

# For patients who underwent elective non-cardiac surgery, a history of stroke is associated with an increased risk of major adverse cardiovascular events and death, particularly if time elapsed between stroke and surgery is less than 9 months

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**Commentary on:** Jørgensen ME, Torp-Pedersen C, Gislason GH, *et al.* Time elapsed after ischemic stroke and risk of adverse cardiovascular events and mortality following elective noncardiac surgery. *JAMA* 2014;312:269–77.

## Context

Non-cardiac surgeries (NCS) performed in patients with a recent myocardial infarction or coronary stent implantation have been associated with increased risk of perioperative cardiac events and bleeding compared with patients with more distant myocardial infarction or stent placement.<sup>1 2</sup> Whether a similar time-dependent relationship exists for stroke is not known, and recommendations on timing of surgery in patients with prior stroke in current perioperative guidelines are sparse. Jørgensen and colleagues investigated the association between prior stroke (including time elapsed between stroke and surgery) and the risk of major adverse cardiovascular events (MACE) and all-cause death up to 30 days after non-cardiac elective surgery in a group of Danish patients.

## Methods

The study included all patients ages 20 years or older undergoing NCS between 2005 and 2011, among whom 7137 had a history of stroke and 474 046 did not. Using government databases, the authors compared outcomes between those who had ischaemic stroke 5 years or less before surgery and those who did not. Haemorrhagic stroke and transient ischaemic attack were not included. The primary outcomes were MACE (ischaemic stroke, myocardial infarction or cardiovascular death) and all-cause mortality at 30 days. The investigators divided the patients into five subgroups, those with: (1) no prior stroke; (2) a stroke less than 3 months before surgery; (3) a stroke more than 3 but less than 6 months before surgery; (4) a stroke more than 6 but less than 12 months before surgery; (5) a stroke 12 months or more before surgery. Surgeries were stratified into low risk (eg, corneal replacement), intermediate risk (eg, a hysterectomy), and high risk (eg, a procedure involving major abdominal vessels).

## Findings

Crude incidence rates of MACE among patients with (n=7137) and without (n=474 046) prior stroke were 54.4 versus 4.1 respectively, per 1000 patients. Prior ischaemic stroke, irrespective of time between ischaemic stroke and surgery, was associated with an adjusted 1.75-fold and 4.03-fold increased relative risk of 30-day mortality and 30-day MACE, respectively, compared with patients without prior stroke. A strong time-dependent relationship was found between prior stroke and adverse post-operative outcome, with patients experiencing a stroke less than 3 months prior to surgery at particularly high risk (adjusted OR 14.23 for MACE). After 9 months, the associated risk appeared stable yet high compared with patients with no stroke (OR 3.04).

Low-risk and intermediate-risk surgeries seemed to pose at least the same relative risk of MACE in patients with a recent stroke compared with high-risk surgery.

When the researchers performed cubic regression splines among patients with prior stroke, they found that the OR levelled off around 9 months for MACE, all-cause mortality and ischaemic stroke (p<0.001 for nonlinearity for all). A stepwise decline in risk was associated with prior stroke for longer times between the stroke event and surgery. For example, for patients with a stroke less than 3 months before surgery, the OR of 30 day MACE was 14.23 (95% CI 11.61 to 17.45) whereas the OR for stroke 12 months or more before surgery was 2.47 (95% CI 2.07 to 2.95) compared with those without prior stroke. The analysis using time elapsed between stroke and surgery showed that there is a very steep decrease in risks before 9 months, but after 9 months there are no statistically significant increased risks. However, if the time increased to 12 months or 2 years, or even 5 years, there was no further decrease in risks.

## Commentary

This study suggests that, similar to patients who suffer acute myocardial infarctions, patients with acute ischaemic stroke are at excess risk for complications immediately following NCS. Risk drops significantly at 6 months and stabilises (although at a level still higher than baseline) at 9 months. However, due to the observational design of the study, it is impossible to know if surgeries were postponed because of a history of stroke or whether the surgeries were performed at any given time regardless of a history of stroke. Another drawback of the study was that only elective surgeries were included and the study patients were mostly Caucasian. Generalising the findings of the current study to other populations may not be possible. A clinical trial, where some patients are randomised to postponement of surgery and others are not, might be warranted to see if it makes a difference in recurrent stroke risk and adverse outcomes. Although further confirmation of the observational findings are needed, we probably should wait at least 9 months before scheduling patients with stroke for elective NCS.

**Competing interests** None.

**Provenance and peer review** Commissioned; internally peer reviewed.



## References

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