ANBAZHAGAN PRABHAKARAN, MD, MRCP (Edin), FACP
Department of Hospital Medicine; Cleveland Clinic; Clinical Assistant Professor, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University; Cleveland, OH

CHRISTOPHER WHINNEY, MD, SFHM, FACP
Chairman, Department of Hospital Medicine; Cleveland Clinic; Clinical Assistant Professor, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University; Cleveland, OH

ONE MINUTE CONSULT

BRIEF ANSWERS TO SPECIFIC CLINICAL QUESTIONS

Q: Should we stop aspirin before noncardiac surgery?

A: In patients with cardiac stents, do not stop aspirin. If the risk of bleeding outweighs the benefit (eg, with intracranial procedures), an informed discussion involving the surgeon, cardiologist, and patient is critical to ascertain risks vs benefits.

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In patients using aspirin for secondary prevention, the decision depends on the patient's cardiac status and an assessment of risk vs benefit. Aspirin has no role in patients undergoing noncardiac surgery who are at low risk of a major adverse cardiac event.[1,2]

Aspirin used for secondary prevention reduces rates of death from vascular causes,[3] but data on the magnitude of benefit in the perioperative setting are still evolving. In patients with coronary stents, continuing aspirin is beneficial,[4,5] whereas stopping it is associated with an increased risk of acute stent thrombosis, which causes significant morbidity and mortality.[6]

Stop aspirin before surgery in patients without coronary heart disease

SURGERY AND THROMBOTIC RISK: WHY CONSIDER ASPIRIN?

The Vascular Events in Noncardiac Surgery Patients Cohort Evaluation (VISION) study[7] prospectively screened 15,133 patients for myocardial injury with troponin T levels daily for the first 3 consecutive postoperative days; 1,263 (8%) of the patients had a troponin elevation of 0.03 ng/mL or higher. The 30-day mortality rate in this group was 9.8%, compared with 1.1% in patients with a troponin T level of less than 0.03 ng/mL (odds ratio 10.07; 95% confidence interval [CI] 7.84–12.94; $P < .001$).[8] The higher the peak troponin T concentration, the higher the risk of death within 30 days:

- 0.01 ng/mL or less, risk 1.0%
- 0.02 ng/mL, risk 4.0%
- 0.03 to 0.29 ng/mL, risk 9.3%
- 0.30 ng/mL or greater, risk 16.9%.[7]

Myocardial injury is a common postoperative vascular complication.[7] Myocardial infarction (MI) or injury perioperatively increases the risk of death: 1 in 10 patients dies within 30 days after surgery.[8]

Surgery creates substantial physiologic stress through factors such as fasting, anesthesia, intubation, surgical trauma, extubation, and pain. It promotes coagulation[9] and inflammation with activation of platelets,[10] potentially leading to thrombosis.[11] Coronary thrombosis secondary to plaque rupture[11,12] can result in perioperative MI. Perioperative hemodynamic variability, anemia, and hypoxia can lead to demand-supply mismatch and also cause cardiac ischemia.

Aspirin is an antiplatelet agent that irreversibly inhibits platelet aggregation by blocking the formation of cyclooxygenase. It has been used for several decades as an antithrombotic agent in primary and secondary prevention. However, its benefit in primary prevention is uncertain, and the magnitude of antithrombotic benefit must be balanced against the risk of bleeding.

The Antithrombotic Trialists' Collaboration[13] performed a systematic review of 6 primary prevention trials involving 95,000 patients and found that aspirin therapy was associated with a 12% reduction in serious vascular events, which occurred in 0.51% of patients taking aspirin per year vs 0.57% of controls ($P = .0001$). However, aspirin also increased the risk of major bleeding, at a rate of 0.10% vs

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0.07% per year ($P < .0001$), with 2 bleeding events for every avoided vascular event.[13]

WILL ASPIRIN PROTECT PATIENTS AT CARDIAC RISK?

The second Perioperative Ischemic Evaluation trial (POISE 2),[1] in patients with atherosclerotic disease or at risk for it, found that giving aspirin in the perioperative period did not reduce the rate of death or nonfatal MI, but increased the risk of a major bleeding event.

The trial included 10,010 patients undergoing noncardiac surgery who were randomly assigned to receive aspirin or placebo. The aspirin arm included 2 groups: patients who were not on aspirin (initiation arm), and patients on aspirin at the time of randomization (continuation arm).

Death or nonfatal MI (the primary outcome) occurred in 7.0% of patients on aspirin vs 7.1% of patients receiving placebo (hazard ratio [HR] 0.99, 95% CI 0.86–1.15, $P = .92$). The risk of major bleeding was 4.6% in the aspirin group vs 3.8% in the placebo group (HR 1.23, 95% CI 1.01–1.49, $P = .04$).[1]

George et al,[14] in a prospective observational study in a single tertiary care center, found that fewer patients with myocardial injury in noncardiac surgery died if they took aspirin or clopidogrel postoperatively. Conversely, lack of antithrombotic therapy was an independent predictor of death ($P < .001$). The mortality rate in patients with myocardial injury who were on antithrombotic therapy postoperatively was 6.7%, compared with 12.1% in those without postoperative antithrombotic therapy (estimated number needed to treat, 19).[14]

PATIENTS WITH CORONARY STENTS UNDERGOING NONCARDIAC SURGERY

Percutaneous coronary intervention (PCI) accounts for 3.6% of all operating-room procedures in the United States,[15] and 20% to 35% of patients who undergo PCI undergo noncardiac surgery within 2 years of stent implantation.[16,17]

Antiplatelet therapy is discontinued in about 20% of patients with previous PCI who undergo noncardiac surgery.[18]

Observational data have shown that stopping antiplatelet therapy in patients with previous PCI with stent placement who undergo noncardiac surgery is the single most important predictor of stent thrombosis and death.[19–21] The risk increases if the interval between stent implantation and surgery is shorter, especially within 180 days.[16,17] Patients who have stent thrombosis are at significantly higher risk of death.

Graham et al[4] conducted a subgroup analysis of the POISE 2 trial comparing aspirin and placebo in 470 patients who had undergone PCI (427 had stent placement, and the rest had angioplasty or an unspecified type of PCI); 234 patients received aspirin and 236 placebo. The median time from stent implantation to surgery was 5.3 years.

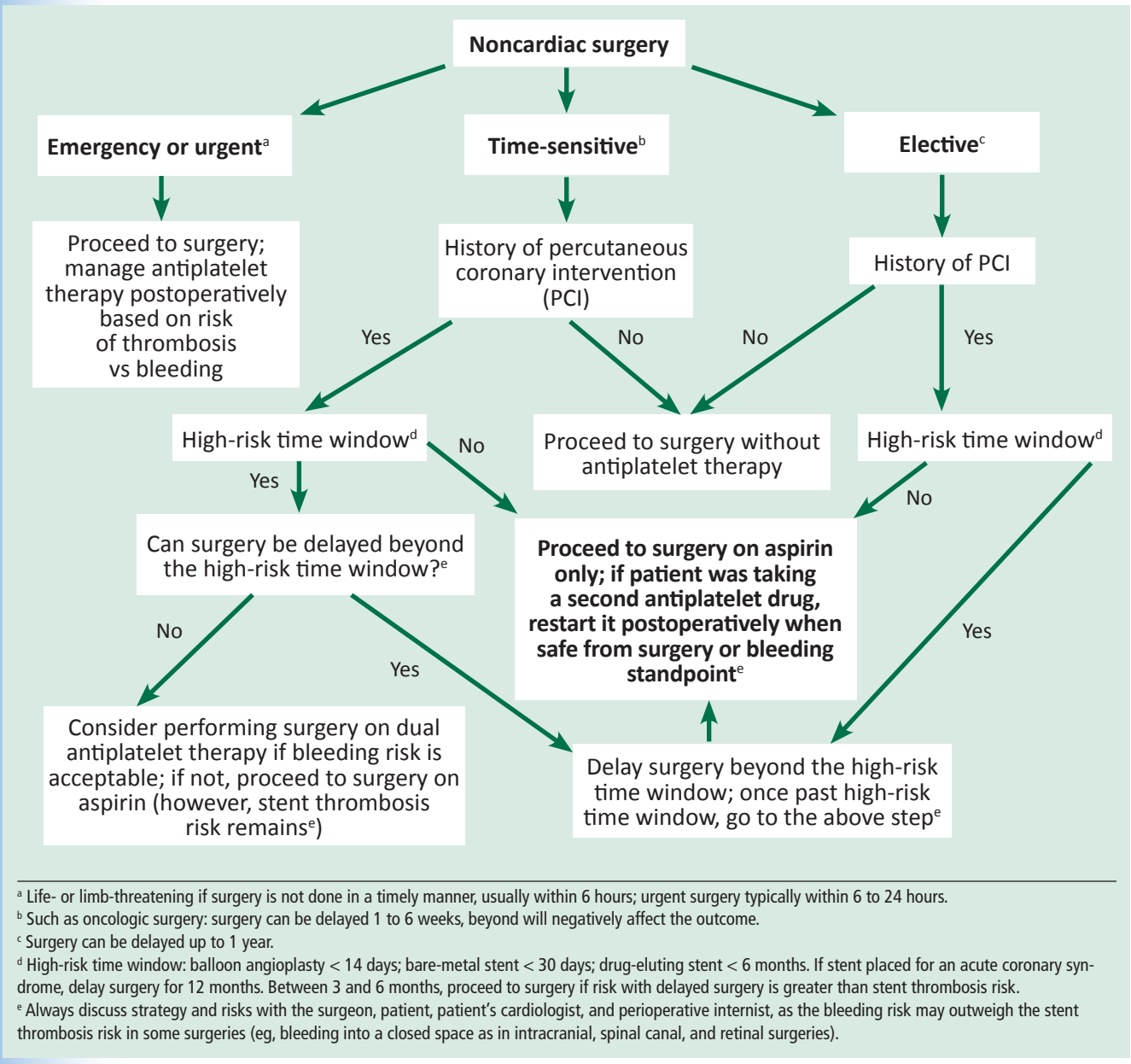
Of the patients in the aspirin arm, 14 (6%) had the primary outcome of death or nonfatal MI compared with 27 patients (11.5%) in the placebo arm (absolute risk reduction 5.5%, 95% CI 0.4%–10.5%). The result, which differed from that in the primary trial,[1] was due to reduction in MI in the PCI subgroup on aspirin. PCI patients who were on aspirin did not have increased bleeding risk. This subgroup analysis, albeit small and limited, suggests that continuing low-dose aspirin in patients with previous PCI, irrespective of the type of stent or the time from stent implantations, minimizes the risk of perioperative MI.

Consider aspirin in patients at high risk if benefits outweigh risk

GUIDELINES AND RECOMMENDATIONS

Routine perioperative use of aspirin increases the risk of bleeding without a reduction in ischemic events.[1] Patients with prior PCI are at increased risk of acute stent thrombosis when antiplatelet medications are discontinued.[20,21] Available data, although limited, support continuing low-dose aspirin without interruption in the perioperative period in PCI patients,[4] as do the guidelines from the American College of Cardiology.[5]

We propose a management algorithm for patients undergoing noncardiac surgery on antiplatelet therapy that takes into consideration whether the surgery is urgent, elective, or time-sensitive (**Figure 1**). It is imperative to involve



[a] Life- or limb-threatening if surgery is not done in a timely manner, usually within 6 hours; urgent surgery typically within 6 to 24 hours.
[b] Such as oncologic surgery: surgery can be delayed 1 to 6 weeks, beyond will negatively affect the outcome.
[c] Surgery can be delayed up to 1 year.
[d] High-risk time window: balloon angioplasty < 14 days; bare-metal stent < 30 days; drug-eluting stent < 6 months. If stent placed for an acute coronary syndrome, delay surgery for 12 months. Between 3 and 6 months, proceed to surgery if risk with delayed surgery is greater than stent thrombosis risk.
[e] Always discuss strategy and risks with the surgeon, patient, patient's cardiologist, and perioperative internist, as the bleeding risk may outweigh the stent thrombosis risk in some surgeries (eg, bleeding into a closed space as in intracranial, spinal canal, and retinal surgeries).

Figure 1. Proposed perioperative management of aspirin and antiplatelet therapy in patients undergoing noncardiac surgery.

the cardiologist, surgeon, anesthesiologist, and the patient in the decision-making process.

In the perioperative setting for patients undergoing noncardiac surgery:

- Discontinue aspirin in patients without coronary heart disease, as bleeding risk outweighs benefit.
- Consider aspirin in patients at high risk for a major adverse cardiac event if benefits outweigh risk.
- Continue low-dose aspirin without interruption in patients with a coronary stent, irrespective of the type of stent.
- If a patient has had PCI with stent placement but is not currently on aspirin, talk with the patient and the treating cardiologist to find out why, and initiate aspirin if no contraindications exist. ■

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***ADDRESS**: Anbazhagan Prabhakaran, MD, MRCP (Edin), FACP, Department of Hospital Medicine, M2 Annex, Cleveland Clinic, 9500 Euclid Avenue, Cleveland OH 44195; prabhak@ccf.org*