GUIDELINES

Definition of the quality of transthoracic echocardiography in 2011. Echocardiography Branch of the French Society of Cardiology

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Background

Echocardiography is the most frequently used, noninvasive imaging technique in cardiology. The clinical utility of echocardiography is largely validated and it has benefited in recent years from numerous developments associated with technological progress and widespread usage. Among these advancements, we can cite, on the technological level: improvement of image quality with the generalization of harmonic imagery; the appearance of new quantification tools (tissue Doppler imaging, analysis of deformations); the development of stress echocardiography (effort-induced or dobutamine-induced); three-dimensional imagery; digital archiving; and a growing miniaturization (with the development of mobile echocardiography and laptops equipped with all the technology available on conventional ultrasound machines [electrocardiogram, two-dimensional imagery, M mode, Doppler, tissue Doppler imaging, transoesophageal echocardiography]). In terms of widespread usage, we can cite an important diffusion of echocardiography techniques to the sick bed, resuscitation, paediatrics, the emergency room, catheterization procedures and surgery, facilitated in all cases by miniaturization.
Parallel to these developments, it is necessary to underline the important efforts made in training for the practice of echocardiography (the establishment of an Inter-University Diploma, continuing education), which have contributed to making this examination an essential diagnostic tool in many areas of cardiology.

Nevertheless, we must remain vigilant that this easy access to echocardiography is not accompanied by loss in quality caused by a less rigorous use of the technique. On another level, the recent appearance of ultraportable ultrasound machines, which do not have all the functionality of conventional ultrasound machines, raises questions about the limitations of the transthoracic echocardiography examination. For these reasons, it is now crucial to clearly differentiate the complete, high-quality transthoracic echocardiography examination (that is equally eligible for reimbursement) from the fast or incomplete ‘echoscope’ ultrasound examination. In addition, specific and appropriate training in echocardiography remains indispensable.

**Objective of this document**

The Echocardiography Branch of the French Society of Cardiology aims to use this document to ‘redefine’ what comprises a complete, high-quality transthoracic echocardiography examination in 2011.

Supporting the quality of echocardiography is a constant and primary undertaking of the Echocardiography Branch. Since 1994, recommendations concerning the training of echocardiographers and the implementation of echocardiography examinations have been published by the Echocardiography Branch [1]. These concerns are shared by the European Association of Echocardiography, which also recently published recommendations on training, competence and improving the quality of echocardiography [2—11].

The objective of this document is not to translate or recapture these European recommendations or redefine the indications for echocardiography, specified in the recommendations of the Echocardiography Branch in 2003, updated in 2008 [2,5] and again more recently in a document by the Haute Autorité de santé (HAS) [12]. Rather, the goal of our document is to specify which elements are indispensable for the completion of a high-quality transthoracic echocardiography examination, with the objective of maintaining the privileged place that this imagery technique occupies in the diagnosis, treatment and follow-up of numerous pathologies in daily practice.

**Echocardiography Branch recommendations for good practice**

The practitioner who conducts and interprets an echocardiography examination is required to justify its use, and the diagnostic and therapeutic consequences that follow. As indicated in the HAS document, the doctor must be able to give a pertinent result for any given application or pathology.

Echocardiography is a test that is often prescribed because it directly addresses a clinical objective. The use of medical-technical tests can in no case be disassociated from the clinical context. The interpretation of the test must always integrate the pathological context and the way in which the test was conducted.

A complete echocardiography examination follows a systematic procedure of analysis and must integrate all of the variables analysed; it must also be accompanied by a structured report and a conclusion.

**Echocardiography Branch recommendations for conducting a high-quality echocardiography examination**

**Technical aspects**

The echocardiography machine used must be of good quality and should not have been in service for more than 7 years. There is an imperative need for quality verification of the transducers used and the machine settings [6]. The machine must be equipped with harmonic imaging, pulsed colour and continuous Doppler imaging. An electrocardiogram tracer is indispensable. The digital backup of images and tracings from the echocardiography examination, which most recent machines have the facility to do, is recommended.

**Practical aspects [8]**

The following measures are recommended for the practical achievement of the echocardiography examination: identification of the patient on the machine records for each examination, including first and last name, date of birth, sex, identification number (if possible), and weight and height (important for normalization by body surface area of a number of measures); recording of a trace electrocardiogram, permitting integration of the electrical information, location within the cardiac cycle and storage of digital tracings; and recording and digital storage of images or tracings that will permit review of the examination and repetition of the measures.

The echocardiography examination must include, at a minimum: two-dimensional images obtained in parasternal intersections (long and short axes) and apical (four-, three- and two-chamber) and subcostal aspects; flow recording in colour Doppler on each of the valves, repeating measures, as necessary, to permit the quantification of regurgitation; an analysis of pulsed flow and power Doppler at the level of the values of the left and right heart; and tissue Doppler imaging analysis pulsed on the mitral valve, septal and lateral edge, and, ideally, on the tricuspid valve (equally recommended), which is available on most of the recent ultrasound machines.

**The report**

A structured report must accompany each echocardiography examination and must be returned to the patient. It
should include, at a minimum, the following information: the patient’s first and last name, date of birth, sex, weight and height; name and qualifications of the operator; reference number of the echo-machine and probe, as well as the date of commissioning; the indication for the examination and the clinical context; the location where the examination took place; and the quality of the examination (conducted with difficulty, at the bedside, etc.).

The following measurements should be included in the report: left ventricle (dimensions, diameters, parietal thickness, volume of the left cavities and estimation of left ventricular ejection fraction, specifying the method used [preferably the Simpson biplane method] [4]; analysis of the kinetic segments and specification of the segmentation used); peaks of velocity and flow integrals of the Doppler flow, and aortic, subaortic mitral and tricuspid valves; peaks of velocity in the tissue Doppler imaging of the mitral valve; derived variables for the study of diastolic function [7]; variables of quantification of valvular pathologies (gradients, surfaces, quantification of regurgitation); diameters of the left ventricular outflow tract and of the ascending aorta (sinus of Valsalva, sinotubular junction, ascending aorta); diameter of the inferior vena cava and respiratory variations; and description of the pericardium.

Of course, the information collected during the examination and its interpretation must take into consideration the reason for the examination, in addition to the measures cited above.

To summarize, the reporting of the echocardiography examination must comprise a summary of the examination, specifying the eventual developments compared with previous examinations, and must conclude with a clinical interpretation that is given to the corresponding doctor. The examination report must be returned to the patient and mailed to the corresponding doctor. Ideally, the iconographic documents will be conserved in digital format for comparison and subsequent review.

Specific problems associated with ultraportable miniature ultrasound machines

Very recently, ultraportable miniature ultrasound machines have appeared on the market. Clearly different from portable ultrasound machines, they offer only some of the modalities of echocardiography. These new tools, which almost fit into a pocket, permit a two-dimensional image of good quality, similar to a colour Doppler image, but only provide limited qualitative information in terms of the criteria for a complete echocardiography examination defined in these recommendations. The precise place for these new machines remains to be established.

Conclusion

A high-quality echocardiography examination in 2011 requires: high-quality echocardiographic imaging; a complete and structured examination that includes two-dimensional imagery analysis, analysis via spectral, pulsed wave and continuous wave, colour flow Doppler and tissue Doppler imagery, if possible; systematic coupling to the electrocardiogram; and a detailed and structured report, with a clinical interpretation by the practitioner responsible that takes into consideration the clinical context and is cautious of peremptory conclusions.

Disclosure of interest

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References