

Multimodality assessment of left ventricular mass in patients with congenital heart disease: What are the differences?

*Michel M., Shabanah W., Körperich H., Kelter-Klöpping A., Laser K.T.
Heart and Diabetes Center North Rhine-Westphalia, Bad Oeynhausen, Germany*

Aims: Non-invasive assessment of left ventricular (LV) mass is important in the evaluation of patients with congenital heart disease. This study was designed to test the accuracy and reproducibility of real-time 3-dimensional echocardiography (RT3DE) in measuring LV mass as compared with the current gold standard of cardiac magnetic resonance imaging (MRI).

Methods: Subjects consecutively underwent RT3DE using a commercially available Toshiba Artida (SSH-880.CV) and MRI on a Philips 3.0T TX Achieva (R3.2) MRI scanner. RT3DE and MRI LV mass assessment was performed with two different analytical 4D-LV-analysis software packages each (RT3DE: Tomtec/Toshiba, MRI: Philips IntelliSpace Portal, Release v7.0.1/homemade HDZ MR-Tools software package).

Results: 20 patients (mean age \pm SD = 17.4 \pm 15.0yrs, range=0.1 to 72.9yrs) and 20 controls (13.0 \pm 3.3yrs, 7.1 to 19.4yrs) were included. Mean RT3DE derived LV mass was 98.2 \pm 38.3 g (Tomtec) and 94.7 \pm 38.4 g (Toshiba), respectively. Mean MRI derived LV mass was 89.1 \pm 38.0 g (Philips) and 90.7 \pm 39.9 g (HDZ), respectively. MRI derived LV mass was not significantly different (MRI Philips vs. MRI HDZ p=0.23, Student's t-test). RT3DE derived LV mass was significantly overestimated compared with MRI derived LV mass (RT3DE Tomtec vs. MRI Philips p=0.000, RT3DE Tomtec vs. MRI HDZ p=0.000, RT3DE Toshiba vs. MRI Philips p=0.001, RT3DE Toshiba vs. MRI HDZ p=0.007), and RT3DE derived LV mass (Toshiba) was significantly overestimated compared with RT3DE derived LV mass (Tomtec) (p=0.009). LV mass assessment applying RT3DE and MRI was accurate and reproducible (intra-class correlation coefficients >0.96), Bland-Altman analysis demonstrated most narrow limits of agreement for intraobserver and interobserver variability for MRI HDZ (MRI HDZ intraobserver: mean difference was 1.8%, 2SD limits of agreement (LOA) 12.5% to -8.8%; MRI HDZ interobserver: mean difference 9.7%, 2SD LOA 28.9% to -9.4%) and for RT3DE Tomtec (RT3DE Tomtec intraobserver: mean difference -0.8%, 2SD LOA 10.1% to -11.7%; RT3DE Tomtec interobserver: mean difference 5.6%, 2SD LOA 18.1% to -6.9%).

Conclusion: Although sophisticated RT3DE analysis software was used with satisfactory results, it cannot completely compensate for minor contrast which complicates border detection and leads to overestimation of LV mass. Old established hardware should be further improved in order to generate more competitive data compared to MRI.