# Assessment of Left Sided Filling Dynamics in Diastolic Dysfunction Using Cardiac CT

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## Introduction:

Left ventricular (LV) diastolic dysfunction (DD) involves a complex interaction between LV and left atrial (LA) filling dynamics. Until now, it has not been possible to easily obtain simultaneous LV and LA volume curves to perform this analysis. We aimed to analyze CT-based filling dynamics in a group of patients with DD and in a normal control group, compared to Echo-Doppler.

## Methods:

We identified 25 patients who had moderate or severe DD by echo-Doppler, and who had also undergone cardiac CT angiography within 1 month, as well as 25 age-matched normal controls. LV and LA volumes were measured every 10% of the RR interval, using semi-automatic commercial software, and end-diastole (ED), end-systole (ES) and diastasis identified. From these 3 volumes, systolic, early-diastolic and late-diastolic volume changes were calculated, and additional parameters of diastolic filling, such as LA emptying fraction (LAEF), conduit volume, and early/late diastolic filling ratios derived.

## Results:

Patients with DD had larger LV volumes and mass and lower ejection fraction (52±15% vs. 63±5%, $p<0.01$) than controls. They had significantly larger atrial volumes and significantly worse LA function, defined as LAEF (27.8±9.8% vs. 41.6±7.2%, $p<0.0001$). Early/late diastolic filling ratio was 2.1±0.6 in controls and 2.9±1.7 in DD, ($p=0.054$). Conduit volumes were similar in both groups. By ROC analysis
LA diastasis volume had an AUC of 0.94 to separate between normal and DD, while LAEF had an AUC of 0.88. Logistic regression using LA ES volume and LAEF had an 88% accuracy to separate between the 2 groups. Patients with severe vs moderate dysfunction had significantly worse LA function (LAEF 20.7% vs. 31.6%, $p<0.001$).

## Conclusion:

Diastolic dysfunction is characterized by significant LA enlargement as well as reduced LA function, which worsens with worsening DD. CT can help detect and characterize DD, mainly via its effect on LA emptying dynamics.