Seminars of diabetes

Diagnostic techniques for ischemic heart disease in diabetic patients: indications and diagnostic algorithm

Técnicas diagnósticas en cardiopatía isquémica en el paciente diabético: indicaciones y algoritmo diagnóstico

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Abstract

Hyperglycemia is an etiologic factor in the pathogenesis of ischemic heart disease (IHD) and the presence of diabetes, in turn, is an important indicator of a worse prognosis. When an IHD is diagnosed in a diabetic patient the coronary disease found is frequently more severe than among the non-diabetic population. The extension and calcification of the affected coronary vessels is greater, the coronary lesions are more complex and the damage to the left main coronary artery is more serious. Diabetic patients are, sometimes, characterised by an "atypical" start of the coronary disease; consequently, the general practitioner who carries out the initial assessment must have a high rate of diagnostic suspicion in order to carry out the diagnosis correctly and, above all, to carry it out at the appropriate time, when the patient first has an acute coronary syndrome. This article analyses the role and the level of scientific evidence of the diagnostic techniques for coronary disease in diabetic patients.

Keywords: diabetes, cardiovascular disease, diagnostic techniques.

Introduction

During the last years, the cardiovascular prevention strategies play an important role in the daily clinical practice. The are several reasons: 1) the cardiovascular diseases (CVD) are the first cause of early mortality in Spain but they are likewise an important cause of disability and contribute remarkably to the increase of the progressive health cost, 2) the atherosclerosis is developed progressively in a silent manner, and when symptoms appear it is usually in an advanced state; 3) usually the death happens all of a sudden and before requesting medical care; 4) the prevalence of the cardiovascular disease is closely related to life habits and modifiable biochemical factors and 5) it has been proved that the control of the risk factors reduce the morbidity and the cardiovascular mortality, mainly in high risk persons.

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List of acronyms quoted in the text:
In the daily clinical practice the priorities of the cardiovascular prevention should be addressed to specific groups of persons, due to the higher risk of suffering an acute event. The groups of population with higher risk on which we have to focus the prevention strategy are: 1) patients with established cardiovascular disease; 2) asymptomatic persons who have a higher risk of CVD because they show multiple risk factors increasing the global cardiovascular risk (cardiovascular mortality risk >5% after 10 years), T2D or T1D with microalbuminuria or lesion of a target organ and 3) first line relatives of patients with early CVD.

The DM is an etiological factor in the pathogeny of the IC, and in turn, it is an important marker of a worse prognosis. When an IC is observed in a diabetic patient, it is frequent to find a more serious coronary lesion regarding to the non diabetic population, that is reflected in a larger extension and calcification of the affected coronary vessels, in the presence of more complex coronary lesions and in a higher lesion of the main left coronary artery. Moreover, it has to be taken into account that the diffuse coronary lesion pattern and of small vessels with distal coronary lesions, frequent in the diabetic population, sometimes entails that the patient with DM is not a subsidiary of the coronary revascularization.

It is important to take into account that the most frequent etiology of the acute myocardial infarction (AMI) is the breakage of non obstructive atherosclerotic plaque in a coronary artery. Therefore, the composition of the plaque (plaque burden), more than the number of obstructive lesions, is the most important determining prognosis factor as the patients with DM usually have a more diffuse coronary lesion and this confers them a higher risk of inflammation, necrosis and breakage of the plaque and, so, a higher risk of having an acute ischemic event.

On the other hand, the patient with DM and IC have a higher prevalence of showing concomitant cardiovascular risk factors (CVRF), implying a worse prognosis.

However, the diabetic patients are characterised on occasions by an “atypical” presentation of the coronary disease, what suggests that the practitioner who carries out the initial assessment must have a high rate of diagnostic suspicion in order to carry out the diagnosis correctly of an acute coronary event and, above all, in an early phase. These atypical presentation forms include from cut-off dyspnea events, with the characteristics in time and precipitating factors similar to an angina event, to a total absence of pain (silent ischemia), attributable, in part, to the neuropathy of the autonomous nervous system in patients with DM. The prognosis of the patients with DM and silent ischemia, proved by changes in the electrocardiogram (ECG) and in the stress test (EST), is similar to the sick persons with angina (symptomatic).

Diagnostic techniques of ischemic cardiopathy in diabetes
When setting out the diagnostic tests in order to carry out the screening of the coronary disease in patients with DM, the most important in the first evaluation is to have the diagnostic suspicion of an underlying IC based on the symptoms that the patients refers and the global cardiovascular risk. Therefore, one has to be careful when confirming that the diabetes is a “coronary equivalent” as it is known that the absolute risk of the CVD ranges among the diabetic patients and the specific risk assessment depends clearly on the individual characteristics. It seems clear that some patients, as the children and young adults with diabetes of recent beginning, have the risk of suffering a relatively low CVD during a specific period (10 years).

Exercise stress test
The early diagnosis of the IC is related to the pre-test probability of suffering the disease; when higher is this possibility, at the same time closely related to the presence of the global profile of the cardiovascular risk factors (CVRF), higher is the probability that the results of the EST are positive and, what is most important, that when the results are negative it should reflect a real negative. The positive predictive value is better in persons who have a higher CVD risk as it happens in the patients with DM.

If the patient refers suggestive angina symptoms, the diagnostic strategy will be the same than in any patient
with a high symptomatic risk, proceeding after the performance of a basal ECG to the performance of a stress ergometry (supposing that the basal ECG does not have impairments that might make difficult its interpretation during the exercise and that the patient might perform physical exercise). The ergometry would be indicated considering the pre-test probability of a coronary disease that is closely related with the pain characteristics, the age, gender and the presence of other CVRFs. The ergometry in these cases has a higher positive prognosis value for the diagnosis of the coronary disease when the pre-test probability is intermediate, and lower when the probability is low or high. In this second case (high pre-test probability), the indication of the ergometry would have a prognosis aim more than diagnostic (for example, the detection of a positive early ergometry).

The Clinical Practice Guidelines about diabetes, pre-diabetes and cardiovascular disease of the European Cardiology Society advise, in its diagnostic algorithm, to perform an ECG, an echocardiogram and an EST. However, nowhere in the text and therefore without clinical evidence, the performance of an ECG or an EST is justified, except for the high prevalence of the coronary disease in diabetic patients. Besides it has to be taken into account the important implication that would entail the performance of an ergometry to all the diabetic patients without benefit evidence or change of therapeutic attitude, not only from the point of view of the impossibility of systematic access to this test in the daily clinical practice and its cost, as it would imply, undoubtedly, a delay of the procedure in the patients on whom this would be justified.

Is it possible to stratify the patients previously to the ergometry? The different equations that analyze the cardiovascular risk in the diabetic patients in order to evaluate all the classic risk factors are not so useful to stratify the coronary risk events. Perhaps the atherosclerosis risk in the diabetic patients does not only depend on the classic risk factors, but on other added factors, as the presence of glycated proteins in the vascular wall, the pro-inflammatory and procoagulant condition of insulin resistance or specific elements of the dyslipemia in the diabetic patient (low concentrations of cholesterol linked to high density lipoproteins, high levels of free fatty acids, cholesterol linked to low density lipoproteins, etc.).

In view of the above, when suggesting a diagnostic algorithm of the coronary disease in an asymptomatic diabetic patient it is essential: 1) to analyze the global profile of the cardiovascular risk (age, gender and presence of other coronary risk factors); 2) to perform a basal ECG, and 3) to perform a consultation with the cardiologist if the silent CV disease is high, in an individual manner and taking into account the need of performing an ergometry in each individualized patient and not through screening. The current recommendations of the American Diabetes Association indicate performing an ergometry to the diabetic patients with typical or atypical symptoms and in those who have an altered basal ECG.

It is important to take into account that notwithstanding that the EST might detect a silent ischemia in a relevant number of asymptomatic diabetic patients, the benefit of treating and varying the therapeutic strategy in these patients does not demonstrate that the clinical evolution improves. Potentially we can submit patients to coronary interventions without being demonstrated the clinical benefit in the asymptomatic diabetic patients, therefore at present the ergometry is not recommended as a screening test and shall only be indicated when there is a suspicion of a latent coronary disease. Perhaps an exception to these points, that is not only determined in diabetic patients but in those who have a high cardiovascular risk profile, is to perform a systematic or screening ergometry in those persons who have a “social risk” profession (for example, school bus drivers, commercial pilots, etc.).

Isotope stress test
This test provides more information as it shows and localizes the impairments in the myocardial perfusion, mainly in diabetic patients with silent ischemia. In a study of 4,755 patients with a 20% of diabetic population, the presence of fixed and reversible effects in the isotope ergometry (SPECT) was an independent predictive variable of cardiovascular mortality, especially in women with DM.

In the Detection of Ischemia in Asymptomatic Diabetics (DIAD), 522 diabetic patients have been studied with a mean age of 60 years and a DM evolution mean time of 8 years, a 21% of which had a coronary disease history. The SPECT was abnormal only in 113 patients, among which 30 had a systolic ventricular function and 33 showed segmental perfusion impairments.
Stress echocardiography
The stress echocardiography is a very useful method to assess the presence of inducible myocardial ischemia. This method can induce the stress with drugs, generally dobutamine, and provides relevant information about the ventricular function in rest period and during stress. The test also provides information about the hibernating myocardium, it means, that it is feasible but hipocontractil because it is under coronary low flow conditions. This technique might be especially useful in the diabetic patients, though its diagnostic value is not completely determined. The cardiac imaging techniques, especially the stress echocardiography, might be indicated in diabetic patients whose initial symptom is the dyspnea.8

Conclusions
There is no scientific evidence that shows that the indiscriminate use of diagnostic tests for the detection of cardiovascular disease in diabetic patients improves its prognosis. The diabetic patients with moderate coronary disease or not seriously obstructive and, therefore, who are not candidates to coronary revascularization, might not have ischemia evidence in the diagnostic techniques and, however, have a high risk of coronary thrombosis and consequently an acute coronary event. Ideally, the use of diagnostic tests should be focused in trying to identify those patients who can obtain a therapeutically benefit that might oblige to modify the treatment strategy. ■

Practical considerations
- The ischemic cardiopathy in patients with diabetes presents frequently in an atypical manner, with cut-off dyspnea events or with the total absence of pain. The coronary lesion is diffuse and affects generally the small calibre and distal vessels.
- It is recommended to perform an ergometry to diabetic patients with typical or atypical symptoms and in those who have an altered basal ECG. The performance of a diagnostic screening is recommended for patients who have “social risk” professions, as school bus drivers, etc.
- Other additional tests, as the isotope stress test or the stress echocardiography, shall be ordered by the cardiologist after the individualized assessment of each case.

Declaration of potential conflict of interest
A. Alonso states that there are no potential conflicts of interest as regards to the content of this work.

References