

Stroke Update

Michel Torbey, MD, MPH, FAHA, FNCS
Medical Director, Neurovascular Stroke Center
Professor
Department of Neurology and Neurosurgery
The Ohio State University Wexner Medical Center

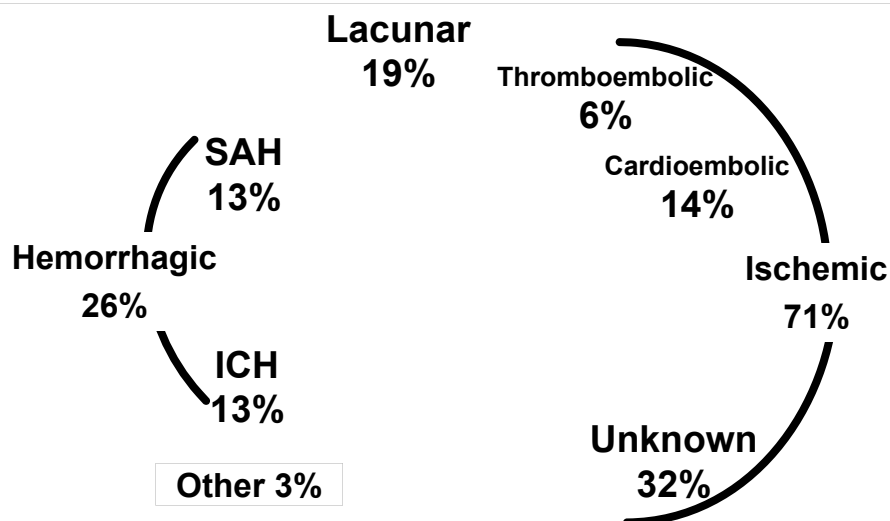
Objectives

- **To provide a comprehensive approach to acute stroke management.**
- **To provide guidelines for IV, IA, combined IA-IV rt-PA, and mechanical thrombectomy.**
- **To provide a review of telestroke.**

Stroke Facts

- Third leading cause of death
- A stroke occurs every 40 s in the USA
- Every 3.3 min someone dies from stroke
- Leading cause of adult disability
- Over 4 million stroke survivors

Stroke Subtypes



NINDS Stroke Data Bank:
Foulkes, et al. *Stroke* 1988;19:547.

Stroke Presentation

- **Transient Ischemic Attack (TIA)**
- **Acute Ischemic Stroke**

Transient Ischemic Attack

TIA

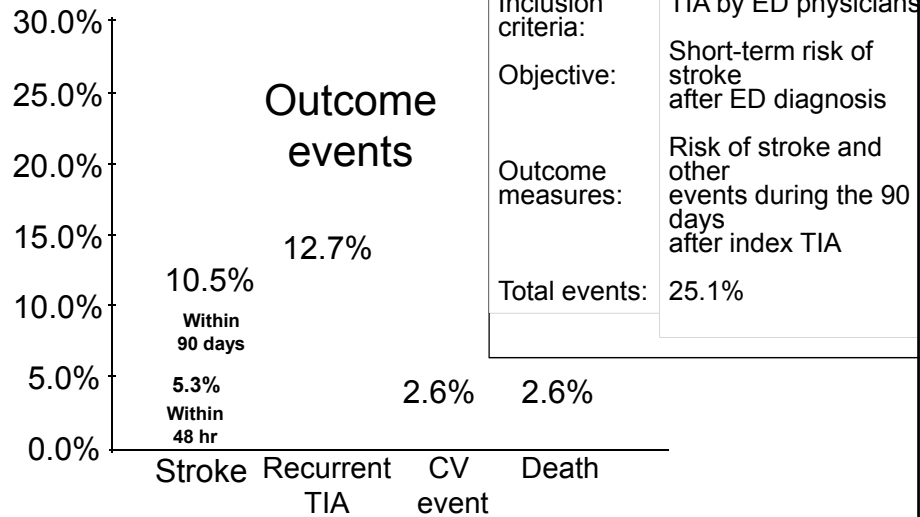
- Old definition: symptoms lasting <24 hr.
- New definition: Symptoms lasting < 1 hr.
- Majority of TIAs resolve within 60 minutes.
- Most TIA resolve within 30 minutes.

TIA and Stroke as Predictors of Secondary Stroke

	Post-TIA (%)	Post-Stroke (%)
30 days	4 – 8	3 – 10
1 year	12 – 13	5 – 14
5 years	24 – 29	25 – 40

Sacco. *Neurology* 1997;49(suppl 4):S39-S44.
Feinberg, et al. *Stroke* 1994;25:1320-1335.

Short-term Prognosis after ED Diagnosis of TIA



Johnston SC, et al. *JAMA* 2000;284:2901-2906.

TIA

- Do we need to admit all TIA's ?
- What work up is enough to D/C from ER

ABCD2 Score

Age older than 60 years	1 point
SBP \geq 140 mm Hg	1 point
DBP \geq 90 mm Hg	1 point
Unilateral weakness	2 points
Speech impairment without weakness	1 point
TIA duration \geq 60 min	2 point
TIA duration 10-59 min	1 point
Diabetes	1 point

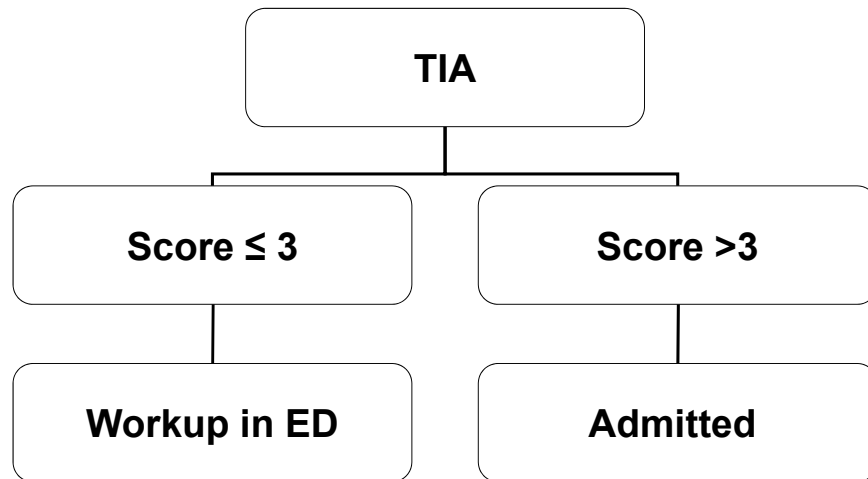
Johnston SC, et al. Lancet 2007; 369:283-92.

ABCD2 Risk stratification

Score	Stroke Risk		
	2 days	7 days	90 days
≤ 3	1%	1.2%	3.1%
4-5	4.1%	5.9%	9.8%
≥ 5	8.1%	11.7%	17.8%

Johnston SC, et al. Lancet 2007; 369:283-92.

ABCD2 and ED Management



Johnston SC, et al. Lancet 2007; 369:283-92.

Ischemic Stroke

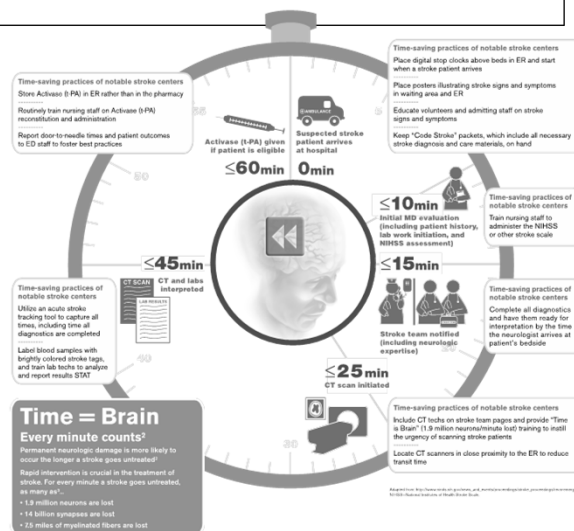
Acute Stroke Treatment

- IV rt-PA
- IA rt-PA
- Combined IV-IA rt-PA
- Mechanical Embolectomy

The Golden Hour of stroke treatment

Evaluation and treatment of acute stroke¹

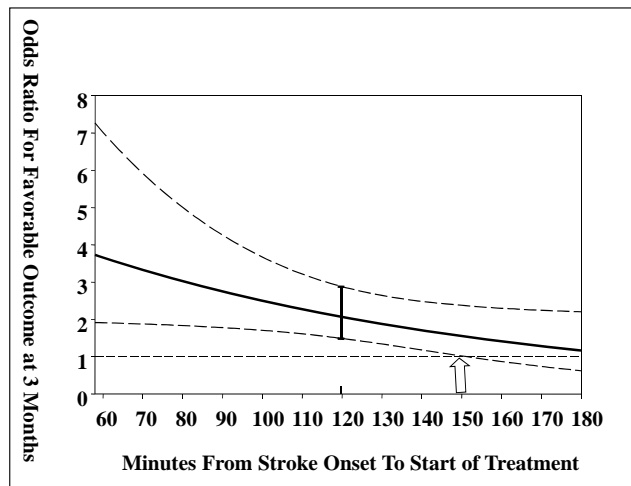
¹ The National Institutes of Health (NIH) recommends time intervals that enable Activase (Alteplase, tPA) stroke patients presenting to the emergency department (ED) to receive treatment within 60 minutes



Stroke: Every Minute Counts



Early Rx was better in the NINDS tPA Trial



Marler JR, et al. Early stroke treatment associated with better outcome: The NINDS rt-PA Stroke Study. *Neurology* 55:1649-55, 2000.

Goal treatment timeline door-to-needle

- **Evaluation by physician: 10 min**
- **Stroke expertise contacted: 15 min**
- **Head CT or MRI performed: 25 min**
- **Interpretation of CT/MRI: 45 min**
- **Start of treatment: 60 min**

**Is the Golden Hour
Achievable?**

Limitations

- **21% of the US population lives in rural areas**
- **Significant shortage of physicians with expertise in acute stroke treatment**
- **Four neurologists per 100,000 persons**
- **Many neurologists have discontinued hospital privileges**

rt-PA Experience

- **A review of Medicare data for 4750 hospitals showed that only 2.4% of patients are treated with t-PA.**
- **60% of hospitals reported no t-PA treatment.**
 - **Smaller hospitals <100 beds**
 - **Rural areas**

Hess DC et al. Cerebrovascular Disease and Stroke. 2011, 13:215

Primary Stroke Centers

- **More than 600 PSC across the US.**
- **Most located in metropolitan areas**
- **<25% of US population lives within 30 min of PSC**
- **Only half able to reach a PSC within 1 h if state boundaries respected by ground ambulance**

Treatment of Stroke in rural area

- **Ship and drip**
- **Drip and ship**

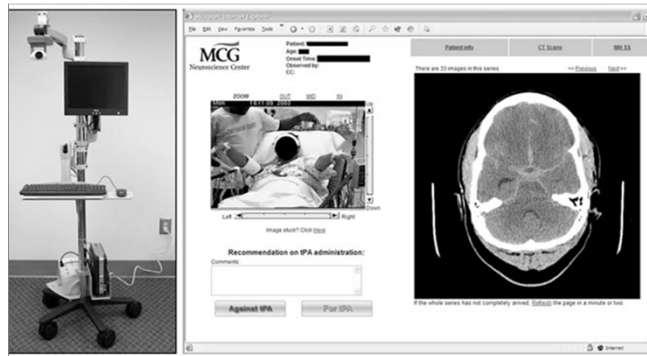
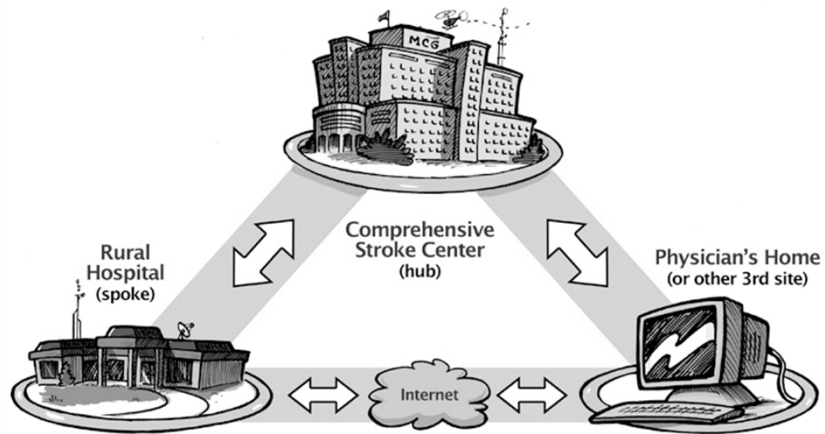
Ship and Drip Concept

- **Patients initially assessed in rural hospital**
- **Transfer patients who are able to get to a PSC within 3 h**
- **This is feasible probably within 80 miles radius**
- **Not a desirable solution**

Drip and Ship Concept

- **Initial assessment in rural hospital**
- **Consultation with stroke expert through phone consultation or telestroke**
- **t-pa started then patient is transferred**

Telestroke



IV rt-PA

- **0-3 h last known well**
- **3-4.5 h last know well**

IV rt-PA Eligibility 0-3 h

- **Diagnosis of ischemic stroke**
- **Onset of symptoms < 180 min**

Updated Contraindications to rt-PA



Clinical

- **Symptoms suggestive of intracerebral hemorrhage or subarachnoid hemorrhage**
- **Persistent blood pressure elevation >185/110**
- **Active bleeding or acute trauma (fx)**

Historical

- **Intracranial or intraspinal surgery or serious head trauma in prior 3 months**
- **Presence of intracranial conditions that increase risk of bleeding (tumor, vascular malformations, ..)**

Laboratory

- **Bleeding diathesis**

Other Relative Contraindications

- Seizure at onset of stroke
- Serum glucose <50 mg/dl or >400 mg/dl
- Hemorrhagic eye disorders
- Myocardial infarction in the prior six weeks
- Suspected septic embolism
- Infective endocarditis

Radiological

- Evidence of hemorrhage
- Major early infarct signs
 - Diffuse swelling of affected hemisphere
 - Parenchymal hypodensity
 - Effacement of >33% of middle cerebral artery territory

NINDS rt-PA Stroke Study

- Prospective, randomized, double-blind trial
- 624 patients: half treated within 90 minutes, half treated within 91 to 180 minutes
- rt-PA dose: 0.9 mg/kg, maximum dose: 90 mg, 10% as IV bolus, remainder via 1-hour infusion
- Careful attention to Bp: <185/110
- No anticoagulant or antiplatelet agents for 24 hours

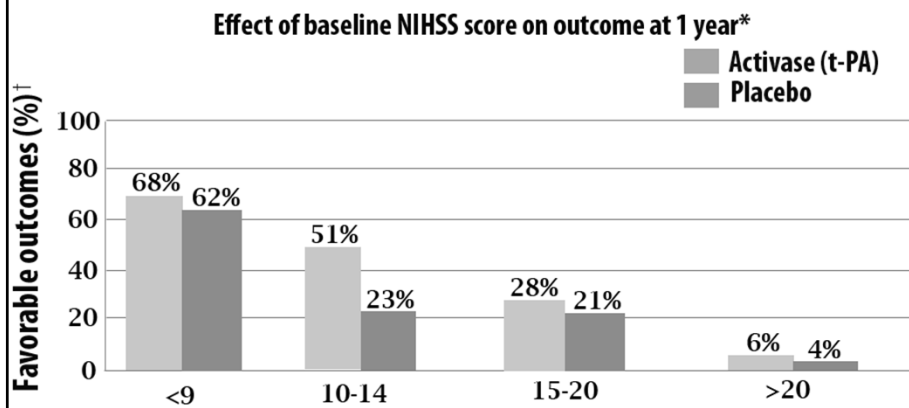
IV rt-PA and Outcome

Discharge dispositions from initial hospitalization in the NINDS study

	t-PA (n=312)	Placebo (n=312)
Home	48%	36%
Inpatient rehabilitation unit	29%	37%
Nursing Home	7%	13%
Other facility	4%	2%
Dead	11%	13%

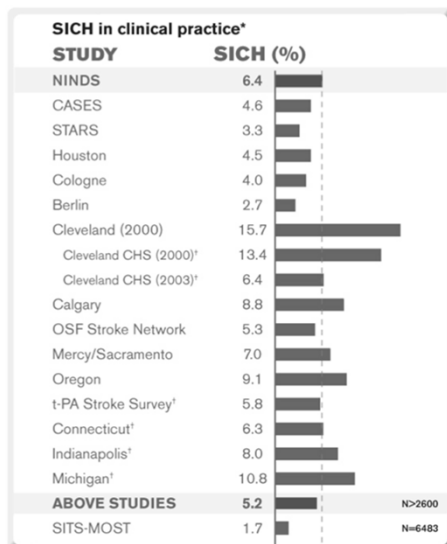
Fagan SC et al. Neurology 1998;50:883

Baseline symptoms and outcome



Kwiatkowski TG et al. N Engl J Med. 1999;340:1781

rt-PA Complications



- In a meta-analysis of 15 published studies rate of ICH was 5.2% in 3 month
- Increase rate of hemorrhage was associated with protocol deviations.

Adapted from Graham GD. Stroke, 2003;34:2487; Katzan IL et al. Stroke, 2003;34:799; Wahlgren N et al. Lancet, 2007;369:275

3 TO 4 1/2 HOURS

- 821 patients
- 18 to 80 years old randomized to tPA vs placebo
 - 52% no disability with tPA vs 45% placebo
 - No mortality difference (7.7% tPA vs 8.4%)
 - Symptomatic hemorrhage 7.9% tPA vs 3.5%

ECASS III: NEJM 2008;359:1317-29

Contraindications to tPA 3 - 4.5 hours

- Patients older than 80 years
- Patients taking oral anticoagulants regardless of INR
- Patients with baseline NIHSS >25
- Patients with history of diabetes and stroke

IV t-PA should be administered to eligible patients who can be treated in the time period of 3 to 4.5 hours after stroke (Class I Recommendation, Level of Evidence B).

Science Advisory from AHA. Stroke 2009;40:2056

Conclusion

- **Acute stroke is analogous to trauma:**
 - **Patients should be quickly assessed and screened for t-PA**
 - **Stroke expertise should be at the bedside either physically or through telemedicine approach**

Stroke Update

Shahid M. Nimjee, MD, PhD
Assistant Professor
Departments of Neurological Surgery, Radiology
and Neuroscience
The Ohio State University Wexner Medical Center

Disclosures

- **None**

Quick facts

- **Ischemic stroke over 700,000 patients annually in the United States**
- **Leading cause of combined morbidity and mortality in the western hemisphere**
- **Most common etiologies**
 - **large-artery atherosclerosis (20– 30%)**
 - **cardiac (20– 30%)**
 - **small-vessel or lacunar stroke (20– 30%)**

Endovascular thrombectomy

- **5 randomized clinical trials demonstrated that mechanical thrombectomy of large vessel occlusion strokes improved neurological outcomes compared to maximal medical therapy**
- **Previously, the only class I data to support therapy in acute ischemic stroke was IV rTPA published in 1995 – 20 years ago!**

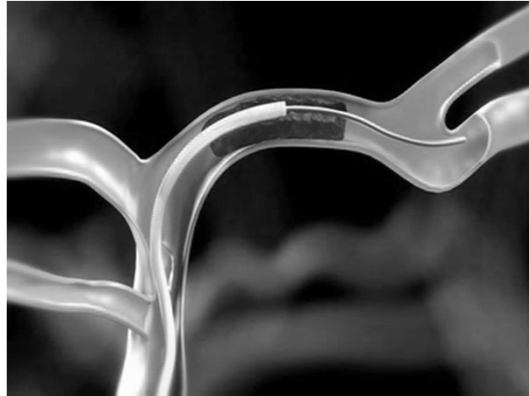
Decompressive hemicraniectomy

- **In patients who suffer large middle cerebral artery ischemic stroke, 3 European randomized clinical trials (HAMLET, DECIMAL and DESTINY) demonstrated**
 - **decreased mortality**
 - **improved neurological outcomes in pooled analysis**

Endovascular thrombectomy

ESCAPE	EXTEND IA	MR CLEAN	REVISCAT	SWIFT PRIME
 Alberta	 Australia	 Netherlands	 Spain	 USA
Improvement in neurological outcomes at 90 days				
Score	Description			
0	No symptoms			
1	No significant disability. Able to carry out all usual activities despite some symptoms			
2	Slight disability. Able to look after own affairs without assistance, but unable to carry out all previous activities			
3	Moderate disability. Requires some help, but able to walk unassisted			
4	Moderate severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted			
5	Severe disability. Requires constant nursing care and attention, bedridden, incontinent			
6	Dead			

Thrombectomy technique



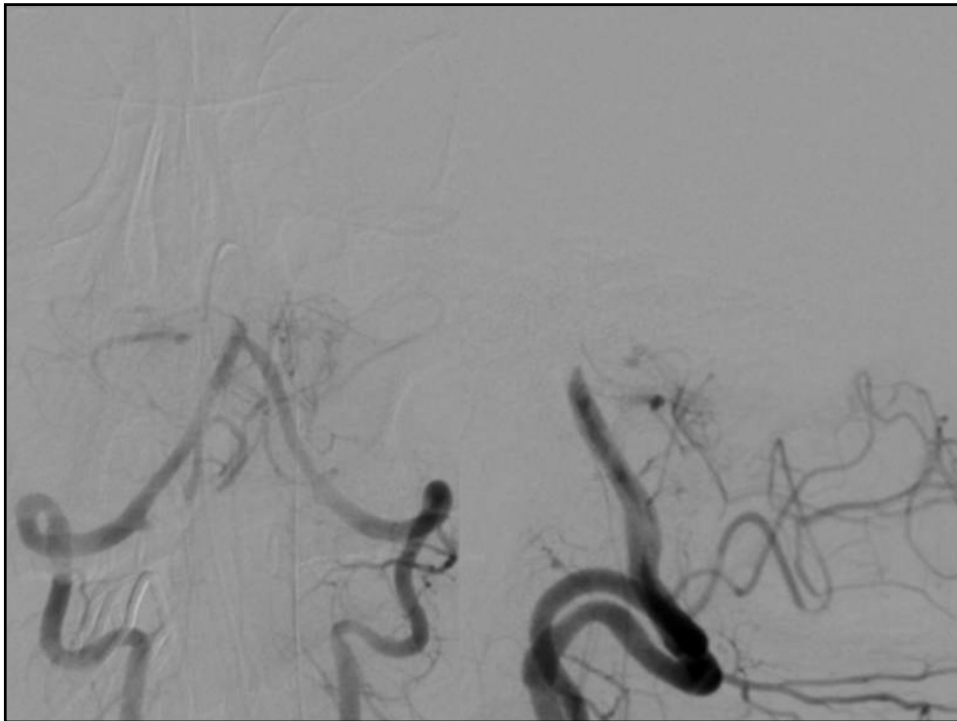
Case

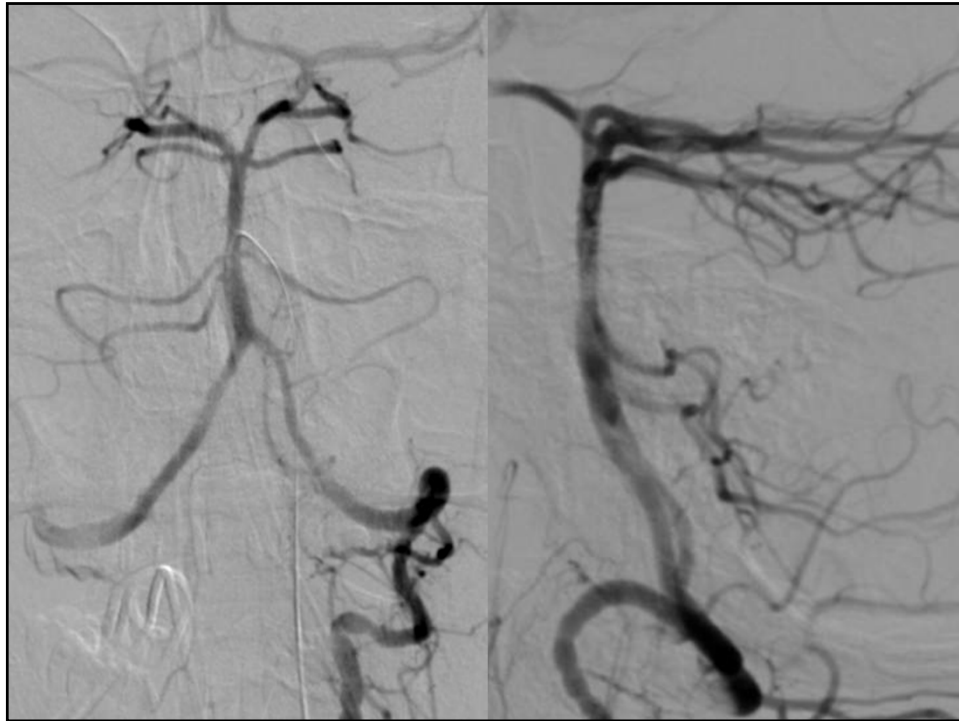
- **75-year-old female with multiple medical problems presented to local hospital with right hemiparesis and aphasia**
- **Patient received IV rTPA and transferred to OSU**
- **CTA demonstrated left M1 occlusion**



Case

- **30-year-old female presented with left facial droop and subtle left weakness**
- **Her exam deteriorated to somnolence and unable to follow commands**
- **CT brain demonstrated no hemorrhage**
- **CTA brain concerning for basilar occlusion**





Decompressive hemicraniectomy

Case

- **63-year-old male presented with right-sided weakness and aphasia**
- **CT demonstrated no hemorrhage**
- **CTA demonstrated no large vessel occlusion**
- **30 hours after presentation, patient become somnolent**



