

POSTER PRESENTATION

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# Assessment of left ventricular filling pressure using mean left atrial transit time from contrast enhanced dynamic MRI

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## Introduction

Left atrial (LA) size and function are often regarded as a reflection of left ventricular (LV) hemodynamics.

**Purpose:** In this study we investigated the hemodynamic correlates of contrast transit time within the left atrium (LA) in patients with LV systolic dysfunction by cardiac magnetic resonance imaging (CMR).

## Methods

Ten subjects undergoing clinically indicated right and left heart catheterization and 48 subjects undergoing noninvasive evaluation were prospectively enrolled and brain natriuretic peptide (BNP) and N-terminal proBNP (NT proBNP) obtained prior to CMR examination. CMR was performed within 5 hrs of invasive hemodynamic assessment. Dynamic MR imaging was acquired in sagittal and coronal planes covering the LA using a saturation recovery SSFP sequence with bolus injection of 0.01 mmol/kg gadopentetate. Mean transit time was measured in the LA and normalized to heart rate. LV systolic dysfunction was defined as LV ejection fraction (LVEF) < 50%. Noninvasive cohort also underwent echocardiography within 2 hours of CMR. Tissue Doppler was used to determine mitral E/e' ratio.

## Results

Normalized mean LA transit time (nLATT) by CMR correlated strongly with LV early diastolic pressure ( $r=0.893$ ,  $p=0.001$ ), end diastolic pressure (LVEDP) ( $r=0.909$ ,  $p<0.001$ ) and mean diastolic pressure ( $r=0.936$ ,  $p<0.001$ ) in the invasive cohort. In the noninvasive cohort nLATT was significantly prolonged in patients

with LV systolic dysfunction (N=39)  $10.1\pm 3.0$  heart beats vs  $6.6\pm 0.7$  heart beats in normal controls (N=9) ( $p<0.001$ ). In patients with LV systolic dysfunction average LVEF was  $37\pm 9\%$  and the NYHA functional class  $1.8\pm 0.9$ . Using a linear regression equation derived from the invasive cohort LVEDP was estimated in the noninvasive cohort which was divided into 3 subgroups:  $\leq 10$  mmHg, 11-15 mmHg and  $\geq 16$  mmHg. There were graded increases from low to high LVEDP subgroups in echocardiographic mitral medial E/e' ratio:  $9\pm 3$ ,  $14\pm 7$  and  $18\pm 13$  ( $p=0.005$ ); BNP:  $53\pm 41$  pg/ml,  $286\pm 433$  pg/ml,  $496\pm 475$  pg/ml ( $p<0.001$ ) and NT proBNP:  $171\pm 268$  pg/ml,  $712\pm 948$  pg/ml,  $1249\pm 1137$  pg/ml ( $p<0.001$ ), demonstrating the concordance of nLATT with established noninvasive indices of hemodynamic status.

## Conclusions

nLATT by dynamic MRI may be a valuable non-invasive marker of LV filling pressure in patients with LV systolic dysfunction.

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