

to peak double product (heart rate peak x systolic blood pressure), maximal dobutamine infusion rate, and atropine administration. The difference between peak and rest wall motion score index ( $\Delta$  WMSI) was  $-0.05 \pm 0.13$  versus  $0.20 \pm 0.23$  ( $p < 0.001$ ) in patients with and without ischemia respectively. A correlation was found between the extent of stress induced ischemia and the reduction of ejection fraction during recovery ( $Y = -3.9 + 0.8 \times$  number of ischemic segments ( $p = 0.003$ )).

**Conclusion:** The transient reduction of ejection fraction during recovery correlates with the presence and extent of stress induced ischemia during DSE. Thus this objective parameter may provide additional informations combined with wall motion analysis in the assessment of myocardial ischemia during DSE.

**1151-148 Aerobic Capacity in the Metabolic Syndrome: An Exercise Echo Doppler Study**

**Jerzy Sterkowicz**, Sorin Danciu, Jeffrey Meltzer, Rachel Wisniewski, Chris Wagner, Cesar J. Herrera, Advocate Illinois Masonic Medical Center, Chicago, IL

**Background:** Recent data indicate epidemic levels of the Metabolic Syndrome (MeS) in the adult population. Physical inactivity, obesity and abnormal LV diastolic performance may affect exercise tolerance in MeS.

**Methods:** To test this notion, we studied consecutive asymptomatic pts and age-matched controls (C) who underwent treadmill echo Doppler. Diastolic function analysis included standard Doppler indices plus TDI at septal mitral annulus and color M-mode pre and post exercise. LA contractile reserve was calculated as  $\Delta$  A wave transmitral velocity rest vs peak exercise. Blind measurements were obtained by 2 experienced sonographers. Individuals with known or suspected CAD, valvular heart disease, atrial fib or LV systolic dysfunction were excluded.

**Results:** 30 pts (16 M, age  $49 \pm 10$  yrs) with 27 of 30 fulfilling 4 or 5 diagnostic criteria for MeS, and 20 healthy C (13 M, age  $44 \pm 10$  yrs;  $p = 0.156$ ) were included; 22 of 30 (73%) pts had abnormal resting diastolic parameters vs 4 of 20 (20%) controls ( $p = 0.001$ ).

Non-parametric analysis showed a significant correlation between exercise duration and: max HR, rest A wave, BMI, triglycerides, systolic BP, waist circumference, FBS, rest E/A, rest E/A, E/A post-valsava, LA size, Vp peak-exercise, A wave peak exercise, rest A', %  $\Delta$  EF and diastolic BP.

**Conclusions:** The reduced aerobic capacity in MeS pts is multifactorial and in part related to LV diastolic dysfunction. A diminished LA contractile reserve during exercise may be an important contributor to this phenomenon.

Rest and exercise data - pts vs C

|                                    | pts                      | C                        | p value*                                    |
|------------------------------------|--------------------------|--------------------------|---------------------------------------------|
| Exercise duration                  | 8'13"±2'32"              | 14'00"±3'11"             | 0.0001                                      |
| METS                               | 9.4±3                    | 14.8±2                   | 0.0001                                      |
| Max HR                             | 158.9±17                 | 181.9±13                 | 0.0001                                      |
| Max diastolic BP                   | 85.3±11                  | 72.5±13                  | 0.001                                       |
| E/A' peak exercise                 | 1.00±0.4                 | 1.22±0.4                 | 0.028                                       |
| Vp peak exercise                   | 65.9±14                  | 78.1±11                  | 0.034                                       |
| E/A' rest                          | 0.89±0.22                | 1.37±0.38                | 0.0001                                      |
| A' rest                            | 12.4±3                   | 9.0±2                    | 0.0003                                      |
| A wave rest                        | 70.5±14                  | 56.1±11                  | 0.0003                                      |
| E/A rest                           | 1.08±0.28                | 1.32±0.25                | 0.001                                       |
| E/A valsava                        | 1.07±0.34                | 1.35±0.30                | 0.014                                       |
| LV mass index                      | 92.5±27                  | 72.8±22                  | 0.007                                       |
| LA size                            | 41.1±6                   | 19.2±6                   | 0.0001                                      |
| LA volume                          | 47±16                    | 36.9±11                  | 0.015                                       |
| $\Delta$ A wave rest/peak exercise | +33.4±15                 | +39.2±21                 | 0.322                                       |
|                                    | Values reflect mean ± SD | Values reflect mean ± SD | * indicates statistically significant value |

**1151-163 Feasibility of Using New Real-Time Volume Rendering Three-Dimensional Dobutamine Stress Echocardiography**

**Todd Pulerwitz**, Kumiko Hirata, Carlos Rodriguez, Marie-Edouard N. Desvarieux, Eugene Shtereman, Marco R. Di Tullio, Shunichi Homma, Columbia University, New York, NY

**Background:** Rapid acquisition of echocardiographic images is necessary for accurate wall motion assessment during stress echocardiography. Real-time 3-dimensional (RT3-D) transthoracic echocardiography with full volume acquisition (Philips SONOS 7500) offers important potential advantages over standard 2-dimensional echocardiography when assessing left ventricular wall motion. This is the first study to evaluate the feasibility of RT3-D imaging during pharmacological stress testing using this system.

**Methods:** Six consecutive patients undergoing dobutamine stress echocardiography (67% women; mean age  $63 \pm 11.7$  years) were studied. Apical full volume and short axis 3-dimensional images were obtained during rest, low dose, and peak dose dobutamine infusion. The images were reviewed separately by 2 experienced echocardiographers to assess image quality (adequate or inadequate) using standard 16 segment American Society of Echocardiography (ASE) criteria.

**Results:** The apical full volume and short axis volume sets were analyzed. 98% of the 16

segment ASE wall segments during rest, 96% during low dose dobutamine infusion and 91% during peak dobutamine infusion protocol could be adequately visualized. Use of only the apical volume set allowed for 96%, 95%, and 91% visualization of all segments during rest, low dose, and peak dose dobutamine infusion respectively. The time to image optimization and acquisition for apical full volume and 3-D short axis volume sets was  $21.8 \pm 3.7$  seconds and  $24.5 \pm 5.3$  seconds at rest,  $19.3 \pm 2.5$  seconds and  $22.2 \pm 1.7$  seconds at low dose, and  $19.5 \pm 1.4$  seconds and  $21.5 \pm 1.8$  seconds at peak dose dobutamine infusion protocol.

**Conclusions:** RT3-D dobutamine stress echocardiography 1) is feasible, 2) quickly acquires full data sets and 3) may become a more frequently used imaging modality for assessment of LV wall motion.

**1151-164 Regression of Left Ventricular Remodelling but Not an Improvement in Resting Left Ventricular Ejection Fraction Following Revascularization Is Determined by the Quantity of Myocardial Viability**

**Michael Hickman**, Nikant K. Sabharwal, Paramjit Jeetley, Avijit Lahiri, Roxy Senior, Northwick Park Hospital, Harrow, United Kingdom

**Background:** It is known that the presence of myocardial viability (MV) in patients with heart failure confers a survival advantage following revascularisation. However, in the presence of a previous subendocardial myocardial infarction, dysfunctional myocardium may be viable but not demonstrate any functional improvement. Therefore, we hypothesised that the quantity of pre-operative viable myocardium would correlate with a beneficial alteration to left ventricular (LV) size and geometry (markers of LV remodelling) irrespective of any improvement in LV systolic function.

**Methods and Results:** Accordingly, 36 patients with heart failure (NYHA II-IV, LV ejection fraction (LVEF)  $\leq 35\%$ ) who were scheduled to undergo revascularisation underwent rest and low-dose dobutamine (5-15  $\mu\text{g/kg/min}$ ) echocardiography prior to revascularisation. Resting echo was repeated 3 months after revascularisation. Resting LVEF, LV end systolic (LVESV), LV end diastolic volumes (LVEDV) and LV sphericity index (LVSI) were calculated at baseline and follow up. MV was assessed using a 12 segment LV model. There was a significant positive correlation between the number of segments demonstrating MV and the percentage decrease in LVESV ( $p = 0.0008$ ), LVEDV ( $p = 0.01$ ) and an increase in LVSI ( $p = 0.05$ ) following revascularisation. No significant relationship was demonstrated between the number of segments with MV and improvement in LVEF ( $p = \text{NS}$ ).

**Conclusions:** A regression of left ventricular remodelling but not an improvement in resting LVEF following revascularisation is determined by the quantity of myocardial viability. Thus, the survival advantage conferred by MV following revascularisation may be due to regression of remodelling rather than an improvement in resting LVEF.

ORAL CONTRIBUTIONS

**844 Clinical Applications of Doppler Tissue Imaging**

Tuesday, March 09, 2004, 2:00 p.m.-3:30 p.m.  
Morial Convention Center, La Louisiane A

2:00 p.m.

**844-1 Doppler Tissue Imaging Assessment of Dyssynchronicity Is a Powerful Predictor of Mortality in Severe Congestive Heart Failure With Normal QRS Duration**

**Goo-Yeong Cho**, Woo-Jung Park, Sung-Woo Han, Seung-Hyuk Choi, Young-Cheoul Doo, Dong-Jin Oh, Chong-Yun Rhim, Yung Lee, Hangang Sacred Heart Hospital, University of Hallym, Seoul, South Korea

**Background:** Prolonged QRS duration is poor prognostic factor in patients with congestive heart failure (CHF). We performed a prospective analysis to identify the association between myocardial dyssynchronicity (Dsyn) measured by tissue Doppler imaging (DTI) and prognosis in severe CHF with normal QRS duration ( $\leq 120\text{msec}$ ).

**Methods:** One hundred six patients (age  $63 \pm 11$ ) with CHF (NYHA class  $\geq 3$ , ejection fraction  $< 35\%$ ) were followed serially. DTI was performed using 5-basal, 5-mid segments to assess the time to peak systolic points from R wave on EKG (RS time). The standard deviation (SD) of RS time of 10 segments was considered an indicator of Dsyn. Two groups, on the SD of RS time  $\leq 40$  or  $> 40$ , were identified. Primary end point was the heart transplantation, death, and readmission due to worsening of CHF.

**Results:** After  $16.5 \pm 10.8$  months follow up, primary end point occurred in thirty-five patients (33%). Prolonged SD of RS time was associated with a significant increase in primary end point (62% vs 38%,  $p < 0.01$ ) or mortality (29% vs 12%,  $p < 0.01$ ). Mean event free survival was 16.6 months (95% CI 11.9-21.4 months) in patients with  $\text{SD} > 40$ , 31.4 months (95% CI 27.9-34.9 months) in  $\text{SD} \leq 40$ , respectively ( $p < 0.001$ ). After adjustment for age, ejection fraction, etiology of CHF, DTI assessment of Dsyn was independent risk factor of primary end point ( $p < 0.001$ ) or mortality ( $p = 0.004$ ). **Conclusion:** Myocardial Dsyn measured by DTI is a powerful predictor of mortality in severe CHF with normal QRS duration.

Noninvasive Imaging