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Non Invasive Imaging

LEFT VENTRICULAR VORTEX FORMATION AND ALTERED FLOW ENERGETICS IN DIASTOLIC DYSFUNCTION

Oral Contributions

Room 146 B

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Session Title: Expanding the Horizons of Echocardiography

Abstract Category: 15. Non Invasive Imaging: Echo

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Background: The diastolic vortex in the left ventricle (LV) acts as a kinetic energy reservoir for facilitating propulsion and redirection of blood flow in systole. We hypothesized that diastolic dysfunction is characterized by breakdown of vortex with increased dissipation of the stored energy which eliminates the beneficial effects of vortex formation.

Methods: We analyzed 92 subjects with varying degree of diastolic function. 2D echocardiographic particle imaging velocimetry was performed for tracking LV flow with an ultrasound contrast. The transmitral filling patterns were graded as normal, impaired relaxation, pseudonormal and restrictive and the vortex depth, geometry, intensity, kinetic energy and energy dissipation were compared between the groups.

Results: Vortex geometry, intensity and kinetic energy were similar; however, energy dissipation was increased significantly for pseudonormal and restrictive filling (Fig A-E; $p=0.003$). Energy dissipation differentiated normal from pseudonormal filling even in the presence of low (<10) early diastolic transmitral flow to mitral annular velocity ratio (Area under the curve, 0.81; $P<0.001$).

Conclusions: The geometry and intensity of LV vortex remains compensated; however, vortex dissipates in patients with diastolic dysfunction with little storage of inflow energy for blood ejection. These results suggest that energy uncoupling between diastole and systole may be a relevant investigative target in heart failure patients.

