Stress Echocardiography in Patients With Acute Myocardial Infarction. What Is the Extent of Coronary Artery Disease and How Should It Be Evaluated?

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In recent years we have seen how the diagnostic capacity of stress echocardiography (SECG) has surpassed that of the exercise electrocardiogram test (EX-ECG). This superiority is clear, both in men and women,[1] in patients with precordial pain[2] or dyspnea,[3] in those with myocardial infarction,[4] previous revascularizations,[5] normal baseline or abnormal ECG due to left branch bundle block,[6] pacemaker[7] or other causes, when left ventricular dysfunction is present,[8] as well as in patients with different coronary artery disease (CAD) pretest probabilities.[9]

In this issue of the REVISTA ESPAÑOLA DE CARDIOLOGÍA, Alonso-Gómez et al[10] add to the data available on the superiority of SECG when analyzing a specific subgroup of patients with inferior myocardial infarction (IMI). The next obvious question, in relation to those patients already diagnosed with CAD, is what is the extent of the disease? The answer to this will help to improve prognosis via revascularization in patients with multivessel disease, especially in those with left anterior descending coronary artery (LAD) disease. We know that presenting distant ischemia due to a previous necrosis, a wall motion score index >1.5, 3-vessel disease or global ischemia, as well as LADCA disease via SECG, carry a worse prognosis[11,12] because all these indexes indicate a greater extent of coronary disease. According to the present study, and other studies done in Spain,[13] 25%-40% of IMI patients have significant LAD disease, and this proportion increases significantly with age.

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Via SECG (75% with exercise and 25% with dobutamine) and EX-ECG, the authors of the article studied 100 patients with IMI (recent in 81%; fibrinolytic therapy in 50%), positive EX-ECG and with coronary angiography findings available. There was LAD disease (>70% stenosis) in 38% of them. Independent predictors of LAD disease were age (odds ratio [OR] =1.1), recent myocardial infarction (MI) (OR=0.14) and ischemia in the LAD territory (OR=20). Even though the SECG was done in a relatively conservative way (i.e., reaching 85% of the theoretical maximum heart rate was a stopping criterion for the test) and that 60% of the patients were under treatment with beta-blockers, the sensitivity of the SECG to predict LAD disease was 74%. This sensitivity was equal to that of the severely abnormal EX-ECG (defined as ST-segment depression >0.1 mV in 3 leads). The sensitivity of both the SECG and EX-ECG would probably have been greater if the beta-blockers and calcium antagonists with their cardiodepressor effect had been suspended before the test and the test had been done in a symptom-limited manner, although there is no evidence concerning the safety of suspending these drugs in patients with MI. However, the most important datum was specificity: whereas the specificity of SECG was 92%, the specificity of the severely abnormal EX-ECG was just 26%. It is clear that if they had studied patients with IMI and a positive or negative EX-ECG and coronary angiography findings had been available for all of them, the specificity of the EX-ECG would have been greater. However, it is clear that, according to the results of this work, a large number of patients with IMI and without LAD disease undergo serious changes in the ST segment during the stress test. It is possible that some of these changes reflect other concomitant ones due to ischemia in the lower wall (mirror image) or in other territories (e.g., in the circumflex artery territory), or that they are due to left ventricular hypertrophy. Whereas only 5 of 62 patients without LAD disease had dyssynergy in this territory in the SECG, the number of patients with ST-segment

depression in at least 3 leads was ten times higher among those without LAD disease (n=46). The authors reasonably conclude that using the EX-ECG even when applying severity criteria, is not suitable for demonstrating LAD disease in patients with IMI. It is clear that one of the advantages of the SECG compared to the EX-ECG is its value as a locator. In fact, the EX-ECG only has a locator value in the rare case of elevation in the ST segment.

After assessing the results of Alonso-Gómez et al,[10] as well as other similar studies, the pending issue is to find out what is the best diagnostic strategy in these patients. Should EX-ECG be done followed by SECG in patients with an abnormal result? Or should an initial SECG be done in all of them? If we bear in mind the data from Alonso-Gómez et al,[10] an SECG should be done in 74 of their 100 patients—those who had ST-segment depression in at least 3 leads (data shown in Table 2)—with the aim of improving specificity. Looked at it in this way, the cost and time would be clearly less with a strategy that began directly with SECG. However, this strategy has not reached sufficient consensus to be recommended in the clinical practice guidelines. The ACC/AHA guidelines on EX-ECG after MI continue to recommend submaximal EX-ECG (if the ECG is interpretable) when this is done 4-7 days after the coronary episode, submaximal being normally defined as 120 beats/min, 70% of the theoretical maximum heart rate depending on age (220–age), or else 5 metabolic equivalents (MET), while only recommending a symptom-limited EX-ECG at about 14-21 days.[14,15] The rationale put forward in the American guidelines for not doing a symptom-limited test before hospital discharge is that the frequency of events is 1.9 times greater than in submaximal tests. On the other hand, they agree that fatal events are extremely rare and that the frequency of detection of ischemia is double in symptom-limited tests. Although it has not been demonstrated, it is reasonable to assume that control of ventricular function, if echocardiography is done during exercise, would lead to greater safety regarding a symptom-limited exercise test.[16] Fewer data are available on the safety of SECG with dobutamine after a recent MI, given that we know that ventricular fibrillation or death occurs in 1 in 300-400 studies with dobutamine testing[17] and that cardiac ruptures have been reported with this test after a recent MI.

It is clear that doing an EX-ECG after hospital discharge is not very practical for logistic ratios, at least in Spain. Hence, the EX-ECG guidelines of the Spanish Society of Cardiology[18] accept doing a symptom-limited EX-ECG (or else submaximal) 5-7 days after the infarction as a class I indication. The same guidelines recommend SECG or radioactive isotope techniques as a first-line test in patients with MI and left branch bundle block, left ventricular hypertrophy, those under treatment with digoxin or with ST-segment depression >1 mm at baseline.

At present, we do not know whether using imaging techniques instead of conventional exercise testing would lead to better prognosis and lower costs. One aspect of clinical practice still pending solution, light of the results of the current and other studies, is whether to do SECG or not as an initial assessment technique in the group of patients who have recovered from an MI.

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