What is the Importance of Cardiovascular Physical Examination in 2018?

¿Cuál es el valor del examen clínico cardiovascular en el año 2018?

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In recent decades, the progress of medicine and especially of cardiology has been based especially on advances in technology through genomics, biomarkers and imaging methods. Within the latter, echocardiography has developed so quickly in the last 35 years that it has become the most used complementary method following electrocardiogram. In addition to providing valuable information on the anatomy and function of the heart for clinical decision making, cell phone-sized equipments have been designed to allow studies in the doctor's office.

The emergence of these new technologies has raised the question of whether they will replace the traditional cardiovascular physical examination. Faced with this dilemma, one must decide if technology is an aid to the doctor or if he/she depends entirely on it. On the other hand, it poses the question of whether physician education should be based on echocardiography or physiopathology training through physical examination.

Within cardiovascular examination, the art of incorporating auscultation into practice has decreased in recent decades, which may be due to: 1) the decrease in the number of cardiologists willing to teach and learn to auscultate, 2) the fact that the health system does not remunerate a diagnosis made by this method as it does with echocardiography and 3) that work is carried out in high litigation environments leading to a "defensive medicine" in which it is more prudent to indicate unnecessary studies to avoid risks. Also, some professionals may not use the physical examination because they do not feel confident about their own findings.

Therefore, although the stethoscope is usually seen around the cardiologists' neck or hanging from the shoulder ("cool position"), it has become more a decorative element than a diagnostic instrument. Many cardiologists think that the stethoscope is "a thing of the past" and that it is a waste of time to auscultate the patient if there is a Doppler ultrasound available in the institution. However, the transducer is not a substitute for the stethoscope because it can lead to false diagnoses in a patient who does not have a murmur, by detecting mild or trivial valve regurgitations that can unnecessarily transform him into a potential cardiac patient. At a time when technology seems to have removed the "enjoyment" of making a correct diagnosis, auscultation restores the intellectual satisfaction of making a diagnosis in a few minutes with prognostic and therapeutic implications. Of course, mastering auscultation takes time and not everyone is willing to wait. To reach this goal requires experience, repeated practice and, above all, patience.

But cardiovascular clinical examination is not only the physical examination but also the interrogation and possibility of interacting with the patient as well as including the electrocardiogram. It is with all these elements that the cardiologist elaborates the "pretest" probability of a heart disease. Several authors have published directly or indirectly, that the cardiovascular physical examination should no longer be performed, that "the stethoscope is dead" and should be replaced by echocardiograms performed with portable equipments. (1, 13) In my experience, physical examination is still useful, especially in the diagnosis of heart valve disease and heart failure; consequently, I will present some examples of patients evaluated in the heart valve disease clinic of Hospital Eva Perón:

- A 28-year-old male patient was referred for mitral valve replacement surgery due to grade II dyspnea and severe mitral regurgitation secondary to myxomatous mitral valve, and with numerous echo-Doppler studies supporting this diagnosis (Fig 1). He had a history of high blood pressure under treatment with enalapril 10 mg and at the time of consultation his blood pressure was 150/90 mmHg. It is improbable that severe mitral regurgitation will lead to essential hypertension in a young patient, so it was necessary to rule out secondary causes of hypertension. Palpation of the femoral pulses showed a significant decrease in pulse amplitude, with a blood pressure difference in the lower limbs of 30 mmHg consistent with the diagnosis of aortic coarctation corroborated by suprasternal echo-Doppler. This echocardiographic view is not routinely performed in all patients and aortic coarctation remained undetected in several studies due to lack of clinical suspicion.

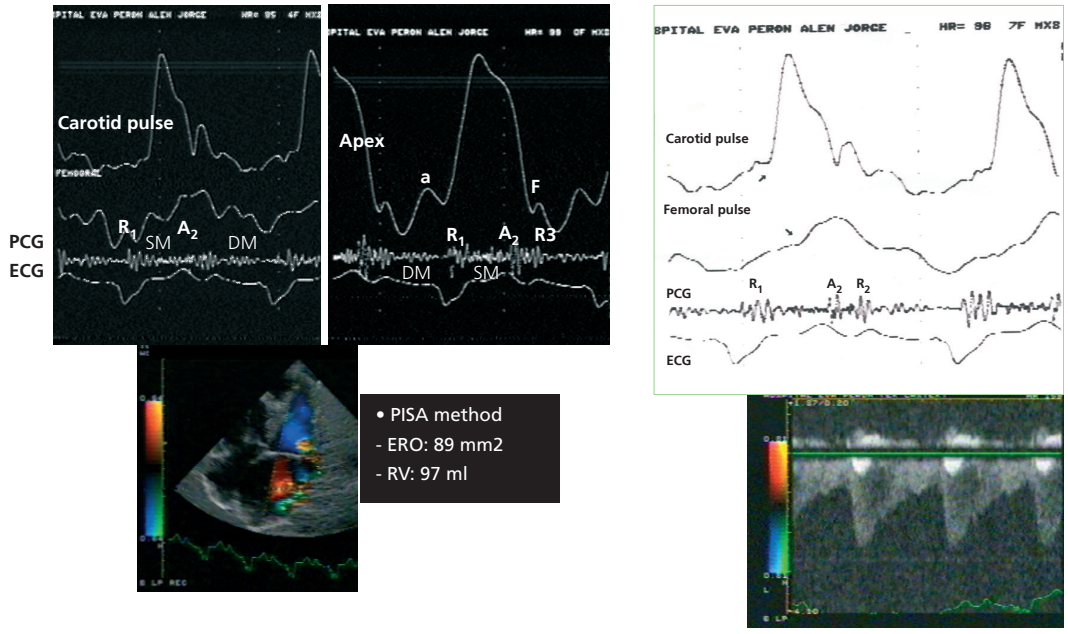

Fig. 1. Twenty-eight year-old patient with severe mitral stenosis. A) Simultaneous phonocardiogram (PVG) in the mitral area, electrocardiogram (ECG), carotid ultrasound (left) with "triangular" shape and apex cardiogram (right) recordings with protodiastolic "F" wave simultaneous with R3 and "a" wave. SM: Systolic murmur. DM: Diastolic murmur of mitral hyperflow. B) Apical 4-chamber view evidencing proximal eccentric mitral regurgitation jet acceleration (PISA, -arrow-) attaching to the lateral wall of the left atrium. ERO: Effective regurgitant orifice. RV: Regurgitant volume. C) Simultaneous carotid and femoral pulse recording showing the delay between them (arrow). D) Continuous suprasternal Doppler recording of flow through the aortic coarctation with systolic and diastolic component.

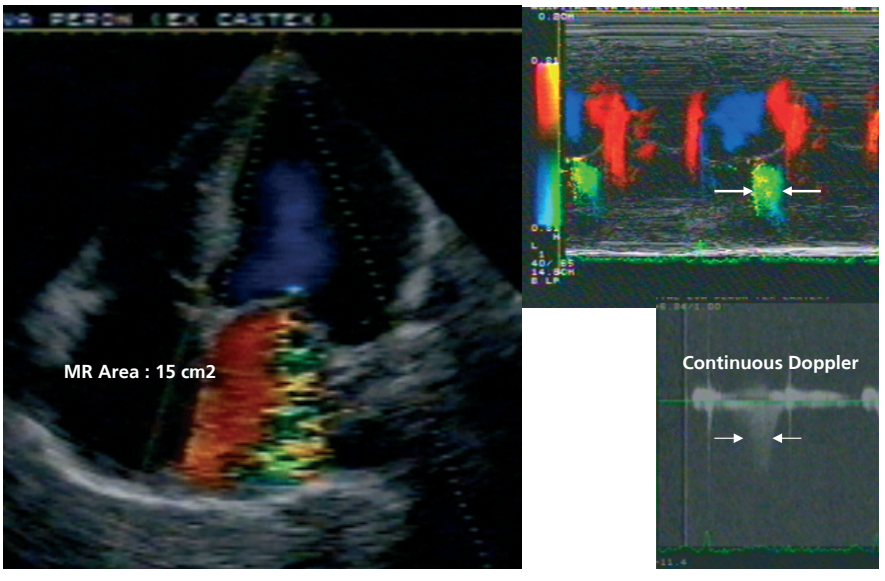

Fig. 2. Forty-five year-old female patient with mitral valve prolapse. *Left*: Apical 4-chamber view showing mitral regurgitation (MR) jet. *Right*: Color M-mode ultrasound and continuous Doppler recordings showing that regurgitation occurs during the final third stage of systole.

- An asymptomatic 45-year-old woman was referred with diagnosis of severe mitral regurgitation secondary to mitral valve prolapse (Fig 2). Physical examination revealed a 3/6 meso-telesystolic murmur increasing towards the second noise and radiating towards the axilla, that increased with hand grip maneuver, but had no third noise. The Doppler ultrasound reported a 12 cm2 jet color area and an effective regurgitant orifice of 36 mm2, consistent with severe mitral regurgitation in a normotensive patient. However, the left ventricle had normal diameters, the left atrium was slightly dilated and peak E wave velocity was also normal. In a new study it was possible to determine that mitral regurgitation was only telesystolic; then, the jet area was registered and the regurgitant

orifice was calculated by the PISA method, assuming that regurgitation occurred during the entire duration of systole, and not just in a third of it. The absence of an increase in peak E wave velocity indicates that fast filling during early diastole is normal, and therefore the regurgitant volume is small, which correlates with the absence of third noise on auscultation and the degree of mitral regurgitation which was mild in this patient.

- An asymptomatic 64-year-old patient with history of smoking was referred for control due to moderate to severe aortic stenosis (Fig 3). On physical examination, the apex beat was not displaced, but a presystolic thrill compatible with "a" wave (increased left ventricular end-diastolic pressure) was palpable. The carotid pulse showed normal upstroke and amplitude. A fourth noise, aortic component of the second preserved sound and a 3/6 ejection murmur in the aortic area was heard. In view of the clinical suspicion of obstructive hypertrophic cardiomyopathy, a Valsalva maneuver was performed, showing increased murmur intensity. The echo-Doppler was repeated, confirming the findings and leaving as a lesson that: *systolic murmur of aortic stenosis + carotid pulse with normal upstroke = dynamic obstructive cardiomyopathy.*
- An asymptomatic 28-year-old female patient was referred for presenting a 2-3/6 aortic ejection systolic murmur apparently caused by a bicuspid aortic valve diagnosed in some echo-Doppler studies but not in others. The auscultation of the patient revealed that the murmur had its maximum intensity in the left subclavicular region, with diastolic component, exhibiting the classic "machinery" murmur characteristic of persistent ductus arteriosus. The new echo-Doppler confirmed the diagnosis, discarding that of bicuspid aortic valve (Fig 4).

From these examples, it can be inferred that the clinical diagnosis prior to the completion of a complementary study such as Doppler ultrasound is fundamental since the latter is also operator dependent (as the physical examination) and may omit information in some cases or overestimate the severity in others. Physical examination can provide significant data at no extra cost, although its advantages and limitations must be known. That is why it is useful to ask: do all the signs of the physical examination have precision in the diagnosis or do they not have utility? Or maybe some signs are accurate and others are not?

The evidence-based physical examination tries to answer this question by comparing the physical examination with diagnostic techniques accepted as reference. For this purpose, the probability ratio (PR) is calculated as the quotient between the prevalence of the sign in patients with documented disease by a certain technique, and the prevalence of the sign in patients without disease. (2) In the case of aortic stenosis systolic murmur, if it is present in 80% of true stenosis and in 10% of patients without stenosis, the PR will be 8: PR=murmur present in 80% true AS/ murmur present in 10% without AS = 8

If PR is greater than 1 the diagnostic probability

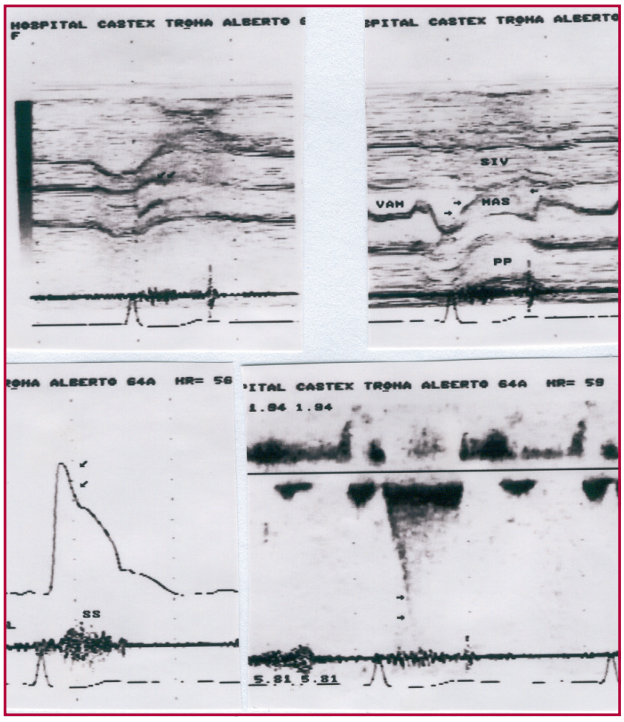

Fig. 3. Sixty-four year-old patient with obstructive hypertrophic cardiomyopathy. *Left* (Upper panel): M-mode ultrasound showing sclerotic aortic valve with reduced opening, without gradient by Doppler ultrasound; (Lower panel): Carotid pulse recording with rapid upstroke and early collapse due to the subaortic obstruction. *Right* (Upper panel): M-mode recording of the systolic anterior motion of the mitral valve; (Lower panel): telesystolic subaortic gradient.

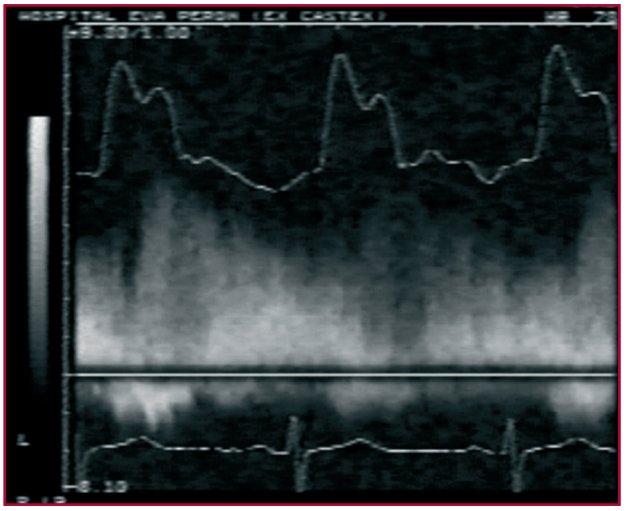

Fig. 4. Simultaneous continuous Doppler recording of flow through ductus arteriosus and carotid pulse (upper panel).

of the sign increases as its value increases, if it is less than 1 it indicates that the sign is not very useful in practice. It is generally accepted that a good PR is ≥3 and PR is poor when it is ≤0.3.

In the case of AS, the absence of systolic murmur in the aortic area has a negative predictive value of 99.6% to rule out aortic stenosis. (3) On the other hand, the presence of systolic murmur in the aortic area can have different origins (mitral regurgitation of the posterior leaflet, obstructive hypertrophic cardiomyopathy, pulmonary stenosis or ventricular septal defect), for which the radiation of the murmur to the neck, the decreased intensity of the aortic component of the second noise (except in AS with arterial hypertension) (4) or the characteristics of the carotid pulse (parvus and tardus) can be useful.

In a study of 123 patients, the decreased amplitude of the carotid pulse was associated with worse survival at 2 years (65%) compared with a normal amplitude pulse (89%). (5) Although none of these signs has isolated value for the diagnosis, the combination of 3 or more signs has a PR of 40 (Fig. 5). (2, 6) A similar analysis can be applied for the physical examination of heart failure, (7, 9) mitral regurgitation (10, 11) and aortic regurgitation. (5, 12)

McGee conducted a study analyzing the relationship between the presence of systolic murmur in the physical examination and echo-Doppler in 409 patients. (9) The echocardiographic findings associated with systolic murmur were: increase in transvalvular aortic velocity, severity of mitral regurgitation, absence of pericardial effusion and correlation with E-wave peak velocity. The location of the murmur was better correlated when heard close to the third left intercostal space, unlike traditional teachings. Other studies did not obtain good correlation between the clinical findings and the echo-Doppler, but they had methodological differences, as a physical examination performed by a general practitioner, (13) or the study population had a low proportion of patients with heart valve disease and only the physical examination was taken into account, not considering the patient interrogation and the data of the ECG or chest radiography that completed the clinical evaluation. (14)

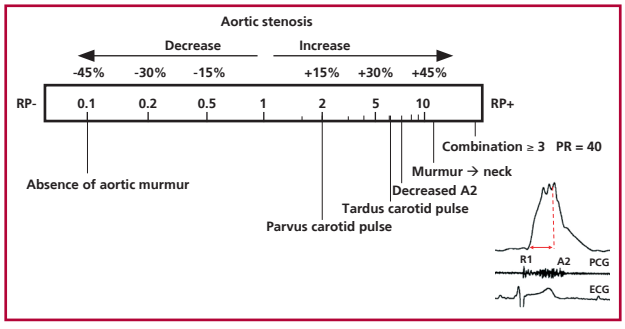

Fig. 5. Explanation in the text. Lower right panel: Simultaneous carotid ultrasound, phonocardiogram (PCG) and electrocardiogram (ECG) in a patient with severe aortic stenosis. The arrow indicates the slow-rising pulse (*tardus*) and the dashed line the decreased amplitude (*parvus*).

In my opinion, the cardiovascular examination is still valid with all its components, especially auscultation (static and dynamic) and simple methods such as ECG and radiology that allow obtaining a high "pretest" probability, especially in heart valve diseases and heart failure. This information is then completed through evaluation with other imaging technologies.

In other words, as their name indicates, these studies should be more than ever, complementary to the clinic.

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