Author's response to reviews

Title: The limited usefulness of real-time 3-dimensional echocardiography in obtaining normal reference ranges for right ventricular volumes

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Author's response to reviews: see over
Dear Sir,

Attached you find our revised manuscript entitled: The limited usefulness of real-time 3-dimensional echocardiography in obtaining normal reference ranges for right ventricular volumes

Following you find our response to the reviewers’ comments.

Reviewer 1:
1. “2D has major limitations for the assessment of RV function and volumes.” Please address.
   We agree that 2D echo has major limitations in this setting. Therefore, we did not include 2D-derived volumes in the study. As a comparator for the reproducibility of RT3DE volumes we included 2D-derived areas and area fraction. According to guidelines (reference 5 in the manuscript) RV areas and area fraction are the recommended method using 2D technology in assessing the right ventricle. This has already been addressed under “Background”.

2. “In line with the previous comment, it does not appear appropriate to compare 2D with 3D without a gold standard such as CMR. Please address.”
   We have not compared 2D and 3D volumes. As stated in the introduction and with reference to older 2D studies it is apparent that RV volumes derived from single plane apical view only reflect RV inflow. Therefore, we did not include RV volumes measured with 2DE, only areas. We agree that inclusion of CMR as a reference would have been optimal, but due to capacity problems in the MR-lab, this was impossible. This has been included at the end of “Study limitations”.

3. “3D was performed by one observer due to his expertise, therefore providing only the intraobserver variability. It would be important to know the inter-observer variability because this is a major flaw of the study design.”
   Since only one operator performed these examinations, the interobserver variability for RT3DE cannot be provided. We agree that this would have strengthened the study, and have commented on this under “Study limitations”.

4. “No Bland-Altman analysis has been performed. Please provide.”
   In the presentation of our reproducibility data we found it most appropriate to use CVs. To include Bland-Altman analyses several figures must be presented. This would expand the manuscript considerably. If the editorial board prefers such an alternative, we are willing to do it. Otherwise we have not aimed to compare RV areas measured by 2DE with RV volumes measured with RT3DE. Therefore, Bland-Altman analyses were not included for such a procedure.
5. “Several studies are raising limitations of volume measurements with RT3D when compared with CMR. Please discuss and extend the discussion also to RV.”
   It seems obvious that “our” methodology using online analyses significantly underestimate RV volumes. Interestingly, off-line analyses with dedicated software (e.g. Tomtec®) seem do this less so. We have commented on this under “Discussion” and included two references (10 and 11).

6. “Clinical and practical implications of the present results should be stated more clearly. Which is the clinical indication for RT3D, in which patients etc.”
   Due to this comment, we have included a para entitled “Clinical implementations” in the end of ”Discussion”.

7. “Please upload clips of sample cases (there is no space limit)”
   We are aware of this possibility, but are unfortunately unable to provide movie clips for the RT3DE exams.

Reviewer 2:
1. “The results would be more interesting if the authors will display the ranges for the right ventricle (RV) function and volumes obtained by RT3DE and for the RV areas and area fraction by 2D echocardiography in different age groups; please, use the same categories you presented in Table 1 (29-39 years, 40-49 years, 50-59 years and 60-80 years)”
   RV volumes and areas according to age group have been implemented in table 2 and 3.

2. “In Table 2 and Table 3- please change the symbol “-” with the symbol “±””
   Table 2 and 3 have been changed not to show the normal range, rather mean ± standard deviation as suggested by this reviewer.

3. “Please note that if you wish the journal allows to publish movies”
   See point “7” above.

With these amendments according to the remarks put forward by the reviewers, we hope that this manuscript now is suitable for publication in Cardiovascular Ultrasound.

Toensberg, 29 June 2009

Sincerely yours,

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