Abstract: P2715
Diastolic dysfunction in women with ischemia and no obstructive coronary artery disease: novel insight from left atrial feature tracking

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Background: Women with signs and symptoms of ischemia but no obstructive coronary artery disease (INOCA) are at increased risk of developing heart failure with preserved ejection fraction (HfPEF); however, the exact mechanism for HfPEF progression remains to be elucidated. Prior studies have focused specifically on impaired left ventricular diastolic function in INOCA. We hypothesized that extending our evaluation to include the left atrium (LA)—a key constituent of the transmural pressure gradient and left ventricular filling—would provide additional, novel, pathophysiological insight.

Purpose: To evaluate LA function in women with INOCA using cardiac MRI (CMR).

Methods: We performed retrospective feature tracking analysis of cine images from CMR (Figure 1A), to evaluate LA strain, in 58 INOCA women with normal sinus rhythm (three were excluded due to suboptimal image quality). All strain measurements were performed in duplicate by an experienced investigator blinded to clinical status. We subdivided the cohort by an established threshold of resting left ventricular end diastolic pressure (LVEDP) <12 mmHg vs ≥12 mmHg, performed invasively within a median of 27 days of the CMR. As illustrated in Figure 1B, LA function was divided into three established phases: (1) reservoir strain, passive expansion of the left atrium from the pulmonary circulation while the mitral valve is closed; (2) conduit strain, passive emptying of the atrium into the ventricle; and (3) booster strain, active emptying of the left atrium following atrial depolarization.

Results: Reservoir strain was higher in the elevated LVEDP group (n=20, 26.1 + 1.3%) vs. not elevated group (n=35, 22.8 + 0.9%, p=0.03; Figure 1C). In contrast, we observed no group difference in conduit strain (16.5 + 1.0 and 16.5 + 0.7, p=0.78, respectively; Figure 1D), resulting in significantly higher atrial booster strain in the elevated LVEDP group (10.0 + 1.1% and 7.0 + 0.6, p<0.01, respectively; Figure 1E).

Conclusions: To our knowledge, this is the first report of LA function in women with INOCA. That reservoir strain was higher in subjects with elevated LVEDP provides important pathophysiologic insight regarding diastolic hemodynamics of the LA. The similar conduit function between groups—despite different LVEDP’s—strongly suggests a ventricular contribution to the impaired transmural pressure gradient. Together, these initial proof-of-concept data support the evaluation of LA function in our quest to better understand heart failure progression in INOCA.
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Figure 1. (A) Left atrial (LA) tissue tracking in a representative horizontal long axis cine image. Left: Contours are drawn on the endo- and epicardial borders at a single phase at end ventricular systole. Middle: Tissue tracking software propagates the contours automatically and follows the motion of the contour throughout the cardiac cycle; displayed as motion vectors across the atrial wall. Right: Longitudinal strain can then be displayed in the form of color maps throughout the cardiac cycle. (B) Representative strain curve illustrating the three atrial phases. (C-E) Mean summary data for each atrial phase, with subjects divided according to an established threshold of resting left ventricular end diastolic pressure (LVEDP) ≤12 mmHg (n=35) vs >12 mmHg (n=20). Data reported as mean ± SE.