Published in final edited form as:

Nat Rev Neurol. 2010 September ; 6(9): 474–475. doi:10.1038/nrneurol.2010.110.

STROKE: Sedation and anesthesia during endovascular stroke therapy

Philip M. Meyers and

Departments of Radiology and Neurological Surgery, Columbia University, College of Physicians and Surgeons, Neurological Institute of New York, 710 West 168th Street, New York, NY 10032, USA

Eric J. Heyer

Departments of Anesthesiology and Neurology, Columbia University, College of Physicians and Surgeons, Neurological Institute of New York, 710 West 168th Street, New York, NY 10032, USA

Abstract

A large, retrospective study indicates that in patients with acute ischemic stroke, endovascular interventions performed under conscious sedation carry a lower risk of poor neurological outcome and mortality than those performed under general anesthetic. Owing to a number of potential confounding factors, however, the results must be interpreted with caution.

When an individual has a stroke—particularly an acute ischemic stroke—seconds count. Every minute after the event, 1.9 million neurons, 830 billion synapses, and 714 km of myelinated fibers are estimated to be destroyed.¹ Early recognition of stroke signs and symptoms is important for timely entry into the emergency medical system. Intravenous fibrinolysis using tissue plasminogen activator is the first line of therapy for patients presenting to hospital within 4.5 h of stroke onset.² In recent years, however, considerable progress has also been made in developing endovascular therapies that aim to re-establish blood flow in occluded cerebral arteries.^{3,4} To enable these endovascular procedures to be performed, fluoroscopic (X-ray) guidance is required. Patients are often unable to cooperate because of their strokes, and the procedures can be painful. Moreover, acute ischemic stroke is a heterogenous disease, and conclusive evidence that these endovascular procedures are effective at improving patient outcomes has remained elusive to date.

In a study published in *Stroke*, Abou-Chebl and colleagues have endeavored to address the debate on the sedation that is used when performing endovascular interventions on patients with acute ischemic stroke.⁵ They ask whether these procedures should be performed using conscious sedation, which may require less time to initiate than other approaches, or whether an anesthesiologist should provide general anesthesia with ventilator support, so as to improve pain control, patient immobilization and fluoroscopic visualization. In a retrospective analysis of 980 patients, who were admitted to 12 unrelated US hospitals between 2005 and 2009 with anterior cerebral circulation strokes due to large-artery occlusions, the authors reach the following conclusion: patients treated under general anesthesia have a greater chance of poor neurological outcome (odds ratio [OR] = 2.33, $P < 0.0001$) and mortality (OR = 1.68, $P < 0.0001$) than those given conscious sedation.

Competing interests

The authors declare no competing interests.

Unfortunately, the study leaves unanswered many questions that are necessary to support this conclusion.

The researchers collected de-identified patient demographic data, NIH Stroke Scale (NIHSS) scores, data on use of intravenous tissue plasminogen activator and general anesthesia, time to groin puncture (procedure start time), location of cerebral artery occlusion, drugs and devices used to effect vessel recanalization, degree of vessel recanalization, time to recanalization, post-procedural hemorrhage, and 90 day neurological outcomes. The numbers of patients treated at any given center during the 5 year period varied from 9 to 264. Use of general anesthesia for these stroke procedures also varied dramatically from center to center, ranging from 0–100%.

The authors' question is an important one, and a decision must be made about the use of general anesthesia in every stroke treatment procedure. Many of the new devices that are used for endovascular stroke treatment are quite substantial in size relative to the vessels requiring treatment. For instance, the most effective version of the Penumbra Stroke System (Penumbra, Inc., Alameda, CA, USA) requires use of a 0.054 in (1.37 mm) suction catheter in delicate cerebral arteries measuring 2–5 mm in diameter (Figure 1). This type of catheter is relatively supple, but its navigation can still result in vessel distortion, pain, and even vomiting. Owing to the tortuosity of the cerebral arteries, navigation can be challenging even under general anesthesia with excellent fluoroscopic visualization. Nevertheless, if clinical stroke data do not support the use of general anesthesia, its use should be eschewed despite its technical benefits.

The paper by Abou-Chebl *et al.* speaks to the difficulties in answering many questions about the treatment of patients with ischemic stroke. Controlled and uniform data are still difficult to obtain. In their introduction, the authors posit that conscious sedation might reduce delays to endovascular treatment, although the relevant data presented in the tables in the paper do not clearly indicate that delays occurred when general anesthesia was used. Nevertheless, the authors state in their discussion that “delays related to [general anesthesia] may still account for some of the differences in outcome.”

Data analysis throughout the article compares ‘good outcome’ versus ‘poor outcome’, yet for the purposes of the paper and its conclusions a more logical comparison would include the method of anesthesia, namely, conscious sedation or general anesthesia. Analysis of the anesthesia records would help define the anesthetics used, blood pressure parameters, and other physiological indicators of patient outcome to guide future therapy. Unfortunately, these data were not collected. In all likelihood, the patients treated under general anesthesia in this study were more-gravely ill or had more-difficult occlusions to revascularize than those who were treated under conscious sedation. Multivariate analysis taking into account other measures of illness might have made the two anesthetic techniques more comparable in terms of overall outcomes.

In summary, the present data are not strong enough to change practice, but the concept of conscious sedation versus general anesthesia will remain in mind and should be addressed in future stroke trials.

References

1. Saver JL. Time is brain—quantified. *Stroke*. 2006; 37:263–266. [PubMed: 16339467]
2. Hacke W, et al. Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke. *N Engl J Med*. 2008; 359:1317–1329. [PubMed: 18815396]
3. Meyers PM, et al. Performance and training standards for endovascular ischemic stroke treatment. *AJNR Am J Neuroradiol*. 2010; 31:e8–e11. [PubMed: 20075105]

4. Meyers PM, et al. Indications for the performance of intracranial endovascular neurointerventional procedures: a scientific statement from the American Heart Association Council on Cardiovascular Radiology and Intervention, Stroke Council, Council on Cardiovascular Surgery and Anesthesia, Interdisciplinary Council on Peripheral Vascular Disease, and Interdisciplinary Council on Quality of Care and Outcomes Research. *Circulation*. 2009; 119:2235–2249. [PubMed: 19349327]
5. Abou-Chebl A, et al. Conscious sedation versus general anesthesia during endovascular therapy for acute anterior circulation stroke: preliminary results from a retrospective, multicenter study. *Stroke*. 2010; 41:1175–1179. [PubMed: 20395617]

Figure 1.

Use of the Penumbra Stroke System to treat acute ischemic stroke. A 37 year-old woman developed sudden onset right hemiplegia and global aphasia 18 days postpartum. She received intravenous fibrinolysis 2 h 10 min post ictus and was referred for emergency endovascular treatment of a left carotid terminus occlusion. **a** | Penumbra catheter (arrow) in the left internal carotid artery and origin of the left middle cerebral artery. **b** | The catheter occludes the middle cerebral artery (arrow) during treatment. **c** | Complete recanalization and flow in the left middle cerebral artery (arrow) after catheter withdrawal.