

Meeting abstract

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I22 Regional myocardial functional patterns by quantitative tagged magnetic resonance imaging in an adult population free of cardiovascular risk factors: the multi-ethnic study of atherosclerosis (MESA)

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Introduction

The importance of having standard patterns of regional myocardial deformation to improve the diagnostic assessment of myocardial dysfunction is crucial. Normal reference values for measures of left ventricle (LV) myocardial deformation in the human LV have not been well characterized in larger groups of individuals free of cardiovascular disease (CVD) or cardiovascular risk factors.

Purpose

To summarize normal tagging MRI myocardial regional parameters, as well as to assess gender differences.

Methods

MESA, a multicenter cohort study of 6814 subjects (men and women) of four ethnic groups (Caucasians, African Americans, Chinese and Hispanic) aged 45–84 without prior clinical CVD. In 1100 consecutive participants who enrolled in the tagged MRI study, we selected participants without hypertension, diabetes, dislipidemia and stratified by gender. Normal radial strain (Err), beta angle, rotation, twist and twist time were determined in 4 LV regions (anterior, lateral, inferior and septal) from the base, mid and apex of LV. One way ANOVA was used to compare the mean of variables across slices, and unpaired t-tests to assess gender differences.

Results

195 participants (age 63.3 ± 10.5 years old; mean \pm SD) were selected (100 men) from the tagged MRI study (Table 1). Err is independent of gender and increased from apex to base in most of walls, with a significant difference between basal Err and/or mid part when compared to apical LV ($p < 0.05$) in most of the regions, except inferior wall in women. On the other hand, the beta angle was found to have smaller values in mid wall for both genders, in all regions, except lateral, when compared to base and apex of LV. Women had greater values of beta angle compared to men ($p < 0.05$) in the anterior, septal and inferior regions. Rotation values increase from base towards apex in men and women ($p < 0.05$); women had

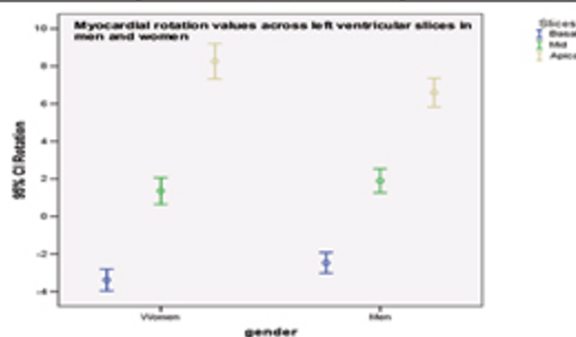
Table 1: Clinical and hemodynamic characteristics of MESA male (n = 100) and female (n = 95) participants.

	MEN (mean \pm SD)	WOMEN (mean \pm SD)
Age	63.09 \pm 11.15	63.40 \pm 9.92
Systolic blood pressure (mmHg)	116.89 \pm 12.82	115.14 \pm 14.33
Diastolic blood pressure (mmHg)	71.56 \pm 7.93*	64.32 \pm 9.36
BMI (kg)/(m ²)	24.94 \pm 3.15	25.03 \pm 3.05
LV end-diastolic mass (g)	161.81 \pm 33.22*	115.29 \pm 26.07
LV end-diastolic volume (mL)	138.06 \pm 29.06*	109.39 \pm 27.34
LV ejection fraction (%)	65.90 \pm 7.09*	69.96 \pm 6.39

* $p < 0.001$, BMI = body mass index

ERR MEN	LV slices	ERR WOMEN	LV slices	ERR MEN	LV slices	ERR WOMEN	LV slices
Err_anterior	Basal	28.20 ± 9.50 [†]	Basal	25.80 ± 9.88	Beta_anterior	Basal	3.28 ± 2.58 [‡]
	Mid	28.84 ± 9.91 [‡]	Mid	26.90 ± 11.44 [‡]		Mid	2.36 ± 1.44 [‡]
	Apex	24.76 ± 9.02	Apex	22.41 ± 9.87		Apex [‡]	3.11 ± 2.06
Err_lateral	Basal	30.82 ± 7.50 [†]	Basal	29.48 ± 9.53*	Beta_lateral	Basal	2.13 ± 1.62 [†]
	Mid	26.60 ± 7.12 [‡]	Mid	26.42 ± 8.12		Mid	2.49 ± 1.13 [‡]
	Apex	24.23 ± 7.82	Apex	25.06 ± 9.56		Apex	3.09 ± 2.01
Err_inferior	Basal	29.75 ± 8.53 [†]	Basal	28.91 ± 9.79	Beta_inferior	Basal	3.06 ± 2.32
	Mid	27.56 ± 10.62	Mid	27.85 ± 9.41		Mid	2.45 ± 1.82 [‡]
	Apex	26.12 ± 9.30	Apex	26.17 ± 13.17		Apex [‡]	3.66 ± 1.96
Err_septal	Basal	27.49 ± 7.49 [†]	Basal	26.97 ± 9.15*	Beta_septal	Basal	2.49 ± 1.79 [†]
	Mid	24.48 ± 5.9	Mid	24.07 ± 6.87		Mid	2.49 ± 1.37 [‡]
	Apex	23.08 ± 8.57	Apex	22.34 ± 10.55		Apex	3.43 ± 2.21

MEN		WOMEN	
Rotation		Rotation	
LVslices		LVslices	
Basal [†]	-2.47 ± 2.79 [‡]	Basal	-3.38 ± 2.80 [†]
Mid	1.90 ± 3.23 [‡]	Mid	1.36 ± 3.48 [‡]
Apex [‡]	6.60 ± 3.90	Apex	8.27 ± 4.62
Twist[†]		Twist	
	9.82 ± 4.19		11.65 ± 3.95
Twist time		Twist time	
	311.47 ± 81.26		320.39 ± 67.84



*p<0.05 comparison between basal slice and mid slice; † p<0.05 comparison between basal slice and apical slice; ‡ p<0.05 comparison between mid slice and apical slice
 || p<0.05 comparison between men and women

Figure 1

Myocardial variables of regional function by cardiac tagged MRI (mean ± SD) in men and women of MESA To summarize tagging MRI myocardial parameters, and to assess gender differences. Radial strain was independent of gender and showed increased values from the apex to base. Women had greater values of beta angle, rotation and twist when compared to men.

significantly different (Figure 1) values of rotation (smaller in basal part and greater at the apex), and greater twist values (p < 0.05) when compared to men, but with no differences when considering the time of twist (Figure 1).

Conclusion

Myocardial regional radial strain is independent of gender and showed increased radial strain values from the apex towards base. On the other hand, women had greater values of beta angle, rotation and twist when compared to men. These findings by tagged MRI may be helpful as an indicator of standard patterns of regional myocardial function and as an important reference with which strain in abnormal hearts can be compared.

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