Reviewer's report

Title: Real Time 3D echocardiography (RT3D) for assessment of ventricular and vascular function in hypertensive and heart failure patients.

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Reviewer: Denisa Muraru

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General comments:
Scali et al studied with 2D and 3D echocardiography a total of 136 subjects (3 groups: normal; hypertensive heart disease with preserved ejection fraction; and systolic heart failure), aiming to assess the feasibility of 3D method for calculating several indexes of left ventricular (LV) and vascular function. In all 3 groups, the Authors tested these functional parameters (calculated using 3D volumes and stroke-volume) and confirmed the expected significant differences among groups by this novel approach. The idea of taking advantage of the superiority of 3D over 2D echocardiography in assessing LV volumes to derive more accurate noninvasive estimates of cardiac-vascular function is particularly attractive and in line with very recent research efforts (Gayat E et al. Am J Physiol Heart Circ Physiol 2011; Gayat E J Am Soc Echocardiogr 2012). However, there are several issues to be addressed:

Major Compulsory Revisions

1. Since 3D does not seem to decrease the time required to obtain the same quantitative data and had lower feasibility (95%) in comparison with 2D echo (100%), more support from this study should be provided to the statements advocating for the use of 3D instead of conventional 2D method. It is unclear why the Authors performed the complete 2D echo study (apart to measure the time consumed) and then did not use also 2D ESV and stroke-volume to explore how 3D indexes relate to the 2D ones (since 2D ESVi in the noninvasive estimation of LV contractility was previously documented as clinically useful by the same group).

2. Although 3D was extensively validated, it also significantly underestimates LV volumes, albeit less than 2D method; its ability to provide reliable noninvasive measures of stroke-volumes and ventricular/vascular functional parameters represents only an inference and was not actually verified yet. To my knowledge, there is a single study that validated 3D echocardiography for measuring LV stroke-volume against catheterization and only in patients with aortic stenosis, a study which is relevant to be cited in this manuscript (Gutierrez-Chico JL Eur Heart J 2008).

Study population

1. Presumably, all subjects were in sinus rhythm; this should be included in the
enrolment criteria.

2. Definition of study groups could be further improved:
- normal subjects: BP (why diastolic BP was not considered among the diagnostic criteria?); presence of risk factors that impact on arterial function (smoking, diabetes)
- arterial hypertension: definition and citation
- heart failure: clinical criteria and/or citation

3. In Table 1, indexed LV volumes are too large for the normal and hypertensive groups, unless they were not actually indexed. Please specify also whether these pertain to 2D or 3D echo, and include the indexed stroke-volumes and HR as well.

Methods
1. 3D echo, as applied in this study, is not actually a real-time method (i.e. single-beat) since several consecutive cycles are stitched together; additional technical details are needed: number of stitched cycles to obtain LV full-volume and mean temporal resolution in the study. This is particularly relevant, since low temporal resolution (as in single-beat full-volume acquisition) may adversely impact on the accuracy of ESV, EF and stroke volume measurement (Lang R et al. Eur Heart J Cardiovasc Imaging 2012).

2. Since small variations in both BP and HR (not rare in clinical settings) may significantly impact on calculations of hemodynamic parameters, the moment when these were collected should be specified.

Minor Essential Revisions
1. There are few typos to be corrected in the manuscript
2. In the Introduction section, LV should be spelled out the first time being used.
3. The term “technically good 2D echo study” as enrolment criteria may be confusing. I suggest to use “good 2D acoustic window” instead.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests