Should the ACC/AHA guidelines be changed in patients undergoing vascular surgery?

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Online publish-ahead-of-print 4 October 2005

This editorial refers to ‘Vascular surgery patients: perioperative and long-term risk according to the ACC/AHA guidelines, the additive role of post-operative troponin evaluation’¹ by F. Bursi et al., on page 2448

In western countries, annually about 4–10% of the population is scheduled for non-cardiac surgery. Patients undergoing vascular surgery are known to be at increased risk of peri-operative mortality and other cardiac complications due to underlying (a)-symptomatic coronary artery disease (CAD). Although the overall peri-operative event rate has declined over the past 30 years, 30-day cardiovascular mortality still remains as high as 3–5%.¹ Myocardial infarction (MI) accounts for 10–40% of post-operative fatalities and can therefore be considered as the major determinant of peri-operative mortality associated with non-cardiac surgery.²

The pathophysiology of a peri-operative MI (PMI) is not entirely clear. However, similar to MIs occurring in the non-operative setting, coronary plaque rupture, leading to thrombus formation and subsequent vessel occlusion is suggested as an important causative mechanism.² Surgery is an important stress factor leading to an increase in the incidence of plaque rupture. In patients with significant CAD, PMI may also be caused by a sustained myocardial supply/demand imbalance due to prolonged haemodynamic stress inducing sustained myocardial ischaemia. Both factors, acute thrombus formation and sustained myocardial ischaemia, probably contribute equally to the pathophysiology of PMI.

In order to improve post-operative outcome, the ACC/AHA developed guidelines for pre-operative cardiac risk evaluation.³ They provide an algorithm for a stepwise approach. Patients are divided into three groups; those who underwent a previous coronary revascularization, previous cardiac testing, and all other remaining patients. If patients underwent a coronary revascularization in the past 5 years and if the clinical status has remained stable without recurrent symptoms or signs of myocardial ischaemia, further cardiac testing is not indicated and the patient can directly proceed to surgery. Similarly, patients who underwent non-invasive testing or coronary angiography in the past 2 years, in the absence of unfavourable results and without new symptoms, can also undergo surgery without further evaluation. All other patients are analysed according to the presence of major, intermediate, and minor clinical risk factors (Table 1) and by addition of procedural risk the individual risk can be assessed. In patients with major risk factors, surgery should be postponed until these symptoms are adequately treated. Patients with no or only minor risk predictors represent a low-risk population and further evaluation is only necessary for those with a poor functional capacity undergoing vascular surgery. However, in patients with intermediate risk predictors, additional non-invasive evaluation is recommended to assess the presence of myocardial ischaemia and to determine further peri-operative management.

The present study of Bursi et al.⁴ reported that despite pre-operative risk stratification according to the ACC/AHA guidelines, patients undergoing elective major vascular surgery are still at high risk of MI and death. Event rates were as high as 45, 23 and 9% in patients with previous revascularization without recurrent symptoms or signs of CAD, with intermediate, and those with minor or no clinical risk factors, respectively. These findings question the current recommendations and, moreover, indicate that the ACC/AHA guidelines are of limited use to pre-operative risk stratification in vascular surgery patients.

The high event rates (45%) in a small subpopulation of patients who underwent previous revascularization without signs of CAD, might be explained by an incomplete or failed revascularization or silent ischaemia. These pitfalls should be taken into account when stratifying these patients. In addition, it should be noted that atherosclerosis is an ongoing disease and that plaque progression and vulnerability is unpredictable and is responsible for 50% of all PMIs. This also has important implications for the current guideline stating that the subgroup of patients who have undergone (non-)invasive coronary evaluation in the past 2 years, in the absence of unfavourable stress test results or changes of symptoms, can undergo surgery without further evaluation. Because of the unpredictable character of CAD, this 2-year time lap may be much too long.

The opinions expressed in this article are not necessarily those of the Editors of the European Heart Journal or of the European Society of Cardiology.

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1 doi:10.1093/eurheartj/ehi430

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post-operative patients.5 Same results were demonstrated confirming the prognostic value of troponin elevations in the current paper of Bursi et al.6 In the present study, only 62% of patients with stable CAD.11 Therefore, screening of high-risk patients for ischaemia is not essential for revascularization but primary to optimize peri-operative patient management, which includes optimal medical therapy with beta-blockers and statins, monitoring and aggressive treatment of myocardial ischaemia, and if possible endovascular treatment. In patients with exclusion criteria of the CARP trial, >50% stenosis of the left main coronary artery, left ventricular ejection fraction <20%, and severe valvular aortic stenosis, the optimal pre-operative treatment is yet not defined and treatment should therefore be individualized using a combination of minimal invasive surgery in combination with medical therapy and coronary revascularization, if post-penome of the index surgery can be accepted.

### Table 1 Clinical predictors of increased peri-operative cardiovascular risk

**Major**
- Unstable coronary syndromes
- Acute or recent myocardial infarction with evidence of important ischemic risk by clinical symptoms or non-invasive study
- Unstable or severe angina (Canadian class III or IV)
- Decompensated heart failure
- Significant arrhythmias
- High-grade atrioventricular block
- Symptomatic ventricular arrhythmias in the presence of underlying heart disease
- Supraventricular arrhythmias with uncontrolled ventricular rate
- Severe valvular disease

**Intermediate**
- Mild angina pectoris (Canadian class I or II)
- Previous myocardial infarction by history or pathological Q waves
- Compensated or prior heart failure
- Diabetes mellitus (particularly insulin-dependent)
- Renal insufficiency

**Minor**
- Advanced age
- Abnormal ECG (left ventricular hypertrophy, left bundle-branch block, ST-T abnormalities)
- Rhythm other than sinus (e.g., atrial fibrillation)
- Low functional capacity (e.g., inability to climb one flight of stairs with a bag of groceries)
- History of stroke
- Uncontrolled systemic hypertension

The high event rates in patients with minor or intermediate risk factors can partly be explained by change of more sensitive diagnostic tools for PMI over time. Nowadays, diagnosis of PMI requires a rise and fall of troponin with or without clinical or ECG findings, while in the past ECG abnormalities, CK/CK-MB changes, and clinical symptoms indicated a PMI. This resulted in a substantial increase of patients being diagnosed as having MI as also seen in the current study of Bursi et al.4 Prior studies have questioned the value of a positive troponin in the peri-operative setting and even suggested a false positive value especially in patients with renal insufficiency or massive CK enzyme release. However, a recent study confirmed the prognostic value of troponin elevations in post-operative patients.5 Same results were demonstrated in the current paper of Bursi et al.4 which showed that cTnI elevations were independent predictors of subsequent death and/or MI.

Available data suggest that beta-blockers may be under-used and yet unpublished results from a survey in the Netherlands also show only 60% use of beta-blockers during vascular surgery.6 In the present study, only 62% of patients with intermediate clinical risk received a peri-operative beta-blocker which may adversely influence outcome. Statins and beta-blockers use may reduce those devastating complications associated with non-cardiac surgery.7,8 Statins may prevent plaque instability and thrombosis, due to their pleiotropic effects, as improvement of endothelial function, reduction of inflammation, and stabilizing atherosclerotic plaques. Beta-blockers can restore the supply/demand mismatch, by the reduction of myocardial oxygen use by decreasing sympathetic tone and myocardial contractility. When beta-blockers are used in the peri-operative period, timing and dose adjustment for heart rate control is important as shown by Raby et al.9 Furthermore, treatment should not be interrupted during the peri-operative period and prolonging beta-blocker therapy beyond the surgical procedure seems to be essential, as the risk of MI remains high in the first post-operative week. Besides beta-blockers and statins, aspirin might be considered to provide optimal medical therapy.

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Vascular surgery patients probably represent the highest risk population because of the underlying CAD. Basically, the stepwise approach of the guidelines is valid for pre-operative cardiac screening. However, considering previous findings, we would like to give the following recommendations:

1. The warranty of previous revascularization might be questioned and therefore risk stratification should be considered independently of previous coronary revascularization.

2. Following the recent publication of Lindenauer et al.,10 beta-blocker therapy appeared to be harmful in low-risk patients, neutral in patients at intermediate risk, and beneficial in high-risk patients.10 This further strengthens the beneficial effects of beta-blockers in high-risk patients and therefore we recommend initiation of beta-blocker therapy in vascular surgery patients. Adjustment of beta-blocker dose is recommended to assure a heart rate between 60–70 b.p.m.

3. In addition, until the results of DECREASE-II are available, which studies the effect of non-invasive screening in patients undergoing vascular surgery without any or few cardiac risk factors, we believe it is appropriate to screen non-invasively all vascular surgery patients, including carotid surgery, for myocardial ischaemia. Recently, the CARP trial demonstrated that coronary revascularization before elective vascular surgery did not significantly alter the incidence of PMI among patients with stable CAD.11 Therefore, screening of high-risk patients for ischaemia is not essential for revascularization but primary to optimize peri-operative patient management, which includes optimal medical therapy with beta-blockers and statins, monitoring and aggressive treatment of myocardial ischaemia, and if possible endovascular treatment. In patients with exclusion criteria of the CARP trial, >50% stenosis of the left main coronary artery, left ventricular ejection fraction <20%, and severe valvular aortic stenosis, the optimal pre-operative treatment is yet not defined and treatment should therefore be individualized using a combination of minimal invasive surgery in combination with medical therapy and coronary revascularization, if post-penome of the index surgery can be accepted.

Conflict of interest: none declared.
References


