EM CASES SUMMARY

Episode 120 Stroke Management in the Age of Endovascular Therapy

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According to the Global Burden of Disease Study published in NEJM in December 2018 the estimated lifetime risk for a 25 year old during their remaining lifespan is 25% [1]. Stroke is the 3rd leading cause of death and 1st leading cause of major disability in North America. As we transition from the relatively simple era of systemic thrombolytics under 3 hours vs "ASA and admit" for over 3 hours, decision making around which patients need what type of scanning where, which patients should get systemic thrombolytics and which patients should get endovascular therapy has become much more complicated and varied, depending on where you work.

We answer the questions that have been plaguing us for a while now: Which patients are eligible for endovascular therapies? Which patients are the ones who will benefit from these therapies and how do we make that happen in our different practice environments? Which patients should be considered for lytic therapy? Which patients should be considered for both lytic and endovascular therapy? and many more…

Time and image based stroke management algorithm

Activating a "code stroke" on every patient that experiences any acute neurologic event within 24hrs of symptom onset based on the **DIFFUSE 3** and **DAWN** trials [2,3] may outstrip resources, with only a tiny minority of these patients receiving potential benefit. There is currently an effort to identify those patients clinically who might be most likely to benefit from endovascular therapy so that not all stroke patients require transport to a stroke center with multiple imaging modalities and acute stroke team care.
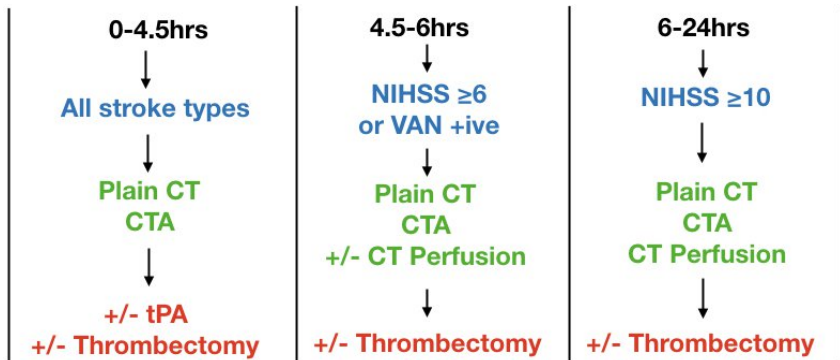
The workup and considerations for tPA and endovascular therapy (thrombectomy) depend on:

1. Symptom onset to needle time
2. Type of stroke, NIHSS or VAN tool (see below)
3. CT, CT angiogram and CT perfusion results
4. Contraindications to tPA/thrombectomy

Time is the key factor in patients with a symptom onset-to-needle time ≤ 6 hours.

Brain tissue salvageability determined by CT perfusion is the key factor in patients with a symptom onset-to-needle time of 6-24 hours.

Acute Stroke Management Time & Tissue Based Algorithm

0-4.5hrs	4.5-6hrs	6-24hrs
↓	↓	↓
All stroke types	NIHSS ≥6 or VAN +ive	NIHSS ≥10
↓	↓	↓
Plain CT CTA	Plain CT CTA +/- CT Perfusion	Plain CT CTA CT Perfusion
↓	↓	↓
+/- tPA +/- Thrombectomy	+/- Thrombectomy	+/- Thrombectomy

Times are symptom onset to needle times at a stroke center. CTA = CT angiogram head. NIHSS = National Institute of Health Stroke Scale. VAN = Vision, Aphasia, Neglect tool.

In 0-4.5 hours category, plain CT will rule in hemorrhagic stroke and CTA may diagnose an underlying vascular abnormality causing the bleed.

For patients in the 4.5-6 hours category, *and* with an NIHSS ≥ or VAN positive, *and* plain CT and CTA consistent with cortical stroke, candidacy for thrombectomy is determined either by CT perfusion, *or* if CT perfusion is not readily available, by the **ASPECTS score**[6].

Using the VAN Tool to identify strokes that may be amenable to endovascular therapy

Which patients are most likely to benefit from endovascular therapy? Stroke patients with large vessel occlusions ("cortical stroke") are the most likely to benefit from thrombectomy – internal carotid artery, MCA, and some ACA occlusions. An NIHSS ≥6 has traditionally been used to predict a cortical stroke. However this score is complicated and time consuming for the ED provider and ideally requires specific training to use it.

Multiple prehospital prediction tools have been developed such as the **LAMS** and **RACE** , however their sensitivities for large vessel strokes were only in the 80's. A more recent tool called the VAN tool (a mnemonic for Vision, Aphasia and Neglect) has been shown in a pilot study to have a 100% sensitivity and 90% specificity, 74% PPV and 100% NPV for large vessel stroke [7]. VAN was more specific than an NIHSS score ≥6 and just as sensitive for large vessel occlusion stroke. Although this study requires validation it is a promising tool to help us in the ED to identify clinically which patients should be considered for advanced imaging and endovascular therapy.

VAN Tool to identify large vessel cortical strokes

Patient must have weakness plus one or all of the V, A, or N to be VAN positive.

Step 1: Weakness

Weakness – ask the patient to raise both arms up for 10 seconds and assess for drift, weakness or paralysis; if any of these are present proceed to step 2

Step 2: V or A or N

Visual disturbance – field cut, diplopia or blindness
Aphasia – expressive (repeat and name 2 objects) or receptive (unable to follow commands – close eyes or make a fist)
Neglect – inability to track to one side, ignoring one side, unable to feel both sides at the same time or unable to identify own arm

Medications for stroke patients who do not fulfill criteria for tPA or endovascular therapy

There is no role for dual antiplatelet therapy in completed stroke. Starting with CAST trial in 1997 and based on two more recent meta-analyses in 2012 and 2013, the risk of hemorrhagic transformation outweighs any potential benefit in patients with completed stroke [8,9,10].

There is no role for starting anticoagulant medications in the ED for patients with history of atrial fibrillation or who present with atrial fibrillation at the time of their stroke. Again, the risk of hemorrhagic transformation outweighs any potential benefit of starting anticoagulants in the acute phase.

The risk of recurrent stroke in patients with atrial fibrillation is approximately 2% per week for the first two weeks after a stroke [4]. At what time after a stroke should patients with atrial fibrillation be started on anticoagulants? Expert opinion consensus suggests that for patients with atrial fibrillation and:

1. Large size stroke, anticoagulation should be considered starting on day 10.
2. Medium size stroke, anticoagulation should be considered starting on day 5-7.
3. Small size stroke, anticoagulation should be considered starting on day 3-5.

Informed consent and shared decision making for thrombolytics and endovascular therapy for stroke

There is a range of opinions as to whether or not informed consent is required for thrombolytics and/or endovascular therapy for stroke. On the one extreme, some stroke neurologists believe that informed consent is not required because they consider these treatments "standard of care". On the other extreme there are some EM physicians who believe that thrombolytics for stroke have no evidence for benefit and don't offer these treatments at all. Our experts recommend obtaining informed consent from the patient and/or POA whenever possible.

With regards to endovascular therapy it is important to explain that only approximately 1-2% of patients will qualify and benefit clinically from endovascular therapy.

With regards to thrombolytic therapy it is important to discuss the values of the patient (see **Episode 47 EBM with Walter Himmel**); whether or not they value life at all costs and whether they consider a possible small improvement worth the risk of getting much worse or dyeing. Explain to the patient and/or POA that some doctors believe that there is a 1 in 6 to 1 in 8 chance that there will be some improvement but on the other hand a 1 in 16 chance that a catastrophic head bleed will occur.

The CAEP stroke position statement recommends discussing and offering tPA for patients who you anticipate a symptom onset to needle time of ≤ 3 hours. For patients between 3 and 4.5 hours, tPA should be offered for patients who present at a stroke center [11].

"Thrombolytic therapy for acute ischemic stroke patients should not be routinely offered for the treatment of acute ischemic stroke for patients if administered beyond three hours of stroke symptom onset (WEAK RECOMMENDATION, MODERATE QUALITY EVIDENCE). The administration of thrombolytic therapy for acute ischemic stroke beyond 3 hours from stroke symptom onset should be restricted to specialized stroke centers with advanced imaging capabilities or as part of a research protocol (WEAK RECOMMENDATION, LOW QUALITY EVIDENCE)."

The ACEP clinical policy recommends discussing and offering tPA for all patients who qualify ≤ 4.5 hours regardless of the center of treatment [12].

References

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