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Meeting abstract

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301 Accurate quantification of aortic regurgitation: comparison of MRI with doppler echocardiography

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Introduction

Echocardiography is the most widely used imaging modality for assessment of aortic regurgitation. Phase contrast MRI may also be used to quantify aortic regurgitation, but no standard imaging location has been identified on MRI. The purpose of this study is to determine which imaging location (at, above, or below the aortic valve) on phase contrast MRI best correlates with echocardiography.

Materials and methods

A retrospective chart review identified 71 patients (52 male, 19 female) who were determined to have aortic regurgitation on PC-MRI. Phase contrast images were analyzed using the ARGUS program (Siemens). Regions of Interest (ROI) were manually defined around flow jets for images at the aortic valve as well as 6 mm above and below the aortic valve. Forward and reverse volumes were measured from these ROIs. To verify the internal consistency of the ARGUS program measurements left ventricular cine true FISP images were used and ROIs were manually drawn around the endocardium in order to calculate the end diastolic volume (EDV) and end systolic volume (ESV). The difference in these two volumes was compared to the forward volume at the valve. Of the 71 patients who underwent PC-MRI, quantitative data were obtained on echocardiogram for 23 patients using the Velocity Time Integral.

Results

For the 71 patients who received PC-MRI, no significant difference was found between forward volume and the difference of EDV and ESV and forward volume at the aortic valve ($p = 0.39$). The means of regurgitant volume at, above and below the valve on MRI were found to be significantly different from each other ($p = .022$ for least significant difference). This difference also held when the regurgitant fraction on MRI was calculated as the ratio of reverse volume below the valve and forward volume above the valve or the ratio of reverse volume below the valve and forward volume at the valve. No significant difference was found on MRI when comparing mean regurgitant fraction below the valve with mean regurgitant fraction calculated with forward volume being above ($p = 0.45$) or at the aortic valve ($p = 0.47$). For 23 patients, regurgitant volume was compared on MRI and Echocardiogram using a paired t-test and linear regression. A positive relationship was observed between regurgitant

Table 1: Regurgitant volume

	Mean volume Echo (mL)	Mean volume MRI (mL)	Pearson Correlation
At valve	35	6.39	.61
Above valve	35	1.91	.45
Below valve	35	21.71	.49

Table 2: Regurgitant fraction. In this retrospective study of 71 patients, Phase Contrast MRI at varying imaging planes was compared with Echocardiography to measure aortic regurgitation. Regurgitant Fraction on MRI correlates best with Echo when the numerator is measured below the aortic valve.

	Mean Echo	Mean MR	Pearson Correlation	p (two tailed t-test)
At valve	.26	.05	.19	<.0001
Above valve	.26	.02	.15	<.0001
Below valve	.26	.22	.18	.46
Below/at	.26	.2	.33	.14
Below/above	.26	.21	.37	.19

volume on Echo and regurgitant volume at the valve on MRI (r = .61) (Table 1). The paired t-test failed to find a significant difference between the means of regurgitant fraction by echo and regurgitant fraction on MRI below (p = 0.46), below/at (p = 0.14) and below/above (p = 0.19) (Table 2).

Conclusion

The Argus program is internally consistent and can be used to provide quantitative data from PC-MRI. The level in relation to the aortic valve is important in quantifying aortic regurgitation with MRI. The best correlation with echocardiography occurs when the regurgitant volume is quantified at the aortic valve, and when the regurgitant fraction is calculated with the reverse volume quantified below the valve.