

Symposium Delivers Imaging Highlights From ESC Congress/EuroEcho-Imaging 2014 Recommendations on Best Practice in CV Imaging

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Highlights from the 2014 recommendations of the European Society of Cardiology (ESC) and the European Association of Cardiovascular Imaging (EACVI) on cardiovascular (CV) imaging were reviewed by representatives in a joint session between EACVI Club 35 and ESC Cardiologists of Tomorrow. The symposium was divided into 4 sections: chamber quantification, cardiomyopathies, vascular imaging, and aortic diseases. Symposia such as these can be very useful for community cardiologists, allowing them to stay abreast of best practices emerging from clinical research in a time-efficient manner.

Denisa Muraru, MD, PhD, University of Padua, Padua, Italy, delivered a presentation on the updated recommendations on cardiac chamber quantification, documented by the American Society of Echocardiography (ASE) and the EACVI. Dr Muraru first briefly reviewed previous recommendations on chamber quantification published in 2005 and again in 2010. Addressing the issue of why an update was needed now, Dr Muraru cited new echocardiographic techniques that have entered the clinical arena since 2005, such as myocardial deformation imaging and 3D echocardiography (3DE). In addition, larger numbers, stricter criteria of normality, more evidence, and multicenter normative studies have led to the emergence of more robust data, warranting a reappraisal of existent recommendations. New guidelines were also needed in order to unify minor discrepancies in limits of normality between the 2005 edition and more recent echocardiography guidelines, said Dr Muraru.

Regarding what has been changed in the updated ASE/EACVI recommendations for chamber quantification, Dr Muraru mentioned that the majority of normal limits for conventional measures of chamber size and function have been revised, and new recommendations have been included for global longitudinal strain, 3D echo volumes, and ejection fraction for both left and right ventricles. In addition, partition values for severity have been questioned, and there have been revisions to sex and body surface area normalized cutoffs, with additional stratifications by age and race, where available. Recommendations on general measurement principles of all cardiac chambers, aorta, and inferior vena cava have been updated and illustrated by numerous figures. Finally, the recommendation to use the same normal ranges for ventricular dimensions and volumes by both transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) has been also included in the document.

In conclusion, Dr Muraru said that this extensive update on cardiac chamber quantification in adults will be published in January 2015 by the ASE and EACVI and will provide new, more reliable reference values for conventional echocardiographic measurements, as well as normative values for 3DE and myocardial deformation imaging.

A presentation on the guidelines on diagnosis and management of hypertrophic cardiomyopathy (HCM) [Elliot PM et al. *Eur Heart J*. 2014] from the ESC Task Force for the Diagnosis and Management of HCM was delivered by Ricardo Fontes-Carvalho, MD, Gaia Hospital Center, University of Porto, Porto, Portugal. The key messages from the task force for imaging cardiologists regarding HCM were to always focus on a clinically based approach, recognizing the diverse range of conditions that can cause the disease, and to take a systematic and individualized approach to diagnosis and treatment in management of left ventricular (LV) outflow tract obstruction. Exploring features of the systematic approach to echocardiography in HCM patients that was encouraged by the task force, Dr Fontes-Carvalho listed a careful examination

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of chamber walls, in particular assessing LV wall thickness, as well as looking for obstruction by including the use of provocation such as the Valsalva maneuver. The task force also emphasized the importance of involving multidisciplinary teams with HCM expertise in care of those patients and reminded echocardiographers to request and interpret genetic tests when clinically relevant. Included in the recommendations was specific advice for women with HCM regarding reproductive- and pregnancy-related issues. However, the feature of the recommendations that received the most advance coverage was the development of a new risk calculator for the prevention of sudden cardiac death in HCM.

The diagnostic criteria for adult HCM are an LV wall thickness ≥ 15 mm in ≥ 1 LV myocardial segments, as measured by echocardiography, cardiac magnetic resonance imaging, or computed tomography (CT), that cannot be explained solely by loading conditions. Genetic and nongenetic disorders can present with slightly less wall thickening (13 to 14 mm). In such a situation, diagnosis of HCM requires evaluation of family history, noncardiac signs and symptoms, electrocardiogram abnormalities, laboratory tests, and multimodal cardiac imaging. A detailed assessment of the mitral valve was also described as key, with the presence of a centrally or anteriorly directed jet of regurgitation indicating potential intrinsic valve abnormality rather than HCM-related systolic anterior motion of the mitral valve, where the jet is directed posterolaterally. Summarizing the key messages from the task force on best practices for cardiac imaging in patients with HCM, Dr Fontes-Carvalho said that multimodality imaging is essential in the evaluation of patients with HCM, and there is an increasing need to integrate cardiac imaging in the clinical context of the disease. Because the success of invasive procedures for therapy depends on detailed imaging as well as careful planning and teamwork, the importance of a systematic approach to use of cardiac imaging techniques in the evaluation and support of treatment for HCM patients was again emphasized.

In the presentation committed to recommendations for vascular imaging, Iana Simova, MD, PhD, National Cardiology Hospital, Sofia, Bulgaria, explained that there were no new ESC/EACVI guidelines for vascular imaging in 2014 but that new guidelines on best use of these useful tools for CV risk assessment could be published in 2015. The 2012 version of the European guidelines on CV disease prevention in clinical practice [Perk J et al. *Eur Heart J*. 2012] says that measurement of carotid intima-media thickness (IMT) and/or screening for atherosclerotic plaques by carotid artery scanning should be considered for CV risk assessment in asymptomatic

adults at moderate risk. Thickening of intima-media (IM) complex is a feature of arterial wall aging and is the first structural change to be detected in atherosclerosis. While IM thickening represents an important risk marker, it is not synonymous with subclinical atherosclerosis and has not been proven as a treatment target. According to the Society of Atherosclerosis Imaging and Prevention, in collaboration with the International Atherosclerosis Society [Atherosclerosis. 2011], it is appropriate to measure IMT in patients at intermediate risk for coronary artery disease (CAD), in patients with metabolic syndrome aged >30 years, and in patients with diabetes without a history of CAD.

Moving on to hypertension recommendations, Dr Simova reviewed the 2013 European Society of Hypertension/ESC guidelines for the management of arterial hypertension [*Eur Heart J*. 2013; *Hypertens*. 2013; *J Hypertens*. 2013]. Risk stratification in hypertensive patients examines asymptomatic organ (artery) damage, as indicated by pulse pressure ≥ 60 mm Hg in the elderly, carotid-femoral pulse wave velocity >10 m/s, an ankle-brachial index (ABI) <0.9 , carotid wall thickening (IMT >0.9 mm), or evidence of plaques. Plaques are defined as focal structures that either encroach ≥ 0.5 mm into the arterial lumen or to a depth of $\geq 50\%$ of the IMT value at their location or demonstrate a thickness >1.5 mm between the intima-lumen to media adventitia interfaces [Touboul PJ. *Cerebrovasc Dis*. 2012].

ESC guidelines on the diagnosis and treatment of peripheral artery diseases [*Eur Heart J*. 2011] are focused on measurement of the ABI as a first-line, noninvasive test for screening and diagnosis of lower extremity arterial disease. This test has some limitations, as in the case of noncompressible ankle arteries or ABI >1.40 . In such situations, alternative methods should be used, such as the toe-brachial index, Doppler waveform analysis, or pulse volume recording.

In the final portion of the symposium, Rafael Vidal-Perez, Hospital Universitario Lucus Augusti, Lugo, Spain, covered the 2014 ESC guidelines on the diagnosis and treatment of aortic diseases, a document drafted by a task force of >20 top European cardiologists [*Eur Heart J*. 2014]. According to Dr Vidal-Perez, their recommendations constitute “10 commandments” for the treatment of acute and chronic disease of the adult thoracic and abdominal aorta. As such, it is the first-ever guideline on aortic diseases to consider the thoracic and abdominal aorta as a single organ, and it includes recommendation on the treatment of not only aortic syndromes but also aortic aneurysms, aortic tumors, aortic inflammation, and both genetic and congenital diseases. Highlights include recommendation of an additional 2-minute scan



Table 1. Comparison of Methods for Imaging the Aorta

Advantages/Disadvantages	TTE	TOE	CT ^a	MRI ^a	Aortography
Ease of use	+++	++	+++	++	+
Diagnostic reliability	+	+++	+++	+++	++
Bedside/interventional use ^b	++	++	-	-	++
Serial examinations	++	+	++ (+) ^c	+++	-
Aortic wall visualization ^a	+	+++	+++	+++	-
Cost	-	-	--	---	---
Radiation	0	0	---	-	--
Nephrotoxicity	0	0	---	--	---

For workup, usually >1 technique is used.

+, a positive remark; CT, computed tomography; MRI, magnetic resonance imaging; TOE, transesophageal echocardiography; TTE, transthoracic echocardiography; -, a negative remark (the number of signs indicates the estimated potential value).

^aPositron emission tomography can be used to visualize suspected aortic inflammatory disease.

^bIntravascular ultrasound can be used to guide interventions.

^c+++ only for follow-up after aortic stenting (metallic struts); otherwise, limit radiation

Adapted from Erbel R et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). *Eur Heart J*. 2014; 35:2873-2926. By permission of the European Society of Cardiology.

of the abdominal aorta for all elderly patients undergoing TTE to screen for abdominal aortic aneurysm. A comprehensive list of standard values was supplied for all imaging techniques, as well as a flowchart designed for emergency room use to increase speed and efficiency of decision making in treatment of acute aortic syndromes, where survival can depend on quick and correct decision making.

Dr Vidal-Perez described the aorta as the ultimate conduit, one that carries nearly 200 million L of blood during an average lifetime. Aortic diameters in healthy adults usually do not exceed 40 mm and can be influenced by sex, body size, and blood pressure. Age also affects size, with an expansion in aortic diameter of about 0.9 mm per decade in men and 0.7 mm per decade in women. Imaging workups for aortic diseases usually involve > 1 technique. The ESC guidelines also provide a comparison of methods used in aortic imaging, including TTE, TEE, CT, magnetic resonance imaging, and aortography (Table 1). These were ranked by ease of use, cost, diagnostic reliability, bedside interventional use, serial examinations, aortic wall visualization, radiation, and nephrotoxicity.

In conclusion, Dr Vidal-Perez said that further studies are needed to determine what combinations of imaging modalities can provide the most accurate, reproducible, and predictive measurements of the aorta. Growing use of 3D imaging and other dynamic imaging methods for the prediction of complications in aneurysmal disease mandates that the superiority of these new techniques over traditional 2D size measurement be tested.

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