The importance of echocardiogram for cardiologists in the clinical practice

Paulo de Lara Lavítola

Group on Acquired Valve Disease, Instituto do Coração do HC-FMUSP, São Paulo, SP, Brazil.

Introduction

We have observed, in the daily practice, a greater number of patients with valve disease (VD) as a consequence of increased life expectancy.

The cardiologist has to be prepared for the correct handling of this health problem in an aging population. For this, they have to: 1) Understand the patient, by applying semiology; 2) Associate this information with the results of complementary tests, especially echocardiogram; 3) Be familiar with the guidelines, adapting them for each case.

According to DATASUS data for 2018, life expectancy has increased, soaring from 75 to 81 years. It is estimated that by 2034, about 39.2% of the population will become elderly, aged 60 or older.

For the cardiologists, greater life expectancy is important, because with aging, there is greater calcification of the valvular cusps, which results in greater incidence in aortic and mitral valve failure. Some authors consider it as the next social epidemic. We need to have well trained cardiologists for a quick and accurate diagnosis.

In valve failure, the choice of treatment is made by identifying the pathology, assessing the magnitude of the lesion, as well as the impact of the valve defect on the circulatory dynamics. To that end, we rely on the following pair: Semiology and complementary medical tests.

Semiology is the study of the symptoms and signs of the disease. To carry out this evaluation, we use the tools provided by physical examination techniques or propaedeutic — anamnesis and physical examination. Through anamnesis, we learn about the patient's quality of life, expressed through functional class, according to the New York Heart Association criteria, in addition to other symptoms, such as chest pain and arrhythmia. This is subjective information for both the informant and the observer.

Through physical examination, focusing on the heart sounds, valve disease (VD) is identified. Analyzing the characteristics of the sounds, besides the shape, intensity and irradiation of the murmurs also allow the quantification of the lesion. It is the perception of the reason for the complaint reported.

Keywords

Echocardiography; Heart Diseases; Diagnosis.

Mailing Address: Paulo de Lara Lavítola •
Av. Dr. Enéas Carvalho de Aguiar, 44 - Cerqueira César, São Paulo - SP, 05403-900 - Brazil
E-mail: dclmonica@incor.usp.br

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However, observation of heart sounds may be impaired and acoustic details may go unnoticed.

In recent years, technological progress, through cardiac imaging scans, when combined with physical examination, allow accurate diagnoses with more objective data.

Of all echocardiographic scans, because of its convenience, accuracy and specificity, echocardiogram became an indispensable test in the identification and quantification of valve diseases, providing essential information for patient management. In turn, echocardiogram depends on a learning curve, cardiocirculatory dynamics conditions (pre and post load) at the time of investigation and the acoustic window offered for the test.

In daily practice, we often find ourselves in a situation where there is inconsistent information. Dichotomy of information occurs because both methods, as discussed, have limitations. Hence the need for a combined analysis.

Three pieces of information — functional class, heart sounds and interpretation of echocardiographic data — allows us to identify and measure valvular dysfunction, and learn its repercussions on the cardiocirculatory dynamics.

The information collected by these methods in multicenter studies, and submitted to meta-analysis, allowed to devise the guidelines of therapeutic management — the compass guiding the treatment.

It is unequivocally demonstrated that cardiac semiology should not be devalued by the objective information provided by the echocardiogram; on the contrary, it gains strength when associated with this graphic method.

Nowadays, in VD, our management procedures are advised by international guidelines (American Heart Association, the European guidelines) and the Brazilian consensus.[1]

The rules of conduct laid down in the guidelines are based on the symptoms expressed by Functional Class (FC), according to the New York Heart Association criteria, and by measurements and images obtained by the echocardiogram.

The images recognize valvular dysfunction. The measurements of jets and the anatomy of the cardiac chamber valves allow quantifying the magnitude of the lesion. It is then established that mild to moderate lesions and asymptomatic patients, management can be expectant, and when the lesions are important and symptomatic, surgical treatment may be indicated. These data, associated with the recognition of adaptive capacity markers (complicators), allow us to find, as the only way, the best management, when patients are still asymptomatic and classified as a serious disease.[1-3]

These concepts modified the therapeutic management previously established as surgical solely based on the symptoms. The result of this knowledge allowed to interrupt

the evolution of VD at the most appropriate time, delivering a postoperative outcome with better quality of life, besides alleviating the "anguish" of the caregiver.

Example 1

Female patient, 65 years old. Asymptomatic in a doctor's visit in 2008. At that time, heart murmur was identified in pre-admission test.

Physical test:

Systolic murmur, mild regurgitation in the mitral area, sparing B_1. Murmur irradiating to the anterior axillary line.

HR=72 beats/min. Rhythmic. BP=130/85 mmHg.

No signs of CHF.

Clinical diagnostic hypothesis of mitral valve regurgitation of moderate magnitude in an asymptomatic patient.

Echocardiogram measurements confirm the hypothesis formulated by the clinical examination.

In 2016, after treatment of infective endocarditis, the patient remained asymptomatic, but with changes in cardiac auscultation.

Physical test: Systolic murmur 5+ in MA, mild, with systolic tremor irradiating beyond the anterior axillary line and region to left sternum up to the pulmonary area.

Clinical diagnostic hypothesis is worsening of mitral regurgitation, but still adapted. Absence of symptoms, without medication, may leave doubt as to the therapeutic procedure. Echo analysis is indispensable.

Echocardiogram confirmed diagnosis by showing regurgitation volume of 65 ml/beat, vena contracta of 0.75 cm^2 and valve area of 0.65 cm^2, allowing regurgitation.

Echocardiographic measurements remained stable and acceptable until 2018 (Table 1). At this time, EF decline (<60) and Ds increase (Ds>40 mm) pointed to the inadequacy of adaptive capacity, and knowledge of these markers made management easier.

According to the guidelines, there is indication of surgically interrupting the course of VD, although it is asymptomatic.

Echocardiographic conclusion: MVP with rupture of chordae tendineae after infective endocarditis.

No medication.

Worsening of markers of adaptive capacity.

Management: Surgical treatment.

Comment: Sequential analysis of echocardiograms shows exaggerated increase of left atrium, but not pulmonary artery pressure. Dilatation of this chamber is beneficial, as it prevents undesirable increase in pulmonary capillary pressure, relieving the patient, for long periods, from the symptoms of dyspnea caused by pulmonary congestion.

In this case, it can be seen that the symptoms were little helpful in the choice of management. The greatest aid was obtained through prospective analysis of the measures expressed in successive echocardiograms. The important thing was to know the evolutionary tendency of the markers of adjustment of measures. In the case of asymptomatic patients, the evolutionary tendency may be known through prospective or retrospective tests.

Example 2

TS, 48a., female sex. RD in childhood.

MS diagnosed 12 years prior during routine prenatal examination.

Asymptomatic. Functional Class I

Current physical examination:

Arrhythmic sounds (AF).

Hyperphonesis of B1 heart sound — in MA.

Normal/hyperphonesis of B2 heart sound in lung area.

No murmurs.

Early mitral valve opening snap.

BP: 140/80 mmHg

HR=82 beats/mm (AF)

Medication: Warfarin 5 mg with periodic dose adjustments.

Current Doppler echocardiography:

LA: 70 mm – PASP: 70 mmHg — Mitral valve area: 0.7 cm^2 – GLA/LV: 11 mmHg (mean).

Conclusion: Severe mitral stenosis.

In daily clinical practice, we observed that the identification of mitral valve stenosis based on heart sounds can be misleading. The diastolic murmur that is typical of the pathology is not always present. In these conditions,

Tabla 1 - Echocardiographic measurements.

	26/04/08	23/11/11	20/09/14	10/12/16	28/12/16	07/08/17	25/07/18
Dd, mm	56	57	64	65	73	69	79
Ds, mm	35	37	38	41	39	42	50
LVEF	67	73	69	64	70	61	55
AE, mm	45	44	54	62	62	66	60
PASP, mmHg	-	-	55	53	40	55	60
	Moderate mitral regurgitation by PVM CF I			Severe mitral regurgitation CF I			

Da = Diastolic diameter of the left verticle, Ds = Systolic diameter of the left verticle; LVEF = Left ventricular ejection fraction; LA Diameter of the left atrium; PASP = Pulmonary artery systolic pressure.

hyperphonesis of first heart sound and presence of mitral valve opening snap serve as an alert for the possibility of mitral valve disease.

Also, in mitral stenosis, absence of reported symptoms does not rule out the potential severity of the lesion. Severe mitral stenosis causes increased pulmonary capillary pressure. The resulting pressure overload in pre-capillary arterioles is triggered by hypertrophic middle-layer of pre-capillary arterioles, initially functional, but with the course of the disease, the high-pressure regime in this area makes it fixed. Hypertrophic middle-layer of arterioles reduces the right ventricular deflux effective area to the pulmonary artery with reduced pulmonary capillary pressure. It is a mechanism of pathophysiological defense, avoiding symptoms resulting from pulmonary congestion, but overloading right ventricular functioning.

Diagnostic conclusion, due to lack of clinical and acoustic parameters, is only possible when based on the previous history of the disease, and on echocardiographic data.

Additional comment: Presence of significant MS with severe repercussions to pre-capillary pulmonary circulation. Indication of surgery, although still asymptomatic. The condition does not take long to appear and will be perceived by the consequences of the right ventricular mechanical failure.

Analysis of successive echoes demonstrates the left atrial "exertion" to spare the pulmonary artery systolic pressure, despite the progressive reduction of the mitral valve area.

Tabla 2 - Evolutionary echocardiographic parameters.

Evaluation	LA (mm)	PASP (mmHg)	MVA (cm^2)	GLA/LV (mmHg)
2010	48	40	1.3	4
2011	45	33	1.3	6
2016	66	49	1.0	10
2018	70	70	0.7	11

LA = Left atrium; PASP = Pulmonary artery systolic pressure; MVA = Mitral valve area; GLA/LV = Pressoric gradient between LA and LV.

Example 3

With a longer life expectancy, aortic valve stenosis has become a frequent pathology in patients older than 70.

ARS, male sex, 74 years old.

Appropriate cognitive capacity.

One year prior, he noticed the onset of syncope or pre syncope while walking.

Since then, tiredness on usual exertion.

Physical examination:

Ejective systolic murmur in aortic and accessory aortic area irradiating to the tip of the heart. There is also irradiation to the furcula and lateral sides of the neck; mild systolic tremor.

BP: 110/70 mmHg; HR: 64 beats/min; Rhythmic.

Echocardiography: current

Dd: 52 mm; Ds: 45 mm; EF: 28%; LA: 49 mm; Septum/wall 12/11 mm.

G LV/Ao: 22 mmHg (mean); a^2 V Ao: 0.94 cm^2

Transaortic flow rate: 3 m/seg.

Clinical data induce us to diagnose aortic valve stenosis with repercussions on cardiac circulatory dynamics.

We found some inconsistency in the echocardiographic measurements. Moderate aortic valve stenosis not consistent with the reduced valve area and with the symptoms. In turn, reduced EF leads us to the diagnosis of associated myocardial failure.

The solution to establish appropriate and definitive diagnosis is in the guidelines describing this situation and defining the pathology, such as aortic stenosis with low gradient and low cardiac output. Analysis of echo results after pharmacological stress is proposed for elucidative management.

Post-stress echocardiogram result:

G LV/Ao: 42 mmHg

A^2V Ao: 0.94 cm^2

EF: 36%

Transaortic flow rate: 4.29 m/cm

Increased transvalvar gradient consistent with the symptoms and clinical diagnosis of major aortic stenosis, in the presence of myocardial reserve (EF: 36%) after dobutamine.

Patient underwent successful aortic bioprosthetic surgery.

Conclusion: We realized that, following the concept of Pythagoras, we need three points to form a plan. Also, in VD investigation, we need three pieces of information to get a treatment plan.

Clinical examination is imperative for us to situate ourselves in the patient's condition. It is through conversation (anamnesis) that we come closer to the patient, who feels that he/she is before someone interested in his/her health, and it is the only way to examine their physical quality of life. Physical examination increases proximity and is a way to find out about the pathology and its repercussions on the cardiocirculatory dynamics. Echocardiogram is necessary to confirm the diagnostic impression more objectively. Faced with patients who claim to be asymptomatic, only echocardiogram measurements can show whether the adaptive capacity remains adequate for the correct management.

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