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Meeting abstract

405 Does diastolic function improve after the left ventricular pressure afterload is removed?

Ronald B Williams*, Mark Doyle, Vikas Rathi, Diane Vido, June Yamrozik, Janice Meister and Robert WW Biederman

Address: Allegheny General Hospital, Pittsburgh, PA, USA
* Corresponding author

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Background

Patients having aortic stenosis will invariably develop left ventricular hypertrophy (LVH) secondary to the increased left ventricular (LV) pressure. This normal compensatory process to accommodate afterload over time impairs diastolic function. LV diastolic function represents, amongst many, the relationship between left ventricular inflow velocities and left atrial pressure. We have previously shown that Cardiac MRI (CMR) can evaluate diastolic function using the phase velocity mapping (PVM) sequence with high accuracy as compared to the traditional modality, Echocardiography. The CMR approach for diastolic function is fast, efficient and reproducible. Using CMR, the impact of relief of pressure afterload on diastolic function metrics following aortic valve replacement (AVR) for patients with aortic stenosis is currently not known.

Hypothesis

We hypothesize that diastolic function following AVR in patients with severe but compensated aortic stenosis will improve over time.

Methods

Ten (10) patients were evaluated for diastolic changes serially over time (prior to aortic valve replacement, baseline, 6 months, one year and variably up to 4 years. The baseline and longest time point available were chosen for this evaluation. All patients were scanned on a GE Excite HD, version 12 software, 1.5 T scanner (Milwaukee, WI), utilizing phase velocity mapping: phase acquisition: slice selection, 2 nex, venc 200, matrix: 256 frequency, 192 phase, 60 cardiac phases in the short axis (SA) position. A PVM slice was placed at the tips of the mitral valve leaflets. The resultant temporal resolution was 16 ± 3 ms. Patient data was analyzed on a separate workstation using the Medis (The Netherlands) Mass Plus flow analysis program. The contours were manually drawn encircling the MV leaflets, throughout the diastolic phase of the cardiac cycle. 'e' and 'a' maximum velocities were measured across the *entire* ROI of the mitral inflow plane. Deceleration time (DT), representing the time from maximum 'e' to isoflow-time (baseline) slope was measured as a metric to further represent diastole, but more importantly to distinguish normal from a pseudo-normal pattern.

Results

Ten (10) pts (age:74 ± 9 yrs) with severe aortic stenosis at 3 ± 1.2 yrs post AVR underwent CMR for the evaluation of diastolic function. By clinical analysis, initially only 2 of the PRE AVR patients had normal diastolic function. The post AVR patients, E:A ratios, when incorporating both change in amplitude and direction, clinically showed marked improvement in 9/10 patients (90%), $p < 0.05$, using Wilcoxon signed rank test. DT markedly improved following AVR in 10/10 patients (100%) (189 ± 44 vs. 232 ± 42 ms, $p < 0.005$). The added time for acquiring the diastolic function data was 2 ± 0.5 minutes while the processing time was (5 ± 0.5 mins). Figure 1.

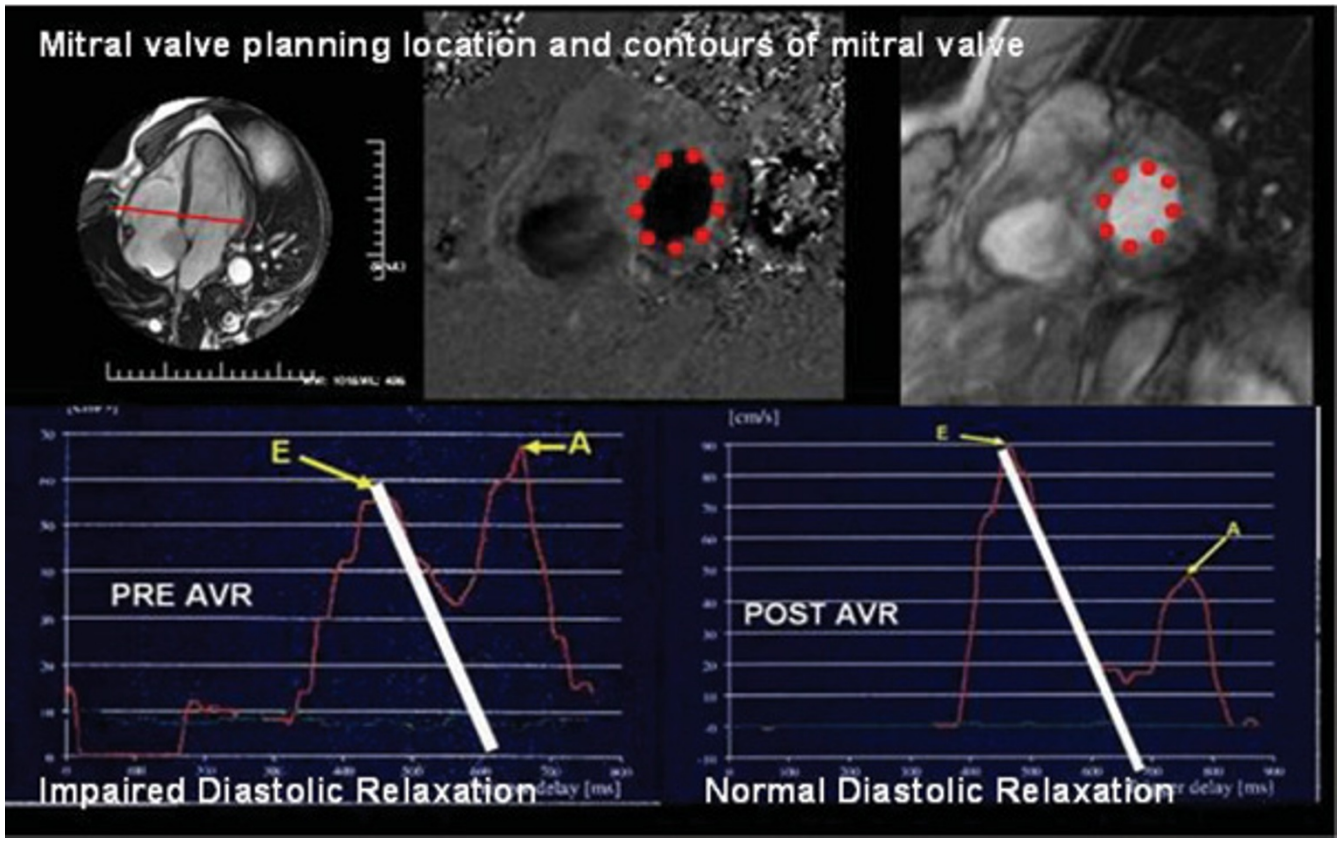

Figure 1
Aortic valve replacement decreases left ventricular pressure overload, allowing regression in diastolic dysfunction.

Conclusion

LVH in patients with pressure afterload, initially beneficial, becomes detrimental to diastolic function. Following aortic valve replacement in patients with severe aortic stenosis for relief of this afterload, diastolic function, as measured by E:A change improved both in direction and amplitude in 90% of the patients and, by DT, in 100% of the patients. Measurements, historically confined to echocardiography, are shown here to be relatively easy and fast to accomplish while yielding important additional information about physiologic metrics in this complex patient population.