

ORAL PRESENTATION

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Left ventricular torsional hysteresis in patients with hypertension: a global parameter for diastolic function

Chun Schiros¹, Ravi V Desai¹, Bharath Ambale Venkatesh¹, Mustafa Ahmed¹, Shilpi Agarwal¹, Steven Lloyd¹, David Calhoun¹, David McGiffin¹, Thomas S Denney², Louis J Dell'Italia¹, Himanshu Gupta^{1*}

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Background

Torsion is an important determinant of left ventricular (LV) systolic and diastolic function. We hypothesized that the area within the torsion volume loop, called the torsional hysteresis (TH), may be an important parameter of diastolic function (DD).

Methods

60 resistant hypertension (HTN) patients, 40 healthy controls were studied using cardiac MRI with tissue

tagging. Volumetric and torsional parameters were evaluated.

Results

HTN patients demonstrated concentric remodeling. All HTN patients had preserved ejection fraction (>55%) and normalized peak ejection rate was significantly greater in HTN vs. controls. HTN patients had significantly decreased MRI-measured early filling rate, E/A ratio (1.33 ± 1.13 vs. 2.19 ± 1.07 , $P < 0.0001$) and early diastolic

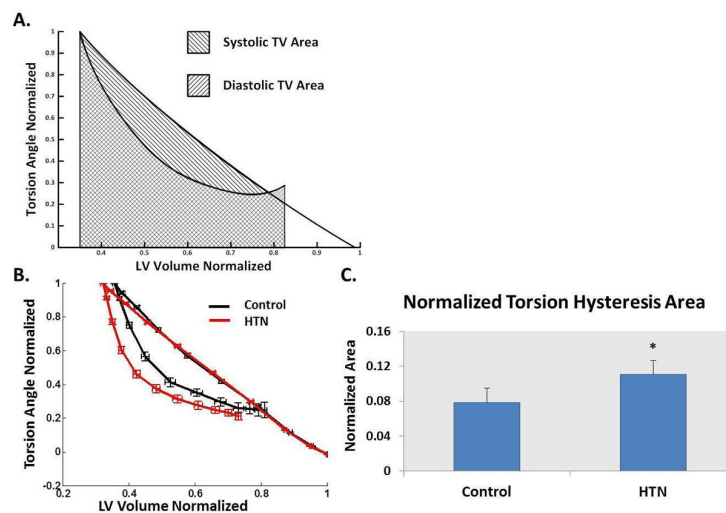
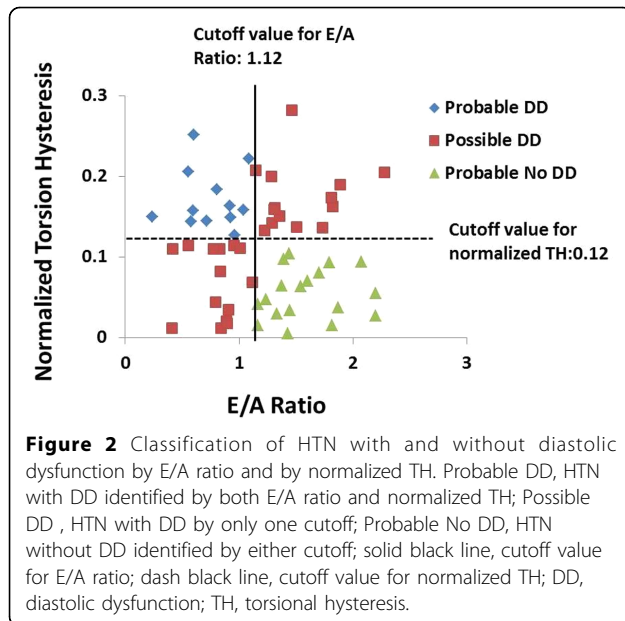


Figure 1 Schematic diagram for calculating torsional hysteresis—the area within the systolic and diastolic arm of the normalized torsion volume (TV) curves (A), normalized TV curves for the two groups (B) and calculated torsional hysteresis (C). Torsion hysteresis is greater in the HTN vs. Control. *, $P < 0.001$ vs. Control; Data points are expressed as mean \pm standard error.

¹Medicine, University of Alabama at Birmingham, Birmingham, AL, USA
Full list of author information is available at the end of the article



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mitral annulus velocity normalized to LV length (66.23 ± 20.65 vs. 85.67 ± 29.96 %, $P < 0.001$) vs. controls. Furthermore, the normalized TH was significantly greater in HTN compared controls (0.11 ± 0.07 vs. 0.079 ± 0.045 , $P < 0.001$) (Figure 1). LV normalized TH best correlated with E/A ratio ($r = -0.23$, $P = 0.025$) but not with LV mass/volume. Mean normalized TH plus 1 standard deviation and mean E/A ratio minus 1 standard deviation of controls were used as cutoffs to identify DD in HTN respectively. Both cutoffs identified ~50% HTN patients with DD (27 by normalized TH, 28 by E/A ratio), among which 13 patients were identified with DD by both cutoffs, as shown in Figure 2.

Conclusions

TH as measured by area within torsion volume loops was significantly increased in hypertensive concentric remodeling with associated DD. TH took into account not only active and passive recoil processes of the LV diastolic phase but also the systolic phase and represents a heretofore new assessment of diastolic function.

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Author details

¹Medicine, University of Alabama at Birmingham, Birmingham, AL, USA.

²Electrical and Computer Engineering, Auburn University, Auburn, AL, USA.

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