

Acute Stroke Update

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Start with **WHY?**



“At the end of your life, you will never regret not having passed one more test, winning one more verdict or not closing one more deal. You will regret time not spent with a husband, a child, a friend, or a parent.” - Barbara Bush

Stroke statistic in US

- » In every **40 seconds**, someone has a stroke
- » About **795,000** people have a new/ recurrent stroke each year.
- » In every **3 minutes 45 seconds**, someone dies from stroke.
- » Stroke ranks **No. 5** among all cause of death in US but **No.2** worldwide.

'It's Almost Like a Ghost Town.' Most Nursing Homes Overstated Staffing for Years



Stroke is a leading cause of long term disability

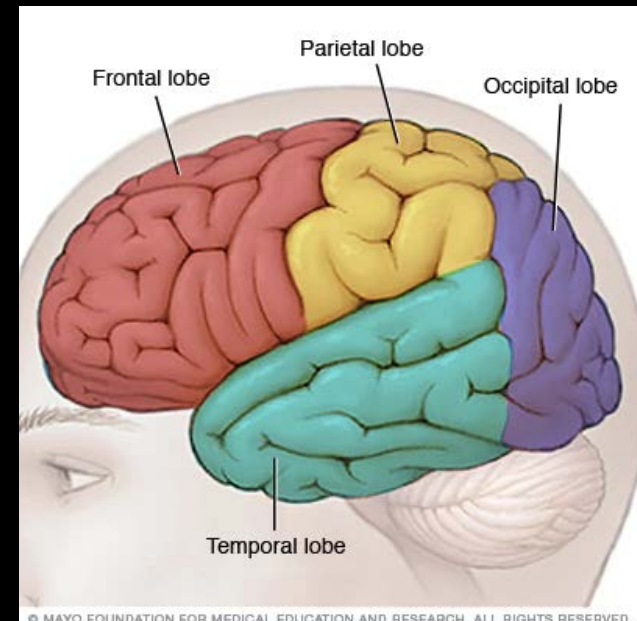
Stan Hugo with his wife, Donna, who is a resident at the Beechtree Center for Rehabilitation and Nursing in Ithaca, N.Y. Mr. Hugo tracks staffing levels at the skilled nursing facility.
Heather Ainsworth for The New York Times



Jay Vandemark, who entered Beechtree after he suffered a stroke that immobilized his left side, complained that the center didn't have enough workers on some shifts. "It's almost like a ghost town," he said. Heather Ainsworth for The New York Times

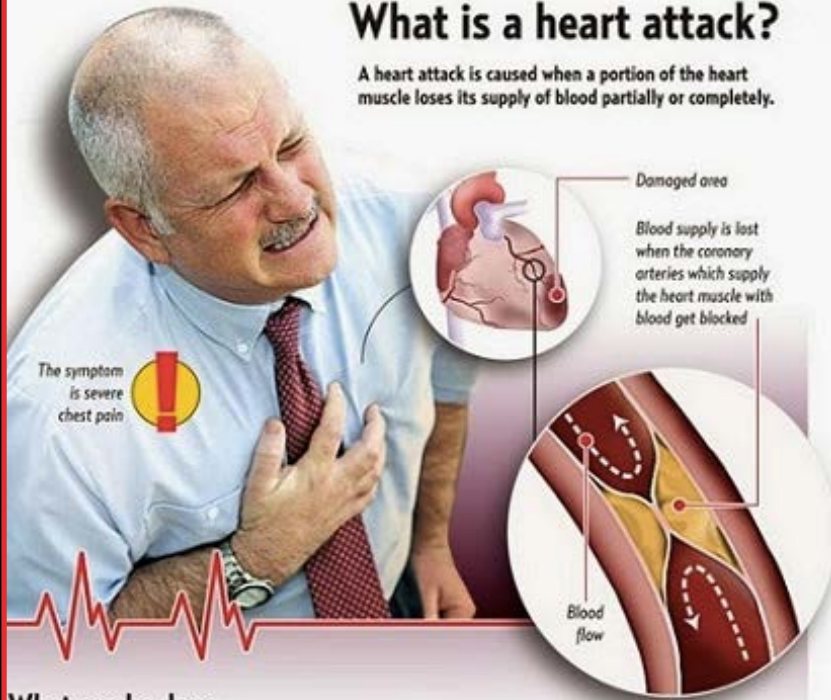
What is a **STROKE** ?

STROKE = BRAIN ATTACK



What is a heart attack?

A heart attack is caused when a portion of the heart muscle loses its supply of blood partially or completely.



What can be done

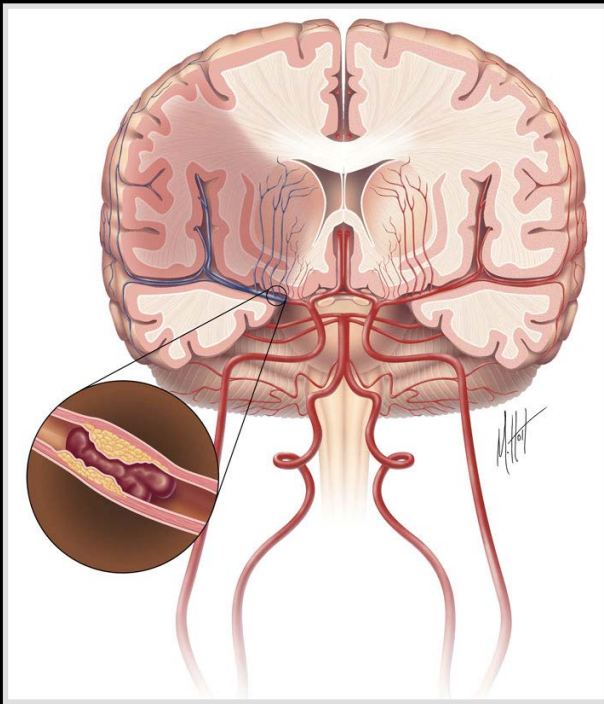
- 1 Call an ambulance. Paramedics will arrive within 10 minutes
- 2 Don't let the patient persuade you the problem is minor
- 3 Massage heart area, let him lie down with head slightly elevated
- 4 If properly trained and the need arises, begin CPR*



Two types of stroke

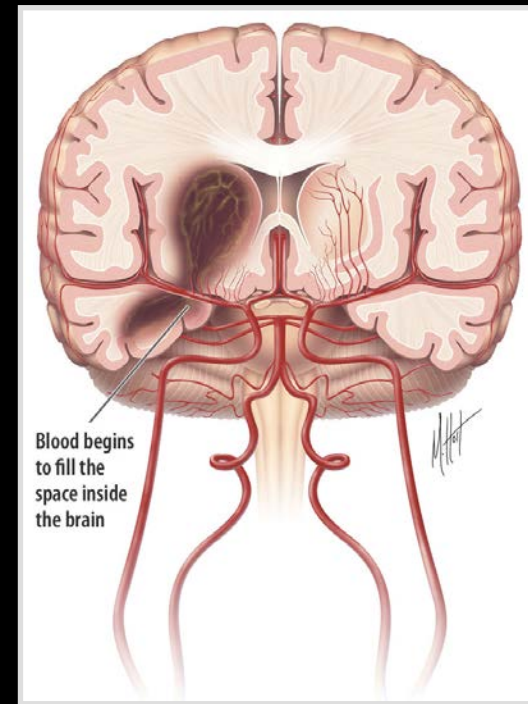
Ischemic Stroke (90%)

- Blockage of an artery, preventing blood flow into the brain.

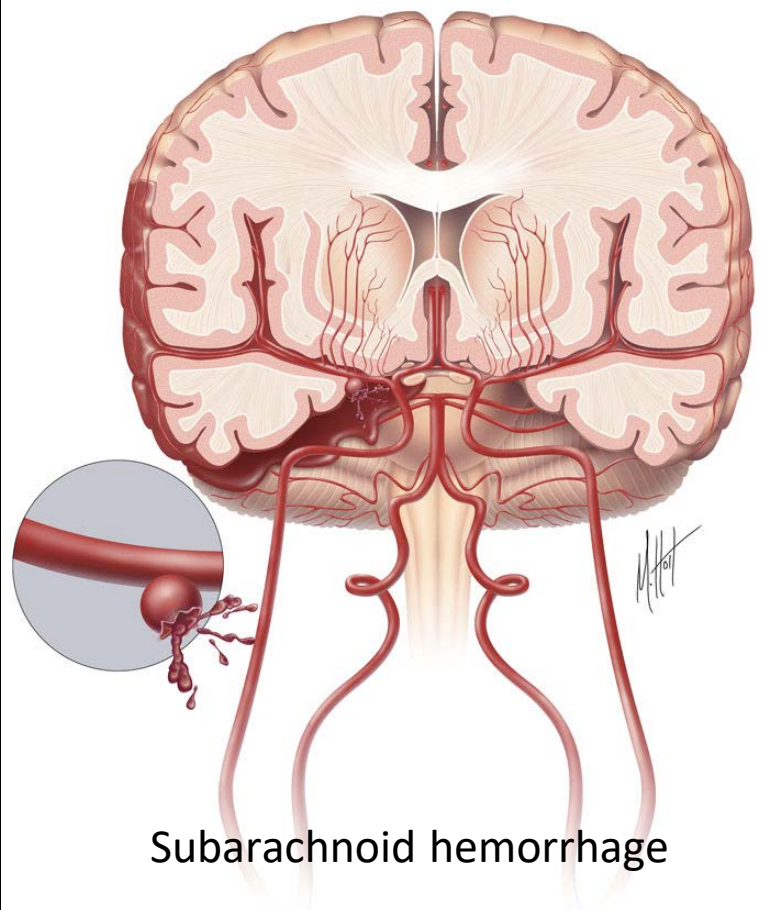
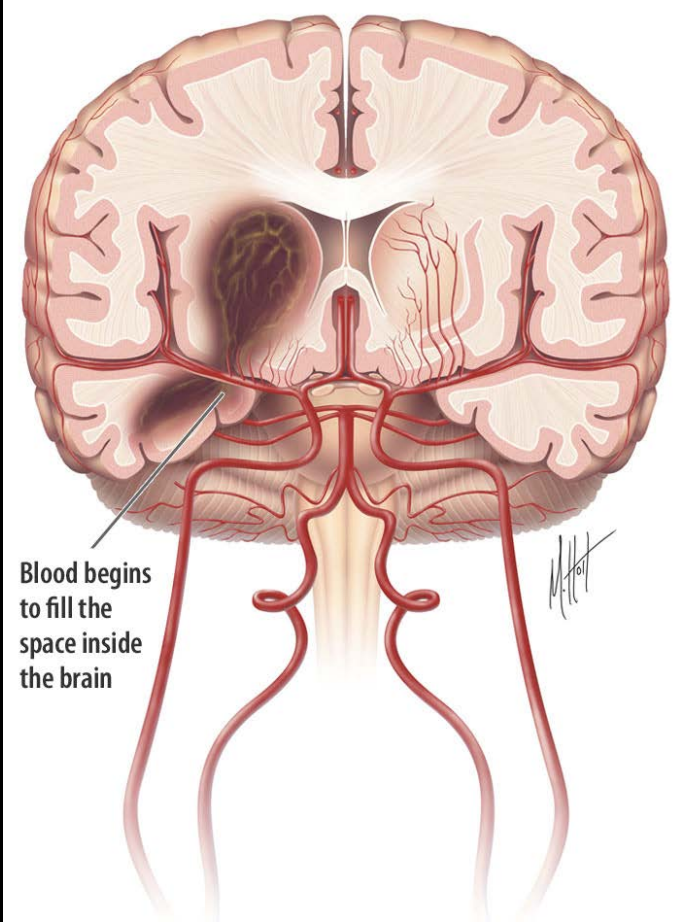


Hemorrhagic Stroke (10%)

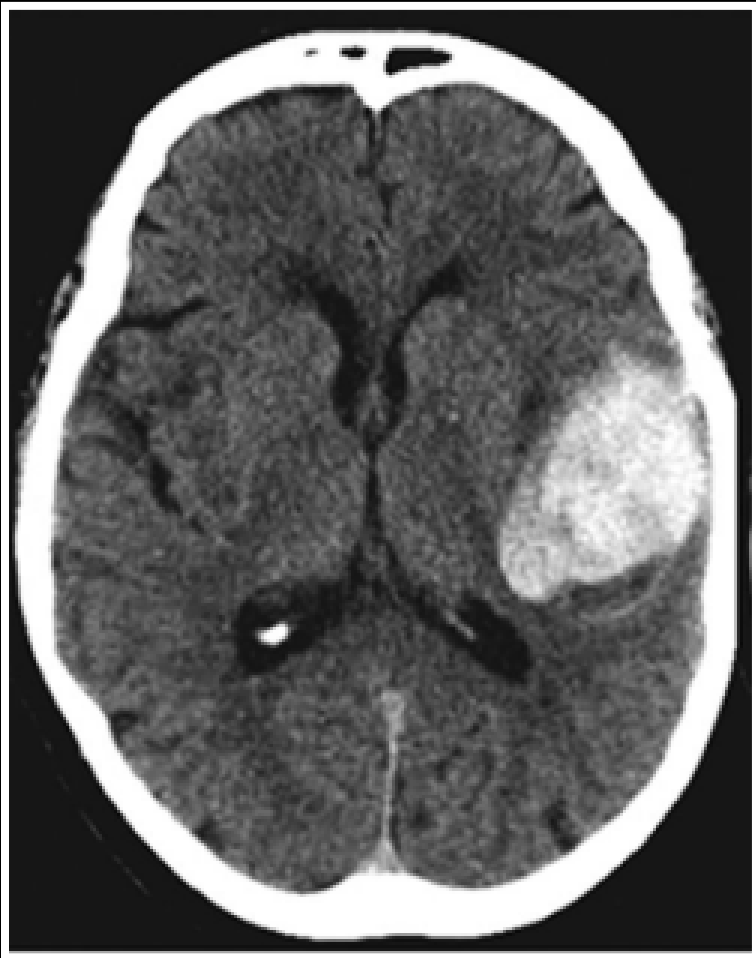
- Bleeding into a brain when blood vessel bursts.



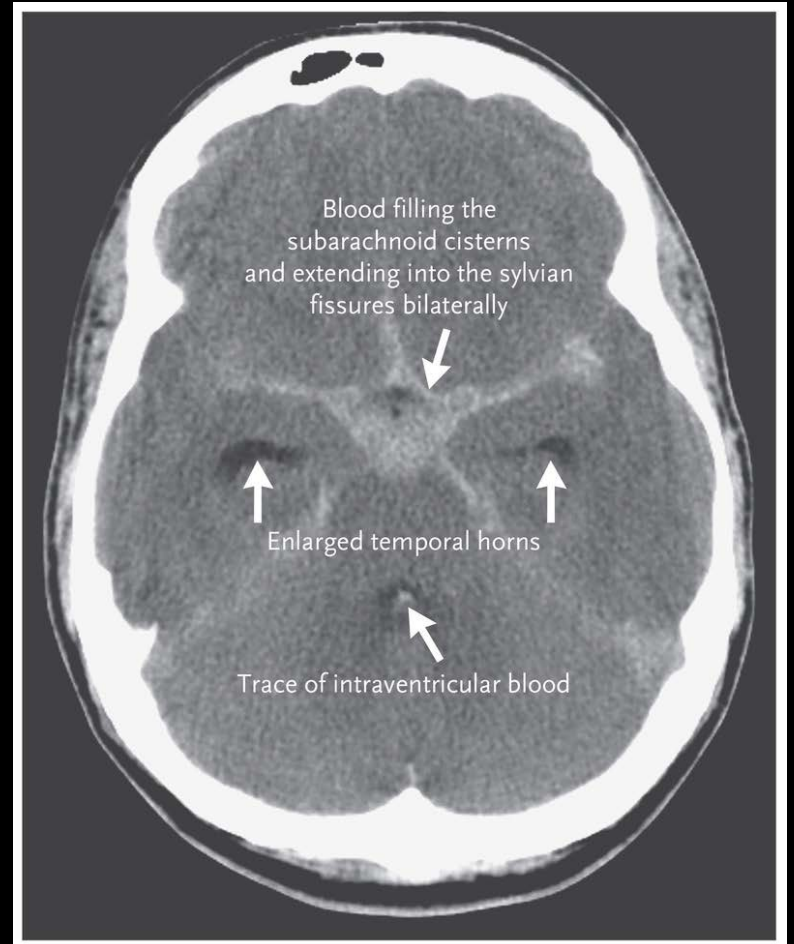
HEMORRHAGIC STROKE



HEMORRHAGIC STROKE

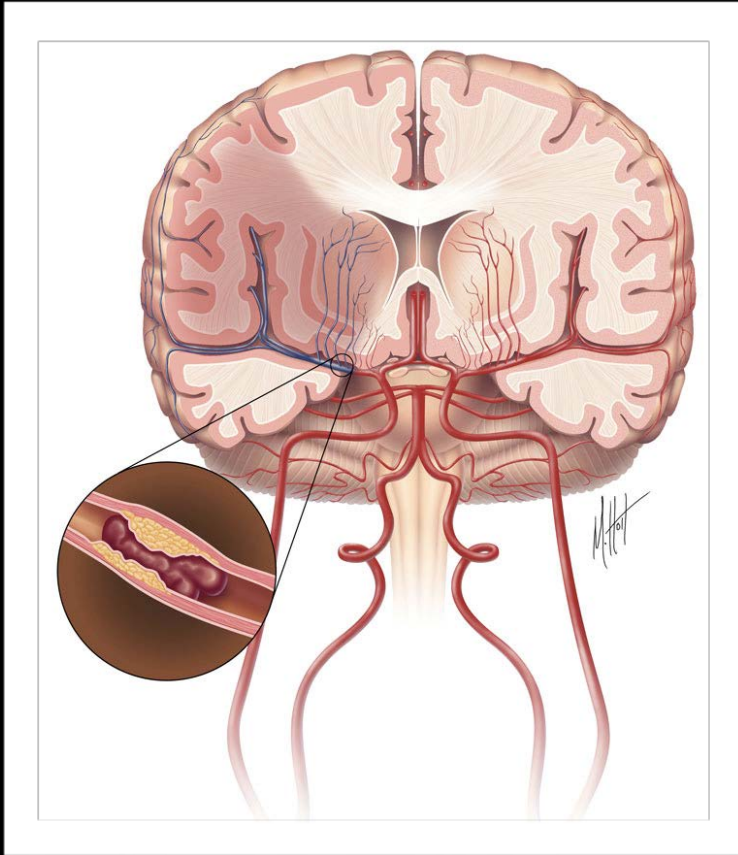


Intracerebral hemorrhage

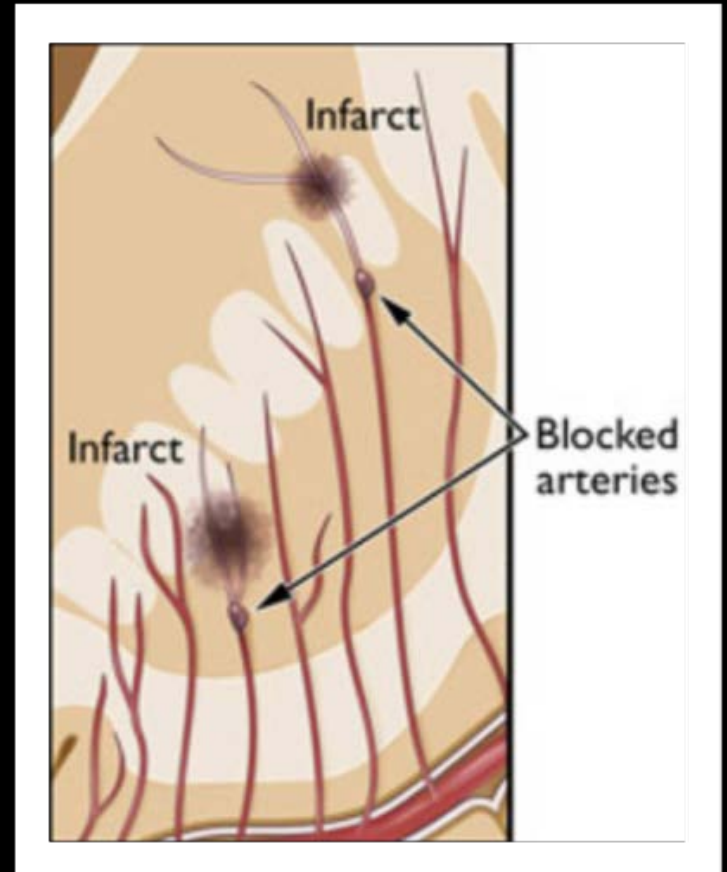


Subarachnoid hemorrhage

ISCHEMIC STROKE

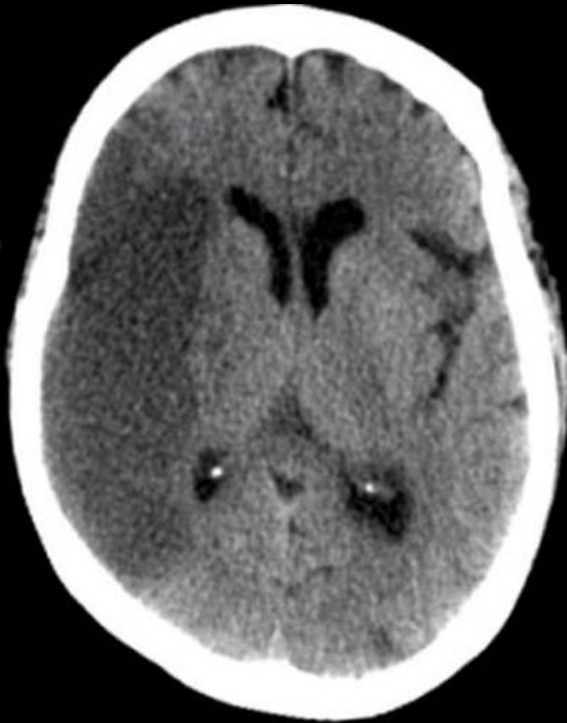


**LARGE VESSEL OCCLUSION
(LVO)**

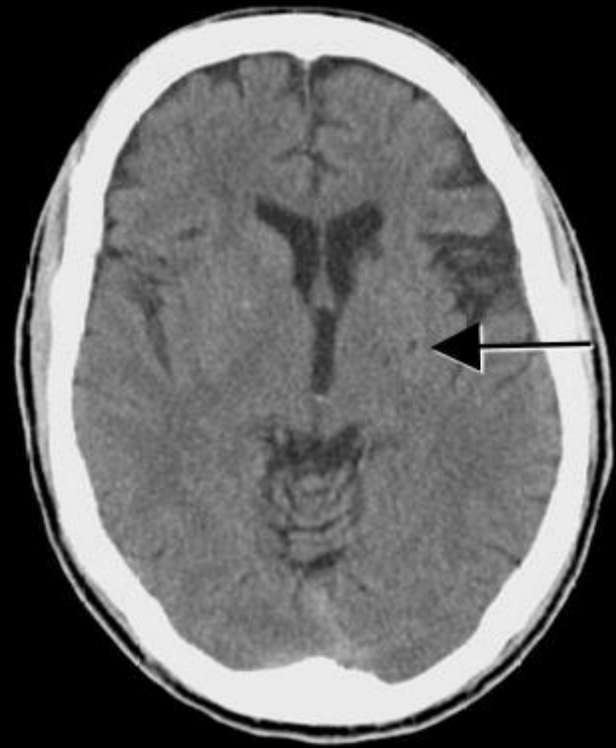


SMALL VESSEL OCCLUSION

ISCHEMIC STROKE



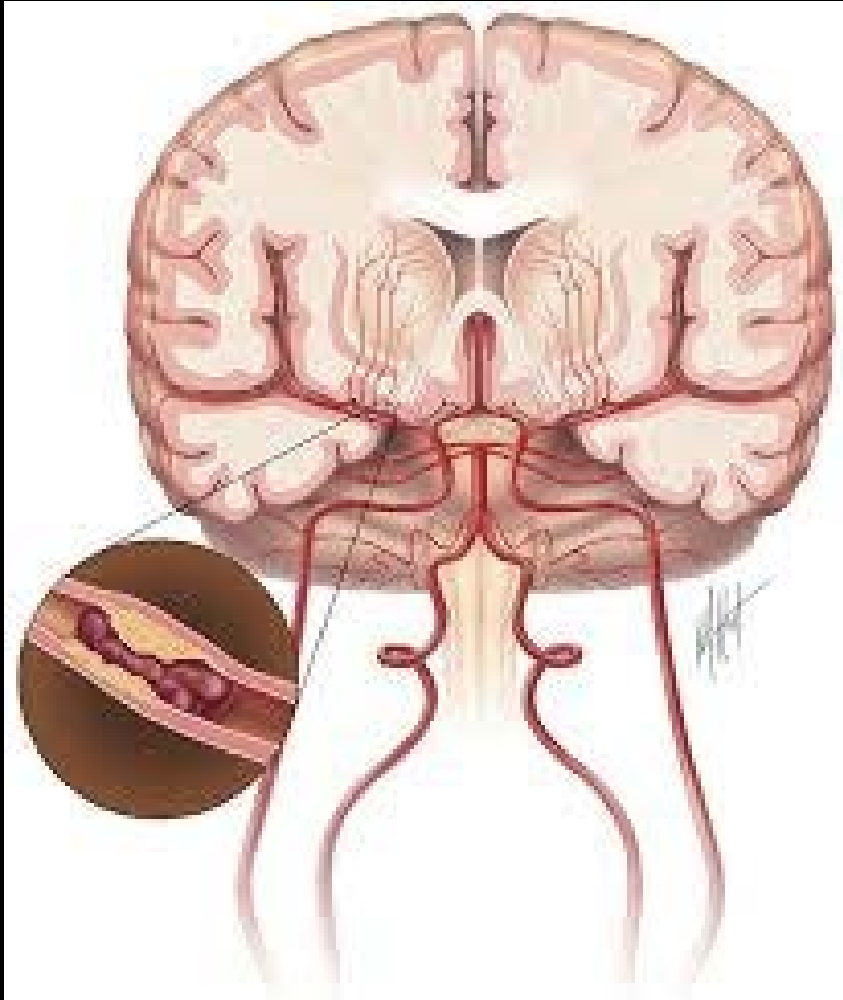
**LARGE VESSEL OCCLUSION
(LVO)**

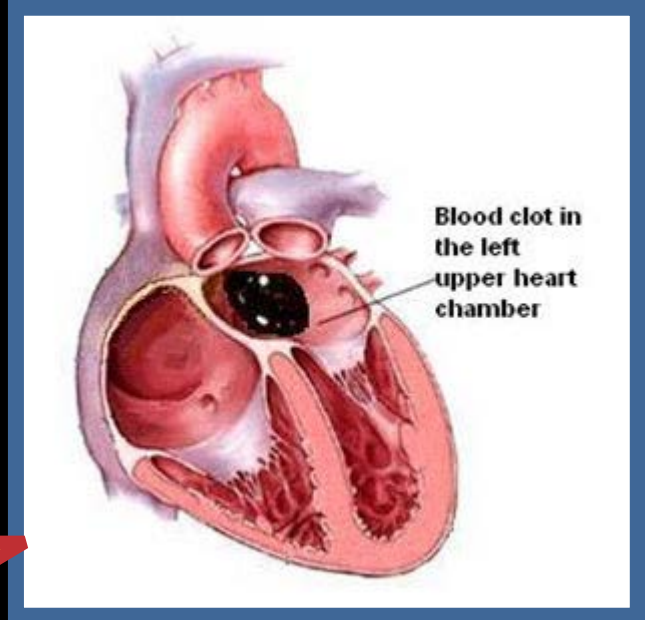
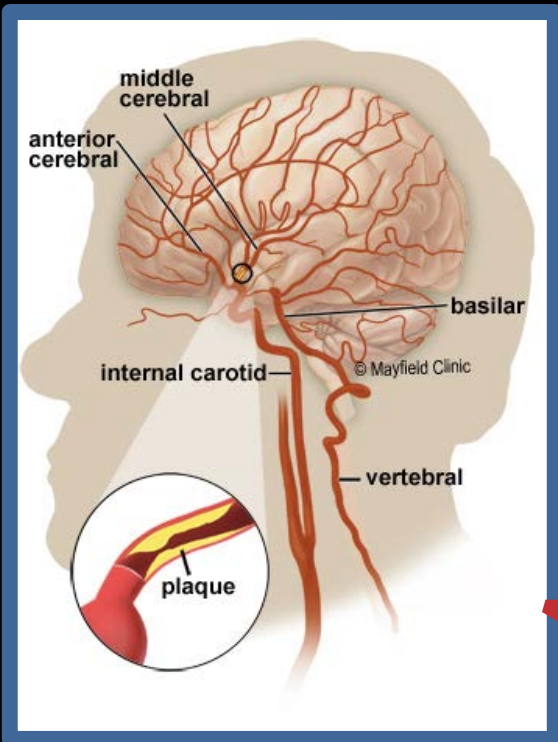


SMALL VESSEL OCCLUSION

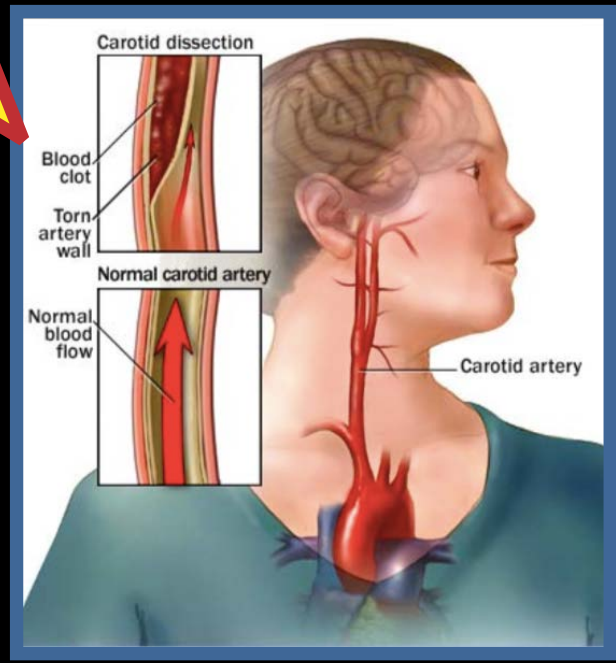
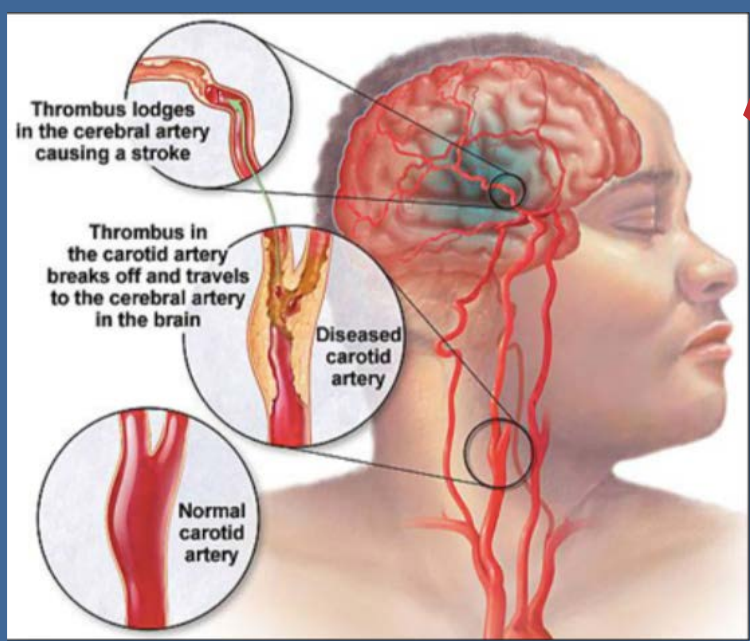
**What is a large vessel occlusion (LVO)
?**

Large Vessel Occlusion (LVO)

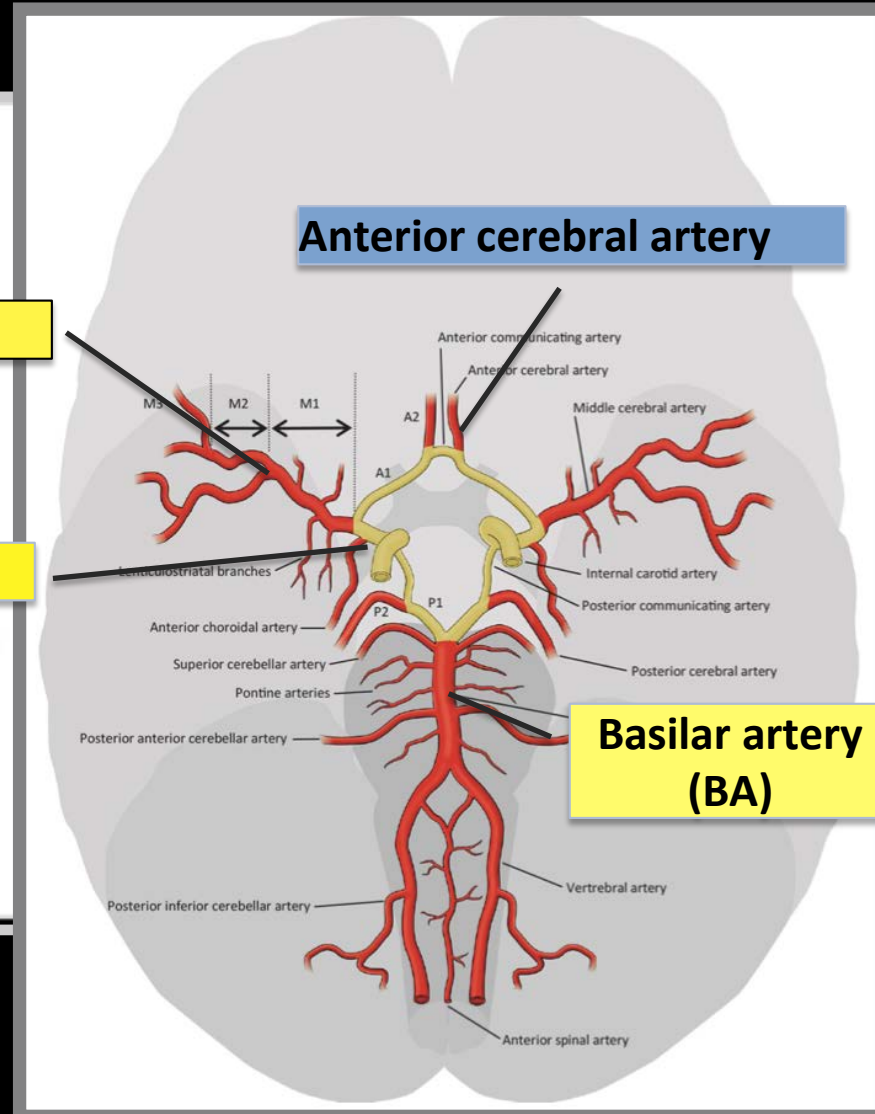
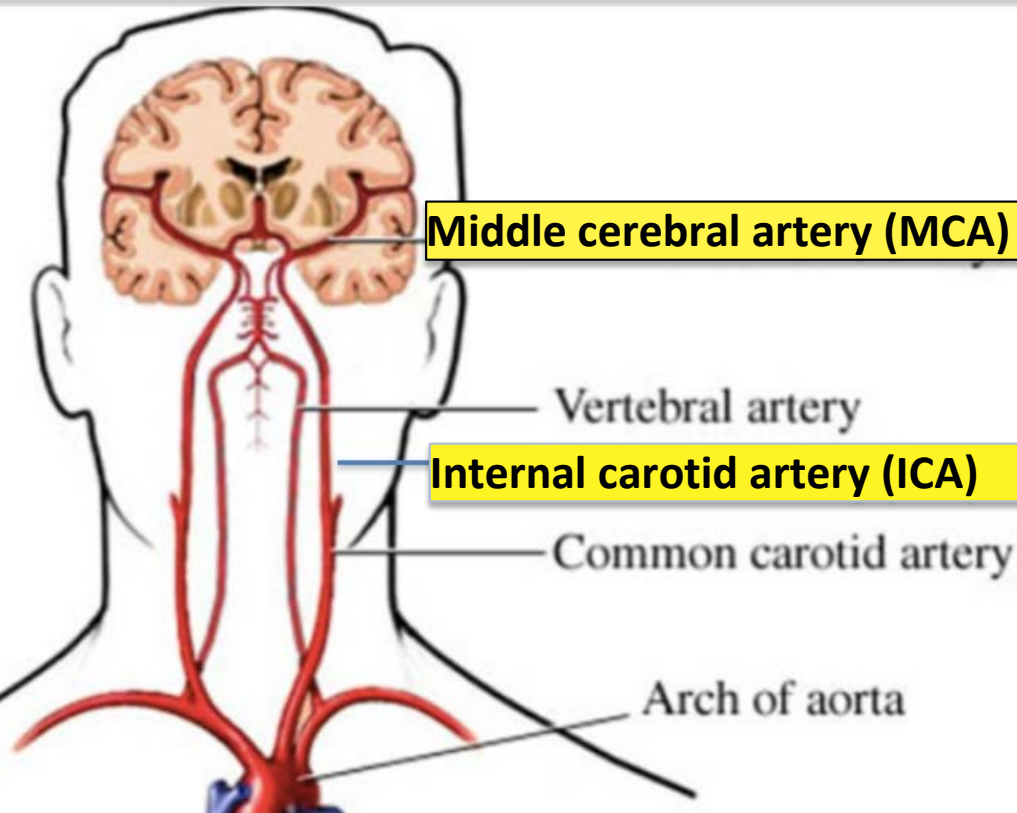




LVO

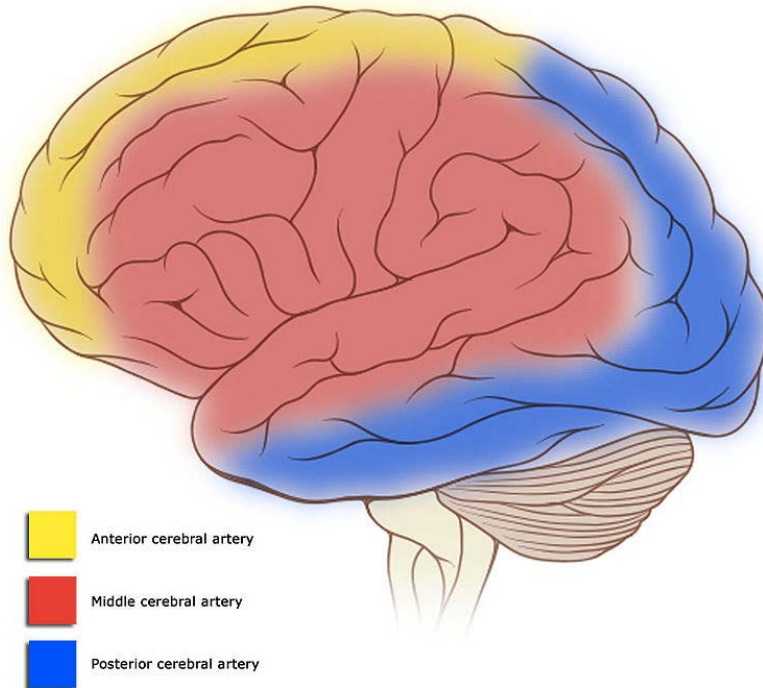


The major circulation of the brain

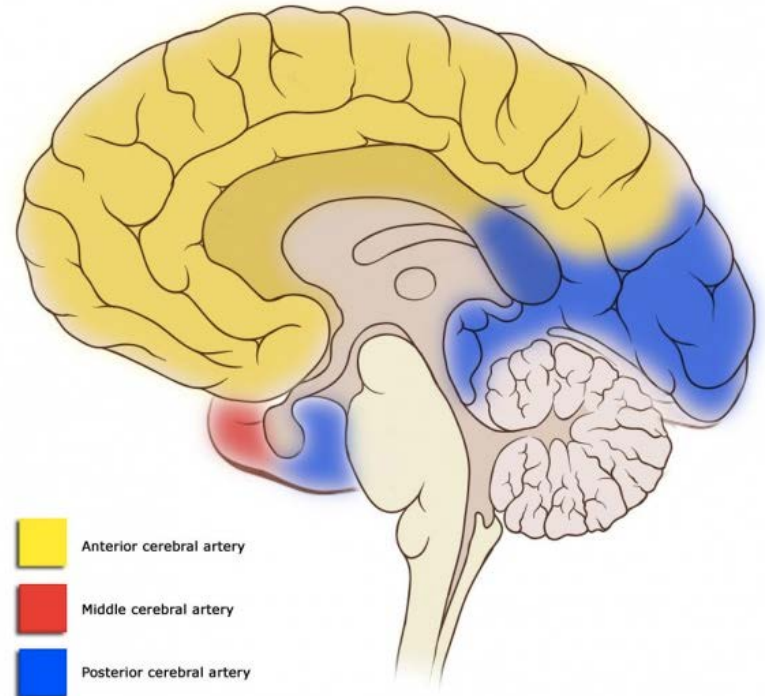


Cerebral circulation

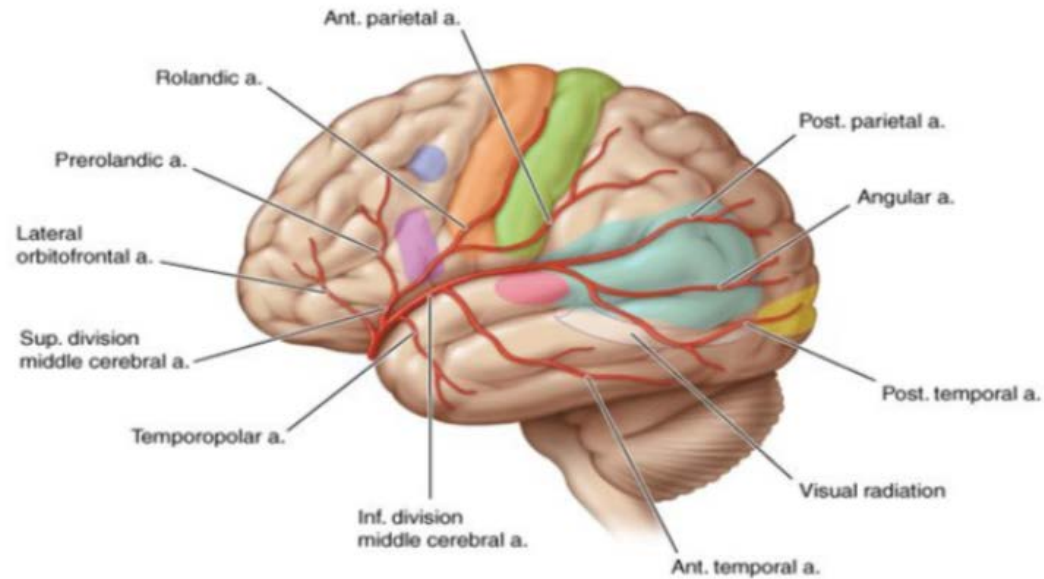
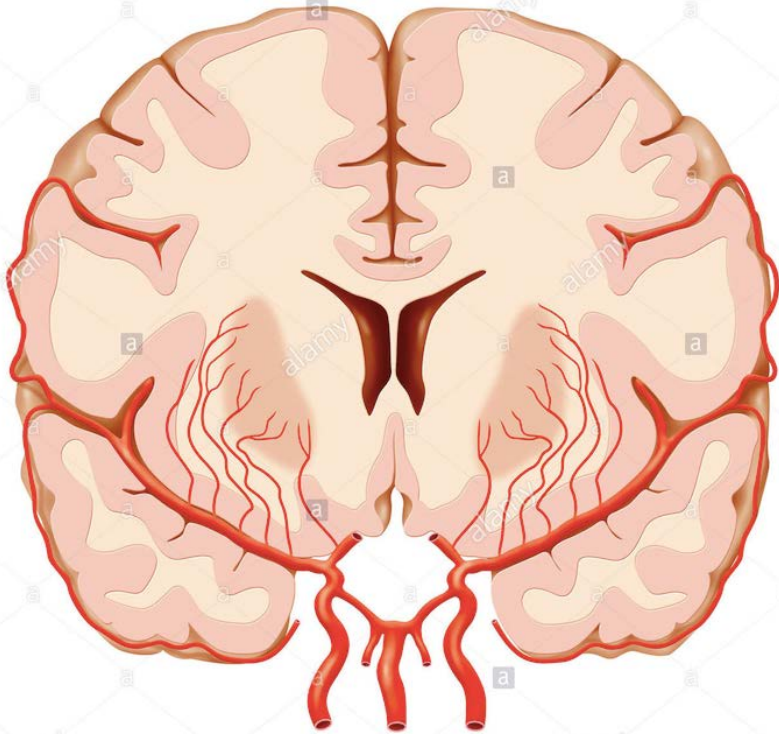
Cortical vascular territories










Cortical vascular territories



Middle cerebral artery (MCA)

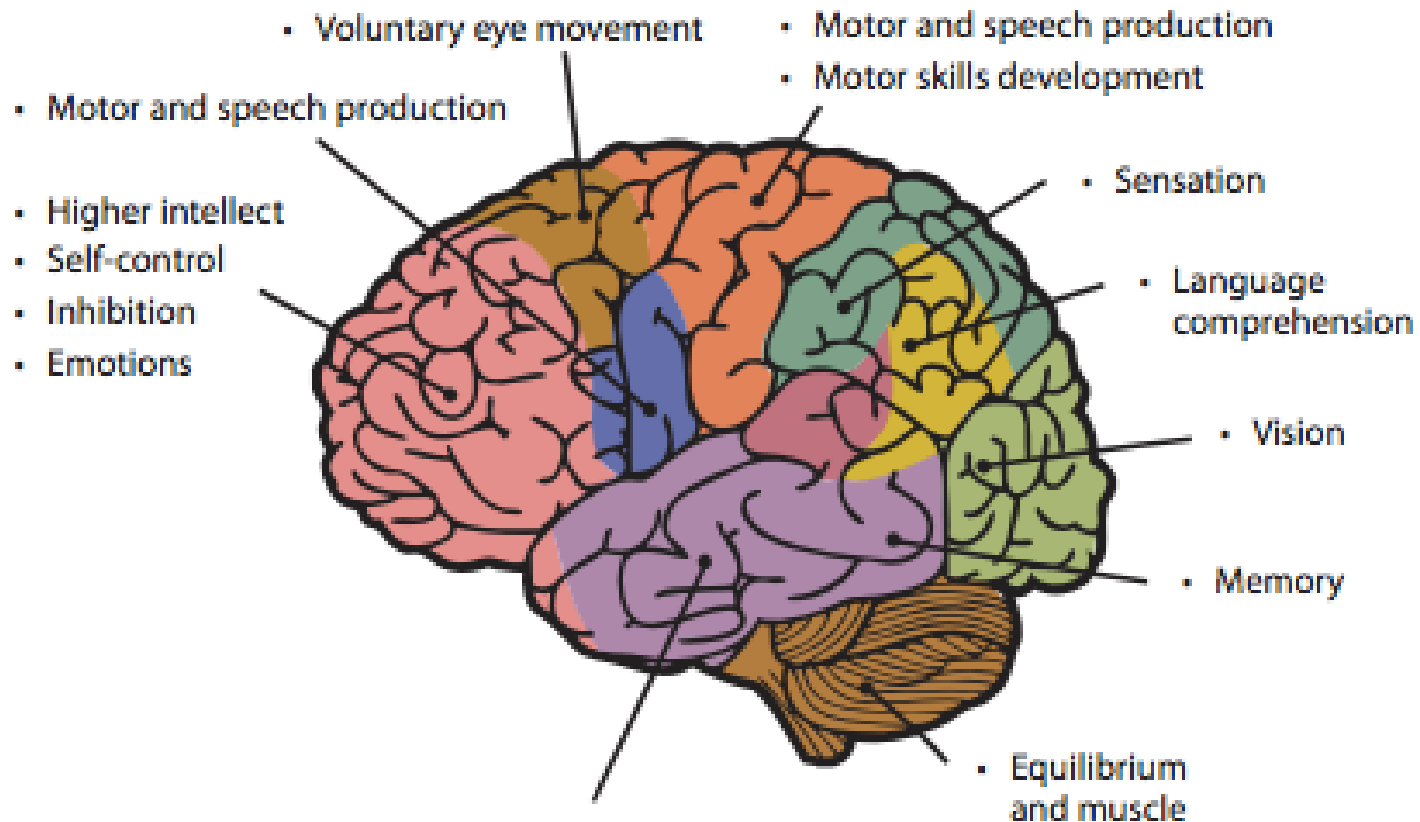


KEY

| | | | |
|--|---|---|---|
|  Broca's area |  Sensory cortex |  Auditory area |  Motor cortex |
|  Contraversive eye center |  Wernicke's aphasia area |  Visual cortex | |

Symptoms depend on the affected location

This illustration shows the brain's functional areas. After a stroke, deficits in function depend on which cerebral artery is affected.



SPOT STROKE

B

BALANCE

E

EYES

F

FACE

A

ARMS

S

SPEECH

T

**TERRIBLE
HEADACHE**



**Sudden loss of
balance ?**



**Loss of vision in
one or both
eyes?**



**Face looks
uneven?**



**Arm or leg
weak?**



**Trouble speaking
or seem
confused?**



**Time to call
911!**

KNOW THE SIGNS OF STROKE

Helpful Tips for Pre-hospital Stroke Screening

B

- **BALANCE LOSS**
- Is the person unsteady on their feet or reporting dizziness?

E

- **EYES**
- Is the person reporting loss of vision in one or both eyes, blurriness, or double vision?

F

- **FACE DROOPING**
- Does the person's face look unequal? Ask the person to smile.

A

- **ARM WEAKNESS**
- Is there weakness in one or both arms? Ask the person to raise each arm and see if either arm drifts downward.

S

- **SPEECH**
- Is the person's speech slurred? Do they have trouble speaking or do they seem confused?

T

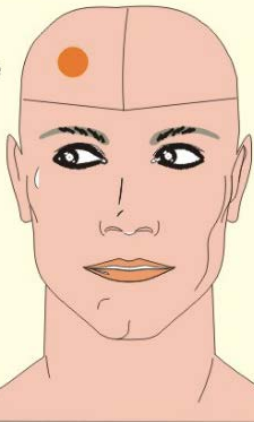
- **TERRIBLE HEADACHE**
- Is the person complaining of a sudden onset intense headache or "worst headache of life"?

LVO stroke Vs Small Stroke

Thrombo-embolic Lesion
of The Right Middle Cerebral Artery

Lesion of the
right hemisphere

Eye deviation
towards the lesion



Right gaze deviation

Left sided weakness

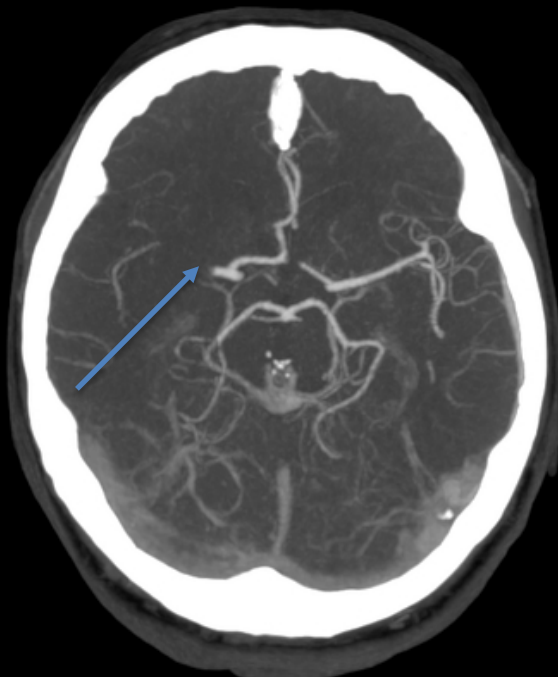
Conjugated eye deviation

Left sided neglect

Unconsciousness

Left visual field defect

Right MCA syndrome



Left gaze deviation

Aphasia

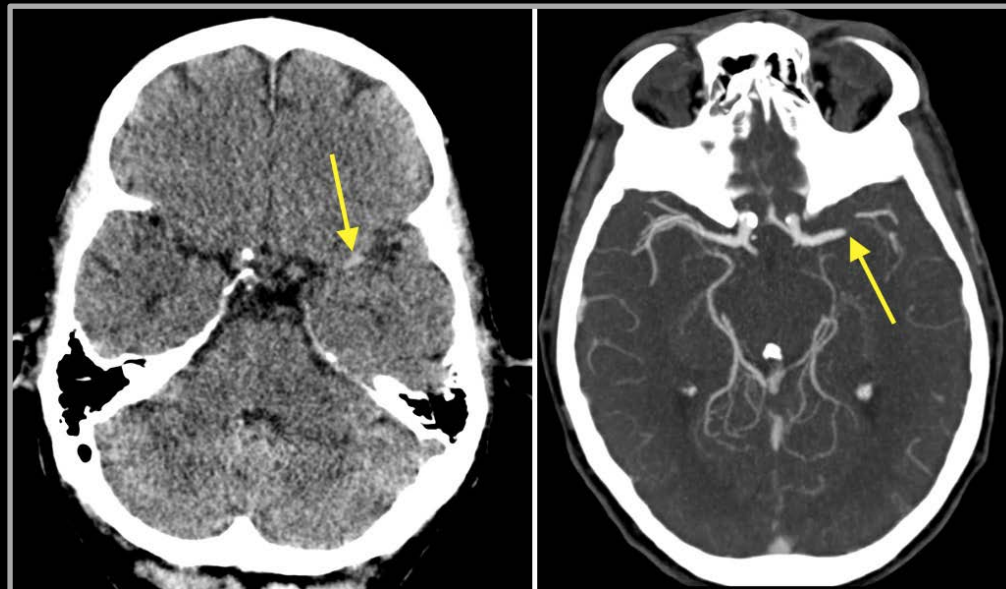
Right sided weakness

Right sided neglect

Right visual field defect



Left MCA syndrome

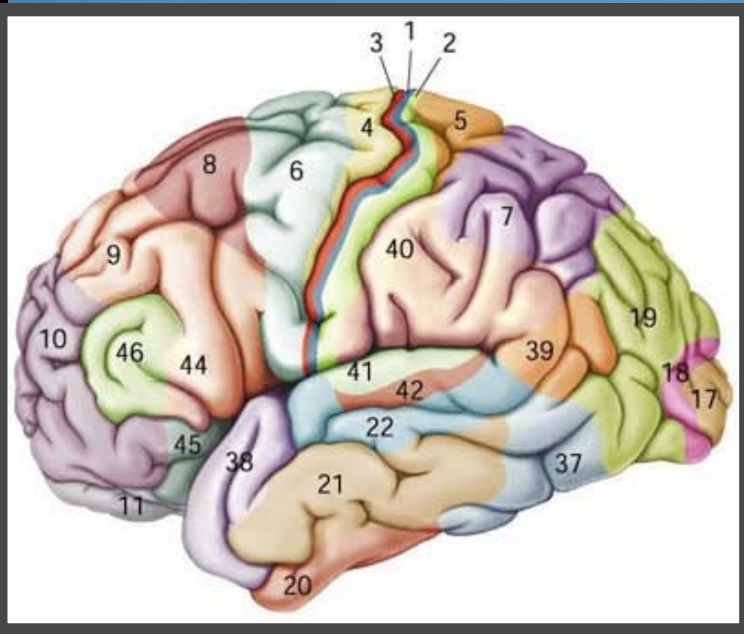




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Look for Cortical Signs





SNOW Scale

The SNO Scale is a tool for EMS to utilize to screen for a large vessel occlusion (LVO). If a person has one or more of the following signs, they may have a LVO and should be transported to the nearest Comprehensive Stroke Center or Thrombectomy Capable Stroke Center



S

Speech Nonfluent speech or expressive aphasia

- Ask person to name objects (example: pen or watch)
- *Slurring of words does not count

N

Neglect- *Ignoring one side of the body*

- Touch person on their right arm and then their left arm and then both. Can they feel both sides at the same time?

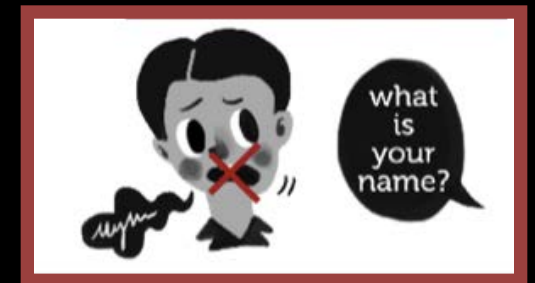
O

Ocular Deviation- *both eyes are forced to one side*

- Can the person move their eyes all the way to the right and all the way to the left?

What is Aphasia ?

A communication disorder that affects a person's ability to process and use language.



Types of Aphasia

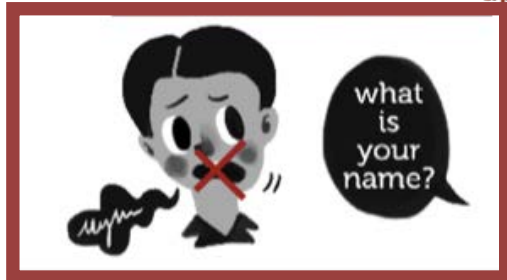
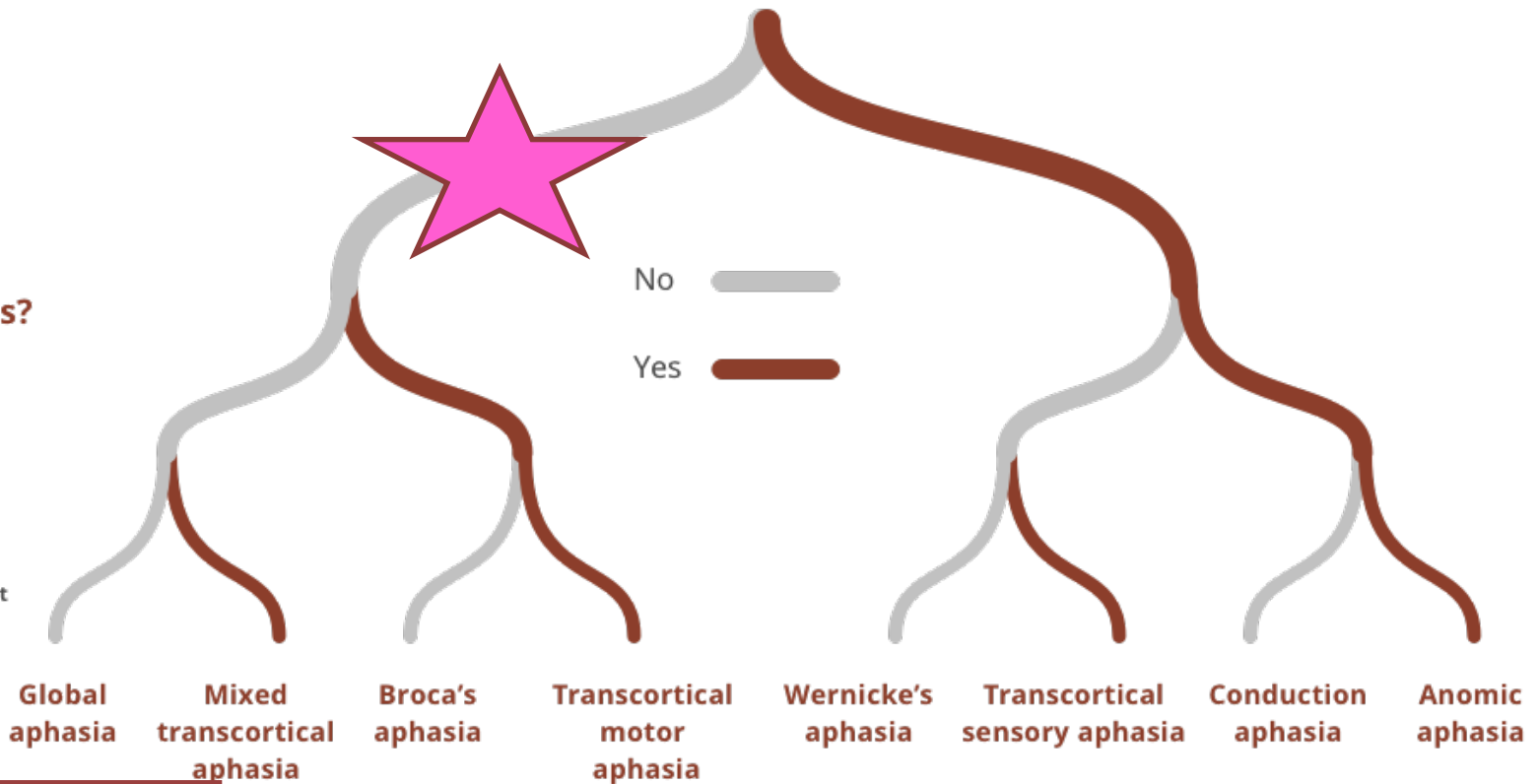


Comprehends?

Can you comprehend of spoken messages?

Repeats?

Can the person repeat words or phrases?



www.aphasia.org

SNO scale ...only check for speech fluency !!



Speech

EXPRESSIVE APHASIA

- Ask person to name objects (example: pen or watch)

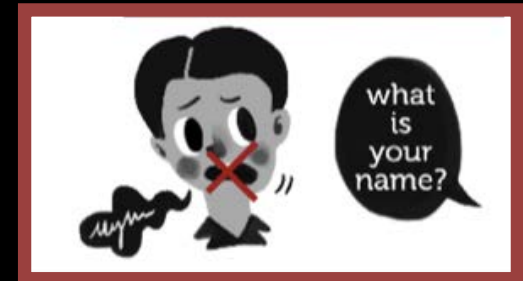
*Slurring of words does not count

1) Spontaneous speech?

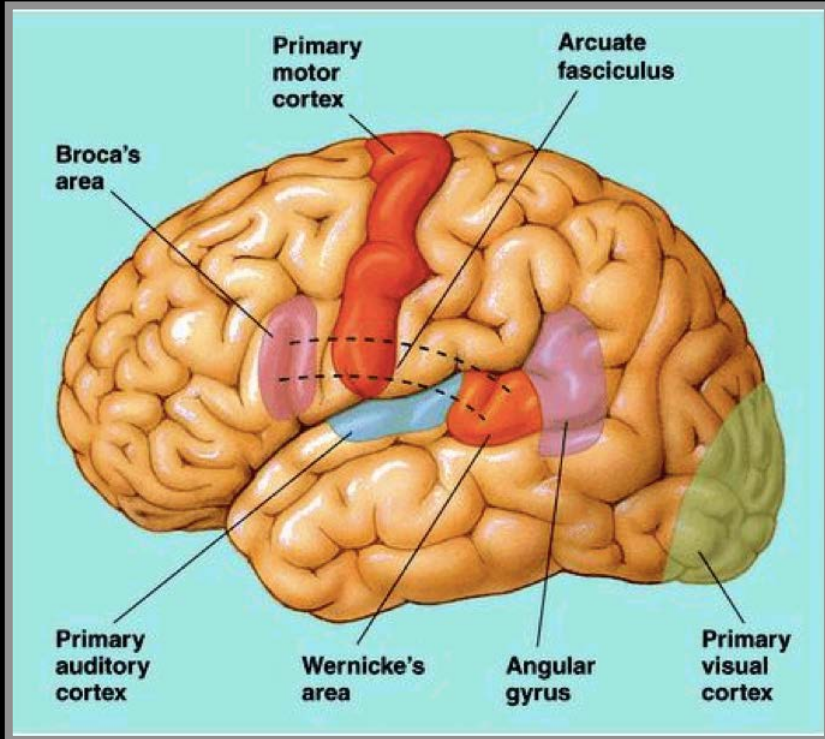
2) What is this ? **Show glasses or watch**

Positive

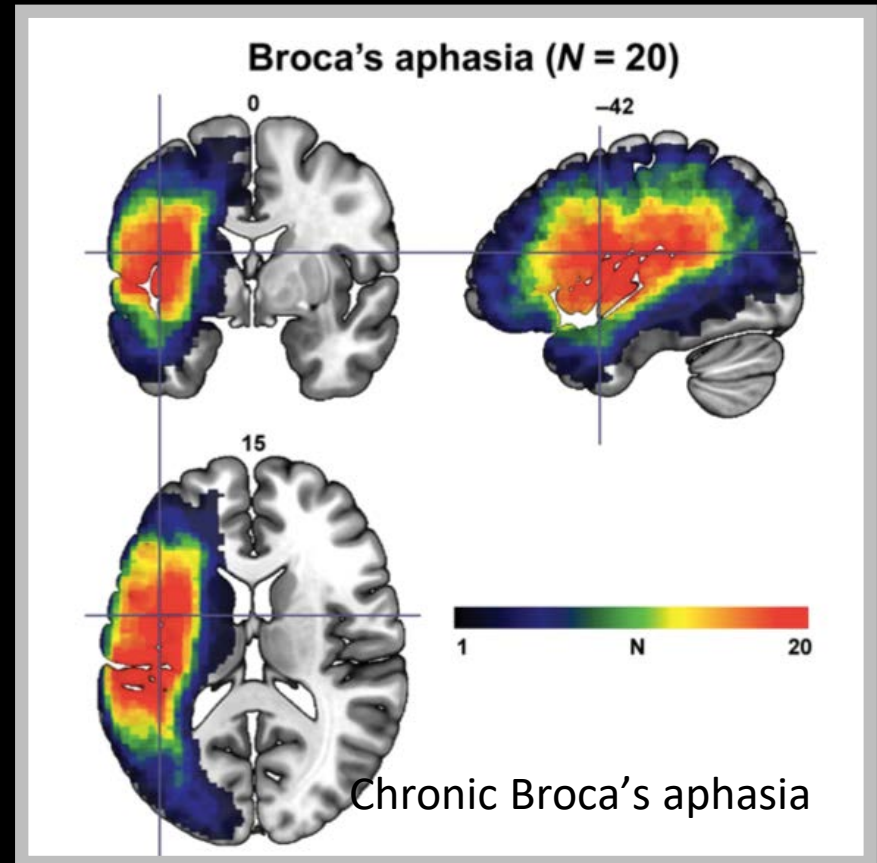
- Mute
 - Can't name
 - Decrease speech fluency
 - Speaking gibberish/incomprehensible



Anatomy of Expressive (Broca's) aphasia



Wernicke-Geschwind Model



Voxel-wise symptom mapping MRI



N

Neglect- *Ignoring one side of the body*

- Touch person on their right arm and then their left arm and then both. Can they feel both sides at the same time?



Copying:

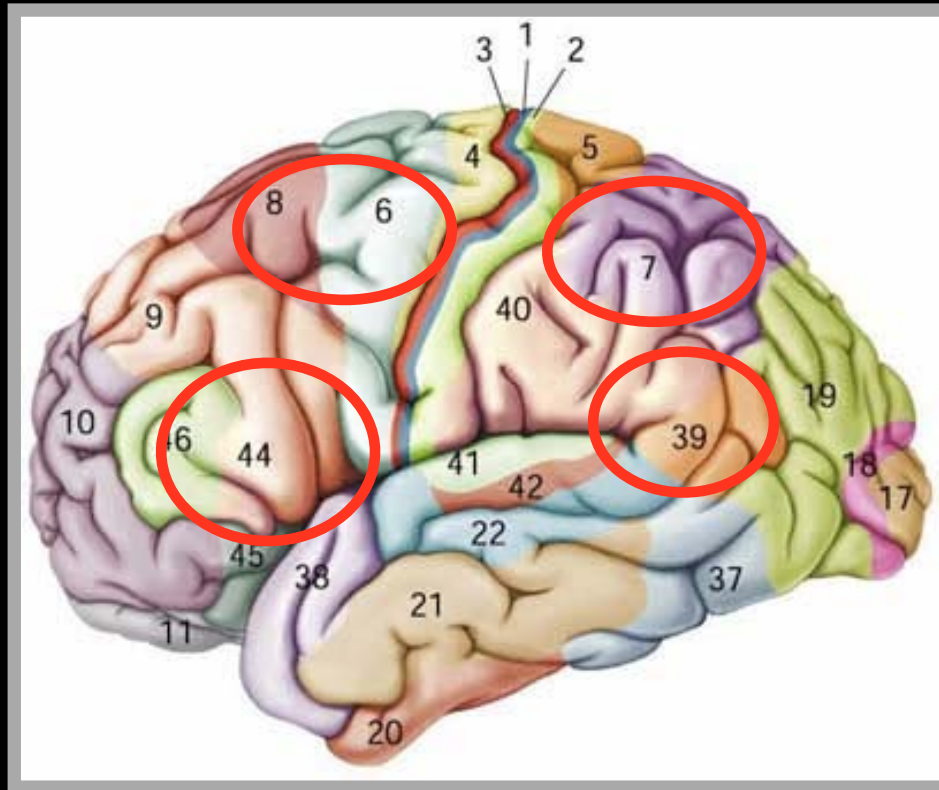
Model



Patient's copy



Anatomy of Neglect



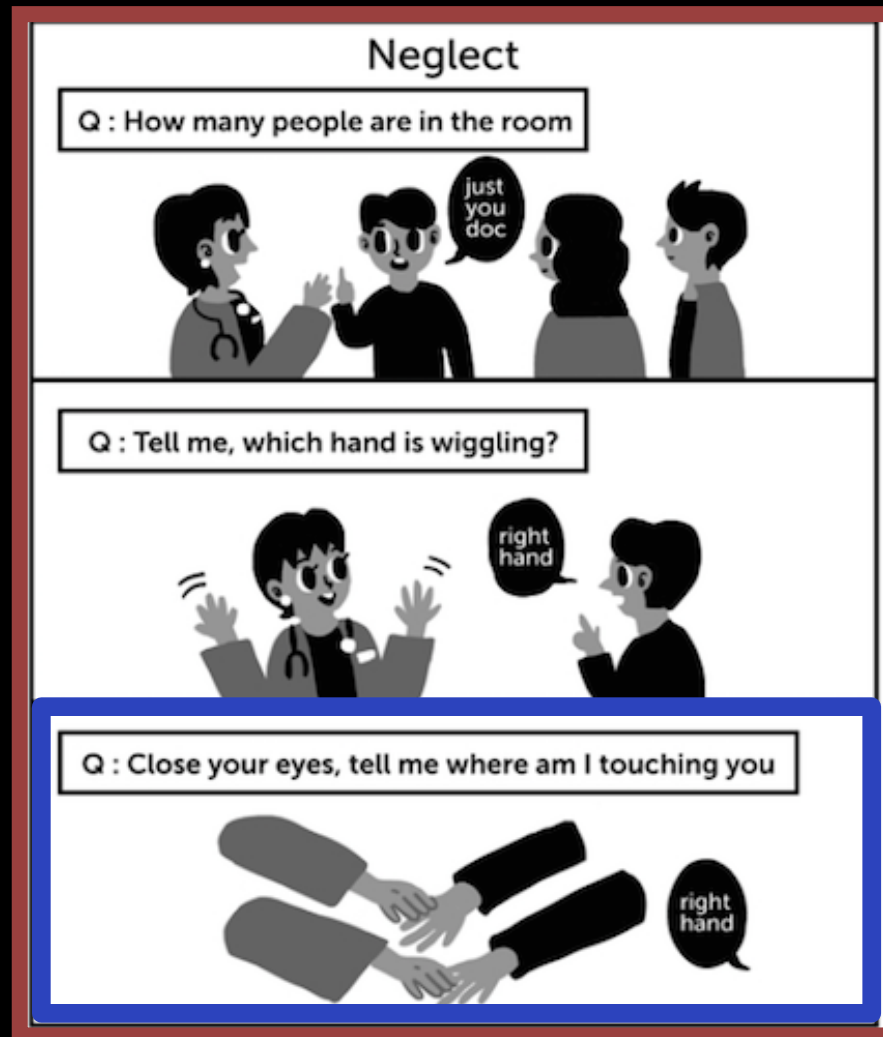
TESTS FOR NEGLECT (TAP TEST)

- Standing on the side that the patient is weak
- **Tap** the patient twice on the **shoulder** and call their first name

Positive if

→ The patient does not quickly turn their head & eyes to fully focus on & notice you

TESTS FOR NEGLIGENCE







Ocular Deviation- *both eyes are forced to one side*
- Can the person move their eyes all the way to the right
and all the way to the left?



Check horizontal movement only :)

O= Ocular (gaze) deviation)



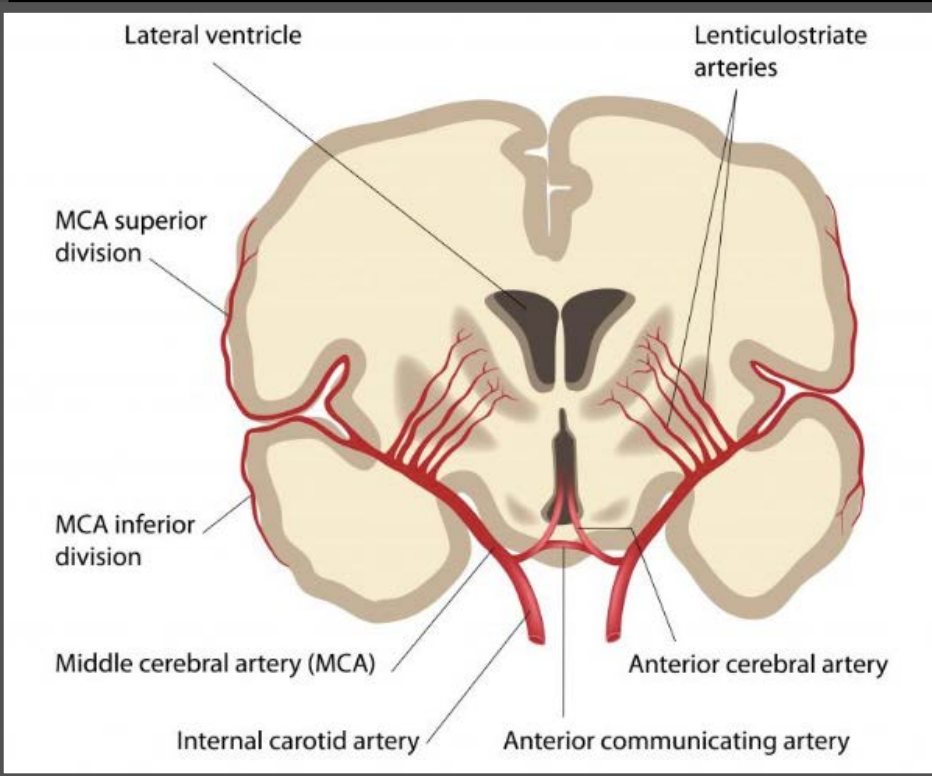
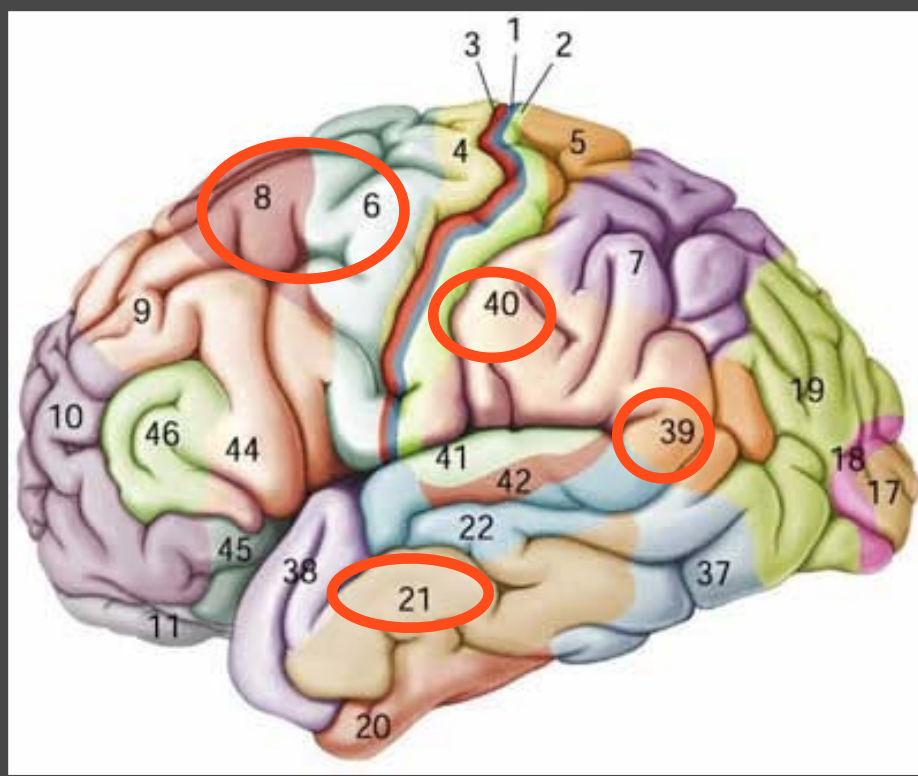
Gaze preference
Vs
Gaze deviation

*Oculocephalic movement

O= Ocular deviation



Anatomy of ocular (gaze) deviation

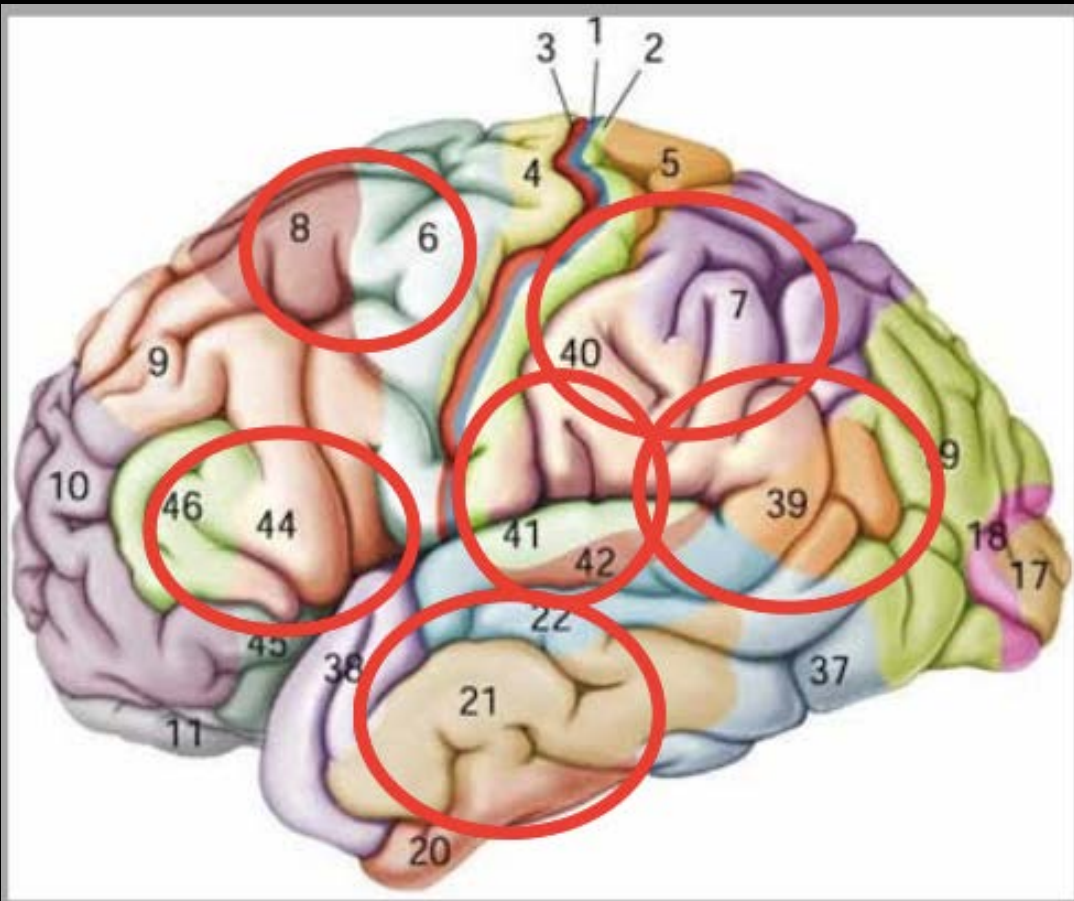


Tips

- Patient in **Coma** has SNOW positive !!!
- Check **Doll's eyes** exam if patient does not cooperate or not follow commands or decreased mental status



+ SNOW scale & potential Cortical areas involvement



SNOW Data

| | Pomona Hospital | Aurora Health Care | St. Luke hospital |
|---|-----------------|--------------------|-------------------|
| Study type | Retrospective | Retrospective | Prospective |
| Number | 776 | 1381 | 283 |
| Correctly identify LVO | 98% | 80% | 84% |
| Incorrectly identify of NLVO to have LVO | 44% | 24% | 37% |



No Perfect scale

- No scale predicted LVO with both high sensitivity and high specificity.
- Systems that use LVO prediction instruments for triage will miss some patients with LVO and milder stroke

The Los Angeles Motor Scale LAMS (Stroke severity)

Facial Droop

| | |
|---------|---|
| Absent | 0 |
| Present | 1 |

Arm Drift

| | |
|---------------|---|
| Absent | 0 |
| Drifts down | 1 |
| Falls rapidly | 2 |

Grip Strength

| | |
|-----------|---|
| Normal | 0 |
| Weak grip | 1 |
| No grip | 2 |

Total score: (0-5)

Score of 4-5 is possible ELVO

Does it Take a VAN
to Identify
Emergent Large
Vessel Occlusion
(ELVO) in Ischemic
Stroke?

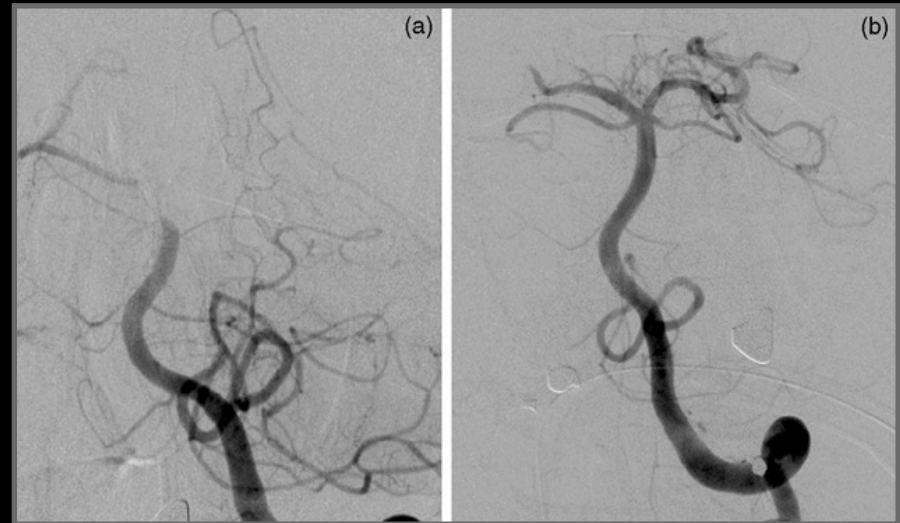


LVO SCREENING SCALES

| Scales | Item test | Scoring |
|-------------------|-----------|----------|
| <i>SNOW</i> | 3 | <i>N</i> |
| <i>CPSS</i> | 4 | <i>Y</i> |
| <i>LAMS</i> | 3 | <i>Y</i> |
| <i>RACE</i> | 6 | <i>Y</i> |
| <i>VAN</i> | 10 | <i>N</i> |
| <i>FAST-ED</i> | 5 | <i>Y</i> |
| <i>PASS</i> | 3 | <i>Y</i> |
| <i>3I-SSS</i> | 3 | <i>Y</i> |
| <i>ACT-FAST</i> | 3 | <i>N</i> |
| <i>ELVO Score</i> | 3 | <i>N</i> |

Posterior circulation stroke !!

- Severe headache
- Severe dizziness
- Nausea/vomiting
- Decreased mental status !!!!!!!!!!!
- Severe slurred speech
- Double vision
- Difficulty swallowing
- Neck pain



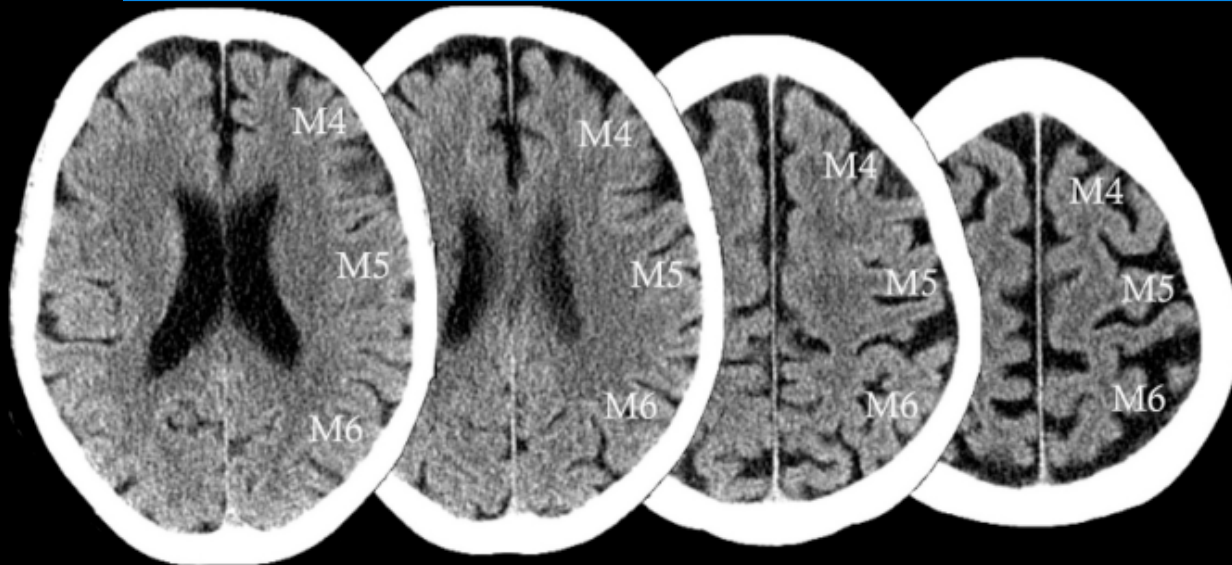
Acute stroke **Imaging**

Ganglionic Level



ASPECT SCORE

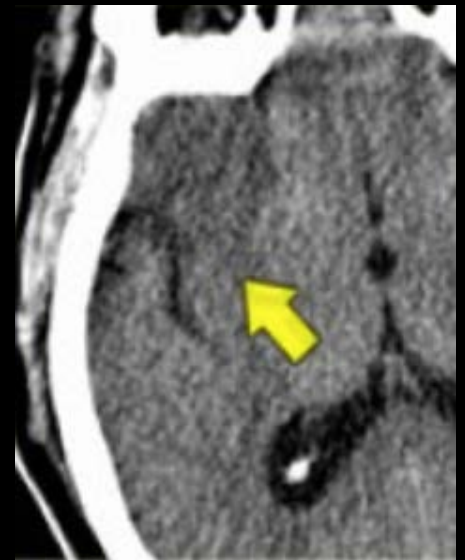
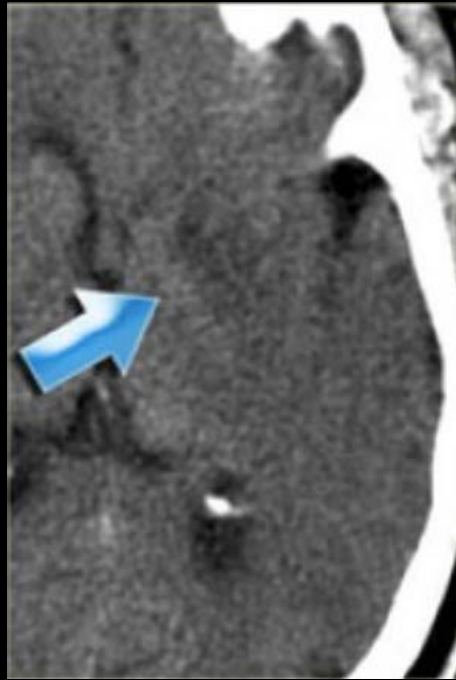
0-4: Large Size = No Reperfusion
5-7: Mid Size = Reperfusion but still significant disability
8-10: Small Size = Reperfusion with high likelihood of good outcome



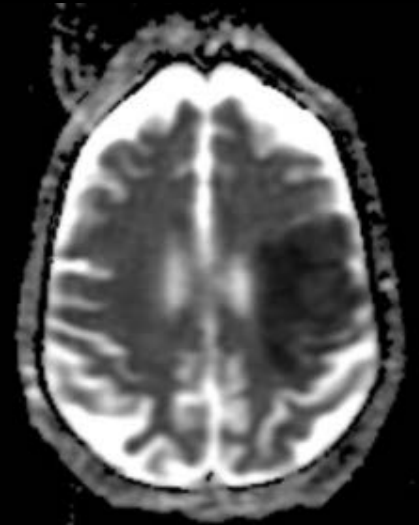
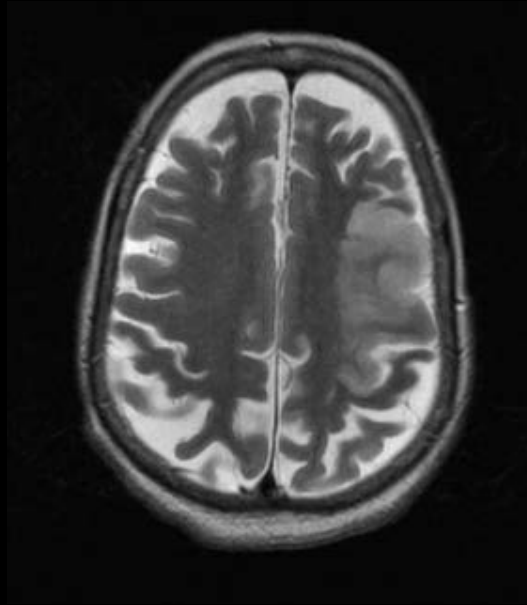
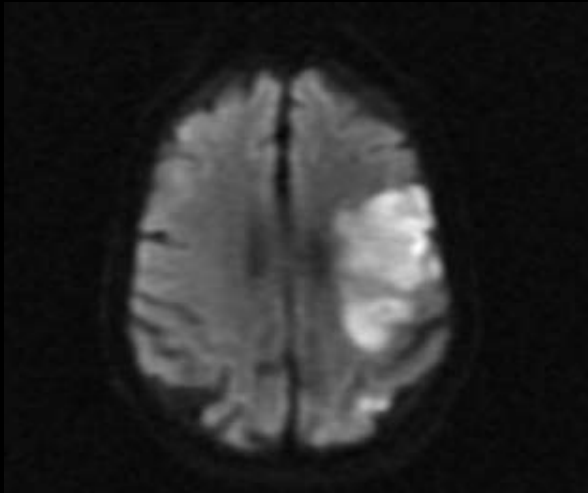
Supraganglionic Level

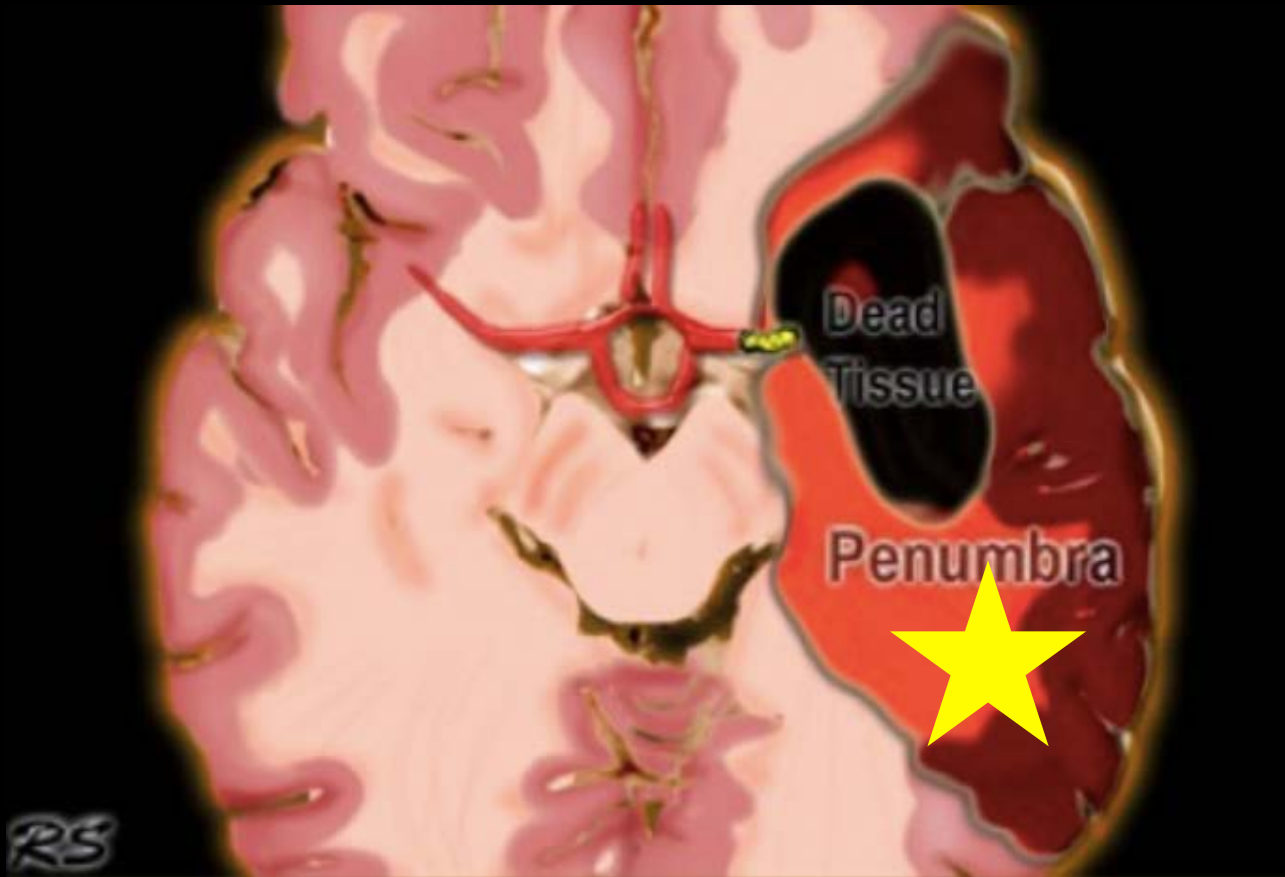
- Start with 10 points, subtract 1 point for each area with hypodensity
- Studies suggest that scores >7 associated with good outcome

CT brain



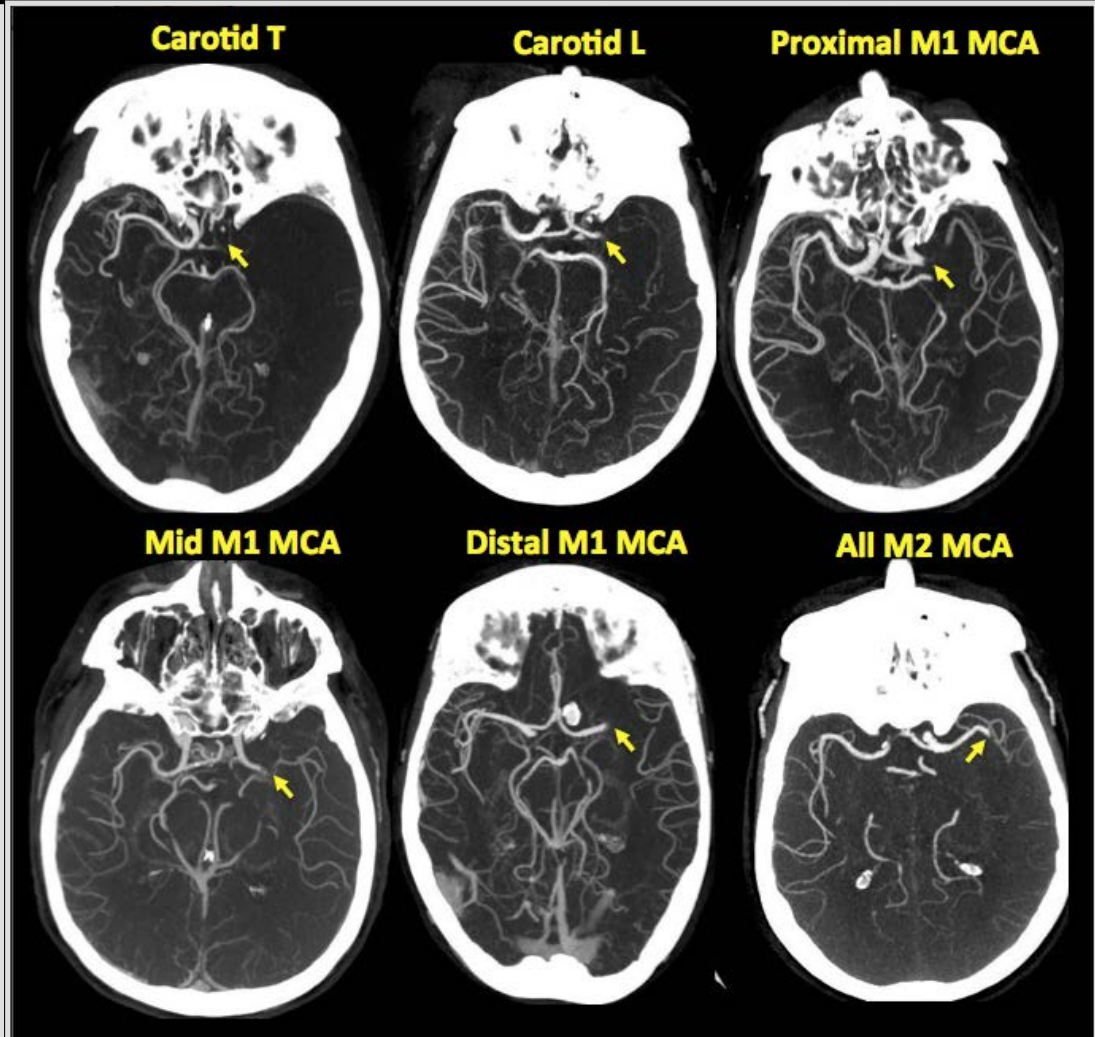
MRI brain

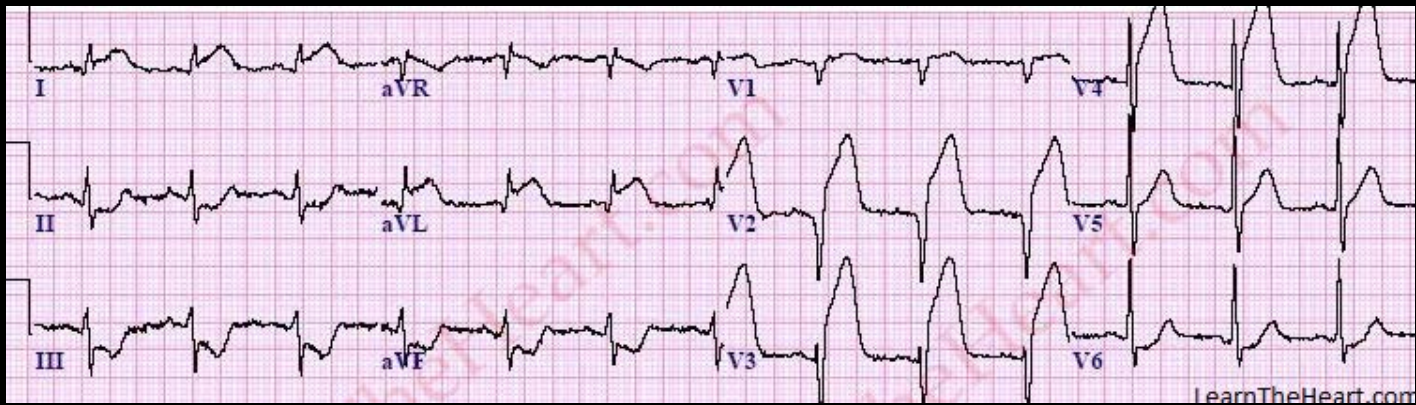




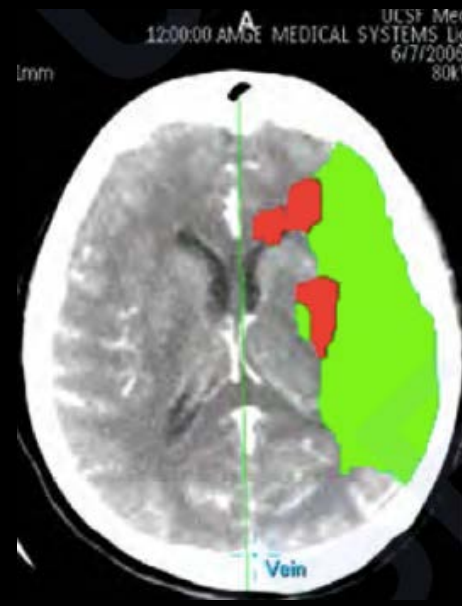
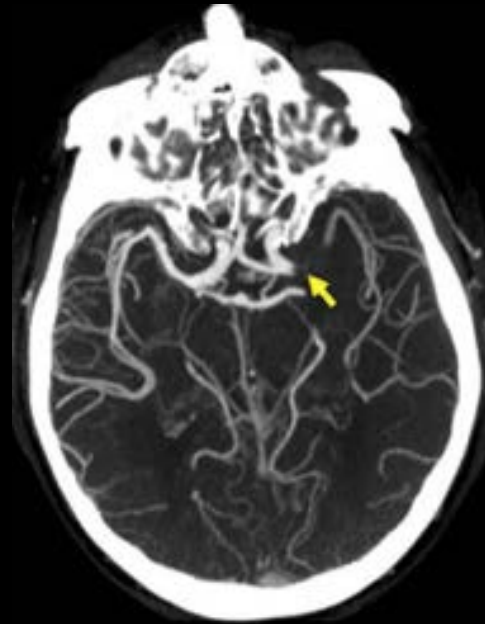
Small core + Big penumbra

CT angiogram of head and neck





=



PENUMBRA

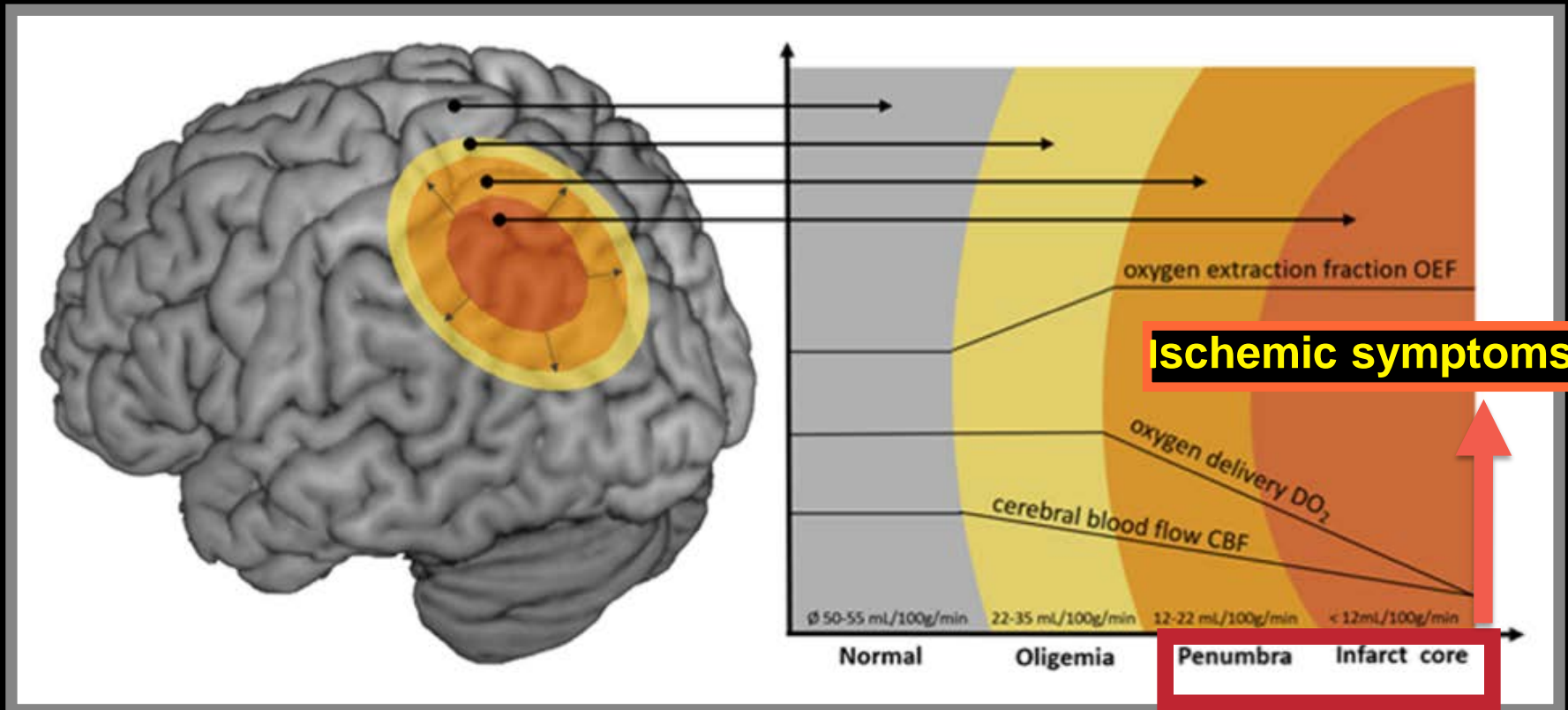
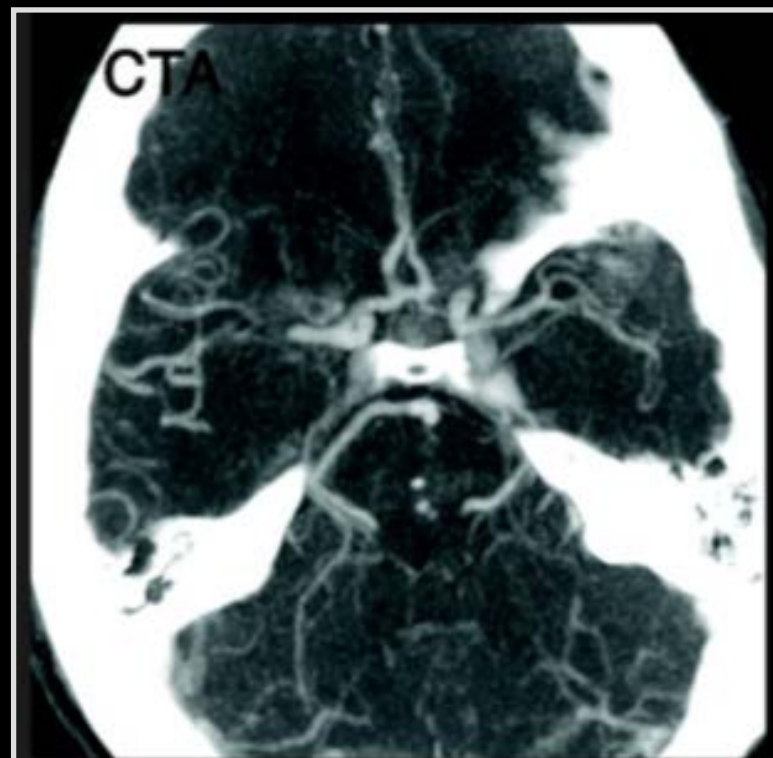
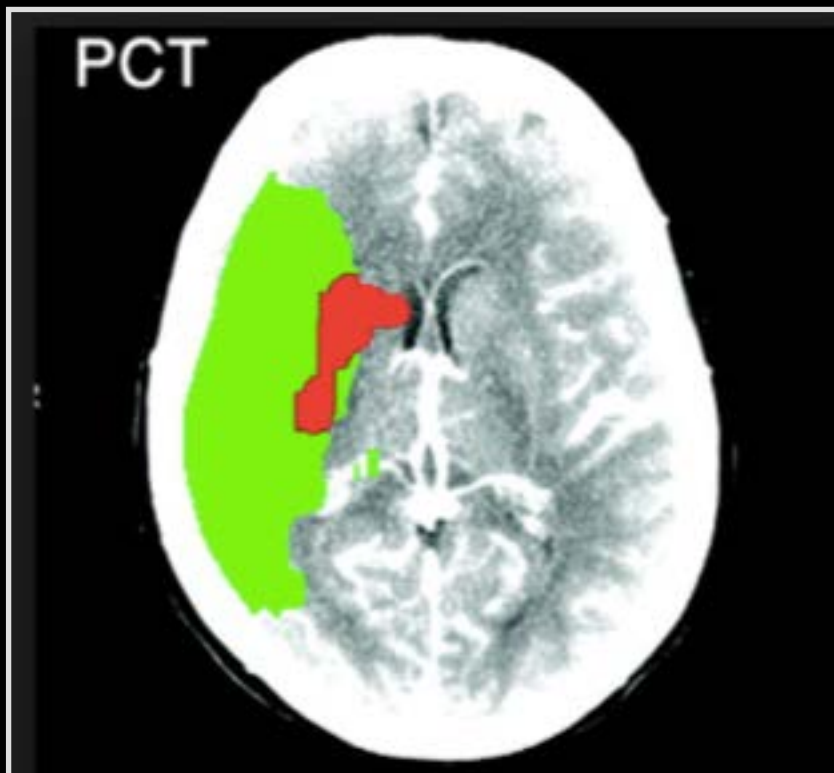
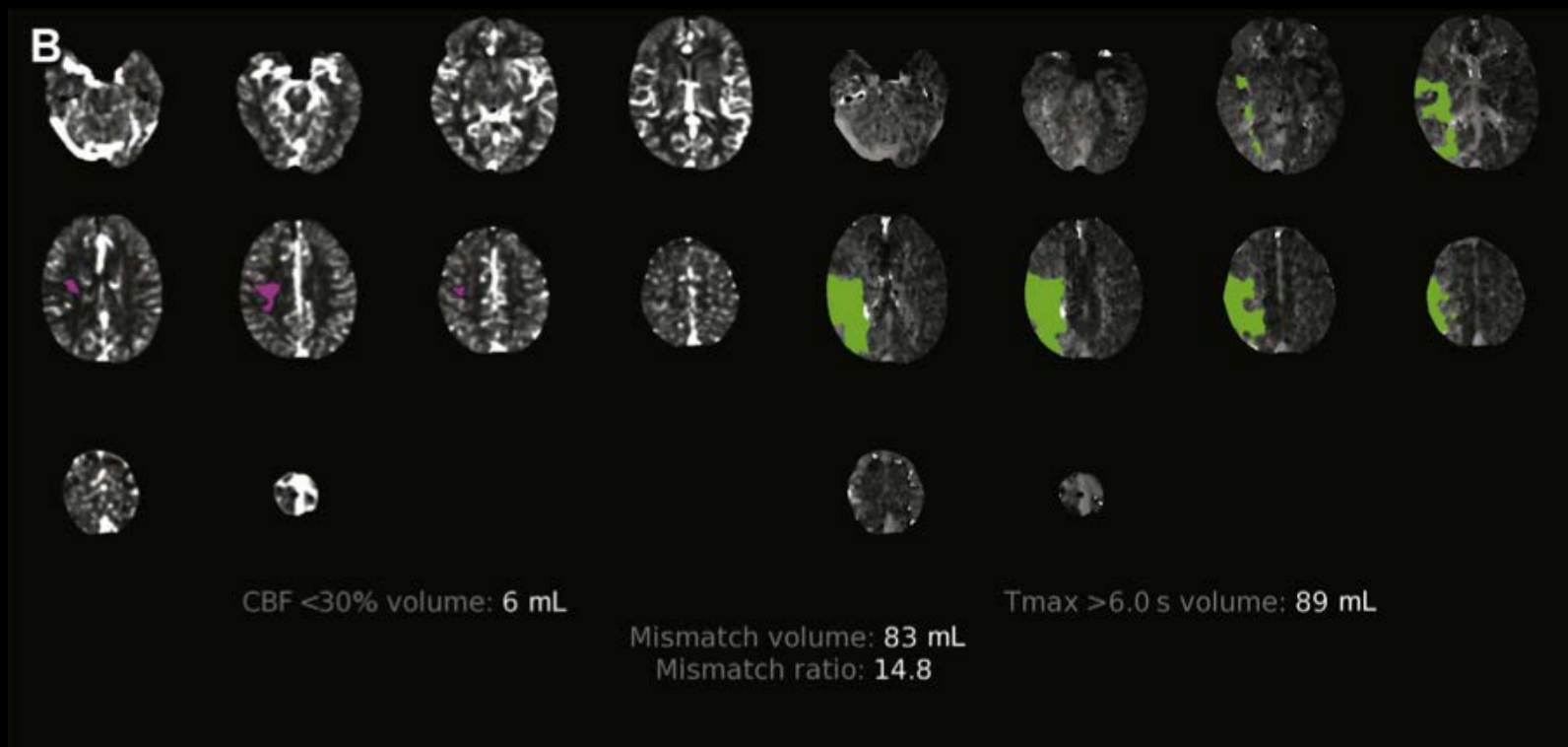


Figure 3: Illustration of the penumbra concept. Infarct core (red): infarcted tissue. Penumbra (orange): salvageable tissue at risk for infarction in case of persistence vessel occlusion. Oligemia (yellow): hypoperfused tissue without risk for infarction. Cerebral blood flow decreases in direction to the infarct core. Decreased blood flow can be compensated by an increased oxygen extraction fraction and vasodilation of collateral vessels sufficiently enough in the oligemia but not in the penumbra. (Picture: Stroke Centre Bern)

CT Perfusion shows a large penumbra



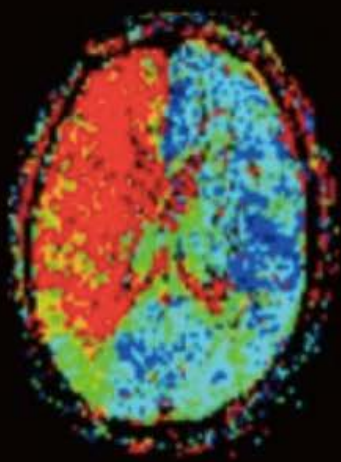
CT Perfusion



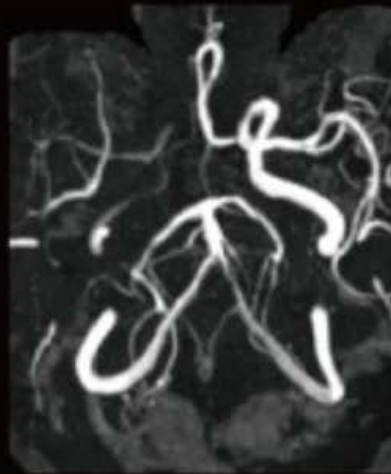
MR Perfusion



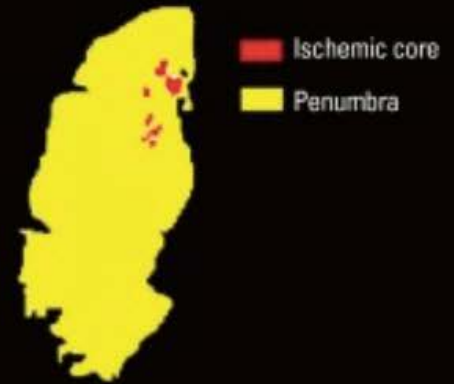
DWI lesion



PWI lesion



MRA



PWI-DWI mismatch

Stroke is TREATABLE !

MODIFIED RANKING SCORE

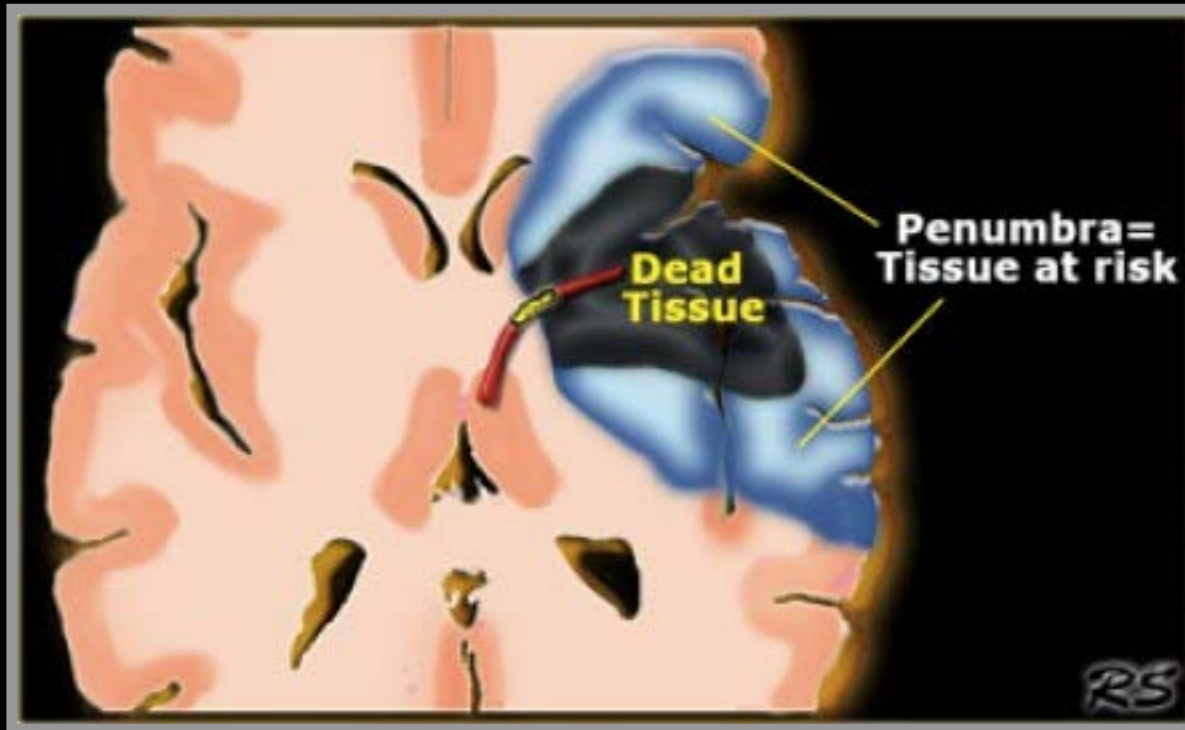
| SCORE | DESCRIPTION |
|-------|---|
| 0 | No symptoms at all |
| 1 | No significant disability despite symptoms; able to carry out all usual duties and activities |
| 2 | Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance |
| 3 | Moderate disability; requiring some help, but able to walk without assistance |
| 4 | Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance |
| 5 | Severe disability; bedridden, incontinent and requiring constant nursing care and attention |
| 6 | Dead |



Modified Rankin Scale Score



PENUMBRA



Impact of collateral flow

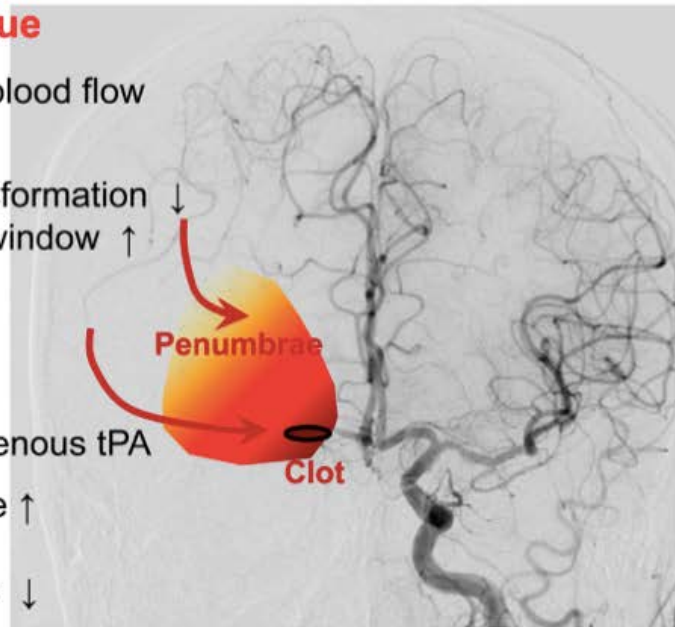
Collateral flow to

(a) Penumbral tissue

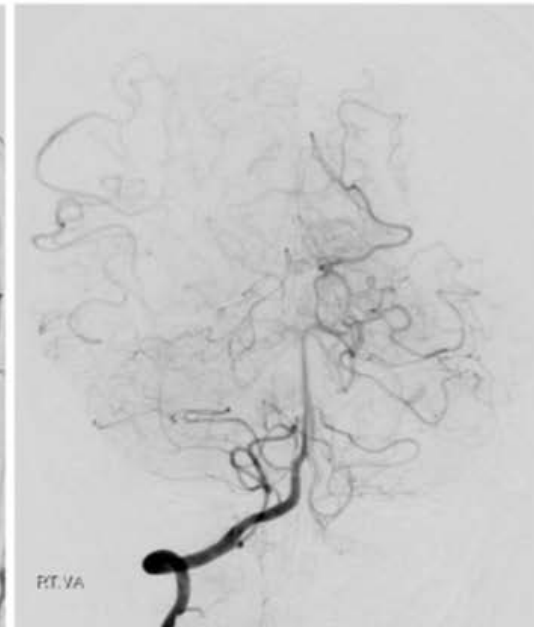
- Maintain cerebral blood flow
- Infarct growth ↓
- Hemorrhagic transformation ↓
- Therapeutic time window ↑

(b) Clot

- Deliver endo/exogenous tPA
- Recanalization rate ↑
- Reocclusion ↓
- Instant thrombosis ↓



Contralateral carotid injection



Vertebral injection

Reperfusion is the KEY!
Save **Penumbra**!!



STROKE HEROES

Treatment options

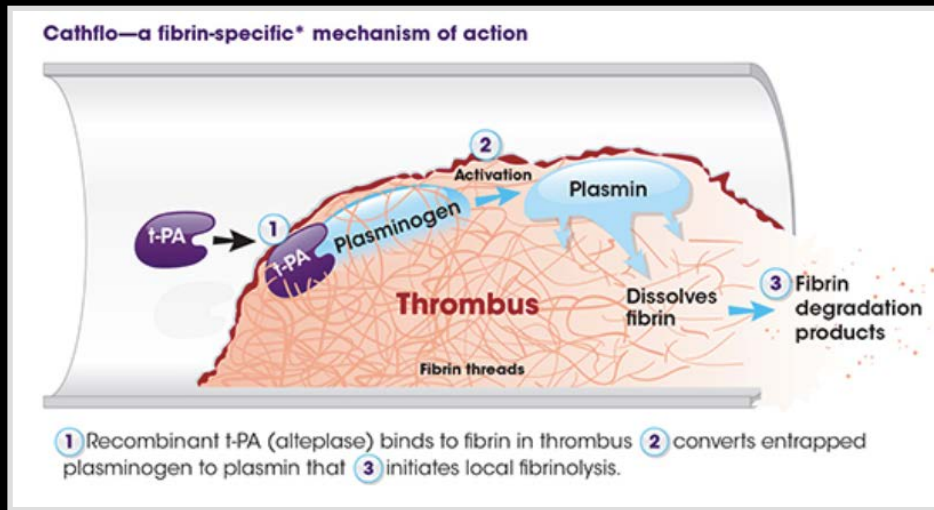
- Small vessel occlusion
 - IV-tPA within 3-4.5 hours
- Large vessel disease
 - IV-tPA within 3-4.5 hours
 - + Mechanical thrombectomy within 6 hours (anterior circulation) and up to 24 hours in selected patients

1 Minute currency

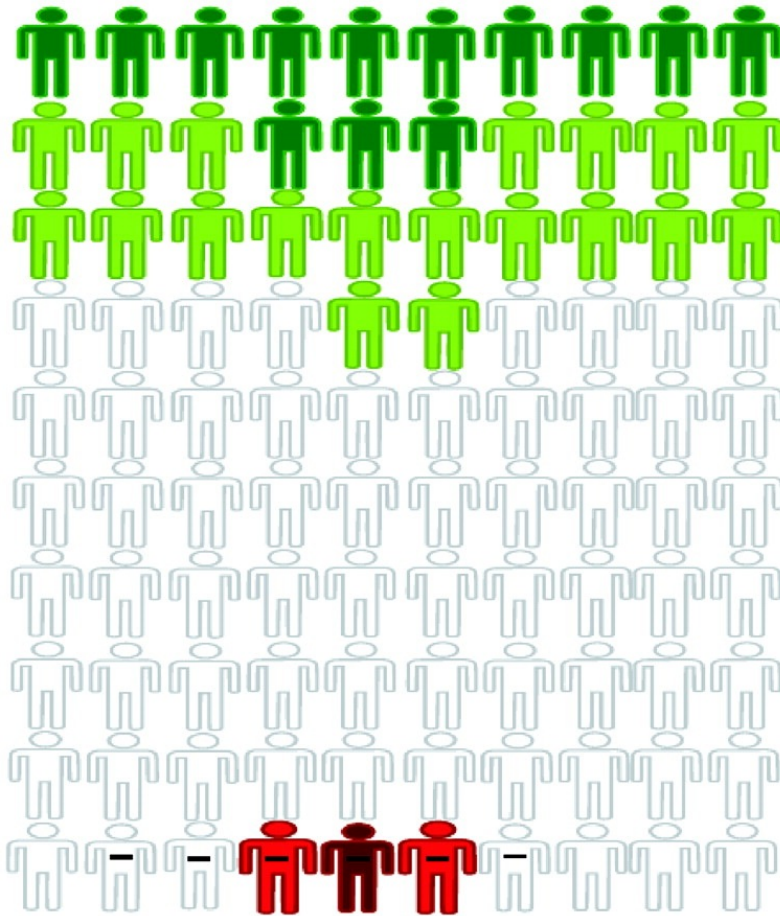


- Loss 1.9 millions neuron
- Loss 2 days of healthy life (delay of tPA Rx)
- Loss 1 week of health life (delay of endovascular Rx, young & big stroke)

rt-PA (Alteplase)



TPA for Cerebral Ischemia within 3 Hours of Onset-Changes in Outcome Due to Treatment



Changes in final outcome as a result of treatment:

- Green: Normal or nearly normal
- Light Green: Better
- White: No major change
- Red: Worse
- Dark Red: Severely disabled or dead

Early course:

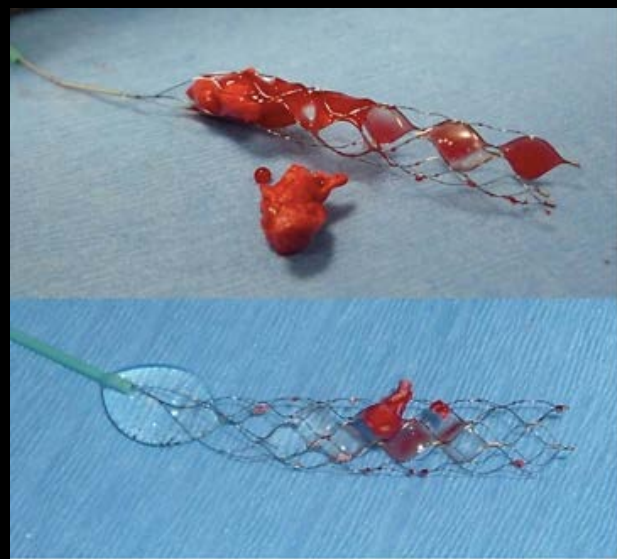
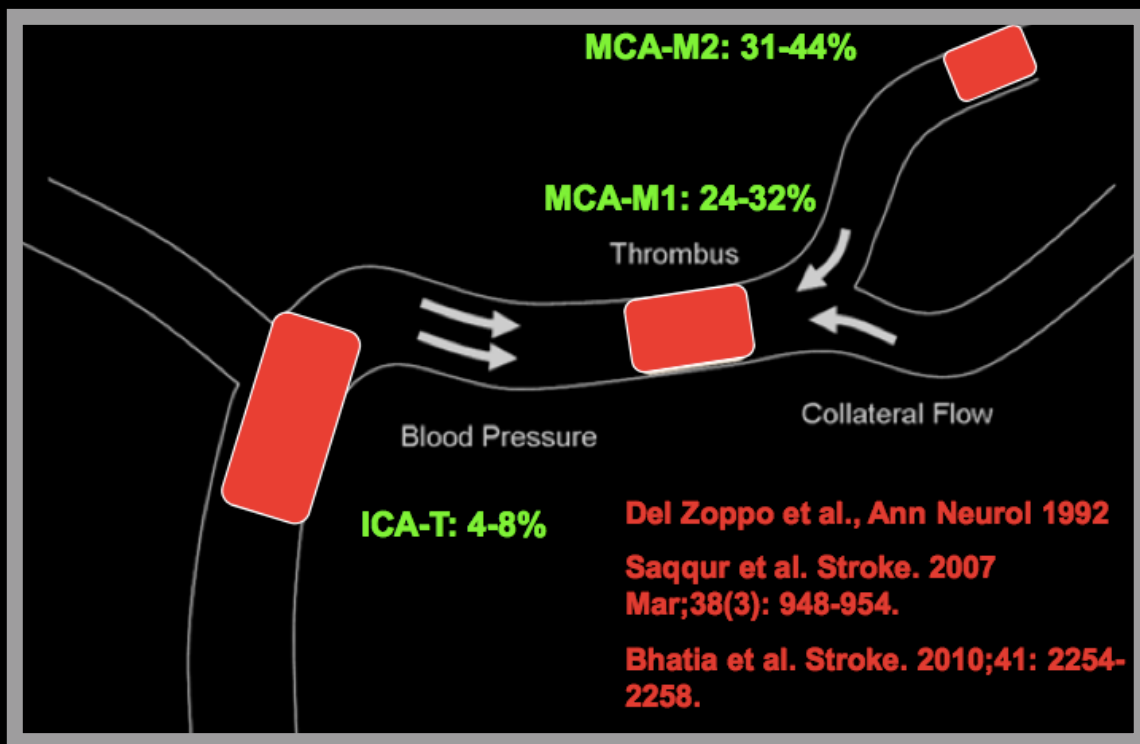
- White: No early worsening with brain bleeding
- White with dash: Early worsening with brain bleeding

tPA efficacy in Stroke

100 pt, **32** benefit if tPA given < 3h
100 pt, **16** benefit if 3-4.5 h
100 pt, **3** will have worse outcome

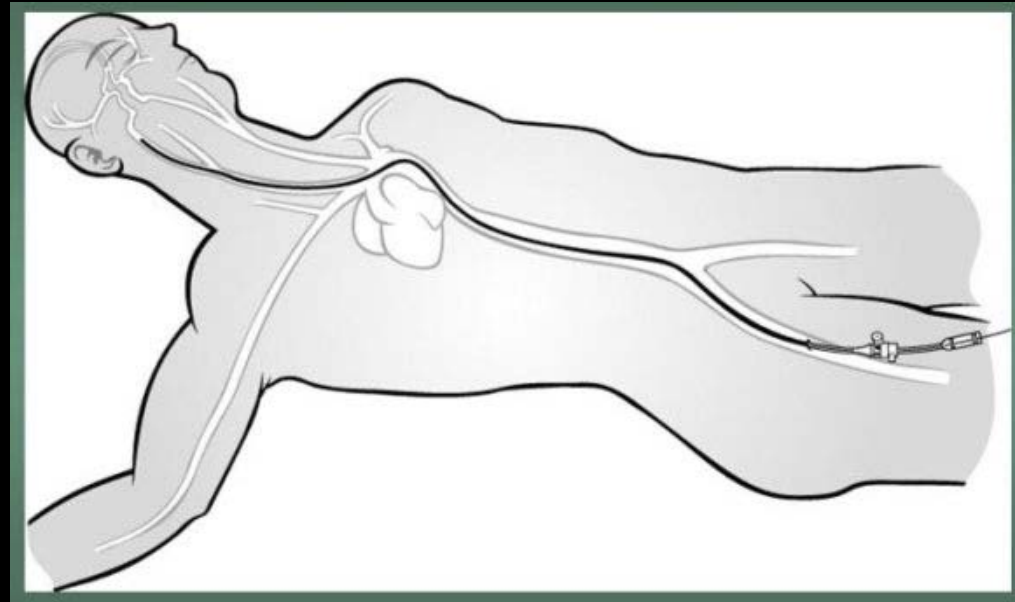
50% OFF

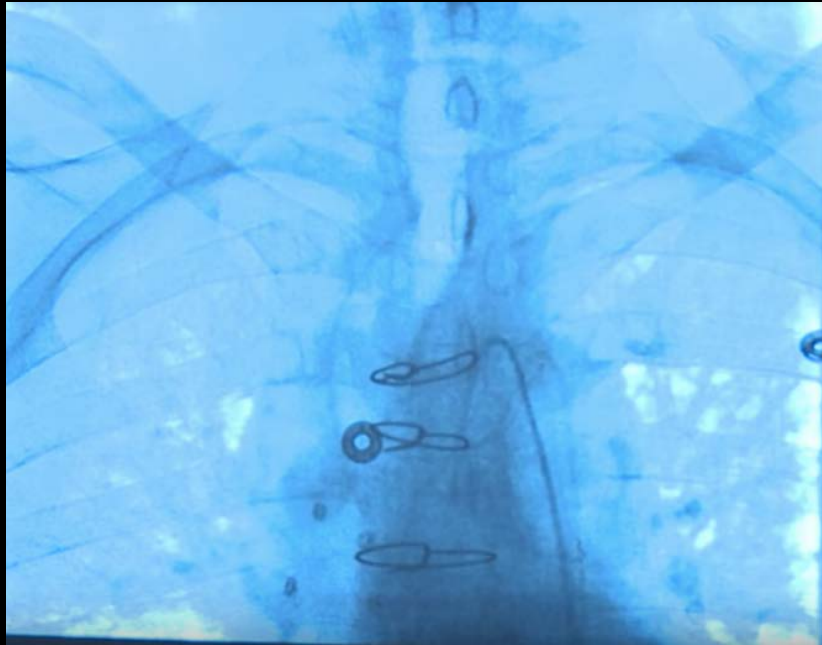
IV-tPA & Proximal arterial occlusion

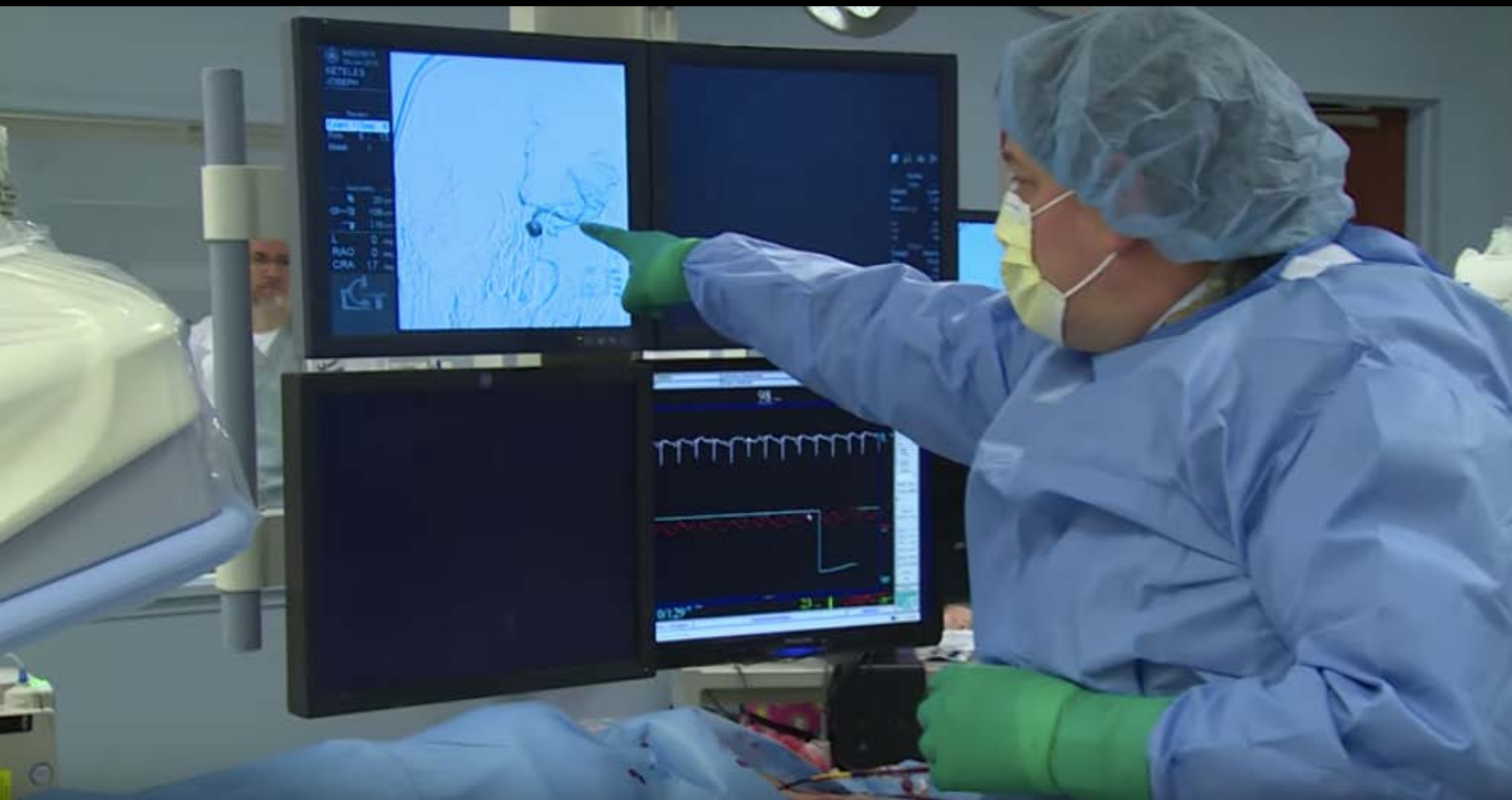


Acute Stroke Intervention (Mechanical thrombectomy)

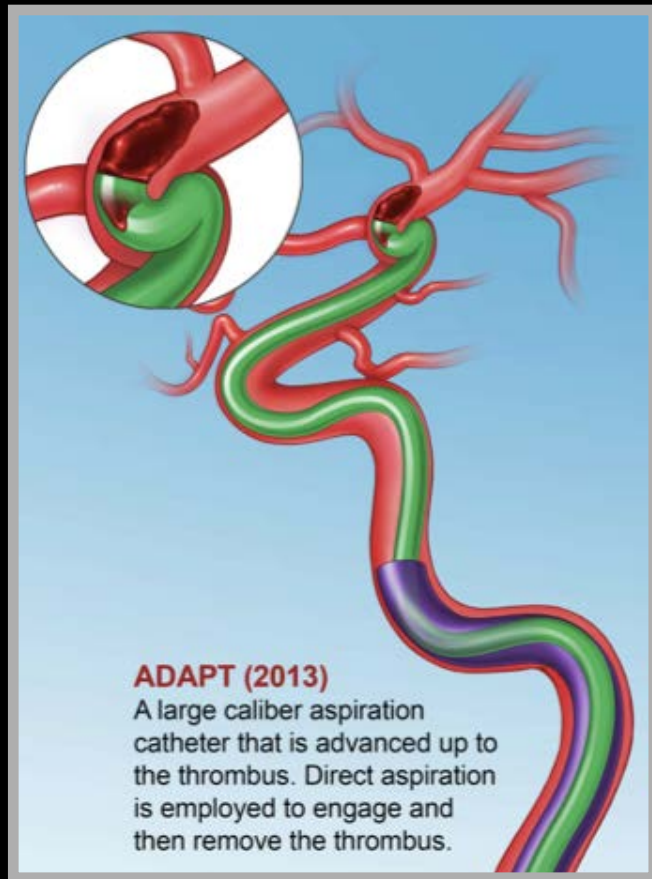








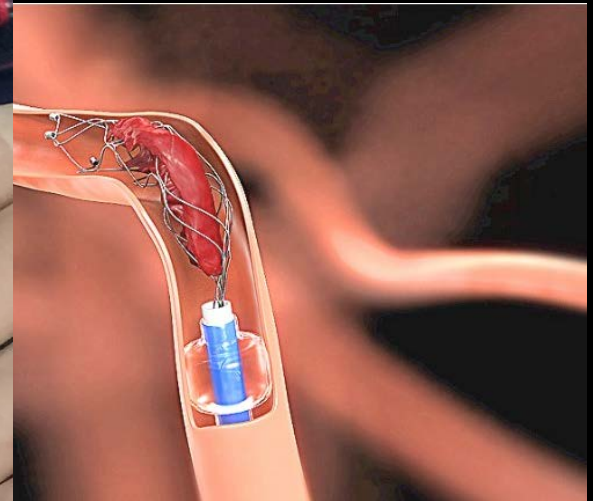
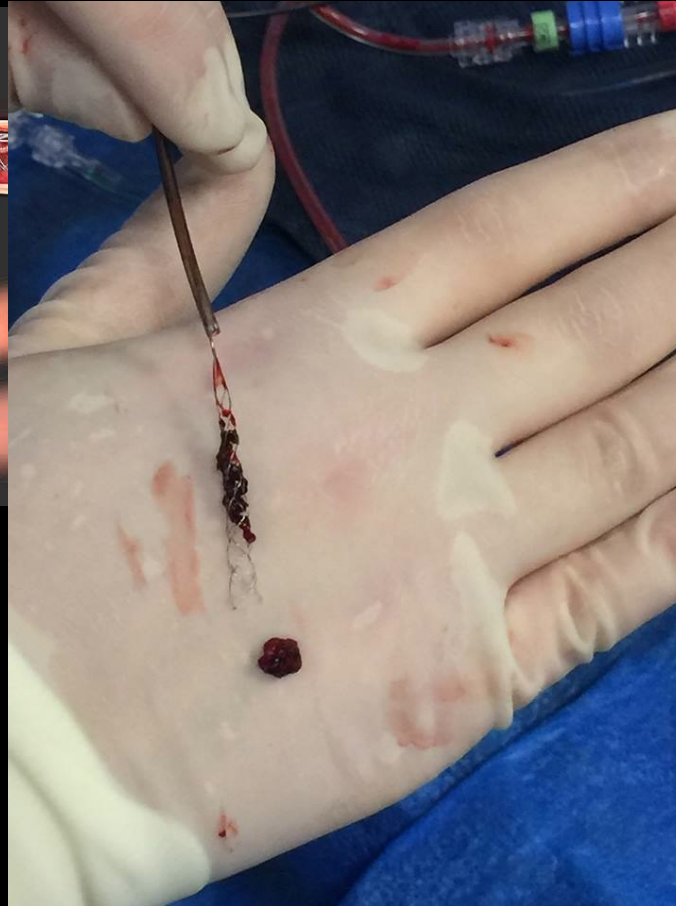
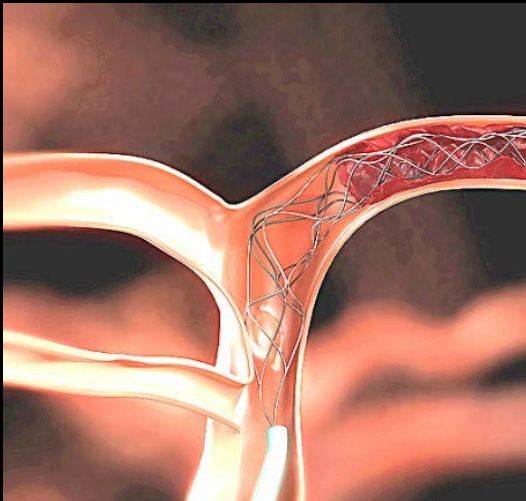
Aspiration Thrombectomy



Aspiration Thrombectomy



Thrombectomy using Stent retriever



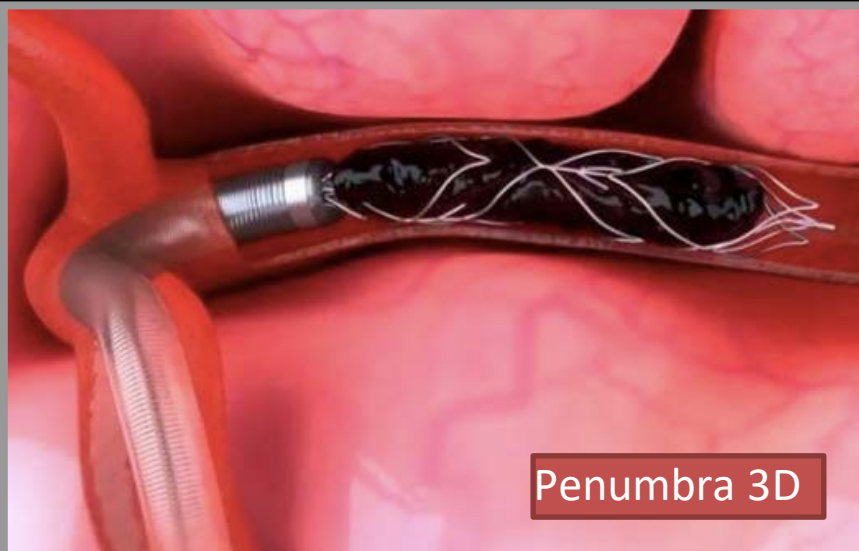


Solitaire Platinum

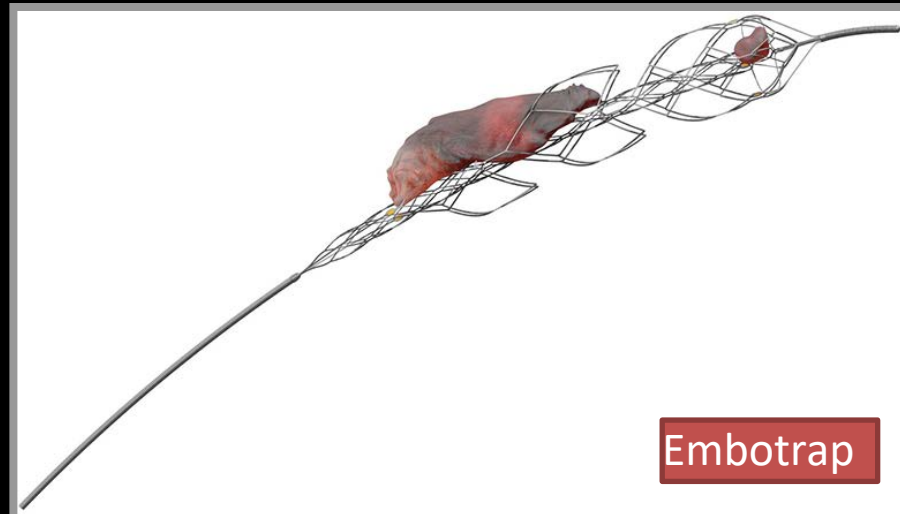


Trevo XP^{XP}

Different types of stent retriever available in US



Penumbra 3D



Embotrap

Five Mechanical Thrombectomy trials

- MR CLEAN
- ESCAPE
- EXTEND-IA
- SWIFT-PRIME
- REVASCAT

2015



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JANUARY 1, 2015

VOL. 372 NO. 1

A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

ORIGINAL ARTICLE

Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke

O.A. Berkhemer, F
P.J. Nederko
G.J. Lycklama à Nije
E.J. van Dijk, J. de Vri
R.J. Dallinga, M.C.
A.V. Tielbeek, H.M
H.A. Marqueri
W.H. van Zwam, Y.

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. Dowlathshahi, 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*

emic Stroke
lection

... 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. Steinfurt, 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*

ORIGINAL ARTICLE

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. Urta, 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*

ESTABLISHED IN 1812

JUNE 11, 2015

VOL. 372 NO. 24

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*

Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials



HERMES meta-analysis

The Thrombolysis in Cerebral Infarction (TICI) Score

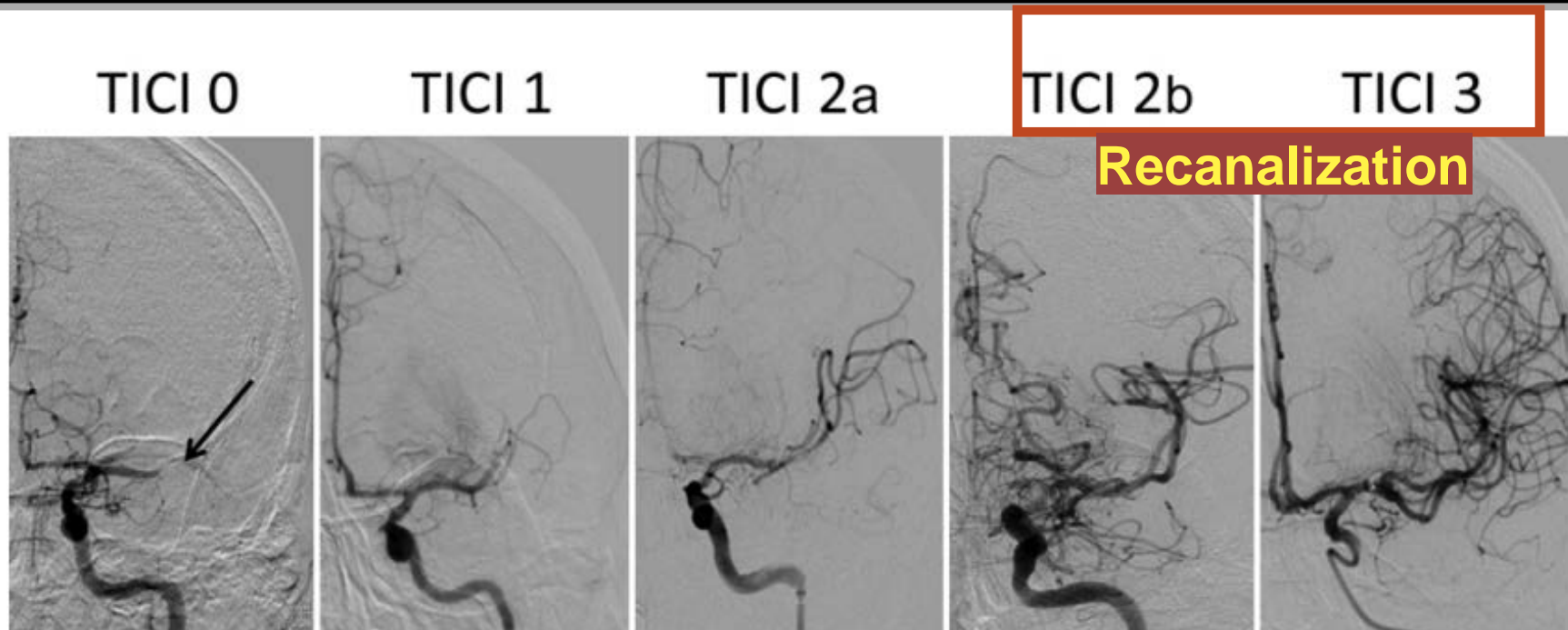
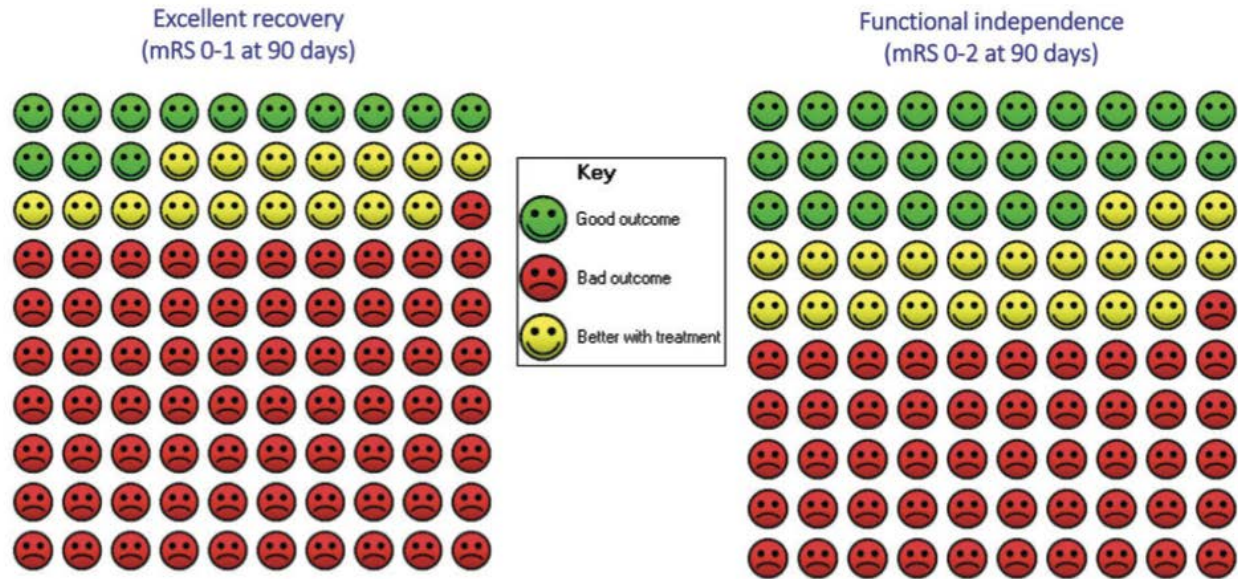


FIG. 2. Examples of the TICI score in a case of proximal MCA occlusion. From left to right: TICI 0 shows no recanalization/reperfusion of the primary occluded vessel (arrow). TICI 1 shows partial reperfusion beyond the initial occlusion but not filling of distal MCA branches. TICI 2a and TICI 2b correspond to partial (< 50%) and near-complete (> 50% but less than full) reperfusion beyond the occlusion site, respectively. TICI 3 indicates complete reperfusion of the entire MCA territory.

Recanalization= 71%

Endovascular Treatment effect

Figure 2. Functional outcomes in the pooled analysis of EVT trials.

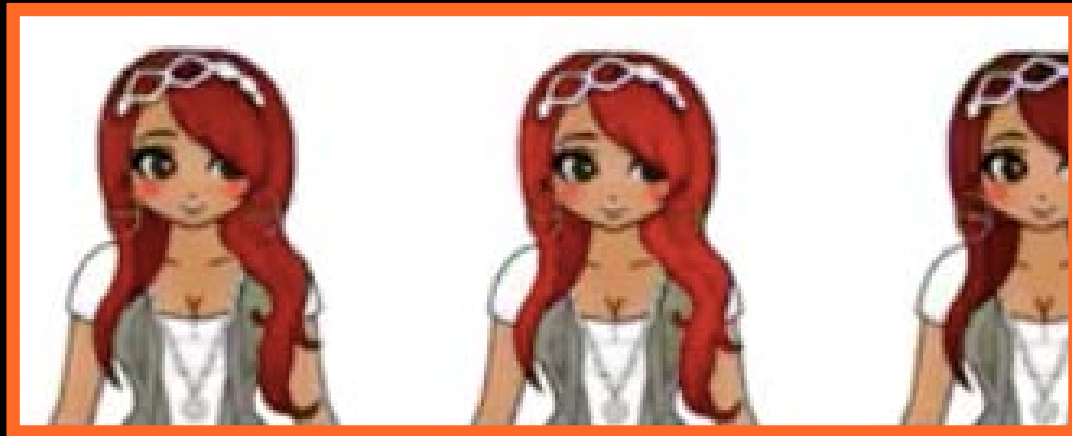


Excellent recovery (mRS 0-1 at 90 days): In the control group 13 out of 100 patients would gain independence at 90 days (mRS 0-1), compared to 29 (95% CI 23 to 35) out of 100 for the intervention group.

Functional independence (mRS 0-2 at 90 days): In the control group 27 out of 100 patients would achieve independence at 90 days (mRS 0-2) compared to 49 (95% CI 43-56) out of 100 for the intervention group.

Functional independence at 3 months
49 pt (endovascular) Vs **27** pt (control)

NNT to reduce disability

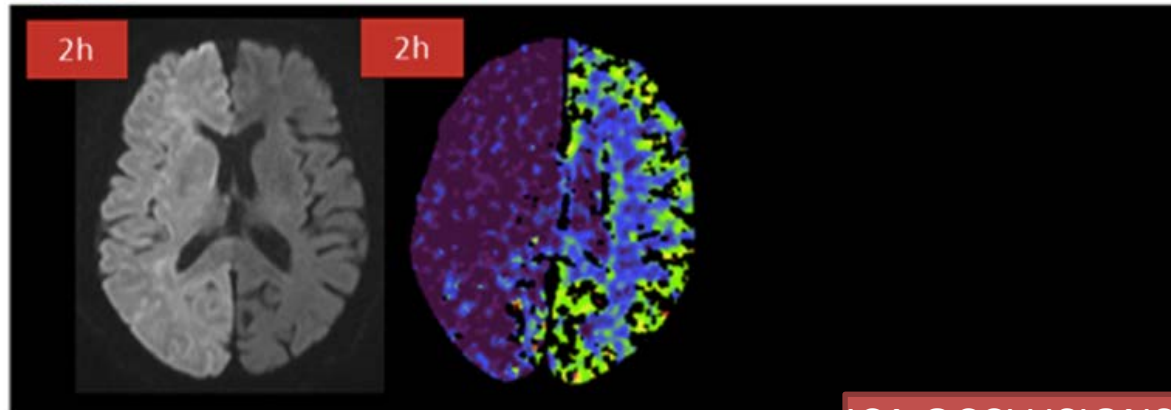


2.6!!

Time is still BRAIN,
but **collaterals** set the PACE!

Variable velocities of infarcted growth

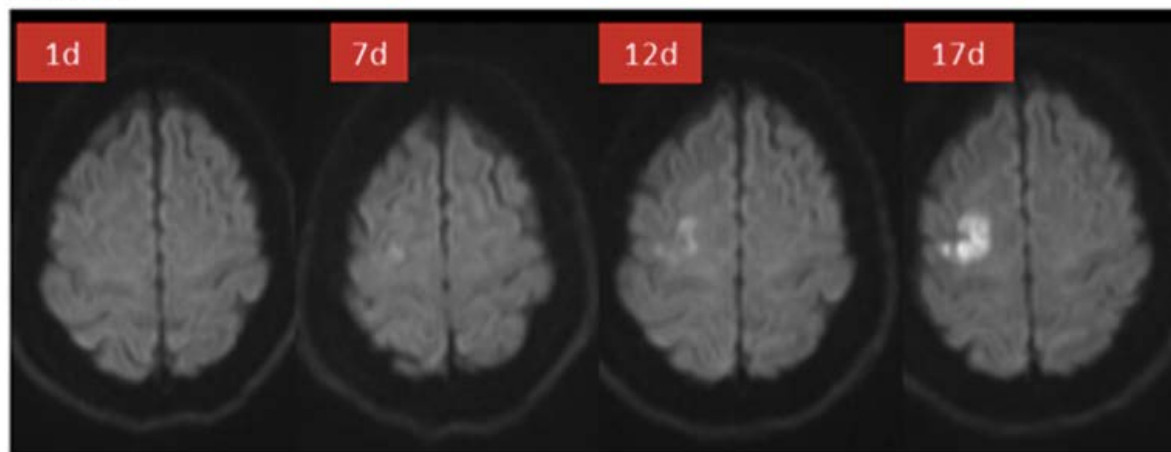
Patient A



>460 billion
neurons/min

ICA OCCLUSIONS

Patient B



≈9000
neurons/min

Impact of collateral flow

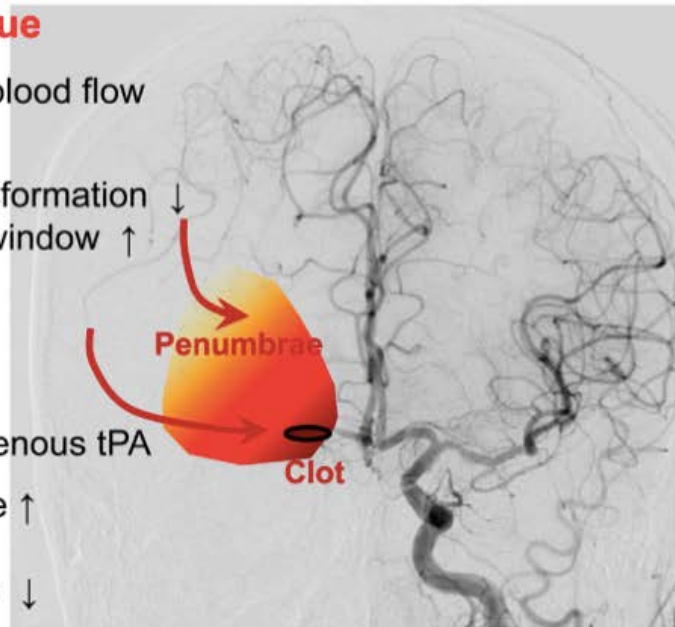
Collateral flow to

(a) Penumbral tissue

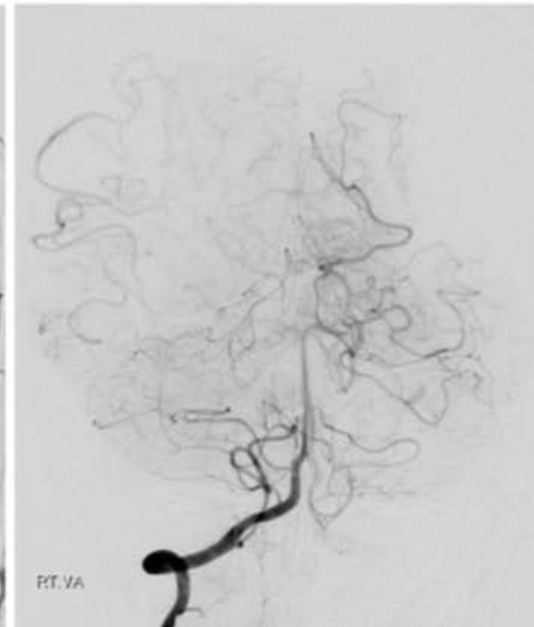
- Maintain cerebral blood flow
- Infarct growth ↓
- Hemorrhagic transformation ↓
- Therapeutic time window ↑

(b) Clot

- Deliver endo/exogenous tPA
- Recanalization rate ↑
- Reocclusion ↓
- Instant thrombosis ↓

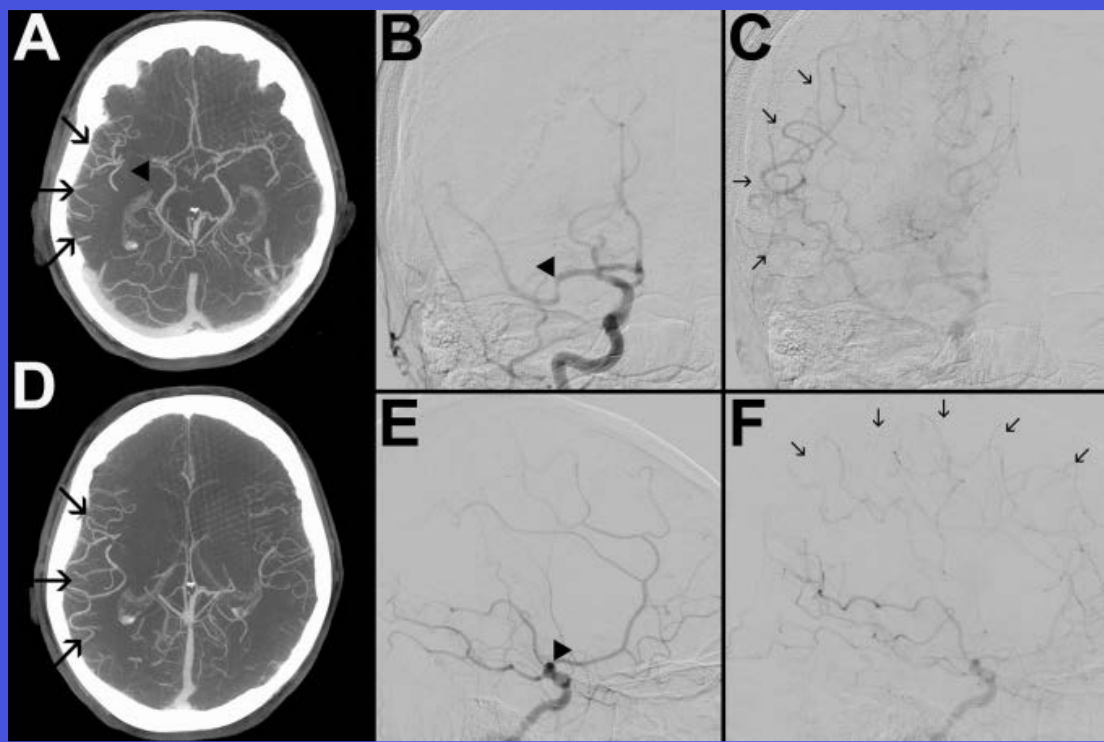


Contralateral carotid injection

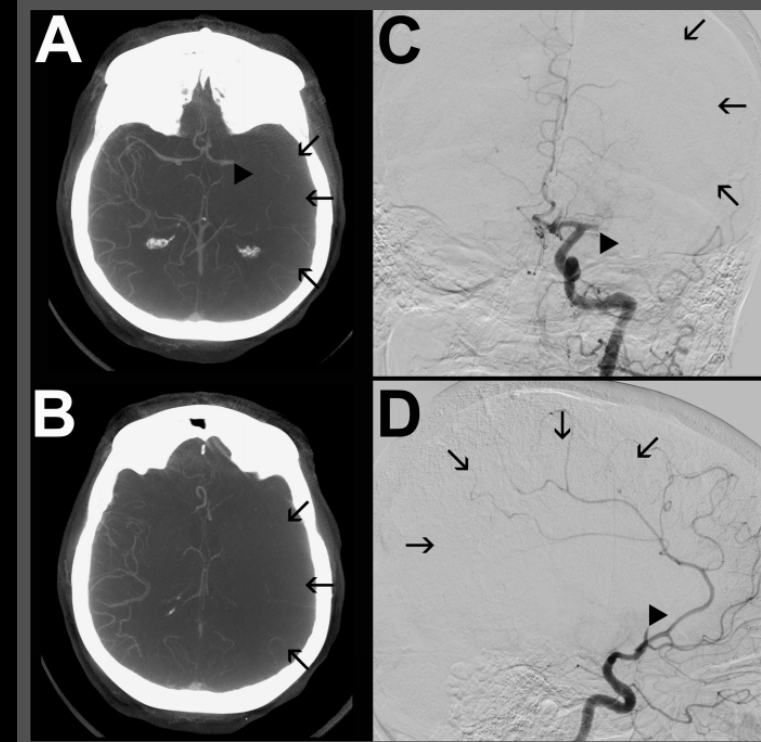


Vertebral injection

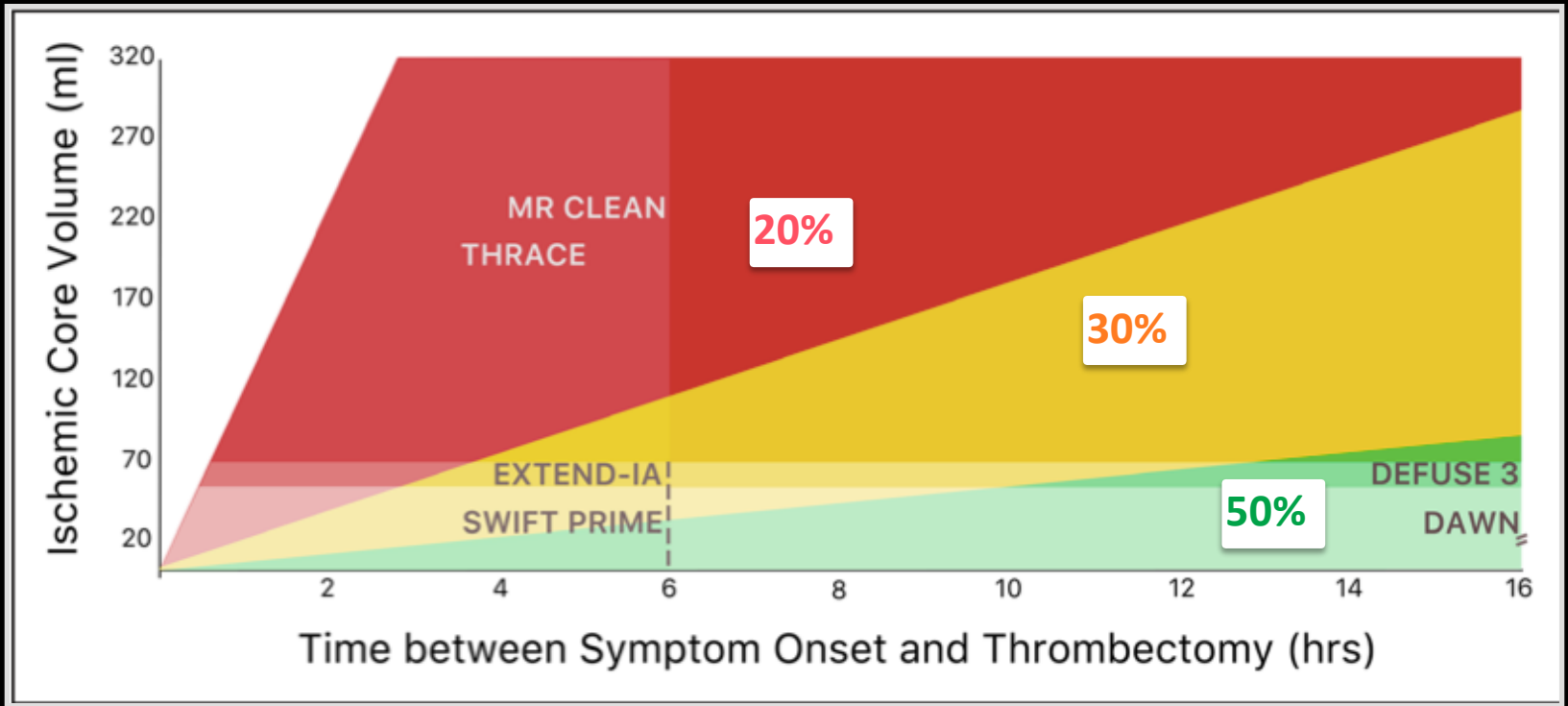
Good Collateral



Poor Collateral



Estimated infarct growth of patients with ICA or MCA occlusions



DAWN & DEFUSE 3 Trials

Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct

R.G. Nogueira, A.P. Jadhav, D.C. Haussen, A. Bonafe, R.F. Budzik, P. Bhuva, D.R. Yavagal, M. Ribo, C. Cognard, R.A. Hanel, C.A. Sila, A.E. Hassan, M. Millan, E.I. Levy, P. Mitchell, M. Chen, J.D. English, Q.A. Shah, F.L. Silver, V.M. Pereira, B.P. Mehta, B.W. Baxter, M.G. Abraham, P. Cardona, E. Veznedaroglu, F.R. Hellinger, L. Feng, J.F. Kirmani, D.K. Lopes, B.T. Jankowitz, M.R. Frankel, V. Costalat, N.A. Vora, A.J. Yoo, A.M. Malik, A.J. Furlan, M. Rubiera, A. Aghaebrahim, J.-M. Olivot, W.G. Tekle, R. Shields, T. Graves, R.J. Lewis, W.S. Smith, D.S. Liebeskind, J.L. Saver, and T.G. Jovin, for the DAWN Trial Investigators*

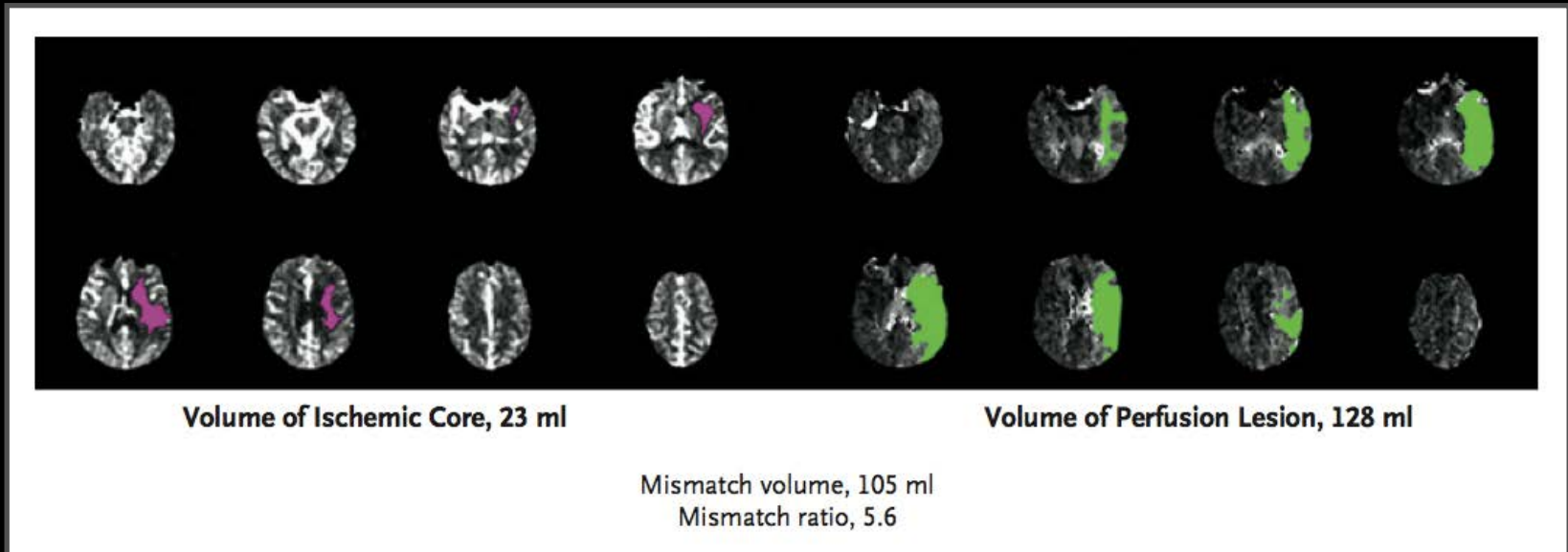
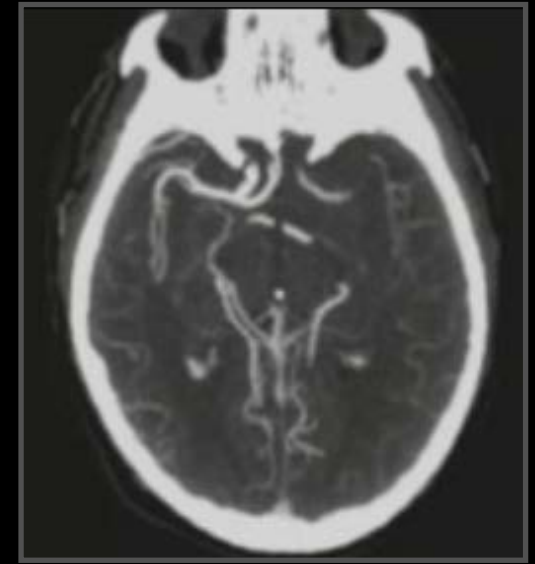
Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging

G.W. Albers, M.P. Marks, S. Kemp, S. Christensen, J.P. Tsai, S. Ortega-Gutierrez, R.A. McTaggart, M.T. Torbey, M. Kim-Tenser, T. Leslie-Mazwi, A. Sarraj, S.E. Kasner, S.A. Ansari, S.D. Yeatts, S. Hamilton, M. Mlynash, J.J. Heit, G. Zaharchuk, S. Kim, J. Carrozzella, Y.Y. Palesch, A.M. Demchuk, R. Bammer, P.W. Lavori, J.P. Broderick, and M.G. Lansberg, for the DEFUSE 3 Investigators*

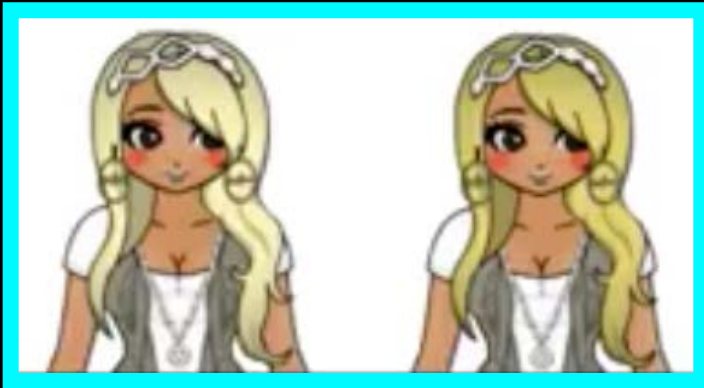
N Engl J Med 2018;378:11-21.

N Engl J Med 2018;378:708-18.

Occlusion of ICA or Proximal MCA and **RAPID mismatch profile**



NNT from DAWN & DEFUSE 3 trials



Reduce Disability



Functional Independence

On scene

- Manage CABs (chest compression-airway -breathing)

- **Stroke ? BEFAST**

- **Large Vessel Occlusion stroke? SNOW scale**

- **Last known well ?**

- Medical problems (old stroke?)

- Any recent surgery?

On scene

- Medication lists (**on Blood thinners?**) (**Taking it?**)

- Bring the **witness** with you or get the cell phone number

- Baseline functional status
- Any advance directive



Pre-notification is critical !

STROKE REPORT

- Age
- Gender
- Last known well
- SNOW score
- Blood pressure
- Glucose
- Anticoagulants
- Contact number
- E.T.A.

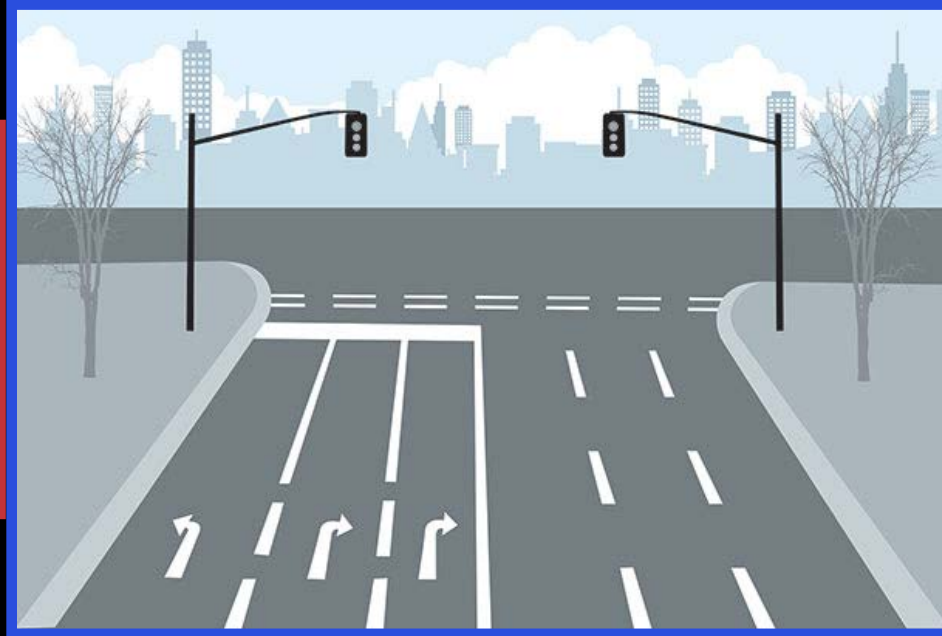
ANTICOAGULANTS

- Coumadin (Warfarin)
- Heparin
- Lovenox (Enoxaparin)
- Pradaxa (Dabigatran)
- Xarelto (Rivaroxiban)
- Eliquis (Apixaban)
- Savaysa (Edoxaban)

Always Pre-Notify!



More likely to receive tPA !!



Drip & Ship Model



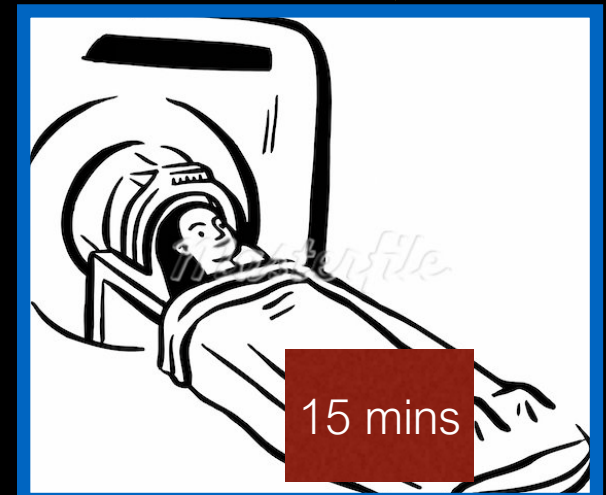
30 mins



45m-2 hrs



5-10 mins



Mothership model



30-40 mins

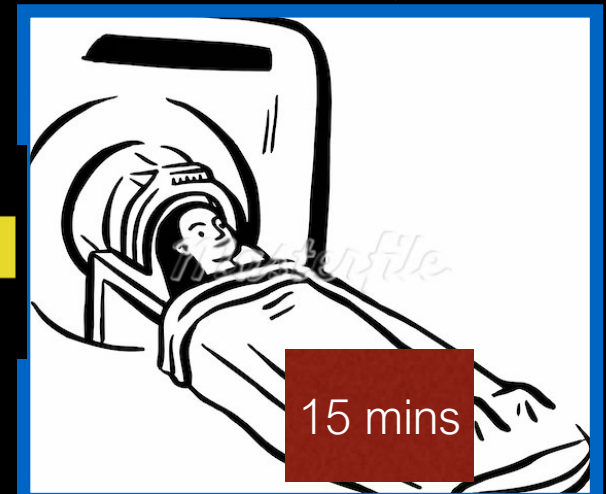


tPA



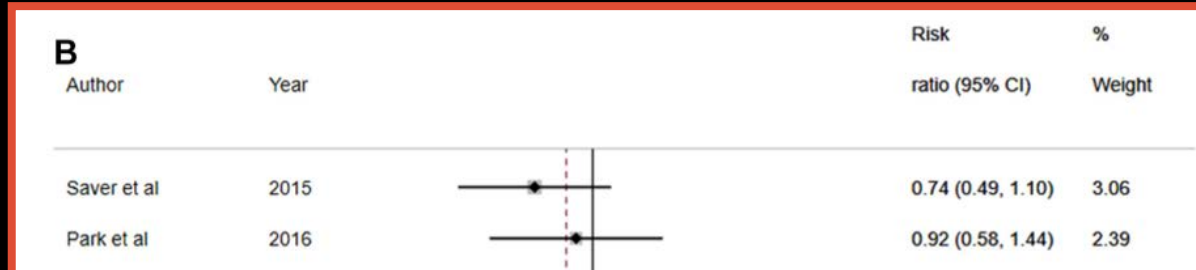
Onset to Groin = 1.5 hrs

5-10 mins

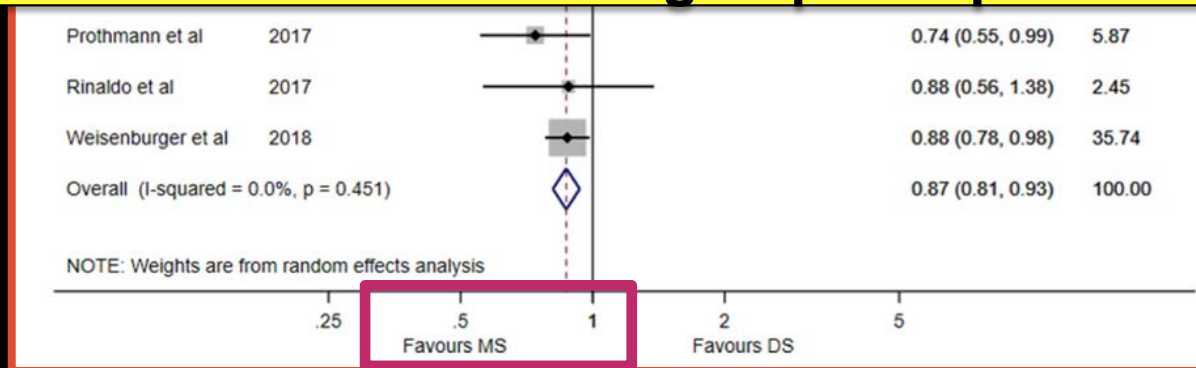


15 mins

Mothership versus drip and ship for thrombectomy in patients who had an acute stroke: a systematic review and meta-analysis



Mothership Patient may have better 90-days outcomes than those receiving drip & ship Rx!



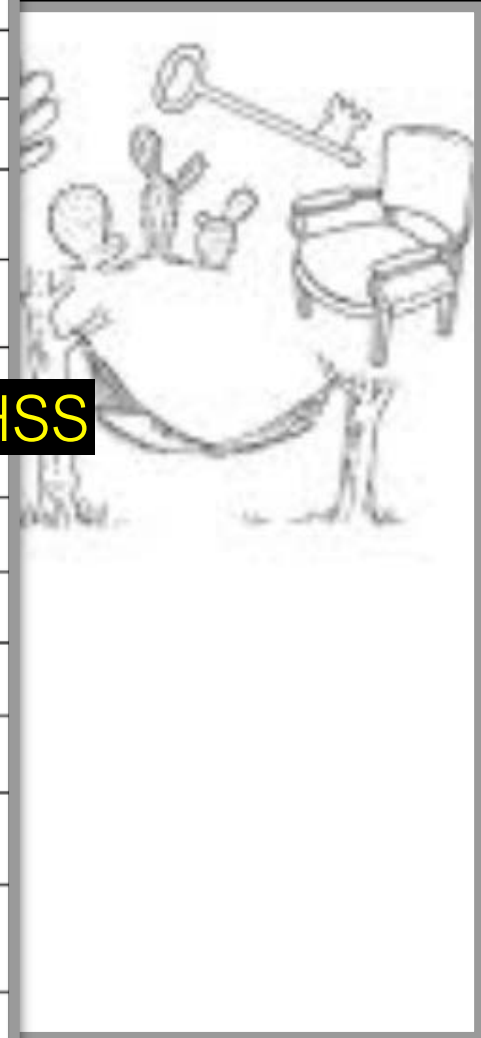
Mothership



Earlier Groin puncture time= **83** mins
 Earlier tPA administration= **16** mins

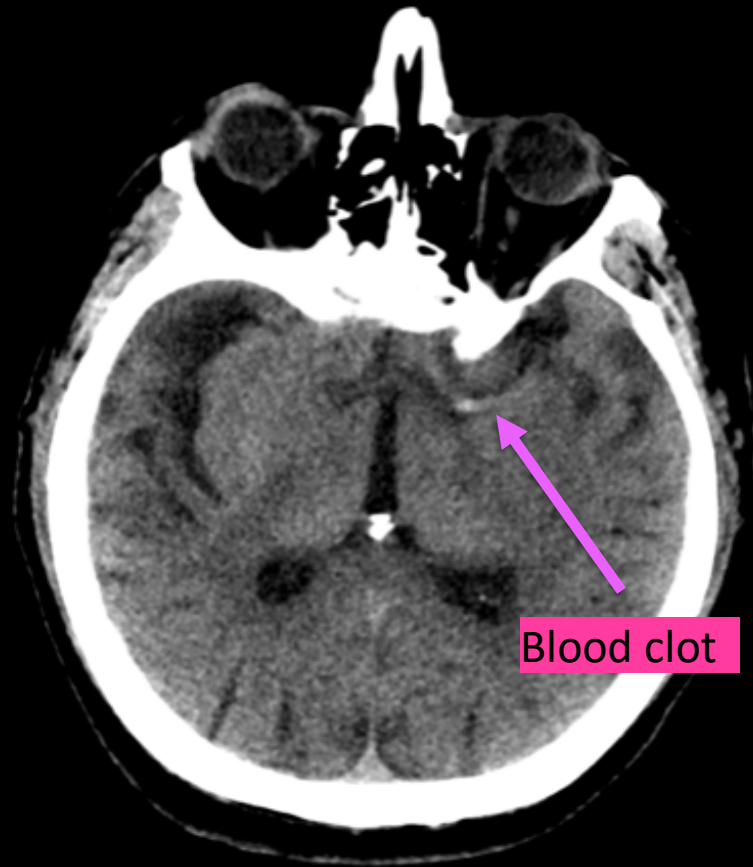


NIH Stroke Scale

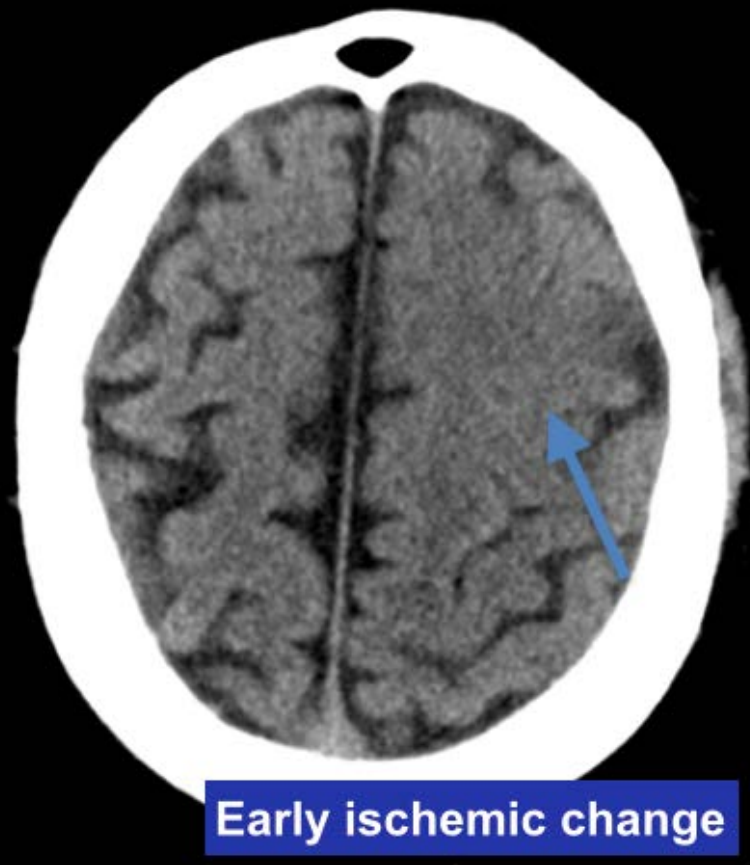


Large stroke = High NIHSS

| Category | Score/Description | Date/Time | Date/Time | Date/Time | Date/Time | Date/Time |
|---|---|-----------|-----------|-----------|-----------|-----------|
| | | Initials | Initials | Initials | Initials | Initials |
| 1a. Level of Consciousness (Alert, drowsy, etc.) | 0 = Alert 1 = Drowsy 2 = Stuporous 3 = Coma | | | | | |
| 1b. LOC Questions (Month, age) | 0 = Answers both correctly 1 = Answers one correctly 2 = Incorrect | | | | | |
| 1c. LOC Commands (Open/close eyes, make fist/let go) | 0 = Obeys both correctly 1 = Obeys one correctly 2 = Incorrect | | | | | |
| 2. Best Gaze (Eyes open - patient follows examiner's finger or face) | 0 = Normal 1 = Partial gaze palsy 2 = Forced deviation | | | | | |
| 3. Visual Fields (Introduce visual stimulus/threat to pt's visual field quadrants) | 0 = No visual loss 1 = Partial Hemianopia 2 = Complete Hemianopia 3 = Bilateral Hemianopia (Blind) | | | | | |
| 4. Facial Paresis (Show teeth, raise eyebrows and squeeze eyes shut) | 0 = Normal 1 = Minor 2 = Partial 3 = Complete | | | | | |
| 5a. Motor Arm - Left 5b. Motor Arm - Right (Elevate arm to 90° if patient is sitting, 45° if supine) | 0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp) | Right | | | | |
| 6a. Motor Leg - Left 6b. Motor Leg - Right (Elevate leg 30° with patient supine) | 0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp) | Left | | | | |
| | | Right | | | | |
| 7. Limb Ataxia (Finger-nose, heel down shin) | 0 = No ataxia 1 = Present in one limb 2 = Present in two limbs | | | | | |
| 8. Sensory (Pin prick to face, arm, trunk, and leg - compare side to side) | 0 = Normal 1 = Partial loss 2 = Severe loss | | | | | |
| 9. Best Language (Name item, describe a picture and read sentences) | 0 = No aphasia 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute | | | | | |
| 10. Dysarthria (Evaluate speech clarity by patient repeating listed words) | 0 = Normal articulation 1 = Mild to moderate slurring of words 2 = Near to unintelligible or worse X = Intubated or other physical barrier | | | | | |
| 11. Extinction and Inattention (Use information from prior testing to identify neglect or double simultaneous stimuli testing) | 0 = No neglect 1 = Partial neglect 2 = Complete neglect | | | | | |
| TOTAL SCORE | | | | | | |



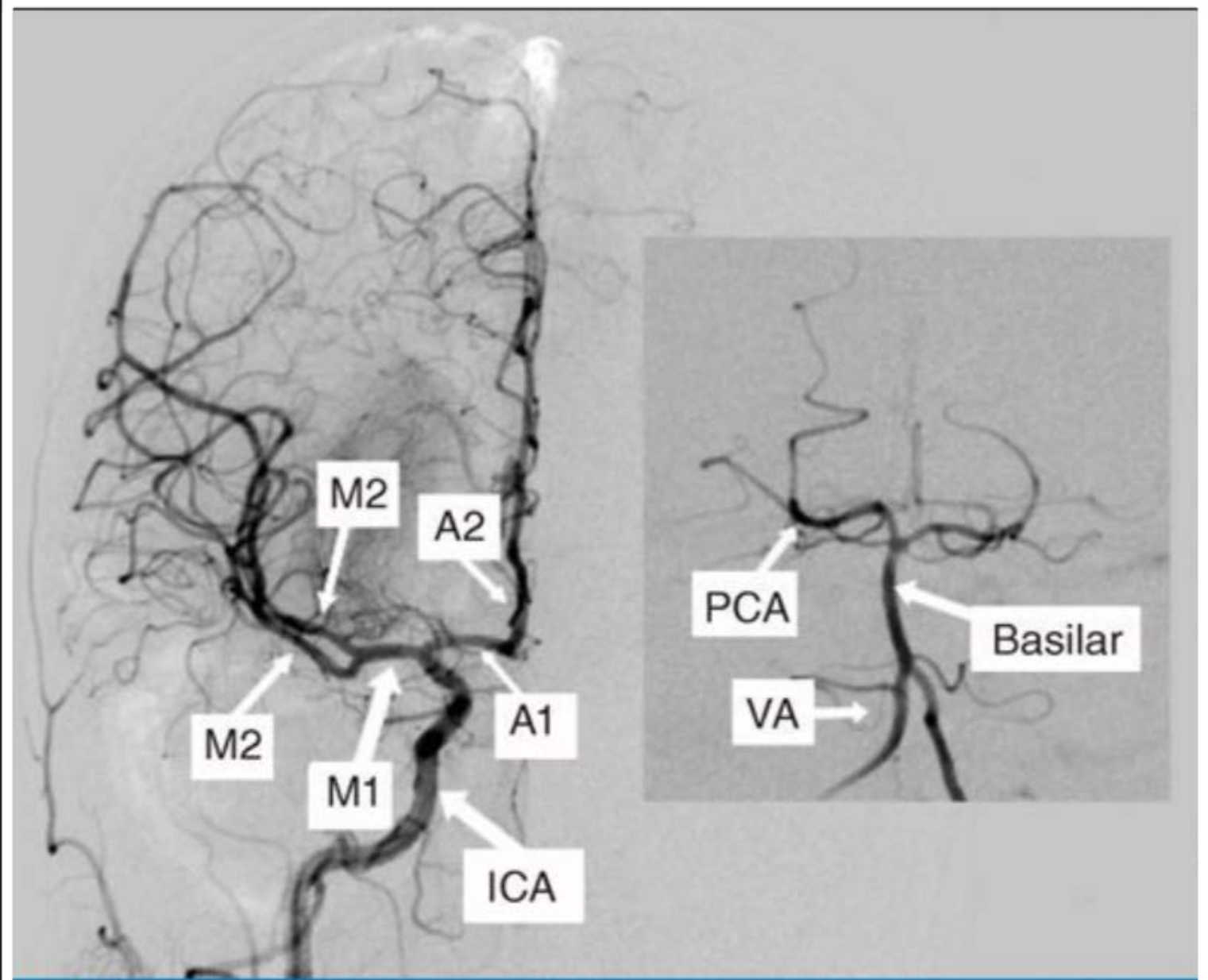
1 hour onset of global aphasia
& right sided weakness



Early ischemic change



Poor collateralization



Blood clots

Stent retriever

2 Passes

POST 6X40 SOLITAIRE/PENUMBRA
LEFT

Full recanalization

Stent retriever

Blood clots



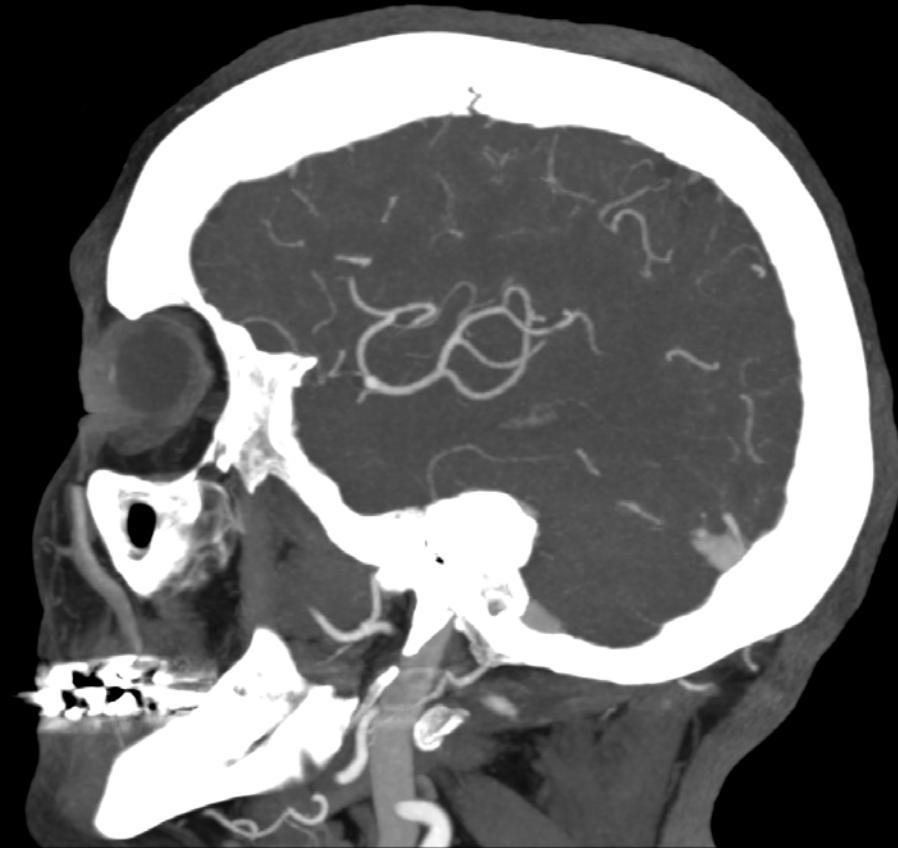
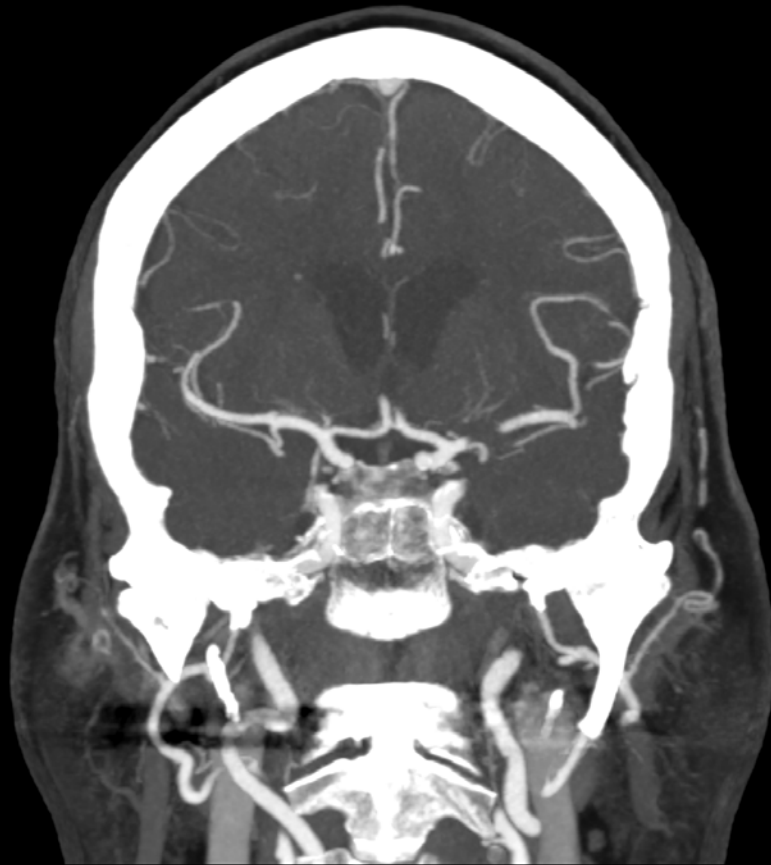
3 days after stroke

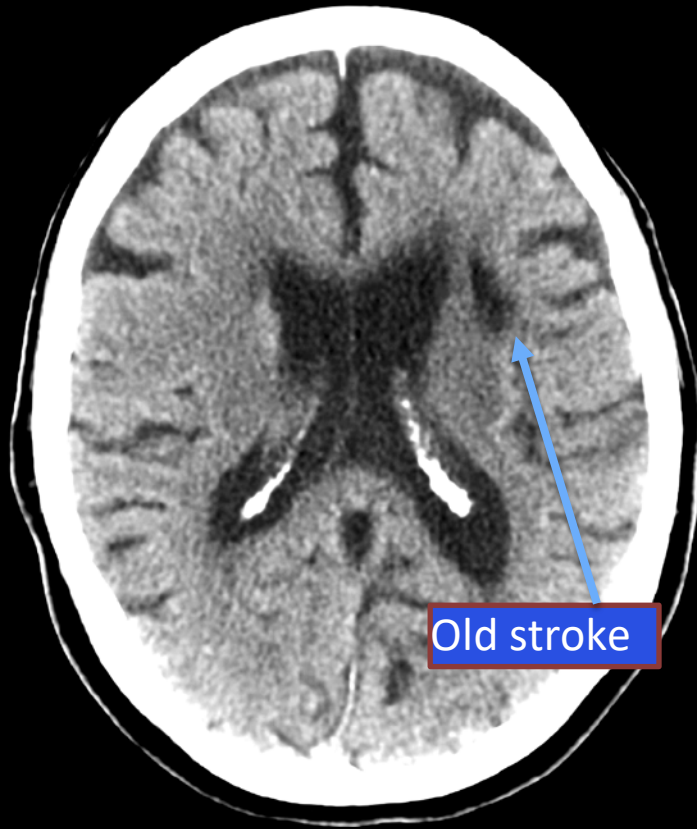
1942 76Y



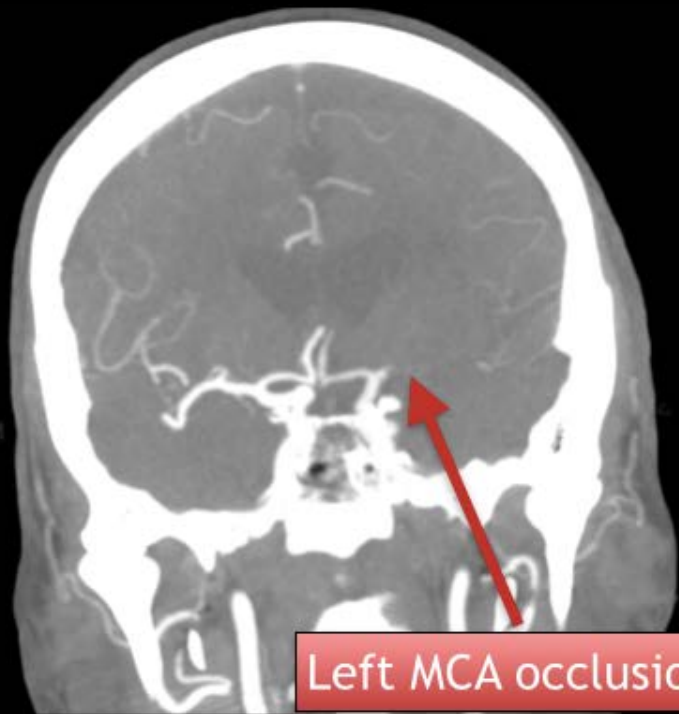
Making sounds
Followed simple commands
Right arm is very weak
Right leg moves spontaneously

Good collaterals

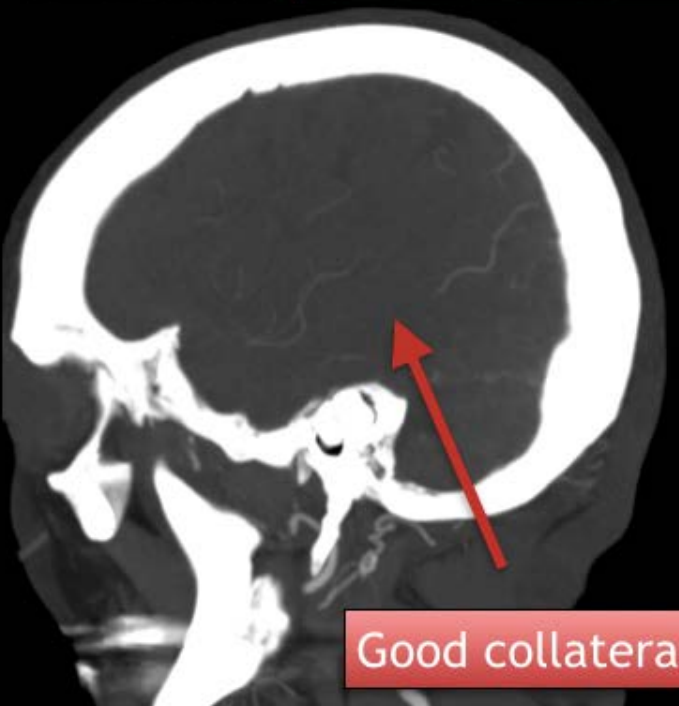




78 years old woman with AF
Unknown onset < 24 hours
Global aphasia
Right sided weakness

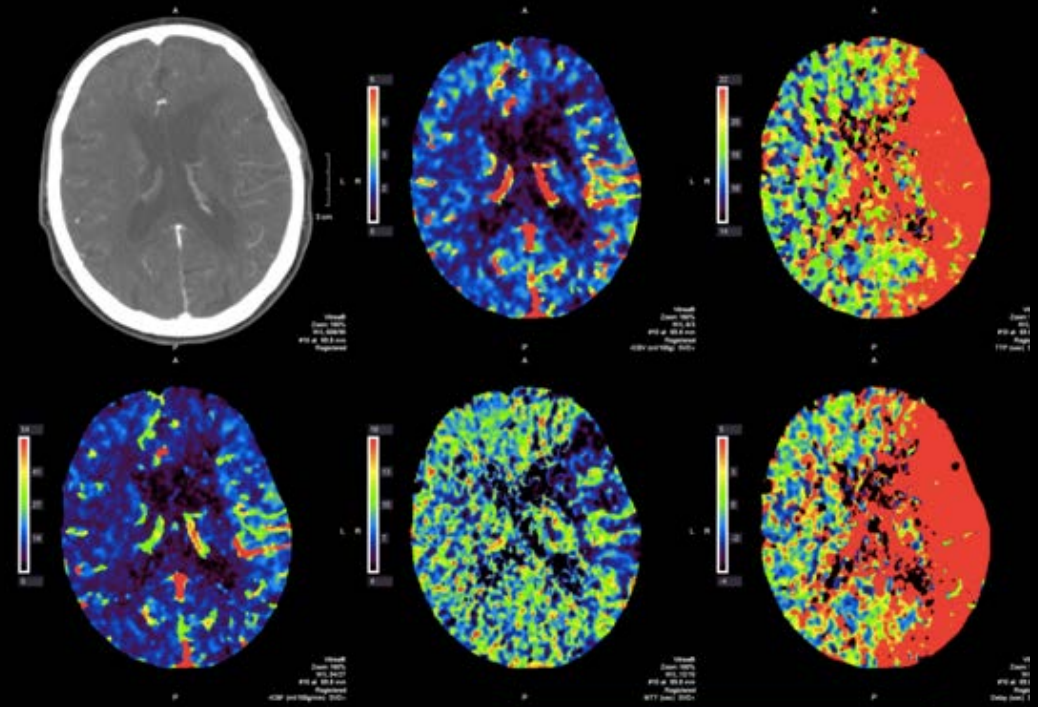


Left MCA occlusion



Good collaterals

CT PERFUSION

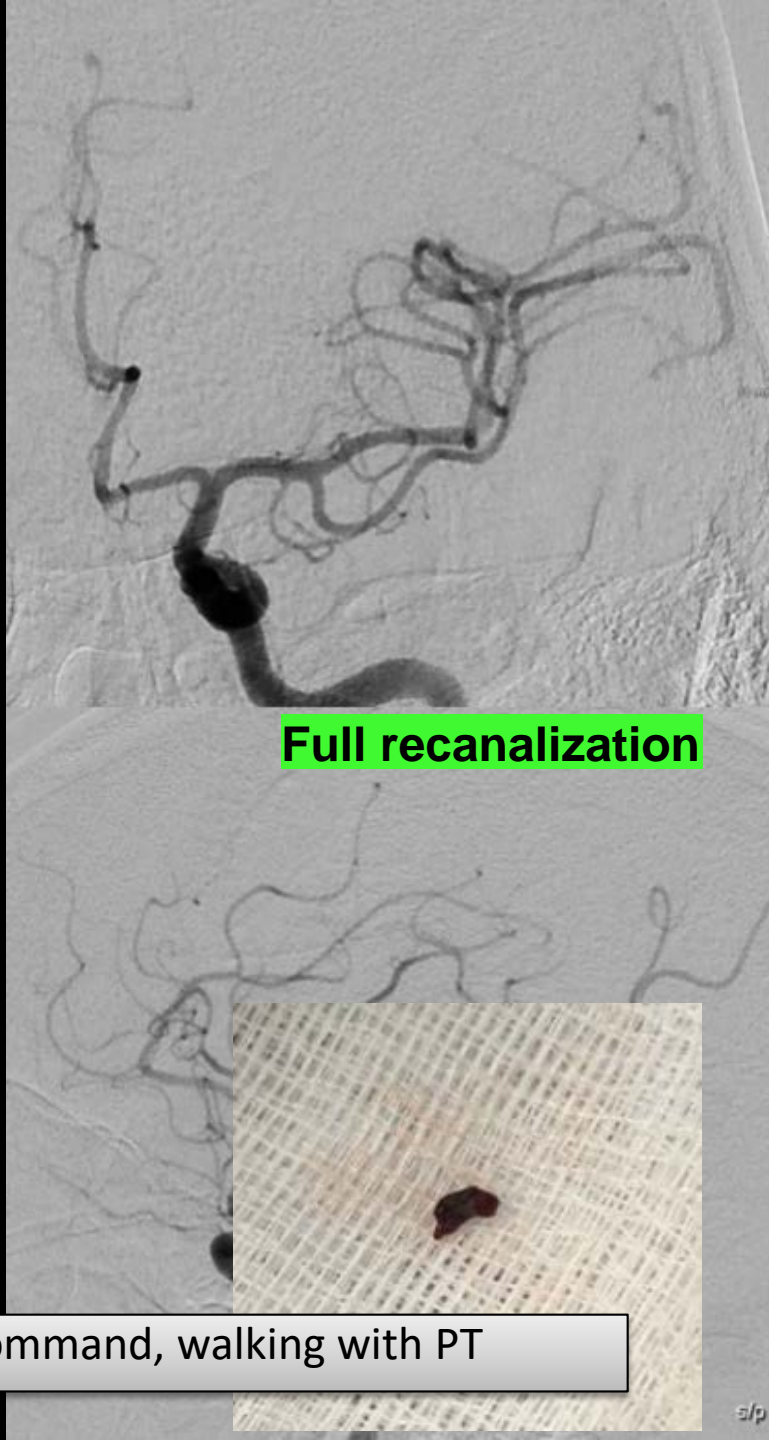


Large penumbra



Left MCA occlusion

2 Passes

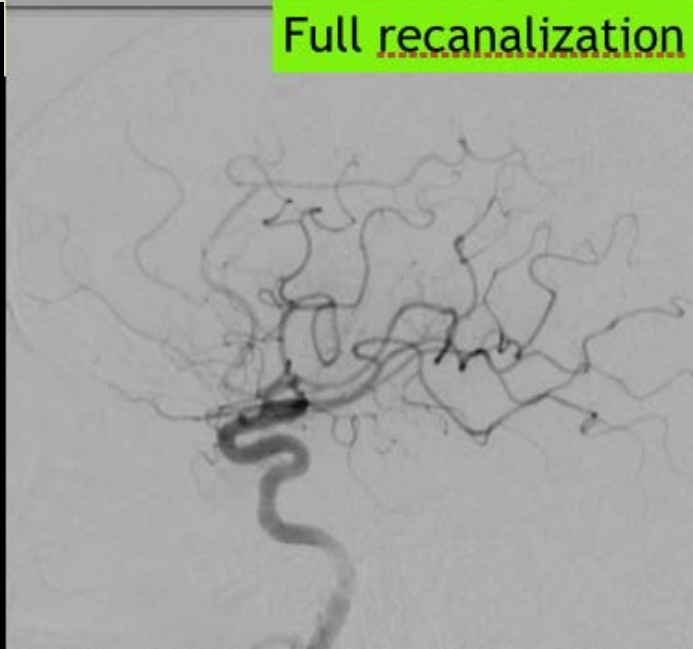
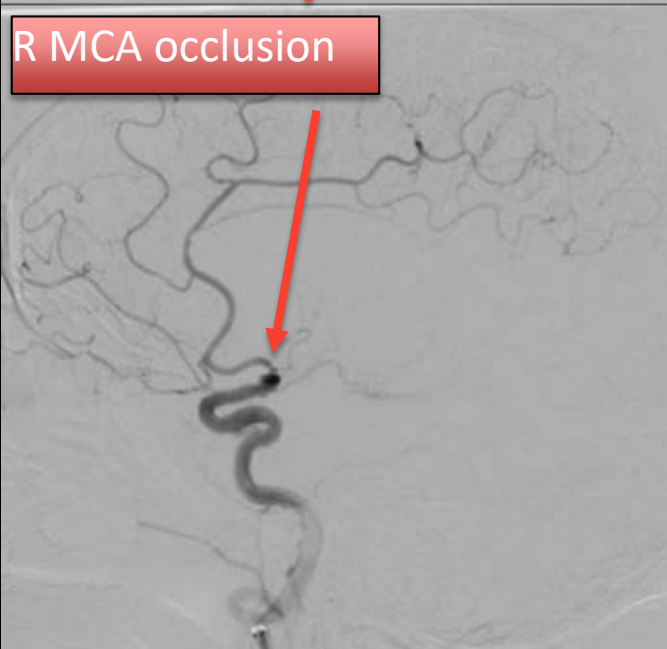


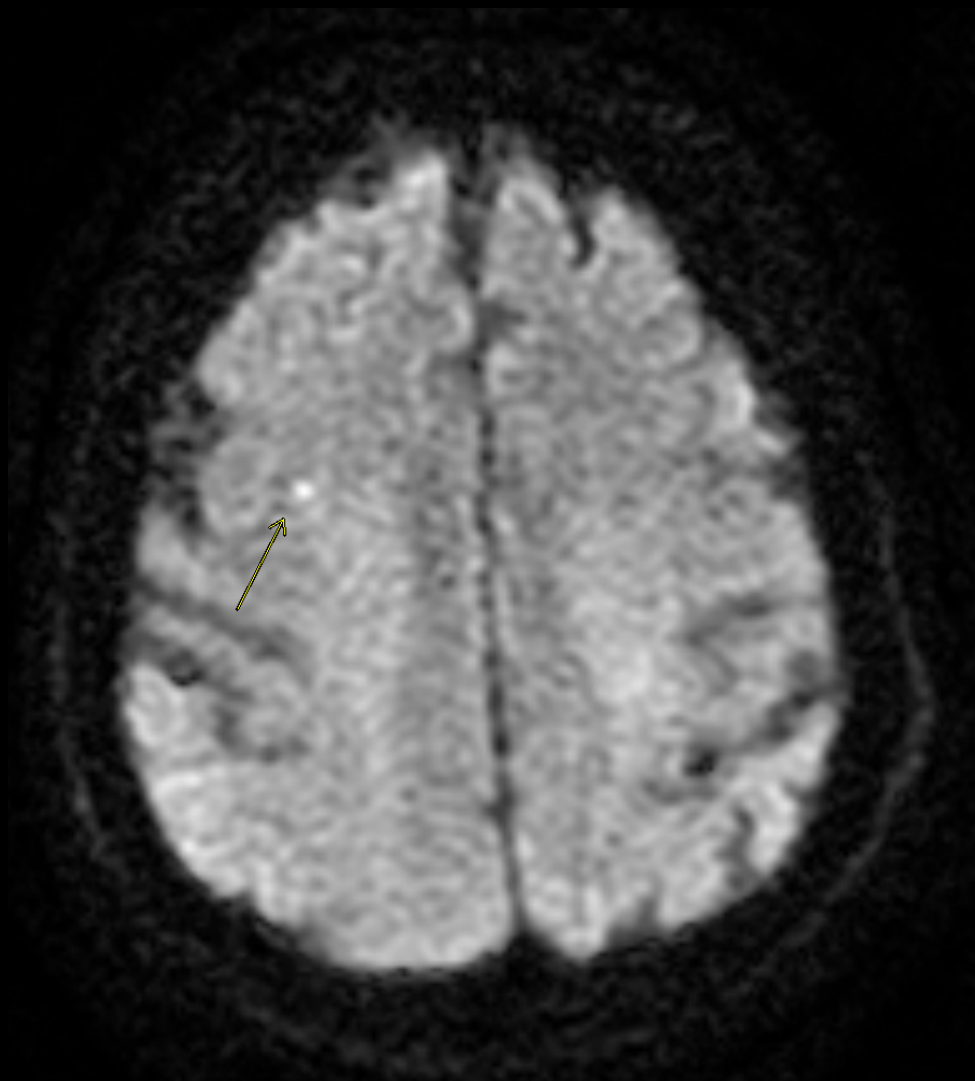
Full recanalization

Next day talking, followed command, walking with PT



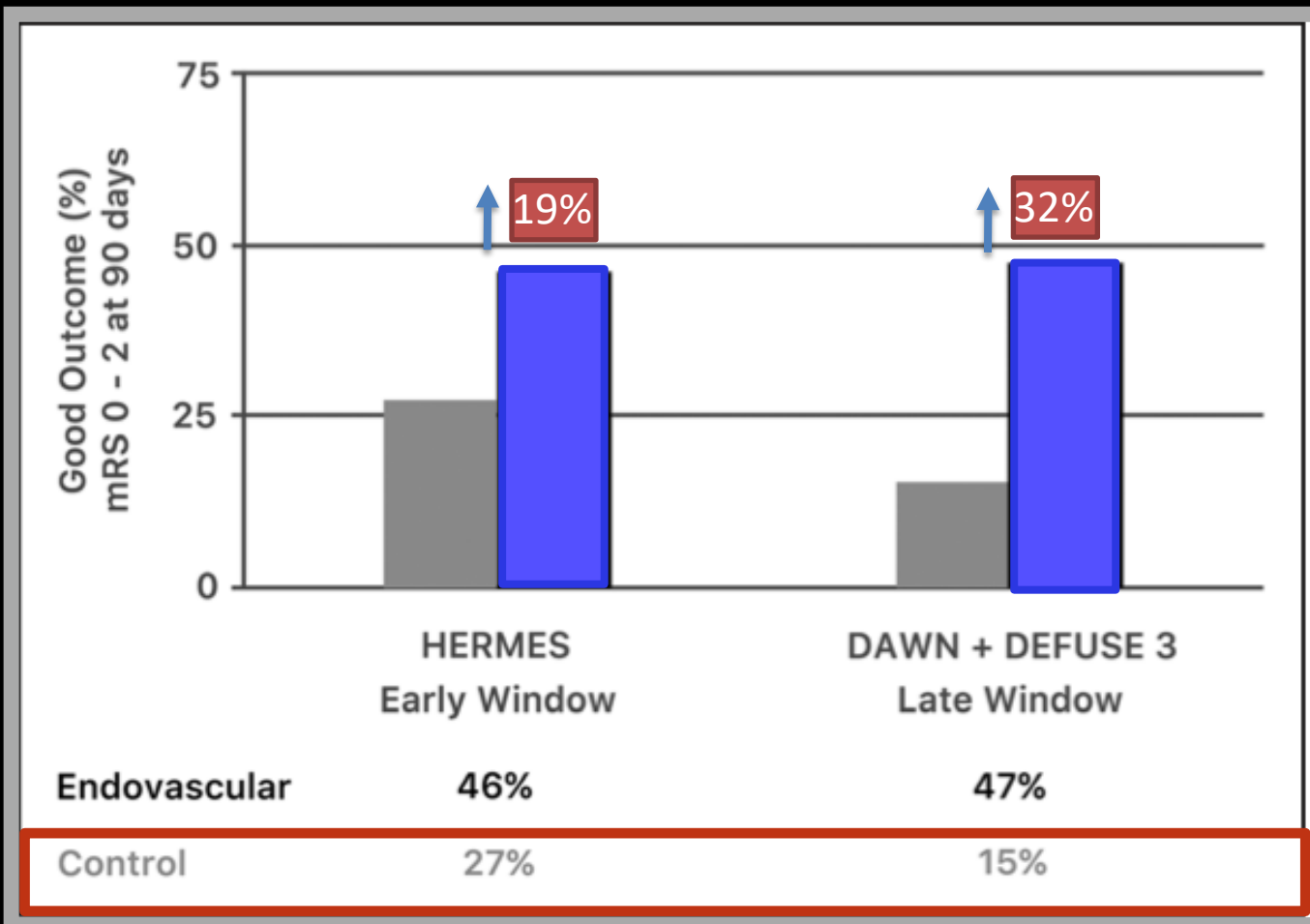
86 years old man with AF, Right MCA (M1) occlusion, NIHSS:23





NIHSS=0

Late Window Paradox



STROKE REPORT

- Age
- Gender
- Last known well
- SNOW score
- Blood pressure
- Glucose
- Anticoagulants
- Contact number
- E.T.A.

ANTICOAGULANTS

- Coumadin (Warfarin)
- Heparin
- Lovenox (Enoxaparin)
- Pradaxa (Dabigatran)
- Xarelto (Rivaroxiban)
- Eliquis (Apixaban)
- Savaysa (Edoxaban)

The SNO Scale is a tool for EMS to utilize to screen for a large vessel occlusion (LVO). If a person has one or more of the following signs, they may have a LVO and should be transported to the nearest Comprehensive Stroke Center or Thrombectomy Capable Stroke Center



S

Speech Nonfluent speech or expressive aphasia

- Ask person to name objects (example: pen or watch)
- *Slurring of words does not count

N

Neglect- *Ignoring one side of the body*

- Touch person on their right arm and then their left arm and then both. Can they feel both sides at the same time?

O

Ocular Deviation- *both eyes are forced to one side*

- Can the person move their eyes all the way to the right and all the way to the left?

B

BALANCE

E

EYES

F

FACE

A

ARMS

S

SPEECH

T

**TERRIBLE
HEADACHE**



**Sudden loss of
balance ?**



**Loss of vision in
one or both
eyes?**



**Face looks
uneven?**



**Arm or leg
weak?**



**Trouble speaking
or seem
confused?**



**Time to call
911!**

KNOW THE SIGNS OF STROKE

Thank you !