Ischemic Stroke

Advances in Diagnosis and Management

Courtney R. Cassella, MD, Andy Jagoda, MD, FACEP*

KEYWORDS

• Acute ischemic stroke • Thrombolysis • Alteplase • Thrombectomy

KEY POINTS

- Tissue plasminogen activator (tPA) (Alteplase) is an treatment approved for treatment of acute ischemic stroke for patients who meet inclusion criteria and who are treated in the appropriate setting.
- The risk of symptomatic hemorrhagic conversion in properly selected patients can be less than 2% with no increase in disability or mortality; conversely, the risk can be greater than 15% in patients with significant comorbidities.
- A decision not to use tPA in the appropriate setting is acceptable, but clinical decision-making must be well supported in the medical record.
- The earlier the treatment for acute ischemic stroke, the better the outcome.
- Exclusion criteria for tPA have been revised: minor strokes, severe strokes, age, and seizures must be placed in context of risk/benefit.

INTRODUCTION

The 3 broad categories of stroke are ischemic (87%), hemorrhagic (10%), and subarachnoid hemorrhage (3%).[1,2] The specific definition is brain, spinal cord, or retinal cell death secondary to infarction. Of ischemic strokes, 60% are thrombotic, and 40% are embolic. The brain in ischemic stroke has a core infarct area and ischemic penumbra. The penumbra represents an area that may be salvaged with prompt reperfusion. The neurologic deficit can be devastating, and stroke remains the leading cause of disability and fourth most common cause of death in the United States.[2]

In the United States, approximately 795,000 people suffer a stroke annually, 77% of which are new strokes and 23% are recurrent.[2] The lifetime risk of stroke from age 55 to 75 years is 20% in women and 15% in men.[3] Approximately 10% of patients with an

Disclosure Statement: Dr A. Jagoda is on the Executive Committee of the Brain Attack Coalition; he has indirectly received honorariums from Vindico, a medical education company, which received an educational grant from Genentech.

Mount Sinai Department of Emergency Medicine, Icahn School of Medicine at Mount Sinai, One Gustave Levy Place, Box 1620, New York, NY 10128, USA
* Corresponding author.
E-mail address: Andy.Jagoda@mssm.edu

Emerg Med Clin N Am 35 (2017) 911–930
http://dx.doi.org/10.1016/j.emc.2017.07.007 **emed.theclinics.com**

acute ischemic stroke (AIS) die within 1 year, and 20% to 25% of patients remain severely disabled.[4–7]

There have been advances in prevention, diagnosis, and therapy over the past 22 years since the National Institute of Neurologic Disorders and Stroke (NINDS) trial was published demonstrating a higher likelihood of having a favorable clinical outcome at 3 months when tPA (Alteplase) was administered versus placebo.[1] Since then, several other studies and data base analyses have supported the benefit of tPA within the appropriate time window,[4–7] and its use is recommended by all major societies, including the American College of Emergency Physicians, the American Stroke Association (ASA), and the American Academy of Neurology.[8–11] This review provides a summary of guideline recommendations with a primary focus on the advances in thrombolytic inclusion/exclusion criteria, diagnostic neuroimaging, and management of large vessel occlusion (LVO).

STROKE ASSESSMENT AND DIFFERENTIAL DIAGNOSIS

The assessment for stroke often starts with prehospital measures by emergency medical services (EMS). Activation of EMS is recommended by the ASA based on evidence showing activation improves door-to-needle times, and thus may be related to improved outcomes (Class I; Level B evidence, see "Applying Classification of Recommendations and Level of Evidence" at reference 12 for grading scheme[11]).[12,13] As EMS plays a crucial role in stroke timelines, the emergency physician (EP) must be aware of prehospital history, assessment tools, and interventions.

The prehospital history emphasizes time of symptom onset, history of diabetes, prior stroke, seizures, hypoglycemia, hypertension, and atrial fibrillation. Additional history aids in the assessment for tPA eligibility, including medications such as antiplatelet/anticoagulants, surgeries within the past 3 months, and head or other major trauma.

The history is performed in conjunction with assessment tools for stroke. In the prehospital setting, the 2 most commonly used tools are the Los Angeles (LAPSS)[14] and Cincinnati Prehospital Stroke Screen (CPSS)[15] (Class I; Level B evidence[11]). Both screens activate stroke notification if any point is abnormal. The LAPSS includes asymmetry of facial smile/grimace, grip, and arm strength/drift. The CPSS assesses for unilateral facial droop, unilateral arm drift, and slurred speech. Given advancements in LVO management, Perez de la Ossa and colleagues[16] developed the Rapid Arterial Occlusion Evaluation (RACE) scale as a prehospital tool to assess stroke severity and possibly identify LVO with the premise that patients identified as high risk of LVO are best transferred to a stroke center with endovascular capabilities. The RACE scale was derived from National Institutes of Health Stroke Scale (NIHSS) items that highly correlate with LVO. The scale encompasses 5 items rated in score 0 to 2, including facial palsy, arm motor function, leg motor function, head and gaze deviation, and aphasia or agnosia. In the validation study, a score of $\geq$5 showed sensitivity 0.85, specificity of 0.68, positive predictive value of 0.42, and negative predictive value of 0.94 for LVO.[16] Despite the promising data, further study is warranted to further validate scales for LVO risk stratification.[17]

Focused prehospital measures include standard ABCs, intravenous (IV) access, cardiac monitoring, and correction of hypoglycemia. Given that hypoglycemia can be a stroke mimic, fingerstick glucose should be checked by EMS (Class I; Level B evidence[11]), and if less than 60 mg/dL, the patient should be given 50 mL of 50% dextrose.

On arrival to the emergency department (ED), the EP should perform the history, physical examination, and stabilizing measures. As thrombolysis is a time-sensitive