

Dobutamine Instead of Exercise Stress Test to Detect Coronary Artery Disease. Is Electrocardiographic Information Enough?

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We live in a time of high technology. The instruments available in tertiary hospitals allow us to exclude or diagnose any heart disease with a high degree of precision. Nevertheless, it is not possible or suitable to use these methods indiscriminately in all patients. It would be an error to perform coronary arteriography in every patient with chest pain. If we did so, we would be absolutely sure of the presence or absence of obstructive injuries of the epicardial vessels, but the cost-benefit relation would be inadequate, and there probably would not be enough hemodynamic units available. For this reason, we usually resort first to noninvasive tests for the diagnosis of ischemic heart disease.

Of all the noninvasive tests for inducing and detecting myocardial ischemia, the most elemental is exercise stress testing. This technique is widely available, inexpensive, easy to perform, and contributes different types of information: functional capacity, chronotropic response and the response of blood pressure to exercise, appearance of arrhythmias or conduction disorders, lower-limb claudication, chest pain, and electrocardiographic changes suggestive of myocardial ischemia. The capacity to tolerate effort testing indicates, in general, a better prognosis than inability to tolerate it.

Pharmacological stress for the diagnosis of ischemic heart disease is indicated only in patients incapable of physical exercise, since the drugs do not reproduce a physiological situation, so many data of interest provided by the effort stress test cannot be evaluated.

Two groups of drugs are used in pharmacological stress tests: inotropic or chronotropic-positive drugs and arteriolar vasodilators. Generally, inotropic or chronotropic-positive drugs are used with echocardiographic imaging and arteriolar vasodilators are used

with radionuclide perfusion scans, although any type of drug can be used with any imaging system.

When pharmacological stress testing is performed with imaging, the electrocardiographic information can usually be overlooked and the image is used fundamentally to determine if a test is positive or negative. Something similar occurs when effort stress testing is accompanied by imaging. When imaging shows ischemia, although there are no exercise-induced changes in the electrocardiogram (ECG), the patient is considered to have ischemia. On the contrary, if the image is normal and ECG changes are suggestive of ischemia, the patient is usually considered an electrocardiographic false positive.

Some authors^{1,2} have compared the ECG and imaging information for the same patient using pharmacological stress testing with dobutamine and conclude that imaging is more trustworthy and informative, and that its precision for detecting ischemia is greater than that of ECG. It has even been suggested² that we should dispense with the ECG when stress echocardiography is performed.

The scant information that some investigators obtain with ECG could be due to inadequate electrode placement or the timing of the recording. When performing an echocardiogram, electrodes have to be moved to place the transducer where it will acquire the best image; in addition the patient is not in supine position, but in left lateral supine position, with the heart displaced. Often, not all the precordial leads are recorded because the chest electrodes interfere with the transducer in certain positions. In the case of radionuclide perfusion scan, serial ECGs are made during drug infusion, but the period of recovery cannot always be recorded because it coincides with the moment of image acquisition, so valuable information is lost. Frequently, dobutamine produces a greater modification in the ECG 5, 10 or even 15 min after concluding the infusion than during infusion.³

Few studies have been made with dobutamine and electrocardiographic control without adding imaging to assess the diagnostic capacity of ECG with this drug. Between 1989 and 1992 some studies in diffe-

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rent groups of patients were published.³⁻⁸ Not only were the ischemic changes in the 12-lead ECG assessed during and after infusion of dobutamine in these studies, but also the appearance of anginal chest pain. Both factors (clinical and ECG) were taken into account to determine if the test was positive or negative, as is usually done with exercise stress testing.

The sensitivity and specificity of a test for the detection of coronary lesions depend not only on the type of test used, but also on the study population and the probability of suffering ischemic heart disease in such patients. In order to assess the ECG, it is fundamental to exclude patients who take digitalis or have a baseline ECG with changes that preclude interpretation of the stress test. When patients with an interpretable ECG and a high probability of suffering coronary artery disease are studied, the sensitivity of pharmacological stress tests with dobutamine-ECG is high if anginal pain is also considered.³ In populations with a lower probability of coronary artery lesions, the sensitivity is lower but the diagnostic precision is acceptable.⁸

In this number of the journal an article is published on the value of dobutamine testing with continuous ECG recording for the detection of coronary lesions.⁹ The authors report that «there are few studies in which the electrocardiographic control is made with recordings every 3 min and always with echocardiographic monitoring». They cite a study³ in which dobutamine stress echography is added to the electrocardiographic control. It should be noted that this study³ was not made with the echocardiogram but with ECG obtained 5 min after each infusion of an increasing dose of dobutamine, as well as 5 and 10 min after finalizing infusion. The high sensitivity of this study is undoubtedly due to the predominance of patients hospitalized for unstable angina who, therefore, have a high probability of suffering ischemic heart disease. The positivity of the test was determined not only by ST-segment depression. ST elevation in leads without pathological Q waves and the appearance of anginal chest pain were also considered. Frequently these disturbances appear in the period of recovery, after discontinuing dobutamine.

Several references³⁻⁸ in this editorial commentary correspond to pharmacological stress testing with dobutamine-ECG, without echocardiographic or radionuclide perfusion imaging. The novelty of the present article⁹ is continuous monitoring of ECG, which may add some information to the ECG recorded at the end of each dose of dobutamine, although it is not very probable. The results obtained are good, in spite of being a heterogeneous group of patients, many of them in the postmyocardial infarction period, with Q waves and repolarization disorders that interfere with the interpretation of dobutamine-induced electrocardiographic changes. In patients with infarction, one must be very cautious in interpreting stress-induced ST depression,

since it can be a mirror image of ST elevation in opposing leads on the same plane (frontal or horizontal) without indicating ischemia.⁶

The authors of the present study⁹ do not mention how they assessed ST-segment depression in patients with infarction. They did not take ST-segment elevation in patients without infarction or anginal pain into account.

The present article presents a method that was used a decade ago and has improved with imaging techniques. The capacity of dobutamine with electrocardiographic control to detect coronary artery disease is similar^{4,5} to the capacity of simple exercise stress testing, but if a patient is capable carrying out exercise stress testing, this study is better than pharmacological stress testing for the reasons discussed.

The choice between a dobutamine test with ECG or imaging is equivalent to the choice between simple exercise stress testing or imaging. Generally, a normal exercise stress test indicates a good prognosis, but when the exercise stress test is performed with an imaging technique not rarely are severe, echocardiographic or radionuclide perfusion disturbances indicative of poor prognosis discovered in the presence of a rigorously normal exercise stress test, without pain or ECG disturbances. The evolution of the patient with medical treatment could be followed-up to confirm which of the two tests has greater prognostic value, but almost no one leaves a patient without coronary arteriography after visualizing ischemia. In these cases, coronary arteriography usually reveals high-risk coronary lesions that terminate in revascularization. It cannot be deduced from this that exercise stress testing must always be accompanied by imaging, since it cannot now be performed in most hospitals, but if it could be, it would be an ideal examination.

We must then ask why exercise stress testing is frequently carried out without imaging while pharmacological stress tests are generally controlled by imaging.

Exercise stress testing is the study of choice in patients with a diagnostic suspicion of ischemic heart disease. If such tests were always controlled by imaging, stress echocardiography and nuclear medicine laboratories would collapse. In populations with a low prevalence of ischemic heart disease, the negative predictive value of simple exercise stress testing is high and very useful for excluding disease. In these cases (mainly women without coronary risk factors), if the test is negative ischemia can be excluded with acceptable safety, without imaging being necessary.¹⁰

Dipyridamole and adenosine, which are the drugs most used with radionuclide perfusion scanning, can induce electrocardiographic disturbances that are not very reliable for the detection of ischemia. In addition, they frequently produce non-ischemic chest pain due to a pharmacological effect. Dobutamine is the only drug that has been shown to produce electrocardio-

graphic changes and anginal chest pain reliably. In spite of this evidence in different studies, the international community recommends that all pharmacological stress tests be carried out with imaging.

Definitively, although dobutamine induces electrocardiographic changes and anginal pain in patients with coronary artery disease, at present this test is not accepted unless accompanied by imaging. Nonetheless, it can be justified in patients with an interpretable ECG who cannot perform exercise stress testing and are seen in centers that do not have stress echocardiography or radionuclide perfusion scanning, at least when it is necessary to perform these tests. It is possible that the appearance of reports of good results may modify the present recommendations regarding their use.

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