



## ARTICLE OF THE MONTH

### General Anesthesia Versus Conscious Sedation in Endovascular Thrombectomy for Stroke: A Meta-analysis of 4 Randomized Controlled Trials

*Campbell, Doug BM\*; Diprose, William K. MBChB†,‡; Deng, Carolyn MBChB\*;  
Barber, P. Alan MBChB, PhD, FRACP†,‡*

*Journal of Neurosurgical Anesthesiology: January 2021 - Volume 33 - Issue 1 - p 21-27  
doi: 10.1097/ANA.0000000000000646*

Welcome to another session of Article of the Month, March 2021. This month we discuss a meta-analysis of four randomized controlled trials comparing outcome differences with conscious sedation versus general anaesthesia in endovascular thrombectomy for stroke, commentary by Drs. William Buxton and Dieter Adelman.

As always, readers are welcome to join us for further discussion and feedback on the SNACC [Twitter](#) feed, or on [Facebook](#).

- Oana Maties, MD, Shilpa Rao, MD, Amie Hoefnagel, MD, and Nina Schloemerkerper, MD

#### **Dr. William Buxton - Biographical Sketch**

Dr. William Buxton is currently the Neuroanesthesia Fellow at the University of California, San Francisco (UCSF). He is a UK military Doctor holding the rank of Major.

Dr. Buxton obtained his medical degree, M.B.B.S from Kings College London University Hospital in 2008 in London, UK. He has completed six years of anesthesia training in the South Thames Deanery and obtained the Fellowship to the Royal College of Anaesthetists in 2017. He has undertaken 3 years of military specific medical work, he has obtained his special forces Parachute Regiment wings and has served with the Royal Marine Commando's as their Doctor in Helmand Province, Afghanistan.

He has a special interest in regional anesthesia, neuroanesthesia, TIVA and the mitigation of environmental issues related to medical care and has undertaken many quality improvement projects in this area. He enjoys teaching and is an active Advanced Life Support instructor. He has published several peer reviewed international papers.

#### **Dr. Dieter Adelman - Biographical Sketch**

Dr. Dieter Adelman is an Assistant Professor at the Department of Anesthesia and Perioperative Care at UCSF. Dr. Adelman completed medical school at the Medical University of Vienna, Austria. Following medical school, he completed a 6-year residency in Anesthesia and Intensive Care and obtained a Ph.D. in Clinical Neurosciences, both at the Medical University of Vienna, Austria. He subsequently completed a liver transplant anesthesia fellowship at UCSF and joined the faculty after completion of his fellowship.

His clinical focus is on neuroanesthesia and anesthesia for liver transplantation. His research is focused on improving the perioperative care of transplant recipients, such as identifying risk factors for perioperative kidney injury during liver transplantation and identifying modifiable risk factors for graft injury after kidney transplantation. He is passionate about improving the collection of high-quality, multicenter data for quality improvement and research in patients undergoing abdominal organ transplantation.

## Commentary

**Dr. William Buxton MBBS**

*Neuroanesthesia Fellow*

*University of California, San Francisco*

**Dr. Dieter Adelman MD**

*Assistant Professor*

*University of California, San Francisco*

Early studies comparing the use of general anesthesia (GA) or conscious sedation (CS) for endovascular thrombectomy for stroke have suggested inferior clinical outcomes in patients receiving GA. However, most evidence was based on secondary analysis of data from studies where the decision on providing GA or CS was not randomized.

Campbell and colleagues performed a meta analysis based on 4 randomized controlled trials in which patients were randomized to receive either GA or CS for endovascular thrombectomy for stroke. Data from a total of 408 patients (203 received GA, 205 received CS) were available for this meta analysis.

The following efficacy and safety outcomes were assessed:

- o Successful recanalization (thrombolysis in cerebral infarction – TICI score: 2b to 3)
- o Good functional outcome (modified Rankin scale score – mRS: 0 to 2 at 3 months)
- o Intracerebral hemorrhage rates
- o Three-month mortality

### Results

Patients treated with GA achieved a higher rate of successful recanalization (OR: 2.14, 95% CI: 1.26 - 3.62; P= 0.005 ) and had a higher rate of good functional outcome (OR 1.71, 95% CI: 1.13-2.59; P= 0.01). For every 7.9 patients receiving GA one more patient achieved good functional outcome compared with those receiving CS (49.3% in GA patients and 36.6% in CS patients, an absolute difference of 12.7%). There were no significant differences in intra-cerebral haemorrhage (OR: 0.61, 95% CI: 0.20-1.85; P= 0.38) or 3-month mortality (OR: 0.62, 95% CI: 0.33-1.17; P= 0.14). Twenty-six patients (13%) randomized to receive CS required conversion to GA.

### Authors Conclusion

Patients who received GA for thrombectomy had a superior recanalization rate and better functional outcome at 3 months than those receiving CS. There was a trend towards lower 3-month mortality in patients receiving GA.

### Discussion

This study is particularly relevant to those working as specialised neuroanesthesiologists. The findings contrast with previous observational studies and meta-analyses of observational studies, where endovascular thrombectomy patients treated with GA were reported to have a worse outcome than those treated with CS. It is noted that these studies often did not report the anaesthetic drugs or doses, or physiological parameters such as perioperative blood pressure. In their discussion, the authors explore why GA patients may fare better. Patients under GA are immobilised, and apnoea can be induced on demand (such as during thrombectomy) which is likely to confer superior procedural conditions. Oxygenation, ventilation, heart rate, systolic blood pressure, and temperature are physiological parameters that can more easily be modified in the GA group, which may improve outcome in patients with brain injury. Anesthetic agents such as propofol and sevoflurane can reduce the cerebral metabolic rate by up to 60%, and show evidence of neuroprotection in animal models of neurological injury.

The authors suggested that the unreported and unadjusted BP differences may have been a major contributor to the signal of harm from GA compared to CS in previous observational studies. Inhalational anaesthetic agents impair cerebral

autoregulation in a dose-dependent manner. Therefore, the maintenance anaesthetic agent could increase the potential for harm due to relative hypotension, or the potential for benefit through increased penumbral perfusion from augmented BP during endovascular thrombectomy.

The study does have limitations, which it openly discusses. It analyses a small number of small RCT's with a total of only 408 participants which may cause reporting bias. None of the trials were designed primarily to investigate pooled outcomes at 3 months and the authors report that the combined results display little heterogeneity. The studies were performed in centres with highly specialised anaesthesiology teams who often provide care for stroke patients. These super specialised teams are not available in all hospitals.

This meta-analysis was approached in a thorough and logical manner and presents compelling, rounded arguments. Its conclusion that high quality, specialized neuroanesthesia care with protocol driven management of GA may have contributed to the superior outcomes in the randomized controlled trials analysed should be carefully considered by neuroradiologists and neuroanesthesiologists alike.

Future Larger Multicenter Randomized Controlled Studies of Interest:

- o Impact of Anesthesia Type on Outcome in Patients With Acute Ischemic Stroke Undergoing Endovascular Treatment - CANVAS study (NCT02677415)  
650 patients, ongoing recruitment. (China, estimated completion date 12/2022)
- o General Anesthesia versus Sedation during intra-arterial treatment for Stroke – GASS study (NCT02822144)  
351 patients, enrolment completed. (France)
- o Sedation Versus General Anesthesia for Endovascular Therapy in Acute Ischemic Stroke – SEGA study (NCT03263117)  
260 patients, ongoing recruitment. (United States, estimated completion date 12/2021)