

Poster presentation

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## Optimizing quantification of aortic root dilation in children and young adults

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### Introduction

Dilated aortic roots occur in patients with congenital heart disease (CHD), bicuspid aortic valve (BAV), or with connective tissue disease. When severe, root dilation can lead to significant morbidity and mortality. Decisions regarding aortic valve/root replacement are based on root size, rate of change over time, and the degree of aortic stenosis and regurgitation, so accurate quantification of root size and progression is vital to patient management. Cardiovascular MRI provides more reproducible and accurate measurement of aortic roots than echocardiography, but the optimal imaging sequences have not been well studied.

### Purpose

Determine the optimal MRI protocol for quantifying aortic root dilation in children and young adults.

### Methods

The MRI database was queried for all patients with a dilated aortic root. Patients were included who underwent all of the following sequences: cine SSFP of the LVOT, cine GRE across the aortic root, respiratory navigator gated 3D-SSFP gated in systole, and contrast enhanced magnetic resonance angiography (CEMRA). The aortic root maximal diameter was prospectively re-measured on all imaging sequences using the cusp-to-cusp technique. Comparisons between sequences were made using Pearson's correlation coefficients.

### Results

30 patients (median age 11 years, range 3.5-28 years) with a dilated aortic root (10 with CHD, 12 with BAV and 8 with connective tissue disease) had all sequences performed. Among them, 5 underwent 3D-SSFP gated in both systole and diastole. Four of the patients with BAV had stenosis and turbulence across the valve that degraded either the 3D-SSFP or the CEMRA images and were excluded. There was excellent correlation between all sequences' measurements ( $r > 0.97$  for all pairs of sequences), but CEMRA and 3D-SSFP gated in diastole underrepresented the maximal diameter compared to cine GRE and 3D-SSFP gated in systole. 3D-SSFP gated in systole produced the maximal measurements, very similar to cine GRE and slightly larger than CEMRA (means of 32.4 vs 32.2 vs 30.7 mm respectively). When 3D-SSFP gated in both systole and diastole were compared, the systolic measurements were larger by 1.6 mm (34.0 vs 32.4 mm).

### Conclusion

3D-SSFP gated in systole provided the maximal aortic root diameter, with cine GRE images producing similar results, and both should be performed in patients with dilated aortic roots. 3D-SSFP gated in diastole and CEMRA produced measurements approximately 1.6 mm smaller than the other two sequences, and are unlikely to add further information regarding the aortic root when the initial 2 sequences are performed.