What do we know about perioperative ischaemic cardiac events in patients undergoing non-cardiac surgery?

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A recent review shows how much more we need to find out about this important problem

Perioperative ischaemic cardiac events include myocardial infarction, cardiac arrest and cardiac death, and are estimated to occur in 2%–5% of patients over 40 years of age.[1] Mortality rates associated with perioperative myocardial infarction and cardiac arrest may be as high as 25% and 65%, respectively.[2,3] In the Australian context, precise data on the numbers of patients at risk are not available, but with more than 440 000 general anaesthetics performed annually, this is likely to be an issue facing many physicians. A recent narrative review of the problem is therefore of timely importance.[1,4]

What is the risk of perioperative myocardial infarction? As the review points out, perioperative myocardial infarction may be difficult to diagnose, and often unrecognised. Three studies were identified totalling 1309 patients, with myocardial infarction diagnosed by creatine kinase MB elevations with new Q waves, with or without autopsy or positive pyrophosphate scan evidence. Myocardial infarction was identified in 30 patients (2.3%); notably, more than half of these did not have symptoms or signs. Creatine kinase MB assays may result in false negative and positive results, and troponin assays — the biomarker currently used in the European Society of Cardiology and American Heart Association guidelines for diagnosis of myocardial infarction — are now preferred. However, in the perioperative setting, troponin elevation may also arise from non-cardiac causes such as pulmonary embolism and renal failure, and limitations exist in the specificity of individual assays.[5]

Further, the pathophysiology of perioperative ischaemic events may differ from the non-perioperative acute coronary syndromes, and these differences may affect risk prediction and treatment. Non-perioperative acute coronary ischaemia results from rupture of an often mild, non-obstructive atherosclerotic plaque and superimposed coronary thrombosis.[6,7] Although such plaque rupture and thrombosis is also thought to occur perioperatively, there are other important influences. The perioperative state is associated with activation and release of multiple inflammatory mediators and cytokines, sympathetic nervous system activation and catecholamine release, hypercoagulability, and hypoxia. These contribute to both plaque rupture and thrombosis. Additionally, the perioperative stress state may contribute to increased myocardial oxygen demand, in the setting of reduced oxygen supply from blood loss, hypoxia, and other factors. This adverse environment may be present up to 3 days into the postoperative period.[8]

How can we assess this risk? Given this propensity for perioperative ischaemic events, individual preoperative risk assessment has been keenly pursued by surgeons and anaesthetists, often resulting in referral to a cardiologist. Two methods are commonly used: clinical assessment, and noninvasive testing. A number of clinical assessment tools have been advised, a commonly used one being the Lee index.[9] This defines a number of features of patient history, physical examination, baseline investigations, and proposed surgical procedure. Based on the presence of one to five of these clinical characteristics, patients' risk can be stratified from 0.4% to 5.4% likelihood of a major perioperative event.[9]

Noninvasive exercise or pharmacological stress testing, usually with echocardiographic or nuclear imaging, is generally reserved for those at higher risk. In Australia, dobutamine stress echocardiography is a commonly used technique, achieving sensitivity and specificity of 85% and 70%, respectively, for a positive test predicting perioperative events in a meta-analysis,[10] with similar results for nuclear imaging techniques.[10] However, the relatively modest sensitivity and specificity of these tests mean a number of high-risk patients will be missed, and many with high risk will not have an event. The advice to patients about their risk must also be tempered by whether the planned surgery is elective or should go ahead regardless of the risk.

How can we manage this risk? Coronary angiography is often advised for patients assessed to be at higher risk, but there is uncertainty in how to respond to the finding of significant coronary artery disease. Revascularisation — either percutaneous or surgical — has been suggested for patients with high grade coronary stenosis, particularly for widespread disease.[11] However, supportive data are scarce; several retrospective studies suggest benefit, but a large recent randomised trial in selected stable patients undergoing vascular surgery showed no improvement in outcomes, and possibly an increased risk of events.[11,12]

At a practical level, if revascularisation is performed, observational data support delaying non-cardiac operations for at least a month following revascularisation surgery.[13] Following coronary stenting, a window of 6 weeks after bare metal stenting is suggested, to allow endothelialisation of the stent struts and reducing stent thrombosis,[14] but also reducing the possibility of in-stent restenosis, occurring maximally at 3–6 months.[15]

There are as yet no comparative data following drug-eluting stents, although these appear less attractive, given that stent-strut endothelialisation takes longer, and combined antiplatelet therapy with aspirin and clopidogrel is likely to be needed for longer, further increasing perioperative bleeding risk if these agents are continued, and increasing the risk of acute stent thrombosis if they are stopped early to allow surgery.[16]

Similar uncertainty surrounds pharmacological methods of perioperative risk reduction. β-Blockers, by reducing myocardial oxygen demand and blocking sympathetic and catecholamine responses, would seem a logical option. Their use is widely promoted, and included in the joint American College of Cardiology and American Heart Association guidelines for perioperative management.[17] However, these recommendations are based largely on two randomised controlled trials: one, a small unblinded study,[18] the second, a larger study, which showed no survival benefit for β-blockade assessed on an intention to treat basis.[19,20] Further trials are currently underway.[20] Use of aspirin or

Perioperative coronary events: risk management strategies for those at increased risk

- Consider not performing surgery if elective
- Smoking cessation: can be advised for all patients
- β-Blockade: some evidence, but disputed
- Aspirin, nitrates, statins: little evidence
- Revascularisation: little evidence of benefit, some evidence of harm; a particular problem with drug-eluting stents ◆

statins also seems appropriate, given their previous efficacy in prevention of non-perioperative events,[21] but aspirin may increase the perioperative bleeding risk,[22] and statins have not yet shown robust benefit, although this is likely an area for future investigation.

How then, should the physician put together what is at times confusing information? Firstly, perioperative ischaemia is relatively common and often unrecognised. Clinical assessment and non-invasive imaging are useful, but far from perfect, in risk stratification. Stopping smoking before surgery is a useful intervention to reduce risk.[23] Revascularisation, while often used for patients with angiographically important disease, has little evidence to support it, delays subsequent surgery, and has a number of associated problems. Lastly, while statins, aspirin and β-blockers may appear intuitive and are commonly used, there is likewise little evidence to support these approaches.

The review by Devereaux et al[1,4] is a timely reminder of how little is known about such an important problem, a call to obtain better data, and a suggestion to discuss the rationale for surgery and its possible attendant risks carefully with patients.

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