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Meeting abstract

1083 Reproducibility of right atrial volume and ejection fraction in healthy subjects and patients with right heart failure using the standard short axis and area-length method

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Background

Measurements of atrial volumes and ejection fraction (EF) are superior to diameters for both accurate determination of the atrial size and follow up studies. Changes of right atrial volume and EF might have a prognostic impact in patients with right heart failure. We therefore sought to evaluate the reproducibility of right atrial volumes and EF in healthy subjects and patients using the standard short axis method (SA) and the rapid area-length method (ALM).

Methods

Right atrial volumes (maximum and minimum) and EF were measured in 10 healthy subjects and 10 patients with right heart failure using SA and ALM. Images were acquired with a steady state free precession gradient-echo sequence on a clinical 1.5 Tesla magnetic resonance scanner (Siemens, Erlangen, Germany). For SA, volumes were determined by the sum the outlined areas. EF was calculated as follows: EF = (EDV-ESV)/EDV × 100. For AML, the right atrial area and length were measured from the horizontal long axis view. Minimum and maximum volumes were calculated as follows: $8 \times (\text{Area})^2/3\pi \times \text{Length}$, EF (%) = (Maximum volume - Minimum volume)/Maximum volume × 100. All patients were examined twice (scan 1 and 2). Both scans were performed at the same day.

Results

For SA, maximum volumes, minimum volumes and EF for healthy subjects were 95.4 ± 19.9 mL, 47.9 ± 8.9 mL, 49.0 ± 8.1% in scan 1 and 95.8 ± 17.5 mL, 49.5 ± 11.2 mL, 48.1 ± 8.8% in scan 2 (p = 0.285). SA-volumes and EF for patients in scan 1 and 2 were 145.2 ± 28.2 mL, 106.9 ± 25.9 mL, 26.5 ± 9.7% and 146.3 ± 26.3 mL, 109.9 ± 23.9 mL, 24.9 ± 9.8%, respectively (p = 0.139). SA-interstudy variability was -0.3 ± 7.9 mL, -1.6 ± 4.9 mL and 0.9 ± 3.5% for healthy subjects (Figure 1A) and -1.1 ± 6.8 mL, -3.0 ± 5.2 mL and 1.7 ± 2.7% for patients, respectively (Figure 1B).

For ALM, maximum volumes, minimum volumes and EF for healthy subjects were 89.3 ± 19.4 mL, 43.7 ± 8.0 mL, 50.1 ± 8.3% for scan 1 and 81.7 ± 15.8 mL, 38.7 ± 7.5 mL, 51.8 ± 10.3% for scan 2 (p = 0.114). ALM-volumes and EF for patients in scan 1 and 2 were 139.9 ± 28.3 mL, 103.7 ± 26.9 mL, 26.5 ± 10.3% and 141.2 ± 28.2 mL, 104.9 ± 28.0 mL, 26.1 ± 10.1%, respectively (p = 0.575). ALM-interstudy variability for healthy subjects was 7.6 ± 12.3 mL, 5.0 ± 8.1 mL and -1.7 ± 3.1% (Figure 1C) and for patients -1.3 ± 22.7 mL, -1.7 ± 20.7 mL and 0.4 ± 3.9%, respectively (Figure 1D). Volume and EF differences for healthy subjects between scan 1 and 2 were smaller for SA compared to ALM (Table 1).

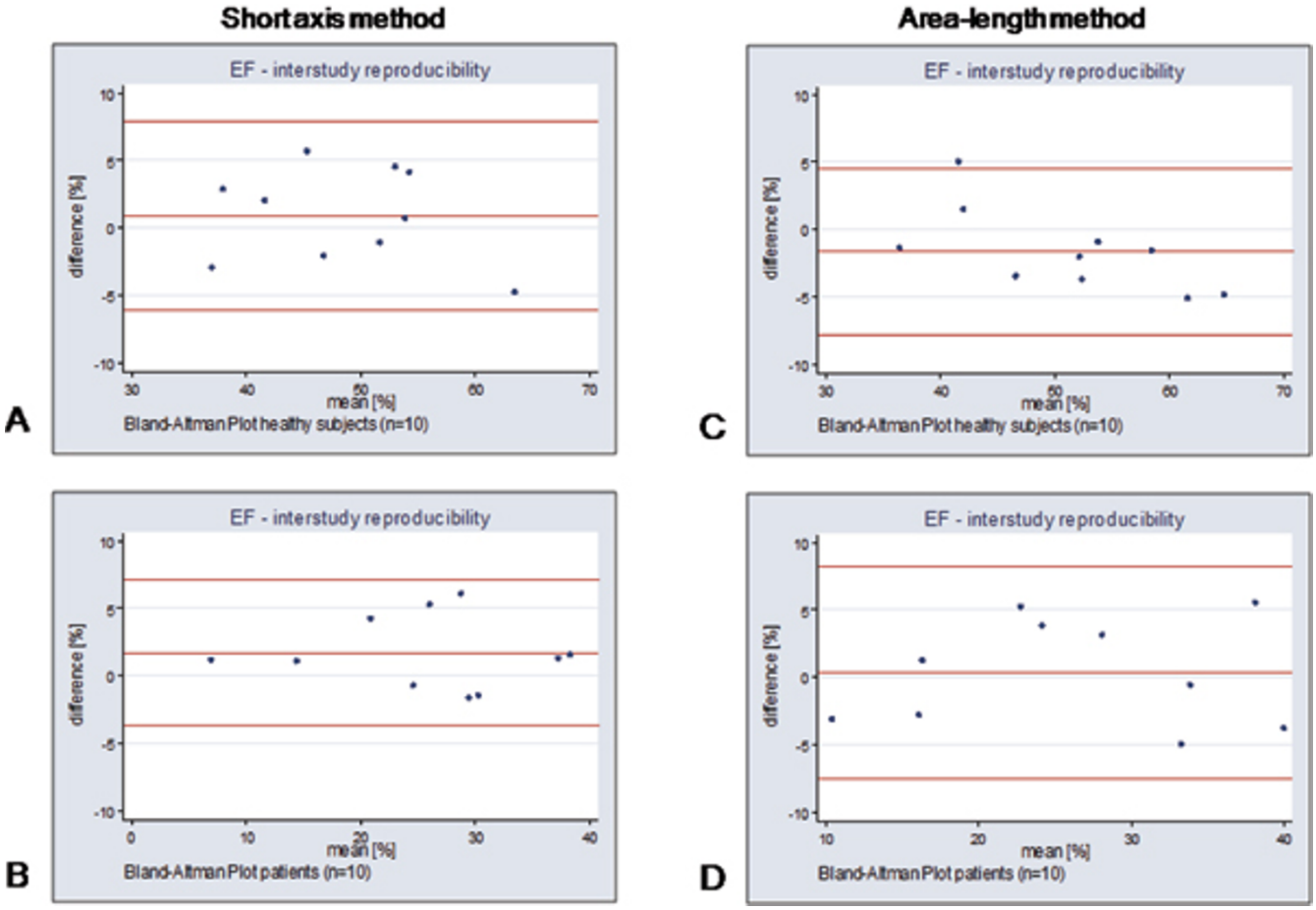

Figure 1
The standard short axis method provides reproducible measurements for right atrial volumes and EF. Reproducibility for ALM is moderately lower, but still reasonable. For most accurate reproducibility assessment the standard short axis method should be preferred.

Conclusion

The standard short axis method provides reproducible measurements for right atrial volumes and EF. Reproducibility for ALM is moderately lower, but still reasonable. For most accurate reproducibility assessment the standard short axis method should be preferred.

Table 1: Absolute values of difference between Scan 1 and 2

Healthy subjects	area length		SA		p-value*
	mean	sd	mean	sd	
maximum volume [ml]	9.6	4.1	5.6	1.8	0.023
minimum volume [ml]	6.0	3.1	3.5	1.2	0.082
patients	**Patients**		SA		p-value*
	mean	sd	mean	sd	
maximum volume [ml]	14.1	4.6	6.1	1.0	0.000
minimum volume [ml]	7.9	3.5	3.9	1.2	0.013
EF [%]	2.7	1.6	0.9	0.4	0.010
maximum volume [ml]	14.1	4.6	6.1	1.0	0.000

*p-value Mann-Whitney two-sample statistic.