

Ergometer tests:

exercise test

DEFINITION AND GENERAL CONSIDERATIONS

For **exercise tests** we mean a test, whose birth dates back to 1918, which exploits the calibrated physical effort to induce events capable of highlighting the cardiovascular response to the effort and its possible deficits. As is known, during the effort there is an increase in heart rate, both systolic and diastolic blood pressure, stroke volume and cardiac output, coronary blood flow, etc. This leads to an increase in myocardial oxygen consumption. These events are evaluated directly or indirectly with different instruments as specified below.

In conditions of normal functioning of the cardiovascular system, the changes that the effort brings always remain in a state of stable equilibrium, vice versa, in conditions of illness, this equilibrium is broken in one or more points, determining symptoms or signs that can be identified mostly through the equipment used during a stress test.

The exercise test, therefore, is performed both in the healthy individuals and in the heart disease affected patients. In the healthy persons, it is performed to assess functional capacity or as a screening in subjects with high coronary risk factors. In the second case, when we want to evaluate the extent of functional impairment, the effects of medical therapy, surgical treatment or rehabilitation therapy.

The **cardiac stress test**, which is part of the group of provocative ergometric tests, is the most common ergometric test and the electrocardiogram is the most important instrument in the evaluation of the test itself. However, we must not forget the importance of both clinical symptoms and pressure behavior during exercise. This test is performed in two main ways: 1) the patient is placed on an exercise bike and pedals against a fixed or progressively increasing resistance; 2) the patient marches on a rotating mat that varies in speed of sliding and slope of the floor. In both cases the patient is constantly connected to an electrocardiograph and a sphygmomanometer for blood pressure measurement.

There are also other tests: the 3-step Master's test or the Kaltenbach climbing test, now little used.

INDICATIONS AND CONTRAINDICATIONS TO THE PROCEDURE

Indications: the cardiac stress test is the most suitable test in the diagnosis and evaluation of stable stress angina. This technique, through the analysis of ECG changes, heart rate and arterial pressure induced by the effort, not only allows the diagnosis of inducible stress ischemia, but also the identification of the angor threshold (stress level at where pain appears), the ischemic threshold (level of effort at which cardiac ischemia appears), any ventricular functional impairment (stress hypotension) or ischemic involvement of the conduction system (marked bradycardia, sinoatrial blocks, atrioventricular blocks, blocks intra-ventricular), the appearance of hyperkinetic stress arrhythmias, or, once diagnosed, the efficacy of anti-ischemic or anti-arrhythmic therapy. It is also possible to obtain information on the extent and severity of coronary lesions, which are greater the earlier they appear and the aforementioned ischemic alterations regress later. However, in ischemic heart disease, the sensitivity and specificity of the exercise test are relatively low and depend on the number and severity of coronary lesions, increasing with the increase in the severity of the coronary anatomical picture. In women, however, they are lower than in men, both the sensitivity (ability to identify really sick patients - real positives) which is around 75%, and the specificity (ability to identify really healthy patients - real negatives) and is around 65%. A more complete functional evaluation of the cardiac pump activity is carried out with the addition of the spirometric study (ergospirometry).

Absolute **contraindications** to the exercise test are: ongoing heart failure, acute myocardial infarction, acute myocarditis / pericarditis, recent pulmonary or systemic embolism, dissecting aneurysm of the aorta, acute infectious diseases, severe arrhythmias not controlled by therapy, severe aortic stenosis, severe obstructions to ventricular outflow

RISKS AND ALTERNATIVES

The **risks** associated with this test are essentially linked to the triggering of acute ischemic crises, threatening arrhythmias, acute heart failure, sometimes creating a life-threatening condition. For this reason, ergometric tests must be performed in a protected environment, by qualified personnel capable of providing cardiorespiratory assistance (assisted breathing, defibrillation, pharmacological therapy, etc.).

The possible **alternatives** are represented by specific pharmacological tests or by atrial pacing which consists in increasing the heart rate artificially, with the aid of an endosophageal cardiac stimulator, simulating, but only partially, the increase in the frequency that occurs during the effort.

INFORMED CONSENT

In order to: 1) define the nature of the cardiac disorders; 2) ascertain the state of the cardiovascular system; 3) decide on the further clinical and therapeutic procedure thanks to the specific knowledge deriving from this survey;

I the undersigned I voluntarily consent to be subjected to the stress test. Before undergoing the procedure I had an interview with the doctor of the clinic, who explained to me the specific methods of carrying out the test. I was therefore informed that the exam consists of a physical effort practiced on an exercise bike, that the effort will be continued until specific electrocardiographic and / or clinical criteria are reached, unless I am particularly tired so the test will be interrupted. Arterial pressure will be measured during the same interval. I was also informed:

- any disorders that may occur during the investigation (chest pain, difficulty in breathing, palpitation, lack of feeling);
- the need to promptly notify medical personnel as soon as these symptoms occur;
- of the risks inherent in the investigation, even if prescribed and conducted according to art and according to the most modern medical knowledge;
- any diagnostic alternatives;
- the right to withdraw my consent at any time without explanation.

I was finally informed that the NON-EXECUTION OF THE CARDIAC STRESS TEST IMPLIES: a) an incompleteness of the clinical and diagnostic procedure; b) therefore a lacking formulation of the final diagnosis; c) the beginning or the continuation of the therapy in empirical terms, or the impossibility of establishing a correct therapy, with all that derives from it in terms of prognosis. Before the investigation was carried out I was examined by a cardiologist who ascertained that there were no conditions for which the test should be postponed or suspended. Trained personnel the equipment necessary to deal with any urgency / emergency will be readily available.

In respect of privacy, my personal data will be used only as regards my health according to the provisions of the European Regulation 2016/679.

I have read and understood the above and have received an answer to all my requests or clarifications.

Place and date _____

Signature of the doctor performing the patient's signature

Patient's signature
