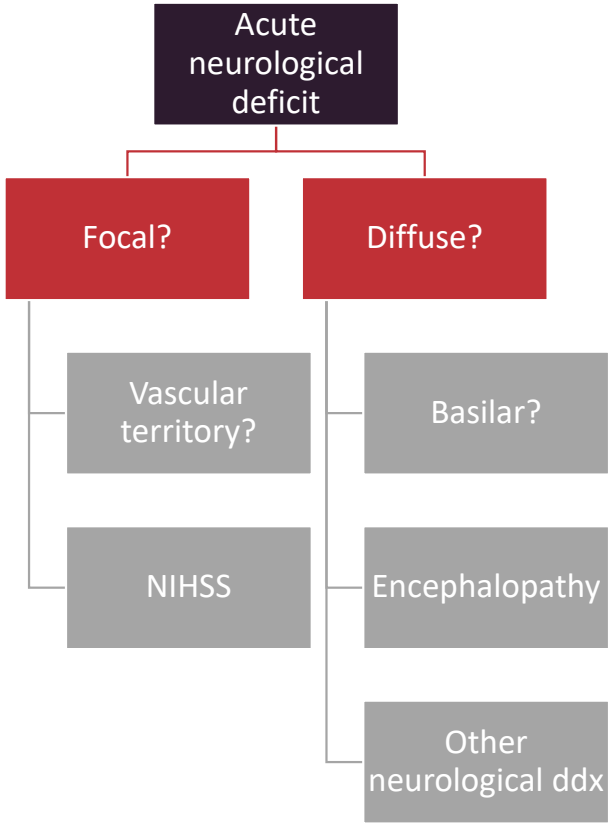
# STROKE BASICS

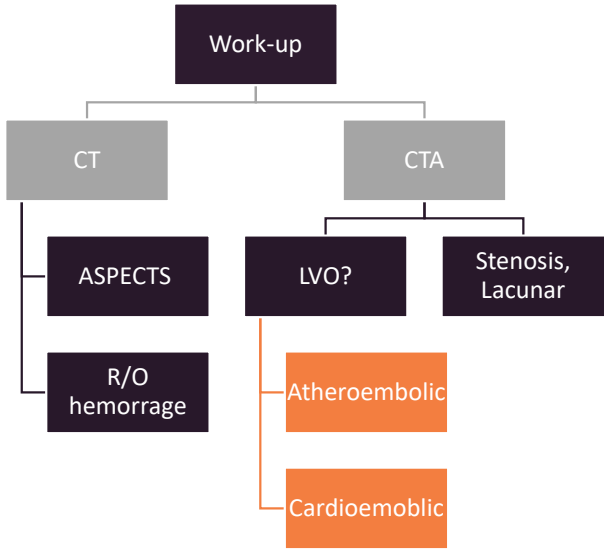
# ACUTE STROKE TRIAGE

When presented with an acute neurological deficit, the clinical needs to determine if it is focal (i.e. right-sided weakness) or diffuse (i.e. altered mental status). Focal deficits can be mapped to a particular vascular territory (i.e. right weakness localized to left motor regions) whereas seemingly diffuse deficits could indicate the basilar territory which can be bilateral involvement or a more diffuse process such as a toxic/metabolic etiology.

An NIH stroke scale (NIHSS) is obtained to assess the degree of deficits. The NIHSS is geared towards left hemispheric strokes, which score highest on the stroke scale due motor and language involvement, and so may underestimate the degree of disability from other infarcted regions.




In addition to the physical exam/ NIHSS, a CT head and often a CTA are obtained. The CT head rules out hemorrhage as a cause of deficits but also evaluates the ASPECTs score (see below). A CTA evaluates for a large vessel occlusion which may be amenable to endovascular therapy.



# CLINICAL HISTORY

It is key to obtain when the patient was last known normal (LKN)/ last known well (LKW). This may not be the same as when the deficits occurred.

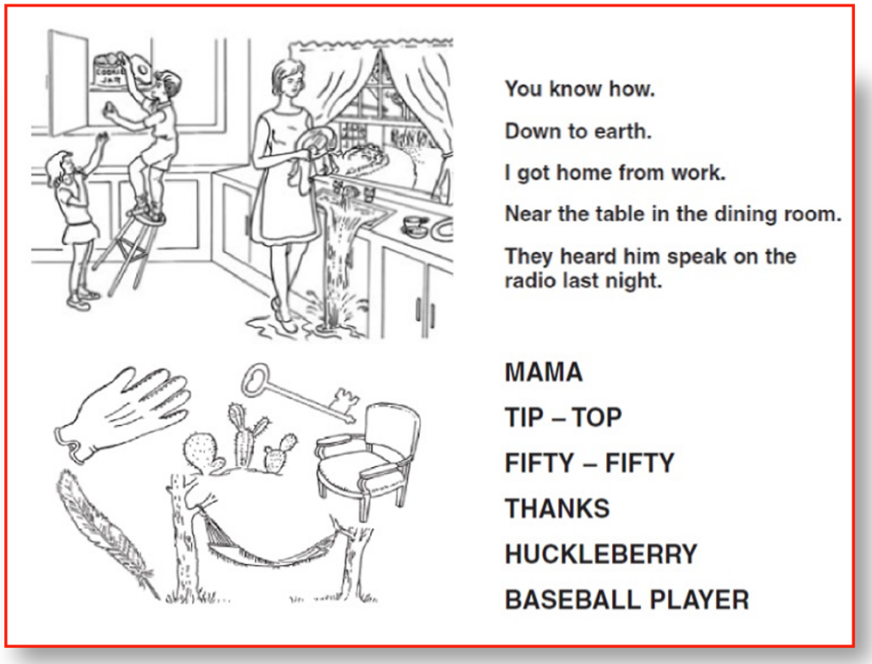
Example:

*A man says goodnight and goes to bed at 10PM. At 5AM he wakes up, showers, and when he looks in the mirror, realizes he has a facial droop. When he tries to call out to his spouse, he is unable to speak; it is 6AM at this time. When did his deficit start? When was he last normal?*

In this case, we do not know when the deficit occurred, only that it was noticed at 6AM but the last known normal would be 10PM. This is important to distinguish as time from LKN will determine tPA eligibility.

# The NIHSS

- COMPONENTS OF THE NIHSS
  - Level of consciousness
    - Questions
    - Commands
  - Conjugate horizontal gaze
  - Visual fields
  - Facial palsy
  - Motor strength: upper limbs, lower limbs
  - Ataxia
  - Sensory
  - Language/aphasia
  - Dysarthria
  - Extinction or inattention



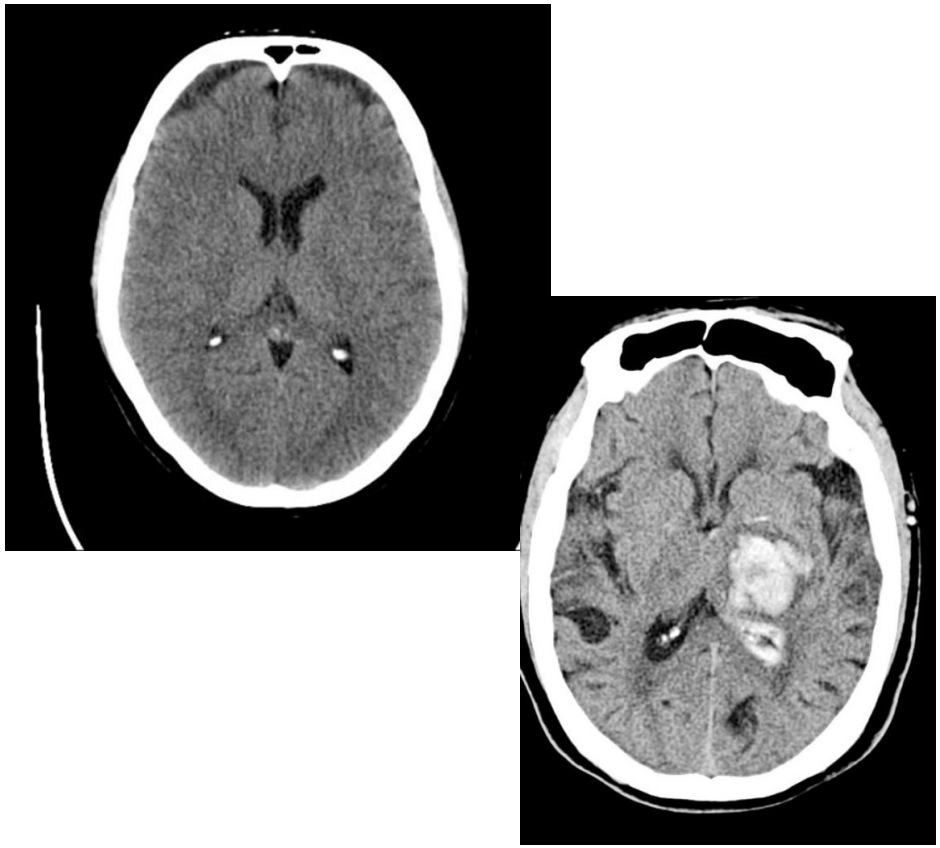

**Top left**: describe the picture – assesses visual fields, understanding of scene, content and fluency of language
**Top right**: read the sentences – assesses reading and fluency of language
**Bottom left**: name the objects – assesses visual recognition and naming
**Bottom right**: repeat the words – assesses auditory processing and repetition

# CT HEAD

How does a hyperacute stroke show up on CT head?

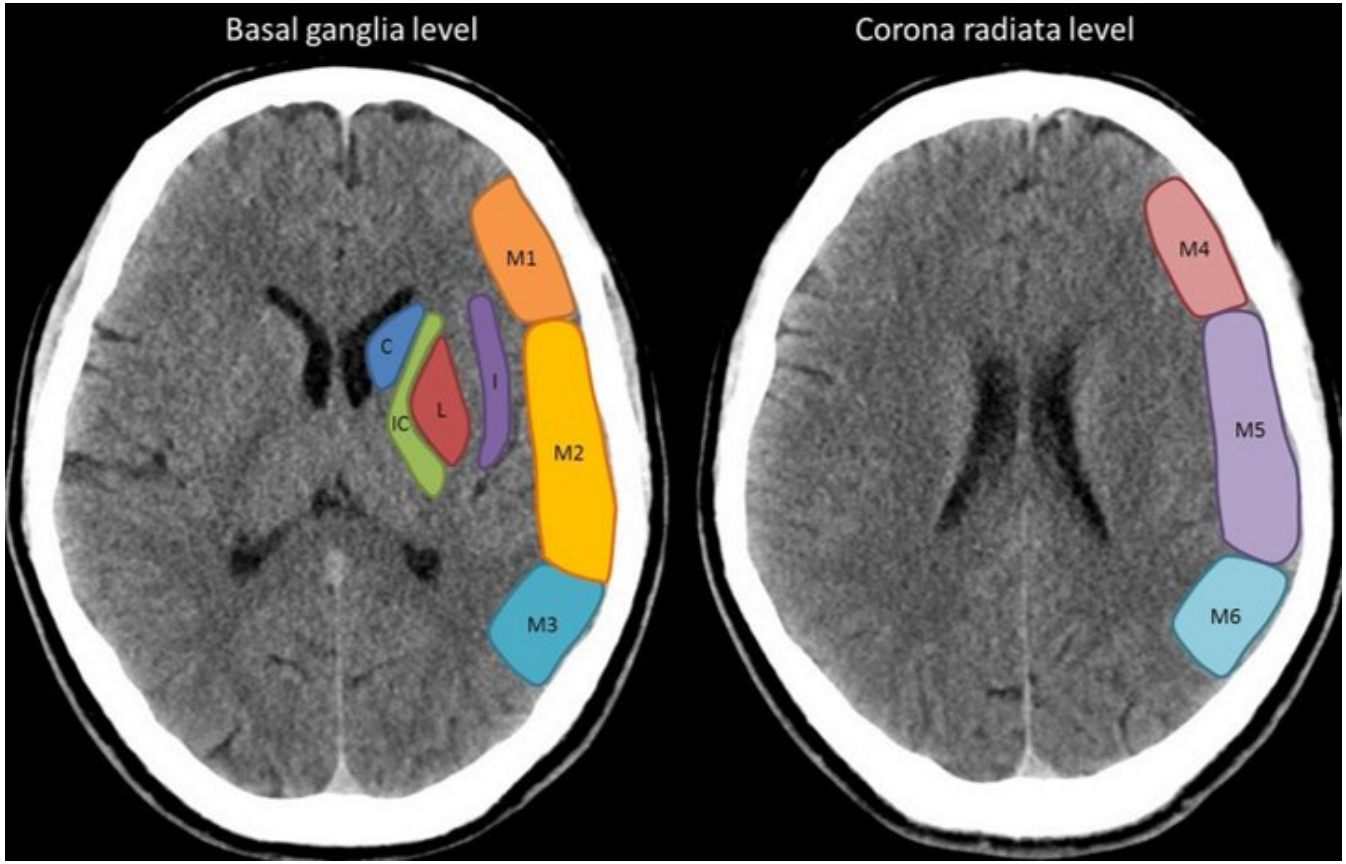
It doesn't! It takes approximately 6 hours from time of onset, although sometimes less, before a stroke will be visible on CT head and those hyperdense regions are the ischemic score.

The CT head is used, first, to rule out intracranial hemorrhages (ICH) as a cause of neurological deficits as this is an absolute contraindication to a thrombolytic and changes the course of care.



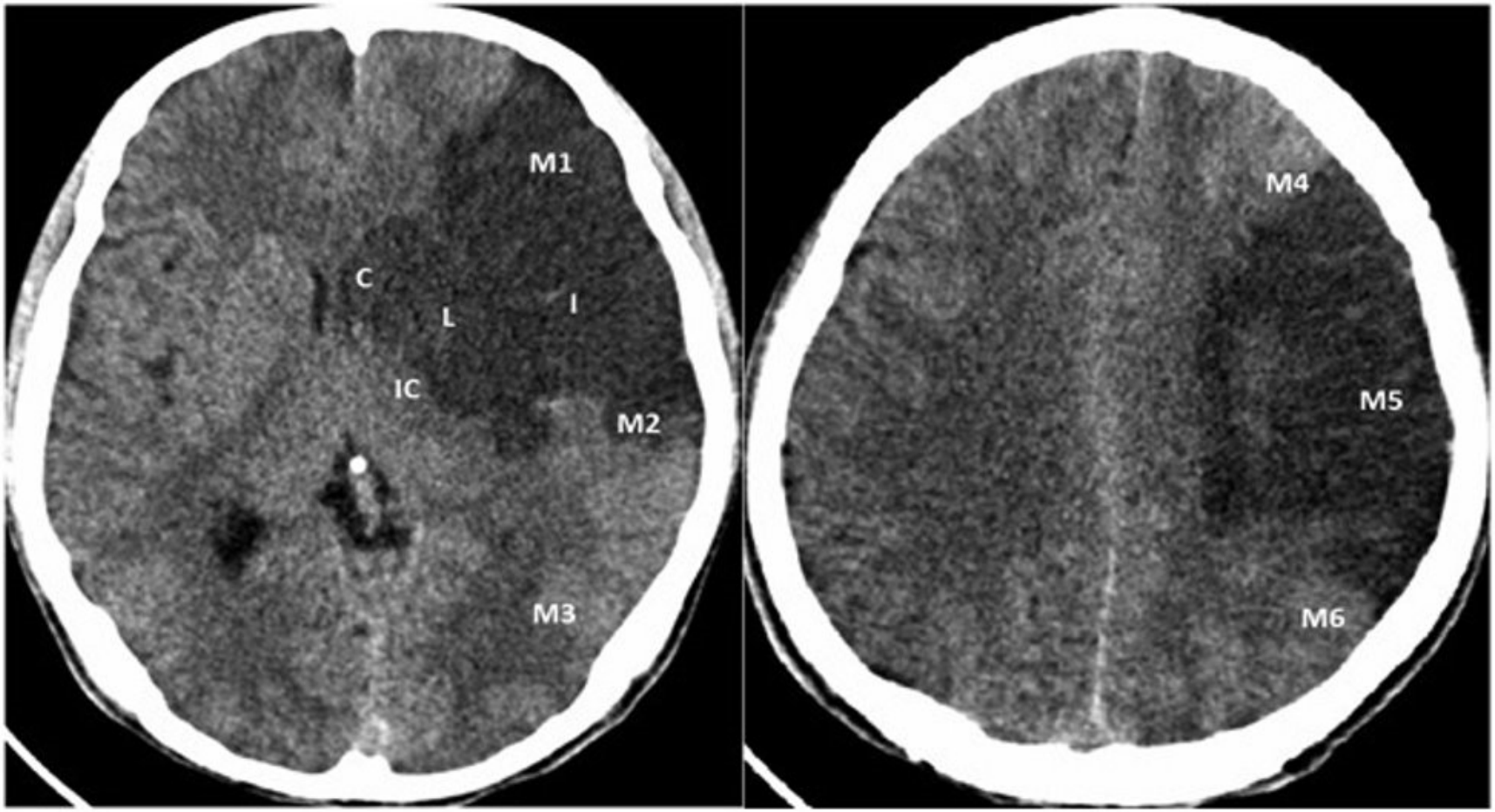
# ASPECTS

Albert Stroke Program Early CT Score




The ASPECT score is a way of communication how much of the MCA territory is hypodense on the CT head – which is to say, already ischemic core.

For each region that is hypodense, you subtract one point from the 10-point total.



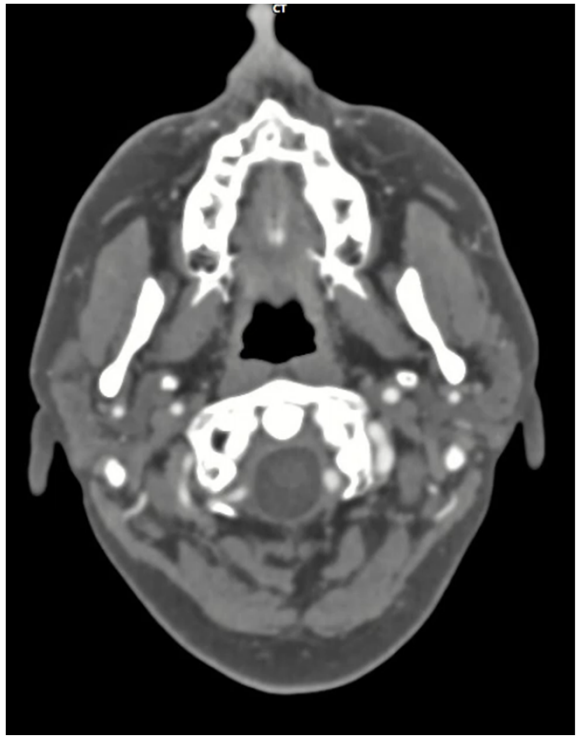

In this example, you subtract one point for each hypodense region: 1) M1, 2) Internal capsule 3) lentiform nucleus 4) caudate 5) M2, 6) M5. From a total of 10 points, you subtract 6 for each hypodense region, which gives you an ASPECT score of 4.

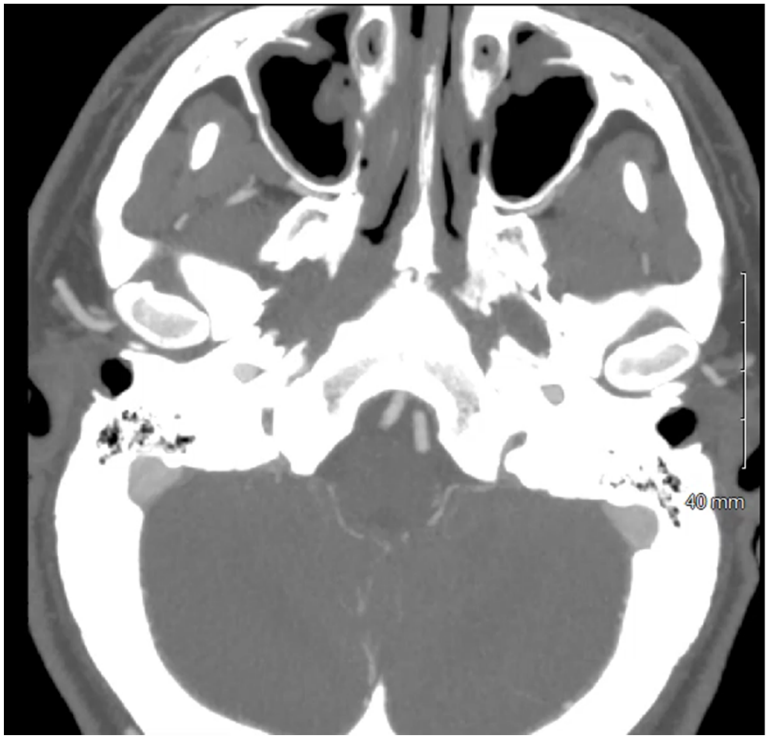
# CT ANGIOGRAM

The CTA is a contrasted study (i.e. has IV contrast) to look at the vessels of the brain. On the left are the raw images. On the right is the MIP (maximal intensity projection) in which layers of the images are stacked together to better track the vessels.

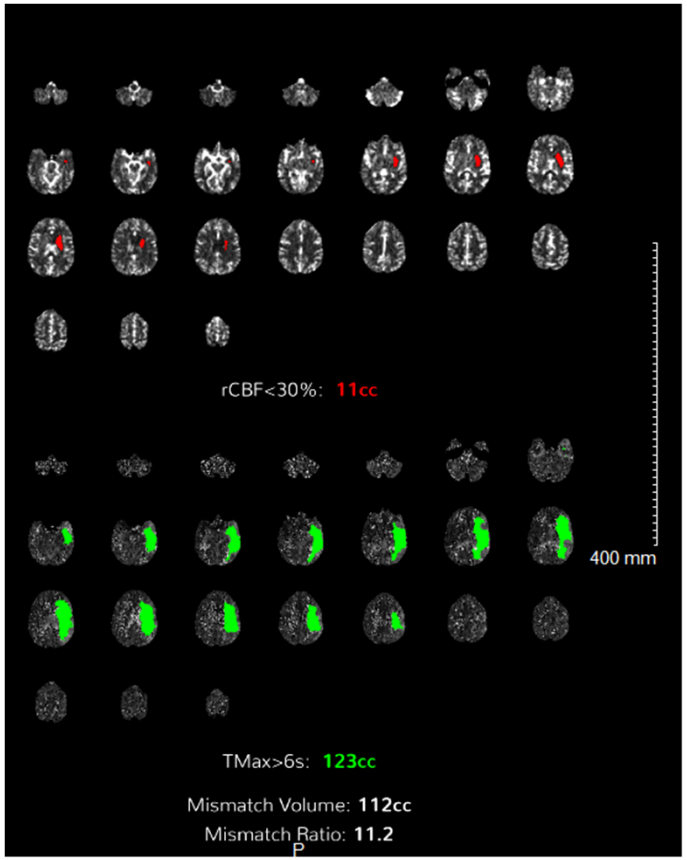
We look for a lack of opacification in a large vessel to denote a large-vessel occlusion (LVO).

Do you see the LVO?





# CT PERFUSION




CT perfusion (CTP) studies can be sued to assess perfusion of at at-risk region. This is a transition from a time window (i.e. from LKN) to a tissue window (i.e. core vs penumbra).

This is useful when the LKN is unknown, the ASPECT score is borderline, and/or when thrombectomy is a possibility if there is territory to save.

On the calculated CTP imaging (left), the red is the core infarct, calculated by cerebral blood flow < 30% compared to an unaffected region, and would correspond to hypodensity of a CT head. The green is the penumbra, which represents at-risk tissue in which there is slower blood flow, calculated by a delay of >6 seconds for blood flow to reach the area, but is not yet ischemic. A mismatch volume (penumbra – core) and mismatch ratio (penumbra:core) are calculated.

In order to consider intervention, you generally want an ischemic core less than 60-70 mL, a mismatch ratio of > 1.8, and a mismatch volume of >15mL, although these parameters may vary based on location on infarct and severity of symptoms.

# THROMBOLYTICS

If a patient has a disabling stroke syndrome, is in the time window, and has no contraindications, they may benefit from a thrombolytic – tissue plasminogen activase (tPA) or Tenecteplase (TNK).

| Eligibility | Contraindications |
| --- | --- |
| • Within 3 hours of LKN (FDA approved) or within 4.5 hours of LKN (data supported)<br>• Glucose is within normal limits *(This is the only lab you need prior to thrombolytic!)*<br>• BP <185/110 | • On anticoagulation<br>• Non-compressible hemorrhage or recent procedure<br>• Cerebral metastasis or ICH<br>• Recent large stroke<br>• Known coagulopathy |

Per the NINDS study, tPA did not impact symptoms at 24 hours but improved neurological outcome at 3 months with a NNT (number needed to treat) of 9 patients.

With thrombolytics there is a risk of hemorrhagic conversion of the ischemic stroke bed. If patients are consentable or a proxy decision maker is available, they should be education on this risk; however, consent IS NOT required for thrombolytics are it is considered an emergency procedure.

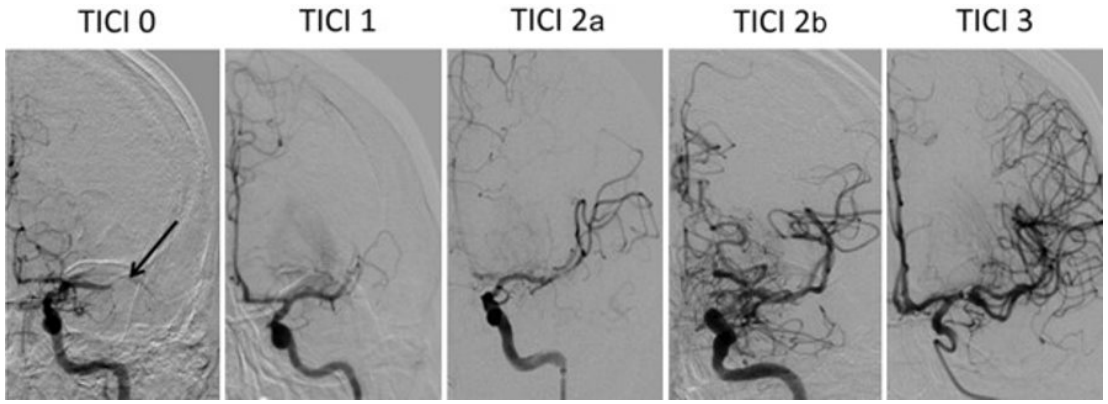
The risk of hemorrhage post-thrombolytics is approximately 6% with ICH more common in patients with a high NIHSS (larger territory infarcts) or evidence of global cerebral edema

# THROMBECTOMY

If a patient has a large vessel occlusion (LVO) that does not resolve with a thrombolytic or they are not a candidate for thrombolytics, it may be possible to physically remove the occlusion through endovascular therapy.

| Eligibility | Contraindications |
| --- | --- |
| • Proximal LVO<br>  • M1, M2<br>  • A1<br>  • Proximal basilar<br>• High disability<br>• Large penumbra | • Unfavourable penumbra<br>• Chronic occlusion<br>• Distal occlusion |

The success of a thrombectomy is graded by the TICI score: Thrombolysis in Cerebral Infarction (TICI) scale.




| Grade | Perfusion |
|---|---|
| 0 | No (re)perfusion |
| 1 | Penetration with minimal (re)perfusion |
| 2 | Partial (re)perfusion |
| 2a | Only partial filling (2/3) of entire vascular territory is visualized |
| 2b | Complete filling of all the expected vascular territory is visualized, but the filling is slower than normal |
| 3 | Complete (re)perfusion |

# POST-STROKE CARE

- Neurochecks
  - Q15 minutes during thrombolytic infusion
  - Q30 minutes for 6 hours post-infusion/intervention
  - Q1 hour for the remaining 24 hours
- STAT CT head and stop thrombolytic (if running) for any change in exam or headache
- Control blood pressure
  - <180/105 post-thrombolytic
  - <160 SBP post-intervention
- NPO pending swallow evaluation; consider isotonic IVF while NPO

# STROKE WORK-UP

- Labs
  - Hemoglobin A1c
  - Lipid panel
- Cardiac evaluation
  - EKG
  - Transthoracic echocardiogram (TTE)
- Imaging
  - CT Head at 24-hours post-tPA to assess for hemorrhagic conversion
  - May consider MRI if it would change the clinical course
- Medications
  - Anti-thrombotic pending clinical picture (antiplatelet vs anticoagulant)
  - Statin