

**ASN 42ND ANNUAL MEETING
JANUARY 24-26, 2019**



PUERTO RICO 

CT Angiogram and CT Perfusion in acute ischemic stroke

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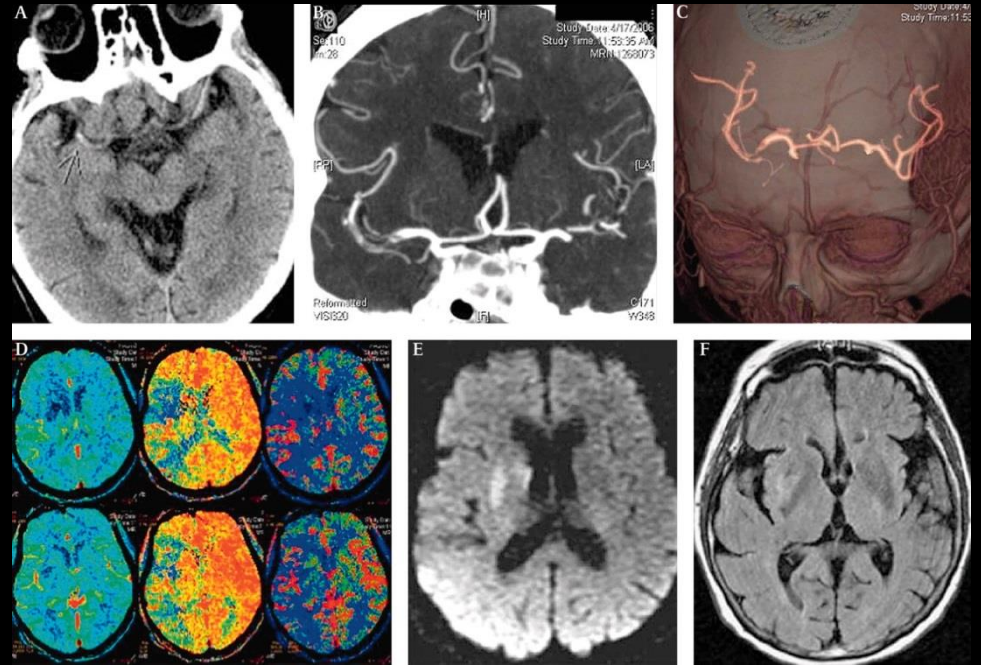
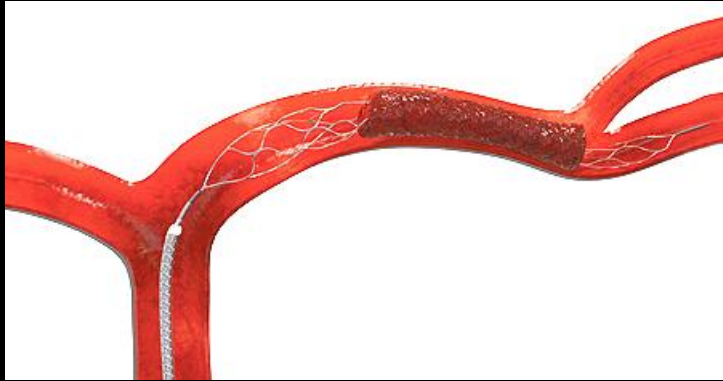
TEXAS TECH UNIVERSITY
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Disclosures

None

- How many of you routinely perform in acute ischemic strokes (In addition to head CT) :
 1. CTA head/neck
 2. CTA and CTP



JNIS, BMJ

Everyone's brain clock is
different



Role of advanced imaging: CTA/CTP

- Identifying Candidates for Endovascular Revascularization : LVO detection: Late window
- Help identify etiology (eg Dissection, ICAD, Carotid stenosis)
- Evaluating stroke mimics (rule out stroke)

Lack of Radiology expertise:

- Perfusion imaging may help identify LVO especially if distal branch occlusion
- New software may be decrease time to Groin puncture: Artificial intelligence



STOP . No need of urgent Advanced Imaging

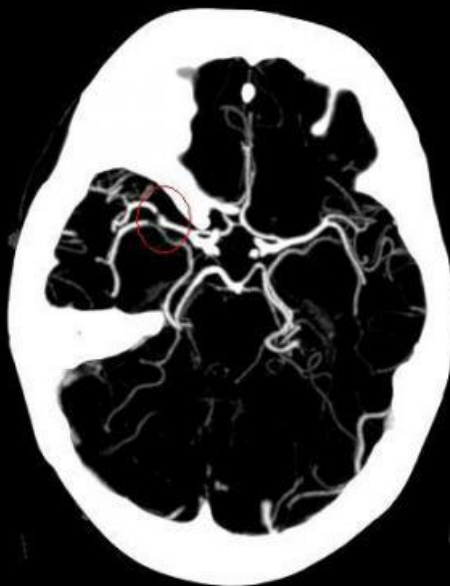
Routine practice guidelines

0-6 hours

- For patients who may be candidates for mechanical thrombectomy, an **urgent CT angiogram or magnetic resonance (MR) angiogram** (to look for large vessel occlusion) is recommended, but this study should not delay treatment with IV tPA if indicated.
- If they can be treated within 6 hours of last known normal. **No perfusion imaging (CT-P or MR-P) is required in these patients.**

3.7. Mechanical Thrombectomy (Continued)	COR	LOE
7. In selected patients with AIS within 6 to 16 hours of last known normal who have LVO in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is recommended.	I	A
8. In selected patients with AIS within 6 to 24 hours of last known normal who have LVO in the anterior circulation and meet other DAWN eligibility criteria, mechanical thrombectomy is reasonable.	IIa	B-R

- “DAWN and DEFUSE 3 are the only RCTs showing benefit of mechanical thrombectomy > 6 hours from onset. Therefore, only the eligibility criteria from these trials should be used for patient selection ... DAWN or DEFUSE 3 eligibility should be strictly adhered to in clinical practice”



CT Angiogram

Intracranial occlusions and stenosis

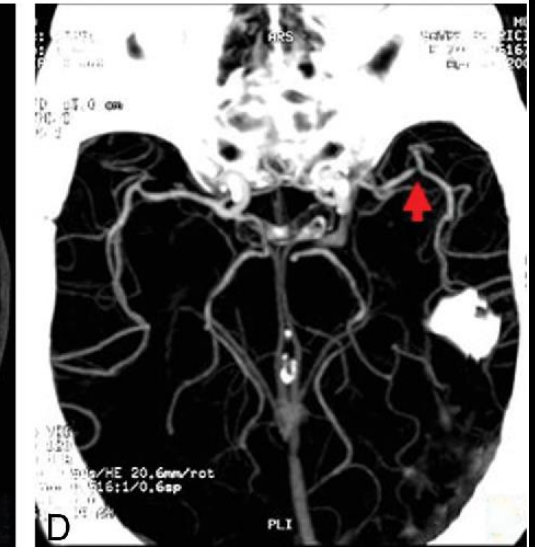
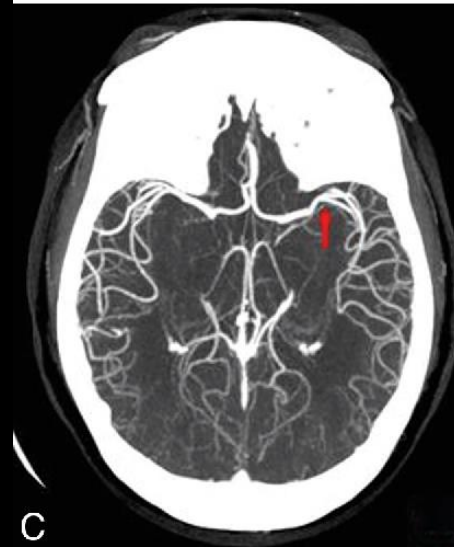
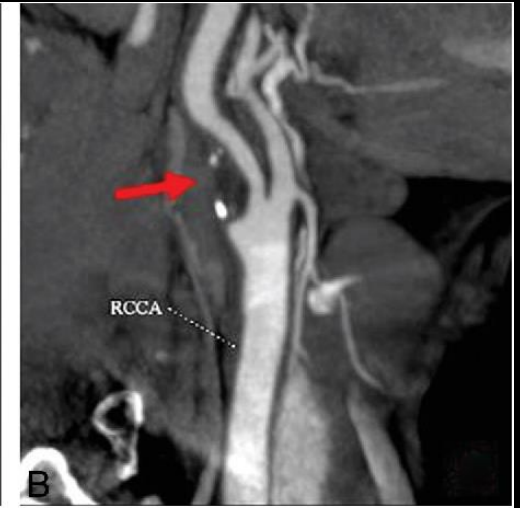
sensitivity (97%–100%)

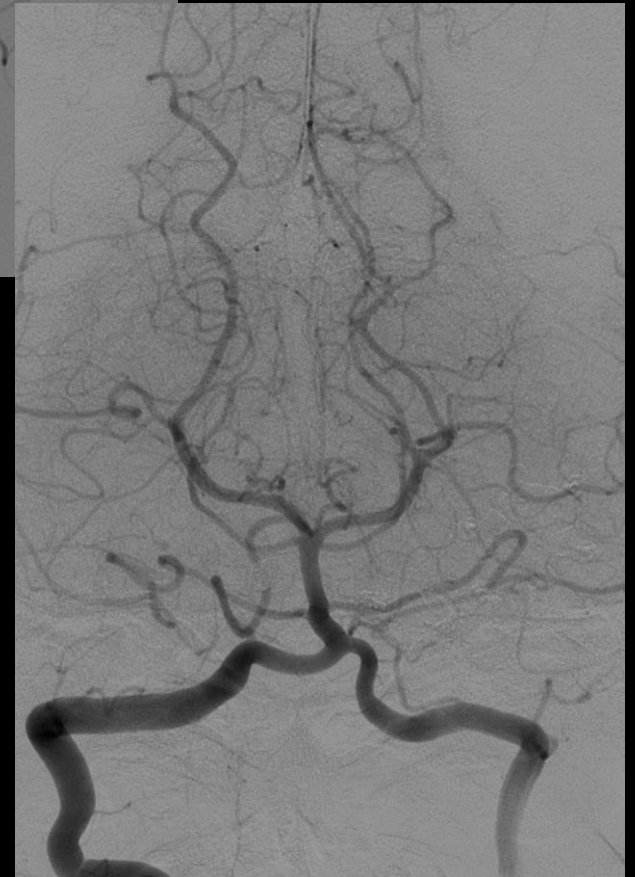
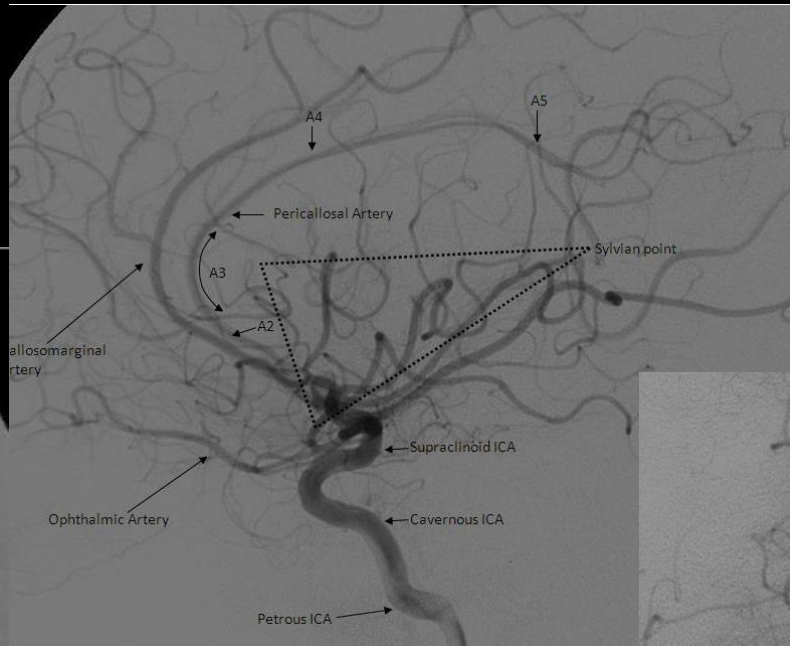
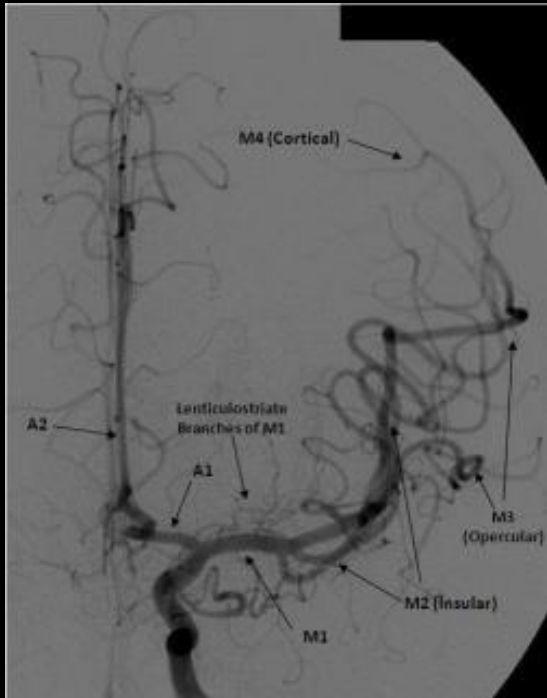
specificity (98%–100%)

Extracranial occlusions and stenosis

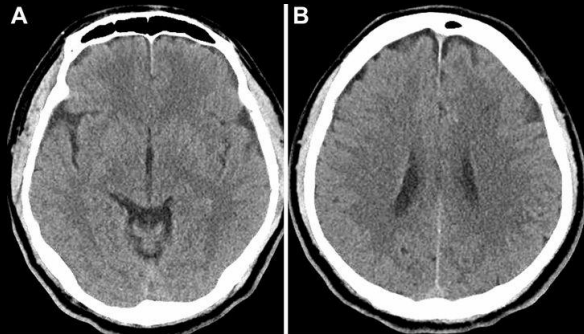
sensitivity (95%–97%)

Specificity (90%–99%)

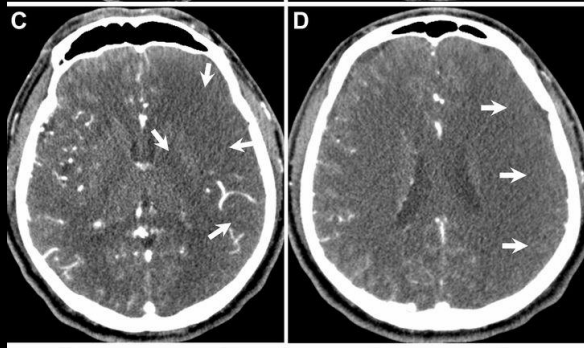




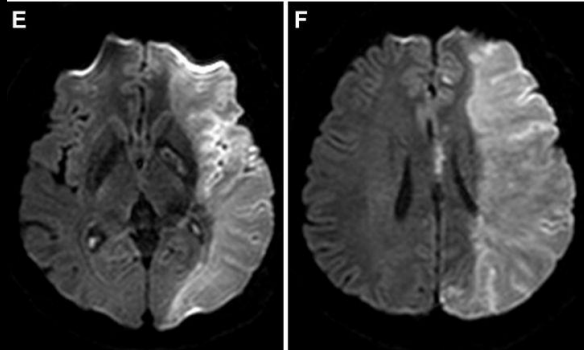
CTA : ASPECTS



ASPECTS : 10



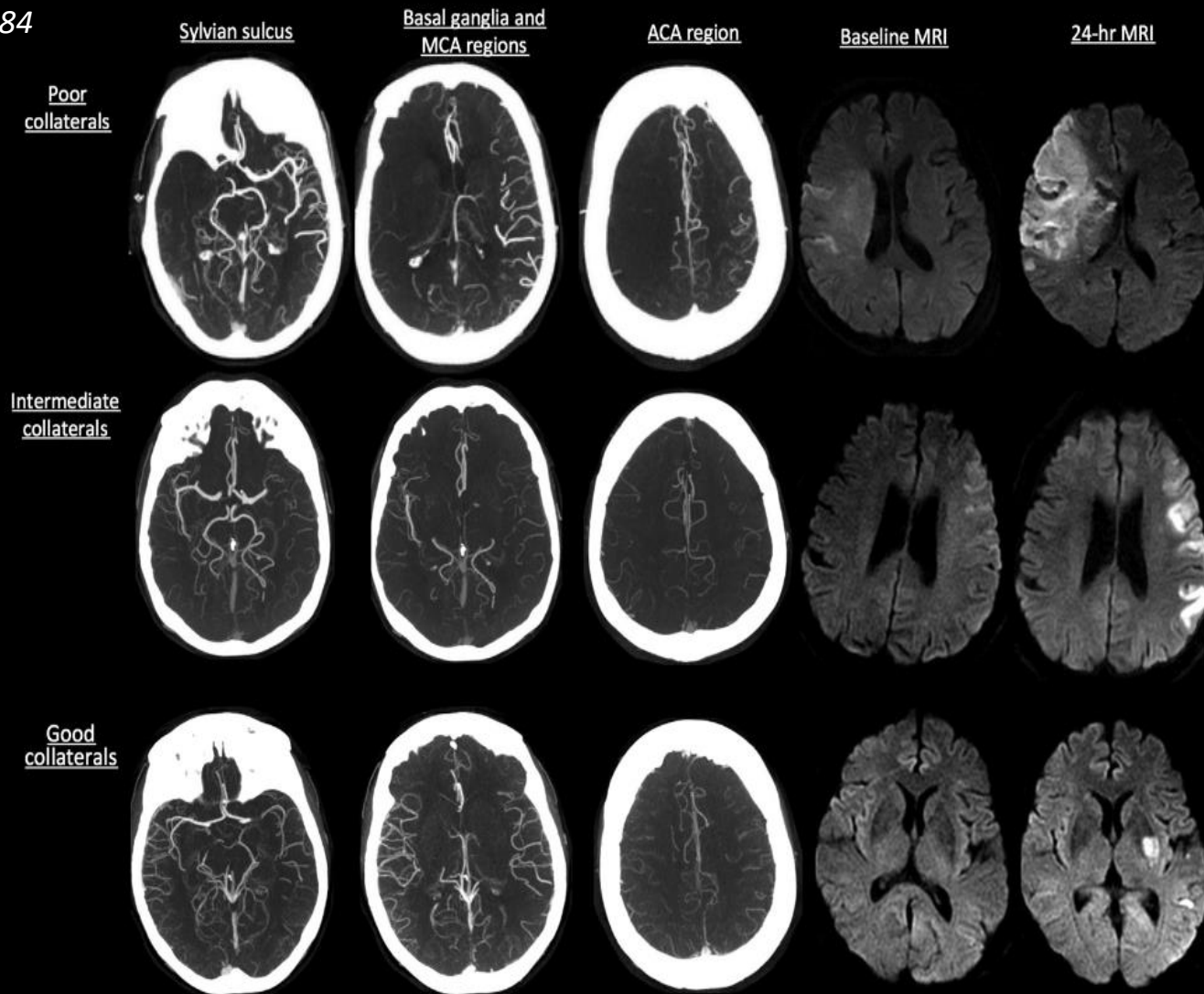
ASPECTS: 3



ASPECTS: 2

CTA-SI-ASPECTS strongly predicts futile recanalization and could be a valuable tool for treatment decisions regarding the indication of revascularization therapies.

CTA source images are able to demonstrate hypoperfused brain parenchyma in acute stroke similar to DWI images.



Only patients with intermediate or good collaterals who recanalized showed a statistically significant association with good clinical outcome (rate ratio = 3.8; 95% CI, 1.2–12.1). Patients with good and intermediate collaterals who did not achieve recanalization and patients with poor collaterals, even if they achieved recanalization, did not do well.

Collaterals Significance

- Good collaterals extend the time window for acute stroke treatment.

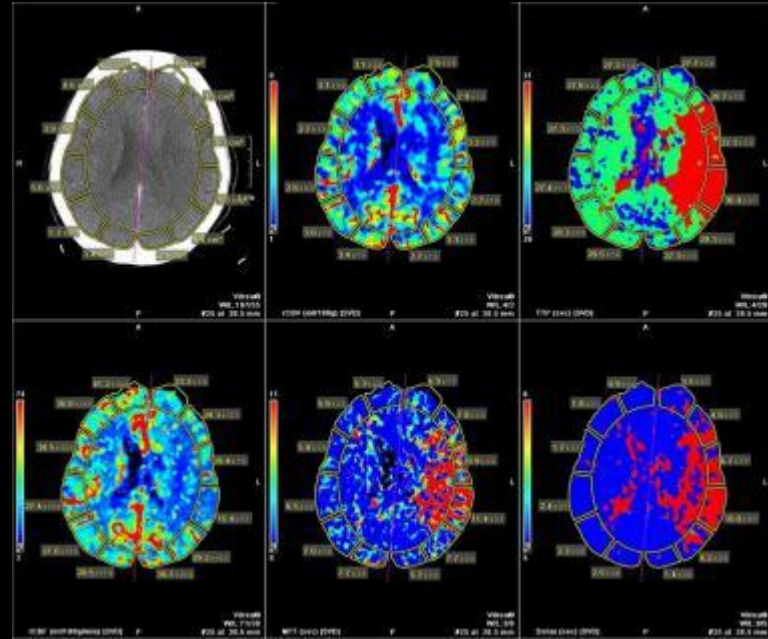
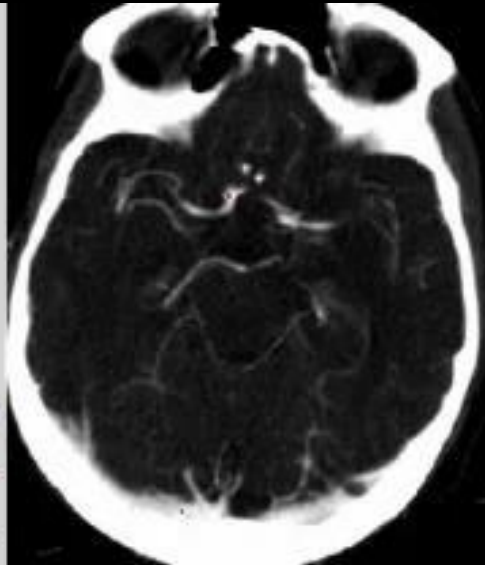
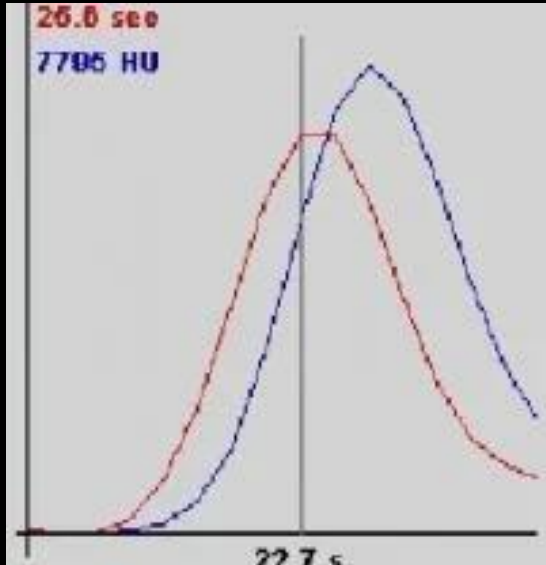
Brain 2013; 136; 3554–3560

- Clot extent, location, and collateral integrity are important determinants of outcome in acute stroke

AJNR 2009, 30 (3) 525-531

Collaterals may actually be more influential than the choice of treatment modality or studied intervention

CT Perfusion



emedicine/medscape

Implications of Increased Utilization CT Perfusion

Need for substantial education regarding CTP

- Understand benefits and risks

- Understand limitations and artifacts

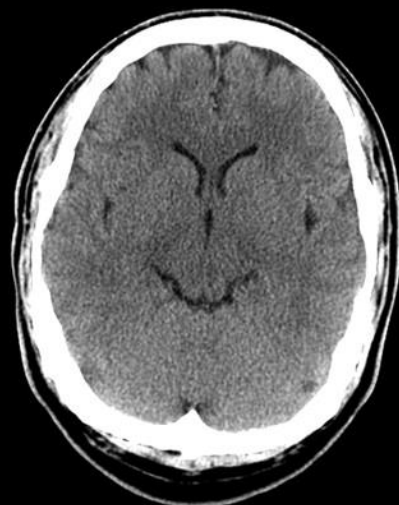
- Know when to order a CTP

CTP technical issues

- Patient movement is the most common cause of CTP artifacts.
- An adequate contrast bolus, with a large bore IV, is also required.
- Adequate scan time

- CTP: core volume depends on CBF or CBV threshold
- Potential over or under-estimation of ischemic core / penumbra
- Abnormal MTT is the most sensitive parameter for detecting decreased perfusion and ischemia. Prolonged MTT, however, has been found to overestimate final infarct size.
- The mismatch between abnormal CBV and abnormal CBF estimates the penumbra

NCCT



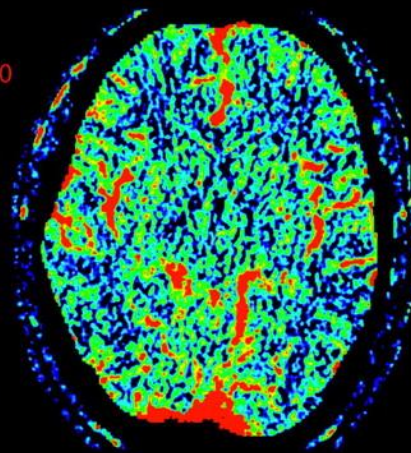
A

104.750

R

11.5

4.750



CBF

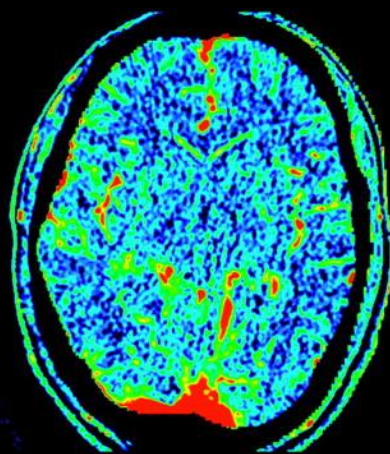
B

10.000

R

11.5

0



CBV

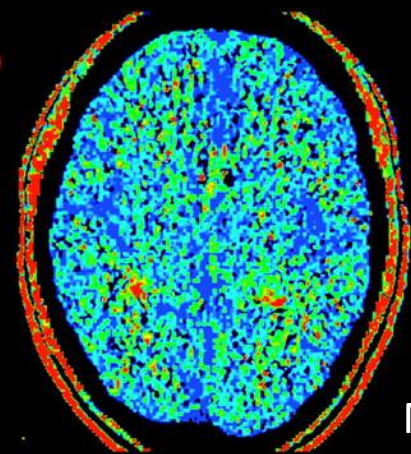
C

16.000

R

11.5

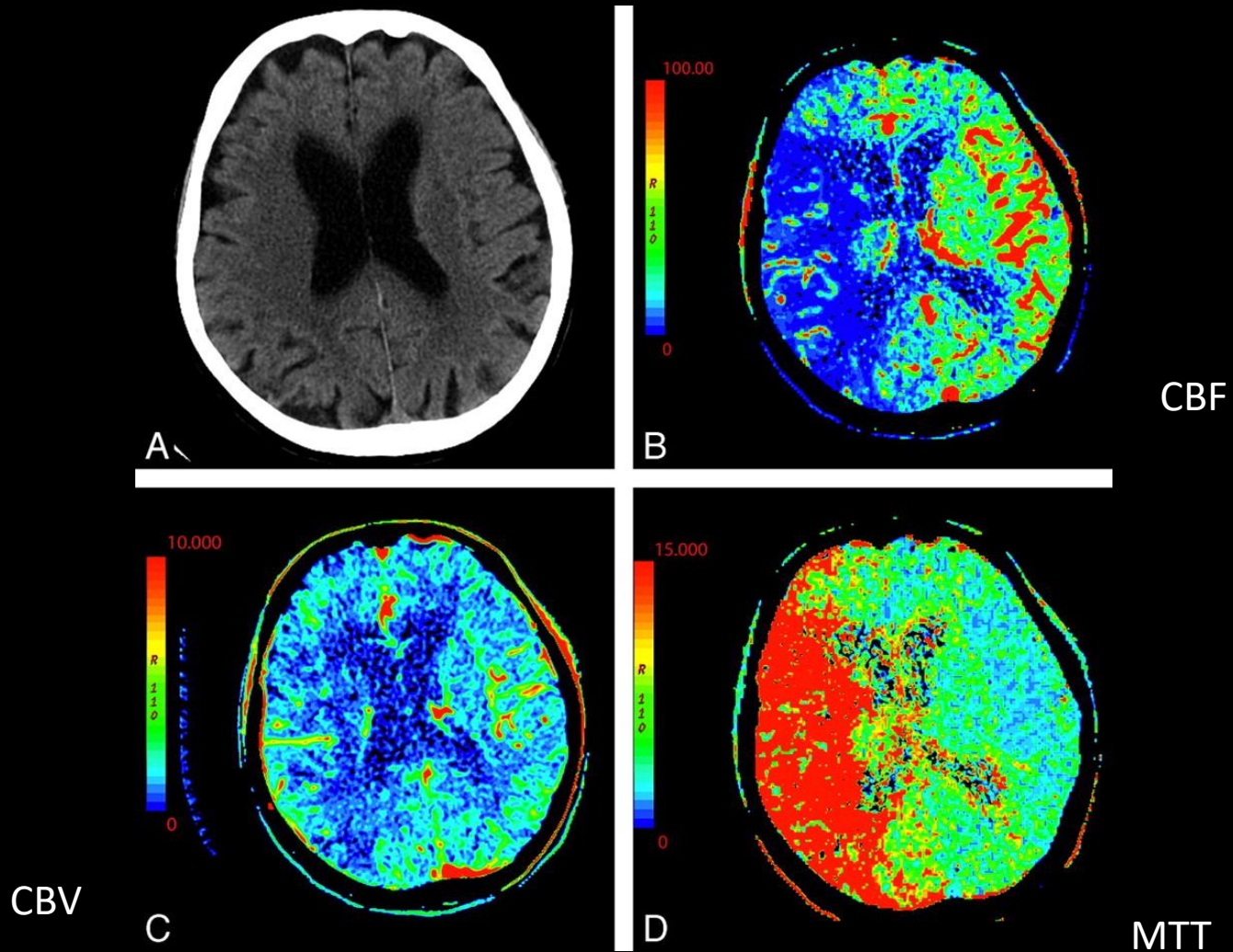
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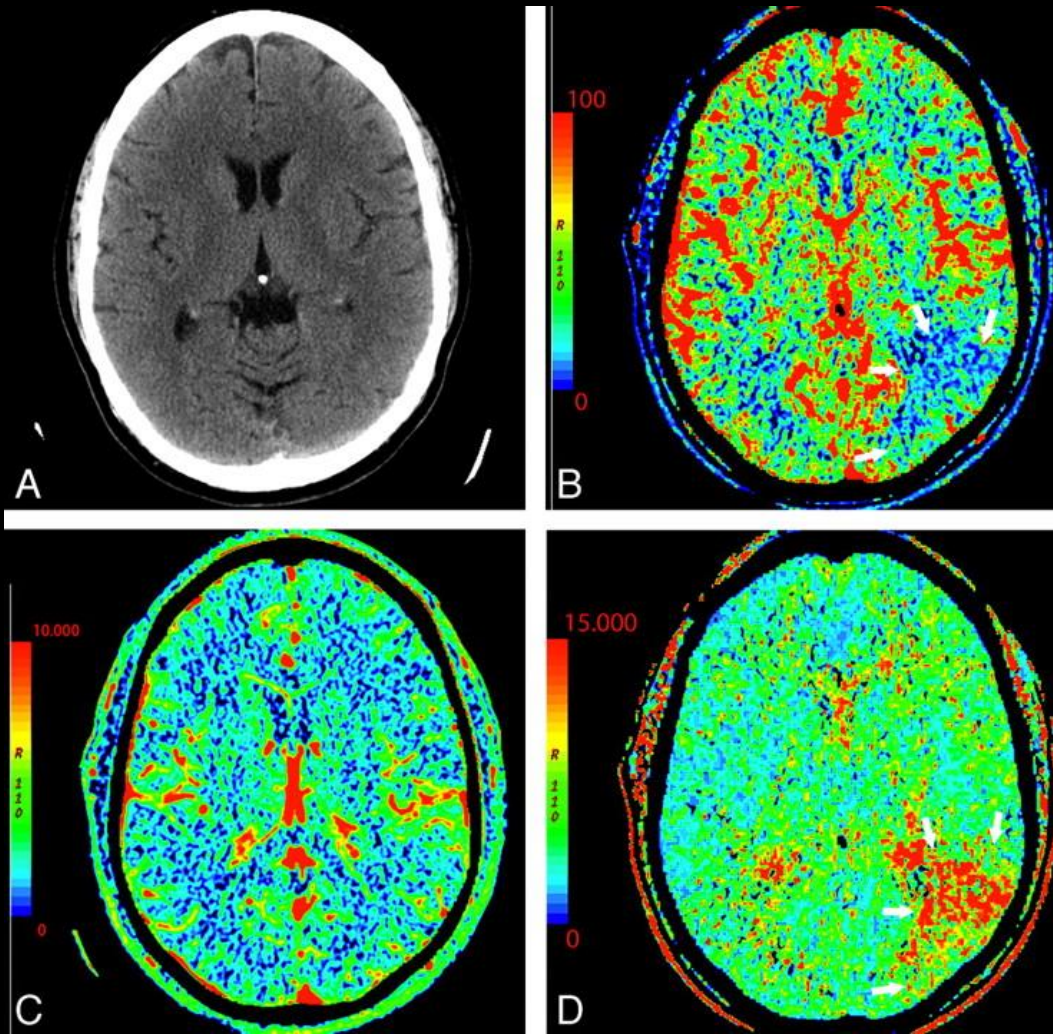
MTT

D

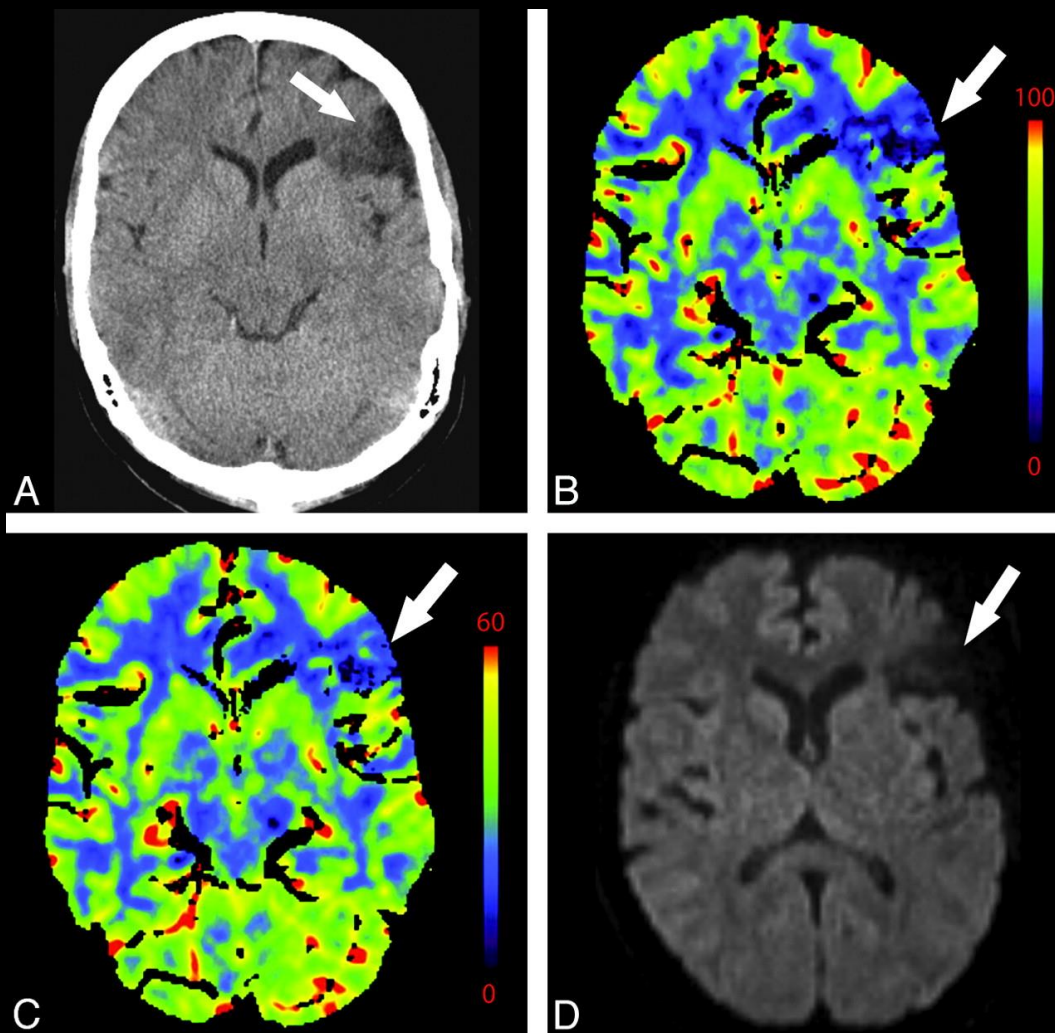
An 87-year-old woman presenting with acute dysarthria, left facial droop, and left-sided weakness



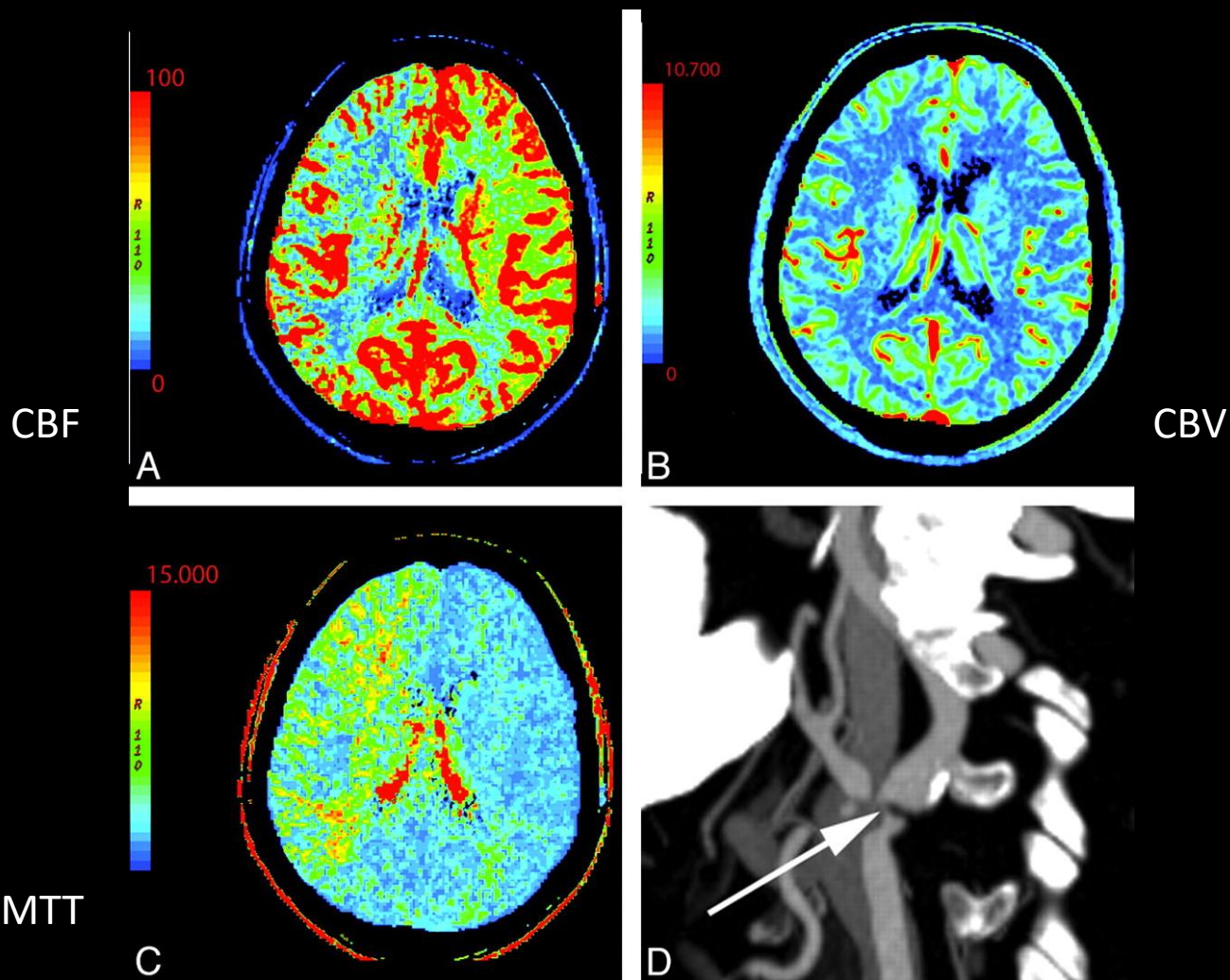
A 64-year-old man presenting with headache and acute aphasia



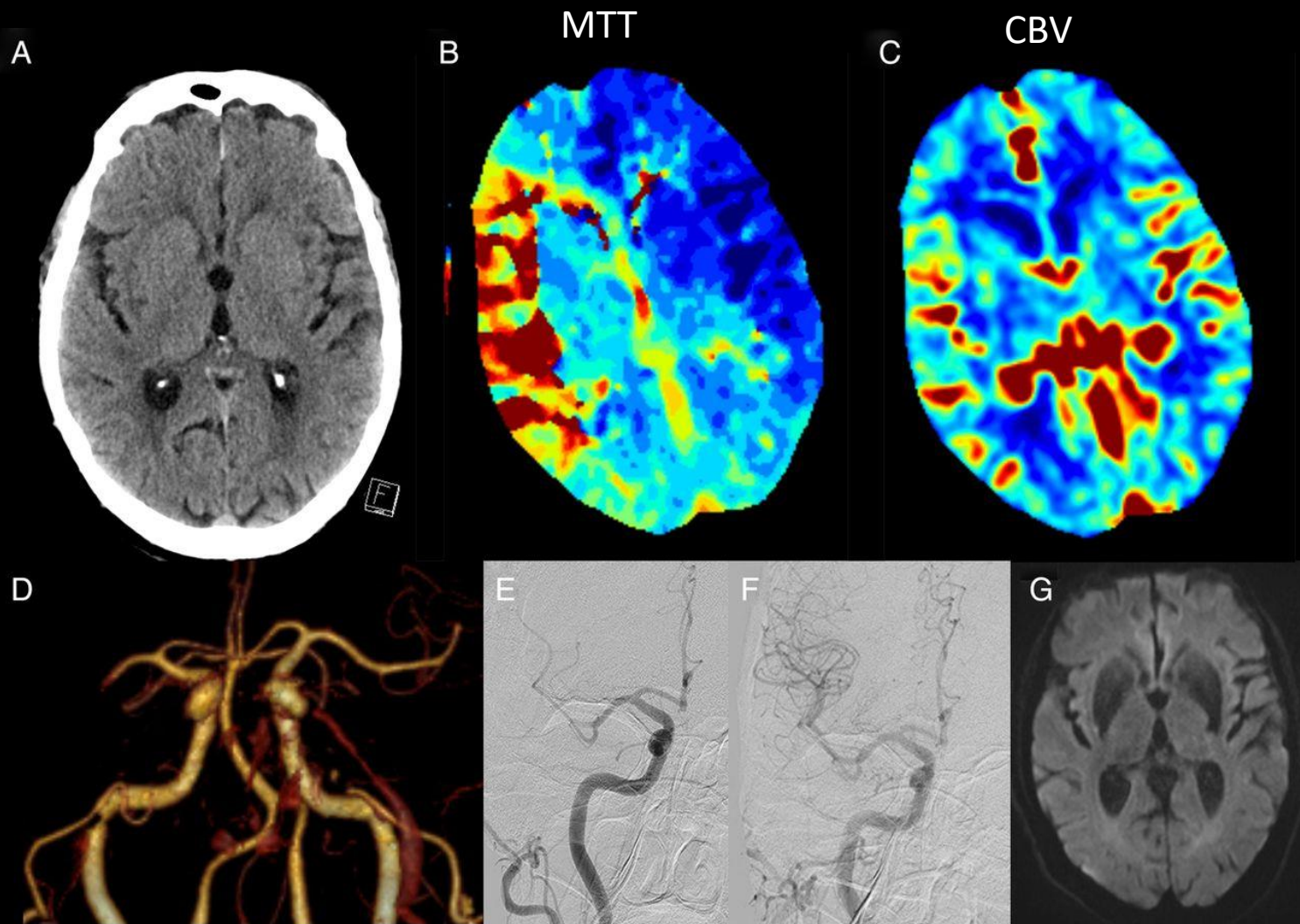
A 44-year-old woman with a history of anxiety disorder presenting with acute right facial weakness and expressive aphasia



A 76-year-old man with change in mental status



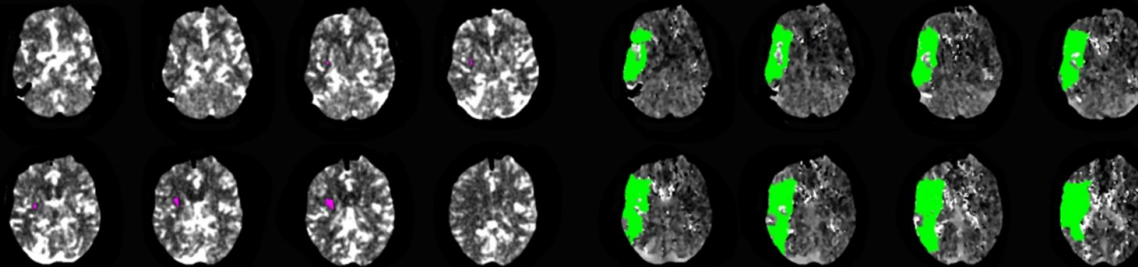
A 92-year-old man presented with left hemiparesis, dysarthria, hemianopia and inattention National Institutes of Health Stroke Scale (NIHSS) 19



RAPID

- Ischemic core volumes: CBF < 30%
- The volume of salvageable tissue : Tmax perfusion parameter with a >6 seconds (Tmax >6 seconds) threshold
- Mismatch volume = Tmax volume – Ischemic core volume
- Mismatch ratio= Tmax volume/Ischemic core

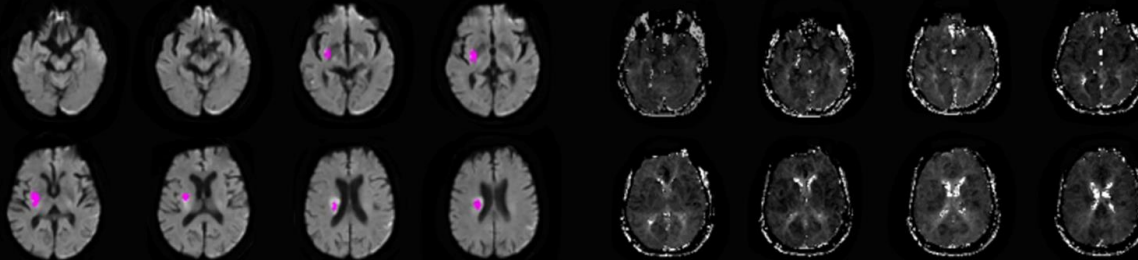
Baseline
CTP



CBF<30% volume: 1 ml

Tmax>6s volume: 129 ml

24 h Follow Up
MRI



Infarct Volume: 5 ml

100% Reperfusion

It is important to appreciate that CTP maps do not identify infarcted tissue, they identify regions with blood flow abnormalities that can predict tissue fate.

CTP maps are not sensitive for detecting brain hemorrhage.

Therefore, a close evaluation of the noncontrast CT is essential to ensure that subacute or chronic infarcts, as well as acute hemorrhage, are not missed.

	DEFUSE 3	DAWN
Ischemic core volume	≤70 mL	≤20 mL if age >80 ≤30 mL if age < 80 and NIHSS 10-20 ≤50 mL if age < 80 and NIHSS >20
Mismatch volume	≥15 mL and a mismatch ratio of ≥1.8	Not required
Vessel occlusion	M1 or ICA (cervical and intracranial)	M1 or ICA (intracranial and cervical if stent not anticipated to be required)

- The use of CT perfusion (CTP) imaging at a referring hospital is feasible and may shorten the door to puncture time for patients with acute ischemic stroke.

J NeuroIntervent Surg 2017;0:1–6

Conclusion

- Advance imaging will definitely help in late window patient selection
- May help in expediting MT including transfers and shorten time to MT
- Familiarity with advance imaging by neurologists and its judicious use is imperative

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