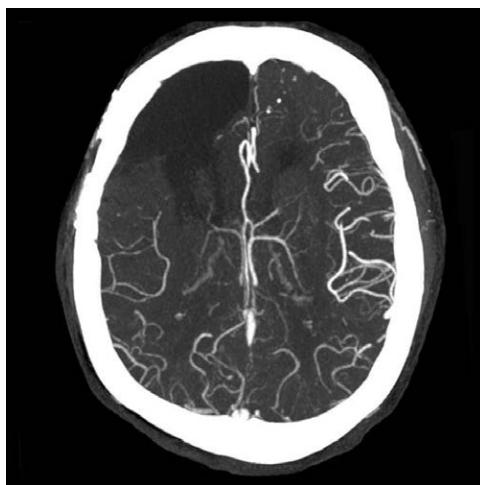


Raising the Alarm on Brain Attacks in Surgical Patients

Are We Doing Enough to Prevent and Treat Postoperative Strokes?

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THE incidence of postoperative strokes in patients undergoing noncardiac, nonneurologic surgery is between 0.1 and 0.7%.^{1,2} Previous studies reported that patients with a history of ischemic stroke are two to three times more likely to experience a postoperative stroke.^{1,2} In this issue of *ANESTHESIOLOGY*, Christiansen *et al.*³ report that a history of stroke within 3 months of emergency noncardiac, nonintracranial surgery is associated with a significantly increased risk of a recurrent postoperative stroke using data on 146,694 acute surgeries from the Danish National Patient Registry (DNRP). Specifically, 10% of patients with a history of ischemic stroke within 3 months had a postoperative stroke compared with 2 to 3% of patients with a history of stroke more than 3 months ago and 0.3% in patients with no previous stroke.³ In a previous study reported in the *Journal of the American Medical Association*, based on 481,183 elective surgeries in the DNRP, this same group reported similar time effects on the risk of postoperative stroke in patients undergoing elective noncardiac surgery: 12.0% in patients with stroke within 3 months, 4.5% in patients with stroke between 3 and 6 months, 1.0 to 2.0% if more than 6 months, and 0.1% in patients with no previous stroke.⁴ Unlike the Danish database, previous studies in the United States that reported a much lower risk of recurrent strokes were based on databases (the Nationwide Inpatient Sample and the American College of Surgeons National Surgical Quality Improvement Program database) that grouped all previous strokes together.^{1,2} These databases did not include information on how much time had elapsed between previous strokes and surgery.



“The time is right...[to update] existing clinical practice guidelines...[on the] management of patients at high risk for perioperative acute ischemic stroke.”

possible that symptoms of a recent stroke may transiently worsen in the setting of surgery without acutely infarcted tissue. Third, the impact of increased magnetic resonance imaging use in the detection of small strokes, and even silent stroke, is increasingly recognized.⁸ Fourth, the DNRP provides no information on the presumed underlying etiology of the recurrent stroke (*e.g.*, hypoperfusion, atheroembolic, proinflammatory, anesthetic effects, and cerebrovascular dysregulation). Finally, these studies are retrospective and used administrative data from one nation.

These authors^{3,4} are to be commended for highlighting an important area that has received little attention in the literature. Perhaps the most important takeaway is the need for additional research to confirm and refine these estimates using different approaches in more diverse populations. In addition, more research is needed to better understand the

The studies by Christiansen and colleagues^{3,4} have important limitations. It is well known that patients with an ischemic stroke are at the highest risk for recurrent stroke soon after the event and that this risk declines over time. The magnitude of postoperative risk found in these studies, however, was considerably greater than that found in a comparable cohort who did not undergo surgery (12.0 *vs.* 3.5%).^{5,6} Second, although the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision ischemic stroke diagnoses have been validated in the DNRP,⁷ there are no data on whether these diagnoses in the postoperative period accurately reflect recurrent or new infarcts. Preexisting stroke symptoms often worsen in the setting of systemic stress (often called an *anamnesic* response, or bringing out an old memory), and it is

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pathomechanisms of postoperative strokes, as well as the various antiischemic strategies (*e.g.*, molecular, antiinflammatory, and cell based) to minimize neuronal injury. Until then, however, we recommend the following:

First, the Society for Neuroscience in Anesthesiology and Critical Care recently published a consensus statement, supported but not endorsed by the American Society of Anesthesiologists, on the prevention and management of postoperative strokes.⁹ They suggest that surgeons consider delaying elective surgery for 1 month in patients after a stroke. According to this consensus statement, the recommendation to delay elective surgery in patients with recent strokes is supported only by “opinion-based evidence.”⁹ The data by Christiansen and colleagues^{3,4} suggest that the recommended delay for elective surgery might need to be longer, possibly up to at least 3 months after an acute stroke. In addition, in those stroke patients who are recommended for surgery, particular attention should be paid to baseline neurologic deficits so that new postoperative deficits can be identified.

Second, perioperative and surgical teams should have a heightened sense of awareness to new neurologic deficits and clear procedures to engage stroke teams.¹⁰ Although major surgery within the past 14 days is a relative contraindication to fibrinolytic therapy,¹¹ existing guidelines state that the use of fibrinolytic therapy may be considered in the absence of intracranial or intraspinal surgery (class IIb recommendation).^{9,11} However, many surgeons and anesthesiologists are likely to be hesitant to use fibrinolytic therapy in the immediate postoperative period due to the risk of major bleeding at the operative site. For many surgical patients, endovascular thrombectomy may be the only practical approach to restoring perfusion after a stroke caused by proximal artery occlusion. Existing guidelines specify that endovascular therapy is reasonable and can be useful in patients with contraindications to fibrinolytic therapy (class IIa recommendations).¹² Endovascular therapies with mechanical thrombectomy have been described as the second quantum leap in stroke care.^{12,13} Not only is endovascular thrombectomy less likely to lead to bleeding complications in surgical patients, it is more likely to lead to better neurologic outcomes. At 90 days, patients with acute ischemic strokes undergoing endovascular therapy are more than 50% more likely to have reduced disability compared with standard lytic therapy.¹⁴ Endovascular thrombectomy may represent a new frontier in the therapy of acute postoperative strokes.

Third, we believe that the care of high-risk patients whose elective surgery cannot be delayed (*e.g.*, cancer surgery) should be regionalized to comprehensive stroke centers with advanced neuroimaging capabilities and neuroendovascular specialists, resources that are not available in most hospitals and primary stroke centers.¹⁵ In 2017 there are 121 comprehensive stroke centers in the United States.¹⁶ For the many patients where this may not be practical (*e.g.*, location is remote from a comprehensive stroke center), however, a

clear plan should be in place to manage such patients *via* a telestroke consultation.¹⁷

Fourth, the American Stroke Association has published clinical practice guidelines on the prevention and early management of patients with acute ischemic strokes.^{11,12,18} These clinical practice guidelines do not discuss the management of patients with a recent stroke undergoing surgery or the approach to patients if a new stroke occurs after surgery. In particular, they do not address delaying elective surgery after a recent stroke. The only currently available guideline addressing this issue is from the Society for Neuroscience in Anesthesiology and Critical Care.¹² These guidelines, however, have not been widely disseminated; they have been cited only 20 times since publication in 2014, compared with 868 citations for the American Stroke Association guidelines, also published in 2014. The timing is right to convene a group of neurologists, anesthesiologists, and surgeons to review the literature and write a focused update of existing clinical practice guidelines focusing on the perioperative management of patients at high risk for perioperative acute ischemic stroke.

Many patients fear disabling strokes more than death.¹⁹ We need to do much more than we are doing to better understand, prevent, and treat strokes in high-risk surgical patients.

Competing Interests

The authors are not supported by, nor maintain any financial interest in, any commercial activity that may be associated with the topic of this article.

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