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Is simple clinical assessment adequate for cardiac risk stratification before elective non-cardiac surgery?

With surgical outcomes being the subject of increasing medical and non-medical scrutiny, there is pressure to identify patients at high risk of perioperative cardiac events, most importantly fatal and non-fatal myocardial infarction. Thomas Lee and colleagues[1] have shown that a simple clinical assessment is the only risk-stratifying measure required for most patients being considered for major non-cardiac surgery. Their revised Cardiac Risk Index, based on the type of surgery and risk factors related to the individual (panel) is derived from multiple-regression analysis of a large cohort of patients (2893 in the derivation set, 1422 in the validation set) and represents a helpful simplification and improvement of their original scoring system developed in the 1970s. Patients with fewer than two risk factors, who made up 75% of the population, had a risk of a major cardiac event of less than 1%. Patients with two or more factors had a 6% risk. Lee and colleagues' approach contrasts with the prevailing trend in many centres, where clinicians rely on an objective non-invasive risk-stratifying investigation, with significant resource implications, rather than trust their clinical judgment, aided by routine investigations.

Patients undergoing minor surgery do not require elaborate cardiac investigation preoperatively, since the identification of obstructive coronary disease will not alter how they are managed. An analysis of the CASS (Coronary Artery Surgery Study) Registry showed that patients who underwent operations with a less than 4% rate of perioperative death or non-fatal myocardial infarction (eg, urological, orthopaedic, breast) were at the same low risk (about 2%) whether or not they had coronary disease, and whether or not they had undergone surgical revascularisation.[2] Patients undergoing more major surgery (eg, abdominal or thoracic) but who are at intrinsically low clinical risk (revised index less than 2) will also not benefit from further investigation, since no non-invasive test will have a positive predictive accuracy sufficient to stratify further a group already known to be at less than 1% risk.

Revised Cardiac Risk Index

Risk factor	Criteria
High-risk surgery	AAA repair, thoracic, abdominal
Ischaemic heart disease	MI, Q, angina, nitrates, EST+
Congestive heart failure	History, examination, CXR
Cerebrovascular disease	Stroke, TIA
Insulin-treated diabetes	
Creatinine >177 μmol/L	

Number of factors	Proportion of population	Major cardiac complications*
0	36%	0·4%
1	39%	1·1%
2	18%	4·6%
⩾3	7%	9·7%

*Myocardial infarction, pulmonary oedema, ventricular fibrillation or primary cardiac arrest, complete heart block.
Abbreviations: AAA=abdominal aortic aneurysm; MI=history of myocardial infarction; Q=Q-waves; EST+=history of positive exercise electrocardiogram; CXR=chest radiograph; TIA=transient ischaemic attack.

Patients with angina need specialist cardiac assessments with non-invasive tests and, when indicated, coronary angiography, whether or not non-cardiac surgery is planned. According to the revised index, the risk of a perioperative cardiac event for patients with angina undergoing major surgery (abdominal or thoracic) is greater than 5%. However, the CASS data suggest that, after successful coronary bypass surgery, the risk of a cardiac event after subsequent non-cardiac surgery for patients with multivessel coronary disease falls from 6% to 2·5%.[2] Thus, if elective non-cardiac surgery is planned for patients with angina, the investigations and any treatment should be completed before the date of the operation.

The most difficult group of patients to assess and manage are those without symptoms of coronary disease who are nevertheless at high risk (5% or more) of a perioperative cardiac event on clinical grounds (revised index 2 or more). Many patients being considered for non-cardiac vascular surgery are in this category, since 40% of those without any cardiac symptoms have obstructive coronary disease on angiography, which leads to a perioperative cardiac event rate for all vascular operations of about 8%.[3,4] It is these symptom-free but high-risk patients for whom further risk stratification with non-invasive stress-based imaging investigations is most useful. Both dipyridamole thallium perfusion scintigraphy and dobutamine stress echocardiography are widely used and well validated in the preoperative setting.[4,5] The choice of test depends primarily on local expertise, and the overall strategy of which it forms a part is of far greater importance than the exact investigation chosen.

Symptom-free but high-risk patients, whether identified on clinical grounds alone or following non-invasive testing, are conventionally assessed with coronary angiography for revascularisation. This strategy provides reassurance for the clinician, although there is little hard evidence to support it. Coronary bypass surgery in symptom-free patients has never been shown to reduce the risk of subsequent non-cardiac surgery, whatever the pattern of coronary disease. Percutaneous intervention is unlikely to improve prognosis because it cannot protect against plaque rupture over most of the length of the coronary artery. Current approaches cannot identify specific

individuals who will definitely experience a perioperative cardiac event, and revascularisation inevitably means treatment of many patients in an attempt to prevent a few adverse outcomes. In any event, the modest survival benefit is unlikely to exceed the additional risk of a bypass operation that would not ordinarily have been done. These risk/benefit considerations apply particularly to patients with peripheral vascular disease, in whom coronary bypass surgery carries an especially high risk.

The cause of perioperative myocardial infarction probably differs from that of spontaneous myocardial infarction, with important management implications. Although infarction might be expected to occur during the stress of the operation itself, it is commonest on the second and third postoperative days, and is strongly predicted by episodes of ischaemia on postoperative Holter monitoring.[6] The peak burden of electrocardiographic ischaemia on postoperative days 2 and 3 is itself preceded by a peak in the amount of tachycardia on days 1 and 2.[7] A hypothesis proposed is that the stress response to surgery (eg, high circulating concentrations of catecholamines, prothrombotic tendency) results in increased myocardial oxygen demand and increased shear stresses on atherosclerotic plaques, leading to secondary plaque rupture.

The emphasis in the perioperative management of patients at high cardiac risk should therefore be directed away from mechanical revascularisation towards improved control of myocardial oxygen demand and protection of vulnerable atherosclerotic plaques. Aggressive modification of coronary risk factors with anti-smoking advice, cholesterol lowering, and control of hypertension are essential.[8] Perioperative haemodynamic monitoring, meticulous pain control, and the careful use of β-blockers are also crucial. Mangano and colleagues[9] showed that atenolol given intravenously at induction of anaesthesia and continued during the hospital stay reduced overall mortality by 55% over the subsequent 2 years. This result was due mainly to improved survival over the first 8 months, possibly as a result of a reduction in shear stresses on vulnerable atherosclerotic plaques postoperatively.[9]

Despite advances in perioperative management, there continues to be pressure for patients at high cardiac risk to be identified preoperatively. The data obtained by Lee and colleagues emphasise that for most patients cardiac risk-stratification before elective non-cardiac surgery requires only a knowledge of the risk associated with the procedure and a simple clinical assessment. Resources should be directed away from the unnecessary investigation of low-risk individuals, towards improved perioperative management for those at high risk.

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Albumin infusion for spontaneous bacterial peritonitis

Spontaneous bacterial peritonitis is a common complication of ascites and cause of death of patients with cirrhosis.[1] The survival of a patient with spontaneous bacterial peritonitis depends on an aggressive approach to diagnosis and treatment[2] (see figure). This strategy has been shown to reduce infection-related mortality to 5% or less.[3] However, about 40% of patients do not survive the admission to hospital during which the infection is detected,[3] and renal failure and gastrointestinal bleeding are the commonest causes of death.[4] This infection may lead to a deterioration in renal function by increasing the peripheral vasodilatation and renal vasoconstriction that are present in patients with advanced cirrhosis.[4]

A recent randomised controlled trial[5] lends support to an association between circulatory dysfunction and bacterial peritonitis in patients with cirrhosis. The study showed that renal impairment can be prevented by intravenous albumin infusion—1·5 g per kg bodyweight within 6 h of detecting the infection and 1 g per kg on day three.[5] The infusion of albumin was associated with a stable plasma renin concentration. Patients who did not receive albumin experienced a significant increase in plasma renin concentrations. In-hospital mortality was 29% in the antibiotic-only group compared with 10% in the antibiotic-plus-albumin group. The latter rate is the lowest reported for patients with spontaneous bacterial peritonitis and the difference in survival rates was still statistically significant at 3 months. The study was not blinded or placebo controlled, but otherwise seems to have been very well done and provides some of the much needed evidence for making "evidence-based" decisions for these patients.

The use of intravenous infusions of albumin in clinical practice is controversial. The Cochrane meta-analysis,[6] which reviewed the use of albumin in many disorders, concluded that albumin may increase mortality. This conclusion led to a very heated debate in the medical and lay press. However, rather than drawing one conclusion about the value and safety of albumin from 30 distinctly different randomised studies, a more useful approach may be to focus on each specific setting in which albumin is used. The randomised trial of albumin infusion carried out by Pau Sort and colleagues[5] to prevent renal failure and death in patients with spontaneous bacterial peritonitis is very encouraging. The recommended initial dose of albumin is more than 100 g for an average man, and 50–100 g for the day 3 infusion. Although this regimen is very expensive, it would be justified if further trials confirm the impressive survival advantage. As the