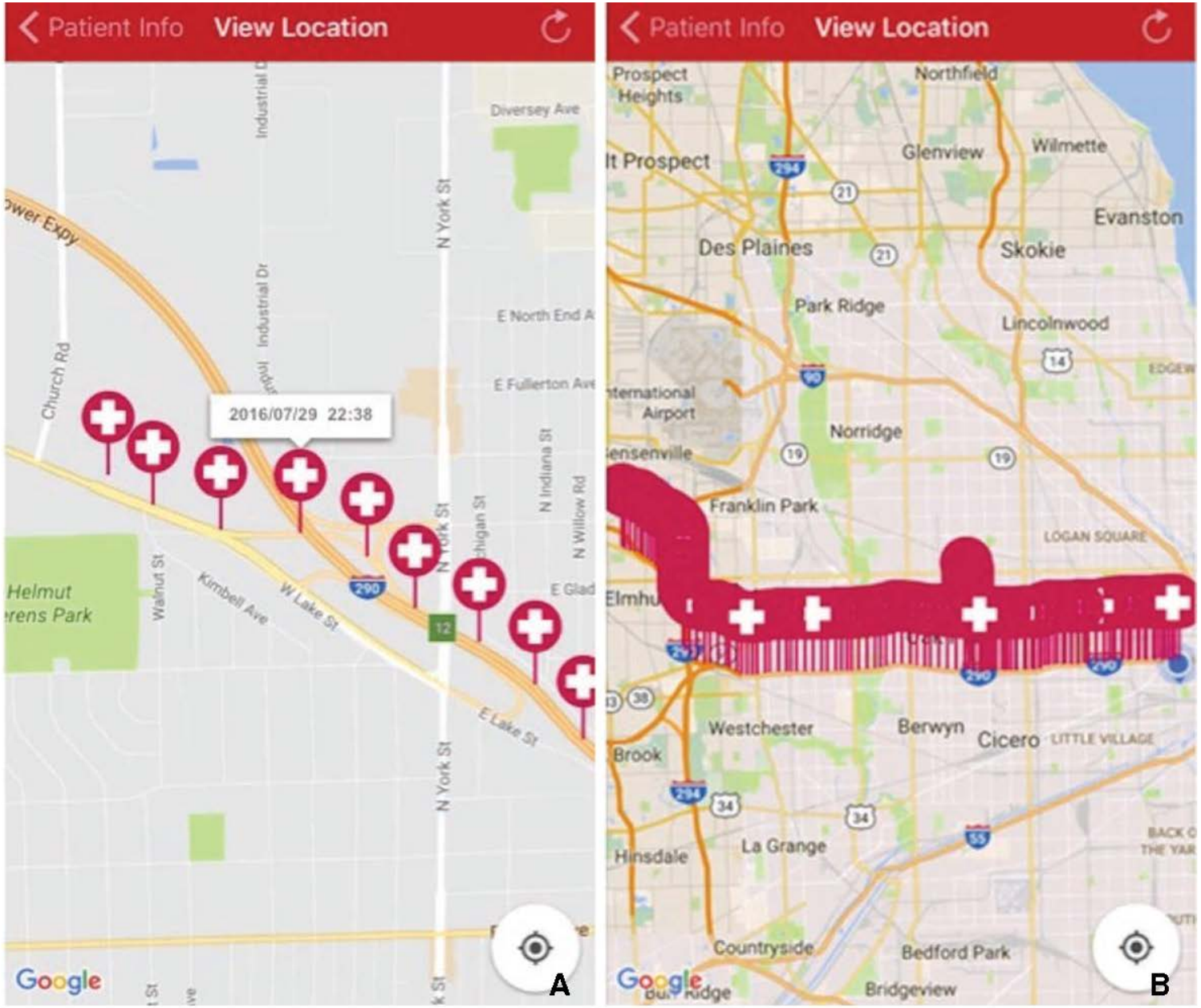
High-Definition DICOM Viewer



Timestamps for Data Monitoring

Text, Audio and Video Chats

www.phri.ca



Real-time patient tracking feature of the Join application. The patient's pick-up time and location can be seen (**A**). Transport

What can you do tomorrow ?

- What we need to know:
  - Is it a stroke ?
  - What was the time of onset ?
  - Witness ?
  - Contraindications to TPA ?
  - SDM contact ?

What can you do tomorrow ?

- Is it a stroke ?
- What was the time of onset ?
- Witness ?
- Contraindications to TPA ?
  - Medications : ODB formulary > 65 , Meds or list at home
  - Trauma
- SDM contact ?
  - Family ?
  - Contact information?

A case of a 64 yo man

- Called to ED for a man brought by EMS from work
  - “Difficulty Speaking”
  - Inattentive, unintelligible speech moving all limbs
  - Dressed in work clothes
    - Workplace unknown to ED staff
  - Wife contacted :
    - I heard him get up and leave for work this morning
    - I think he was ok but I didn’t talk to him
    - Works at different sites – not sure where he was today

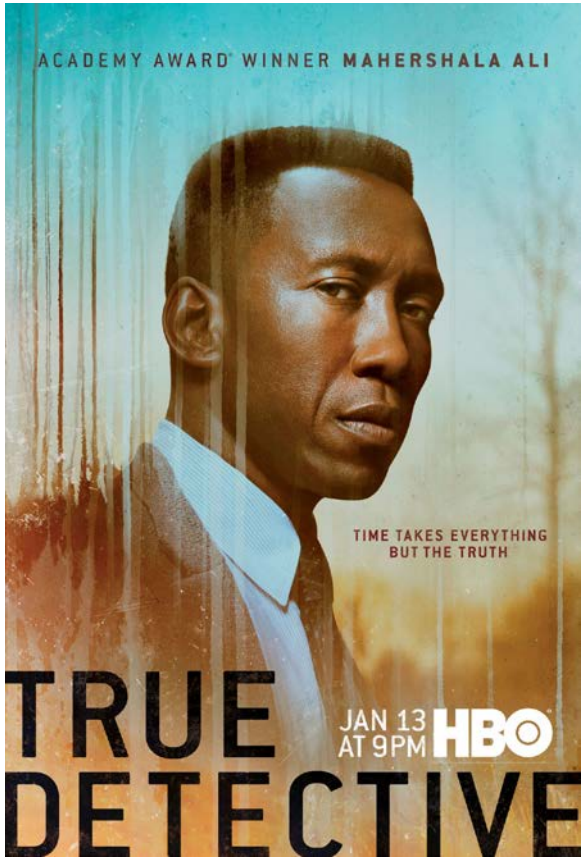
  - Questions
    - What happened to him ?
    - When did it happen ?

What can you do tomorrow ?

- What we need to know:
  - Is it a stroke ?
  - What was the time of onset ?
  - Witness ?
  - Contraindications to TPA ? ☺
  - SDM contact ? ☺

Time of Onset

- Defined as last known well
  - *Not when found or noticed*
  - *If wake with deficit*
    - *Onset is bedtime*
  - *When was he last known well?*
    - *Was the onset witnessed?*



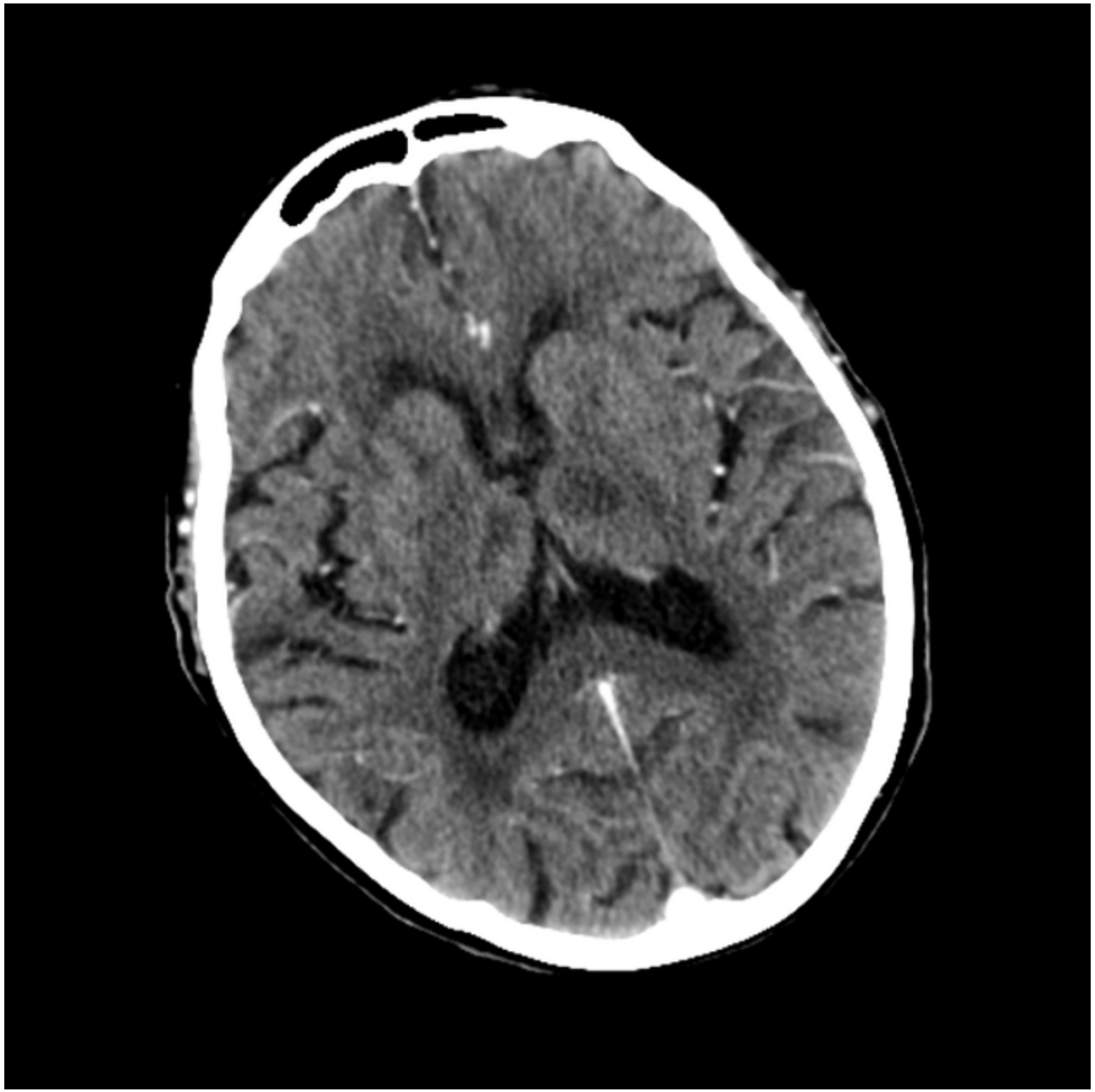
Is it a stroke?

- Abrupt onset
- Focal

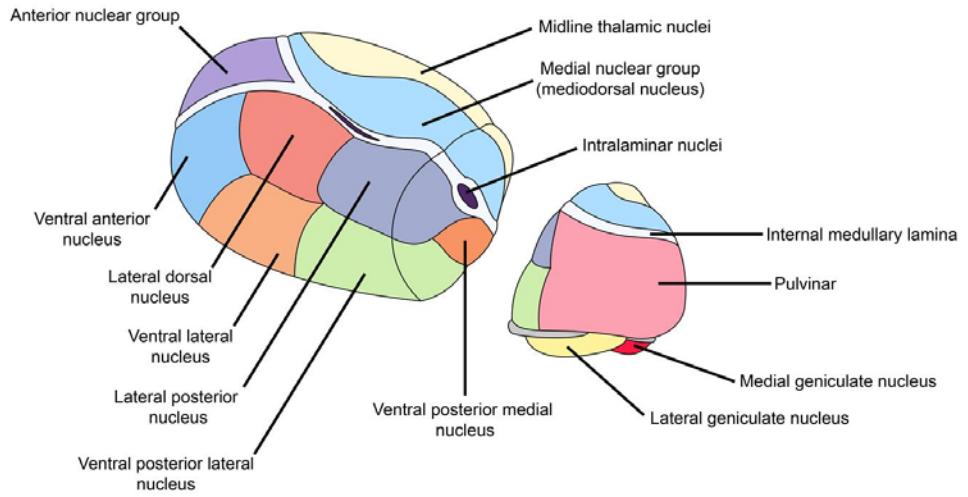
- So far in our story ….
  - Unclear

Not a stroke (probably)

- Isolated seizure
- Seizure at onset
  - Stroke is associated with Sz < 5% of the time
  - Postictal deficits clear rapidly (usually)
- Recurrent stereotyped episode
  - Many episodes spread over time



Thalamus



Moises Dominguez

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

O.A. Berkhemer, P.S.S. Fransen, D. Beumer, L.A. van den Berg, H.F. Lingsma, A.J. Yoo, W.J. Schonewille, J.A. Vos, P.J. Nederkoorn, M.J.H. Wermer, M.A.A. van Walderveen, J. Staals, J. Hofmeijer, J.A. van Oostayen, G.J. Lycklama à Nijeholt, J. Boiten, P.A. Brouwer, B.J. Emmer, S.F. de Bruijn, L.C. van Dijk, L.J. Kappelle, R.H. Lo, E.J. van Dijk, J. de Vries, P.L.M. de Kort, W.J.J. van Rooij, J.S.P. van den Berg, B.A.A.M. van Hasselt, L.A.M. Aerden, R.J. Dallinga, M.C. Visser, J.C.J. Bot, P.C. Vroomen, O. Eshghi, T.H.C.M.L. Schreuder, R.J.J. Heijboer, K. Keizer, A.V. Tielbeek, H.M. den Hertog, D.G. Gerrits, R.M. van den Berg-Vos, G.B. Karas, E.W. Steyerberg, H.Z. Flach, H.A. Marquering, M.E.S. Sprengers, S.F.M. Jenniskens, L.F.M. Beenen, R. van den Berg, P.J. Koudstaal, W.H. van Zwam, Y.B.W.E.M. Roos, A. van der Lugt, R.J. van Oostenbrugge, C.B.L.M. Majoie, and D.W.J. Dippel, for the MR CLEAN Investigators*

Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke

M. Goyal, A.M. Demchuk, B.K. Menon, M. Eesa, J.L. Rempel, J. Thornton, D. Roy, T.G. Jovin, R.A. Willinsky, B.L. Sapkota, D. Dowlatshahi, D.F. Frei, N.R. Kamal, W.J. Montanera, A.Y. Poppe, K.J. Ryckborst, F.L. Silver, A. Shuaib, D. Tampieri, D. Williams, O.Y. Bang, B.W. Baxter, P.A. Burns, H. Choe, J.-H. Heo, C.A. Holmstedt, B. Jankowitz, M. Kelly, G. Linares, J.L. Mandzia, J. Shankar, S.-I. Sohn, R.H. Swartz, P.A. Barber, S.B. Coutts, E.E. Smith, W.F. Morrish, A. Weill, S. Subramaniam, A.P. Mitha, J.H. Wong, M.W. Lowerison, T.T. Sajobi, and M.D. Hill for the ESCAPE Trial Investigators*

Endovascular Therapy for Ischemic Stroke with Perfusion-Imaging Selection

B.C.V. Campbell, P.J. Mitchell, T.J. Kleinig, H.M. Dewey, L. Churilov, N. Yassi, B. Yan, R.J. Dowling, M.W. Parsons, T.J. Oxley, T.Y. Wu, M. Brooks, M.A. Simpson, F. Miteff, C.R. Levi, M. Krause, T.J. Harrington, K.C. Faulder, B.S. Steinfort, M. Priglinger, T. Ang, R. Scroop, P.A. Barber, B. McGuinness, T. Wijeratne, T.G. Phan, W. Chong, R.V. Chandra, C.F. Bladin, M. Badve, H. Rice, L. de Villiers, H. Ma, P.M. Desmond, G.A. Donnan, and S.M. Davis, for the EXTEND-IA Investigators*

Stent-Retriever Thrombectomy after Intravenous t-PA vs. t-PA Alone in Stroke

Jeffrey L. Saver, M.D., Mayank Goyal, M.D., Alain Bonafe, M.D., Hans-Christoph Diener, M.D., Ph.D., Elad I. Levy, M.D., Vitor M. Pereira, M.D., Gregory W. Albers, M.D., Christophe Cognard, M.D., David J. Cohen, M.D., Werner Hacke, M.D., Ph.D., Olav Jansen, M.D., Ph.D., Tudor G. Jovin, M.D., Heinrich P. Mattle, M.D., Raul G. Nogueira, M.D., Adnan H. Siddiqui, M.D., Ph.D., Dileep R. Yavagal, M.D., Blaise W. Baxter, M.D., Thomas G. Devlin, M.D., Ph.D., Demetrius K. Lopes, M.D., Vivek K. Reddy, M.D., Richard du Mesnil de Rochemont, M.D., Oliver C. Singer, M.D., and Reza Jahan, M.D., for the SWIFT PRIME Investigators*

Thrombectomy within 8 Hours after Symptom Onset in Ischemic Stroke

T.G. Jovin, A. Chamorro, E. Cobo, M.A. de Miquel, C.A. Molina, A. Rovira, L. San Román, J. Serena, S. Abilleira, M. Ribó, M. Millán, X. Urra, P. Cardona, E. López-Cancio, A. Tomasello, C. Castaño, J. Blasco, L. Aja, L. Dorado, H. Quesada, M. Rubiera, M. Hernández-Pérez, M. Goyal, A.M. Demchuk, R. von Kummer, M. Gallofré, and A. Dávalos, for the REVASCAT Trial Investigators*

Mechanical thrombectomy after intravenous alteplase versus alteplase alone after stroke (THRACE): a randomised controlled trial

*Serge Bracard, Xavier Ducrocq, Jean Louis Mas, Marc Soudant, Catherine Oppenheim, Thierry Moulin, Francis Guillemin, on behalf of the THRACE investigators**

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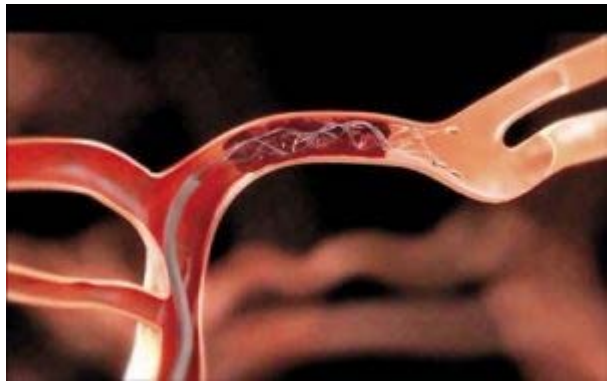
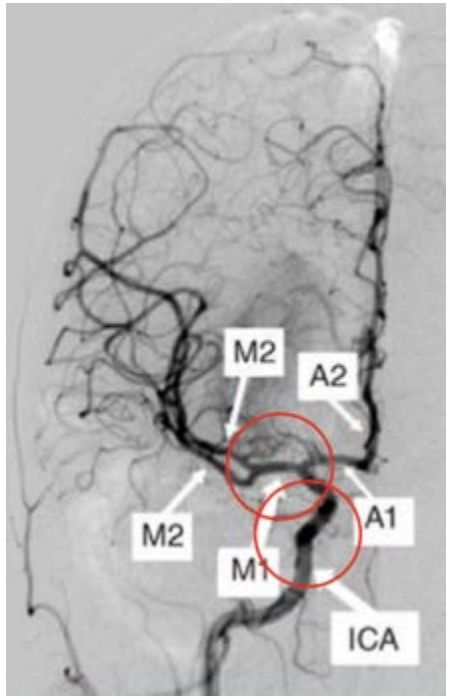
Endovascular Treatment of Ischemic Stroke





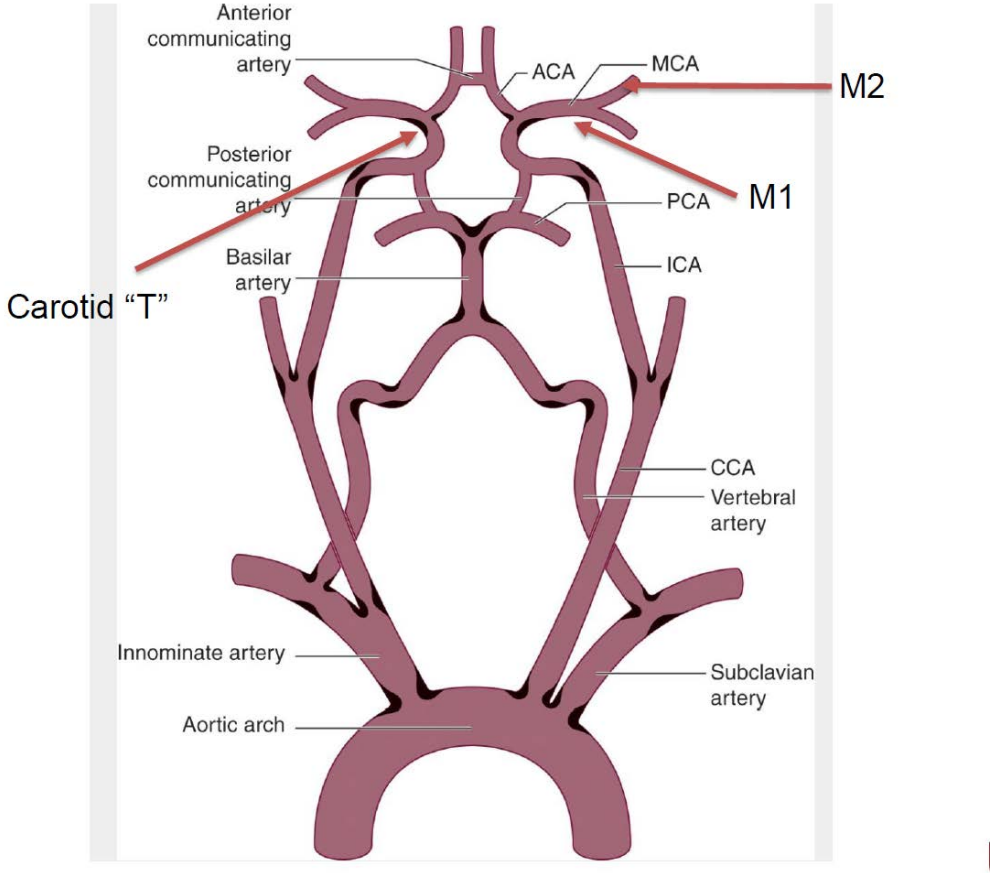
Endovascular Devices

Results: DAWN & DEFUSE3

Rate of functional independence (mRS of 0, 1, or 2) at 90 days

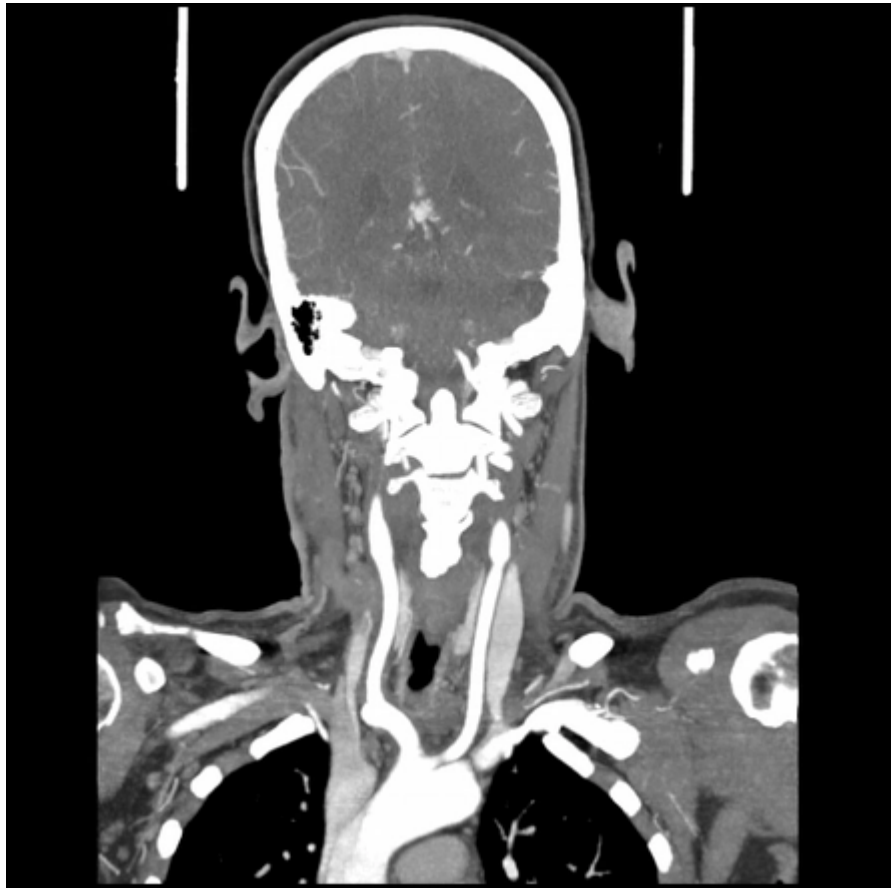
Trial	Endovascular	Medical Tx Alone	
DAWN	**49%**	**13%**	Adjusted difference 33%; 95% CI 21-44)
DEFUSE 3	**45%**	**17%**	RR 2.67; 95% CI, 1.60 to 4.48; P<0.001
HERMES	***46%***	***26.5%***	*RR 2.47 (1.79-3.41), P<0.0001*

Vascular Anatomy

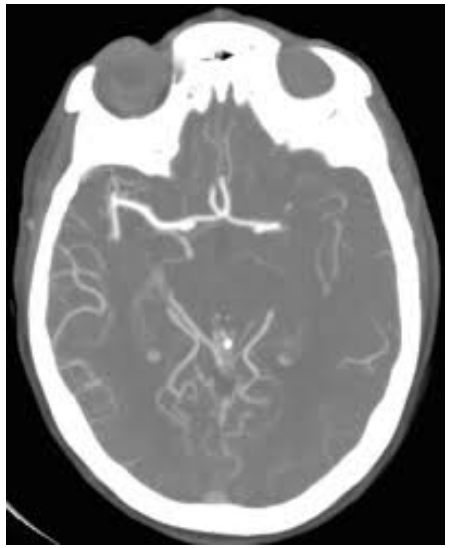


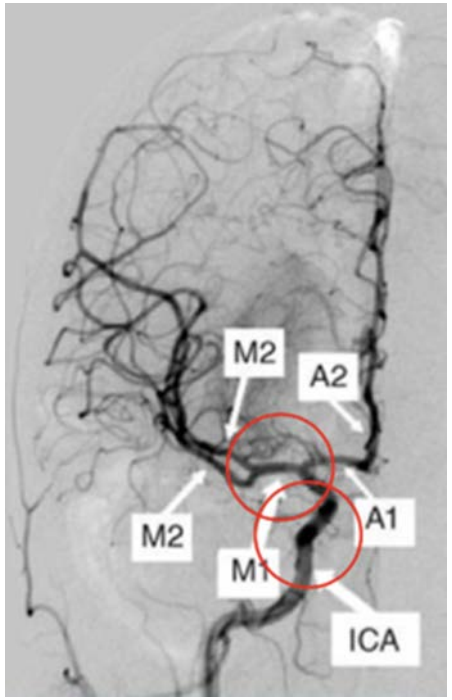
Caplan's Stroke: A Clinical Approach 5th Ed. 2016

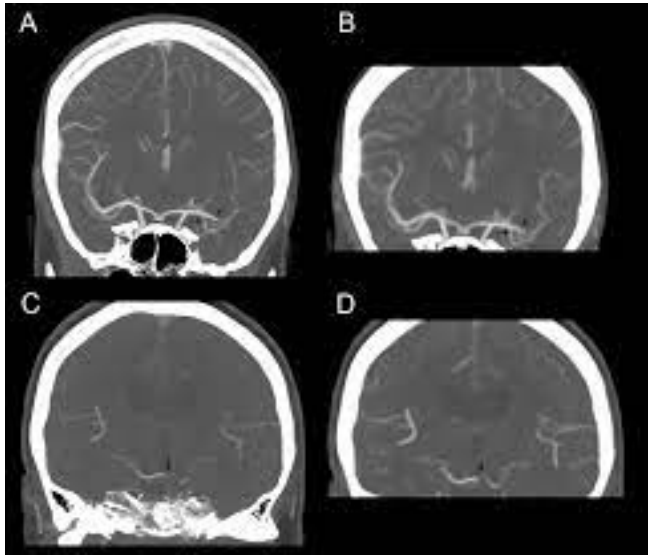
CT Angiogram – arch to vertex



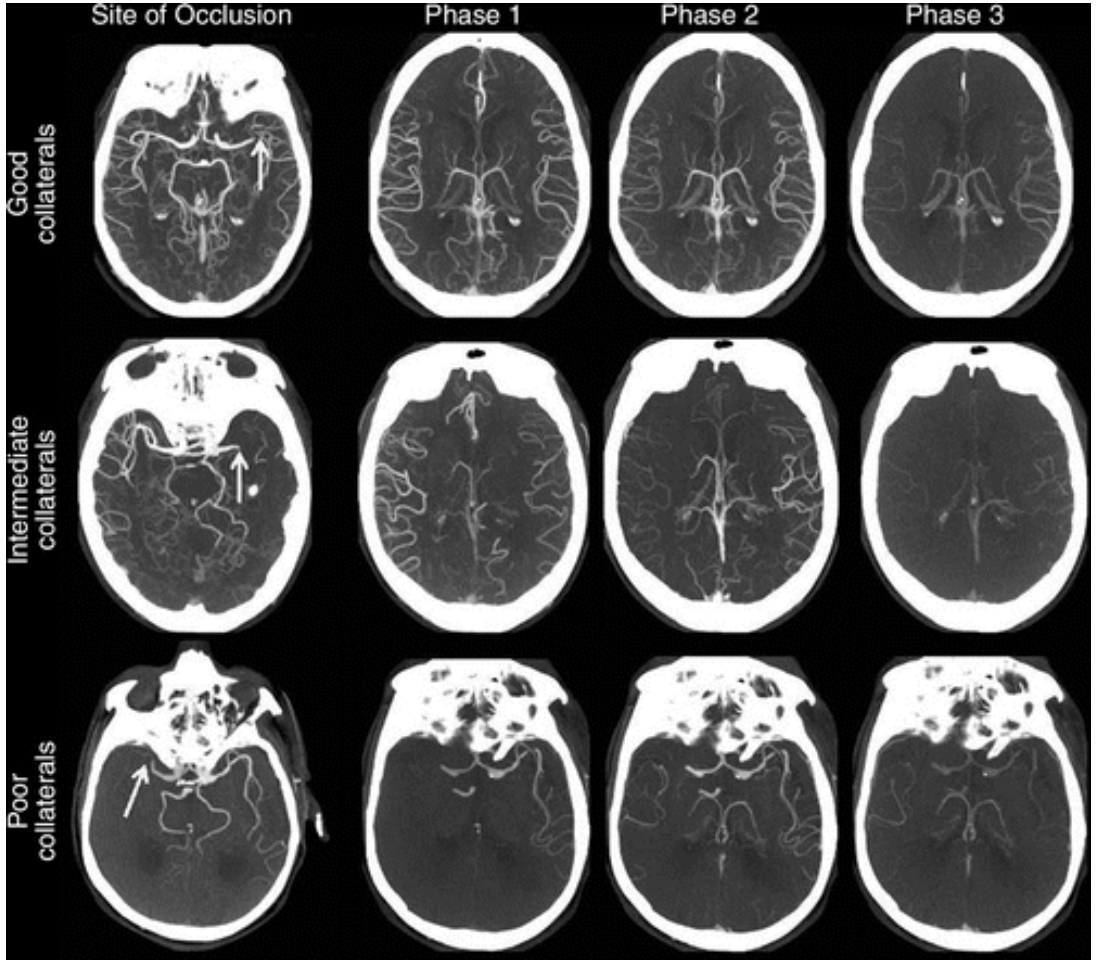
Large Vessel Occlusion - LVO







LVO and Collaterals




Back
RAPID:
lvo_us1_site1_8150572 ›
Status
LVO
10:58 AM -, F
Apr 23 CHS Mercy
RESULT SOURCE
Suspected LVO
RAPID
1 / 2
Axial
Coronal
Sagittal
3D
Suspected Hemorrhage
4 Image Column
Close
CTP

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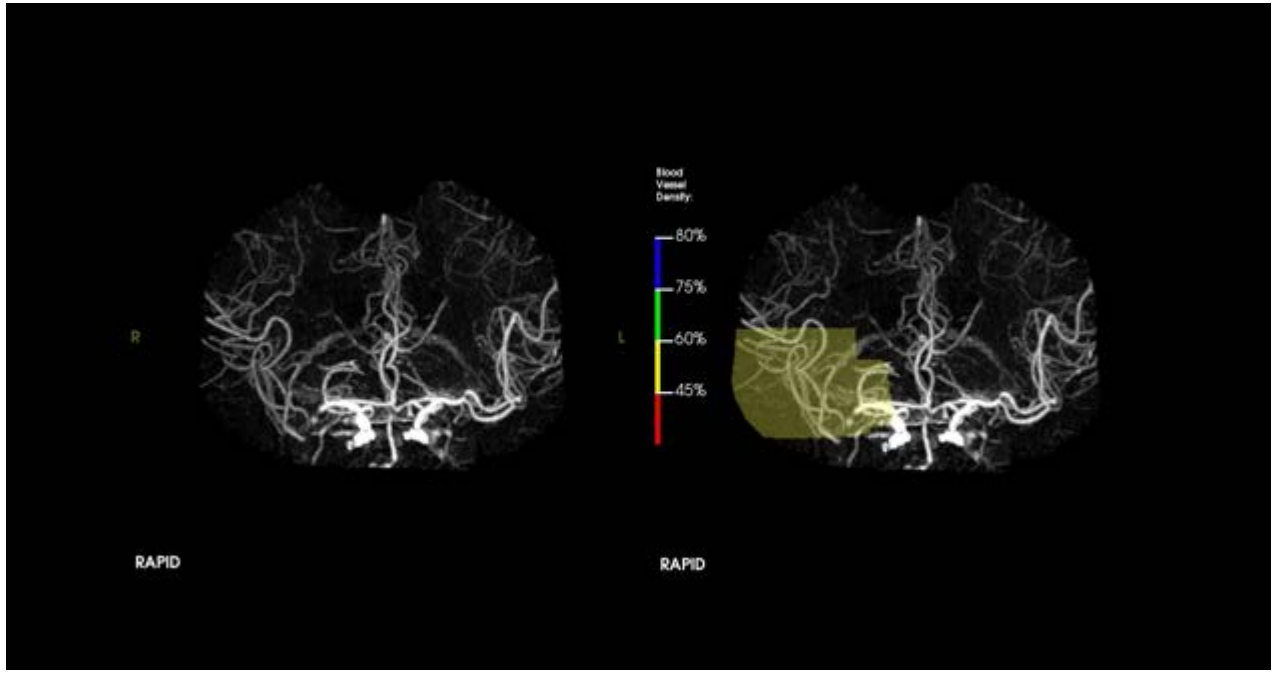
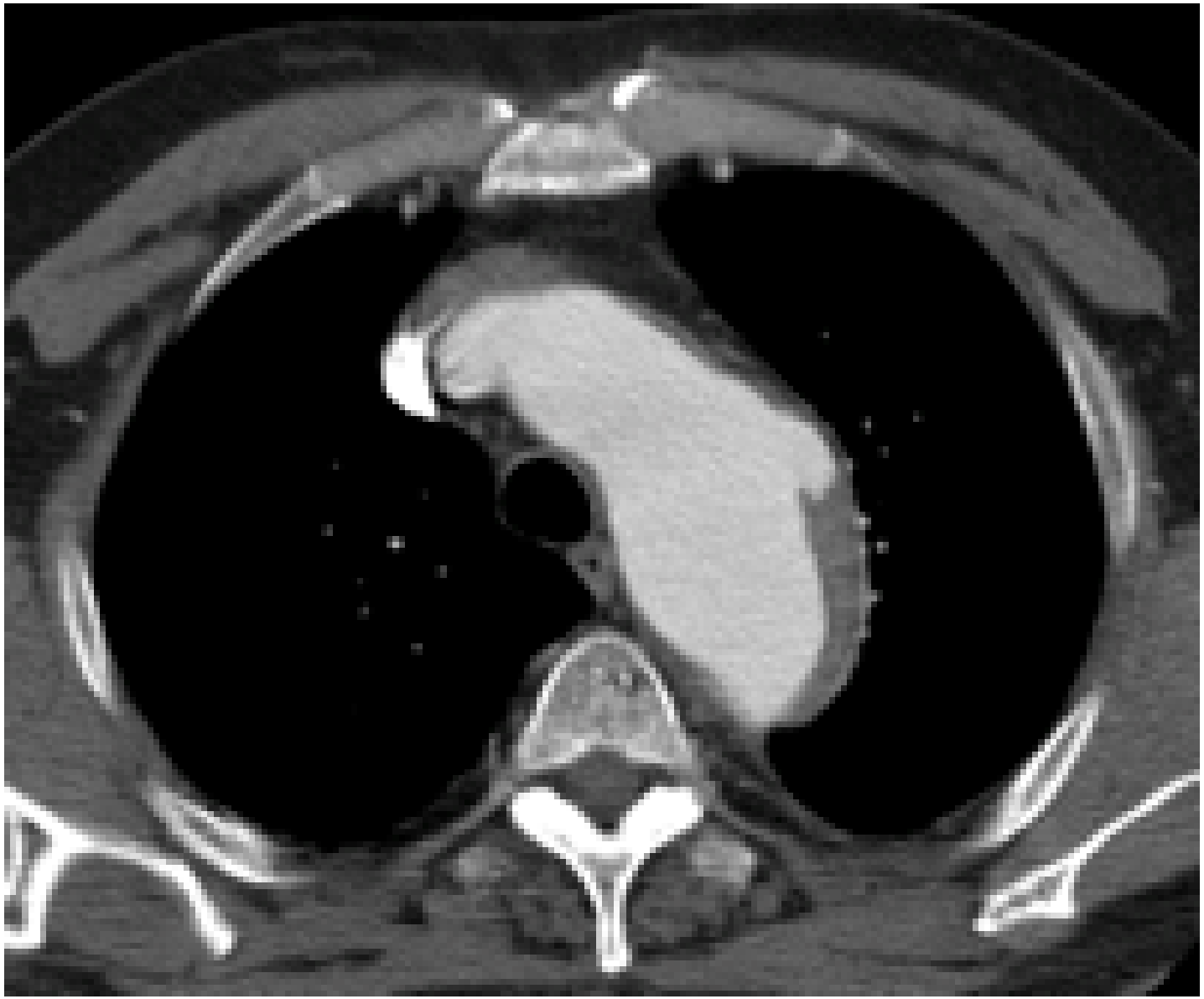
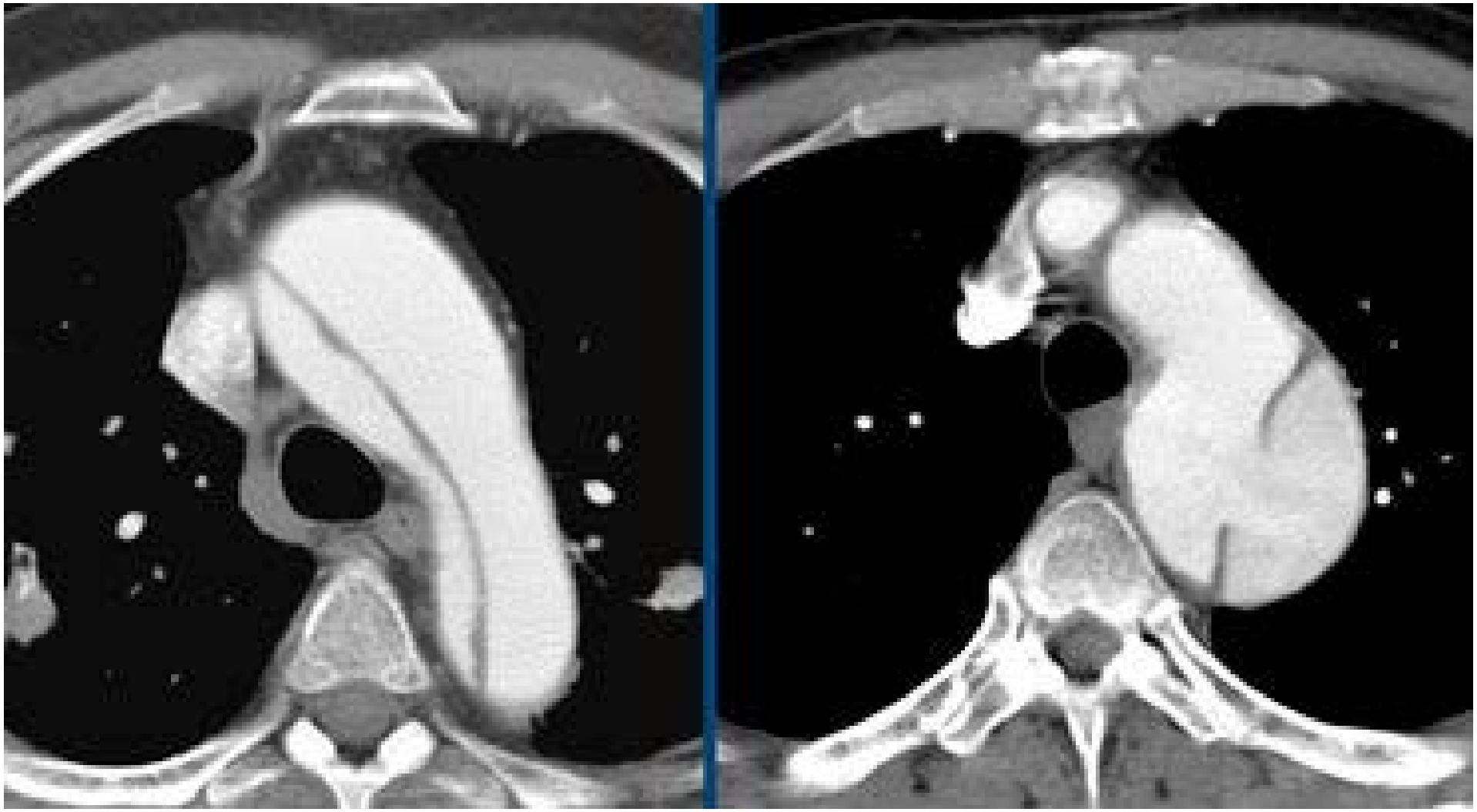
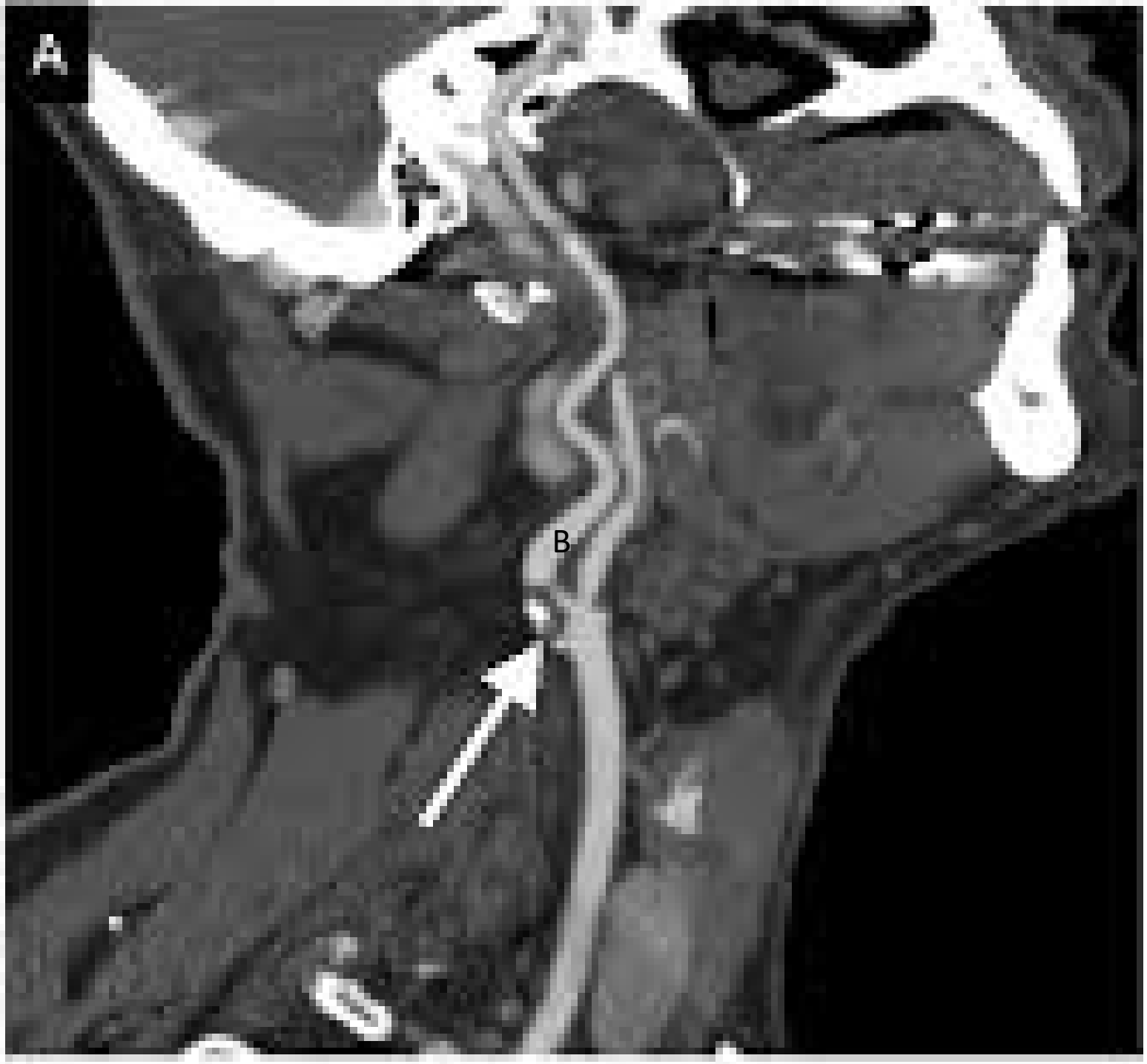
LVO in RAPID





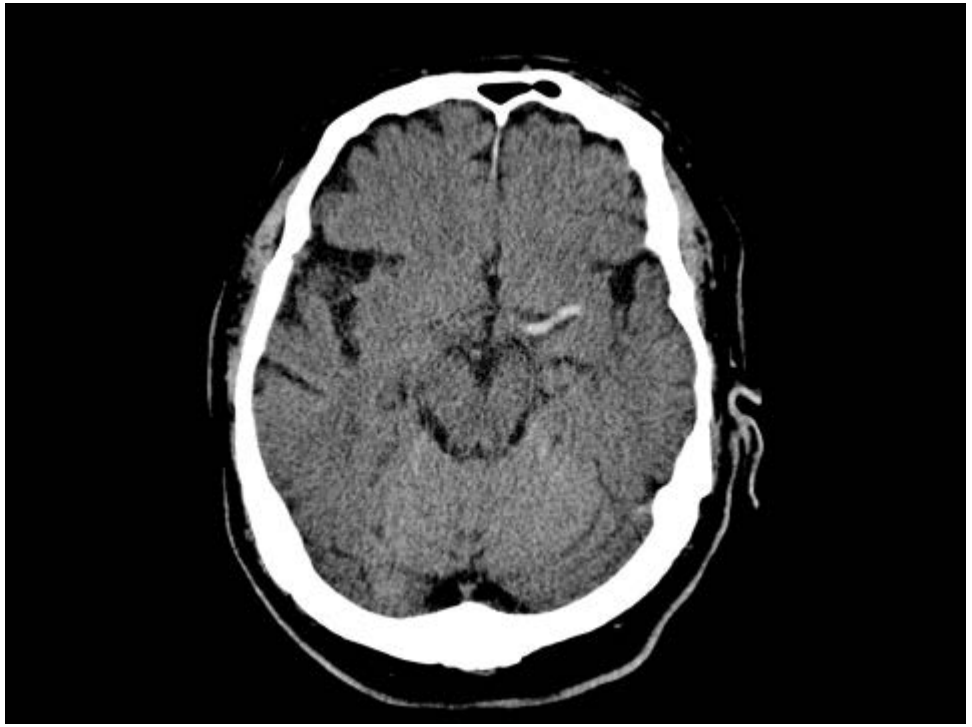



A
B

A Case of a 44 yo woman

- Mechanical aortic valve
- Having supper
  - Stops speaking
  - Drops fork
  - Slumps in chair
- Exam
  - Alert, eyes open
  - No speech, follows no commands
  - Not moving R arm and leg
  - R face droop

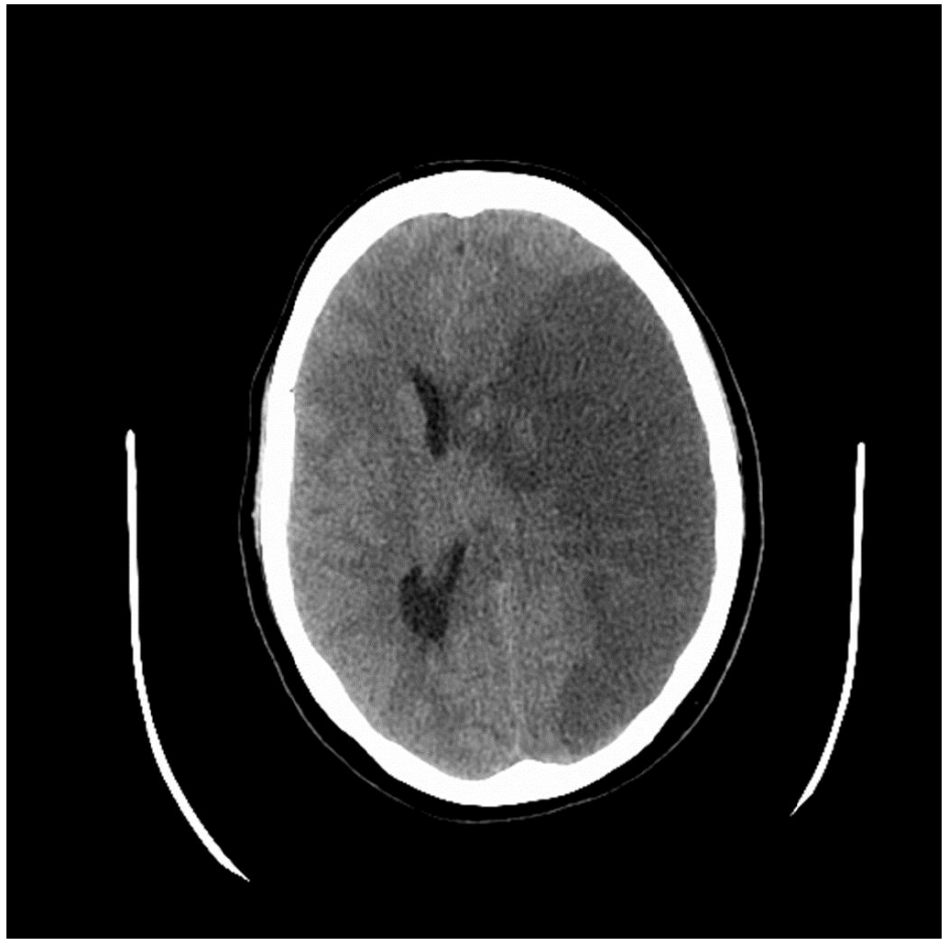
CT scan (no contrast) 2 hours after onset



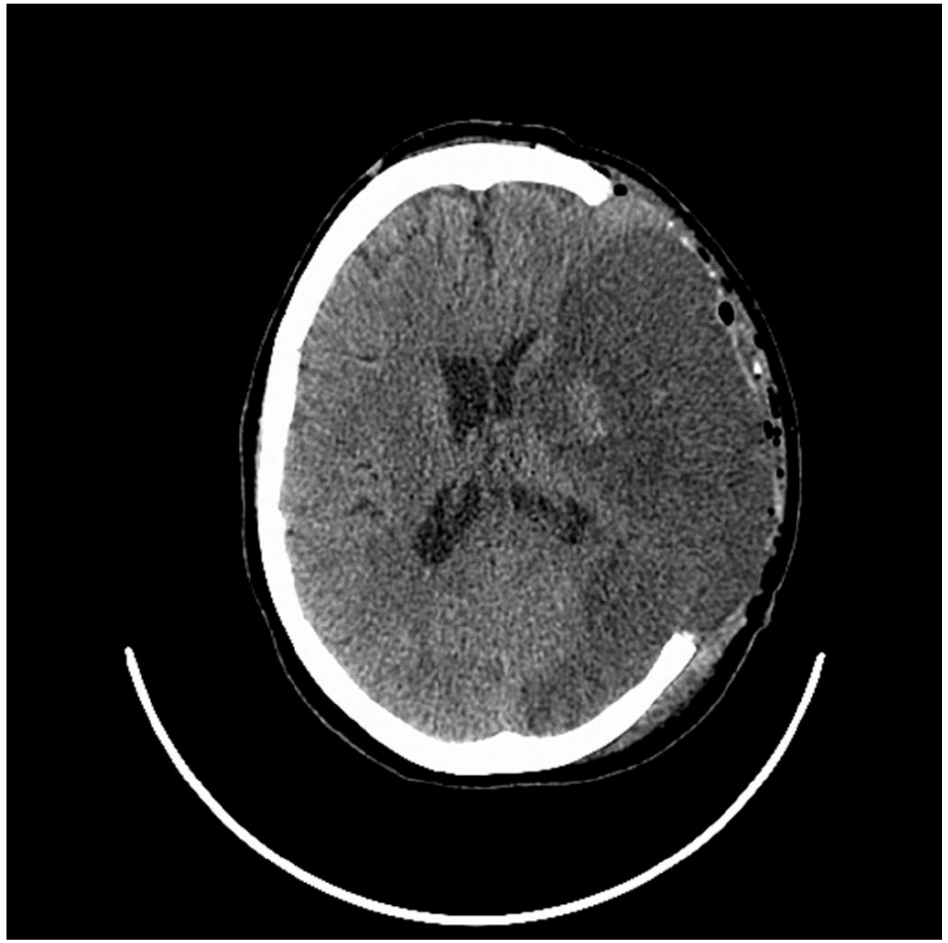
Outcome

- CTA confirmed L M1 Occlusion
- On Warfarin
  - INR sent (TAT 1 hour)
- Prep for EVT
- Successful recanalization
- Minor deficits at 24 hours
- Rehab then home

CT Scan 2 days after onset



Ct Scan post hemicraniectomy

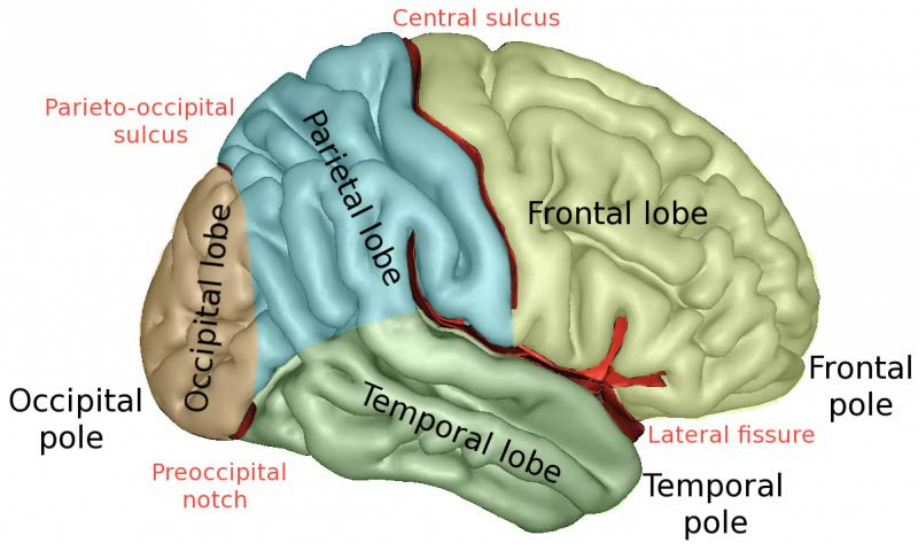


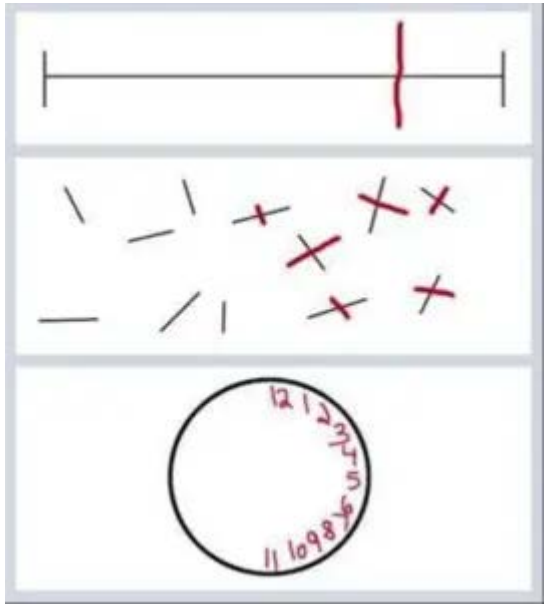
Case of 74 yo woman

- Did not get out of bed in the morning
- Denied anything was wrong but speech slurred

- Exam
  - Alert, speech ? Slurred
  - Moving everything
  - Tends to look to the right

Hemispatial Neglect



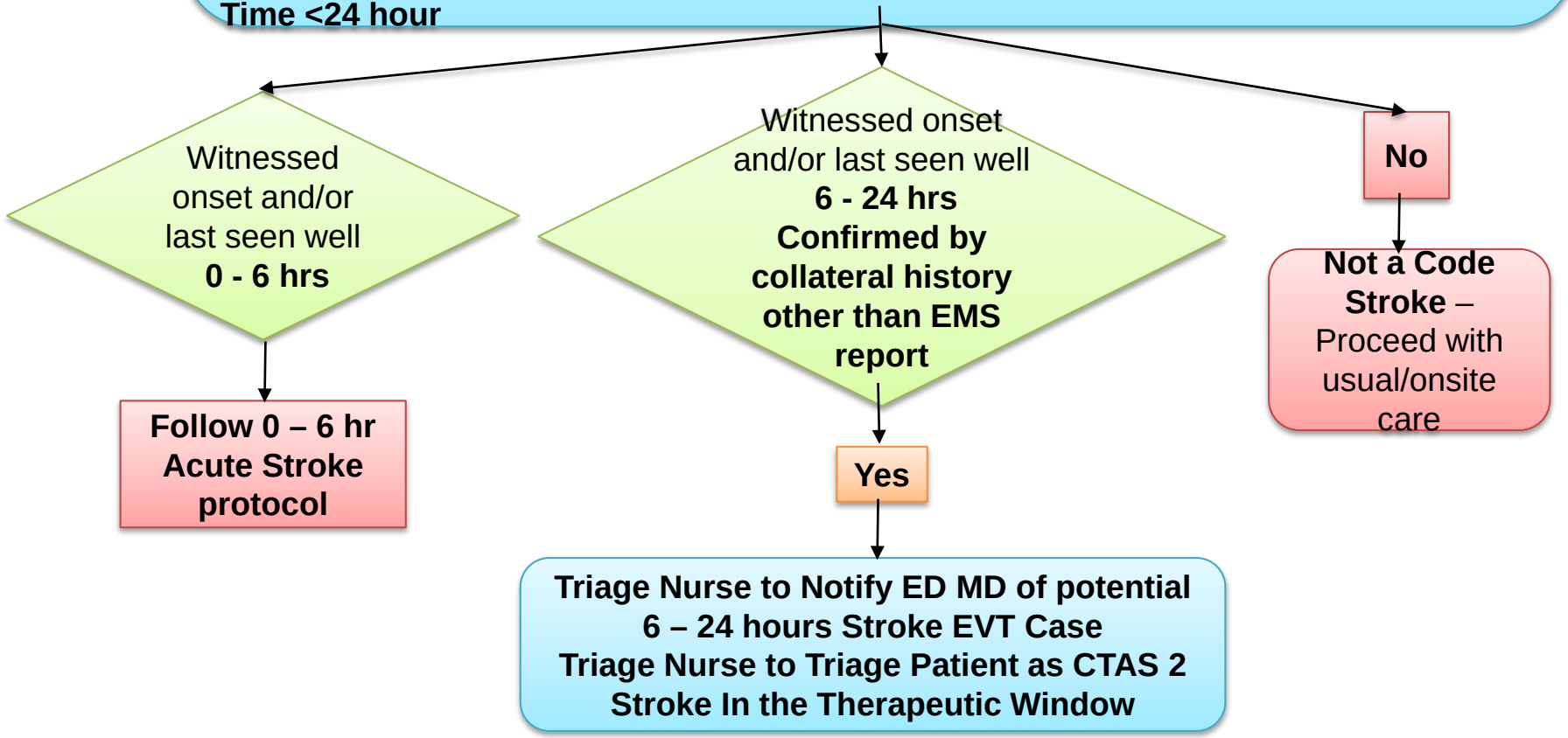


Hamilton General Hospital 6 to 24 Hour Acute Stroke Protocol

Triage Nurse to Complete FAST Screen:

- **ABC's Stable**
- **Sudden Onset of at least one or more of the following:**
  - **Facial Droop**
  - **Arm Weakness**
  - **Slurred Speech, Inappropriate Words or Mute**
- **Verify Last Known Well Time with Confirmed with Witness**

FAST Stroke Screen Positive if:
☐ One or more symptoms from Face, Arm, Speech and ☐ LAST SEEN NORMAL Time <24 hour



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MRP to assess Patient's Baseline Functional Status
Patient is NOT wheelchair or bed bound or has severe dementia

No ←

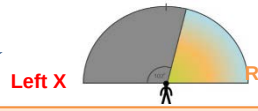
Not a Code Stroke – Proceed with usual/onsite care

Yes ↓

MRP to Complete ACT- FAST Stroke Screen

"ARM" (one-sided arm weakness)
Position both arms at 45 degrees from the horizontal with elbows straight
POSITIVE TEST
One arm falls completely within 10 seconds of being held up.
For patients that are uncooperative or cannot follow commands:
Witness minimal or no movements in one arm & movement in the other arm

Proceed if Positive ↓



If **RIGHT** ARM is weak

"CHAT" (severe language deficit)
Ask the patient to repeat "You can't teach an old dog new tricks" OR perform simple tasks ("make a fist", "open and close your eyes")

POSITIVE TEST
Mute, Speaking incomprehensibly, unable to follow simple commands

If **LEFT** ARM is weak

"TAP" (gaze and shoulder tap test)

Stand on patient's weak side & call name
POSITIVE TEST – Consistent gaze to the RIGHT
OR
Tap shoulder & call name

POSITIVE TEST - does not quickly turn head and eyes to you

Proceed if Positive ↓

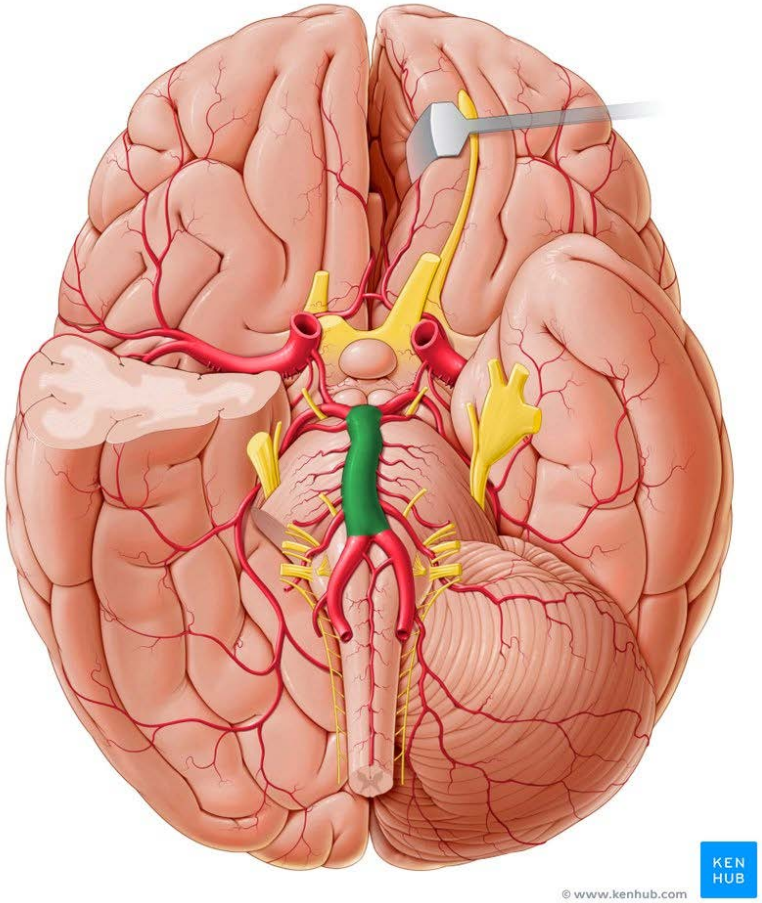
MRP to contact HGH Stroke TPA MD STAT through Paging.
Stroke TPA MD to arrange STAT Late Window Stroke Imaging (CT Head, CT Perfusion, CTA).
If Late Window Imaging positive – Stroke TPA MD to Contact INR MD.

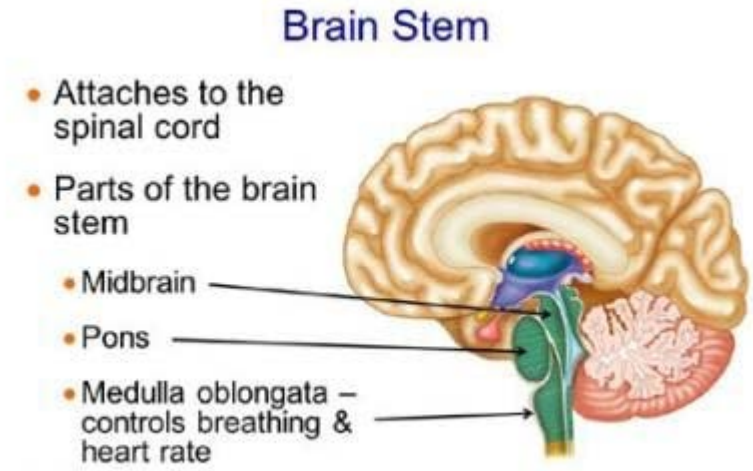
Case of an 84 yo woman

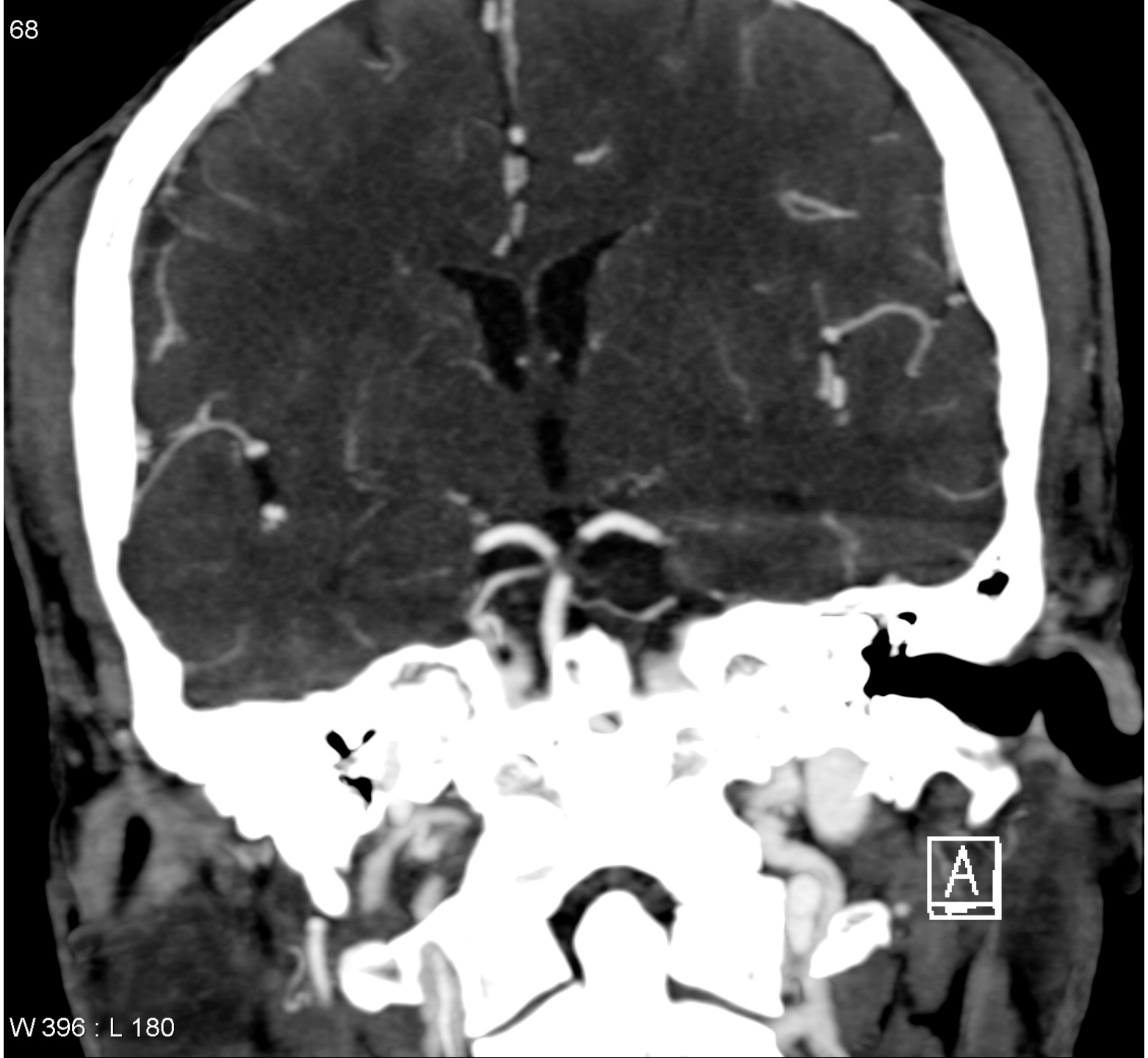
- Dizzy, vomited
- Then trouble seeing and speech slurred

- Exam
  - Eyes are jumping and look crossed
  - Speech hard to understand
  - Left arm and leg weak
  - No facial droop

Basilar Artery






68
A
W 396 : L 180

Content

- Critical initial clinical information for treatment decisions
  - What really helps when you hit the ED
- Large vessel occlusion ?
  - A critical branch point in therapy
- Getting to the base
  - The basilar artery