The exercise ECG – here today, gone tomorrow?

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Key words

exercise ECG, NICE

Br J Cardiol 2011;**18**:7–8

In March 2010 the National Institute of Health and Clinical Excellence (NICE) published guidance on the management of patients with chest pain of recent onset.[1] The guidance is based upon contemporary literature and provides an evidence-based approach to the diagnosis of patients with acute and stable chest pain.

Although the guidelines for the assessment of acute chest pain are largely in keeping with modern practice, those for the assessment of stable chest pain of recent onset are controversial in denying a role for the exercise ECG.[2] The guidance concerns only the diagnosis of obstructive coronary artery disease (CAD) causing angina (or "the diagnosis of angina" to use NICE's incorrect terminology) and it does not consider management. It highlights the need for clinical assessment to determine the likelihood of CAD and places appropriate emphasis on the nature of the chest pain. This follows classical teaching in describing chest pain as typical angina, atypical angina or non-anginal depending upon the site and nature of the pain, and precipitating and relieving features.

Patients with non-anginal chest pain require no further investigation, since angina is excluded by definition from the history although, depending upon risk factors, these patients may have a significant likelihood of CAD, and might still be considered for investigation if clinical suspicion is high. Patients with likelihoods below 10% or above 90% also require no further diagnostic investigation. For the majority of patients, who will have likelihoods in-between, initial computed tomography (CT) coronary calcium scoring is recommended from 10% to 30%, coronary functional imaging from 30% to 60% and either invasive angiography or functional imaging above 60%. In fact, the recommendation in this higher likelihood group is to go straight to invasive angiography if revascularisation is planned, which would be unusual before a diagnosis has been made and medical therapy initiated. It is therefore logical, even in this higher likelihood group, to use an imaging test and to reserve angiography for patients with extensive ischaemia or symptoms not adequately controlled on medical therapy.

Of the imaging tests, myocardial perfusion scintigraphy (MPS), stress echocardiography, stress magnetic resonance (MR) wall motion imaging and MR perfusion imaging are considered to be equivalent with the choice depending upon local resources and patient preference.

The reliance on initial clinical assessment and the exclusion of any testing in a sizeable minority of patients is welcome, as is the move towards functional imaging as a cost-effective way of achieving a diagnosis when testing is required. However, many cardiologists will find it difficult to understand why the exercise electrocardiogram (ECG) is not recommended, and may struggle to divert resources from the ubiquitous treadmill to the various forms of imaging in which equipment and expertise is less common. NICE's argument against the exercise ECG is not that it cannot be used to diagnose CAD and the presence of ischaemia, but that the imaging techniques can do the same and more cost-effectively.[3,4]

Cost-effectiveness

The cost-effectiveness models used by NICE rely upon a number of assumptions, many of which are realistic, but some of which do not reflect real life. For instance, invasive coronary angiography (an anatomical test) is assumed to be perfectly accurate for the diagnosis of angina (a functional abnormality). This is clearly not the case and only a functional test can provide objective evidence of myocardial ischaemia underlying the symptom of angina, whereas an anatomical test requires the notoriously difficult assumption of haemodynamic significance. The odds are stacked further in favour of the invasive strategy by the assumption that all patients with CAD require angiography. The alternative approach of initial medical treatment, reserving angiography as a prelude to revascularisation in patients with intractable symptoms or markers of high risk, now has a weight of evidence in its favour.[5-7] These assumptions lead to the comparatively low likelihood threshold (60%) above which invasive angiography is cost-effective, but more realistic models differ.[8]

Perhaps the most important problem with the models used is that they stop at the point of diagnosis and take no account of clinical outcome or investigations that might be required downstream to assess prognosis or to guide intervention. If a diagnosis of obstructive CAD is made based upon an anatomical test such as CT angiography, patients may still require treadmill or imaging tests, and a diagnostic strategy that included these in the first place would become more cost-effective. In essence, the guidance is based upon the cost-effectiveness of diagnosis alone and not on full management of the patient.

Finally, the assumption that the imaging tests are similar in terms of cost and diagnostic accuracy conveniently avoids the large body of work that would be required to distinguish between them, but it is unlikely to be true. For instance, MPS is the only one that is readily combined with treadmill testing and, in a strategy that does not otherwise provide exercise time or an objective assessment of symptoms on the treadmill, it may have considerable advantages.

The exercise ECG

Despite these reservations, the guidance is sensible in relying upon simple clinical features in the first instance, most notably the history of the chest pain. It recognises the need for clinical judgement, but patients often present with a constellation of symptoms and it can be difficult to categorise the nature of the pain clearly. In these circumstances, clinical observation on the treadmill can be helpful, and one must not forget the potentially therapeutic effect of a treadmill test followed by reassurance from an experienced healthcare professional. If a test is to be used for these purposes, better that it is relatively cheap and without exposure to ionising radiation.

Beyond that, the treadmill exercise time provides helpful prognostic information and will continue to be necessary, with or without associated imaging, to select patients who may benefit from revascularisation irrespective of symptoms and to provide an objective assessment of the response to therapy. Whether the simple exercise ECG is cost-effective in this role compared with imaging remains to be seen but the evidence so far suggests that MPS is superior.[9]

Service provision

Most hospitals in the UK provide a rapid access chest pain clinic to assess patients with stable chest pain. The clinics are often run by a clinical nurse specialist with immediate access to treadmill testing, and they are an effective way of assessing patients quickly and providing appropriate management. The guidance will require a significant change in the way that these clinics are run. Current access to cardiac CT, MPS, stress echocardiography and cardiac MR is not uniform, and considerable investment will be required to provide imaging of adequate quality and quantity.

It seems unlikely that anything other than equipment dedicated to cardiac imaging will be suitable if the service is to be sufficiently responsive. One example of the practical difficulties that will need to be overcome in a cardiac imaging service dedicated to the assessment of chest pain is in cardiac CT. According to the guidance, low likelihood patients undergo an initial coronary calcium scan and may, or may not, proceed to CT coronary angiography depending upon the calcium score. The calcium score is, at most, a 15 minute investigation and can be technician led, but CT angiography requires intravenous cannulation, possible administration of beta-blockade and consideration of the potential adverse effects of contrast medium. It will not be easy to run an efficient service with tight scheduling given the dependence of further testing upon the calcium score and the different complexities of the CT protocols.

The future

The NICE guidance is an important, evidence-based contribution that has not shrunk from making far-reaching recommendations in advising cardiac imaging in preference to the exercise ECG for the assessment of stable chest pain. The recommendation that the exercise ECG has no role is based upon the superior cost-effectiveness of imaging but it is controversial and will be difficult to implement. In the contemporary world of funding restrictions, cost-effective approaches have their attractions, but without initial capital investment it may prove difficult to take advantage of the potential revenue savings.

We look forward to July 2011 when further NICE guidance on the management of stable angina will be published. This should provide guidance on the role of cardiac imaging beyond diagnosis, such as for the assessment of prognosis, although it is unlikely that it will be easy to combine the two guidelines to judge the best use of imaging in the pathway from diagnosis to management to clinical outcome. We also look forward to being able to test the effect of the guidance in clinical practice and to assess to what extent it can improve patient care

Acknowledgment

Dr Ronak Rajani is currently funded by the British Cardiovascular Society (BCS) and the American College of Cardiology (ACC).

Conflict of interest

None declared.

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