



AMSER Case of the Month: March 2019

62 year-old male with left-sided weakness

Ashley Graziano OMS IV, Lake Erie College of Osteopathic Medicine

Erik Yannone MD, Charles Q. Li MD, Warren Chang MD, Matthew Hartman MD, Russell Cerejo MD, Michael Goldberg, MD

Allegheny Health Network



Patient Presentation

- 62 year-old male awoke at 4:00 AM with left-sided weakness
- Last known normal was 11:30 PM

- PMHx: BPH
- Vitals: BP 164/89, HR 56, 97.7°F, 19 RR
- Physical Exam: Left upper and lower extremity weakness, slurred speech, and left-sided facial droop
- NIH Stroke Scale Score at presentation: 9

Pertinent Labs

- Glucose: 101 mg/dL
- INR: 1.0, aPTT: 25 sec
- Urine Drug Screen: Negative
- Troponin: <0.01 ng/mL
- EKG: Sinus Bradycardia
- Urinalysis: Normal
- LDL: 143 mg/dL
- Hemoglobin A1c: 5.7%

What Imaging Test(s) Should We Order?

Select the applicable ACR Appropriateness Criteria

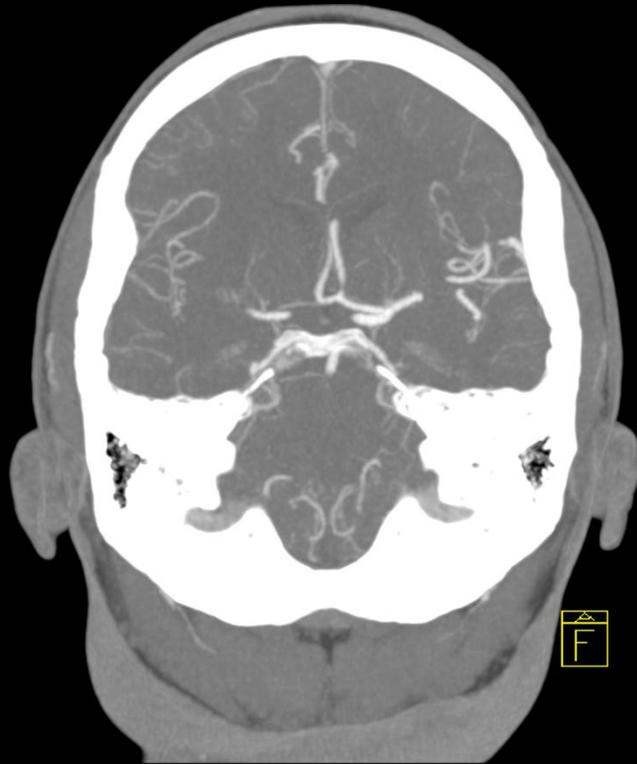
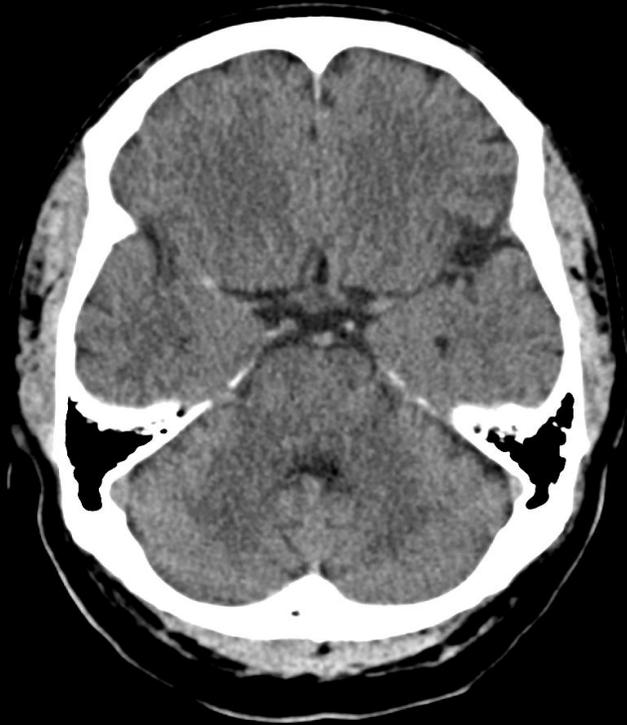
Variant 3:

New focal neurologic defect, fixed or worsening. Less than 6 hours. Suspected stroke.

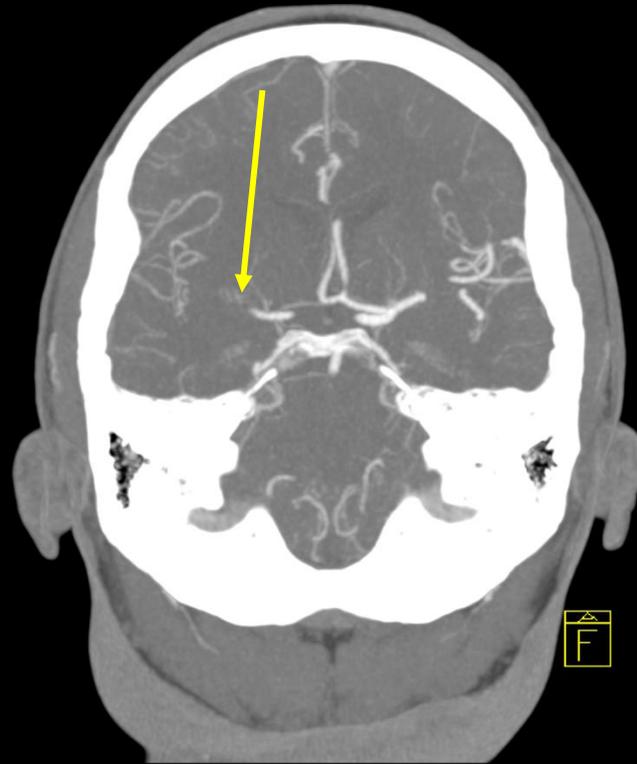
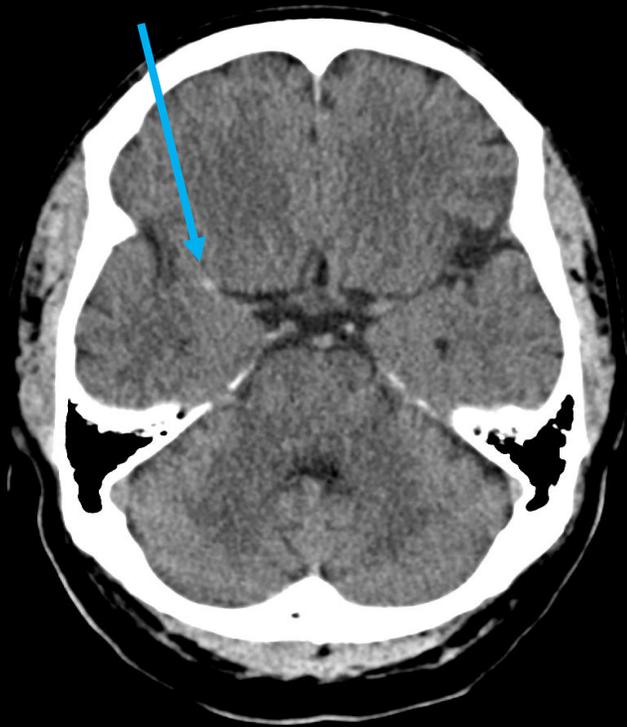
Radiologic Procedure	Rating	Comments	RRL*
CT head without IV contrast	9	Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.	⊕⊕⊕
MRI head without IV contrast	8	Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Can be useful if there is a contraindication to contrast. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.	○
MRI head without and with IV contrast	8	Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI head with contrast can be helpful to determine the age of infarct and to evaluate for other causes of symptoms such as tumor or infection.	○
MRA head and neck without IV contrast	8	Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA. Can be useful in patients with renal failure or contrast allergies.	○
MRA head and neck without and with IV contrast	8	Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA.	○
CTA head and neck with IV contrast	8	CTA can be obtained after NCCT.	⊕⊕⊕

These imaging modalities were ordered by the ER physician

Findings



Findings



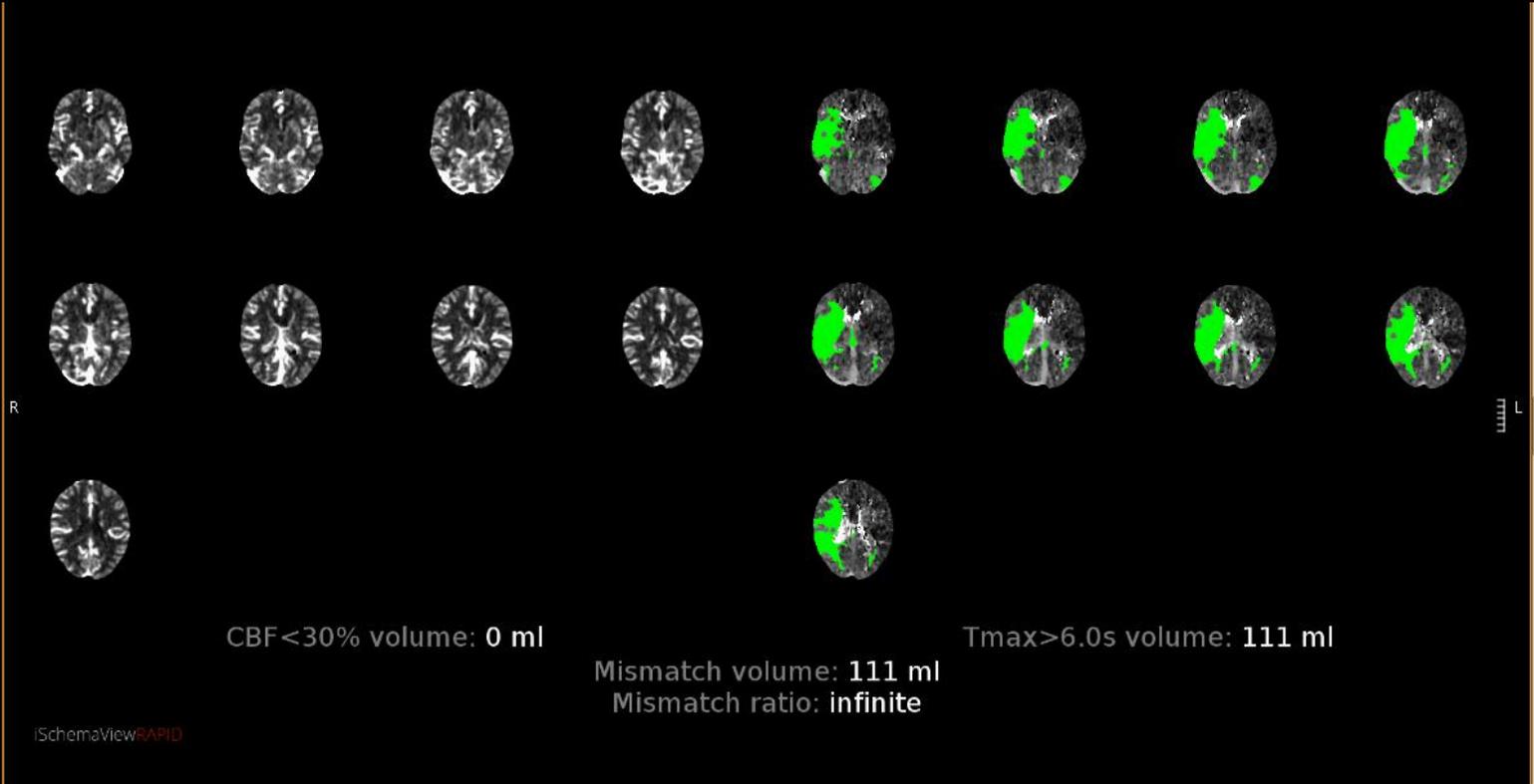
CT Head without Contrast:

- Hyperdense Right Middle Cerebral Artery (blue arrow)

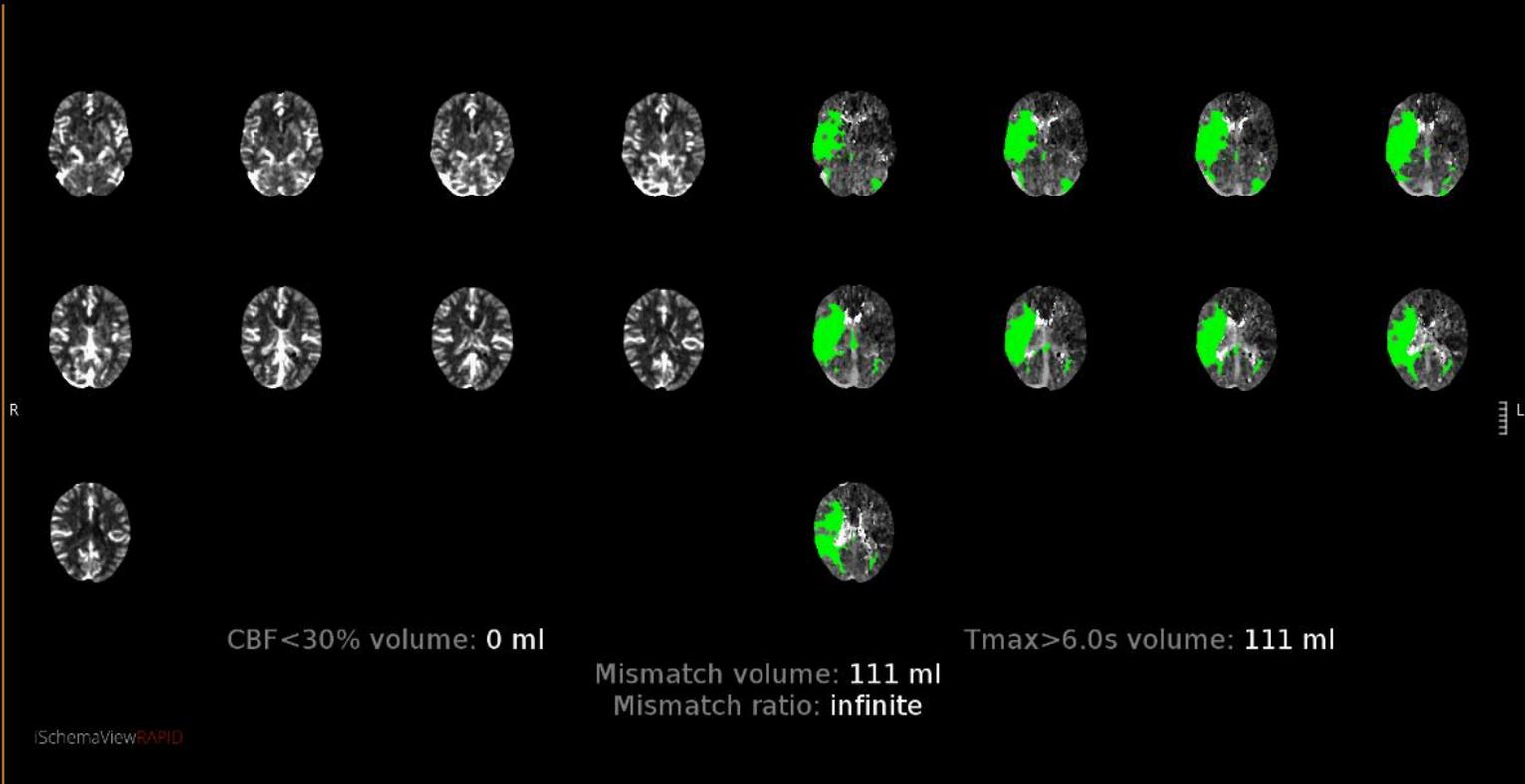
CTA Head with Contrast:

- Abrupt termination of the M1 segment of the right MCA (yellow arrow)

Findings



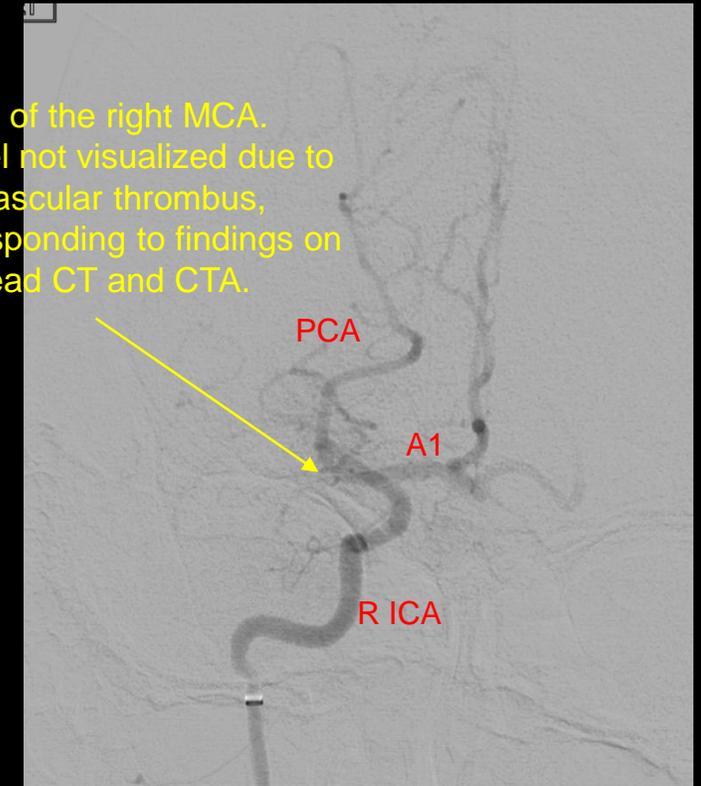
Findings



CT Perfusion Study:

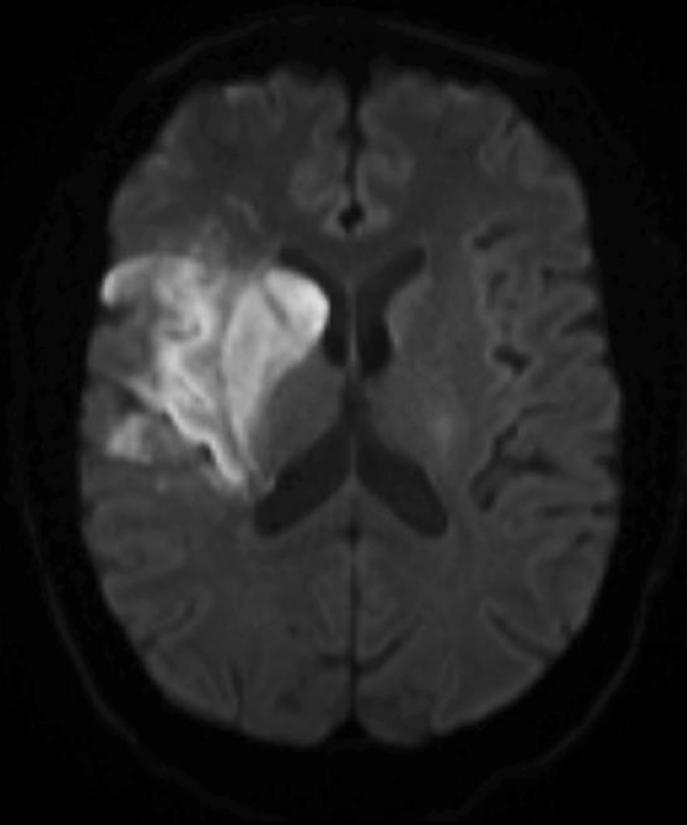
- Core of 0 mL and Penumbra of 111 mL demonstrated
- Mismatch ratio: Infinite
- Mismatch volume: 111 mL

Origin of the right MCA.
Vessel not visualized due to intravascular thrombus, corresponding to findings on the head CT and CTA.

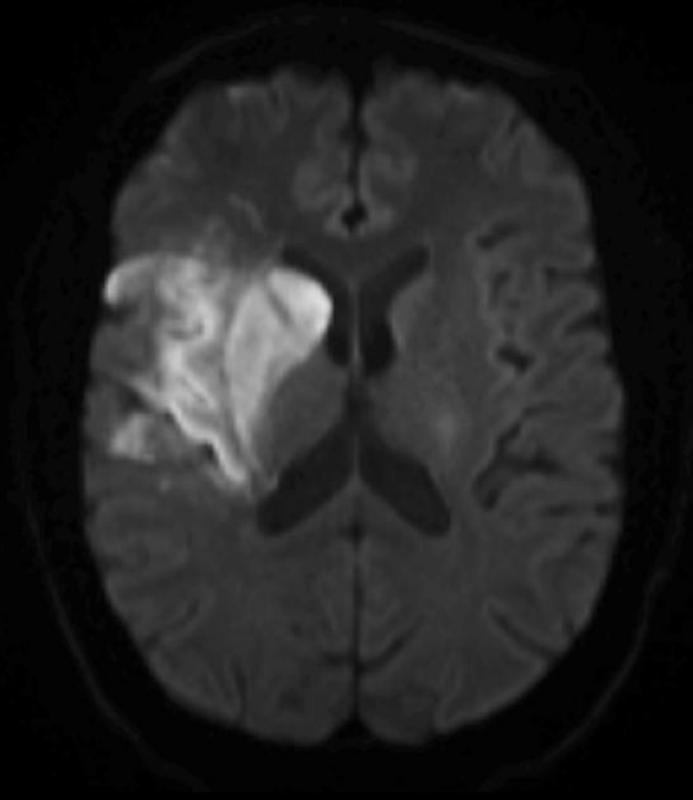


AP view of cerebral angiogram during endovascular therapy after contrast injection into the right internal carotid artery

Findings



Findings



Axial DWI:
Increased signal in right basal ganglia
and frontotemporal region



Axial ADC:
Reduced signal on the ADC map confirms
restricted diffusion, consistent with acute ischemia

Final Diagnosis:

Acute Right Middle Cerebral Artery Territory Infarction

Acute Ischemic Stroke

- Strokes are classified as either ischemic (80%) or hemorrhagic (20%)
 - Ischemic strokes can be caused by thrombosis, embolism, or systemic hypoperfusion
- Patients typically present with an acute onset of neurologic symptoms
 - The exact symptoms depend on the region of brain affected
 - The NIH Stroke Scale, depicted on the right, (ranging from 0-42) is used widely to assess the degree of neurologic deficit

National Institutes of Health Stroke Scale score	
1a. Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b. Level of consciousness questions: What is the month? What is your age?	0 = Answers two questions correctly 1 = Answers one question correctly 2 = Answers neither question correctly
1c. Level of consciousness commands: Open and close your eyes. Grip and release your hand.	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2. Best gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3. Visual	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4. Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides
5. Motor arm 5a. Left arm 5b. Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
6. Motor leg 6a. Left leg 6b. Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7. Limb ataxia	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8. Sensory	0 = Normal; no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe to total sensory loss
9. Best language	0 = No aphasia; normal 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia
10. Dysarthria	0 = Normal 1 = Mild to moderate dysarthria 2 = Severe dysarthria
11. Extinction and inattention	0 = No abnormality 1 = Visual, tactile, auditory, spatial, or personal inattention 2 = Profound hemi-inattention or extinction
Total score = 0-42.	

Acute Ischemic Stroke

- Brain and neurovascular imaging is required for diagnostic workup and treatment planning
 - The non-contrast head CT (NCCT) remains the standard of care for the first imaging test to be performed:
 - The initial role of NCCT is to quickly assess for contraindications to thrombolytic therapy, including:
 - Acute hemorrhage
 - Large, established infarct
 - “Stroke mimic” (e.g. brain tumor, abscess)

Acute Ischemic Stroke

- Classic imaging findings of acute ischemia on NCCT include:
 - Hypoattenuation within the affected brain parenchyma with loss of gray-white matter differentiation due to cytotoxic edema
 - The “insular ribbon sign” (loss of gray-white differentiation at the insula) in the setting of an MCA infarction
 - Obscuration of the lentiform nucleus in the setting of an M1 or basal ganglia infarction
 - Sulcal effacement
 - Hyperdense vessel in the affected territory due to intravascular thrombus
- The main role of CT angiogram of the head and neck is to detect a large vessel occlusion (LVO) that would be amenable to endovascular therapy (EVT)

Acute Ischemic Stroke

- CT perfusion (CTP) scans are used to assess the amount of potentially salvageable brain tissue by measuring the amount of “core” and “penumbra”
 - The **core** represents irreversibly infarcted tissue secondary to marked reduction in blood supply
 - The **penumbra** is the area of tissue surrounding the core that is possibly salvageable if normal blood supply is quickly re-established (through EVT)
 - The volumes of core and penumbra are used to formulate a mismatch ratio (Amount of penumbra in mL: Amount of core in mL) to determine appropriateness of EVT
 - Ideal candidates for EVT will have a mismatch ratio of ≥ 1.8 , mismatch volume ≥ 15 mL, and a total core < 70 mL
- Diffusion-weighted imaging (DWI) on MRI remains the gold standard for the imaging diagnosis of acute ischemia due to high sensitivity and specificity

Acute Ischemic Stroke

- For eligible patients, IV administration of alteplase (tPA) is first-line therapy
 - Inclusion criteria include: Age ≥ 18 years, clinical diagnosis of ischemic stroke causing measurable neurologic deficit, and onset of symptoms < 4.5 hours before beginning treatment (although recent research is expanding this window)
- For eligible, mechanical thrombectomy (EVT) can be used in patients with acute ischemic stroke due to a LVO who can be treated within 24 hours of symptom onset
 - The administration of tPA does not preclude the patient from undergoing an EVT

Patient Outcome

- Our patient underwent a successful thrombectomy with recanalization of the right MCA
- The patient was discharged to an inpatient rehabilitation facility after a 12 day hospital course
- Although many of the patient's presenting symptoms resolved, the patient with persistent left lower extremity weakness and an inability to perform activities of daily living

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