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Meeting abstract

1060 Evaluation of aortic valve regurgitation by cardiac magnetic resonance imaging: a comparison with echocardiography

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Objectives

Measuring the severity of aortic regurgitation (AR) is necessary due to the typical progression of aortic valve disease and the need for intervention before deterioration of left ventricular (LV) function. Echocardiography (ECHO) has been accepted in the past for clinical assessment of AR, but this method has limitations due to sub optimal acoustic windows, Doppler alignment, and geometric assumptions. Cardiac magnetic resonance imaging (CMRI) is a sensitive and specific tool for non invasive assessment of aortic regurgitant fraction (ARF) and left ventricular dimensions and systolic function in adults. Limited corresponding pediatric CMRI data exist for AR. This pediatric study was designed to prospectively compare ARF determined by CMRI and by ECHO measures used clinically to determine AR severity. CMRI and ECHO measures of LV size and systolic function were also prospectively compared.

Methods

Ten pediatric patients (aged 8 – 20 years), with aortic regurgitation by clinical examination, were referred by their primary cardiologists for same day CMRI and ECHO evaluations. CMRI (1.5 T Siemens Sonata) and ECHO (Hewlett Packard Sonos 7500) were performed according to protocol by dedicated technologists. ARF was assessed by phase contrast velocity encoded CMRI and by comparison of right and left ventricular CMRI stroke volume (SV) difference. ECHO measures included: pulsed Doppler, diastolic retrograde flow, deceleration slope, pressure half-time, color jet width, and effective regurgitant orifice assessments. Off-line CMRI and ECHO analyses were performed by two independent, blinded observers. Statistical significance was assessed by Pearson correlation coefficients. All p-values are two-sided.

Results

Aortic regurgitant fraction (ARF), measured by phase contrast MRI, was most comparable to that determined by the ratio of aortic regurgitant jet width to aortic valve diameter (ARJW/AVD) determined by ECHO ($r = 0.92$, $p = 0.0003$). ARF, measured by phase contrast CMRI, did not, however, correlate well with AR by pulse wave Doppler ECHO ($r = -0.12$, $p = 0.76$) or with other ECHO measures of AR. ARF measured by phase contrast CMRI showed good interobserver reproducibility (mean coefficient of variation = 4.6% with SD = 8.4%). Furthermore, ARF by phase contrast CMRI correlated well with ARF by CMRI SV difference ($r = 0.82$, $p = 0.004$). LV EDV by CMRI correlated well with 2D LV diastolic volume ($r = 0.93$, $p = 0.0001$) and M Mode LV diastolic dimension ($r = 0.90$, $p = 0.0004$). LV EF measured by CMRI showed moderate correlation with fractional shortening by M Mode ($r = 0.70$, $p = 0.02$) and 2D ECHO ($r = 0.53$, $p = 0.12$).

Discussion

Clinical use of aortic regurgitant jet width by ECHO for pediatric AR patients seems warranted, as the quantitative

CMRI assessment of ARF was most comparable with the ARJW/AVD by ECHO. Inherent assumptions about alignment of Doppler may have limited other ECHO measures of AR severity, like pressure half-time, deceleration slope, and pulsed Doppler. Others have also shown ARJW to be a reliable indicator for severity of aortic regurgitation, as this closely compares with the effective regurgitant orifice irrespective of the plane of regurgitation. Comparable CMRI and ECHO LV dimensions and systolic function will allow clinicians comfort with this newer technology, CMRI, which should be used serially in the evaluation of pediatric AR patients, because of the added benefit of reproducible quantitative measures of AR severity.