

Longitudinal changes in cardiac morphology and function in women with INOCA: results from repeat cardiac magnetic resonance imaging a median of 6 years apart

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Funding Acknowledgement: Type of funding sources: Public grant(s) – National budget only. Main funding source(s): National heart, lung, and blood institute (NIH)

Background: Women with signs and symptoms of ischemia but no obstructive coronary arteries (INOCA) are at increased risk of developing heart failure with preserved ejection fraction. The exact mechanism(s) driving disease progression, however, remains incompletely understood.

Purpose: To evaluate longitudinal changes in cardiac morphology and function across all four chambers of the heart, in women with INOCA.

Methods: To accomplish our goal, we leveraged 13 cases of repeat cardiac magnetic resonance imaging (cMRI), performed a median of 6 years apart (range: 3–11 years), in women with INOCA. Cardiac morphology and function were retrospectively assessed from conventional cine images using commercially available software (V5.11.1, CVI42, Circle Cardiovascular Imaging). Left and right ventricular (LV, RV, respectively) mass, volume, and ejection fraction were assessed using a series of short axis images spanning the base to apex. Left atrial (LA) volume was assessed using three orthogonal long-axis images, while right atrial (RA) area was assessed using a single horizontal long axis image. Concentricity was defined as the mass-to-end-diastolic volume ratio. Lastly, strain and strain rate were assessed in all four chambers by feature tracking analysis.

Results: Upon follow-up, LV and RV end-diastolic volume index (Figure 1A), LA volume index (from 36 ± 5 to 32 ± 5 mL/m², $P=0.02$) and RA area index (from 11.3 ± 1.6 to 9.6 ± 2.0 cm²/m², $P=0.003$) were significantly reduced. LV mass was preserved (Figure 1B), resulting in a significant increase in LV concentricity (from 0.59 ± 0.07 to 0.64 ± 0.09 , $P=0.02$), together with an increase in LV ejection fraction (Figure 1C), and reduction in both longitudinal (Figure 1D) and circumferential (from 1.3 ± 0.2 to 1.1 ± 0.3 s⁻¹, $P=0.05$) LV early diastolic strain rate. In contrast, RV mass was significantly reduced (Figure 1B), while RV concentricity (from 0.19 ± 0.02 to 0.20 ± 0.04) and ejection fraction (from 58 ± 4 to 59 ± 6) were preserved.

Conclusions: To our knowledge, this is the first study to evaluate long-term changes in cardiac morphology and function in women with INOCA. That LV early diastolic strain rate was reduced at follow-up, is consistent with a growing body of cross-sectional observations from our group and others, highlighting diastolic dysfunction as an important contributor of disease progression in this patient population. That we observed a discordant pattern of change between LV and RV concentricity is unique and warrants further consideration.

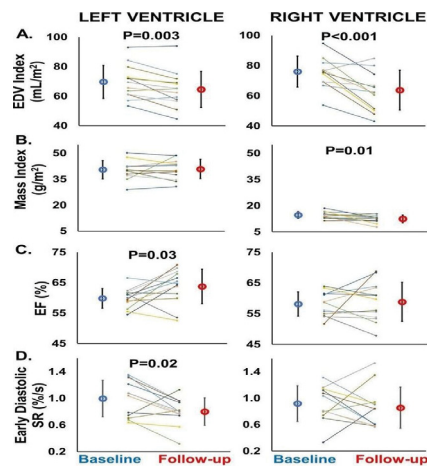


Figure 1. Left and right ventricular end-diastolic volume index (A), mass index (B), ejection fraction (C) and early longitudinal diastolic strain rate (D). Summary data reported as mean \pm SD.