Perioperative myocardial infarction in peripheral vascular surgery

Various components of care will influence myocardial function

EDITOR,—N Mamode and colleagues report the number of cases of myocardial infarction after vascular surgery in their unit but do not seem to have looked critically at the components of care that influence myocardial function in this context.¹ Most patients with arterial disease will have coronary artery disease and a degree of left ventricular dysfunction due to ischaemia and the frequently associated hypertension. The issue is not whether these problems exist and their consequences but the potential for optimising the cardiovascular system and preventing adverse sequelae. Even after preoperative optimisation there are many factors that can compromise both the delivery of oxygen to the myocardium and the myocardium's demand for oxygen perioperatively, causing worsening left ventricular function without infarct or arrhythmia without infarct.

Critical events in this regard include induction of anaesthesia, intubation, surgical stimuli, hypovolaemia, and reversal of neuromuscular blockade. Postoperative hypothermia, pain, hypoxia, hypovolaemia, and anaemia all contribute to subendocardial ischaemia, which manifests as left ventricular dysfunction or arrhythmias; these arrhythmias are in turn aggravated by disturbances of electrolyte concentrations. A considerable number of these components are heavily influenced by the choice of regional versus general anaesthesia and the use of regional anaesthesia as part of a general technique. These components are capable of being minimised, but since their impact is not easily quantifiable they could easily be dismissed as hypothetical. Boyd *et al*, however, have shown the positive impact of aggressive optimisation of the cardiovascular system and oxygen delivery in high risk surgical patients, with demonstrable improvement in morbidity and mortality.²

Until these components of care are looked at critically, optimised routinely, and audited, Mamode and colleagues' study will remain purely an observation. It is thus difficult to accept the authors' proposal that preoperative stratification in its own right will minimise the risks of vascular surgery.

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- 2 Boyd O, Grounds RN, Benner ED. A randomised clinical trial of the effect of deliberate peri-operative increase of oxygen delivery on mortality in high risk surgical patients. *JAMA* 1993;270:2699-707.

Stratifying patients by perioperative risk is equivalent to screening

EDITOR,—N Mamode and colleagues are correct when they state that studies of the risk of perioperative myocardial infarction are needed.¹

Their study goes some way to meeting this need. The way in which they present their data, however, makes it difficult to draw useful conclusions. The results of tests of association (χ^2 and Fisher's exact tests) are shown, but no indication is given of the relative risk associated with each risk factor, and no adjustment is made for the effect of other risk factors. It is not unreasonable to expect that age and perhaps sex (unspecified in Mamode and colleagues' report) may have confounded the associations detected. The type and urgency of surgery should also be taken into account in any analysis. Aortic surgery, which entails cross clamping of the aorta, is a considerably greater cardiovascular insult than peripheral vascular surgery. The risks of emergency surgery have consistently been shown to be greater than those of elective surgery.²

The authors recommend further studies to ascertain the best methods of stratifying patients by perioperative risk. Such stratification may be regarded as a form of screening. Effective screening tests are most easily derived from risk factors that have a large effect. Logistic regression analysis and the presentation of adjusted odds ratios would be of considerable value.

For a screening test to be of value, treatment should be available for the condition detected by the test. There is probably general agreement about situations in which the risks of surgery are very great. I believe that most authorities would be reluctant to undertake elective aortic surgery on an elderly patient with severe intractable heart failure. A risk index would be of most value in patients for whom the risks of surgery are more difficult to judge—for example, in a middle aged man with controlled angina and moderate left ventricular impairment undergoing revascularisation of the leg. The definitive management of such patients is not clearly established. Some studies have shown benefit from the use of epidural anaesthesia, but this is not a consistent finding across all studies.^{3,4} If we are to offer our patients more than just an estimate of how likely they are to come to harm then systematic research is needed into the best management of high risk patients undergoing major surgery.

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Presence of renal artery stenosis may indicate risk

EDITOR,—N Mamode and colleagues' finding of an increased incidence of perioperative myocardial infarction in patients undergoing peripheral vascular surgery is important.¹ The authors fail

to point out, however, that these patients, in addition to having coronary artery disease, also have generalised vascular disease, which often affects the renal^{2,3} and carotid arteries. This may have important implications in patients undergoing surgery for peripheral vascular disease.

Forty two consecutive patients referred to our institution for investigation of severe ischaemia of the leg underwent renal angiography at the same time as peripheral angiography. Nineteen of the 42 had renal artery stenosis (mean (SD) serum creatinine concentration 112 (40) $\mu\text{mol/l}$; mean age 74 (10)). In the 23 patients with no evidence of renal artery stenosis the mean serum creatinine concentration was 97 (23) $\mu\text{mol/l}$ and the mean age 69 (10)). All patients had elective salvage vascular surgery for severe pain or gangrene. Of those with renal artery stenosis, six died postoperatively (three had bilateral, two had severe, and one had moderate renal artery disease; four died of myocardial infarction and two of a combination of heart failure and renal failure). No postoperative deaths occurred among those with no evidence of renal artery stenosis (Fisher's exact test, $P = 0.005$).²

These findings in patients referred with symptoms of critical ischaemia of the leg suggest that the presence of renal artery stenosis, which can be assessed at the same time as angiography is done, may indicate risk before vascular surgery. We suggest, therefore, that such patients should always be regarded as having generalised vascular disease and need to be assessed not only for coronary artery disease but also for renal artery stenosis and carotid artery disease before surgical revascularisation of the leg.

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Authors' reply

EDITOR,—Our study was aimed primarily at ascertaining the incidence of perioperative myocardial infarction rather than at determining how it might be predicted. We concluded that the incidence is fairly high and that larger studies are needed to define which are the most useful predictors of risk. We agree with M D D Bell that the factors involved in precipitating perioperative myocardial infarction are complex, but we did not claim that stratification would itself reduce the risks of surgery. We aimed to clarify whether the incidence of perioperative myocardial infarction is sufficiently high to justify further attempts at reducing the risk; we showed that it is.

Simon Howell and Pierre Foex's plea for a more complex statistical analysis is inappropriate.