

Tissue Doppler and Risk Stratification in Hypertrophic Cardiomyopathy

LORENZO MONSERRAT IGLESIAS^{MTSAC}

Clinicians often think that simple and clearly established routine procedures are used to manage hypertrophic cardiomyopathy. However, there are few cardiac disorders with the degree of complexity and uncertainty encountered in this disease. Hypertrophic cardiomyopathy may be caused by hundreds of different mutations in several tenths of genes identified until now, and in approximately 30-40% of cases has an idiopathic origin after a complete genetic study. (1) This etiological complexity is one of the main reasons of the great variability observed in its clinical expression and prognosis. Therefore, we could state that hypertrophic cardiomyopathy is not a single disease but a group of diseases with a common denominator: the presence of abnormal myocardial thickening. (2) If this concept is accepted, it must be realized that it is not simple to establish a unique course for the appropriate and efficient clinical management of this disease in all patients. The clinical approach to hypertrophic cardiomyopathy can be summarized in four main tasks: diagnosis, symptom treatment, risk stratification to prevent complications and family assessment. There is ample margin for improvement in each of these areas. We should develop an earlier and more precise diagnosis in affected patients and their families, and devise new treatments which, in addition to controlling symptoms, avoid disease progression. But above all, we need to improve our ability to accurately determine the risk of disease-associated complications in each patient.

For the last 30 years, risk stratification has been the main clinical research area in hypertrophic cardiomyopathy, and although considerable progress has been made, it is still an unresolved issue of great clinical significance. Risk stratification aims, in the first place, to identify patients at higher probability of presenting clinical complications (mainly sudden death, but also death due to heart failure, progression to systolic dysfunction, development of atrial fibrillation, stroke and endocarditis), to adopt adequate pre-

vention measures (defibrillator implantation, medical treatment of systolic and diastolic dysfunction, anticoagulation, etc). In the second place, risk stratification must allow precise identification of the majority of low risk patients who would benefit from a non-aggressive clinical management (avoiding iatrogenic effects) and from the confidence we may convey regarding his/her probable evolution.

Concerning the evaluation of the risk of sudden death, current knowledge establishes the convenience of assessing at least a number of main risk factors, including family history of sudden death, syncope of unknown origin, non-sustained ventricular tachycardia in Holter monitoring, severe hypertrophy (especially with wall thickness > 30 mm), and abnormal blood pressure response in the exercise test (in young patients). When none of these factors is present, risk is assumed to be very low and no intervention is indicated, whereas in the face of multiple factors, all authors recommend defibrillator implantation. There is no consensus when only a single risk factor is present, in which case additional evaluation aspects are recommended, as patient age and presence of other risk markers. (2-4) We have recently postulated a formula for the quantitative estimation of individual risk of sudden death. (5) This formula, derived from the multivariate analysis of a multicentric cohort of more than 3000 patients, takes into account patient age, maximum wall thickness, family history of sudden death, syncope, non-sustained ventricular tachycardia, subaortic dynamic gradient and left atrial diameter. It represents an evident improvement compared with previous approaches to the problem, but as any formula modeling biological behavior, it has limitations. Specifically, the application of this formula underestimates risk in patients with a more severe profile, and overestimates it in low risk patients. Conversely, most patients with an implanted defibrillator as primary prevention do not receive adequate therapies during a prolonged follow-up period, and some patients with

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Instituto de Investigación Biomédica de A Coruña. Servicio Galego de Saúde

Address for reprints:

Dr. Lorenzo Monserrat Iglesias. Edificio Fortín. Hospital de Oza. As Xubias 84. A Coruña 15006. España

e-mail: Lorenzo.monserrat@healthincode.com

one or no risk factors may die. This indicates that our predictive ability is still limited, and it is necessary to achieve greater accuracy in the calculation of individual risk.

The article of Ochoa et al, published in this issue of the Argentine Journal of Cardiology represents a clear breakthrough to achieve this purpose. (6)

Echocardiography is one of the most useful tools for risk stratification of hypertrophic cardiomyopathy, but few parameters are currently systematically applied in risk estimation. The new equation we have just commented only considers maximum wall thickness, the dynamic gradient and left atrial diameter. Fernández et al. and other authors have shown that the presence of systolic dysfunction in patients with hypertrophic cardiomyopathy is an important risk factor. (7, 8) However, ejection fraction was not a useful predictor in the risk equation we have previously discussed. (5) The reason for this paradox is that, on the one hand, overt systolic dysfunction (significant decrease of ejection fraction) is present in a low percentage of patients with hypertrophic cardiomyopathy (< 10%) and, on the other hand, the event that may occur in these patients is death due to heart failure or transplantation. For these reason, in a global cohort, ejection fraction does not attain a high predictive power for sudden death. It is also true that systolic dysfunction is not independent from other factors included in the equation, as wall thickness, left atrial diameter or ventricular arrhythmias.

Ochoa et al. show in their study that altered systolic function, evaluated by tissue Doppler imaging, is associated with patient prognosis and specifically allows identifying a very low risk subgroup, which corresponds to patients with preserved systolic velocity. (6) It is important to point out that the authors excluded from their evaluation patients with evident systolic dysfunction by other parameters.

These findings are of great interest, but should not be surprising. A preserved ejection fraction in hypertrophic cardiomyopathy is not equivalent to normal contractility and tissue Doppler allows identifying contractile disorders undetected by ejection fraction. There are manifold possible causes for this subclinical dysfunction, including presence of fibrosis, ischemia due to small vessel disease and oxygen supply and demand imbalance, and myofibrillar disarray producing less efficient contraction. All these factors are associated with greater risk of arrhythmias and sudden death. (2-4) Moreover, among the mutations leading to hypertrophic cardiomyopathy, the ones with worse prognosis produce at the molecular level a decreased contractile capacity and altered contractile coordination that turn it inefficient. (9, 10)

Although the work by Ochoa et al. did not show a significant association between diastolic function parameters obtained by tissue Doppler imaging, several studies have suggested that they may be useful in the diagnosis and prognosis of the disease. (6) Taken together, it can be concluded that tissue Doppler evaluation in patients with hypertrophic cardiomyopathy definitely contributes to greater precision in the diagnosis and prognosis of these patients.

Conflicts of interest

None declared

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