

Meeting abstract

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## I33 Obesity is associated with decreased myocardial contraction fraction despite preserved ejection fraction

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from 11<sup>th</sup> Annual SCMR Scientific Sessions  
Los Angeles, CA, USA. 1–3 February 2008

Published: 22 October 2008

*Journal of Cardiovascular Magnetic Resonance* 2008, **10**(Suppl 1):A34 doi:10.1186/1532-429X-10-S1-A34

This abstract is available from: <http://jcmr-online.com/content/10/S1/A34>

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### Introduction

Obesity is increasingly prevalent in the developed world and may be associated with alterations in cardiac structure and function even in the absence of overt cardiac disease. Prior studies have shown increased left ventricular (LV) end-diastolic volume, stroke volume and mass, in obese versus lean subjects, even after indexation to body size. Myocardial contraction fraction (MCF), the ratio of LV stroke volume to myocardial volume, is a volumetric measure of total myocardial performance (analogous to midwall fractional shortening) that is distinct from ejection fraction (EF) which reflects LV endocardial surface function. EF has been shown to be normal or increased in obese subjects, but the association of MCF and obesity is unknown.

### Methods

Lean and obese adults from the Framingham Heart Study Offspring cohort with normal ( $\geq 60\%$ ) CMRE EF (278 men, 547 women) underwent ECG-gated multislice SSFP imag-

ing encompassing the left ventricle in the short-axis orientation (THK = 10 mm, no gap,  $1.92 \times 1.56$  mm<sup>2</sup> in-plane resolution) on a 1.5 T system (Philips). Systolic blood pressure (SBP) was measured during CMR using an automated device with calf cuff; the mean of at least 3 measurements was used. Epi and endocardial contours were manually segmented by an expert observer blinded to subject characteristics, LV and myocardial volumes were determined using a "Simpson's rule" method of disks approach. LV EF and MCF were determined. Subjects were grouped by sex and by body mass index (BMI), which ranged 20–25 kg/m<sup>2</sup> for lean subjects and  $\geq 30$  kg/m<sup>2</sup> for obese. Results are summarized as mean  $\pm$  SD; group differences were assessed by 2-tailed t test, with  $p < 0.05$  considered significant.

### Results

Across all subjects, MCF was greater in women ( $0.93 \pm 0.13$ ) than men ( $0.79 \pm 0.15$ ),  $p < 0.0001$ , as was EF (women:  $69.7 \pm 5.3$  vs. men:  $67.5 \pm 5.0$ ,  $p < 0.0001$ ). EF

**Table 1: Ejection Fraction. Obesity may be associated with changes in cardiac structure and function. We found that even among subjects with normal ( $>60\%$ ) ejection fraction, myocardial contraction fraction, a geometry-independent volumetric measure of myocardial performance, is depressed in obese versus lean subjects.**

EF	Lean Men (n = 131)	Lean Women (LW, n = 313)	Obese Men (OM, n = 86)	Obese Women (OW, n = 203)
mean $\pm$ SD	66.5 $\pm$ 4.4	69.2 $\pm$ 5.1	69.1 $\pm$ 5.6	70.4 $\pm$ 5.6
T test vs LW	<0.0001	-	-	-
T test vs OM	0.00013	0.50 (NS)	-	-
T test vs OW	<0.0001	0.020	0.083 (NS)	-

**Table 2: MCF**

MCF	Lean Men	Lean Women (LW)	Obese Men (OM)	Obese Women (OW)
mean ± SD	0.83 ± 0.13	0.94 ± 0.13	0.72 ± 0.17	0.89 ± 0.13
T test vs LW	<0.0001	-	-	-
T test vs OM	<0.0001	<0.0001	-	-
T test vs OW	<0.0001	<0.0001	<0.0001	-

was greater in obese than lean subjects of the same sex (Table 1). Lean women had greater EF than lean men; there was a trend ( $p = 0.08$ ) for greater EF in obese women versus men. MCF was greater in women than men in each BMI category (lean or obese). Within the same sex, MCF was significantly greater in lean than obese subjects (Table 2). Calf SBP did not differ between lean men ( $150 \pm 26$ ) and lean women ( $146 \pm 25$  mmHg),  $p = 0.17$ . Similarly, SBP did not significantly differ,  $p = 0.06$  between obese men ( $159 \pm 25$ ) and obese women ( $152 \pm 22$  mmHg). However, within each sex, lean subjects had lower SBP than obese ( $p = 0.014$ ).

**Conclusion**

In this sample from a free-living cohort of adults without overt systolic dysfunction, EF is unchanged or slightly increased in obese versus lean subjects for both sexes. However, MCF, a measure of total myocardial performance (as opposed to EF which reflects endocardial surface function only) is decreased in obese subjects as compared with lean. The greater SBP amongst obese versus lean subjects in our cohort may contribute to this difference, but other pathophysiologic mechanisms underlying these differences in MCF remain to be clarified. These findings strongly suggest that obesity is associated with decreased myocardial performance despite preserved EF.

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