A Stroke of Good Luck:
EMS Care of the Stroke Patient

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www.virginiastrokesystems.org

Objectives

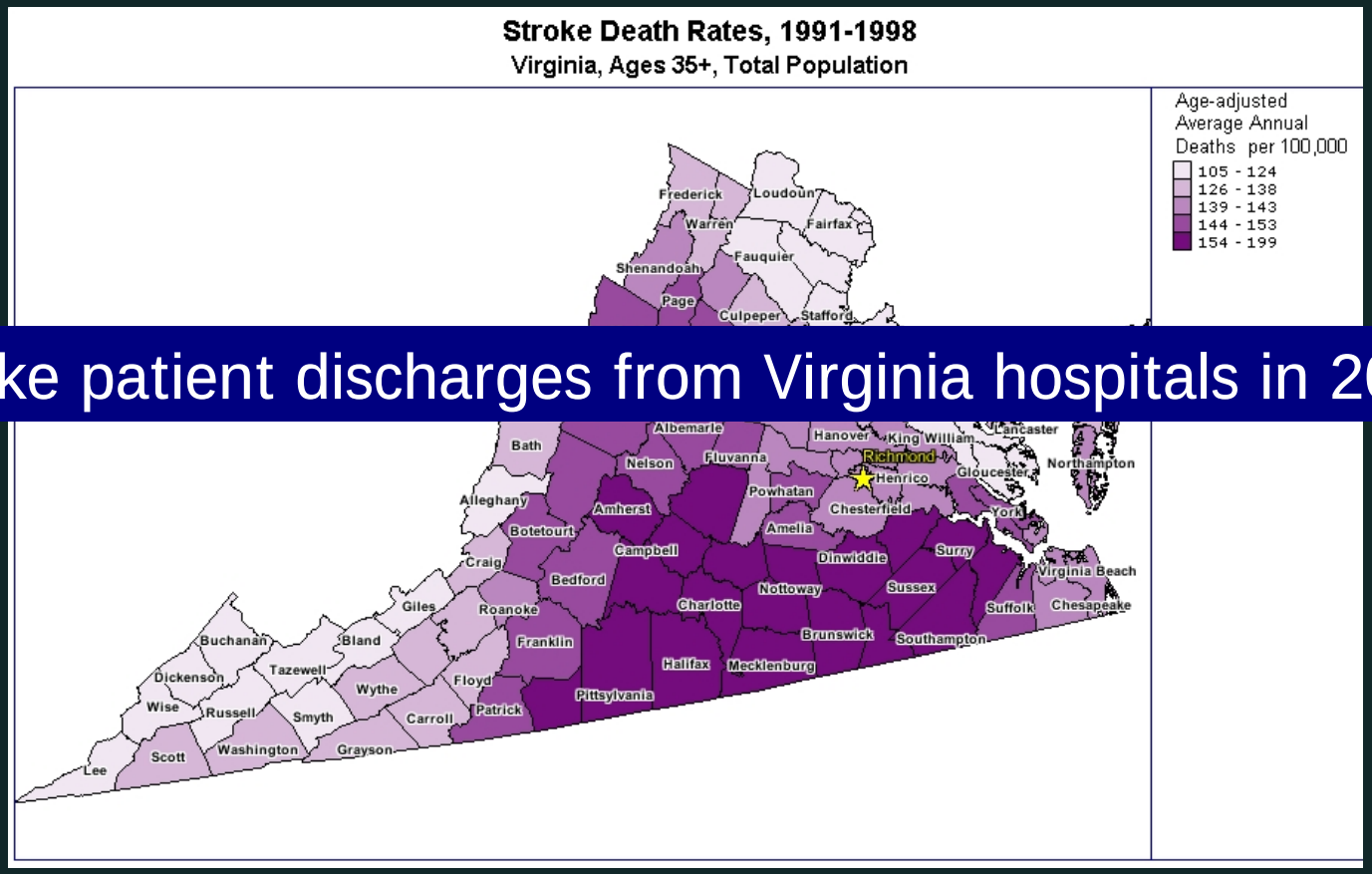
- Background
  - demographics
  - basic types/etiology of stroke
  - current treatment paradigms
  - expanding therapeutic time windows
- Review basic outcome data - 4 brief real-life case studies will be presented
- Review barriers to rapid treatment of stroke
- To provide tools to better assess the patient in the field
- To learn how regional councils EMS in Virginia are improving the continuum of stroke care

Background – U.S.

- ~785,000 strokes/yr
- ~150,000+ deaths/yr
- 80% ischemic
- 20% hemorrhagic
- "Stroke Belt"
  - ? Buckle

The Grim Reaper's style is severely cramped when budget cutbacks force him to carry a toenail clipper instead of a scythe.

Background – VA Regional Disparity



20,674 stroke patient discharges from Virginia hospitals in 2006*

Sources: *Compiled from discharge data provided by Diane Hillman Dr.H.A, ** Virginia Department of Health

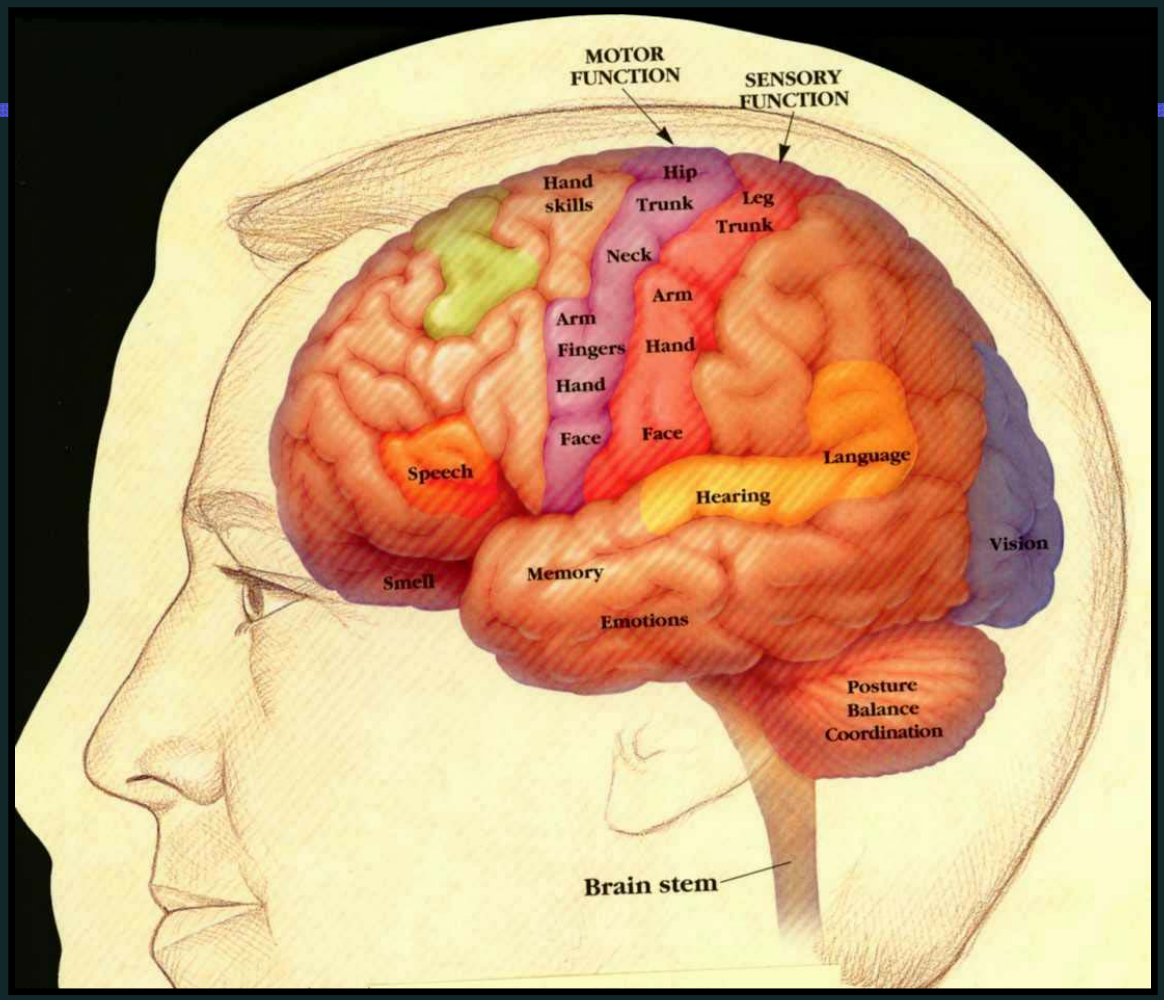
Background

- Economic impact (U.S.)
  - $ 63 billion (2007)
  - Lifetime cost - $140,000
  - Young – vocational loss
  - Rising elderly population
    - From now until 2050, will cost $1.52 trillion among non-Hispanic whites, $313 billion for Hispanics,

      $379 billion for African Americans*

*Brown, D. Neurology (2006)

The Effects Vary



Stroke systems of care elements

1.	2.	3.	4.	5.	6.
Prevention - Help communities start programs - Help programs sustain once started	**EMS Notification & Response** -Detection -Dispatch -Delivery	**Acute Treatment** -Knowing options and opportunities for intervention	**Sub-Acute Care & Secondary Prevention**	**Rehabilitation** - Access to appropriate rehab - Support systems	**Continuous Quality Improvement (CQI)**





Case 1: EMS

- 48 yo walked into house smoking cig, when it fell out of his mouth, onset 17:55
- BP 142/84, P 88, R 16, sat 96% RA
- Cincinnati Stroke Scale:
  - + Drift: R face/arm/leg weakness
  - + Difficulty w speech
  - + R facial droop
- No PMH
- Glucose 84
- Arrival ER 18:55

STROKE THROMBOLYTIC CHECKLIST **Reference 10**

Permitted Levels B | I | P

Date:_____ **Time:**_____**Unit:** _____

PHOTOCOPY THIS FORM AND LEAVE COPY WITH ED PHYSICIAN OR NEUROLOGIST AT BEDSIDE*******

Patient Name:_____ Age:_____ Est.Wt:_____lbs/kg

1. Did patient awaken with symptoms? Yes / No
2. Time last seen at baseline: _____
3. Time of symptom onset: _____
4. Onset Witnessed or reported by: _____
5. Witness/Family coming to ER? _____
   [ENCOURAGE TO DO SO]. If not, phone # where they will be immediately available for calls from hospital staff to assist in giving additional patient history.

( ) -

Cincinnati Stroke Scale Score: CSS=

Symptoms from **Cincinnati Stroke Scale** (circle abnormal findings)

ANY ONE NEW POSITIVE FINDING = POSSIBLE STROKE=MINIMIZE ON SCENE TIME

FACIAL DROOP: R L

ARM DRIFT: R L

SPEECH: slurred wrong words mute /unable to speak

Possible Contraindications (check all that apply)

Current use of anticoagulants (e.g., warfarin sodium)	Yes	No	?
Has blood pressure consistently over 180/110 mm Hg	Yes	No	?
Witnessed seizure at symptom onset	Yes	No	?
History of intracranial hemorrhage	Yes	No	?
History of GI or GU bleeding, ulcer, varices	Yes	No	?
Is within 3 months of prior stroke	Yes	No	?
Is within 3 months of serious head trauma	Yes	No	?
Is within 21 days of acute myocardial infarction	Yes	No	?
Is within 21 days of lumbar puncture (spinal tap)	Yes	No	?
Is within 14 days of major surgery or serious trauma	Yes	No	?
Is pregnant	Yes	No	?
Abnormal blood glucose level (<50 or >400): FSBS (if done): glu=	Yes	No	?

Have you identified any contraindications to thrombolytic therapy? □ **YES** □ **NO**

Receiving Site/Physician Printed Name: _____Time_____

EMS Provider Name: _____Signature_____

Case 1: Emergency Dept

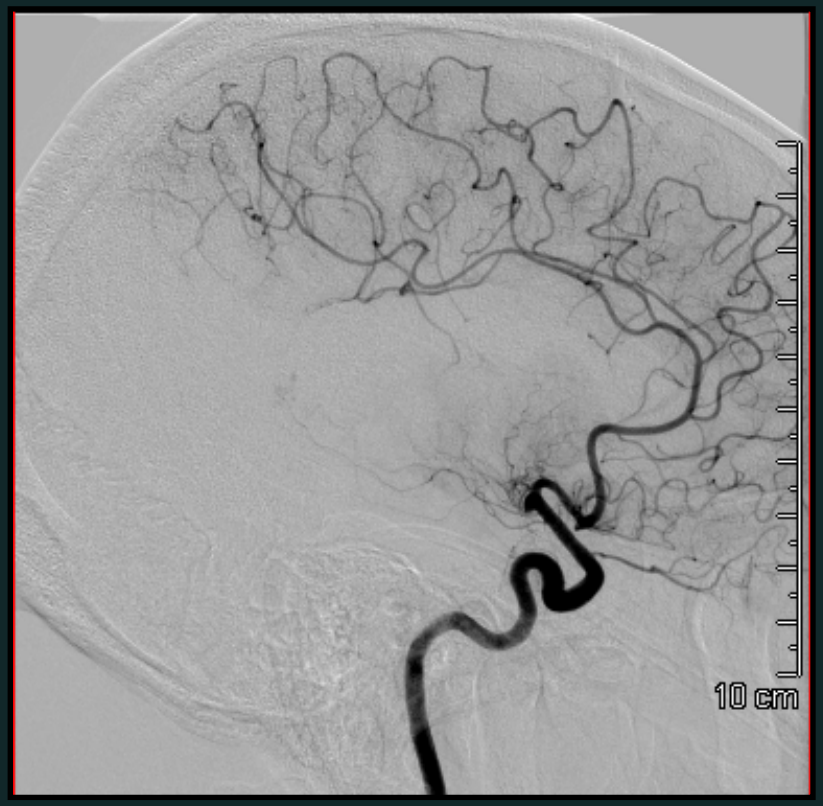
- NIH Stroke Scale = 22 - severe stroke
  - Aphasia,
  - near R sided plegia,
  - hemisensory loss
- Head CT – no blood
- IV TPA at 19:42 PM transfer to UVA
- CT-A, cerebral A-gram demonstrates:

Recommended Stroke Evaluation Targets for Potential Thrombolytic Candidates

`	Time
•Door to doctor	10 minutes
•Access to neurological expertise*	15 minutes
•Door to CT completion	25 minutes
•Door to CT read	45 minutes
•Door to treatment	60 minutes
•Access to neurosurgical expertise*	2 hours
•Admit to monitored bed	3 hours

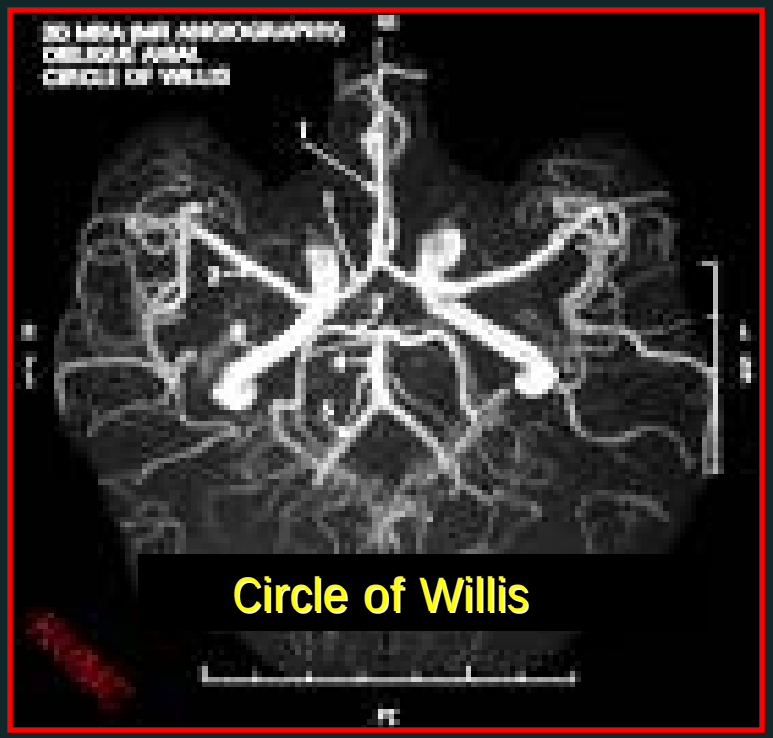
* By phone or in person

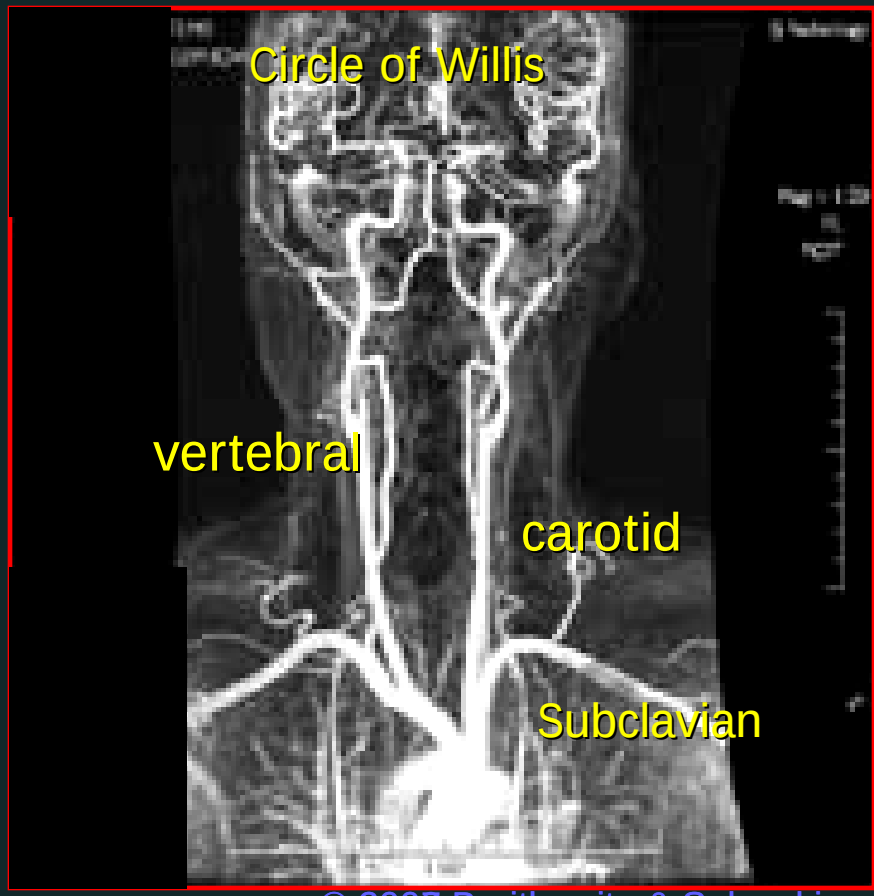
Case 1: Angiogram



Background Pathophysiology

- Cerebrovasculature





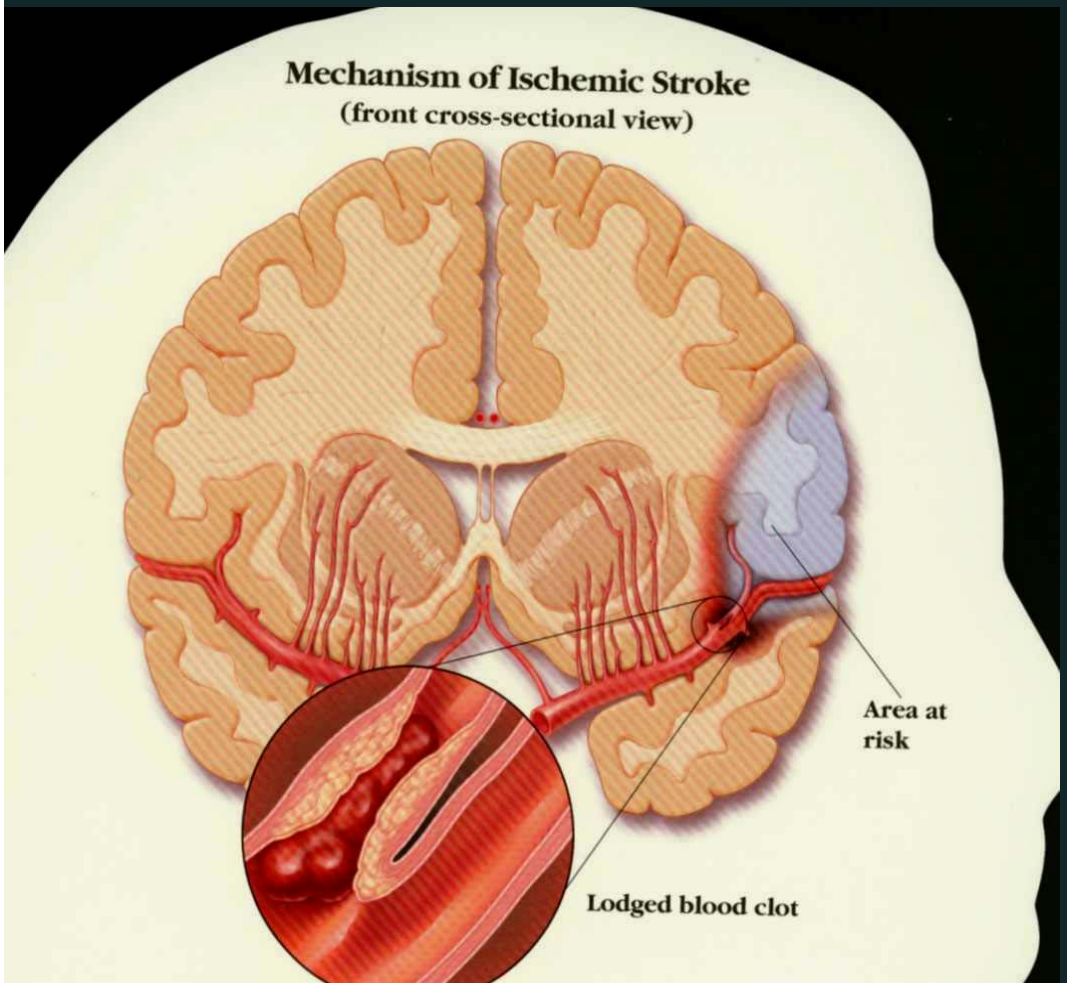
Background Pathophysiology

- Large vessel
  - Anterior circulation – ~65%
  - Extra-, intracranial ICA
    - » Face/arm > leg
  - Middle cerebral artery
    - » Complete, branch
    - » Motor, sensory
    - » Aphasia – “confusion”
    - » L hemisphere – 95% language (R handed)

Case 1: Hospital Course

- Day 3 – 4+/5 strength R, standing
- Expressive aphasia
- Able to understand / comprehension recovered
- Feeding himself
- DC to HOME w PT/OT/Speech

What is an Ischemic Stroke?

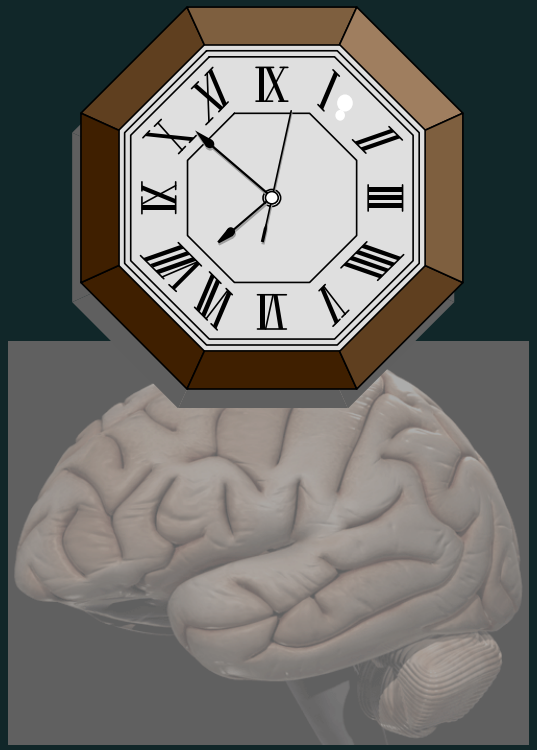


Loss of brain functions caused by a loss of blood circulation **to areas of the brain.**

Blockage usually occurs when a clot or plaque breaks away from another area of the body and lodges within the blood vessels of the brain.

What are treatment options?

"Time is brain"



- **TPA = "Tissue Plasminogen Activator"**
- **Only FDA-approved therapy**
- **Effective when used judiciously**
- **Strict 3-4.5 hour window**
  - **Longer time = increased hemorrhage rate**

What do patients need to know?

- Intravenous “clot buster”
- Higher dose of a “natural clot buster”
- Increases your chances of complete recovery by 30 - 50%
- 10X increase in brain hemorrhage (0.6% to 6.4%)

Truths about IV TPA

- If administered wrong … it can increase mortality
  - Strict eligibility criteria
- No protocol violations -Lower rates including community hospital**
- Increase chance of *complete* recovery by 30-50%*
- Not a panacea – complex "well organized" thrombus difficult to lyse
- Grossly underutilized

*NINDS t-PA Stroke Study Group. N Engl. J Med.. 1995; 333:1581-1587.
**Dick, AP and Straka, J. Neurologist. 2005;11(5):305-308.

Myths about IV TPA

- Only for younger patients
  - > 80 yo: similar recanalization, improvement and symptomatic ICH rates;higher in-hospital mortality*
- Only for thrombotic strokes
- Never if on a blood thinner
- No TPA if just took an aspirin
- Severe strokes no improvement
- Minor strokes should not be treated

*Chen et al. *European Neurology* 2005;54:140-144

Case 1: Summary

- Young patient – no “risk factors” apparent
- Classic carotid – MCA syndrome
- Rapid EMS assessment, recognition of time critical element
- Rapid IV TPA eval and tx
- No improvement: additional therapy options are available
- Excellent recovery in spite of initial deficits

Case 2: EMS

- 74 yo female
- Awoke “weak and dizzy”
- BP 220/110, P 88, R 16, sat 95% RA
- Cincinnati Stroke Scale
  - Neg facial droop
  - Neg pronator drift
  - Generalized weakness, not lateralized
- Stumbled and had balance problems in transfer to stretcher
- Glucose 133

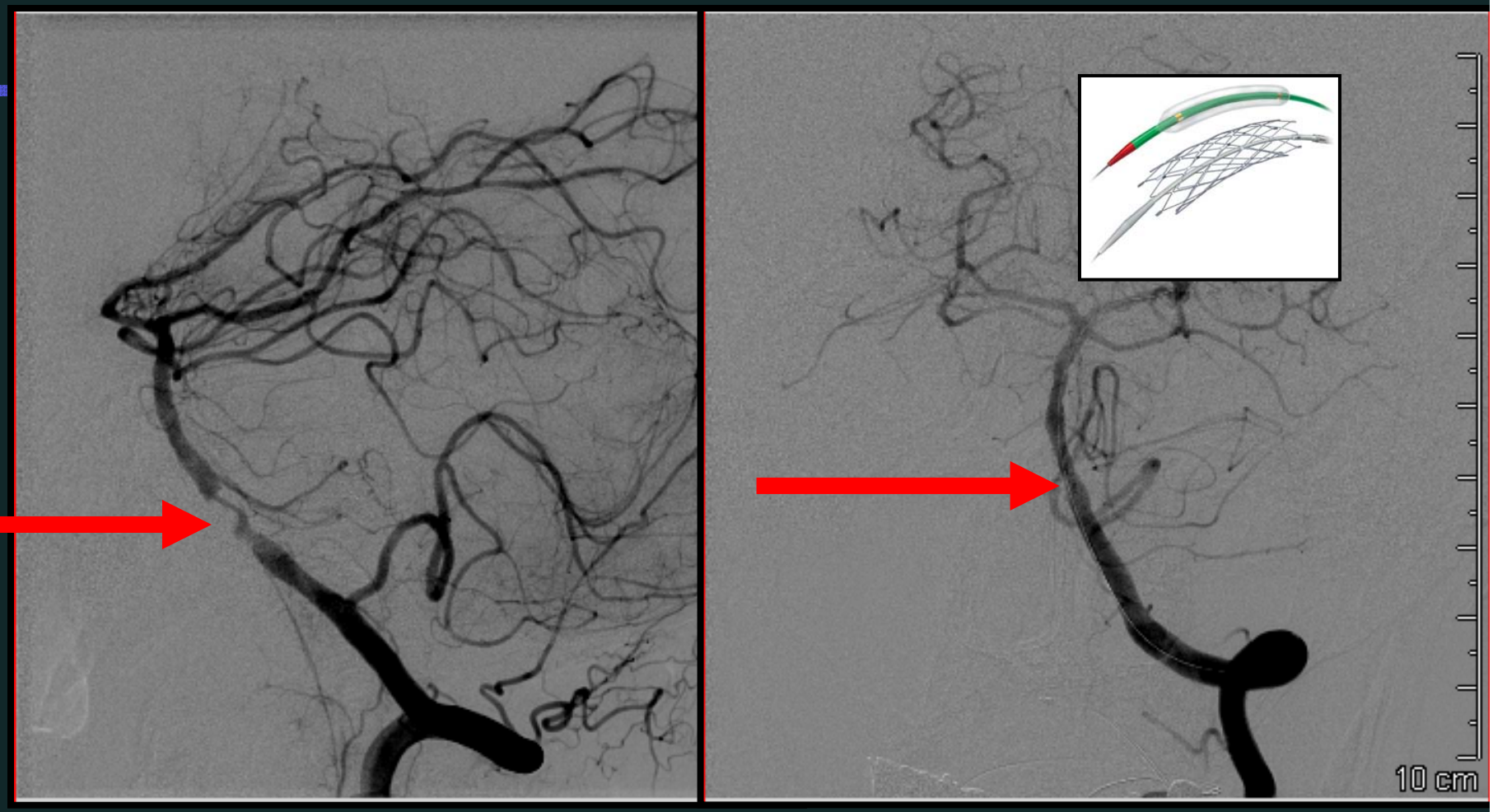
Case 2: Emergency Dept

- 74 year old female
- PMH: paroxysmal atrial fibrillation, hyperlipidemia, hypertension and tobacco abuse
- Seen in non-stroke center, elevated blood pressure treated
- Symptoms worsened
- Transfer to stroke center
- In transit, noted by EMS that patient's symptoms significantly worse when sitting up
- CT- Angiogram:

Case 2: Hospital Course

- Remained supine, fluid resuscitation, heparin gtt (prevent clot propagation)
- Repeat CTA – clot burden less
- Basilar artery angioplasty stent

Case 2: Hospital Course



Case 2: Summary

- Dizzy – can be many things:
  - Benign: vertigo
  - Serious: stroke
- Positional TIAs suggest critical hemodynamically significant impairment / narrowing of arterial flow
- NO need to intervene with BP unless acute MI or evidence of end organ damage

Case 2: Questions

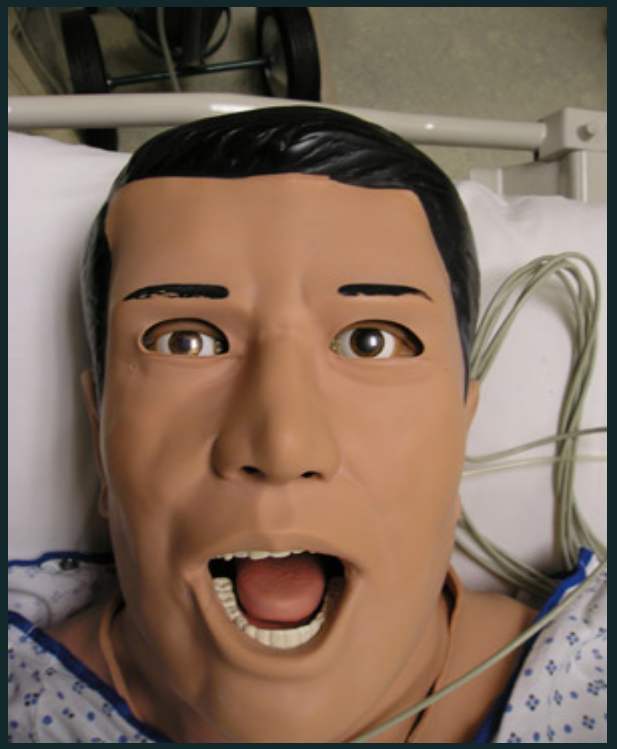
- Why not given TPA?
- What are posterior circ symptoms?
  - The D's – Dysarthria, Dysequilibrium, Diplopia, Dizzy (vertigo), Dysphagia
- What if near comatose – can it still be a stroke?
  - YES – brainstem damage
  - "Pontine pupils", snoring respirations

Case 3: EMS

- 24 yo female, 16 weeks pregnant
- “Not acting right”
- Went to bed with a headache
- BP 122/72, P 94, R 18, sat 98% RA
- Cincinnati Stroke Scale:
  - + right arm drift
  - + right facial droop
  - + abnormal speech
- Glucose 66

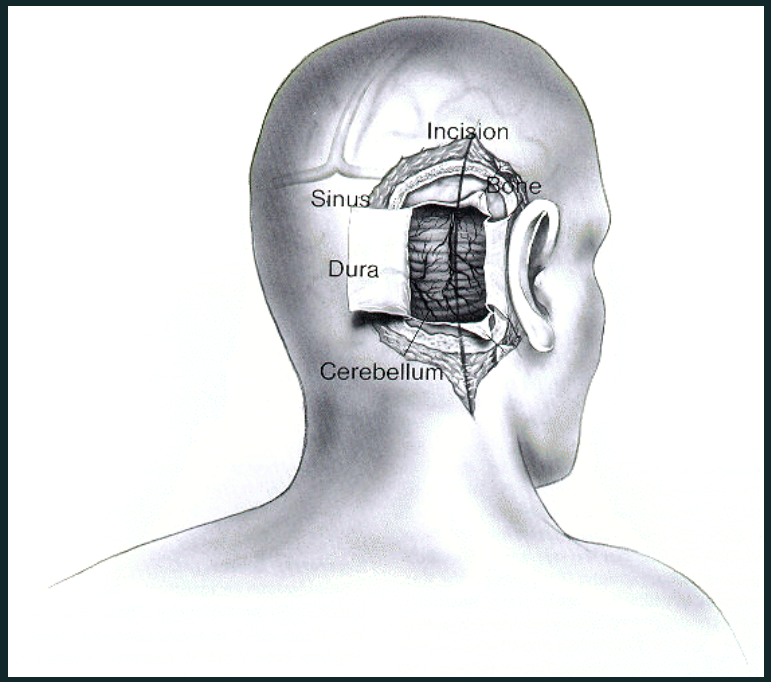
Case 3: Emergency Dept

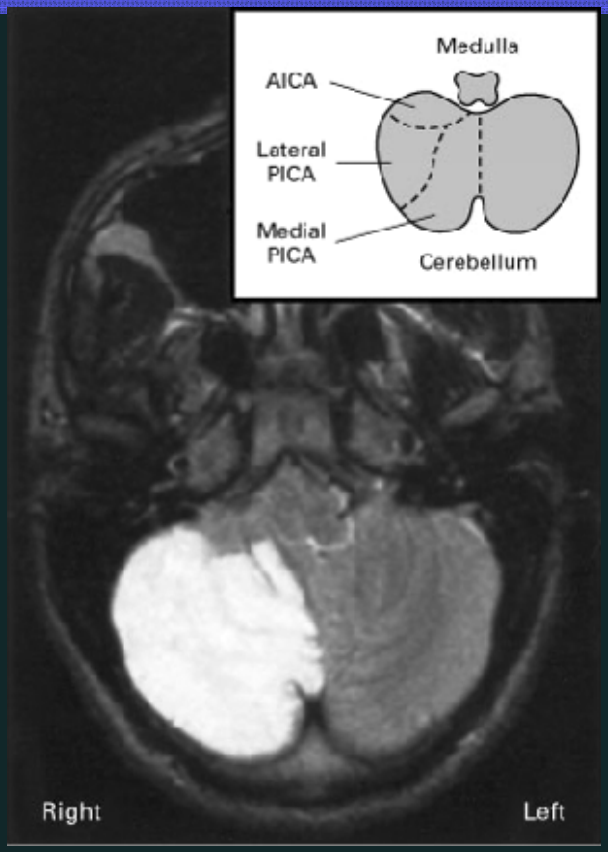
- 23 yo WF, 24 wk pregnant, acute slurred speech, vertigo, severe N/V, incoordination R side
- Arrived ER 18 hrs from onset
- Stroke Alert
  - CT Angiogram:
    - R distal vertebral thrombosis;
    - large hypodensity in R cerebellum
- Increased lethargy, headache



HERNIATING !!!

Posterior Fossa Decompression





Case 3: "Malignant Syndrome"

- Survived
- Normal – minimal deficits
- Beautiful baby boy
- Large anterior circulation infarctions as well especially proximal carotid artery occlusion (half a hemisphere stroke)

Case 3: Summary

- **Reassess, reassess, reassess: rapid decompensation possible**
- **Treatment window can vary—extends up to 24 hours for some interventions**
- **Every potential stroke potential requires rapid dispatch, delivery**
  - **IV TPA –3-4.5 hr;**
  - **IA TPA 6 hr**
  - **MERCI 8 hr**
  - **BA thrombosis up to 24 hr!**
- **EMS should not make decisions on patient eligibility—time is not the only factor**

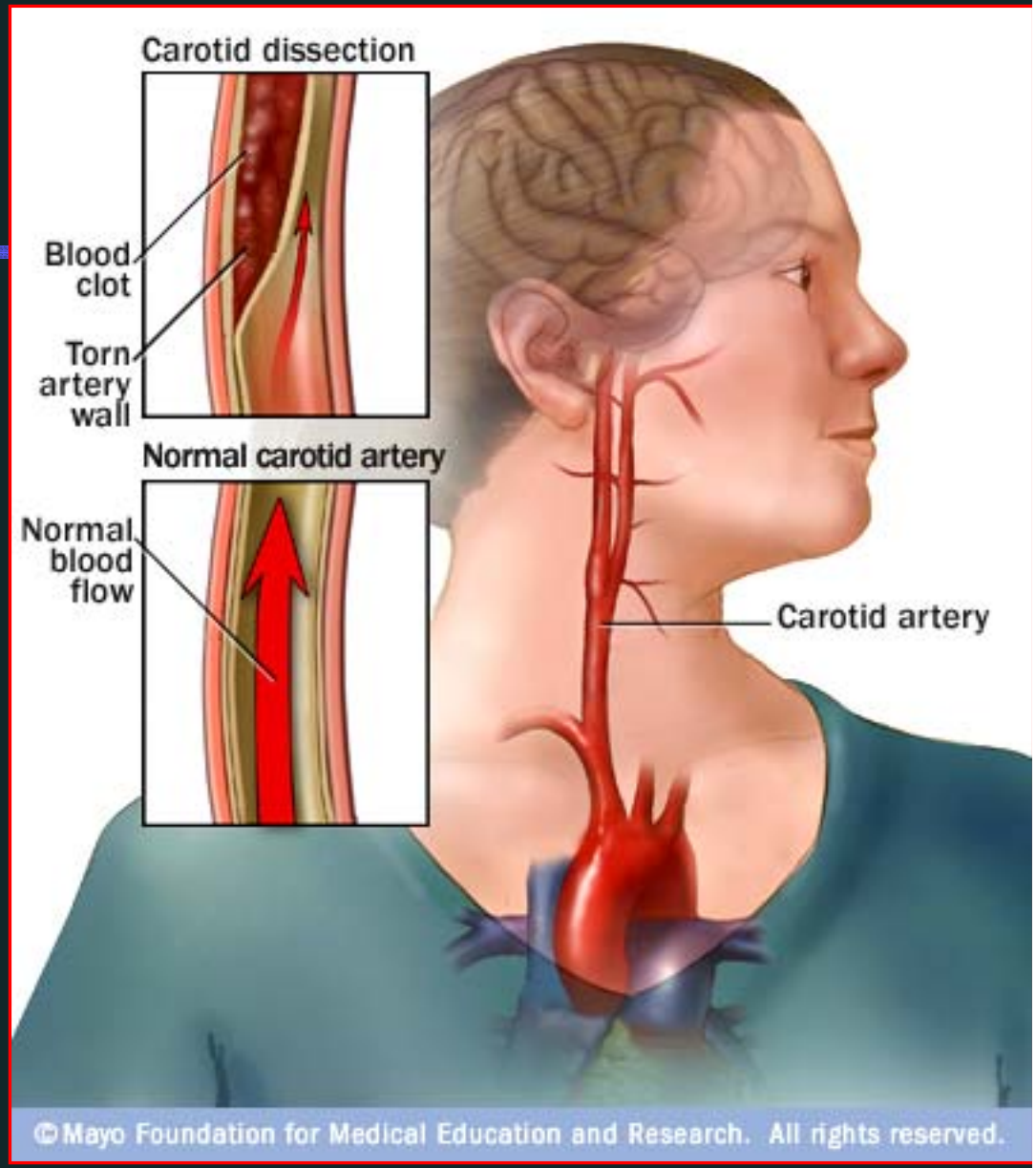
Case 4: EMS

- 29yo female
- Tingling on right side of body with headache
- BP 130/82, P 70, R 28 (anxious)
- PMH: migraine
- Cincinnati Stroke Scale:
  - Neg drift
  - Neg facial droop
  - Neg speech abnormality
- Glucose: 82

Case 4: Emergency Dept

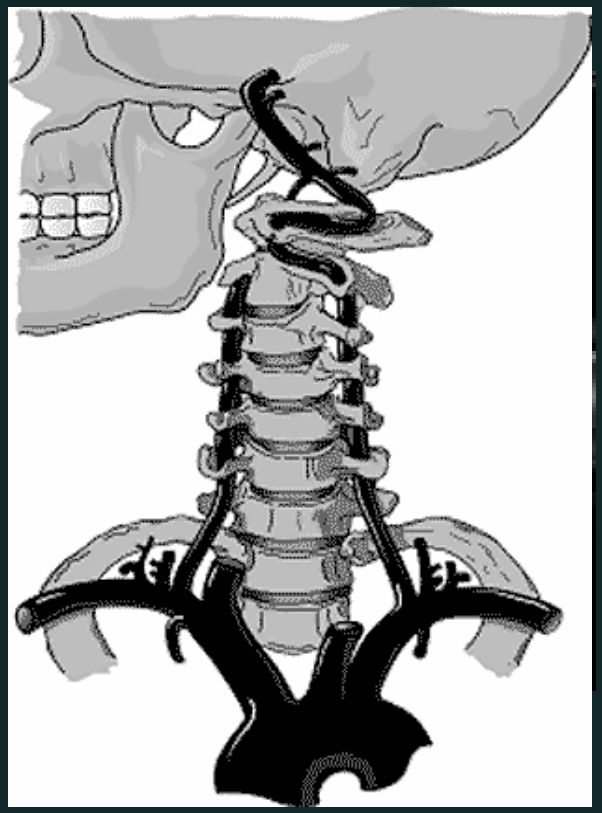
- Drooping of L eyelid, decreased sensation R side of body, occipital HA
- Dx – migraine HA
  - Benadryl-Compazine,
  - Neuro eval for focal findings on face

Case 3: Dissection Pathology



Atypical Presentation: Vertebral Artery Dissection

- Traumatic L vertebral artery dissection
- Stroke in the Posterior Fossa – no room to swell
  - Increased morbidity; young
  - Downward herniation - BS
  - Rapid progression – vigilant monitoring



Case 3: Hospital Course

- "Horner's syndrome" diagnosis suspicious for vascular etiology
- MRI – DWI – small medullary stroke
- Abnormal vascular studies – bilateral vertebral artery "dissections"

Case 3: Summary

- Not all headaches are migraine
- Exam findings are critical
- Dissection can occur spontaneously (atraumatic)

Case 4: Man down

- 44yo male, fine this morning
- Sudden, severe vomiting
- Girlfriend heard a “thud”
- Curled up in fetal position on floor, unresponsive
- BP 180/96, P 52, R 16 snoring
- Glucose: 92
- Cincinnati: not performed

Case 4: Emergency Dept

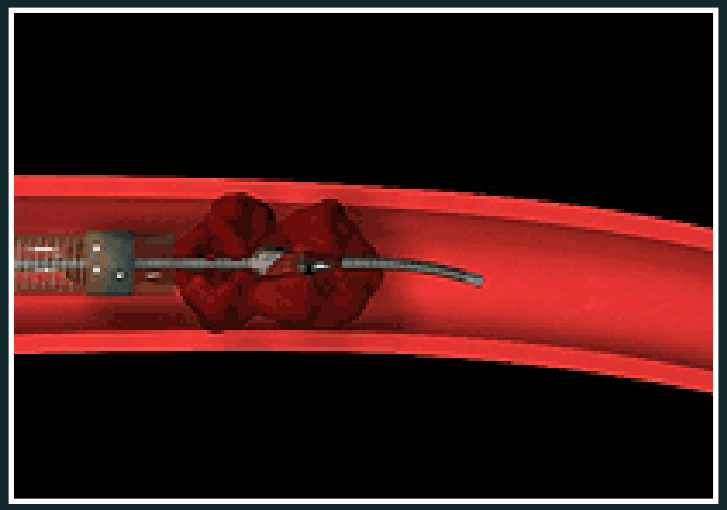
- Transported to non-stroke center
- Pt more awake but nonverbal on arrival there, not able to follow commands
- GI evaluation initiated
- Recurrent decreased mental status, right sided weakness noted
- Intubated for airway protection
- Head CT negative, MRI positive
- Transferred to stroke center

Case 4: Emergency Dept

- MRI showed acute left pontine infarct with occlusion of the basilar artery and both vertebral arteries
- Transferred 13 hours after onset
- IV TPA not given
- IA TPA and penumbra device - both were deployed

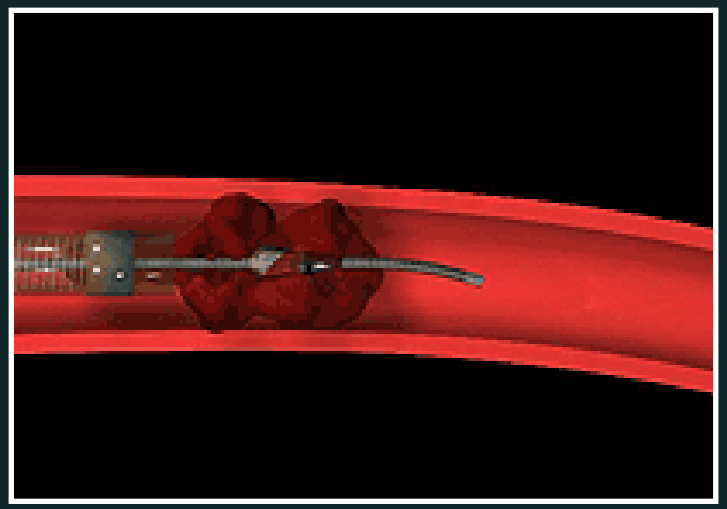
Case 4: Hospital Course

- MRI left pontine infarct on DWI.
- Cerebral angiography revealed complete thrombosis proximal three-fourths of the basilar artery.
- Emergent IA tpa was given, and penumbra device deployed



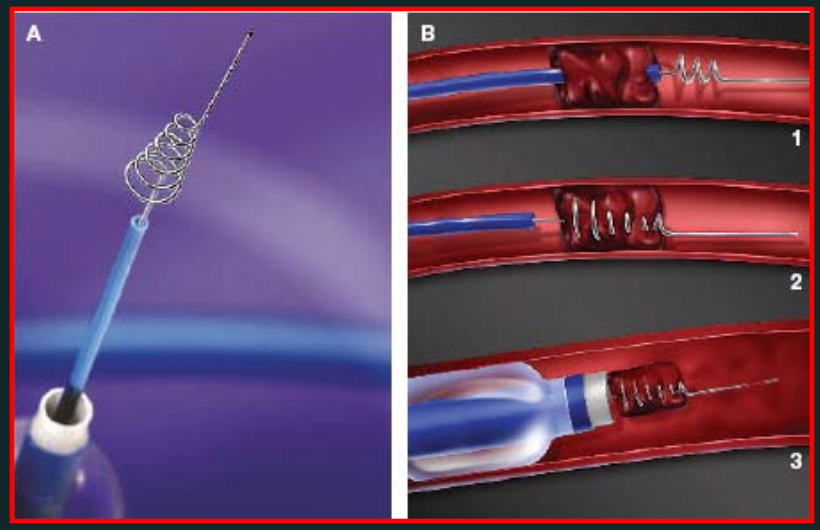
Case 4: Hospital Course

- TEE – revealed cogential heart defect (PFO)
- US LE – R leg clot
- Placed on warfarin
- Discharged, alert, mild dysarthria, no weakness, no ataxia



Devices – "MERCI"

- **Intravascular retrieval system: MERCI**
  - **FDA approved for clot removal —not approved for acute stroke treatment**
  - ~8 hr tx. window
  - **High mortality (early models only)?**

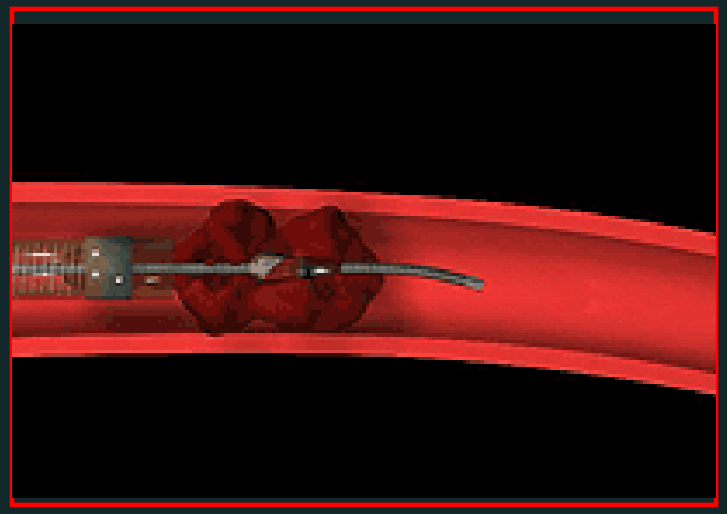


WS Smith *Nature Clinical Practice Neurology* (2007) 3, 45-53

Devices – "PENUMBRA"

Intravascular retrieval system:

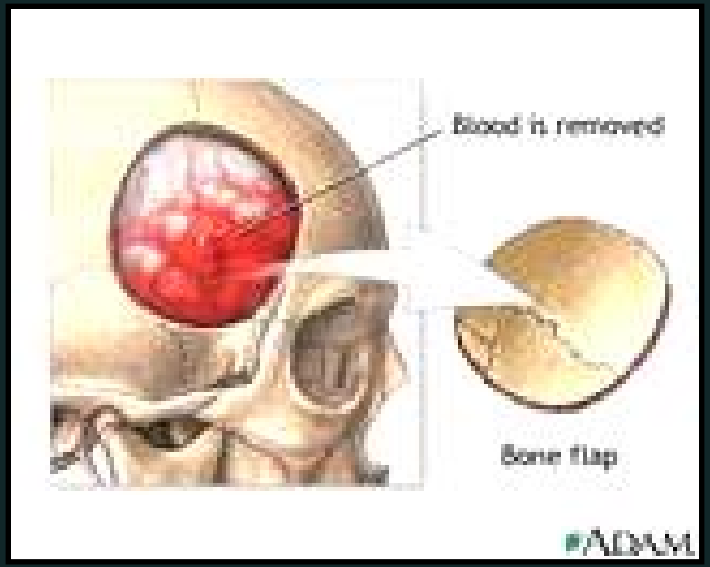
- **FDA approved for clot removal —not approved for acute stroke treatment**
  - ~8 hr tx. Window
  - NIHSS > OR = 8

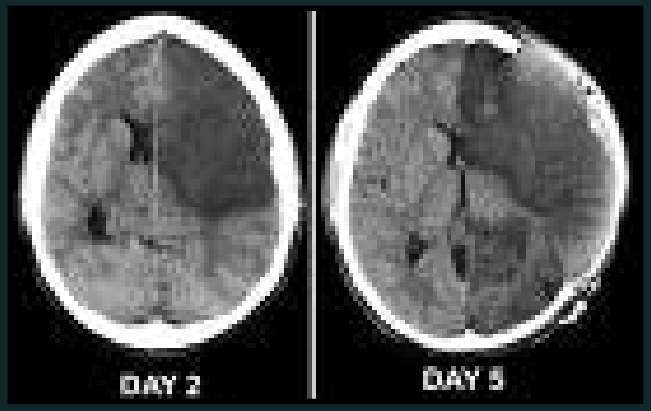


ASA Abstract (2008); Smith, et. al., Stroke 2005;36:1432

Acute Neurosurgery

- Hemicraniectomy
- Less acute – IC-EC bypass, CEA, stenting (TIA)





Case 4: Summary

- LOC not always syncope, drugs induced, or seizure
- Bilateral brainstem disease – abnormal neuro exam (ex ocular findings critical for next triage steps)
- Successful treatment > 13hr from onset

Summary

- Regional approach and plans
- Mode of transport
- Stroke scale utility
- Time frame flexibility
- Role of different types of hospitals
- Range of treatment options