

Echocardiographic findings: Experience in 1,468 cases

Hallazgos ecocardiográficos: experiencia en 1,468 casos

Francisco Sánchez-Lezama,* Carlos Harrison-Gómez,** Adalberto Arceo-Navarro,***
Víctor Arredondo-Arzola,**** Luis Gerardo Domínguez Carrillo*****

Key words:
Echocardiographic
findings.

Palabras clave:
Hallazgos
ecocardiográficos.

* Cardiologist. Chief
of Echocardiography
Department. Hospital
Ángeles León. México.

** Cardiologist.
Professor of Medicine
School from León,
Guanajuato University.
México.

*** Interventional
Cardiologist. Cardiology
Department, Hospital
Ángeles León.
**** Cardiologist.

Cardiology Department
T21, IMSS. León,
Guanajuato. México.

***** Rehabilitation
Medicine Specialist.
Professor of Medicine
School from León,
Guanajuato University.
México.

Received:
18/05/2016
Accepted:
11/07/2016

ABSTRACT

Background: Echocardiogram is an important diagnostic tool to evaluate cardiac disease and very useful in diagnosis and management. It is important to know the spectrum of cardiac abnormalities detected by transthoracic echocardiography, the frequency of findings that may vary depending on the prevalence of the disease and type of studied population. **Objective:** To know the spectrum of findings identified in resting transthoracic echocardiography in 1,468 patients. **Material and methods:** A 3 years retrospective review of resting transthoracic echocardiograms in 1,468 patients. **Results:** The age range of the 1,468 patients was from 1 day to 94 years with mean (SD) age 51 ± 7.2 years; females 52.9% (n = 776) and males 47.1% (n = 692). One hundred thirty three patients (9.05%) had normal echocardiograms; 1,335 patients had an average of 1.8 findings/patient; 2,464 findings were classified in ten different categories: heart valves abnormalities was the most frequent alteration detected in 36.47% (n = 487); diastolic dysfunction 30.71% (n = 410); and cardiac chambers dilation 27.79% (n = 371). **Conclusions:** Clinical history and physical examination can not be substituted by an imaging test, but with the clinical data obtained, in conjunction with an echocardiographic study, gives us clues to the diagnosis and pathophysiology of heart disease essential for the proper evaluation and management.

RESUMEN

Antecedentes: La ecocardiografía es una herramienta indispensable para evaluar y manejar las enfermedades cardíacas. Es importante conocer el espectro de anomalías cardíacas detectadas por ecocardiografía transtorácica en reposo y la frecuencia de esos hallazgos, los cuales varían de acuerdo a cada enfermedad cardíaca. **Objetivo:** Reportar el espectro de hallazgos ecocardiográficos en 1,468 pacientes. **Material y métodos:** Los estudios ecocardiográficos transtorácicos en reposo realizados durante un período de 3 años. **Resultados:** Un total de 1,468 pacientes con edades comprendidas entre el primer día de vida y 94 años con edad promedio y desviación estándar de 51 ± 7.2 años; correspondiendo 52.9% (n = 776) al género femenino y 47.1% al masculino (n = 692). De los estudios, 9.05% (n = 133) fueron normales; 1,335 pacientes presentaron un promedio de 1.8 hallazgos/paciente; se detectaron 2,464 hallazgos catalogándose en 10 capítulos. Los tres hallazgos más frecuentes fueron: valvulares 36.47% (n = 487); disfunción diastólica 30.71% (n = 410); y dilatación de cámaras cardíacas 27.79% (n = 371). **Conclusiones:** Una imagen no puede sustituir a la historia clínica y a la exploración física, siendo la ecocardiografía una prolongación de esta última, permitiendo valorar la estructura y fisiología cardíaca así como sus alteraciones, por lo que actualmente es esencial su realización en la valoración cardíaca.

INTRODUCTION

Evaluation of cardiac structures and function with images and recordings produced by ultrasound is known like echocardiography (E).¹ Currently, E provides essential clinical information;² in cardiology it is the second most frequently performed diagnostic procedure.³ Echocardiographic study is becoming an exten-

sion of clinician's physical examination. The appreciation of cardiac anatomy and hemodynamics by E makes the physician's clinical evaluation more relevant to the patient care.⁴ Cardiovascular disease is the leading cause of mortality worldwide; in developing countries contributed to 80% of deaths. In both conditions E is an important evaluation tool. Habitually E is mostly restricted to cardiologists, however other specialists frequently

Table I. Echocardiographic findings by frequency in 1,335 patients.

No.	Findings	N patients 1,335	%	N 2,464 % of total findings
1	Heart valves abnormalities	487	36.47	19.76
2	Diastolic dysfunction	410	30.71	16.63
3	Cardiac chambers dilation	371	27.79	15.05
4	Pulmonary hypertension	299	22.39	12.13
5	Myocardial structural changes	284	21.27	11.52
6	Myocardial thickening disorders	245	18.35	9.94
7	Abnormal LV ejection fraction	180	13.48	7.30
8	Pericardial diseases	41	3.07	1.66
9	Congenital heart diseases	41	3.07	1.66
10	Miscellaneous	28	2.09	1.13

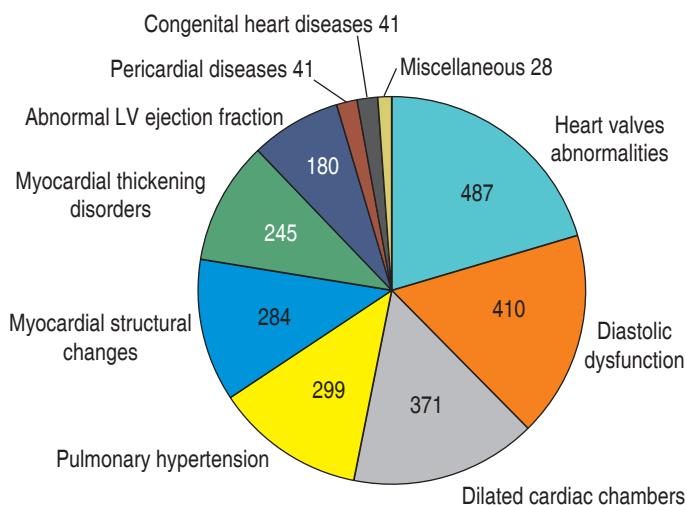


Figure 1. Echocardiographic findings in 1,335 patients.

refer patients for E evaluation. Common E findings may vary depending on cardiac diseases.⁵ It may be different in private clinic or in cardiac center in comparison to general hospital with multiple disciplines. So in this study, the aim was to find out the E profile of findings.

MATERIAL AND METHODS

A retrospective and observational study during a three year period from January 1st 2011 to December 31st 2013 was done. Studies were performed by a physician board certified in

cardiology and echocardiography. E were done using either a Philips Ecocardiograph model iE33 or a Philips Sonus echocardiograph 5500; a total of 1,468 resting transthoracic echocardiograms were done in the three year period, conventional measurements in M-mode echocardiography, two-dimensional, pulsed, continuous, color and tissue Doppler reports were performed and all were included in the study. Demographic profiles and findings were recorded. A single patient could have had more than one finding. Data analysis was done using SPSS 17, students t test was applied wherever applicable.

RESULTS

Age range of patients was from 1 day to 94 years with mean (SD) age 51 ± 7.2 years. Of the 1,468 patients, 52.9% were female (n = 776); and 47.1% were males (n = 692) ($p = 0.4$). Normal echocardiograms were found in 9.05% (n = 133), the remaining 1,335 patients had an average of 1.8 findings/patient. A Total of 2,464 findings were found and classified in ten different categories (Table I and Figure 1). As disclosed in Table I, the most frequent finding was heart valve abnormalities in 36.47% of patients (n = 487), of these, tricuspid regurgitation was the most common in 35.31% of cases (n = 172); in second place mitral valve regurgitation in 24.64% (n = 120), and finally aortic regurgitation in 11.08% (n = 54) (Table II).

Diastolic dysfunction was the second most common findings, in 410 patients (30.71%) (Table I).

Cardiac chambers dilation were identified in 371 cases (27.79%); left atrial enlargement was seen in 242 cases (65.13%) (Figure 2). Pulmonary hypertension (PH) with 299 cases (22.39%), PH mild or moderate in 249 cases (83.27%); and severe PH 50 cases (16.72%) (Table I). Structural changes of the myocardium

were present in 284 patients (21.27%), left ventricle concentric remodeling was the most common structural change found in 165 cases (58.09%) (Table III).

Cardiac muscle thickening disorders were detected in 245 patients (18.35%) and they were classified according to alterations of each coronary artery territory: left anterior descending artery 147 cases (60%), right coronary artery 70 cases (28.57%), circumflex artery 18 cases (7.34%) and global hypokinesis 10 cases (4.08%) (Table IV). Left ventricle ejection fraction (LVEF) was classified as normal when it was $\geq 55\%$ and it was found in 1,288 patients (87.73%); abnormal LVEF was in 180 patients (13.48%), including 45 cases (3.06%) who had severe LVEF $< 35\%$ (Table I). Pericardial anomalies, 41 patients (3.07%) of them, pericardial effusion was the most in 37 patients (90.24%) (Table I). Congenital heart diseases were observed in 41 patients (3.07%), atrial septal defect and ventricular septal defect were

Table II. Cardiac valves anomalies by frequency in 487 patients.

Finding	N	%
Tricuspid regurgitation	172	35.31
Mitral regurgitation	120	24.64
Aortic insufficiency	54	11.08
Aortic stenosis	45	9.24
Mitral stenosis	27	5.54
Bicuspid aortic valve	20	4.10
Aortic valve prosthesis	13	2.66
Pulmonary insufficiency	6	1.23
Mitral valve prolapsed	6	1.23
Mitral valve calcification	5	1.02
Mitral valve prosthesis	5	1.02
Pulmonary stenosis	4	0.82
Endocarditis	4	0.82
Bulging mitral valve	3	0.61
Multivalvular affection	1	0.20
Valve tumors	1	0.20
Aortic sclerosis	1	0.20
Total	487	100.00

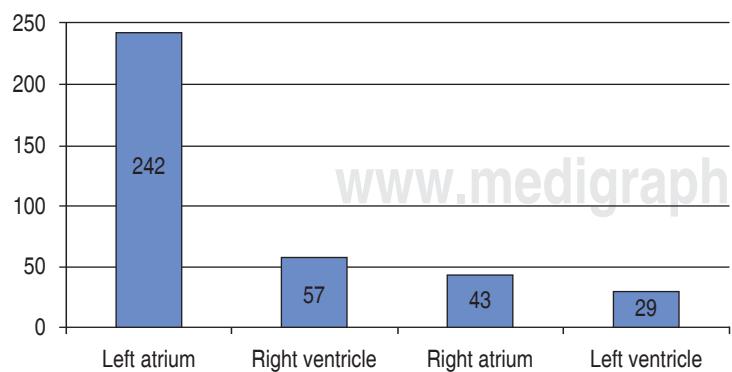


Figure 2. Dilated cardiac chambers.

Table III. Myocardial structural changes in 284 patients.

Disorder	N	%
Concentric remodeling	165	58.1
Eccentric hypertrophy	58	20.4
Isolated septal hypertrophy	33	11.6
Concentric hypertrophy	24	8.45
Right ventricular hypertrophy	3	1.05
Infiltrative cardiomyopathy	1	0.35
Total	284	100.0

Table IV. Myocardial thickening disorders according to the coronary arteries territory.

Disorder	N	%
Left anterior descending coronary artery	147	60.00
Right coronary artery	70	15.63
Circumflex artery	18	15.63
Global (3 arteries)	10	8.64
Total	245	100.0

the most common with 9 cases (21.95%) of each respectively, followed by aortic coarctation and persistent arterial duct with 6 cases of each respectively (14.63%); Fallot tetralogy, Eustachian valve and hypoplastic left heart syndrome were isolated findings (Figure 3). Tenth place corresponded to miscellaneous findings, with a total of 28 cases (2.09%) corresponding to 1.9% of all patients (Table V).

DISCUSSION

Echocardiography is the single most useful test in the diagnosis of heart failure, because structural abnormalities, valvulopathies, systolic and diastolic dysfunction, pulmonar hypertension, or a combination of these traits have to be explored and documented in order to establish the definitive diagnosis in patients with resting or/and exertional symptoms of heart failure.

It is important to demonstrate an objective evidence of structural or functional abnormalities to explain patient's symptoms of heart failure, because symptoms of heart failure are not specific and more than a third of patients with a clinical diagnosis of heart failure may not actually have it. It is also interesting to note from the SHAPE⁶ study that only 3% of more than 7,000 subjects surveyed from nine European countries recognized breathlessness, fatigue, and edema as symptoms of heart failure. Moreover, even when someone presents with typical symptoms of heart failure, a diagnostic test, most

frequently an echocardiography examination, is required to establish the underlying etiology for an optimal management strategy.

An important issue is about the four different geometric patrons of the left ventricle which have been described, and these are based on two parameters: a) the presence or absence of increased left ventricular mass (hypertrophy), and b) wall thickness/left ventricular cavity ratio (relative wall thickness). Considering these four different groups of left ventricle geometry are determined: normal geometry, concentric remodeling, concentric hypertrophy and eccentric hypertrophy.⁷

The prognostic value of the different geometric patterns is immense, but, unfortunately, this is not well recognized in daily clinical practice. This prognostic value has been mainly demonstrated in hypertensive patients, but also in other groups at high cardiovascular risk. In hypertensive patients, left ventricular hypertrophy is an index of cardiovascular complications and greater mortality than blood pressure itself.⁸ Hypertrophy in hypertensive patients entails a risk of cardiovascular events 20 times greater than when left ventricular geometry is normal.⁷

The risk of mortality or non-fatal complications increases between 2 and 4 times in the

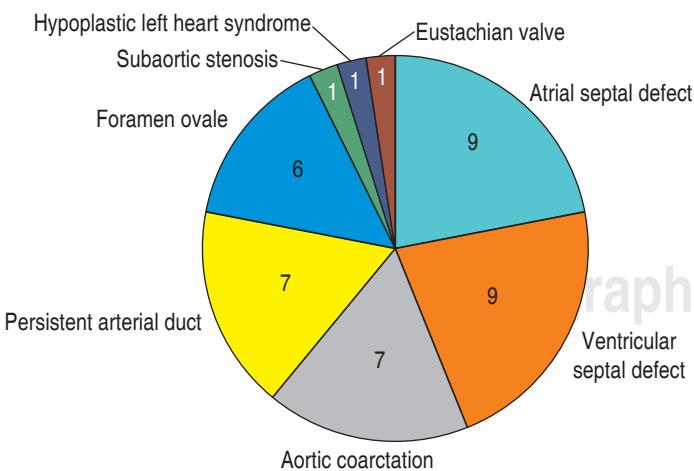


Figure 3. Congenital heart diseases.

Table V. Miscellaneous echocardiographic findings in 28 patients.

Disorder	N	%
Aortic dilation	6	21.42
Pleural effusion	3	10.71
Pulmonary artery dilation	3	10.71
Amiodarone	2	7.14
Septo apical aneurysm	2	7.14
Infra basal aneurysm	2	7.14
Coronary sinus dilation	2	7.14
Apical thrombus	2	7.14
Aortic aneurysm	2	7.14
Cava vein dilation	1	3.57
Aneurysmal enlargement of left atrium	1	3.57
Right atrial tumor	1	3.57
Left atrial tumor	1	3.57
Total	28	100.0

presence of left ventricular hypertrophy in patients with coronary disease or noncomplicated myocardial infarction. For example, Liao et al⁹ studied 1,089 patients with coronary disease who had undergone cardiac catheterization. Naturally, the factors that were significantly associated with prognosis after stepwise multiple regression analysis were ejection fraction (relative risk [RR] = 2) and the number of vessels with stenosis (RR = 1.6), but the factor that had the greatest impact was left ventricular hypertrophy (RR = 2.4).

In this study structural changes of the myocardium were present in 284 patients (21.27%), and left ventricle concentric remodeling was the most common structural change, followed by eccentric hypertrophy; concentric hypertrophy occupied the third position. Accordingly with the previously mentioned is very important to identify and recognize these morphological alterations.

It has been reported previously the frequency and severity of pulmonary arterial hypertension in a mexican population.¹⁰ In the current report the disease was found in 20.36% of all the echocardiograms performed, which confirms the importance of assessing pulmonary arterial pressure in all cases.

The two-dimensional echoscope of echocardiography was developed by Wild and Reid in 1952. In the past half century, echocardiography has become an established science with a vast literature. Current research appears in peer-reviewed journals. The ability of Doppler echocardiography to provide unique noninvasive information with minimal discomfort or risk without using contrast material or ionizing radiation, coupled with its portability, immediate availability, and repeatability, accounts for its use in virtually all categories of cardiovascular disease. However, two-dimensional Doppler echocardiography is best used after a careful history, physical examination, appropriate electrocardiogram (ECG), and chest radiograph have been obtained so that the appropriate questions can be asked. Echocardiography is a basic tool for diagnosis and follow-up of heart disease. Items of interest in reports can be categorized. In clinical practice, the findings^{11,12} are best interpreted with a view to underlying cardiac physiology and the patient

clinical status. Knowing the inherent limitations of echocardiography will help referring physicians to interpret results¹³ and to avoid misdiagnoses based on false assumptions about the procedure.¹⁴

CONCLUSIONS

One imaging test cannot substitute history taking and physical examination. In conjunction with clinical knowledge about the patient and a basic understanding of cardiac physiology, however, echocardiography study is essential for cardiovascular evaluation and follow up. Echocardiography is rapidly evolving. Future development of innovative techniques and consequent changes and improvements in the reports that referring physicians receive from E procedures are sure to come.

REFERENCES

1. Gottdiener J, Bednarz J, Devereux R, Gardin J, Klein A, Manning W et al. Recommendations for use of echocardiography in clinical trials. A report from the American Society of Echocardiography's Guidelines and Standards Committee and the Task Force on echocardiography in clinical trials. *J Am Soc Echocardiogr*. 2004; 17: 1086-1119.
2. Lang R, Bierig M, Devereux R, Flachskampf F, Foster E, Pellikka P et al. Recommendations for chamber quantification. A report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, Developed in Conjunction with the European Association of Echocardiography, a Branch of the European Society of Cardiology. *J Am Soc Echocardiogr*. 2005; 18: 1440-1463.
3. De la Cruz RA, Solorio MS, Valdespino EA, Lara OA. Hallazgos ecocardiográficos en el paciente mayor de 65 años. *Rev Mex Cardiol*. 2001; 12: 115-120.
4. Masip A, Alonso GA, Durán R, Yagüela M, Oliver Ruiz J, Padial L y cols. Guías de práctica clínica de la Sociedad Española de Cardiología en ecocardiografía. *Rev Esp Cardiol*. 2000; 53: 663-683.
5. Lodewijks-van der Bolt B, Lenderink T, Guldemond F, Nijhof J, Winkens R, Hundscheid M et al. The Dutch experience of open access echocardiography. *Neth Heart J*. 2007; 15: 342-347.
6. Coletta PA, Cleland JG, Freemantle N, Clark AL. Clinical trials update from the European Society of Cardiology Heart Failure meeting: SHAPE, BRING-UP 2 VAS, COLA II, FOSIDIAL, BETACAR, CASINO and meta-analysis of cardiac resynchronization therapy. *Euro J Heart Failure*. 2004; 6: 673-676.
7. Koren MJ, Devereaux RB, Casale PN, Savage DD, Laragh JH. Relation of ventricular mass and geometry to morbidity and mortality in uncomplicated essential hypertension. *Ann Intern Med*. 1991; 114: 345-352.

8. Koren M, Ulin RJ, Koren AT, Laragh JH, Devereaux RB. Left ventricular mass change during treatment and outcome in patients with essential hypertension. *Am J Hypertens.* 2002; 15: 1021-1028.
9. Liao Y, Cooper RS, McGee DL, Mensah GA, Ghalil JK. The relative effects of left ventricular hypertrophy, coronary artery disease, and ventricular dysfunction on survival among black adults. *JAMA.* 1995; 273: 1592-1597.
10. Sánchez LF, Harrison GC, Arceo NA, Arredondo AV, Armenta FR, Domínguez CL. Mean pulmonary pressure estimation by echocardiography: three equations comparison. *Rev Mex Cardiol.* 2015; 26: 108-112.
11. Ejim EC, Ubani-Ukoma CB, Nwaneli UC, Onwubere BJ. Common echocardiographic abnormalities in Nigerians of different age groups. *Niger J Clin Pract.* 2013; 16: 360-364.
12. Sanjaya Humagain, Ramsundar Twayana, Rajendra Koju. Echocardiographic profile of patients in Dhu-likhel Hospital, a medical College Hospital in Nepal. *Nepalese Heart Journal.* 2014; 11: 13-17.
13. De la Cruz Rivera A, Contreras K, Arbaje O, Molano V, Belén F. Hallazgos ecocardiográficos en pacientes mayores de 45 años del área de ecocardiografía del Hospital Salvador B Gautier Santo Domingo. *Rev Ciencia y Sociedad.* 2001; 28: 422-430.
14. Martínez MA, Abu AE, Raposeiras RS, Vega FJ. Protocolo de interpretación clínica de los hallazgos ecocardiográficos. *Medicine.* 2013; 11: 2479-2482.

Correspondence to:

Dr. Francisco Sánchez Lezama
Hospital Ángeles León
E-mail: sanchezlezama@angelesleon.com