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Meeting abstract

2056 Quantitative magnetic resonance first-pass perfusion analysis in hypertrophic cardiomyopathy. Intrastudy variability

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Aims

Microvascular perfusion abnormalities in hypertrophic cardiomyopathy (HCM) are important markers of prognosis and may act as a trigger for arrhythmic events. Magnetic resonance first pass perfusion is a validated non-invasive imaging tool for the assessment of microvascular dysfunction by the quantification of myocardial perfusion reserve indices (MPRI). There are limited data available for the intrastudy and interstudy reproducibility of quantification using commercially available software. We sought to determine the intrastudy variability for MPRI in patients with HCM.

Methods

We performed adenosine first-pass stress and rest perfusion on 26 patients with HCM on a 1.5 T Siemens Avanto scanner at our institution. A 3 slice hybrid-EPI sequence was used (TR 5.8 ms, 30°, ETL 4, 1860 Hz/pixel,2.8 × 2.8 × 8 mm voxels over typically 360 × 270 mm FOV (adapted per patient) at TI = 110–140 ms after BIR-4 saturation for each of the 3 fat-suppressed slices per cycle, using TSENSE (R2, coil profiles average 8)). Gadolinium dose used for first-pass was 0.1 mmol/kg injected as a bolus at 7 mL/sec followed by a 15 mL saline flush through a power injector. In the 1st 50 ms of the perfusion scan, a low resolution FLASH image was acquired to determine the blood signal (arterial input function) in order to determine the MPRI. A single observer, blinded to patient clinical data, analyzed each perfusion study at two separate time points to reduce bias. For perfusion analysis, the epi and endocardium was manually delineated and the myocardium was divided into 16 segments according to the ACC/AHA model. Each segment was subdivided into endocardial and epicardial segments and MPRI were calculated using customized software (CMRTools, Cardiovascular Imaging Solutions, London, UK).

Results

Coefficients of variation were calculated as the standard deviation of the differences between the two measurements divided by the mean value, and comparison of values was calculated using a Bland-Altman plot (Figure 1). In total, 825 segments were compared for agreement and sub analysis was performed to determine if greater intrastudy variability occurred in different segments. In general there was a good agreement between all segments between analysis dates, with a coefficient of variability of 34% for all segments. There was no significant difference in agreement on a segment by segment basis. Agreement was greater for MPRI values which are considered abnormal (<2.5) and this may be relevant for analysis of abnormal perfusion studies. See table in Figure 2.

Conclusion

Microvascular perfusion abnormalities are common in HCM and may represent a novel therapeutic target. The spatial resolution on CMR perfusion is such that changes in perfusion values over time or in response to therapies

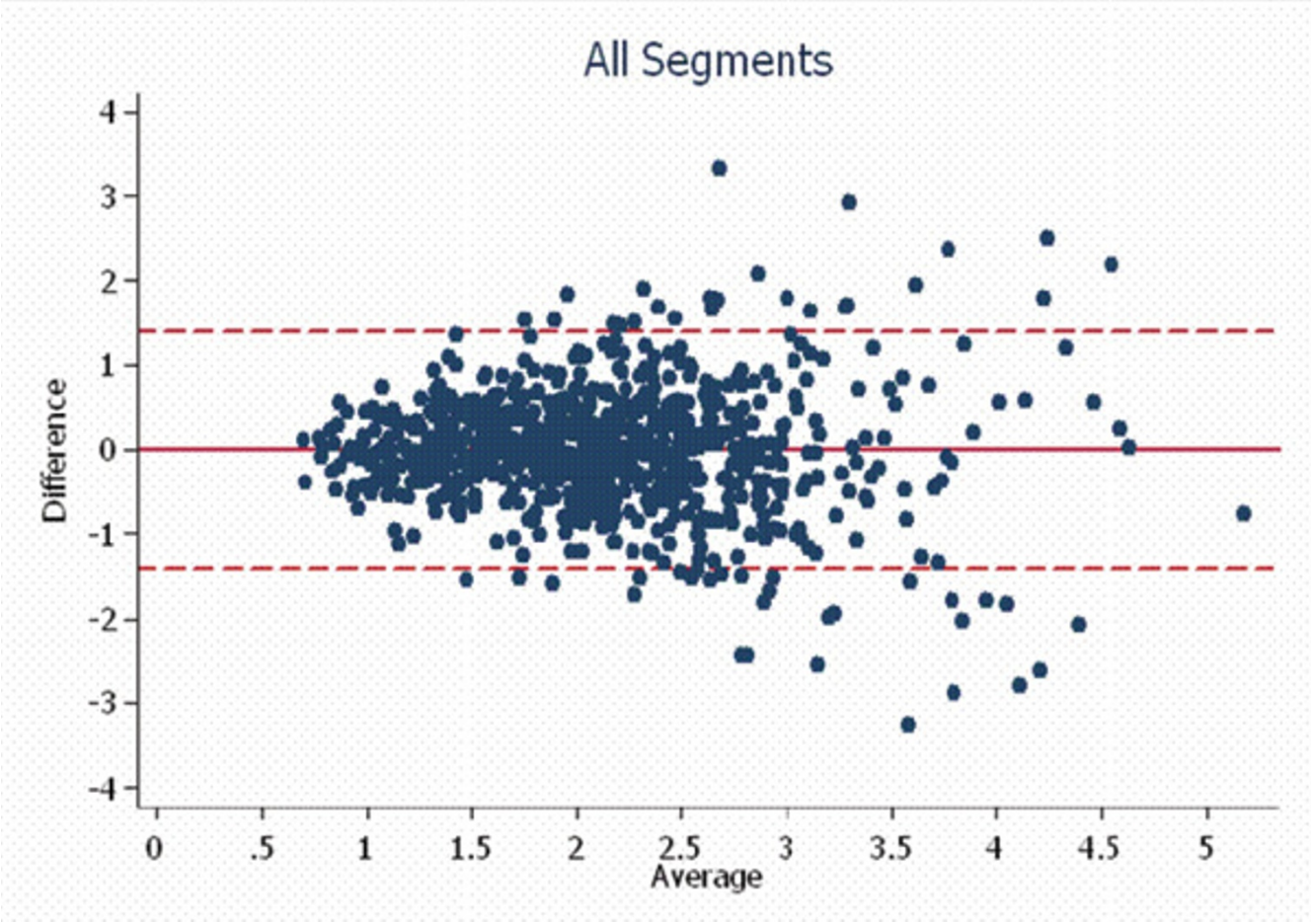

Figure 1
Bland Altman plot of intrastudy agreement in MPRI analysis for 825 myocardial segments in hypertrophic cardiomyopathy.

may be reliably and reproducibly quantified. In order to power any study assessing changes in MPRI over time, it is important to know the intrastudy and interstudy variability of the technique. We have determined the intrastudy variability for myocardial perfusion reserve index analysis patients with HCM undergoing adenosine stress MR perfusion, which an important step in potentially following values over time.

Area	Mean Difference	SD of Difference	95% LoA		CoV
Endo Anterior	0.04	0.63	-1.20	1.28	32%
Endo Inferior	0.01	0.85	-1.66	1.67	42%
Endo Lateral	0.01	0.71	-1.39	1.41	34%
Endo Septal	-0.02	0.52	-1.04	1.00	27%
Epi Anterior	-0.15	0.78	-1.68	1.37	36%
Epi Inferior	-0.11	0.76	-1.60	1.37	34%
Epi Lateral	0.06	0.82	-1.55	1.67	35%
Epi Septal	-0.01	0.68	-1.34	1.31	32%
All Segments	-0.01	0.72	-1.42	1.39	34%

Figure 2
Table of segmental MPRI variability for 825 myocardial segments in hypertrophic cardiomyopathy.