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SOCIETY FOR NEUROSCIENCE IN ANESTHESIOLOGY AND CRITICAL CARE

ARTICLE OF THE MONTH

Risks of Cardiovascular Adverse Events and Death in Patients with Previous Stroke Undergoing Emergency Noncardiac, Nonintracranial Surgery: The Importance of Operative Timing

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Welcome to the August 2018 SNACC Article of the Month!

The chosen article by Christiansen et al is looking at the implications of timing of emergency surgery on major adverse cardiac events in patients with previous stroke.

Our expert commentator this month is Dr. Sandy Kisilevsky. Sandy received her MD and a PhD in neuroscience from the University of Calgary, Alberta, Canada. She subsequently completed anesthesiology residency training at the University of British Columbia in Vancouver. Sandy is a clinical anesthesiologist with the Department of Anesthesiology and Perioperative Medicine at Vancouver General Hospital and is currently pursuing a neuroanesthesia fellowship at University of California San Francisco.

We continue to encourage our readers to join us on the SNACC **Twitter** feed or on **Facebook**.

~ Oana Maties MD, Nina Schloemerkemper, MD and Adrian Pichurko, MD

Commentary

Sandy Kisilevsky, MD, PhD

The study by Christiansen *et al.*[1] in *Anesthesiology* is a retrospective observational study on outcomes following emergent surgery in patients with a prior history of ischemic stroke. It includes all adult patients > 20 years of age undergoing urgent or emergent non-cardiac, non-neurological surgery between 2005 and 2011 in the Danish National Patient Register (DNPR). Patients were excluded if they underwent an intervention deemed high risk of association with prior stroke (i.e. gastrostromy, tracheostomy, surgery of the carotid artery or aortic arch).

Patients with a history of ischemic stroke (within five years prior to surgery) were compared to patients without a history of stroke (control) and were stratified into three groups based on time elapsed between stroke and surgery as follows: 1) stroke less than three months prior, 2) stroke within three to nine months prior, and 3) stroke greater than nine months prior to surgery. Data were adjusted for confounders and odds ratios (ORs) with 95% confidence intervals (CI) calculated using logistical regression. Cubic spline regression was used for analysis of time between stroke and surgery as a continuous variable. In a second data analysis, patients with ischemic

stroke within 14 days prior to surgery were stratified into two groups: “immediate” surgery (one-three days prior) or “early” surgery (four-14 days prior). Outcomes for “immediate” and “early” groups of patients were compared using propensity-score matching to reduce potential confounding inherent in observational studies.

Primary outcomes included 30-day all cause mortality and a combined endpoint of 30-day major adverse cardiac events (MACE) defined as nonfatal ischemic stroke, nonfatal myocardial infarction (MI), and cardiovascular death. The secondary outcome of interest was non-fatal ischemic stroke alone. Data analysis was stratified by vascular and non-vascular surgery for both primary and secondary outcomes. The authors clearly state their hypothesis that patients with very early surgery (i.e. one-three days post stroke) or delayed surgery would have improved outcomes compared with patients undergoing surgery at an intermediate time point (i.e. four-14 days post stroke) as a consequence of maximal dysfunction in cerebral autoregulation at the intermediate time point.

A total of 146,694 emergency surgeries were identified including 7861 (5.4%) patients with prior ischemic stroke. Compared to control, patients with stroke less than three months prior to non-vascular surgery were at high risk of both 30-day MACE and all-cause mortality (OR 4.71 95% CI 4.18-5.32 and OR 1.65 95% CI 1.45-1.88, respectively). Risk decreased with time elapsed from stroke but remained elevated above control in patients with stroke three to nine months prior to (OR 1.93 95% CI 1.55-2.40 and OR 1.20 95% CI 0.98-1.47, respectively) and greater than nine months prior to non-vascular surgery (OR 1.62 95% CI 1.43-1.84 and OR 1.20 95% CI 1.08-1.34, respectively). The risk of repeat ischemic stroke alone was also much greater in patients with a prior history of stroke and decreased with time elapsed between index stroke and surgery (but remained elevated above control in all patient subgroups). Specifically, risk of repeat stroke was 10% in patients with a history of stroke three months before surgery compared to a 0.3% risk in patients with no prior history of stroke. Similar results were observed for vascular surgery but confidence intervals were wide as small numbers of surgeries were reported. 323 patients with previous ischemic stroke undergoing “early” emergency surgery were propensity-matched to 323 stroke patients undergoing “immediate” surgery. Risk of 30-day MACE was significantly greater in the early group (29% vs 21%, p=0.029).

This study by Christiansen and colleagues highlights the importance of timing of emergent surgery relative to ischemic stroke with regards to perioperative risk. It follows their 2014 *JAMA* article demonstrating stabilization of risk at nine months post index stroke in patients undergoing elective surgery.[2] Strengths of the current study include large patient numbers, contemporaneous data and use of a nationwide patient registry that captures all system users. Weaknesses include data from a single Scandinavian country which may not be generalizable, a retrospective study design, and inherent limits to the data available in the registry. Detection of post-operative MI may have been missed, for example, in the absence of routine troponin monitoring. Covert stroke may also have been missed without routine post-operative imaging and may be as high as 10% in the non-cardiac, non-carotid surgery population.[3] Importantly, it is possible that the observed incidence of post operative ischemic stroke in patients having emergent surgery less than three months post index stroke (i.e. 10%) is artificially elevated by unmasking of pre-existing neurological deficit (due to the index stroke) following anesthesia and surgery rather than by occurrence of new stroke territory *per se.*[4] Finally, the author's hypothesis that worse cardiovascular outcome in patients with a history of stroke undergoing early surgery is a consequence of alterations in cerebral autoregulation remains speculative as the study provides no direct evidence to support (or refute) this claim.

In practice, the results from this study may help guide anesthetic management in several ways. Firstly, an understanding of perioperative risk may influence decisions on optimal timing of urgent surgery. Hip fracture repair in the elderly patient with co-morbid cardiovascular disease is a prime example; in patients with a history of ischemic stroke co-incident with fracture, the current study suggests early surgical repair (within 72 h) may reduce risk. Secondly, when minimal option regarding emergent surgical timing exists, the current study may help inform evidence-based pre-operative risk discussions with patients and families. Thirdly, the results of the current study may help guide post-operative patient management. A high index of suspicion should be present for new neurological deficits post operatively in at-risk individuals with changes predicated on a comprehensive pre-operative neurological examination. Management in a high acuity setting allowing for frequent neuromonitoring should be considered. It has been recommended that patients at high risk for recurrent ischemic stroke be managed at a comprehensive stroke center or, when this is not possible, via telestroke conference.[5]

References

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