Should we use myocardial perfusion imaging for prognostic stratification in low-risk patients after exercise ECG?

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The notion of the relevant prognostic impact of functional tests in patients with known or suspected coronary artery disease (CAD) is not novel. Non-invasive parameters related with the functional state of the myocardium and the presence of inducible ischaemia are known to provide an incremental prognostic information over coronary anatomy. The simple exercise electrocardiographic (ECG) testing, although its value has been debated, adds on clinical data, coronary arteriography, and left ventricular ejection fraction. As far as non-invasive imaging is concerned, the predictive power of clinical data is strengthened by adding the results of stress echocardiography, or myocardial perfusion imaging, whereas coronary angiography parameters do not add significant power to the models. As a matter of fact, all evidences definitively underline the superiority of functional non-invasive risk stratification in a hierarchical order over an approach with direct referral to coronary angiography.

The study by Schinkel et al. has the specific value to point the attention on patients with a negative exercise ECG. As much as 50% of these patients had an abnormal stress SPECT scan and 20% a reversible perfusion defect indicating ischaemia. The summed rest score expressing the amount of infarcted myocardium was an independent predictor of mortality, whereas the summed stress score taking into account both infarcted (if present) and ischaemic myocardium was an independent predictor of major adverse cardiac events12 are increasingly recognized as independent determinants of the outcome such as myocardial perfusion, viability and their relationship with left ventricular function. As a matter of fact, the extent of resting perfusion defects expresses the amount of infarcted myocardium which may be a better predictor of mortality than the left ventricular ejection fraction alone. The presence of reversible perfusion defects or of a global reduction in myocardial perfusion, as measurable by the quantitative analysis of PET and more recently SPECT perfusion scans, have indeed a powerful negative prognostic value independently on the presence and the extent of critical coronary stenosis. Coronary abnormalities other than luminal narrowing, such as atherosclerotic degeneration of the vessels wall, endothelial or microvascular dysfunction associated with atherosclerotic, or non-atherosclerotic cardiac diseases are increasingly recognized as independent determinants of impaired blood flow, disease progression, and adverse prognosis.

Accordingly, it is not surprising that MPI data have an additional value over anatomic information, provided by other imaging techniques, for patient management and outcome.

The problem raised by the study of Schinkel et al. is if and when, in patients with stable ischaemic heart disease, myocardial perfusion imaging should be performed avoiding redundant investigations.
In current clinical practice, a functional risk assessment may conflict with a health-care delivery policy-oriented towards cost saving and direct reperfusion. In this respect, a recent survey of the European Society of Cardiology has shown that non-invasive functional tests are under-utilized, with wide variability between different countries, so that several patients without significant ischaemic heart disease directly undergo invasive coronary angiography. On the other hand, coronary lesions detected by coronary angiography are often revascularized even without the evidence that either myocardial blood supply or mechanical function is altered. This ‘anatomically oriented’ invasive approach may negatively affect patient management, with consequent suboptimal medical treatment, inappropriate revascularizations, additional risks, and increased health costs. A functional stress imaging-based strategy could be desirable but according to some specific conditions, First the better definition of pre-test probability of disease based on new predicting models incorporating clinical data, risk factors, and possibly biohumoral markers in order to exclude patients with very low probability. Recent studies demonstrate that the models currently used largely overestimate CAD probability in the European population. Secondly, radiation risk should be taken into account and all available strategies to reduce the radiation dose to the patient should be routinely utilized in the nuclear cardiology laboratories. Finally, the risk of procedures, stressors, contract agents, etc. are also non-trivial and should be additionally estimated during the clinical decision-making process for each patient. At this purpose, both risks and costs should be included as variables in new large studies of comparative-effectiveness research to demonstrate which non-invasive strategy, including stress imaging and CTA, could better predict the final outcome and better target effective treatment. And finally coronary angiography should be more and more restricted to patients in whom revascularization is already foreseen.

Conclusions

Several lines of evidence, collected with different approaches, demonstrate that a functional assessment as obtained by perfusion imaging is superior to clinical and ECG assessment in prognostic stratification of patients with known or suspected ischaemic heart disease. On this basis, stress/rest myocardial perfusion abnormalities should be obtained—whenever possible—before coronary angiography in order to guide decision-making, provided that the effectiveness of this approach when compared with other functional or non-invasive anatomical information and favourable patient’s risk/benefits ratio will be demonstrated in dedicated trials.

References