



Article in Press

Intervendor Consistency and Accuracy of Left Ventricular Volume Measurements Using Three-Dimensional Echocardiography

[Denisa Muraru](#), MD, PhD, [Antonella Cecchetto](#), MD, [Umberto Cucchini](#), MD, PhD, [Xiao Zhou](#), MD, [Roberto M. Lang](#), MD, [Gabriella Romeo](#), MD, [Mani Vannan](#), MD, [Sorina Mihaila](#), MD, PhD, [Marcelo Haertel Miglioranza](#), MD, [Sabino Iliceto](#), MD, [Luigi P. Badano](#), MD, PhD  



PlumX Metrics

DOI: <http://dx.doi.org/10.1016/j.echo.2017.10.010>
 Article Info

Abstract **Full Text** Images References

Highlights

- Semiautomated LV endocardial delineation provided close 3DE and CMR LV volumes.
- LV volumes measured with the three 3DE systems tested in this study were similar.
- Semiautomated algorithms provided larger LV volumes than the fully automated ones.
Fully automated methods were faster and more reproducible in measuring LV volumes.

Background

Intervendor consistency of left ventricular (LV) volume measurements using three-dimensional transthoracic echocardiography (3DTTE) has never been reported. Accordingly, we designed a prospective study to (1) compare head-to-head the accuracy of three three-dimensional echocardiography (3DE) systems in measuring LV volumes and ejection fraction (EF) against cardiac magnetic resonance (CMR); (2) assess the intervendor variability of LV volumes and EF; and (3) compare the accuracy of fully automated versus semiautomated (i.e., manually corrected) methods of LV endocardial delineation against CMR.

Methods

We studied 92 patients (64% males, 52 years [95% CI, 20-83]) with a wide range of end-diastolic volumes (from 87 to 446 mL) and EFs (from 16% to 77%) using three different 3DE platforms (iE33; Vivid E9; Acuson SC2000) during the same echo study. CMR was performed within 3 ± 5 hours from the 3DE study in 35 patients.

Results

LV volumes provided by the three 3DE systems correlated with CMR volumes: end-diastolic volume (iE33: $R^2 = 0.93$; E9: $R^2 = 0.94$; SC2000: $R^2 = 0.94$), end-systolic volume (iE33: $R^2 = 0.93$; E9: $R^2 = 0.95$; SC2000: $R^2 = 0.94$), and EF (iE33: $R^2 = 0.79$; E9: $R^2 = 0.80$; SC2000: $R^2 = 0.77$). In the 92 patients studied, LV volumes and EFs measured with the three systems were similar. Use of fully automated endocardial border detection algorithms significantly underestimated LV volumes, and the degree of underestimation was higher with larger LV volumes.

Conclusions

LV volumes and EFs measured with the three 3DE systems are consistent. Fully automated algorithms underestimated LV volumes. Our findings may help in the clinical interpretation of LV parameters obtained using different 3DE systems and encourage the clinical use of 3DTTE.

Keywords:

[Three-dimensional echocardiography](#), [Reproducibility](#), [Left ventricle](#), [Volumes](#), [Ejection fraction](#), [Cardiac magnetic resonance](#), [Fully automated](#), [Repeatability](#)

