

# AMSER Case of the Month

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### 31-year-old Stroke Alert

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# Patient Presentation

- A 31-year-old male presented to the emergency department (ED) with slurred speech, right facial droop, and profound right upper and mild right lower extremity weakness.
- Patient presented to the ED at 2 am; last known normal was at 2 pm the prior day. In the ED, the patient was awake, not speaking, and nodded yes to every question.
- PMHx- none
- FHx- hypertension
- Social Hx- former cigarette smoker, occasional alcohol and marijuana use

# Pertinent Labs

- Normocytic anemia (Hgb ~12.6)
- Thrombocytopenia (132,000)
- PT 14.4
- PTT 24.2
- INR 1.1

What Imaging Should We Order?

# Select the applicable ACR Appropriateness Criteria

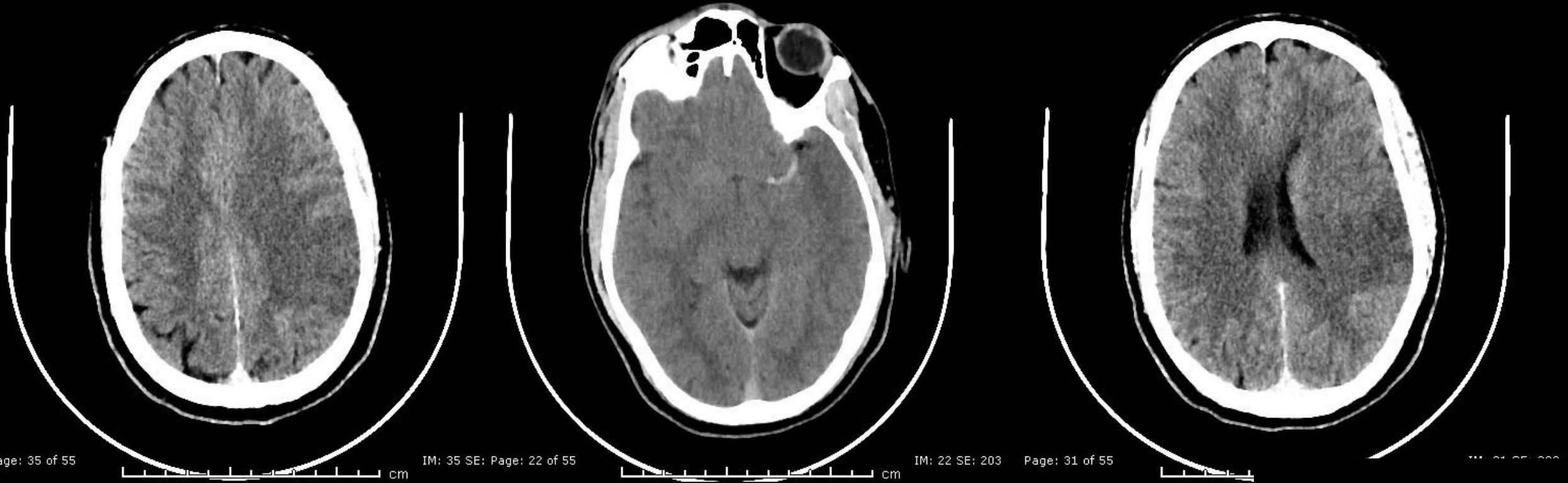
**Variant 4: New focal neurologic defect, fixed or worsening. Longer than 6 hours. Suspected stroke.**

Radiologic Procedure	Appropriateness Category	Relative Radiation Level*
MRI head without IV contrast	Usually Appropriate	○
MRI head without and with IV contrast	Usually Appropriate	○
MRA head and neck without IV contrast	Usually Appropriate	○
MRA head and neck without and with IV contrast	Usually Appropriate	○
CT head without IV contrast	Usually Appropriate	☠☠☠
CTA head and neck with IV contrast	Usually Appropriate	☠☠☠
Arteriography cervicocerebral	May Be Appropriate	☠☠☠
CT head perfusion with IV contrast	May Be Appropriate	☠☠☠
MRI head perfusion with IV contrast	May Be Appropriate	○
CT head with IV contrast	Usually Not Appropriate	☠☠☠
CT head without and with IV contrast	Usually Not Appropriate	☠☠☠
US duplex Doppler carotid	Usually Not Appropriate	○
<b>Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate</b>		
<b>*Relative Radiation Level</b>		

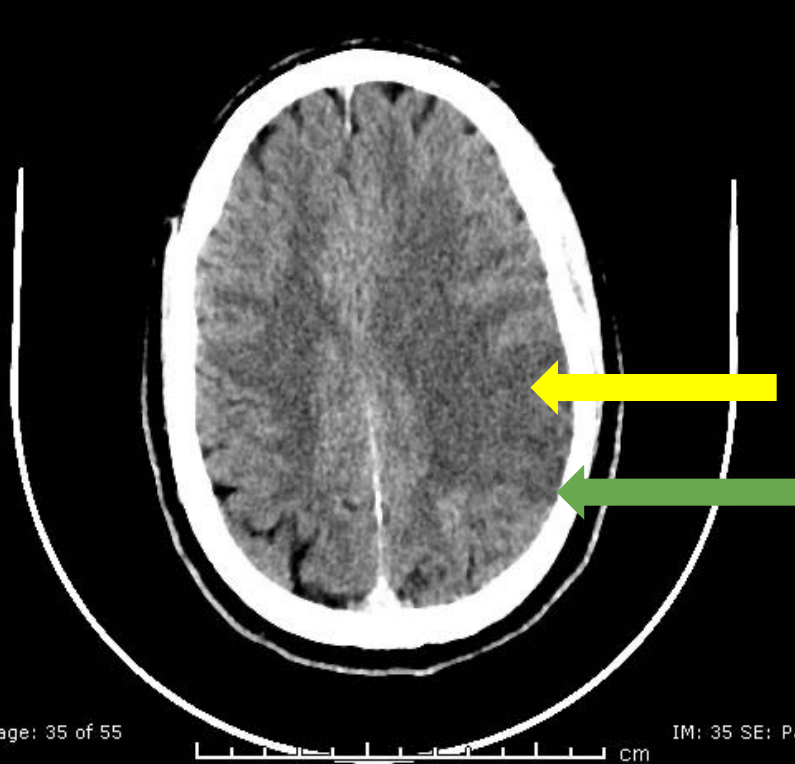
This imaging modality was ordered by the ER physician



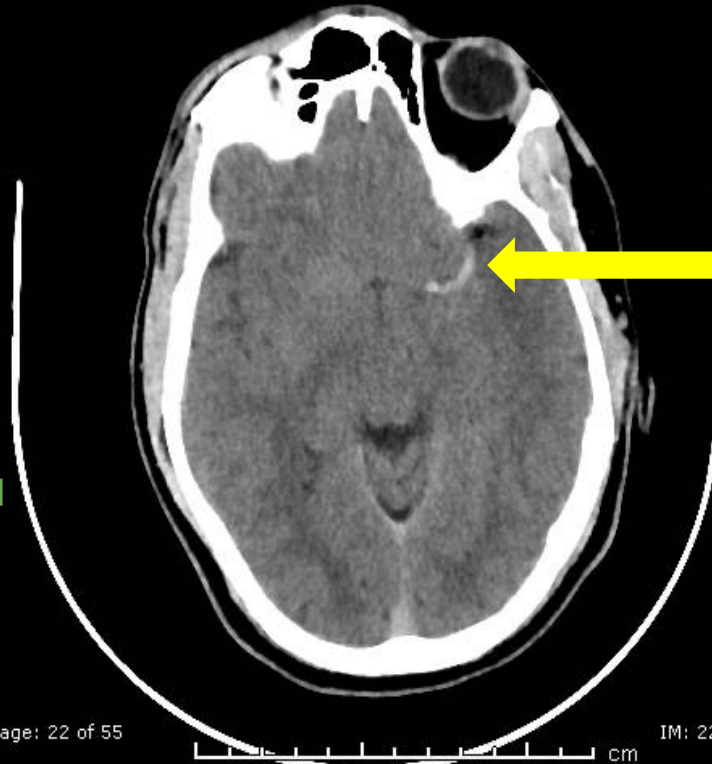
# CT Findings (unlabeled)



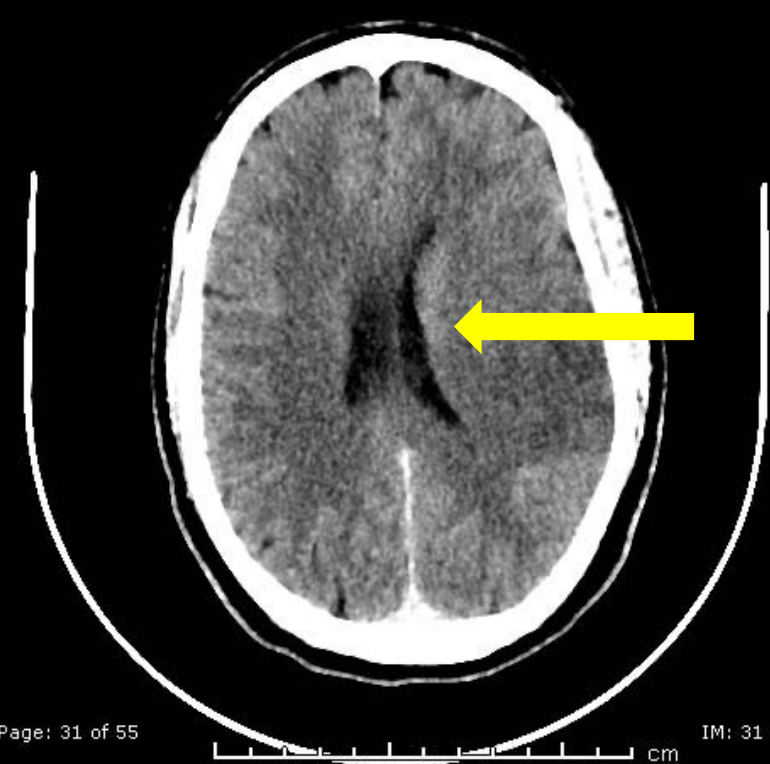
# CT Findings: (labeled)



Axial non-contrast head CT showing an area of hypoattenuation extending to the cortex on the left (Yellow Arrow), as well as sulcal effacement (Green Arrow).



Axial non-contrast head CT showing a curvilinear hyperdensity (MCA sign) (Arrow).



Axial non-contrast head CT showing local mass effect with mild effacement of the left lateral ventricle without significant midline shift (Arrow).

# Select the applicable ACR Appropriateness Criteria

**Variant 4: New focal neurologic defect, fixed or worsening. Longer than 6 hours. Suspected stroke.**

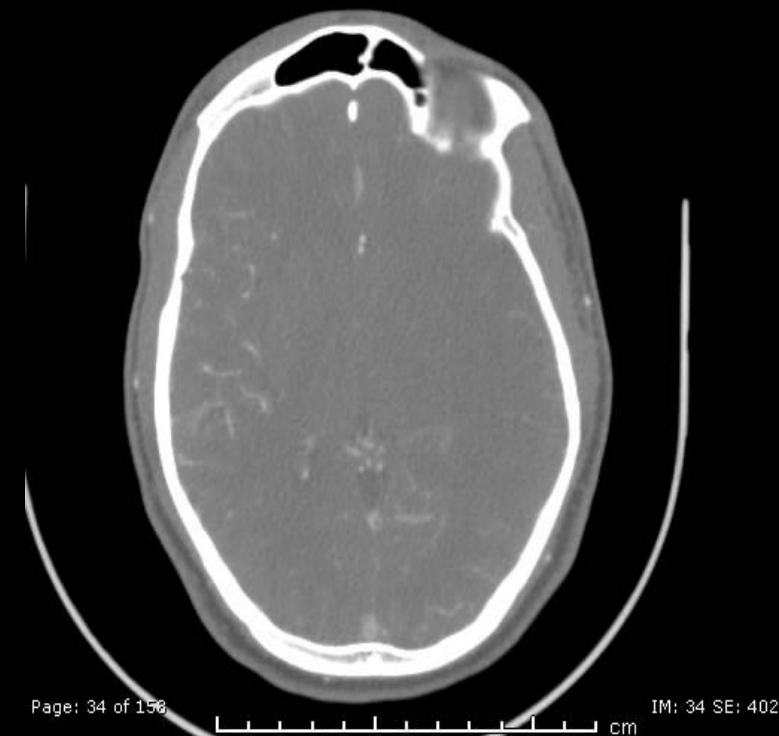
Radiologic Procedure	Appropriateness Category	Relative Radiation Level*
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CTA head and neck with IV contrast	Usually Appropriate	☼☼☼
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MRI head perfusion with IV contrast	May Be Appropriate	○
CT head with IV contrast	Usually Not Appropriate	☼☼☼
CT head without and with IV contrast	Usually Not Appropriate	☼☼☼
US duplex Doppler carotid	Usually Not Appropriate	○

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

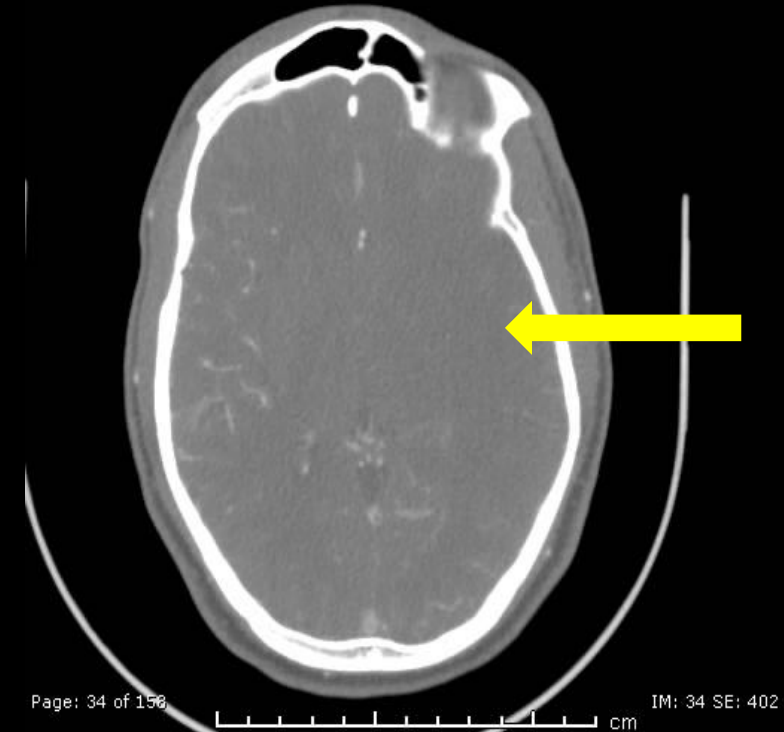
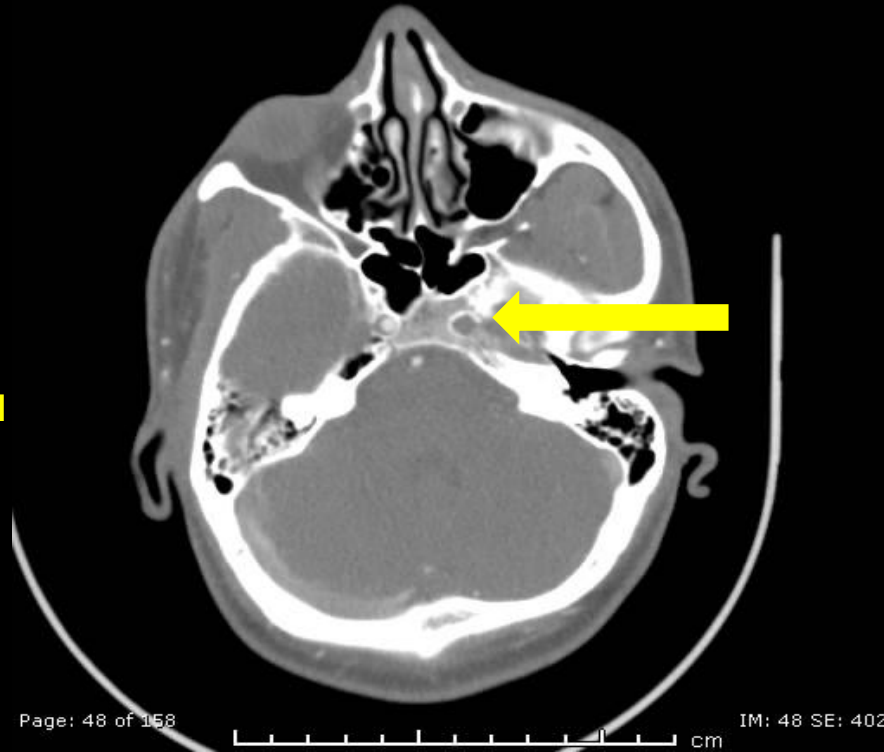
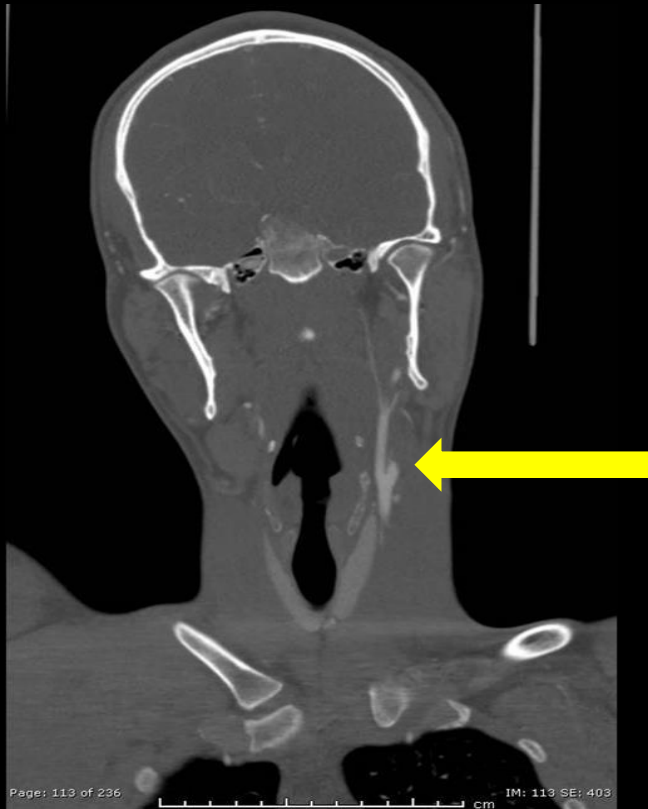
\*Relative Radiation Level



# CTA Findings: (unlabeled)



# CTA Findings



Coronal CT angiography of head and neck shows complete occlusion of the left internal carotid artery, distal to the common carotid bifurcation without distal recanalization (Arrow).

Axial CT angiography of head showing complete occlusion of the left internal carotid artery at the petrous portion of the skull (Arrow).

Axial CT angiography of head showing absence of opacification of the distal branches of the left middle cerebral artery (Arrow).

Diagnosis:

Ischemic Stroke secondary to Tandem Occlusion of the  
Left Internal Carotid Artery (ICA) and Middle Cerebral  
Artery (MCA)

# Image Findings for MCA Ischemic Stroke

- **Non-contrast head CT :**
  - **Hyperdense Vessel sign (MCA sign) :** (Seen in this patient)
    - Hyperdensity of an artery can indicate thrombus formation
    - Highly specific for MCA occlusion seen in the proximal and distal branches
    - Can be visualized in 30-40% of individuals with MCA stroke
  - **Early Infarct signs**
    - Loss of gray-white matter differentiation in the basal ganglia
    - Loss of insular ribbon or obscuration of Sylvian fissure
    - Cortical hypoattenuation and sulcal effacement (Both seen in this patient)
- **CT Angiography**
  - Used to detect intracranial and extracranial vessel occlusions and stenosis (ICA occlusion seen on CTA in our patient.)
  - 92-100% sensitive and 82-100% specific when compared to conventional angiography

# Tandem Occlusion

- Defined as acute occlusion of the extracranial or intracranial ICA with ipsilateral occlusion of either the MCA (M1 or M2) or ACA (A1 or A2) branches.
  - 50% patients presenting with Acute ICA occlusion have MCA occlusion.
  - Approximately 25% of patients with MCA occlusion have concomitant ICA occlusion
- 6-15% of patients with acute ischemic stroke are from ICA occlusion and are associated with high morbidity and mortality.
- Etiologies of the proximal ICA occlusion include atherosclerotic disease (older patients) and dissection (younger patients) with an ipsilateral embolus causing the distal occlusion in tandem lesions.
- (Note that isolated ICA occlusions can be asymptomatic in patients with adequate collateral flow.)

# Tandem Occlusion Continued

- Treatment recommendations for tandem occlusive lesions are less well defined than established treatments of intracranial branch vessels alone.
- Poorer recanalization rates (only 10-15%) are seen in tandem occlusions after systemic intravenous thrombolytic therapy alone - likely related to larger clot burden limiting delivery of recombinant tissue plasminogen activator (rt-PA) to the intracranial occlusion.
- Recanalization with mechanical endovascular treatments is favored over systemic rt-PA alone. But even the preferred method (thrombectomy, stent placement, or angioplasty) is controversial - challenged by longer procedure times and risk of intracranial hemorrhage from antiplatelet therapy.

# Our Patient's Course

- Symptom onset was >4.5 hours, outside time window for tPA
- CTA showed additional findings, including complete occlusion of the left internal carotid artery.
- Echocardiogram showed normal left and right ventricular function, no valve abnormalities and no shunts
- Conventional angiogram confirmed left ICA thrombosis and raised possibility of carotid dissection.
- Interventional radiology and neurosurgery believed thrombectomy would be too dangerous because of significant brain edema and risk of Malignant MCA Syndrome
- Patient underwent decompressive hemicraniectomy

# Malignant MCA Syndrome

- Definition: MCA territory infarction in which there is extensive cerebral edema leading to increased intracranial pressure and brain herniation
- 50% of MCA strokes progress to malignant transformation with an 80% mortality rate without surgical intervention with survivors suffering severe disabilities
- Clinical predictors include younger age, higher NIHSS scores on admission and parenchymal hypodensity > 50% MCA territory on initial head CT.
- Treatment includes surgical intervention with decompressive hemicraniectomy



# Decompressive Hemicraniectomy

- Procedure
  - Frontal-temporal-parietal decompressive hemicraniectomy
- Indications
  - Malignant MCA infarction
- Expectations
  - Decreases intracranial pressure and mass effect and improves blood flow leading to improved survival but residual major disability.
- Possible Complications
  - Hydrocephalus, hemorrhages, infection, seizures, sinking skin flap syndrome, headaches and paradoxical herniation



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