

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 ± 3.0 heart beats vs 6.6 ± 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 ± 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: ≤ 10 mmHg, 11-15 mmHg and ≥ 16 mmHg. There were graded increases from low to high LVEDP subgroups in echocardiographic mitral medial E/e' ratio: 9 ± 3 , 14 ± 7 and 18 ± 13 ($p=0.005$); BNP: 53 ± 41 pg/ml, 286 ± 433 pg/ml, 496 ± 475 pg/ml ($p<0.001$) and NT proBNP: 171 ± 268 pg/ml, 712 ± 948 pg/ml, 1249 ± 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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