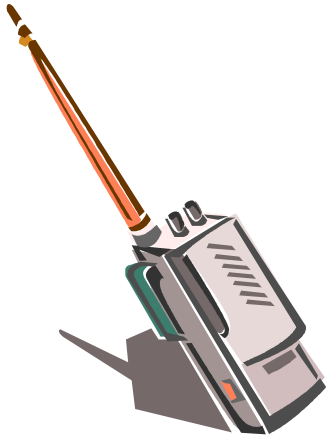


Different Strokes for Different Folks: Case studies in the diagnosis and treatment of acute stroke

Bruce Lo, MD, FACEP

11/12/09

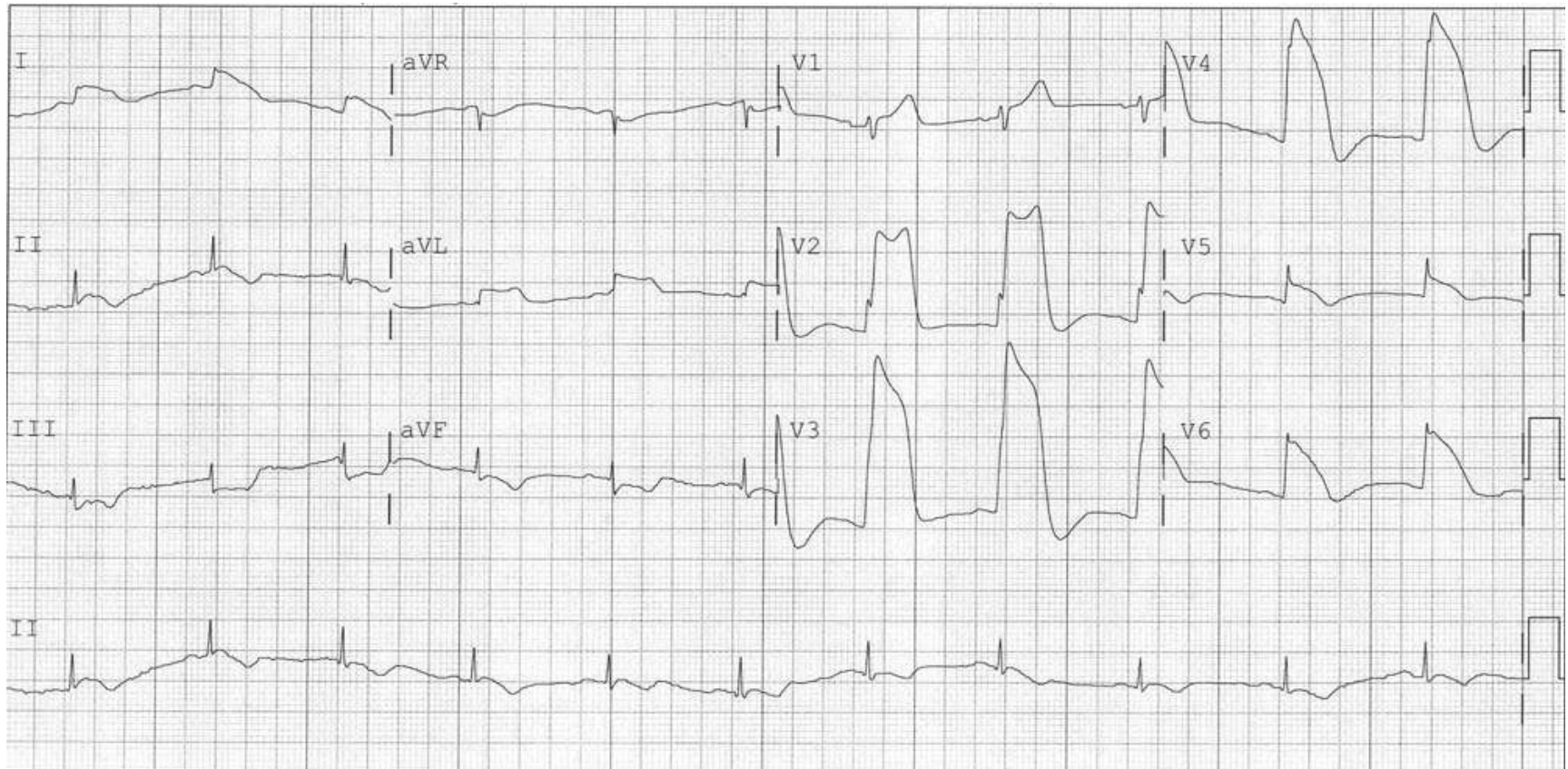
Patient 1



Radio Call:

“55 year old male with substernal chest pain for 2 hours”

No Brainer!



Patient 2



“60 year old female with weakness to left arm and leg for 1 hour”

Patient 3



“35 y/o baby daddy found by girlfriend sleeping with girlfriend’s secret lover....”

Where to send?

- Patient 1: STEMI
 - PCI center?

- Patient 3: Baby Daddy with Knife in back
 - Trauma center?

- Patient 2: Stroke
 - Stroke center?

Objectives



- Review basic pathophysiology of acute stroke (Understand the “Lingo”)
- Discuss evaluation of the acute stroke patient in the prehospital arena
- Review current treatments for acute stroke
- Discuss triage process for acute stroke patients



VIRGINIA STROKE SYSTEMS





VIRGINIA STROKE SYSTEMS





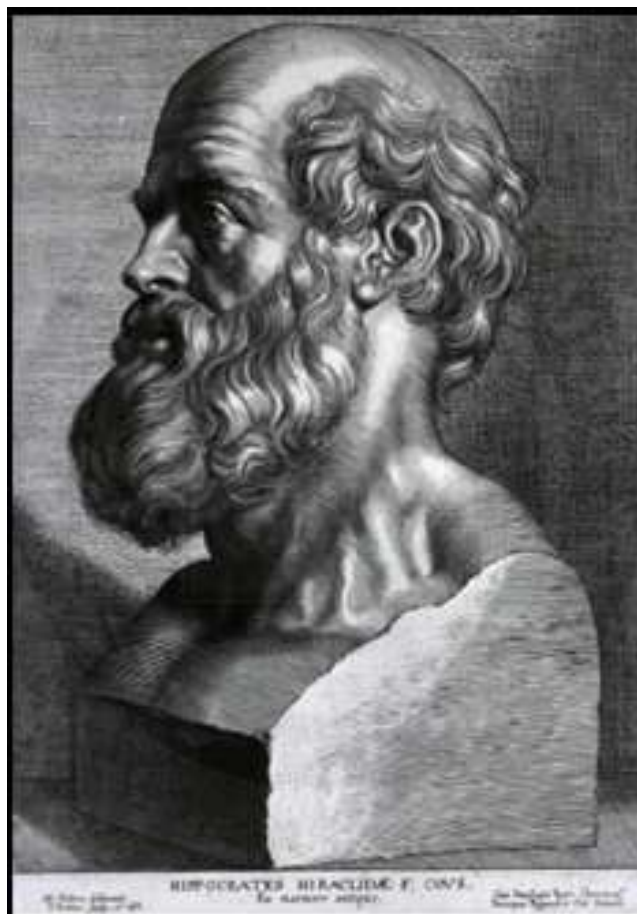
1958-2009

Definition



Stroke: A sudden loss of brain function caused by a blockage or rupture of a blood vessel to the brain.

History



- Hippocrates (460-370 BC)
 - First described stroke
- “Unaccustomed attacks of numbness and anesthesia are signs of impending apoplexy”

Why is it important?

- 3rd leading cause of death
- Leading cause of disability
 - 26% needs assistance
 - 26% needs long term placement
 - 33% have depression
- 20% arrive within 2hrs of onset
 - 1/3 receive treatment
- Direct/Indirect cost: \$70 billion/year (2009)

TIA (aka mini-stroke)



- Resolution of symptoms within 24 hours
 - Controversial
- 15% strokes preceded by TIA
 - 1/3 of TIAs are actual strokes (by MRI)
- After TIA, up to 17% will have a stroke
 - Up to 5% will have within 2 days
- Up to 25% will die within 1 year

Stroke Treatment

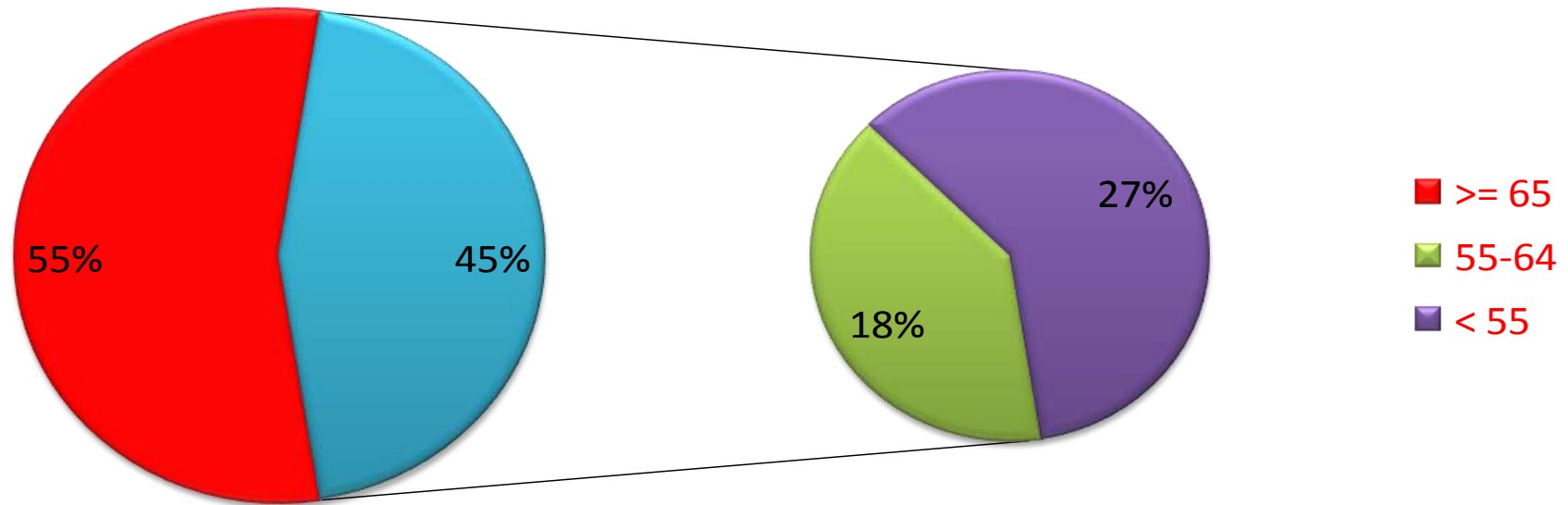


- Acute Treatment Time Frame
 - Within 3 hours
 - Within 6 hours
- Prevention

Who is at risk?

- Anyone can get stroke

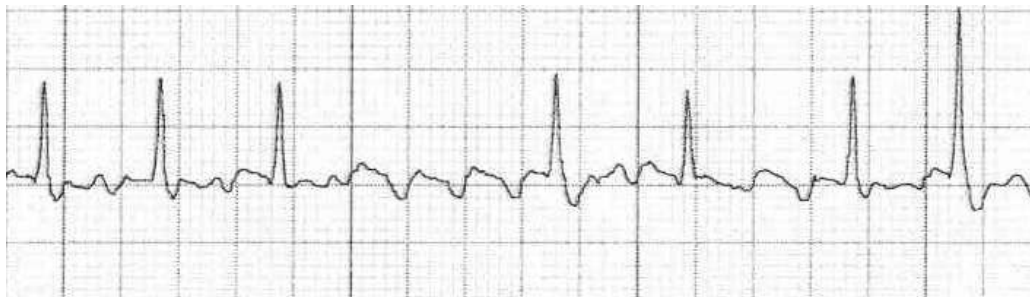
Age



Risk Factors



VIRGINIA STROKE SYSTEMS



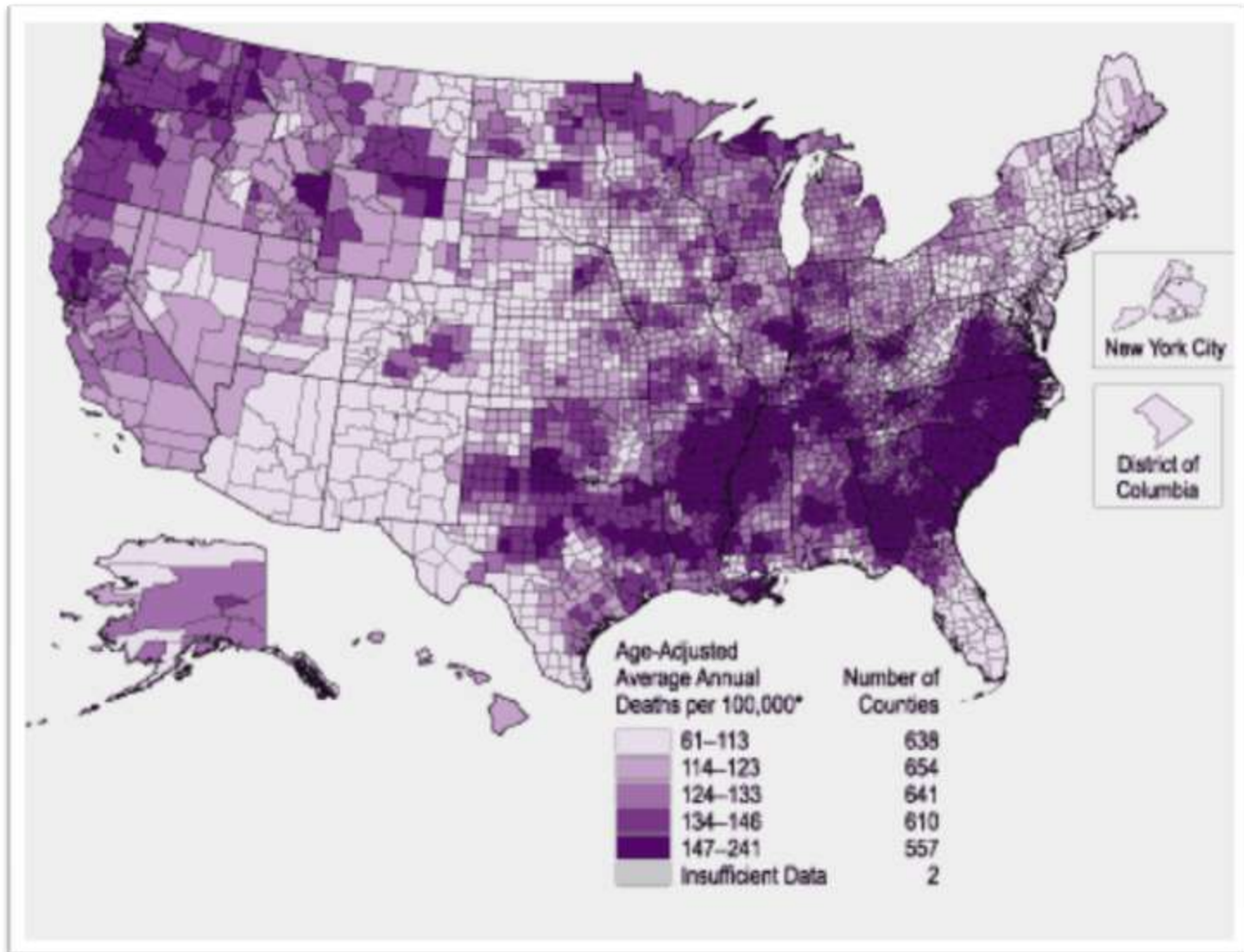
Other Risk Factors

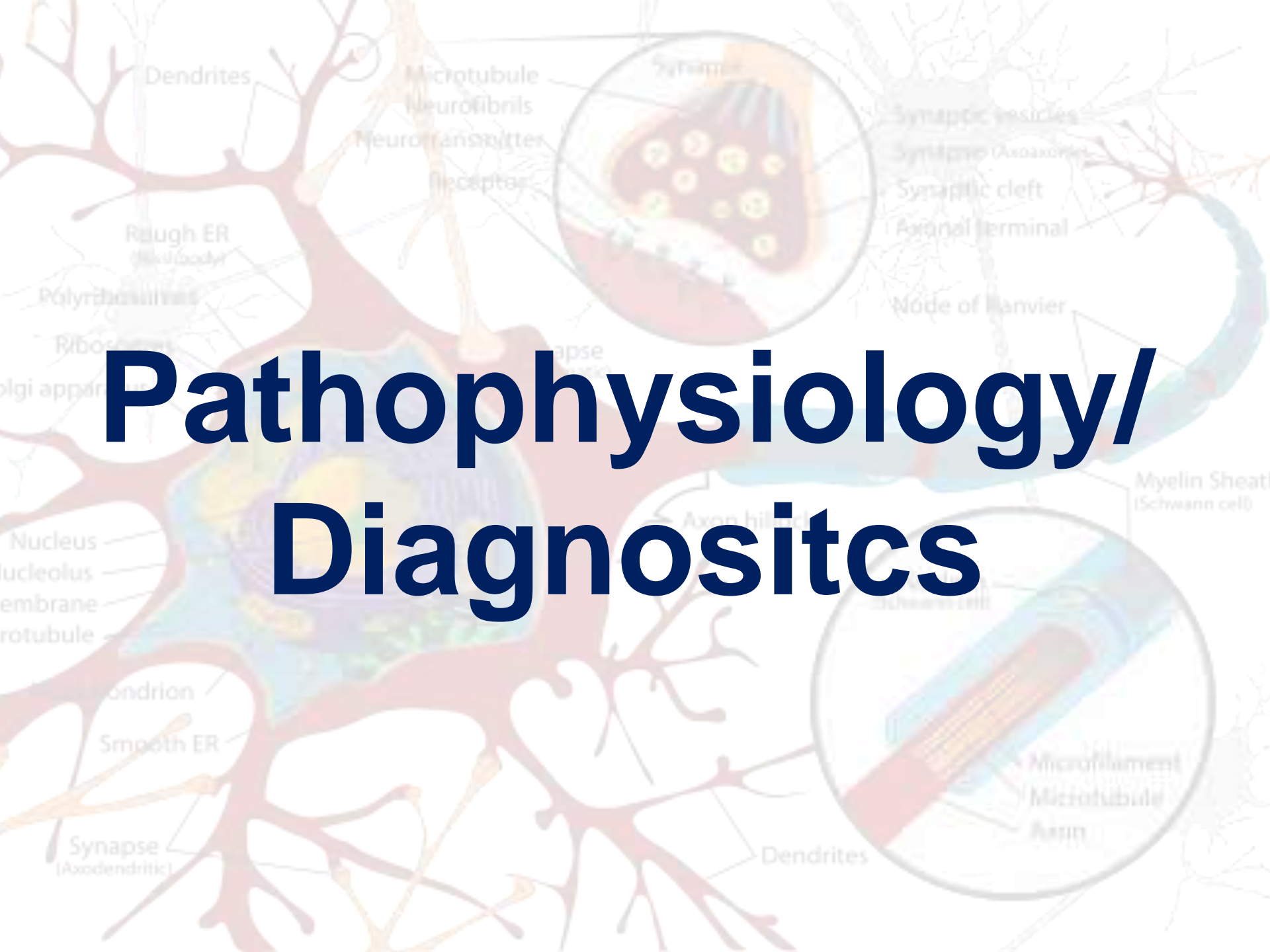
- Sickle cell disease
- Polycythemia
- Congenital heart disease (PFO)
- Pregnancy/Birth Control
- Hypercoagulable states
- Elevated Lipids
- Obesity
- Illicit drugs

Stroke Belt



VIRGINIA STROKE SYSTEMS





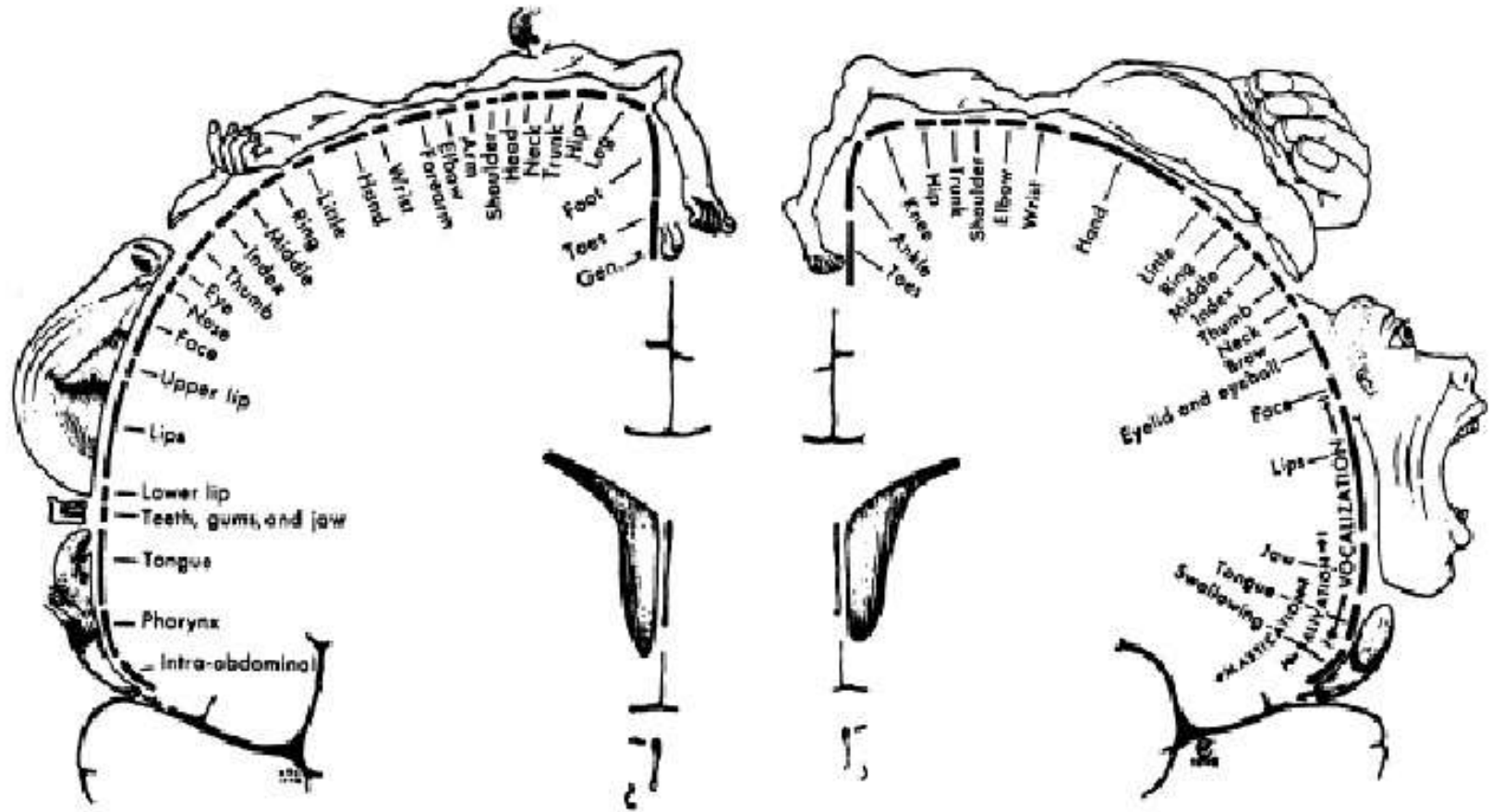
Pathophysiology/ Diagnosites

Brain consumption

- 2% of body mass
- Metabolic Demand:
 - 15% of cardiac output
 - 20% of oxygen consumption
 - 25% of glucose consumption
- Failure to meet: loss of consciousness
 - Minutes to irreversible neuronal death

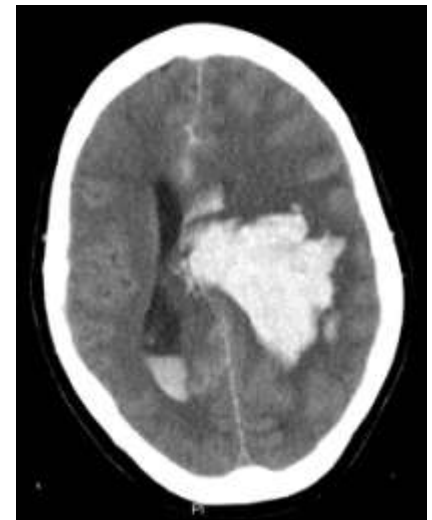


Homunculus

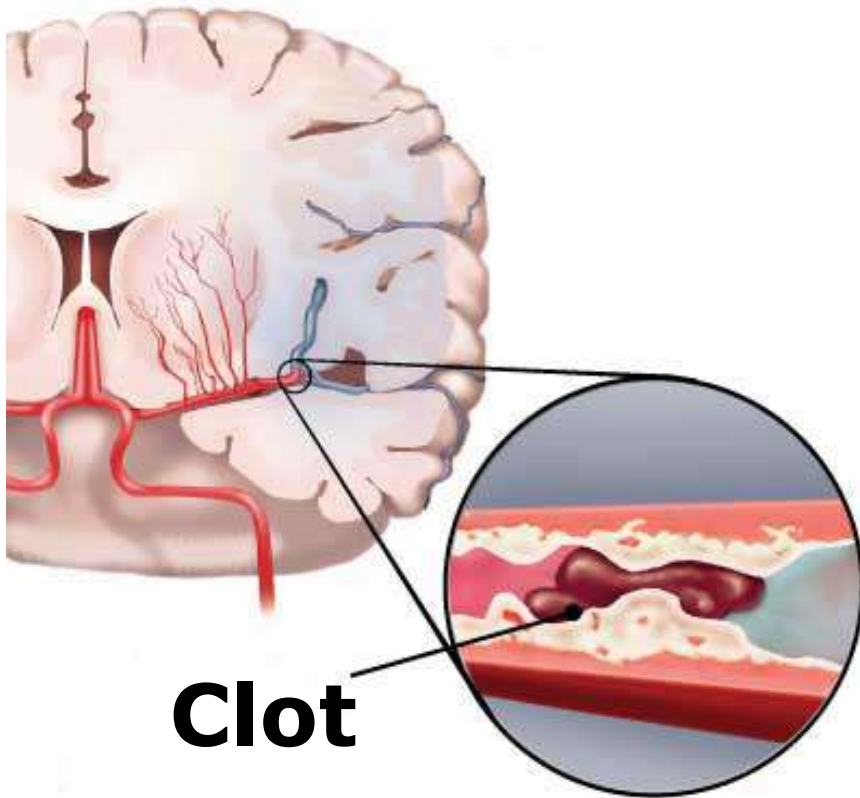


Kinds of Stroke

- **Ischemic**: 85%
- Mortality:
 - 1 month: 10%
- Types:
 - Thrombotic
 - Embolic
 - Hypoperfusion
- **Hemorrhagic**: 15%
- Mortality
 - 1 month: 38%
- Types:
 - Intracerebral (10%)
 - SAH (3%)

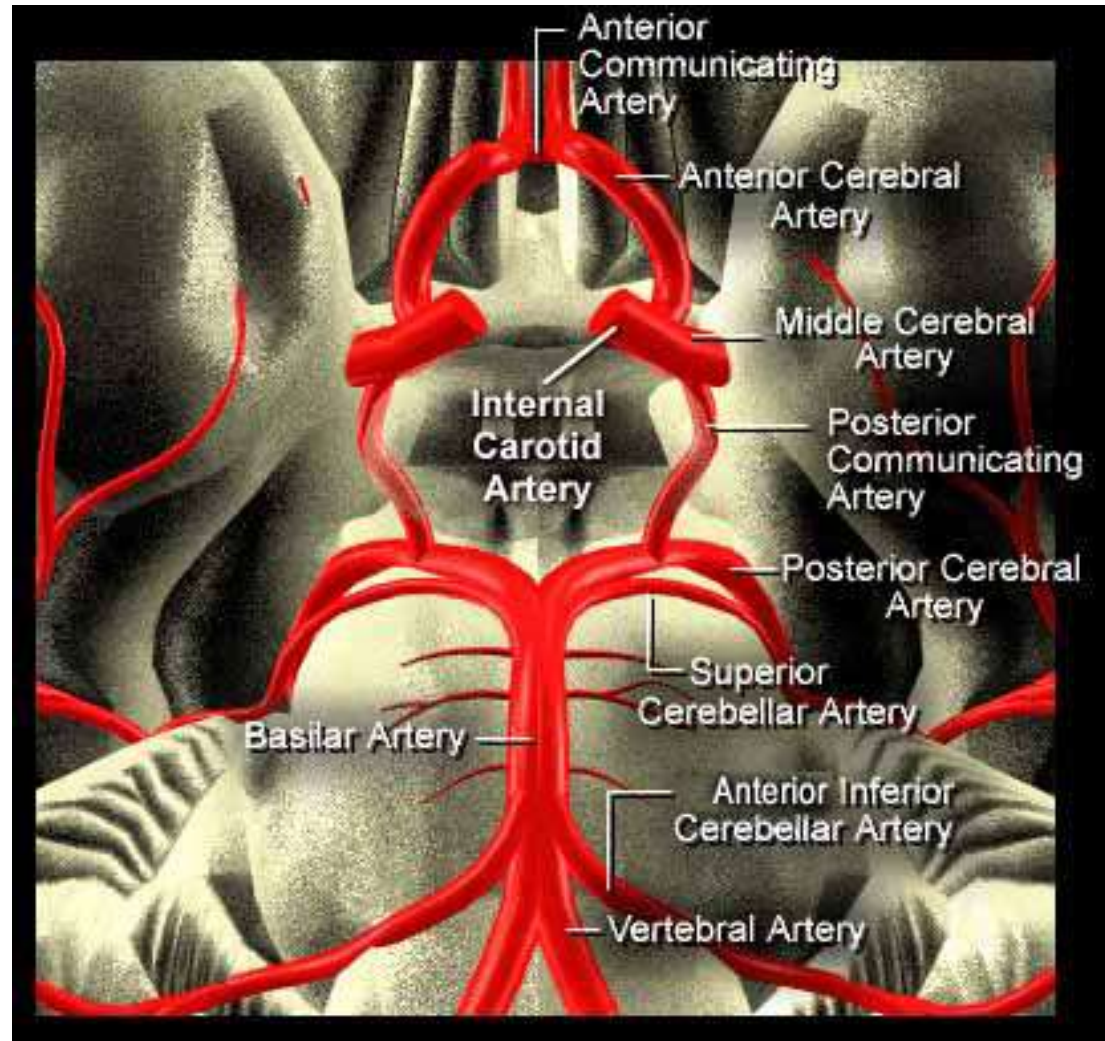


Ischemic



- Occlusion of vessel
- Cause:
 - Embolic
 - Thrombotic
 - Hypoperfusion
- Irreversible death - minutes

Large Vessel Disease



Penumbra

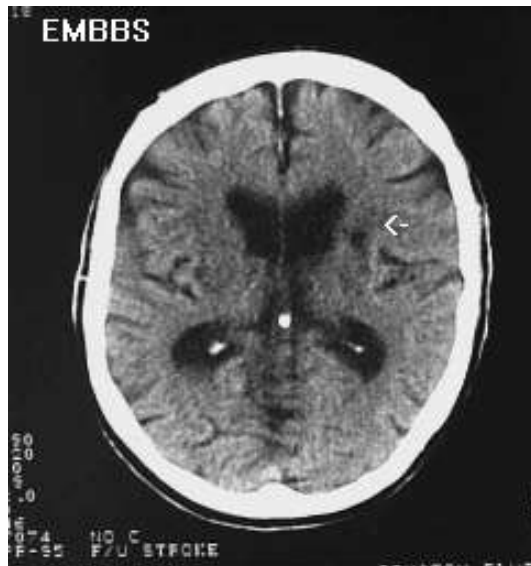
- Area of injured tissue (viable)
 - Collateral



Ischemic strokes

Lacunar

- 20% of ischemic CVA
- Branches off major vessels
- HTN (important)



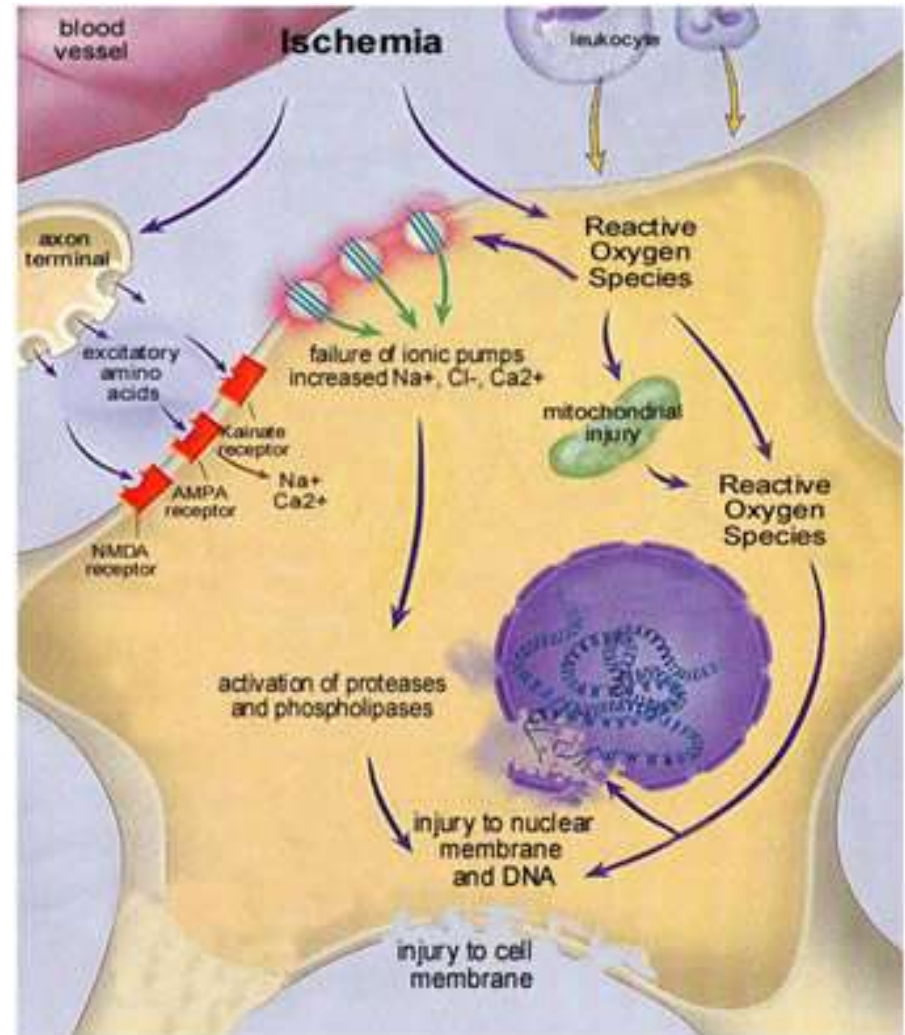
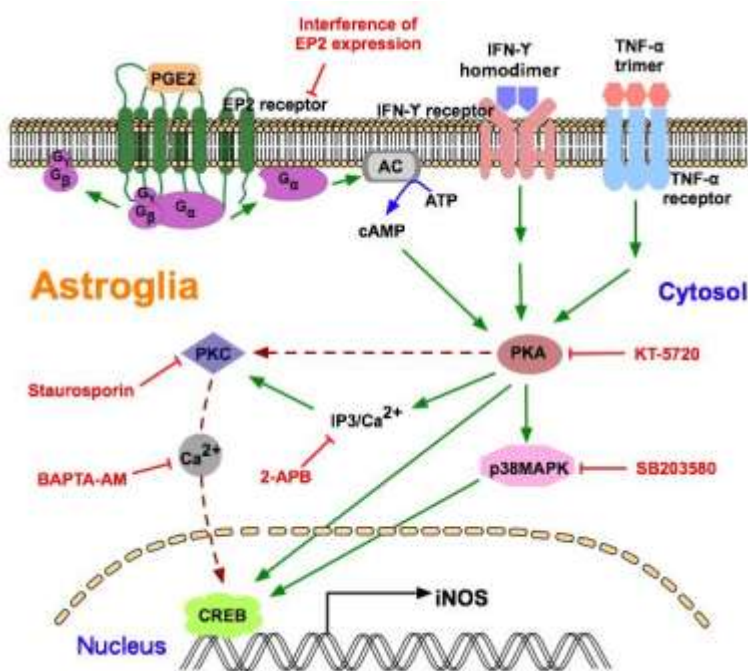
Watershed

- Most distal arteries
- Hypoperfusion



Neuronal Ischemia

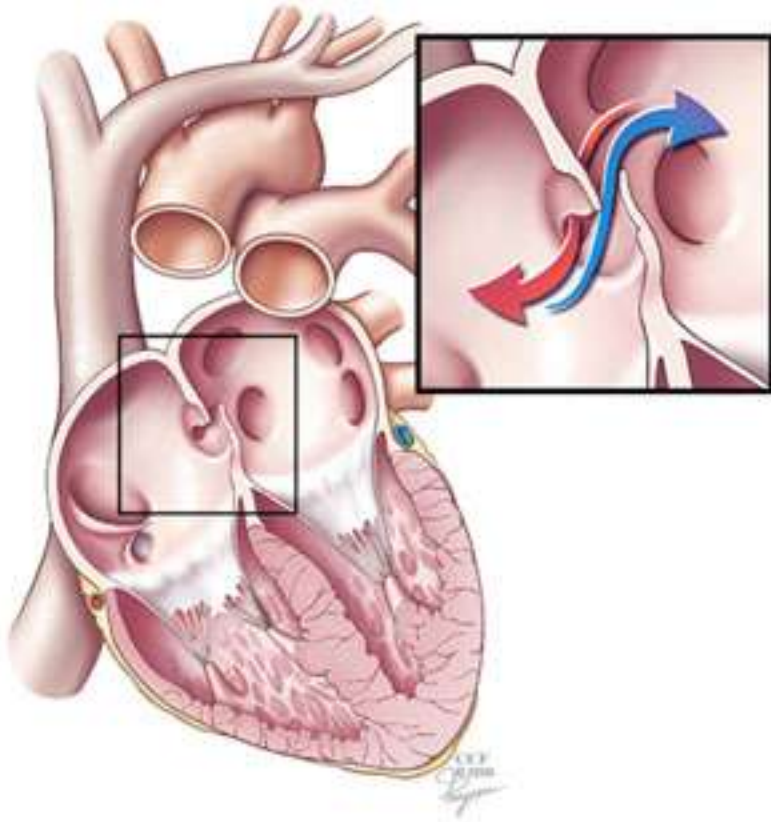
- Ischemia → Cytokine cascade → edema → Neuronal cell death



“Wake Up” Strokes

- Patient’s awoken from sleep with symptoms
- Unknown time of onset
- No acute treatment at this time

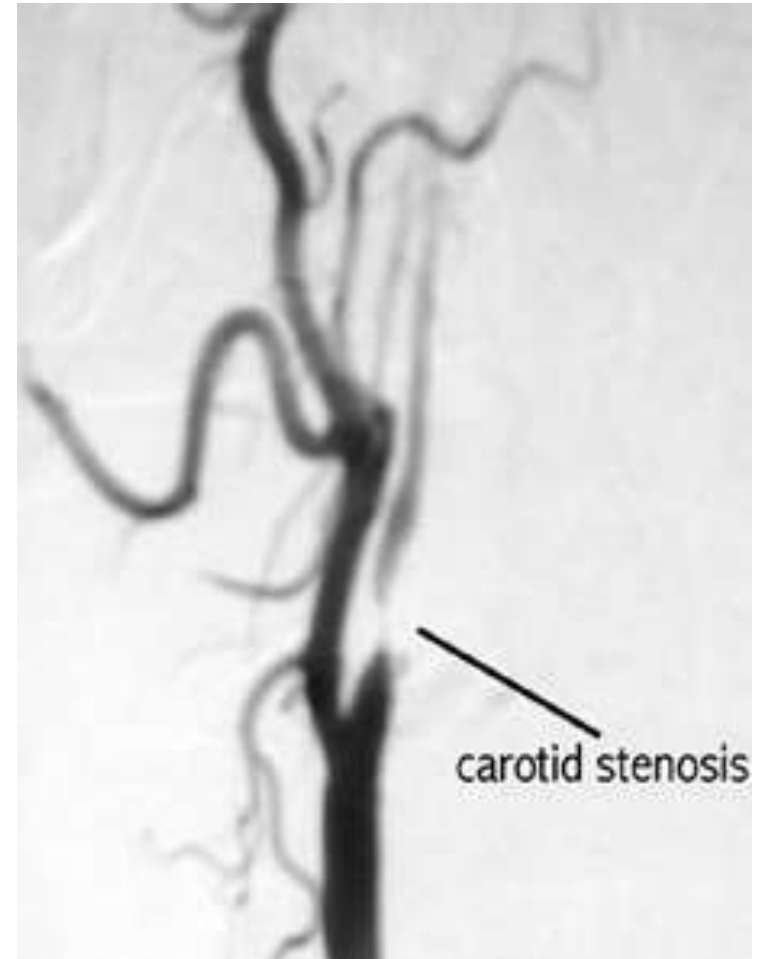
Patent Foramen Ovale



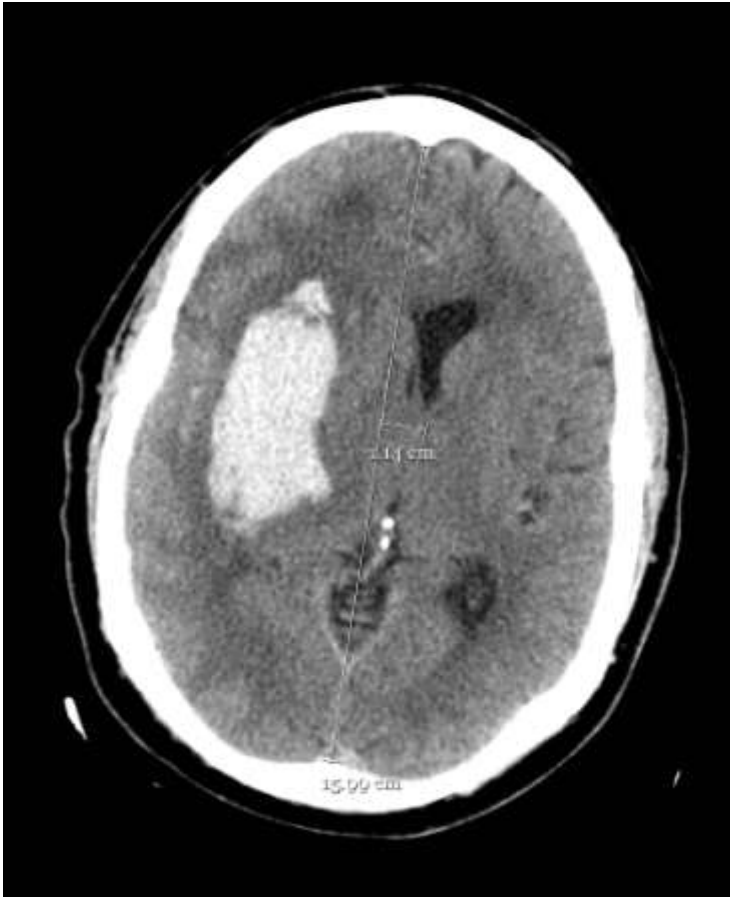
- Incidence:
 - Up to 25% have PFO
 - 40% for those who have CVA unknown cause
- Paradoxical embolism
- ECHO
 - Bubble test

Carotid Stenosis

- Atherosclerotic disease
- Embolic source
- Increase stenosis,
Increased risk
- Surgery >70%
 - Possible >60%



Hemorrhagic Stroke



- Usually hypertensive
- Conversion from ischemia

Subarachnoid



Hospital Diagnostics

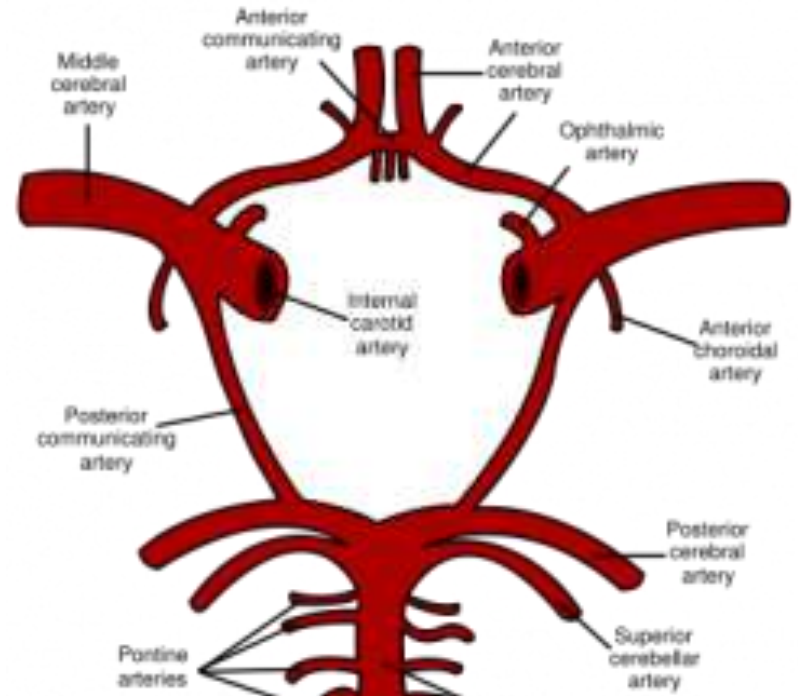
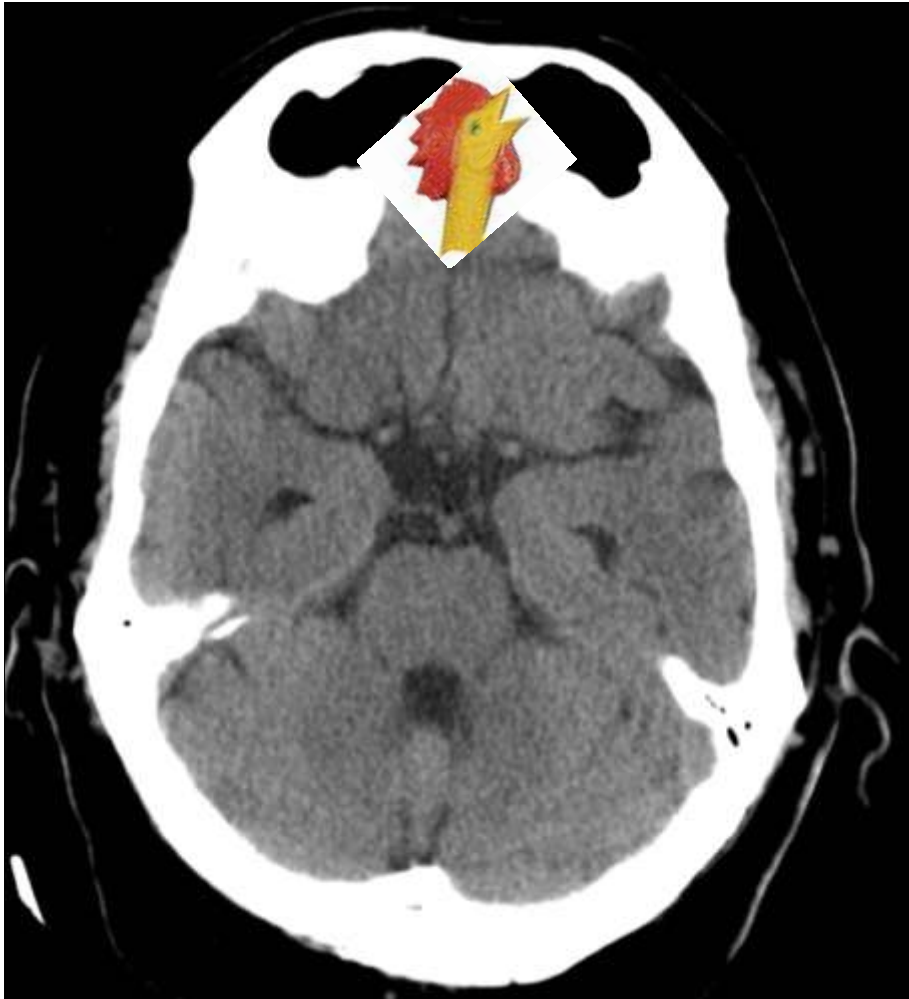


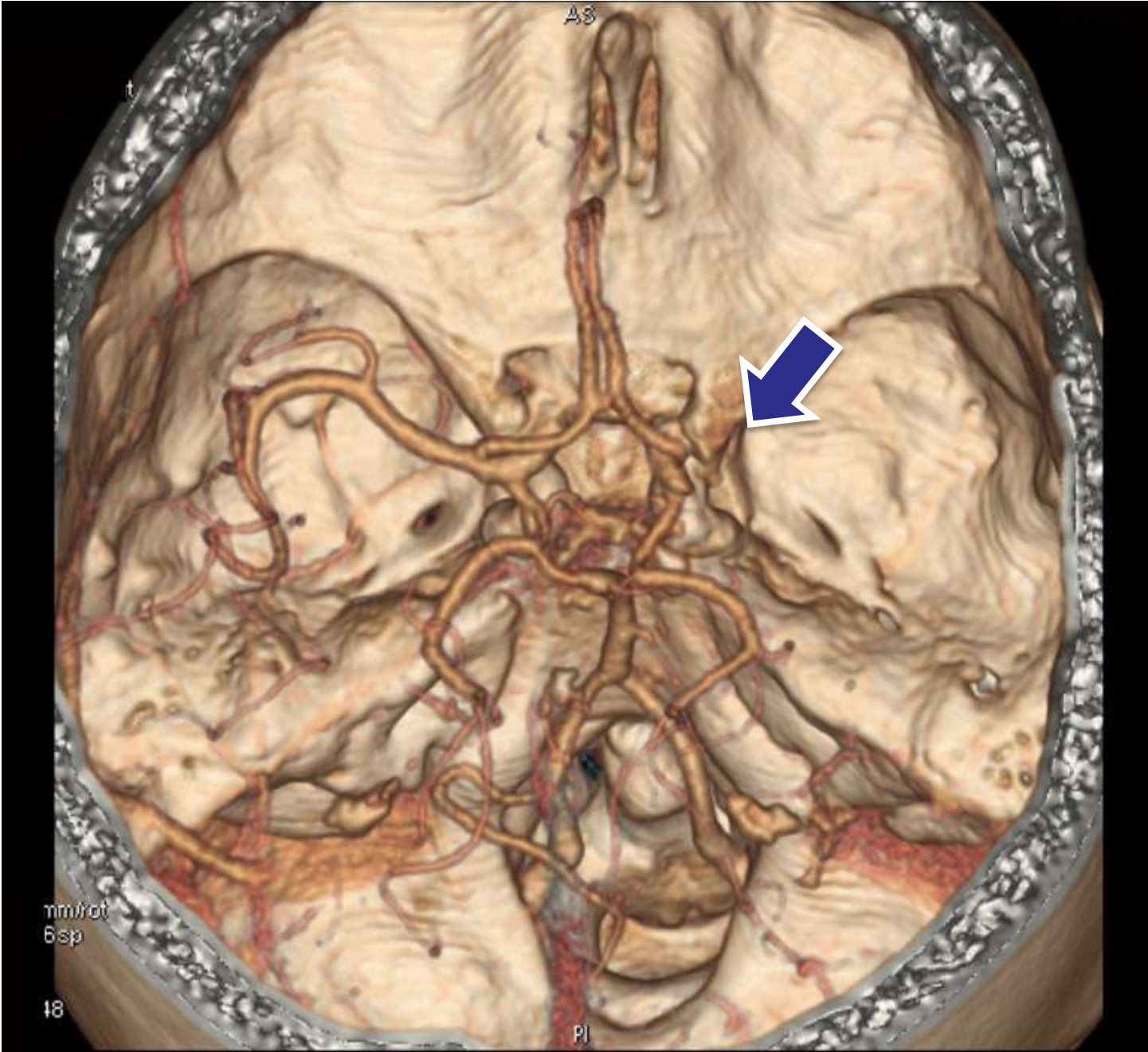
Tests – In Hospital

- Blood Work
 - CBC, BMP (including glucose)
 - PT/PTT
 - Troponin
 - Alcohol/UDS
 - Pregnancy
- EKG
- Head CT
- CXR

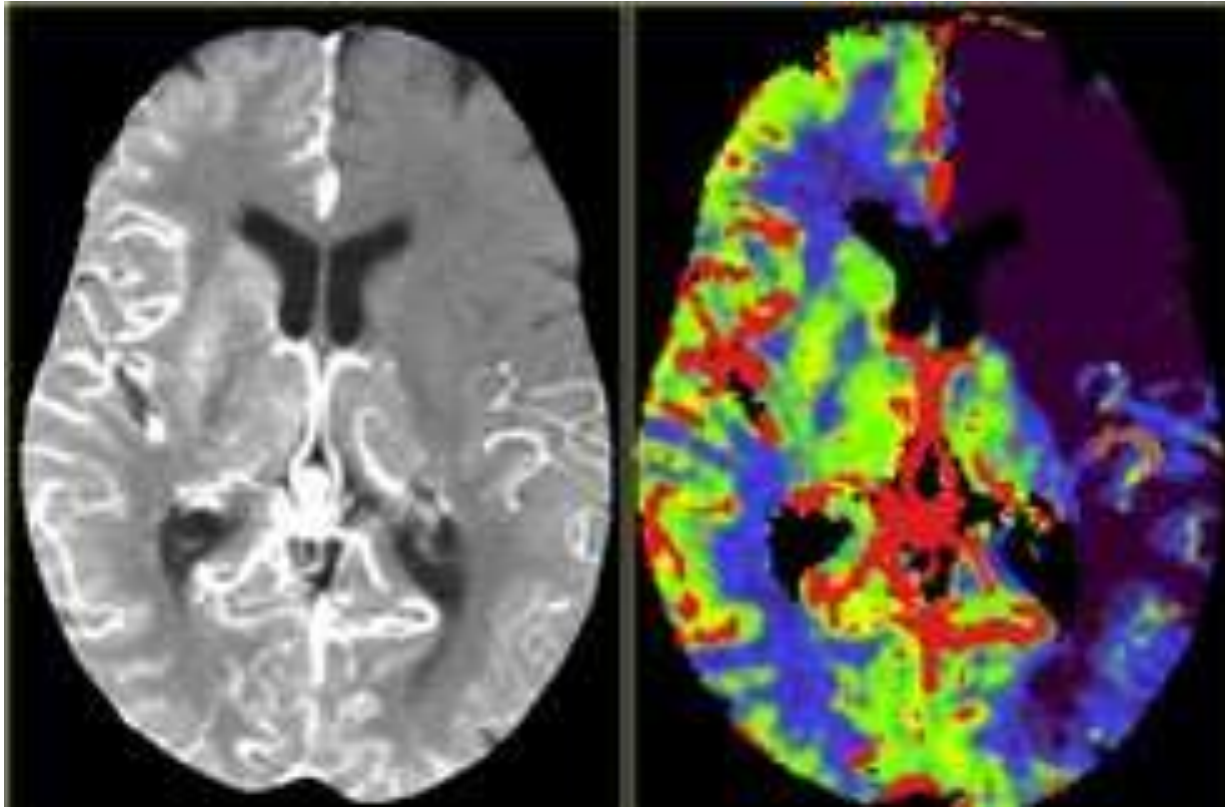


Vascular anatomy





CT Perfusion

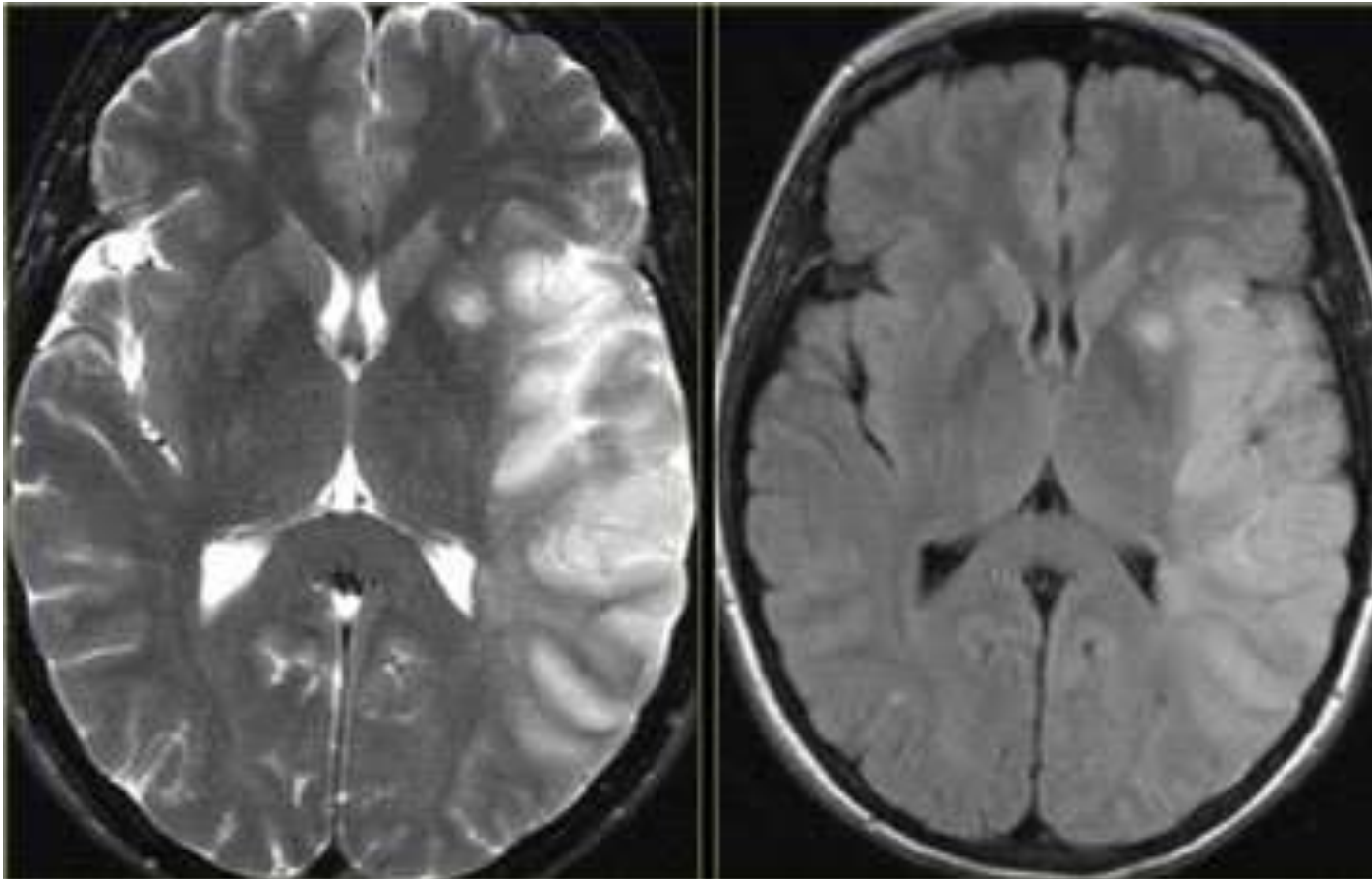


Penumbra

- Area of injured tissue (viable)
 - Collateral



MRI



Other Tests



- Evaluate Carotids
 - PVL
 - CTA
 - MRA
- ECHO

Cases

#1: 65 y/o Slurred Speech



- Sudden onset of difficulty speaking and right sided weakness
- Started 1 hr ago
- History of DM, HTN
- Stable vital signs

Is it a stroke?

#2: 40 y/o Facial Droop



Is it a stroke?

#3: 27 y/o Dizzy



HPI

- Mild headache and dizziness progressive for 3 days
- Felt 'off balance'
- No medical problems
- Smokes tobacco, marijuana

EXAM

- Stable Vitals
- Strength intact
- Sensation intact
- Finger to nose intact

Is it a stroke?

#4: 36 y/o Dysarthria



HPI

- Getting procedure in MD's office
- Sudden onset of seizure after injection with lidocaine
- 911 – transport to hospital
- At hospital: dysarthria, right side weakness

EXAM

- Stable vitals
- Dysarthria
- Unable to move right arm/leg

Is it a stroke?

#5 45 y/o from Jail



HPI

- Being booked at Police Station
- Became anxious
- Sudden onset of left side weakness/parasthesia
- No PMX; Denies drugs

EXAM

- Stable Vitals
- Unable to move left arm/leg
- No sensation to noxious stimulus to left arm/leg

Is it a stroke?

Is It a Stroke?

- Case #1: 65 y/o with aphasia/left sided weakness
- Case #2: 40 y/o with left facial droop
- Case #3: 27 y/o with dizziness
- Case #4: 36 y/o with weakness after seizure
- Case #5: 45 y/o from jail with weakness/numbness



Identification

Symptoms



- Weakness
- Paresthesia
- Visual complaints
- Dysarthria/Aphasia
- Ataxia/Vertigo
- Confusion
- Neglect
- Amnesia
- Altered Level of Consciousness
- Cranial Nerve deficit
- Gaze Deficit

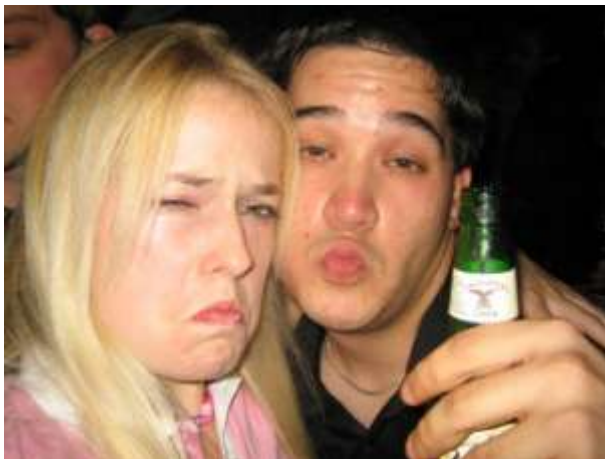
History Elements



- What are the symptoms?
- PMHx/Surgery
 - DM
 - Recent surgery?
 - Cardiac/Afib?
- Medications
 - Coumadin
 - Aspirin/Plavix
- Allergies
- **Onset of symptoms**
 - **Witnessed?**
- Previous CVA
 - When?
 - What are old deficits?
- Code Status

Cincinnati Stroke Scale

- 3 components:
 - **F**acial Droop
 - **A**rm Drift
 - **S**lurred Speech
 - **T**ime (onset)



LA Stroke Scale



Screening Criteria

	<u>Yes</u>	<u>No</u>
1) Age over 45 years?	_____	_____
2) No prior history of seizures?	_____	_____
3) New onset neuro sx within 24 hrs?	_____	_____
4) Patient ambulatory at baseline?	_____	_____
5) Blood Glucose between 60 and 400?	_____	_____

Exam: obvious asymmetry

	<u>Normal</u>	<u>Right</u>	<u>Left</u>
Facial smile:	_____	___ Droop	___ Droop
Grip:	_____	___ Yes	___ Yes
Arm Weakness:	_____	___ Yes	___ Yes

If weakness is present, is it unilateral?

Transport



- IV, O₂, monitor
 - 20ga AC
- Medications
 - List/pills
- Start within 15 min of arrival
 - History < 10 min

Prehospital Testing

- Accucheck

**Case #1:
Hypoglycemia –
Not a Stroke!**



#2: 40 y/o Facial Droop



**Not a stroke:
Bell's Palsy**

Case #4: 36 year old



- Inadvertent vascular injection of lidocaine
- Seizure
 - Dysarthria, weakness
- Todd's Paralysis: Neurological deficit after seizure
 - Exhaustion/Inhibition of neurons
 - May last several days

**Post Seizure –
Not a Stroke!**

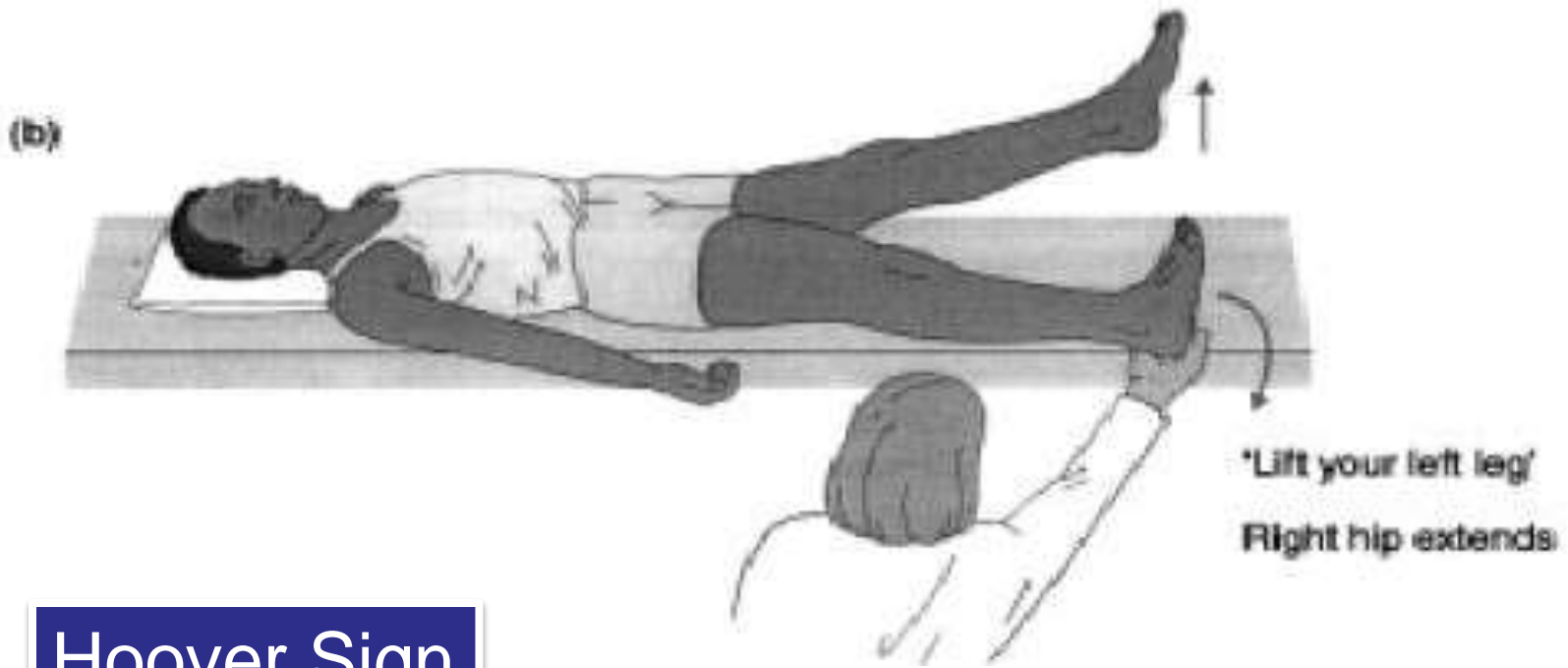
Case #5: 45 y/o Jailbird



- Sudden onset of left side paresthesia and weakness to leg/arm
- Intermittent left facial droop
- Admitted
 - Tries to escape from hospital room

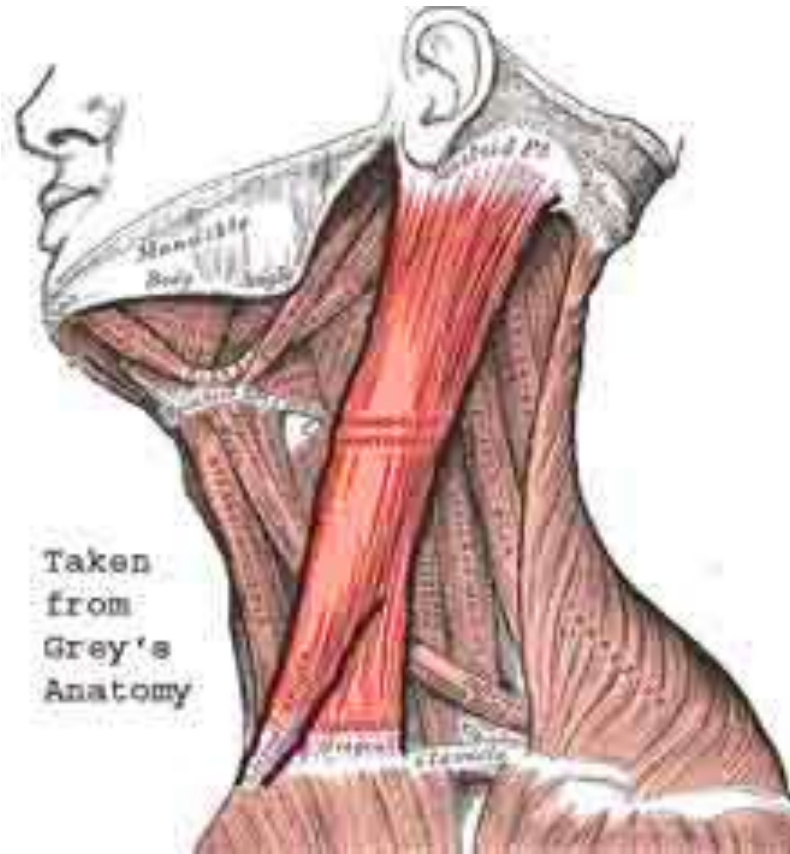
**Not a stroke:
Conversion
Disorder**

Clues on Exam



Hoover Sign

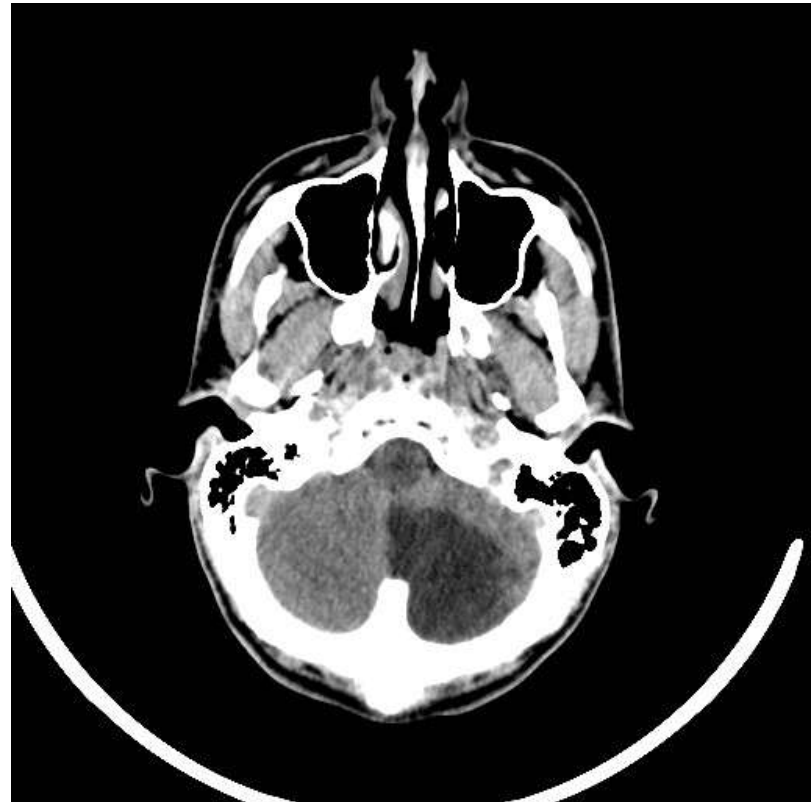
Clues on Exam



- Sternocleidomastoid
- Moves head opposite direction

Case #3: Dizzy

- 27 year old dizziness/headache for 3 days
- Normal Vitals
- Negative CPSS



Differential Diagnosis



- Bell's Palsy
- Hypoglycemia
- Seizure
- Migraines
- Tumor
- Infection
(meningitis/encephalitis)
- Sinus Thrombosis
- Vasculopathies
- Demyelinating disorders
- Conversion Disorder
- Ingestion/Intoxication

An orange pill bottle is lying on its side on a light-colored surface. The bottle is tilted, and several white, round pills are scattered on the surface in front of it. The background is a soft, out-of-focus light blue and white. The word "Treatment" is written in a bold, dark blue font across the center of the image.

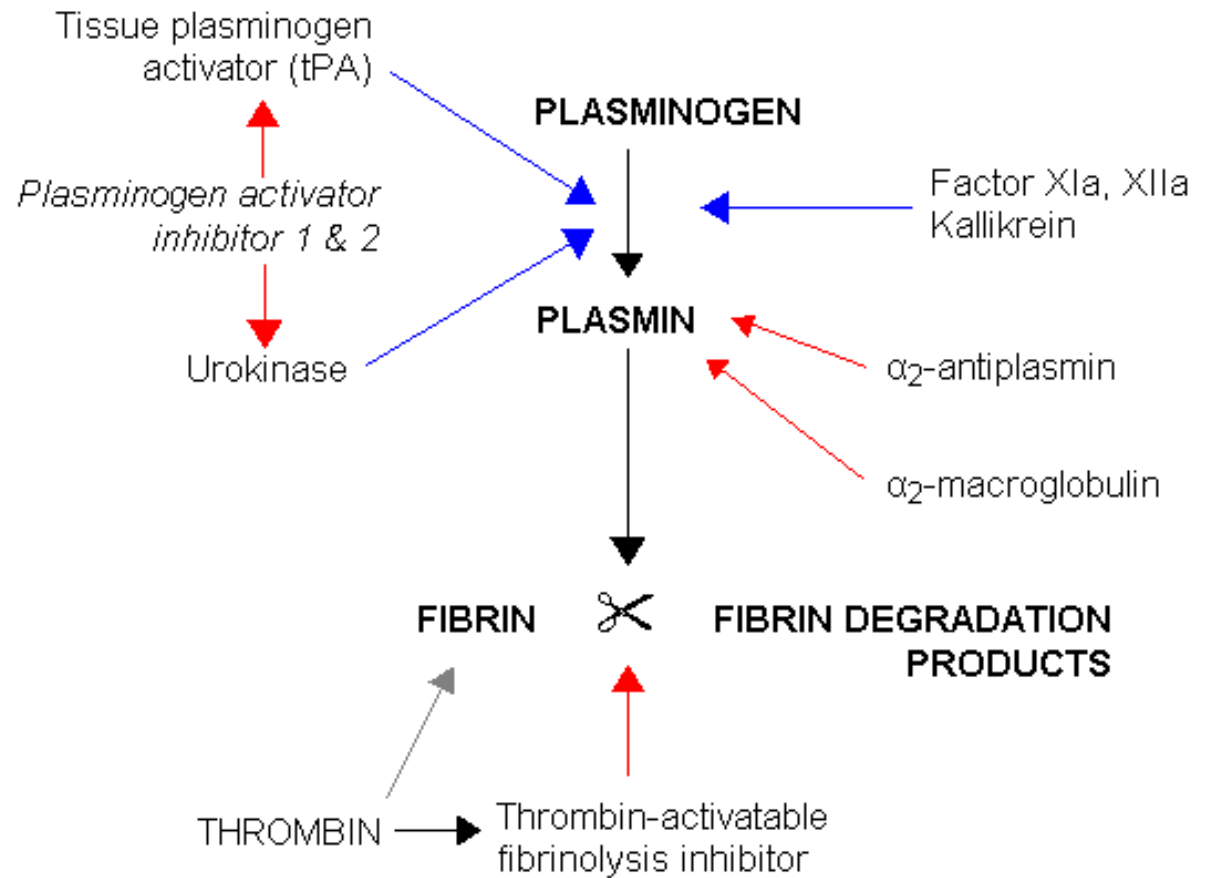
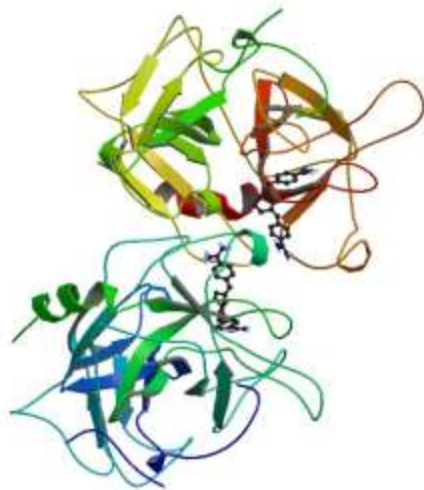
Treatment

tPA



- FDA approved: 1995
 - Based on NINDS study
 - Class 1 recommendation (AHA)
- Use onset of time:
 - IV tPA: within 3 hours
 - IA tPA: within 6 hours
- Recent recommendation to 4.5 hrs of onset (IV tPA) – Class 2 recommendation

tPA



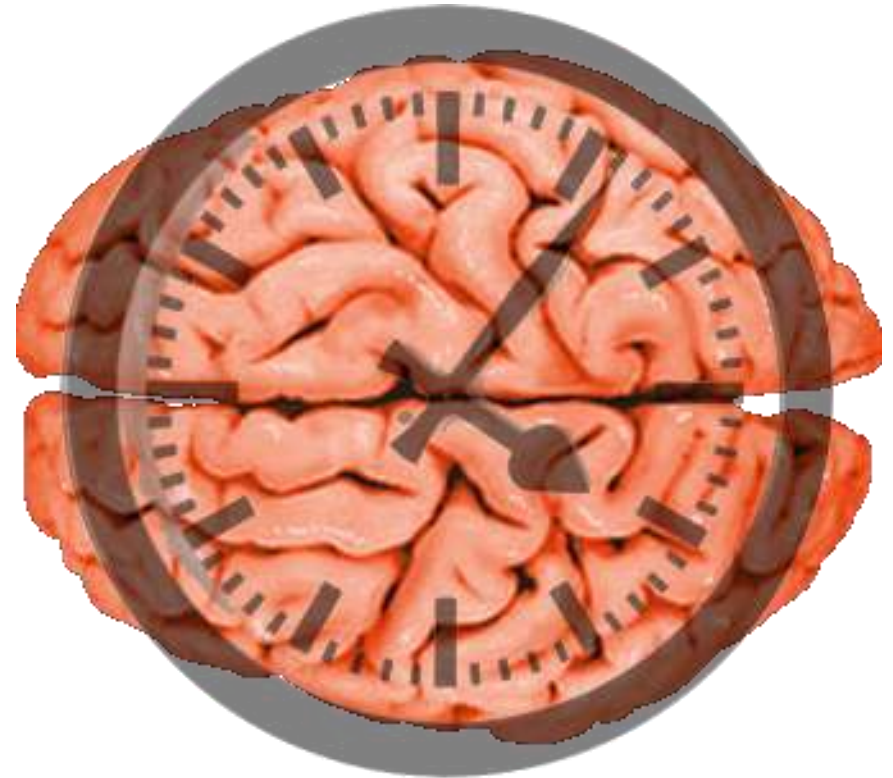
Contraindications to tPA



- Stroke/Head Trauma <3 months
- Major surgery <14 days
- History of ICH
- Rapidly improving symptoms
- GI Bleed/Urinary Bleed <21 days
- SBP >185, DBP >110
- Symptoms suggestive of SAH
- Seizure with symptoms
- Rapidly improving symptoms
- Art Puncture, non-compressible site <7 days
- INR <1.7, Platelet >100
- Pregnancy

Time Goals

- Door to tPA – 60 min
- Must do within 3 hours onset of symptoms

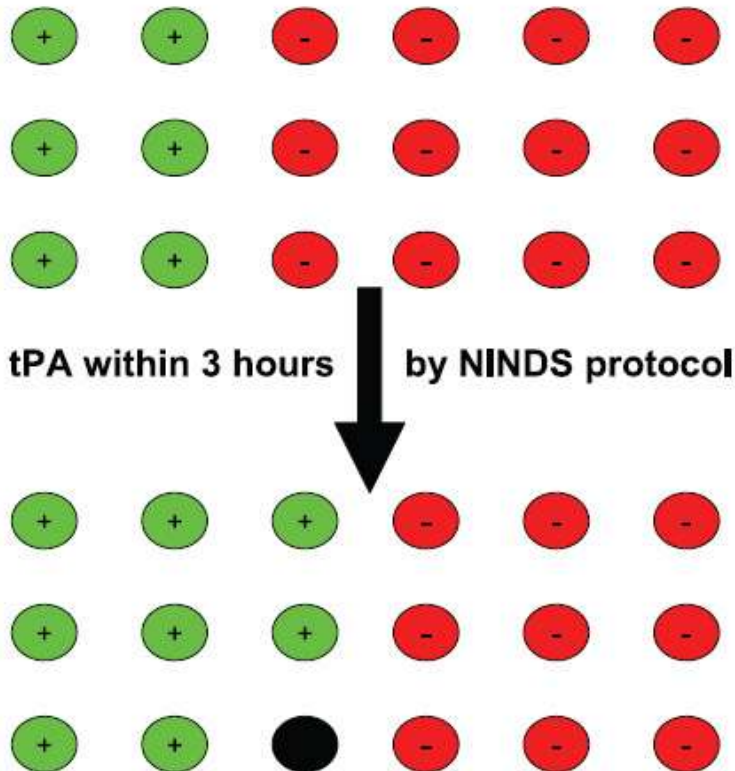


tPA Outcomes

24 hr outcome:
– No difference

90 day:

- Mortality: 17% vs. 21%
- 30% more likely no deficit
- Bleed: 6.4% vs. 0.6%



Legend:

- = good recovery
- = poor/no recovery
- = brain bleed/45% die

Extension to 4.5 hours



Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke

Werner Hacke, M.D., Markku Kaste, M.D., Erich Bluhmki, Ph.D., Miroslav Brozman, M.D., Antoni Dávalos, M.D., Donata Guidetti, M.D., Vincent Larrue, M.D., Kennedy R. Lees, M.D., Zakaria Medeghri, M.D., Thomas Machnig, M.D., Dietmar Schneider, M.D., Rüdiger von Kummer, M.D., Nils Wahlgren, M.D., Danilo Toni, M.D., for the ECASS Investigators

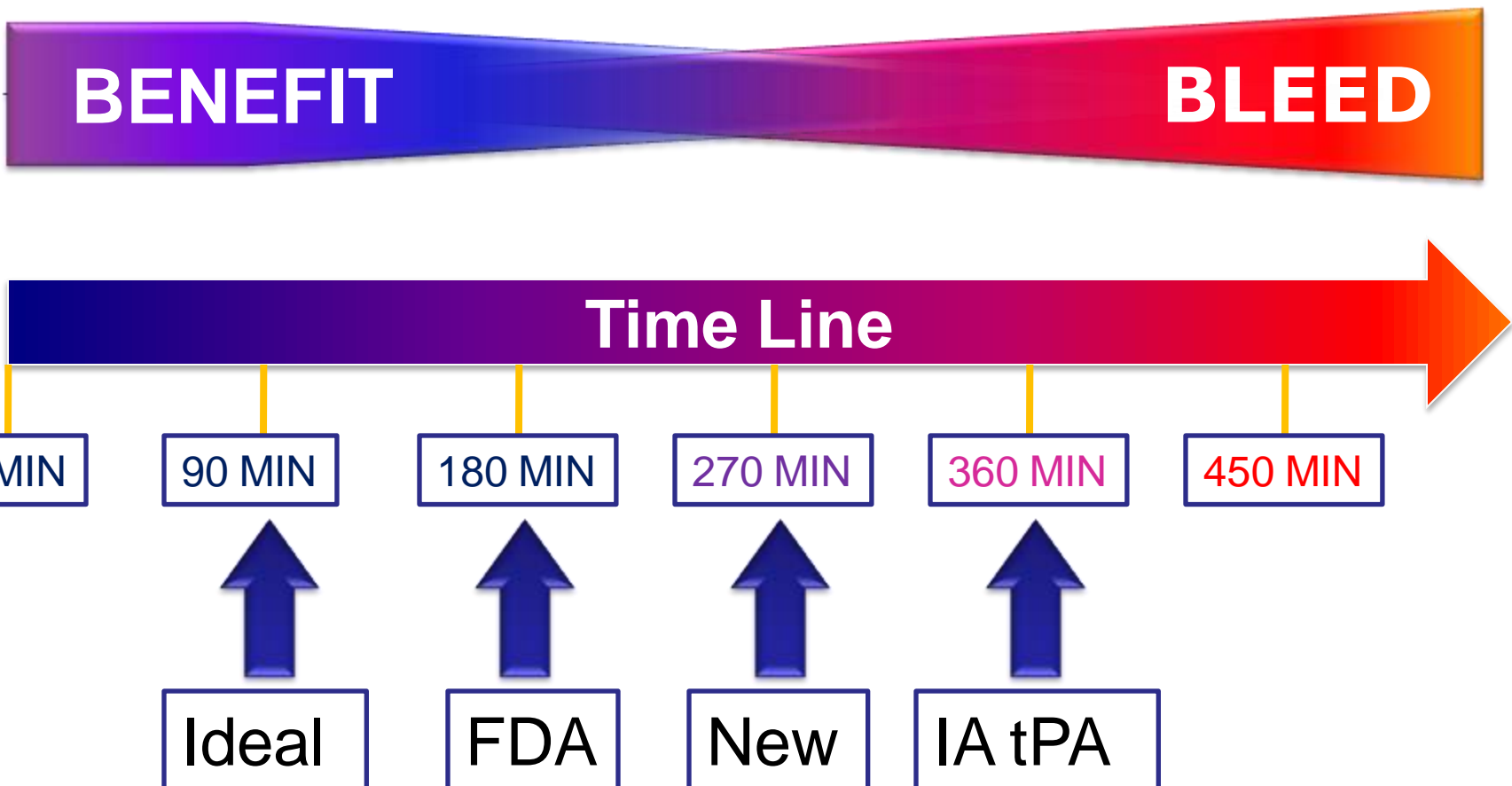
- ECASS III
- Exclusion:
 - >80 years
 - NIH \geq 25
 - Hx DM/CVA
 - On Anticoagulants
- AHA recommended



The NEW ENGLAND
JOURNAL of MEDICINE

Not FDA approved

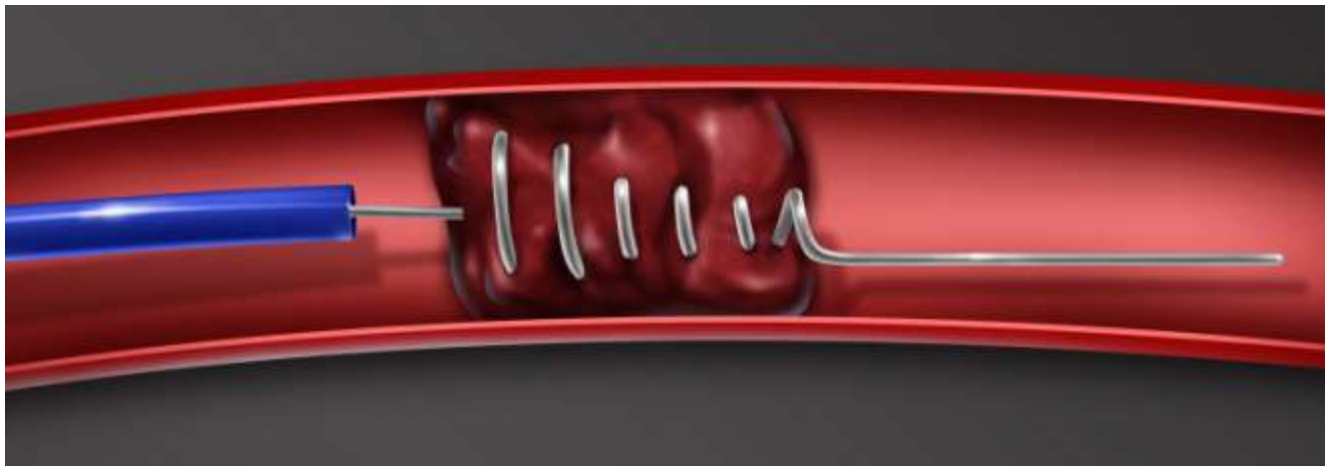
Treatment with IV tPA



Merci Retrieval System



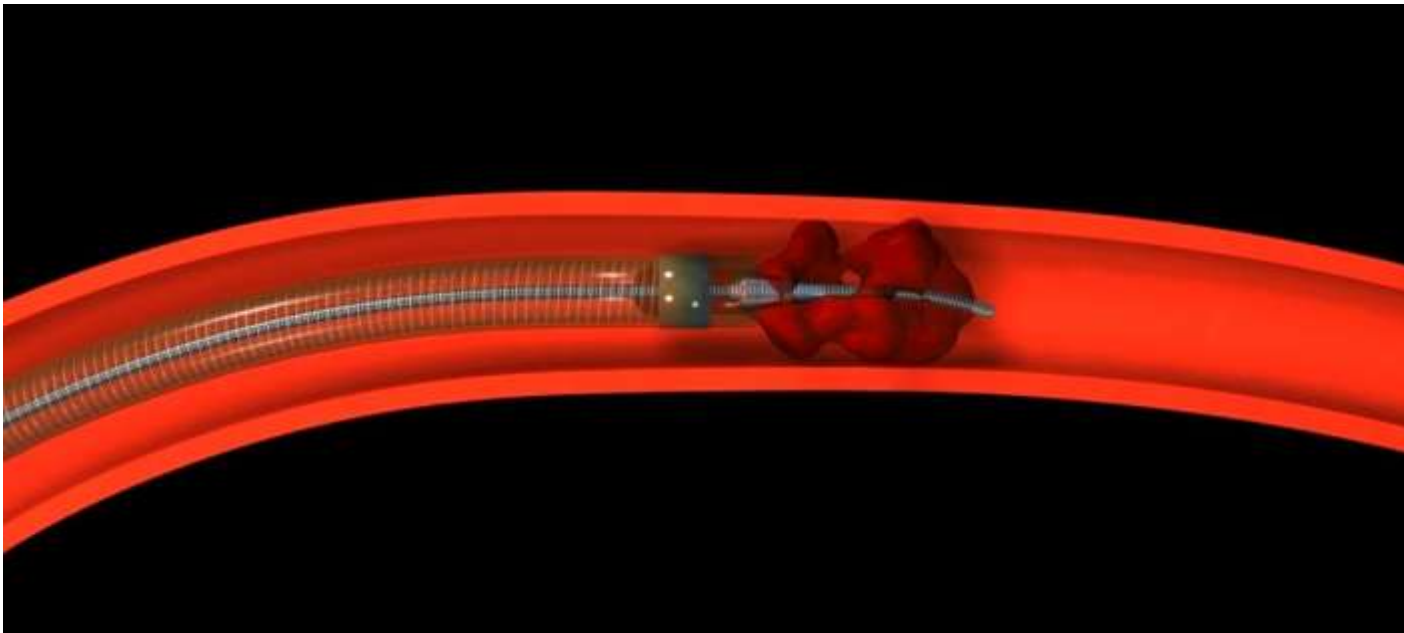
- Corkscrew mechanism
- Up to 8 hours after onset
- With or without IV tPA
- Multi-MERCI trial (90 day outcome):
 - Favorable outcome: 49% vs. 9.6%
 - Mortality: 25% vs. 52%



Penumbra Retrieval System



- Suction device
- Up to 8 hours of onset
- With or Without IV tPA
- Recanalization rate: 81.6%



Special Circumstances

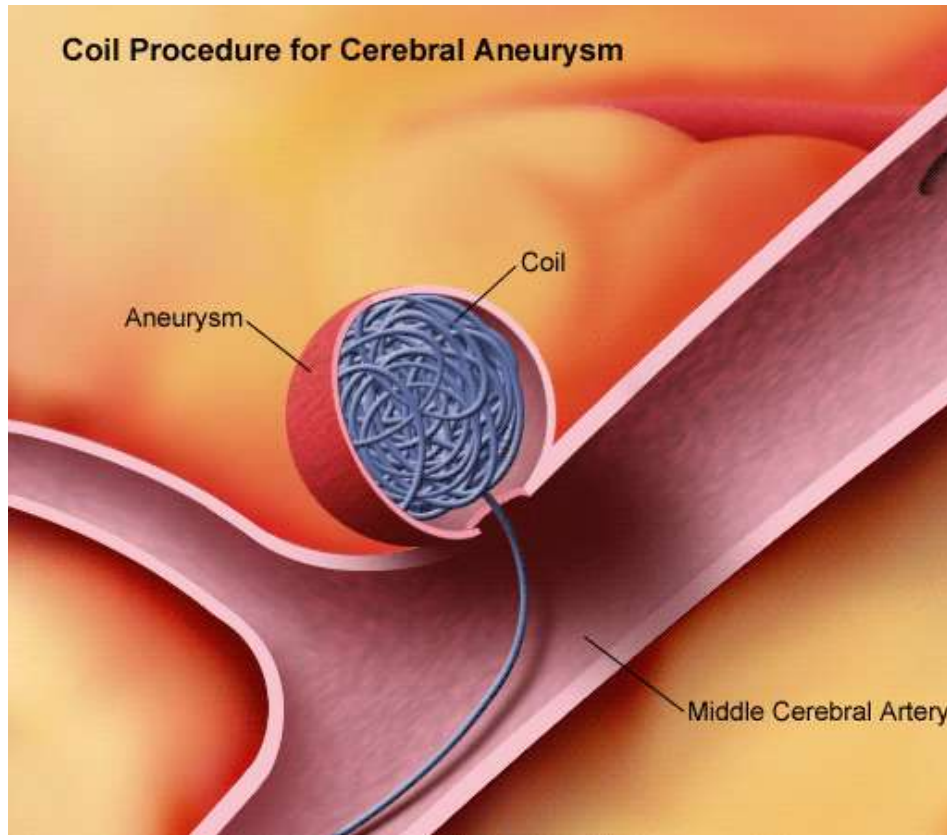


- Posterior Circulation – double time frame
 - Basilar Artery
 - IV tPA: 6 hrs
 - IA tPA: 12 hrs

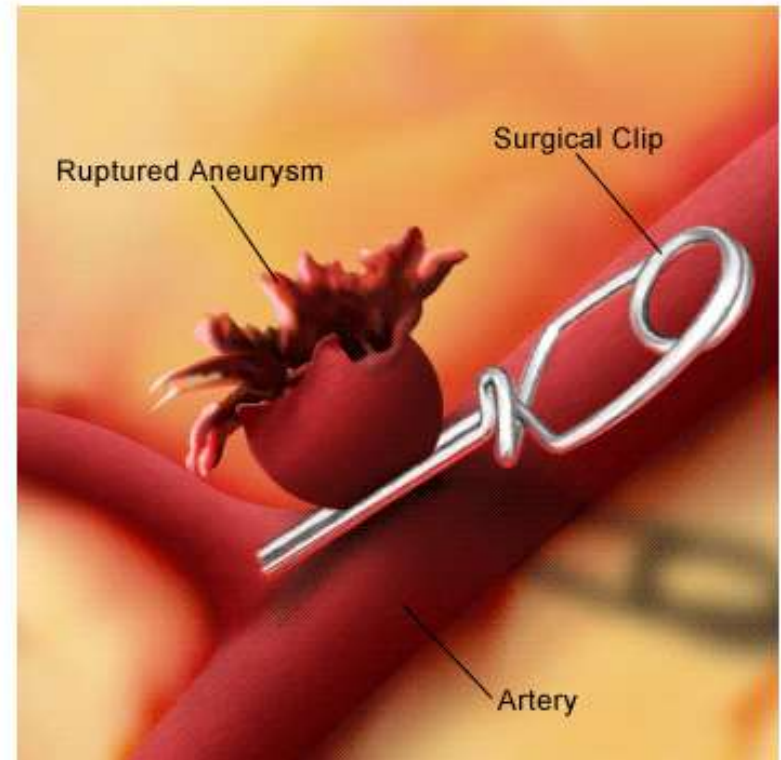
- Mechanical Retrieval
 - Up to 24 hrs (Case Reports)

Aneurysmal Stroke

Coil Procedure for Cerebral Aneurysm



Clipping Treatment for Cerebral Aneurysm



Hemorrhagic Stroke



- Ventriculostomy
 - Reduce ICP

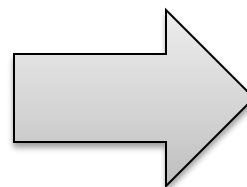
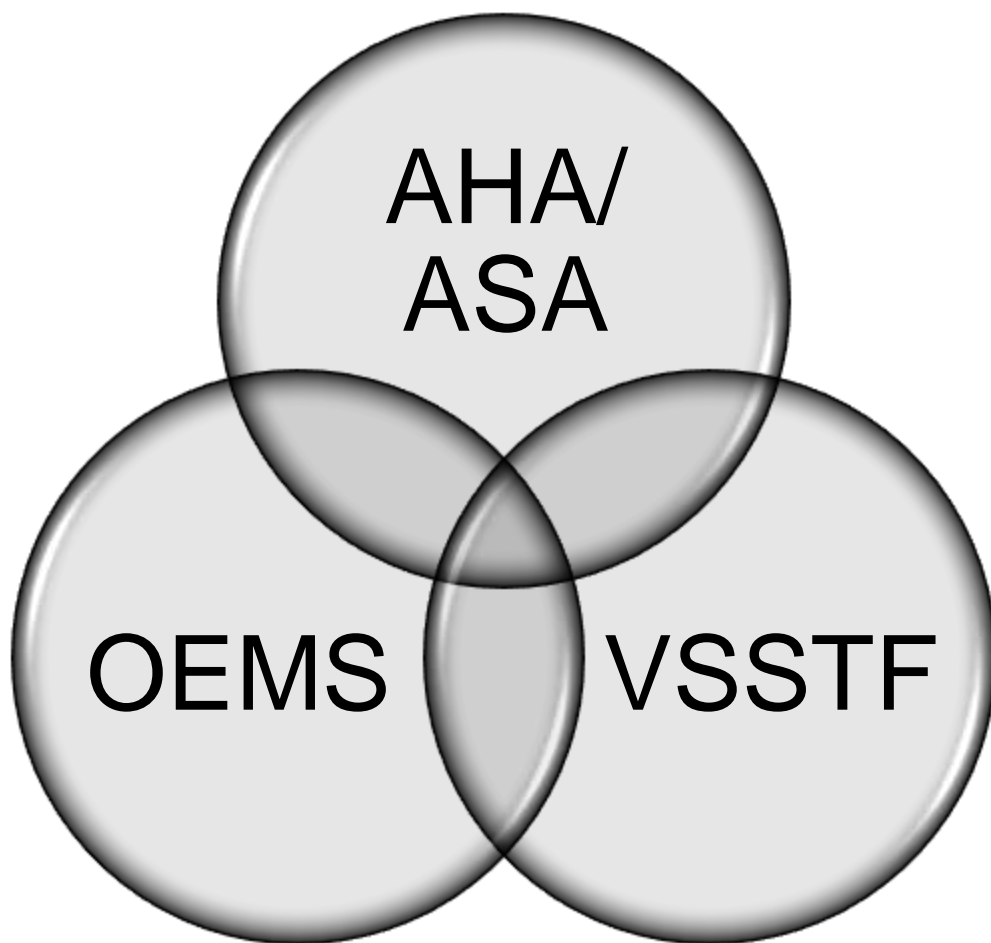
Hemorrhagic Stroke

- Operative Management
 - Clot removal
- Needs to be near surface
- Rare

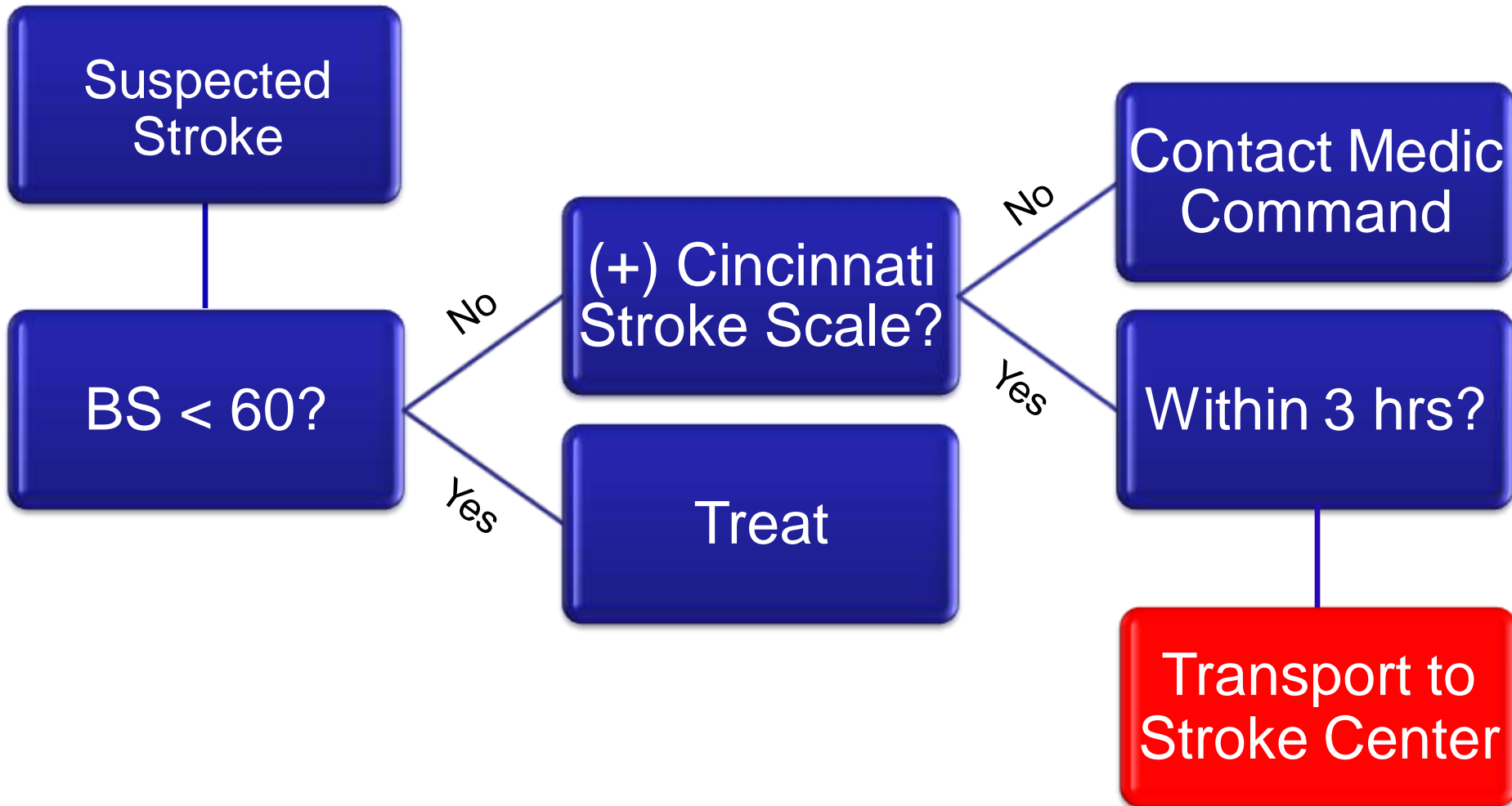


So Where to Go?

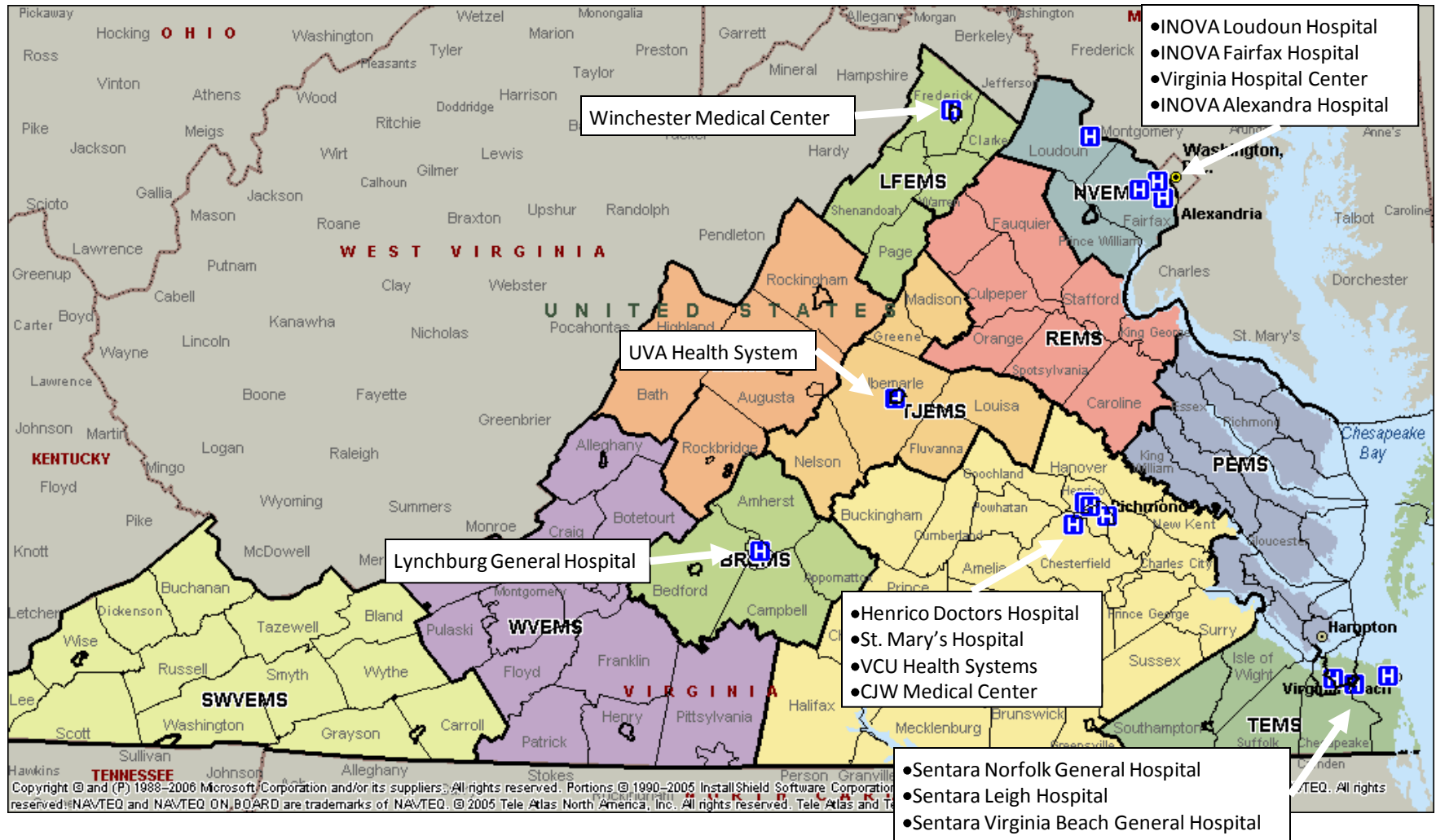
Policy Making



VA Stroke Triage Plan



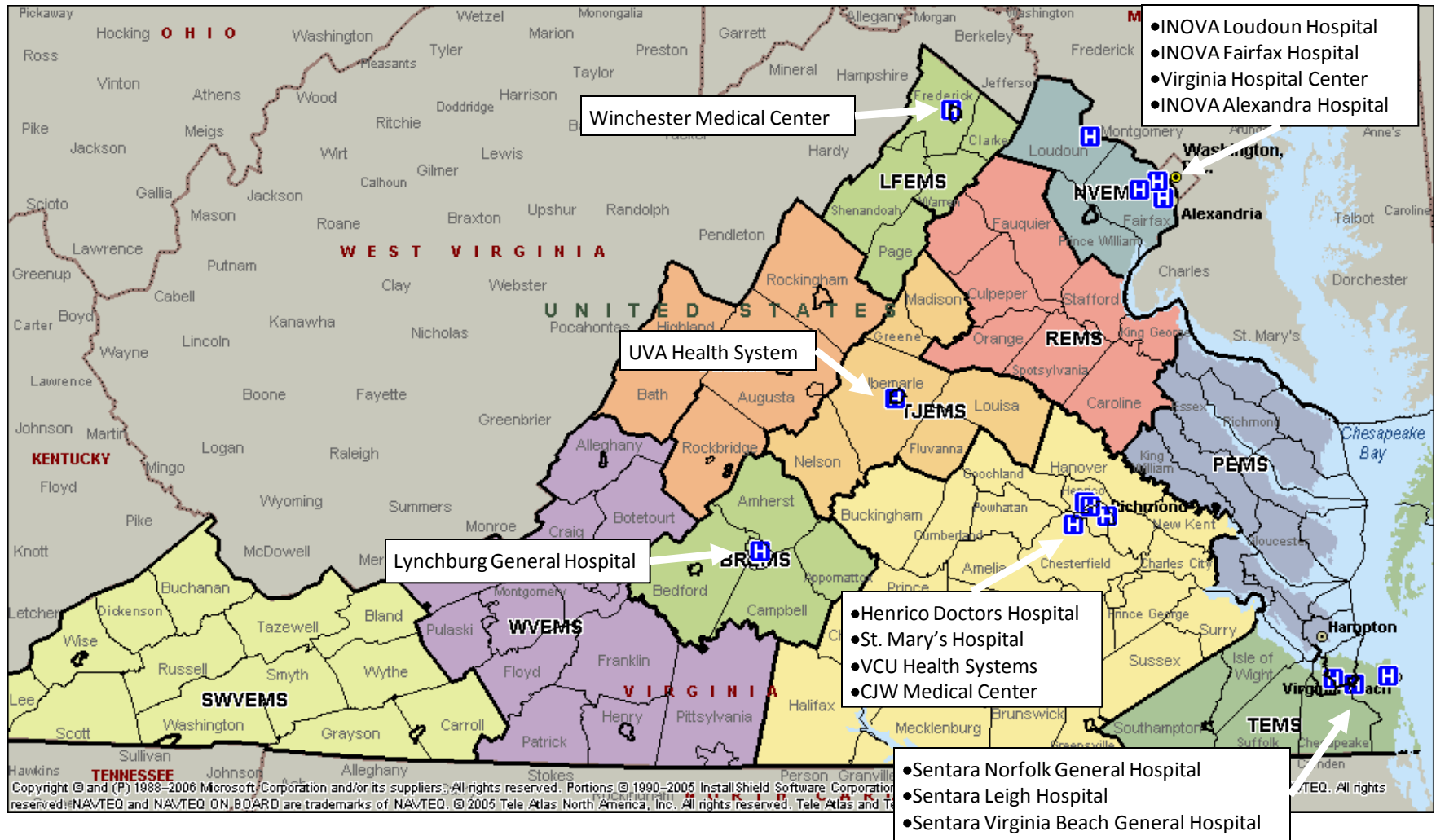
Primary Stroke Centers



To Fly or Not to Fly?



Primary Stroke Centers



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Non-Stroke Centers



- Many are capable to treat acute stroke patients
 - Becoming Certified Stroke Centers
- Hub and Spoke

Case Study 1

- 49 year old male
- Sudden onset right sided weakness
- Started 1 hour prior
- (+) CPSS
 - Transfer to Stroke Center

Case Study 1

- Head CT: no bleeding
- CTA: clot to left MCA
- IV tPA



What IF.....



- Symptoms started at 4 hours?
- Nearest Stroke center is 40 miles away?
 - Nearest hospital is 5 miles away?

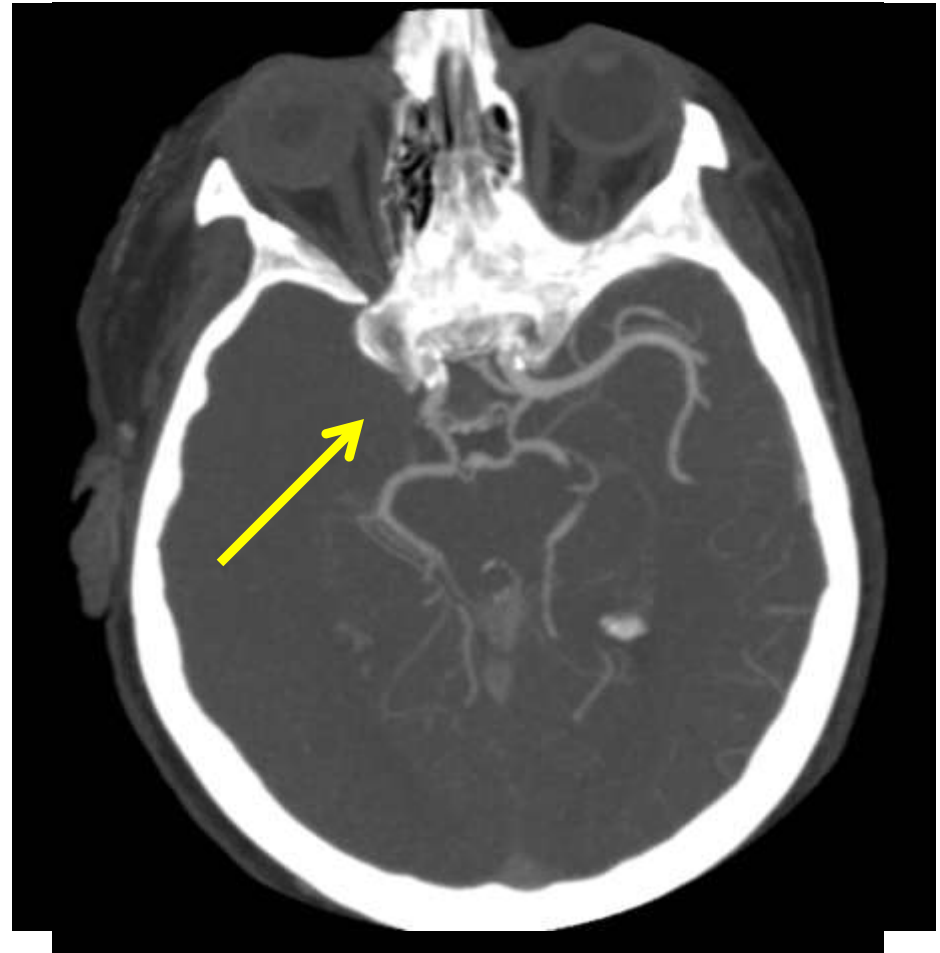
Case Study 2



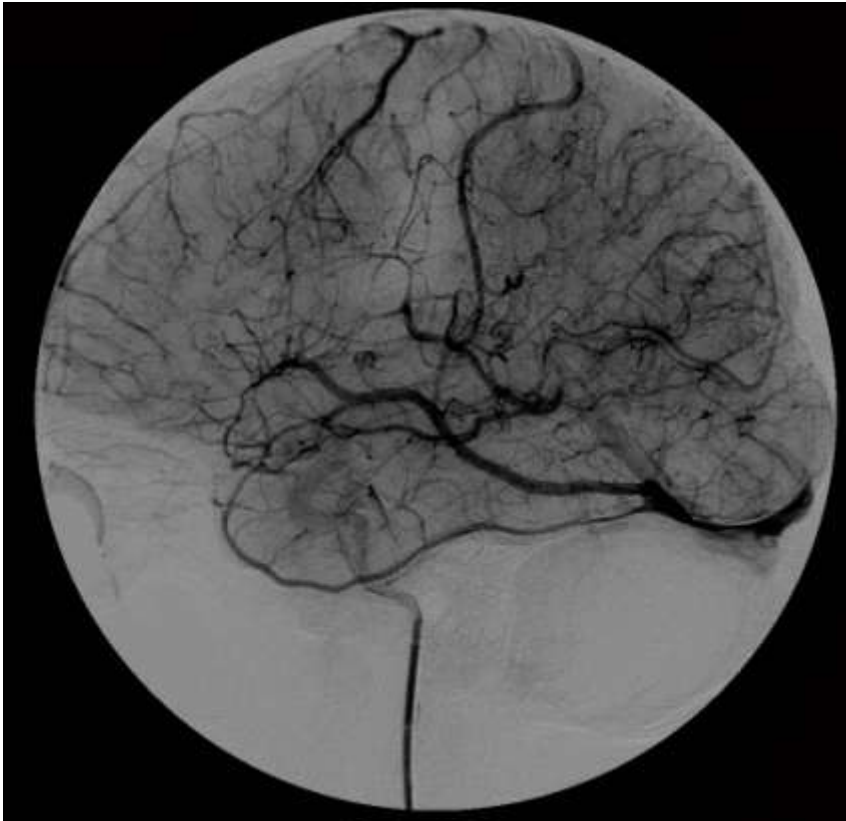
- 54 year old female
- Dense left hemiparesis 2 hours prior
- Recent CABG 14 days ago
- CPSS
- Transfer to Stroke center?

Case Study 2

- Head CT: no bleed
- CTA: clot to right MCA

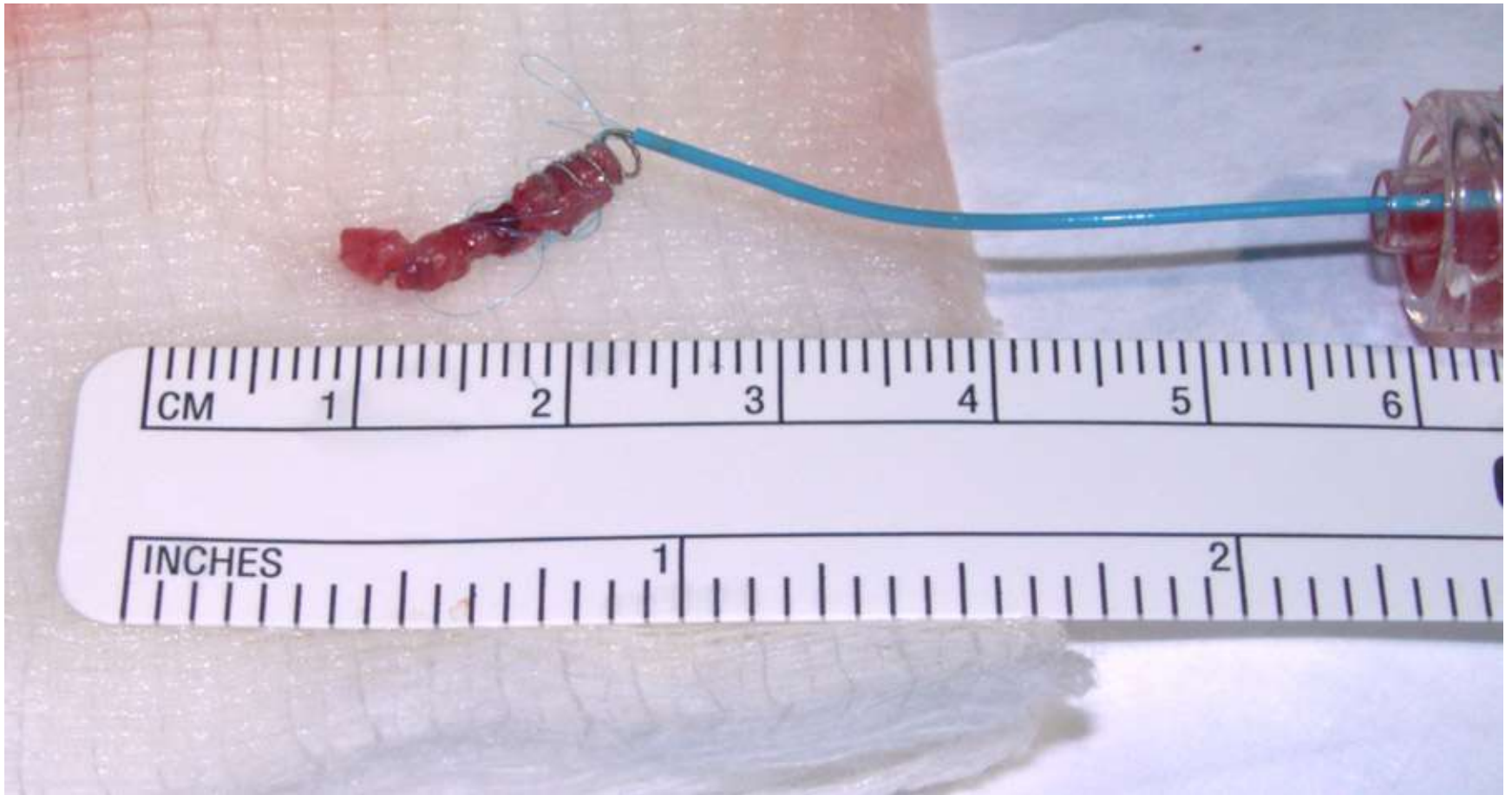


Interventional



- Angiography done
- Large MCA defect
- Clot removed

Clot



Summary



- **Identification**
 - CPSS
 - Accucheck
- Treat acute stroke patients as emergent
 - Goal of stroke center if symptoms within 3 hours
- Know your EMS protocols for transport

Stroke Resources



- Virginia Stroke System Web page:
<http://virginiastrokesystems.org/>
- Virginia Office of EMS Stroke Web page:
<http://www.vdh.virginia.gov/OEMS/Trauma/Stroke.htm>
- Joint Commission:
<http://www.jointcommission.org/CertificationPrograms/PrimaryStrokeCenters/>



Questions?