

Breaking News—Two New Trials Offer Treatment Options for Stroke: Mechanical Thrombectomy for Acute Ischemic Stroke up to 24 Hrs after Onset

► Stroke team members at Penn Medicine are now performing endovascular thrombectomy up to 24 hours after acute ischemic stroke in patients for whom imaging suggests a therapeutic benefit from intervention. The extension of the window of intervention to 24 hours in select patients with acute stroke is a departure from what was previously standard practice, which limits treatment to six hours from symptom onset.

Time of symptom onset is among the most critical factors for patients with acute ischemic stroke. Prior studies have reported that the average patient loses 1.9 million neurons, 13.8 billion synapses, and 12 km (7 miles) of axonal fibers for every minute a large vessel ischemic stroke is untreated.¹

Receiving immediate care is thus critical to minimizing brain damage and reducing disability in stroke.

In traditional time-based protocols for acute stroke, treatment is limited to six hours from symptom onset. After the six-hour window, it is assumed that damage to the neural tissues will not be rectified or improved by intervention.

There are two major limitations to time-based approaches to acute stroke intervention, however. First, defining the time of stroke onset is often difficult. When the onset of symptoms is unwitnessed, for example, symptoms are assumed to have begun when the patient was last known to be well. While observation of “wellness” posits an objective time for onset, it excludes many patients—those who awake with stroke, for example—from treatment within the traditional 6-hour timeframe for intervention. Additionally, differences in individual anatomy and physiology make it likely that a strict 6 hour time window is not appropriate for all people.

The DAWN of a 24-Hour Window for Acute Stroke Management in Selected Patients

Advances in medical imaging and new clinical trials (see next page) now allow acute stroke management teams at the Joint-Commission Certified Penn Comprehensive Stroke Center to treat stroke in selected patients up to 24 hours after symptom onset. CT angiogram and perfusion imaging are combined

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► **Figure 1:**
A. Non-contrast CT head, showing hyperdense right middle cerebral artery (MCA), suggestive of proximal MCA occlusion.
B. Digital subtraction angiography confirms occlusion of the right MCA.
C. Stent-retriever is used to extract the thrombus (image shows the device and the clot).
D. Digital subtraction angiography shows recanalization of the right MCA after thrombectomy.

CASE STUDY

Ms. M, a 29-year-old woman, was discovered in her bed by her mother when she failed to arrive for breakfast before going to work. At this time, she was unable to rise from bed, unable to move the left side of her body and unable to speak. Ms. M’s mother recognized the symptoms of stroke and with the assistance of her brother, took her to a nearby hospital emergency room.

Following a definitive diagnosis of stroke in the ER, the Comprehensive Stroke Center at Penn was notified and a PennSTAR helicopter was dispatched to the hospital. While Ms. M was in transit, a team, including vascular neurologists, neurosurgeons and neuroradiologists was alerted at Penn Medicine.

Upon her arrival at Penn Medicine, Ms. M was met by the interventional team and transferred to a CT scanner. The resulting scan suggested an occlusion of right internal carotid artery with a small core of infarcted tissue and no evidence of intracranial hemorrhage. On this evidence, Ms. M was taken immediately to the interventional suite, where a catheter was introduced at her femoral artery containing a stent retriever and suction device and threaded up to her brain to remove the clot, with successful recanalization.

Following her thrombectomy, Ms. M was taken to the ICU. Over the next 24 hours her symptoms improved substantially. She remained in the ICU for another day, then was transferred to the stroke unit. At six months post-thrombectomy, an assessment of her function found mild residual symptoms but no disability.

References

1. Saver JL. Time is Brain. *Stroke* 2006;37:263-266.
2. Nogueira RG, et al. Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct. *N Engl J Med* 2018;378:11-21.
3. Albers GW, et al. Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging. *N Engl J Med*. 2018 Jan 24.

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to identify patients in the 6–24 hour time window who have are likely to benefit from intervention. These technologies are available at Penn Medicine and other Comprehensive Stroke Centers.

Two recent clinical trials played a major role in shifting the window of intervention for acute stroke.

The DAWN trial, published in November 2017,² used advanced imaging to select patients for endovascular mechanical thrombectomy up to 24 hours after the patient was last known to be well. This landmark study showed a 36% absolute benefit at 90 days for patients with a large vessel occlusion and a favorable imaging profile.

Then, in January 2018, the DEFUSE-3 trial (in which the Penn Stroke Center participated) showed that thrombectomy performed 6–16 hours after the patient was last known to be well was associated with a 28% absolute benefit at 90 days.³ The patient population in DEFUSE-3 differed slightly compared to DAWN, but together these studies confirm the strong benefit of thrombectomy for stroke patients, even beyond the traditional 6 hour time window.

On the basis of DAWN, DEFUSE-3, and other investigations, the Joint-Commission certified Penn Comprehensive Stroke Center now performs thrombectomy in selected patients up to 24 hours after acute stroke.

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About the Penn Comprehensive Stroke Center

In addition to participating in stroke research, the Penn Comprehensive Stroke Center offers dedicated neuro-intensive care unit beds for complex stroke patients 24/7; care for patients with diagnosed subarachnoid hemorrhage, acute ischemic stroke or aneurysm; advanced imaging capabilities and techniques; and management of post-hospital care. The Stroke Center faculty includes vascular neurologists, neurosurgeons and neuroradiologists, who are supported in their efforts by the dedicated teams from PennSTAR, the intensive care units and the neurorehabilitation program.

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