European Heart Journal (2008) **29**, 283–284
doi:10.1093/eurheartj/ehm521

EDITORIAL

Preoperative cardiac risk assessment in vascular surgery patients: seeing beyond the perioperative period

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This editorial refers to 'Predictors and outcomes of a perioperative myocardial infarction following elective vascular surgery in patients with documented coronary artery disease: results of the CARP trial' by E.O. McFalls *et al.*,† on page 394

Patients scheduled for non-cardiac vascular surgery are at significant risk of cardiovascular morbidity and mortality due to underlying symptomatic or asymptomatic coronary artery disease (CAD). As was shown by Hertzer *et al.* in their landmark study in 1984 using coronary angiography in 1000 patients undergoing non-cardiac vascular surgery, 61% of all patients did have at least one significant lesion.[1] In fact, only 8% of all patients had no abnormalities. More recent studies using functional tests for CAD such as dobutamine stress echocardiography confirmed these findings. In a study population of 1097 vascular surgical patients, the incidence of rest wall motion abnormalities was nearly 50%, while one-fifth of patients had stress-induced myocardial ischaemia.[2]

The high prevalence of CAD in vascular surgical patients explains the adverse outcome in this patient population. The incidence of perioperative myocardial infarction, defined as the presence of two out of three of the following markers: (i) the presence of typical chest pain complaints; (ii) ECG abnormalities; and (iii) increased troponin levels, is ~5%. Importantly, 75% of the perioperative myocardial infarctions remain asymptomatic and may therefore be difficult to assess. This might be attributable to the disguising effects of sedation and the simultaneous occurrence of symptoms directly related to surgery such as nausea. The incidence of troponin release is even up to 25% in the vascular surgery population. However, the impact of perioperative asymptomatic myocardial ischaemia on long-term outcome is not fully appreciated.

The preoperative evaluation offers a unique opportunity to identify patients at increased perioperative risk and initiate appropriate lifestyle changes and risk reduction therapy, as these will also improve long-term outcome. Importantly, patients should live long enough to enjoy the benefits of surgery. The preoperative evaluation of high risk patients is hampered by the complex pathophysiology of a perioperative myocardial infarction (MI). Both coronary plaque rupture, leading to thrombus formation and subsequent vessel occlusion, and a sustained oxygen supply–demand mismatch contribute equally to the incidence of a perioperative MI.[3,4] The former is related to the inflammatory status of the coronary artery tree. This has important implications on perioperative and long-term risk reduction strategies. A single intervention, for instance aiming at restoration of the supply–demand mismatch, may offer insufficient protection for coronary plaque instability. Therefore, treatment of the coronary culprit lesion only offers limited protection as the disseminated inflammatory disease of the coronary artery tree progresses.

Recently Kertai *et al.* used a total of 2310 patients to develop a Bayesian model for the prediction of all-cause mortality in patients undergoing all types of open vascular surgery.[5] The type of surgery was a strong risk factor; patients with a ruptured abdominal aortic aneurysm had the worst outcome, followed by elective thoracoabdominal and abdominal aortic surgery, lower extremity arterial bypass surgery, and carotid surgery. Risk factors based on medical history, in order of descending risk, were: renal dysfunction, congestive heart failure, ischaemic heart disease, cerebrovascular event, hypertension, and pulmonary disease. The data of the Coronary Artery Revascularization Prophylaxis (CARP) study of McFalls *et al.*[6] confirm these preoperative risk factors and offer the clinician hints for long-term outcome. Recently biomarkers such as high sensitive C-reactive protein (hsCRP) have also emerged as potential predictors of adverse cardiovascular events after vascular surgery. As shown by Owens *et al.* in a group of 91 vascular surgery patients, a preoperative hsCRP level >5 mg/L was associated with a 2.3-fold increased risk for adverse cardiovascular events during a mean follow-up of 12 months.[7]

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† doi:10.1093/eurheartj/ehm620

Another well known biomarker, in the CARP study assessed after the stress of surgery, is troponin release. In line with these findings, Landesberg *et al.* showed in 2003 that patients with a perioperative troponin T release >0.03 ng/mL and/or a troponin I release >0.6 ng/mL had a significant 2-fold increased risk for long-term mortality during a mean follow-up of 32 months, irrespective of the type of vascular surgery and clinical risk factors.[8] This was also confirmed in a study of 393 vascular surgery patients by Kertai *et al.*: an increase in troponin T level >0.1 ng/mL was associated with a 1.9-fold increased risk for all-cause mortality during a median follow-up of 4 years.[9]

Although the combination of clinical cardiac risk factors and biomarkers offers a unique opportunity to stratify patients according to the long-term risk, outcome in patients with peripheral arterial disease (PAD) remains poor. The 5-year event rate of cerebrocardiovascular events is ~20%, with mortality rates of up to 30%. The Reduction of Atherothrombosis for Continued Health (REACH) Registry, including 55 814 patients with known atherosclerotic disease (CAD, PAD and cerebrovascular disease) showed that patients with polyvascular disease, i.e. the combination of PAD and CAD, have a significantly worse outcome compared with patients with CAD only.[10] An explanation for the high event rate is the medical undertreatment of patients with PAD. Recently a report from Denmark confirmed the undertreatement of PAD patients as compared with CAD patients. Patients with PAD were less likely to receive antiplatelet therapy, statins, angiotensin-converting enzyme (ACE) inhibitors, and β-blockers. For all of these therapies there is substantial evidence that they are associated with an improved event-free survival. In fact, current guidelines recommend the aggressive use of statins, antiplatelet therapy, and blood pressure lowering in these patients.[11] The investigators of CARP are to be congratulated for their effort in giving their patients so-called best medical treatment; ~80% were on β-blockers during 2 years of follow-up, 85% were on antiplatelet therapy, 70% on statins, and 60% on ACE inhibitors.

For the improvement of the long-term prognosis of patients with PAD it is advisable that current guidelines on lifestyle changes and treatment targets of cardiac risk factors are fully disseminated among physicians involved in care of these patients. The recent results of the Euro Heart Survey underscore the importance of continuous education and surveillance of guideline implementation.

Conflict of interest: none declared.

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