



## **The Diagnosis and Management of Acute Ischemic Stroke: New Frontiers in Managing ED Stroke Patients**

*Edward P. Sloan, MD, MPH, FACEP*

Professor  
Department of Emergency Medicine  
University of Illinois at Chicago  
Chicago, IL

### **Case Presentation**

A 65 year old woman presents with a history of L sided weakness, slurred speech, and a facial droop that began during breakfast with her family. The family reports that she may have had some twitching of her arm and face prior to this happening, and that she seemed “a bit out of it” for a few minutes prior to the arrival of EMS.

In the Emergency Department, the patient is awake and alert, but still has the observed extremity weakness, facial droop, and slurred speech as noted at home by the family. The emergency physician discusses with the neurology consultant the way in which this patient should be evaluated and treated in the ED, given that there may have been a seizure, that this might be related to some CNS lesions, and that the symptoms have somewhat improved in the ED.

**If IV tPA is deferred in this patient, is there a role for interventional radiological techniques such as cerebral angiography, intra-arterial tPA, and use of devices such as the Merci clot retrieval device?**

**Can the diagnosis of this patient’s pathology be achieved initially using less invasive tests such as CTA, MRI, and MRA?**

## **Key Clinical Questions and Learning Points**

### **What modalities exist for the acute diagnosis of ED stroke patients?**

The modalities that exist for the acute diagnosis of ED stroke patients include:

- Non-contrast and contrast cranial CT
- CT angiography
- MRI, including diffusion and perfusion weighting studies
- MR angiography
- Cerebral angiography of the anterior and posterior circulations
- Carotid angiography and Doppler ultrasonography

### **What vascular modalities exist for the acute management of ED stroke patients?**

The modalities that exist for the acute treatment of ED stroke patients include:

- IV thrombolysis
- IA thrombolysis
- Cerebrovascular stenting
- Merci clot retrieval device
- Operative intervention (carotid endarterectomy)

### **What is meant by the “double play” or “triple play” for stroke patients?**

Patients who present with a stroke as a result of a carotid artery lesion with thrombus formation, and a cerebrovascular embolus have two problems that can be addressed with a coordinated intervention. Following carotid artery stenting, specialized centers can then perform clot retrieval with the Merci device, followed by intra-arterial tPA, which prevents the occurrence of complications as a result of the embolus removal. When all three occur, it is termed the “triple play”. When there is no carotid artery intervention acutely, and only the Merci device is utilized followed by intra-arterial tPA, it is termed the “double play”.

**What is the role of the initial non-contrast cranial CT in stroke patients?**

The initial cranial CT is performed in order to determine the presence of four findings:

1. Intracranial hemorrhage (subdural, epidural, SAH, ICH)
2. Space-occupying lesions (tumor, abscess)
3. Midline shift, other signs of mass effect, cerebral edema
4. Evidence of a large MCA stroke or a stroke of many hours' duration

**What is the role of MRI in evaluating stroke patients?**

Although MRI has been shown to be effective in detecting the presence of acute hemorrhage and may successfully stratify patients who might best benefit from thrombolytic therapy, there is no role for cranial MRI in supplanting cranial CT in the initial ED assessment of stroke patients.

The future use of MRI may result from its ability to detect a diffusion/perfusion mismatch, which distinguishes the portion of the cerebral cortex that has infarcted and is not salvageable from the ischemic penumbra which may possibly be salvaged with an aggressive therapeutic approach, including thrombolytic therapy, stenting, and mechanical clot retrieval devices.

**What is the role of additional tests in diagnosing acute stroke patients?**

Evaluation of the carotid arteries allows for the detection of critical stenosis of these vessels and the need for a percutaneous or operative intervention. Cerebral angiography, CTA, and MRA are utilized to detect the presence of intracranial vascular occlusions and/or vascular abnormalities (AVMs, aneurysms, cavernomas) that define the etiology of the cerebrovascular accident. These tests are performed when a thromboembolic carotid artery occlusion is not the confirmed etiology of the stroke. A formal cerebral angiogram is indicated if any of these tests are inconclusive or if clot retrieval or intra-arterial tPA is planned.

**What are the indications for CNS vascular interventions such as vascular stents, intra-arterial tPA, and the Merci clot retrieval device?**

These advanced stroke patient treatment techniques are indicated when IV thrombolysis cannot be provided due to passage of the three hour time window, because the likely distribution of the infarct is too large to justify thrombolysis, or because there is uncertainty as to the diagnosis or that the likely etiology of the stroke is an occlusive thrombus or embolus.

In these instances, it may be optimal to utilize advances diagnostic and therapeutic modalities in order to establish the diagnosis definitively and to provide the optimal means of clot removal and salvage of the ischemic penumbra.

**Are these advanced stroke patient treatment techniques the standard of care, such that they should be offered to all stroke patients (necessitating inter-hospital transfer in some cases)?**

No. These advanced methods for stroke patient diagnosis and management are not uniformly available, nor have they been established to be clinically efficacious such that they must be offered to all stroke patients.

It would be prudent for all emergency physicians to be aware of which of these modalities are available via consultation within their own hospitals, and to understand how external consultation for possible inter-hospital transfer for these interventions can be facilitated when clinically indicated.

**PM**