806

Advances in Echocardiographic Speckle Tracking Imaging

Monday, March 26, 2007, 7:00 a.m.-8:30 a.m.
Room 271-273

7:00 a.m.

806-3   **Vector Velocity Imaging Yields Accurate Measures of Left Ventricular Torsional Mechanics: Comparison to Magnetic Resonance Imaging**

Wei Zhao, Peng Li, Huy Trong Nguyen, Geu Ru Hong, Shannon Jin, Luqin Cao, Margaret Knoll, Farhood Saremi, Jagat Narula, Mani Vannan, University of California,Irvine, Irvine, CA
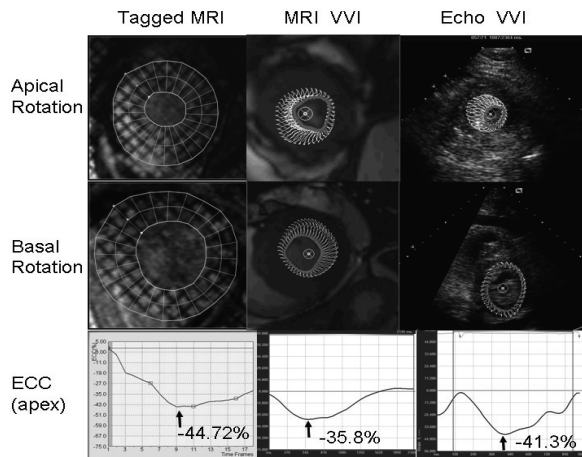
Background: Vector velocity imaging (VVI) can be used to measure LV torsion. We compared VVI and tagged MRI to measure of LV torsion and also assessed the accuracy of VVI of MRI data.
Methods: 14 patients underwent standard tagged MRI and 2-D TTE. Tagged MRI and B-mode echo images of LV apex and base were analysed for rotation (rot), torsion (tor) and circumferential strain (ECC). VVI (Siemens, CA) was applied to both MRI and echo images.
Results: The table shows the data for rot, tor (difference of the rot normalized to LV length) and global ECC (p=NS). The figure shows an example of tagged MRI and VVI of MRI and Echo. ES freeze frames are shown with ECC curves at the bottom.
Conclusions: VVI provides accurate measure of LV torsional dynamics when compared to MRI, and can also be applied to MRI data.

Parameters	Echo-VVI	MRI-VVI	Tagged-MRI
Apical rotation(Deg)	4.47±1.49	6.85±2.09	5.49±1.36
Basal rotation(Deg)	-3.04±0.48	-3.54±0.44	-5.01±0.75
LV torsion(Deg/cm)	1.2±0.29	1.24±0.33	1.18±0.39
ECC(%)	-12.37±2.56	-13.42±2.66	-16.43±3.86

7:15 a.m.

806-4   **Automated Quantification of Left Ventricular Volumes and Ejection Fraction Using 2D Speckle Tracking Echocardiography**

Jing Ping Sun, John D. Merlino, Xing Sheng Yang, Neil L. Greenberg, Lei Lei Cheng, Di Xu, Angel R. Leon, James D. Thomas, Emory University School of Medicine, Atlanta, GA, The Cleveland Clinic Foundation, Cleveland, OH
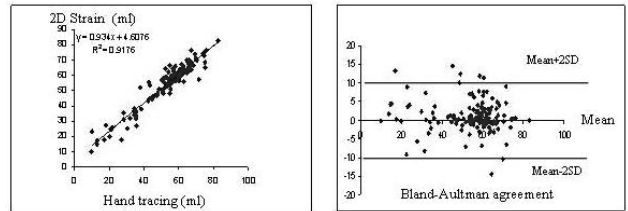
Background: Two-D strain based on speckle tracking is a new echocardiographic technique, whose utility would be enhanced by automated derivation of LV volume and ejection fraction (EF). Aim: To validate automated boundary detection measurements of LV volumes and EF by speckle tracking.
Methods: We studied 71 pts (20 dilated, 11 ischemic and 20 hypertrophic cardiomyopathy, and 20 pressure-overload hypertrophy; 58 ±17 years, 30 F) and 70 normal sunjects (41 ± 16 years, 30 F). End-diastolic volume (EDV), end-systolic volume (ESV), and LV EF were calculated by automated boundary detection using the speckle tracking method requiring only manual placement of 3 points (apex + 2 annular points) on the end systolic image, and compared with routine hand traced volumes using GE VV7 from apical 4-chamber view.
Results: Speckle tracking automated boundary detection measurements (EDV=103 ± 66 ml, ESV= 53 ± 57 ml, EF=55 ± 14 %) agreed well with two-dimensional measurements by hand tracing for EDV (EDV=103 ± 66 ml, Y=1.0X+0.6, r = 0.97); ESV (52 ± 56 ml, Y=1.0X+0.6, r = 0.98), and EF (55 ± 14 %, Y=0.93X+4.6, r = 0.96). The correlation and

Bland-Aultman agreement for EF are shown in figures 1 and 2.
Conclusion: Two-D speckle tracking can measure ventricular volumes and EF from B-mode images. Automated boundary detection requires only 3 points on one frame, which is less timing consuming than hand tracing, This new technique yields rapid results and agreed well with hand tracing,and may be useful in clinical practice.

7:30 a.m.

806-5   **Assessment of Temporal Uniformity of Regional Wall Thickening by Speckle Tracking to Evaluate Left Ventricular Dyssynchrony**
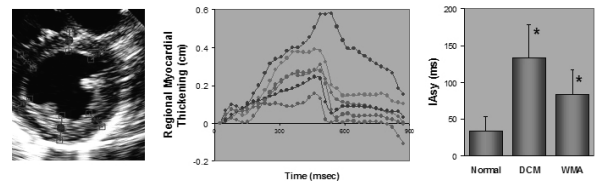
Avrum Jacobs, Keith A. Collins, Roberto M. Lang, Scott Settlemier, Ivan S. Salgo, University of Chicago, Chicago, IL

Background: Cardiac dyssynchrony has been measured using several echocardiographic modalities, i.e. M-mode, tissue Doppler and more recently 3D imaging, by analysis of the timing of regional endocardial motion, which are all limited by angle dependence and/or cardiac translation. Accordingly, we developed a new technique based on tissue speckle tracking to measure the temporal uniformity of regional LV wall thickening.
Methods: Short axis views were obtained in 3 groups of patients: normal (NL, n=9), dilated cardiomyopathy (DCM; n=7) and regional wall motion abnormality (RWMA; n=5). Images were analyzed using custom software: 6 regions of interest (ROI) were identified; 2 points were placed over the endocardium and epicardium in each ROI (fig 1) and the distance between them was tracked throughout the cardiac cycle, resulting in 6 time curves of regional wall thickening over time, from which the time interval between the R wave and maximum wall thickening was measured (fig 2). The SD of these time intervals was used as an index of asynchrony (IAsy) and compared between groups.
Results: IAsy was significantly shorter in NL group than in DCM and RWMA groups (fig 3, *p<0.05 vs NL; t-test): 33.6±19.8 ms in NL, 133.3±44.4 ms in DCM (p=.0006) and 83.7±32.6 ms in RWMA (p=.0108).
Conclusions: LV dyssynchrony can be assessed by quantifying the temporal uniformity of regional wall thickening using tissue speckle tracking, without being confounded by cardiac translation or angle-dependency.

7:45 a.m.

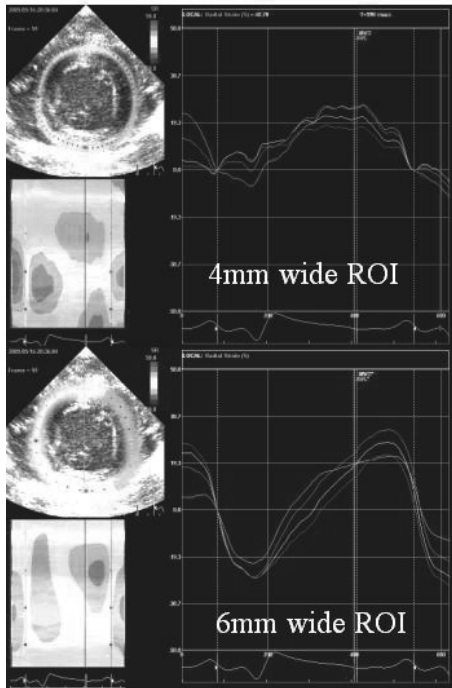806-6   **2D Strain Quantification Varies With Size and Location of Region of Interest**

Muhammad Ashraf, Long Liu, Min Pan, David J. Sahn, Oregon Health & Science University, Portland, OR

Background: The size and location of a region of interest (ROI) across the thickness of cardiac wall could have an impact on quantifying strain values.
Methods: 25 pigs (50-55kg) were anesthetized and hearts exposed by midline sternotomy. Short axis views were acquired at mid cavity level directly from the heart surface, using a 10 MHz sector probe on GE Vivid 7 Dimension system. Frequency and frame rate were optimized, achieving axial resolution of 215um and lateral resolution of 345um. 2D speckle based radial strain measurements were taken at comparable points by placing the ROI in subendocardium and then in subepicardium. The ROI was placed in the center between endocardial and epicardial borders. Measurements were taken with 4mm, 5mm and 6mm width of the ROI.
Results: Peak strain values were highest in endocardium (16.08±7.63) and lowest in subepicardium (7.65±6.44). Peak strain values in middle myocardium were in between these two values (12.90±6.80). A similar variation in radial strain values was seen (30.90±6.65 in subendocardium, 10.05±5.45 in subepicardium and 22.45±6.55 in mid myocardium). Increasing the width of ROI had little effect on circumferential strain; however, radial strain values were significantly different at different widths of ROI especially in the anterior septal region(18.45±6.55 at 4mm, 20.15±3.95 at 5mm, and 26.75±4.45 at 6mm).
Conclusions: This study has shown that strain value varies with size and location of ROI because of regional differences in mechanics between layers.

4mm wide ROI

6mm wide ROI

8:00 a.m.

806-7 **Longitudinal Strain and Torsion Assessed by 2-D Speckle Tracking Correlates with the Serum Level of Tissue Inhibitor of Matrix Metalloproteinase-1, A Marker of Myocardial Fibrosis, in Patients With Hypertension**
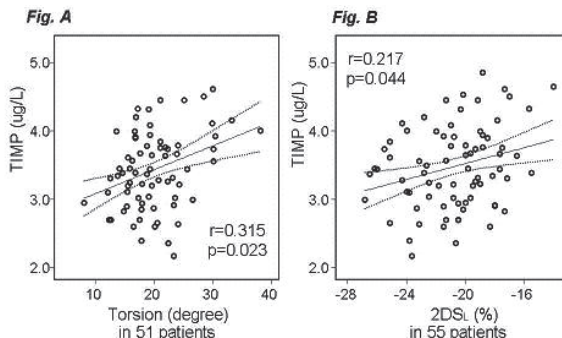
Soo-Jin Kang, Byung-Joo Choi, So-Yeon Choi, Myeong-Ho Yoon, Seung-Jea Tahk, Joon-Han Shin, Hong-Seok Lim, Ajou university hospital, suwon, South Korea

Background; The severity of myocardial fibrosis may affect the regional contractile function in hypertensives.

Method: In 55 patients with hypertension (BP 155/93mmHg, 48±11yrs, EF>55%) and 20 age-matched normotensives, the serum levels of aminoterminal propeptide of procollagen I/III (PINP/PIIINP, marker of collagen synthesis) and tissue inhibitor of matrix metalloproteinases-1 (TIMP, marker of inhibition of collagen degradation) were measured by ELISA & RIA. To assess the myocardial contractile function, the average of negative longitudinal strain of 6 segments on apical 4 chamber view ($2DS_L$), the average of radial and circumferential strain of 6 segments on mid-short axis view ($2DS_R$, $2DS_C$) and basal to apical torsion were obtained by 2D-speckle tracking. Myocardial performance index (MPI, [ICT+IRT] / ET) was calculated.

Results: TIMP was higher in patients compared with controls (3.6 ± 0.6 vs 3.0 ± 0.5 μg/L, p<0.001), while PINP and PIIINP were not. TIMP was related to LV mass (r=0.339, p=0.003), MPI (r=0.218, p=0.05) and inversely correlated with E/A ratio (r=-0.243, p=0.034). In patient group, torsion showed positive correlation with TIMP (Fig A). $2DS_L$ significantly correlated with TIMP (Fig B), whereas $2DS_R$ and $2DS_C$ were not. Significant correlation between $2DS_L$ and MPI (r=0.396, p=0.002) was found.

Conclusion: Depressed longitudinal strain with compensatory increase of torsion relates to elevated TIMP level representing the extent of myocardial fibrosis in hypertensives with normal EF.
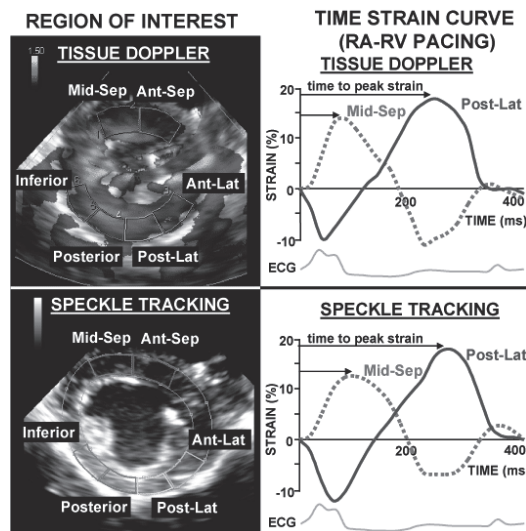

8:15 a.m.

806-8 **Validation of Novel Echocardiographic Speckle Tracking Radial Strain to Assess Ventricular Dyssynchorny: Comparison With Angle Corrected Tissue Doppler Strain Imaging**

Masaki Tanabe, Matthew S. Suffoletto, Michael R. Pinsky, John Gorcsan, III, University of Pittsburgh, Pittsburgh, PA

Background: Regional radial strain is an important means to quantify ventricular dyssynchrony. A novel approach from routine grayscale echo images, known as speckle tracking, calculates myocardial strain independent of angle of incidence. The aim was to validate this new technique using angle corrected tissue Doppler (TD) strain imaging in an animal model of dyssynchrony.

Methods: Ten open-chest dogs had both grayscale and TD mid-LV short-axis echo images (Aplio 80, Toshiba Corp). Right atrial (RA), right ventricular (RV) to simulate left bundle branch block (LBBB) and left ventricular (LV) pacing leads were placed. Time-to-peak strain was measured by angle-corrected TD and speckle tracking using a new program on the same loop and 6 manually drawn regions of interest during 4 different pacing modes (RA-baseline, RA-RV (LBBB), RA-LV, RA-BiV).

Results: Of 240 segments, 222 (93%) were analyzed for strain data by both methods; segments with catheter or pacing lead artifacts were prospectively excluded. Speckle tracking and angle corrected TD quantified dyssynchrony for LBBB similarly with maximum strain delay 173±68ms* and 167±72ms*, respectively vs. baseline control 59±44ms and 61±37ms (*p<0.05). Comparative time-to-peak strain overall by each method correlated well: r=0.97, bias of -6±20ms.

Conclusions: Time to peak strain assessment by speckle tracking correlated with time to peak strain by TD in an animal pacing model of dyssynchrony, and has potential for clinical applications.

ACC.SYMPOSIUM/FEATURED
ORAL ABSTRACT PRESENTATION

620

Assessment of Myocardial Viability: Who Needs It and How to Do It?

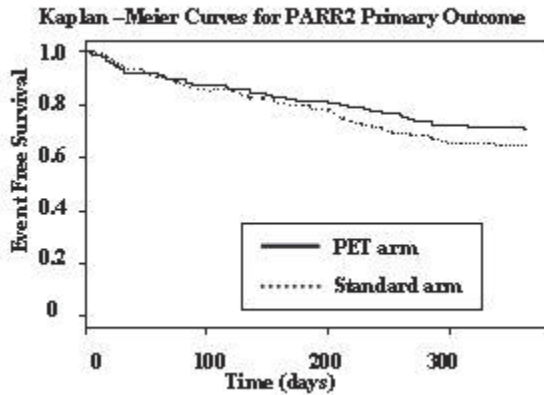Monday, March 26, 2007, 9:00 a.m.-10:30 a.m.
Room 271-273

9:30 a.m.

620-5 **FDG PET-guided Therapy Versus Standard Care In Severe LV Dysfunction (The PARR-2 Trial)**

Rob S.B. Beanlands, Graham Nichol, Ella Huszti, Linda Garrard, Dennis Humen, Normand Racine, Michael Freeman, Karen Gulenchyn, Francois Benard, Robert deKemp, R.Mark Iwanochko, PARR Investigators, University of Ottawa Heart Institute, Ottawa, ON, Canada

Introduction: It is unclear whether the use of F-18-fluorodeoxyglucose (FDG) PET imaging in patients with LV dysfunction and CAD, improves outcomes.

Methods: This multicenter trial randomized patients with poor LV function to PET guided therapy versus standard care. Randomization was stratified for 'prior angiography'. Our primary outcome was the composite endpoint of cardiac death, MI, transplantation, or re-hospitalization for cardiac cause. Included patients(Pts) had EF≤35%, CAD, were being considered for a) Revascularization (RV); or b) heart failure work-up. Exclusions were a) MI within 4 weeks, b) emergency RV, c) severe valve disease, d) unsuitable for RV, e) other co-morbidities. When PET identified viable myocardium, RV was recommended. For control Pts, alternative tests were considered at the MD's discretion.

Results: 9 centers enrolled 430 Pts (218 PET, 212 controls). At 1 year, relative risk for the composite endpoint was 0.84 (95%CI=0.63,1.1; p=0.25). When analysis considered 'treatment received', the Hazard Ratio (HR) for FDG PET guided therapy was 0.7(95%CI=0.5,0.99; p=0.046). Intention to treat analysis of Pts without recent angiography (n=199) showed a significant reduction in cardiac death rate with PET compared to standard care (HR=0.37, 95%CI=0.14,0.94; p=0.03).

Kaplan –Meier Curves for PARR2 Primary Outcome

Conclusions: Compared to standard care, PET-guided therapy tended to yield fewer cardiac events at 1 year; and increased survival significantly in Pts without recent angiography. Long-term follow-up is ongoing.

ACC.ORAL CONTRIBUTIONS

811

Coronary Calcium: Physiologic and Clinical Significance

Monday, March 26, 2007, 9:00 a.m.-10:30 a.m.
Room 278-281

9:00 a.m.

<u>811-3</u>   **Coronary Calcium Predicts Near-Term Coronary Heart Disease Events in Major American Ethnic Groups: The Multi-Ethnic Study of Atherosclerosis**

Robert C. Detrano, Alan Guerci, J. Jeffrey Carr, Diane Bild, Gregory L. Burke, Aaron R. Folsom, Kiang Liu, Steven Shea, Moyses Szklo, David Bluemke, Daniel H. O'Leary, Russell Tracy, Karol Watson, Nathan D. Wong, Richard Kronmal, University of California, Irvine, Irvine, CA

Background: There is a consensus that coronary calcified plaque measured by cardiac CT predicts incident coronary heart disease (CHD) and that the prevalence of calcified plaque varies by race ethnic groups in the United States (US); however, there is sparse data related to the prediction of events in American minority groups. Therefore, the generalizability of associations with CHD to the diverse US population has been questioned.
Methods: We examined the impact of coronary calcium (CAC) independent of global risk assessment in the Multi Ethnic Study of Atherosclerosis cohort, a population based sample without CHD at entry, drawn from four major American ethnic groups. Six thousand seven hundred and twenty six participants from six field centers, (mean age 62.1 +/- 10.2 years, 50 % women and 38% white, 28% black, 22% Hispanic, 12% Chinese) underwent coronary risk factor evaluation, cardiac CT scanning for CAC measurement using electron beam computed tomography or multi-detector computed tomography, and clinical follow-up for 35.4 months. Local clinical teams contacted participants or their families every nine months to determine the occurrence of myocardial infarction, CHD death, definite angina or angina requiring revascularization.
Results: There were 127 total CHD events of which 72 were hard events (either myocardial infarction or CHD death). CAC hazards ratios (HR) for calcium (per unit change in log transformed calcium score), and for Framingham risk score (unit of 1%), in the combined multi-racial cohort, were 1.45 (95% C.I.:1.33 - 1.56) and 1.04 (95% C.I.:1.02 - 1.05) respectively. Cox regression of CAC and Framingham risk score as predictors of CHD events in the four ethnic groups resulted in HR for calcium (per unit change in log transformed calcium score) of 1.4 for Caucasians, 1.8 for Chinese, 1.7 for African Americans, and 1.4 for Hispanics (all p<0.001).
Conclusions: Greater CAC score, as measured using cardiac CT, is a strong predictor of an increased rate of incident CHD events and provides additional predictive information beyond that afforded by traditional risk factor assessment in four major US ethnic groups.

9:15 a.m.

<u>811-4</u>   **Global and Regional Thoracic Aortic as Well as Coronary Calcification, Are Inversely Related With Coronary Flow Reserve Measured by Rb-82 Positron Emission Tomography/Computed Tomography in Intermediate-Risk Patients**

Jong Ho Kim, Arlene Travis, Ash Rafique, Josef Machac, Mount Sinai School of Medicine, New York, NY

Background: The aim of this study was to assess the interrelationship between myocardial perfusion images (MPI), coronary flow reserve (CFR), coronary artery (CAC) and thoracic aorta calcium (TAC).
Methods: In 100 pts (M/F = 56/44; age=57±12 yrs) with intermediate risk of CAD, both CAC and global/regional TAC, and MPI at rest and pharmacologic stress were obtained using Rb-82 PET/16-slice CT. All MPI were visually interpreted quantitatively using a 17 segment model as normal or abnormal (mild, moderate, severe). CFR was measured using the method of Yoshida (JNM 1996).
Results: 45 pts had abnormal MPI (mildy in 31 and moderate to severe in 14) whereas 55 had normal MPI. Intraclass correlation coefficients for intraobserver variability for CAC, CFR and TAC were $\geq$ 0.95 respectively. There was increasing proportion of both abnormal MPI (15%, 46%, and 76%) and moderate-to-severe abnormal MPI (15%, 11%, 35%) with increasing TAC of 0, 1-1000, >1000, respectively. Spearman correlation (Rho) of CFR with CAC, TAC, regional ascending aorta (ASC), aortic arch (ARC), and descending thoracic aorta (DSC) calcium were - 0.47, - 0.48, - 0.31, - 0.44, and - 0.38, respectively (p<0.005 in all). By multivariate analysis, age was a most potent independent predictor for CFR cut-off value of 2.0 (Odds ratio=0.99, CI= 0.85-0.96; p=0.001) followed by CAC (OR=0.99, CI=0.99-1.00; p=0.04).
Conclusions: Global and regional thoracic aortic as well as coronary calcification is inversely related with CFR in intermediate risk pts.

CFR versus CAC and TAC

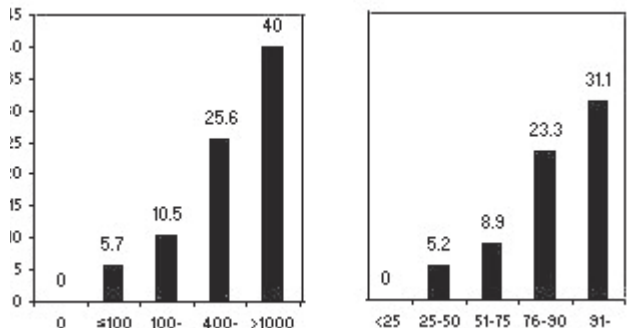| CFR	All (n=100)		Male (n=56)		Female (n=44)	
	r	p	r	p	r	p
CAC	-0.47	0.00001	-0.49	0.0001	-0.44	0.003
TAC	-0.48	0.00001	-0.47	0.0003	-0.45	0.002
ASC	-0.31	0.002	-0.35	0.009	-0.23	ns
ARC	-0.44	0.00001	-0.50	0.0001	-0.36	0.02
DSC	-0.38	0.0001	-0.35	0.009	-0.43	0.004

9:30 a.m.

<u>811-5</u>   **Correlation Between Coronary Calcium Score and Presence of Ischemia on Rubidium-82 Positron Emission Tomography Stress Test**

Hitender Jain, Kate Brag, Bangalore V. Deepak, Stuart Zarich, Jay L. Meizlish, Adam Schussheim, Bridgeport Hospital/ Yale New Haven Health System, Bridgeport, CT

Introduction: Coronary artery calcium score (CAC) reflects plaque burden but not necessarily obstructive coronary stenoses. Prior studies of the relationship of CAC to ischemic burden based on SPECT myocardial perfusion imaging (MPI) have shown conflicting results. As pharmacological stress test using Rb-82 PET (RbPET) has superior sensitivity and specificity when compared to SPECT, we studied the correlation between CAC score and presence of ischemia on RbPET.
Methods: A total of 230 consecutive subjects had a CAC score determined (Agaston scoring system) using a 16-slice multi-detector CT, followed by a dipyridamole stress MPI with RbPET.
Results: The average age was 62.8 years (range 31-90) and there were 109 females (47.4%). The average calcium score was 431 (range 0-5953). There was a statistically significant positive correlation between CAC score and the presence of ischemia on RbPET, r= 0.37 (p<0.001). There was also a significant positive correlation between the presence of ischemia and CAC percentile score (derived from MESA database and adjusted for age, gender and ethnicity), r= 0.36 (p<0.001). On multiple regression analysis using conventional risk factors for CAD, only the presence of diabetes mellitus and CAC were significant independent predictors of the presence of ischemia on RbPET (p= 0.024 and <0.0001 respectively).

Conclusion: CAC score is an independent predictor for the presence of ischemia. CAC score should play an increased role in the evaluation of patients with suspected CAD.

9:45 a.m.

811-6   Gender Independent Stratification of Cardiovascular Risk Based on Quantification of Atherosclerotic Inflammation

Raimund Erbel, Stefan Möhlenkamp, Nils Lehmann, Axel Schmermund, Susanne Moebus, Andreas Stang, Eva-Maria Beck, Lothar Volbracht, Rainer Seibel, Dietrich Grönemeyer, Klaus Mann, Karl-Heinz Jöckel, University Clinic Essen, Essen, Germany, University Witten/Herdecke, Mülheim / Bochum, Germany

Background The NCEP ATP III suggests using CAC and hs-CRP in individuals at intermediate risk. The combined effect of "atherosclerotic inflammation", i.e. the combination from CAC and hsCRP, on risk stratification has not yet been tested in an unselected general population. In a cross-sectional analysis of the ongoing population-based Heinz Nixdorf Recall (HNR) cohort study, we analyzed age-adjusted prevalence rate ratios (RR) of CHD.
Methods: In the HNR study, 4487 (93.2%) subjects without and 327 (6.8%) of 4814 subjects with CHD (age 45-75 years) were screened including CAC and hs-CRP. Age-adjusted RRs for prevalence of CHD in relation to risk factors were determined. The following CAC and hs-CRP-categories were used: 1) CAC<100, 100-399 and ≥400 or >75th percentile, respectively, 2) hs-CRP≤1 mg/L, 1-3mg/L, >3mg/L, and 3) a combined CAC and hs-CRP score in three groups.
Results: RRs for established risk factors including BMI>30, age, smoking, diabetes, hypertension, dyslipidemia, history of stroke or peripheral artery disease (PAD), ranged between 1.29 (95%-CI=1.0-1.7) for BMI>30 in men and 4.95 (95%-CI=1.7-14.4) for a history of PAD in women. For high versus low hs-CRP-values a significant RR was found for women (RR=2.5, 95%-CI=1.3-4.6, p<0.01) but not for men (RR=1.1, 95%-CI=0.8-1.5, p=NS). Highest RRs of CHD were found for high CAC versus low CAC in men (RR=18.2, 95%-CI=10.6-31.3) and for high versus low categories in the combined CAC+hs-CRP-Index in women (RR=11.0, 95%-CI=5.1-23.6, both p<0.0001). We observed strong gender differences as to the effect of different risk factors. However, when the combined index of CAC and hs-CRP was used, prevalence RR were higher than conventional risk factors and gender differences nearly vanished (men: RR=10.7 (95%-CI=6.5-17.5), p<0.01; women: 11.0 (95%-CI=5.1-23.6), p<0.01).
Conclusions: Prevalence rate ratios of CHD using CAC and hcCRP were higher compared to established risk factors. Measuring atherosclerotic inflammation may gender-independently improve risk prediction in a general population.

10:00 a.m.

811-7   Risk Factors and Associations of Coronary Artery Calcification in Hemodialysis Patients

Gulay Asci, Meral Kayikcioglu, Recep Savas, Oner Ozdogan, Soner Duman, Mehmet Ozkahya, Levent H. Can, Gulperi Celik, Huseyin Toz, Meltem Sezis, Savas Sipahi, Ercan Ok, Ege University Medical School Cardiology Department, Izmir, Turkey, Ege University Medical School Nephrology Department, Izmir, Turkey

Bacground: Coronary artery calcification (CAC) has been suggested as a non-traditional risk factor to explain incredibly increased rate of cardiovascular disease (CVD) in hemodialysis (HD) patients. We carried out a large scale analysis to determine risk factors for CAC and the associations of CAC with other surrogate markers of CVD.
Methods: In this study, 598 prevalent HD patients (mean age: 58±14 year) underwent multi-slice CT to quantify CAC, echocardiography to assess left ventricular mass index (LVMI), ultrasonography to measure carotid artery intima-media thickness (CA-IMT), pulse wave analysis to determine pulse wave velocity (PWV) and augmentation index (AIx). Correlation analysis was made with Spearman test and multiple logistic regression analysis; comparison of groups was evaluated by ANOVA.
Results: Mean total CAC score (CACs) was 595±1228 (0-11941). CACs was ≤100 in 50% of cases, between 100-400 in 19%, and ≥400 in 31%. One hundred sixty-six patients (27.7%) had no vascular calcification. Mean CA-IMT was 0.80±0.77 mm, plaques prevalence was 51%. LVMI was 130±32 g/m2; mitral annular calcification (MAC) was found in 27% of patients. Mean PWV and AIx were found 9.7±2.2 m/s and 27±11%, respectively. CACs was significantly correlated with age, dialysis duration, body-mass index (BMI), systolic BP, calcium, CaxP product, cardiothoracic index, glucose, high sensitive CRP, LVMI, CA-IMT and plaque volumes. CAC was inversely correlated with URR, protein catabolic rate and albumin. CACs were not related to phosphorus, parathormone, lipid parameters, PWW and AIx, calcium based phosphate binder doses. Independent predictors for CACs were age (OR:1.08, p<0.0001), gender(OR:3.92, p<0.0001), dialysis duration (OR:1.02, p<0.0001), presence of diabetes (OR: 2.45, p:0.02) and CVD in history (OR: 2.66, p:0.007), BMI (OR:1.09, p:0.02), calcium (OR:2.05, p:0.001), LVMI (OR:1.01, p:0.004), and presence of MAC (OR: 2.88, p:0.003)
Conclusion: Severe CAC is present in 31% of HD patients. Older age, male sex, vintage of dialysis, diabetes, higher BMI, and higher serum calcium are predictors of CAC. CAC is associated with left ventricular hypertrophy and MAC in HD patients.

10:15 a.m.

811-8   Waist-Hip Ratio Is the Strongest Measure of Abdominal Obesity in the Prediction of Subclinical Atherosclerosis as Measured by Coronary Artery Calcium in Persons Without Multiple Metabolic Syndrome Risk Factors

Torry A. Kahute, Heidi B. Gransar, Nathan D. Wong, Leslee J. Shaw, Donna Polk, Johanna H. Moon, Romalisa Miranda-Peats, Daniel S. Berman, Cedars-Sinai Medical Center, Los Angeles, CA

Background: Waist-hip ratio (WHR), has been shown to be superior to BMI and waist circumference (WC) in predicting coronary artery calcium (CAC). Patients with metabolic syndrome (MetS) are at an increased risk for development of coronary heart disease. It is not known if WHR is predictive of CAC in patients with no known MetS. Our goal was to determine which abdominal obesity measurement is most closely associated with subclinical atherosclerosis as measured by CAC in subjects with versus without MetS.
Methods: Among 862 asymptomatic subjects (age 58.3±9, 53% male) recruited for CAC screening, we examined BMI, WC, and WHR and their associations with CAC. Multiple logistic regression was used to predict the presence of CAC in those with versus without MetS according to having other MetS risk factors.
Results: Relative to their first tertile, those with WHR (but not BMI or WC) in the third tertile among those with 0-1 or 2 other MetS risk factors had an increased likelihood of CAC (Table).
Conclusions: Increased WHR may be a superior anthropometric predictor of subclinical atherosclerosis compared to BMI or WC in subjects with 2 or fewer other MetS risk factors. In subjects with more than 2 other MetS risk factors, WHR is not predictive of subclinical atherosclerosis, suggesting other MetS risk factors may be more important in these individuals.

Odds Ratios by Abdominal Obesity Measures

Obesity Measure	0-1 MetS Risk Factors	2 MetS Risk Factors	3-4 MetS Risk Factors
Tertile	OR (95% CI) p-value	OR (95% CI) p-value	OR (95% CI) p-value
BMI 2nd	1.18 (0.76,1.81) 0.47	0.87 (0.43,1.76) 0.70	1.84 (0.66,5.12) 0.24
BMI 3rd	1.24 (0.77,2.00) 0.39	0.96 (0.50,1.85) 0.91	1.44 (0.53,3.86) 0.47
WC 2nd	1.12 (0.73,1.72) 0.60	0.66 (0.33,1.32) 0.24	0.75 (0.29,1.94) 0.55
WC 3rd	1.42 (0.87,2.32) 0.16	0.92 (0.48,1.79) 0.82	0.88 (0.36,2.12) 0.77
WHR 2nd	1.28 (0.83,1.99) 0.27	1.62 (0.82,3.23) 0.17	0.63 (0.27,1.46) 0.28
WHR 3rd	2.31 (1.43,3.74) 0.001	2.05 (1.07,3.92) 0.03	0.90 (0.40,2.02) 0.79

ACC.ORAL CONTRIBUTIONS

813

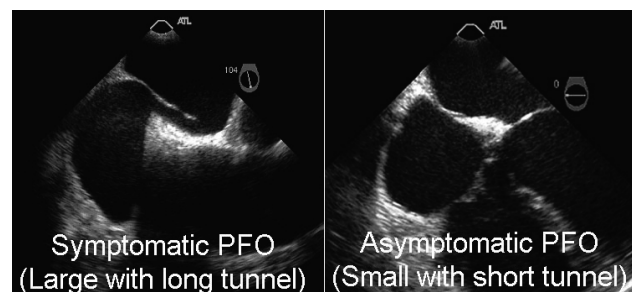# Advances in Real-Time 3D Echocardiography

Monday, March 26, 2007, 11:00 a.m.-12:30 p.m.
Room 271-273

11:00 a.m.

813-3   Can Morphology on Transesophageal Echocardiography Differentiate an Asymptomatic From Symptomatic Patent Foramen Ovale?

Sachin S. Goel, Eduardo De Oliveira, Peter P. Borek, Richard Krasuski, E. M. Tuzcu, Samir R. Kapadia, Cleveland Clinic Foundation, Cleveland, OH

Background: Data on the relationship between patent foramen ovale (PFO) morphology and risk of stroke are limited. Quantitative analysis by Transesophageal Echocardiography (TEE) can help distinguish symptomatic from asymptomatic PFO.
Methods: We studied 58 TEEs performed prior to PFO closure for cryptogenic cerebrovascular event (CVA), and compared them to 58 consecutive patients with asymptomatic PFO found incidentally on TEE. We analyzed the data for PFO size (maximum separation of septum primum and secundum), tunnel length (maximum overlap of septum primum and secundum), presence of atrial septal aneurysm (ASA) (>11 mm mobility), severity of shunting (mild: 3-9, moderate: 10-30, severe >30 microbubbles), prominence of Eustachian valve and presence of Chiari network.
Results: CVA group had larger PFO size (3.9±1.6 vs 2.9±1.4 mm, p<0.001), longer tunnel length (14±6 vs 12±6 mm, p=0.05) and a greater frequency of ASA (45% vs 21%, p<0.005) compared to the controls. They also had a higher proportion of large PFOs (≥ 4 mm) (46% vs 17%, p<0.001), long tunnels (≥1 cm) (78% vs 55 %, p<0.01) and severe shunting (16% vs 5% p<0.06). Frequencies of prominent Eustachian valve and Chiari network were not significantly different.
Conclusion: Symptomatic PFO is larger in size, has a longer tunnel and is more frequently associated with ASA. This information should be considered when evaluating patients with cryptogenic CVA in the presence of a PFO.

Symptomatic PFO (Large with long tunnel)   Asymptomatic PFO (Small with short tunnel)

11:15 a.m.

<u>813-4</u>   **First Experience With a New Real-Time Three-Dimensional Transesophageal Echocardiographic Transducer**

Lissa Sugeng, Lynn Weinert, Bernie Savord, Wojtek Sudol, Jacquie Byron, Patrick Coon, Georgeanne Lammertin, Roberto M. Lang, University of Chicago, Chicago, IL, Philips Medical Systems, Andover, MA

Background. Three-dimensional (3D) transesophageal echocardiography (TEE) is currently performed using gated sequential acquisition in multiple planes, which is lengthy and thus is frequently affected by motion artifacts. Accordingly, a fully-sampled 3D matrix array TEE (3D mTEE) transducer capable of imaging in real time was recently developed. We tested the feasibility of using this probe in the clinical setting and assessed the quality of images it provides.
Methods: 63 patients were studied using 3D mTEE probe (iE33, Philips) during clinically indicated TEE studies. Images of the mitral valve (MV), aortic valve (AV), fossa ovalis (FO) and left atrial appendage (LAA) were obtained in a zoom mode. A wide-angled acquisition of the LV was also performed. Images were reviewed (Excelera workstation with Q-Lab, Philips). Each structure was graded: 0 = inadequate visualization, 1 = <75% visualization with motion artifact and 2 = excellent visualization without dropout or motion artifacts.
Results. We were unable to intubate 2 of 63 patients (~3%). Excellent visualization without artifacts or dropout (grade 2) was obtained for the MV in 87%, AV in 20%, IAS in 90%, LAA in 95% and LV in 68% of the patients. Mean scores were: anterior MV: 1.8, posterior MV: 1.8, LAA: 1.9, FO: 1.8 and LV: 1.6. **Conclusion**: In its current development state, the use of the new 3D mTEE probe is highly feasible. While excellent volume renderings of the MV, LAA and FO and LV were obtained, the AV was not as successfully visualized.

11:30 a.m.

<u>813-5</u>   **Dealiasing of Mitral Regurgitant Color Doppler Flow: A Novel Approach for Direct Flow Quantification at the Vena Contracta Based on Real-Time 3D Color Doppler Echocardiography**
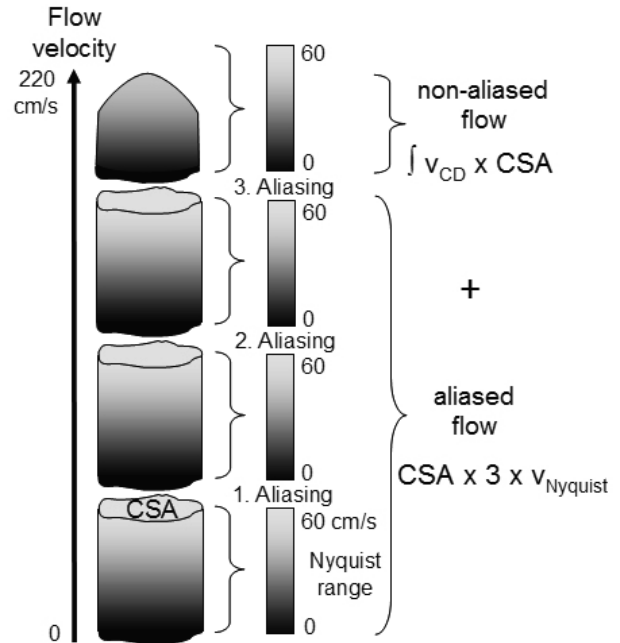
Bjoern Plicht, Ranny Goldwasser, Philipp Kahlert, Thomas Buck, West German Heart Center Essen, University Duisbug-Essen, Essen, Germany

Background: Quantification of mitral regurgitant (MR) flow directly at the lesion using color Doppler (CD) echocardiography has been prevented due to multiple aliasing from turbulent flow. Recent studies, however, demonstrated that flow at the vena contracta is laminar with a narrow velocity spectrum that should allow dealiasing to accurately calculate MR flow. This hypothesis was tested in an in vitro flow model using real-time 3DCD flow analysis.
Methods: In an in vitro flow model MR jets of flow rates from 5 - 60 ml/s were produced through asymmetric orifices of 0.2 - 0.6 cm². From 3DCD data sets (IE33, Philips) MR flow was calculated by automated integration of the non-aliased CD velocities over the cross-sectional area (CSA) of the vena contracta (4D Echo View, TomTec) with aliasing avoided by maximum baseline shift doubling Nyquist velocity. Aliased flow was calculated by flow CSA times Nyquist velocity times the number of aliasing transitions derived from maximum continuous wave Doppler velocity. Total MR flow was calculated as the sum of non-aliased and aliased flow.
Results: 3DCD imaging of the CSA of the vena contracta was feasible in all flow stages without CD aliasing. Flow rates calculated from 3DCD data sets correlated excellent with actual values (r=0.99) with a mean difference of 3.7±2.5ml (NS by t-test).

Conclusions: At the vena contracta dealiasing of 3DCD provides accurate MR flow. This novel approach can be readily implemented in current systems to provide rapid semiautomated MR flow.

11:45 a.m.

<u>813-6</u>   **Utility of Real-time Three-Dimensional Echocardiography for Optimizing Cardiac Resynchronization Therapy: Comparison With Tissue Doppler Imaging**

Ebere O. Chukwu, Stuart O. Schecter, Justine S. Lachmann, Dennis G. Mihalatos, Dali Fan, Rena S. Toole, Steven Greenberg, Joesph Levine, Vinod Jayam, David Hoch, Nathaniel Reichek, Aasha S. Gopal, St. Francis Hospital, Roslyn, NY, Stony Brook University, Stony Brook, NY

Background: Time-to-peak longitudinal velocity (TTPV) by tissue Doppler imaging (TDI) is used to assess intraventricular dyssynchrony. Real-time three-dimensional echocardiography (RT3DE) allows computation of time-to-minimum systolic volumes (TMSV) for each regional segment and may be an alternative approach. We compared regional TTPV curves obtained from a 12-segment model to the corresponding regional TMSV curves in patients undergoing cardiac resynchronization therapy (CRT).
Methods: Data were obtained from 468 regional segments at 40 different biventricular V-V timing interval settings in patients undergoing CRT. Patients underwent conventional TDI as well as full-volume RT3DE at each pacemaker setting. V-V interval timing was changed in an iterative fashion; A-V timing interval was held constant. TTPV and TMSV curves were derived for each of 12 regional segments. Three time windows for selection of TDI velocity peaks were compared to TMSV: 1) 60 ms after QRS onset to 200 ms after machine estimated end-systole based on the R-R interval (Default) 2) 60 ms after QRS onset to 200 ms after Doppler derived aortic valve closure (200+AVc) and 3) aortic valve opening to aortic valve closure (AVo-AVc). Default and 200+AVc were generated automatically by the machine (Automated) and manually by the sonographer (Manual). Apical 4, 2 and 3 chamber TDI were analyzed using 6 mm x 6 mm region of interest placed in basal and mid-portions of opposing walls in each view (12 segments). Regional TMSVs were computed from 3D endocardial tracking over the R-R interval using Q-lab (Philips) for each of 12 wall segments and compared to the corresponding regional TTPVs for the three time windows by Spearman rank correlation.
Results: Manual derived TPPVs showed significant correlation compared to TMSV(r =0.1, p= 0.02-default; r = 0.1 p = 0.02-200 + AVc; and r = 0.3 ,p =<0.0001- AVo-AVc. Automated derived TTPV did not correlate with TMSV (r= 0.03, p-ns-default; r = -0.04, p-ns-200 + Avc). 132/432 or 30.6% of peaks detected by the automatic method occurred during the isovolumic contraction period.
Conclusions: TMSV by RT3DE correlates significantly with manual but not automated TTPV measurements for all studied time windows.

Diagnostic Testing

813-7   **Impact of Left Ventricular Lead Position on Left Ventricular Function and Remodelling After Long-Term Follow-Up With Cardiac Resynchronization Therapy Using 3D Echocardiography**

Michael Dr. Becker, Rainer Prof. Hoffmann, Harald Dr. Kühl, Alexander Dr. Sasse, Malte Prof. Kelm, Andreas Prof. Franke, Department of Cardiology, University Hospital RWTH Aachen, Aachen, Germany

Background: This study sought to assess if 3D-Echocardiography (3DE) allows definition of an optimal left ventricular (LV) lead position for improved effectiveness of cardiac resynchronisation therapy (CRT).
Methods: 48 patients (53±8 years,28 men) with heart failure were included. 31 patients (pts) had ischemic heart disease. Echocardiograms were performed before CRT and at 12 (±3) months follow-up (FU) using a 3D digital ultrasound scanner (iE33,Philips,Ando ver,MA). Analysis of temporal course of contraction in 16 LV segments was performed offline using a semiautomatic contour tracing software (LV Analysis,TomTec,Untersc hleissheim). Based on the resulting volume-time-curves the segment with the latest minimum of systolic volume in each pts was identified pre-CRT (=segment A). Additionally the temporal difference between pre- and post-CRT minimum of systolic volume was determined (Dts) for each segment. The segment with the longest Dts was defined to show the greatest effect of CRT. The location of LV lead position was assumed within this segment (=segment B). LV lead position was defined as optimal when segments A and B were equal as non-optimal when they were different. To verify LV lead position assumed by 3DE biplane fluoroscopy was performed with CRT.
Results: 20 pts showed a non-optimal, 28 pts an optimal LV lead position. Before CRT ejection fraction (EF), endsystolic/diastolic volumes (LVESV,LVEDV) and peak oxygen consumption (VO2max) were equal in both groups (EF 32±5 / 31±5%, LVESV 244±90 / 247±89ml, LVEDV 316±84 / 320±92ml, VO2max 14.1±1.3 / 14.5±1.5 ml/min/kg). At 12 months FU pts with an assumed non-optimal LV lead position showed an increase of 6±2% (EF), 1.6±0.5 ml/min/kg (VO2max) and a decrease of 26±7ml (LVESV), 12±6ml (LVEDV), pts with an assumed optimal LV lead position 10±3% (p<0.001), 2.3±0.4 ml/min/kg (p<0.01), 39±8ml (p<0.01) and 21±8ml (p<0.01). In 44 pts there was an agreement between anatomical LV lead position defined by fluoroscopy and assumed LV lead position defined by 3DE. **Conclusion:** A correspondence of the assumed LV lead position (segment B) and the segment with the latest preoperative LV contraction (segment A) results in a significant greater benefit of CRT.

813-8   **Real-Time Three-Dimensional Echocardiography Is Superior to Inducibility on Electrophysiological Testing for Predicting Adverse Clinical Outcomes Among Post-Myocardial Infarction MADIT-II Patients**
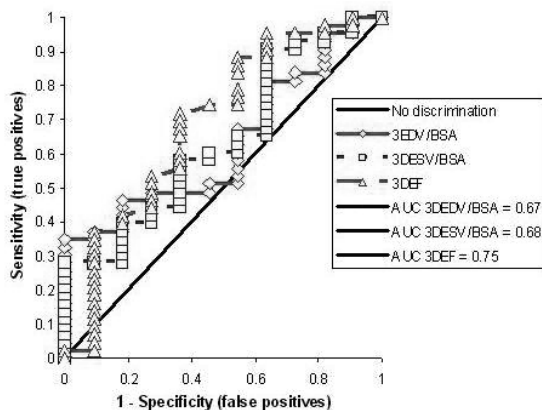
Ebere O. Chukwu, Rena S. Toole, Jeanette McLaughlin, Joseph H. Levine, Steven Greenberg, Stuart O. Schecter, Vinod Jayam, Aasha S. Gopal, St. Francis Hospital, Roslyn, NY, Stony Brook University, Stony Brook, NY

Background: LVEF and inducibility on electrophysiologic testing (EPS+) are common determinants for implantable defibrillator (ICD) implantation as demonstrated by the MADIT-II study. However, the arrhythmic event rate is low; hence the need for superior risk stratification strategies post-myocardial infarction.
Methods: 54 patients (48M, age 68 ± 9) who met MADIT II criteria for ICD placement based on an EF≤30% by 2DE, nuclear or cath were studied. Thirty-three patients were EPS+. Subjects were followed up for 472 days for adverse events (death, sustained VF/VT and ICD discharges). Receiver operator curves were obtained to determine the association between EPS+, 3D, 2DE LV volumes indices, mitral regurgitation (MR), and adverse events.
Results: Mean indexed end-diastolic (3DEDV) and end-systolic volumes (3DESV) were 116±41 and 87± 6 ml/m² respectively with a mean 3DEF of 26±7%. Three deaths occurred. The incidence of ICD discharge & sustained VT/VF was 26%. Mild MR and moderate MR were seen in 32 and 9 subjects respectively. ROC curve analysis showed that 3DEDV (*p* = 0.05), 3DESV (p=0.03) and 3DEF (p=0.0015) were significantly associated with adverse clinical events whereas 2DEDV, 2DESV, 2DEF, EPS+, mild MR and moderate MR (p=0.10, 0.14, 0.40, 0.10, 0.34, 0.24 respectively) were not.
Conclusions: 3DE derived LV volume and EF indices are superior to those derived by 2DE, and better than EPS+ status and MR for predicting increased risk of death, ICD firing and sustained VF/VT in the MADIT-II patient population.

824

Novel Insights From Cardiovascular Magnetic Resonance

Monday, March 26, 2007, 4:00 p.m.-5:30 p.m.
Room 265-268

824-3   **Mechanistic Insights From Serial Cardiac Magnetic Resonance Imaging at 3 and 15 Months After Application of Blood-Derived Progenitor Cells in Recanalized Chronic Coronary Total Occlusions**

Holger Thiele, Andreas Schuster, Dietmar Kivelitz, Sandra Erbs, Volker Adams, Axel Linke, Rainer Hambrecht, Gerhard Schuler, University of Leipzig - Heart Center, Leipzig, Germany

Background: Transplantation of circulating progenitor cells (CPC) was shown to improve left ventricular (LV) function after successful recanalization of CTO at short-term follow-up. Cardiac magnetic resonance imaging (CMRI) is an excellent diagnostic tool for serial assessment of changes in left ventricular function and might uncover underlying mechanisms by assessment of myocardial perfusion and infarct size at mid-term and long-term follow-up.
Methods and Results: Twenty-eight patients with reperfused CTO were randomized to either CPC's or inactive serum (control) infused into the target vessel. Serial CMRI performed at baseline, after 3 and 15 months revealed a significant increase in left ventricular (LV) ejection fraction in the CPC group (from 51±14 to 58±13% and 60±10%; p<0.01 versus baseline), a decrease in endsystolic volume (from 68±33 to 60±33 ml and 60±31 ml; p<0.05 versus baseline) and unchanged enddiastolic volumes (136±37 vs. 133±33 and 147±45, p=n.s. vs. baseline). Infarct size decreased significantly from 10.3±7.7 to 9.0±7.2 and 9.5±8.5 ml, p<0.05 vs. baseline. First-pass myocardial perfusion at rest and stress using adenosine revealed significant improvement of the myocardial perfusion reserve index in affected segments by 1.50±0.17 to 1.76±0.16 (p<0.001) and 1.82±0.20 (p<0.001) at 3 and 15 months, respectively. In control ejection fraction showed no increase at 3 (p=0.99) but delayed improvement at 15 months (p=0.04), whereas myocardial perfusion was improved at 3 (p=0.01) and 15 months (p=0.004) follow-up. There was an inverse relationship between infarct transmurality and regional functional improvement in control, whereas this effect was attenuated in the CPC group.
Conclusions: Analysis of serial CMRI suggests that intracoronary application of CPC post CTO recanalization is associated with improved myocardial perfusion, reduction in infarct size and subsequent improved recovery of LV function as compared to control at mid-term and long-term follow-up.

824-4   **Poor Cardiac Prognosis in Patients Without Inducible Left Ventricular Wall Motion Abnormalities but With Increased Left Ventricular Wall Thickness During Intravenous Dobutamine Stress Testing**

Thomas F. Walsh, IV, Timothy M. Morgan, William Ntim, W. Gregory Hundley, Wake Forest, Winston Salem, NC

Background: In patients with increased left ventricular (LV) wall thickness, the sensitivity of dobutamine stress-induced LV wall motion abnormalities for identifying inducible ischemia is reduced. This study examined the influence of LV wall thickness on the prognostic utility of the absence of inducible LV wall motion abnormalities observed during a dobutamine stress test.
Methods: One hundred seventy-nine participants (105 women, 74 men), aged 68 ± 12 years with a resting LV ejection fraction > 55%, underwent dobutamine cardiovascular magnetic resonance imaging (DCMR) because of a chest pain syndrome. All participants reached 80% predicted maximum heart rate for age and none displayed inducible wall motion abnormalities indicative of ischemia. LV posterior wall thickness (PWT) and septal wall thickness (SWT) were measured at the mitral chordae level at end diastole using the apical 3-chamber view. After DCMR, all participants were contacted by personnel unaware of DCMR test results at a mean of 5.5 years to determine post DCMR occurrence of a cardiac death, myocardial infarction, and congestive heart failure or unstable angina warranting hospital admission.
Results: The overall event rate was 20.9% over 5 years. SWT (p=0.0001) and PWT (p<0.0001) were associated with cardiac events. In a multivariate analysis, PWT > 12mm (hazard ratio 4.4 CI 2.3 to 8.6) and SWT > 12mm (hazard ratio 3.967 CI 1.9 to 8.1) were associated with future cardiac events independent of the presence of risk factors for coronary arteriosclerosis.
Conclusions: Increased LV wall thickness is an adverse predictor of cardiac events in patients with chest pain even in the absence of inducible wall motion abnormalities during dobutamine cardiac stress testing. For this reason, parameters other than an isolated observation of wall motion may be needed to assess cardiac risk in patients with thick walled ventricles that are referred for dobutamine stress testing.

+/- 0.65 ml/min/g (p<0.001). Intrasubject perfusion was best distinguished by the ratio of ischemic to normal (remote) flow which averaged 0.57 +/- 0.17.

Conclusions: Quantitative stress perfusion imaging independently has the same diagnostic accuracy as qualitative methods that incorporate cine, rest perfusion, and delayed enhancement imaging.

4:30 p.m.

824-5   **Characterization of Intraventricular Blood Flow Vorticity In Health and Disease By Contrast Echocardiography Using Vector Particle Image Velocitimetry**
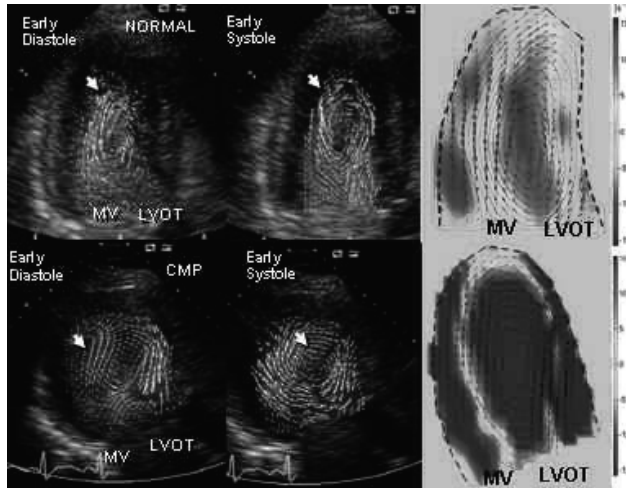
Geu-Ru Hong, Peng Li, Gianni Pedrizzetti, Partho Sengupta, Federico Domenichini, Wei Zhao, Helene Houle, Shannon Jin, Marek Belohlavek, Jamil Tajik, Namsik Chung, Bijoy Khandheria, Jagat Narula, Mani Vannan, University of California, Irvine, Orange, CA

Background: Intraventricular blood flow is optimized to facilitate efficient systolic ejection of blood. Vortices that form during left ventricular (LV) filling have specific geometry and anatomical location which are critical determinants of directed blood flow during ejection. We used a novel Particle Image Velocimetry(PIV) of contrast echocardiograms in normal and abnormal LV for study of the vortex formation.

Methods: 7 normals, 7 with dilated cardiomyopathy(DCM) and 5 with myocardial infarction, underwent 2-D contrast echocardiography with Definity and imaged at a low mechanical index in the apical 4 chamber and apical long axis(APLX) views. The two components of the velocity vector on the scan-plane were estimated by PIV, combined with a Feature Tracking Algorithm.

Results: Flow data in freeze frames in APLX represent the divergence-free velocity vector on the scan-plane, superimposed to the reconstructed Doppler representation. In normals, a compact elliptical vortex is seen in the proximity of the anterior mitral leaflet directed towards apex during diastole, and LV outflow tract during ejection (Fig, upper). In CMP, Echo shows a weak vortex in diastole and a circular apically displaced recurring vortex in systole with no trajectory (Fig, lower).

Conclusions: Vorticity imaging by contrast echocardiography using vector profile is a novel approach to depict flow vortex. It offers a new method for early detection of LV dysfunction and potential application for the resynchronization therapy.

4:45 p.m.

824-6   **Accuracy of Fully Quantitative Cardiac Magnetic Resonance Myocardial Perfusion in Detection of Coronary Disease as Measured by Quantitative Coronary Angiography**

Federico E. Mordini, Tariq M. Haddad, Li-Yueh Hsu, W. Patricia Bandettini, Peter Kellman, Tracy B. Lowrey, Anthony H. Aletras, Andrew E. Arai, National Institutes of Health, Bethesda, MD, Suburban Hospital, Bethesda, MD

Background: Qualitative assessment of perfusion MRI introduces subjective factors that could be minimized by objective or quantitative measures.

Purpose: to determine the sensitivity, specificity, and accuracy of a fully quantitative stress perfusion method versus quantitative coronary angiography (QCA).

Methods: Patients (n=67) with known or suspected coronary artery disease underwent dipyridamole stress dual bolus first pass perfusion imaging. Endocardial perfusion was quantified using Fermi function deconvolution (ml/min/g, 12 radial sectors/slice). Qualitative analysis was performed with our standard clinical protocol which utilizes cine, delayed enhancement (DE), and perfusion imaging. A second qualitative analysis was performed using the Duke University algorithm which utilizes DE and perfusion imaging. QCA was performed by a cardiologist blinded to the MRI results.

Results: Patients averaged 60+/-11 years and 45 were men (67%). Thirty six patients (54%) had coronary stenoses >60% in diameter: 5 had 3-vessel disease (VD), 6 had 2-VD, and 25 had 1-VD.

Standard clinical interpretation yielded a sensitivity of 81% and specificity of 84%. The qualitative Duke algorithm had a sensitivity of 89% but a specificity of only 71%. Quantitative analysis yielded a sensitivity and specificity of 81% and 81%. The accuracy of all three methods ranged from 81-82%.

Receiver operator curve analysis found that the optimal threshold for abnormal perfusion was a 20% or greater flow reduction. This agreed well with coefficient of variation analysis in subjects with no significant stenosis. In normal segments, myocardial blood flow averaged 2.70 +/- 0.76 ml/min/g while true positive perfusion defects averaged 1.51

5:00 p.m.

824-7   **Race/Ethnic Differences in Regional Myocardial Function in an Adult Population Asymptomatic for Cardiovascular Disease: A Tagged Magnetic Resonance Imaging Study of the MESA Cohort**

Verônica R. S. Fernandes, Sachin Agarwal, Yu-Jen Cheng, Ciprian M. Crainiceanu, Robyn McClelland, David A. Bluemke, João A.C. Lima, Johns Hopkins Hospital, Baltimore, MD, University of Washington, Seattle., WA

Background: Observational studies have shown differences in morbidity and mortality of congestive heart failure (CHF) among races. The risk for cardiovascular mortality is still conflicting, with some studies showing higher mortality among Chinese and Caucasians. Shorter timing to systolic myocardial deformation might confer an increased risk to develop arrhythmias and late CHF. Our purpose was to evaluate ethnic differences in regional myocardial function, assessed by time to peak of circumferential strain (t-Ecc) in asymptomatic participants of the Multi-Ethnic Study of Atherosclerosis (MESA)

Methods: Midwall t-Ecc were calculated from tagged MRI harmonic phase analysis in 1100 participants. Linear regression with t-Ecc and races was performed before and after adjustments for risk factors.

Results: The mean participant age was 66.2 ± 9.7 years (mean ± sd). The mean t-Ecc (ms) was estimated by myocardium regions (Mean ± se: Anterior, 297.8 ± 2.54; Lateral, 332.4 ± 2.89; Posterior, 338.2 ± 3.01; Septal 309.20 ± 2.68; p<0.0001). In most of the walls, except septal, Chinese had significantly shorter t-Ecc (p<0.05) compared to Hispanics, even after adjustments for risk factors (Table 1)

Conclusions In a large population based study, regional myocardial function differs by ethnic groups even after adjustments for risk factors. These results may partly explain differences in CHF outcomes among different race/ethnic groups with a potential for guiding future early detection and treatment to prevent CHF.

Relationship between Time to Peak of Midwall Myocardial Strain and Different Ethnicities			
Regression Coefficients for Time to Peak of Circumferential Ecc (ms), based on Multiple Regression Analysis*			
	Caucasian (33.1%)	**African American** (28%)	**Hispanic** (29.7%)
anterior	11.33 ± 9.96	12.63 ± 10.39	22.60 ± 10.17 **
lateral	21.33 ± 11.25	20.68 ± 11.75	27.17± 11.50 **
inferior	17.30 ± 11.84	21.20 ± 12.36	25.09 ± 12.10 **
septal	-9.54 ± 10.37	-4.64 ± 10.84	8.18 ± 10.60
Notes: -Chinese (9.2%) is the reference group for race;			
* Coefficients represent the differences in time to peak Ecc (ms) among the ethnic groups (Caucasians African-American and Hispanics), with Chinese as the reference group for race, adjusted by age, gender, body mass index, blood pressure medications, cigarette smoking and practice of regular exercise; **p<0.05			

5:15 p.m.

824-8   **Angiographic Estimates of Myocardium at Risk During Acute Myocardial Infarction: A Validation Study Using Cardiac Magnetic Resonance Imaging**

Jose T. Ortiz, Sheridan N. Meyers, Daniel C. Lee, Preeti Kansal, Francis J. Klocke, Thomas A. Holly, Charles J. Davidson, Robert O. Bonow, Edwin Wu, Northwestern University, Chicago, IL
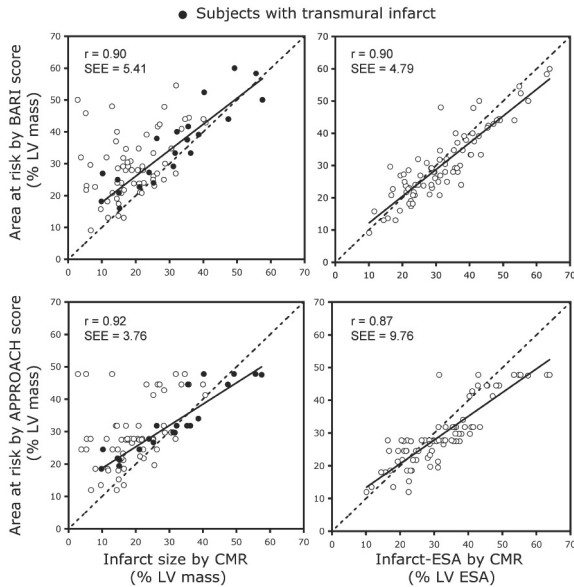
Background: The extent of necrosis after acute coronary occlusion is largely dependent on the distal distribution of the coronary arteries. We used contrast enhanced magnetic resonance (CMR) to validate the area at risk measured by angiography and to assess salvage provided by collateral flow and time to reperfusion.

Methods: In 83 subjects with myocardial infarction treated with primary angioplasty, the myocardium at risk was estimated using the Myocardial Jeopardy Index (BARI) and a modified version of the Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease (APPROACH) scores. CMR was performed within a week to measure infarct size, endocardial surface area (infarct-ESA) and transmural extent.

Results: The area at risk using BARI and APPROACH scores matched the infarct size in 21 subjects with transmural infarcts (r=0.90 and r=0.92, P<0.001). Additionally, BARI and APPROACH scores matched the infarct-ESA in all subjects independently of collateral flow and time to reperfusion (r=0.90 and r=0.87, P<0.001). Subjects with collaterals or reperfusion <3 hours had fewer segments with transmural infarct and less mean infarct transmurality score (P<0.05 for all) despite no differences in the area at risk or infarct-ESA.

Conclusion: The myocardium at risk can be determined by angiography as confirmed in subjects with transmural infarct and absent myocardial salvage. Salvage provided by early reperfusion or collaterals occurs predominantly by a reduction in infarct transmurality.

Diagnostic Testing

• Subjects with transmural infarct

ACC.ORAL CONTRIBUTIONS

831

Coronary Computed Tomography Angiography and Prognosis

Tuesday, March 27, 2007, 7:00 a.m.-8:30 a.m.
Room 260-261-262

7:00 a.m.

831-3   **Normal Results on 64-Detector Coronary Computed Tomography Angiography Predict Excellent Outcomes at 1-Year Follow-Up**

Jason H. Cole, Ralph S. Buckley, Gerry M. Phillips, Cardiology Associates, Mobile, AL, University of South Alabama, Mobile, AL

Background: 64 detector coronary CT angiography (CTA) is a rapidly emerging technology. Correlation studies with angiography show excellent negative predictive value for obstructive coronary artery disease (CAD); however, outcomes data from clinical practice are scarce. This study looks at 1-year outcomes for patients evaluated with CTA.
Methods: CTA was performed to evaluate patients suspected of having CAD, and studies were interpreted by experienced cardiologists. All results were tracked in a clinical database. Nurses contacted patients at 1-year follow-up to track clinical outcomes, evaluating for death, myocardial infarction (MI), hospitalization, subsequent catheterization, and catheterization results. Catheterization results were confirmed by chart review. All data points were subsequently maintained in a deidentified database, and outcomes were analyzed. Comparisons between groups were by chi-square analysis.
Results: 387 individuals had CTA performed with documented follow-up. 139 had normal results, with no soft or calcified plaque. 121 had evidence of nonobstructive luminal irregularity. 127 had potentially obstructive plaque on CTA. At 1 year, 6 patients had died: 1 with no obstructive disease (confirmed on catheterization) died of cardiomyopathy; 5 with potentially obstructive disease died, 4 of MI (p<.001 between groups.) Of the 138 surviving patients with normal results, 9 ultimately underwent catheterization, but no patients in the group underwent bypass surgery or stenting. Of the 121 persons with apparent nonobstructive plaque, 14 underwent catheterization at some point: 1 had stenting and 1 bypass. Thus, of 259 patients with no apparent obstructive disease on CTA, 2 (0.8%) had revascularization at 1 year. Of the 127 with potentially obstructive disease, 82 (65%) underwent catheterization: 42 had stenting; 19 had bypass surgery (74% predictive value for revascularization). **Conclusion**: CTA with no evidence of obstructive disease demonstrates over 99% negative predictive value for coronary intervention at 1-year follow-up. Death from myocardial infarction is much more likely in individuals with obstructive disease on CTA.

7:15 a.m.

831-4   **Usefulness of 64-Slice Multi-Detector Computed Tomography as a First Diagnostic Approach in Acute Chest Pain Patients**

Sung-A Chang, Eue-Keun Choi, Hyung-Kwan Kim, Jin-Wook Jung, Kyu-Seok Kim, Eun-Ju Chun, Sang-il Choi, Young-Seok Cho, Woo-Young Chung, In-Ho Chae, Dong-Joo Choi, Byung-Hee Oh, Young-Bae Park, Yun-Shik Choi, Hyuk-Jae Chang, Seoul National University Bundang Hospital, Cardiovascular Center, Seoul, South Korea, Seoul National University Bundang Hospital, Department of Radiology, South Korea

Background : 64 multi-detector computed tomography (MDCT) is a recently introduced diagnostic tool for chest pain. Despite high sensitivity and specificity of MDCT, guidelines for the clinical application of MDCT are limited especially compared with conventional diagnostic methods. We present the interim finding of ongoing prospective randomized trial 'Usefulness of MDCT as a first diagnostic approach in acute chest pain patients in emergency room (ER).'
Method : We prospectively enrolled the patients who presented to ER with acute chest pain from April 2006. Exclusion criteria included ST elevation myocardial infarction (MI), unstable vital sign, uncontrolled arrhythmia, renal failure, hypersensitivity to contrast dye and clinically no possibility of angina. Patients were divided into the following 3 clinical categories based on history, physical exam, and electrocardiogram : 1) definite angina with uncertainty of regarding MI (group1), 2) probable angina (group2), 3) probable not angina (group3). After categorization, patients were randomized to either standard evaluation and conventional treatments (control group) or immediate 64-MDCT and CT-guided treatments (MDCT group). We evaluate the length of stay in ER, admission rate, diagnostic accuracy, and major adverse cardiac events (MACE) and clinical diagnosis at 1 month after discharge from ER.
Results: 136 patients were included (68 in MDCT, 68 in control). Control and MDCT group were similar in demographics and risk factors. In high risk group (group1), no impact was found between groups. However, in the intermediate and low risk group (group2 and group3), unnecessary admission was significantly reduced in MDCT group (p=0.037). MDCT group with low risk (group3) had a shorter length of stay compared with control group, although it did not reach the statistical significance (mean 10.5 vs 6.4 hour, p=0.24). There was no statistical difference in MACE between groups during follow-up with a very low rate.
Conclusion : MDCT as a first diagnostic approach to acute chest pain in ER can reduce the unnecessary admission and possibly reduces the length of stay in ER for patients with clinically low and intermediate risk of coronary artery disease.

7:30 a.m.

831-5   **Predictive Value of Coronary CT Angiography for Late Adverse Cardiac Events (MACE) in Patients With Chest Pain Syndromes**

Ronen Rubinshtein, David A. Halon, Tamar Gaspar, Nathan Peled, Basil S. Lewis, Lady Davis Carmel Medical Center, Haifa, Israel

Background: Coronary CT angiography (CTA) correlates well with angiographic findings on selective coronary angiography but its predictive value for late major adverse cardiac events (MACE) is unknown.
Methods: CTA (Philips, Brilliance 64 or 40 slice) was analyzed in 546 consecutive pts without known coronary disease (58±12 yrs, 31% women) referred for investigation of a chest pain syndrome. Predictive value of CTA stenosis(es) (>25% narrowing) and of high Agatston calcium score (>100) for MACE (death, myocardial infarction, revascularization, hospitalization for acute coronary syndrome) was examined at 18.6±6.3 (range 9-30) months.
Results: MACE rate increased with percent stenosis on CTA [CTA <25%, 7/329 (2.1%); CTA 26-49%, 32/109 (29%); CTA>50%, 56/108 (52%) p<0.0001] and with higher calcium score (>100) [62/171 (36%) vs 33/375 (9%) pts, p<0.0001]. Calcium score <100 and CTA <25% combined excluded MACE in 280/282 pts (NPV=99%).

Predictive value of CTA and calcium score

	Sensitivity	Specificity	PPV	NPV	PA
Calcium score ≥100	65	76	36	91	74
CTA narrowing(s) >25%	93	71	41	98	75
Calcium score ≥100 **or** CTA >25%	98	62	35	99	68
PPV=positive predictive value, NPV=negative predictive value, PA=predictive accuracy					

Conclusions: In pts with chest pain syndromes: 1. MACE rate increased with increasing CTA stenosis and higher calcium score. 2. CTA markedly improved sensitivity and negative predictive value of calcium score for MACE.

7:45 a.m.

831-6   **Use of Multidetector Computer Tomography Angiography Following Abnormal Myocardial Perfusion Stress Testing in a Large Single-Specialty Cardiology Practice**

Jerome L. Hines, Sorin C. Danciu, Manan Shah, Mary Jane Borg, Cathleen Biga, Illinois Heart and Vascular, LaGrange, IL

Background: The 64-slice computed tomograph angiography (CTA) scanner offers the latest in noninvasive cardiac imaging technology and is increasingly being incorporated into clinical practice. However, limited research exists regarding the impact of CTA on the number of invasive cardiac catheterizations. Therefore the objective of this study was to compare cardiac catheterization rates before and after implementation of a CTA scanner in a large, suburban, outpatient, single-specialty cardiology practice.
Methods: All patients undergoing CTA are entered into a database starting April 2005. We conducted a search that included any patient that was referred to CTA after a mildly

abnormal myocardial perfusion imaging (MPI) scan, defined as an ischemic area of less than 10% of the myocardium. We then randomly selected controls, matched for age (± 5 years), gender and presence of either known coronary artery disease (CAD), previous CABG or previous stent placement, from all patients who had a mildly abnormal MPI during 2004, before the implementation of the CTA scanner. The main end-point was the cardiac catheterization rate within six months of the initial nuclear stress test in the 2 groups.

Results: There were 194 patients that satisfied the inclusion criteria (post-CTA) and they were matched to 194 pre-CTA patients. In both groups, the average age was 67 (std dev ±11), 66% were men, and 58% had the presence of CAD, previous CABG or previous stent placement. Cardiac catheterizations were observed in 62 (38%) of the pre-CTA patients versus 27 (14%) of the post-CTA patients (P=0.0001). After controlling for background covariates, patients in the post-CTA cohort were 80% (OR 0.2, 95% CI: 0.1-0.4) less likely to receive a cardiac catheterization than patients in the pre-CTA cohort (P<0.0001).

Conclusions: In patients with a mildly abnormal myocardial perfusion stress test, CTA can reduce the need for cardiac catheterization. This requires further confirmation in a prospective study.

8:00 a.m.

<u>831-7</u>   **Cost-Effectiveness and Clinical Outcomes of Coronary Computed Tomographic Angiography Compared to Myocardial Perfusion Imaging for the Diagnosis of Coronary Artery Disease**

<u>James Min</u>, Fay Lin, Antonio Legorreta, Ning Kang, Amanda Gilmore, Weill Medical College of Cornell University, New York, NY

Background: Coronary computed tomography angiography (CTA) and myocardial perfusion imaging (MPI) are two diagnostic modalities capable of diagnosis of coronary artery disease (CAD). We examined healthcare-associated costs in patients (pts) referred to either CTA or MPI as an initial screen for diagnosis of CAD, as well as clinical endpoints following these exams.

Methods: Private payer administrative claims with complete facility, physician and pharmacy data from two large health plans for 2002-2005 were employed. Pts who received MPI or CTA as an initial diagnostic screen for CAD, with no prior screen within six months, were studied. Cardiac risk level was defined using a validated baseline index measure which included use of CAD-related medications and CAD-related hospitalizations, among others. Two distinct endpoints were evaluated: 1) healthcare costs--CAD-related costs and downstream diagnostic test-related costs, and 2) clinical endpoints--myocardial infarction (MI) and angina. Cox proportional hazards and log transform regression models were used to examine clinical endpoints and costs respectively, controlling for pt characteristics and cardiac risk level.

Results: The CTA pts (N=2,082) were younger (51 vs 57 yrs), included more women (68% vs 49%), had more comorbidities (1.4 vs 1.2), and higher cardiac risk scores (0.32 vs 0.24) compared to the MPI pts (N=43,903). After multivariate adjustment, CAD-related and CAD-plus test-related medical costs were more than three-fold (p<.0001) and 64% (p<.0001) greater for the MPI group compared to the CTA group. Risk of angina or MI post-screen was 40% (Hazard Ratio [HR] 0.40, p<.0001) higher for all pts and 49% (HR 1.49, p=0.02) higher for pts without known CAD in the MPI group compared to the CTA group in a 1-year follow-up. Results were similar after excluding pts without MI in the followup period

Conclusions: CAD-naïve patients who receive CTA as an initial diagnostic screen for CAD incur lower CAD-related and downstream diagnostic screen-related healthcare costs compared to MPI pts, and are at lower risk of incident MI or angina in 1-year followup. These results suggest that CTA may be a reasonable alternative to MPI for the evaluation of CAD.

8:15 a.m.

<u>831-8</u>   **A Cost-Effective Analysis of 64-Row Cardiac Computed Tomography (CCT) for the Diagnosis of Coronary Artery Disease in the Intermediate-Risk Population: A Reflection on Recent ACC CCT Appropriateness Criteria**

<u>Benjamin Z. Galper</u>, Troyen Brennan, Harvard School of Public Health, Boston, MA

Background: The ACC recently released appropriateness criteria for utilizing Cardiac Computed Tomography (CCT) to diagnose CAD. No cost-effective analysis of implementing the criteria in the patient population has been conducted.

Methods: To establish the increased level of effectiveness of a diagnostic work-up for CAD beginning with 64-row CCT, 1,000 theoretical patients of intermediate risk were subjected to several diagnostic protocols including CCT only, ECG stress test only, stress echo only, MIBI only, stress echo followed by MIBI, and CCT followed by MIBI. Sensitivities, specificities, and predictive values for each protocol were determined from the literature. The effectiveness of each protocol was determined based on the ability to reduce the number of false negative studies as well as the number of angiograms performed on patients without CAD. A cost-effective analysis was performed based on a determination of the necessary dollars required to be spent in order to realize a one percent increase in the effectiveness of a given diagnostic protocol.

Results: The sensitivity, specificity, and negative predictive value of 64-row CCT were found to be 95%, 90%, and 99% respectively. CCT followed by MIBI had a false positive rate of only 8.4% and a false negative rate of 6.7% far below that of the next best protocol, stress echo plus MIBI which had rates of 18.8% and 10.3% respectively. The incremental cost effectiveness ratio of the CCT plus MIBI protocol versus the stress echo plus MIBI protocol was $31,969, $60,541, and $96,255 per 1% increase in effectiveness at costs per CCT scan of $600, $1,000, and $1,500 respectively.

Conclusions: There is sufficient evidence to warrant the use of 64-row CCT in the acute setting to rule out CAD in the intermediate risk population and determine if a patient will require coronary angiography and subsequent revascularization. CCT followed by MIBI leads to fewer false positive and false negative tests when compared to other non-invasive cardiac imaging protocols and when priced below $1,000 per CCT scan can realize an increase in effectiveness at a price far below the typically cited cost effectiveness thresholds.

ACC.ORAL CONTRIBUTIONS

834

New Echocardiographic Tools to Evaluate Diastolic Dysfunction

Tuesday, March 27, 2007, 7:00 a.m.-8:30 a.m.
Room 278-281

7:00 a.m.

<u>834-3</u>   **Analysis of End-Systolic Intraventricular Pressure Gradients Improves the Noninvasive Assessment of Left Ventricular Relaxation**
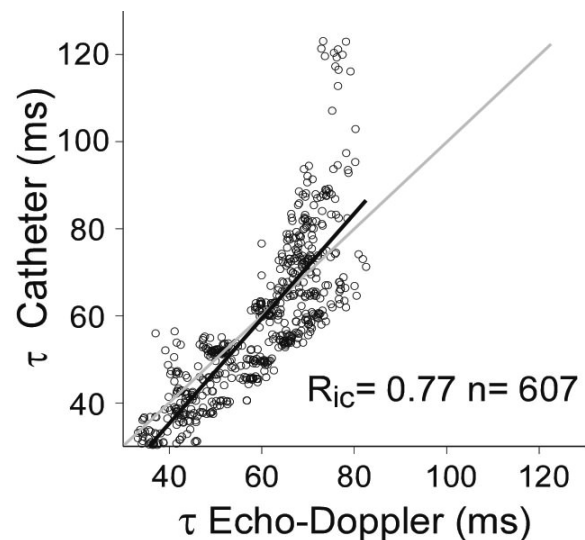
<u>Raquel Yotti</u>, Cristina Cortina, J. Carlos Antoranz, Mar Desco, Daniel Rodriguez, Javier Bermejo, Hospital Gregorio Marañón, Madrid, Spain, Universidad Nacional de Educación a Distancia, Madrid, Spain

We hypothesized that end-systolic features of the ejection intraventricular pressure difference (EIVPD) curve can improve the estimation of the time constant of relaxation (tau) using Doppler-echocardiography.

Methods and Materials. Simultaneous color-Doppler M-mode images of LV outflow and high fidelity pressure-volume signals were acquired in pigs undergoing load and inotropic interventions. EIVPDs were obtained with custom software for solving Euler's equation. Nine animals were used for wave intensity analysis (WIA) and to develop a predictive model to estimate tau from EIVPD parameters. Another 5 pigs were used for validation. Finally, the performance of EIVPD-based predictions was compared to early annular mitral velocity (Ea; Doppler-tissue imaging) in 5 pigs at baseline and during acute apical myocardial infarction (AMI).

Results. WIA demonstrated that the energy of the relaxation wave closely correlated with tau, with the peak reverse EIVPD, and with the time to EIVPD abolishment. Thus, tau linearly correlated with the peak reverse EIVPD and the time to EIVPD abolishment. A bivariate model including the EIVPD parameters, showed good agreement with tau in the validation group (Ric= .77, n= 607 beats; Figure). Predictions based on EIVPDs correlated far better with tau than Ea in animals undergoing AMI (R= .72 vs R= .45, respectively).

Conclusions. Doppler-derived EIPVDs provide an accurate estimation of tau, that can improve assessment of diastolic function in the clinical practice.

7:15 a.m.

<u>834-4</u>   **Siemens Velocity Vector Imaging Versus GE 2-D Speckle Tracking: Are We Measuring the Same Thing?**

<u>Tadaaki Honda</u>, Panupong Jiamsripong, Christina S. Reuss, Bijoy J. Khandheria, Steven J. Lester, Mayo Clinic Arizona, Scottsdale, AZ

Background: The ability to objectively quantify myocardial motion from standard echocardiographic images can be achieved by both Velocity Vector Imaging (VVI) and 2-Dimensional specking tracking (2DST) algorithms. However, both VVI and 2DST differ in the mechanism of "tracking". It is unclear whether the values obtained by each technique can be reported interchangeably.

Methods: 9 subjects underwent echocardiography on both a Siemens Sequoia™ and GE Vivid™ 7 ultrasound systems. Parameters of myocardial motion were derived by analysis with dedicated VVI and 2DST software. Each cardiac cycle was isochronally normalized. Torsion is the net difference in degrees of end-systolic rotation between an apical and basal short axis image. Peak systolic velocity (PSV), strain (S) and strain rate (SR) values were averaged from the apical 4 and 2-chamber views.

Results: The results are outlined in the table. Amplitude values for deformation parameters (PSV, S and SR) differ when evaluated by VVI and 2DST. Torsion did not differ between VVI and 2DST myocardial motion tracking methods.

	VVI	2DST	
Torsion (°)	7.49 ± 3.95	12.48 ± 8.52	P = 0.131
PSV (cm/s)	2.60 ± 0.73	3.61 ± 1.23	P = 0.005
Strain (%)	-16.19 ± 4.24	-19.19 ± 2.37	P = 0.01
Strain Rate (s-1)	-0.84 ± 0.25	-0.97 ± 0.18	P = 0.07

Conclusions: VVI and 2DST both can objectively quantify myocardial motion. Differences in tracking algorithms between these two novel software programs influence values obtained. Further work is need to ensure that as we evolve to a truly objective echocardiographic assessment of myocardial function that methods used are well understood before values espoused are assumed similar.

7:30 a.m.

834-5   **Assessment of Left Ventricular Torsion by Speckle Tracking Echocardiography in Patients With Ventricular Pacing**

Paolo Devecchi, Cristina Piccinino, Gianni Sarasso, Giuliano Marti, Eraldo Occhetta, Miriam Bortnik, Gabriella Francalacci, Andrea Magnani, Virginia Bolzani, Andrea Rognoni, Maria E. Caccia, Paolo N. Marino, Clinical Cardiology, University of Eastern Piedmont, Novara, Italy

Background: During systole the left ventricle (LV) presents an opposite rotation (ROT) between the apical and the basal level, that causes LV torsion (TOR).The aim of this study was to assess (by speckle tracking echocardiography) LV TOR in patients with permanent ventricular pacing as compared with a group of normal subjects.
Methods: We studied 12 patients (10 males; mean age 77±9 years) with normal ejection fraction (EF : 56±4%) and without valvular or ischemic disease. All patients presented ventricular pacing from right ventricle apex. The control group included 17 normal subjects (10 males; 36±18 years; mean EF 60±5%). We acquired 2 short axis views of the LV at the base and at the apex . The apical and basal ROT (expressed in degrees, negative if clockwise and positive if counterclockwise) were calculated by a dedicated software. Time to peak (TTP) was calculated from ECG R wave.LV TOR was the difference between apical and basal ROT.
Results: At basal level, in paced patients, there was an early systolic counterclockwise ROT significantly smaller than in controls (0.5±0.7° vs. 2.8±2.4°: p=0.003). Early systolic TTP was significantly shorter in the paced group (35±50 msec vs. 80±36 msec: p=0.008). In late systole there was a clockwise ROT, with no difference between the groups (-7.2±3.0° vs. -8.0±2.5°: p= NS; TTP 342±57 msec vs. 338±58 msec: p=NS). At the apex there was an early systolic clockwise ROT with no difference between the groups (-1.2±1.5° msec vs. -1.0±0.9° msec: p=NS). The early systolic TTP was longer in the paced group (57±43 msec vs. 32±21 msec: p=0.04). In late systole there was a counterclockwise ROT without difference between the groups (9.1±2.5° vs. 10.9±4.4°: p=NS; TTP339±84 msec vs. 301±73 msec: p=NS). Early systolic clockwise TOR was significantly smaller in the paced group (-0.5±1.2° vs. -2.4±1.9°: p=0.004) with a smaller TTP (22±34 msec vs. 50±27 msec: p=0.02). In late systole TOR was counterclockwise, without difference between the groups (15.6±4.2° vs. 18.0±5.7°: p=NS; TTP 345±44 msec vs. 317 ±53 msec: p=NS).
Conclusion: During ventricular pacing LV TOR is significantly altered in early systole: this could be due to the abnormal LV activation caused by conventional pacing.

7:45 a.m.

834-6   **Twisting Motion Within the Septum Using High Frequency Ultrasound: Studies on Piglets**
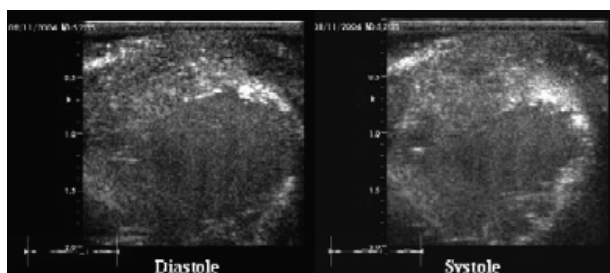
James Pemberton, Edward Hickey, Timothy Thigpen, Ross M. Ungerleider, Xiao Kui Li, David J. Sahn, Oregon Health & Science University, Portland, OR

Background: We have performed high frequency ultrasound studies at 10 and 14 MHz on 7 open-chest piglets (2.9-3.9 kg).
Methods: Epicardial imaging was performed with a gel standoff at highest frequency with a near field transmit focus on a GE VingMed Vivid 7 system.
Results: Imaging from an epicardial position at the highest frequency near the apex clearly differentiates the fiber orientation of the subendocardial layer of the septum in all animals and verifies that its motion precedes the rest of the heart. The contraction was visualized as a torsional subendocardial deformation and counter-clockwise (CCW) twist at the onset of systole at mid-level from papillary muscles to apex. CCW twist was a mean of 15° ± 0.6 in the inner band segment vs 5° ± 0.4 in the more rightward anterior outer band portion of this region.
Conclusions: This high frequency study identifies a major location of mid level twist as a descending transverse band on the septum to the apex inside the left ventricular cavity and shows its torsional motion in very early systole.

8:00 a.m.

834-7   **Regional Nonuniformity of Left Ventricular Strain, Rotation, and Twist Assessed by Two-Dimensional Speckle Tracking Imaging**
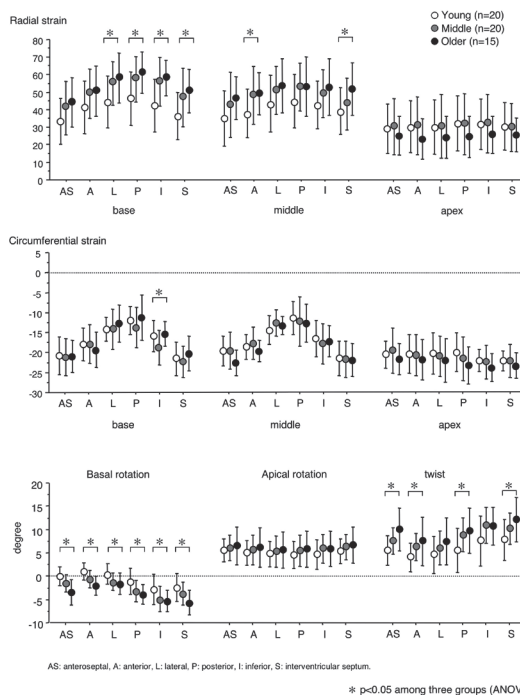
Masaaki Takeuchi, Hiromi Nakai, Tomoko Nishikage, Toshiki Nagakura, Shinichiro Otani, Roberto M. Lang, Tane General Hospital, Osaka, Japan, University of Chicago Medical Center, Chicago, IL

Aim: To evaluate the effects of aging on the regional uniformity of left ventricular (LV) strain and rotation.
Methods: We acquired LV short-axis (SAX) views at 3 levels (base, middle and apex) in 45 normal subjects over a wide age range. Using 2D strain software, time-domain regional strain and rotational analysis was performed in 6 equidistant segments in each SAX plane. Radial strain, circumferential strain and rotation were measured in 18 LV segments.
Results: Radial strain decreased from base to apex, while circumferential strain increased. Circumferential strain non-uniformity was observed in the basal and middle SAX views. The highest value of radial strain was seen in the posterolateral wall while the highest value of circumferential strain was noted in the interventricular septum (IVS). The time interval between the peak of the R wave and peak strain (Tpeak) occurred earlier in the middle SAX compared to the basal SAX, and earlier in the IVS compared to the posterolateral wall in the middle SAX. The standard deviation of Tpeak in 18 LV segments lengthened with age. Regional apical rotation was relatively homogeneous, but basal rotation was augmented in the IVS compared to the anterolateral wall. The basal rotation was significantly higher in the older subjects, thus resulting in larger LV twist with aging.
Conclusions: Non-uniformity in regional LV strain, rotation and twist is exaggerated with aging. The LV regional contribution to strain and rotation is highly variable even in normal subjects.

8:15 a.m.

834-8   **The Ratio of Mitral Deceleration Time to E-Wave Velocity Outperforms Its Individual Components in Predicting Cardiovascular Outcomes: The Strong Heart Study**

Rakesh K. Mishra, James M. Galloway, Elisa T. Lee, Mary J. Roman, Richard B. Devereux, Weill Medical College-Cornell University, New York, NY

Background: The deceleration time of early mitral inflow (E) is a marker of left ventricular (LV) chamber stiffness and is prolonged in many disease states. For any given rate of deceleration of early mitral inflow, a higher E-wave velocity is associated with a longer deceleration time. It is not known whether normalization of deceleration time for E-velocity improves prediction of cardiovascular (CV) events compared to use of deceleration time or E-velocity alone.
Methods: We compared the prognostic value of deceleration time, E-velocity and deceleration time /E-velocity in 3,102 American Indian participants in the Strong Heart Study, free of clinical CV disease and documented atrial fibrillation, in predicting fatal and non-fatal CV events.
Results: Participant characteristics were: age 60±8 years, 64% female, 47% with diabetes and 44% with hypertension. Most participants had normal LV systolic (mean ejection fraction 64±8%) and diastolic (81% with mitral E/A between 0.6 and 1.5) function.During a mean follow-up of 8.5±2.4 years, there were 637 fatal and non-fatal CV events. After adjustment for traditional CV risk factors, deceleration time / E-velocity (3.18±0.89 msec./(cm/s)) predicted CV events (H.R. 1.10 per msec./(cm/s); 95% C.I. 1.01 - 1.21; p=0.04)

whereas deceleration time (H.R. 1.00 per msec.; 95% C.I. 1.00 - 1.00; p=0.27) and E-velocity (H.R. 1.00 per cm/s; 95% C.I. 0.99 - 1.00; p=0.11) did not. When participants with restrictive-type filling (n=74 with E/A>1.5) were removed from the analysis, deceleration time /E-velocity predicted CV events even more strongly (Wald statistic 4.84 vs. 4.12 with E/A>1.5 included; H.R. 1.11 per msec./(cm/s); 95% C.I. 1.01 - 1.22; p=0.03).

Conclusion: In a large population-based sample of American Indians with high prevalences of hypertension and diabetes, free of prevalent CV disease, deceleration time /E-velocity predicts CV events whereas its components (deceleration time and E-velocity) do not. This suggests normalization of deceleration time for E-velocity more precisely captures prognostically significant prolongation of deceleration rate than does deceleration time alone.

ACC.ORAL CONTRIBUTIONS

841

Nuclear Cardiology for Predicting Prognosis

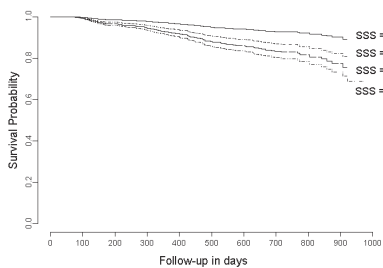Tuesday, March 27, 2007, 11:00 a.m.-12:30 p.m.
Room 228-229-230

11:00 a.m.

841-3   **Incremental Prognostic Value of Rubidium-82 Myocardial Perfusion Positron Emission Tomography-Computed Tomography Imaging in Patients With Known or Suspected Coronary Artery Disease**

Sharmila Dorbala, Rory Hachamovitch, Raymond Y. Kwong, Zelmira Curillova, Marcelo F. Di Carli, Brigham and Women's Hospital, Boston, MA, University of Southern California, Los Angeles, CA

Background: The prognostic value of Rb-82 myocardial perfusion imaging (MPI) with CT attenuation correction is not known.
Methods: We studied 1602 consecutive patients with known or suspected CAD, referred for rest/stress PET-CT. The CT was used only for attenuation correction. A 17-segment model and a 0-4 scale were used and summed stress (SSS) score computed. The vital status of all patients was assessed from the social security death index. Patients with coronary revascularization <60 days after PET were excluded.
Results: The mean age of the cohort was 63±14 years (51% women, mean body mass index (BMI) 31±8 kg/m2). During follow-up (median: 511 days), 113 patients (7%) died. On univariable analysis, survivors were more often female, obese, non-smokers with less recent myocardial infarction (MI), chest pain, insulin use or LBBB on ECG. Unadjusted all cause mortality rates increased from normal to severely abnormal scans, 3.8%, 3.6%, 10%, 14% and 14%, P< 0.001 with SSS =0, 1-3, 4-7, 8-13, >14 respectively. The most predictive Cox proportional hazards clinical model included female gender, age, smoking, BMI, insulin use, and recent MI (P <0.0001); addition of SSS increased the predictive capability of the model (x2: 84 to 94, p < 0.0001). As with SPECT, increases in PET SSS translated into proportional increases in predicted mortality (P =0.0003) (Figure).
Conclusions: Myocardial perfusion imaging with Rubidium-82 PET-CT provides incremental value to clinical variables in predicting overall survival.

11:15 a.m.

841-4   **Impact of Renal Function on Mortality Prediction in Patients Undergoing Stress Myocardial Perfusion SPECT**

Abdul Hakeem, Sabha Bhatti, Jeffrey R. Cook, Eric M. Williams, Su Min Chang, University of Wisconsin, Madison, WI

Background: Patients (pts) with chronic kidney disease (CKD) have worse outcome. We examined the relation between renal function and the prognostic value of MPS.
Method: 1747 pts (age 65 ± 10 y/o, 37 % diabetic) had stress MPS (32 % exercise , 95 % gated) and were followed for cardiac death (CD) for 2.15 ± 0.8 years. Modified MDCD equation was used for Creatinine clearance (CrCl) . CKD (CrCl < 60ml/min/1.73 Kg/m2) was present in 632 pts (36%). Renal function was classified into 4 groups: 1 (CrCl >= 90), 2 (CrCl 60-89), 3 (CrCl 30-59), and 4 (CrCl < 30)
The extent and severity of MPS were determined with Sum Stress Score. (Normal: < 4, Mildly abnormal : 4-8, Moderate-severe abnormal: >8)
Result: The annual CD rate was much higher in pts with abnormal MPS across all renal function groups (Table)

In addition, annual rates of CD rose as the MPS defect increased in both pts with CKD (normal MPS 2.4% vs mild abnl 3.8% vs mod-severe abnl 14.8 p<0.01) and those with normal CrCl (normal MPS 0.6 % vs mild abnl 2.1% vs mod-severe abnl 4.8 p<0.01)
Pts who died had significantly worse MPS defect (SSS 11± 10 vs 5 ± 7 p <0.01) and lower baseline CrCl (54 ±20 vs 66 ± 21 ml/min) compared to those who did not.
After adjusting for diabetes, multivariable model showed that both CKD (hazard ratio [HR] 1.4; 95% CI 10-2.0 p=0.05) and abnormal MPS (HR 1.5 95% CI 1.1-2.0 p=0.01) are predictors of all cause mortality.
Conclusion: MPS was useful in risk stratifying patients with different renal function. Both MPS and renal function have additive prognostic value over each other.

Annual CD rate

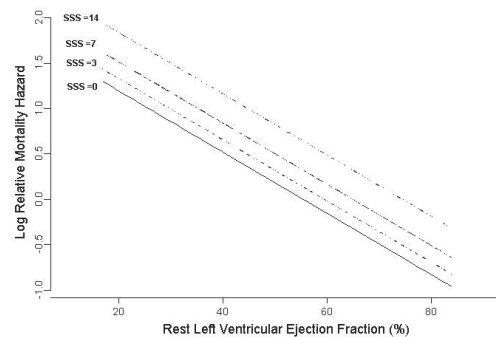|	CrCl >=90 n=188	CrCl 60-89 n=927	CrCl 30-59 n=541	CrCl <30 n=91
Normal MPS	0.4%	0.8%	2%	4.4%
Abnl MPS	4%	3.5%	9.7%	6.7%
p=	0.02	<0.001	<0.001	0.7

11:30 a.m.

841-5   **Incremental Prognostic Value of Left Ventricular Ejection Fraction Assessment Over Myocardial Perfusion Imaging: A Rubidium-82 Positron Emission Tomography/Computed Tomography Study**

Sharmila Dorbala, Rory Hachamovitch, Curillova Zelmira, Raymond Y. Kwong, Marcelo F. Di Carli, Brigham and Women's Hospital, Boston, MA, University of Southern California, Los Angeles, CA

Background: The prognostic value of left ventricular ejection fraction (EF) over myocardial perfusion imaging (MPI) with Rubidium-82 imaging is not described.
Methods: We studied 1274 consecutive patients (pts) with known or suspected CAD, without valvular heart disease who underwent rest/stress PET-CT imaging. The low-dose CT scan was used only for attenuation correction. A 17-segment heart model and a 0-4 scale were used and summed stress (SSS) scores computed. Gated rest EF was calculated using commercial software. The vital status of all patients was assessed from the social security death index. Patients with coronary revascularization <60 days after PET were excluded.
Results: The mean age of the cohort was 63±13 years (51% women, mean SSS 5±8). During follow-up (median: 534 days), 74 patients (6%) died. The mean EF was 59±13% vs. 51±19% in survivors and non-survivors respectively. Addition of rest EF added incremental value to the Cox proportional hazards model incorporating significant clinical (female gender, age, smoking, BMI, insulin use, and recent MI) and MPI variables, SSS (x2: 27 to 43, p < 0.0001). As anticipated, mortality hazard was inversely related to EF. Also, MPI added incremental value to EF (at any EF, a higher SSS had greater risk) and EF added incremental value to MPI (at any SSS, a lower EF had greater risk) (Figure).
Conclusions: Resting EF with Rubidium-82 PET-CT provides incremental value to clinical variables and MPI variables in predicting overall survival.

11:45 a.m.

841-6   **Abnormal Myocardial Perfusion Imaging Predicts Decreased Survival in Patients With a Negative Coronary Angiogram**

Michael A. Morse, Nils P. Johnson, Charles J. Davidson, Thomas A. Holly, Northwestern University, Chicago, IL

Background: Myocardial perfusion imaging (MPI) has been shown to be a predictor of mortality. However, some patients with abnormal MPI have no significant coronary artery disease (CAD) by angiography. We hypothesized that these "false positive" (FP) MPI patients have a higher risk of mortality when compared to subjects with normal MPI.
Methods: We performed a retrospective analysis of 3,968 subjects without a known

history of CAD who underwent exercise or pharmacologic stress SPECT MPI over an 11-year period. MPI studies were read using a 20-segment model of the left ventricle and summed stress scores (SSS) were calculated. Of the total, 3,846 subjects had a normal MPI (SSS=0), while 122 subjects had at least a moderately abnormal MPI (SSS≥9) as well as a subsequent negative coronary angiogram (no stenosis greater than 50%). Mortality rates acquired from the Social Security Administration Death Master File and clinical cardiac risk factors from hospital records were compared between groups.

Results: There were 203 deaths (5.3%) in the normal population over an average 5.2 years of follow-up. There were 8 deaths (6.6%) in the FP population over an average 3.7 years of follow-up, with an average of 3 weeks between MPI and angiography. Subjects with a FP MPI were more likely (p<0.05 by either chi-squared or t-test) to have diabetes (30% vs 14%), hypertension (60% vs 46%), and a greater body mass index (BMI) (32.2 vs 28.9 kg/m^{2}). Additionally, FP MPI subjects had a lower ejection fraction (56% vs 62%) and underwent pharmacologic stress more often (65% vs 39%). FP MPI subjects had a lower mean survival by Kaplan-Meier analysis (6.1 years vs 10.8 years, p<0.05).

Conclusion: Subjects with an abnormal MPI but a subsequent negative coronary angiogram have decreased survival compared to those with a normal perfusion study. These patients also have more clinical predictors of endothelial dysfunction, notably diabetes, hypertension, and BMI, than do those with a normal study. Despite the reassurance of having no obstructive CAD, "false positive" MPI patients may have endothelial dysfunction that would not be detected by standard angiography. This might warrant more aggressive management of their CAD risk factors.

                                                                                           Noon

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841-7   **A Prospective Study Comparing Two Different Algorithms for Predicting Cardiovascular Events in Renal Transplant Candidates: In Whom Should Cardiac Scintigraphy Be Performed?**

Luis Henrique W. Gowdak, Rodolfo L. Arantes, Flavio J. de Paula, Marcos Rienzo, Luiz Antonio M. Cesar, Luiz Estevan Ianhez, Elias David Neto, Eduardo M. Krieger, Jose Antonio F. Ramires, Jose J. G. de Lima, Heart Institute (InCor), University of São Paulo Medical School, São Paulo, Brazil, Renal Transplant Unit, University of São Paulo Medical School, São Paulo, Brazil

Background: Patients (pt) with end-stage renal disease (ESRD) routinely undergo cardiovascular assessment for their increased risk of cardiovascular disease (CVD) and major adverse cardiovascular events (MACE). No prospective study compared the value of two different clinical risk stratification algorithms in predicting the ocurrence of MACE, and in selecting pt in which additional workup might be needed.

Methods: 663 pt (65% men, 55±10 years-old) with CKD on dialysis were stratified according to either the American Society of Transplantation (AST) (*high-risk [HR]*: age ≥ 50 years, or diabetes [+], or CVD [+]; *low-risk [LR]*: none of the above) or the European Renal Association (ERA) (*HR*: CVD [+]; *intermediate-risk [IR]*: diabetes [+] or age ≥ 50 years; *LR*: none of the above). All pt were further stratified by cardiac scintigraphy (SPECT-Sestamibi-dipyridamole), irrespectively of symptoms, and followed-up for 60 months (median, 24). The risk for the primary endpoint (the composite incidence of fatal/non-fatal MACE) was determined using the Cox proportional hazards model.

Results: There were 120 fatal/non-fatal MACE. HR-pt (n=537) by the AST criteria had twice the risk for MACE compared to LR-pt (n=96) (RR=2.00 [1.29-3.61]; P=.0006). When SPECT results were included in the analysis, HR-pt with abnormal scans (n=167) had the lowest survival free of events (RR=1.36 [1.11-1.67]; P=.002). In LR-pt, an abnormal scan (n=12) did not influence long-term prognosis (RR=0.72 [0.12-1.31]; P=.12). Using the ERA criteria, HR-pt (n=244) also had a significant increase in the risk for MACE compared to IR-pt (n=294) (RR=2.6 [1.85-3.99]; P<.0001), whereas LR-pt (n=95) had the lowest risk (RR=0.42 [0.19-0.75]; P<.0001). Adding the SPECT results to the analysis, only IR-pt with abnormal scans had an increased risk for MACE (RR=1.54 [1.11-2.16]; P=.01). Pt with abnormal scans at HR (RR=1.04 [0.81-1.36]; P=.74) or LR (RR=0.66 [0.18-1.47]; P=.11) had no increase in the risk for MACE.

Conclusions: Pt with CKD on dialysis should be first risk-stratified by current clinical algorithms. Further stratification by SPECT should be reserved to HR-pt (AST) or IR-pt (ERA), affording a more rational use of resources.

                                                                                           12:15 p.m.

841-8   **Prognostic Value of Stress Gated SPECT Imaging in Diabetics: Contribution of Perfusion and Function for Prediction of Adverse Cardiac Outcome**

Alexey V. Sorokin, Gerasimos Stavens, Alan W. Ahlberg, Gary V. Heller, Hartford Hospital, Hartford, CT

Background: Diabetes is considered a coronary disease equivalent. There are limited prognostic data using gated SPECT (GS) in this population. This study examined the prognostic contribution of perfusion and function from GS among diabetics.

Methods: Consecutive diabetic patients were identified from a prospective database. Images were interpreted in blinded fashion by 3 readers using a 17-segment model. Abnormal summed stress score (SSS), summed difference score (SDS) and ejection fraction (EF), respectively, were defined as: 4-13, 2-7 and 30-49% (mildly to moderately abnormal); >13, >7 and <30% (severely abnormal). Follow-up was 92.5% over 2.7 ± 1.9 years. Patients revascularized ≤60 days after GS were excluded. Endpoints were cardiac death (CD) or non-fatal myocardial infarction (MI). Cox regression modeling (I. pre-scan, perfusion, function; II. pre-scan, function, perfusion) was applied to identify predictors of adverse outcome.

Results: Of the 2649 patients, 292 had CD or MI. Multivariate analysis demonstrated abnormal SSS and EF predict adverse outcome. Each variable significantly increased the global chi-square regardless of model (I. SSS=60.61, p<0.001 and EF=12.09, p=0.002; II. EF=51.18, p<0.001 and SSS=24.08, p<0.001). Integration of SSS and EF enhanced risk stratification (Figure).

Conclusions: Among diabetics, perfusion and function data from gated SPECT provide independent and incremental prognostic information and should be utilized routinely in risk stratification.

ACC.ORAL CONTRIBUTIONS

842

Exercise Testing

Tuesday, March 27, 2007, 11:00 a.m.-12:30 p.m.
Room 271-273

                                                                                           11:00 a.m.

842-3   **Improved Detection of Stress-Induced Ischemia Using Analysis of High-Frequency ECG Components**

Eran Toledo, Nechi Almogy, Jonathan A. Lipton, Stafford G. Warren, Michael Broce, Donald R. Lilly, Dan B. Lucas, Galen S. Wagner, Duke University, Durham, NC, Charleston Area Medical Center, Charleston, WV

ECG detection of ischemia is based on identifying changes in the repolarization phase. Investigation of mid-QRS potentials, related to depolarization, using analysis of high frequency QRS (HFQRS) components was recently reported to better identify ischemia. Our aims were to validate (i) this technique in patients undergoing exercise myocardial perfusion SPECT (MPS) and (ii) compare its performance with conventional ECG.
Methods. Exercise MPS was performed in 133 consecutive pts (63±12 yo, 100 men) and used as the gold standard for ischemia. Pts with BBB (n=19) or inconclusive MPS (n=5) were excluded. Conventional ECG was combined with high resolution ECG acquisition that was digitized and analyzed using the HyperQ™ System (BSP, Tel Aviv, Israel). The relative HFQRS intensity change during exercise was used as an index of ischemia.
Results. HFQRS analysis was possible in 105 pts of whom 22 exhibited MPS ischemia (4 pts excluded due technical reasons). The HFQRS index of ischemia was found more sensitive than the conventional ST analysis (77% vs 43%, p<0.05, see table) with comparable specificity (66% vs 57%, p=NS). In women, HFQRS analysis resulted in improved specificity relative to conventional ECG (70% vs 33%, p<0.05). In pts with inconclusive ST changes, HFQRS analysis correctly identified 17/21 pts.
Conclusions. HFQRS analysis was more sensitive in detecting stress-induced ischemia and exhibited improved specificity in women. Thus, it may aid in the non-invasive diagnosis of ischemic heart disease.

	Number of subjects	HFQRS Sensitivity	ST Sensitivity	HFQRS Specificity	ST Specificity
All patients	105	77% * (17/22)	43% (9/21)	66% (55/83)	57% (37/65)
Women	29	83% (5/6)	75% (3/4)	70% * (16/23)	33% (5/15)
Inconclusive ECG	21	100% (2/2)	NA	79% (15/19)	NA

                                                                                           11:15 a.m.

842-4   **Enhanced External Counterpulsation Treatment Decreases Arterial Stiffness and Myocardial Oxygen Demand in Patients With Refractory Angina**

Darren P. Casey, C. Richard Conti, Wilmer W. Nichols, Matheen A. Khuddus, Calvin Y. Choi, Randy W. Braith, Center for Exercise Science, Department of Applied Physiology and Kinesiology, University of Florida, Gainesville, FL, Department of Cardiovascular Medicine, University of Florida, Gainesville, FL

Background: Enhanced external counterpulsation (EECP) is a non-invasive modality

for treatment of symptomatic coronary disease (CAD) in patients not amenable to revascularization procedures. However, the mechanism(s) underlying the benefits of EECP remain unknown. We hypothesized that extra-cardiac factors, such as peripheral arterial stiffness and elevated myocardial oxygen demand are the therapeutic target for EECP.

Methods: We randomly assigned 20 symptomatic patients with CAD to 35 1-hr sessions of EECP (n=12) or 35 1-hr sessions of sham-EECP (n=8). Radial artery pressure waveforms were recorded by applanation tonometry and aortic pressure waveforms were generated using a mathematical transfer function. Augmentation index (AI_a) and timing of the reflected pressure wave (Δt_p) were calculated from the generated aortic pressure waveform. Aortic pulse wave velocity (PWV; m/sec) between the carotid and femoral arteries (CFPWV) was calculated by determining the delay between the appearance of the pressure waveform foot at each site. Exercise duration, anginal threshold, and peak oxygen consumption (VO_{2peak}) were measured by a graded treadmill test.

Results: EECP decreased AI_a and increased Δt_p (24 ± 1.9% vs. 18 ± 2.0%, $P < 0.01$; 135 ± 3.3 vs. 142 ± 2.9 msec, $P < 0.01$, respectively) but did not change in sham (22 ± 3.7% vs. 21 ± 3.7%; 134 ± 4.7 vs. 132 ± 4.8 msec, $P > 0.05$, respectively). Left ventricular wasted energy, a measure of myocardial oxygen demand, decreased after EECP (6149 ± 924 vs. 3704 ± 595 dynes/sec/cm², $P < 0.01$) but did not change in sham (5471 ± 706 vs. 5105 ± 635 dynes/sec/cm²; $P > 0.05$). EECP decreased CFPWV (11.9 ± 0.8 vs. 10.4 ± 0.6 m/s, $P < 0.01$) but did not change in sham (11.3 ± 0.8 vs. 11.4 ± 0.5 m/s, $P > 0.05$). EECP increased exercise duration, time to angina, and VO_{2peak} (595 ± 52 vs. 762 ± 73 sec, $P < 0.01$; 377 ± 50 vs. 598 ± 50 sec, $P < 0.01$; 17.3 ± 1.5 vs. 19.9 ± 1.6 ml/kg/min $P < 0.01$, respectively) but did not change in sham (601 ± 56 vs. 625 ± 57; 376 ± 26 vs. 400 ± 21; 17.0 ± 1.1 vs. 17.9 ± 1.3 ml/kg/min, $P > 0.05$, respectively).

Conclusions: EECP therapy reduces central arterial stiffness, reduces myocardial oxygen demand, and improves exercise tolerance and anginal threshold in symptomatic patients with CAD.
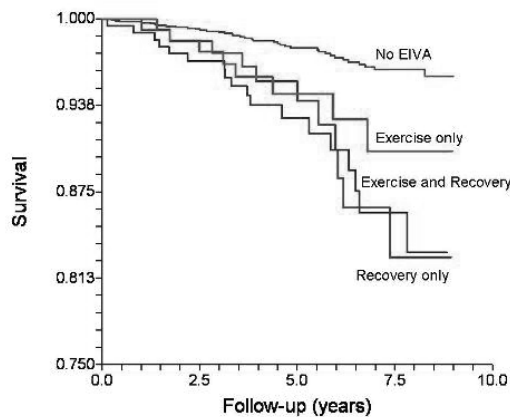
11:30 a.m.

842-5   Do Premature Ventricular Contractions During Exercise Have the Same Prognostic Value as Those During Recovery?

John R. Kapoor, Ryan S. Williams, David Hadley, Jonathan Myers, Euan Ashley, Victor F. Froelicher, <u>Frederick E. Dewey</u>, Stanford University School of Medicine, Stanford, CA, CardioScience, Bothell, WA,

Background: Premature ventricular contractions (PVCs) during treadmill testing are associated with increased mortality. However, there are conflicting data as to the significance of PVCs occurring during exercise compared to those occurring during recovery.

Methods: We studied 1,959 patients undergoing treadmill testing for clinical reasons at the Palo Alto Veterans Affairs Medical Center from 1997 to 2003. A ramp protocol was employed without a cool down walk. Digital playback of ECG data using holter-like software was used to quantify PVCs in beats/minute. Exercise-induced ventricular arrhythmia (EIVA) was defined as a rate of greater than 1 PVC/min during exercise, recovery, or both. Kaplan-Meier survival curves were plotted and Cox hazard analyses adjusted for age and coronary artery disease (CAD).

Results: The mean age was 57 +/- 12 years; 30% had CAD and 6% had heart failure. Over 5.4 years, 3.7 % of the population died of cardiovascular causes. Age-adjusted hazard ratios were 2.5 (CI 1.3-5.0, P<0.01) for the patients experiencing EIVA during recovery only, 2.1 (1.2-3.8, P=0.01) for those with EIVA during both exercise and recovery, and 1.6 (CI 0.7-3.6, P=0.23) for the patients experiencing EIVA during exercise only. When adjusted for the presence of CAD, similar results were obtained.

Conclusions: Recovery is the most important period for assessing the risk of exercise-induced PVCs.

11:45 a.m.

842-6   Exercise Oscillatory Ventilation Is a Strong Predictor of Sudden Death in Heart Failure Patients

Marco Guazzi, Ross Arena, <u>Sherry Pinkstaff,</u>, Giuseppe Reina, Nello Ascione, Maurizio D Guazzi, University of Milano, Milano, Italy

Background: Considering the relevant incidence of sudden death in the heart failure (HF) population, appropriate tools for the prediction of sudden death are desirable.

Cardiopulmonary exercise testing (CPET) is a valuable prognostic tool in the heart failure (HF) population. Exercise oscillatory ventilation (EOV) is an indicator of unstable reflexogenic control and heightened sympathetic activity and thus may increase the risk of cardiac arrhythmias. This study tests EOV as a predictor of sudden death.

Methods: One hundred and fifty-six subjects (mean age: 60.9 ±9.4 years, mean ejection fraction: 34.9 ±10.6%) underwent CPET. The minute ventilation/carbon dioxide production (VE/VCO_2) slope, peak oxygen consumption (VO_2) and EOV were derived from CPET.

Results: The mean tracking period following CPET was 27.8 ±25.2 months. Nineteen subjects died secondary to cardiac arrhythmia while another 19 subjects died from non-arrhythmic cardiac causes. Subjects who survived had a significantly higher peak VO_2 (16.8 ±4.5 mlO$_2$•kg^{-1}•min^{-1}) and lower VE/VCO_2 slope (32.8 ±6.4) and percent of subjects with EOV (20.3%) compared to subjects who died of arrhythmic (13.5 ±3.3 mlO$_2$•kg^{-1}•min^{-1}; 41.5 ±11.3; 100%) and non-arrhythmic (14.1 ±4.7 mlO$_2$•kg^{-1}•min^{-1}; 38.1 ±7.3; 68.0%) causes (p<0.05). Peak VO_2 and the VE/VCO_2 slope were not significantly different between the arrhythmic and non-arrhythmic groups while the percent of subjects with EOV was significantly greater in the arrhythmic group (p<0.001). Cox regression analysis revealed all three variables were significant univariate predictors of both arrhythmic and non-arrhythmic cardiac death (p<0.01). EOV was the strongest predictor of sudden death (Chi-square: 54.8, p<0.001) while the VE/VCO_2 slope was the strongest predictor of non-arrhythmic cardiac death (Chi-square: 14.5, p<0.01).

Conclusion: Study findings indicate EOV is a robust predictor of arrhythmia induced mortality in patients with HF. Conversely, while EOV was still a significant predictor of non-arrhythmic death, the VE/VCO_2 slope was superior. These results highlight the importance of different pathophysiologic mechanisms behind the predictive ability of CPET variables.

Noon

842-7   Assessment of Exercise Heart Rate Parameters for Predicting Mortality and Sudden Death

<u>A. Selcuk Adabag</u>, Gregory A. Grandits, Ronald J. Prineas, Richard S. Crow, Hanna E. Bloomfield, James D. Neaton, Veterans Affairs Medical Center, Minneapolis, MN, University of Minnesota, Minneapolis, MN

Background: Exercise treadmill testing (ETT) is a widely-available tool used in the diagnosis and management of coronary heart disease (CHD). We sought to determine whether heart rate parameters (i.e. resting heart rate, heart rate increase with exercise and heart rate recovery) obtained during ETT are predictors of sudden death and all-cause death in a large, asymptomatic cohort of men who participated in the Multiple Risk Factor Intervention Trial (MRFIT).

Methods: The MRFIT was a randomized clinical trial of 12,866 men, ages 35-57 years, without any clinical CHD but at increased risk for future CHD based on higher Framingham risk. At study entry 12,555 men performed an ETT. Of these, 10,194 reached 85% of age-specific maximal heart rate. All men were followed for 7 years and causes of death were ascertained. Subsequently, mortality data were obtained via death certificates for a total of 25 years. Cox proportional hazards model was used to compare the upper 3 quartiles each heart rate parameter to the lowest quartile. All analyses were adjusted for age, blood pressure, smoking, lipids, diabetes and exercise duration.

Results: After 7 years, 153 (1.2%) men died suddenly and 238 (2%) died due to CHD. After 25 years 4,642 men (37%) died due to all causes. After adjusting for baseline risk factors failing to reach 85% of maximal heart rate was associated with a 80% increase in the risk of sudden death (p=0.001), 60% increase in the risk of CHD death (p=0.002) and 30% increase in the risk of all-cause death (p<0.001). Resting heart rate ≥80 beats was associated with 1.7 fold increase in the risk of sudden death (p=0.04) and 1.2 fold increase in the risk of all-cause death (p=0.004) compared to those with resting heart rate <65 beats. Heart rate increase during exercise and heart rate recovery were associated with all-cause death (p=0.02 and p=0.05 respectively). Having ≥2 abnormal heart rate parameters increased the sudden death risk by 1.6 fold (p=0.01) and all-cause death risk by 1.3 fold (p<0.0001) compared to those with normal parameters.

Conclusions: Exercise heart rate parameters can be used as prognostic markers for sudden death and all-cause death in asymptomatic men with unfavorable cardiac risk factor profile.

12:15 p.m.

842-8   Long-Term Effects of Cardiac Rehabilitation in Men and Women

<u>Leslie Cho</u>, Byron Hoogwerf, Danielle Brennan, Gordon Blackburn, stanley hazen, cleveland clinic foundation, cleveland, OH

Background: Gender differences in diagnosis and treatment of coronary artery disease are well known. However, gender differences and benefits of cardiac rehabilitation on exercise, quality of life and long-term mortality are not well-known.

Methods: All patients who completed 12 weeks of cardiac rehabilitation phase II program at The Cleveland Clinic Foundation and who had entry and exit exercise stress test were included in the analyses.

Results: There were 312 women (30.6%) and 707 men (69.4%). Women and men were similar in age, however, women were more likely to have hypertension. Women had lower exercise capacity than men at entry to the program and scored lower than men in SF36 physical (34.6±9.8 vs. 39.1±9.5, p<0.001) and mental scores (46.8±11.4 vs. 48.9±10.7, p=0.01). After the program, both group had significant improvement in exercise capacity and function level and quality of life. However, there was a trend toward increased mortality rate in women and women had lower physical quality of life compared to men. In multivariable model, functional capacity, aspirin and age were predictors of survival but gender was not a predictor of survival.

Conclusion: Women appear to present to cardiac rehabilitation with less aggressive medical treatment and lower functional status then men. Both men and women derive

similar benefit from cardiac rehab phase II program although women had a trend toward long-term higher mortality.

Exercise Parameters pre and post rehabilitation

	Female (n=312)	Male (n=707)	p-value
Entry peak METS	5.5 ± 2.1	7.3± 4.0	<0.001
Exit peak METS	6.9 ± 2.0	9.0±2.7	<0.001
METS % change	31.2%± 38.3%	26.0%± 32.6%	0.4
Entry Peak Heart rate	128.4± 25	130.5± 25.2	0.2
Exit Peak Heart Rate	132± 23.7	137.2± 24.7	0.08
HR %change	5.4%± 16.9%	5.0%± 13.0%	0.9
Entry Peak minutes	6.0± 2.4	7.8± 2.8	<0.001
Exit peak minutes	8.4± 2.4	10± 2.7	<0.001

ACC.ORAL CONTRIBUTIONS

850

Echocardiography in Cardiac Dyssynchrony and Resynchronization

Tuesday, March 27, 2007, 2:00 p.m.-3:30 p.m.
Room 271-273

2:00 p.m.

850-3   **Angle-Corrected Displacement Imaging Is Superior to Conventional M-Mode to Assess Intraventricular Dyssynchrony**
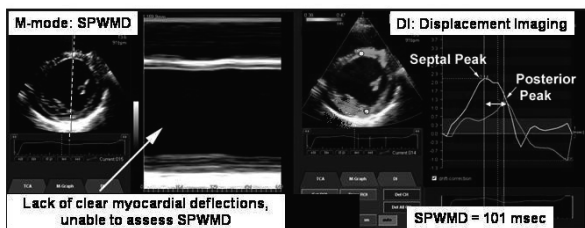
Jeffrey C. Hill, Dennis A. Tighe, Matthew A. Hittron, Jeffrey C. Normand, Dinesh Chandock, Jason M. Rashkin, Gerard P. Aurigemma, University of Massachusetts Medical School, Worcester, MA

Background: Septal to posterior wall motion delay (SPWMD) by M-mode echocardiography has been used to identify intraventricular delay (IVD) and predict response to cardiac resynchronization therapy (CRT). However this method is limited by its inability to clearly identify wall displacement. Myocardial displacement imaging (MDI) is a color-coded tissue tracking method that can measure myocardial displacement over time.
Methods: To assess the ability of angle-corrected MDI (Toshiba Aplio) to determine SPWMD compared to standard M-mode, we studied 22 pts (18 male, 13 nonischemic) undergoing CRT evaluation. M-mode and MDI were performed in the short-axis plane at the papillary muscle level with regions of interest placed in the septum and posterior wall (Figure). Delay ≥130 ms defined IVD by these methods. Additionally, we compared MDI to other CRT assessment methods: standard deviation of time to peak systolic velocity in 12 LV segments ≥33 ms (Ts-SD); ≥65 ms between any two LV walls (≥65 ms method).
Results: M-mode SPWMD assessment was feasible in only 11/22 (50%); by contrast, MDI was feasible in 21/22 (95%) pts (p<0.001). SPWMD by M-mode averaged 113±62 ms; 3/11 (27%) had IVD. With MDI, SPWMD averaged 119±76 ms and 10/22 (45%) had IVD. By Ts-SD, 10/22 (45%) and 16/22 (72%) by the ≥65 ms method had IVD.
Conclusions: Compared to M-mode, the yield of MDI was significantly greater to assess SPWMD and compared favorably to Ts-SD, but less than the ≥65 ms method. MDI may represent a rapid alternative method to assess IVD.

2:15 p.m.

850-4   **Comparison of the Tissue Doppler Yu Index to the Opposing Wall Delay Method to Predict Response to Cardiac Resynchronization Therapy: Impact of Post-Systolic Peak Velocities**

Masaki Tanabe, Matthew S. Suffoletto, Samir Saba, Randolph P. Martin, John Merlino, Angel R. Leon, John Gorcsan, III, University of Pittsburgh, Pittsburgh, PA, Emory University, Atlanta, GA
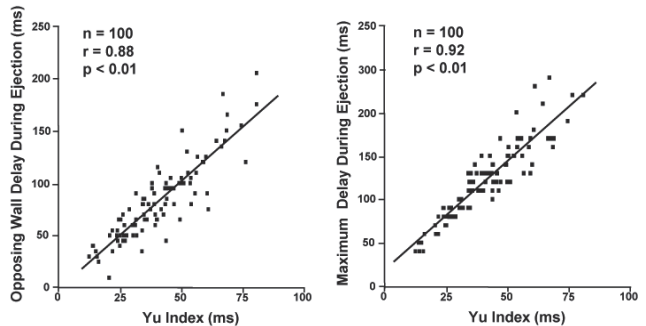
Background: Controversy exists regarding approaches to dyssynchrony analyses pre-cardiac resynchronization therapy (CRT). Our objective was to directly compare the ability of several popular tissue Doppler approaches to predict response to CRT.
Methods: We studied 100 CRT pts (EF 25±7%, QRS 164±27ms). Color-coded longitudinal velocity (GE Corp) was recorded in apical 4-, 2-chamber, and long-axis views at basal and mid levels (12-sites). Time-to-peak velocity was analyzed in 2 ways: 1) including post-systolic peak velocities after aortic valve closure and 2) limited to LV ejection. Dyssynchrony indices were calculated in 3 ways: 1) Yu index (12-site standard deviation), 2) opposing wall delay (by view) 3) maximum delay (all sites).
Results: Response to CRT was defined as ≥15% increase in EF at 6±4 months and occurred in 74%. Inclusion of post-systolic peaks by all 3 approaches weakened ability to predict CRT response. Yu index (34 ms cut-off), opposing wall delay (65 ms cut-off), and maximum delay (110 ms cut-off) during LV ejection all showed similar favorable sensitivities (82-88%) and specificities (73-81%) to predict response to CRT and were linearly related to one another (r=0.88 to 0.92).
Conclusions: Inclusion of post-systolic peaks weakens the ability of tissue Doppler to predict response to CRT. By limiting analysis to the LV ejection interval, the Yu index, opposing wall delay and maximal wall delay are similarly favorable and appear clinically equivalent to predict response to CRT.

2:30 p.m.

850-5   **Left Ventricular Dyssynchrony Predicts Long-Term Left Ventricular Remodeling After Acute Myocardial Infarction**

Sjoerd A. Mollema, Su San Liem, Gabe B. Bleeker, Eric Boersma, Laurens F. Tops, Ernst E. van der Wall, Martin J. Schalij, Jeroen J. Bax, Leiden University Medical Center, Leiden, The Netherlands

Background: Left ventricular (LV) remodeling after acute myocardial infarction is associated with adverse long-term prognosis. Early identification of patients prone to LV remodeling after acute infarction is needed to optimize therapeutic management.
Methods: Consecutive patients presenting with uncomplicated acute myocardial infarction who underwent primary percutaneous coronary intervention were included. Within 24 hours of intervention, 2D echocardiography was performed to assess LV volumes, LV ejection fraction (LVEF), and severity of mitral regurgitation (MR). LV dyssynchrony was determined using speckle-tracking radial strain analysis. At 6 months follow-up, LV volumes, LVEF and severity of MR were reassessed. LV remodeling was defined as an increase in LV end-systolic volume ≥15%.
Results: A total of 178 patients were included (140 men, age 61 ± 11 years). Patients were divided into subjects with LV remodeling (n=36, 20%) and without LV remodeling (n=142, 80%) at 6 months follow-up. Baseline LV volumes and LVEF were comparable between the 2 groups. At 6 months follow-up, LV end-systolic volume (104 ± 38 ml versus 60 ± 18 ml, P<0.001) and LV end-diastolic volume (166 ± 50 ml vs. 123 ± 29 ml, P<0.001) were significantly larger and LVEF (39 ± 9% vs. 51 ± 7%, P<0.001) was significantly lower in the patients with LV remodeling. At baseline, no significant differences were observed between the 2 groups, except a higher prevalence of the left anterior descending coronary artery being the infarct-related artery (64% vs. 49%, P<0.05) and higher peak troponin T levels (11.4 ± 7.9 μg/L vs. 6.2 ± 5.0 μg/L, P<0.001) in the patients with LV remodeling. Moreover, mean LV dyssynchrony was 155 ± 69 ms in the patients with LV remodeling, as compared to 46 ± 46 ms in the patients without LV remodeling (P<0.001). Multivariate analysis demonstrated that LV dyssynchrony was the only significant predictor of LV remodeling at 6 months follow-up. ROC curve analysis demonstrated that a cutoff value of 90 ms for LV dyssynchrony yielded a sensitivity and specificity of 81% to predict LV remodeling.
Conclusions: LV dyssynchrony immediately after acute myocardial infarction is predictive of LV remodeling at 6 months follow-up.

2:45 p.m.

850-6   **Speckle Tracking Radial Strain Reveals Left Ventricular Dyssynchrony in Patients With Permanent Right Ventricular Pacing**

Laurens F. Tops, Matthew S. Suffoletto, Gabe B. Bleeker, Ernst E. van der Wall, John Gorcsan, III, Martin J. Schalij, Jeroen J. Bax, Leiden University Medical Center, Leiden, The Netherlands, Cardiovascular Institute, Pittsburgh, PA

Background: Recent studies have shown detrimental effects of permanent right ventricular (RV) pacing. The purpose of the present study was to assess the effects of permanent RV pacing on left ventricular (LV) function and LV dyssynchrony, as assessed with 'speckle tracking' radial strain.
Methods: Fifty-eight patients (33 men, age 61 ± 11 years), treated with His bundle ablation and pacemaker implantation, were studied. At baseline, and after a minimum of 1 year RV pacing, NYHA functional class was assessed and an echocardiogram was

obtained. Novel 'speckle tracking' radial strain analysis was applied to standard LV short-axis images, to assess the effect of RV pacing on time-to-peak radial strain of 6 standard LV segments. LV dyssynchrony was defined as a time difference ≥130 ms between time-to-peak radial strain of the anteroseptal and posterolateral segments.

Results: At baseline, similar time-to-peak strain for each of the 6 segments was observed (mean 371 ± 3 ms). In contrast, after a mean of 3.8 ± 2.0 years of RV pacing, there was a marked heterogeneity in time-to-peak radial strain of the 6 segments. In 33 patients (57%) LV dyssynchrony, as represented by a time difference ≥130 ms between the time-to-peak radial strain of the anteroseptal and the posterolateral segments, was present. In these patients, a deterioration of LV systolic function (LVEF from 48 ± 5% to 39 ± 10%, p<0.01) and NYHA class (from 1.8 ± 0.7 to 2.4 ± 0.7, p<0.01) was observed. In 11 patients 'upgrade' of the conventional pacemaker to a biventricular pacemaker resulted in partial reversal of the detrimental effects of permanent RV pacing.

Conclusions: Speckle tracking radial strain revealed that permanent RV pacing induced heterogeneity in time-to-peak strain within the left ventricle, resulting in LV dyssynchrony in 57% of patients, associated with deterioration in LV systolic function and NYHA functional class. Biventricular pacing may reverse the adverse effects of RV pacing.

3:00 p.m.

850-7   **Cardiac Dyssynchrony Quantitated by Time-to-Peak or Temporal Uniformity of Strain at Circumferential and Longitudinal Level: Implication for Resynchronization Therapy**

Benedetta Bertola, Marina Sulis, Cristina Piccinino, Gianni Sarasso, Giuliano Marti, Paolo Devecchi, Andrea Magnani, Gabriella Francalacci, Miriam Bortnik, Eraldo Occhetta, Paolo N. Marino, Clinical Cardiology, University of Eastern Piedmont, Novara, Italy

Time to peak strain standard deviation (TPS-SD) has been proposed as an index of ventricular dyssynchrony (DYS). This index is limited in that it does not take into account differences in phases among ventricular segments. Alternatively, DYS can be indexed by temporal uniformity of strain (TUS), where a time plot of regional strains, arranged for ventricular location, is generated and subjected to a Fourier analysis. If all segments shortened simultaneously , the plot would appear as a straight line, with power only in 0 order Fourier term, whereas regionally clustered DYS generates an undulating plot with higher power in 1 order term. TUS index reflects 0 order relative to 1 order plus 0 order power.

TPS-SD and TUS were used to ascertain if DYS was present in a group of 36 patients with cardiomyopathy of nonischemic (n=26) and ischemic etiology (n=10) in whom we measured longitudinal (Long) and circumferential (Circ) strains using speckle-tracking 2D analysis. 3D ventricular volumes were also computed. 10 normals were used for comparison purposes. Mean QRS duration ranged 80-200 ms. Ventricular volumes in patients were increased relative to normals (180±59 vs. 77±16 ml for diastolic, 131±56 vs. 29±6 ml for systolic volumes, p<0.001 both), and strains uniformly depressed (-10±4 vs. -20±2% for Long, -12±4 vs. -22±4% for Circ, p<0.001 for all). Both TPS-SD and TUS index differed significantly between patients and normals when either Long (14.6±6.1 vs. 5.6±1.4 ms; 0.73±0.19 vs. 0.87±0.04, p<0.01 for both) or Circ strains were considered (16.2±6.3 vs. 6.8±4.1 ms; 0.67±0.18 vs. 0.86±0.05, p<0.001 both). Only TUS index correlated significantly with ventricular volumes or QRS duration (p<0.001 for both). In 19 patients TPS-SD and TUS index were re-computed after resynchronization. There was a 2±30% acute improvement in Long strain, which correlated with a 14±63% increment in TUS index (p=0.06), while no correlation could be demonstrated for TPS-SD at both Long and Circ level.

It is concluded that DYS indexed by TUS at Long motion yields greater quantitative results and potential benefits than TPS-SD, supporting the idea of targeting TUS-measured DYS as the real synchrony measure in cardiomyopathy patients.

3:15 p.m.

850-8   **Left Ventricular Asynchrony in Coronary Heart Disease With Preserved and Impaired Systolic Function**

Alex PW Lee, Qing Zhang, Gabriel WK Yip, Li-wen Wu, Joseph YS Chan, Jeffery WH Fung, Cheuk-man Yu, The Chinese University of Hong Kong, Hong Kong, Hong Kong

Background: Left ventricular (LV) systolic asynchrony is common in patients with coronary heart disease and LV systolic dysfunction. However, the prevalence and degree of ventricular dyssynchrony in patients with preserved LV ejection fraction (LVEF) is unknown.

Method: 204 consecutive patients with stable coronary heart disease and 119 normal controls were evaluated. LVEF and Asynchrony Index (derived from the standard deviation of the time to peak systolic velocity in ejection phase in the 6-basal, 6-mid segmental model; or Ts-SD) were measured using standard echocardiography with tissue Doppler imaging. Patients with LVEF ≥45% (Preserved-LV group), LVEF <45% (LV-dysfunction group) and normal controls were compared. Sub-group analysis was performed in patient with narrow (QRS duration ≤120 ms) and wide (QRS duration >120 ms) QRS complex.

Results: Significant difference in LV systolic synchronicity was observed among the three groups. The Asynchrony Index in the preserved-LV group (N=85) was significantly higher than normal controls (28.7±15.7 ms vs 17.7±9.1 ms, p<0.0001), but was lower than that of the LV-dysfunction group (N=119) (28.7±15.7 ms vs 36.5±15.1 ms, p<0.0001). Significant LV dyssynchrony (defined as Asynchrony Index >33ms) was present in 44.3% of patients with preserved LVEF and 54.2% with LV dysfunction. Similarly, in both narrow (N=158) and wide (N=46) QRS complex subgroups, patients with LV dysfunction had a significantly higher Asynchrony Index than patients with preserved LVEF (Narrow QRS: 35.8±15.9 ms vs 28.7±16.0 ms, p=0.006; Wide QRS: 38.7±13.7 ms vs 27.6±10.1 ms, p=0.046). However, the severity of systolic asynchrony is similar in the wide and narrow QRS subgroups for similar LVEF.

Conclusions: Significant LV systolic asynchrony is common in patients with coronary heart disease even when LVEF is preserved, and irrespective of QRS duration. However, systolic asynchrony becomes more severe and more prevalent when LV systolic dysfunction develops.

ACC.ORAL CONTRIBUTIONS

852

Advances in Coronary Computed Tomography Angiography

Tuesday, March 27, 2007, 2:00 p.m.-3:30 p.m.
Room 278-281

2:00 p.m.

852-3   **Usefulness of 64-Slice Multi-Slice Computed Tomography Coronary Angiography to Assess In-Stent Restenosis**

Joanne D. Schuijf, Filippo Cademartiri, Francesca Pugliese, Nico R. Mollet, J Wouter Jukema, Alessandro Palumbo, Lucia J. Kroft, Diego Ardessino, Patrick W. Serruys, Gabriel P. Krestin, Ernst E. van der Wall, Pim J. de Feyter, Jeroen J. Bax, Leiden University Medical Center, Leiden, The Netherlands, Erasmus Medical Center, Rotterdam, The Netherlands

Background: Recent investigations have shown increased image quality and diagnostic accuracy for non-invasive coronary angiography with 64-slice MSCT as compared to previous generations MSCT scanners, but no data are currently available on the evaluation of coronary stents. The purpose of the present study was to evaluate the diagnostic accuracy of 64-slice multi-slice computed tomography (64-slice MSCT) coronary angiography in the follow-up of patients with previous coronary stent implantation.

Methods: In 182 patients (152 (84%) males, aged 58 ± 11 years) with suspected obstructive coronary artery disease and previous stent (≥2.5mm diameter) implantation (n=192), 64-slice MSCT angiography using either a Sensation 64 (Siemens, Germany) and Aquilion 64 (Toshiba, Japan) was performed. Coronary stents were evaluated by two experienced observers and evaluated for the presence of significant (≥50%) in-stent restenosis. Quantitative coronary angiography served as the standard of reference.

Results: A total of 14 (6.8%) stented segments were excluded because of poor image quality. Twenty of the 178 (11.2%) evaluated stents were significantly diseased, of which 19 were correctly detected by 64-slice MSCT. Accordingly, sensitivity, specificity and positive and negative predictive values to identify in-stent restenosis were 95.0% (CI: 85% to 100%), 93.0% (CI: 90% to 97%), 63.3% (CI: 46% to 81%), and 99.3% (CI: 98% to 100%), respectively.

Conclusions: In stents with a diameter ≥2.5mm, in-stent restenosis can be evaluated with 64-slice MSCT with good diagnostic accuracy. In particular a high negative predictive value of 99% was observed, indicating that 64-slice MSCT may be most valuable as a non-invasive alternative to exclude in-stent restenosis.

2:15 p.m.

852-4   **Criteria for Defining Coronary Segments Using Computed Tomography - The Core-64 Trial**

Armin Arbab-Zadeh, Andrea L. Vavere, Kakuya Kitagawa, Ilan Gottlieb, Albert C. Lardo, John Texter, Pedro Lemos, Jeffrey Brinker, Christopher Cox, Joao A.C. Lima, Julie M. Miller, Johns Hopkins University, Baltimore, MD

Background: Existing American Heart Association criteria for defining coronary segments (AHA/CASS) do not account for extensive variability in coronary anatomy. The resulting ambiguity leads to mis-registration of coronary segments in blinded comparisons between imaging modalities, which in turn can result in low to moderate agreement among blinded readers.

Objective: To evaluate a novel revision to the current AHA/CASS criteria for defining coronary segments.

Methods: The Core-64 trial is a multi-center, international study designed to compare coronary angiography by computed tomography using 64 detectors to conventional catheter based angiography for the assessment of obstructive coronary artery disease. Based upon our initial experience, we revised the current AHA/CASS criteria for defining coronary segments by incorporating rules for qualifications of side branches based on size and distance between them. Two investigators were asked to identify 210 coronary segments (7 subjects) using both the AHA/CASS criteria and the revised "Core-64" criteria. Segments were categorized as major (originating from the body of the three main arteries) or minor (side branches). Data sets were compared for agreement between the readers and Kappa values obtained.

Results: Using the AHA/CASS criteria readers agreed on 174 segments and disagreed on 36 segments (Kappa = 0.66 ± 0.07, p Kappa > 0.7 = 0.8) compared with Core-64 criteria where readers agreed on 188 segments and disagreed on only 22 segments (Kappa = 0.79 ± 0.07, p Kappa > 0.7 = 0.02) . Eleven of the 14 segments, which were agreed on in addition to the AHA/CASS criteria, were major segments.

Conclusion: The revised criteria for the definition of coronary segments improves agreement between blinded readers and thus may reduce segment registration errors for the blinded comparison of coronary imaging modalities.

Diagnostic Testing

2:30 p.m.

852-5   Three-Dimensional Quantification of Coronary Plaque Burden by 64-Slice Computed Tomography: A PROSPECT-MSCT Substudy

Masato Ostuka, Nico Bruining, Niels van Pelt, Eleni Vourvouri, Jurgen Ligthart, Annick Weustink, Nico Mollet, Ronald Hamers, Dariusz Dudek, Stefan Verheye, William Wijns, Patrick Serruys, Gregg Stone, Pim de Feyter, Erasmus MC, Rotterdam, The Netherlands
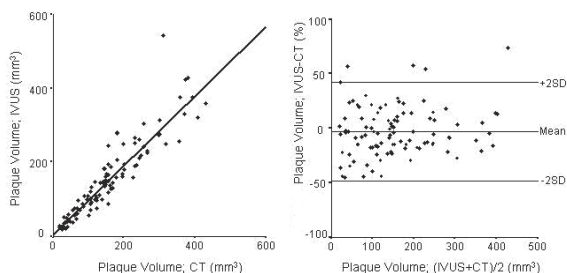
Quantification of Coronary Plaque Burden by 64-slice Computed Tomography: A PROSPECT-MSCT Substudy

Background: The aim of this study is to investigate the accuracy of coronary plaque volume measurement by CT with a newly developed 3-dimensional quantification software as compared to intravascular ultrasound (IVUS).

Methods: Forty-seven patients with recent acute coronary syndromes undergoing CT (Sensation 64, Siemens) and IVUS as part of the PROSPECT-MSCT substudy were examined. Using dedicated software (CURAD) allowing simultaneous display of extracted vessels, from CT or IVUS the matched regions of interest (ROI's) were determined by corresponding landmarks (e.g. side-branches). CT analysis was performed by dedicated quantification software and compared to the quantitative IVUS parameters measured separately.

Results: In 100 assessable ROI's with adequate CT and IVUS image quality (25 ± 14 and 25 ± 14mm lengths for IVUS and CT, respectively, p=0.31), lumen volume, vessel volume and plaque volume in both modalities resulted in high correlation (R>0.9). Plaque volume showed good agreement (160 ± 121 and 166 ± 121mm^3, -3.0% bias, R=0.84, p=0.16) (Fig.). Maximum area stenosis (%area obstruction) within the ROI also agreed well in IVUS and CT (58 ± 15 and 56 ± 16%, R=0.88, p=0.63).

Conclusions: 64-slice CT with dedicated quantification software allows accurate non-invasive measurement of coronary plaque burden.

2:45 p.m.

852-6   Diagnostic Accuracy of Dual Source Coronary Tomography Coronary Angiography in Patients Referred for Conventional Angiography

Annick C. Weustink, Nico R. Mollet, Willem B. Meijboom, Masato Otsuka, Fransesca Pugliese, Carlos van Mieghem, Roberto Malago, Niels van Pelt, Filippo Cademartiri, Gabriel P. Krestin, Pim J. de Feyter, Erasmus Medical Center, Rotterdam, The Netherlands

Background: To prospectively evaluate the diagnostic accuracy of Dual Source Computed Tomography (DSCT) coronary angiography to detect significant stenoses (defined as ≥50% lumen diameter reduction) in patients referred for conventional coronary angiography without the use of pre-scan beta-blockers.

Methods: We studied 100 consecutive symptomatic patients (79 men; mean age 61±11 yrs) with atypical or typical angina pectoris or unstable coronary artery disease scheduled for diagnostic conventional coronary angiography. All patients were scanned with a DSCT scanner (Somatom Definition, Siemens Medical Solutions Forcheim, Germany) equipped with an improved temporal resolution of 83 ms as compared to previous CT scanner generations. Only patients in sinus rhythm were included. Patients with contra-indications to Iodinated contrast material were excluded. No ß-blockers were administered prior to the scan. Mean scan time was 8.6±1.5 seconds. Pitch varied between 0.20 and 0.53. Mean heart rate was 68±11 bpm. The CT angiograms were analyzed by 2 observers blinded to the results of invasive coronary angiography, which was used as the standard of reference.

Results: Conventional coronary angiography demonstrated the absence of significant disease in 16% (16 of 100), no significant stenosis in 7 (7 of 100), single vessel disease in 31% (31 of 100), and multi-vessel disease in 46% (46 of 100) of patients. Sensitivity of CT coronary angiography for detecting significant stenoses on a segment-based analysis was 95% (95% CI: 90-97), specificity was 95% (95% CI: 93-96), and positive and negative predictive values were 75% (95% CI: 69-80) and 99% (95% CI: 74-100).

Conclusions: Our preliminary results show that the diagnostic accuracy of DSCT coronary angiography for the detection of significant lesions in patients referred for conventional coronary angiography is high, even in patients with high heart rates.

3:00 p.m.

852-7   Cardiac Computed Tomographic Angiography in an Outpatient Setting: An Analysis of Patient Outcomes Over a 30-Month Period

Ambarish Gopal, Naser Ahmadi, Emily Young, Nicole Weinberg, JIma Tiano, Amelia Young, Margarita Flores, Anne M. Witteman, Tate C. Holland, Song S. Mao, Hans Fischer, Matthew J. Budoff, Los Angeles Biomedical Research Institute, Torrance, CA

Background: Cardiac computed tomographic angiography (CTA) with its excellent negative predictive value is an invaluable tool in evaluating symptomatic patients with an intermediate likelihood of coronary artery disease (CAD). In this study, we sought to evaluate the prevalence of normal and non-obstructive CAD (< 50% stenosis) in an outpatient setting using CTA and analyze the clinical outcomes in those patients over a period of 30 months.

Methods & Results: 493 consecutive symptomatic patients with an intermediate likelihood of CAD who were referred for CTA evaluation in an outpatient setting were followed. Individuals with known coronary artery disease, myocardial infarction and those with prior revascularization were excluded. In our study, 32% (157 patients) had a normal study, 41% (204) had non-obstructive disease, 19% (93) had obstructive disease and 8% (39) were non-diagnostic. Thus in 27% of the study population (patients with obstructive disease and inconclusive studies), a cardiac catheterization was recommended for further management. The remaining 73% did not undergo invasive angiography. The mean age was 57± 12 years and 68.1% of the individuals were males. Follow-up demonstrated no hard (myocardial infarction or death) or soft (stroke, invasive angiography, revascularization, cardiac hospitalization) events over a mean of 30 months.

Conclusion: Patients with normal and non-obstructive CAD as diagnosed by CTA have an excellent 30-month prognosis. Larger cohorts and longer follow up is underway.

3:15 p.m.

852-8   Noninvasive Diagnosis of Ischemic Cardiomyopathy Using 64-Slice Computed Tomography

Said Ghostine, Christophe Caussin, Michel Habis, David Pesenti Rossi, Mostari Gharbi, Yacine Haddouche, Yacoub Habib, Claude Yves Angel, Bernard Lancelin, Andre Capderou, Jean Francois Paul, Marie Lannelongue Hospital, Le Plessis Robinson, France

Objectives: We evaluated the diagnostic accuracy of 64-slice computed tomography (CT) to identify ischemic cardiomyopathy in patients with heart failure (HF) and left ventricular (LV) systolic dysfunction but without clinical suspicion of coronary artery disease (CAD).

Background: Differentiation of ischemic from nonischemic cardiomyopathy is clinically important for both therapeutic and prognostic implications, thus conventional coronary angiography (CCA) is usually required.

Methods: Eighty-four consecutive patients with HF, dilated cardiomyopathy and LV systolic dysfunction (LV ejection fraction 32 ± 7 %), admitted for CCA were enrolled. We excluded patients with known history of CAD. CT was performed 3 ± 4 days before CCA. The accuracy of 64-slice CT to detect significant stenosis (>50% lumen narrowing) was compared to quantitative coronary angiography. Results were analyzed by patient and by coronary segment using the American Heart Association 15-segment model. Ischemic cardiomyopathy was defined as the presence of significant stenosis of the left main coronary artery or proximal left anterior descending artery or more than one diseased vessel.

Results: Forty-three out of 1260 segments (3.4%) were excluded related to blurred image quality due to coronary calcifications or motion artifacts. CT correctly assessed 100 of 134 (75%) significant stenosis. CT correctly identified 41 of 44 (93%) patients without significant stenosis, and all the 40 (100%) patients with significant stenosis on CCA. CT correctly classified 55 of 56 (98%) patients without ischemic cardiomyopathy and 27 of 28 (96%) patients with ischemic cardiomyopathy. Overall, accuracy, sensitivity, specificity, positive predictive value and negative predictive value of 64-slice CT for identifying CAD was by segment 97%, 75%, 99%, 93% and 97%, respectively; by patient 96%, 100%, 93%, 93% and 100%, respectively; and for identifying ischemic cardiomyopathy was 98%, 96%, 98%, 96%, 98%, respectively.

Conclusions: In patients with HF and LV systolic dysfunction, 64-slice CT is an excellent tool for detecting the underlying CAD. Thus CT may offer a valid alternative to CCA for the detection of ischemic cardiomyopathy.

E-POSTER SESSION

901

E-Poster Session 901

Sunday, March 25, 2007, 9:00 a.m.-10:00 a.m.
Hall H

9:00 a.m.

901-221   Regional Strain Values Are Different According to The Type of Left Ventricular Hypertrophy: Demonstration by 2-Dimensional Speckle Tracking Imaging
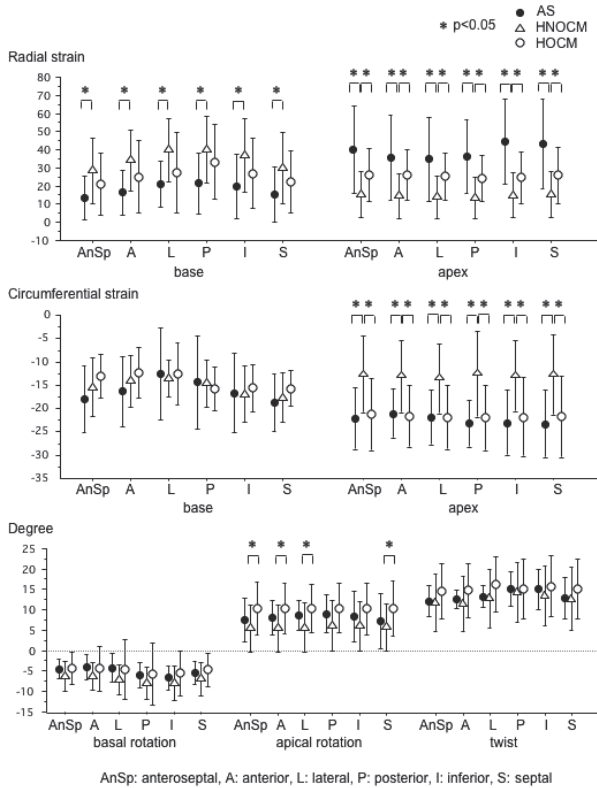
Hidetoshi Yoshitani, Masaaki Takeuchi, Takeshi Hozumi, Toshiki Nagakura, Kenichi Sugioka, Ryo Otsuka, Yasuhiro Takagi, Hiroki Oe, Keitarou Ogawa, Shinichi Iwata, Yasuhiko Takemoto, Minoru Yoshiyama, Osaka City Medical School, Osaka, Japan, Tane General Hospital, Osaka, Japan

Background: Little is known about the effect of different pathology of LVH on regional systolic function.
Methods: To address this, we acquired basal and apical short-axis images for 2D speckle tracking analysis in 51 patients with LVH, including12 aortic stenosis (AS), 11 hypertrophic obstructive cardiomyopathy (HOCM) and 28 hypertrophic non-obstructive cardiomyopathy (HNOCM). All patients had preserved LV systolic function without any regional wall motion abnormalities. Using 2D strain software, peak radial strain (RS), circumferential strain (CS) and rotation were measured in 6 equidistant segments in each view. LV twist was defined as apical rotation relative to the base.
Results: Peak pressure gradient was 85Â±26 in AS and 86Â±35mmHg in HOCM. Regional RS in the basal segments was significantly larger in HNOCM group than that in AS. Apical RS in HNOCM was significantly decreased compared to AS and HOCM. Although basal CS was not different, apical CS was also significantly decreased in HNOCM compared to that in AS and HOCM. LV twist, LV mass and LVEF were not different among the three groups.
Conclusions: Regional LV systolic function in the apical segments was significantly depressed in patients with HNOCM. The stiffening of the valvular plane might be account for the reduction of basal RS in patients with AS. These results suggest intracavitary pressure and different structural alteration of myocardium has a significant impact on regional LV systolic function, especially in the apex.

AnSp: anteroseptal, A: anterior, L: lateral, P: posterior, I: inferior, S: septal

901-222   The Mitral L Wave: A marker of Advanced Diastolic Dysfunction in Patients with Atrial Fibrillation

Masaaki Takeuchi, Hiromi Nakai, Tomoko Nishikage, Toshiki Nagakura, Shinichiro Otani, Tane General Hospital, Osaka, Japan

Background: The prominent mid-diastolic LV filling wave (mitral L wave) is rarely encountered, but its appearance indicates advanced diastolic dysfunction in patients with sinus rhythm. The aim of this study was to determine the prevalence of mitral L wave and its clinical implication in patients with chronic persistent atrial fibrillation (AFib).
Methods: We consecutively enrolled patients with non-valvular AFib who underwent 2D and Doppler transthoracic echocardiographic studies. The mitral L wave was defined as a distinct mid-diastolic flow velocity following the E wave with a peak velocity > 20 cm/sec.
Results: The prevalence of L wave in patients with AFib (30/82, 37%) was significantly higher than that observed in patients in sinus rhythm (22/817, 2.7%, p<0.001). Patients with atrial fibrillation and L wave were older, more frequently female, had slower HR, shorter isovolumic relaxation times, larger E wave velocities, lower E' resulting in the higher E/E' compared to those without L waves (p<0.05 to 0.001). RR interval corrected time difference between the onset of the E wave and E' was also prolonged in patients with L wave. No significant differences in LA volume were noted between groups (table). The Valsalva maneuver unmasked delayed relaxation and decreased the amplitude of L wave in the subset of patients who had received this procedure. **Conclusions:** The appearance of mitral L wave in AFib is relatively common, and its presence indicates elevated filling pressure and delayed LV relaxation.

	Mitral L wave (+) (n=30)	Mitral L wave (-) (n=52)	p-value
Age	81±8	72±9	<0.001
Sex (male/female)	11/19	41/11	<0.001
Heart rate (bpm)	70±18	82±17	<0.01
LV mass index (g/m2)	104±30	84±28	<0.005
LA volume index (ml/m2)	95±49	78±49	ns
IVRT/√RR interval (msec)	104±18	113±16	<0.05
E wave velocity (cm/sec)	94±22	84±18	<0.05
DcT/√RR interval (msec)	167±46	176±52	ns
E/E'	18.1±5.1	13.7±4.6	<0.001

901-223   Tissue Doppler Diastolic Variables Can Differentiate Hibernating Myocardium

Sadia N. Khan, Patrick M. Heck, David P. Dutka, Addenbrooke's Hospital, Cambridge, United Kingdom
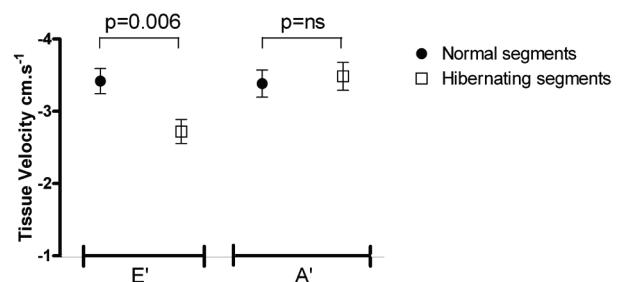
Background: Systolic tissue Doppler velocities have been shown to correlate with myocardial vaibility but little is known about diastolic velocities. We postulated that diastolic E' velocities measured at rest would correlate with myocardial viability as assessed by [18]Fluorodeoxyglucose positron emission tomography (PET).
Methods: 28 subjects (mean age 68 years) with left ventricular ejection fraction < 35%, NYHA Class 2-4 heart failure and minimal angina underwent PET scanning and resting echocardiography with TDI prior to being considered for revascularisation. Segments were identified as being normal or hibernating based on PET imaging. Digitized ultrasound images were obtained and analysed off-line for diastolic TDI data (Echopac, GE medical systems) and the results compared.
Results: 165 segments were identified as normal and 118 as hibernating The diastolic TDI velocities are shown in Figure 1. E' velocities were significantly lower in hibernating compared to normal segments (- 3.1+/- 1.9cm/s versus -3.32+/-2.35 cm/s, p<0.05). A' velocities did not differ significantly between the two groups.
Conclusions: Diastolic tissue Doppler velocities at rest can differentiate normal from hibernating myocardium.

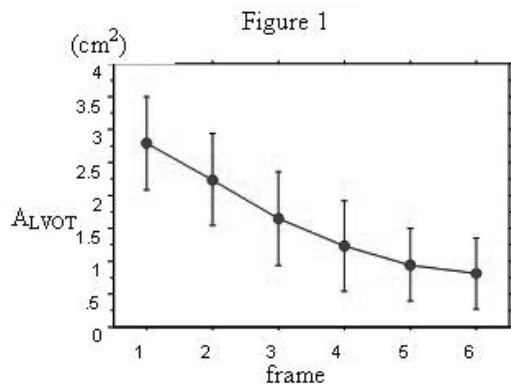Figure 1

Diagnostic Testing

9:00 a.m.

901-224   Dynamic Obstructive Area Change Measured by Quantitative Three Dimensional Echocardiography in Patients with Hypertrophic Obstructive Cardiomyopathy

Yukiko Tsuru, Hiroyuki Watanabe, Miyuki Kawakubo, Masao Daimon, Masaru Aikawa, Tetsuya Tohbaru, Nobuo Iguchi, Kazuhiko Misu, Masatoshi Nagayama, Ryuta Asano, Jun Umemura, Tetsuya Sumiyoshi, Sakakibara Heart Institute, tokyo, Japan

Background: Although late peaking systolic gradient recorded by Doppler echocardiography is a major echocardiographic characteristic of hypertrophic obstructive cardiomyopathy (HOCM), the mechanism is unclear. Recently, minimal area at the left ventricular outflow tract (A_{LVOT}) can be measured by three-dimensional echocardiography(3DE). Thus, we measured dynamic change of A_{LVOT} during systole in patients with HOCM using 3DE, and assessed its severity compared with its maximal flow velocity.
Methods: A_{LVOT} was measured 20 times for 12 HOCM patients (age: 67.8±10.8 years, 7 male). The pyramidal 3DE images were digitally captured by SONOS7500 (Philips) and analyzed by TOMTEC (4D ECHO-VIEW©). Minimal A_{LVOT} was measured in two-dimensional C-planes which were cut from 3DE images on each frame during systole. The maximal velocity across the left ventricular outflow tract (LVOT) was measured by conventional method by continuous wave Doppler echocardiography.
Results: The 3DE images were available in all the subjects (feasibility 100%). The dynamic A_{LVOT} became smaller nonlinearly during systole, from 2.8 ± 0.7 to 0.8 ± 0.5 cm² (Figure 1). Maximal velocity across the LVOT was well correlated with minimal A_{LVOT} (3.0 ± 0.6 m/s. y=5.818-4.734x+1.172x2, r2=0.824, P<0.01). Conclusion: Nonlinear dynamic obstructive area change is a mechanism of late-peak Doppler characteristics in patients with HOCM. Quantitative 3DE is a new and important tool for analysis of geometrical change for HOCM.

Figure 1

9:00 a.m.

901-225   The Effect Of Metabolic Syndrome On Myocardial Contractile Reserve During Exercise In Non-diabetic Hypertensive Patients

Hye-Sun Seo, Sungha Park, Jong-Won Ha, Se-Jung Yoon, Tae Soo Kang, Eui-Young Choi, Se-Joong Rim, Namsik Chung, Soonchunhyang university hospital, Bucheon, South Korea, Yonsei University College of Medicine, Seoul, South Korea

Background: Metabolic syndrome(MS) is associated with increased LV mass and diastolic dysfunction. However, the effect of MS on LV systolic function at rest and during exercise is still controversial. Therefore, we sought to determine that MS would be associated with decrease in longitudinal contractile reserve during dynamic exercise utilizing relatively load independent Doppler tissue echocardiography.
Methods: A total of 112 patients with controlled hypertension who complained of exertional dyspnea were enrolled. (Average age: 56.7±10.5) Fifty six were non diabetic patients with MS(Group 1) while 56 patients were age-sex matched patients without MS(Group 2). Diastolic stress echo was performed using a symptom limited, multistage supine bicycle exercise test. Variable Doppler parameters were obtained at baseline, at each stage of exercise, and during recovery.
Results: There was no significant difference in terms of age, gender and hemodynamic variables such as BP, heart rate and ejection fraction(EF) at rest and during peak exercise between two groups. Although there was no significant difference in LV dimension and baseline EF, group 1 demonstrated significantly higher relative wall thickness and LV mass index. E/E', an index of LV filling pressure, was significantly higher in patients with MS at rest and during exercise. Annular systolic tissue velocity(S') was not different at rest but the change of S' from baseline to peak exercise, the longitudinal contractile reserve, was significantly lower in the MS group. (2.00 ± 1.65 vs 2.90 ± 1.66, P = 0.015) At peak exercise, S' was significantly lower in the MS group. Multiple regression analysis showed the independent association of MS with longitudinal contractile reserve when controlled for confounding factors such as LV mass index, gender, blood pressure and age. (β = - 0.235, P = 0.035)
Conclusion: Longitudinal contractile reserve was reduced in patients with MS compared to patients without MS although both group demonstrated similar longitudinal contractile function at rest. We demonstrated, for the first time, that metabolic syndrome is independently associated with LV systolic dysfunction during exercise in hypertensive patients.

9:00 a.m.

901-226   Prediction Of Function Recovery By Myocardial Contrast Echocardiography In Patients With Chronic Coronary Artery Disease Undergoing Bypass Surgery. Comparison With Late Gadolinium-enhanced Cardiovascular Magnetic Resonance.

Petr Tousek, Martin Penicka, Jaroslav Tintera, Pavel Osmancik, Hana Linkova, Pavel Gregor, Zbynek Straka, Cardiocenter, 3rd Medical school, Charles University and University Hospital Vinohrady, Prague, Czech Republic, Institute for Clinical and Experimental Medicine, ZRIR-MR, Prague, Czech Republic

Background: Very little is known about the accuracy of intravenous myocardial contrast echocadiography (MCE) in prediction of function recovery in patients with left ventricle dysfunction and chronic coronary artery disease undergoing revascularization. There are also currently no data on the comparison of MCE to late gadolinium-enhanced cardiovascular magnetic resonance (LGE-CMR) in this clinical setting.
Methods: Twenty six patients (24 men, age 65 ± 6,9 years) with chronic coronary artery disease and left ventricle dysfunction (EF 32 ± 4,3 %) underwent MCE shortly before bypass surgery. Patients also underwent LGE-CMR (n=15) before revascularization. MCE was performed using continuous Optison infusion with intermittent imaging (Power Harmonic Doppler). Control echocardiography was repeated at 6 months after bypass surgery. 16 segment model of the left ventricle was used for the analysis. Myocardial perfusion was graded semi-quantitatively as 1=normal, 2=patchy and 3= absent. By LGE-CMR, segments were scored according to the transmural extent of hyperenhancement (HYE) as 1=without HYE, 2= HYE less than 50% of myocardial wall, 3= HYE more than 50% of myocardial wall, which reflects nonviable myocardium
Results: Of the 356 revascularized segments, MCE was adequately visualized in 328 (90%) segments, out of whom 282 segments were preoperatively dysfunctional. Contractile function recovered at 6-month follow-up in 127 (45%) dysfunctional segments, from where 80 (28%) segments where preoperatively akinetic. The sensitivity of preserved myocardial perfusion (score 1+2) for segmental contractile function recovery of akinetic segments was 78% and was similar to LGE-CMR (88%, p-NS). Specificity of MCE was higher than for LGE-CMR (72%, and 50%, respectively; p<0,01).
Conclusions: In patients with chronic coronary artery disease undergoing bypass surgery, MCE predicts segmental function recovery in akinetic segments with similar sensitivity and improved specificity compared with LGE-CMR.

9:00 a.m.

901-227   Regional Mechanical Dyssynchrony: A Determinant of Degenerative Mitral Regurgitation in Hypertensive Patients with Isolated Diastolic Dysfunction

Yi-Chih Wang, Chih-Chieh Yu, Juey-Jen Hwang, Ling-Ping Lai, Lung-Chun Lin, Chia-Ti Tsai, Chuen-Den Tseng, Jiunn-Lee Lin, National Taiwan University Hospital, Taipei, Taiwan,ROC

Background: Degenerative mitral regurgitation (MR) is an important contributor to acute pulmonary edema in patients (pts) with left ventricular (LV) diastolic dysfunction (DD) and a normal ejection fraction (EF). However, its mechanism is uncertain.
Methods: We hypothesized that intraventricular dyssynchrony could play a role on MR in pts with isolated DD. Echocardiography was studied in 53 hypertensive pts who had diastolic abnormality defined as mitral E/A < 1 or mitral annular early diastolic velocity (Ea) < 8 cm/s, preserved LVEF (≥50%), narrow QRS complex, no active ischemia, and no history of cardiac surgery, endocarditis, rupture of chordae tendineae, or rheumatic heart disease. There were 26 men and 27 women with a mean age of 67±9 years. Among them, 28 pts (MR group) had at least mild MR with regurgitant jet area/left atrial area ≥10%, and the other 25 pts were the non-MR (NMR) group. Between the two groups, we compared the clinical features, echocardiographic parameters including the dyssynchrony index (SD-Ts12: standard deviation of the electromechanical delay of the 12 LV segments in tissue Doppler imaging), and plasma N-terminal pro-brain natriuretic peptide (NT-proBNP).
Results: When compared to pts in the NMR group, those in the MR group were older (70±9 vs 64±9 y/o, p=0.028), and had longer aortic ejection time (334±24 vs 307±39 ms, p=0.003), borderline larger left atrial diameter (37.2±5.3 vs 33.3±8.8 mm, p=0.053), lower mean peak systolic myocardial velocities of the 12 LV segments (6.2±0.7 vs 6.6±0.8 cm/s, p=0.03), and higher NT-proBNP (324±445 vs 105±94 pg/dl, p=0.032). Pts in the MR group also had greater SD-Ts12 (53.7±22.7 vs 30.7±22.1 ms, p<0.001) with significant time delay occurring mainly in the LV free wall (p<0.05). A positive correlation was found between the SD-Ts12 and the plasma level of NT-proBNP (r=0.39, p=0.008). Multivariate analysis showed SD-Ts12 ≥33 ms (odds ratio=26, 95 % CI=2-477, p=0.027) was independently associated with MR in hypertensive pts with DD.
Conclusions: Regional mechanical dyssynchrony, a correlate with elevated NT-proBNP, plays as an independent contributor to degenerative mitral insufficiency in hypertensive pts with diastolic abnormality.

9:00 a.m.

901-228   Lateral vs Septal E/E' by Tissue Doppler Imaging to Assess Left Ventricular Filling Pressures in Patients with Regional Wall Motion Abnormalities After Myocardial Infarction : Which Should We Use?

Hong-Seok Lim, Woon-Jung Choi, Seong-ill Woo, Jung-Won Hwang, Soo-Jin Kang, Byoung-Joo Choi, So-Yeon Choi, Myeong-Ho Yoon, Seung-Jea Tahk, Joon-Han Shin, Ajou University Medical Center, Suwon, South Korea

Background: The ratio of early transmitral flow velocity to early diastolic velocity of mitral annulus (E/E') is useful in the assessment of left ventricular filling pressures (LVFP), however, there has been few data on diagnostic utility of E/E' in the presence of regional wall motion abnormalities (RWMA). We assessed the usefulness of E/E' measured at the mitral annulus adjacent to the segment with RWMA for the prediction of LVFP.
Methods: We studied 135 patients (60±12 years, 102 males) with RWMA after myocardial infarction (MI). By 2D echo, global and regional left ventricular (LV) systolic function were evaluated, and E/E' at septal and lateral mitral annulus (septal E/E', lateral E/E') were measured using tissue Doppler imaging (TDI). Within 6 hours after echocardiographic measurements, all patients underwent cardiac catheterization to investigate LV pre-A pressures (LVP_{PRE-A}). We classified the patients without RWMA of basal septum and basal lateral segment as group A (n = 83), the patients with RWMA of basal septum and normal basal lateral wall motion as group B (n = 28) and the patients with RWMA of basal lateral segment and normal basal septal wall motion as group C (n = 19).
Results: In all studied patients, both septal and lateral E/E' positively correlated with LVP_{PRE-A} (septal E/E', r = 0.314, p < 0.001; lateral E/E', r = 0.458, p < 0.001). In subgroup analysis, septal E/E' showed significant correlation with LVP_{PRE-A} in group A and C (r = 0.249, p = 0.023 ; r = 0.482, p = 0.037, respectively), whereas lateral E/E' correlated with LVP_{PRE-A} in all three groups (group A, r = 0.380, p < 0.001; group B, r = 0.416, p = 0.028; group C, r = 0.727, p < 0.001). In group C, both septal and lateral E/E' showed good correlations with LVP_{PRE-A}, but according to the result of multiple linear regression analysis, lateral E/E' was a better predictor for LVP_{PRE-A} than septal E/E' (OR=0.727, p < 0.001).
Conclusion: Echocardiographic measurement of E/E' by TDI is a reliable method for the assessment of LVP_{PRE-A} in patients with RWMA after MI, and lateral E/E' is more useful predictor of LVFP regardless of RWMA in this patient population.

9:00 a.m.

901-229   Anatomical Correlates Of A Normal Perfusion Scan Using 64-slice Computed Tomography Coronary Angiography

Jaap M. van Werkhoven, J. D. Schuijf, J. W. Jukema, L. J. Kroft, M. P. M. Stokkel, E. E. van der Wall, J. J. Bax, Leiden University Medical Centre, Leiden, The Netherlands

Background: In patients presenting with chest pain, both myocardial perfusion imaging (MPI) and Multi-Slice Computed Tomography are currently used to detect the presence of coronary artery disease (CAD). However, the techniques provide different information and may therefore not be interchangeable. The aim of this study was therefore to examine the range of anatomical findings corresponding to a normal MPI study using non-invasive 64-slice computed tomography coronary angiography (CTA).
Methods: In 214 patients presenting with chest pain complaints, first-line imaging using both MPI and CTA was performed. In patients with a normal MPI examination, the prevalence of completely normal coronary anatomy, non-significant CAD, and significant CAD were determined on CTA. The occurrence of triple vessel disease, defined as a significant stenosis in the right coronary, left anterior descending, and left circumflex coronary artery, was also ascertained.
Results: A normal MPI examination was obtained in 103 (48.1%) patients (50.5% female patients, average age 58±11.8, 9.7% known CAD). MSCT was successful in 102 (99.0%) patients. 37 patients (36.3%) showed normal coronary anatomy, whereas non-significant and significant CAD was observed in respectively 38 (37.3%), and 27 (26.5%) patients. Excluding patients with known CAD, these parameters were 37 (41.3%), 32 (34.8%), and 23 (24.7%), respectively. Importantly, only 2 (1.9%) patients presented with 3-vessel disease on 64-slice CTA.
Conclusions: Our results confirm that a normal MPI is associated with a wide range of anatomical observations and cannot exclude the presence of both non-obstructive and obstructive stenoses. Of note, the observed prevalence of high-risk CAD however was low, suggesting that this is not an important factor hampering the clinical use of MPI.

9:00 a.m.

901-230   Incidence of Contrast Induced Nephropathy in Patients with Acute Chest Pain Undergoing Contrast- Enhanced Coronary MDCT

Khurram Nasir, Ammar Sarwar, Nina Dannemann, Fabian Moselewski, Johns Nichols, Ahmed Tawakol, Ricardo Cury, Suhny Abbara, Micheal Shapiro, THomas Brady, Udo Hoffmann, Massachusetts General Hospital, Boston, MA

Background: Contrast-enhanced coronary multidetcetor computed tomography (MDCT) may improve triage of patients with acute chest pain In this study we determined the incidence of contrast-induced nephropathy (CIN) in patients with acute chest pain but normal renal function undergoing coronary MDCT..
Methods: We prospectively studied 133 patients (59% males, mean age: 54±12 years) who presented with acute chest pain in the emergency department (ED) and underwent standard 64-slice coronary MDCT (0.6mm slice thickness, 120 kVp, tube current modulation, 99±13 ml (range 72-150 ml) contrast agent. All patient had normal renal function at baseline serum creatinine ≥ 1.3 mg/dl (Scr) and had follow up measurements

of renal function. CIN was defined as 1) a ≥25% increase of serum creatinine (Scr), 2) a ≥50% increase of serum creatinine, and 3); an absolute increase of Scr≥0.5 mg/dl.
Results: In 8/133 (6%) patients invasive coronary angiography was performed within 48 hours of coronary MDCT. These patients were excluded from the analysis. The mean±SD time difference between coronary MDCT and follow-up Scr was 29±22 hours. Overall, 17% (21/125) of patients had an increase in Scr ≥25%, 4% (6/125) had an increase of Scr ≥50%, and 1.6% (2/125) had an absolute increase in Scr≥0.5 mg/dl. Incidence of CIN was higher in patients with diabetes mellitus (7/19 (37%) vs. 14/106 (13%); p=0.01) using a 25% increase of Scr. None of the other baseline patient variables (gender, age, baseline Scr levels) or the amount of contrast used was associated with a higher incidence of CIN.
Conclusion: Incidence of CIN varies from 2-17% in patients with acute chest pain and normal renal function undergoing coronary MDCT.

9:00 a.m.

901-231   Coronary Ct Angiography Decreases Need For Invasive Cardiac Catheterization In Patients With Indeterminate Stress Test

Kavitha M. Chinnaiyan, Laxmi S. Mehta, Michael J. Gallagher, James A. Goldstein, Gilbert L. Raff, William Beaumont Hospital, Royal Oak, MI

Background: Many patients with symptoms suggestive of coronary artery disease (CAD) undergoing stress testing have "equivocal" posttest probability, due either to indeterminate test or the combination of high clinical suspicion and negative test or vice versa. With a negative predictive value ≥90%, normal results on coronary computed tomography angiography (CTA) may make invasive angiography unnecessary to establish definitive diagnosis. The purpose of this study was to evaluate the value of CTA in guiding treatment and predicting 30-day major adverse cardiac events (MACE) in patients with equivocal stress tests.
Methods: Patients with indeterminate stress test and/or discrepant symptoms were prospectively enrolled. On pre-CTA questionnaires, referring physicians indicated choice of therapy had CTA not been available: diagnostic cardiac catheterization (cath), further non-invasive testing, medical therapy, and/or observation. CTA was performed with a 64-slice multi-detector CT scanner (Siemens Sensation Cardiac, Siemens Medical Solutions) with 2.5-3 mm slices for calcium scoring, and 0.6 mm slices for CTA. Final interpretation of disease severity, analyzed with a semiqualitative scale and based on the most severe stenosis, was classified as normal, mild (<25%), moderate (25-50%), moderate-to-severe (50-75%) or severe (>70%).
Results: Over 9 months, 200 patients (age 55±12 years, 54% male) were prospectively enrolled. Follow-up data at 3 months are available in 162 patients. Planned therapy on pre-CTA questionnaire consisted of observation in 17 (10%), medical therapy in 75 (46%), non-invasive testing in 45 (28%) and cath in 96 (60%). In the latter group, cath was performed in 24 (15%) patients. While 4 (6%) in the remaining 66 (40%) patients in the non-invasive group underwent cath, none with normal CTA did. There were no MACE. Normal CTA results deemed cath unnecessary in 73 patients, decreasing overall cath rate by 75%.
Conclusion: In patients with equivocal or discrepant stress tests, CTA adds incremental value in establishing diagnosis and decreases need for cath. Normal CTA portends excellent 30-day prognosis. Studies are underway to assess its long-term prognostic value.

9:00 a.m.

901-232   Left Ventricular Volumes and Regional Wall Motion by Multislice Computed Tomography, as Compared to Magnetic Resonance Imaging Using the Tagging Technique

Ilan Gottlieb, Katherine C. Wu, Veronica Fernandes, Sachin Agarwal, Andre Schmidt, Albert Lardo, David Bluemke, Joao A.C. Lima, Johns Hopkins University, Baltimore, MD

Results

1a - Volumetric measurement comparison

LV Measurements	EDV (ml)	ESV (ml)	EF (%)	SV (ml)	Mass (g)
MSCT Mean (SD)	262 (107)	191 (110)	30 (11)	70 (22)	177 (57)
CMR Mean (SD)	249 (101)	187 (101)	27 (9)	62 (22)	152 (53)
Pearson's correlation coefficient (R)	0.96*	0.97*	0.81*	0.81*	0.90*

1b - MSCT visual analysis compared to CMR circumferential strain measured with tagging

MSCT visual analysis ‡	Normal	Hypokinesis	Akinesis	Dyskinesis	
CMR Strain mean (SD)	-11.2 (6.1)	-8.6 (5.4)†§	-7.6 (5.1)†§	-1.3 (2.5)†	

LV: left ventricle; EDV: end-diastolic volume; ESV: end-systolic volume; EF: ejection fraction; SV: stroke volume; MSCT: multislice computed tomography; CMR: cardiac magnetic resonance; SD: standard deviation
* p<0.05
† p<0.05 for the comparison with the normal segments
§ p=ns for the comparison between hypokinetic and akinetic segments
‡ all segments were analyzed, none was excluded due to lead-induced artifacts

Objective: To investigate the accuracy of multislice computed tomography (MSCT) in assessing left ventricle (LV) volumes and regional function in patients with LV dysfunction, most of whom had an intracardiac defibrillator (ICD), comparing it with Cardiac Magnetic Resonance (CMR).

Methods: 34 patients with clinical ICD indication and ejection fraction <40% had cardiac MSCT and CMR studies; 22 patients had an ICD at the time of the MSCT study. A 64 slice scanner was used in 13 patients and a 32 slice scanner in 21. MSCT image reconstruction was done in short axis images with 8mm slice thickness. CMR cine images were acquired with 8mm slice thickness and tagged CMR was done in 5 to 8 short axis slices. Visual LV regional wall motion (RWM) analysis was done based on a 16-segment model; and circumferential strain using the tagged images was determined for each segment.

Results: Comparing MSCT with MRI volumes, we found significant correlations for all variables analyzed (table 1a). The visual MSCT LV RWM analyses compared to strain values were significantly different between the normal and abnormal segments, but no difference was found between hypokinesis and akinesis segments (table 1b). LV RWM visually assessed with MSCT and CMR was significantly correlated, with a Spearman's rho of 0.89, p<0.05.

Conclusion: MSCT LV volumetric data correlated very well with CMR, and MSCT was able to differentiate normally from abnormally contracting segments, but its ability to differentiate hypokinesis from akinesis was limited.

9:00 a.m.

901-233   **The Amount and Pattern of Myocardial Fibrosis Correlate to Left Ventricular Dysfunction in Hypertrophic Cardiomyopathy Patients by Cardiovascular Magnetic Resonance.**

Afonso A. Shiozaki, Tiago S. Santos, Edmundo Arteaga, João R. Parga, Luiz F. Ávila, Charles Mady, Carlos E. Rochitte, Heart Institute (InCor), University of São Paulo Medical School, São Paulo, Brazil

Introduction: Cardiovascular Magnetic Resonance (CMR) has emerged over the last few years as a major diagnostic tool in Hypertrophic Cardiomiopathy (HCM). Recently, the presence of specific patterns of myocardial fibrosis (MF) by CMR has been correlated with classical risk factors for sudden death in HCM patients. Moreover, recent data from the literature suggests that reduced left ventricular ejection fraction (LVEF) portends poor prognosis in this group. Previous studies in ischemic heart disease have shown that MF inversely correlates with LVEF. To date, the correlation between MF and LVEF in HCM patients has not been established.

Methods: Seventy-three of 600 outpatients were submitted to CMR in our facility (1.5-T Signa CV/I; GE Medical Systems). Myocardial hypertrophy, LV mass, end-systolic, end-diastolic volumes and LVEF (Simpson method) were obtained with cine-MR (SSFP). Inversion-recovery prepared GRE, 5-20min after IV bolus of 0.2mmol/kg of gadolinium-based contrast for delayed enhancement (DE) and MF quantification (as a percentage of total LV mass). Specific patterns of MF previously associated with prognostic risk factors were assigned to each patient: absence, trans-septal, RV septal, ventricular junction, multi-focal, subendocardial and others. Correlation between MF and LVEF was performed by regression analysis. Mean LVEF across all subgroups was compared using ANOVA and Bonferroni sub-test.

Results: Regression analysis showed an inverse correlation between MF and LVEF (r=-0.64; p<0.0001). There were significant differences in LVEF and MF among subgroups (p<0.01 by ANOVA) with multi-focal pattern showing significantly lower LVEF and higher MF, compared to MF absence and ventricular junction (p<0.01, by Bonferroni).

Conclusion: We demonstrated an inverse correlation between LVEF and MF in HCM patients. Our data suggest that MF multi-focal pattern is associated to greater amount of MF and lower LVEF. Thus, multi-focal MF pattern patients may be at higher risk than previously suggested.
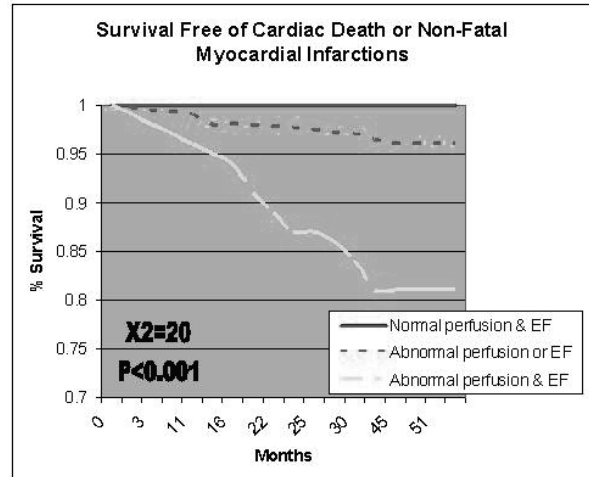
9:00 a.m.

901-235   **Comparison Between Coronary Anatomy and Physiology in Predicting Hard Events in Symptomatic Patients Undergoing Coronary Angiography**

Fadi G. Hage, Homayoun Moddarresifar, Stuart Smalheiser, Eva Dubovsky, Johnny Scott, Jaekyeong Heo, Ami E. Iskandrian, University of Alabama at Birmingham, Birmingham, AL

Background: Both coronary angiography (CAG) and myocardial perfusion are important predictors of risk. This study compared the prognostic value of stress SPECT perfusion imaging to CAG in symptomatic patients.

Methods: There were 364 patients [67 % men, age 61 +/-12 years, 33% diabetic] who had CAG for clinical indications between 1/2001 and 10/2002. All patients had stress SPECT imaging (51% with exercise). Of those, 41 % had stenosis of ≥50% in 2 or 3 coronary vessels. The perfusion was abnormal in 275 patients [75 %]. The mean left ventricular ejection fraction (EF) by gated SPECT was 55+/- 15 %. The follow-up was 34 +/-15 months.

Results: During the follow-up, 18 patients had cardiac events [cardiac death or non-fatal myocardial infarction]. The Kaplan-Meier analysis showed better survival in patients with normal perfusion and normal EF (0 events in the 83 patients) than in those with abnormal perfusion and EF (11 events in 75 patients, 15%) or with either abnormal perfusion or abnormal EF and (7 events in 206 patients, 3%) (Figure). The chi-square values of gated SPECT was higher than CAG (20 vs 4, p<0.001).

Multivariate analysis using Cox proportional hazards regression model that included clinical, CAG, stress testing and SPECT variables revealed that only the gated SPECT to be predictor of outcome (x^2 =20, P<0.001).

Conclusions: Stress SPECT imaging is a stronger predictor of outcome in symptomatic patients than CAG. The patients with normal perfusion and EF are at extremely low risk up to 3 years of follow-up.

9:00 a.m.

901-236   **Combined Pet And Tagging-mri Reveal Altered Patterns Of Regional Function And Metabolism In Ventricular Dyssynchrony**

Vincenzo Lionetti, Letizia Guiducci, Anca Simioniuc, Claudia Simi, Alessandro Pingitore, Daniele De Marchi, Barbara Scattini, Lorenza Pratali, Fabio Bernini, Silvia Burchielli, Piero Salvadori, Massimo Lombardi, Danilo Neglia, Fabio A. Recchia, Institute of Clinical Physiology-CNR, Pisa, Italy, Scuola Superiore Sant'Anna, Pisa, Italy

Background: Ventricular dyssynchrony is a relatively common problem in patients with heart failure and it has been associated with increased mortality. Regional alterations in flow, contractility and metabolism are thought to play an important pathophysiological role, however they remain poorly defined.In our study we tested whether positron emission tomography (PET), combined with tagged magnetic resonance imaging (MRI), can reveal regional alterations of function and metabolism in a translational model of acute left ventricular (LV) dyssynchronous contraction.

Methods: Eight adult male minipigs (35-40 kg) were chronically instrumented with a unipolar pacemaker connected to the epicardial surface of the anterior LV wall. LV pacing notoriously induces abnormal myocardial stress/stretch due to dyssynchronous contraction. The heart was paced at 180beats/min for 90 minutes and myocardial perfusion and metabolism were measured by PET with, respectively, 13NH3 and 18FDG. Regional LV contractility, as assessed as maximum systolic midmyocardial circumferential shortening (Ecc), was measured in three tagged MRI (1,5 T) short axis slices (basal, middle and apical) for matched correlation with PET slices.

Results: The pacing stress caused a significant increase in flow in the LV pacing site (anterior and lateral-anterior regions) (+43.2±1.0%), but not in the opposite regions (inferior and septal-inferior regions) (+4.0±1.0%, P<0.05 vs pacing site). Ecc was globally reduced during pacing, yet it was better preserved in the LV pacing site, where it positively correlated with flow (r=0.80, P<0.05). No significant correlation between flow and Ecc was present in the opposite LV site. Surprisingly, despite these regional differences in flow and contractile function, myocardial glucose uptake was not significantly different in the pacing site compared to the opposite site (0.26±0.1 vs 0.25±0.1 µmol/gr/min), suggesting a functional/metabolic mismatch.

Conclusions: Our data indicate that combined PET and tagging-MRI are an accurate and sensitive diagnostic approach to identify abnormal patterns of regional function and metabolism in early phases of LV dyssynchronous contraction.

E-POSTER SESSION

902

E-Poster Session 902

Sunday, March 25, 2007, 10:00 a.m.-11:00 a.m.
Hall H

10:00 a.m.

902-221 Discrepancies in the Degree of Aortic Valve Stenosis Based on the Assessment of Valve Area, Mean Pressure Gradient, and Maximal Flow Velocity

Jan Minners, Martin Allgaier, Christa Gohlke-Baerwolf, Franz-Josef Neumann, Nikolaus Jander, Herz-Zentrum Bad Krozingen, Bad Krozingen, Germany

Background: Evaluation of the severity of aortic valve stenosis is based on echocardiographic measures including valve area (AVA), mean pressure gradient (dPm), and peak flow velocity (Vmax). For example, current guidelines/recommendations define severe stenosis as AVA <1cm^2 (or <0,6cm^2 adjusted for body surface area), dPm>40mmHg, or Vmax>4m/s, criteria that should be exchangeable at least in patients with normal left ventricular function.
Methods: We tested the consistency of these criteria in 3631 echocardiography studies performed between 1994 and 2004 in patients with normal left ventricular function and a calculated aortic valve area of ≤2cm^2.
Results: Based on the Gorlin formula the predicted dPm for an AVA of 1.0cm^2 indicating severe stenosis is 26mmHg. On the other hand a dPm of 40mmHg relates to an AVA of 0.7cm^2. To test whether in vivo measurements show similar discrepancies we plotted echo-derived AVA against dPm from our study population. Patients presenting with a severe stenosis based on a calculated valve area of 1cm^2 had a dPm of only 27+/-10mmHg and a Vmax of 3,4+/-0,6m/s, corresponding well with the predicted values. Correction for body surface area did not significantly change the results (e.g. valve area 0,6cm^2: dPm 32mmHg, Vmax 3,2m/s). Consequently, the percentage of patients diagnosed with severe stenosis varied between 38% and 80% depending on which criterion was used.
Conclusions: In the context of current guidelines the grading of aortic stenosis is inconsistent and calculation of aortic valve area systematically overestimates the severity of disease.

10:00 a.m.

902-222 Similar Unfavorable Effects of Diabetes Mellitus and Metabolic Syndrome on Hypertensive Target Organ Damage. Data From the Hippokration Hellenic Hypertension (3H) Study

Efstathios Taxiarchou, Costas Tsioufis, Dimitris Chatzis, Maria Selima, Konstantinos Giannakopoulos, Apostolis Kakkavas, Eleftherios Tsiamis, Christodoulos Stefanadis, Ioannis Kallikazaros, Department of Cardiology, Hippokration Hospital, Athens, Greece

Background: The presence of diabetes mellitus type II (DM) or metabolic syndrome (MS) in hypertensive subjects further accelerates cardiovascular risk. Our aim was to determine the differential effects of DM and MS on hypertension-related target organ damage.
Methods: Among 2723 consecutive hypertensives that were included in the Hippokration Hellenic Hypertension (3H) Study, an ongoing registry of hypertension-related target organ damage, we separated 439 diabetics and 631 non-diabetic subjects with MS. Apart from echocardiographic measurements, microalbuminuria (MA) was determined in two non-consecutive morning spot urine samples and arterial stiffness was evaluated on the basis of carotid to femoral pulse wave velocity (PWV), by means of a computerized method (Complior SP).
Results: Hypertensives with DM compared with those with MS were older (by 5.2 years, p<0.001) and exhibited increased waist to hip ratio (by 0.01, p=0.008) and office pulse pressure (by 4.1 mmHg, p<0.001). Moreover, they were less frequently smokers (27 vs 34%, p=0.011) and had a better lipidaemic profile (lower LDL by 6.7 mg/dL, p=0.007 and higher HDL by 2.7 mg/dL, p<0.001). Although left ventricular mass index was not significantly different between the two groups, relative wall thickness (0.45 vs 0.44, p=0.049) and both left atrial diameter (40.7 vs 39.8 cm, p=0.012) and left atrial volume index (25 vs 22.5 ml/m^2, p<0.001) were significantly increased in the DM population. In accordance, the prevalence of left ventricular hypertrophy was almost the same (42 vs 41.2%, p=0.84). Arterial stiffening was more pronounced in subjects with DM (increased PWV by 0.5 m/s, p=0.003) but this difference was abolished after adjustment for confounders. Similarly, the slightly higher prevalence of MA on DM compared to MS (22.5 vs. 16.5%, p=0.13) was not statistically significant.
Conclusions: Adverse impact of MS and DM on hypertension-related target organ damage appears to be similar. These findings denote the importance of glucose intolerance in the process of hypertensive atherosclerotic disease especially in the setting of MS.

10:00 a.m.

902-223 Is There Incremental Value to Transesophageal Echocardiography in Suspected Endocarditis When Transthoracic Echocardiography is Unequivocally Normal?

David M. Casey, Judy R. Mangion, Linda D. Gillam, Hartford Hospital, Hartford, CT, Columbia University Medical Center, New York, NY

Background: In aggregate, transesophageal echocardiography (TEE) has been shown to have incremental value over transthoracic echocardiography (TTE) in patients with suspected infective endocarditis (IE). However the degree to which clinical and/or echocardiographic variables might impact this effect has not been thoroughly studied.

Methods: We conducted a retrospective analysis of 156 consecutive inpatients who underwent TTE followed by TEE for suspected IE between 02/02 and 12/05. Patients with TTE studies graded as "diagnostically inadequate" or patients in whom studies were performed >7 days apart, intraoperatively, or on patients with a firm diagnosis of IE at the time of TTE or TEE were excluded. Clinical variables and echocardiographic findings were obtained from chart review and computer databases. The modified Duke criteria were utilized to assess likelihood of IE as possible, definite or rejected before and after TEE. TTE studies were graded as "normal" or "abnormal" based on a set of prespecified criteria which identified as abnormal patients with prosthetic valves, prior valve repair, pacemakers or ICDs, valve stenosis, significant valvular thickening or calcification, greater than mild valvular regurgitation, congenital abnormalities, or intracardiac/valvular masses.
Results: TTE was scored as normal in 19 patients (12.1%). Of those, 18/19 had normal TEEs (NPV=94.7%). Only 2/19 pts with a "normal" TTE had a final diagnosis of IE. Both had blood cultures positive for methicillin resistant staphylococcus aureus and a history of recent IV drug use. After TEE, 86 patients (55.1%) had either definite or suspected IE by modified Duke criteria. TEE findings changed the Duke criteria in 62 patients (39.7%). In those with an initial "abnormal" TTE, 72/137 (52.6%) had vegetations on TEE. Of patients with vegetation demonstrated by TEE, 72/73 (98.6%) had an abnormal TTE.
Conclusions: TEE is extremely helpful in assessing the likelihood of IE in patients with "abnormal" TTE studies. However, TEE has a low diagnostic yield for vegetation when TTE is unequivocally "normal" and may be unnecessary in this setting.

10:00 a.m.

902-224 Feasibility of Real Time Three-Dimensional Intraoperative Transesophageal Echocardiography Using a Matrix Transducer

Stanton K. Shernan, Douglas Shook, John A. Fox, Brigham and Women's Hospital, Boston, MA

Background: Large dimensions of current real-time three-dimensional echocardiography Matrix (RT3-DM) transducers, have limited their utilization to transthoracic or epicardial imaging. This pilot study evaluated a newly developed RT3-DM transesophageal (TEE) transducer (Philips Medical Systems, Andover, MA) in a cardiac surgical patients.
Methods: Limited RT3-DM TEE exams were performed in 33 cardiac surgical patients, to assess feasibility and image quality. Image quality of valvular structures was graded from 1 - 4: **Grade 1** - unable to visualize leaflets; **Grade 2** - valve borders poorly visualized, **Grade 3** - valve borders easily visualized but details limited to leaflet edges; **Grade 4** - clear delineation of leaflet edges and structure.
Results: RT3-DM TEE probe insertion was performed in all patients without difficulty. Near-field structures including enface views of the mitral valve (Figure 1) were particularly well visualized (Table 1). Gated, full volume data sets permitted RT3-DM TEE color-flow Doppler imaging and comprehensive left ventricular global and regional function.
Table 1. Real-Time Three-Dimensional Intraoperative Transesophageal Echocardiography Image Quality

Structure:	Mean Grade
Mitral Valve	3.6
Aortic Valve	1.8
Tricuspid Valve	1.6
Pulmonic Valve	1.1

Conclusion: Intraoperative RT3-DM TEE is feasible, and provides practical and unique echocardiographic imaging planes, which may permit a more comprehensive evaluation to facilitate perioperative surgical planning.

10:00 a.m.

902-225 Strain Rate is Superior to Peak Systolic Strain for the Detection of Ischemia during Dobutamine Stress Echocardiography

Carlos A. Benejam, Ali Ahmad, Zoran Popovic, Neil Greenberg, Hung Tran, James Thomas, Leonardo Rodriguez, CLEVELAND CLINIC FOUNDATION, CLEVELAND, OH

Background: Speckle Tracking is a new technique for objective quantification of regional wall motion. longitudinal strain (SL) and longitudinal strain rate (SRL) can be obtain by this method during Dobutamine Stress Echocardiography (DSE) but their relative utility

in the diagnosis of myocardial ischemia is not established. The purpose of this study is to test the ability of peak SL and SRL to detect ischemia at peak stress. Methods: Seventy five patients (46 males, 66±10 years) were examined with a Vivid-7 ultrasound (General-Electric (GE)). Echo-Pac was used to derive SL and SRL in the basal, mid and apical segments of the six standard walls. Seventeen patients (9 males, 67±10 years) were positive for ischemia by expert reading and underwent coronary angiography. Based on the angiography results, 289 segments were identified as either normal or ischemic. Results: At rest the mean SL and SRL were -18.06 ±6.8 % and -1.49 ± 0.3 seg-1 respectively. With peak stress, the mean SL and SRL for the normal segments were -22.3 ± 7.4 % and -1.76 ±0.57 seg-1 respectively while the mean SL and SRL for the Ischemic areas were -7.3 ±3.8 % and -0.86 ±0.27 seg-1 p=0.003 and 0.01 respectively. The area under the ROC curve for SRL (0.86) was greater than for SL (0.77), p=0.04, leading to a sensitivity and specificity of 85% and 87%, using a cut-off value of -0.96 for SRL and 81% and 67% using a cut-off value of -10.9 for SL. Conclusion: Strain rate is superior to peak longitudinal strain in identifying ischemic segments during DSE.

10:00 a.m.

902-226   Synthesis And Acoustic Characterization Of A Novel Ultrasound Controlled Drug Delivery System Based On Echogenic Liposomes
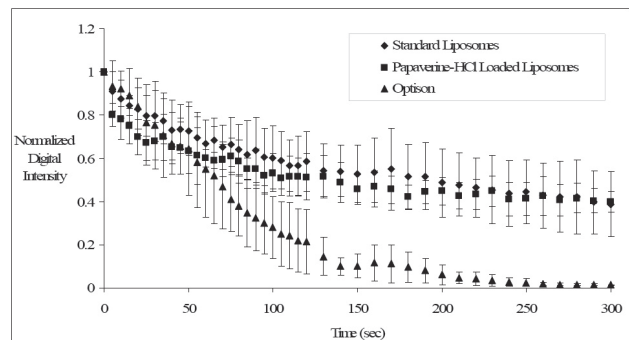
Patrick Kee, Todd Abruzzo, Denise AB Smith, Boyu Wang, Shaoling Huang, Robert C. MacDonald, Christy K. Holland, David D. McPherson, University of Texas at Houston, Houston, TX, University of Cincinnati, Cincinnati, OH

Background: Development of encapsulated therapeutics for release upon ultrasound exposure has implications for targeted concentration of drug effect. We have developed echogenic liposomes (ELIP) suitable for ultrasound-mediated drug release. Papaverine (PAP) was chosen as it could exert greater local effects in treatment of post-hemorrhagic cerebral vasospasm.
Methods: ELIP were modified by lipid hydration with PAP and 3 freeze-thaw cycles to encapsulate PAP. Sizing and encapsulation studies were performed. Papaverine ELIP (PELIP) was monitored (Philips HDI 5000 diagnostic ultrasound scanner - L12-5 linear array transducer) by assessing the mean gray scale value (MGSV) within a 4 X 5 mm2 region of interest over time. The MGSV within the ROI was quantified. Echogenicity and stability of PELIP was compared against standard ELIP and Optison.
Results: Compared with the standard preparation, PELIP are a slightly larger in diameter, 1.0-1.1 um in PELIP vs. 0.8-0.9 um in ELIP, and have similar echogenicity, 104+/-17 MGSV in PELIP vs. 123+/-11 MGSV in ELIP. Optimal encapsulation efficiency and mean encapsulated concentration were 24%+/-7% and 2.1+/-0.7 mg/ml, respectively. Stability of both PELIP and standard ELIP is similar and the PELIP are more resistant to dissolution than Optison.
Conclusions: Our results suggest that PELIP can be used as an ultrasound-controlled drug delivery, enabling ultrasound imaging of blood flow and ultrasound mediated drug release.

10:00 a.m.

902-227   Global Diastolic Strain Rate for the Assessment of Left Ventricular Relaxation and Filling Pressures

Jianwen Wang, Vinay Thohan, Guillermo Torre-Amione, Sherif F. Nagueh, the Methodist DeBakey Heart Center, Houston, TX

Background: The rate of LV relaxation during isovolumic relaxation period (IVR) is little affected by LV filling. Thus, the rate of total myocardial deformation considering all LV myocardial segments as a whole, i.e., global strain rate, during IVR (SR_{IVR}) could be a less preload-dependent indicator of LV relaxation. The accuracy of the ratio of early diastolic mitral flow velocity (E) to annular velocity (Ea), E/Ea, for assessing LV filling pressure is reduced in the presence of regional dysfunction and normal EF. The ratio of E to SR_{IVR} (E/SR_{IVR}) may be a better alternative.
Methods: An initial group of 50 patients (age: 59±16 years) with sinus rhythm who were undergoing right heart catheterization had simultaneous imaging with transthoracic echocardiography. Global strain rate was derived using 2D speckle tracking. SR_{IVR} was measured in each of apical 4, 2 chamber and long axis views. The mean value of SR_{IVR} from 3 apical views was used for analysis. We further tested our findings in 10 prospective patients.
Results: In the initial group, SR_{IVR} correlated well with tau (r=-0.74, p<0.001). E/SR_{IVR} significantly correlated with pulmonary wedge pressure (PCWP)(r=0.79, p<0.001). Such significant correlation remained in 20 patients with regional dysfunction (r=0.83, p<0.001). However, E/Ea showed a weaker correlation with PCWP in patients with regional dysfunction (r=0.63, p<0.01). Using ROC curves, an E/SR_{IVR} of 236 cm had the best accuracy for the prediction of a PCWP≥15mmHg, with a sensitivity of 96% and a specificity of 82% (AUC = 0.93). These 50 patients were further divided into low EF (<50%, n=30) and normal EF (≥50%, n=20) groups. Good correlations were noted between E/SR_{IVR} and PCWP in both groups (r=0.74 in low EF group and 0.91 in normal EF group, both p<0.001). In contrast, the correlation between E/Ea and PCWP was better in low EF group (r = 0.71, p<0.001) compared to normal EF group (r = 0.65, p=0.03). In the prospective 10 patients, the correlation between E/SR_{IVR} and PCWP remained strong (r=0.80, p=0.001).
Conclusions: SR_{IVR} is a good indicator of LV relaxation. E/SR_{IVR} can predict LV filling pressures with good accuracy, particularly in patients with regional dysfunction and those with normal EF.

10:00 a.m.

902-228   Holosystolic Stretch With Postsystolic Shortening Identifies Scarred Myocardial Segments: A Comparative Echocardiography-PET Study

Ali Ahmad, Dalia Ibrahim, Zoran Popovic, Carlos Benejam, Neil Greenberg, Manuel D. Cerqueira, James Thomas, Cleveland Clinic, Cleveland, OH

Background: While post-systolic shortening is a common finding on 2D speckle tracking by echocardiography, its significance for diagnosis relative to other imaging modalities has not been defined
Methods: We studied 21 patients (14 males, mean age 56±14 years) with echocardiography and positron emission tomography (PET). Longitudinal strain by 2D speckle tracking (Echo pac PC GE medical) was performed in the standard 2, 3 and 4-chamber views. The patients also underwent PET resting rubidium and FDG cardiac scan within two weeks of the echo study.Holosystolic stretch with post-systolic shortening was defined as stretching of the myocardial segment >50% of the systolic time coupled to shortening after aortic valve closure. PET studies were analyzed using a 17-segment model as normal, hibernating or scarred myocardium
Results: Longitudinal strain by 2D speckle tracking was feasible in 316 out of 357 segments. Holosystolic stretch with postsystolic shortening occurred in 69 out of 82 scarred myocardial segments. It also occurred in 9 non-scarred segments. Specificity and sensitivity of these findings were 96 % and 84% respectively, with positive, negative predictive value and accuracy of 88%, 94%, and 93% respectively.
Conclusions: Holosystolic stretch with post systolic shortening is a highly specific and fairly sensitive measure to identify scarred myocardial segments on 2D strain imaging.

PET and Peak systolic Strain polar maps with apical long axis tracing of 62 years old male patient consistent with scar of the posterior wall.

10:00 a.m.

902-229   CT For Acute Chest Pain: Is It Time- And Cost-effective?

Christian Thilo, Peter Zwerner, Eric R. Powers, Shaun A. Nguyen, Philip Costello, U. Joseph Schoepf, MUSC, Charleston, SC

Background: Our goal was to assess time- and cost-savings utilizing 64-slice CT as a triage tool for patients with acute chest pain (CP) in the emergency department (ED).

Methods: 38 patients presenting to the ED with acute CP without biomarkers or significant ST-changes were evaluated. Patients had standard care for the evaluation of CP. In addition, a contrast enhanced ECG-gated 64-slice CT (Sensation 64, Siemens) of the entire chest was performed. Data were reconstructed with a full field of view using soft tissue and lung reconstruction algorithms and a coned-down field of view for dedicated coronary assessment. The final diagnosis upon discharge was compared with the diagnosis based on CT alone.

Results: In all patients, the CT diagnosis regarding presence and nature of thoracic pathology agreed with the final diagnosis based on conventional work-up. CT correctly identified 2 cases of ACS with initially negative biomarkers/ECG. 27 patients were admitted to the hospital. In 20 of these both, CT and conventional work-up did not identify a reason for CP. Had these patients been discharged from the ED based on the diagnosis at CT total savings of 3908.0$ (STD=3287.8$; -38.0%±28.8%) per patient and a reduction of the length of stay of 21.1±20.4 hours per patient could have been realized compared to the conventional work-up of CP.

Conclusions: Our preliminary results indicate that 64-slice CT can correctly identify and exclude cardio-thoracic disease in patients with acute CP. Significant reductions in cost and length of stay may be realized, if CT is used as a triage tool in the ED.

10:00 a.m.

902-230   Multislice Computed Tomography And Intravascular Ultrasound For Risk Stratification In Non ST-Elevation Myocadial Infarction And Unstable Angina

Francesca Pugliese, Nico R. Mollet, Annick C. Weustink, Eleni C. Vourvouri, Jurgen Ligthart, Gabriel P. Krestin, Pim J. de Feyter, Erasmus MC, Rotterdam, The Netherlands

Background: Given the accuracy of computed tomography coronary angiography in the assessment of coronary stenoses, we evaluated the safety and capability of multislice computed tomography coronary angiography (MSCT-CA) to determine the
1. location of culprit lesions
2. extent of underlying coronary artery disease (marker of long term risk)
3. necrotic core (marker of long term risk)
4. vessel wall remodeling (marker of long term risk)
5. intracoronary thrombus (marker of acute risk)
in patients with non-ST elevation myocardial infarction (NSTEMI) and unstable angina (UA). Conventional angiography and intravascular ultrasound (IVUS) were reference methods.

Methods: Forty-eight patients (32 males; age 57±8 years) underwent MSCT-CA <78 hours following symptoms onset. Arrhytmias, renal insufficiency and contrast allergy were exclusion criteria. A 64-slice scanner (Somatom Sensation, Siemens, Germany) was used in 30 patients. A dual-source scanner (Somatom Definition, Siemens) in 18 patients. We obtained IVUS pullbacks in 1-3 vessels per patient depending on clinical indication. Proximal plaque, presence of necrotic core, intracoronary thrombus and positive wall remodeling were assessed as dichotomous variables. Association between MSCT-CA and IVUS was analyzed by logistic regression.

Results: Ten patients had normal coronary arteries. MSCT-CA overestimated disease in 4 patients. Sensitivity was 93%, specificity 91%, PPV 72% and NPV 97%. Lesion location, vessel wall remodeling and presence of necrotic core assessed by MSCT-CA showed significant association with IVUS findings (OR=1,28; confidence interval 1,01-1,78).

Conclusions: MSCT-CA is safe for risk stratification in patients with NSTEMI and UA. Plaque location, necrotic core, intracoronary thrombus and positive wall remodeling can reliably be assessed as dichotomous variables in a cost-effective way compared to IVUS.

10:00 a.m.

902-231   Dietary Fat and Subclinical Atherosclerosis as Detected by Coronary Artery Calcium

Linh M. Lu, Nathan D. Wong, Heidi Gransar, Romalisa S. Miranda-Peats, Johanna H. Moon, Donna Polk, Daniel S. Berman, Cedars-Sinai Medical Center, Los Angeles, CA

BACKGROUND: Coronary artery calcium (CAC) is a marker of subclinical atherosclerosis, but there is little information available about its relation with lifestyle factors. The purpose of this study was to examine the association between dietary fat assessed by the National Cholesterol Education Program (NCEP) MEDFICTS dietary score and CAC. METHODS: This cross-sectional analysis examined 1,107 asymptomatic participants (mean age 60.3±7.9 years, 46.2% female) enrolled in the Early Identification of Subclinical Atherosclerosis Using Noninvasive Imaging Research (EISNER) study who had completed a risk factor assessment, a dietary questionnaire and a CT scan. The association of MEDFICTS dietary factors and total fat score (grouped into low [score ≤39], medium [score 40-69], and high [score ≥70] fat consumption) with CAC was examined. CAC score was categorized into absent (CAC=0) and present (CAC>0). Multiple logistic regression was used to examine whether any dietary factors independently predicted the presence of CAC after controlling for cardiac risk factors, including age, gender, hypertension, diabetes, family history of coronary artery disease, smoking, cholesterol, and exercise. RESULTS: 55.6% of participants had CAC. There was no significant difference in the total MEDFICTS score between participants with versus without CAC (p=0.086); however, high-fat meat consumption was strongly associated with CAC (p=0.001). After adjusting for cardiac risk factors, the association of high-fat

meat consumption and CAC remained significant (adjusted OR 1.32, p=0.045) and the association between high-fat condiment consumption (adjusted OR 1.42, p=0.010) and CAC was also significant. CONCLUSIONS: While we found total dietary fat not to be associated with CAC, high-fat meat consumption remained an independent risk factor for CAC. High fat condiment consumption was only significant with the presence of CAC when adjusted for risk factors. These findings provide further evidence of the importance of considering types of fat upon evaluating atherogenic potential.

10:00 a.m.

902-232   A Novel Acquisition and Analysis Technique for Accurate Myocardial Perfusion Measurement during Helical Multi-detector Computed Tomography Imaging
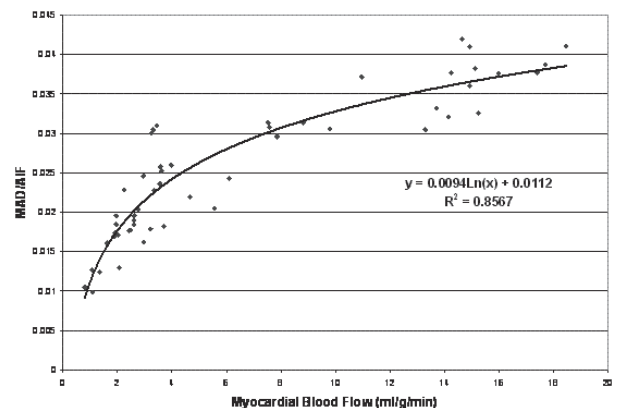
Richard T. George, Caterina Silva, Joao A. C. Lima, Albert C. Lardo, Johns Hopkins University, Baltimore, MD

Background - Quantitative myocardial perfusion imaging (MPI) relies on the accurate assessment of the arterial input function (AIF), which reflects the rate of contrast delivery to the myocardium. The purpose of this study is to describe a novel imaging technique to quantify the AIF during helical MDCT imaging and thus enable MPI during MDCT coronary angiography.

Methods - Seven canine models of left anterior descending artery stenosis underwent adenosine stress (0.14 - 0.21 mg/kg/min X 5 min) MDCT using bolus tracking followed by helical MDCT. The AIF was constructed as follows: 1) the early portion of the AIF was generated using aortic time-density data produced by the bolus tracking feature; 2) the mid and latter portions of the AIF were generated using an algorithm that registers time of acquisition for each slice to allow generation of simulated dynamic data. Combination of 1) and 2) allowed for complete construction of the AIF. Myocardial attenuation densities (MAD) were measured and a perfusion index was defined (MAD divided by the area under the AIF) and compared with microsphere myocardial blood flow (MBF).

Results - Perfusion indices normalized to the area under AIF curve during helical acquisition agreed well with microsphere MBF (see Fig).

Conclusions - Combined bolus tracking and time registered helical imaging can accurately assess the AIF during adenosine stress MDCT. Moreover, myocardial attenuation densities normalized to the AIF provide accurate quantitative metrics of myocardial perfusion.

$$y = 0.0094 Ln(x) + 0.0112$$
$$R^2 = 0.8567$$

10:00 a.m.

902-233   Reduced Accuracy of T2 Weighted MR Imaging in Detecting Acute Myocardial Infarction in Patients with Microvascular Obstruction

Yoko Mikami, Hajime Sakuma, Motonori Nagata, Nanaka Ishida, Tairo Kurita, Takashi Tanigawa, Katsuya Onishi, Issei Komuro, Masaaki Ito, Mie University Hospital, Tsu, Mie, Japan, Chiba University Graduate School of Medicine, Chiba, Japan

Background: In patients with acute myocardial infarction (AMI), high signal intensity (SI) on T2-weighted MRI (T2WI) indicates myocardial edema and is useful in differentiating acute from chronic MI. The purpose of this study was to determine if the detection of AMI on T2WI is impaired in patients with microvascular obstruction (MO), since extravasation of red cells with deoxyhemoglobin in MO may cause short T2 relaxation time and reduced SI.

Methods: T2WI and late gadolinium enhanced (LGE) MRI were obtained in 28 AMI patients 5.0±2.7 days after onset. MR images were analyzed based on a 16-segment model. The presence and transmural extent of LGE and MO were qualitatively evaluated, and the SI ratio as compared to normal myocardium was determined in infarcted myocardium and periinfarction edema.

Results: Of the 448 segments, 51 segments had transmural MO, 55 had LGE without MO, and 28 had periinfarction edema without LGE. All LGE segments without MO showed transmural high intensity on T2WI regardless of transmural extent of LGE. The SI in LGE segments without MO (SI ratio=1.88±0.51) and the SI in periinfarction edema (SI ratio=1.63±0.20) were significantly higher than that in normal myocardium (Figure 1, p<0.001). However, the mean SI in segments with MO was not significantly higher than that in normal myocardium (SI ratio=1.09±0.19).

Conclusions: AMI lesions with MO did not exhibit high signal intensity on T2WI. Careful observation is required when interpreting T2WI and LGE MRI in AMI patients with large MO.
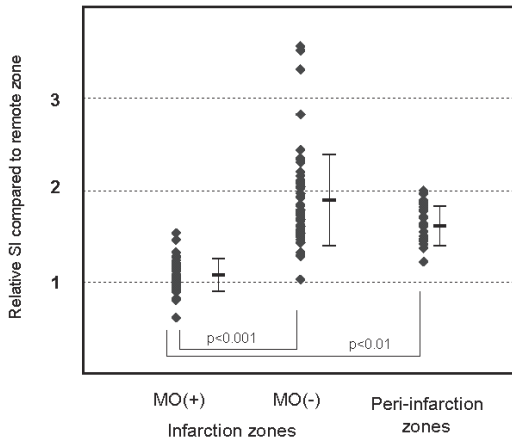
Figure 1. Relative signal intensity in infarction zones and periinfarction zones compared to normal myocardium on T2 weighted MRI

dyspnea, abnormal heart rate response to stress (either type), abnormal resting ECG, LV enlargement, diabetes and male gender were all independent predictors of ACM (all p<0.05); however, presence of chronic beta-blocker and digoxin therapy both contributed independent information in predicting ACM after adjustment for all other clinical/MPS predictors in the model. With this regard, digoxin therapy was associated with significantly worse cumulative prognosis in all analyzed clinical subsets, whereas beta-blockers were associated with a favorable prognostic impact especially in group of patients with moderately and severely abnormal MPS (p<0.001 vs. those not on beta-blocker therapy).

Conclusions: PD is a marker of long-term cumulative mortality, independent of other clinical prognostic predictors. The 10-year unadjusted and adjusted ACM rate was significantly higher in those patients who were on digoxin at time of MPS. Beta-blocker therapy, in contrast, was associated with a reduced long-term ACM risk, especially in patients with moderately and severely abnormal MPS.

E-POSTER SESSION

903

E-Poster Session 903

Sunday, March 25, 2007, 11:00 a.m.-Noon
Hall H

11:00 a.m.

903-221   Abnormalities in Left Ventricular Systolic Function Predict Heart Failure Events Despite Normal Baseline Ejection Fraction: Data from the Heart and Soul Study

Sanjiv J. Shah, Nelson B. Schiller, Mary A. Whooley, University of Chicago, Chicago, IL, University of California, San Francisco, San Francisco, CA

Background: Recent studies utilizing tissue Doppler have challenged the notion that patients with heart failure and normal ejection fraction (HFnlEF) have normal "systolic function". Others have shown that hemodynamic parameters of systolic function are normal in patients with HFnlEF. These studies typically exclude patients with coronary heart disease (CHD), an important co-morbidity in HFnlEF. We hypothesized that in patients with CHD and normal baseline EF, abnormalities in systolic function predict future hospitalization for HF.

Methods: In a prospective study of 884 outpatients with CHD and baseline EF >50%, we used simultaneous echo and sphygmomanometry to measure parameters of systolic function: preload-recruitable stroke work (PRSW; single-beat method), stroke work / end-diastolic volume (SW/EDV) ratio, EF (by biplane method of discs), and end-systolic elastance (end-systolic pressure / end-systolic volume [ESP/ESV]). We used Cox proportional hazard models to determine whether systolic function parameters were independent predictors of HF outcomes, after adjusting for clinical, laboratory, cardiac structural, and diastolic function characteristics.

Results: During 4-year follow-up, 75/884 (8.5%) were hospitalized for HF. Subjects who developed HF were older, more often diabetic, and had wider pulse pressure and lower creatinine clearance. Those who developed HF had increased baseline LV mass and LV volumes, and had worse baseline diastolic function. All baseline systolic parameters were decreased in subjects who developed HF (PRSW 95±35 vs. 120±40 g/cm^2 [p<0.0001]; SW/EDV 90±39 vs. 112±43 g/cm^2 [p=0.0001]; EF 61±6 vs. 64±6% [p<0.0001]; ESP/ESV 3.2±1.6 vs. 4.1±1.7 mmHg/ml [p<0.0001]). Subjects with baseline PRSW below the median level (<113 g/m^2) had an unadjusted 2.6-fold increased risk of HF (95% CI 1.6-4.2, p<0.0001), and a multivariate adjusted 2.5-fold increased risk of HF (95% CI 1.1-5.9, p=0.035).

Conclusions: CHD patients with normal baseline EF who subsequently develop HF have worse baseline LV systolic function than those who do not develop HF, suggesting that these patients may be more similar to traditional "systolic HF" than previously recognized.

11:00 a.m.

903-222   Cardiac Structure and Function in Diabetics With Acute Myocardial Infarction Complicated by Heart Failure, Left Ventricular Dysfunction, or Both: The VALIANT Echo Study

Rahman Shah, Anil Verma, John J.V. McMurray, Jalal K. Ghali, Aldo P. Maggioni, Eric J. Velazquez, Lars Kober, Marc A. Pfeffer, Brigham and Women's Hospital, Boston, MA, Duke Clinical Research Institute, Duke University Medical Center, Durham, NC

Background. Diabetics are at increased risk for cardiovascular (CV) death and heart failure (HF) after acute myocardial infarction (MI). Whether poor prognosis of diabetic patients can be attributed to the abnormalities of cardiac structure and function is not well defined.

Methods. The VALIANT echo study prospectively enrolled 603 patients with left ventricular (LV) dysfunction, HF, or both after MI (mean 5 days). Baseline echocardiographic characteristics were compared between non-diabetics and diabetics (diagnosed prior to or at time of index MI).

Results. While LV volumes, ejection fraction (EF), infarct segment length and right ventricular (RV) function were similar (Table), LV wall thickness and left atrial (LA) volumes were significantly greater in diabetics. In multivariate Cox analyses adjusted for age, Killip class, eGFR, prior MI, HF, hypertension, PCI post-MI, EF, EDV, and MR, diabetes was associated with increased risk of CV death or hospitalization for HF (HR 1.5, 95% CI 1.02-2.2). Adjustment for LV wall thickness and LA volume index in addition to the above factors attenuated the association of diabetes with CV death or hospitalization for HF (HR 1.3, 95% CI 0.9-1.9).

10:00 a.m.

902-235   Sympathetic Nerve Activation Predicts Origin Of Tachyarrhythmia In Patients With A History Taking Paroxysmal Palpitation.

Yasushi Akutsu, Yuka Saiki, Yusuke Kodama, Yukihiko Kinohira, Hui-Ling Li, Hideyuki Yamanaka, Akira Shinozuka, Takehiko Gokan, Youichi Kobayashi, Takashi Katagiri, Showa University School of Medicine, Tokyo, Japan

Background: Palpitation is caused by tachyarrhythmias, but it is not always easy to discriminate life-threatening arrhythmic event from benign episode non-invasively in patients with a history taking paroxysmal palpitation. Sympathetic nerve system activation predicts sudden death from arrhythmic cause. Heart imaging with an analogue of norepinephrine, iodine-123 metaiodobenzylguanidine (^{123}I-MIBG) can be used for the non-invasive assessment of sympathetic nerve activation. We hypothesized that sympathetic nerve abnormality would be associated with origin of tachyarrhythmia.

Methods: Resting ^{123}I-MIBG scintigraphy was performed in 184 patients (mean ± standard deviation, age: 52.7 ± 18.8 years, 71.6% males) with a history taking paroxysmal palpitation. The patients with structural heart disease or left ventricular dysfunction were excluded from this study. Cardiac sympathetic nerve abnormality was assessed from Heart/Mediastinum (H/M) later index and ^{123}I-MIBG washout rate when the patients remained on the condition of sinus rhythm, not having paroxysmal tachyarrhythmia. The sustained ventricular tachycardia (VT) in 46 patients and sustained supraventricular tachycardia (SVT) in 103 patients were diagnosed by 12-lead electrocardiography or holter monitoring during onset of arrhythmia, or electrophysiologic studies employing programmed cardiac stimulation. The tachyarrhythmia was not proven in 35 patients (Control). In 8 patients with SVT, ^{123}I-MIBG scintigraphy was repeated one month after successful catheter ablation.

Results: H/M index was lower and washout rate was higher in tachyarrhythmia groups than Control group (H/M index: 2.75 ± 0.55 in VT group, 3.01 ± 0.78 in SVT group vs 3.34 ± 0.48 in Control group, p<0.001 and p<0.05, Washout rate: 39.6 ± 12.1% in VT group, 38.1 ± 8.5% in SVT group vs 34.2 ± 6.8% in Control group, p<0.05 in each). H/M index was lower in VT group than SVT group (p<0.05). H/M index in SVT group recovered one month after successful catheter ablation (2.99 to 3.42, p<0.05).

Conclusions: Sympathetic nerve system activation is a powerful predictor of origin of tachyarrhythmia.

10:00 a.m.

902-236   Predictors Of All-Cause Mortality And Impact Of Medical Therapy On Long-term Prognosis In Patients Undergoing Myocardial Perfusion SPECT: Results Of 10-year Follow-up

Aiden Abidov, Sean W. Hayes, John D. Friedman, Xingping Kang, Ishac Cohen, Guido Germano, Daniel S. Berman, Cedars-Sinai Medical Center, Los Angeles, CA

Background: We sought to evaluate clinical, historical and nuclear perfusion data for the prediction of long-term (10-year) all-cause mortality (ACM) and to assess the prognostic impact of chronic cardioactive medical therapy at the time of the index test in patients referred for the myocardial perfusion SPECT (MPS).

Methods: We identified 12,853 patients (38.8% women, mean age 65±12 yrs) free of cardiomyopathy/valve disease, who underwent stress MPS (adenosine stress: 31.9%) and then followed up (for 10.0±1.7 yrs). Multivariable Cox proportional hazards analysis was used to assess the prognostic value of clinical/MPS variables in predicting ACM. Deaths were identified through the hospital-based patient information system (WebVS) and the Social Security Death Index.

Results: During the follow-up there were 3462 ACM events (26.9%). In a multivariable model, age, perfusion defect (PD), type of stress (exercise vs adenosine), symptoms of

Conclusion. Despite similar infarct sizes, ventricular volumes, and systolic function, diabetics are at increased risk for dying or developing HF after MI. The increased LV wall thickness and LA volumes observed in diabetics suggest that abnormalities of diastolic function might partly account for the increased risk.

	DM n=138	Non-DM n=465	P
EF, %	39.2±5.3	39.2±5.8	0.90
EDV, mL	120.3±28	119.1±33	0.71
ESV, mL	73.3±19.9	73.27±25	0.97
LAVi, mL/m²	26.1±8.4	23.5±8.1	0.001
MR jet area/LA area	9.6±9.3	7.4±8.9	0.02
RVFAC, %	41.8±4.0	41.9±4.4	0.75
Infarct length, cm	7.1±2.1	7.35±2.4	0.31
AV wall thickness, cm	1.04±0.1	0.97±0.1	<0.001
RWT	0.42±0.08	0.38±0.07	<0.001
LVH, %	40.6	28.4	0.007
LV-systolic sphericity index	38.2±10.5	39.6±11.6	0.17

DM, diabetes mellitus; EF, ejection fraction; EDV, end diastolic volume; ESV, end systolic volume; LAVi, left atrial volume index; MR, mitral regurgitation; LA, left atrial; RVFAC, right ventricular fractional area of contraction; AV, atrioventricular; RWT, relative wall thickness; LVH, left ventricular hypertrophy; LV, left ventricular; CVD, cardiovascular death; HF, heart failure.

11:00 a.m.

903-223   **Early Assessment Of Transesophageal Echocardiography In The Definition Of Ischemic Stroke Subtypes In Emergency Department: Implications On Clinical And Therapeutic Decision Making.**

Stefano De Castro, Daria Santini, Emanuele Di Angelantonio, Ilaria Passaseo, Stefano Caselli, Elena Cavarretta, Marco Fiorelli, Danilo Toni, La Sapienza University, Rome, Italy

Background. Aim of our study was to determine its etiopathogenetic and therapeutic impact in the early phase of ischemic stroke event.
Methods. We prospectively enrolled 345 consecutive patients admitted to our Emergency Department Stroke Unit with a diagnosis of acute IS. Within 48 hours from symptoms onset, a routine clinical diagnostic protocol (CT scan or MRI, carotid artery ultrasound, EKG and transthoracic echocardiography) and TEE were performed. Stroke etiology (TOAST criteria) and therapeutic options (antiplatelet or anticoagulant drugs), according to international guidelines, were analyzed before and after TEE examination.
Results. We were able to perform TEE in 318 (92%) out of 345 eligible patients (mean age 65.2 years, 59.4% male). The reason why TEE was not carried out of all eligible patients was the degree of NIH stroke scale, dysphagia or intolerance. Forty-seven (14.8%) patients were on atrial fibrillation at hospital admission. Pre- and post-TEE comparison are reported in the table.
An early TEE examination strongly influenced the stroke etiology classification and reduced consistently the percentage of cryptogenetic stroke patients. In addition it influenced therapeutic strategy in more than one fifth of our study population.
Conclusions. These data suggest that early TEE procedure in acute phase of stroke event is largely feasible. It has an important role in the classification of stroke subtypes and in secondary prevention of therapeutic strategies.

	Pre-TEE	Post-TEE	p-value
	TOAST		<0.001
Large-artery atherosclerosis	47 (14.78%)	24 (7.55%)	
Cardioembolic Source	45 (14.15%)	131 (41.19%)	
Small-vessel occlusion	29 (9.12%)	23 (7.23%)	
Other determined etiology	16 (5.03%)	13 (4.09%)	
Multiple etiology	4 (1.26%)	13 (4.09%)	
Undetermined etiology	177 (55.66%)	114 (35.85%)	
	THERAPY		<0.001
Antiplatelet agents	203 (63.84%)	150 (47.17%)	
Oral anticoagulation	115 (36.16%)	168 (52.83%)	

11:00 a.m.

903-224   **Determinants And Clinical Implications Of Ventricular Dyssynchrony In Patients With Reperfused Myocardial Infarction: Study With Realtime 3d Echocardiography**

Yoh Arita, Hiroshi Ito, Katsuomi Iwakura, Shigeo Kawano, Atsunori Okamura, Toshiya Kurotobi, Yasushi Koyama, Motoo Date, Koichi Inoue, Kenshi Fujii, Sakurabashi Watanabe Hospital, Osaka, Japan

Background: Myocardial ischemia is a cause of mechanical dyssynchrony and it may worsen hemodynamics. Realtime three-dimensional echocardiography (RT3DE) provides noble method to assess ventricular dyssynchrony irrespective of its locations. The aim of this study was to assess the presence or absence of dyssynchrony in acute MI patients with RT3DE and its determinants.
Method: The study population consisted of 54 patients with acute MI undergoing primary PCI. We recorded data set of full volume from the apical window with RT3DE (iE33 or SONOS7500) 1 week after the onset. QLAB (Philips) displays the temporal changes in total and regional LV volumes. Systolic dyssynchrony index (SDI) was derived as standard deviation of times to minimum regional volume of 16 segments divided by R-R intervals. In 21 patients, we performed intracoronary myocardial contrast echocardiography (MCE) after PCI.
Results: SDI increased with an increase in Killip class (1 vs. 2 vs. 3 vs. 4; 1.9±1.3 vs. 1.9±0.3 vs. 2.8±2.3 vs. 7.4±8.5 %, p=0.0016). Patients with prolonged CHF (lasting ≥ 3 days) had higher SDI than those without it (3.6±4.0, 1.9±1.2%, p=0.0227). We divided 54 patients into 4 quartiles (q1, q2, q3, q4) from SDI values. Higher SDI quartile, q4, had the lowest LVEF (q1 vs. q2 vs. q3 vs. q4; 62.6±11.5 vs. 62.5±9.9 vs. 56.7±11.1 vs. 49.5±10.8 %, p=0.0083). There was no difference in QRS width among 4 quartiles (85±21vs. 94±21 vs. 84±17 vs. 85±17 msec, NS). Among 21 patients undergoing MCE, 16 patients showed good-reflow and 5 patients showed no-reflow. SDI was significantly higher in the no-reflow group than in the good-reflow group (3.0±2.0 vs.1.4±0.7 %, P=0.011).
Conclusions: 1) LV dyssynchrony is observed in patients with reperfused acute MI and is associated with severe and prolonged HF. 2) Reduced LVEF is associated with the higher possibility of dyssynchrony. 3) The no-reflow phenomenon may be a cause of the dyssynchrony.

11:00 a.m.

903-225   **Stress Echocardiography Can Safely, Rapidly and Accurately Risk Stratify Patients with Suspected Non-ST Elevation Acute Coronary Syndrome and an Initial (12 hour) Negative Troponin: Implications for Early Use of Stress Echocardiography in the Emergency Department**
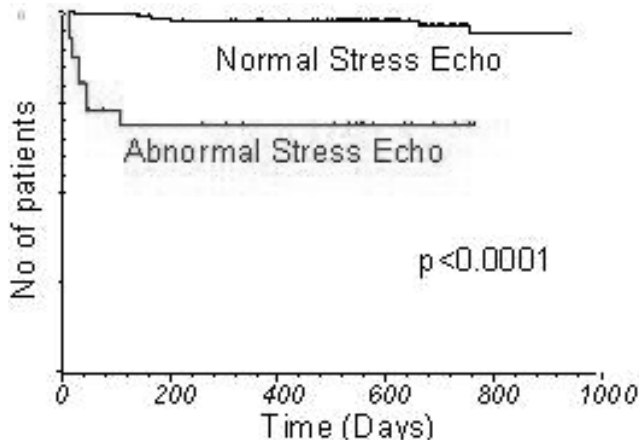
Paramjit Jeetley, Leah Burden, Roxy Senior, Northwick Park Hospital, Harrow, United Kingdom

Background: Patients (pts) presenting to hospital with suspected acute coronary syndrome (ACS) and an initial negative troponin (Tn) require further investigation. We hypothesised that stress echocardiography (SE) was both safe and accurate for the risk stratification of pts with suspected ACS but a negative 12 hour troponin.
Methods: Patients with cardiac risk factors presenting with suspected ACS and a negative Tn measured 12 hours from onset of pain underwent SE. A further Tn measure was taken after admission before SE. A positive SE was defined as presence of a new or inducible wall motion abnormality in any one of the 16 left ventricular segments. Patients were followed up for hard cardiac events (cardiac death and acute myocardial infarction (AMI)).
Results: Of the 190 pts who underwent SE, 16 pts (8.4%) suffered cardiac events (1 cardiac death and 15 AMI) over a follow-up period of 18±9 months. Of the 40 pts with positive SE, cardiac events occurred in 10 pts (25%) as opposed to only 6 cardiac events out of 150 pts (4%) with a negative SE (p<0.0001). Kaplan-Meier survival curves (Figure) illustrate outcomes for positive versus negative SE. The majority of cardiac events (11/16) occurred early after admission. A positive SE predicted 8 (20%) out of 40 pts while only 3 (2%) out of 150 pts with negative SE suffered cardiac events.
Conclusions: SE is a safe effective and rapid method of risk stratifying pts with suspected ACS and an initially negative Tn. A negative SE is associated with an excellent long-term prognosis.

Diagnostic Testing

11:00 a.m.

<u>903-226</u>   **Contrast Enhanced Carotid Ultrasound Shows Greater Intraplaque Neovascularization In High Risk Plaques**

Stefano Coli, Marco Magnoni, Domenico Cianflone, Giulio Melisurgo, Massimiliano Marrocco Trischitta, Roberto Chiesa, Steve B. Feinstein, Attilio Maseri, Università Vita Salute San Raffaele, Milano, Italy, Rush University Medical Center, Chicago, IL

Background: pathologic studies show that neovascularization (NV) is more extensive in vulnerable plaques. Preliminary experiences suggest that contrast ultrasound (CUS) allows imaging of carotid plaque NV. We correlated carotid plaque NV by CUS with plaque echogenicity, as more echolucent plaques have a higher risk of clinical events and more vulnerable pathologic features.
Methods: we studied 32 patients (pts), 27 males, age 68.9 ± 8.1 years, who had at least one carotid stenosis >30%. A GE-Vivid 7 with a 7L probe was used. As 16 pts had multiple lesions, globally 52 plaques were studied. Each plaque was classified in terms of echogenicity according to a widely used scheme (class I: uniformly echolucent; II: predominantly echolucent; III: predominantly echogenic; IV: uniformly echogenic; V: calcification with acoustic shadowing). CUS imaging was performed with Optison (GE-Healthcare) at a low mechanical index (0.10-0.08). Moving bright spots (contrast bubbles) within the plaque were considered to represent plaque NV. Plaque NV by CUS was scored as follows: grade 0: absence of contrast; grade 1: contrast confined to plaque adventitial side and/or shoulder; grade 2: contrast reaching plaque core; grade 3: extensive contrast enhancement throughout the plaque.
Results: different echogenicity classes were well represented in our series: I 14%, II 21%, III 17%, IV 23%, V 25%. Some degree of NV was found in nearly two thirds of the plaques (0: 37%, 1: 31%, 2: 17 %, 3: 15 %). More echolucent plaques had a significantly higher degree of NV (p <0.001 by chi square for trend). When plaque echogenicity and NV were dichotomised, class I-II (echolucent) plaques had a significantly higher prevalence of grade 2-3 NV compared to class III-V (echogenic) plaques (67% vs 15% respectively, p < 0.001 by chi square analysis). This association remained significant even after correcting for stenosis and pts having multiple plaques (p <0.05).
Conclusions: intraplaque NV evaluated by CUS is greater in echolucent plaques. As echolucency is a known feature of high risk lesions, our findings confirm in the clinical setting the association between plaque NV and vulnerability observed in pathologic studies.

11:00 a.m.

<u>903-227</u>   **Characterization of Ventricular Myocardial Performance in Fetus by Tissue Doppler Imaging**

sayaka watanabe, Fukiko Ichida, Ikuo Hashimoto, Shigeru Saito, Toshio Miyawaki, David J. Sahn, University of Toyama, Toyama, Japan

Background: The aim of this study was to evaluate the characteristics of myocardial velocities and gestational age-related changes in normal fetuses, and to determine useful indices for quantitative assessment of fetal cardiac function using tissue Doppler imaging (TDI).
Methods: Fifty-three pregnancies between the 17th and 38th weeks of gestation were studied. The different study groups included 38 normal fetuses, 4 fetuses with hydrops fetalis (HF), and 11 fetuses with intrauterine growth retardation (IUGR). Peak velocities during early diastole (E) and late diastole (A) were measured by pulsed-wave Doppler and the peak annular velocities during systole (Sa), early diastole (Ea), and late diastole (Aa) were measured by TDI on a four-chamber view. Ejection fraction (EF) was estimated using an area-length method.
Results: In normal fetuses, Sa, Ea, and Ea/Aa ratio of both ventricles increased significantly with advancing gestational age, with right ventricle dominancy, whereas E/Ea and the ratio of Sa of the right ventricle to that of the left ventricle (RVSa/LVSa) were constant throughout gestation. There was a significant correlation between Sa and EF in both ventricles (p<0.001). In all fetuses in the HF group, LVSa was below 2 cm/s and LVE/Ea was above 13 (sensitivity100%, specificity 92.1%). In addition, RVSa/LVSa in the HF group was higher than that in the normal group (p<0.001).
Conclusions: A combination of low LVSa and high LVE/Ea shows reduced global myocardial performance of the LV, and is a sensitive parameter for quantitative assessment in high-risk pregnancies. Changes of RVSa/LVSa ratio may reflect afterload changes in both ventricles and compensatory cardiovascular mechanisms occurring during the process of placental insufficiency and heart failure.

11:00 a.m.

<u>903-228</u>   **Presence of Mechanical Dyssynchrony Predicts Response to Cardiac Resynchronization in Heart Failure Patients with Narrow QRS**

Asim M. Rafique, C. Thomas Peter, Tasneem Z. Naqvi, Cedars-Sinai Medical Center, Los Angeles, CA, UCLA School of Medicine, Los Angeles, CA

Background Electrical asynchrony is not a good predictor of response to cardiac resynchronization treatment (CRT). We hypothesized that mechanical asynchrony will predict response to CRT irrespective of QRS width.
Methods We determined the prevalence of cardiac asynchrony and response to CRT in 90 pts, 38 with narrow QRS <130 ms (nQRS) and 52 with wide QRS ≥130 ms (wQRS) cardiomyopathy (CMP) who had presence of mechanical asynchrony immediately before CRT and underwent follow up by echo post CRT. Mean age was 65±16 yrs, NYHA class 3±1, 53% had ischemic CMP and mean follow up time was 4±7 weeks. 98% of pts met at least one criterion for asynchrony and 92% had 2 or >. Responders (R) were defined as patients in whom end systolic volume (ESV) reduced by 10% post CRT.
Results There was no difference in the presence and severity of asynchrony in the two gps pre CRT. 70% of pts had more than 4 criteria for presence of mechanical asynchrony

in both gps. Table shows echocardiographic and asynchrony criteria pre and post CRT. There was no difference in the response to CRT in the two gps (Δ % ESV = 12±17 vs 15±29, p=0.6), Δ % LVEF = 26±46 vs 38±48%, p=0.3, and % R (57% vs 73%, p=0.22) in nQRS vs wQRS gps. 23% vs 91% of non responders had ischemic CMP in nQRS vs wQRS gps, p=0.001. **Conclusion** In pts with CMP with comparable mechanical asynchrony, response to CRT in nQRS gp is similar to those with wQRS. Mechanical and not electrical asynchrony should be used in pts with nQRS for CRT.

Pre CRT Echocardiographic Variables	QRS<130 ms (N= 38)	QRS≥130 ms (N=52)	p value
Left ventricular end diastolic diameter (cm)	6.6±0.9	6.3±1.0	0.18
Left ventricular end systolic diameter (cm)	5.6±0.9	5.2±1.2	0.08
Mitral regurgitation JA/LAA Ratio (%)	33±19	28±19	0.45
Peak pulmonary artery pressure (mmHg)	43±14	44±19	0.82
Left ventricular ejection fraction (%)	29±10	32±11	0.23
Asynchrony parameters by tissue Doppler Imaging			
SD of Tp in 12 LV segments (>33ms)	47±16	48±15	0.73
Basal septolateral wall delay (>60ms)	61±40	63±41	0.86
Max diff Tp 6 basal segments (>110ms)	216±123	239±117	0.39
Septoposterior wall delay M-Mode (>130ms)	111±36	136±74	0.07
Sum of basal LV and RV Asynchrony (>102 ms)	156±108	148±86	0.81
Delayed longitudinal contraction (2 or more basal LV segments)	42%	31%	0.39
Post CRT			
% Δ Left ventricular ejection fraction	34±9	40±11	0.01
Δ Left ventricular ejection fraction (%)	4.7±8.9	8.6±11.7	0.10
↓in left ventricular end systolic volume (mL)	16±27	21±30	0.42

SD=standard deviation, Tp=time to peak contraction. Values in brackets represent published cut offs for presence of mechanical asynchrony.

11:00 a.m.

<u>903-229</u>   **Can the Burden of Coronary Atherosclerosis be Predicted by a Patient's Pre-test Probability for Coronary Artery Disease?**

Benjamin J. W. Chow, Micheal C. Ling, Carole Dennie, Terrence D. Ruddy, Rob S. Beanlands, University of Ottawa Heart Institute, Ottawa, ON, Canada

Background: The pre-test probability for significant coronary artery disease (CAD; coronary stenosis >/= 50%) is commonly determined by using patient's age, gender and symptoms. However, the relationship between the pre-test probability for significant CAD and coronary atherosclerosis (obstructive and non-obstructive) has not been previously studied.
Methods: 275 consecutive patients (without prior revascularization) underwent 64-multi-detector CT coronary angiography (CTA). Retrospective ECG-gated data sets were acquired with the GE VCT (General Electric, Milwaukee, Wisconsin) with 64 X 0.625 mm slice collimation and a gantry rotation of 350ms (mA = 400-800, kV = 120). The MDCT data sets were reconstructed with a scan interval of 0.4 mm using the cardiac phase(s) with the least cardiac motion. ECG-gated MDCT images were processed using the GE Advantage Volume Share Workstation and interpreted by one of two expert observers. A 17-segment model of the coronary arteries was used to assess for the presence or absence of calcific or non-calcific plaque. A total plaque score was determined by summing the number of coronary segments with calcific or non-calcific plaque. Plaque Jeopardy Score was calculated using a similar anatomical scoring system as the Duke Jeopardy Score.
Results:

	n = 275
Mean age (yrs)	58.3 +/- 12.5
Men	144 (52%)
Diabetes	41 (15%)
Smoker or ex-smoker	139 (51%)
Hypertension	133 (48%)
Dyslipidemia	158 (57%)
Mean Pre-test probability	45.5 +/- 37.5
Mean Total Plaque Segment Score	3.2 +/- 3.5
Mean Plaque Jeopardy	6.0 +/- 5.1
Correlation - Pre-test probability and Total Plaque Segment Score	0.25
Correlation - Pre-test probability and Plaque Jeopardy Score	0.24

Conclusion: Patient pre-test probability for significant CAD as measured by routine clinical measures does not accurately predict the presence or absence of coronary atherosclerotic plaque.

11:00 a.m.

903-230 Noninvasive Assessment of the Low Density Plaque in Culprit Lesion of Patients With Unstable Angina Pectoris by Multislice Computed Tomographic Coronary Angiography

Ryo Nakazato, Masao Moroi, Taeko Kunimasa, Kaoru Sugi, Toho University Ohashi Medical Center, Tokyo, Japan

Background: Intravascular ultrasound (IVUS) study shows that patients with unstable angina pectoris (UAP) have more soft plaques in the culprit coronary arteries compare with those with stable angina pectoris (SAP). We evaluated plaque characteristics of culprit lesions in patients with UAP by multislice computed tomographic coronary angiography (MSCTA).

Methods: MSCTA (Aquillion 64, Toshiba Medical, Tokyo, Japan) was performed in consecutive 22 patients (UAP=10, SAP=12) before percutaneous coronary intervention (PCI). Coronary plaque area was measured by manual tracing as the difference between the area including both plaque and vessel lumen (equals the external elastic membrane area in IVUS) and the area of the vessel lumen (equals the internal elastic membrane area in IVUS) at the site of maximal luminal narrowing on cross-sectional MSCTA images which lesion was PCI site. Within this plaque area, low density plaque area (a mean CT density less than 50 Hounsfield units) was measured.

Results: As shown in table, culprit lesion showed significantly greater area of low density plaque in patients with UAP than in those with SAP.

Conclusion: Noninvasive MSCTA image findings of both great plaque burden and greater area of low density plaque (more than 30% for plaque area) are associated with high-risk plaque.

Measurements in culprit coronary lesions

	Unstable angina pectoris (n=10)	Stable angina pectoris (n=12)	p value
Low density plaque area (mm²)	5.8 ± 3.4	1.1 ± 1.6	0.0005
Plaque area (mm²)	13.8 ± 7.8	11.9 ± 4.8	0.5
Low density plaque area / plaque area (%)	44.3 ± 15.7	8.7 ± 11.9	<0.0001
Plaque burden (%)	82.1 ± 11.2	83.7 ± 10.7	0.7

11:00 a.m.

903-231 Coronary Calcium Scores add Incremental Diagnostic Value to SPECT Myocardial Perfusion Imaging for Detecting Significant Coronary Artery Disease

Tiziano Schepis, Oliver Gaemperli, Pascal Koepfli, Mehdi Namdar, Sebastian Leschka, Lars Husmann, Lotus Desbiolles, Hatem Alkadhi, Philipp A. Kaufmann, Cardiovascular Center, University Hospital Zurich, Zurich, Switzerland, Institute of Diagnostic Radiology, University Hospital Zurich, Zurich, Switzerland

Background: To evaluate the incremental diagnostic value of coronary calcium (CAC) score as an adjunct to single photon emission computed tomography (SPECT) for the detection of coronary artery disease (CAD) by using 64-slice CT angiography (CTA) as reference standard, and to define the optimal CAC cutoff for this purpose.

Methods: The institutional review board approved this study, written informed consent was obtained from all patients. Ninety-six patients with intermediate pre-test likelihood of CAD underwent SPECT, CAC imaging and CTA within 1 week. The receiver operating characteristic (ROC) curve was calculated for the combination of SPECT plus CAC to define the optimal CAC cutoff point for predicting CAD (area stenosis ≥75% in one or more vessel on CTA). CAD was considered to be present if either SPECT (reversible or fixed defect) and/or CAC (above the cutoff defined by ROC) was abnormal.

Results: At a CAC threshold ≥750 Agatston units (AU), combination of SPECT plus CAC significantly improved sensitivity (from 79% to 96%; ROC area under the curve 0.94 vs. 0.82; $P < .01$) for the detection of patients with significant coronary stenoses compared to SPECT alone, without affecting specificity (89% vs. 89%).

Conclusions: Complementary use of SPECT and CAC score prooved superior to SPECT alone for detecting angiographically significant CAD in patients with intermediate likelihood referred for myocardial perfusion imaging.

11:00 a.m.

903-232 Time is Muscle: Delay in Primary PCI results in Larger Infarct Size by Delayed Enhancement Cardiac Magnetic Resonance - Results from the APEX-AMI Study.

Manesh R. Patel, Stephen G. Worthley, Amanda Stebbins, Thorsten Dill, Frank E. Rademakers, Philip E. Alyward, Frans Van de werf, Christian W. Hamm, Raymond J. Kim, for the APEX-AMI Investigators, Duke University, Durham, NC

Background: Although a clear relationship exists between time from symptom (sx) onset to percutaneous intervention (PCI) and clinical outcomes, the relationship between time to PCI and infarct size is uncertain. Delayed-enhancement cardiovascular magnetic resonance (DE-CMR), which detects minute amounts of damage after myocardial infarction(MI), was used to address this question.

Methods: Consecutive patients with AMI undergoing primary PCI as part of the

pexelizumab in AMI trial were enrolled in a substudy at five centers. DE-CMR was done at day 3-5 and day 90 following PCI. Central core lab masked analysis for quantified LV mass and infarct size by planimetry was performed. Baseline clinical data and time from sx onset to PCI were collected.

Results: Patients (n=81) were 61±9 years (median), male 70(86%), and predominantly(by design) had anterior 49(60%)MI. Time from sx onset to presentation was 1.7±1 hrs, and 24(30%) pts required transfer to a PCI center. DE-CMR infarct size by quartiles of time from sx onset to PCI is in the **Table**. Increased time to PCI as a continuous variable was associated with a trend towards increased infarct size measured as a % of LV at both day 3-5 (p=0.06) and day 90 (p=0.05) on DE-CMR, with a 1.6% LV infarct size increase for each 60 minute delay.

Conclusion: Delays in primary percutaneous reperfusion for acute myocardial infarction result in increased myocardial infarct size as measured by delayed enhancement cardiac magnetic resonance.

DE-CMR	Total N=81	Time from symptom onset to PCI			
		< 2.5 hrs n=20	2.5-3.1 hrs n=21	3.1 - 4.0 hrs n=19	≥ 4 hrs n=21
Infarct Size as % LV Day 3-5 (Q1,Q3)	14.3 (5.6, 19.3)	8.6 (5.0,17.8)	13.9 (7.9, 19.1)	15.5 (4.8,22.0)	16.2 (12.5,19.7)
Infarct Size as % LV Day 90 (Q1,Q3)	8.6 (4.1, 15.8)	6.3 (2.4, 12.7)	7.3 (3.4, 13.4)	8.8 (3.4,16.0)	12.3 (5.9,17.3)

11:00 a.m.

903-233 Characteristic Findings of Constrictive Pericarditis by Magnetic Resonance Imaging

Ronan J. Curtin, Eugene H. Blackstone, Allan L. Klein, Srikanth Sola, Cleveland Clinic, Cleveland, OH

Background: Constrictive pericarditis is a challenging condition to diagnose. We evaluated the imaging characteristics of surgically proven constrictive pericarditis by cardiac magnetic resonance imaging (MRI).

Methods: We assessed 136 consecutive patients referred for evaluation of suspected constrictive pericarditis by cardiac MRI between January 2004 and December 2005. All patients underwent MRI scanning on a 1.5T magnet (Siemens Sonata) with turbo spin echo, bSSFP, and cine tagged sequences.

Results: 40 (29%) of 136 patients (mean age 59 ± 14 years) had evidence of constrictive pericarditis by MRI. 7 patients with MRI findings of constriction were managed medically due to severe co-morbidities or mild clinical symptoms; 34 patients had surgically confirmed constrictive pericarditis by surgery and pathology. MRI diagnosed constrictive pericarditis in 33 of the 34 (97%) surgical patients, and was equivocal in the remaining 1 patient who had a large pericardial effusion. In the surgical patients, the etiology of constriction was: idiopathic 22 (65%); post surgical 9 (38%); radiation therapy 1; SLE 1; and tuberculosis 1. On MRI, pericardial tethering was present in 31/34 (92%), pericardial thickening (>4mm) in 27/34 (79%), a diastolic septal bounce in 31/34 (92%), and pericardial calcification in 16/34 (49%). All patients with constrictive pericarditis had at least 3 of the following 5 characteristics: pericardial tethering; pericardial thickening/ calcification; tubular/conical deformity of a ventricle; abnormal diastolic septal motion; and diastolic restraint of the ventricles. In patients with idiopathic constrictive pericarditis, pericardial thickening was more prominent over the right ventricle or right atrioventricular groove (18 of 22 patients), whereas pericardial thickening was more common over the left ventricle or left atrioventricular groove in patients with post-surgical constriction (6 of 9 patients), p=0.006.

Conclusions: Patients with surgically proven constrictive pericarditis have at least 3 of 5 characteristic findings described above on MRI.

11:00 a.m.

903-235 Characteristics of the Coronary Velocity Profiles of Patients with Decreased Coronary Flow Velocity Reserve Despite Normal Thallium Stress Test

Hideki Okayama, Kazuhisa Nishimura, Makoto Saito, Katsuji Inoue, Go Hiasa, Takumi Sumimoto, Akira Kurata, Akiyoshi Ogimoto, Tomoaki Ohtsuka, Jitsuo Higaki, Ehime University Graduate School of Medicine, Toon, Japan

Background: Coronary flow velocity reserve (CFVR) demonstrates physiological significance when used to evaluate the severity of coronary stenosis. However, there are cases of patients with decreased CFVR despite showing no evidence of ischemia on stressed thallium-201 myocardial imaging (TL). To clarify characteristics of coronary circulation in patients with discordant results between CFVR and TL, we compared the coronary flow velocity data with TL results.

Methods: A consecutive series of 250 patients suspected of coronary artery disease underwent TL stressed by adenosine triphosphate (ATP) and CFVR. CFVR in the distal LAD was measured by transthoracic Doppler echocardiography (TTDE) with intravenous infusion of ATP. It was defined as the ratio of hyperemic to resting averaged diastolic peak velocity (ADPV) in the distal LAD.

Results: CFVR could be measured in 240 of 250 patients. A decreased CFVR (<2.0) predicted the presence of TL defects of the LAD territory in 39 of 51 patients (sensitivity = 76%, specificity = 84%, kappa=0.54). Patients were divided into four groups by combination of TL and CFVR results (true positive (TP); abnormal TL and decreased CFVR, true negative (TN); normal TL and normal CFVR, false positive (FP); normal TL

but decreased CFVR, false negative (FN); abnormal TL but normal CFVR). The CFVR in TP (1.6 ± 0.3) and FP (1.4 ± 0.4) was significantly lower than that in TN (3.2 ± 1.0) and FN (3.3 ± 1.4)(P<0.01). Resting ADPV in FP (26 ± 11 cm/sec) was significantly higher than that in TP, TN and FN (19 ± 6, 16 ± 7 and 14 ± 6 cm/sec, respectively, P<0.05). Hyperemic ADPV in TP (26 ± 10 cm/sec) was significantly lower than that in TN (48 ± 18 cm/sec), FN (43 ± 15 cm/sec) and FP (43 ± 21cm/sec) (P<0.01). When cases with resting ADPV > 29.3 cm/sec (+2SD above resting ADPV in TN) were excluded (n=17), CFVR < 2.0 showed improved predictive value for TL findings (sensitivity = 76%, specificity = 89%, kappa = 0.63).

Conclusions: Our data suggest that the mechanism of decreased CFVR but normal TL findings in FP is indicative of a high resting ADPV, but showing a normal hyperemic response. Cases with decreased CFVR due to increased resting ADPV should be carefully interpreted when used to determine the presence of ischemia.

11:00 a.m.

903-236   Correlation of Microalbuminuria With Delayed Recovery Response of Blood Pressure After Exercise in Patients With Essential Hypertension.

Helen triantafyllidi, vasiliki galea, sofia haniotaki, georgia georgoula, christoforos komporozos, matina koutroumbi, john lekakis, dimitrios kremastinos, 2nd Cardiology Department, Medical School, University of Athens, Attikon Hospital, Athens, Greece, Haematology Laboratory, Evangelismos Hospital, Athens, Greece

Background: Microalbumin levels represent an index of diffuse endothelial dysfunction in hypertensive patients. Delayed recovery of blood pressure after exercise may represents an increased cardiovascular risk for hypertensive individuals. We hypothesize that a relationship should exist between microalbumin levels with blood pressure response after exercise in patients with newly-diagnosed essential hypertension.

Methods: Twenty (20) non-diabetic patients with recently diagnosed essential hypertension under antihypertensive treatment with ramipril for the last month (mean age 55±10 years, 11/9 male/female, mean office blood pressure before treatment 157/93 mmHg) participated in a 45 min submaximal exercise test on a bicycle ergometer with a six-minute recovery period. We calculated the systolic blood pressure recovery slope index (SPRI) during recovery period using the formula a = xb+c, where x stands for slope index. Simultaneously, microalbumin levels (MAU) were measured in 24h urine collection in all patients one day before exercise.

Results: All patients completed successfully the exercise test. At the beginning of exercise test, peak exercise and 6o min recovery, mean systolic blood pressure was 134 ± 19 mmHg, 178 ± 25 mmHg and 114 ± 20 mmHg, respectively. While mean SPRI was 64, the lowest values were indicative for delayed blood pressure recovery. Mean MAU levels were 25.5 ± 31 mg/24h. We noticed that during recovery a strong negative correlation was found between MAU and systolic blood pressure recovery slope index (r=-0.51, p=0.03).

Conclusions: It seems that a good correlation exists between MAU, an index of cardiovascular risk, and delayed recovery of blood pressure after exercise in patients with essential hypertension. It seems that systolic blood pressure recovery index may serve as a simple novel index of cardiovascular risk.

E-POSTER SESSION
904

E-Poster Session 904

Sunday, March 25, 2007, Noon-1:00 p.m.
Hall H

Noon

904-221   Oxidative Stress, Not Iron Overload, Is Associated with Systolic and Diastolic Strain Rate in Asymptomatic Subjects with Hereditary Hemochromatosis

Yukitaka Shizukuda, Charles D. Bolan, Dorothy J. Tripodi, Vandana Sachdev, Tammy Nguyen, Gilberto Botello, Yu-Ying Yau, Inez Ernst, Ali I. Mir, Susan Leitman, Douglas R. Rosing, National Heart, Lung, and Blood Institute, NIH, Bethesda, Department of Transfusion Medicine, NIH, Bethesda, MD

Background: Abnormal systolic and diastolic function has been previously reported in a cohort of predominantly asymptomatic patients with hereditary hemochromatosis (HH). Little is known about the mechanisms mediating these abnormalities; however, it is possible that increased oxidative stress related to iron overload is involved. Thus, we evaluated relationships between cardiac function measured with Tissue Doppler strain rate (SR) imaging and biomarkers of oxidative stress and iron overload in asymptomatic HH subjects.

Methods: 94 consecutive visits of 43 HH subjects, age 30 to 74 (50±10, mean±SD) and 37 consecutive visits of 21 normal volunteers ages 30 to 63 (48±8) were evaluated over a three-year period with SR using the Vivid 7 GE system and with biochemical markers. All patients had confirmed C282Y homozygosity, a documented history of iron overload and were NY functional class I. Normal volunteers did not have known HFE gene mutations associated with HH. SR was obtained in the apical 4-chamber view at the basal septum. Oxidative stress levels were evaluated by plasma malondialdehyde (MDA), erythrocyte glutathione (GSH), and erythrocyte superoxide dismutase (SOD) levels. Correlations between SR and biomarkers were evaluated with a Pearson correlation analysis.

Results: In subjects with HH, peak systolic SR correlated with GSH (r=-0.250, P=0.015) and MDA (r=-0.225, P=0.029), peak diastolic early filling (E) SR correlated with GSH (r=0.285, P=0.005), peak diastolic atrial contraction (A) SR correlated with MDA (r=0.325, P=0.001), and the E/A SR ratio correlated with MDA (r=-0.212, P=0.0402). SR measurements did not significantly correlate with serum ferritin, serum iron, and transferrin saturation levels in HH subjects. SR did not correlate with oxidative stress or iron biomarkers in normal volunteers.

Conclusions: These results suggest that systolic and diastolic function is affected by oxidative stress levels, but not by iron levels in asymptomatic HH subjects. Thus, oxidative stress may be a significant modulator of cardiac function in disease processes such as HH which are associated with increased oxidative stress.

Noon

904-222   Severe Left Ventricular Dilation is Associated with Poor Long Term Survival.
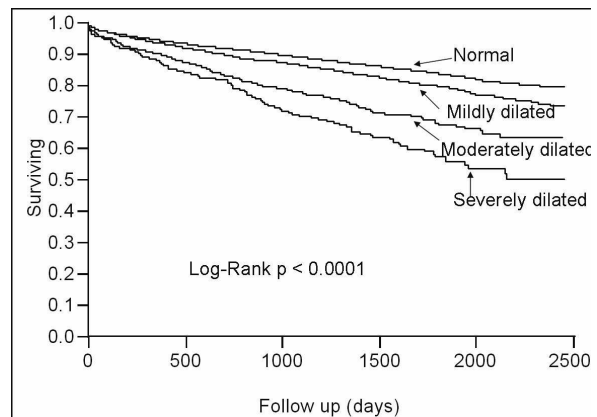
Jayant Nath, Vinod Raxwal, Martin Emert, James L. Vacek, David Wilson, University of Kansas Medical Center, Kansas City, KS

Objective: Increased left ventricular end diastolic dimension (LVEDD) is an indicator of poor survival in the short and mid-term. However little long term data is available in large population groups and the impact of the severity of dilation is not well defined.

Method: We identified consecutive 31421 patients (age 57 ± 17; male 49%) undergoing echocardiogram at University of Kansas Medical Center for over 6.5 years (mean 1104 ± 717 days). Left ventricle was considered normal if left ventricular end diastolic dimension (LVEDD) is <5.6 cm, mildly dilated if 5.6-6.2 cm, moderately dilated if 6.3-7.0 cm and severely dilated if LVEDD is >7.0 cm. Kaplan-Meier and proportional hazards methods were used to compare differences in survival between varying grades of left ventricular dilation.

Results: Patients with severely dilated left ventricle had lower ejection fraction (mean 21 ± 9%) than patients in other groups (normal; 60 ± 6%, mild; 51 ± 11%, moderate; 13 ± 13%, ANOVA p <0.0001). Increased left ventricular dilation was associated with worse prognosis (figure). When adjusted for left ventricular ejection fraction and age, severe left ventricular dilation (HR 1.12, p= 0.03) was associated with significantly poorer survival while mild dilation (HR 0.98, p= 0.25) and moderate dilation (HR 1.06, p= 0.10) dilation were not associated with poor prognosis.

Conclusion: Severely dilated left ventricle is an important objective clinical determinant of poor long term prognosis.

Noon

904-223   Transesophageal Echocardiographic Indices Are More Powerful Predictors Of Atrial Spontaneous Contrast Compared To Rheological Parameters.

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Background: Atrial spontaneous echo contrast (SEC) or "smoke" is an echocardiographic finding seen in situations of stasis of blood flow inside the atria. Increased hematocrit and fibrinogen levels have been associated with SEC in prior studies. Whether low hemoglobin (HB) levels is an independent predictor of lower prevalence of SEC is a question that remains unanswered.

Methods: Retrospective study of all patients who had transesophageal echocardiography (TEE) for various indications between 01-07/2004. HB levels within one month from the TEE study were used as the baseline HB prior to the study (75% had HB on the same day of the TEE). Clinical characteristics and demographics, and all relevant TEE variables including left atrial size, left atrial appendage velocity (LAAV), presence or absence of SEC were obtained using electronic patient information system search of TEE reports. Continuous variables were compared using Students' t-test and dichotomous variables were compared using Chi square/Fisher testing. Multivariate regression analysis was performed to identify the independent predictors of SEC.

Results: A total of 266 patients formed the study group. Average age was 59 years with 134 males. Only 7 patients had both left and right atrial SEC. Two groups were analyzed SEC (n=45) or no SEC (n=221). On univariate analysis male sex, greater age, prior CABG, low EF (< 50%), atrial fibrillation, renal failure, aortic atheroma, dilated left atrium and decreased LAAV (< 40 cm/sec) predicted SEC whereas low HB levels were significantly associated with a lower prevalence of SEC (p=.01). However, after adjusting

for clinical and echocardiographic variables, low HB levels did not independently predict absence of SEC. Low LAAV (p<.001), dilated left atrium (p=.001) and prior statin therapy (p=.001) were the most powerful independent predictors of SEC.

Conclusions: A low HB level is not associated with a lower prevalence of SEC when controlled for clinical and echocardiographic variables. Our study confirms the importance of LAAV and dilated left atrium in determining presence of SEC, but also raises interesting questions of the relationship between statins and SEC which warrants further study.

Noon

904-224 **Diagnostic Value of Left Ventricular Outflow Area in Patients with Hypertrophic Cardiomyopathy: A Real-time Three-dimensional Echocardiographic Study**

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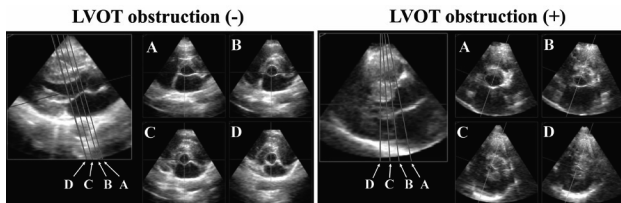
Background. Earlier studies demonstrated the ability of real-time 3D echocardiography (RT3DE) to measure the left ventricular outflow tract (LVOT) area (A_{LVOT}) in patients with hypertrophic cardiomyopathy (HCM). However, its clinical value is unknown.

Purpose. To investigate the feasibility and accuracy of A_{LVOT} derived from RT3DE to diagnose significant LVOT obstruction in a large number of patients with HCM.

Methods. 162 patients with HCM had RT3DE by using a Volumetric System (n=58), a Sonos 7500 (n=80) or an IE-33 (n=24). The smallest A_{LVOT} during systole was determined by moving a 2-dimensional plane in 3D space (Figure). The pressure gradient across LVOT (PG_{LVOT}) was assessed by continuous-wave Doppler method. Provocation was performed in patients without significant LVOT obstruction (PG_{LVOT} <50 mmHg) at rest.

Results. Patients with poor image quality of RT3DE were excluded; 28% of patients from a Volumetric System, but only 4% of patients from Sonos 7500 and IE-33 (p<0.001). Significant LVOT obstruction was observed at rest in 79 patients and after provocation in 43 patients. A_{LVOT} inversely correlated with PG_{LVOT} both at rest (r=0.82) and after provocation (r=0.60)(both p<0.001). The value of A_{LVOT} <0.85 cm² and <2.0 cm² predicted resting and provocative LVOT obstruction with sensitivity of 87% and 81%, and specificity of 77% and 90%, respectively.

Conclusions. RT3DE was successful in diagnosing and quantifying LVOT obstruction at rest and after provocation in a large number of patients with HCM.

LVOT obstruction (-)   LVOT obstruction (+)

Noon

904-225 **Predictors of Long Term All-Cause Mortality in Patients with Normal Exercise Echocardiography Study**

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Background: Absence of inducible ischemia on Exercise Echocardiography (EE) is associated with excellent long-term outcomes (< 2% annual event rate). However, the independent predictors of all cause mortality in the setting of normal EE are not well defined. The aim of this study is to identify the independent predictors of all-cause mortality in patients with negative EE for ischemia.

Methods: Retrospective study of consecutive patients who had a normal EE between January-December 1997. A normal study was defined as absence of new or worsening wall motion abnormality. Baseline demographics and EE variables were obtained through medical record review and the EE report. Patients were followed up for a median follow up duration of 95 months to identify all cause mortality, which was verified by the national death registry.

Results: A total of 677 patients met the inclusion criteria. The mean age was 51 ± 13 years, 49% were females, 8% had prior diabetes 13% had known coronary disease and 96% had normal ejection fraction. At the end of follow-up duration, 32 (5%) patients died. The annual event rate was less than 1%. The univariate predictors of all cause mortality were age, hypertension, METS level and peak heart rate achieved. Multivariate analysis showed that METS achieved (Log Chi2= 18, OR .75, 95% CI .65 - .86, p<.001) and failure to achieve adequate heart rate. (Log Chi2= 8.6, OR 3.21.34, 95% CI 1.5 - 6.9, p=.003) are the independent predictors of long term all cause mortality.

Conclusions: Our study confirms the excellent long term prognostic value of negative EE. In this low risk population, low exercise capacity and failure to achieve adequate peak heart independently predicts long term mortality. Routine reporting of exercise capacity (preferably METS achieved) and percentage of predicted maximal heart rate achieved should be part of EE reports and be factored into patient management and prognostication rather than concentrating of absence of ischemia alone.

904-226 **Predictors Of Reduced Coronary Flow Reserve In Heart Transplant Recipients Without Cardiac Allograft Vasculopathy: A Contrast-enhanced Echocardiographic Study.**

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Background: Coronary flow reserve (CFR) is increasingly used to assess the functional significance of cardiac allograft vasculopathy (CAV). Although the relation between CFR and angiographic vasculopathy has been studied extensively, the factors determining CFR in heart transplant (HT) recipients with normal coronary angiography are ill defined.

Methods: 61 consecutive patients (43 male, aged 49±12 years at HT) were studied at 6.3 ± 4.5 years after HT. Rejection scores (RS) on endomyocardial biopsy were calculated (ISHLT grades: 0=0; 1A=1; 1B=2; 2=3; 3A=4; 3B=5; 4=6) in the first year and in the whole follow-up. RS including only severe grades (≥3A) were also calculated. Coronary blood flow velocity in the left anterior coronary descending artery was detected by contrast-enhanced transthoracic echocardiography (CE-TTE) at rest and during intravenous infusion of adenosine (0.14 mg/kg/min). CFR was obtained as the ratio of hyperaemic diastolic peak velocity (DPV) to resting DPV. All patients had normal ventricular angiography and coronary arteriography and a normal left ventricular mass. Manual backward elimination was performed on blocks of variables until regression models with only significant variables were obtained. Variables included were: gender, age at HT, diabetes, hypertension, cholesterol and tryglicerides, hemoglobin, ischemic time, donor age and gender, gender mismatch, RS and RS including only severe grades in the first year and in the whole follow-up, total number of rejection episodes and rejection episodes in the first year.

Results: At univariate analysis only diabetes (p=0.04) and donor age(r -0.359, p=0.02) were related to CFR impairement. At multivariate analysis diabetes (β -0.389, p=0.01), RS in the first year (β 0.773, p=0.02) and in the whole follow up (β -0.951, p=0.009) were independently related to CFR.

Conclusions: In HT patients with angiographically normal coronary arteries, CFR by CE-TTE was inversely related to the number of previous rejection episodes. Since a high rejection burden is associated with increased risk of CAV, a CFR reduction may be an early marker of CAV. Prospective studies are warranted.

Noon

904-227 **The Mitral E/E' Ratio Provides Independent Prognostic Information in Heart Failure Patients with Moderate to Severe Secondary Mitral Regurgitation**

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Background/Aim We attempted to study the diagnostic usefulness and prognostic impact of tissue Doppler imaging (TDI) in patients (pts) with chronic heart failure (CHF) and moderate to severe secondary mitral regurgitation (MR).

Methods We prospectively enrolled 370 pts with stable CHF (age 59±13 years, mean ejection fraction (EF) 31±10%). Moderate to severe MR was considered present if the effective regurgitant orifice area was ≥ 0.20 cm² (PISA method). Clinical variables included age, New York Heart Association functional (NYHA) class, medication, and the presence of chronic kidney disease and/or anemia. Echo measurements comprised left ventricular dimensions/volumes, EF, mitral E/A-ratio, deceleration time and TDI derived mitral annular velocities (S', E', A'). As a non-invasive measure of filling pressures the mitral E/E' ratio was calculated. All-cause mortality was considered as study end point.

Results Moderate to severe MR was present in 92 pts (25%, mean ERO 0.26±0.04 cm²). Pts. with or without MR did not differ with respect to age, medication, EF or mitral annular E' velocity, but MR pts were in a poorer NYHA functional class (2.8±0.4 vs. 2.6±0.5, p=0.01) and had a higher mitral E/E' ratio (15.5±9.7 vs. 12.5±6.1, p=0.001). During a follow-up of 790±450 days, 70 pts (18%) died. Mortality was significantly higher in patients with vs. without MR (32.6% vs. 14.1%, p<0.001). In the entire population, multivariate Cox analysis identified MR (hazard ratio: 2.42, 95% CI 1.43-4.13, p=0.001), age (HR: 1.04, 95% CI 1.016-1.066, p=0.001), and anemia (HR: 2.06, 95% CI 1.21-351, p=0.007) as independent prognostic predictors. In the MR group, independent prognosticators were the mitral E/E' ratio (HR: 1.06, 95% CI 1.009-1.111, p=0.021) and age (HR: 1.043, 95% CI 1.01-1.077, p=0.011). In MR pts with an E/E' ratio > 13.5 (cut-off value derived from ROC analysis), outcome was markedly worse in comparison to pts with an E/E' ratio < 13.5 (event-free survival rate 31% vs. 64%, p<0.001).

Conclusions In CHF pts with moderate to severe secondary MR, elevated filling pressures contribute to increased morbidity and predict adverse outcome. TDI should be used in the diagnostic work-up and risk stratification of such pts.

Noon

904-228 **Detection of Coronary Artery Disease using Delayed Strain Imaging; Comparison with Conventional Exercise Stress Echocardiography.**

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Background: Treadmill stress echocardiography is an established tool for detecting coronary artery disease. However, it requires image acquisition immediately after the termination of exercise stress. It has been reported that prolongation of time to peak strain (TPS) is a sensitive marker of the myocardial ischemia.

Methods: To evaluate whether delayed strain imaging obtained at five minutes after the termination of exercise stress can detect coronary artery disease, 31 patients who

underwent treadmill stress echocardiography and coronary angiography were studied. Patients with abnormal wall motion at rest were excluded. Digital echocardiographic images were recorded at rest and immediately after the termination of the exercise stress. Exercise induced wall motion abnormality was considered as a marker myocardial ischemia. Tissue velocity images were also recorded at rest and five minutes after the termination of the exercise stress, and TPS was measured. TPS ratio (TPSR) was calculated as the ratio between TPS at post-stress and TPS at rest. According to the previous report, a cut-off value >/= 1.1 of TPSR was defined as a marker of myocardial ischemia.

Results: Coronary angiography revealed that 21 of the 31 patients had significant coronary artery disease >/= 50% diameter stenosis. The sensitivity, specificity and diagnostic accuracy of the conventional exercise stress echocardiography for detecting coronary artery disease were 76%, 70%, and 74%, respectively. The sensitivity, specificity and accuracy of delayed strain imaging for detecting coronary artery disease were 100%, 60%, and 87%, respectively.

Conclusions: Delayed stain imaging obtained at five minutes after the termination of exercise stress can detect significant coronary artery disease.

Noon

904-229   **Diagnostic accuracy of 64-slice Computed Tomography versus Conventional Coronary Angiography: Results on 300 Consecutive Patients**

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Background: We sought to compare the diagnostic value of 64-slice CT coronary angiography (CTCA) to detect significant coronary stenoses with that of invasive conventional coronary angiography (CCA) in a large consecutive population.

Methods: 64-slice CT coronary angiography (Siemens Sensation 64, Germany) was performed in 300 patients (mean age 59.0+/-11.7 years) with atypical chest pain, stable or unstable angina pectoris and non-ST-segment elevation myocardial infarction who were scheduled for diagnostic CCA. Patients who had undergone coronary artery bypass grafting or previous percutaneous coronary intervention were excluded. All patients had stable sinus rhythm. Patients with initial heart rates ≥65 bpm received beta-blockers and/or benzodiazepines. The CT scans were analyzed by 2 observers unaware of the results of CCA, which was used as the reference standard using quantitative methods (QCA). All available coronary segments, regardless of size, were included in the evaluation. Coronary lesions with ≥50 luminal narrowing were considered significant stenoses.

Results: Prevalence of a significant lesion per patient was 64%. Mean scan time was 12.9+/-0.9 seconds and mean heart rate was 58.9+/-7.3 b.p.m. Mean calcium score was 437+/-722. Sensitivity for detecting significant stenosis with segment-by-segment analysis was 91% (367/404; 95% CI, 87-93), specificity 93% (3587/3856; 95% CI, 92-94) and positive and negative predictive values were 58% (367/636; 95% CI, 54-62) and 99% (3587/3624; 95% CI, 98-99). No segments were excluded. Complications with CTCA were contrast extravasation (n=2), second degree AV block due to beta blockers (n=1) and contrast-allergic reactions (n=2).

Conclusions: 64-slice CT angiography has a high sensitivity to detect a coronary stenosis and is reliable to exclude the presence of significant coronary artery disease in patients with a wide variety of clinical presentation.

Noon

904-230   **Multi-Detector Computed Tomography Coronary Angiography Detects a High Prevalence of Obstructive, Non-Calcified Plaques in Symptomatic Patients and Zero Calcium Score**

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Background:' The incremental value of CorCTA beyond CAC is unknown.

Methods: 210 patients (pts) sent for 64-slice CorCTA were included. Pts with typical angina/atypical chest pain were considered symptomatic; all others asymptomatic. CAC was expressed as Agatston score; any score other than 0 was considered positive (+). Coronary stenoses were graded semi-quantitatively (mild, intermediate, obstructive if >70%). Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of CAC for the detection of obstructive CAD by CorCTA were calculated using contingency tables; relationship between CAC and obstructive disease with Fisher's exact test.

Results: Of the 210 pts,134 (64%) were symptomatic. Of these, 49 (36.6%) had 0 CAC. Importantly, 4 of these symptomatic pts with 0 CAC (8.2%) had obstructive stenosis by CorCTA; all 4 were confirmed by angiogram. 45 pts (91.8%) with symptoms and 0 CAC had no obstructive stenosis. 85 (63.4%) had + CAC; 24 (28.2%) had obstructive disease; 61 (71.8%) did not. There was significant relationship between CAC and obstructive disease (p=0.007). Sensitivity, specificity, PPV and NPV of CAC for detection of obstructive disease were 0.86 (0.66-0.95), 0.42 (0.33-0.52), 0.28 (0.19-0.39) and 0.92 (0.8-0.97) (95% CI in parentheses). Of the 210 pts, 76 pts (36%) were asymptomatic. 21 (27.6%) had 0 CAC; none had obstructive disease. 55 (72.4%) pts had +CAC. 10 (18.2%) had obstructive disease and 45 (81.1%) did not. There was significant relationship between CAC and obstructive disease (p=0.05). Sensitivity, specificity, PPV and NPV of CAC for detection of obstructive disease in the asymptomatic pts were 1.00 (0.66-1.00), 0.32 (0.21-0.45), 0.18 (0.10-0.31) and 1.00 (0.80-1.00). 0 CAC in asymptomatic pts ruled out obstructive disease. In asymptomatic pts with any + CAC, obstructive stenosis was found in 18.2%

Conclusions: 0 CAC in symptomatic pts does not exclude obstructive stenoses; these were found in 8.2%. Obstructive stenosis with any + CAC might be found even in absence of symptoms (18.2%). CorCTA might be considered in symptomatic pts despite 0 CAC and in asymptomatic pts with any + CAC. 0 CAC in asymptomatic pts excludes obstructive disease.

Noon

904-231   **Multi-slice Cardiac CT Imaging of Patients Undergoing Percutaneous Aortic Valve Replacement (Core Valve)**

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Background: Percutaneous aortic valve replacement (PAVR) is an emerging technology in the management of patients with severe aortic stenosis that are felt to be unsuitable for surgical management. Limited experience with this technology has made the understanding of the effects of the implantation of these devices on cardiac anatomy difficult. We report the results of imaging studies in patients treated with the CoreValve Revalving™ system.

Methods: Patients with symptomatic, severe (area < 0.6 cm²/m²) AS unsuitable for aortic valve surgery. Exclusion criteria included severe peripheral vascular disease and major comorbidity (life expectancy <1 year). Patients underwent assessment with computed tomography (CT) scans prior to device deployment. CT scans were used to evaluate the size of the aortic annulus and iliac arteries to ensure adequate patient selection and feasibility of passage of the 21French system. Following implantation, followup cardiac CT multi-slice scans were done to evaluate device position and ventricular function.

Results: Between March 2005-June 2006, 11 patients underwent successful PAVR with the CoreValve Revalving™ system after imaging with CT to ensure patient suitability. Following device implantation, the following parameters were examined on multi-slice cardiac CT scan: distance between mitral annulus and distal portion of the device, device diameter at the left ventricular outflow tract (LVOT), aortic annulus and aortic root and the angles of the device with the aortic root. Five patients had cardiac CT scans post-PAVR. The distance between the mitral annulus and distal device ranged from 6.5mm to 14.6mm, mean of 12.3mm. The mean device diameter at the LVOT, aortic annulus and aorta was 25.3 x 26.7mm, 24.0 x 26.0mm, and 31.1 x 30.7mm respectively. The angle of the device at the LVOT, annulus and aorta ranged from 114 to 138, with a mean of 128 degrees.

Conclusions: Multi-slice cardiac CT imaging provides valuable information that aids in appropriate patient selection for percutaneous aortic valve replacement. This imaging modality also provides information regarding changes in cardiac anatomy as well as the relationship of the prosthesis to the cardiac structures.

Noon

904-232   **The Shrinking Heart: Normal Right Ventricular Structure and Function**

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Background: Right ventricular (RV) shape makes quantitation difficult but cardiac magnetic resonance (CMR) permits 3D assessment. We examined effects of age and gender on the RV using CMR.

Methods: Volunteers with echocardiographic abnormalities or any condition or medication likely to affect cardiovascular function or body size and composition were excluded. CMR was performed in 156 healthy normotensive, nonobese (BMI<28), nondiabetic volunteers aged 20-90 yrs (mean 51 ±15, 82 female), using TrueFISP breath-hold segmented cine CMR and contiguous 8mm slices in the left ventricular short axis plane. RV end-diastolic and end-systolic ventricular volumes (EDV, ESV), ejection fraction (EF) and mass (M) were determined and indexed (i) to body surface area.

Results: Women had higher RV EF and lower RVEDVi, RVESVi, and RVMi than men. As age increased, RV EDVi and ESVi decreased, but there was no age-related difference in EF or RVMi. The relationship between age and EDVi and ESVi was statistically significant in women but not in men, despite a similar downward trend. RV systolic pressure (Doppler) also increased slightly with age in women but did not correlate with RVMi.

Variable	Gender			Age		
	Female (n=82)	Male (n=74)	p	Pooled (n=156)	Female (n=82)	Male (n=74)
RVEF (%)	57 +/- 8 *	51 +/- 7	<.0001	0.08 (0.32)**	0.07 (0.53)	0.08 (0.50)
RVEDVi (ml/m2)	65 +/- 14	74 +/- 14	<.0001	-0.31 (<.0001)	-0.42 (<.0001)	-0.22 (0.06)
RVESVi (ml/m2)	28 +/- 9	36 +/- 9	<.0001	-0.25 (0.002)	-0.29 (0.008)	-0.21 (0.07)
RVMi (g/m2)	21 +/- 7	24 +/- 6	0.007	-0.17 (0.03)	-0.15 (0.17)	-0.19 (0.10)
RVSP (mmHg)	24 +/- 7	26 +/- 7	0.26	0.25 (0.0025)	0.32 (0.0034)	0.18 (0.15)
* mean +/- SD				** correlation coefficient (p-value)		

Conclusions: Aging results in concentric RV remodeling with reduced chamber volumes, but constant mass and EF. Age-related changes are more evident in women than men and associated with increased RV systolic pressure. Underlying mechanisms are unknown but physical inactivity and deconditioning may play a role.

Noon

Noon

904-233 Comparison of MRI and ECG for Prediction of Myocardial Fibrosis and Ventricular Hypertrophy in Patients with Hypertrophic Cardiomyopathy

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Background: On electrocardiography (ECG), presence of pathologic Q-waves in patients with hypertrophic cardiomyopathy (HCM) is thought to be related to myocardial fibrosis (scar) or right/posterior left ventricular hypertrophy (LVH). Magnetic resonance imaging (MRI) accurately measures LV thickness & is highly sensitive in detecting/localizing myocardial scar & hypertrophy. We sought to determine the accuracy of ECG in predicting & localizing myocardial scar & hypertrophy in HCM patients, using MRI as gold standard. Methods: Forty-one patients (mean age 43±17 years, 66% males) with echocardiography confirmed HCM had MRI on 1.5T scanner (Siemens Sonata, Erlangen, Germany). Maximal regional LV thickness was recorded at end-diastole on steady state free precession (TrueFISP) cine images. Three short axis delayed hyper-enhancement (scar) images (8-10 mm thick) were obtained at base, mid LV & apex, ~ 20 minutes after injection of 0.2 mmol/kg of Gadolinium DTPA. Scar was determined semi-automatically (as % of myocardium) using customized software (Siemens Research) and defined as having intensity >2 standard deviation above viable myocardium. ECG diagnosis of LVH was made by Sokolov-Lyon criteria & pathologic Q-waves were defined as 1/3rd the height of QRS & 4 msec in duration in ≥ 2 contiguous leads. Results: While 24 patients (59%) had myocardial scar, only 8(20%) had Q-waves on ECG. Seven out of 8 patients with Q-waves had scar. Accuracy of ECG in scar detection was as follows: 22% sensitivity, 89% specificity, 71% positive predictive value (PV) & 47% negative PV. ECG & MRI demonstrated LVH in 22 & 40 patients respectively. For detection of LVH, the sensitivity of ECG was 51% and positive PV was 95%. ECG correctly localized scar & LVH in only 3 & 1 patient(s) respectively. On MRI, scar was most commonly present in hypertrophied areas of ventricle (76% cases). Conclusion: ECG is insensitive in detection & localization of scar or hypertrophy in patients with HCM. Because of strong association of hypertrophy & scar, MRI should be considered in HCM patients for precise calculation of LV thickness & associated scar. Clinical significance of scar detection in HCM patients remains to be conclusively proven.

Noon

904-235 Gender Differences in the Application of the Appropriateness Criteria for Single-Photon Emission Computed Tomography Myocardial Perfusion Imaging

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Background: This study evaluated the referral of women for myocardial perfusion imaging (MPI) according to the ACCF/ASNC appropriateness criteria. **Methods:** Indications for testing were evaluated in 812 consecutive patients undergoing MPI. Tests were scored as outlined in the appropriateness criteria, using pre-test probability of CAD, Framingham risk, baseline ECG and ability to exercise, as having an appropriate (A), uncertain (U) or inappropriate (I) indication. Percent Ischemia was evaluated for all MPI studies. **Results:** Of the 812 patients reviewed, 438 (54%) were women. Overall, there were 651 (80%) A, 56 (7%) U and 105 (13%) I tests. A greater fraction of women had I tests (16.4% vs 8.8% of men, p<.01) and of all I tests the majority were in women (69% vs 52% of A, p=0.1). Among I tests, normal MPI studies were more common in women than men (81% vs 49%, p<.01). When results were abnormal, I women were found to have less ischemia than either A group (5% of myocardium vs. 11% in A women and 13% in A men, p<.05) or I men (5% vs. 9% of myocardium, p<.01). **Conclusion:** Overall, the appropriateness criteria appear to reasonably stratify test ordering. However, indications for referral for MPI in women are more likely to be deemed I than in men, and these tests are less likely to reveal significant ischemia. Further study into the reasons for gender differences in test ordering and application of the appropriateness criteria is warranted.

Fraction of Normal Studies

904-236 Synergistic Effects of Systolic Hypertension and Female Sex on the Arterial-Ventricular Coupling Ratio.

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Background: In normotensive (NT) individuals, left ventricular end systolic elastance (E_{LV}), an index of contractility, is tightly coupled to arterial elastance (E_A), an index of arterial load, to optimize cardiac performance. We examined the effects of systolic hypertension (SH) and gender on the arterial-ventricular coupling ratio (E_A/E_{LV}). **Methods:** We noninvasively characterized E_A/E_{LV} = end-systolic volume (ESV)/stroke volume (SV) and its determinants E_A= end-systolic pressure/SV, and E_{LV} = end-systolic pressure/ESV (Table) in 156 subjects (67% men, 50% SH). Cardiac volumes were measured with gated blood pool scans and indexed to body surface area. **Results:** By 2-way ANOVA, E_A/E_{LV} was lower in women than men in both NT (18%, p<0.01) and SH (24%, p<0.01). E_A/E_{LV} was also lower in SH than NT in both men (14%, p=0.02) and women (20%, p=0.06). To explore the mechanisms that underlie the differences in E_A/E_{LV}, we examined its components E_A and E_{LV} separately. In both genders, SH have a lower E_A/E_{LV} than NT because of disproportionate increases in E_{LV} vs E_A in both SH men (43% vs 22%) and SH women (30% vs 8%), suggesting that E_{LV} is overcompensating for the higher systolic pressures. **Conclusions:** Women have a lower E_A/E_{LV} than men. In both genders, E_A/E_{LV} is lower in SH than NT due to mismatched increases in E_A and E_{LV}, suggesting suboptimal arterial-ventricular coupling. Since E_A/E_{LV} is an important determinant of exercise performance, the impact of suboptimal coupling on exercise reserve deserves further study.

	NT men	SH men	NT women	SH women
N	52	52	26	26
Age (Years)	68 ± 10	67 ± 10	67 ± 11	67 ± 12
BSA (m²)	1.93 ± 0.14††	1.96 ± 0.16††	1.68 ± 0.14	1.68 ± 0.18
SBP (mm Hg)	125 ± 10.9**	152 ± 9.3	120 ± 12.6**	148 ± 8.7
E_A/E_{LV}	0.62 ± 0.23*††	0.54 ± 0.17††	0.51 ± 0.20	0.41 ± 0.12
E_A(mm Hg/ml/m²)	2.44 ± 0.59**	2.98 ± 0.48†	2.41 ± 0.56	2.61 ± 0.55
E_{LV} (mm Hg/ml/m²)	4.25 ± 1.33*†	6.08 ± 2.15	5.31 ± 2.56**	6.90 ± 2.66

Data: mean ± SD
Interaction between BP group and gender is not significant
*P<0.05, **P<0.001 comparing NT to SH of the same sex.
†P<0.05, ††P<0.01, comparing men and women from the same BP group.

E-POSTER SESSION

905

E-Poster Session 905

Sunday, March 25, 2007, 1:00 p.m.-2:00 p.m.
Hall H

1:00 p.m.

905-221 Doppler Restrictive Filling Pattern Is An Independent Predictor Of Survival In Patients With Heart Failure Of Both Ischemic And Non-ischemic Aetiology - Results From An Individual Patient Meta-analysis (MeRGE).

Gillian A. Whalley, Jithendra B. Somaratne, Greg D. Gamble, Frank L. Dini, Allan L. Klein, Jacob E. Møller, Miguel Quintana, Cheuk-Man Yu, Robert N. Doughty, Meta-Analysis Research Group in Echocardiography (MeRGE) Collaborators, The University of Auckland, Auckland, New Zealand
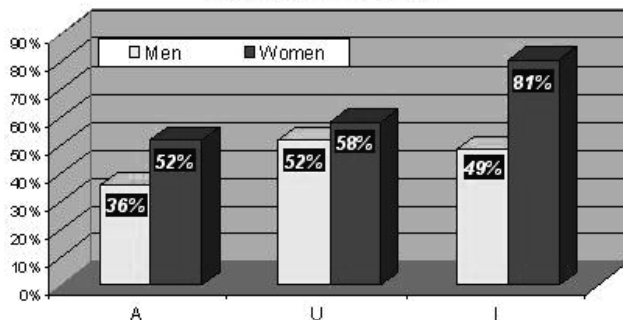
The MeRGE study, a global collaboration of 18 prospective studies, has shown that the restrictive mitral filling pattern (RFP) by Doppler echocardiography is an independent predictor of outcome in patients with chronic heart failure (HF). The aim of this analysis is to investigate whether this relationship h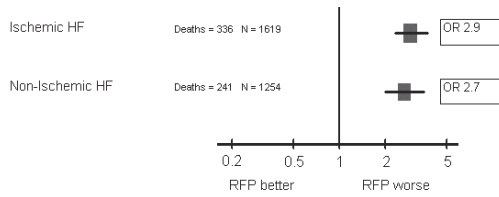olds irrespective of HF etiology. **Methods:** This sub-analysis includes 2873 patients in whom etiology of HF was defined as either ischemic (IHD) or non-ischemic (non-IHD). Each group was then divided by the presence or absence of RFP and 4 year mortality (Kaplan Meier curves) was examined within each group. Multivariate predictors of outcome were examined within each group. **Results:** Mortality in the IHD group was 20.8 % (336 deaths/1619 patients at risk) and 19.2 % in the non-IHD (241 deaths/1254 patients at risk). The prevalence of RFP was 38 % in both IHD and non-IHD groups. RFP was associated with higher mortality in both groups: IHD: RFP OR 2.87 (95%CI: 2.25, 3.67); non-IHD: RFP OR 2.72 (95%CI: 2.05, 3.62) (see Fig 1). There was no difference in the survival of IHD and non-IHD pts irrespective of RFP (P=0.56). Multi-variate analysis revealed that RFP, age and EF were independent predictors of outcome (in order importance) in both groups. **Conclusion:** Restrictive filling pattern in this large individual patient meta-analysis of chronic HF was the main predictor of outcome, irrespective of etiology, confirming the prognostic importance of this parameter and highlighting its applicability to all HF patients.

Diagnostic Testing

Fig 1

1:00 p.m.

1:00 p.m.

905-222   **Transmural Myocardial Strain Profile Assessed by Strain M-mode Imaging is Useful to Predict the Transmurality of Myocardial Necrosis in Acute Myocardial Infarction**

Takashi Tanimoto, Takashi Kubo, Takashi Yamano, Takashi Masho, Yoshiki Matsuo, Shigeho Takarada, Toshio Imanishi, Kazushi Tsuda, Yoshiaki Tomobuchi, Takashi Akasaka, Wakayama Medical University, Wakayama, Japan

Background: Evaluation of the transmurality of myocardial necrosis after acute myocardial infarction is clinically important. Contrast-enhanced magnetic resonance imaging (Ce-MRI) can differentiate transmural from non-transmural myocardial infarction. Although some reports demonstrated the accuracy of transmural myocardial strain profile with Tissue Doppler M-mode imaging, it had not been fully evaluated in case of acute myocardial infarction.The aim of this study was to evaluate the relationship between transmual extent of myocardial infarction measured by Ce-MRI and transmural myocardial strain profile assessed by Tissue Doppler M-mode imaging.
Methods: A total of 15 patients with acute myocardial infarction underwent Ce-MRI and 2-dementional echocardiography two weeks after the onset of symptom. Transmurality of myocardial necrosis by Ce-MRI was graded based on the extent of hyperenhanced tissue within each segment (group A:0-25% hyperenhanced extent of the LV wall, group B:26-50%, group C:51-100%) according to the previous reports. We recorded transmural myocardial strain profile in the infarct segments with tissue strain M-mode imaging (Aplio, TOSHIBA Medical Inc.) and evaluated peak end-systolic myocardial strain and its location (%distance of the wall thickness from the endcardium; 0%=endocardium, 100%=epicardium).
Results: There was a progressive decrease in peak end-systolic myocardial strain in the infarct segments in proportion to an increase of transmurality of infarction by Ce-MRI(group A:0.69±0.33, group B:0.51±0.13, group C:0.17±0.11, p<0.01). The location of peak strain shifted from endocardium to epicardium in accordance with the transmurality increased(group A:36.5±9.6%, group B:52.8±4.3%, group C: 77.8±9.0%, p<0.001).
Conclusions: In patients with acute myocardial infarction, peak end-systolic myocardial strain decreased and the location of peak strain shifted toward epicardium with increasing transmurality of infarction as defined by Ce-MRI. Strain M-mode imaging might be useful to predict the transmurality of myocardial necrosis in acute myocardial infarction.

1:00 p.m.

905-223   **Real-time 3D Echocardiography And The Role Of Interpapillary Muscle Dyssynchrony In Functional Mitral Regurgitation In Severe Heart Failure**

Emily Ho, Stamatis Kapetanakis, Peter Pearson, Amit Bhan, Bushra Rana, Francis Murgatroyd, Mark J. Monaghan, King's College Hospital, London, Ireland

Background: Recent evidence suggests that dyssynchronous papillary muscle activation may be a contributing factor in functional mitral regurgitation (FMR). Using real-time 3D echocardiography (RT3DE), we evaluated the contribution of dyssynchronous interpapillary contraction to FMR improvement after cardiac resynchronisation therapy (CRT).
Methods: Thirty consecutive patients (23 male, ejection fraction 21 ± 7%) undergoing CRT with at least mild FMR were studied. FMR severity was assessed as regurgitant jet/ left atrial area ratio (JA/LAA). RT3DE was used to evaluate left ventricular (LV) volumes, ejection fraction (EF), and indices of global and regional intraventricular dyssynchrony; at baseline pre-implant and at 6 months follow-up.
Results: Seventeen patients showed a response to CRT, with evidence of LV reverse remodelling, (LV end-systolic volume (LVESV) reduction 155 ± 76 ml to 96 ± 58 ml; *p* = 0.0001), improvement in EF (20% ± 9% to 34% ± 11% *p* < 0.0001) and reduction in 3D global dyssynchrony (14.3 ± 5.3% to 7.5 ± 4%, *p* < 0.0001). FMR was significantly reduced in these patients, JA/LAA ratio (18 ± 16% to 6 ± 9%, *p* = 0.006). In the remaining 13 patients, in whom there was a non-response to CRT, (LVESV 163 ± 63 ml to 174 ± 59 ml, *p* = 0.2; EF 22 ± 6% to 22 ± 7%, *p* = 0.6), there was no reduction in global dyssynchrony (12 ± 6% to 10 ± 6%; *p* = 0.1), nor improvement in FMR (17 ± 15 to 25 ± 13, *p* = 0.1). In both responders and non-responders, there was no difference in interpapillary activation delay times after CRT (98 ± 89 ms v 100 ± 107 ms respectively, *p* = 0.9). In addition, no correlation between improvement in the regional dyssynchrony in the mid LV at papillary muscle insertion sites and the degree of FMR improvement was noted in the responder group (r = -0.04, *p* = 0.8).
Conclusions: Cardiac resynchronisation therapy significantly reduces FMR. Regional dyssynchrony involving the papillary muscle insertion sites however, is not a determinant of FMR reduction in CRT at 6 months follow-up.

1:00 p.m.

905-224   **Impact of Geometric Change of Mitral Apparatus on Severity of Left Ventricular Outflow Tract Obstruction in Patitents with Obstructive Hypertrophic Cardiomyopathy: Real-Time Three-Dimensional Echo Evaluation**

Hye Jin Hwang, Eui Young Choi, Se-Jung Yoon, Hye-Sun Seo, Jee Hyun Lee, Jong Won Ha, Namsik Chung, Cardiology, Yonsei University College of Medicine, Seoul, South Korea

Background: We sought to investigate the relationship between geometric changes of mitral apparatus and degree of trans-left ventricular outflow tract (LVOT) pressure gradient (PG) in patients with hypertrophic cardiomyopathy using three-dimensional (3D) echocardiography. Methods: Utilizing real-time 3D echocardiography, we obtained transthoracic volumetric images in 17 patients with HCM presenting with different severity of LVOT pressure gradient and in 18 controls. Original software was used to crop the 3D data into 18 radial planes, and we marked the mitral annulus and leaflets in each plane in mid-systole and mid-diastole. The 3D images of the leaflets and annulus were reconstructed for the quantitative measurements. Also, we obtained LVOT pressure gradient and degree of MR by two-dimensional echocardiography. Results: : In obstructive HCM, the annulus heightened with apparent tenting of the leaflets compared to control subjects (7.7 ± 2.8 mm vs. 5 ± 1.6 mm, p <0.0001). Maximum and mean tenting length were longer and tenting volume was larger in obstructive HCM than control subjects(maximum tenting length: 13.26 ± 4.18 mm vs. 8.0 ± 3.4 mm, p<0.0001, mean tenting length: 5.3 ± 3 mm vs. 2.3 ± 2.3 mm, p< 0.005, tenting volume/body surface area: 3.35 ± 1.52 ml/m2 vs 1.42 ± 0.76 ml/m2, p <0.0001). In subgroup analysis according to LVOT PG, patients with higher LVOT PG (n= 8) has larger tenting indices compared with lower LVOT PG (n= 9). However LV ejection fraction, maximal thickness of interventricular septum and degree of mitral regurgitation didn't show difference between two groups.
Conclusions: Obstructive HCM is associated with apparent mitral annular heightening and tenting of the leaflets. Furthermore, severity of LVOT PG is significantly associated with degree of mitral leaflet tenting.

1:00 p.m.

905-225   **New Observations in Application of Contraction Front Mapping to Detect Ischemia during Live 3-Dimensional Dobtuamine Stress Echocardiography**
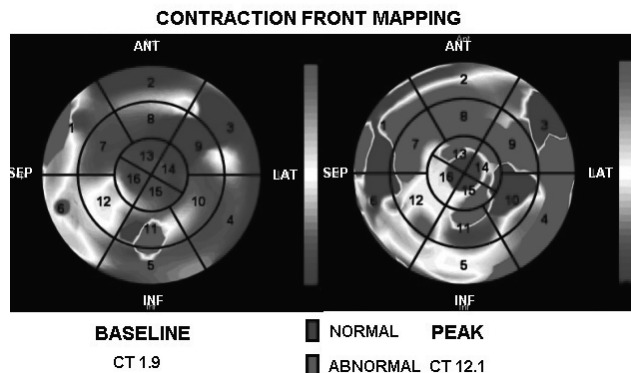
Masood Ahmad, Meneleo Dimaano, Umamahesh C. Rangasetty, Connie Xie, University of Texas Medical Branch, Galveston, TX

Background: Regional left ventricular (LV) wall motion assessment by 3D Dobutamine stress echocardiography (3DDSE) is subjective and has interobserver variability. Contraction front mapping (CFM, Tom Tec), based on analysis of temporal and spatial activation of LV contraction, displays a bulls eye plot of the contraction wave front of the myocardial segments that reach peak contraction every 25 msec. CFM is quantitative in the analysis of LV contraction.
Methods: Seventy one patients (pts), age range 40 to 89 yrs , with coronary angiograms had 3DDSE. LV wall motion and CFM were analyzed by 2 different observers. Contraction time index (CT) was a standard deviation of the time to reach peak contraction in 16 myocardial segments. A > 10% increase in CT from baseline to peak stress was considered abnormal.
Results: Thirty eight of 71 pts with angiographic coronary artery disease (CAD)had an increase in CT (mean ± SD) from 5.31 ± 3.22 at baseline to 7.09 ± 2.86 at peak stress (sensitivity 100%); stress induced LV wall motion abnormality in 3DDSE was seen in 32 of 38 pts (sensitivity 84.2%). In 33 pts without CAD, CT decreased in all pts from 5.2 ± 3.3 at baseline to 4.21 ± 2.92 at peak stress; 3DDSE was negative for ischemia in 27 pts and nondiagnostic in 6 pts. The concordance between 3DDSE and CFM results was 83.1 % (Figure: CFM at baseline and at peak stress in a pt with ischemia).
Conclusions: Contraction front mapping provides a dynamic map of the abnormally contracting segments and a quantitative analysis of ischemia during 3DDSE.

CONTRACTION FRONT MAPPING

BASELINE   NORMAL   PEAK
CT 1.9   ABNORMAL CT 12.1

1:00 p.m.

905-226   **Resting Myocardial Blood Flow Not Myocardial Flow Reserve Predicts Hibernating Myocardium: A Quantitative Myocardial Contrast Echocardiography Study**

Michael Hickman, Leah Burden, Roxy Senior, Northwick Park Hospital, Harrow, United Kingdom

Background: Both resting myocardial blood flow (MBF) and myocardial flow reserve (MFR) may be affected in hibernating myocardium (HM). We assessed the relative value of resting MBF parameters and MFR for the prediction of HM, using quantitative myocardial contrast echocardiography (MCE).
Methods: Accordingly, 27 pts (LVEF: 30±10%) scheduled for revascularisation underwent resting low power MCE and vasodilator stress followed by echocardiography (23 pts) 3-6 months after revascularisation. Resting peak contrast integrity A and microbubble velocity B(MBF) parameters and β reserve (MFR) were assessed. Improvement in wall thickening of dysfunctional segments or improvement after low dose dobutamine in a persistently dysfunctional segment after revascularisation was defined as HM.
Results: Of the 310 dysfunctional segments before revascularisation 228(74%) demonstrated HM. All resting MCE parameters were significantly reduced in HM compared to segments with normal baseline function but were significantly higher compared to necrotic myocardium (Table). However, β reserve was similarly (p=0.15) reduced in hibernating and necrotic myocardium. A cut-off of 5dβ of A provided the best sensitivity (87%) an specificity (67%) for the detection of HM.
Conclusion:Both resting MBF parameters and MFR are reduced in HM, but only the former predicted HM. Thus, MCE provides both pathophysiological and diagnostic information in pts with HM.

Quantitative MCE in Segments with Normal and Abnormal Function

	Segments	A(dβ)	B(dβ/sec)	β reserve
Group 1	Normal baseline function(n=35)	8.1±2.1	0.85±0.47	1.68±1.02
Group 2	Hibernating myocardium (n=156)	7.2±2.3*	0.67±0.56**	1.36±3.3**
Group 3	Necrotic myocardium (n=55)	4.4±2.3***	0.43±0.32***	0.82±4.1**

*p<0.05 vs Group 1; **p<0.01 vs Group 1; ***p<0.01 vs Group 2

1:00 p.m.

905-227   **Postsystolic Strain Index by Either Adenosine or Dobutamine: Correlations to Adequacy of Left Anterior Descending Flow Reserve.**

George Athanasopoulos, Yong Zhu, George Karatasakis, George Hatzigeorgiou, Dennis V. Cokkinos, Onassis Cardiac Surgery, Athens, Greece

Background: The proportion of delayed (post systolic-PS) left ventricular strain (S) to the systolic one (PSS index) has been shown to be an accurate parameter to interrogate ischemia post dobutamine (DOB). We assessed the relation between PSS index and the respective coronary flow reserve (CFR) in the left anterior descending territory (LAD), using as stressors either DOB or adenosine (AD) in the setting of chronic coronary artery disease (CAD).
Methods: 68 patients were studied (age 63+9). None had akinesis/severe hypokinesia in the LAD territory. 23 pts had a >70% LAD diameter stenosis. LAD CFR was estimated by AD 140μg/kg/min for 4 min by transthoracic echo. The peak systolic S (SS), and peak postsystolic S (PSS) were measured by Doppler tissue imaging (DTI) in 4 territories supplied by LAD (mid-apical anterior and septal wall from 2/4 chamber apical views respectively).The PSS index was calculated as (peakPSS-peak SS)/peaksSS during AD (140mg/kg/min) and DOB (20mg/kg/min) infusion
Results: PSS index (DOB) was greater than PSSindex(AD) (anteroapical/anteroseptal: 0.15+0.13/0.16+0.14 vs 0.20+0.17/0.21+0.18, both p<0.05). Both PSSindexes had linear relation with LADCFR (anteroapical/anteroseptal segments: r= 0.42/0.46 for AD and r=0.69/0.68 for DOB, all p<0.05). Pts with either >70%LAD stenosis or CFRLAD<2 had smaller both DOB/AD PSSindexes in the apical segments. When ROC analysis was performed for PSSindex to predict LAD>70%. then the best cut off values for DOB/AD respectively were 0.29/0.22: (area under curve -AUC: 0.90/0.94, sens: 91/85, spec: 0.89/0.93). When ROC analysis was performed for PSSindex to predict CFR LAD<2. then the best cut off values for DOB/AD respectively were 0.30/0.23: (area under curve -AUC: 0.94/0.87, sens: 93/71, spec: 1/0.96). For both stressors the apical segments had greater accuracy than the mid segments (best AUC for DOB/AD:mid: 0.76/0.65 vs apical:0.98/0.87).
Conclusion: In chronic CAD, delays in strain profile , induced by either DOB or AD and expressed quantitatively, are related with the respective LAD CFR. PSSindex using either DOB or AD as stressors, is more precise for the detection of underlying LAD ischemia when the apical segments are considered.
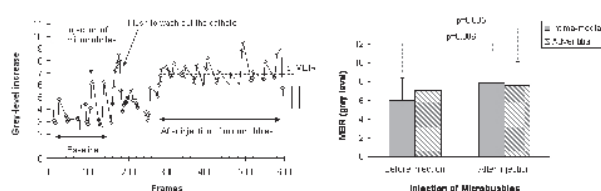
1:00 p.m.

905-228   **Imaging And Quantification Of Coronary Plaque Neovascularization With Contrast Enhanced Intravascular Ultrasound And A New Computational Image Analysis Technique**

Manolis Vavuranakis, Theodore G. Papaioannou, Ioannis A. Kakadiaris, Sean M. O'Malley, Elias A. Sanidas, Andreas Synetos, Morteza Naghavi, Stephane Carlier, Christodoulos I. Stefanadis, 1st Dept. of Cardiology, Hippocration Hospital, Medical School, National Univeristy of Athens, Athens, Greece, Computational Biomedicine Lab, Dept. of Computer Science, University of Houston, Houston, TX

Background: Vasa vasorum (VV) is the network of microcapillaries that proliferates during atherosclerotic plaque formation through angiogenesis. Up to now, techniques for in-vivo imaging of VV are lacking. Intravascular ultrasound (IVUS) is the most widely available clinical tool for the assessment of plaque characteristics and vulnerability. The aim of this study was the detection of VV density in plaques by using contrast enhanced IVUS with proper computational image analysis.
Methods: Sixteen pts with coronary artery disease (12M, age 62.9±9.3 yrs), undergoing a percutaneous coronary intervention were studied. Pts underwent IVUS examination by a 20MHz IVUS catheter. After finding a non-culprit lesion (plaque area>40% and positive remodeling), a bolus injection 0.5cc of ultrasound contrast agent (Sonovue) was injected through the guiding catheter. IVUS images were continuously recorded up to 3 min post injection. Changes in the grey-scale level of IVUS images after the injection were evaluated by the mean enhancement in region of interest (MEIR), provided by computerized difference-imaging algorithms (ACES™).
Results: Quantitative analysis (figure) of the pre- and post-injection images showed a significant enhancement in MEIR of intima-media after injection of microbubbles (from 6.0±2.5 to 7.9±3.3%, p=0.006).

Conclusions: This technique introduces a new window to the detection of vulnerable plaques and neovascularization and warrants further investigations.

1:00 p.m.

905-229   **Diagnostic Accuracy of Coronary 64-row MDCT in Clinical Setting**

Takeshi Kondo, Shinichi Takase, Jagat Narula, Takashi Uchiyama, Akitsugu Ohida, Hiroshi Fukazawa, Masahiko Suguta, Makoto Kondo, Tadaaki Orihara, Satoshi Sumino, Minoru Matsuhama, Takase Clinic, Takasaki, Japan, UC Irvine, Irvine, CA

Background: Although 75% diameter stenosis is considered significant in clinical practice, almost all MDCT studies have adapted 50% stenosis for calculating diagnostic accuracy. In addition, arrhythmias, severe calcifications and stents, which often coexist with coronary disease, have been excluded. The purpose is to estimate true diagnostic accuracy of coronary MDCT in clinical setting.
Methods: CAG were performed after coronary 64-row MDCT (Aquilion 64, Toshiba) in 59 consecutive patients in one month (male: 42, female:15, mean age: 67.6±10.5 years old). Coronary MDCT could not be estimated in 2 patients, who could not hold breath. From the remaining 57 patients, 554 coronary segments which were bigger than 2 mm diameter were analyzed for >75% diameter reduction; coronary vessels were smaller than 2 mm in 71 segments. Severe calcifications (always determined to be >75% stenosis), arrhythmias, tachycardia, stents or motion artifacts were not excluded.
Results: The sensitivity for the detection of >75% diameter CAG stenosis was 89%, specificity 92%, PPV 67% and NPV 98%. Diagnostic accuracy was >90% in >2mm vessels and 100% in 4 mm vessels. The accuracy was lowest in 1-2mm vessels. Extent of calcification was directly related to the degree of stenosis.
Conclusions: The diagnostic accuracy of MDCT is excellent in >2mm vessels with 75% diameter obstruction, i.e. the lesions which are clinically relevant and deserving of intervention.

1:00 p.m.

905-230   **Non-invasive coronary angiography: 16-Slice Computed Tomography vs. 1.5 T Magnetic Resonance Imaging Validated by Coronary Angiography**

Christoph Langer, Marcus Wiemer, Andreas Peterschroder, Karin Franzke, Hermann Esdorn, Dirk Huske-Kraus, Hermann Korperich, Hans Meyer, Dieter Horstkotte, Department of Cardiology, Heart and Diabetes Center, North Rhine-Westphalia, Ruhr University Bochum, Bad Oeynhausen, Germany

Background: Coronary angiography (CA) is the gold standard for the diagnosis of coronary artery disease (CAD). Multislice computed tomography (MSCT) based non-invasive coronary angiography (NCA) was shown to be an alternative in preselected patients but is limited by calcifications. After the institutional ethics committee was approved we validated MRI, which is not disturbed by calcium, and MSCT comparing it with CA in a prospective, monocentric study.

Methods: 68 consecutive patients (m n=37, f n=31, age 63.3±11.5) admitted for CA gave written informed consent before MRI (1.5 T, vectorcardiogram-triggered, free-breathing, navigator-gated multislice 3D balanced TFE sequences) and MSCT (16× 0,75mm, rotation time 420ms, 120 KV, 500 mAs, 80mL contrast medium) were performed the day before CA. Heart rate control was achieved by beta blocker medication if necessary. MSCT image reconstruction windows were positioned at 60%±5. The coronary tree was analysed by three teams of two experts each on an independent and blind basis using a 15 segment model. Based on visual assessment of maximum intensitiy projections (MSCT: 3mm, MRI: 2-3mm) binary stenoses were considered significant. **Results:** Mean heart rate in MSCT: 59.9bpm±11.6, in MRI: 64.6bpm±14. Mean scan time in MSCT: 20.3sec±3.8, in MRI: 36min±12.3. **Conclusions:** NCA is limited in the detection of CAD. MSCT is superior to MRI although being limited by calcifications. MRI is less applicable than MSCT to rule out CAD. MSCT shows a better overall performance.

Overall Statistics

Modality	Segments n/%	Binary Stenoses n/%	Sensitivity	Specifity	Accuracy	Positive Predictive Value	Negative Predictive Value
MSCT	826/95	57/75	0.79	0.97	0.96	0.74	0.98
MRI	594/68	25/33	0.53	0.91	0.88	0.33	0.96

1:00 p.m.

905-231   Assessment of Left Ventricular Function by Computed Tomography: Effects of the Number of Reconstructed Phases on the Calculated Ejection Fraction

Dianna ME Bardo, Barbara Newby, Roberto M. Lang, Victor Mor-Avi, University of Chicago, Chicago, IL
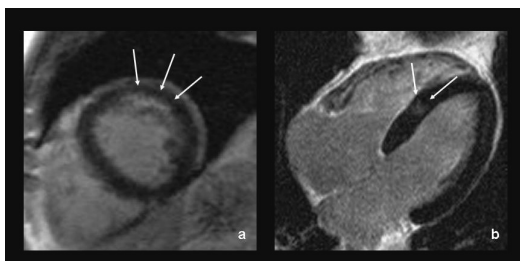
Background. Multi-detector computed tomography (MDCT) is the most recent addition to the arsenal of cardiac imaging. Its superb spatial and contrast resolution provide unparalleled endocardial border definition, which together with its true 3D nature make this modality perfectly suited for quantitative evaluation of left ventricular (LV) function. Theoretically, as a result MDCT could be more accurate and reproducible than other imaging modalities. However, recent studies have shown that LV ejection fraction (EF) measured from MDCT images are slightly, but significantly, underestimated compared to MRI reference values. The goal of this study was to determine whether this underestimation could be explained by the low temporal resolution at which MDCT data is usually reconstructed. **Methods.** MDCT cardiac images obtained in 15 non-selected patients (64-slice scanner, Philips) were reconstructed at 4 different temporal resolutions: every 10, 5, 3 and 1% of the RR interval. For each reconstruction, end-diastolic volume (EDV) was measured at the earliest reconstructed phase following the ECG R-wave, while end-systolic volume (ESV) was measured just before the onset of closure of the aortic valve. EDV and ESV were used to calculate EF for each temporal resolution. **Results.** In 9/15 patients, the timing of end systole varied with increasing temporal resolution, and EF gradually increased from 54±6% at 10% temporal resolution by 4.7±4.4% at 5%, then 5.8±3.4% at 3% and finally 6.4±3.8% at 1% resolution. In the remaining 6 patients, the timing of end-systole did not vary between reconstructions, and EF remained essentially unchanged. **Conclusions.** Our results demonstrate that misidentification of the true end systole due to the low temporal resolution, at which MDCT data are routinely reconstructed, is sufficient to explain the previously reported underestimation of LV EF. This error can be corrected by estimating the approximate timing of end systole from the initial reconstruction, and then selectively reconstructing at high temporal resolution additional phases around this estimate.

1:00 p.m.

905-232   Healthy Male Masters Marathon Runners Have an Unexpectedly High Prevalence of Myocardial Late Enhancement in Cardiac Magnetic Resonance Imaging

Frank Breuckmann, Kai Nassenstein, Burkhard Sievers, Thomas Schlosser, Torleif Sandner, David Kiefer, Joerg Barkhausen, Raimund Erbel, Stefan Möhlenkamp, University Duisburg-Essen, Essen, Germany

Background: Cardiac magnetic resonance imaging (cMRI) as an established imaging modality for the assessment of cardiac disorders is currently considered gold standard for the detection of myocardial fibrosis. Aim of our study was to assess the prevalence of myocardial late enhancement (LE) in non-professional masters male marathon runners by means of gadolinium-enhanced cMRI.

Methods: 105 asymptomatic male marathon runners without known cardiac disease aged 50-72 years who had completed 5 marathon races during the past 3 years were studied. Cine steady state free precession and inversion recovery fast low angle shot sequences after contrast application (DE-CMR) were collected. **Results:** The cMRI exam could be completed in 102 individuals. Of those, 11 subjects (11%) had LE on DE-CMR. Three patients (3%) showed subendocardial LE suggestive for ischemic myocardial scaring. Further 8 subjects exhibited atypical midmyocardial LE suggestive of non-ischemic origin. No patient had regional wall motion abnormalities. **Conclusions:** In the rising number of masters marathon runners, a substantial rate of LE suggestive of myocardial disease can be observed, which may be a substrate of vulnerable myocardium. DE-CMR for determination of LE may contribute to pre-participation risk stratification in some masters marathon runners. **Figure:** Short axis view of subendocardial LE suggestive for ischemic fibrosis (a) versus spotted midmyocardial LE in long axis orientation suggestive for non-ischemic genesis (b).

1:00 p.m.

905-233   Total Scar Burden on Contrast-Enhanced Magnetic Resonance Imaging Determines Response to Cardiac Resynchronization Therapy

Claudia Ypenburg, Stijntje D. Roes, Gabe B. Bleeker, Theodorus A. Kaandorp, Albert de Roos, Martin J. Schalij, Ernst E. van der Wall, Jeroen J. Bax, Leiden University Medical Center, Leiden, The Netherlands

Background: It has been demonstrated that improvement in LV function and reverse remodeling after cardiac resynchronization therapy (CRT) were larger in patients with non-ischemic dilated cardiomyopathy than in patients with ischemic dilated cardiomyopathy. The aim of this study was therefore to evaluate the influence of scar burden on response to CRT. **Methods:** We included 34 patients with ischemic cardiomyopathy (New York Heart Association class 3.1±0.4, left ventricular ejection fraction 23±7%). Contrast-enhanced magnetic resonance imaging (MRI) was used to determine the total scar burden, using a 17-segment model with a 5-point hyperenhancement scale (from score 0 = no hyperenhancement indicating no scar, to score 4 = hyperenhancement > 76%, transmural scar). Clinical and echocardiographic parameters were assessed at baseline and after 6 months of follow-up. **Results:** Extensive regions of scar tissue were present as indicated by a total scar burden of 1.0±0.6 (ranging from 0 to 2.12). Linear regression analysis showed a significant correlation (r=-0.91, P<0.05) between the total scar burden at baseline and the improvement in LV end-systolic volume after 6 months of CRT. Also, the 16 patients not responding to CRT (<10% improvement in LV end-systolic volume) had significantly more scar tissue than responders (1.5±0.3 vs. 0.6±0.4, P<0.05). In fact, a scar burden of >1.20 resulted in complete functional non-response. **Conclusions:** Total scar burden, as assessed with contrast-enhanced MRI, is an important factor in influencing response to CRT and may be included in the selection process for CRT candidates.

1:00 p.m.

905-235   Phase Analysis of Gated Myocardial Perfusion SPECT Compared to Tissue Doppler Imaging for the Assessment of Left Ventricular Dyssynchrony

Maureen M. Henneman, Ji Chen, Claudia Ypenburg, Petra Dibbets, Gabe B. Bleeker, Eric Boersma, Marcel P. Stokkel, Ernst E. van der Wall, Ernest V. Garcia, Jeroen J. Bax, Leiden University Medical Center, Leiden, The Netherlands, Emory University School of Medicine, Atlanta, GA

Background: Recently, it has been suggested that left ventricular (LV) dyssynchrony is an important predictor of response to cardiac resynchronization therapy (CRT); dyssynchrony is predominantly assessed by tissue Doppler imaging (TDI) with echocardiography. Information on LV dyssynchrony can also be provided by gated myocardial perfusion SPECT (GMPS) with phase analysis of regional LV maximal count changes throughout the cardiac cycle which tracks the onset of LV thickening. The aim of the study was to compare LV dyssynchrony assessment by GMPS and TDI. **Methods:** In 75 patients with heart failure, depressed LV function and wide QRS complex, GMPS and 2D echocardiography, including TDI, were performed as part of clinical screening for eligibility for CRT. Clinical status was evaluated using NYHA classification, 6-minute walk distance and quality-of-life score. Different parameters (histogram bandwidth, phase standard deviation (SD), histogram skewness and histogram kurtosis) of LV dyssynchrony were assessed from GMPS and compared with LV dyssynchrony on TDI using Pearson's correlation analyses. **Results:** Histogram bandwidth and phase SD correlated well with LV dyssynchrony assessed with TDI (r=0.89, P<0.0001 and r=0.79, P<0.0001 respectively). Histogram skewness and kurtosis correlated less well with LV dyssynchrony on TDI (r=-0.52, P<0.0001 and r=-0.45, P<0.0001 respectively). **Conclusions:** LV dyssynchrony assessed from GMPS correlated well with dyssynchrony assessed by TDI; histogram bandwidth and phase SD showed the best correlation with LV dyssynchrony on TDI. These parameters appear most optimal for assessment of LV dyssynchrony with GMPS. Outcome studies after CRT are needed to further validate the use of GMPS for assessment of LV dyssynchrony

1:00 p.m.

<u>905-236</u>   **The Minute Ventilation/Carbon Dioxide Production Slope Prognostically Outperforms the Oxygen Uptake Efficiency Slope**

Ross Arena, Jonathan Myers, Marco Guazzi, Mary Ann Peberdy, <u>Sherry Pinkstaff</u>, Joshua Abella, Daniel Bensimhon, Paul Chase, Virginia Commonwealth University, Richmond, VA

Background: The oxygen uptake efficiency slope (OUES) has demonstrated prognostic value in heart failure (HF) but additional comparisons to other cardiopulmonary exercise test (CPX) variables are required.

Methods: Two hundred and twenty-three subjects (165 male/58 female, 100 ischemic/123 non-ischemic, mean age: 53.5 ±15.2 years, ejection fraction: 31.9 ±13.3%) were included in this analysis. The minute ventilation/carbon dioxide production (VE/VCO$_2$) slope and OUES (VO$_2$ = a log$_{10}$VE + b, units: L/min) were calculated using 50% (VE/VCO$_2$ slope$_{50}$ or OUES$_{50}$) and 100% (VE/VCO$_2$ slope$_{100}$ or OUES$_{100}$) of exercise data. Peak oxygen consumption (VO$_2$) was also determined. Subjects were tracked for cardiac-related mortality following CPX.

Results: There were 39 cardiac-related deaths during the three year tracking period (annual mortality rate: 9.0%). Mean peak VO$_2$ was 16.0 ±6.3 mlO$_2$•kg^{-1}•min^{-1}. VE/VCO$_2$ slope$_{50}$ (31.8 ±8.9) was significantly less (p<0.001) than VE/VCO$_2$ slope$_{100}$ (34.0 ±8.6). OUES$_{50}$ (1.7 ±0.81) and OUES$_{100}$ (1.7 ±0.77) were not significantly different (p=0.94). Receiver operating characteristic (ROC) curve analysis and hazard ratios for CPX variables are listed in Table 1. The VE/VCO$_2$ slope$_{100}$ was the most powerful predictor of mortality.

Table 1: Prognostic Assessment of CPX Variables

	Area Under ROC Curve (95% CI)	Optimal Threshold	Sensitivity/ Specificity	Hazard Ratio (95% CI)	p-value
VE/VCO$_2$ slope$_{50}$	0.74 (0.65-0.83)	</≥34.7	77/59	4.0 (2.1-7.6)	<0.001
VE/VCO$_2$ slope$_{100}$	0.80 (0.73-0.87)	</≥35.7	77/69	6.6 (3.3-13.1)	<0.001
OUES$_{50}$	0.69 (0.60-0.78)	≤/>1.4	65/61	2.4 (1.3-4.4)	0.008
OUES$_{100}$	0.72 (0.64-0.80)	≤/>1.4	63/72	3.7 (1.8-7.2)	<0.001
Peak VO$_2$	0.68 (0.60-0.77)	≤/>14.2	62/69	3.1 (1.6-6.2)	0.001

Discussion: While a number of exercise test variables provide prognostic information in patients with HF, an elevated VE/VCO$_2$ slope may be the single best indicator of increased risk for adverse events.

E-POSTER SESSION

906

E-Poster Session 906

Sunday, March 25, 2007, 2:00 p.m.-3:00 p.m.
Hall H

2:00 p.m.

<u>906-221</u>   **Tissue Doppler Peak Atrial Systolic Mitral Annular Velocity is an Accurate Measurement of Left Atrial Function.**

<u>Jennifer E. Liu</u>, Gregory Bloom, Rebecca Hahn, Bernard Restivo, Stanley Katz, Jonathan Bella, Debbie Kazlo, Carol Chen, North Shore University Hospital, Manhasset, NY

Background: Assessment of left atrial (LA) function is clinically important due its important contribution to cardiac output in diastolic dysfunction. Measurement of LA function by transthoracic echo has been cumbersome and not routinely used in clinical practice. This study assesses the relationship of peak tissue Doppler (TD) A' velocity with measurements of LA systolic function, LA hemodynamic parameters measured invasively and LA volume (LAV).

Methods: Eighty-four patients who had an echo followed by cardiac catheterization less than 1 hour apart were included. Pulsed Doppler transmitral inflow velocities were recorded at the tips of the mitral leaflets from the apical 4 chamber view (AP4CH). TD A' is the average of A' measured at the medial and lateral annulus from the AP4CH. LAV is calculated using the biplane method of discs. Left atrial systolic force (LASF) is calculated using formula previously reported.

Results:

Age (years)	66± 13
Gender (M/F)	62/22
Body surface area (BSA)(m²)	2.00 ± 0.24
Systolic Blood Pressure (SBP) (mm Hg)	146 ± 22
LV end-diastolic pressure (mm Hg) by cardiac cath	20 ± 6
LV mass (gm)	192 ± 59
Ejection Fraction (%)	58 ± 11
Mitral E/A	1.0 ± 0.4
Atrial Filling Fraction (AFF)	0.41 ± .49
TD A' (cm/sec)	8.4 ± 2.3
LASF (kdynes)	11.7 ± 5.6

In univariate analysis, TD A' is positively associated with LASF (r = 0.55; p<0.001), AFF (r = 0.260, p= 0.02) and EF (r = 0.507, p <0.001) but inversely related to LAV (r = -0.30; p= 0.007) and LVEDP (-0.239, p = 0.05). After adjusting for age, gender, BSA and SBP, the association remains statistically significant (all p<0.05).

Conclusion: TD A' is an index of LA systolic function with inverse relationship to LA size. It is positively related to LA preload and inversely related to LA afterload . The simplicity of TD A' measurement allows accurate assessment of LA function in clinical practice.

2:00 p.m.

<u>906-222</u>   **Velocity Vector Imaging of the Mitral Annulus: A Novel Method to Quantify Global Ventricular Function**
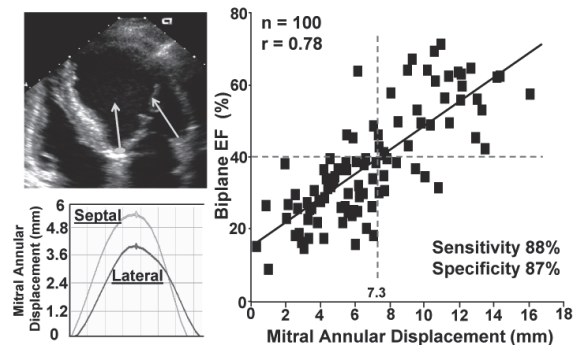
<u>Glen R. Miske</u>, Masaki Tanabe, Nini C. Thomas, John Gorcsan, III, University of Pittsburgh, Pittsburgh, PA

Background: Velocity vector imaging (VVI) is a new semi-automated means to quantify regional left ventricular (LV) function. Our objective was to test the hypothesis that VVI can automatically track mitral annular displacement (MAD) as a means to rapidly quantify global ventricular function.

Methods: We studied 100 patients (42% Ischemic Disease) ejection fraction (EF) 32±9% and 20 normal controls, EF 62±5%. VVI was applied to the septal and lateral mitral annulus (4-chamber view) and the anterior and inferior mitral annulus (2-chamber view). Maximum 4 and 2 chamber average MAD were compared with EF by biplane Simpson's rule using least square linear regression. ROC curve analysis was performed to determine detection of abnormal EF (<40%).

Results: VVI successfully tracked MAD in 80 pts and all controls (83% overall). The 4-site MAD was significantly correlated with EF; r = 0.781 (p<0.001). A MAD cut-off < 7.3 cm predicted abnormal EF < 40% with 88% sensitivity and 87% specificity.

Conclusion: MAD by VVI is a simple and rapid means to quantify global LV function, has the ability to detect abnormal EF and has potential for clinical application.

2:00 p.m.

<u>906-223</u>   **Intra-Coronary Sinus Echocardiography: A New Approach to Guide Cardiac Interventional Procedures**

<u>Andrew Celigoj</u>, David Cesarion, Aman Mahajan, Anthony Koppula, Barbara Natterson Horowitz, Jonathan Tobis, Noel Boyle, David Sahn, Kalyanam Shivkumar, UCLA Cardiac Arrhythmia Center, Los Angeles, CA

Background: Intracardiac echocardiography (ICE) is routinely used to guide interventional procedures. The purpose of this study was to determine if ICE in the coronary sinus (CS) could provide a new perspective of highly detailed cardiac anatomy.

Methods: In 9 patients, a phased array intracardiac ultrasound catheter (AcuNav, Siemens Mountainview CA) was used for imaging within the coronary sinus. The catheter was advanced into the great cardiac vein, near the take off of the anterior interventricular vein, and a pull back was performed with atrial and ventricular imaging. Images obtained

by transesophageal echocardiography (TEE) and CS ICE were compared.
Results: The left atrial appendage, pulmonary veins, mitral valve chordae, papillary muscles, aortic valve, the proximal left, left circumflex, and right coronary arteries were successfully visualized with clarity equal to that of TEE. Intra-cardiac catheters were also successfully visualized in the right ventricle, right atrium, and left atrium. The right coronary artery, lateral wall of the left ventricle, and the aortic root and the mitral valve structures (scallops/closure line) were better seen with CS ICE. There were no complications due to the use of the ICE catheter in the coronary sinus. **Conclusions:** Intra-coronary sinus imaging with an ultrasound catheter is safe and provides highly detailed images to identify structures that are hard to visualize by TEE and has the potential to be an alternative to TEE for valvular interventions.

2:00 p.m.

906-224   **Normal Values Differ between Right Ventricular and Left Ventricular Measurements of Doppler-derived Velocity, Displacement, Strain Rate, and Strain**

Jing Ping Sun, Xing Sheng Yang, John D. Merlino, Angel R. Leon, Steven R. Sigman, Anita Bhandiwad, James D. Thomas, William J. Stewart, Emory University School of Medicine, Atlanta, GA, The Cleveland Clinic Foundation, Cleveland, OH

Background: The assessment of right ventricular (RV) contractile function is an important clinical issue, but remains difficult because of the RV's complex anatomy and structure.
Aim: We sought to investigate whether new Doppler-derived myocardial deformation indices may quantify regional contractile of RV function and whether these values vary between the RV and LV segments by segment.
Methods: Tissue Doppler Image (TDI) was performed in 112 normals (43 ± 15 yrs, 62 male) using apical 2, 4-chamber views, and modified apical 2-chamber views of the RV for RV function. LV and RV function were evaluated by myocardial velocity, displacement, strain and strain rate using Echo Pac. Systolic measurements were obtained from basal, mid and apical segments and averaged for each wall
Results: Velocity and tracking parameters decreased from basal to apical segments, while strain and strain rate increased from base to apex for both ventricles. Compared LV to RV, all of TDI parameters are higher in lateral and inferior walls of RV than the same walls of LV. There was no significant difference in the anterior wall between the ventricles.

Average of each wall		Velocity (cm/s)	Displacement (cm)	Strain Rate(1/s)	Strain (%)
Lateral Wall	LV	5.1±2.4	0.7±0.2	1.2±0.4	15±4
	RV	8.3±1.9	1.6±0.4	1.5±0.4	26±6
	p	<0.0001	<0.0001	<0.0001	<0.0001
AnteriorWall	LV	4.5±1.9	0.9±0.2	1.3±0.5	20±5
	RV	4.1±1.1	0.7±0.2	1.2±0.3	20±5
	p	ns	ns	ns	ns
InferiorWall	LV	5.1±1.1	1.0±0.2	1.0±0.4	18±5
	RV	6.5±1.8	1.3±0.4	1.3±0.3	22±5
	p	<0.0001	<0.0001	<0.0001	<0.0001

Conclusions: Myocardial velocity, displacement, strain and strain rate represent important new, non-invasive methods for quantifying regional myocardial function in health and disease. All of TDE parameters are higher in lateral and inferior walls of the RV than those of LV. These normal values should assist in evaluating RV function and might be useful in clinical practice.

2:00 p.m.

906-225   **Incremental Benefit of Strain Rate Imaging to the Accuracy of Novice and Expert Interpreters of Dobutamine Stress Echocardiography**

Lizelle Hanekom, Nghi V. Mai, James Hare, Kieran Dauber, Jodi Harker, Thomas H. Marwick, University of Queensland, Brisbane, Australia

Background: Dobutamine stress echo (DbE) is accurate for the detection of coronary artery disease (CAD), but interpretation is subjective and dependent on observer experience. Strain rate imaging (SRI) offers a quantitative technique for identification of CAD. We sought whether SRI could improve the accuracy of less expert readers.

Methods: 121 patients (64±10yrs) underwent DbE with SRI, and coronary angiography. Segmental peak systolic SR was measured independently and previously derived cutoffs were applied to categorize segments as normal or abnormal. The accuracy of WMS by novice, experienced and expert readers, and SRI were compared with quantitative coronary angiography (Significant CAD=QCA diameter stenosis >50%).
Results: The accuracy of WMS by novice (57%, AUC 0.59) and experienced readers (67%, AUC 0.63) was less than experts (89%, AUC 0.67, p<0.0001). By applying a cutoff of <-0.9/s, the accuracy of SR for diagnosing CAD was 89% (AUC 0.69), which improved the sensitivity of WMS by experienced readers, as well as the sensitivity and specificity of WMS by novice readers(Table). SRI added specificity to the diagnosis of LAD disease by experienced and novice readers (88% vs. 80%, p=0.03 and 62%, p<0.0001). SRI also improved the sensitivity for diagnosing postero-lateral disease in experienced and novice readers (86% vs. 47%, p<0.0001 and 41%, p<0.0001). SRI did not add to the accuracy of expert readers.
Conclusions: SRI offers an improvement in accuracy of WMS to less expert echocardiographers.
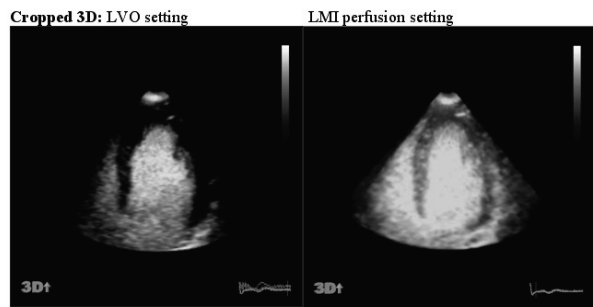
Accuracy of WMS vs. SRI

	SR	Expert	p	Experienced	p	Novice	p
Sensitivity	90%	89%	0.84	54%	0.000	56%	0.000
Specificity	88%	81%	0.24	87%	1.0	59%	0.000

2:00 p.m.

906-226   **Real Time 3D Myocardial Perfusion- Is It Feasible?**

Amit Bhan, Stam Kapetanakis, Bushra S. Rana, Karen Wilson, Emily Ho, Mark J. Monaghan, Kings College Hospital, London, United Kingdom

Background: 2D low mechanical index (LMI), contrast specific myocardial perfusion imaging is now an accepted technique. We evaluated the first real time 3D echo (RT3DE) LMI implementation to establish it's feasibility, in unselected patients.
Methods: 22 consecutive patients (10 male) referred for contrast enhanced echo were imaged using a Philips IE33 3D scanner, with novel 3D LMI power modulation software. All patients underwent 2D echo and a RT3DE apical full volume acquisition during contrast infusion (Sonovue 0.7 ml/min). Datasets were taken in the left ventricular opacification (LVO) and LMI perfusion modes.
These were then evaluated segmentally for wall motion and myocardial contrast enhancement, relative to the LVO mode.
Results: A total of 352 left ventricular segments were evaluated. Wall motion and perfusion could be assessed in 98.8% and 98% respectively of the 2D segments and in 97.4% and 96% of the 3D segments.
318 segments had normal wall motion and thickening. In these, normal 3D myocardial opacification was seen in 97.5% of apical, 96.5% of mid and 94.3% of basal segments (p= NS for all comparisons). 21 segments were akinetic with no 2D evidence of perfusion and of these RT3DE successfully demonstrated a perfusion defect in 19 (90.5%), (p=NS).
Conclusions: Evaluation of myocardial perfusion using LMI RT3DE appears to be feasible in most segments. In the future it should be useful, not only for specifying accurate location, but also quantifying volume of perfusion defects.

Cropped 3D: LVO setting   LMI perfusion setting

2:00 p.m.

906-227   **Time to Peak Displacement on Speckle Tracking Imaging: A Better Parameter for Left Ventricular Synchrony.**

Adrian Fluture, Lisa Massie, William Hiser, Hany Aziz, June Heideman, Denise Bienvenue, James R. Cook, Leng Jiang, Baystate Medical Center / Tufts University School of Medicine, Springfield, MA

Background: 2D speckle tracking imaging derived strain (SpS) has recently been introduced to assess left ventricular (LV) synchrony. We have observed that myocardial displacement on speckle tracking imaging (SpD) is easy to define and can be measured on all segments in a LV cross sectional view simultaneously. To explore the potential value of SpD in assessing LV synchrony, we compared time to peak SpD with time to peak SpS. The previously proposed time to maximum motion on M-mode (M) and time to peak velocity by tissue Doppler (TD) were used for comparison.
Methods: 51 pts with normal QRS and wide range of LVEF (10-65%) were studied. Standard mid-LV short axis views were obtained for TD, M, SpD and SpS analysis. Time to peak values of each parameter was measured on the anteroseptum and posterior

wall. Bland-Altman plots were constructed to compare TD, M and SpD with SpS. ANOVA was used to determine differences between measures. Lin's concordance correlation coefficient was used to test the agreement.

Results: SpD had the strongest agreement with SpS, followed by M (SpD better than M p=0.01, SpD better than TD p<0.001) and TD (M better than TD p<0.001). (table) Significant concordance with SpS was found for SpD and M (p<0.0001) but no concordance was found for TD (p=0.38).

Conclusion: Time to peak SpD has good agreement with time to peak SpS. It appears better than time to peak motion on M-mode and far superior than time to peak velocity on TD. SpD has the potential of providing an alternative measure to better evaluate LV synchrony.

Bland Altman comparison of TD, M and SpD with SpS for AS and PW

	Method	Mean difference (ms)	95%CI (ms)
AS	TD	216	196.88 to 236.20
	M	35.88	20.29 to 51.50
	SpD	5.063	-13.23 to 23.35
PW	TD	228.35	206.29 to 250.42
	M	21.84	6.30 to 37.39
	SpD	-3.39	-18.06 to 11.27

AS= anteroseptal wall; PW= posterior wall.

2:00 p.m.

906-228   **A Novel Non-Invasive Technique for Pulse-Wave Imaging and Characterization of Vascular Mechanical Properties In-Vivo**
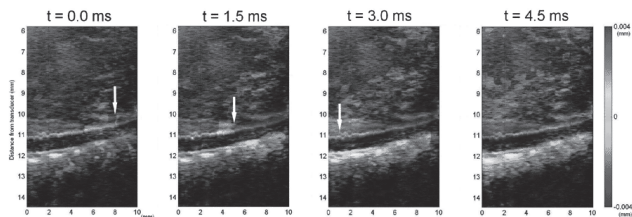
Kana Fujikura, Jianwen Luo, Elisa E. Konofagou, Victor Gamarnik, Royd Fukumoto, Mathieu Pernot, Shunichi Homma, David Tilson, III, Columbia University, New York, NY

Background: Very high frame-rate ultrasound imaging is a novel technique to capture pulse-wave propagation in the tissue by scanning non-invasively at one transducer position. We hypothesized that imaging of the pulse-wave propagation and elasticity may contribute to a non-invasive detection of the mechanical properties of the aortic wall. We evaluated the feasibility of estimating non-invasively the elasticity of the abdominal aortic wall using ultrasound with 8000 frames/s.

Methods: Twelve wild-type mice were anaesthetized, and the abdominal wall was scanned non-invasively at 30 MHz (Vevo 770, Visualsonics, Inc.). The radiofrequency(RF)-data and the ECG signals were acquired during several cardiac cycles. A complete set of 2D ultrasound RF-data was reconstructed off-line through ECG triggering. The pulse wave generated by the blood flow in the abdominal aorta was imaged (see Figure) and its velocity was calculated using signal processing techniques built in Matlab-based software (MathWorks, Inc).

Results: The pulse-wave propagated along the murine aortic wall in forward direction with the velocity of 2.70 ± 0.54 m/s (r2=0.85 ± 0.062; n=12). The elasticity of the abdominal wall was 56.3 ± 19.5 kPa.

Conclusion: The estimated pulse-wave velocity and the elasticity in the murine aorta were within the range of previously reported literature measured invasively using catheter. This a novel technique may be capable to vulnerability of plaque and/or aneurysm rupture in the future.

2:00 p.m.

906-229   **Anomalous Coronary Origin and Course in 1682 Patients Undergoing Computed Tomograph Angiography**

Sorin C. Danciu, Cesar J. Herrera, Jerome L. Hines, Advocate Illinois Masonic Medical Center, Chicago, IL, Illinois Heart and Vascular, LaGrange, IL

Background: The incidence of coronary anomalies (CA) in patients undergoing invasive angiography was reported to be 1.3%. Because of intrinsic limitations of the method, some may be missed or misclassified. Computed tomograph angiography (CTA) has emerged as a noninvasive method for assessing coronary anatomy. We aimed to describe the incidence, type and risk classification of CA in unselected patients undergoing CTA.

Methods: From April 2005 to August 2006, all patients undergoing CTA at a large, outpatient, cardiology practice for various indications were entered into a database. We searched this database for CA. We then classified these based on the presence of previously described risk factors for adverse cardiovascular outcomes and presence of atherosclerosis.

Results: A total of 1682 patients were reviewed, out of which 35 (2%) had CA. Age was 60Å±12 years and 19 (54%) were men. Chest pain or dyspnea on exertion was present in 12 (34%). The distribution of CA was: Ectopic origin of the CX from the right sinus of Valsalva (rsV) -10; Separate origin of LAD and CX from the left sinus of Valsalva (lsV) -9; Ectopic origin of the RCA from the lsV -9; Ectopic origin of the LAD from the rsV -1; Ectopic origin of the LM from rsV -1; Single coronary artery from rsV -3; Ectopic coronary origin from pulmonary artery -1; RCA to coronary sinus fistula -1. Out of these 35 CA,

12 (34%) had high risk features: Slit-like orifice/ acutely angled take-off -4; Inter-arterial course -6; Origin from pulmonary artery -1; Large fistula -1. Coronary atherosclerosis was present in 57% of patients with CA, as compared to 72% in the entire cohort.

Conclusions: CTA can accurately identify coronary anomalies in 2% of patients referred for various indications. A third of these, exhibit features that have been previously associated with high risk for adverse cardiovascular outcomes. The average age of our cohort suggests that these associations may have a lower cardiovascular risk than initially thought. Future prospective studies are needed for better risk stratification.

2:00 p.m.

906-230   **Comparison of 64-Slice Computed Tomography with Conventional Coronary Angiography for the Detection of In-Stent Restenosis in the Left Main Coronary Artery.**

Emilio Chiurlia, Fabio Alfredo Sgura, Andrea Di Girolamo, Elisa Guerri, Federica Fiocchi, Guido Ligabue, Maria Grazia Modena, Institute of Cardiology, Modena, Italy, Institute of Radiology, Modena, Italy

Background: Multislice computed tomography (MSCT) is a new promising approach for non invasive coronary artery imaging. We evaluated the diagnostic accuracy of MSCT in the follow-up of patients after percutaneous coronary intervention of the left main coronary artery (LMCA).

Methods: Between May 2005 and April 2006, we screened 31 consecutive patients scheduled for follow-up coronary angiography after LMCA stenting for inclusion in a protocol to compare MSCT with conventional coronary angiography. MSCT was performed with a 64-slice MSCT scanner (Lightspeed 64, GE Healthcare: detector collimation 64x0.6 mm, table feed 3.8 mm per rotation, gantry rotation time 330 ms, tube voltage 120 kV, and tube current of 900 mA) in the fortnight before conventional angiography. A beta-blocker was administered in case the patient's heart rate was above 65 beats per minute. The analysis was independently performed by double blinded observers, with the use of a computer-assisted system. Results were compared with conventional quantitative coronary angiography (QCA). In-stent restenosis (ISR) was defined angiographically as ≥50% diameter stenosis at follow-up.

Results: The MSCT investigation was completed successfully without any complications in all patients. Mean heart rate during the scan was 57±8 beats/minute and total scan time was 13.8 seconds. Image quality of MSCT-scans was sufficient for analysis in 30 of the 31 (97%) patients. Among patients with technically adequate scans, MSCT correctly identified all patients with ISR (4 of 30) but misclassified 1 patients without ISR (false-positive). Overall, the accuracy of MSCT for detection of angiographic ISR was 97%. The sensitivity, specificity, and positive and negative predictive values were 100%, 96%, 80%, and 100%, respectively.

Conclusion: Current MSCT technology allows reliable noninvasive evaluation of selected patients after LMCA stenting. A negative MSCT scan virtually rules out the presence of left main ISR and may therefore be an acceptable first-line alternative to coronary angiography.

2:00 p.m.

906-231   **Clinically Significant Non-Cardiac Findings Are Common in 64-Slice Multi-Detector Computed Tomography of the Heart**

Peter Zimbwa, Shoba B. Narayan, Paul Schoenhagen, Milind Y. Desai, Mario J. Garcia, Srikanth Sola, Cleveland Clinic, Cleveland, OH

Background: Most cardiologists who interpret cardiac multi-detector CT (MDCT) studies limit their interpretation to a narrow, high resolution field of view limited to the area immediately surrounding the heart. Datasets with a wider field of view are then reviewed by a radiologist for non-cardiac findings. We determined the prevalence of clinically significant non-cardiac findings within this limited cardiac field of view in a large cohort of patients undergoing 64-slice MDCT.

Methods: We conducted a retrospective study of consecutive patients who had undergone 64-slice MDCT on a Siemens Sensation or Philips Brilliance scanner for evaluation of suspected coronary artery disease (n=443) or to assess pulmonary venous anatomy for patients undergoing pulmonary vein isolation for atrial fibrillation (n=612) between January-December 2005. The field of view was limited to the area surrounding the heart. Abnormal non-cardiac findings were noted. Clinically significant abnormalities were defined as those requiring additional imaging or clinical follow-up.

Results: Of 1055 patients (69% male, age 58±10 years), 256 (24%) had non-cardiac abnormalities. Significant non-cardiac abnormalities occurred in 110 patients (10% of the study population; 133 abnormalities total). Pulmonary findings were most common, including 60 patients with non-calcified lung nodules > 6 mm, 14 with moderate-severe emphysema, 9 with bronchiectasis, and 3 with infiltrates. Other findings included pulmonary emboli in 2 patients, and mediastinal lymphadenopathy > 1cm in 2 patients. Lung cancer was subsequently diagnosed in 2 patients.

Conclusions: In a cohort of 1055 patients referred for 64-slice cardiac MDCT for common clinical indications, non-cardiac findings requiring additional clinical or imaging follow-up were seen in 10% of the study population, despite a limited field of view. These findings emphasize the need for cardiologists who interpret these studies to be aware of non-cardiac findings that may influence the overall MDCT results.
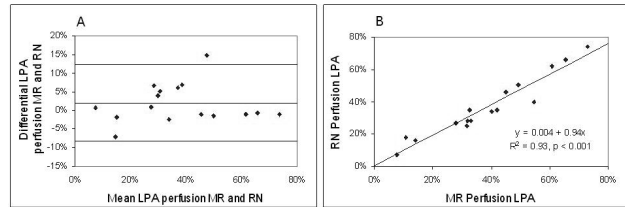
Diagnostic Testing

2:00 p.m.

906-232   Accuracy and Importance of Phase Contrast Magnetic Resonance for Measurement of Blood Flows in Branch Pulmonary Arteries With and Without Stenosis in the Presence of Pulmonary Regurgitation: Comparison With Radionuclide Lung Perfusion Scintigraphy

Matthew A. Harris, Timothy Y. Liu, Matthew J. Gillespie, Jonathan J. Rome, Paul M. Weinberg, Mark A. Fogel, The Children's Hospital of Philadelphia, Philadelphia, PA

Background: Radionuclide lung perfusion scintigraphy (RN) quantifies the net branch pulmonary blood flow (PBF). We sought to confirm the accuracy of Phase-Contrast MRI (pcMRI) and identify its advantage over RN.
Methods: We retrospectively reviewed RN and pcMRI branch PBF studies of 16 consecutive postoperative conotruncal anomalies pts (median age 10.5y, range 1.5-33.4y). Studies occurred within two years of each other without an intervening surgical or catheter procedure. All pts had branch pulmonary artery (PA) regurgitation in at least one branch PA. Six of 16 pts had catheterization data available for review.

Results: There was a strong correlation between the net PBF measured by both RN and pcMRI (r=0.93, p<0.001), as demonstrated by Bland-Altman (A) and Pearson Correlation plots (B). In pcMRI measurements, the sum of the branch PA net flows correlated strongly with the net flow of the main PA (r=0.88, p<0.001) and the aorta (r=0.78, p<0.001). Two pts with unilateral branch PA stenosis but relatively small differences in their net PBFs (>33% to the stenotic PA) have >80% of the total regurgitant volume observed in the non-stenotic PA. At catheterization, there was elevated vascular resistance measured in the non-stenotic pulmonary artery.
Conclusions: pcMRI accurately measures net branch PBF in pts with PA regurgitation without using ionizing radiation. Moreover, only pcMRI non-invasively identifies elevated vascular resistance of the contralateral lung in patients with unilateral PA stenosis.
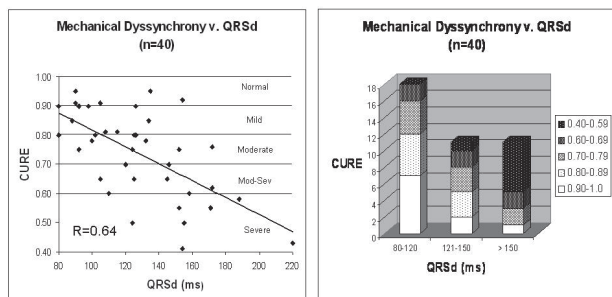
2:00 p.m.

906-233   Quantitative Tagged Magnetic Resonance Imaging Strain Assessment of Mechanical Dyssynchrony in Patients with Narrow and Wide QRS Complexes

Kenneth C. Bilchick, Robert H. Helm, Katherine C. Wu, Robert Weiss, Joao A. Lima, Ronald D. Berger, Nael Osman, Henry R. Halperin, David A. Kass, Albert C. Lardo, Johns Hopkins Medical Institutions, Baltimore, MD

Background: Although the primary direction of myocardial contraction has been shown to be circumferential, standard mechanical dyssynchrony (MD) indices are based on longitudinal strain. Magnetic resonance imaging myocardial tagging (MRI-MT) integrates circumferential strain in 24 segments into the circumferential uniformity ratio estimate (CURE) (0-1; 0=asynchrony, 1=perfect synchrony). We sought to validate this method in patients with a wide range of QRS durations (QRSd). Methods: We performed a retrospective analysis of 40 cardiomyopathy patients (Reynolds Study, age 63 ±11, 68% ischemic cardiomyopathy, EF 23 ± 10%) referred for implantable cardioverter defibrillators ± cardiac resynchronization therapy (CRT) with MRI-MT and 12-lead electrocardiograms prior to implant. Results: In 9 control subjects (age 47 ± 13), CURE approached unity (0.96 +/- 0.029 (SD)) and a normal CURE was defined as ≥ 0.90. CM patients had QRSd 124 ± 31 ms (80-220ms) with CURE as follows: CURE≤120ms = 0.82 ± 0.023 (SEM), CURE121-150ms = 0.76 ± 0.038, and CURE>150ms = 0.61 ± 0.046 (p < 0.001 v. CUREnormals for all). Although there was variability, CURE resulted in a stronger correlation between MD and QRSd than previously reported with echocardiography. 5/7 with severe MD received CRT, as did 2/15 with moderate or moderately severe MD, and 5/18 with no or only mild MD. Conclusions: MRI-MT/CURE reveals a greater correlation between QRSd and MD than previously reported and may be superior to current methods of quantifying MD.

2:00 p.m.

906-235   The Value of Repeat SPECT Testing After Initial Normal or Low-Risk SPECT in Patients with Coronary Artery Calcium

John W. Askew, Todd D. Miller, Philip A. Araoz, Jerome F. Breen, David O. Hodge, Raymond J. Gibbons, Mayo Clinic, Rochester, MN

Background: The value of repeat stress single-photon emission computed tomography (SPECT) testing after an initial normal or low-risk SPECT study in asymptomatic patients with coronary artery calcium (CAC) is unknown. The purpose of this study was to determine whether asymptomatic patients with atherosclerosis, indicated by the presence of CAC on electron beam computed tomography (EBCT), are at enough risk for progression of disease to justify repeat stress SPECT imaging after an initial normal-low risk study.
Methods: Retrospective study of 69 asymptomatic patients (mean age of 58.2 ± 7.6 years, 91% male) with the presence of CAC (score >0) on EBCT who underwent repeat stress SPECT imaging within 4 years of their initial normal-low risk study with a summed stress score (SSS) of 0 to 3. The value of repeat SPECT imaging was assessed by detection of a significant change in the repeat SPECT study (progression from a normal-low risk SSS (0 to 3) to an intermediate-risk SSS (4 to 8) or high-risk SSS (>8). Patients were also followed for the occurrence of a clinical event (death, nonfatal myocardial infarction, and/or revascularization). Follow-up was 100% complete at a mean of 4.3 ± 1.6 years.
Results: The median CACS was 443 (range 1 - 2716). The distribution of patients by CACS was as follows: 1 - 10 (n=5, 7.3%), 11 - 100 (n=16, 23.2%), 101 - 400 (n=13, 18.8%), and >400 (n=35, 50.7%). The mean time between the index SPECT study and the repeat SPECT study was 1.9 ± 0.8 years. Only 4 patients (5.8%) had a significant progression in their SPECT risk category (3 to an intermediate-risk SSS and 1 to a high-risk SSS). Significant changes in the SPECT scans only occurred in patients with a CAC score >100; however, the CAC score was not a predictor for significant change in the SSS (p = 0.18). There were only 3 revascularizations (all were percutaneous coronary interventions), yielding a 5-year cumulative probability for revascularization of 5.9% (95% CI 0-12). There were no deaths or non-fatal myocardial infarctions.
Conclusion: Asymptomatic patients with CAC, but an initial normal-low risk SPECT study are not at high enough risk for disease progression to justify repeat stress SPECT within 4 years.

2:00 p.m.

906-236   Increased Aortic Stiffness Predicts Lower Exercise Stress Test Work Capacity in Subjects With Essential Hypertension

Dimitris Syrseloudis, Costas Tsioufis, Kyriakos Dimitriadis, Efstathios Taxiarchou, Dimitris Syrogiannidis, Ioannis Vlasseros, Christodoulos Stefanadis, Ioannis Kallikazaros, Department of Cardiology, Hippokration Hospital, Athens, Greece

Background: Low exercise capacity and impaired aortic mechanics has been associated with adverse cardiovascular outcome. We investigated the interrelationships between treadmill exercise testing parameters and aortic stiffness status.
Methods: In 58 newly diagnosed and untreated hypertensive subjects (40 male) with a negative for ischemia maximal treadmill exercise stress test , carotid to femoral pulse wave velocity (c-f PWV) was determined by means of a computerized method (Complior SP). According to the median value of c-f PWV, subjects were classified to those with increased stiffness (c-f PWV ≥ 7.9, n=28, male=21) and to those with low stiffness (c-f PWV<7.9, n=30, male=19). The two groups were compared regarding work capacity resting and peak exercise blood pressure (BP) parameters and heart rate (HR).
Results: Subjects with increased aortic stiffness compared to those with low stiffness were older by 8.6 years (p<0.001) and had increased waist to hip ratio by 0.036 (p=0.04) while they did not differ regarding body mass index (BMI), smoking status, sex and metabolic profile. Office systolic and diastolic BP, pulse pressure (PP) and HR were higher in subjects with increased stiffness compared to those with low by 12.9 (p=0.001), 4.4 (p=0.04), 8.4 (p=0.006) mmHg and 7.8 bpm (p<0.0005) respectively. Subjects with increased stiffness compared to those with low had a lower amount of work performed by 1.17 METs (p=0.04) and a shorter duration of exercise by 68, 7 sec (p=0.02) and these differences remained significant even after adjustment for a number of confounders. The maximal work capacity was correlated to age (r= -0.4, p<0.0005), BMI (r= -0.3, p= 0.005), c-f PWV (r= -0.4, p=0.003), office PP (r= -0.2, p=0.03) exercise resting PP (r= -0.6, p=0.02) and exercise peak PP (r= -0.6, p=0.01). On multiple regression analysis maximal work performance expressed in METs was associated with BMI, male sex, peak exercise HR and pulse wave velocity (p<0.05 in all cases).
Conclusion: Increased aortic stiffness predicts a lower treadmill exercise test work capacity in subjects with essential hypertension with possible reflections to their overall cardiovascular risk.

E-POSTER SESSION

907

E-Poster Session 907

Sunday, March 25, 2007, 3:00 p.m.-4:00 p.m.
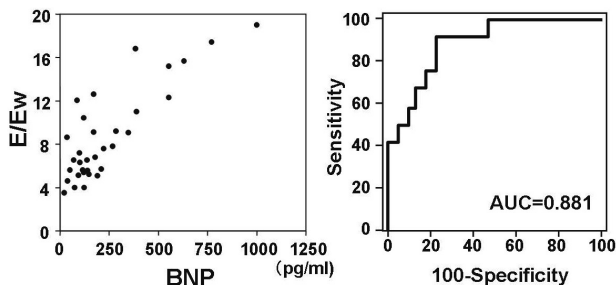Hall H

3:00 p.m.

907-221   **Relationship Between the Ratio of Peak Early Diastolic Transmitral Flow and Mitral Annular Velocities and the Plasma B-Type Natriuretic Peptide (BNP) Concentration in Patients with Atrial Fibrillation: Assessment by Simultaneous Recording of Transmitral Flow and Mitral Annular Velocity**

Kenya Kusunose, Hirotsugu Yamada, Hiroyuki Niki, Tomohiro Nakajima, Koji Yamaguchi, Kunihiko Koshiba, Tomohito Kawano, Takeshi Soeki, Tetsuzo Wakatsuki, Susumu Ito, The University of Tokushima, Tokushima, Japan

Backgrounds: The ratio of the peak early diastolic transmitral flow velocity (E) and mitral annular velocity (Ew) have been established as a reliable index to assess left ventricular filling pressure. The efficacy of the E/Ew has been proposed even in patients with atrial fibrillation (AF), however, E and Ew were measured in the different beats in the previous studies. A newly developed ultrasound machine (Hitachi EUB-7500) has a capability of recording pulsed Doppler waveforms at two different places. We evaluated the usefulness of E/Ew calculated from simultaneously recorded E and Ew in patients with AF.
Methods: Thirty-three patients with nonvalvular AF (9 female and 24 men, age 73±13 years old) underwent routine echocardiographic study. The transmitral flow and lateral mitral annular velocity were recorded simultaneously in 30 seconds. We also evaluated plasma BNP concentration.
Results: There was a positive liner relationship between E/Ew and the plasma BNP concentration (r=0.84, p<0.0001). A cutoff value 7.16 of E/Ew predicted a plasma BNP level of ≥200 pg/ml, with 91.7% sensitivity and 76.2% specificity by ROC analysis. The area under the curve using E/Ew to differentiate plasma BNP level ≥ 200 from <200 pg/ml was 0.88 (Figure).

Conclusions: The Doppler derived index of E/Ew correlates well with BNP in patients with AF and is useful for evaluating the severity of heart failure. The novel dual Doppler technique has an advantage as it provide this index correctly even in patients with AF.

3:00 p.m.

907-222   **A Novel Method For Visualization Of Vortex In LV Using Flow Velocity Vector Estimated From Color Doppler Velocity Data**
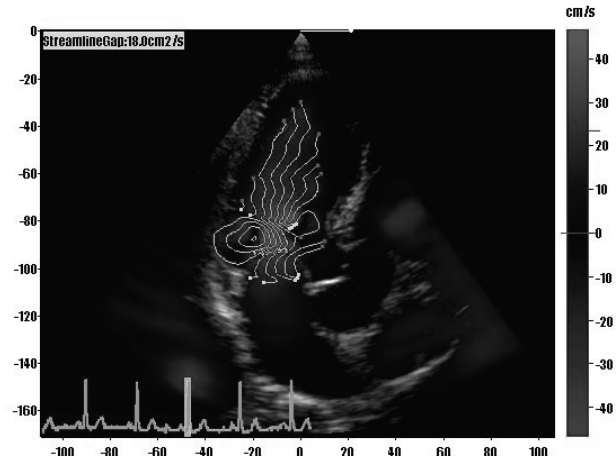
Aya Ebihara, Kansei Uno, Yoko Eto, Motonao Tanaka, Shigeo Ohtsuki, Lijun Yuan, Makoto Sonoda, Haruko Iida, Kenichi Asada, Kazuno Sasaki, Takako Komuro, Reiko Miyazaki, Mayumi Chigira, Yutaka Yatomi, Katsu Takenaka, University of Tokyo, Tokyo, Japan

Backgrounds: Velocity measured by conventional color Doppler is angle-dependent. Therefore, vortex can never be visualized nor measured by this method. "Echodynamography" is a novel technique to estimate the blood flow velocity vector from color-Doppler data. The aim of this study was to assess the feasibility of "Echodynamography".
Methods: We calculated the flow velocity vector from the conventional color-Doppler data conveying only the velocity in the beam direction. The stream-line represents the direction of the velocity vector of the flow and the interval between two adjacent stream lines represents the flow volume. First, we assessed the accuracy of this algorithm by measuring artificially made Rankine's vortex velocity. Then, we applied this method to the color-Doppler data in apical long-axis view of LV obtained from 33 normal subjects and 6 patients with LV dysfunction.
Results: In this study, we could observe the distribution of blood flow stream and velocity vector clearly through an entire cardiac cycle in all the study subjects. In addition, in 22 of 39 cases, we could identify a vortex swirling in the narrow space between the posterior mitral leaflet and the ventricular wall in diastole.
Conclusions: Using "Echodynamography", we could observe the blood flow stream and velosity vector in the LV on the 2D plane with high resolution. With the option to visualize dynamic pressure distribution calculated from the velocity vector, it will be a useful method to evaluate cardiac function.

3:00 p.m.

907-223   **The Actual Condition Of Ulceration And Attenuation In Gray Scale Intravascular Ultrasound By Using Virtual Histology Ivus**

Amano Hideo, Division of interversional Cardiology,Cardiovascular Center,Toho University Omori Medical Center, Tokyo, Japan

Background: There are few reports of how gray scale Intravasucular Ultrasound(IVUS) findings of ulcerated lesions (ulceration) or attenuation echo behind plaque without calcification in coronary artery (attenuation), believed to be strongly associated with peripheral emboli during percutaneous coronary
intervention, appear in Virtual-Histology IVUS (VH). Subjects: Subjects were patients undergoing VH at the time of stenting, with 25 patients showing ulceration, 25 patients exhibiting attenuation, and 70 patients comprising the control group.
Methods: Images displaying ulceration and attenuation in gray scale IVUS were analyzed by VH. With regard to attenuation, only the site of attenuation was analyzed by VH. Tissues were classified into four groups for study: Fibrous (F), fibrofatty (FF), dense calcium (CA) and necrotic core (NC) (all in %).
Results: Ulceration was F (64±10%), FF (15±6%), CA (7±5%), and NC (14±9%), showing no significant difference with the control group. Attenuation was F(64±10%), FF (51±13%), CA (2±2%), and NC (7±7%), with significantly more FF, and less F, CA and NC than the control group (p<0.01, 0.01, 0.05, 0.05, respectively). There were scattered deposits of CA and NC where posterior attenuation began, and components behind this were mainly FF.
Conclusions: There were no consistent VH findings for ulceration, with it believed that vulnerable plaque had been carried to the peripheries after plaque rupture. For attenuation, as fibrofatty was the main component behind the interspersions of calcium and necrotic core, it was suggested that fibrofatty plaque is associated with the cause of peripheral emboli.
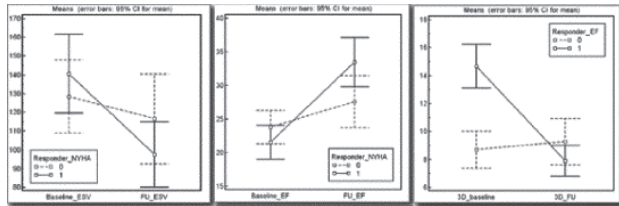
3:00 p.m.

907-224   **Real-time Three-dimensional Echocardiography And Its Potential Role In Cardiac Resynchronisation Therapy Patient Selection-Ready For Prime Time?**

Emily Ho, Stamatis Kapetanakis, Peter Pearson, Amit Bhan, Bushra Rana, Francis Murgatroyd, Mark J. Monaghan, King's College Hospital, London, United Kingdom

Background: A significant proportion of patients with severe heart failure who fulfil current criteria for cardiac resynchronisation therapy (CRT) fail to respond to treatment. We evaluated real-time 3D echocardiography (RT3DE) quantification of left ventricular (LV) mechanical dyssynchrony in predicting response to CRT.
Methods: In eighty-one consecutive patients (84% male, age 70 ±10 years) undergoing CRT, RT3DE assessment of LV volumes, ejection fraction (EF), global and regional dyssynchrony was carried out pre-implant and at 6 months follow-up.
Results: Forty-five patients showed a response to CRT with evidence of LV reverse remodelling (LV end-systolic volumes (LVESV) 140 ± 72 ml to 98 ± 59 ml, $p < 0.0001$), EF (22 ± 8.5% to 33 ± 12%, $p < 0.0001$) and NYHA improvement (3.2 ± 0.4 to 2.1 ± 0.7, $p < 0.0001$). The remaining 31 patients showed no response to CRT (LVESV 128 ± 59 ml to 116 ± 73 ml, $p = 0.2$; EF 24 ± 7.5% to 28 ± 12%, $p = 0.05$; NYHA 3.1 ± 0.3 to 2.9 ± 0.6, $p = 0.02$). Those who responded to CRT had a significant improvement in dyssynchrony (14.7 ± 5.4 to 7.9 ± 3.9, $p < 0.0001$), in contrast to those who did not (8.8 ± 3.9 to 9.3 ± 4.7, $p = 0.5$). The AUC for RT3DE in predicting response to CRT was 0.81 (95% CI 0.71 to 0.89, $p < 0.0001$). On multivariate analysis factoring in age, gender, aetiology, QRS duration and medication, RT3DE dyssynchrony was the only strong predictor ($p = 0.0008$) of response to CRT.

Responder and non-responder LV end-systolic volume (ESV), ejection fraction (EF) and RT3DE dyssynchrony (SDI) at baseline and 6 month follow-up (FU).

Conclusion: RT3DE-derived LV dyssynchrony is a strong predictor of response to CRT, with an excellent potential role in patient selection.

3:00 p.m.

907-225   Prognostic Significance Of Renal Function In Patients Undergoing Dobutamine Stress Echocardiography For Detection Of Coronary Artery Disease.

Stefanos E. Karagiannis, Harm H.H. Feringa, Abdou Elhendy, Ron van Domburg, Radosav Vidakovic, Jeroen J. Bax, George Athanassopoulos, Dennis V. Cokkinos, Don Poldermans, Erasmus MC, Rotterdam, The Netherlands, Onassis Cardiac Surgery Center, Athens, Greece

Background: The value of dobutamine stress echocardiography (DSE) among the entire strata of renal function has not been determined. We assessed the prognostic value of renal function relative to DSE findings.
Methods: We studied 2292 patients, 1015 (44%) with normal renal function (creatinine clearance (CrCl) > 80ml/min) and 1277 (66%) with renal dysfunction classified as mild (CrCl: 60-80ml/min, 647 patients), moderate (CrCl: 40-60ml/min, 403 patients) and severe (CrCl < 40ml/min, 227 patients). All underwent DSE for evaluation of coronary artery disease and were followed for a mean of 8 years.
Results: New WMA during DSE and mildly, moderately and severely abnormal CrCl were powerful independent predictors for all cause mortality (HRs, (95%CIs), 1.8 (1.5-2.1), 2.0 (1.5-2.5), 3.9 (3.0-4.9),5.5 (4.2-7.1), cardiac death (2.7 (2.1-3.6),2.4 (1.7-3.3),5.0 (3.7-6.9),6.1 (4.3-8.7) and hard cardiac events (2.3 (1.8-3.0),2.0 (1.5-2.6),3.6 (2.7-4.7),4.8 (3.5-6.5). Kaplan-Meier curves demonstrated that patients with normal DSE and renal dysfunction have greater probability for cardiac death and hard cardiac events compared to those with normal renal function The warranty of a normal DSE in the presence of mild, moderate and severe renal dysfunction was respectively 48, 36 and 6 months.

Kaplan-Meier curves for cardiac death (A and B) and hard cardiac events (C and D) in patients with NWMA and > 4 abnormal segments in DSE and according to renal function.

Conclusions: Renal dysfunction has additional independent prognostic value over DSE findings. The low risk warrantee period after a normal DSE is determined by the presence and the severity of renal dysfunction.

3:00 p.m.

907-226   Safety and Efficacy of Intermediate Dobutamine Stress Imaging With Real Time Perfusion Echocardiography in the Elderly

Feng Xie, Edward O'Leary, Saritha Dodla, Thomas R. Porter, University of Nebraska Medical Center, Omaha, NE

Background. It has been shown that myocardial perfusion (MP) abnormalities, analyzed with real time perfusion echocardiography (RTPE) and continuous infusions of microbubbles, precede wall motion (WM) abnormalities during dobutamine stress (DS).We therefore hypothesized that MP analysis with RTPE may permit early detection of coronary artery disease (CAD) during DS in an elderly subgroup at risk for DS complications.
Methods. In 67 patients >65 years old who had inducible WM or MP at peak DS (>85% predicted maximum heart rate), MP in each of the three coronary artery territories (CAT) was analyzed by an independent reviewer at an intermediate stage (80-120 beats per minute). In 31 of these patients, MP and WM variables were compared with quantitative

coronary angiography (QCA) using a > 50% diameter stenosis as abnormal.
Results. MP defects at intermediate DS were seen in 42 of 53 CAT (79%) that developed WM abnormalities at peak DS. In the 44 patients who had inducible WM abnormalities at peak DS, 35 (80%) already had a MP defect at intermediate stress. Using QCA as a reference, the sensitivity of intermediate stress MP was lower than MP at peak DS, but accuracy was not significantly different from WM or MP analysis at peak DS(Table). Complications at peak DS (atrial fibrillation in 5 patients, chest pain in 11 patients) were not present at intermediate DS.
Conclusion: Detection of CAD in the elderly is possible with RTPE using an intermediate level of DS, and may prevent the need and risk of proceeding to peak DS.

Sensitivity and Accuracy at Intermediate and Peak DS

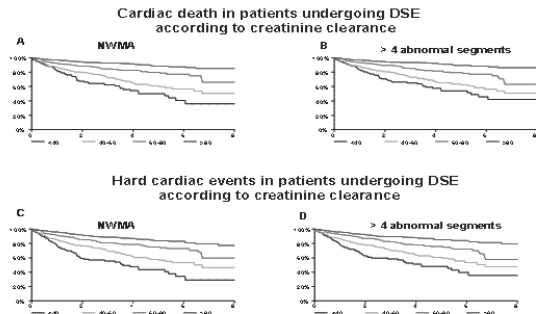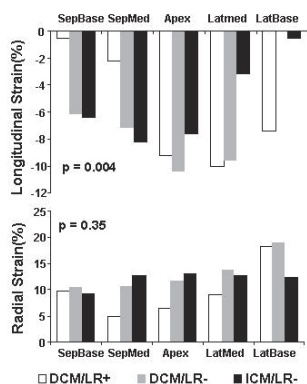|	Intermediate DS	Peak DS	
MP Sensitivity	Myocardial Perfusion	Myocardial Perfusion	Wall Motion
Sensitivity	76%	96%	88%
Accuracy	71%	81%	77%

3:00 p.m.

907-227   Tissue Doppler Echocardiographic Evidence of Primary Atrial Mechanical Dysfunction in Hypertrophic Cardiomyopathy

Cinzia Cianfrocca, Francesco Pelliccia, Antonio Auriti, Vincenzo Guido, Vincenzo Pasceri, Sabina Ficili, Giuseppe Richichi, Massimo Santini, San Filippo Neri Hospital, Rome, Italy

Background: Atrial abnormalities are common in hypertrophic cardiomyopathy (HC) but it is unclear if they are the consequence of ventricular impairment or are determined primarily by the myopathic process 'per se'. Accordingly, we assessed the relation of Tissue Doppler Imaging indexes of right atrial (RA), left atrial (LA), and interatrial septum (IAS) function to clinical and echocardiographic factors in HC.
Methods: We compared 20 HC patients (Gr.A, age: 46±12 years) with 20 age- and sex-matched patients with LV hypertrophy due to essential hypertension (Gr.B, age: 47±11 years). All patients had echocardiography with color-coded Tissue Doppler Imaging and both the peak atrial contraction velocity (V(A)) and the timing of mechanical events were assessed off-line at the LA and RA free walls and IAS.
Results: The two groups did not show any significant difference in functional class or other clinical features. Gr.A and Gr.B patients had similar LV mass index (175±55 vs 199±61 g/m²), LV end-diastolic diameter (45±11 vs 48±15 mm), and LV ejection fraction (70±11 vs 67±12%). Also, the two groups showed no difference in RA and LA dimension, area and maximal volume, as well as in LV diastolic performance (i.e. early diastolic velocity/early diastolic mitral annular velocity: 10.2±4.9 vs 9.5±2.9, NS). As compared with Gr. B, conversely, Gr.A patients showed significantly lower values of V(A) in the LA (5.0±2.6 vs 7.7±2.6 cm/s, p=0.002), RA (6.8±3.1 vs 9.2±2.9 cm/s, p=0.016) and IAS (4.6±1.7 vs 5.7±1.6, p=0.042). Inter-atrial delays for the onset and peak atrial contraction between RA and LA were similar in the two groups. By multivariate regression analysis, no index related to LA size in Gr.A, whereas severity of LV diastolic dysfunction (p=0.013) and LV mass (p=0.023) had the largest effects on LA volume in Gr.B.
Conclusions: Tissue Doppler Imaging indexes of atrial mechanical dysfunction are worse in patients with primary vs secondary LV hypertrophy, and relate to LV diastolic dysfunction and LV mass in secondary but not in primary forms of LV hypertrophy. These findings are consistent with the concept that both atria are primarily involved by the cardiomyopathic process in HC.

3:00 p.m.

907-228   Longitudinal Rotation of the Left Ventricle is a Marker of Asymmetric Strain Distribution

Zoran Popovic, Ali Ahmad, Deborah Agler, Neil L. Greenberg, Richard A. Grimm, James D. Thomas, Cleveland Clinic, Cleveland, OH

Background: Patients who are candidates for cardiac resynchronization therapy (CRT) frequently display systolic clockwise rotation of the left ventricle (LV) when imaged in a 4-chamber plane. Here we examine if this longitudinal rotation (LR) is associated with asymmetric distribution of LV strains.
Methods: We used our pre-CRT echocardiography database to select DCM patients with marked clockwise LR (DCM/LR+; n=10), DCM patients with minimal LR (DCM/LR-; n=5), and ischemic cardiomyopathy patients with minimal LR (ICM/LR-; n=5). Segmental longitudinal and radial strains were calculated from high frame rate 2-dimensional echocardiography by EchoPac software (Ge Medical).
Results: Average LR in DCM/LR+ group was -9.7±3.0°, -1.3±1.4° in DCM/LR - group, and 1.7±2.6° in ICM/LR - group. ICM/LR- patients had lower LV end-systolic volumes than DCM/LR- and DCM/LR+ patients (p <0.03 for both), and higher LV ejection fraction than DCM/LR+ patients (p = 0.04). While average longitudinal strains were similar in 3 groups (p = 0.57), pattern of longitudinal strain distribution was markedly different, with DCM/LR+ having lower septal and higher basal strains than either DCM- or ICM- group (p = 0.004)(Figure). Radial strains were similar in 3 groups both in its average value (p=0.57) and in its pattern of distribution (p=0.35).
Conclusion: LR reflects asymmetric distribution of LV longitudinal strains. LR may be used as a simple marker of LV dyssynchrony.

(71%) specificity, 77% (72%) PPV, and 50% (55%) NPV. Respective values on QCA were 63% (54%), 47% (82%), 68% (82%), and 41% (54%). There was good (r=.68) correlation between CT functional analysis and MPI for detection of regional functional abnormalities. **Conclusions:** CTA and QCA identify coronary stenosis yet have only moderate correlation with ischemia demonstrated on MPI. CTA and MPI regional wall motion analysis correlate well. CTA may replace invasive catheter angiography in a MPI-based algorithm for workup of patients with known or suspected CAD.

3:00 p.m.

907-231   **Cardiac Computed Tomography Measurement of Aortic Annular Diameter: Implications for Percutaneous Aortic Valve Implantation**

David A. Wood, Sanjeevan Pasupati, Mann Chandavimol, Karin Humphries, Chris Thompson, John Mayo, John Webb, University of British Columbia, Vancouver, BC, Canada

Background: Percutaneous aortic valve (AV) implantation is a new technique for treating patients with severe symptomatic aortic stenosis (AS). Correct sizing of the implanted valve is critical to prevent dislodgement or perivalvular leak. Compared to open heart surgery where the valve size is determined using a sizing ring, valve size in percutaneous implantation is determined using either echocardiographic or angiographic imaging. AV measurements in calcific AS are often dramatically different between these two techniques. At present, no gold standard exists for determining the aortic annular diameter prior to valve implantation. We sought to explain the discrepancy between echocardiographic and fluoroscopic annular measurements using 3D reconstructed contrast enhanced Cardiac Computed Tomography (CCT).
Methods: 11 patients with percutaneous AV implantation had preoperative transthoracic echocardiograms (TTE), ascending aortic arch angiograms, and cardiac gated CT scans. Aortic annular diameter was measured in the parasternal long axis on TTE and in the posterior-anterior projection on angiography. Cardiac gated CCT images were acquired at 0.75 mm thickness and reconstructed using an intermediate spatial frequency algorithm at 0.4 mm spacing using a Siemens Sensation 64 CT Scanner. 3D images of the AV in diastole (50-65% of the RR interval) were generated using 3D software on a Siemens Leonardo work station. The annulus was measured using electronic calipers on double oblique sagittal and coronal images at a window width of 1100 HU and level of 500 HU.
Results: Aortic annular measurements by angiography were greater than those obtained by TTE [Bland-Altman plot; Bias (95%CL): 2.0 (-0.2, 4.2) mm]. Five of the eleven patients had the appearance of oval shaped valves with elongation in the coronal projection on CCT. The coronal view measurements for these patients were greater than those obtained in the sagittal view.
Conclusions: The aortic annular diameter appears larger on angiography than on echocardiography as the severely calcified AV may be captured in its elongated coronal projection. Improved understanding of aortic annular geometry may help refine percutaneous AV implantation
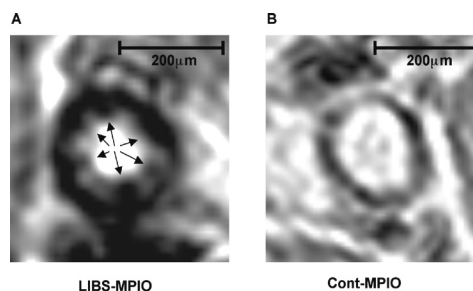
3:00 p.m.

907-232   **Activated Platelets Can Be Imaged By Activation-specific Glycoprotein IIb/IIIa Antibodies Conjugated To Iron Oxide Microparticles In An *Ex Vivo* Magnetic Resonance Imaging Mouse Model**

Constantin von zur Mühlen, Ziad Ali, Jürgen Schneider, Martina McAteer, Keith Channon, Christoph Bode, Karlheinz Peter, Robin Choudhury, University of Freiburg, Freiburg, Germany, University of Oxford, Oxford, United Kingdom

Background: Ruptured atherosclerotic plaques are lined with activated platelets We evaluated whether microparticles of iron oxide (MPIO) coupled to single-chain antibodies against ligand-induced binding-sites (LIBS) specific for the activated form of glycoprotein IIb/IIIa (GPIIb/IIIa) could image platelets using MRI in a mouse model.
Methods/Results: 1μm sized MPIOs were conjugated to anti-LIBS single-chain antibody (LIBS-MPIO) or a non-specific antibody (cont-MPIO). Dense platelet adhesion on mouse femoral arteries was induced by wire injury. Mice were sacrificed and perfused with cont-MPIO or LIBS-MPIO via the left ventricle. MRI was performed at 11.7 T, a 3D gradient echo (TR=30ms/TE=6ms) sequence was used with a resolution of 25 μm^3. Bound MPIOs appeared as circular low signal areas in the lumen (Figure A). Quantified by MRI low signal areas were more frequent with LIBS-MPIO than cont-MPIO (23.7 vs 6.2 p<0.01). Histology confirmed significantly greater binding of LIBS-MPIO (9.98 vs 0.5 beads/section; p<0.01). Low signal zones on MRI and MPIOs in the histological sections correlated strongly (R^2=0,72; p<0.001).
Conclusions: (1) LIBS-MPIO specific for activated GPIIb/IIIa-receptor on platelets provide a *functional* molecular MRI contrast agent (2) Bound MPIOs are readily identified with MRI (3) MRI provides quantitative data on MPIO binding. (4) This provides a promising basis for the use of this contrast imaging strategy to identify activated platelet thrombi found on ruptured plaques.

LIBS-MPIO

Cont-MPIO

3:00 p.m.

907-229   **Plaque Morphology in Coronary Arteries and Extent of Visceral Fat Mass as Assessed by 64-Row Multidetector Computed Tomography in Patients with Ischemic Heart Disease**

Fumie Kureha, Atsushi Yamamuro, Minako Katayama, Tomoyuki Oda, Natsuhiko Ehara, Makoto Kinoshita, Koichi Tamita, Shuichiro Kaji, Tomoko Tani, Kazuaki Tanabe, Shigefumi Morioka, Yasuki Kihara, Kobe General Hospital, Division of Cardiovascular medicine, Kobe, Japan

Background: Patients with metabolic syndrome are regarded as high-risk candidates for acute coronary syndrome. Visceral obesity is the primary factor of this syndrome; however, the relationship between the fat burden and the character of coronary plaques is unknown. The 64-row multidetector computed tomography (64-MDCT) might simultaneously provide quantitative information about visceral fat mass and the coronary plaques.
Methods: We studied 109 consecutive patients (mean age 64.5±11.5, 63 males) who were likely to have coronary artery disease, while excluding those with post perctaneous coronary intervention and coronary artery bypass grafting. All patients underwent CT-coronary angiography (CTA) by 64-MDCT (LightSpeed VCT, GE; rotation time 350 ms, slice thickness 0.625 mm, with a retrospective ECG gating). The abdominal fat scan at the umbilical transverse section was obtained at the same time. We divided the patients into two groups (A group, n=49, with visceral fat area≥100 cm^2 and B group, n=60, with visceral fat area<100 cm^2). The coronary plaques were assessed by the number per patient, the remodeling index (RI), and by the calcified score (C: non, spotty, or diffusely calcified).
Results: The number of patients with calcified plaque and without significant coronary plaques was not different between the two groups. There was a non-significant trend for an association about the number per patients with non- and spotty calcified plaques. (non-, A vs. B = 0.33±0.08 vs. 0.28±0.07, p=0.69; spotty, A vs. B = 0.41±0.12 vs. 0.18±0.07, p=0.10). Besides, RI of coronary arteries was not significantly changed (A vs. B = 1.29±0.05 vs. 1.27±0.05, p=0.80).
Conclusion: Non-invasive assessment of coronary lesions by 64-MDCT might provide an early detection and the risk stratification of the vulnerable patients. However, sub-clinical atheromatous plaques in coronary arteries may not, at least directly, correlate to the presence of visceral obesity.

3:00 p.m.

907-230   **Comparison of 64-slice CT Coronary Angiography with CT Cardiac Function Analysis and Quantitative Catheter Angiography to Myocardial Perfusion Imaging for Predicting Functionally Relevant Coronary Artery Stenosis**

Christian Thilo, Sal Chiaramida, Peter Zwerner, Shaun A. Nguyen, Philip Costello, U. Joseph Schoepf, MUSC, Charleston, SC

Background: We compared 64-slice CT angiography (CTA) with and without functional analysis to quantitative catheter angiography (QCA) for predicting ischemia on myocardial perfusion imaging (MPI).
Methods: 42 patients with suspected/known coronary artery disease (CAD) underwent 64-slice CTA (Siemens), QCA, and gated SPECT MPI. CTA and QCA were analyzed for ≥50% and ≥70% stenosis. MPI studies were evaluated for the presence and location of perfusion deficits. CTA without and with functional analysis (Terarecon) was compared with QCA for predicting ischemia on MPI.
Results: 176 coronary arteries were analyzed. CTA and QCA detected ≥50% stenosis in 36 and 39 (p=.94) and ≥70% in 27 and 25 (p=.78) vessels. For predicting matching ischemic areas on MPI, ≥50% (≥70%) stenosis on CTA had 44% (35%) sensitivity, 84% (90%) specificity, 53% (63%) PPV, and 79% (75%) NPV. For QCA, results were 47% (31%), 83% (94%), 54% (74%), and 79% (73%) respectively. Stenosis ≥50% (≥70%) in any vessel on CTA predicted ischemia on MPI in any region with 63% (57%) sensitivity, 67%

3:00 p.m.

907-233   Intramyocardial Allogeneic Mesenchymal Stem Cells Reduce Infarct Size in a Porcine Model of Chronic Ischemic Cardiomyopathy

Karl H. Schuleri, Marco Centola, Jeffrey M. Zimmet, Andrew J. Boyle, Gary S. Feigenbaum, Alan W. Heldman, Albert C. Lardo, Joshua M. Hare, Johns Hopkins University, Baltimore, MD

Background: While several studies show that sub-acute intra-myocardial injection of allogeneic mesenchymal stem cells (MSC) prevent remodelling after myocardial infarction (MI) and improve Left ventricular injection fraction (LVEF), it is unknown whether this therapy can achieve reverse remodelling in the chronic injured heart. Therefore, we hypothesized that MSCs reduce infarct size and stimulate cardiac regeneration in chronic ischemic cardiomyopathy.
Methods: Adult Göttingen minipigs underwent 120 to 150 minute coronary artery occlusion followed by reperfusion, resulting in a reproducible transmural infarction and ischemic cardiomyopathy. Mean infarct size at 3 months post-MI was 15.5 ± 1.3% of LV volume, and LV ejection fraction was 32 ± 1.4% with no difference between study groups. At this time point, pigs were randomized to endomyocardial injection of placebo (n=5) or 200 million allogeneic MSC (n=6) at ~15 sites in the infarct and border zone. No difference in mortality was observed between groups.Serial cardiac MR imaging was performed prior to cell injection, and at 1, 4, 8 and 12 weeks after the procedure to evaluate infarct size and LV function.
Results: MSC therapy resulted in 7.72 ± 4.71% and 7.93±5.4% reduction in infarct size at 8 and 12 weeks respectively (p<0.05). In contrast, control animals showed infarct expansion during the same period of 22.58±5.7%.
Interestingly, this change evolved over 8 weeks - a time scale consistent with previous findings in acute MI models. However, LVEF did not change during the 12 week follow-up period in either group. None of the MSC animals were inducible in elctrophysiological studies at 12 weeks.
Conclusions: Together our results demonstrate that MSC therapy reverses remodelling and reduces infarct size and is not complicated by pro-arrhythmic potential in an adult porcine model of chronic ischemic cardiomyopathy.
These findings support the conduct of clinical trials of MSC therapy in patients with chronic ischemic cardiomyopathy.

3:00 p.m.

907-235   Gender Normal Limits for Dipyridamole Induced Changes in Left Ventricular Volumes and Transient Dilatation with RB-82 PET Imaging

Dalia Y. Ibrahim, Bret A. Rogers, Wael A. Jaber, Frank P. DiFilippo, Richard C. Brunken, Manuel D. Cerqueira, Cleveland Clinic, Cleveland, OH

Background: Dipyridamole-stress Rb-82 PET offers superior spatial resolution and image quality over SPECT especially in obese patients and women. Since methods of quantitative analysis are not available due to absence of defined normal limits, we defined normal limits for rest and stress volumes and transient LV dilatation (TD) for dipyridamole PET studies.
Methods: We identified 50 patients referred for clinically indicated PET MPI studies with normal perfusion and LV function and a <10% 10 year Framingham risk. Studies were acquired on a Siemens HR+ using conventional protocols and processing. Rest and stress volumes and TD were measured using 4DM SPECT with visual adjustment of valve planes and contours.
Results: There were 27 males (age 54 ± 8years) and 23 females (age 57 ± 11 years). For the group, the mean±1SD and range for rest, stress and TD were 56±24 (18-112 mL), 53±24 (16-114 mL), and 0.96±0.11 (0.75-1.18) respectively. In analysis by gender, males had greater rest and stress volumes than females, 67±27 versus 42±20 (p= 0.0008) and 63±28 versus 42±20 (p= 0.005). TD was 0.93±0.09 in males and 1.00±0.1 in females (p=0.04).
Conclusions: Using a cohort of low-likelihood patients we developed dipyridamole Rb PET normal reference limits for stress-induced changes in LV volumes and TD. There were gender differences in absolute rest and stress volumes and TD. These differences need to be considered in assessing the results of testing based on quantitative normal file comparison.

Group and Gender Specific Volumes and TD Ratio:

	Group (n=50)Mean± SD(Range)	Male (n=27)	Female (n=23)	p value
Rest Volumes	56 ± 24 (18-112)	67±27	42±20	0.0008
Stress Volumes	53± 24 (16-114)	63±28	42±20	0.005
TD	0.96± 0.11(0.75-1.18)	0.94±0.09	1.00±0.10	0.04

3:00 p.m.

907-236   Impact of Exercise Training in the Cardiac and Autonomic Dysfunctions After Myocardial Infarction in an Experimental Menopause Model

Lucinar Flores, Iris Sanches, Luciana Jorge, Marcelo Heeren, Bruno Rodrigues, Maria Irigoyen, Kátia De Angelis, Sao Judas Tadeu University, Sao Paulo, Brazil, Heart Institute (InCor), University of Sao Paulo, Medical School, Sao Paulo, Brazil

Background: Cardiac dysfunction and baroreflex sensitivity (BRS) impairment have been consistently associated with increased mortality risk after myocardial infarction (MI). Menopause induces increase in cardiovascular risk in women. On the other hand, exercise training has been recognized as a non pharmacological treatment for cardiovascular disease. The aim of the present study was to investigate the effects of

exercise training on cardiac function, arterial pressure (AP) and BRS in ovariectomized rats submitted to MI.
Methods: Female Wistar rats (220±5g) were divided into: sedentary ovariectomized+MI (SOI, n=8) and trained ovariectomized+MI (TOI, n=10). MI was induced by left coronary artery ligation 2 days after ovariectomy. TOI group was submitted to an exercise training protocol on treadmill for 8 weeks (1h/d; 5d/wk; 50-65% VO2max.). The left ventricular (LV) function was evaluated by LV catheterization. AP signals were recorded using a data acquisition system (CODAS, 2 KHz). BRS was evaluated by the tachycardic (TR) and bradycardic (BR) responses to AP changes induced by sodium nitroprusside and phenylephrine.
Results: The MI size was similar between MI groups (~45% LV wall). The LV systolic pressure (LVSP) was similar between studied rats (SOI: 117±4 vs. TOI: 128±5 mmHg). The LV +dP/dt and -dP/dt were impaired in SOI group (5973±568 and -4703±418 bpm/mmHg) in relation to TOI group (7905±668 and -6724±846 bpm/mmHg). The SOI group showed mean AP reduction (103±2 mmHg) as compared to TOI group (113±3 mmHg). Exercise training induced improvement in TR (4.3±0.3 vs. 2.6±0.2 bpm/mmHg in SOI) and BR (-1.68±0.1 vs. -1.08±0.2 bpm/mmHg in SOI) in TOI rats when compared to SOI rats. The BR was correlated with LVSP (r=-0.6), +dP/dt (r=-0.7) and -dP/dt (r=0.9). Additionally, correlations were obtained between TR and LVSP (r=0.7) and -dP/dt (r=-0.7).
Conclusions: These data indicated that exercise training in female rats submitted to ovarian hormones deprivation and MI induces attenuation of LV dysfunction, probably associated with an improvement on BRS, suggesting a positive role of physical training in the management of cardiovascular risk in postmenopause infarcted women.

E-POSTER SESSION

908

E-Poster Session 908

Sunday, March 25, 2007, 4:00 p.m.-5:00 p.m.
Hall H

4:00 p.m.

908-221   Segmental Diastolic Functional Change due to Myocardial Ischemia and its Persistence: 2-D Strain Analysis

Sungwon Cho, Yong Bin Song, Sang-Chol Lee, Seung Woo Park, Sang Hoon Lee, Samsung Medical Center, Seoul, South Korea

Background: Myocardial diastolic dysfunction due to transient ischemia has been briefly reported to persist for few minutes to few weeks. We sought to validate this phenomenon by performing a 2-D strain analysis of segmental myocardial diastolic functional changes due to transient ischemia by coronary artery spasm provocation.
Methods: Twenty-one patients who underwent coronary angiography and spasm provocation test for diagnosis of variant angina were evaluated prospectively. Segmental diastolic function was evaluated following the provocation by echocardiography; a 6-segment analysis was performed in apical 4-chamber and parasternal short axis views (papillary muscle level). Segmental 2-D strain and strain rate (SR) were evaluated offline in each segment. For estimation of the segmental diastolic function, the '2-D strain diastolic index (%)', which is the ratio of time from end systolic to early diastolic peak SR (peak SR_E) divided by total diastolic time, was measured. Echocardiography was performed within 30 minutes after the provocation and at 4 weeks after the provocation. Difference in this index between ischemic & nonischemic segments and its persistence were evaluated.
Results: Among the 21 subjects, 12 patients showed positive coronary artery vasospasm. Ischemic segments summed up to 27 and nonischemic segments were 99 in total. There was no residual global or segmental systolic dysfunction on echocardiography following the provocation. However, the longitudinal 2-D strain diastolic index (SrL) was 26.06±12.21% in the ischemic segments and 20.70±8.84% in the nonischemic segments (p=0.01). This finding persisted at 4-week follow-up (24.20±7.04% in ischemic vs 19.83±6.59% in nonischemic segments, p=0.02). No such findings could be found in circumferential 2-D strain diastolic index (SrC).
Conclusions: Segmental changes in myocardial diastolic function can be found after transient ischemia which persists for weeks. This is the first report validating the presence of persistent diastolic functional change after transient myocardial ischemia, which has been recently proposed.

4:00 p.m.

908-222   The Association of Chronotropic Responses with C-Reactive Protein Level and Echocardiographic Parameters

HyungSeop Kim, YunKyeong Cho, ChangWook Nam, SungWook Han, SeungHo Hur, YoonNyun Kim, KwonBae Kim, Keimyung university, daegu, South Korea

Background: The aim was to investigate the association of inflammatory marker and echoparameters with impaired chronotropic response during treadmill test.
Methods: We enrolled 151 patients underwent treadmill exercise test. Conventional echocardiography with tissue Doppler imaging (TVI) of mitral annulus motion was conducted in the simultaneous day. TVI was performed at the septal side of the mitral annulus, using apical 4 chamber view. Serum for the level of C-reactive protein (CRP) was obtained for the inflammatory activity. Chronotropic incompetence (CI) was defined as failure to achieve 85% of the age predicted maximum heart rate.
Results: Of no evidence of coronary artery diseases, 36 (24%) exhibited CI. The patients with CI showed lower TVI of mitral annulus systolic velocity (E'), higher mitral inflow to early diastolic tissue velocity ratio (E/E') and CRP. Simple linear regression analysis

showed the chronotropic response was negatively correlated with the value of CRP and E/E' ratio. By multivariate analysis, impaired chronotropic responses were significantly associated with the increased E/E' ratio and CRP level.And the patients with increased E/E' ratio were more often older and more likely to have a low metabolic equivalents of oxygen consumption with impaired chronotropic response.

Conclusions: : Impaired chronotropic response with the subtle change of inflammatory marker or echocardiographic parameters may contribute to the increased risk of cardiovascular disease.

4:00 p.m.

908-223   **Novel Assessment of Aortic Stenosis Using Real-time Three Dimensional Echocardiography: Comparison of Continuity Equation Derived Aortic Valve Area with Planimetry**
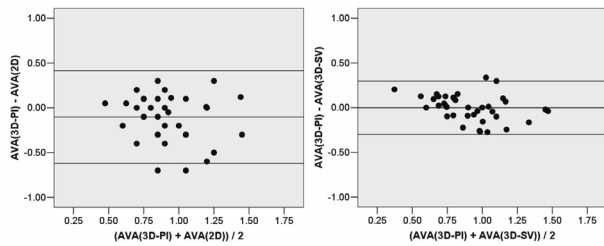
Kian Keong Poh, Jorge Solis, Mary Flaherty, Yue-Jian Kang, Robert A. Levine, Judy Hung, Massachusetts General Hospital and Harvard Medical School, Boston, MA

Background: Real time three dimensional (RT3D) echocardiography allows measurement of the smallest aortic valve area (AVA) in aortic stenosis (AS). In addition, RT3D color flow mapping enables quantitation of left ventricular outflow tract (LVOT) stroke volume (SV) for more accurate continuity equation (CE) derived AVA. We hypothesize that CE-AVA derived from RT3D flow (AVA_{3D-SV}) correlates and agrees better with directly planimetered values (AVA_{3D-PI}) than CE-AVA derived from two dimensional (2D) Doppler (AVA_{2D}) that assumes uniform subvalvular velocity.
Methods: We prospectively enrolled 38 AS pts (75±10 yrs). In addition to AVA_{2D}, RT3D AVA was calculated in 2 ways: First, color Doppler datasets incorporating the LVOT were obtained. Using a hemispheric sampling curve placed perpendicular to the direction of flow (Tomtec), flow velocity profile and aortic SV were calculated. AVA_{3D-SV} was obtained by dividing by time-velocity integral of continuous wave Doppler profile. Second, RT3D was used to directly measure AVA_{3D-PI} using cropping methods to align plane at narrowest orifice.
Results: AVA_{3D-SV} correlated better with AVA_{3D-PI} than AVA_{2D} (r = 0.81 vs 0.51, z = -2.4, P = 0.018; SEE = 0.14 vs 0.24, F-test P < 0.005). In addition, AVA_{3D-SV} agreed better with AVA_{3D-PI} than AVA_{2D} (mean difference = -0.001±0.15 cm² vs -0.10±0.26 cm², P = 0.038; Bland-Altman plot).
Conclusion: CE derived AVA using RT3D color flow mapping is more consistent with planimetered area compared to using conventional 2D method.

4:00 p.m.

908-224   **Washout Ratio of ^{123}I-BMIPP Myocardial Scintigraphy Predicts Negative Cardiac Remodeling After Acute Myocardial Infarction. Comparison With Three-dimensional Echocardiography**

Nobuyuki Masaki, Yoshiaki Maruyama, Toshihiko Nishioka, Hiroyuki Ito, Nobuo Yoshimoto, Makoto Suzuki, Akihiko Matsumura, Yuji Hashimoto, Kameda Medical Center, Kamogawa, Japan, Saitama Medical Center, Kawagoe, Japan

Background: Early prediction of future cardiac remodeling in patients with acute myocardial infarction (AMI) is important to know their prognosis. Recently, 3-dimensional echocardiography (3DE) analysis is considered more accurate for cardiac volume measurements. ^{123}I-BMIPP myocardial scintigraphy (BMIPP) differentiates ischemic myocardium where fatty-acid metabolism is impaired and recoverable.
Purpose: To investigate the relation of BMIPP washout ratio (WR) to negative cardiac remodeling (NR) measured by 3DE after AMI.
Methods: Consecutive 51 AMI patients (62 ±11y/o) with successful recanalization therapy underwent BMIPP/^{201}Thallium(TI) dual scintigraphy within 2 weeks after the onset. Full-volume images were obtained using 3-dimensional image transducer (×4, SONOS 7500, Phillips) at 2 weeks and 6 months. End-systolic volume (ESV) and end-diastolic volume

(EDV), and ejection fraction (EF) were measured off-line using 4DLV analysis software (TomTec). NR was defined as the percent change of EDV (delta%EDV) < -20%.
Results: The EDV, ESV, and EF measured by 3DE were not significantly different between 2 weeks and 6 months (EDV 80±23 and 79±26ml, ESV 37±20 and 37±22ml, EF 56±11 and 56±11%, respectively). The peak creatine kinase and TI extension score, indicating infarction size, correlated with the 3DE measurements more than conventional biplane. However, they did not influence on delta%EDV. Average, maximum, and minimum WR were predictors of delta%EDV in both 3DE (R= 0.342, 0.406, 0.288, P= 0.014, 0.003, 0.041, respectively) and biplane (R=0.258, 0.283, 0.278, P= 0.068, 0.045, 0.048, respectively). The maximum WR could predict NR; cut-off value 41%, sensitivity 71.4%, specificity 88.4% and area under the curve (AUC) 0.83 in receiver-operator characteristic (ROC) curve. In a subgroup of 27 patients with anteroseptal AMI, the maximum WR also correlated with delta%EDV (R=0.523, P=0.005) and could predict NR; cut-off value 41%, sensitivity 80.0%, specificity 81.8% and AUC 0.86.
Conclusions: High BMIPP WR within a risk area after reperfusion in patients with AMI resulted in NR after 6 months. In this study, 3DE was a powerful modality to monitor left ventricular volume change after AMI.

4:00 p.m.

908-225   **Calculation Of Peak Filling Rate By Real-time Three-dimensional Echocardiography For Detection Of Diastolic Abnormalities During Adenosine Stress Nuclear Perfusion Imaging**

Ebere O. Chukwu, Regina S. Druz, Kenneth J. Nichols, Vikram J. Premkumar, Rena S. Toole, Nathaniel Reichek, Aasha S. Gopal, St. Francis Hospital, Roslyn, NY, Stony Brook University, Stony Brook, NY

Background: Diastolic LV filing abnormailites are early sensitive signs of myocardial ischemia, persisting longer than systolic changes. Real-time three-dimensional echocardiographic (RT3DE) voxel-based endocardial border tracking allows computation of abnormal LV peak filling rate (PFR), an early event in the ischemic cascade.
Methods: We sought to detect abnormal PFR by RT3DE in 19 patients (age 68.4 ± 15 yrs; 14M) with intermediate-high risk or with a history of CAD undergoing adenosine 99mTc-sestamibi gated single-photon computed emission tomography (GSPECT). Two-dimensional (2DE) and RT3DE were performed at rest and at peak adenosine. GSPECT and RT3DE data were analyzed by QGS (Cedars-Sinai) and QLab (Philips) algorithms, respectively. Volumes vs. time curves were fitted to 3rd order harmonics to compute PFR by custom software (RSI, Inc., Boulder, CO). PFR difference (PFR Δ) = PFR stress-PFR rest. Myocardial ischemia was assessed by 17-segment/5-point stress and rest nuclear perfusion scores; a summed difference score (SDS) > 2 accepted as abnormal. Rest and stress two-dimensional echo wall motion scores (WMS) were determined for 17 segments. A 2DE WMS difference (WMS Δ) > 1 was considered abnormal.
Results: 6 patients had SDS>2. Of the 6 patients SDS>2, 2 had both a normal WMS Δ and a normal PFR Δ. The remaining 4 had abnormal PFR Δ compared to those without ischemia (-0.12±0.77° versus +0.66±0.44 EDV/s, p=0.02). Of these 4 patients, 2 also had an abnormal WMS Δ. PFR Δ correlated inversly with ischemia (Spearman's coefficient = -0.55, p=0.03, 95% confidence interval = -0.81 to -0.08), Fisher exact test-p=0.006. PFR Δ also predicted myocardial ischemia with 89% accuracy, 100% specificity, 66% sensitivity, 100% positive predictive value and 86% negative predictive (ROC PFR Δ threshold > 0.0).
Conclusion: Rest-stress differences in PFR computed from RT3DE volume-versus-time measurements correlate with myocardial ischemia on GSPECT. A difference in PFR was highly specific, and had a very high positive predictive value for myocardial ischemia as compared with 2DE segmental WMS. Further prospective studies in large patient cohorts is warranted.

4:00 p.m.

908-226   **Is Framingham Risk Score A Good Predictor Of Coronary Artery Disease In Early Menopausal Women Referred For Stress Echocardiography? A Contrast Echocardiography, Cardiac CT And Serum Biomarker Study**

Mathieu Bernier, Moir Stuart, Sahar Abdelmoneim, Pellikka A. Patricia, Sue Ann Ness, Dalene Bott-Kitslaar, Sharonne N. Hayes, Sharon L. Mulvagh, Mayo Clinic, Rochester, MN

Background: The Framingham risk score (FRS) is a frequently utilized clinical tool for predicting coronary heart disease risk. Recent work has suggested that application of this score to women may underestimate the presence of CAD. We sought to verify if FRS was positively correlated with calcium scoring or positive stress echo.
Methods: In this sub-study of the larger SMART (Stress echo in Menopausal women at risk for coronary ARTery disease) trial (n=500), evaluating use of contrast stress echocardiography to predict 5 year outcome in early menopausal women, we prospectively studied women aged 40 to 60 (with symptomatic and hormonally confirmed menopause) but without a history of CAD referred for stress echocardiographic examination. All patients had detailed risk factor assessment and agreed to undergo contrast stress echocardiography (CSE) for optimized endocardial border definition, cardiac CT for coronary artery calcification scoring (CACS), serologic evaluation for hsCRP and lipids. CSE and cardiac CTs were read by independent reviewers who were blinded to clinical data.
Results: 106 women (age 53.6 ± 4.6 years, BMI 31.9 ± 7.1 kg/m2;) underwent stress echocardiography (23 dobutamine, 83 treadmill), cardiac CT and biomarker assessment. Low risk FRS [defined as < 1% event/year] was present in 93 (88%). Despite this, 12 (11%) of these "low risk" patients had evidence of myocardial ischemia by contrast stress echocardiography and 47 (44%) had demonstrable CAC, including 34 (32%) with CACS > 10 and 15 (14%) with CACS > 100. The mean hsCRP of the "low-risk" population, was 3.9 +/- 3.7 mg/dl,, and mean LDL was116 +/-31 mg/dl. The FRS was not correlated with an abnormal CSE (r=0.01, p=0.9) or CACS (r=0.1 p= 0.3). BMI was significantly correlated with positive CSE r=0.24 p=0.01 and this association strengthened with increasing obesity.

Diagnostic Testing

Conclusions: The FRS significantly underestimates the presence of obstructive and non obstructive coronary atherosclerosis (manifest as inducible myocardial ischemia and coronary calcification) in early menopausal women referred for stress echocardiography. This suggests the need for further refinement of strategies to predict CAD in this population.
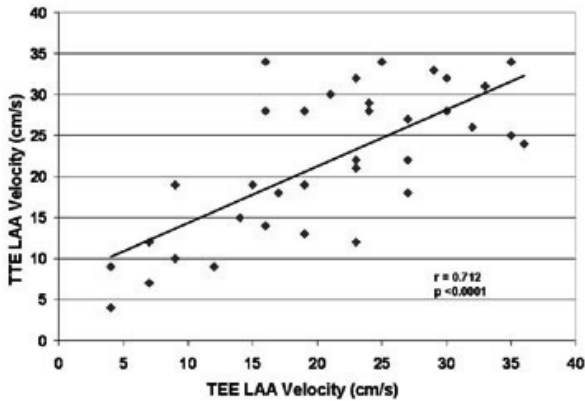
4:00 p.m.

908-227   **A Novel Method to Assess Left Atrial Appendage Function in Atrial Fibrillation with TTE: A Tissue Doppler Study**

Seth Uretsky, Ajay Shah, Deborah R. Cantales, Donna Macmillan-Marotti, Rawa Sarji, Sripal Bangalore, Bette Kim, Siu-Sun Yao, Eyal Herzog, Farooq A. Chaudhry, Mark V. Sherrid, St Luke's-Roosevelt Medical Center, New York, NY

Background: In non-rheumatic atrial fibrillation (AF) there is no parameter on transthoracic echo (TTE) that stratifies stroke risk. Transesophageal echo (TEE) stratifies risk by detection of spontaneous contrast (SEC) risk. A TTE parameter that would stratify AF risk would be useful. Tissue Doppler imaging (TDI) may be a good tool to characterize LAA left atrial appendage (LAA) contraction. LAA emptying velocity (E_v) is a low amplitude signal; in contrast, TDI LAA contraction velocity is a high amplitude signal.
Methods: We studied 36 pts (61 ± 18 yrs, 34% men) referred for TEE, 5 were in AF. In blinded fashion, we compared TDI LAA contraction velocities from TEE and TTE.
Results: TTE LAA traces were obtained in 33 pts (92%). Mean LAA E_v was 69 ± 31 cm/s, mean left atrial volume was 55 ± 34 ml and mean LAA area was 5.6 ± 7.6 cm². TDI LAA contraction velocity on TEE was 21 ± 9 cm/s and 22 ± 9 cm/s on TTE. There was a strong correlation (r = 0.71; p<0.0001) between TDI LAA velocity on TEE and TTE (Figure). TDI LAA velocities were significantly higher in SR than AF on TTE (24 ± 8 cm/s vs. 8 ± 4 cm/s, p < 0.0001). Pts with LAA SEC had lower TDI LAA velocities than without SEC on TTE (9 ± 3 cm/s vs. 24 ± 7cm/s, p < 0.0001).

Conclusions: TDI LAA contraction velocity is feasible on TTE in a high percentage of pts and correlates with TEE. On TTE echo TDI LAA velocity is low in AF and in patients with SEC. All pts with SEC had TTE velocities ≤12 cm/sec. This novel TTE functional parameter, TDI contraction velocity, may prove useful for risk stratification of AF.

4:00 p.m.

908-228   **The Assessment of Left Ventricular Dyssynchrony in Patients With Atrial Fibrillation Using Tri-plane Tissue Doppler Echocardiography**

Toshiki Nagakura, Masaaki Takeuchi, Hiromi Nakai, Tomoko Nishikage, Shinichiro Otani, Tane General Hospital, Osaka, Japan

Background: The assessment of left ventricular (LV) dyssynchrony using tissue Doppler imaging (TDI) in patients with atrial fibrillation (AFib) is difficult, because the RR intervals between cardiac cycles differ with the planes imaged. Although tri-plane TDI has a potential for the simultaneous evaluation of LV dyssynchrony in multiple LV segments, obtaining averaged value of LV dyssynchrony index over several cardiac cycles is tedious and time-consuming. The aim of this study was to determine whether the accurate evaluation LV dyssynchrony could be achieved by measuring parameters in a single beat when the prepreceding RR (RR1) and preceding RR (RR2) intervals are identical.
Methods: Tri-plane TDI (GE Healthcare) from apical window was acquired in 30 patients with AFib (75±12 years). LV dyssynchrony index was evaluated in 6 basal and 6 middle LV segments from 3 standard apical TDI views with the same cardiac cycle. Time interval between the onset of the R wave and peak systolic velocity (Tsv) was measured in each segment, and the standard deviation of Tsv in 12 segments (Tsv-12SD) was calculated in every cardiac cycle. In each patient, a beat with most identical RR1 and RR2 was selected, and Tsv-12SD with this beat was compared with averaged Tsv-12SD value over all cardiac cycles.
Results: The RR interval ranged from 346 to 1853 ms (mean: 787±183 ms). The mean number of cardiac cycle recorded was 10 consecutive beats. The RR1/RR2 ratio that was selected for a single beat in each patient was ranging from 0.84 to 1.17. No significant difference was noted between Tsv-12SD of a single beat with identical RR1 and RR2 intervals (22.2±9.4 ms) and averaged Tsv-12SD value (23.6±7.5 ms, p=ns). Good correlation was noted between the two methods (r=0.87, p<0.001). If we defined as Tsv-12SD of a single beat with identical RR1 and RR2>30 ms for predicting averaged Tsv-12SD over several cardiac cycles > 33 ms, sensitivity, specificity and accuracy was 100%, 88% and 90%, respectively.

Conclusions: Tsv-12SD at RR1/RR2=1 using Tri-plane TDI was highly correlated with averaged Tsv-12SD values derived from several cardiac cycles, and thus provides another strategy for evaluating LV dyssynchrony in patients with AFib.

4:00 p.m.

908-229   **Comparison Of 64-slice Computed Tomography Coronary Angiography, Radionuclide Myocardial Perfusion Imaging and Stress Echocardiogram In The Detection Of Significant Coronary Artery Stenosis.**

Gary Spektor, Alfonso H. Waller, Nicoleta Daraban, William L. Duvall, Michael E. Farkouh, Milena J. Henzlova, Eric H. Stern, Martin E. Goldman, Lori B. Croft, Bruce J. Darrow, Valentin Fuster, Mount Sinai Heart - Mount Sinai School of Medicine, New York City, NY

Background: SPECT myocardial perfusion imaging (MPI) and stress echo (SE) have data supporting detection of obstructive coronary artery disease (CAD), but 64-slice coronary CT angiography (CTA) is still under investigation.
Methods: We searched the database of a tertiary hospital for patients who had CTA, MPI or SE over 9-mo. period followed by coronary catheterization (CC) within 3 months. We evaluated their performance in the detection of >50% CAD using clinical reports with CC as gold standard. The results were used to calculate sensitivity, specificity and predictive values per patient, per vessel and per segment.
Results: We identified three patient groups. 267 patients (801 vessels) had MPI, 42 patients (168 vessels) had SE and 21 patients (86 vessels, 292 segments) had CTA prior to CC. The groups were similar in age and body mass index. SE group had the fewest male, diabetic and hypertensive patients with a lower prevalence of CAD. CTA group had the highest prevalence of CAD adversely affecting the specificity.
SE had the best negative and CTA the best positive predictive value per patient. CTA had the best sensitivity and positive predictive value per vessel. CTA also had a high specificity and negative predictive value per segment.

	MPI (n=267)	SE (n=42)	CTA (n=21)
PATIENT CHARACTERISTICS			
Age (y) (mean ± standard deviation)	62.8 ± 11.6	65.4 ± 9.6	66.7 ± 12.4
Body Mass Index (mean ± standard deviation)	29.7 ± 7.4	27.8 ± 9.4	27.3 ± 6.7
Prevalence of obstructive CAD by cardiac catheterization (%)	68	48	91

RESULTS (Values reported with 95% confidence intervals in parenthesis; non-overlapping confidence intervals in bold and italic font)			
PER PATIENT (n=total number of patients)	**MPI (n=267)**	**SE (n=42)**	**CTA (n=21)**
Sensitivity (%)	90 (87,94)	95 (88,100)	95 (85,100)
Specificity (%)	30 (25,36)	41 (26,56)	50 (29,71)
Positive Predictive Value (%)	73 (68,78)	59 (45,74)	*95 (88,100)*
Negative Predictive Value (%)	59 (53-65)	*90 (81,99)*	50 (35,65)
Accuracy (%)	71 (65,77)	67 (52,81)	91 (78,100)
PER VESSEL (n=total number of vessels analyzed)	**MPI (n=801)**	**SE (n=168)**	**CTA (n=86)**
Sensitivity (%)	58 (55,61)	61 (54,69)	*80 (71,88)*
Specificity (%)	72 (69,76)	79 (73,85)	89 (83,96)
Positive Predictive Value (%)	62 (59,65)	44 (37,52)	*91 (85,97)*
Negative Predictive Value (%)	69 (66,72)	88 (83,93)	77 (68,86)
Accuracy (%)	66 (63,70)	75 (68,82)	84 (76,92)

PER SEGMENT CTA PERFORMANCE (n=total number of segments evaluated (88% of all segments))	CTA (n=292)
Sensitivity (%)	69 (63,74)
Specificity (%)	92 (89,95)
Positive Predictive Value (%)	79 (74,83)
Negative Predictive Value (%)	89 (85,93)
Accuracy (%)	88 (84,92)

Conclusion: CTA compares favorably with MPI and SE in a positive predictive value per patient and per vessel. It also has a high specificity and a negative predictive value per segment in a real world setting. Thus, CTA may become a viable alternative to SE and MPI in the near future.

4:00 p.m.

908-231   Relationship of Coronary Flow Reserve with Coronary Artery and Thoracic Aorta Calcium in Patients with End-Stage Renal Disease (Monckberg Sclerosis) compared to Controls with Intermediate Risk using Rb-82 PET/CT

Jong Ho Kim, Arlene Travis, Ash Rafique, Anthony Squire, Van H. Nguyen, Newshaz Ghodsi, Josef Machac, Mount Sinai School of Medicine, New York, NY

Background: Arterial calcification frequently seen in end-stage renal disease (ESRD) is predominantly limited to the tunica media, mainly in the internal elastic lamina and not directly localized to atherosclerotic lesions associated with an increased risk of ischemic cardiovascular events due to plaque instability. We had previously reported global/regional coronary flow reserve (CFR) is inversely related with coronary artery calcium (CAC) in 85 pts with intermediate risk for CAD (r = -0.29/-0.25; p = 0.007/0.0001, respectively) (JNM 2006;47(1):205p). The aim of this study was to assess the relationship of CFR, CAC and thoracic aorta calcium (TAC) in ESRD.
Methods: We studied 38 consecutive pts with ESRD referred to our Rb-82 PET/16-slice CT to evaluate for severity of atherosclerosis. 7 ESRD with cardiac/renal transplants (4/1), and PCI (2) were excluded. 31 ESRD (F/M = 11/20; mean age = 53 yr), were compared with 31 age- and gender-matched controls with intermediate risk, who underwent Rb-82 myocardial perfusion imaging (MPI) at rest and pharmacologic stress, CAC and TAC scoring. All MPI were visually interpreted quantitatively using a 17 segment model. Global and regional CFR in each of the coronary territories was measured using method of Yoshida (JNM 1996).
Results: There were no significant differences of summed rest, stress and difference scores in between 31 ESRD and 31 controls (1.7 vs 0.7, 3.9 vs 2.4, 2.2 vs 1.7; p=ns, respectively). Intraclass correlation coefficients for intraobserver variability for CFR, CAC and TAC were $\geq$ 0.95, respectively. Compared to controls, ESRD showed significantly lower CFR (1.7 $\pm$ 0.6 vs 2.2 $\pm$ 0.6; p=0.002), and higher TAC (2575 $\pm$ 804 vs 804 $\pm$ 2657; p=0.05) and CAC (453 $\pm$ 567 vs 233 $\pm$ 760; p=ns). There was a significant negative correlation between regional CFR and CAC in corresponding 93 coronary territories (r=-0.21 p=0.05) although inverse associations of global CFR with CAC and TAC did not reach significance (r=-0.28 and r=-0.18; p=ns, respectively).
Conclusions: With both higher TAC and CAC probably due to medial artery calcification in ESRD, regional CFR was inversely associated with regional coronary calcium burden similarly to classical atherosclerosis.

4:00 p.m.

908-232   Tissue Characterization in Hypertrophic Cardiomyopathy: Typical Focal Hyperintensities in T2 Weighted Images Suggesting Intramyocardial Edema

Henning Steen, Andreas Haars, Katharina Kolbe, Stephanie Lehrke, Dirk Loßnitzer, Evangelos Giannitsis, Hugo A. Katus, University of Heidelberg, Heidelberg, Germany

Background: Cardiac-MRI (CMRI) has recently become the method of choice for the assessment of myocardial hypertrophy and left ventricular (LV) function in patients (pts.) with hyper-trophic non-obstructive/obstructive cardiomyopathy (HN-/OCM). A typical contrast enhanced delayed gadolinium (Gd) MRI pattern (CEMRI) has been found in about 80% of pts. with severe HN-/OCM. We hypothesized that T2-W MRI could detect septal hyper-intensities similar to T1-W CEMRI.
Methods: We scanned 36 pts. with HCM (24 HNCM, 12 HOCM) and 12 pts. with hypertensive heart disease (septal wall thickness$\geq$15mm) by employing a gated black-blood T2-W Turbo-Spin sequence planned two- and four-chamber SSFP image planes on a 1,5T whole body MRI scanner. T2-W SA images were obtained on a mid-ventricular level using a six-segmental model plus two focal segments at the anterior and posterior insertion of the right ventricle (antero-septal/infero-septal) to measure regional signal-intensities (SI). SI was measured as mean SI plus standard deviation (SD) of mean SI for intra-individual analysis. Hyper-intensity was defined as SI>2 SD above the acquired mean SI level. Hypo-intensity was conversely defined as SI< two SD below the acquired SI level.
Results: Typical hyper-intensities could be found in 66% of HN-/OCM pts. in regions of pronounced hypertrophy including the focal antero-septal/infero-septal areas. In LVH pts., no segmental hyper-intensities >2 SD could be measured.
A focal hyperintensity (antero-septal/infero-septal) could be shown in 34% of the HN-/OCM pts. and were less accentuated in hypertensive heart disease pts. (17%). There was a significant correlation between the presence of T2-W hyper-intensity and CEMRI areas (p<0.0001; r=0.528).
Conclusion: We could demonstrate the existence of typical signal patterns in T2-W in HN-/OCM. Hyper-intensity in T2-W imaging suggests chronic myocardial fibrosis with elevated levels of edema due to myocyte disarray. T2-W assessment may provide additional diagnostic information for HN-/OCM.

4:00 p.m.

908-233   TIMI Grade 3 After Successful Percutaneous Coronary Intervention Reduced Myocardial Infarction Volume Assessed by Delayed Enhancement MRI.

Hidetoshi Yoshitani, Shuichiro Kaji, Atsushi Yamamuro, Kazuaki Tanabe, Makoto Kinoshita, Koichi Tamita, Minoru Yoshiyama, Yasuki Kihara, Osaka City Medical School, Osaka, Japan, Kobe General Hospital, Kobe, Japan

Background: While the immediate revascularization for acute coronary syndrome effects the reduction in the myocardial infarction volume, some patients do not achieve adequate tissue perfusion and have large infarction with low thrombolysis in myocardial infarction (TIMI) grade score. Using magnetic resonance imaging with delayed enhancement (DE-MRI), myocardial infarct size can be measured directly and noninvasively. However the relationship between the TIMI grade after successful percutaneous coronary intervention (PCI) and the extent of myocardial infarction volume assessed by DE-MRI has not been evaluated clinically. The aim of this study was to examine the influence of TIMI 3 after PCI on the extent of myocardial infarction assessed by DE-MRI.
Methods: Thirty patients with first anterior acute myocardial infarction were studied after PCI (angiographically <50% residual stenosis). The TIMI grade was determined by coronary angiography after PCI. The extent of myocardial volume was evaluated after PCI on the basis of the DE area using DE-MRI by 1.5-T MR scanner. Left ventricular (LV) mass was assessed by tracing the endocardial and epicardial contours manually in each of the short axis slice and the sum of each slice. The DE volume as the infarct size was assessed by tracing DE area in the short axis views and the percentage of LV volume (%LV) was calculated as the DE volume divided by LV mass.
Results: All patients were classified into TIMI grade 0, 1, 2 and 3 angiographically after PCI (grade 0: none, grade 1: one patient, grade 2: 8 patients and grade 3: 21 patients). DE volume as the extent of myocardial infarction was smaller in patients with TIMI grade 3 than in those without TIMI grade 3 (17.1$\pm$9.2 vs. 25.9$\pm$7.4 cm3, respectively, p<0.05). %LV, as the severerity of myocardial infarction, was smaller in patients with TIMI grade 3 than in those without TIMI grade 3 (16.3$\pm$8.2 vs. 23.6$\pm$6.4 %, respectively, p<0.05).
Conclusions: The DE volume as the volume of myocardial infarction and %LV as the severity of myocardial infarction were significantly reduced in patients with TIMI grade 3 after PCI compared with those in patients without TIMI grade 3.
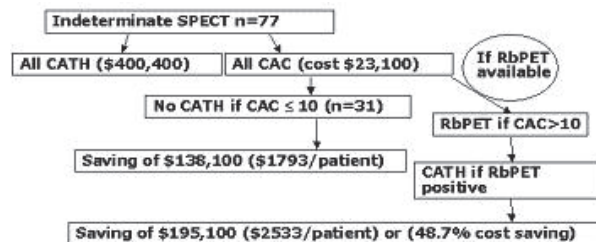
4:00 p.m.

908-235   Cost-Benefit Analysis of the Use of Coronary Artery Calcium Score And Positron Emission Tomography in the Evaluation of Subjects With Indeterminate Tc 99m SPECT Stress Test

Hitender Jain, Kate Brag, Bangalore V. Deepak, Stuart Zarich, Jay L. Meizlish, Adam E. Schussheim, Bridgeport Hospital/ Yale New Haven Health System, Bridgeport, CT

Introduction: Indeterminate stress test (IST) results are common following myocardial perfusion imaging with SPECT requiring further work-up. We investigated the role of coronary artery calcium score (CAC) and Rubidium-82 positron emission tomographic stress test (RbPET) as a cost-effective next step in the work-up of such patients.
Methods: 77 subjects with IST subsequently had CAC using a 16-slice multi-detector CT scan and a dipyridamole RbPET within 90 days. RbPET is known to have better accuracy to rule out significant CAD.
Results: The mean age was 61 years (range 36-85 years) and there were 27 females (35%). A CAC score of $\leq$10 was present in 40% of subjects and had a negative predictive value of 100% (0/31) to rule out significant CAD. We used Medicare global average payment estimates for CAC ($300), RbPET ($1700), or invasive coronary angiogram (CATH, $5,200). CATH in all patients will cost $400,400. Performing CAC in all patients with no further work-up if CAC is $\leq$10 (31/77) will save $138,100 ($1793/patient). RbPET in all patients (negative in 57 patients) without CAC, as the next step will save $165,500 as compared to CATH. An algorithm using a CAC followed by RbPET in patients with CAC >10 followed by CATH if RbPET is positive (n=20), will save $195,100 ($2533/patient or 48.7% cost saving).

Conclusion: CAC score is a reliable and cost-effective first step in the investigation of patients with indeterminate SPECT results. RbPET prior to CATH in subjects with abnormal CAC scores results in further cost savings.

4:00 p.m.

908-236   **Evaluation of Exercise Tolerance by Cardiopulmonary Exercise Test in Patients with Heart Failure after Cardiac Resynchronisation Therapy**

Yoshimitsu Soga, Kenji Ando, Takashi Yamada, Shinichi Shirai, Masahiko Goya, Masashi Iwabuchi, Hiroyoshi Yokoi, Hitoshi Yasumoto, Hideyuki Nosaka, Masakiyo Nobuyoshi, Kokura Memorial Hospital, Kitakyushu, Japan

BACKGROUND: Cardiac resynchronisation therapy (CRT) using biventricular pacing improves hemodynamics and symptoms in patients with heart failure by reducing ventricular dyssynchronity. However, their effects on oxygen uptake (VO2) kinetics at the exercise have not been elucidated. The aim of the present study was to examine the mid-term effects of the ventilatory response to exercise after CRT and the response to CRT.
METHODS: A prospective analysis was performed on 42 patients with chronic heart failure (mean age 68±6 years, 28 males, NYHA class >/= 3, with left ventricular ejection fraction /=10% or as a relative decrease VE/VCO2 slope >/=10%.
RESULTS: Follow-up at 6 month was completed in 37 patients (NYHA class 3.1 ± 0.4, left ventricular ejection fraction 29 ± 7 %, left ventricular enddiastolic diameter 63.6 ± 4.4 mm, QRS duration 154 ± 26 ms and Ischemic heart disease 57%). The severe incidence in symptom-limited exercise test was none. Compared to baseline, pVO2 and AT significantly increased during follow-up period. NYHA class significant decreased and VE/VCO2 slope and TC significantly reduced. Responders were 31 patients (84%) at 6 months after CRT.
CONCLUSION: Exercise tolerance, ventilatory response and subjective symptoms in patients with chronic heart failure have improved significantly during 6 months after CRT.

	Baseline	3 months	6 months	P (B-3)	P (B-6)
NYHA class	3.2±0.4	2.1±0.4	1.9±0.3	<0.0001	<0.0001
PeakVO2 (ml/kg/m)	13.1±3.1	14.6±2.4	15.7±2.7	0.006	0.0001
AT (ml/kg/m)	10.2±1.9	10.7±1.6	11.0±1.6	0.2	0.03
VE/VCO2 slope	36.1±3.3	36.0±3.8	31.2±3.4	0.04	<0.0001
TC (sec)	26.5±18.9	22.0±10.6	19.0±8.1	0.2	0.05

NYHA class: New York Heart Association functional classification, P (B-3): Baseline and 3 months after the CRT, P (B-6): Baseline and 6 months after the CRT

E-POSTER SESSION
909

E-Poster Session 909

Monday, March 26, 2007, 9:00 a.m.-10:00 a.m.
Hall H

9:00 a.m.

909-221   **Isolated Left Ventricular Diastolic Dysfunction Immediately After Defibrillation Threshold Testing in Patients with Implantable Cardioverter Defibrillator**

Miki Horigome, Jun Koyama, Mitsuaki Horigome, Kazunori Aizawa, Hiroki Kasai, Takeshi Tomita, Setsuo Kumazaki, Hiroshi Tsutsui, Yoshikazu Yazaki, Osamu Kinoshita, Uichi Ikeda, Shinshu University, Matsumoto, Japan

Background: It is reported that defibrillation threshold testing after implantation of the cardioverter defibrillator causes left ventricular (LV) pump failure in some patients. We investigated the influence of defibrillation threshold testing on LV function using echocardiography.
Methods: Thirteen consecutive patients who underwent an automatic defibrillator implantation for ventricular tachycardia or fibrillation were examined. Patients with atrial fibrillation were excluded from this study. Standard 2 dimensional, Doppler flow echocardiography (transmitral, pulmonary venous, and LV out-tract flow records), color m-mode of LV inflow and tissue Doppler examination at mitral annulus and mid-ventricle (the mean value of longitudinal strains from three mid-ventricular segments) were performed before and immediately after direct current (DC).
Results: The propagation velocity of LV inflow had significant reduced, and E/A ratio of transmitral flow and ejection time had significantly increased after DC without the change of cardiac dimension. The mean value of longitudinal peak strains from three mid-ventricular segments had significant increased.
Conclusions: DC shock improved LV systolic function (Strain, Ejection time) and deteriorated LV diastolic function (decreased propagation velocity).

Echocardiographic parameters before and after DC

	Pre DC	Post DC	P value
Left atrial diameter(mm)	42±8	42±8	ns
Flow propagation velocity(cm/s)	36±14	28±9	0.02
Transmitral flow- E/A	0.87±0.29	0.95±0.31	0.01
Transmitral flow- deceleration time(ms)	199±64	188±58	ns
Isovolumic relaxation time(ms)	128±39	139±40	0.06
Ejection Time(ms)	264±71	272±73	0.03
E/Ea(IVS/Lat)	0.21±0.10/0.15±0.13	0.19±0.08/0.13±0.06	0.07/0.09
Pulmonary venous flow- A duration(ms)	169±24	182±31	0.04
Peak longitudinal strain in mid-ventricle(%)	-15.6±8.9	-18.3±10.5	0.046

9:00 a.m.

909-222   **Noninvasive Detection and Characterization of Abdominal Aortic Aneurysms in Mice using Ultrasound**

Jonathan J. Passeri, Alexander Y. Lin, Neil Ahluwalia, Robert E. Gerszten, Michael H. Picard, Marielle Scherrer-Crosbie, Massachusetts General Hospital, Boston, MA

Background: Murine models have been recently developed to study the molecular mechanisms of abdominal aortic aneurysm (AAA) formation. We hypothesized that ultrasound (US) could be used as a noninvasive imaging technology to assess AAA development in mice.
Methods: Fourteen hyperlipidemic ApoE -/- mice were treated with angiotensin II (AT-II) infusions for 14 to 28 days, which reproducibly generates suprarenal AAA often with superimposed dissection. Mice were imaged using a 13 MHz linear array US probe placed on the abdomen to obtain longitudinal and cross sectional images. The diameter of the infrarenal and suprarenal segments of aorta were measured. When present, absolute thrombus area was quantified on cross-sectional images by subtracting the area of blood flow, by color Doppler, from the total vessel area. The thrombus burden was defined as the percentage of total vessel area encompassed by thrombus. After imaging, the mice were euthanized, aortas dissected, and pathologic measurements were made with IP Lab software by blinded observers to compare with US findings. Five mice without AT-II infusion were imaged as a control group.
Results: Compared to controls, mice infused with AT-II had larger suprarenal (1.36 ± 0.42 vs. 0.86 ± 0.13mm, p<0.01) but similar infrarenal aortic diameters (0.49 ± 0.07 vs. 0.48 ± 0.07 mm), reflecting the usual distribution of AAA in this model. The diameter of the AAA by US correlated well with pathologic measurement (r=0.79, p<0.01). The mean thrombus burden in AT-II infused mice was 38.2 ± 3.1%. Compared to controls, mice infused with AT-II had similar blood flow area (1.17 ± 0.27 vs. 0.88 ± 0.32 mm², p=0.11) despite a larger total vessel area (2.46 ± 1.4 vs. 0.92 ± 0.34 mm², p<0.01), indicating that thrombus formation did not result in flow obstruction. Both the thrombus area and thrombus burden were correlated with aneurysm diameter (r=0.79 and r=0.62, respectively) indicating the amount of thrombus is proportional to the severity of aneurysm.
Conclusions: Noninvasive detection, measurement and characterization of AAA in mice with a 13 MHz US system is feasible. This technique may be useful for serial monitoring of aneurysm formation in transgenic or therapeutic models.

9:00 a.m.

909-223   **A Novel Noninvasive Quantification Method of Left Ventricular Diastolic Function**

Tiesheng Cao, Lijun Yuan, Ying Li, Hong Wang, Jie Liu, Ruijing Yang, Zuojun Wang, Yunyou Duan, Tangdu Hospital, Xi'an, People's Republic of China

Background: It is well-known that pulmonary artery (PA) diastolic pressure (DP) is normally similar to the mean pulmonary capillary wedge pressure (PWP). We assessed the hypothesis that with a slow Müller maneuver the pressure in the PA decreases synchronously with intrathoracic pressure decrease while the pressure decrease in the right heart will be canceled by the blood inflow from the peripheral veins. When the pressure decrease in PA is lower than that in the right heart, the pulmonary valve (PV) may be opened in diastole by the maneuver.
Methods: Fourteen patients for catheterization measurement of PWP and 65 human subjects with pulmonary regurgitations were selected in this study. The peak regurgitant velocities of all the subjects, including 9 from the catheterization group were used to calculate the pressure gradient across PV using Doppler method, which are equal to PADP when estimated right atrial pressure is added. A mask connected with a manometer was air-tightly applied on the mouths of the subjects who were taught to carry out a slow Müller maneuver so that the intrathoracic pressure decrease may be clearly observed and the opening of the PV may be monitored with either 2D or Doppler echocardiograph. With the earliest detection of the opening, the pressure decrease indicated by the manometer was recorded. The pressure data were then compared

statistically using T test with the catheterization and Doppler measurements.

Results: The pressure data of all the 79 subjects obtained with the manometer were ranged from 6 to 34 mmHg and were significantly correlated with the catheterization and Doppler methods (r = 0.860 and 0.784). The PVs of the subjects who have lower PWP (<9 mmHg) were opened regularly during normal inspiration.

Conclusions: This noninvasive method of PWP measurement was proved to be accurate and simple and may be used as an index of left ventricular diastolic function. The detection of the PV opening in diastole during routine echo study may rule out elevated PWP and is useful for LV diastolic function evaluation. This study provided us with a new insight of heart-lung interaction.

9:00 a.m.

909-224   **Transesophageal Echocardiographic Direct Measurement of Left Ventricular Outflow Tract Area Improves Accuracy of Aortic Valve Area Determination by the Continuity Equation in Aortic Stenosis**

Buddhadeb Dawn, Tariq S. Siddiqui, Ahmed Abdel-Latif, Akash Makkar, Robert K. Lewis, Marcus F. Stoddard, University of Louisville, Louisville, KY

Background: Calculation of aortic valve area (AVA) by continuity equation (CE) critically depends on accuracy of measurement of outflow tract (LVOT), which is assumed to be circular. The impact of this assumption on accuracy of AVA determined by CE is unknown.

Methods: 109 pts (83 M/26 F; age 68±13 yr) underwent multiplane TEE for assessment of AS severity. AVA was determined in 3 ways: 1) planimetry of valve orifice (AVA-Plan); 2) CE using the LVOT diameter (assuming a circular LVOT, CE-Diam); and 3) CE using LVOT area by planimetry (CE-Plan). Pts were stratified into 4 groups on the basis of LVOT shape, namely circular (G1), oval shape in lateral-medial (G2) or anterior-posterior (G3) direction, and irregular shape (G4).

Results: Mean LV EF was 48±18%; AVA by planimetry was 1.23 ± 0.50 cm2. LVOT was not circular in >50% pts (Table). AVA obtained by AVA-Plan correlated better with AVA by CE-Plan (r=0.89, SEE = 0.22 cm2; P=0.0001) than that by CE-Diam (r = 0.85, SEE = 0.25 cm2; P=0.0001). In G2, compared with AVA-Plan, AVA calculated by CE-Diam was smaller, overestimating AS severity. A similar trend was evident in G4. These findings were not explained on the basis of EF, stroke volume, or gradient. AVA by CE-Plan was similar to AVA-Plan in all groups.

Conclusions: LVOT is not circular in >50% pts with AS. When LVOT is oval in a lateral-medial plane, significant underestimation of AVA or overestimation of AS severity occurs. This potential pitfall of CE should be considered when AS severity by area is disproportionate to gradient.

Table

Group	LVOT Shape	N (%)	AVA (Mean ± SD; cm2) AVA-Plan	AVA (Mean ± SD; cm2) CE-Diam	AVA (Mean ± SD; cm2) CE-Plan
G1	Circular	54 (49.5)	1.21 ± 0.47	1.17 ± 0.46	1.18 ± 0.45
G2	Oval Lateral-Medial)	37 (34.0)	1.28 ± 0.55	1.05 ± 0.47**	1.25 ± 0.52
G3	Oval Anterior-Posterior)	8 (7.3)	1.12 ± 0.43	1.28 ± 0.49	1.18 ± 0.37
G4	Irregular	10 (9.2)	1.30 ± 0.52	1.16 ± 0.52#	1.23 ± 0.55
**P = 0.0001 vs. AVA-Plan; #P = 0.08 vs. AVA-Plan.					

9:00 a.m.

909-225   **Dobutamine Stress Echo Adds Incremental Prognostic Information in the Long-term Risk Stratification of Medically Treated Patients With Ischemic Cardiomyopathy**
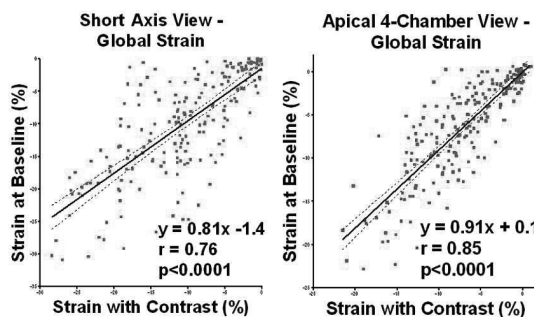
Waddah Maskoun, Muhammad Tarakji, Nowwar Mustafa, Irmina Gradus-Pizlo, Masoor Kamalesh, Joe Mahenthiran, Harvey Feigenbaum, Stephen Sawada, Krannert Institute of Cardiology, Indiana University, Indianapolis, IN

Background: The utility of stress testing for long-term risk stratification of medically treated patients with ischemic cardiomyopathy (CADCM) has not been well validated. Clinical factors, drug therapy, and assessment of resting function are adequate predictors of short-term risk. We investigated the utility of dobutamine stress echo (DSE) for prediction of long-term outcome in patients with CADCM.

Methods: DSE was performed on 450 medically treated ischemic cardiomyopathy patients (mean age: 62 ± 11 years; male: 76%; diabetic: 43%; mean ejection fraction: 38 ± 6%). Follow-up was conducted for cardiac death.

Results: There were 209 cardiac deaths (47 %). Mean follow-up was 6.7 years. Univariate predictors of death were age, use of ACE-I, prior MI, history of CHF, reduced ejection fraction, and presence of ischemia on DSE. Use of beta-blocker was a predictor of survival. The incremental prognostic value of DSE was tested in a stepwise analysis for cardiac death. In step 1, age, old MI and history of CHF yielded p < 0.001 and chi-square 33. In step 2, the prognostic value was added by beta-blocker status (p < 0.001, total chi-square 48). In step 3, ejection fraction yielded p < 0.001 and total chi-square 67. In step 4, the presence or absence of ischemia with DSE added further prognostic value (p = 0.007, total chi-square 75).

Conclusion: In medically treated patients with CADCM, DSE adds incremental prognostic value beyond the value of clinical and medical treatment variables and resting function.

9:00 a.m.

909-226   **The Effect of Echocardiographic Contrast on Velocity Vector Imaging Myocardial Tracking**

Christina S. Reuss, Kwan S. Lee, Tadaaki Honda, Panupong Jiamsripong, Christy M. Baxter, Shu-Chuan Chen, Terrence J. Adam, Bijoy K. Khandheria, Steven J. Lester, Mayo Clinic Arizona, Scottsdale, AZ

Background Velocity Vector Imaging (VVI), (Siemens Medical Solutions Inc, Mountain View, CA) from B-mode echocardiographic images provides complete 2-dimensional myocardial motion tracking from which deformation parameters can be derived. The combination of VVI with echocardiographic contrast holds potential to evaluate perfusion and motion from a single exam. This study evaluates the effect of echocardiographic contrast on VVI myocardial tracking.

Methods 10 subjects received echo contrast as part of a clinically indicated transthoracic echo. Standard echo images from the apical 4-chamber and parasternal short axis (papillary muscle level) were acquired with and without echo contrast using an Acuson Sequoia™ echo system (Siemens Medical Systems). Cardiac cycles were isochronally normalized to allow for comparison. Strain was derived off-line from corresponding noncontrast and contrast images. Linear regression was performed on the isochronal strain curves.

Results For all segments, noncontrast strain (NCS) values were higher than contrast strain (CS). There is regional variability in the correlation between NCS and CS with generally poor correlation (r range 0.29 to 0.71). The global index of strain has the highest correlation in both views (See Figure).

Conclusion The use of VVI with echo contrast affects VVI measurements of myocardial strain. Further understanding and refinements are needed before VVI derived parameters of myocardial motion are used in the setting of a contrast enhanced study.
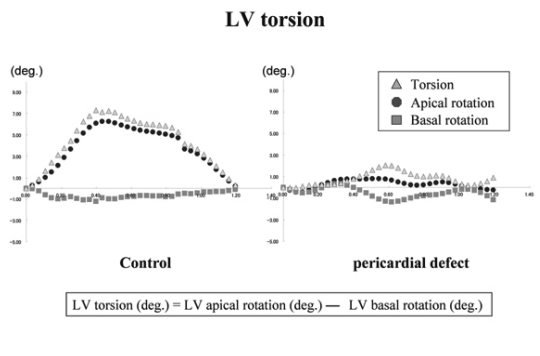

Short Axis View - Global Strain: y = 0.81x -1.4, r = 0.76, p<0.0001

Apical 4-Chamber View - Global Strain: y = 0.91x + 0.1, r = 0.85, p<0.0001

9:00 a.m.

909-227   **Total Absence of the Left Pericardium Brings Lack of Left Ventricular Torsion But No Impairment of Regional Myocardial Function**

Yoshifumi Oishi, Yukio Mizuguchi, Hideji Tanaka, Hirokazu Miyoshi, Takeo Ishimoto, Norio Nagase, Takashi Oki, Higashi Tokushima National Hospital, Tokushima, Japan

Background: The relation between left ventricular (LV) torsional deformation and myocardial function has been recently recognized. However, little is known about whether pericardium affects this relation. Our aim was to identify contribution of the pericardium to LV torsion and regional myocardial function in the clinical setting.

Methods: We examined LV torsion in basal and apical LV short-axis views, and regional LV myocardial function, such as longitudinal strain in apical 4-chamber view, and circumferential and radial strains in parasternal LV short-axis views using 2-dimensional strain imaging method in 5 patients with congenital total absence of the left pericardium and 15 normal subjects.

Results: There was no significant difference in LV ejection fraction determined by 2-dimensional echocardiography between pericardial defect and normal groups. LV torsion was markedly decreased in the pericardial defect group than in the normal groups. There were no significant differences in longitudinal, radial, and circumferential strains in the LV walls between the 2 groups.

LV torsion

LV torsion (deg.) = LV apical rotation (deg.) — LV basal rotation (deg.)

Conclusions: In conclusion, pericardial defect causes lack of LV torsion while maintaining LV regional myocardial function, and therefore pericardium plays an important role in LV torsion.

Diagnostic Testing

9:00 a.m.

909-228   **Is the Prevalance of Left Ventricular Asynchrony Depends on the Degree of Systolic Dysfunction in Patient with Heart Failure?**

Gary CP Chan, Qing Zhang, Gabriel WK Yip, Joseph YS Chan, Jeffery WH Fung, Li-wen Wu, Yat-yin Lam, Leo CC Kum, Cheuk-man Yu, The Chinese University of Hong Kong, Hong Kong, People's Republic of China

Background: LV systolic asynchrony is important pathological mechanism in patients with clinical heart failure (HF) and LV systolic dysfunction. However, the prevalence of LV asynchrony in patients with different ejection fraction (EF) is unknown.
Method: 402 patients (age 64.19+/-17.08 years, male 65.9%) with clinical HF and 120 controls were evaluated. LVEF and different asynchrony indices:Ts-SD-12 (the standard deviation of the time to peak systolic velocity (Ts) in ejection phase of 12 segmental model), Ts-12 (the maximal difference of Ts in ejection phase of 12 segmental model),Ts-Sep-Lat (difference of Ts between basal septal and basal lateral segments), Ts-SD-6 (the standard deviation of Ts in ejection phase of basal 6 segmental model) and Ts-6 (maximal difference of Ts in ejection phase of basal 6 segmental model) were measured by using TDI. Patients were divided into 3 groups by LVEF (LVEF ≤20%, LVEF 20-35%, LVEF 35-50%) and were compared with controls.
Results: All indices of asynchrony were higher than control (Table) (p<0.0001). Based on the established cutoff values, systolic asynchrony is more prevalent in 3 patient groups (Table). Systolic asynchrony is more frequent using 12-segment rather than 2-segment indices.
Conclusions: Systolic asynchrony is highly prevalent in HF with systolic dysfunction. The role of extending CRT in those with LVEF 35-50% warrants further studies in view of high prevalence of systolic asynchrony in them.

	LVEF≤20% (n=45)*	LVEF 20%-35%(n=167)*	LVEF 35%-50%(n=190)*	Controls (n=120)	ANOVA P value
Ts-SD	38.88+/-12.25	38.71+/-16.25	37.76+/-16.84	17.68+/-9.04	<0.0001
Ts-12	115.29+/-37.59	112.37+/-44.70	107.77+/-45.96	52.54+/-47.60	<0.0001
Ts-SD-6	35.23+/-16.36	34.09+/-18.96	34.32+/-18.48	15.09+/-9.15	<0.0001
Ts-6	88.13+/-40.63	81.20+/-44.80	79.86+/-42.13	36.57+/-21.82	<0.0001
Ts-Sep-Lat	46.09+/-36.47	48.95+/-42.03	48.82+/-41.01	18.46+/-19.50	<0.0001
Prevalence of significant asynchrony by Ts-SD>33ms	69.88%	59.28%	57.89%	5.00%	<0.0001
Prevalence of significant asynchrony by Ts-Sep-Lat > 60ms	37.78%	36.36%	34.92%	6.83%	<0.0001

*P=NS when compared among all the heart failure groups

9:00 a.m.

909-229   **A New Automated Method For Quantitative Computer Tomography Coronary Angiography (QMSCT-CA): An In-vivo validation study With Intracoronary Ultrasound As Reference**

Nico Bruining, Filippo Cademartiri, Alessandro Palombo, Ludovico La Gruta, Pim de Feijter, Ronald Hamers, Erasmus MC, Rotterdam, The Netherlands

Background: evaluation of an automated method for quantitative analysis of coronary plaque dimensions by Multislice Computer Tomography Coronary Angiography (QMSCT-CA) with intracoronary ultrasound (ICUS) as reference.
Material and methods: 48 consecutive patients with suspected coronary artery disease underwent retrospectively ECG-gated MSCT-CA (Sensation 16, Siemens, Germany) and conventional coronary angiography with retrospective image-based gated ICUS. Automated software (Curad BV , NL) was used to extract the coronary arteries and surrounding tissue from the MSCT-CA datasets. Matching of the segments was performed by identification of the same side-branches in both modalities.
Two operators, blinded to the ICUS data, performed the QMSCT-CA quantification twice in order to obtain the inter- and intra-observer variability. An experienced observer performed the ICUS evaluation. An automated coronary lumen detector was also investigated. Analyzed parameters: target vessel length, lumen-, vessel- and plaque volumes. The differences between the measurements were tested with a paired t-test and a p-value of <0.05 was considered significant. Numerical data are presented as mean±SD.
Results: of the 48 vessels 27 were left anterior descending, 6 left circumflex and 15 right coronary arteries. Mean target region length [mm] was 29±13 (QCU) and 30±13 (QMSCT-CA), p=0.6. Lumen volume [mm³]: 267±139 (QCU) vs. 187±97 (CT obs1, p<0.01) and 190±95 (CT obs2, p<0.01). Automated QMSCT-CA lumen volume: 218±111, p<0.01 vs. QCU. Vessel volume: 454±194 (QCU) vs. 405±186 (CT obs1, p=0.01) and 401±201 (CT obs2, p<0.01). Plaque volume: 187±93 (QCU) vs. 232±121 (CT obs1, p=0.02) and 212±126 (CT obs2, p=0.07). Reproducibility of the measurements was

without major statistical significant differences.
Conclusion: QMSCT-CA systematically underestimates lumen- and vessel dimensions compared to QCU, resulting in a small overestimation of plaque volumes. However, important for longitudinal studies, reproducibility was without significant differences. For further evaluation, QMSCT-CA might be considered to be used additionally in progression-regression trials.
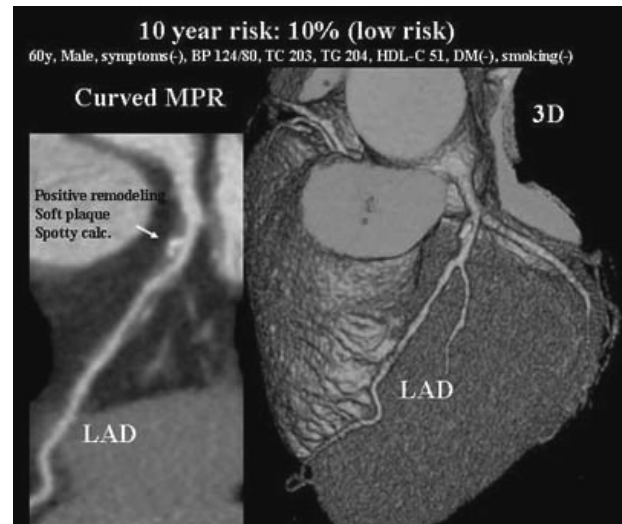
9:00 a.m.

909-230   **"10-year CHD risk" Can not Predict Coronary Artery Plaques on Multislice CT**

Sadako Motoyama, Takeshi Kondo, Masayoshi Sarai, Takahisa Sato, Kaori Inoue, Hiroto Harigaya, Hitoshi Hishida, Jagat Narula, Fujita Health University, Toyoake, Japan, University of California Irvine School of Medicine, Irvine, CA

Background: A simple coronary disease prediction algorithm (10-year CHD risk) was developed using categorial variables, which allows physicians to predict multivariate coronary heart disease (CHD) risk in patients without overt CHD. MSCT can detect coronary artery plaques in patients without symptoms. The purpose of this study is to clarify whether "10-year CHD risk" is useful for prediction of coronary artery plaques on MSCT.
Methods: One hundred and twelve patients without overt CHD underwent MSCT. "10-year CHD risk" was calculated using CHD score sheet. The presence of plaques and plaque characteristics were compared with %risk.
Results: % CHD risk was significantly higher in patients with plaques on MSCT (n=49) than in patients without plaques(n=63) (15.3±9.9 vs 9.1±5.4, p<0.0001), however, plaques were detected in 29% of 10%risk-patients. More than 1findings of vulnerable plaques (positive remodeling, soft plaque or spotty calcification) was detected in 22% of 10%risk-patients, while %risk was significantly higher in patients with vulnerable plaques on MSCT (n=39) than in patients without vulnerable plaques (n=73) (15.5±9.3 vs 9.9±7.0, p=0.0009). Although the presence of spotty calcification could be predicted by %risk of 15.5%, sensitivity was 55%. The presence of positive remodeling and soft plaque could not be predicted by %risk.

Conclusions: "10-year CHD risk" could not predict the presence of coronary artery plaques on MSCT. MSCT may allow for improved CHD risk stratification.

9:00 a.m.

909-231   **Distribution of Myocardial Adipose Tissue by MDCT**

Aidan R. Raney, Farhood Saremi, Khushboo Kaushal, Swaminatha Gurudevan, Jagat Narula, University of California, Irvine School of Medicine, Orange, CA

Background: Adipose tissue in the myocardium has been demonstrated in ARVD, myocardial infarction, and scars of dilated cardiomyopathy. Current literature offers little mention of the presence and distribution of myocardial fat in a normal population. We determined the frequency and anatomic distribution of myocardial fat in asymptomatic patients using the accepted threshold of less than -50 HU on CT image as indicative of adipose tissue.
Methods: 115 cardiac CT coronary angiograms were completed in asymptomatic patients using a 64 MDCT scanner, and 104 studies had good image quality and were retrospectively reviewed. Short and long axis views were analyzed for presence of myocardial fat (low density area greater than 1 mm with a threshold of < 50 HU) and verified on at least two gated data sets in two different views to exclude artifact.
Results: LV fat deposition was primarily seen at the basal level (29 patients, 43% of females, 15% of males). The anteroseptal segment was the most common region, (9 of 29). Fatty infiltration was very uncommon in the remaining levels of the LV. Punctate foci of fatty deposits were commonly seen in LV papillary muscles (64). RV intramyocardial fat typically extended from the endocardium towards the pericardium, and was seen mainly in the basal (47% of females, 29% of males) and mid (39% of females, 40% of males) levels. The most common RV segments were basal lateral (27), pulmonary outflow tract (21), inferior midventricular (32), and lateral midventricular (21). Fatty infiltration at the inferior septal insertion of RV free wall was seen in 21 patients while it was detected anteriorly in only 2 patients.
Conclusion: Fatty infiltration in the normal population is primarily located at the basal level of the LV and RV and the midventricular level of the RV. It is similar in both sexes in the RV while more frequent in females in the LV. Fatty infiltration of normal RV myocardium

originates primarily on the endocardial side of myocardium but extends toward epicardial side in severe examples. The fatty infiltration in normal LV myocardium presented here should be considered in differentiation from fatty deposition after pathologic processes such as myocardial infarct.

9:00 a.m.

909-232   **Correlation of Aortic Valve Area Obtained by the Velocity-Encoded Phase Contrast Continuity Method to Direct Planimetry using Cardiovascular Magnetic Resonance Imaging**

Kaoru Tanaka, Amgad N. Makaryus, Steven D. Wolff, Columbia University Medical Center, New York, NY

BACKGROUND: Aortic stenosis (AS) is the most common valvular heart disease resulting in surgical intervention. Echocardiography utilizing the continuity equation is commonly used to determine aortic valve area (AVA). However, echo can be limited by poor acoustic windows, annulus calcification, or eccentric jet morphology. Cardiac magnetic resonance imaging (CMR) provides an alternative non-invasive method for the evaluation of AVA using direct planimetry as it has been shown by prior studies to have good correlation with other modalites such as TTE, TEE, and cardiac catheterization. We sought to assess whether velocity-encoded phase-contrast (VEPC) MRI could provide an alternate accurate means of quantifying AVA by using the continuity equation.
METHODS: Twenty-two consecutive AS patients were imaged through the use of a 1.5-T MRI scanner with an 8-element, phased-array cardiac coil (GE Signa® EXCITE). AVA was determined by VEPC imaging using the continuity equation and by direct planimetry on fast imaging employing steady-state acquisition image.
RESULTS: Mean AVA by planimetry was 1.05±0.41cm2 and 1.00±0.4 cm2 by VEPC; with a strong correlation (R2=0.86, P<0.0001) between the two methods. The mean difference of AVA was 0.05±0.15 (95% CI=[0.02-0.08]) and the limits of agreement were -0.26 to 0.36 cm2. The mean difference between 2 observers for planimetry was 0.030±0.07 (95% CI=[0.02-0.04]) with limits of agreement of -0.11 to 0.16 cm2; and for VEPC was 0.008±0.085 (95% CI=[-0.01-0.026]) with limits of agreement of -0.16 to 0.18 cm2.
CONCLUSION: VEPC CMR is an alternate method to direct planimetry for accurately determining AVA. Both techniques can be easily incorporated into a single CMR exam to increase the confidence of AVA determination.

9:00 a.m.

909-233   **Predictive Value of Normal Adenosine-Stress Cardiac Magnetic Resonance Imaging Exams - A Prospective Follow-up Study over 12 Months After Diagnosis**

Günter Pilz, Andrea Jeske, Markus Klos, Berthold Höfling, Peter Bernhardt, Cardiac MRI, Clinic Agatharied, University of Munich, Hausham, Germany

Background: Adenosine-stress cardiac magnetic resonance imaging (CMR) is increasingly proposed for non-invasive detection of relevant coronary artery disease (CAD). Given the clinical impact of underdiagnosing significant CAD, the CMR exam's negative predictive value seems particularly important. Aim of our prospective study was to estimate the prognostic value of normal adenosine-stress CMR in routine patients.
Methods: Consecutive patients with suspected CAD who were scanned in a 1.5 T whole-body scanner (GE Signa Excite) with resulting exclusion of adenosine-stress hypoperfusion and/or delayed enhancement were included into the study. Patients were observed for 12 months for occurrence of major adverse cardiovascular events (MACE) as primary endpoint: cardiovascular mortality, myocardial infarction, revascularization therapy, hospitalization due cardiovascular event. Follow-up interviews with the patients and referring physicians were performed 6 and 12 months after inclusion into the study.
Results: 121 consecutive patients fulfilled the inclusion criteria, 113 consented to follow-up interviews and were included. Indication for CMR was either symptomatic angina (Canadian Cardiovascular Society [CCS] II in 56 [49.6%] and CCS III in 14 [12.4%]) or evaluation of myocardial ischemia in CCS I patients presenting with arrhythmia, syncope and/or equivocal stress tests and underlying cardiovascular risk factors (n=43 [38%]). MACE rate during 6 months after the exam was 1/113 (0.9%) due to stent implantation required in one patient. At the 12 months follow-up, a second MACE (bypass surgery) was recorded, thus the total MACE rate was 2/113 (1.8%). Negative predictive value of normal adenosine-stress CMR was 99.1% at 6 months and 98.2% at 12 months. There were no cases of cardiac death or myocardial infarction.
Conclusions: Normal adenosine-stress CMR has a very high negative predictive value and allows for non-invasive assessment in patients with suspected CAD. Hence, CMR may serve as a reliable non-invasive gatekeeper to reduce the number of redundant diagnostic coronary angiographies.

9:00 a.m.

909-235   **Whole-Body and Myocardial Insulin Resistance in Type 2 Diabetes Mellitus and Established Coronary Artery Disease: a BARI 2D PET Substudy**

Panithaya Chareonthaitawee, Stuart D. Christenson, Frank P. Kennedy, Charanjit S. Rihal, David O. Hodge, Bradley J. Kemp, Raymond J. Gibbons, Robert L. Frye, Mayo Clinic and Mayo Clinic College of Medicine, Rochester, MN

Background: Whole-body insulin resistance (IR) is characteristic of type 2 diabetes mellitus (DM2), has been implicated in the pathogenesis of atherosclerosis, and is associated with increased risk of cardiac events. Whether IR extends to normally contracting myocardium in DM2 with established coronary artery disease (CAD) remains controversial.
Methods: The Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI

2D) trial is designed to determine the efficacy of aggressive medical strategies for DM2 and established CAD with and without revascularization. Nineteen patients underwent overnight standardization of metabolic conditions followed by assessment of insulin-mediated whole body (M) and regional myocardial glucose uptake (rMGU) with the hyperinsulinemic euglycemic clamp and positron emission tomography with F-18 fluorodeoxyglucose at 35±15 days after study enrollment. Myocardial segments with a wall motion abnormality were excluded from the analyses.

Results:

	BARI 2D (n=19 patients)	DM2+CAD* (n=13 patients)	Controls* (n=14 patients
Age (years)	63±9	62±10/60±10	49±7
Males (%)	89	100	100
BMI (kg/m^2)	32.1±3.5	26.3±2.8/26.5±2.4	25.3±2.3
Fasting plasma glucose (mg/dL)	156.3±54.0	160.2±68.4/102.6±12.6	88.2±12.6
LVEF (%)	64±5	49±16/35±11	61±10
Clamp glucose (mg/dL)	98.3±7.8	106.2±23.4/97.2±12.6	93.6±16.2
M (µmol/min/kg)	**13.7±6.1**	**20.3±11.3**	**41.4±15.7**
rMGU (µmol/min/100 g)	**30±11**	**34±13**	**61±8**

*Values from Iozzo P et al., Diabetes 51:3020-24, 2002. **Conclusions:** In this BARI2D substudy, patients have severe IR at both a whole-body and a myocardial level. The degree of IR is comparable to prior published values of patients with concomitant type 2 diabetes and established coronary artery disease.

9:00 a.m.

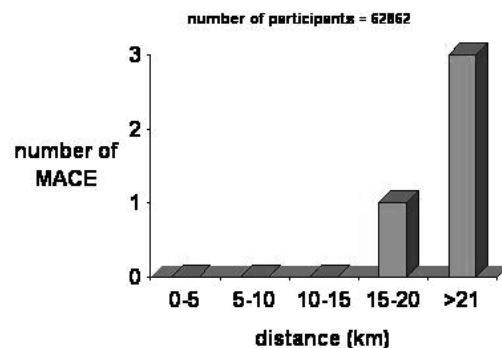909-236   **Major Adverse Cardiac Events During Endurance Sports**

Victor A. Umans, Anne Belonje, Mary Nangrahary, Hans de Swart, Medical Center Alkmaar, Alkmaar, The Netherlands

Background: Major adverse cardiac events (MACE) in endurance exercise are y due to underlying heart disease. We present an analysis of MACE that have occurred during 5 consecutive annual long distance athletic races. These beach races took place in January. All event pts were admitted in our hospital.
Methods: We reviewed the clinical files of MACE pts who participated in these athletic races. Among the participants were also professional African runners (20) and Olympic nominees (50).
Results: : A total of 62.862 athletes participated in either the cycling race (36km), or the half marathon (21km). The majority of participants was male (77%), with a mean age of 40 years. Of these, 4 (3 runners, 1 cyclist) had a MACE. All were male with a mean age of 48 yrs. Two pts developed chest pain and had an infarction, a 3rd pt collapsed due to VF without chest pain due to a catecholamine-induced VT/VF and the 4th stopped because of a heat stroke with positive CKmb and troponins. Two of 4 had a successful external defibrillation at the site of the event. The 2 infarction pts had a primary PCI. All pts recovered well. The figure shows the timing of MACE in endurance sports

MACE in 21 km marathon and bike race

number of participants = 62862

Conclusions: The risk of MACE during endurance sports in well-trained athletes is very low with an incidence of 0.006%. There were no casualties. All events occurred shortly after or just before the completion of the race. A rapid available external defibrillator is mandatory for all major sport events.

Diagnostic Testing

E-POSTER SESSION

910

E-Poster Session 910

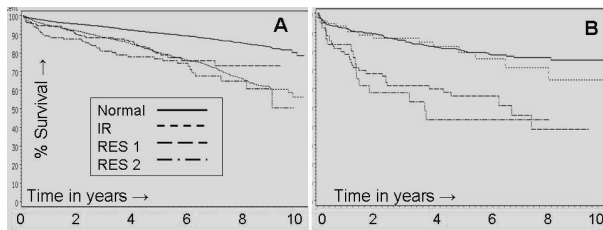Monday, March 26, 2007, 10:00 a.m.-11:00 a.m.
Hall H

10:00 a.m.

910-221   **Diastolic Function Analysis by Echocardiography Predicts Mortality Incremental to Clinical Risk and Ejection Fraction**

Sanderson Cauduro, Christina Wood, Kent Bailey, Patricia Pellikka, Bernard Gersh, Diego Bellavia, Bijoy Khandheria, James Seward, Rick Nishimura, Jamil Tajik, Fletcher Miller, Theodore P. Abraham, Mayo Clinic, Rochester, MN

Background: We examined whether diastolic function (DF) evaluation by echocardiography (ECHO) predicts mortality.
Methods and Results: We followed 84,837 patients for a mean of 2.8 years (range 0.01-9.8 yrs) and noted 16,837 deaths. Standard ECHO definitions were used to classify DF into normal (NL), impaired relaxation (IR) and restrictive (RES). Compared to NL, RES not IR predicted mortality incremental to known risk factors (Table). In subjects with no clinical risk factors, IR predicts worse mortality than NL (Fig A) in those >65 years and ejection fraction (EF)>55% but is no different than NL in those <65 years regardless of EF (Fig B).

Kaplan-Meier plots of two sample sub-populations: (A) Age >65 years, EF >55% and no clinical risk factors associated with mortality (Charlson Risk Index); n=20,225, 1973 events. (B) Age <65 years, EF <55% and no clinical risk factors (n=893, 165 events). RES 1= deceleration time <150 ms + mitral E/A ratio >1.5; RES 2 = only deceleration time <150 ms.

Conclusions: RES DF consistently predicts mortality incremental to known risk factors and EF in all age groups. IR predicts increased mortality in older individuals.

Diastolic function (RES 1 & 2 as defined in figure)	Unadjusted hazard ratios, HR (95% confidence intervals)	HR adjusted for age and gender	HR adjusted for age, gender, body mass index, hypertension, diabetes and ejection fraction	HR adjusted for all in previous column and 17 Charlson indices
Impaired Relaxation	1.7 (1.6,1.8)	1.0 (1.0,1.1)	1.1 (1.0,1.1)	1.0 (1.0, 1.1)
RES 1	2.9 (2.6,3.2)	2.6 (2.4,2.9)	1.9 (1.7,2.1)	1.8 (1.6, 2.0)
RES 2	3.3 (3.0,3.6)	2.1 (1.9,2.3)	1.6 (1.5,1.8)	1.7 (1.5,1.9)

10:00 a.m.

910-222   **Failure of Doppler Echocardiography to Accurately Estimate Left Ventricular Filling Pressures in Healthy Volunteers**

Eric L. Pacini, Anand Prasad, Jeff Hastings, Benjamin D. Levine, The University of Texas Southwestern Medical Center, Dallas, TX

Background: Echocardiographic indices based on tissue Doppler imaging and color M-mode propagation velocity (Vp) have been widely used as a noninvasive method to estimate left ventricular filling pressures (LVFP). Two indices, based on the ratio of the early diastolic mitral inflow velocity (E) to mitral annular velocity (E') and the ratio of E toVp, have emerged as the most reliable indicators for estimating LVFP. However, previous studies have assumed a consistent relationship between Doppler variables and LVFP for individual subjects based on regressions developed from group data. The purpose of this study was to elucidate the accuracy and precision of the relationship between Doppler indices and LVFP *for individuals* during five preload altering maneuvers.
Methods: 37 subjects, including 25 healthy seniors (69±4 years), and 12 young healthy adults (32±9 years) underwent right heart catheterization with simultaneous Doppler echo. Pulmonary capillary wedge pressure (PCWP) and echo variables were measured at baseline and during two phases of preload altering maneuvers: lower body negative pressure (-15 and -30 mmHg), and saline infusion (15ml/kg and 30 ml/kg).
Results: PCWP ranged from 0.80 to 24.0 (mean 10.3±5.3). The E/E' and E/Vp

ratios related well to PCWP when averaged at each preload level (r=0.77 and r=0.96 respectively). However, a much weaker correlation was found when linear regression was applied to all the group data together: E/E' (y=0.71[E/E'] + 6.34, r=0.20, SEE=5.04) and E/Vp (y=3.15[E/Vp] + 5.04, r=0.26, SEE=4.92) with a large error of measurement. In individuals, E/E' (mean r=0.53±0.29) and E/Vp (mean r=0.46±0.27) had a modest correlation to PCWP, but showed a wide variability; for example, individual slopes for E/E' (mean 1.74±3.70, range -4.57 to 11.03) and E/Vp (mean 4.20±9.28, range -16.4 to 25.4) were quite variable (with no age effect) making it impossible to assume a single, consistent relationship between Doppler indices and PCWP.
Conclusions: The relationship between E/E' or E/Vp and PCWP is highly variable among individuals and cannot be used to accurately predict LVFP in healthy volunteers.

10:00 a.m.

910-223   **Prerequisites for Avoiding Manual Boundary Editing using Semi-Automated Left Ventricular Quantitation By Real-time Three-dimensional Echocardiography**

Ebere O. Chukwu, Alan S. Katz, Rena S. Toole, William Schapiro, Nathaniel Reichek, Aasha S. Gopal, St. Francis Hospital, Roslyn, NY, Stony Brook University, Stony Brook, NY

Background: Quantitation of LV volumes and EF by RT3DE is semi-automated but still requires manual selection of diastole and systole as well as manual contour editing to obtain accurate results. We evaluated the prerequisites for optimal performance without manual boundary editing of a novel 3D voxel-based endocardial border tracking method. **Methods:** : 54 normals were imaged by RT3DE (Philips) and by TRUE-FISP CMR within 24 hrs. Diastole and systole were determined automatically (TomTec LV-Analysis©2.0) and endocardial boundaries were generated by placing 3, 5, or 7 initial LV contour points as well as by placing a complete contour in 3 orthogonal apical views. Then 3D contours were generated automatically using variable reliance on initial operator specified information (0%=ignored operator specified contours; 50%=partially bound to operator specified contours; 100%=completely constrained by operator specified contours). Once automatic LV volumes were generated, no subsequent manual contour editing occurred and results were compared to CMR (**Table**). Conclusions**:** 1) Automated border tracking is more accurate when a complete contour is provided as a starting point rather than 3, 5 or 7 contour points. 2) Partial reliance (50%) of the border tracking algorthim on operator provided contours performs best. 3) Manual contour editing can be avoided to obtain accurate automated LV volumes comparable to CMR in normals. However, further validation of this automated technique is necessary in abnormal LVs.

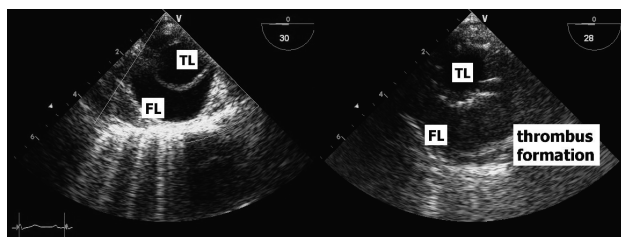| n=54	EDV	EDV	EDV	ESV	ESV	ESV	EF	EF	EF
	r, SEE	p value	Bias	r, SEE	p value	Bias	r, SEE	p value	Bias
3 points									
0%	0.67, 8.1	<0.0001	-67.1	0.67, 2.7	<0.0001	-31.8	0.25, 9.2	0.065	6.6
50%	0.69, 9.3	<0.0001	-46.6	0.69, 3.5	<0.0001	-17.9	0.15, 8.8	0.28	2.1
100%	0.65, 9.9	<0.0001	-54.0	0.73, 3.1	<0.0001	-23.3	0.30,10.6	0.03	0.6
5 points									
0%	0.79, 7.6	<0.0001	-45.9	0.69, 3.4	<0.0001	-25.2	0.15, 8.8	0.28	2.1
50%	0.79, 9.0	<0.0001	-21.3	0.76, 4.1	<0.0001	-7.5	0.20, 7.8	0.15	-1.0
100%	0.77, 9.5	<0.0001	-23.0	0.72, 4.2	<0.0001	-12.9	0.20, 9.2	0.14	3.6
7 points									
0%	0.74, 8.9	<0.0001	-38.5	0.62, 3.6	<0.0001	-23.2	0.06, 8.9	0.68	8.5
50%	0.80, 9.8	<0.0001	-14.1	0.73, 4.6	<0.0001	-5.5	0.26, 9.1	0.054	0.3
100%	0.81, 9.7	<0.0001	-14.9	0.69, 4.6	<0.0001	-9.9	0.23, 8.4	0.089	3.6
Full contour-no edits									
0%	0.83, 8.8	<0.0001	-29.7	0.80, 3.5	<0.0001	-18.1	0.28, 7.9	0.04	6.4
50%	0.83,11.0	<0.0001	-5.6	0.71, 5.7	<0.0001	0.8	0.38, 6.5	0.004	-1.1
100%	0.82,11.7	<0.0001	-5.4	0.62, 7.0	<0.0001	-3.2	0.34, 7.8	0.01	2.6

10:00 a.m.

<u>910-224</u>   **Intraoperative Monitoring by Transesophageal Echocardiography of Surgical Implantation of a Novel Prosthesis-Stent Combination in Aortic Dissection Involving Arch and Descending Aorta**

<u>Bjoern Plicht</u>, Ulf Herold, Rainer Leyh, Heinz Jakob, Thomas Buck, West German Heart Center - University Clinic Essen, Essen, Germany

Background: For intended one-stage repair of aortic dissections involving aortic arch and descending aorta a novel hybrid stent was developed which allows simultaneous prosthetic arch replacement and stent implantation into the descending aorta. We studied the feasibility of intraoperative transesophageal echocardiography (TEE) for guiding and monitoring of stent position and successful false lumen exclusion.
Methods: Five patients with aortic dissection (4 Type A classic dissections and 1 Type A intramural hematoma) were treated by ascending aorta and aortic arch replacement and stenting of the descending aorta with the new hybrid stent (Jotec E-Vita a.Open). In all cases intraoperative TEE monitoring was performed for documentation of stent position and false lumen exclusion.
Results: In all five cases TEE guidance and monitoring was feasible providing important information on stent positioning and successful stent implantation. After stent implantation slow flow and thrombus formation within the false lumen could be demonstrated by TEE intraoperatively.

Conclusion: Intraoperative TEE monitoring of hybrid stent implantation is a practical approach for documentation of stent positioning and therapeutic success.
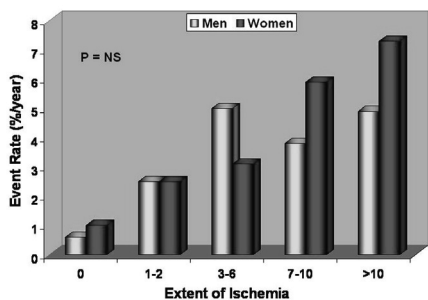
10:00 a.m.

<u>910-225</u>   **Prognostic Gender Differences During Stress Echocardiography**

<u>Sripal Bangalore</u>, Emad Aziz, Jorge Silva, Sabrina Sawhney, Ajay Shah, Ramya Smitha Suryadevara, Shruthi Pranesh, Danny Pudpud, Naohiko Imai, Siu-Sun Yao, Farooq A. Chaudhry, St Lukes Roosevelt Hospital, New York, NY

Background: Coronary artery disease (CAD) is the leading cause of mortality in women but the awareness is low.
Methods: We evaluated 3214 consecutive patients (mean age 60 ± 13 years; 52% women) undergoing stress echocardiography (59% dobutamine). Extent of ischemia was defined as the number of new wall motion abnormality during stress that increase in wall motion score of ≥1 (range 0-16). Followup (2.7 ± 1.0 years) for confirmed MI (n = 65) and cardiac death (n = 104) were obtained.
Results: Women were a lower risk cohort with lesser percentage with CHF and known CAD (prior MI, angioplasty and bypass surgery) compared to men. Compared to men fewer women presented with typical angina (20.6% vs. 18.1%, p = 0.04), fewer could exercise and fewer had abnormal stress echocardiograms (42.1% vs. 27.9%, p <0.0001). They had a higher ejection fraction (55% vs. 51%, p <0.0001), lower rest and stress wall motion score index, lower extent and severity of ischemia compared to men. However, though women were a lower risk cohort based on clinical and stress echo data, for the same extent of ischemia, their prognosis was comparable to men with a trend towards worse prognosis at greater extent of ischemia (Figure).

Conclusions: Though women seemed to be a lower risk cohort based on clinical and stress echocardiographic data, for the same extent of ischemia, women had comparable prognosis as high-risk men with a trend towards worse prognosis at greater extent of ischemia emphasizing the need to recognise and aggressively treat women.

10:00 a.m.

<u>910-226</u>   **Molecular Imaging of Post-ischemic Inflammation with Contrast Ultrasound and Microbubbles Bearing Dimeric P-Selectin Glycoprotein Ligand-1**

<u>Beat A. Kaufmann</u>, Aris Xie, Jonathan R. Lindner, Oregon Health and Sciences University, Portland, OR

Background: The use of bioengineered ligands as molecular imaging probes may be desirable in terms of safety, affinity, and cross-species use. We hypothesized that recombinant human P-Selectin Glycoprotein Ligand-1 (rPSGL-1) could be used for selectin-targeted contrast-enhanced ultrasound (CEU) imaging of inflammation.
Methods: Lipid microbubbles bearing either rPSGL-1-Immunoglobulin fusion protein (YSPSL, Y's Therapeutics) (MB_Y), monoclonal antibody to mouse P-Selectin (MB_{Ab}), or control antibody (MB_C) were prepared. The binding capability of microbubbles was tested with a flow chamber (P-selectin density of 100 molecules/μm^2) at shear stresses of 1-8 dyne/cm^2, and by intravital microscopy of mouse cremasteric muscle undergoing surgical trauma. Targeted signal from microbubbles was compared by CEU of the proximal hindlimb adductor muscle after ischemia (8 min) and reperfusion (45 min) in wild type and P-Selectin null (P-/-) mice, and in non-ischemic controls.
Results: In flow chamber experiments, microbubble attachment to P-selectin was equivalent for MB_Y and MB_{Ab} at all shear stresses. On intravital microscopy, P-selectin expression from surgical preparation resulted in venular leukocyte rolling and venular endothelial attachment for MB_Y and MB_{Ab} (13±9 vs11±9 per optical field). On CEU, targeted microbubble signal in post-ischemic muscle in wild-type mice incrementally increased (p<0.05) for MB_C, MB_Y and MB_{Ab} (4±2, 14±13, and 48±23 IU respectively). There was minimal signal in post-ischemic P-/- mice (<3 IU for all agents). Signal in non-ischemic control mice was higher (p<0.05) for MB_{Ab} (15±9 IU) compared to MB_Y and MB_C (3±3 IU for both). Accordingly, relative increase in signal due to ischemia was greater for MB_Y than MB_{Ab} (4.9- versus 3.1-fold).
Conclusions: A bioengineered form of the natural P-selectin ligand PSGL-1 can be used for CEU molecular imaging of inflammation. This strategy provides less total enhancement than antibody targeting, but greater specificity due to very low non-specific attachment in normal tissue. Microbubbles bearing a PSGL-1 analogue may provide an effective and safe means for diagnostic molecular imaging in humans.

10:00 a.m.

<u>910-227</u>   **Preload Independence of Diastolic Torsional Dynamics Evaluated by Two-Dimensional Ultrasound Speckle Tracking Imaging**
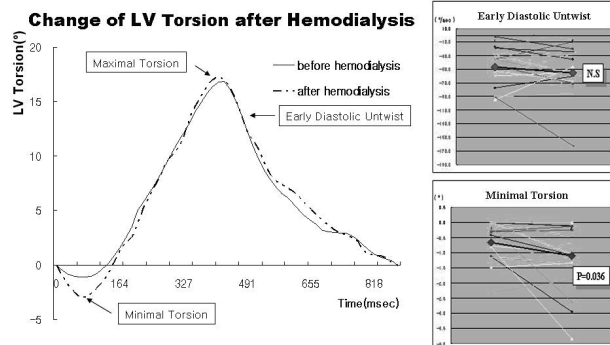
<u>Dae-Hee Shin</u>, Sang-Chol Lee, Jin-Oh Choi, Hak Jin Kim, Wang-Soo Lee, Sung-won Cho, Joo-Yong Hahn, Myung Joon Park, Jun Hyung Kim, Young Bin Song, Ji Hyun Yang, Seung Woo Park, Sang Hoon Lee, Kyung Pyo Hong, Jeong Euy Park, Samsung Medical Center, Seoul, South Korea

Background: Left ventricular (LV) torsion has been proposed as a sensitive index for LV diastolic and systolic function. Our aim was to assess the preload-dependence of LV torsion in patients undergoing hemodialysis.
Methods: 25 patients with end stage renal disease underwent echocardiography before and after hemodialysis. To assess LV torsion, LV rotation data was acquired at apical and basal short-axis levels with speckle tracking software. LV torsion was defined as the net deference of LV rotation between the apex and base. Diastolic untwist was estimated by diastolic torsional deformation slope during the early relaxation period. Systolic torsional dynamics were assessed by minimal torsion (peak negative clockwise torsion occurring in early systole) and maximal torsion (peak positive counterclockwise torsion).
Results: Data on 20 of 25 patients were usable for speckle tracking imaging analysis. After hemodialysis (3.1±0.9L), the early diastolic untwist was not changed (-0.47°/ms vs -0.56°/ms). Maximal torsion was not changed after preload reduction (16.82° vs 17.80°). Interestingly, during early systole, minimal torsion was significantly decreased after preload reduction(-0.6±0.7° vs -1.1±1.1°; p<0.05).
Conclusions: Early diastolic untwist may be a preload independent parameter of LV diastolic dysfunction. Early systolic LV torsional deformation is thought to be sensitive to preload change. Such parameters may be valuable tools for evaluation of LV diastolic and systolic function.

Diagnostic Testing

10:00 a.m.

910-228   Quantification of Global Left Ventricular Early Diastolic Expansion and Its Coupling to Systolic Contraction in Normal and Hypertrophic Myocardium by Speckle Tracking Global Strain and Strain Rate Imaging
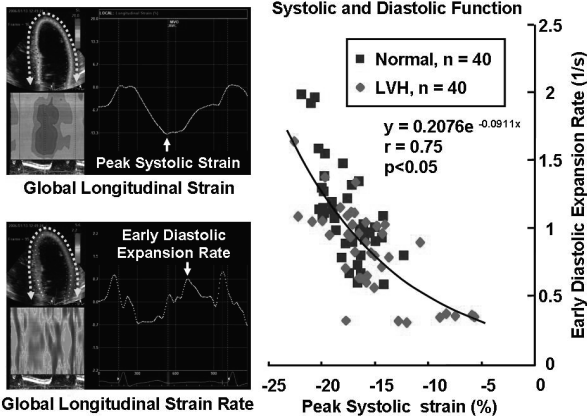
Takeshi Takamura, Kaoru Dohi, Katsuya Onishi, Yuko Sakurai, Nakoki Fujimoto, Tairo Kurita, Takashi Tanigawa, Naoki Isaka, Tsutomu Nobori, Masaaki Ito, Mie University Graduate School of Medicine, Tsu, Japan

Background: Left ventricular hypertrophy (LVH) is one of the major contributions of diastolic dysfunction. However, it has not been fully investigated whether impairments of diastolic function precede or coexist with the abnormality of myocardial contraction in those patients.
Methods: To quantify global LV longitudinal and circumferential function, 40 LVH patients with ejection fraction of 59 ± 8% and 40 age matched normal controls were studied with speckle tracking strain and strain rate. Global peak systolic strain (PSS) and early diastolic expansion rate (EDER) were analyzed from apical 4-, 2-, long axis, and mid-ventricular short axis views (Vivid 7 and EchoPAC, GE Medical).
Results: Longitudinal PSS and EDER were significantly impaired in LVH than controls: -15 ± 4* vs. -17 ± 2 % and 0.85 ± 0.33* vs. 1.13 ± 0.35 1/s (*p<0.05 vs. controls, respectively) although circumferential PSS and EDER were similar. Longitudinal EDER was significantly related to PSS with linear regression in both LVH (y = -0.06x-0.06, r = 0.72) and controls (y = -0.11x-0.74, r = 0.69). Moreover, there was a strong correlation between longitudinal PSS and EDER with exponential regression (r = 0.75) all through controls and LVH.

Relationship Between Global Longitudinal Systolic and Diastolic Function

$y = 0.2076e^{-0.0911x}$
$r = 0.75$
$p<0.05$

Conclusions: Speckle tracking strain and strain rate imaging quantified global systolic and diastolic function and revealed the importance of longitudinal early diastolic expansion rate as sensitive marker of diastolic dysfunction which coexist and strongly related to systolic contraction in normal and LVH.

10:00 a.m.

910-229   Does Subcutaneous Adiposity Protect Women Against Coronary Disease?

Kui-Hian Sim, Bernard Sze-Piaw Chin, Choon-Kiat Ang, Andreas H. Mahnken, Felix Schoth, Tiong-Kiam Ong, Tobias M. Seyfarth, SGH-IAA Investigators, Sarawak General Hospital, Kuching, Sarawak, Malaysia, RWTH-Aachen University, Aachen, Germany

Background: Obesity is associated with increased cardiovascular events. The relationship between abdominal visceral adiposity (VA) and subcutaneous adiposity (SCA) with coronary artery disease (CAD) is not known. In particular, the relative importance of abdominal adiposity for CAD between men and women has not been investigated. Using a 64-row multidetector computed tomography (MDCT) scanner, we performed minimally-invasive coronary imaging with less discomfort to the patient and determined if excess abdominal adiposity conferred higher likelihood of underlying CAD in the high-risk patient.
Methods: 361 patients (188 male, mean age 54±9 years) with multiple cardiovascular risk factors and specific indications for coronary imaging underwent cardiac MDCT and an abdominal scan. From Cardiac MDCT patients with lesions greater than 25% stenosis in any main coronary segment was diagnosed as CAD present. VA and SCA areas were estimated from a single slice CT at the level of L3/4.
Results: 139 patients (38.5%) have some degree of CAD with 27% having at least one lesion greater than 50% stenosis. The CAD group were older, with preponderance towards male sex, hypertension, dyslipidaemia, smoking history, higher mean serum triglyceride and creatinine. Median VA area was higher in men than women (125 vs. 108 cm2, P=0.002) but SCA area was lower (112 vs. 154 cm2, P<0.001). For women, median SCA area was lower in the CAD group compared to non-CAD (161 vs. 133 cm2, P=0.04). For men, neither SCA nor VA area were signficantly different between CAD and non-CAD groups. The independent predictors for presence of CAD were elevated serum creatinine, history of hypertension, dyslipidaemia, smoking and duration of diabetes.
Conclusions: Increased subcutaneous adiposity, as measured by a single CT cut at the level of L3/L4 is associated with lower likelihood of CAD in women with multiple risk factors. Traditional risk factors remain the most important predictors of CAD in general.

10:00 a.m.

910-230   Diagnostic Accuracy of Multidetector 64-Slice CT Coronary Angiography in Assessing Patency of Coronary Artery Bypass Grafts

Refat Jabara, Nicolas Chronos, Larry Klein, Steve Eisenberg, Rebecca Allen, Shannon Bradford, Stephen Frohwein, SJRI / Saint Joseph's Hospital, Atlanta, GA

Background: CT angiography (CTA) has been considered as an attractive alternative to the gold standard invasive coronary angiography in the evaluation of CAD.
Aim: To prospectively evaluate the diagnostic accuracy of the multidetector 64-slice CTA in assessing the patency of coronary artery bypass grafts compared to invasive coronary angiography.
Methods: 148 bypass grafts (101 venous grafts, 47 mammary artery grafts) were evaluated in 50 consecutive patients (46 men and 4 women, age 64±8years). A contrast-enhanced 64 slice CT was performed and compared to the invasive angiogram, using a scan protocol with 64x0.5mm slice collimation, 0.33s gantry rotation time and simultaneous ECG registration. All patients with heart rate above 65bpm at baseline received 50mg metoprolol orally (mean heart rate was 60±11). Bypass graft patency and the presence of stenosis as well as the proximal and distal anastomoses were evaluated by two experienced blinded readers.
Results: Overall 145 out of 148 bypass grafts (98%) were detected by CTA. The three un-visualized grafts were occluded at the time of the invasive coronary angiogram. Of the grafts visualized, 27 were totally occluded, 112 were patent, and 6 had significant stenoses which were confirmed by invasive angiography. 83% (98/118) of the distal anastomoses could be visualized very well and the remaining 17% (20/118) were not visualized well, in part due to vascular clips. 96% (113/118) of the patent grafts demonstrated good run-off distal to anastomoses, without ability to accurately evaluate retrograde flow. Interestingly, two grafts were not demonstrated by invasive angiography but were accurately detected by CTA and were found to be widely patent; one of them was a right internal mammary artery grafted to the LAD, and the other was a Y-graft originating from the inferolateral part of the aortic arch and grafted to the RCA and OM1.
Conclusions: Multidetector 64-slice CTA is a valuable tool for direct visualization of coronary bypass grafts and assessment of their patency. Dysfunctional bypass grafts can be detected with very high diagnostic accuracy. With further improvements, CTA may become the preferred method for bypass graft assessment.

10:00 a.m.

910-231   Effect of Slice Thickness on Quantitative Chronic Myocardial Scar Imaging by Multidetector Computed Tomography: Comparison to Magnetic Resonance Imaging and Pathology

Karl H. Schuleri, Marco Centola, Richard T. George, Robert Evers, Kristina S. Evers, Gary Feigenbaum, Joshua M. Hare, Albert C. Lardo, Johns Hopkins University, Baltimore, MD

Background: Delayed enhancement multidetector computed tomography (DE-MDCT) can accurately characterize myocardial necrosis and microvascular obstruction following acute myocardial infarction (MI). The ability of DE-MDCT to quantify chronic collagenous scar (CCS) resulting from healed reperfused MI and the effect of MDCT reconstruction parameters such as slice thickness on the accuracy of these measurements, however, has not been systematically studied.
Methods: Eight mini-pigs underwent 120 to 150min-coronary artery occlusion followed by reperfusion. DE-MDCT and delayed enhancement magnetic resonance imaging (DE-MRI) studies were performed on the same day 6 months after MI induction followed by animal sacrifice. DE-MDCT images were acquired on a 64-slice CT scanner with an axial slice thickness of 0.5 mm five minutes after 150 ml iodine contrast injection. DE-MDCT-images were reconstructed at 2 and 8 mm. DE-MRI was performed 15 minutes following 0.2μm/kg Gd-DTPA the same day using an inversion-recovery gradient-echo pulse sequence and slice thickness of 8-mm on a 1.5 T scanner. Semi-automated quantitative analysis was performed using a uniform threshold technique of the remote myocardium to the infarct areas. Post-mortem hearts were cut into 2mm slices, photographed and infarct size was evaluated.
Results: Total infarct volumes were 19.81±1.8, 19.53±3.4 and 18.51±2.6 % of left ventricular volume for DE-MRI, 8mm DE-MDCT and 2mm DE-MDCT, respectively. DE-MRI demonstrated excellent correlation with pathology (r=0.961; p<0.01). DE-MDCT showed similar results at 8mm and 2mm slice thickness(r=0.672 and r=0.769, respectively; p<0.05).Bland-Altman analysis demonstrated an overestimation of infarct size by DE-MRI and 8mm DE-MDCT (mean -4.8 and -3.0 respectively; p<0.05), while 2mm DE-MDCT was in closer agreement to pathology (mean 2.8; P=NS).
Conclusion: DE-MDCT provides an accurate measure of the spatial extent of CCS compared to DE-MRI and pathology. However, the accuracy of DE-MDCT measurements is inversely proportional to slice thickness. This is most likely attributed to a reduction of partial volume effects with decreasing slice thickness.

10:00 a.m.

910-232   Apolipoprotein E Derived Peptide Containing Gadolinium Mixed Micelles For Macrophage Imaging In Atherosclerotic Plaque Of Apoe -/- Mice

Esad Vucic, Karen C. Briley-Saboe, Juan G. Aguinaldo, Vardan Amirbekian, Sandro Keller, Edward A. Fisher, Margitta Dathe, Zahi A. Fayad, Mount Sinai School of Medicine, New York, NY, 2Leibniz Institute of Molecular Pharmacology, Berlin, Germany

Backround: Lipid nanoparticles containing Apolipoprotein E derived peptide (P2A2) have been shown to be effectively incorporated in various endothelial cell types in vitro. P2A2

comprises binding sites for the low-density lipoprotein receptor and for cell surface heparan sulfate proteoglycan. This study tests the hypothesis that the incorporation of P2A2 into Gadolinium mixed micelles will shift the properties of untargeted micelles from a non-cellular to a cellular interaction in atherosclerotic plaque with the potential of specific macrophage imaging.

Methods: P2A2 containing Gadolinium mixed micelles (ApoE Micelles) were sytnthesized. Fifteen-month-old ApoE -/- mice(n=5) underwent in vivo MRI of the abdominal aorta using a 9.4T MR system. Lissamine Rhodamine containing ApoE Micelles (0.038 mmol Gd/Kg) were injected into the tail vein and pre- and post-contrast enhanced MR at 24h using a T1W black blood sequence was performed. As a control ApoE -/- mice (n=6) were injected with NBD containing untargeted micelles (0.038 mmol Gd/Kg) and were imaged as described. Another control group (n=6) was injected with Gd-DTPA and imaged at 1h and 24h post-injection.After MRI, frozen sections were obtained and were indicated stained with CD68 for macrophage staining and imaged using confocal microscopy for co-localization studies.

Results: Relative to muscle (as described by the %NENH), administration of untargeted and ApoE micelles resulted in significant enhancement of the vessel wall of ApoE -/- mice.% NENH: 62% +/-5 for untargeted micelles, and 113% +/-5 for ApoE micelles. Following administration of GdDTPA, transient signal enhancement was observed in the vessel wall of ApoE-/- mice one-hour post injection. No significant enhancement of the vessel wall of ApoE-/- mice was observed 24-hour postinjection.Confocal fluorescence imaging demonstrates the localization of untargeted micelles primarily to perivascular areas and areas rich in extracellular matix. Aortic Sections after ApoE micelle injection demonstrate localization of ApoE micelles to intra-plaque macrophages.

Conclusion: We demonstrate the specific molecular imaging of macrophages using ApoE micelles.
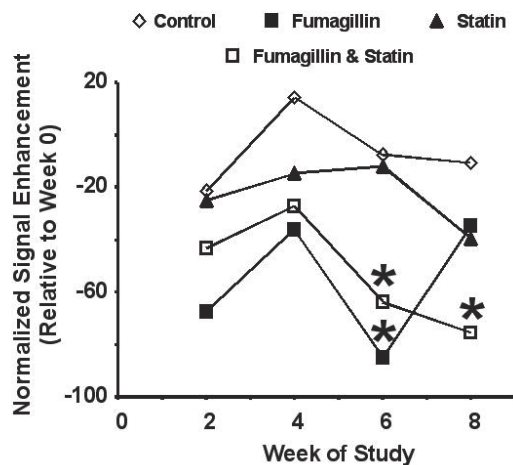
10:00 a.m.

910-233   Combination Therapy of Targeted Anti-Angiogenic Drug Delivery and Oral Statin Against Atherosclerosis

Patrick M. Winter, Shelton D. Caruthers, John S. Allen, Todd A. Williams, Huiying Zhang, Samuel A. Wickline, Gregory M. Lanza, Washington University Medical School, St. Louis, MO

Background: Atherosclerosis is associated with an expanding neovasculature that can be assessed and treated acutely with a_vB_3-targeted paramagnetic nanoparticles (a_vB_3-NP) incorporating drugs, such as fumagillin (a_vB_3-fumagillin-NP). The objective of this study was to determine if the acute antiangiogenic effects of (a_vB_3-fumagillin-NP) could be maintained with oral statin therapy.

Methods: Atherosclerotic rabbits received: no treatment, a_vB_3-fumagillin-NP at weeks 0 and 4, oral atorvastatin, or a_vB_3-fumagillin-NP and atorvastatin. Anti-angiogenic response in the aorta was evaluated by MRI enhancement (1.5T) at weeks 2, 4, 6 and 8 using a_vB_3-NP.

Results: Control rabbits had similar MRI enhancement, normalized to week 0, at all time points (Figure). Aortas in rabbits receiving a_vB_3-fumagillin-NP on weeks 0 and 4 had a marked decrease in signal 2 weeks later that rebounded over the following 2 weeks. Addition of atorvastatin to the a_vB_3-fumagillin-NP treatment significantly maintained the anti-angiogenic effects at 8 weeks (* p < 0.05) but not at 4 weeks. Atorvastatin alone did not significantly decrease MRI signal (p>0.05).

Conclusion: These data suggest that the acute anti-angiogenesis effects achieved with a_vB_3-fumagillin-NPs may be maintained with oral statins. Such rapid and persistent inhibition of atherosclerotic neovascularization with a_vB_3-fumagillin-NP in combination with statins may provide a clinically viable approach to plaque stabilization in high-risk patients.

10:00 a.m.

910-235   Evaluation Of The Appropriateness Criteria For Myocardial Perfusion Imaging: A Clinical Appropriateness Score Stratifies Perfusion Findings

Regina S. Druz, Karen Ngai, North Shore University Hospital, Manhasset, NY, St Francis Hospital, Roslyn, NY

Background: Appropriateness criteria for Myocardial Perfusion Imaging (MPI) aim to identify test appropriateness based on 52 clinical scenarios: appropriate (A; 27), uncertain (U;13), and inappropriate (I;12). We developed a clinical appropriateness score, and applied it to the findings of MPI.

Methods: 1889 pts (age 65±14 yrs, 1171 male) with MPI Jan 2005-Jan 2006 were identified. Summed stress scores (SSS) were known for 1686 pts (5-point/20-segments), and post-stress ejection fraction (EF; QGS) for 1751 pts. MPI results were: normal if no perfusion defects; abnormal if 1 or more perfusion defects. Clinical appropriateness score (0-3) was calculated as a sum of the: EITHER the pre-test likelihood of coronary heart disease (CHD; very low/low=0; intermediate/intermediate-high=1; high/very-high=2) in pts without CHD, OR symptoms in pts with CHD (none=0; typical/atypical chest pain or shortness of breath=1) AND each of the 52 scenarios (present=1; absent=0). For pts with very low/low likelihood of CHD, Framingham risk scores were used (<10%=0; 10-20%=1; >20%=2). MPI tests were categorized by appropriateness score: I=0; U =1; A =2-3. Kruskal-Wallis and chi-square tests were used for MPI results in I, U, and A categories.

Results: Table. Conclusion: Clinical appropriateness score stratifies MPI tests into A, U, and I categories. There are predominantly normal findings in the I category, more abnormal findings in the A category, with intermediate results for U.

MPI	A	U	I
n=1889 (100%)	1077 (57%)	623 (33%)	189 (10%)
Normal MPI within category (%)	582 (54%)*	523 (84%)**	172 (91%)
Abnormal MPI within category (%)	495 (46%)*	100 (16%)**	17 (9%)
SSS (mean±SD) n=1686	6±9*	2±5**	0±2
EF (%; mean±SD) n=1751	60±16*	68±12	68±9

*p<0.0001 for A vs. U and I ** p<0.02 for U vs. I

10:00 a.m.

910-236   Is O2-pulse Obtained From Respiratory Gas Analysis Useful for Estimating the Stroke Volume During Exercise in Patients With Left Ventricular Dysfunction?

Masayo Hoshimoto, Akira Koike, Osamu Nagayama, Kaori Yamaguchi, Akihiko Tajima, Ayumi Goda, Tadanori Aizawa, The Cardiovascular Institute, Tokyo, Japan

Background: O2 uptake (VO2) is equal to cardiac output x the arterial - mixed venous O2 difference. Thus, in normal subjects, O2-pulse (VO2/heart rate) measured by respiratory gas analysis during exercise is assumed to reflect the stroke volume. However, it has not been validated as to whether the O2-pulse is a reliable parameter reflecting the stroke volume in cardiac patients. In this study, we compared O2-pulse and stroke volume during exercise in patients with left ventricular dysfunction.

Methods: Forty consecutive patients (57±10 years, LVEF=35±6 %) with a previous myocardial infarction underwent constant work rate exercise at 80 % of the anaerobic threshold (40±8 W) for 6 min, along with an incremental symptom-limited maximum exercise. O2-pulse during constant work rate exercise and during incremental exercise was measured continuously by respiratory gas analysis. The stroke volume at 6 min during constant exercise was measured by the dye dilution method in combination with a radioisotope technique.

Results: O2-pulse measured at 6 min during constant work rate exercise (7.2±1.4 mL/beat) significantly positively correlated with the stroke volume measured at the same time (82.8±26.4 mL/beat) (r=0.46, p=0.002) and tended to correlate with the increase in the stroke volume from rest to 6 min of constant exercise (10.6±13.8 mL/beat) (r=0.31, p=0.05). O2-pulse measured at peak exercise during incremental exercise (9.1±1.9 mL/beat) also significantly positively correlated with both the stroke volume at 6 min during constant work rate exercise (r=0.39, p=0.01) and the increase in the stroke volume from rest to 6 min of constant exercise (r=0.49, p=0.001).

Conclusions: Although O2-pulse has been underrated among the established respiratory gas indexes during exercise, it can be used as an additional useful and noninvasive parameter reflecting the stroke volume during exercise in patients with left ventricular dysfunction, which is not easy to estimate by other methods.

E-POSTER SESSION

911

E-Poster Session 911

Monday, March 26, 2007, 11:00 a.m.-Noon
Hall H

11:00 a.m.

911-221   Transmural Torsional Deformity in Hypertrophic Cardiomyopathy: Temporal and Spatial Analysis by Two-Dimensional Tissue Tracking System
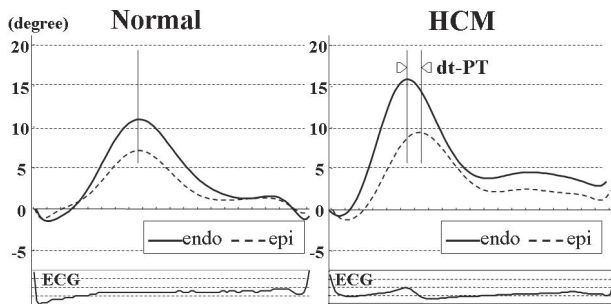
Takeo Tanaka, Kazuya Murata, Eizo Akagawa, Yoshio Nose, Yasuhiro Fukagawa, Hiroko Yoshino, Ryo Hashimoto, Yasuaki Wada, Hideki Kunichika, Masunori Matsuzaki, Yamaguchi University Graduate School of Medicine, Ube, Japan

Background: Quantification of left ventricular (LV) torsion has been feasible with newly developed two-dimensional echocardiographic tissue tracking system (2DTT), which based on pattern matching algorithm.Our objective was to evaluate the magnitude and timing of LV systolic torsion in endo- and epicardium (Endo, Epi) separately, and the transmural torsional deformity in patients with hypertrophic cardiomyopathy (HCM).
Methods: The LV basal and apical short-axis images were acquired in 10 patients with non-obstructive HCM and 10 normal subjects (N). Total eight points were placed on anterior, lateral, posterior and septum both at Endo and Epi in each base and apex, and the movements of these points were automatically tracked by 2DTT (EUB-8500, Hitachi). The rotation angle of each point was calculated and averaged. The LV torsion was defined as the net-difference between basal and apical rotation angles. Time interval from end-diastole to the timing of peak torsion (t-PT) corrected by R-R interval was obtained and the difference of t-PT between Endo and Epi (dt-PT) was calculated.
Results: LV Epi-torsion was not different between two groups. However, Endo-torsion in HCM was grater than that in N (13.6±3.1 vs 10.2±3.7°, p<0.05). In addition, dt-PT in HCM was greater than in N (18.2±24.8 vs -17.8±25.0msec$^{0.5}$, p<0.01).
Conclusions: The temporal and spatial transmural torsional heterogeneity is present in HCM. This might be attributed to hypertrophic myocardial structure and myofiber disarray in HCM.

11:00 a.m.

911-222   Left Atrial Phasic Dysfunction: A Potent Marker for First Atrial Fibrillation or Flutter in an Elderly Cohort
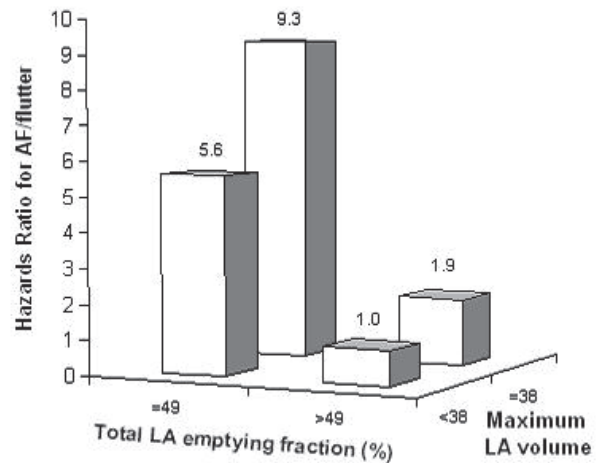
Walter Abhayaratna, Kaniz Fatema, Marion Barnes, James Seward, Grace Verzosa, Bernard Gersh, Kent Bailey, Teresa Tsang, Mayo Clinic, Rochester, MN

Background: Although left atrial (LA) size is an established predictor of atrial fibrillation (AF), little is known regarding the relationship between LA function and the risk of first atrial fibrillation (AF)/ flutter.
Methods: In this prospective study, we quantitated LA volumes and phasic function by echocardiography in 574 adults (mean age 74 ± 6 years; 52% men) without a history of atrial arrhythmia.
Results: During a mean follow-up of 1.9 ± 1.2 years, 30 (5.2%) subjects developed electrocardiographically confirmed AF/flutter. Subjects with new AF/flutter had lower LA reservoir function, as measured by total LA emptying fraction (LAEF) (38% versus 49%, p<0.0001), and higher maximum LA volume (47mL/m² versus 40mL/m², p=0.005); but did not differ with regard to measures of LA conduit function (mitral E wave VTI / A wave VTI; p=0.83) or LA pump function (mitral A velocity [p=0.84] and septal a' velocity [p=0.81]). An increase in age-adjusted risk for AF/flutter was evident when the cohort was stratified according to medians of LAEF (<=49%: HR 6.5, p=0.001) and LA volume (>=38mL/m²: HR 2.0, p=0.07), with the risk being highest for subjects with both LAEF<=49% and LA volume >=38mL/m² (HR 9.3, p=0.003) (Table). LAEF (p=0.002) was associated with risk of first AF/flutter after adjusting for baseline clinical risk factors for AF/flutter, left ventricular ejection fraction, diastolic function grade, and LA volume.
Conclusions: Reduced LA reservoir function markedly increases the propensity to first AF/flutter.

11:00 a.m.

911-223   Gender and Severity of Left Ventricular Hypertrophy Predict Long-Term Survival
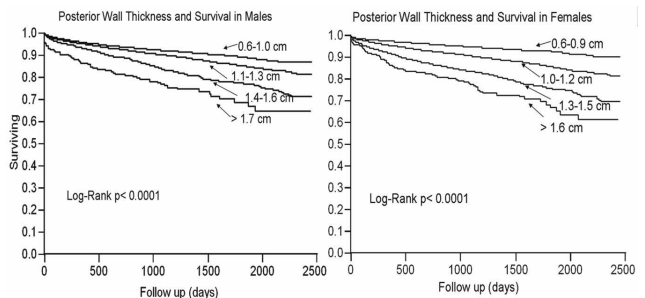
Jayant Nath, Paul Heidenreich, Vinod Raxwal, Kevin Mulhern, Randall Genton, James L. Vacek, David Wilson, University of Kansas Medical Center, Kansas City, KS, Stanford University, Stanford, CA

Objective: The study was designed to evaluate the impact of the severity of left ventricular posterior wall thickness (LVPWT) on long term survival in large population.
Methods: We identified consecutive 40,884 subjects (gender: male 19,650, female 21,234, age: male 57±16, female 57±18 years) who underwent echocardiography at University of Kansas Medical Center during a 6.5-year period (mean 1107±720 days). LVPWT was measured using American Society of Echocardiography guidelines as normal (0.6-1.0 cm in males, 0.6-0.9 cm in females), mild hypertrophy (1.1-1.3 cm in males, 1.1-1.2 in females), moderate hypertrophy (1.4-1.6 cm in males, 1.3-1.5 in females) and severe hypertrophy (≥1.7 cm in males, ≥1.6 cm in females). Kaplan-Meier and proportional hazards methods were used to compare differences in survival between varying grades of LVPWT.
Results: Increased left ventricular posterior wall thickness was associated with worse prognosis (figure 1). When adjusted for left ventricular ejection fraction, age, history of hypertension, and aortic stenosis, moderate (risk ratio=1.28, p=0.05) and severe (risk ratio=2.98, p <0.0001) left ventricular hypertrophy (LVH) in males and any LVH in females (risk ratio: mild 1.36 p <0.001, moderate 1.95, p <0.0001, severe 2.77, p=0.0001) was associated with significantly worse survival.
Conclusion: Moderate or greater LVH in males and any left ventricular hypertrophy in females is associated with poor long-term prognosis.

11:00 a.m.

911-224   Quantitative Assessment of Mitral Annular Dynamics Using Real-Time 3D Echocardiography

Federico Veronesi, Cristiana Corsi, Enrico G. Caiani, Lissa Sugeng, Lynn Weinert, Victor Mor-Avi, Claudio Lamberti, Roberto M. Lang, University of Chicago, Chicago, IL, University of Bologna, Bologna, Italy

Mitral annulus (MA) shape has been studied using real-time 3D echocardiography (RT3DE), based on static MA measurements alone. Assuming that the evaluation of MA dynamics would add to the understanding of MA functionality, we developed and tested a tool for automated 3D tracking and quantification of MA motion throughout the cardiac cycle.
Methods. Transthoracic RT3DE imaging was performed in 45 subjects: 15 normal (NL) subjects and 30 pts with moderate MR (regurgitant orifice area ≥0.2 cm²) secondary to dilated (DCM; N=15) or ischemic (ISC; N=15) cardiomyopathy. Custom software based on optical flow was used to semi-automatically track the annulus and calculate MA surface area, longitudinal displacement and peak-systolic (S'), peak-early diastolic (E') and peak-late diastolic (A') velocities.

Results. Significant inter-group differences were noted in end-diastolic MA surface area (NL: 6.9±1.8 cm²; DCM: 11.1±2.6 cm²; ISC: 9.0±2.0 cm²) and in both magnitude (NL: 10.0±3.0 mm; DCM: 3.4±1.7 mm; ISC: 4.9±1.5 mm) and timing of maximum MA displacement (NL: 57±3 %; DCM: 67±7 %; ISC 64±8 % of RR interval). Also S' (NL: -39±12 mm/s; DCM: -19±6 mm/s; ISC: -24±7 mm/s), E' (NL: 73±32 mm/s; DCM: 23±7 mm/s; ISC: 31 ±16 mm/s) and A' (NL: 27±11 mm/s; DCM: 14±9 mm/s; ISC: 20 ± 11 mm/s) were reduced in the MR groups.

Conclusion. This new technique allows for the first time direct measurement of MA dynamics throughout the cardiac cycle, which provides additional, potentially clinically useful insight into the pathophysiology of MR.

11:00 a.m.

<u>911-225</u>　　**Left ventricular Longitudinal Contractile Reserve is Abnormal in Hypertensive Patients With Left Ventricular Hypertrophy**

Sungha Park, Hye-Sun Seo, Chi Young Shim, Eui Young Choi, Young-Guk Ko, Donghoon Choi, Jong-Won Ha, Se-Joong Rim, Namsik Chung, Yonsei University College of Medicine Cardiovascular Center Division of Cardiology, Seoul, South Korea

Background: LVH is associated with a reduction of subendocardial coronary flow reserve. Because the subendocardial layer mainly consists of longitudinal fibers, the decrease in coronary flow may result in abnormal myocardial longitudinal contractile reserve during exercise.

Methods: A total of 182 patients with well-controlled hypertension were enrolled. Patients were classified as follows: patients with normal geometry (Group 1, n=116), concentric remodeling (Group 2, n=31), or concentric LVH (Group 3, n=35). Exercise Doppler echocardiography was performed using symptom-limited, multistage supine bicycle exercise testing. Variable Doppler parameters including mitral inflow and annular velocities were obtained at baseline, at each stage of exercise, and during recovery.

Results: There was no significant difference in terms of baseline characteristics between the three groups. However, the ratio of E/E' was significantly higher in group 3 at rest and 25W of exercise [Rest (Group1:Group2:Group3 = 11.3 ± 3.6:11.3 ± 3.9:13.9 ± 4.1, P = 0.002), 25W (Group1:Group2:Group3 = 12.0 ± 4.2:12.2 ± 4.6:14.6 ± 4.8, P = 0.018)] and showed a tendency to be higher during 50W of exercise.(Group1:Group2:Group3 = 12.1 ± 4.1:12.4 ± 3.1:14.5 ± 5.4, P = 0.052) Although the mitral annular systolic velocity (S') was similar between the three groups at rest, S' during exercise was significantly lower in group 3 .[25W(Group1:Group2:Group3 = 7.66 ± 1.53:7.68 ± 1.86:6.69 ± 1.53, P = 0.006), 50W (Group1:Group2:Group3 = 8.32 ± 1.58:8.61 ± 2.27:7.36 ± 1.68, P = 0.017), Peak(Group1:Group2:Group3 = 8.93 ± 1.92:8.64 ± 2.25:7.70 ± 1.90, P = 0.018)] The change in S' from baseline to exercise was also significantly lower in group 3. [Baseline to 25W(Group1:Group2:Group3 = 1.26 ± 1.27:1.20 ± 1.51:0.51 ± 1.33, P = 0.014), Baseline to 50W(Group1:Group2:Group3 = 1.94 ± 1.46:2.03 ± 1.78:1.14 ± 1.62, P = 0.047), Baseline to peak exercise(Group1:Group2:Group3 = 2.58 ± 1.65:2.30 ± 1.79:1.53 ± 1.44, P = 0.013]

Conclusions: LVH was associated with abnormal LV longitudinal contractile reserve in hypertensive patients when compared to patients with normal geometry and concentric LV remodeling.

11:00 a.m.

<u>911-226</u>　　**Quantification Methods For Determination Of Myocardial Blood Flow During Real-Time Dobutamine Perfusion Contrast Echocardiography: Is it necessary to normalize?**

Sahar S. Abdelmoneim, Mathieu Bernier, Stuart Moir, Edward M. Mendrick, Joe V. Gertcher, Jennifer A. Warmsbecker, Patricia Pellikka, Robert McCully, Sunil V. Mankad, Sharon L. Mulvagh, Mayo Clinic, Rochester, MN

Background: Microvascular cross-sectional area (A) may vary within and between myocardial regions. We compared conventional versus corrected or normalized replenishment curve equations during dobutamine real-time perfusion contrast echocardiography (RTP-CE)
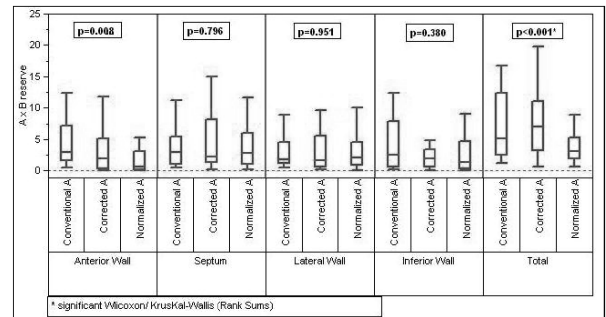
Methods: From April - June 2006, 50 consecutive patients underwent simultaneous dobutamine echocardiography (DE) and RTP-CE using Definity infusion (BMS USA). Analysis (Syngo Siemens) was done using 16 segments representing all myocardial walls. Conventional A reserve (Ar) was calculated using $(y=A (1-e^{-\beta t})$. Correction for A was calculated by using either relative blood volume [corrected A= A/ A_{LV}, A_{LV} reflects left ventricular video intensity (VI) adjacent to each segment] or normalized A [A=$10^{(A-blood pool VI/10)}$ x 100]. Myocardial blood flow (MBF) (A x β) reserve was calculated as stress/rest values (β reflects micro bubble velocity)

Results: The study included 25 males [mean age 71 ± 11 years, BMI 28 ± 4.8 Kg/m²]. DE was negative in 36(72%) patients. Mean A x β reserve was 8.2 ± 2.8 in this group vs. 5.2 ± 2.6 in positive DE (p=0.09). Different calculation methods yielded significant differences in Ar values in the anterior wall, septum and in total segments (p= 0.002, 0.006 & <0.001, respectively). For A x β reserve in normal DE, both correction and normalization resulted in less variability in calculated MBF reserve (Figure)

Conclusions: Corrected equations for the replenishment curve may generate more stable measurements of MBF during RTP-CE

Figure. Myocardial blood flow (A x β) reserve using different corrections of the replenishment curve.

11:00 a.m.

<u>911-228</u>　　**Diastolic Index Of Color Kinesis Can Noninvasively Detect Therapeutic Effects Of Angiotensin II Receptor Blocker On Lv Diastolic Function In Hypertensive Diastolic Heart Failure Model.**

Yasuharu Takeda, Yasushi Sakata, Toshiaki Mano, Mayu Nishio, Tomohito Ohtani, Seiko Umekawa, Yumiko Kobayashi, Michie Tao, Kazuhiro Yamamoto, Masatsugu Hori, Osaka University Graduate Schhol of Medicine, Suita, Japan

Background: Color-encoded echo images can quantitatively assess LV wall motion through a cardiac cycle. We investigated whether diastolic index of color kinesis (CK-DI) can noninvasively detect therapeutic effects of angiotensin II receptor blocker on LV diastolic function using hypertensive diastolic heart failure model rats.

Methods: Dahl salt-sensitive rats were fed on 8% NaCl from 6 weeks. Echocardiographic and hemodynamic data were collected in rats with (n=9, ARB(+)) or without (n=14, ARB(-)) 9-week-administration of subdepressor dose of angiotensin II receptor blocker (telmisartan 0.1mg/kg/). Seven rats fed on 0.3% NaCl served as controls (N). CK-DI was calculated as a ratio of LV segmental cavity area expansion during the first 30% of diastolic filling time to that during whole diastolic filling period.

Results: There was no difference in blood pressure (sBP) between ARB(-) and ARB(+). LV midwall fractional shortening (MFS) was not different among the three groups. Time constant of LV relaxation (Tau) was longer in ARB(-) than N, and a subdepressor dose of telmisartan prevented its prolongation. CK-DI was smaller in ARB(-) than in N, and this change was attenuated in ARB(+). E/A was not different between ARB (-) and ARB (+).

Conclusions: Color-encoded imaging may be superior to transmitral flow velocity curves in the noninvasive assessment of therapeutic effects on LV diastolic function.

	N	ARB(-)	ARB(+)
sBP(mmHg)	131±9	233±9*	224±17*
MFS(%)	18±3	20±3	19±3
Tau(msec)	17.8±4.0	24.9±5.2*	20.5±2.7†
CK-DI(%)	54±9	29±7*	36±7*†
E/A	2.9±1.1	1.2±0.3*	1.5±0.5*
*:p<0.05 vs N †:p<0.05 VS ARB(-)			

11:00 a.m.

911-229 **Noninvasive Coronary Angiography With 64-Slice MDCT Compared to 16-Slice in the Same Patients: Is the Benefit of More Slices Clinically Relevant?**

Ralph Haberl, Michaela Englert, Charlotte Lingg, Eike G. Boehme, Andreas Czernik, Doreen Voss, Juergen Buck, Peter Steinbigler, Klinikum München Pasing, Munich, Germany

Background: 64-slice MDCT is the upcoming standard of CT coronary angiography (CTA), however, the clinical benefit of more slices has not yet been demonstrated.
Methods: We directly compared 64-slice MDCT (CT64, Philips Brilliance, collimation 64x0.625mm, scan time 100-210ms, pitch 0.2, 70cc of contrast, 5cc/s) and 16-slice MDCT (CT16, Philips, collimation 16x0.75mm, scan time 210ms, pitch 0.24, 120 cc of contrast, 3.5cc/s) in 62 symptomatic patients, who had a clinical indication to perform CTA with both modalities within one year. The scans were read independently and blinded by 2 experienced cardiologists. All data were analyzed with the Philips MX View software package (Comprehensive Cardio). In all patients invasive angiography was also available.
Results: With CT64 the coverage per rotation was 40mm, with CT16 it was 12 mm, respectively. Due to the larger coverage, the breathhold was significantly shorter with CT64 compared to CT16 ($9s \pm 1.8$ vs. $23s \pm 3.5$, p<0.001). Also the following parameters were significantly different between CT64 and CT16 (p<0.01): increase of heart rate during the scan (7 bpm ± 6 vs. 14 bpm ± 12), number of extrasystoles during the scan (1.2 ± 1.1 vs. 2.8 ± 3), number of segments with diagnostic image quality (91% vs. 73%), venous superposition (n=4 vs. n=14). Segments, which often impose problems with CTA (segments 2,3 of the RCA, 12, 13 of LCx) could adequately be analyzed with CT64 in 87% of cases, but in only 52% with CT16, respectively.
Invasive coronary angiography proved 37 significant stenoses >50% in the patient cohort. Segment based analysis performed significantly better with CT64 compared to CT16 (sensitivity 91 vs. 72%, specificity 96% vs. 81%, positive predictive value 72 vs. 41% and negative predictive value 96% vs. 88%). In-stent stenosis neither could be evaluated with CT64 nor with CT16 (Kernel D).
Conclusions: CTA with 64-slice MDCT is clearly superior to the 16-slice scanner with less artefacts and better contrast of the coronary arteries. This results in a much better accuracy to prove or to exclude significant coronary stenosis, which may help to save diagnostic catheters in the future.

11:00 a.m.

911-230 **CT Angiography Should Be a Collaborative Effort Between Cardiologists and Radiologists**

Regina Y. Chiu, Rachael A. Wyman, Samuel Wann, University of Wisconsin School of Medicine and Public Health, Madison, WI, Wisconsin Heart Hospital, Milwaukee, WI

Background: With the growth of coronary computed tomography angiography (CTA), questions have arisen regarding the reporting of non-cardiac findings (NCF) and appropriateness of using CTA as a screening tool. Little data exists regarding current practice patterns or views regarding the interpretation of NCF.
Methods: Approximately 800 attendees of the 1st Annual Society of Cardiovascular Computed Tomography 2006 meeting were asked to fill out a survey regarding their current practices and views.
Results: Of the 214 returned surveys, 15.9% were radiologists and 82.2% were cardiologists. Ninety-three individuals were experienced readers. In very few (8.9%) centers, cardiologists read both the cardiac and non-cardiac portions.
A minority (8.9%) felt that cardiologists alone adequately interpreted NCF. This was independent of experience (p=0.116) or specialty (p=0.272). The majority (72%) of individuals in both the experienced and novice groups felt that interpretation of NCF required input from radiologists (p=0.896). Radiologists were more likely to feel their input was needed (p=0.007).
54% felt that CTA should not be used as a screening procedure but 71% felt that CT for calcium scoring should be used as a screening procedure for coronary artery disease. Approximately 35% of experienced and novice readers felt that lung CT is an appropriate screening procedure for patients at high risk for lung cancer (p=0.991). Radiologists were more likely than cardiologists to feel lung CT was an appropriate screening tool (p=0.003).
Conclusions: The majority of survey respondents felt that both radiologists and cardiologists should be involved in CTA interpretation. Additionally, CTA for coronary disease and CT for lung cancer should not be used as a screening tool. Whereas, CT for calcium scoring should be available as a screening tool.

11:00 a.m.

911-231 **Usefulness Of CT Angiography In The Follow Up Of Abdominal Aortic Aneurysm Treatment**

Patricia M. Carrascosa, Carlos Capuñay, Tulio Sampere, Elba Martín López, Marina Ulla, Jorge Carrascosa, Diagnostico Maipu, Buenos Aires, Argentina

Background: Endoluminal treatment of abdominal aortic aneurysm has become a widely used technique. The aim of this study is to determine the usefulness of the CT Angiography (CTA) in the detection of complications after endoluminal abdominal aortic aneurysmatic treatment.
Methods: in a 180 patients series (143 male, 37 female; mean age 63,5 years) CTA was performed as a post-treatment control. CTs were carried out on a Multidetector CT scanner using 2mm slice thickness and 1.3mm reconstruction interval and the injection of 100ml of iodinated contrast material using a power injector at 2.5-4ml/sec.
Post-processing volume rendering, MPR and MIP images were obtained.
Results: thirty-trhee complications were detected: a) periprosthetic hematoma (n=2); b) neointimal hyperplasia (n=2); c) partial stent-graft thrombosis (n=5); d) total stent-graft thrombosis of an iliac branch (n=9); e) endoleak type II (n=8); f) endoleak type III (n=4), separation of the stents' components (n=3).
Conclusion: CTA is an accurate, fast and minimally invasive imaging method in the evaluation of complications after abdominal aortic aneurism repair.

11:00 a.m.

911-232 **Comparison of Positron Emission Tomography and Magnetic Resonance Imaging for the Evaluation of Infarct Size in Acute Myocardial Infarction Patients**

Nicolas Meneveau, Joanna Oettinger, Laurent Laborie, Oleg Blagoskonov, Bruno Kastler, Pierre Legalery, Vincent Descotes-Genon, Marie-France Seronde, Francois Schiele, Jean-Pierre L. Bassand, University Hospital Jean Minjoz, Besancon, France

Background: Positron emission tomography (PET) is a promising new method for identification of irreversible tissue injury, while magnetic resonance imaging (MRI) has been reported to be useful for assessing both viability and ischemia in acute myocardial infarction (AMI). We aimed to evaluate infarct size by PET, [^{18}F]2-fluoro-2-deoxy-D-glucose (FDG) and MRI in comparison with peak myocardial enzymes early after AMI.
Methods: Prospective study of AMI patients with no previous history of cardiovascular disease. A total of 42 patients (33 STEMI, 9 NSTEMI) were examined by PET 4 to 5 days after AMI. Troponin, Creatine Kinase (CK), and Creatine Kinase MB (CK-MB) levels were measured at 6, 12, 24, 48 and 72 hours after admission in order to assess peak myocardial enzymes. Infarct size was quantified by an absolute threshold of FDG uptake (< 50%) obtained from the parametric (voxel-by-voxel) image of the metabolic rate of FDG. In MRI, a previously validated model summed segmental scores using a 17-segment model to obtain a global index of infarct size. PET and MRI infarct size estimates were compared with peak myocardial enzymes.
Results: Main results are shown in the table.
Conclusions: MRI appears to be more reliable for the assessment of infarct size in AMI patients as compared with PET scan. Particularly, MRI can be used in NSTEMI and non-anterior MI, whereas PET is not applicable in these sub-groups.

Correlation	R	R^2	P
PET vs CK	0.48	0.23	0.0012
MRI vs CK	0.59	0.35	<0.0001
PET vs CK in STEMI	0.45	0.2	0.009
MRI vs CK in STEMI	0.48	0.23	0.005
PET vs CK in NSTEMI	0.22	0.005	0.57
MRI vs CK in NSTEMI	0.8	0.65	0.009
PET vs troponin in non-anterior MI	0.31	0.095	0.13
MRI vs troponin in non-anterior MI	0.57	0.33	0.0028

11:00 a.m.

911-233 **Cardiac MRI for differential Diagnosis of the Apical Ballooning Syndrome**

Florian H. Behrendt, Holger Thiele, University of Leipzig - Heart Center, Department of Cardiology, Leipzig, Germany, University of Leipzig - Heart Center, Department of Radiology, Leipzig, Germany

Background: The apical ballooning syndrome has recently been recognized in western countries. The underlying mechanisms of this clinical entity mimicking acute coronary syndromes are still controversially discussed. Cardiac MRI might be an imaging tool to further elucidate the underlying mechanisms.
Methods: Between January 2005 and July 2006 22 consecutive patients, showing a left ventricular dysfunction with apical ballooning not explainable by the coronary artery status and initially admitted with an acute coronary syndrome, underwent cardiac MRI. Cardiac MRI included a free precession technique for the assessment of left ventricular function and sequences for the assessment of oedema and delayed enhancement.
Results: Between January 2005 and July 2006 2089 patients were admitted presenting with an acute coronary syndrome with ST-elevation or non-ST-elevation myocardial infarction. Of these 22 (1.0%) patients (21 female, age 68± 12 years) were identified with apical ballooning syndrome without significant coronary artery disease. Cardiac MRI revealed extensive delayed enhancement in the territory of the left anterior descending coronary in 4 patients and a delayed enhancement pattern suggestive of acute myocarditis in 1.
In all other patients neither delayed enhancement nor oedema was detected. In these latter patients cardiac MRI showed impaired left ventricular ejection fraction which normalized at 3 months follow-up (EF baseline: 49.6± 11.0%; EF 3 months: 67.9± 4.5%; p<0.001 versus baseline). There were no differences in patient characteristics between the patients with presumed coronary emboli with spontaneous lysis and myocarditis in comparison to those with classical apical ballooning syndrome with the exception that in patients with apical ballooning syndrome emotional stress as a trigger could be identified in 11 (65%) versus 0 (p=0.03).
Conclusions: Cardiac MRI allows to differentiate apical ballooning syndrome from other rare causes such as myocarditis and coronary emboli with spontaneous lysis. Therefore cardiac MRI should be performed in all patients with suspected apical ballooning syndrome for further differential diagnosis.

Diagnostic Testing

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E-Poster Session 912

Monday, March 26, 2007, Noon-1:00 p.m.
Hall H

11:00 a.m.

911-235   **Adherence to the American College of Cardiology/
American Society of Nuclear Cardiology
Appropriateness Criteria for Single-Photon Emission
Computed Tomography Myocardial Perfusion Imaging**

Todd C. Kerwin, Ronald Lo, Michael D'Anca, Joshua R. DeLeon, Winthrop University
Hospital, Mineola, NY

Background: In 2005 the American College of Cardiology/ American Society of Nuclear
Cardiology (ACC/ASNC) published criteria which categorized the various indications for
the performance of Single-Photon Emission Computed Tomography Myocardial Perfusion
Imaging (SPECT MPI) as appropriate, inappropriate, or uncertain. We sought to assess
the adherence to such published criteria in our outpatient Nuclear Cardiology laboratory
at a community-based teaching hospital.
Methods: 650 consecutive patients referred for stress SPECT MPI were analyzed. Data
was collected with regard to whether a cardiologist or non-cardiologist ordered the test,
the indication for the test, and the imaging results.
Results: Overall, 55% of tests ordered were appropriate, 28% uncertain and 17%
inappropriate. 9% of tests ordered by cardiologists were inappropriate, compared to
24% ordered by non-cardiologists (p<0.001). There was no difference in the proportion
of tests ordered for an uncertain indication. The most common indication for ordering
an inappropriate test was for the evaluation of chest pain in a patient with a low pre-
test probability who was able to exercise and with an interpretable ECG (56% of
inappropriate tests). The most common indication for ordering an uncertain test was the
detection of coronary disease in an asymptomatic patient at moderate Framingham risk
(73% of uncertain tests). An abnormal test result was significantly more frequent in the
appropriate compared to the inappropriate group (19.1% vs. 4.6%, p<0.001), but similar
in the appropriate compared to the uncertain group (19.1% vs. 14.8%, p=ns).
Conclusions: Non-cardiologists order inappropriate tests at a higher rate than
cardiologists. An abnormal test occurs significantly more frequently in appropriate tests
compared to inappropriate tests, however there is a similar rate of abnormal findings
in appropriate and uncertain tests. The inappropriate and uncertain tests tend to
cluster in several indication categories. The continued examination of the ACC/ASNC
Appropriateness Criteria in clinic practice will serve to optimize the document from both a
patient care and reimbursement perspective.

11:00 a.m.

911-236   **How Long Does Sympathetic Activation Persist After
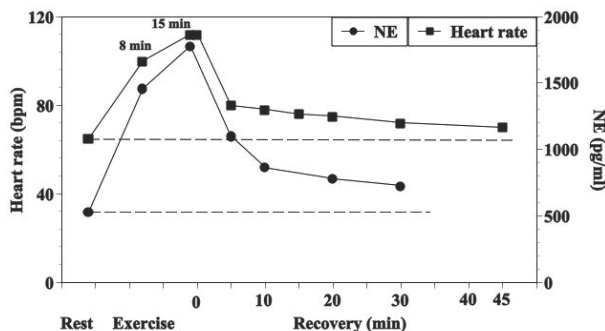Submaximal Exercise in Subjects with Coronary Artery
Disease?**

Norman Wang, Jason Ng, Indranil Sen-Gupta, Alan H. Kadish, Jeffrey J. Goldberger,
Northwestern University, Chicago, IL

INTRODUCTION: The post-exercise recovery period (PERP), a known period of risk
for sudden cardiac death (SCD), is characterized by sympathetic withdrawal and
parasympathetic activation.
METHODS: To evaluate the time course of autonomic change in the PERP, submaximal
bicycle exercise for 16 minutes was performed by 29 subjects (21 males, mean age
56 ± 15 years) with coronary artery disease, followed by a 45 minute recovery period.
Continuous ECG recording was performed to assess the QT interval and heart rate
variability in the PERP. Plasma norepinephrine (NE) was measured during rest, exercise,
and recovery.
RESULTS: Heart rate (HR) and plasma NE are shown in the Figure. Compared to rest
values (shown in graph by dashed lines), HR at 45 minutes and plasma NE at 30 minutes
in the PERP were increased by 8.3% (p = 0.00003) and 37.7% (p = 0.0004), respectively.
Time dependent changes in QT interval (p < 0.0001) and root mean squared successive
differences (p < 0.0001) were noted in recovery but had not returned to the baseline value
even at 45 minutes.
CONCLUSIONS: Persistent sympathetic activation manifested by increased HR and NE
levels is noted for at least 30-45 minutes in the PERP. This is likely an important factor
in the increased SCD risk in this time period, and may be the mechanism by which ß-
blockers reduce this risk.

Noon

912-221   **Associations of Left Atrium Volume With Aortic
Stiffness and Neurohumoral Factors in the Early
Stages of Essential Hypertension**

Efstathios Taxiarchou, Costas Tsioufis, Dimitris Chatzis, Maria Selima, Konstantinos
Giannakopoulos, Apostolis Kakkavas, Eleftherios Tsiamis, Christodoulos Stefanadis,
Ioannis Kallikazaros, Department of Cardiology, Hippokration Hospital, Athens, Greece

Background: Left atrial (LA) enlargement, impaired aortic mechanical properties
and increased brain natriuretic peptide (BNP) levels are associated with adverse
cardiovascular events in various clinical settings. The possible interrelationship between
LA enlargement, BNP levels and aortic stiffness in essential hypertensive subjects was
investigated in this study.
Methods: 226 consecutive, newly diagnosed subjects (aged 52±10 years), with
untreated stage I-II essential hypertension [office blood pressure (BP) =151/97 mmHg]
underwent ambulatory BP monitoring. Blood samples were obtained for determination of
BNP levels. Aortic stiffness was evaluated on the basis of the carotid-femoral pulse wave
velocity (c-f PWV) measurement by an automatic device (Complior SP). LA volume was
indexed for body surface area to estimate LA volume index (LAVI) and accordingly the
study population was divided into those with increased LAVI (>26ml/m^2, n=45) and those
without increased LAVI (<or =26ml/m^2, n=181).
Results: Subjects with increased LAVI compared to those without increased LAVI did
not differ regarding age, body mass index, 24-h systolic and diastolic BP and metabolic
profile. Subjects with increased LAVI compared to those without increased LAVI had
significantly increased 24-h pulse pressure (54.6±9.0 vs 51.3±7.9 mmHg, p<0.05),
left ventricular mass index (123±31 vs 99±23 gr/m^2, p<0.0001), relative wall thickness
(0.45±0.08 vs 0.43±0.07, p<0.05), and BNP plasma levels (41.5±14 vs 19.7±10 pg/ml,
p<0.05). In contrast, they did not differ regarding c-f PWV (8.2±1.3 vs 8.1±1.3 m/sec,
p=NS). Multiple regression analysis revealed that left ventricular mass index and BNP
levels were independent predictors of LAVI (p<0.05).
Conclusions: Even in newly diagnosed essential hypertensive subjects LA enlargement
is associated with increased plasma levels of BNP but not pronounced impaired aortic
stiffness. Although these findings support the notion that LA enlargement is closely
related with humoral activation, the clinical significance of these findings remains to be
elucidated in future studies.

Noon

912-222   **Effect Of Intramyocardial Bone Marrow Cell Injection
On Diastolic Function In Patients With Chronic
Myocardial Ischemia**

S. L.M.A. Beeres, H. J. Lamb, S. D. Roes, J. van Ramshorst, E. R. Holman, T. A.M.
Kaandorp, W. E. Fibbe, A. de Roos, E. E. van der Wall, M. J. Schalij, J. J. Bax, D. E.
Atsma, Leiden University Medical Center, Leiden, The Netherlands

Background: Recent studies suggested that intramyocardial bone marrow cell injection
in patients with chronic ischemia improves myocardial perfusion and increases left
ventricular systolic function. However, the effect on diastolic function in patients with
chronic ischemia remains to be investigated.
Methods: In 24 patients (19 male; 65±9 years) with refractory angina (CCS class III-IV)
bone marrow-derived mononuclear cells (84.6±28.7x10^6) were injected intramyocardially
(NOGA system) in regions with ischemia on Tc-99m tetrofosmin SPECT. Diastolic function
was evaluated at baseline and at 3 months using magnetic resonance imaging (MRI) and
tissue Doppler imaging (TDI).
Results: MRI revealed an increased early (E) peak filling rate (374±121 ml/s vs. 412±102
ml/s at 3 months; P=0.04), whereas atrial (A) peak filling rate remained unchanged
(340±81 ml/s vs. 334±93 ml/s at 3 months; P=NS). The E/A peak flow ratio increased
from 1.09±0.33 to 1.23±0.47 at 3 months (P=0.02). TDI demonstrated a significant
improvement in early diastolic velocity (E') from 4.4±1.7 cm/s to 4.8±1.6 cm/s at 3 months
(P=0.03), whereas late diastolic velocity (A') remained unchanged (6.0±1.6 cm/s vs.
6.0±1.7 cm/s at 3 months; P=NS). Consequently, E'/A' ratio increased from 0.74±0.19 to
0.84±0.28 at 3 months (P=0.02).
Conclusion: Intramyocardial bone marrow cell injection in patients with chronic
myocardial ischemia improved MRI and TDI-derived parameters of diastolic function.

Noon

912-223   **Feasibility and Clinical Utility of 3D Echocardiography
in Routine Practice**

James Hare, Carly Jenkins, Satoshi Nakatani, Akio Ogawa, Thomas H. Marwick,
University of Queensland, Brisbane, Australia

Background: Research studies have shown 3D echocardiography (3DE) to be a feasible
and more accurate method of assessing LV volumes and ejection fraction when compared
to conventional 2D echocardiography (2DE). However, there is limited information
regarding the feasibility and incremental value of 3DE in clinical practice.
Methods: Unselected pts referred to two hospital-based echo laboratories underwent
2DE and 3DE with measurement of acquisition and analysis time. Feasibility was defined

Diagnostic Testing

by ability to measure LV parameters. Potential of 3DE to alter clinical decisions based on 2DE was evaluated by the ability to identify four clinically-relevant thresholds: 1) LVEF<40% (indication for heart failure treatment); 2) LVEF<35% (indication for ICD); 3) LV end-systolic volume (LVESV) >30ml/m² (prognosis post-MI); and 4) LVESV >50ml/m² (indication for surgery in regurgitant valve disease).

Results: Of 168 pts, 3DE was feasible in 150 (89.3%) with 2D and 3D data available in 148 pts (88.1%). Time for 3D sample acquisition and analysis was 5.3 ± 1.9 min. The proportion of pts in which 3DE changed categorization above or below a threshold as defined by 2DE was 5.4% (8/148) for LVEF<40%, 2.7% (4/148) for LVEF<35%, 11.5% (17/148) for LVESV>30ml/m², and 2.7% (4/148) for LVESVi>50ml/m², with 82% of impact for EF in range 30-45% and 75% for LVESV in 20-40ml/m².

Conclusion: Measurement of LV volumes and ejection fraction by 3DE is clinically feasible and has the potential to significantly alter clinical decision making.

Noon

912-224 **Left Atrial Contraction Assessed By Real-time Three Dimensional Echocardiography (RT3DE) In Healthy Volunteers And In Consecutive Patients With Various Cardiovascular Disorders**

Stefano De Castro, Stefano Caselli, Sara Del Colle, Emanuele Di Angelantonio, Daria Santini, Renzo Lombardo, Francesca Mirabelli, Giardina Arianna, Natesa G Pandian, La Sapienza University, Rome, Italy, TUFTS University, New England Medical Center, Boston, MA

Objective: Aim of this study was to examine left atrial contraction detected by real-time three dimensional echocardiography (RT3DE) in subjects with various cardiovascular disorder in comparison to demographic characteristics and two-dimensional (2D) Doppler echocardiographic parameters of the active phase of atrial emptying.

Methods: Two-hundred-thirty-one sinus rythm subjects (age 57,2 ± 15,2 y., 112 male) underwent clinical examination and a complete two-dimensional Doppler, TDI and RT3DE. Of these, 68 were selected healthy volunteers and 165 were consecutive patients with cardiovascular disorders in the absence of valvular heart disease. By off-line analysis of 3D dataset we calculated left atrial maximum and minimum volume (LAVmax, LAVmin) and the conduit phase volume (LAVp). Total emptying volume (TEV = LAVmax-LAVmin), active emptying volume (AEV = LAVp - LAVmin) and active empying fraction (AEF= AEV/TEV) were obtained and compared to 2D, Doppler and TDI parameters. For the statistical analysis a cut-off for AEF was defined according to the median value in the healthy volunteers population.

Results: See table. A value of 40% of the TEV was identified as the cut-off for AEF.

Conclusions: Left atrial contraction increases with age and is inversely correlated with the e/a ratio.

	Active Emptying Fraction (AEF%)		p value
	≤ 40% (n=74)	>40% (n=139)	
Age (years)	49.3 (17.1)	61.6 (12.2)	<0.001
Sex, male	31 (41.9)	74 (53.2)	0.115
PwE (cm/s)	79.0 (20.6)	66.7 (17.4)	<0.001
PwA (cm/s)	68.0 (21.8)	79.2 (18.3)	<0.001
E/A	1.28 (0.63)	0.90 (0.38)	<0.001
E/E'	8.05 (4.16)	8.04 (3.47)	0.973
LAVmax (ml/m²)	33.2 (13.2)	35.5 (9.5)	0.155
LAVmin (ml/m²)	16.1 (10.7)	17.2 (7.8)	0.377
LV EF (%)	55.9 (10.7)	55.4 (7.8)	0.637
LV Mass (gr/m²)	70.4 (19.6)	72.4 (19.1)	0.494

Noon

912-225 **Prognostic Significance Of Dyspnea In Patients Referred For Stress Echocardiography**

Vinod Raxwal, Samantapudi Daya, Robert Candipan, Thomas Rosamond, James Vacek, David Wilson, Peter Tadros, Kansas University medical Center, Kansas City, KS

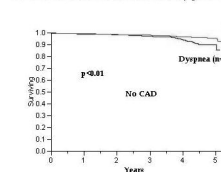Background Although dyspnea is a common symptom, there has been only limited investigation of
its prognostic significance among patients referred for cardiac evaluation.

Methods We studied 6824 patients undergoing stress echocardiography. Patients were divided into two categories on the basis of symptoms at presentation (chest pain and dyspnea). Patients were followed from 1998 through April 2005. End point was all cause mortality. Survival curves of patients grouped by indication for stress test were calculated by the Kaplan-Meier method and compared with the log-rank test. Logistic regression model was used to evaluate the significance of symptoms after adjusting for diabetes, HTN and CAD.
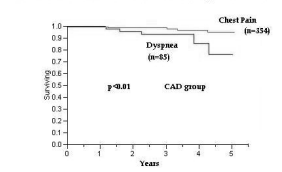
Results After a mean follow-up of 2.5±1.5 years, the rate of death was significantly higher among patients with dyspnea on exertion than among patients with chest pain 3.5% vs 1.7% p <0.01. Patients with dyspnea were older and had a higher prevalence of diastolic dysfunction. Left ventricular ejection fraction and ischemia induced wall motion abnormalities were similar in both the groups. Clinical characteristics were comparable in both the groups.

Conclusion Dyspnea on exertion is a worse prognostic marker and identifies a subgroup of patients at increased risk for death. An assessment of dyspnea should be incorporated into the clinical evaluation of patients referred for cardiac stress testing.

Noon

912-226 **Two-dimensional Ultrasound Speckle Tracking Imaging is Useful in Assessing Left Ventricular Early Diastolic Function. -Comparison with Invasive Parameters**

Kazuaki Wakami, Nobuyuki Ohte, Takahiro Nagata, Takehiro Tsunekawa, Koutaro Morimoto, Kaoru Asada, Hiroumi Mizuno, Seiichiro Sakata, Seiji Mukai, Kenji Kobayashi, Tomoaki Saeki, Genjiro Kimura, Nagoya City University Graduate School of Medical Sciences, Nagoya, Japan

Background: Newly developed 2-dimensional ultrasound speckle tracking imaging (2D-STI) enables us to assess local left ventricular (LV) function. However, it is still uncertain whether LV strain obtained using 2D-STI is useful to evaluate LV function. Accordingly, we investigated the relationships between myocardial strain in the longitudinal direction obtained using 2D-STI and invasively obtained LV relaxation parameters.

Methods: Study subjects were consecutive 30 patients who underwent diagnostic cardiac catheterization and 2D-STI (Velocity Vector Imaging) on the same day. Sixteen were prior myocardial infarction (8 anterior wall, 4 infero-posterior wall and 4 combined). The remaining 14 had no localized LV wall motion abnormality (5 stable angina pectoris, 3 exercise test abnormality and 6 reevaluation after PCI). LV strain was measured in the tangential direction on a sample line set along the endocardium in the both apical 4- and 2-chamber views. Zero strain was set at end-diastole. LV strain values were obtained in 6 segments on each view at end-systole (Ses) and at the end of early-diastole (Sed). In cardiac catheterization using a catheter-tipped micromanometer, time constant τ of LV pressure decay and peak negative dP/dt were computed from the LV pressure waves.

Results: The mean Sed-Ses values in all segments had significant relationships with both the time constant τ (r=-0.63, p=0.0002) and the peak negative dP/dt (r=0.42, p=0.021). Furthermore, the mean Sed-Ses in the apical region had relatively closer correlations with both the time constant τ (r=-0.68, p<0.0001) and the peak negative dP/dt (r= 0.52, p=0.0031).

Conclusions: These findings indicate that LV early diastolic function can be evaluated using the 2D-STI in patients including prior myocardial infarction. The 2D-STI is a promising non-invasive tool in assessing LV early diastolic function.

Noon

912-227 **Accurate and Reproducible Quantification of Global and Regional LV Function Using Tissue Tracking Based Automated Function Imaging (AFI)**

Alexander Sasse, Alexander Schuh, Malte Kelm, Andreas Franke, Rainer Hoffmann, University Clinic Aachen Medical Clinic I, Aachen, Germany

Background: Automated function imaging (AFI) is a novel tissue tracking based imaging modality for rapid quantification and parametric display of global and regional left ventricular (LV) function. This study sought to define the accuracy and interobserver variability of AFI in the assessment of global and regional LV function.

Methods: 55 consecutive patients (62±15 years, ejection fraction 49±15%) with a broad variety of cardiac diseases were evaluated. 2D echocardiography using apical 4Ch, 2Ch and long axis views was performed with an average frame rate of 72±18 fps with a Vivid7

ultrasound scanner (GE ultrasound). AFI was used to generate LV maps displaying average peak longitudinal systolic strain on a segmental basis (Rstrain) and to calculate global strain (Gstrain) for the entire ventricle. Two independent observers performed the analysis.

Results: Global strain defined by AFI correlated to biplane EF (r^2=0.77 for observer 1 and r^2=0.75 for observer 2). Gstrain defined by AFI was -17.3±4.5% (n=24) for normal function (EF > 55%), -13.9±3.3% for mild (EF 55-45%, n=12), -9.2±2.4% for moderate (EF 45-30%, n=12) and -6.6±2.9% for severe LV dysfunction (EF < 30%, n=7); (ANOVA p<0.0001). The mean relative difference between both observers was 0.40±1.7 (Bland-Altman) indicating a high degree of concordance. Gstrain allowed accurate distinction between the four LV function groups (ROC area 0.75 - 0.88 between adjacent LV function groups). Use of AFI for regional function analysis allowed distinction between normokinetic (Rstrain -16.0±7.5%, n=1227), hypokinetic (Rstrain -7.1±6.6%, n=368), akinetic (Rstrain -2.9±6.3%, n=49) and dyskinetic segments (Rstrain -0.5±7.7%, n=13) (p-ANOVA<0.001). The validity of regional wall motion assessment is further underscored by ROC areas of 0.82 (normo- vs. hypokinetic), 0.69 (hypo- vs. akinetic) and 0.61 (a- vs. dyskinetic). The average time duration required for the analysis with AFI was 204±74 s.

Conclusion: AFI allows rapid and accurate quantification of global and regional LV function with high interobserver reproducibility of data.

Noon

912-228   **Left Atrial Volume and Booster Pump Function Assessed With Tissue Doppler Imaging Predict Paroxysmal Atrial Fibrillation Occurrence in Patients With Hypertension**
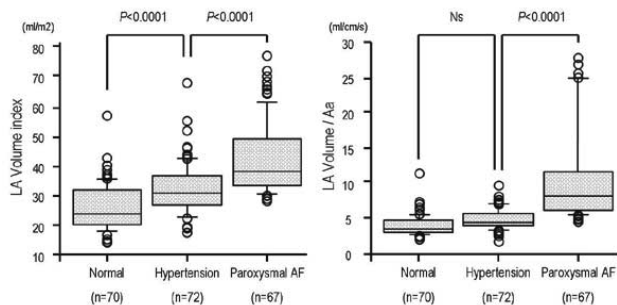
Norihisa Toh, Hideaki Kanzaki, Satoshi Nakatani, Yoshiyuki Sumita, Masafumi Kitakaze, National Cardiovascular Center, Suita, Japan

Background: Prediction of the occurrence of atrial fibrillation is important in the risk management. Left atrial remodeling from elevated diastolic filling pressure over time can be related to atrial fibrillation in hypertension. Our objective was to find echocardiographic characteristics of left atrium in patients with paroxysmal atrial fibrillation (PAF).

Methods: We studied 209 subjects: 67 patients with hypertension and PAF (Group P), 72 patients with hypertension alone (Group H) and 70 normal subjects (Group N). Left atrial volume (LAV) was calculated using the biplane modified Simpson's method. Mitral inflow velocities (E and A) by Doppler echocardiography, and early and late diastolic mitral annular velocities (Ea and Aa) by pulsed tissue Doppler imaging were measured. E/Ea was obtained as a marker of diastolic filling pressure.

Results: LAV, LAV index and E/Ea were increased in Group H and P (LAV 39±12 vs. 49±11* vs. 72±25** ml, LAV index 24±6 vs. 31±8* vs. 42±12** ml/m², E/Ea 8±2 vs. 9±3* vs. 12±5**, *p<0.0001 vs. Group N, **p<0.0001 vs. Group H). Mitral Aa was increased in Group H but decreased in Group P (9.8±2.3 vs. 10.6±2.1* vs. 7.7±2.4** cm/s). A cutoff value of LAV/Aa >8.0 detected patients with PAF with a sensitivity of 52% and a specificity of 98% and LAV/Aa >5.8 with 84% and 85%, respectively.

Conclusions: In patients with PAF, left atrium was characterized by mild enlargement and attenuation of the booster pump function. The LAV/Aa ratio may be useful for diagnosis of the mechanical remodeling.

Noon

912-229   **Variation Of Coronary Artery Size With End-systolic To Mid-diastolic Triggering With Ct Angiography**

Matthew J. Budoff, Ambarish Gopal, Emily Young, Yanlin Gao, Junichiro Takasu, marianne Ferrer, Ferdinand Flores, Ronald J. Oudiz, Song S. Mao, Los Angeles Biomedical Research Institute, Torrance, CA

Background: CT angiography evaluates coronaries between end-systolic (35-50% of the R-R interval) and late-diastolic (75-80% of the R-R interval) timing. The study aim was to compare the coronary artery lumen sizes at these two times to see if there are significant differences.

Method And Materials: Studies from 42 patients who were imaged with a mean heart rate of 72 bpm who underwent CTA with evaluation of six phases of the cardiac cycle per level were analyzed. Reconstructions ranged from 35% to 80%. The RCA diameter (RCAD) and motion speed (distance of RCA movement between phases/scan time) were measured in all 6-phases from 2D images at the RCA-mid segment. The heart length (cranio-caudal length from left main level to apex) was measured at the 1st and 6th phase 3D-reconstructed image. The CT Hounsfield unit (CT HU) of mid-RCA was measured and averaged in three axial slices. ANOVA test and linear correlation R-value were completed in all measurements.

Results: For different phases, RCA diameter was significantly greater at 37% of the R-R than at 44, 50, 60, 65, 75 and 80%), RCAD (mm) (4.3** 4.0, 3.8, 3.6, 3.4, 3.6), CT HU (220*, 210†, 180, 180, 170, 190), Motion Speed (mm/second) (27*, 31†, 50, 83, 109, 67), and Heart Length (64* for 37% and 69 mm for 80%), ** = P<0.001 between end-systole (phase 1) and other phases, *= P<0.05 between end-systole and others, except 44% trigger time(†). Analysis of all phases as a group demonstrated a significant positive linear correlation between RCAD and CT HU (R=0.95, P<0.001) and negative linear correlation between RCAD and motion speed of the mid-RCA (R=0.91, P<0.01).

Conclusions: Serial phase assessment demonstrated significant increases in CT HU and RCAD and decreases in heart length and RCA motion speed with end-systolic triggered images compared to early to mid-diastolic triggered images. The end-systolic trigger is a more optimal phase for cardiac imaging when heart rates average above 70 beats per minute.

Noon

912-230   **Diagnostic Accuracy of Global and Regional Left Ventricular Function Measured by 64-slice Multidetector Computed Tomography for Acute Coronary Syndrome in Patients with Acute Chest Pain**

Sujith K. Seneviratne, Michael Shapiro, Ian Rogers, Fabian Moselewski, Ricardo C. Cury, John H. Nichols, Udo Hoffmann, Massachusetts General Hospital, Boston, MA

Background: Cardiac multidetector computed tomography (MDCT), emerging as a useful tool for risk stratification in patients with acute chest pain also permits the assessment of LV function without additional radiation or contrast. We determined the diagnostic accuracy of global and regional LV dysfunction assessed by MDCT for acute coronary syndrome (ACS) in patients with acute chest pain but normal initial biomarkers and ECG.

Methods: Twenty-eight patients (mean age 59 ± 15 years, 86% male) who presented to the emergency department (ED) with acute chest pain and negative initial troponins and ECG underwent 64-slice cardiac MDCT within 3 hours of presentation. In 14 patients who were deemed to have an ACS on clinical grounds (9 unstable angina, 5 myocardial infarctions), global and regional LV function was assessed qualitatively using the AHA/ACC 17-segment model and compared with 14 age and sex matched controls. Two observers blinded to the clinical course and coronary anatomy assessed the 4-dimensional data.

Results: Diagnostic performance of regional and combined regional and global LV dysfunction is demonstrated below.

	Regional LV dysfunction	Regional and/or Global LV dysfunction
Sensitivity	11/14 (79%, 95% CI 49-95%)	12/14 (86%, 95% CI 57-98%)
Specificity	13/14 (93%, 95% CI 66-99%)	13/14 (93%, 95% CI 66-99%)
Positive predictive value	11/12 (92%)	12/13 (92%)
Negative predictive value	13/16 (81%)	13/15 (87%)

Conclusion: The detection of global and regional LV dysfunction by MDCT is highly specific for ACS and may improve the diagnostic accuracy of cardiac MDCT for early triage of patients with acute chest pain, particularly in patients with equivocal CT angiographic findings for stenosis.

Noon

912-231   **Coronary Artery Calcium Percentiles & Absolute Scores - which is a stronger predictor of mortality?**

Ambarish Gopal, Khurram Nasir, David Z. Chow, Sandy T. Liu, Steven R. Weinstein, Yanlin Gao, Anne M. Witteman, Tate C. Holland, Song S. mao, Ferdinand Flores, Roger S. Blumenthal, Matthew J. Budoff, Los Angeles Biomedical Research Institute, Torrance, CA

Background: High coronary artery calcium (CAC) scores are a strong predictor of future cardiac events, strokes and all-cause mortality. In this study, we sought to determine whether the absolute CAC scores would be a stronger predictor of death when compared to age- and gender-adjusted percentile score.

Methods & Results: Overall the study population consisted of 25,252 individuals (77% males, 55±11 years) followed for 8±3 years. There were 512 (2%) deaths during follow-up. The distribution of CAC scores at baseline were as follows: <10 (n=14,490, 57%), 10-99 (n=5156, 20%), 100-399 (n=13%, 13%), 400-999 (n=1456, 6%) and ≥1000 (n=956, 4%). Patients were also delineated into age-gender CAC percentiles of <25%, 25-49%, 50-74% and ≥75%. Multivariate analysis include adjustment for age, gender, smoking, dyslipidemia, diabetes, hypertension, and family history of CHD. In age, gender and risk factor adjusted analyses, compared to those with CAC<25% percentile, the hazard ratio for deaths was 1.32 (95% CI: 0.86-2.04) for CAC 25-49 percentile, 2.2 (1.5-3.12) for CAC 50-74 percentile and 3.4 (2.4-4.9) for CAC≥75th age-gender adjusted CAC percentile. Risk-adjusted ratios for CAC were 2.8-, 3.7-, 4.6-, and 9.8-fold for scores of 10-99, 100-300, 400-999, and >1,000, respectively (p<0.0001).

Conclusion: Age-gender CAC percentiles when used alone are able to predict mortality. However, when further adjusted for absolute CAC scores, only absolute CAC scores were predictive of deaths. Hence absolute CAC scores are a stronger indicator than percentile score for predicting mortality.

Noon

912-232   Phase Velocity Magnetic Resonance Imaging is Fundamentally Flawed when Compared with Doppler Echocardiography

Vikas K. Rathi, Robert W. Biederman, Diane A. Vido, Srinivas Vengala, Mark Doyle, Allegheny General Hospital, Pittsburgh, PA

Introduction: Blood flow and velocity can be measured using phase contrast (PC-MR) imaging. The ability to measure velocity in a spatially and temporally resolved manner allows PC-MR data to be used in a manner different from Doppler echocardiography (D-Echo). However, it has not been clinically established that PC-MR provides equivalent information to D-Echo when confining measurement to similar variables.

Methods: We imaged two groups (n=57) to examine two distinct flow-fields 1) Mitral inflow in 31 pts (21 diastolic dysfunction pts and 10 normal) to assess relatively low velocity and moderate temporal acceleration and 2) Aortic flow in 26 pts (19 severe AS and 7 normal) to assess high velocities and high temporal acceleration. All pts received flow-field examination following ASE guidelines by Echo (Philips, Andover, NJ) and with a PC-MR scan (GE Signa CVi, Milwaukee, WI) performed to assess all 3 velocity components. The slope of the linear regression curve fitted to compare local Doppler max velocities with the corresponding PC-MR velocities were calculated.

Results: Compared to D-Echo, PC-MR systematically underestimates max velocity for the mitral E and A flow-field (slope = 0.77, r =0.81, p<0.001), and systematically overestimated maximal velocity for aortic stenosis flow (slope = 1.24, r =0.88, p<0.0001). The D-Echo mitral E and A velocities and aortic stenosis velocity were characterized by max velocity and acceleration values (mean±SD) of 0.68±0.24 m/s, 8.4±3.3 m/s^2; and 4.4± 0.6 m/s and 35±7.2 m/s^2, respectively. Morphologic waveform analysis and diastolic function classification of the mitral flow-field showed 100% agreement between PC-MR and Doppler echocardiography.

Conclusions: Currently, PC-MR can result in systematic error when imaging clinically encountered flow-fields. The form of error is influenced by the acceleration and velocity components of the flow-field. These error terms are manifest in commonly encountered clinically relevant flow-fields. Our data is based on a single vendor at our site, therefore a vendor specific investigation should be undertaken interrrogating PC-MR at variable clinical acceleration factors.

Noon

912-233   In Vivo Magnetic Resonance Imaging of Stem Cell Viability

Yoriyasu Suzuki, Charles H. Cunningham, Alan C. Yeung, Robert Robbins, Steven Conolly, Phillip C. Yang, Stanford University, Stanford, CA

Background: Cellular MRI is emerging as a main diagnostic modality to track iron-oxide labeled cells. However, significant controversy remains regarding the ability to determine the viability of these magnetically labeled cells. This study investigates *in vivo* correlation between MRI and bioluminescence imaging (BLI) of mouse embryonic stem cells (mESC), the current gold-standard in assessing cell viability *in vivo*.

Methods: Using stable mESC transfected with Click Beetle Red luciferase reporter gene (mESC-luc[+]) and iron-oxide particles, BLI (Xenogen IVIS System 200, CA) and MRI (1.5T Signa MRI Scanner, GE, WI) were performed. 3 x 10^6 iron-oxide labeled viable mESC-luc[+] and iron-oxide labeled formalin fixed non-viable mESC-luc[+] were transplanted into the each hind limb of mice (n=8). The mice were studied serially on Day 1, 4, 7, 10, and 16 following delivery to measure BLI luciferase activity and MRI signal. Conventional GRE sequence generated negative signal (TR=100msec, TE=10msec, FA=30, FOV=8x8cm, slice thickness=1mm) and novel off-resonance (OR) sequence generated positive contrast (TR=800msec, TE=10msec, FOV=20cm) of the labeled cells.

Results: The BLI measurement of luciferase activity of viable mESC demonstrated no significant change from D 1 to 10. However, significant increase was seen from D 1 to 16 (2.23x10^7±0.7x10^7 vs. 1.10x10^9±0.2x10^9 p/sec/cm^2/sr, *p*<0.05) indicating proliferation of the transplanted mESC. The BLI measurement of non-viable mESC demonstrated no luciferase activity. Using MRI, the signal area of labeled mESC generated from GRE and OR showed no difference during the 16-day period. Furthermore, the GRE and OR signal demonstrated no difference between viable and non-viable mESC at any time. Finally, the BLI activity and MR signal area (GRE, OR) demonstrated no significant correlation for any duration (D 1-4, R^2=0.03, 0.02; D 1-7, R^2=0.07, 0.05; D 1-10, R^2=0.05, 0.09; and D 1-16, R^2=0.11, 0.04).

Conclusions: Iron-oxide based *in vivo* cellular MRI does not allow evaluation of cell viability.

Noon

912-235   Diagnostic Value of Left Ventricular Function of Post-Stress and at Rest in the Detection of Multi-Vessel Coronary Artery Disease as Assessed by Electrocardiogram-Gated Single-Photon Emission Computed Tomography

Satoshi Hida, Taishiro Chikamori, Hirokazu Tanaka, Yasuhiro Usui, Yuko Igarashi, Tadashi Nagao, Yuka Otaki, Chie Shiba, Akira Yamashina, Tokyo medical university, Tokyo, Japan
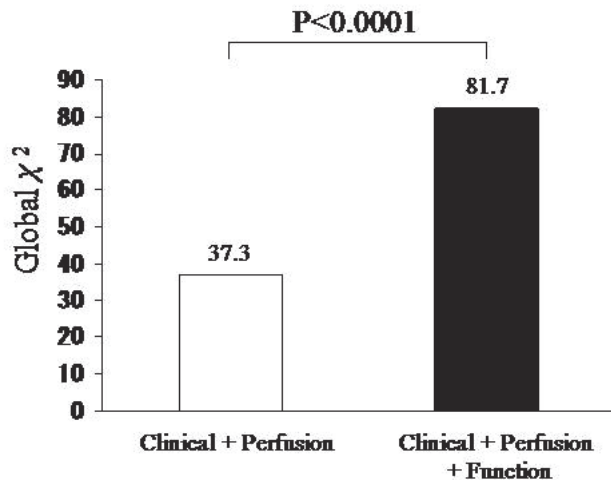
Background: Although transient left ventricular (LV) dilation is a well-known marker for extensive coronary artery disease (CAD), few studies performed quantitative analysis of LV function of post-stress and at rest to detect extensive CAD.

Methods: 175 patients with suspected CAD underwent post-stress and resting gated single-photon emission computed tomography (SPECT). All of the patients underwent coronary angiography within 3-months of gated SPECT.

Results: In 83 patients with multi-vessel CAD, summed difference score (SDS) was

greater (9.2±7.0 vs 3.3±4.0; p<0.0001), post-stress increase in end-systolic volume (ESV) was larger (7.0±8.0ml vs -0.8±4.7ml; p<0.0001), and post-stress increase in ejection fraction (EF) was less (-4.7±5.4% vs -0.4±4.5%; p<0.0001), than in 92 patients with insignificant or single-vessel CAD. To detect multi-vessel CAD, SDS of ≥9 showed sensitivity of 46%, and specificity of 90%, while increase in ESV ≥5ml and decrease in EF ≥5% after exercise had sensitivities of 66%, 52%, and specificities of 87%, 83%, respectively. The multivariate discriminant analysis revealed that the combination of post-stress increase in ESV≥5ml, SDS of ≥9 and diabetes mellitus best identified multi-vessel CAD, with sensitivity of 72% and specificity of 84% (chi-square=81.7).

Conclusions: The addition of "post-stress" and "at rest" LV functional analysis using gated SPECT on conventional perfusion analysis, help better identify patients with multi-vessel CAD.

Noon

912-236   Multiparametric Risk Assesment In Patients With Chronic Heart Failure

angela beatrice scardovi, Renata De Maria, Claudio Coletta, Nadia Aspromonte, Silvia Perna, Marina Parolini, Giuseppe Cacciatore, Roberto Ricci, Alessandro Carunchio, Vincenzo Ceci, S Spirito Hospital, Rome, Italy, CNR Clinical Phisiology Institute, Milan, Italy

Background: Whether brain natriuretic peptide (BNP) combined to cardiopulmonary exercise test (CPx) and echocardiographic findings, improves prognostic stratification in systolic heart failure (HF) is currently unclear.

Methods: 244 consecutive stable outpatients, median age of 71 [62, 76] years, with mild-to-moderate HF and left ventricular ejection fraction (LVEF) < 45% underwent plasma BNP measurement, doppler echocardiography and performed a maximal CPx. Median BNP was 166 [70, 403] pg/ml, median LVEF 35 [28, 40]%.

Results: An echocardiographic restrictive filling pattern (RFP) was present in 44 patients (18%). At CPx, peak oxygen uptake was 12 [9.7, 14.4] mL/Kg/min and an enhanced ventilatory response to exercise (EVR, slope of the ventilation to CO2 production ratio ≥ 35) was found in 90 patients (37%) During 18 [9, 37] follow-up months, 80 patients died or were admitted for worsening HF (32.7%). In addition to bedsides simple clinical variables (NYHA class III, creatinine clearance, hemoglobin), laboratory parameters predictive of outcome were supramedian BNP plasma level , RFP and a steeper VE/VCO2 slope. Three-year HF admission-free survival rates were 80% in patients with all predictors absent (n=101), 61% in subjects with a single predictor (n=57), 42% in those with two predictors (n=59) and 16% in the very-high-risk group (n=27) with all three prognostic factors (p < 0.0001).

Conclusions In chronic HF, EVR and RFP are the strongest predictors of outcome in addition to bedsides simple clinical variables (NYHA class III, creatinine clearance, hemoglobin), while plasma BNP levels ≥ 160 pg/ml have an additive prognostic value. The present study highlights the importance of a multiparametric approach for an optimal risk stratification in CHF patients. Patients at high or very high-risk should undergo closer follow-up and be carefully evaluated for different therapeutic options, including non pharmacological treatment.

1:00 p.m.

E-Poster Session 913

Monday, March 26, 2007, 1:00 p.m.-2:00 p.m.
Hall H

1:00 p.m.

Prediction of Improvement in Cardiac Function after Revascularization Using Myocardial Deformation Imaging

Michael Dr. Becker, Alexandra Dr. Lenzen, Andreas Prof. Franke, Harald Dr. Kühl, Malte Prof. Kelm, Rainer Prof. Hoffmann, department of Cardiology, University Hospital RWTH Aachen, Aachen, Germany

Objective. This study sought to compare the value of MRI and myocardial deformation imaging (MDI) for prediction of improvement in cardiac function after revascularization.
Methods. 20 patient (64±8 years,11 men) with ischemic heart disease underwent MRI with late enhancement (LE), 5 groups of segmental LE were created:1: 0%, 2: 1-25%, 3: 26-50%, 4: 51-75%, 5: 76-100%. In addition, the maximal thickness of myocardium without LE was determined for each segment as a parameter of remaining viable myocardium. On the same day MDI based on frame-to-frame tracking of acoustic markers in 2D echocardiography (EchoPAC,GE) was used to determine peak systolic radial strain (SR), circumferential strain (SC), radial strain rate (SRR), circumferential strain rate (SRC). All patients underwent coronary revascularization.Development of LV function was determined at 12 months follow-up. Of 219 segments with abnormal resting function, 77 segments showed regional recovery.
Results. Comparing segments with and without functional recovery there were significant differences: thickness without LE: 7.9 vs. 5.4mm (p<0.001), group of LE: 2.0 vs. 2.9 (p=0.002), SR: 18.8 vs. 14.2% (p=0.004), SC: -14.2 vs. -9.3% (p<0.001), SRR: 1.3 vs. 0.8 1/s (p<0.001), SRC: -1.3 vs. -0.8 1/s (p=0.002). Using ROC analysis cut-off values were calculated for prediction of functional recovery (table).
Conclusion. MDI allows prediction of improvement in cardiac function after revascularization with accuracy which is comparable to those of MRI.

	Cutt-off value	sensitivity (%)	specificity (%)	area under the curve
LE group	2	64	61	0.66
Thickness without LE (mm)	6.4	65	60	0.67
SR (%)	17.3	63	67	0.63
SC (%)	-12.2	70	69	0.72
SRR (1/s)	1.1	69	63	0.69
SRC (1/s)	-1.2	65	64	0.66

1:00 p.m.

Echocardiography Provides Important Prognostic Information in Patients With Advanced Pulmonary Hypertension, Even After Initiation of Vasodilator Therapy

Richard A. Krasuski, P. Brad Smith, Andrew Wang, Victor F. Tapson, J. Kevin Harrison, Thomas M. Bashore, The Cleveland Clinic, Cleveland, OH, Duke University Medical Center, Durham, NC

Background: Echocardiography is an extremely useful tool during diagnostic work-up of patients with pulmonary hypertension (PH). In addition to non-invasively assessing pulmonary artery pressure (PAP), echo can help exclude secondary etiologies of PH and provides important prognostic information. The additional value of repeat echo studies is less clear, however.
Methods: We prospectively followed a cohort of 93 patients with PH referred for pulmonary vasodilator challenge. Complete clinical follow-up was achieved in 99% of patients. All patients underwent initial echocardiography and repeat studies were preformed at physician discretion.
Results: Baseline characteristics of the cohort included age 54 ± 14 years, 80% women, 56% with idiopathic PH, NYHA function class 2.9 ± 0.7, systolic PAP 73 ± 24 mm Hg and pulmonary vascular resistance 9.2 ± 7.0 Wood units. Following testing, >75% of patients were treated with prostaglandins or calcium channel blockers and >50% were anticoagulated. Thirteen patients (14%) died before follow-up echocardiography was performed. Sixty-two patients (67% of the initial cohort) had repeat echos (29 ± 17 months after the initial study). Twenty of these patients (32%) died in the period following repeat echo. Similar to baseline echos, higher rates of mortality were seen with larger (p=0.001) and less contractile (p=0.041) right ventricles (RV), higher grade tricuspid regurgitation (p=0.036) and higher estimated PAP (p=0.003) on the repeat study. A strong initial impact of RV hypertrophy on mortality (p<0.001) was no longer evident after pharmacological therapy (p=0.377). Additionally, patients who failed to reduce the size of their right ventricles or improve RV systolic function between studies had a much greater subsequent risk of mortality (40% vs. 14%, p=0.047).
Conclusions: Repeat echocardiography in patients with pulmonary hypertension appears to provide important additional information regarding response to medical therapy. Failure of the RV to decrease in size or right ventricular function to improve over time portends a worsened clinical outcome and may indicate a need for more aggressive medical management or consideration for transplantation.

1:00 p.m.

Incidence of Left Atrial Thrombus by Transesophageal Echocardiography Prior To Pulmonary Vein Isolation Procedures for Atrial Fibrillation

Joanne K. Mazzarelli, Martin G. Keane, Susan E. Wiegers, Mathew Hutchinson, David Callans, Francis Marchlinski, Frank E. Silvestry, The Hospital of The University of Pennsylvania, Philadelphia, PA

Background: Patients are frequently referred for TEE to exclude thrombus prior to pulmonary vein isolation (PVI) for atrial fibrillation (AF) if anticoagulation is felt to be inadequate prior to the procedure. The incidence of left atrial (LA) and LA appendage (LAA) thrombus in this setting is not known. Previously documented incidence of thrombus by TEE in all patients with AF of > 3 days duration is ~14%, and the annual rate of AF-related stroke is approximately 4.5%. However, as PVI is an elective procedure most patients receive prior anticoagulation. We hypothesized that the incidence of LA or LAA thrombus in patients prior to PVI is very low, thereby calling into question the routine use of TEE as a cost-effective clinical decision making tool in patients presenting in AF for PVI.
Methods: Single center retrospective review of TEEs performed up to 24 hrs prior to PVI. TEE was performed in patients presenting for PVI in AF with an INR <2, or with evidence of an INR <2 in the 4 weeks immediately prior to PVI. Variables identified include: presence or absence of 1] LA or LAA thrombus, 2] spontaneous echo contrast (SEC) in the LA or LAA, 3] LVEF, 4] rhythm (AF or sinus), and 5] type of AF.
Results: 676 patients were referred to our center for PVI over 4 years, and 212 (31.3%) patients (81% men, mean age 56 +/- 10, range 25-80) underwent TEE prior to PVI. The overall incidence of TEE identified LA or LAA thrombus was zero. 31 patients (14.6%) had SEC in the LA (74.2%) and/or LAA (48.4%). The mean LVEF was 57.8% +/- 10. Rhythm at time of TEE: 70.3 % AF, and 29.7 % normal sinus. AF characterized at presentation: 23 (11.3%) permanent AF (mean duration 29.4 months, range 12 to 120 months), 119 (59%) persistent AF and 60 (29.7%) paroxysmal AF.
Conclusions: In patients referred for TEE prior to PVI the incidence of thrombus in the LA and LAA was 0%. This brings into question the routine use of TEE prior to PVI as a screening tool to detect LA or LAA thrombus in these highly selected patients. Further risk stratification based on age, clinical predictors, duration and type of AF, and/or degree of systolic dysfunction may identify a subpopulation of patients in whom TEE prior to PVI is neither necessary nor cost effective.

1:00 p.m.

Quantitative Evaluation of The Media in the Thoracic Aorta using Integrated Backscatter by Transesophageal Echocardiography as a New Marker for Coronary Artery Disease

Koji Ono, Takashi Katou, Ryuhei Tanaka, Tomoko Hirose, Maki Nagaya, Tomonori Segawa, Takatomo Watanabe, Syunichirou Warita, Takeshi Hirose, Makoto Iwama, Hideki Takahashi, Hitoshi Matuo, Sachiro Watanabe, Department of Cardiology, Gifu Prefectural Gifu Hospital, Gifu City, Japan

Objective; The aim of this study was to test the hypothesis that integrated backscatter Values (IB) of the media in the thoracic aorta evaluated by transesophageal Echocardiography (TEE) is a useful marker for coronary artery disease (CAD).
Background; Pathologic and clinical studies have shown that atherosclerotic aortic plaque is a marker for CAD and quantitative tissue characterization of the artery can be evaluated by IB, but quantitative evaluation with IB in the thoracic aorta as a marker of CAD has not yet been elucidated.
Methods; We performed TEE with multiplane probe of 7 mm diameter on 124 patients aged 66±9 (mean ± SD) years who had undergone cardiac catheterization within one month. We measured IB of the media with thickness less than 2 mm and no plaque at the arch of the thoracic aorta, and also examined atherosclerotic plaque in the thoracic aorta according to the AHA classification. Significant stenosis of the coronary artery was defined as a diameter reduction of >50%. Corrected IB (cIB) was determined by subtracting IB of the tunica externa. Relation between CAD and atherosclerotic plaque, CAD and cIB were examined.
Results; In 38 of the 124 patients, CAD was detected by angiography in at least one vessel. In 50 of 124, atherosclerotic plaque was detected in the thoracic aorta by TEE. The presence of aortic plaque on the TEE study had a sensitivity of 87% and a specificity of 80% for angiographically proved CAD. The positive predictive value of aortic plaque for CAD was 66% and the negative predictive value was 93%. cIB of the media was significantly different between patients with CAD and patients without CAD (-15.7±1.4 vs -19.4±1.9, respectively p<0.0001). In 35 of 38 patients with CAD, cIB was more than -17dB, and in 80 of 86 without CAD, cIB was less than -17dB. Using this standard (-17dB) as a cutoff value, sensitivity was 92% and specificity was 93%. Positive predictive value was 85% and negative predictive value was 96%.
Conclusions; This study clearly demonstrates that IB value of the media at the arch of the thoracic aorta by TEE appears to be a more useful marker for the identification of CAD than classic detection of atherosclerotic plaque.

1:00 p.m.

913-225 **LV Hypertrophy is Associated with Exercise Induced Intraventricular Dyssynchrony in Hypertensive Patients**

Hye-Sun Seo, Sungha Park, Jong-Won Ha, Tae Soo Kang, Eui-Young Choi, Se-Joong Rim, Namsik Chung, Soonchunhyang university hospital, Bucheon, South Korea, Yonsei University College of Medicine, Seoul, South Korea

Background: Previous studies have reported that LV hypertrophy (LVH) is related to LV dyssynchrony at rest. Impaired exercise tolerance with dyspnea is common in hypertensive patients with LVH and this may be due to the exaggeration of nonuniform ventricular activation during exercise. The aim of the study was to evaluate the effect of LVH on systolic intraventricular dyssynchrony during exercise.
Method: A total of 58 patients with relatively well controlled hypertension who complained of exertional dyspnea were enrolled. (mean age: 55.5 ±12.1 years) Twenty patients were classified as having LV hypertrophy.(>125g/m^2 for men, 110g/m^2 for women) Exercise stress echocardiography was performed using a symptom limited, multistage supine bicycle exercise test. To evaluate the dyssynchrony of LV, we calculate the standard deviation (SD) of the averaged time-to-peak systolic velocity (TPS-SD, ms) of 12 middle and basal LV segments obtained from the three standard apical views at rest and peak exercise.
Results: There was no significant difference in terms of gender, proportion of patients having DM, exercise duration and hemodynamic variables such as systolic BP, diastolic BP and HR between the two groups. LV mass index and LA volume index was higher and E/E'(an index of diastolic filling pressure) was elevated at exercise in LVH group. TPS-SD was significantly higher in patients with LV hypertrophy at rest (32.6±10.9 vs. 23.8±12.1ms, p=0.011) with exaggeration of the degree of LV dyssynchrony at peak exercise. (41.4±13.0 vs. 25.1±12.9ms, p<0.001) Multiple regression analysis showed that LV mass index was independently associated with LV dyssynchrony at peak exercise(β=0.515, P=0.001) when controlled for age, sex, systolic BP at peak exercise, LV ejection fraction.
Conclusion: Intraventricular systolic dyssynchrony during exercise is significantly associated with the degree of LVH in patients with hypertension. This may be one of the possible mechanisms for exaggerated symptoms of exercise intolerance in patients with hypertensive LVH.

1:00 p.m.

913-226 **Atrial Strain Rate Echocardiography can Predict Maintenance of Sinus Rhythm after Pulmonary Vein Isolation in Paroxysmal Atrial Fibrillation.**

Sung Hee Shin, Mi Young Park, Jong Il Choi, Jin Seok Kim, Soon Jun Hong, Seong Mi Park, Hui Nam Pak, Do Sun Lim, Young Hoon Kim, Wan Joo Shim, Korea University Medical Center, Seoul, South Korea

Background: This study aimed to assess the role of left atrial (LA) function using strain rate (SR) imaging in predicting the maintenance sinus rhythm after pulmonary vein isolation for paroxysmal atrial fibrillation (AF) and to evaluate the impact of sinus rhythm restoration on LA structure and function.
Methods: Seventeen paroxysmal AF patients (M:F=13:4, mean age=55.1±13.4 years) who underwent pulmonary vein isolation were enrolled. Echocardiographic studies including SR imaging were performed before the ablation and one month after the procedure. Mean peak systolic SR (SR-LAs), early diastolic SR (SR-LAe) and late diastolic SR (SR-LAa) were calculated by averaging the SR for each LA segments (septum, lateral, anterior, and inferior). LA reservoir index was calculated as (LA end-systolic volume - LA end-diastolic volume) / LA end-systolic volume.
Results: Thirteen patients (76.5%) were free from AF at the one month follow-up after catheter ablation. Pre-ablation mean SR-LAe and SR-LAa were significantly higher in patients who maintained sinus rhythm compared with those of AF recurrence (SR-LAe, 2.59±0.69 s^{-1} vs 1.72±0.56 s^{-1}, *p*=0.03; SR-LAa 2.74±0.63 s^{-1} vs 1.61±0.49 s^{-1}, *p*=0.03). However, pre-ablation mean SR-LAs and LA emptying fraction showed no significant difference between them. In patients with maintenance of sinus rhythm, left atrial volume decreased significantly at the one month follow up (24.6±4.2ml/m^2 vs 22.2±6.5 m^2, *p* = 0.03). However, LA function measured by SR imaging, e.g, SR-LAs, SR-LAe, SR-LAa and LA reservoir index did not change significantly after one month of ablation.
Conclusions: Patients with greater SR-LAe and SR-LAa seem to have a high probability of maintaining sinus rhythm after catheter ablation of paroxysmal AF. Left atrial strain rate may have a superior sensitivity in predicting successful catheter ablation of paroxysmal AF compared with LA reservoir index.

1:00 p.m.

913-227 **Right Ventricular Apical Pacing Impairs Left Ventricular Torsion as Well as Synchrony**

Ken Matsuoka, Masami Nishino, Akihito Hashimoto, Kiyoshi Yamagami, Takahito Tamai, Hiroyasu Kato, Yasuyuki Egami, Ryu Shutta, Hitoshi Yamaguchi, Kenjiro Tanaka, Jun Tanouchi, Yoshio Yamada, Hirotsugu Yamada, Osaka Rosai Hospital, Sakai, Japan

Background: Newly developed two-dimensional ultrasound speckle tracking imaging (2DST) provided an objective estimation of left ventricular (LV) torsion. Recently, it has been reported that right ventricular apical (RVA) pacing induced dyssynchrony and increased mortality. However, LV torsional change caused by RVA pacing is unknown. We hypothesized that LV dyssynchrony may decrease LV torsion, which may contribute to induce LV dysfunction in the patient with RVA pacing in this study.
Methods: We studied 23 sick sinus syndrome patients with RVA pacing, showing normal LV function and no structural heart disease. We compared echocardiographic parameters of torsion (a net-difference of LV rotation between apical and basal short-axis planes) using 2DST system (vivid7, GE and EUB-8500, HITACHI), synchronization (tissue

Doppler-derived intraventricular delay (TDD)), and cardiac function (ejection fraction (EF)) between intrinsic AV conduction (AOO mode) and RVA pacing (DDD mode).
Results: Results were shown in a table. As the reason for LV torsion impairment, each peak rotation of apical and basal planes tended to decrease and peak basal rotation time tended to be delayed. The change of LV torsion significantly correlated with the changes of TDD (P=0.03) and EF (P=0.003).
Conclusions: RVA pacing impaired LV torsion as well as synchrony, that might induce LV dysfunction. LV torsion impairment may be caused by decrease of apical and basal peak rotation and time-delay of basal rotation.

Comparison of Each Parameter between AOO and DDD Pacing Mode in RVA Pacing Patients			
	AOO mode	DDD mode	P value
LV torsion (degree)	17.3 ± 9.3	11.6 ± 7.5	0.002
TDD (msec)	4.4 ± 7.8	46.3 ± 34.2	<0.001
Ejection fraction (%)	67.5 ± 6.6	62.0 ± 7.7	0.009
Peak apical rotation (degree)	13.8 ± 6.3	10.9 ± 6.9	0.09
Peak basal rotation (degree)	-6.3 ± 5.3	-4.5 ± 3.8	0.08
Peak basal rotation time (sec)	0.56 ± 0.16	0.65 ± 0.14	0.07

1:00 p.m.

913-228 **Use of Positron Emission Tomography and Computed Tomography to Discriminate Between Ischemic and Non-Ischemic Dilated Cardiomyopathy**

Michael Barry, Joseph Craft, Brian Seeck, Pilar Herrero, Molly Mohrman, Pilgram Thomas, Robert Gropler, Pamela Woodard, Cardiovascular Division, Department of Medicine, Washington University School of Medicine, Saint Louis, MO, Division of Radiological Sciences, Mallinckrodt Institute of Radiology, Washington University School, Saint Louis, MO

Background: Cardiac catheterization (CC) is currently the gold standard for distinguishing ischemic cardiomyopathy (ICM) from non-ischemic cardiomyopathy (NICM). Unfortunately, CC is invasive and occasionally complicated by adverse outcomes. To date, non-invasive imaging, although safer, has not yielded sufficient predictive power to supplant CC. Computed tomography (CT) and positron emission tomography (PET) have the potential to measure coronary anatomy and physiology, respectively. This study assesses the potential of PET and/or CT to provide a noninvasive means of distinguishing between ICM and NICM.
Methods: Patients with LV ejection fraction < 40% and a diagnosis of ICM or NICM on recent cardiac catheterization were enrolled and underwent 3 tests: cardiac PET imaging using ^{11}C-acetate to measure global and regional variability in myocardial blood flow (MBF) and oxygen consumption (MVO$_2$); a retrospectively EKG-gated CT coronary angiogram (CTA) (Sensation 64, Siemens) to assess extent and severity of coronary artery stenoses; and a prospectively EKG-gated non-contrast CT scan to establish coronary artery calcium (CAC) score.
Results: Thirty three patients (ICM=17, NICM=16) have completed the study to date. Assessment of coronary calcium was limited by the presence of intracoronary stents in (16/17) ICM patients. Logistical regression analysis demonstrates the significant predictive power of CTA defined coronary stenosis severity (r^2=0.66, p< 0.0001) and extent (r^2=0.70, p< 0.0001) to differentiate cardiomyopathy etiology. The only PET index in isolation that showed a discriminatory trend was regional variability in MBF (r^2=0.33, p=0.0001). The rest of the PET indices and CAC score were not accurate discriminators. Combination of CTA coronary stenosis extent and PET regional variability in MBF proved to be equivalent to CC in discriminating etiology (r^2=1, p<0.0001).
Conclusion: CTA alone accurately discriminates between ICM and NICM when compared to the reference standard, CC. More importantly, the combination of PET regional variability in MBF and CTA defined coronary stenosis was equivalent to CC in differentiating cardiomyopathy etiology.

1:00 p.m.

913-229 **Usefulness of Multidetector Computed Tomography for Noninvasive Evaluation of Coronary Arteries in Asymptomatic Patients With Type 2 Diabetes**

Koichi Tamita, Fumie Kureha, Atsushi Yamamuro, Syuichirou Kaji, Minako Katayama, Kazuaki Tanabe, Tomoko Tani, Makoto Kinoshita, Yasuki Kihara, Kobe General Hospital, Kobe, Japan

Background: Coronary artery disease (CAD) is often asymptomatic in subjects with type 2 diabetes (T2D). Recently, it has been demonstrated that 64-row multidetector computed tomography (MDCT) have the potential for noninvasive evaluation of coronary arteries in symptomatic patents. However, its applicability and diagnostic accuracy of MDCT as compared with coronary angiography (CAG) have never been reported in asymptomatic T2D patients. The aim of this study was to investigate the efficacy of MDCT to detect CAD in patients with asymptomatic high-risk T2D and unrevealed CAD.
Methods: Twenty-one consecutive T2D patients who were free from CAD, without symptoms and resting electrocardiogram suggesting ischemia, but with peripheral vascular disease and/or ≥ two atherogenic factors, were studied. A contrast-enhanced 64-row MDCT was performed. In a subset of patients with the detection of significant stenosis ≥ 50% by MDCT, the conventional coronary angiography was performed. The significant CAD was defined by stenosis ≥ 75%.
Results: In 20 of 21 patients, 64-row MDCT enabled the visualization of the entire coronary tree with diagnostic image quality (American Heart Association 15-segment model). MDCT indicated a CAD prevalence of 40% (n=8). The patient-based analysis

showed that 11 of 12 patients who required coronary angiography were correctly detected by MDCT (sensitivity of 92%). The segment based analysis showed that sensitivity for the detection of stenosis ≥ 50% and stenosis ≥ 75% was 82% and 82%, respectively, and specificity was 98%.

Conclusions: 64-row MDCT demonstrates noninvasively the degree of coronary artery stenosis in asymptomatic high-risk patients with T-2D and unrevealed CAD.

1:00 p.m.

913-230   **Usefulness of Multiple Detector-Row Computed Tomography in Renal Transplant Candidates**

Miguel A. Rosário, José Jayme de Lima, Eduardo Tassi, Victor MA Monsão, José R. Parga, Luiz F. Ávila, Luis H. Gowdak, Pedro A. Lemos, Carlos E. Rochitte, Heart Institute (InCor), University of São Paulo Medical School, São Paulo, Brazil

Background: The most common cause of death in renal transplant candidates (RTC) is coronary artery disease (CAD). Results of conventional non-invasive tests for CAD detection in this group are inconsistent. Multi detector-row computed tomography (MDCT) has been accurate for CAD detection. However, it has not been evaluated in RTC. Our goal is to evaluate MDCT performance for the CAD detection in RTC.

Methods: In 60 RTC we compared MDCT angiography (MDCTA), performed in Aquillion16/64, Toshiba Medical, and conventional coronary angiography (CCA) for the detection of significant coronary stenosis (â‰¥50% luminal diameter reduction). MDCTA stenosis was qualitatively graded and quantitative coronary angiography (QCA) was the reference method. Agatston score (AS) was compared to CCA. Data was presented as mean, standard deviation, percentiles and confidence interval.

Results: Significant CAD was found in 29 pts. On the significant CAD assessment, MDCTA showed sensitivity, specificity, positive and negative predictive values of 86.2, 61.3, 67.6 and 82.6%, and AS (threshold 165, percentile 50) 72.4, 71.0, 70.0 and 73.3%, respectively. Logistic regression for MDCTA and CCA showed pseudo-R^2=0.18, p<0.0001 and area under ROC curve of 0.74, and for AS and CCA pseudo-R^2=0.15, p<0.001 and area under ROC curve of 0.82. Mean and percentile AS are shown in Table 1.

Conclusion: In the diagnosis of significant coronary stenosis, MDCTA as well as AS showed good performance in renal transplant candidates.

Table 1

Agatston Score	ALL	CAD +	CAD -	P
Mean/SD	646.8/1311.8	1119.4/1706.6	204.7/498.1	<0.001
Percentile 5 (CI)	0 (0-0)	21(0-54)	0(0-0)	
Percentile 25	14(0-52)	138(46-321)	0(0-12)	
Percentile 50	165(55-354)	602(194-865)	19(1-135)	
Percentile 75	784(358-929)	1145(821-3324)	191(62-415)	
Percentile 90	1822(858-4129)	3620(1381-7994)	500(274-2687)	
Percentile 95	3579(1646-7994)	6164(2102-7994)	1551(362-2687)	

1:00 p.m.

913-231   **Subendocardial Perfusion Deficits Predict the Functional Significance of Coronary Stenoses during Adenosine Stress Multidetector Computed Tomography in Patients with Chest Pain**

Richard T. George, Albert C. Lardo, Caterina Silva, David A. Bluemke, Jon Resar, Joao A. C. Lima, Johns Hopkins University, Baltimore, MD

Background: Normally perfused myocardium exhibits a homogenous distribution of myocardial blood flow (MBF) in the subendocardial and subepicardial layers; however, reduced subendocardial MBF is the hallmark of flow-limiting coronary stenoses and cannot be specifically quantified by nuclear technologies that lack sufficient spatial resolution to discern transmural differences in MBF. The purpose of this study was to quantify the extent of subendocardial perfusion deficits during adenosine stress multidetector computed tomography (MDCT) in patients with chest pain.

Methods: One to fourteen days prior to invasive coronary angiography, eleven patients with a history of chest pain were enrolled in the study. Adenosine (0.14 mg/kg/min) was infused for 5 minutes and patients underwent MDCT angiography according to the following protocol: 0.5mm X 64 collimation, 120kV, 400mA. MDCT images were reconstructed with a 3 mm slice thickness in the cardiac short axis. Using a 16-segment model, the myocardium was divided into sectors and each sector was sub-divided into subendocardial, mid-myocardial, and subepicardial layers. The mean attenuation density (AD) of each sector was measured throughout the layers of myocardium and a transmural perfusion ratio (TPR) was calculated (Subendocardial AD / Subepicardial AD).

Results: Eight patients with >50% diameter coronary stenoses had subendocardial perfusion deficits in the corresponding territory. Out of the three patients without coronary artery disease, one patient had a perfusion deficit. Comparing perfusion deficits and remote territories the transmural AD was 106.4±20.1 and 127.1±17.1, respectively (mean difference: 20.7, p=0.03) while the subendocardial AD was 94.3±14.1 and 128.4±18.2,

respectively (mean difference: 34.1, p<0.001). The TPR for perfusion deficits and remote territories was 0.77±0.08 and 1.03±0.08, respectively (p<0.0001).

Conclusions: Marked differences in the transmural perfusion ratio and subendocardial AD accurately differentiate between ischemic and remote myocardium. MDCT myocardial perfusion imaging provides functional assessment of coronary artery stenoses in combination with coronary angiography.

1:00 p.m.

913-232   **The Relative Value of Cardiac Magnetic Resonance and Echocardiography for Diagnosing Myxoma in Patients with Carney Complex**

W. Patricia Bandettini, Andrew C. McUsic, Douglas R. Rosing, Constantine A. Stratakis, Andrew E. Arai, National Institutes of Health, Bethesda, MD

Background: Echocardiography (echo) is the most commonly used tool to image intracardiac masses. The purpose of this study was to assess the added benefit of performing CMR in conjunction with echo as a screening tool in patients (pt) with Carney complex, a multiple neoplasia syndrome that predisposes to recurrent cardiac myxoma.

Methods: 26 Carney complex pts were imaged by both echo and CMR. Echo included standard views with 2-D, M-Mode, and Doppler techniques. CMR included cine, T2-weighted imaging, perfusion, and delayed enhancement (DE) methods.

Results: The mean age was 28 ± 12 years, there were 11 males (42%), and 15 (58%) had a prior history of myxoma resection. On a per pt basis, CMR identified 12/26 pts as having at least 1 intracardiac mass, and echo identified 6/26 pts as having at least 1 intracardiac mass. On a per mass basis, CMR identified 20 masses, and echo identified 8 masses. In 2 pts, mobile masses were seen more clearly by echo than by CMR. One mass identified by both techniques was proven to be a lipoma by CMR. The distribution of locations for myxomas was: 1 right atrial, 4 left atrial, 11 right ventricular, and 3 left ventricular. All myxomas hypoenhanced on perfusion images but there were variable patterns of DE (10 hypoenhanced, 4 hyperenhanced, 3 showed heterogeneous/intermediate enhancement, and 3 were not seen by DE). 6 pts had small regions of myocardial DE, consistent with subclinical embolic myocardial infarction (MI). In one pt with a transmural MI, angiography demonstrated normal coronary arteries, suggesting an embolic event as the etiology.

Conclusions:
1.CMR is more sensitive than echo on both a per mass and per pt basis.
2.The right ventricle was the most common location.
3.The DE patterns were variable and may represent various stages of myxoma.
4.There was a high incidence of subclinical MI, which represents embolic phenomena.
5.Echo may have advantages in detecting highly mobile masses compared with CMR.
This study represents the largest series of Carney complex pts with myxoma characterized by CMR. Both echocardiography and CMR should be performed in all pts with a high suspicion of intracardiac mass.

1:00 p.m.

913-233   **Abnormal Papillary Muscle Morphology Is Independently Associated With Increased Left Ventricular Outflow Tract Obstruction in Hypertrophic Cardiomyopathy**

Deborah H. Kwon, Randy M. Setser, Maran Thamilarasan, Zoran Popovich, Nicholas Smedira, Paul Schoenhagen, Mario J. Garcia, Harry Lever, Milind Y. Desai, Cleveland Clinic Foundation, Cleveland, OH

Background: Abnormal papillary muscle (PM) morphology (eg. antero-apical displacement or double bifid PM) is frequently seen in patients with hypertrophic cardiomyopathy (HCM). We sought to assess if abnormal PM are associated with significant left ventricle outflow tract (LVOT) obstruction, & whether this was independent of other factors, including septal thickness.

Methods: Fifty-six patients (mean age 42 [interquartile range 27,51] years, 70% males) with echo-confirmed HCM had magnetic resonance imaging on 1.5T scanner (Siemens, Erlangen, Germany). TrueFISP cine images were obtained in short axis (base to apex), along with 2, 3 & 4 chamber views. Presence of double bifid PM was recorded on multiple cine images. Antero-apical PM displacement was recorded in 2 or 4 chamber views & confirmed on apical short axis image. Septal thickness was measured at end-diastole on cine images. Resting LVOT gradients were recorded by Doppler echocardiography. Resting heart rate (HR) & medication use was recorded.

Results: Antero-apical displacement & double bifid PM were present in 70% and 77% subjects, respectively. Resting HR was 67 beats (60, 72) & 71% patients were on beta-blocker/calcium channel blockers (BB/CCB). HCM subjects with antero-apically displaced PM & double bifid PM had higher resting LVOT gradient compared to those without {45 [6, 81] vs. 12 [0, 12] mm Hg (p < 0.01) & 42 [6, 64] vs. 11 [0, 17] mm Hg (p=0.02) respectively}. Both antero-apical displacement & double bifid PM were significantly associated with resting LVOT gradient independent of septal thickness (both p < 0.05 respectively). In patients with significant (≥ 30 mm Hg) resting gradient, using stepwise logistic regression, the odds ratio of having antero-apically displaced PM & double bifid PM were 7.1 and 10.4 respectively (p<0.005); independent of septal thickness, BB/CCB use and HR.

Conclusions: HCM patients with abnormal PM morphology, i.e. antero-apical displacement or double bifid PM have abnormally elevated resting LVOT gradient, independent of septal thickness & resting HR. Studies are required to determine if an altered surgical technique which corrects abnormal PM will be incrementally beneficial to septal myectomy alone.

Diagnostic Testing

1:00 p.m.

913-235 **[18F] Fluoromisonidazole is Selectively Retained in Ischemic Human Myocardium During Dobutamine Stress: A Pilot Study**
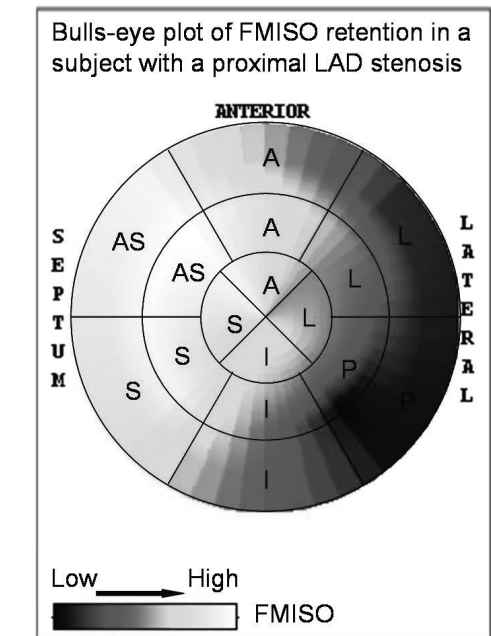
Stephen P. Hoole, Patrick M. Heck, Sadia N. Khan, Tim D. Fryer, David P. Dutka, University of Cambridge, Cambridge, United Kingdom

Background: Nuclear imaging modalities identify myocardial ischemia by detecting a difference in radiotracer retention between rest and stress studies. [18F] Fluoromisonidazole (FMISO) is selectively retained within ischemic tumor and brain cells, but not in normal or infarcted tissue. We hypothesized that FMISO could be used to quantify myocardial ischemia in humans with coronary disease.

Methods: Five subjects (80 myocardial segments) with single vessel coronary disease were studied. Dobutamine stress echocardiography (DSE) was performed to induce regional demand ischemia and tissue Doppler velocities analysed (EchoPAC, GE medical systems) at peak stress. The following week, the DSE was repeated and FMISO (300mBq) injected at peak dobutamine and a dynamic emission scan acquired for 120 minutes (GE advance PET camera). Post-processing and modelling was performed using dedicated software (PMod).

Results: Myocardial ischemia was confirmed in segments subtended by the diseased coronary artery by a reduced increase in S wave velocity (Vs) at peak dobutamine, 3.1 ± 0.5 cm.s^{-1} (mean ± SEM) vs 4.6 ± 0.5 cm.s^{-1}; p = 0.023. Segmental distribution of FMISO retention (Figure) correlated with ischemic segments defined using MYDISE criteria (r = 0.39, p = 0.004; κ = 0.38, 95%CI: 0.12-0.63).

Conclusions: This is the first study to demonstrate selective retention of FMISO by ischemic human myocardium and may offer potential to quantify the extent of myocardial ischemia in patients with coronary artery disease.

Bulls-eye plot of FMISO retention in a subject with a proximal LAD stenosis

1:00 p.m.

913-236 **Excessive Inotropic Response During Exercise Testing is Associated With Left Ventricular Diastolic Dysfunction Detected by TDI: Understanding the Prognostic Role of Blood Pressure Elevation at Peak Exercise in Hypertensives**

Dimitris Chatzis, Costas Tsioufis, Apostolis Kakkavas, Andreas Katsimichas, Ioannis Vlasseros, Eleftherios Tsiamis, Christodoulos Stefanadis, Christodoulos Stefanadis, Ioannis Kallikazaros, Department of Cardiology, Hippokration Hospital, Athens, Greece

Background: Left ventricular (LV) diastolic dysfunction and excessive inotropic response during exercise are correlated with adverse cardiovascular events. We sought to investigate the potential relationship between these two parameters in the setting of early essential hypertension (H).

Methods: 55 consecutive patients (aged 54 years) with stage I - II H underwent treadmill exercise testing and were classified as excessive inotropic responders (group A, n=18) based on the systolic blood pressure (BP) elevation at 210 mmHg or more for men and 190 mmHg or more for women, at peak exercise. The remaining patients were classified as normal inotropic responders (group B, n=37). LV diastolic function was estimated by pulsed tissue Doppler Imaging (TDI), averaging diastolic mitral annular velocities (Em, Am) from 4 separate sites of measurement (LV lateral, septal, anterior and inferior wall). All the participants were also underwent blood sampling for the determination of metabolic profile.

Results: The two groups did not differ significantly in terms of age, sex, body mass index (BMI) and metabolic profile, as well as office systolic, diastolic BP and pulse pressure (PP). Excessive inotropic responders did not differ compared to normal inotropic

responders regarding LV mass index and relative wall thickness (100 ± 24 vs 97 ± 24 g/m^2 and 0.43 ± 0.06 vs 0.41 ± 0.07 respectively, p=NS for both cases). Regarding the TDI data, the excessive inotropic responders compared to those with normal inotropic response exhibited significantly lower values of Em/Am ratio (0.72 ± 0.1 vs 0.83 ± 0.2, p<0.05). In the total population the Em/Am ratio was significantly correlated with systolic BP at peak exercise (r=-0.206, p<0.05) and office PP (r=-0.158, p<0.05).

Conclusions: The excessive inotropic response during exercise testing is accompanied by impairment of LV relaxation. This interrelationship may further explain the prognostic role of the maximal systolic BP achieved at peak exercise.

E-POSTER SESSION
914

E-Poster Session 914

Monday, March 26, 2007, 2:00 p.m.-3:00 p.m.
Hall H

2:00 p.m.

914-221 **Left Ventricular Apical Initial Clockwise Rotation in Early Systole in Patients with Dilated Cardiomyopathy: Evaluation by a Novel Two Dimensional Echo Tracking System**
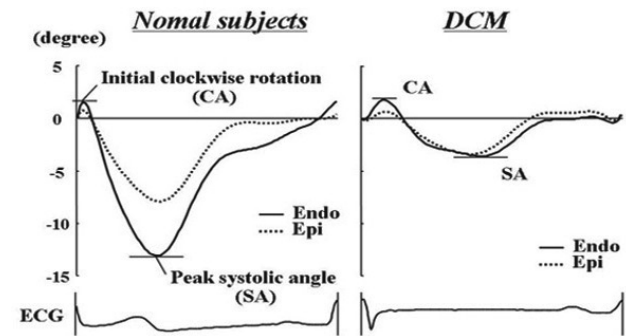
Eizo Akagawa, Kazuya Murata, Hideki Kunichika, Yasuaki Wada, Takeo Tanaka, Yoshio Nose, Masunori Matsuzaki, Yamaguchi university, Ube, Japan

Background: As viewed from left ventricular (LV) apex, systolic apical rotation is predominantly counterclockwise. However, a small clockwise rotation is present during isovolumic contraction. The behavior of this initial clockwise rotation in patients with LV systolic dysfunction remains unknown.

Methods: LV 2-dimensional short-axis images at apex were acquired in 16 normal subjects (N) and 14 patients with dilated cardiomyopathy (DCM). Total eight points, anterior, lateral, posterior, and septum in both endo- and epi-cardium (Endo, Epi) were placed, and the movements of these points were tracked by 2-dimensional tissue tracking system (HITACHI, EUB-8500). The center of these points was determined and rotation angle of each point was calculated, and averaged at each Endo and Epi. We measured initial clockwise rotation angle (CA) and peak systolic angle (SA), and calculated the ratio of CA to SA.

Results: Although SA in DCM at both Endo and Epi were attenuated compared to that in N (Endo; 2.8±1.2 vs 7.8±2.3°, Epi; 2.5±1.2 vs 5.1±1.5°, p<0.01, respectively), there was no difference in CA between two groups. Consequently, the values of CA/SA in DCM were greater than in N (Endo; 0.6±0.5 vs 0.1±0.1, Epi; 0.4±0.4 vs 0.08±0.09, p<0.01, respectively).

Conclusions: Different from LV apical systolic rotation, this initial clockwise rotation might not play an important role for LV ejection but be attributed to electro-mechanical response during isovolumic contraction.

2:00 p.m.

914-222 **Cardiac Velocity, Strain And Strain Rate Using Velocity Vector Imaging In Normal Adults**

Khung-Keong Yeo, Razieh Zarghami, Andrew Praserthdam, William J. Bommer, UC Davis Medical Center, Sacramento, CA

Aim: To describe and evaluate normal reference measurement values for velocity vector imaging (VVI).

Background: VVI is a new echocardiographic technology that measures myocardial velocity and deformation using speckle tracking, independent of transducer beam angle. This technique offers unique advantages in evaluating synchrony and dyssynchrony in cardiac disease. However, normal values for this tool have not yet been established.

Methods: We reviewed 21 normal transthoracic echocardiograms and performed analysis in the parasternal short axis and apical four-chamber views using VVI. Peak/trough measurements of velocity (V), strain (S), strain rate (SR), timing (QRS to peak/trough V, S and SR), rotational angle and velocity were recorded for 6 radial short axes and 6 central apical segments.

Results: Table 1 shows the results for the short axis views. The time interval between

peak-to-peak S and SR between opposing segments of the heart in the parasternal short axis views ranged from 24.71 to 39.43msec and 31.00 to 55.52msec respectively. Similar findings were recorded for the apical four-chamber views. Mean peak rotational velocity was 17.99 degrees/s and rotation angle was 1.03 degrees.

Conclusions: VVI is a novel echocardiographic technology. These normal reference values allow serial comparisons in patients with disease that affects cardiac synchrony and contraction.

	Septum	Anterior	Anterior-lateral	Posterior-lateral	Posterior	Inferior
Peak Velocity (cm/s)	2.54 ±1.42	2.88 ±1.30	2.53 ±1.02	2.63 ±0.85	2.37 ±0.79	2.33 ±0.82
Peak Strain (%)	-25.04 ±8.46	-21.49 ±9.98	-20.68 ±10.13	-21.89 ±6.21	-21.90 ±8.38	-22.44 ±8.26
Peak Strain Rate (1/s)	-1.61 ±0.52	-1.55 ±0.52	-1.61 ±0.46	-1.47 ±0.46	-1.53 ±0.57	-1.58 ±0.66
Time to peak velocity (msec)	211.10 ±59.21	190.38 ±51.02	171.81 ±41.67	157.24 ±48.94	200.86 ±52.23	215.33 ±66.97
Time to peak strain (msec)	350.86 ±9.34	346.43 ±65.64	358.76 ±66.11	341.00 ±50.66	374.05 ±81.32	346.95 ±69.53
Time to peak strain rate (msec)	199.71 ±46.03	199.57 ±45.73	226.43 ±71.40	184.24 ±46.54	188.19 ±59.40	208.76 ±71.84

Table 1. Velocity, strain, strain rate and timing for different segments on a short axis view of the heart

2:00 p.m.

914-223   **Geometric Deformity of the Mitral Annulus in Patients with Hypertrophic Obstructive Cardiomyopathy: Real-time Three-dimensional Echocardiographic Study**

Nozomi Wada, Shota Fukuda, Manatomo Toyono, Yoshiki Matsumura, James D. Thomas, Nozomi Watanabe, Kiyoshi Yoshida, Takahiro Shiota, The Cleveland Clinic Foundation, Cleveland, OH, Kawasaki Medical School, Kurashiki, Japan

Backgrounds: The geometry of the mitral annulus in normals is known to be a saddle shape. However, 3D geometry of the mitral annulus in patients with hypertrophic obstructive cardiomyopathy (HOCM) is unknown.

Purpose: The purpose of this study was to clarify and quantify mitral annular geometry in patients with HOCM using real-time three-dimensional echocardiography (RT3DE).

Methods: 12 patients with HOCM and 9 healthy control subjects were examined using RT3DE. Three-dimensional mitral annular images were reconstructed and annular area (Ann area), annular circumference (Ann circ), annular height (Ann HT), antero-postero annular length (AP), antero/postero annular length ratio (A/P ratio), medial-lateral annular length (ML), left atrial volume (LA) were quantified with a custom made software. End-diastolic and systolic left ventricular cavity diameters (LVDd, LVDs) and interventricular septum wall (IVS) were measured by two-dimensional echocardiography. These data were compared with two groups.

Results: LA volume was significantly larger in patients with HOCM than in normals. Mitral annular area and circumference were significantly dilated and AP was greater in patients with HOCM. There was no significant difference in HT, ML and A/P between two groups.

Conclusion: The mitral annulus in patients with HOCM was significantly dilated, particularly in the antero-posterior direction although the saddle-shape geometry was maintained.

Table. Compare with HOCM and normal subjects

		HOCM	Control	*p*
2-D	IVS (cm)	2.0±0.3	0.9±0.1	< 0.01
	LVDd (cm)	3.5±0.6	4.4±0.4	< 0.01
	LVDs (cm)	2.1±0.5	2.9±0.3	< 0.01
3-D	Ann area(mm²)	7.3±0.9	6.1±1.3	< 0.05
	Ann circ(cm)	9.8±0.6	8.9±0.9	< 0.05
	Ann HT (mm)	4.6±1.2	4.5±1.2	NS
	AP (mm)	30.1±2.7	25.7±2.5	< 0.01
	ML (mm)	30.7±2.7	29.5±3.8	NS
	LA (ml)	65.9±17.5	26.6±8.4	< 0.01

2:00 p.m.

914-224   **Intracardiac Echocardiography For Conservative Aortic Valve Surgery: A New Investigative Tool**

François Raoux, Raphaelle Dumaine, isabelle di centa, Patrick Nataf, Ariel Cohen, Emmanuel Lansac, Ecole de Chirurgie de l'APHP, PARIS, France, Saint Antoine Unviversity Hospital, Paris, France

Background: Dystrophic aortic insufficiency is characterised by dilation of aortic annulus and sino-tubular junction (STJ). We suggest a standardised approach of conservative aortic valve surgery using external prosthetic ring. Intracardiac Echocardiography (ICE) was used to study root dynamics before and after implantation in an ovine model

Methods: 6 sheeps underwent a double sub and supravalvular annuloplasty, with implantation of 2 expansible rings, at the level of the aortic annulus and sino-tubular junction (STJ). Images were obtained using ICE probe (AcuNav®, Siemens), introduced through the left internal jugular vein into the right atrium. Coaptation height and expansion of the aortic root were studied pre-operatively (A) and at 6 months (B).

Results: Comprehensive echographic examination was always possible (table 1). Prosthetic rings produced significant reduction of annulus and STJ diameters, respectively -15% and -28%, without significant gradient.

Aortic roots dynamics on ICE

		SystoleDiameter (mm)	DiastoleDiameter (mm)	Expansion rate (%)
Ascending aorta	A	22.9 ± 1.6	21.6 ± 1.9	6.4 ± 4.8
Ascending aorta	B	21.5 ± 2.3	19.8 ± 2.9	7.5 ± 5.7
Sino-tubular junction	A	22.6 ± 1.9	20.7 ± 2.5	9.6 ± 6.1
Sino-tubular junction	B	16.3 ± 3.5	14.5 ± 2.8	12.5 ± 3.6
Sinuses of Valsalva	A	29.8 ± 2.1	28.7 ± 2.2	3.9 ± 1.6
Sinuses of Valsalva	B	23.4 ± 2.9	22.3 ± 3.0	5 ± 1.1
Aortic annulus	A	21.4 ± 1.3	19.6 ± 1.2	9.1 ± 4.9
Aortic annulus	B	18.2 ± 4.2	16.1 ± 3.9	13.2 ± 1.8

ICE allowed good visualization of valvular coaptation, with a mean coaptation height of 2.5 ± 0.7 mm pre-implantation and 6.2 ± 1.1 mm after 6 months (p<0.001).

Conclusions: Implantation of expansible aortic ring prosthetic ring reduces aortic root diameters, increases leaflet coaptation area while preserving root expansibility.

ICE provided a precise analysis of aortic root dynamics in an ovine model. It might be an interesting tool to assess the efficiency of the aortic root after valve repair for dystrophic aortic insufficiency

2:00 p.m.

914-225   **Obesity Paradox in Risk Stratification and Prognosis of Patients Undergoing Stress Echocardiography**

Sripal Bangalore, Emad Aziz, Ajay Shah, Seth Uretsky, Jorge Silva, Sanobar Parkar, Sabrina Sawhney, Donna MacMillan Marotti, Siu-Sun Yao, Farooq A. Chaudhry, St Lukes Roosevelt Hospital, New York, NY

Background: Obesity paradox, a paradoxical decrease in cardiovascular events in obese patients has been described in coronary artery disease (CAD), heart failure and hypertension. However, whether such a paradox exists in patients undergoing stress echocardiography is not known.

Methods: 3012 patients (60 ± 13 years; 47% men) underwent stress echocardiography (58% dobutamine). Patients were divided into 4 groups based on BMI as: normal weight (<24.9 kg/m²), overweight (25-29.9 kg/m²), obese (30-34.9 kg/m²) and morbidly obese (>35 kg/m²). Followup (2.7 ± 1.0 years) for confirmed myocardial infarction (n = 55) and cardiac death (n = 98) were obtained.

Results: Stress echo risk stratified normal vs. abnormal subgroup in each BMI categories. For the entire cohort, obese patients had the lowest event rate for both normal and abnormal stress echo study (Figure). In patients with CAD, the event rate for an abnormal stress echo for normal, overweight, obese and morbidly obese were 4.9%, 5.7%, 3.9% and 6.8%/y and that for a normal study was 1.0%, 2.3%, 0.0% and 1.8%/y. In patients without CAD, the event rate for an abnormal stress echo for normal, overweight, obese and morbidly obese were 3.7%, 3.0%, 2.5% and 1.5% and that for a normal study was 0.8%, 0.8%, 0.7% and 0.4% respectively again depicting the lowest event rate in the obese cohort.

† P <0.0001

Conclusions: In patients with known or suspected CAD, obesity paradox exists in patients undergoing stress echocardiography mimicking the paradox seen in heart failure and CAD.

2:00 p.m.

914-226   Left Ventricular Filling Pressure: An Independent Determinant of Post-Exercise Ventricular Dyssynchrony in Systolic Heart Failure Patients with Narrow QRS Complex

Yi-Chih Wang, Chih-Chieh Yu, Juey-Jen Hwang, Ling-Ping Lai, Lung-Chun Lin, Chia-Ti Tsai, Chuen-Den Tseng, Jiunn-Lee Lin, National Taiwan University Hospital, Taipei, Taiwan,ROC

Background: Intra-left ventricular (LV) dyssynchrony is an evolving parameter for resynchronization therapy in patients (pts) with refractory systolic heart failure (SHF). However, the role of exercise on dyssynchrony remains uncertain.
Methods: We hypothesized that dyssynchrony would be induced after exercise in SHF pts without dyssynchrony at rest. Echocardiography coupled with tissue Doppler imaging (TDI) was studied in 25 pts with narrow (<120 ms) QRS complex, impaired LV ejection fraction (<50%), and dyssynchrony index [SD-Ts12: standard deviation of the absolute time difference (Ts) between the QRS onset to the peak systolic myocardial velocity (Sm) of the 6-basal and 6-mid segments in TDI] less than 33 ms at rest. All pts received 6-minutes (stage 2) treadmill exercise test by modified Bruce protocol. Both the peak Sm and the Ts of the 12 LV segments were recorded immediately after exercise.
Results: There were 23 men and 2 women with a mean age of 58±14 years. Among them, 9 pts (36 %) developed dyssynchrony (SD-Ts12>33 ms) after exercise. Pts with post-exercise dyssynchrony (ED group) had larger left atrial diameter (44.3±10.5 vs. 37.5±5.8 mm, p=0.045), and greater mitral E-flow velocity (94±41 vs. 58±17 cm/s, p=0.005), when compared to pts without post-exercise dyssynchrony (ND group). There was no significant difference in the etiology (ischemic or non-ischemic) of HF, QRS width, LV chamber sizes, LV ejection fraction (37±7 vs. 35±8 %), peak mitral annular early diastolic velocity (Ea) (6.6±3.1 vs. 7.4±4.0 cm/s), mean of the peak Sm (4.9±1.2 vs. 5.4±1.2 cm/s), and SD-Ts12 (20.6±8.9 vs. 16.7±9.9 ms) between the two groups. After exercise with similar peak heart rates, the SD-Ts12 became significant greater in the ED group than the ND group (44.1±9.4 vs. 15.6±8.7 ms, p<0.001). In multiple regression analysis, E/Ea>10 was an independent determinant of the development of post-exercise dyssynchrony (odds ratio=14, 95% CI=1.2-163, p<0.04).
Conclusions: Exercise induced intraventricular dyssynchrony in 36 % of SHF pts with narrow QRS and no dyssynchrony at rest. Greater E/Ea, an indicator of higher LV filling pressure, independently predicted the development of post-exercise dyssynchrony.

2:00 p.m.

914-227   Left Atrial Strain Assessed by 2-dimensional Speckle Tracking Imaging is a Useful Method in Assessing Left Ventricular End-diastolic Pressure

Kazuaki Wakami, Nobuyuki Ohte, Takahiro Nagata, Takehiro Tsunekawa, Kaoru Asada, Hiroumi Mizuno, Seiichiro Sakata, Seiji Mukai, Kenji Kobayashi, Tomoaki Saeki, Genjiro Kimura, Nagoya City University Graduate School of Medical Sciences, Nagoya, Japan
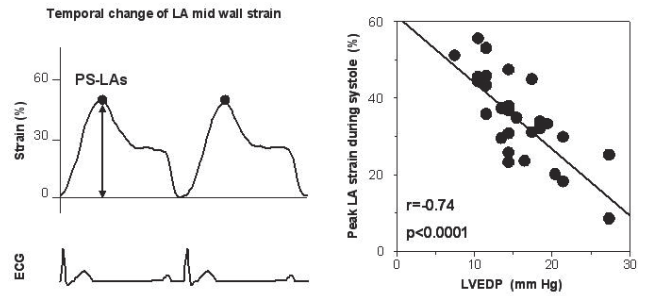
Background: It is acknowledged that left atrial (LA) behavior mirrors left ventricular (LV) function, especially in the viewpoint of LV stiffness. A novel 2-dimensional ultrasound speckle tracking imaging (2D-STI) technique enables us to evaluate LA function more accurately. Accordingly, we investigated whether LV end-diastolic pressure (LVEDP) could be predicted by LA wall strain.
Methods: Study subjects were consecutive 30 patients who underwent diagnostic cardiac catheterization and the 2D-STI (Velocity Vector Imaging) on the same day. Sixteen were prior myocardial infarction. The remaining 14 had no localized LV wall motion abnormality. LA strain was obtained during 2 cardiac cycles on the both septal and lateral mid-LA walls in the apical 4-chamber view and also obtained on the both inferior and anterior mid-LA walls in the apical 2-chamber view. Peak LA strain value on each segment during LV systole and the average of them were obtained. In cardiac catheterization, we measured LVEDP using a catheter-tipped micromanometer.
Results: A significant negative correlation was observed between the average of peak LA strain during systole (PS-LAs) and LVEDP (r=-0.74, p<0.0001).
Conclusions: This finding indicates that LV stiffness can be assessed by LA strain during LV systole using the 2D-STI. The PS-LAs is a new useful parameter for noninvasive prediction of LVEDP.

Temporal change of LA mid wall strain

2:00 p.m.

914-228   Radiation Dose in 128 Patients Imaged with Dual Source Multi-Detector Row Computed Tomography for Cardiovascular Indications

Sandra Simon Halliburton, Stacie A. Kuzmiak, Paul Schoenhagen, Cleveland Clinic, Cleveland, OH

Background: Recently introduced dual source computed tomography (DSCT) significantly reduces temporal resolution (83 ms). However, DSCT radiation dose requirements have not been investigated in patients. We examined a large patient population to determine if DSCT could limit radiation exposure of scans encompassing the heart to 13 mSv in accordance with existing American College of Radiology guidelines for cardiac CT.
Methods: 128 (90 male) patients were imaged with DSCT (Siemens) using dedicated protocols for coronary artery disease (CAD), coronary anomalies, bypass grafts, cardiac mass, pulmonary vein stenosis (PVS), pericardial disease, arrythmogenic right ventricular dysplasia (ARVD), thoracic and thoraco-abdominal aortic disease. Retrospective ECG gated spiral techniques were used and both pitch and tube current modulation window were adjusted according to heart rate (HR). The effective dose (E) was estimated for each scan from the dose-length product (DLP) provided by the scanner [E = k x DLP where k=0.017 mSv x mGy-1 x cm-1 for females and males].
Results: Estimated E values were within guidelines except 1) in patients w/ severe arrhythmia where tube current modulation was significantly widened or turned off and 2) in some patients w/ HR ≤ 55 bpm and low pitch (≤0.25).

Indication	N	Heart Rate (HR) [bpm]	mAs/rot	Slice Col/ Thick [mm]	Scan Range [mm]	Effective Dose [mSv]
CAD Coronary Anomaly Cardiac Mass	34	64 (48-112)	331 (240-410)	0.6/0.75	131 (110-191)	12.6 (8.3 24.5)
Bypass Graft Patency	3	61 (52-69)	330 (320-340)	0.6/0.75	222 (213-241)	12.6 (8.3-24.5)
Bypass Graft Location	15	66 (53-89)	273 (240-320)	1.2/2	229 (191-314)	18.1 (11.2-32.5)
PVS	42	80 (54-116)	282 (240-360)	1.2/1.5	141 (110-171)	11.6 (7.0-19.2)
ARVD Pericardial Disease	10	75 (51-103)	276 (200-320)	1.2/1.5	146 (125-177)	11.2 (8.4-13.6)
Thoracic Aortic Disease	20	63 (44-91)	146 (120-180)	1.2/3	465 (330-598)	12.1 (8.1-25.4)
Thoraco-Abdominal Aortic Disease	4	68 (44-91)	140	1.2/3	465 (330- 598)	18.1 (10.7- 23.3)

CONCLUSION: If DSCT scan protocol is carefully selected, patient radiation dose for cardiovascular indications is within guidelines and comparable to single source CT except for patients with severe arrhythmia or HR ≤ 55 bpm.

2:00 p.m.

914-229   Coronary CT Angiography In Elderly High Risk Patients Presenting With Atypical Cardiac Symptoms

Jeffrey P. Goldman, Francis Perrone, Joseph J. DeRose, Rich Mather, Tony DeFrance, Manhattan Diagnostic Radiology, New York, NY

Background: Elderly patients often present with nonspecific symptoms for coronary artery disease (CAD). These complaints may include fatigue, shortness of breath, and palpitations. The purpose of our study was to measure the clinical efficacy of coronary CTA in triaging elderly high risk patients with atypical cardiac symptoms.
Methods: Retrospective review of 240 coronary CTA's (referred by two physicians, one cardiologist and one internist) was performed in elderly high risk patients who presented with atypical cardiac symptoms. Patients with chest pain were excluded from the study.

All patients were over age 70 and had multiple risk factors for CAD. All studies included a coronary calcium score (CCS) and a contrast enhanced coronary CTA. Studies were performed on a 64 detector CT (Toshiba, Tustin CA) and interpreted on a 3D workstation (Vital Images, Minnetonka, MN). In patients who went on to catheterization (N = 48), correlation was made between the results of the two exams.

Results: The range of CCS was 0 - 4353 with a mean score of 693 (> 80th percentile for patients > 70 years old). 20% of patients underwent subsequent x-ray angiography based solely upon the results of the coronary CTA. Overall, 19% of elderly high risk patients presenting with atypical cardiac symptoms who were sent for coronary CTA were subsequently found to have at least one coronary stenosis requiring angioplasty, stent or CABG. There was no statistically significant difference between the CCS of patients in this study who did or did not have an obstructive coronary artery stenosis. On a per patient basis, 96% of patients who underwent cardiac catheterization based upon the coronary CTA results had an obstructive coronary artery requiring intervention. The two false positive CTA's were of limited quality due to motion artifact.

Conclusion: In our patient population of elderly high risk patients with atypical cardiac symptoms there was a high rate (19%) of silent ischemia. Coronary CTA was found very useful (positive predictive value of 96%) while CCS was found not to be useful for triaging elderly, high risk patients with atypical cardiac symptoms.

2:00 p.m.

914-230   **Volume and Mix of Cardiac Diagnostic Procedures Before and After the Introduction of a Multidetector Computer Tomograph Angiography in a Large Single-specialty Cardiology Practice**

Jerome L. Hines, Sorin C. Danciu, Manan Shah, Mary Jane Borg, Cathleen Biga, Illinois Heart and Vascular, LaGrange, IL

Background: The 64-slice computed tomography angiography (CTA) scanner offers the latest in noninvasive cardiac imaging technology and is increasingly being incorporated into clinical practice. However, limited research exists regarding the impact of CTA on the volume and mix of all cardiac diagnostic procedures. Therefore, the objective of this study was to assess the change in volume and mix of cardiac diagnostic procedures after the introduction of a CTA scanner in April 2005 for a large, suburban, outpatient, single-specialty cardiology practice.

Methods: Data were abstracted for 2 years before and 1 year following CTA acquisition. A descriptive analysis was conducted to determine the cardiac diagnostic procedure volume and mix in relation to the volume of patient visits for each year. The cardiac procedures included in the study were nuclear perfusion stress tests, diagnostic catheter angiography and CTA. Results were charted over time and the growth rates were compared before and after the implementation of the CTA scanner.

Results: In year 1, the cardiology practice had 15,286 visits, which increased to 17,327 visits in year 2 (13.4% growth rate) and continued to rise in year 3 with 17,681 visits (2.0% growth rate from year two). The CTA scanner services were available at the beginning of year 3, when a total of 1,665 CTA procedures were conducted. Nuclear perfusion stress tests increased at a rate of 6.2% between years 1 (N=2,299; 14.5%) and 2 (N=2,670; 15.4%) and decreased at a rate of 5.8% between years 2 and 3 (N=2,559; 14.5%). Diagnostic catheter angiography decreased at a rate of 10% between years 1 (N=1,268; 8.0%) and 2 (N=1,250; 7.2%) and decreased at a rate of 11.1% between year 2 and 3 (N=1,132; 6.4%).

Conclusions: Despite the growth in the number of patient visits as well as additional CTA procedures, there was a decrease in the rate nuclear perfusion stress tests and diagnostic catheter angiographies after the implementation of the CTA scanner.

2:00 p.m.

914-231   **Smaller Pulmonary Vein Ostia Area is Associated with Recurrent Arrhythmia Following Pulmonary Vein Antral Isolation for Atrial Fibrillation**

Subramanya K. Prasad, Andrea Natale, Mandeep Bhargava, Milind Y. Desai, Srikanth Sola, Cleveland Clinic, Cleveland, OH

Background: Intrinsic autonomic activity within the smooth muscle sleeves of the pulmonary veins can trigger electrical actiiviation which leads to atrial fibrillation (AF). We hypothesized that pulmonary vein ostia area, as determined by multi-detector computed tomography (MDCT), would predict recurrent atrial fibrillation after PVAI.

Methods: We prospectively evaluated 329 consecutive patients with symptomatic AF resistant to >2 antiarrhythmics referred for PVAI. Patients who had previously undergone PVAI were excluded from the study. All patients underwent MDCT study of the pulmonary veins using either a 16- or 64-slice Siemens Sensation scanner prior to the PVAI procedure. The number and total ostial area of all pulmonary veins, indexed to body surface area, were determined by 2 independent blinded observers. Left atrial and left atrial appendage volumes were also determined. Patients were followed with transtelephonic monitoring for 6 months, and clinically at 3 months and one year for recurrent AF.

Results: We followed 329 patients (85% male, age 56±11 years) for an average of 12±2 months following PVAI for AF. Recurrent AF occurred in 56 patients (17%) during the follow-up period. Mean total area of the pulmonary venous ostia was lower in patients with recurrent AF than in patients who maintained normal sinus rhythm during the follow-up period (total area 357±13 mm²/m² vs. 442±19 mm²/m²; p=0.02). A smaller ostial area of the left superior (LSPV) and left inferior pulmonary veins (LIPV) was also associated with recurrent AF (LSPV 65±4 mm²/m² vs. 88±5 mm²/m²; p=0.007; LIPV 66±4 mm²/m² vs. 82±4 mm²/m²; p=0.006). There was no relationship between left atrial volume, left atrial appendage volume, the number of pulmonary veins, or the right sided pulmonary venous ostia area and recurrent AF.

Conclusions: A smaller total pulmonary vein ostia area, particularly of the left sided pulmonary veins, as measured by MDCT is associated with recurrent AF in patients undergoing PVAI.

2:00 p.m.

914-232   **Gray Zone, Scar Size and Ejection Fraction are Determinants of Arrhythmic Risk in MADIT II Patients**

Chizor Iwuchukwu, Saadi Siddiqi, Sunil Mathew, Thomas O'Donnell, Jeannette McLaughlin, William Schapiro, Jing Han, Yi Wang, Kathy McGrath, Steven M. Greenberg, Stuart Schecter, David Hoch, Vinny Jayam, Joseph Levine, Nathaniel Reichek, Research Department St. Francis Hospital, Roslyn, NY, Stony Brook University, SUNY, Stony Brook, NY

Background: MADIT II eligible patients (prior myocardial infarction(MI), LV ejection fraction (EF) $\leq$ 30%) are at increased risk of lethal ventricular arrhythmias. Infarct size and heterogeneity are proposed markers of inducibility of ventricular tachycardia (VT) and outcome risk. We examined LV structure and function including infarct size (Scar) and heterogeneous periphery (gray zone, GZ) in such patients using cardiac MRI (CMR).

Methods: Sixty-one patients meeting MADIT II criteria had CMR and were followed for 22 $\pm$ 8 months; 43 underwent EPS at intake. CMR delayed enhancement (DE) and volumetric LV cine imaging were performed. Using semiautomated software (Siemens Corporate Research), Scar was defined as signal 2s.d. above mean remote signal intensity (SI). GZ size was assessed at thresholds of 50% and 75% of maximal Scar. Scar, GZ mass, clinical and CMR EF were compared to inducibility of sustained monomorphic VT at EPS and to a combined clinical endpoint including EPS inducibility and follow-up arrhythmic events (sudden death, late EPS inducibility, documented VT, valid ICD firings).

Results: (Table)Absolute Scar size and GZ size at 75% SI were associated with inducibility (p=0.04, p=0.02), while clinical and CMR EF and absolute Scar size were associated with a combined clinical event(p= 0.02, p= 0.02, p=0.04).

Combined Clinical End points and Inducibility

Variable	Combined Clinical End Points				Inducibility at intake		
	No event (n=27)	Event (n=34)	p	p* (age adjusted)	Non inducible (n=14)	Inducible (n=29)	p
	Mean (s.d.)	Mean (s.d.)			Mean (s.d.)	Mean (s.d.)	
Age	63.5 (11.5)	69.4 (10.6)	0.04	-	69.1 (9.2)	69.9 (9.1)	0.78
Clinical EF (%)	26.0 (4.4)	22.9 (4.5)	0.01	**0.02**	24.9 (4.3)	23.4 (4.6)	0.38
CMR EF (%)	29.3 (10.3)	25.3 (7.8)	0.09	**0.02**	28.0 (12.6)	26.1 (8.0)	0.62
%Scar	22.0 (12.1)	25.4 (11.0)	0.34	0.30	23.2 (17.0)	24.7 (10.2)	0.78
Scar Mass (gm)	39.3 (16.9)	58.1 (31.9)	0.02	**0.04**	36.7 (18.8)	62.8 (32.3)	**0.04**
Gray Zone 75% (gm)	13.6 (6.8)	18.4 (17.0)	0.21	0.31	10.1 (5.5)	20.5 (17.7)	**0.02**
Grey Zone 50% (gm)	31.3 (13.9)	42.3 (24.0)	0.07	0.10	27.9 (14.2)	46.0 (24.2)	0.07

Conclusions: Clinical EF, CMR EF, infarct size and grey zone size are all potential markers of increased risk in patients meeting MADIT II criteria.

2:00 p.m.

914-233   **Gadolinium-enhanced CMR Predicts MACE in Patients with Coronary Artery Disease and Preserved Left Ventricular Systolic Function: Results of a Four-year Prospective Study**

Anna KY Chan, Yat-yin Lam, Yan Zhang, Wynnie Lam, Nina So, John E. Sanderson, Cheuk-man Yu, The Chinese University of Hong Kong, Hong Kong, Hong Kong

Background: LV systolic function is an independent predictor of event-free survival in patients with proven or suspected coronary artery disease (CAD). The impact of presence of myocardial infarct/scar detected by gadolinium-enhanced cardiac magnetic resonance imaging (CMR) on major adverse cardiovascular events (MACE) in patients with CAD and preserved LV systolic function is not known.

Methods: Gadolinium-enhanced CMR were performed on 216 consecutive patients (mean age 64.2 ± 12.4 years) referred for evaluation of systolic function and detection of infarct/scar. Patients were subdivided into 4 groups by CMR score: score0, EF $\geq$ 50% without late gadolinium enhancement (LGE) (n =54); score1, EF $\geq$ 50% with LGE (n =25); score2, EF <50% without LGE (n =17) and score3, EF <50% with LGE (n =120). They were followed up for a mean of 43.0 ± 18.3 months for MACE.

Results: Total 56 patients (25.9% of the total study population) had MACE during follow-up; 12 cardiovascular deaths (5.5%); 24 (11.1%) hospital readmissions for unstable angina and congestive heart failure; 20 patients (9.3%) underwent coronary revascularization (bypass operation or angioplasty) and were censored. Kaplan-Meier survival curves demonstrated significantly better outcome for those patients with CMR score 0 (i.e. EF

≥ 50% without LGE) than those with higher CMR scores (p=0.006, Figure 1). In Cox-regression analysis, CMR score predicted MACE independently of other clinical variables (Hazard ratio, 1.62; 95% CI, 1.22-2.16; p=0.001).

Conclusions: In patients with proven or suspected coronary artery disease and preserved systolic function, presence of LGE by CMR is associated with significantly lower event-free survival. CMR score showed powerful prognostic value independent of clinical variables for MACE.

Figure 1. Kaplan-Meier Curves for MACE according to CMR Score

2:00 p.m.

<u>914-235</u>   **Wall Thickness in Human Carotid Arteries Correlates Negatively With Plaque Inflammation measured by FDG PET**

<u>James H. Rudd</u>, Karen Weinshelbaum, Venkatash Mani, Kelly Myers, Sameer Bansilal, Michael Farkouh, Josef Machac, Silvia Aguiar, Valentin Fuster, Zahi Fayad, Mount Sinai School of Medicine, New York

Background: Atherosclerosis an inflammatory disease, where the degree of inflammation, not plaque size, determines risk of rupture and clinical events. MRI images plaque with high resolution, and MRI parameters of disease extent correlate with atherosclerotic risk factors. By providing a measure of metabolic activity, FDG PET can quantify plaque inflammation with a strong correlation between FDG uptake and plaque macrophage content. We imaged patients with established vascular disease (post-PCI or CABG) using both MRI and FDG PET to assess the relationship between plaque FDG uptake and MRI indices of disease burden.

Methods: 26 patients underwent PET/CT imaging on a GE Discovery LS. Aortic and carotid images were acquired 90 mins after 10 mCi FDG injection with CT coregistration. To estimate FDG uptake into plaque, standardized uptake values (SUV) were calculated using ROI applied to the PET/CT images and corrected for blood FDG activity.
MR imaging was performed on a 1.5T scanner. 24 carotid slices 3mm thick and 24x5mm slices from the aortic arch to diaphragm were obtained using the published black blood REX sequence. Imaging parameters: TR/TE=2130/5.6ms, FOV 12×12cm, bandwidth 488Hz, matrix 256×256, turbo factor 15. We measured mean and max wall thickness, and wall area/vessel area (atherosclerotic disease index - ADI), using previously validated methods.

Results: Mean age was 62 years with 40% females.
The mean (+/-SEM) carotid FDG SUV measured by PET was 1.51 (0.05), with a mean MRI-derived ADI of 0.45 (0.01). There were significant **negative** correlations between mean carotid FDG SUV and both carotid wall thickness (**r=-0.38, p<0.05**) and carotid wall ADI (**r=-0.45, p<0.05**).
In the aorta, there were no significant correlations between the FDG and MRI results.

Conclusions: We used non-invasive multimodality imaging to show negative correlations between atherosclerotic plaque size and degree of inflammation in the carotid arteries of high risk patients. This result reinforces the fact that plaque rupture events are caused by small highly inflamed lesions. A potential use for this method may be study of plaque inflammation regression with novel drug therapies

2:00 p.m.

<u>914-236</u>   **Objectively Measured Daily Physical Activity in Relation to Fitness and Fatness in an Urban Sample of Children**

<u>Magnus Dencker</u>, Thorsson Thorsson, Magnus K. Karlsson, Christian Lindén, Per Wollmer, Lars B. Andersen, Dept of Clinical Sciences, Malmo University Hospital, Malmö, Sweden, Norwegian University of Sport and Physical Education, Oslo, Norway

Background: There is growing concern about possible negative health effects associated with lack of physical activity. Limited knowledge exists about the association between objectively measured daily physical activity versus aerobic fitness and body fat on a population-based level.

Methods: Cross-sectional study of 248 children aged 8-11 years, recruited from a population-based cohort. Abdominal fat and total body fat were quantified by Dual-Energy X-Ray Absorptiometry. Total body fat was expressed as a percentage of total body mass. Maximal oxygen uptake was measured by indirect calorimetry during a maximum cycle ergometer exercise test and reported as ml/min/kg. Daily physical activity was assessed by accelerometers for four days, and daily accumulation of vigorous activity was calculated.

Results: Significant univariate relationship (P<0.05) existed for daily accumulation of vigorous activity versus percent body fat (r=-0.38), abdominal fat mass (r=-0.34), and aerobic fitness (r=0.37). Multiple regression analysis with inclusion of possible confounders concluded that vigorous physical activity was independently related to percent body fat, abdominal fat mass and aerobic fitness.

Conclusions: In this population-based cohort, low physical activity was, already in children aged 8-11 years, associated with more body fat and lower aerobic fitness which indicates that a negative health profile occurs early in life.

E-Poster Session 915

Monday, March 26, 2007, 3:00 p.m.-4:00 p.m.
Hall H

3:00 p.m.

<u>915-221</u>   **Unfavorable Structural and Functional Cardiac Adaptations in Hypertensive Subjects With Metabolic Syndrome. Data From the Hippokration Hellenic Hypertension (3H) Study**

<u>Costas Tsioufis</u>, Giorgos Chartzoulakis, Dimitris Tsiachris, Platonas Missovoulos, Apostolis Kakkavas, Vagelis Chatzistamatiou, Ioannis Vlasseros, Pavlos Toutouzas, Christodoulos Stefanadis, Ioannis Kallikazaros, Department of Cardiology, Hippokration Hospital, Athens, Greece

Background: Hypertensive patients with metabolic syndrome (MS) are at greater risk for cardiovascular disease. Our aim was to investigate the structural and functional left ventricular (LV) characteristics in essential hypertensive subjects with MS.

Methods: A total of 2723 consecutive hypertensives (age 57.2 years, 1343 males) that were included in the Hippokration Hellenic Hypertension (3H) Study, an ongoing registry of hypertension-related target organ damage, were considered for analysis. MS was identified according to ATP III report and was present in 978 patients (35.9%). Apart from the standard echocardiographic measurements, LV diastolic function was estimated by means of tissue Doppler imaging (TDI) derived indices, averaging diastolic mitral annular peak velocities (Em, Am, Em/Am ratio) from four separate LV sites (septal, lateral, anterior and inferior walls).

Results: Among hypertensives, subjects with MS compared with those without MS were older (p=0.003) and exhibited increased body mass index (p<0.001), waist to hip ratio (p<0.001) and office systolic blood pressure values (p=0.001). Regarding structural characteristics, they showed increased left ventricular mass index (107.7 vs 104.7 gr/m², p=0.013) and relative wall thickness (0.44 vs 0.43, p<0.001), indicating altered geometry of the LV, while left atrial enlargement was demonstrated by means of increased left atrial diameter (40.1 vs 38.3 cm, p<0.000) and left atrial volume (by 2.3 ml, p=0.002). In accordance, impaired diastolic function in subjects with MS was exhibited according to the decreased values of both the transmitral Doppler derived E/A ratio (by 0.05, p<0.001)) and the TDI derived indices Em (by 0.6 cm/s, p<0.001) and Em/Am ratio (by 0.06, p<0.001).

Conclusions: Hypertensive subjects with MS are characterized by altered LV geometry, impaired diastolic function and left atrial enlargement compared with those without MS. These cardiac adaptations may contribute to the higher cardiovascular risk observed in this setting.

3:00 p.m.

<u>915-222</u>   **Changes in Left Atrial Volumes with Mild Hypertension**

<u>Suzanne Eshoo</u>, David L. Ross, Liza Thomas, University of Sydney, Sydney, Australia

Background: Left atrial (LA) enlargement has been documented to occur in hypertension. We sought to evaluate the changes in total LA volume and LA volumes in the various phases of atrial filling in a cohort with mild hypertension (HT).

Methods: 100 patients with mild HT, (mean systolic BP = 147 mm Hg, mean diastolic BP= 84 mmHg, MAP= 105 mmHg) were prospectively recruited and compared to 92 normal volunteers. All recruits had a transthoracic echo performed. Attention was paid to maximizing LA size on echo. Those with left ventricular dysfunction, significant valvular disease, implantable devices and arrhythmias were excluded from inclusion. Maximum (LAESV) and minimum (LAEDV) LA volumes were calculated using Simpson's biplane method of discs. The pre 'P' LA volume (prior to active atrial contraction) was measured plus the passive filling, active filling and conduit volumes.

Results: Results were adjusted for age, gender and BMI.

	Normals (mean ± SE)	Hypertensives (mean ± SE)	p-value
LA diameter (M-mode) (mm)	37.7 ± 0.5	39.9 ± 0.5	0.005
LAESV (mL)	43.8 ± 1.7	53.3 ± 1.6	0.000
LAEDV (mL)	20.8 ± 0.9	22.0 ± 0.9	0.377
Pre P LAV (mL)	31.0 ± 1.4	37.0 ± 1.3	0.003
Passive emptying volume (mL)	12.8 ± 0.7	16.5 ± 0.7	0.001
Passive emptying fraction (%)	29.1 ± 1.0	31.5 ± 1.0	0.106
Conduit volume (mL)	33.5 ± 1.4	30.0 ± 1.3	0.087
Active emptying volume (mL)	10.5 ± 0.7	15.0 ± 0.6	0.000
Active emptying fraction (%)	32.6 ± 1.1	40.2 ± 1.1	0.000

On subgroup analysis, comparing hypertensives without and with LVH, LAESV (p<0.02), LAEDV (p<0.0002), LAEDVI (p< 0.006) and Pre P LAV (p< 0.007) were significantly increased. There were no significant differences in passive, active and conduit volumes.

Conclusion: Hypertension results in increased LV stiffness with a corresponding decrease in LV compliance and reduced LV diastolic filling. This results in an increase in LA size (as demonstrated by both LAD and LAESV) and LV filling is augmented by an increase in both active and passive LA transport.

3:00 p.m.

915-223   **Transnasal Omniplane Echocardiography: First Clinical Application for Guiding Catheter-based Interventions in Non-sedated Patients**

Thomas Buck, Bjoern Plicht, Thomas Konorza, Philipp Kahlert, Raimund Erbel, West German Heart Center, University Duisburg-Essen, Essen, Germany

Background: Monitoring and guiding of catheter-based interventions as device closure of intraatrial communication using ultrasound imaging techniques has been limited. Continuous monitoring with transesophageal echocardiography (TEE) is only feasible in intubated patients under general anesthesia. Compared to TEE, intracardiac echocardiography (ICE) can be performed in patients without sedation but is limited by a monoplane image sector that can be steered but not rotated as a result of the transducer design. Further, high costs of treatment result from single-use of ICE catheters. To overcome these limitations we studied the feasibility of transnasal omniplane transesophageal echocardiography (TNE) using a new miniaturized omniplane TEE probe for guiding intracardiac interventions.
Methods: In 12 consecutive patients (7 male, 5 female, age 67±14 years) for catheter intervention (12 device closures of patent foramen ovale (8), atrium septum defect (3), and paraprosthetic valve leakage (1)), TNE was performed by using a miniaturized flexible omniplane TEE probe that was introduced transnasal in patients with only intranasal anesthesia (2% lidocain gel). The tip of the 48 element 3-7 MHz probe (S7-3t, Philips) was 10 mm wide and 5.5 mm thick compared to a conventional TEE probe of 14 mm by 11.5 mm. The probe allows 180° mechanical rotation of a 90° image sector, flexion of the tip, and all Doppler modalities. In all 12 patients ICE (AcuNav 10F, Siemens) was performed for comparison. Informed consent was obtained.
Results: Transnasal introduction of the probe was well tolerated by all patients with no complications. During the procedure patients were able to swallow and speak. TNE provided high-resolution image quality that was only slightly inferior to ICE, whereas unlimited image plane navigation of TNE due to 180° image rotation provided superior monitoring and guiding of interventions compared to ICE.
Conclusions: Omniplane transnasal echocardiography using a new miniaturized TEE probe is feasible without patient sedation for monitoring and guiding during cardiac interventions. Requiring no sedation and reducing procedure costs TNE should overcome the limitations of TEE and ICE.

3:00 p.m.

915-224   **High Prevalance Of Left Atrial Thrombus In Patients With Atrial Fibrillation Undergoing Defibrillator Implantation. A Case For Routine Transesophageal Echocardiographic Screening.**

Madhavi Kadiyala, Sobhan Kodali, Darren Traub, Cathy Jakub, Brahma N. Sharma, Leonard I. Ganz, Alan H. Gradman, The Western Pennsylvania Hospital, Pittsburgh, PA

Background: Cardioversion in patients (pts) with atrial fibrillation (AF) is associated with high risk of thromboembolism. In AF pts undergoing implantable cardioverter defibrillator (ICD) implantation, defibrillator testing is routinely performed and often results in transient conversion to sinus rhythm. In order to determine if these pts are at increased risk for embolic events, we retrospectively analyzed transesophageal echocardiograms (TEE) performed in patients with AF prior to ICD implantation. The prevalence of thrombus and spontaneous echo contrast (SEC) in the left atrial appendage(LAA) in these pts has not been reported previously.
Methods: TEE's from 45 pts were evaluated for the presence of thrombus or SEC in the LAA. The relationship between these findings and anticoagulation status, left ventricular ejection fraction, LAA velocity, LAA ejection fraction, LAA diameter, and the degree of mitral regurgitation was statistically analyzed.
Results: Thirty-six men and 9 women (mean age 72 yrs) were included in the study. 33 (73%) pts were on chronic anticoagulation which was held several days prior to ICD implantation. Thrombus was detected in the LAA in 15 (33%)pts; dense (Grade III or IV) SEC alone was seen in 6(13%) additional pts. Defibrillation testing was witheld in the presence of thrombus. Of the 21 pts with thrombus/SEC, 15 were on anticoagulation and 6 were not. There was no correlation between thrombus/SEC and left atrial size, left ventricular ejection fraction or the degree of mitral regurgitation. However, significant correlations were found, between thrombus/SEC and LAA diameter, LAA ejection fraction and LAA velocity.
Conclusions: There is a high prevalence (46%) of thrombus/dense SEC in patients with AF undergoing ICD implantation regardless of the anticoagulation status. Thrombus/SEC correlated with larger LAA diameter, lower LAA ejection fraction and lower LAA velocity, but not with LA size. Given the high prevalence of thrombus and SEC in our analysis, there may be a significant risk of embolic events with defibrillator testing in AF patients. Routine screening TEE prior to ICD implantation and defibrillator testing should be strongly considered in pts with AF.

3:00 p.m.

915-225   **Detection of Albumin Microbubble Adherence To Aortic Endothelium At Different Stages In The Atherosclerotic Process**

Feng Xie, Jeane M. Tsutsui, Daniel Anderson, Stanley J. Radio, John Lof, Thomas R. Porter, University of Nebraska Medical Center, Omaha, NE

Background: Albumin-coated microbubbles (MB) adhere to activated endothelial cells. One mechanism for this is via complement (C3) activation, but it is unknown what mediates binding of MB at different stages of atherosclerotic development. The study objective was to determine the role of C3 in mediating adherence of albumin-encapsulated MB to atherosclerotic endothelium, and at one point in the atherosclerotic process retention of these MB is detectable with ultrasound.
Methods: Atherosclerotic plaque was induced in six apolipoprotein E deficient mice (apoE-/-). Adherence of albumin MB (PESDA) to endothelium was evaluated by microscopy of fluorescein isothiocynate-conjugated (FITC) MB and by scanning electron microscopy (SEM).Three apoE-/- mice were treated with cobra venom factor (CVF) to deplete C3 prior to PESDA injections. In four atherosclerosis-prone rats (JCR:LA-cp) on high fat diets and four control rats, triggered low mechanical index (MI) ultrasound (Contrast Pulse Sequencing; 0.1 MI) of aortas was performed at 4-6 minutes following 0.1 milliliter 10% PESDA injections. Retained MB were defined by ultrasound as isolated reflectors in the same border location for > 4 cardiac cycles after clearance of MB from the blood pool. Endothelial intercellular adhesion molecule (ICAM) and nitric oxide synthase (eNOS) upregulation, as well as serum triglyceride levels, were all correlated with MB retention by ultrasound and SEM.
Results: Fluorescent microscopy demonstrated adherence of MB to the endothelial surface of atherosclerotic plaque in untreated apoE-/- mice (median 172 MB/field) compared to 3 MB/field in CVF treated mice; p<0.001. In JCR:LA-cp rats, both ultrasound and SEM detected adherence of MB prior to plaque development. The quantity of adherent MB with SEM was higher than low MI imaging in the same region (p<0.01). Retention of MB correlated with serum triglyceride levels (r=0.82) and degree of eNOS upregulation (r=0.62).
Conclusions: Complement activation mediates adherence of albumin MB to endothelium overlying atherosclerotic plaque. Imaging of these retained MB is possible with high resolution low MI ultrasound early in the atherosclerotic process.

3:00 p.m.

915-226   **Regional Distribution Of Dyssynchrony In Patients With And Without Heart Failure**

Hygriv B. Rao, Raghu Krishnaswamy, Sharada Kalavakolanu, Narasimhan Calambur, CARE Hospital and CARE Foundation, Hyderabad, India

Background: Presence of ventricular dyssynchrony in heart failure (HF) correlates with benefit from Cardiac ResynchronizationTherapy (CRT). We compared, using Tissue Doppler Imaging (TDI), the regional distribution of ventricular dyssynchrony in HF patients (pts) with Wide (≥120 msec,Gp I) or Narrow QRS (Gp II) & normal individuals with complete bundle branch block.(Controls)
Methods: Gp I and II comprised of adult HF pts with systolic LV dysfunction (LVEF≤ 40%) in sinus rhythm, refractory to optimal medical therapy.Pts with valvular heart disease or diastolic HF,recent coronary events were excluded.All had standard 2D-echocardigraphic examination and TDI on Vivid 5 Vingmed.Tissue velocity curves obtained by placing sample volumes in opposing basal and mid segments of Septal, Lateral, Inferior, Anterior and Posterior walls were analyzed offline using customized software. Inter ventricular dyssynchrony (IVD) was assessed by the difference between aortic and pulmonary pre ejection intervals. LV dyssynchrony (LVD) was assessed by the difference in times to peak velocity. IVD or LVD ≥ 40 msec was considered significant.
Results: Gp I (N= 70) were compared with Gp II (N=30) and Controls (N=25).Gp I & II differed from controls in their mean LVEF(32 ± 6% Vs 61± 10%),while Gp II pts differed from other pts in their QRS width (95 ± 14 Vs 150 ± 23 msec). Prevalence of IVD in controls and Gp II was similar (7% Vs 18%) but was significantly higher in Gp I (47%, p < 0.01) and highest in the pts in Gp I with lateral wall delay (71%).LV dyssynchrony was seen in 67% and 70% in Gp I & II pts (p = ns), significantly more than controls (27%). Lateral wall delay was seen only in Gp I and II pts (33% & 47%) and absent in controls, while septal delay was similarly distributed in all 3 groups. (21%, 23%, 23%). Multiple regional areas of dyssynchrony were seen in Gp I and II (23% Vs 23%) but none in controls.
Conclusions: LVD is present in about 2/3rds of heart failure population irrespective of QRS duration. LVD in normal individuals with bundle branch block is predominantly in form of septal delay. Lateral wall delay and multiple areas of dyssynchrony are present only in HF pts .These findings may have implications for pt selection for CRT.

3:00 p.m.

915-227   **A New Method for Strain Determination in Adjacent Slices of the Left Ventricle on the Same Beat**
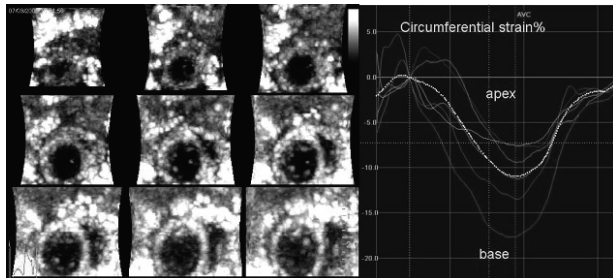
Muhammad Ashraf, Petra S. Niemann, Peter Lysyansky, Zvi Friedman, Edward Hickey, David J. Sahn, Oregon Health & Science University, Portland, OR, GE Medical Systems, Haifa, Israel

Background: Digital tracking of speckle in high-resolution 2D ultrasound images (2D strain) has been useful in characterizing cardiac mechanics. Despite its enhanced ability to measure orthogonal vectors as compared to Doppler based methods, 2D strain cannot track through plane motion. To overcome this difficulty, we sought to assess the possibility of obtaining 3D/4D speckle images.
Methods: 6 open-chest piglets (6-7kg each) were studied. 3D full volume images were acquired from the surface of the heart with a new generation matrix probe on a GE Vivid 7 Dimensions system at the rate of >30 volumes/sec over a 65° x 65° pyramid at 1.7/3.5 MHz. 2D short axis images were also acquired with a 10 MHz sector and a 14MHz linear probe. The 2D slice images were analyzed by the 2D speckle tracking method. 3D images of the left ventricle were sliced into overlapping volumes in EchoPac PC at 9 slice levels along the long axis. 2D strain could be determined within and between planes using 2D speckle tracking.
Results: Gradients of strain were found to increase from apex to base, and counterclockwise twist increased from base to apex.
Conclusions: 2D strain measurements in each slice allowed full characterization of strain mechanics from 4D images from apex to base.

Diagnostic Testing

3D image of a pig heart sliced at different levels

3:00 p.m.

915-228 Usefulness and Place of Multislice Coronary CT Scan in Heart Transplant Patients.

Patrick J. Dupouy, Emmanuelle Vermes, Diaa El Din Abdel Hakim, Jean Luc Dubois Rande, Daniel Loisance, Eduardo Aptecar, Jean Marc Pernes, Pcvi, Hopital Prive D' Antony, Antony, France, Departement De Cardiologie Et De Chirurgie Cardiaque, Hopital Universitaire Henri Mondor, Ap-hp, Creteil, France

Background : Cardiac allograft vasculopathy (CAV) remains the primary cause of late morbidity and mortality in heart transplant (HT) recipients and is characterized by significant epicardic stenosis but also by early infiltrative lumen loss. Diagnosis and monitoring of CAV relies on systematic annual coronarography. EKG gating Multislice computed tomography (MSCT) is a validated imaging technic for detection significant coronary artery disease. We investigated the diagnosis value of MSCT to detect CAV development in HT recipients.

Methods: From january 2004 to april 2005, we studied 70 consecutive patients at a mean of 7.0±4 years after heart transplantation (age 51±11 years, 50 men), who underwent systematic annual coronary angiography. All patients had a MSCT (16 then 40 slices) 24±12 hours before angiography. Thirteen to 17 segments per angiography were analysed and compared to scanner for the presence of non significant (<50%) or significant (>50%) stenosis. Interpretation was done by 2 independent and blinded observers.

Results: Mean heart rate during MSCT acquisition was 75±11 bpm (54-105) and mean apnea was 16±5 sec (12-32). On a total of 852 analysed segments, 70 (8%) were not interpretable on MSCT. Of 15 significant lesions diagnosed on coronary angiography, 13 were well classified on scanner and 2 were not detected. The sensitivity, specificity, positive predictive value and negative predictive value of MSCT for the detection of significant angiographic CAV were 87%, 100%, 100% and 99% respectively. Of 33 infiltrated segments, 30 were well diagnosed and 3 were missed on scanner. The sensibility, specificity, positive and negative predictive values of MSCT for the detection of infiltrative CAV were respectively 91%,99% 88% and 99%.

Conclusion: MSCT scan provides high diagnostic accuracy in the evaluation of significant and infiltrative CAV in HT recipients and could be the standard non invasive method for routine systematic evaluation of these patients. However, larger studies are required to confirm these findings.

3:00 p.m.

915-229 A New Approach To Non-invasive Coronary Angiography By Multidetector Computed Tomography. Preliminary Experience Using Gadolinium.

Patricia M. Carrascosa, Carlos Capuñay, Alejandro Goldsmit, Marcelo Bettinotti, Jorge Carrascosa, Raul Pissinis, Diagnostico Maipu, Buenos Aires, Argentina

Background: to investigate the role of gadolinium as a contrast media for MDCT coronary angiography and compare its results with the ones obtained with digital angiography (DA) considered as the gold standard.

Methods: eighteen patients with known coronary artery disease underwent DA following MDCT coronary angiography with gadolinium.

MDCT´s were performed with a 16-row CT scanner, with 16x0.75 collimation, 1mm slice thickness, 0.5mm reconstruction interval, pitch 0.24, 120kV, 500mAs, and 420 milliseconds gantry rotation time. The scan was initiated automatically when the MDCT density at the ascending aorta reached the 75 Housnfield Units

A volume of 45-55 ml of gadolinium was injected. Triggered tube-current modulation was used to acquire images in order to reduce the radiation exposure.

Oral beta-blockers were administered to all patients whose heart rate was above 60 bpm 24 to 48 hours prior the study.

DA`s were carried out with a standard Judkins technique.

A stenosis above or equal 50% was considered a positive finding and a stenosis under 50% as a negative finding. MDCT results were matched with DA findings.

Fifteen segments were analyzed in each patient. Two readers interpreted the MDCT coronary angiography without knowledge of the results of the digital angiography. A statistical analysis was performed taking into account the 270 segments. The 95% confidence intervals for the proportions were calculated by the exact binomial method.

Results: there were no complications, and all studies were diagnostic. From the 270 coronary segments, 255 (95%) were evaluative. The patient's heart rate ranged between 45-61 bmp (mean 57). The level of maximal enhancement in the coronary arteries was 183.0 HU ±28 HU.

Sensitivity, Specificity, Positive and Negative Predictive Values for Observer 1 were 90.43 %, 93.17%, 87.38% and 94.34% and for observer 2 were 89.11%, 91.66%, 87.38% and 92.86% respectively.

Conclusion: Preliminary results obtained with gadolinium MDCT coronary angiography

showed very good correlation with DA. It can be considered as an alternative modality to perform coronary MDCT angiography. Further studies with larger samples of patients are needed to validate these results.

3:00 p.m.

915-230 Diagnostic accuracy of 64-slice Computed Tomography Coronary Angiography in Patients with Unstable Angina and non-ST-segment elevation myocardial infarction

Willem B. Meijboom, Carlos A. Van Mieghem, Annick C. Weustink, Francesca Pugliese, Nico R. Mollet, Eleni Vourvouri, Filippo Cademartiri, Masato Otsuka, Niels van Pelt, Koen Nieman, Gabriel P. Krestin, Pim J. de Feyter, Erasmus Medical Center, Rotterdam, The Netherlands

Background: To investigate the diagnostic accuracy of 64-slice CT coronary angiography (CTCA) to detect significant coronary artery disease in comparison with invasive conventional coronary angiography (CCA) in patients with unstable angina or non-ST-segment elevation myocardial infarction.

Methods: 64-slice CT coronary angiography (Siemens Sensation 64, Germany) was performed in 75 patients (mean age 58.0+/-10.3 years) with unstable angina (N:33) and non-ST-segment elevation myocardial infarction (N:42) who were scheduled for diagnostic CCA. Only Class B and C of the Braunwald classification of unstable angina were included.

Patients with a previous percutaneous coronary intervention, coronary artery bypass grafting or an irregular heart rate were excluded. Patients with initial heart rates ≥65 bpm received beta-blockers and/or benzodiazepines. The CTCA were analyzed by 2 observers unaware of the results of CCA. The CCA were quantified with quantitative methods (QCA). Coronary lesions with ≥50 luminal narrowing were considered significant stenoses. All available coronary segments, regardless of size, were included in the evaluation.

Results: Prevalence of significant coronary artery disease, defined as having at least one ≥ 50% stenosis per patient was 84%. Mean scan time was 13.3+/-1.1 seconds and mean heart rate was 58.5+/-7.7 b.p.m. Mean calcium score was 521.4+/-666.9.

Conventional coronary angiography demonstrated the absence of significant disease in 16% (12 of 75), single-vessel disease in 39% (29/75), and multivessel disease in 45% (34 of 75) of patients. Sensitivity for detecting significant stenosis with segment-by-segment analysis was 92% (136/148; 95% CI, 86-96), specificity 90% (850/945; 95% CI, 88-92) and positive and negative predictive values were 59% (136/231; 95% CI, 52-65) and 99% (850/862; 95% CI, 98-99). No segments were excluded.

Conclusions: 64-slice CT angiography reliably detects significant coronary stenoses in patients who present with unstable angina pectoris and non-ST-segment elevation myocardial infarction.

3:00 p.m.

915-231 MDCT Quantitatively Distinguishes Grades of Left Atrial Appendage Spontaneous Echo Contrast and Thrombus in Patients Undergoing Evaluation for Radiofrequency Pulmonary Vein Antral Isolation
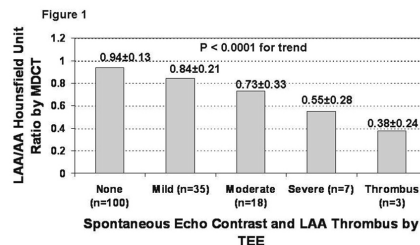
Yuli Y. Kim, Sandra S. Halliburton, Zoran B. Popovic, Allan L. Klein, Stacie A. Kuzmiak, Mario J. Garcia, Paul Schoenhagen, Milind Y. Desai, Cleveland Clinic, Cleveland, OH

Background: Atrial fibrillation patients with severe spontaneous echo contrast (SEC) or left atrial appendage (LAA) thrombus by transesophageal echocardiography (TEE) are at increased risk of stroke. We ask if multi-detector CT (MDCT) is able to quantitatively distinguish between grades of SEC and LAA thrombus in such patients undergoing TEE prior to radiofrequency pulmonary vein antral isolation.

Methods: We retrospectively identified 163 patients (mean age 56±9 years, 83% men) with ejection fractions ≥ 55% who had MDCT and TEE within 7 days of each other. MDCT was performed on 16- or 64-(1-1.5 mm) detector scanners (Siemens Sensation, Germany). Average Hounsfield units were measured in a 1 cm^2 (0.9-1.4 cm^2) region of interest in the LAA and ascending aorta (AA) in the same slice and a LAA/AA ratio was generated. Grades of LAA SEC (none, mild, moderate, severe) or thrombus by TEE were determined in a blinded manner.

Results: Mean LAA/AA ratios by grades of SEC are shown in Figure 1. Using receiver operating characteristic curve analysis, the LAA/AA ratio with optimal sensitivity, specificity and negative predictive value (90%, 80% and 99%, respectively) in separating 2 groups (severe SEC and/or thrombus vs. lesser grades of SEC) was 0.79 (Area under curve 0.89, p<0.0001). Using 0.79 as a cutoff, the odds ratio of separating these 2 groups was 34 (p<0.001).

Conclusion: Using LAA/AA Hounsfield unit ratio, MDCT can noninvasively distinguish between significant (severe SEC and/or thrombus) and lesser grades of SEC.

Figure 1

3:00 p.m.

915-232   Association of Myocardial Fibrosis detected by MRI and Ventricular Tachyarrhythmia in Hypertrophic Cardiomyopathy

Deborah H. Kwon, Randy M. Setser, Maran Thamilarasan, Paul Schoenhagen, Zoran Popovich, Nicholas Smedira, Mario J. Garcia, Harry Lever, Milind Y. Desai, Cleveland Clinic Foundation, Cleveland, OH

Background: Patients with hypertrophic cardiomyopathy (HCM) are predisposed to ventricular tachycardia (VT). Magnetic resonance imaging (MRI) accurately measures left ventricular (LV) myocardial thickness & myocardial fibrosis (scar). We sought to determine the association between LV thickness, myocardial scar & VT or sudden cardiac death (SCD).
Methods: Forty-nine patients (mean age 43±16 years, 65% males) with documented HCM underwent MRI (Siemens Sonata 1.5 T scanner, Erlangen, Germany) & Holter monitoring. Maximal regional LV thickness (including septal thickness) was recorded at end-diastole on TrueFISP cine images. Three short axis delayed hyperenhancement (scar) images (8-10 mm thick) were obtained at base, mid LV & apex, ~ 20 minutes after injection of 0.2 mmol/kg of Gadolinium DTPA (inversion recovery spoiled gradient echo sequence with phase sensitive reconstruction). Scar was determined semi-automatically (as % of myocardium) using custom software (Siemens Research) & defined as intensity >2 standard deviation above viable myocardium. VT was documented on Holter monitoring, along with history of SCD.
Results: Two patients had history of SCD, & 5 had VT on Holter monitor. Septal hypertrophy was present in all patients (mean septal thickness 2.4±0.7 cm). On delayed images, 29(59%) patients had myocardial scar. Concordance between scar location & hypertrophied areas was seen in 76% patients. There was significant correlation between scar % & septal thickness (r=0.41, p=0.003). Patients with VT &/or SCD had higher scar %, compared to those without (16±14% vs. 6±7 %, p = 0.01). On logistic multiple regression, only the presence of scar was associated with VT & SCD (p=0.02). Septal thickness cutoff ≥ 2.3 cm had highest sensitivity & specificity (76% & 70%) of detecting myocardial scar on receiver operating characteristic curve (area under curve 0.78, p<0.001).
Conclusions: In HCM patients, septal thickness is significantly associated with myocardial scar %. HCM patients with VT & SCD have higher scar %; & presence of scar independently predicts VT/SCD in such patients. Studies are needed to determine if presence & degree of scar stratifies HCM patients at increased risk for SCD or VT.

3:00 p.m.

915-233   24 Month Outcome Following Negative Adenosine Stress MRI Perfusion Imaging In 92 Patients Presenting With Chest Pain.

Andrew M. Crean, Vikki Hughes, Linda Sharples, David Stone, Papworth Hospital, Cambridge, United Kingdom

Background: To describe patient mortality and morbidity following a negative adenosine stress myocardial perfusion MRI (ASMP-MRI) examination in a cohort of patients presenting to rapid access chest pain clinics.
Methods: 92 patients, who had a negative ASMP-MRI as the initial diagnostic test for chest pain symptoms, were followed for 18-24 months by clinic visit and telephone interview for Major Adverse Cardiac Events (MACE) and mortality.
Results: Fifty two out of the total 92 patients were sent for coronary angiography despite having a negative MR examination - reasons for this are given below:

No reason given by clinician	20
Doubts about reliability of MRI	5
Convincing patient history	7
Limiting symptoms	4
Patient request	1
Patient reassurance	4
Positive exercise test	9
Strong family history of IHD	1
Other	1

Following angiography 36 of the 52 patients (69%) remained on medical therapy. Fifteen patients (29%) underwent elective PTCA and one patient had elective coronary artery bypass surgery. Within this planned revascularisation group of 16 patients there were 8 subsequent MACE events during follow up distributed amongst 3 patients (1 unplanned PTCA and 7 admissions with troponin negative chest pain). In the remaining 76 patients, there were:
a) no cardiac deaths
b) 3 non cardiac deaths (lung Ca, pancreatic Ca and carcinomatosis)
c) 11 hospital admissions with troponin negative chest pain and no subsequent revascularisation
Conclusions: ASMP-MRI had a high negative predictive value for subsequent significant cardiac events in our population with 0% cardiac mortality, 16% revascularisation rate by PTCA and only a 1% CABG rate. These results could indicate a role for stress MRI in long term risk stratification.

3:00 p.m.

915-235   Predictiong Lethal Cardiac Events By Combining Impaired Cardiac Sympathetic Nerve Activity With Myocardial Perfusion Abnormality In Patients With Dilated Cardiomyopathy

Naofumi Kaneko, Takeru Wakabayashi, Akiyoshi Hashimoto, Hitomi Yamamoto, Atsuko Muranaka, Seiichirou Sakurai, Sakiko Fujii, Noriyuki Fujii, Shinya Shimoshige, Satoshi Yuda, Mamoru Hase, Tomoaki Nakata, Kazufumi Tsuchihashi, Kazuaki Shimamoto, Sapporo Medical University, Sapporo City, Japan, Muroran City General Hospital, Muroran, Japan

Background: Patients with cardiac dysfunction have high risks for pump failure and sudden death because of not only cardiac structural but also functional abnormalities, including triggering factors, such as fluctuation of autonomic nerve activities. We examined prognostic values of combined assessment of cardiac sympathetic nerve function assessed by I-123-metaiodobenzylguanidine (MIBG) activity and myocardial perfusion assessed by Tc-99m tetrofosmin (TF) in patients with dilated cardiomyopathy (DCM).
Methods: Fifty-nine patients (44 idiopathic DCMs, 11 dilated-phase hypertrophic cardiomyopathies, 4 secondary cardiomyopathies) underwent both cardiac MIBG and TF imagings at rest then were prospectively followed with an endpoint of cardiac events (CE), including admission due to heart failure, fatal arrhythmias and cardiac death, for more than 6 months. Cardiac MIBG activity was quantified as a heart-to-mediastinum ratio (HMR) and myocardial perfusion abnormality (MPA) was quantitatively assessed using a percent uptake and a polar map technique.
Results: Twenty-nine patients (49%) had CE during a follow-up period. Patients with CE demonstrated significantly lower HMR and greater MPA than did those without CE; 1.50±0.67 vs. 1.71±0.29 (p<0.005) and 11.9±7.6vs. 8.5±5.5 (p<0.05), respectively. Patients who had both HMR ≤1.60 and MPA ≥10 demonstrated a significantly greater CE rate compared to those who had both HMR >1.60 and MPA <10 (71% vs. 29%, p<0.005), and hat a significantly lower Kaplan-Meier event-free curve (log rank 4.92, p<0.05).
Conclusions: Combined assessment of cardiac sympathetic nerve activity and myocardial perfusion is of great value for identifying DCM patients at a higher risk of lethal cardiac events.

3:00 p.m.

915-236   Six-minute corridor Walking Performance Correlates with Sub-clinical Inflammation in Patients with newly-diagnosed Systolic Heart Failure.

Christina Chrysohoou, Christos Pitsavos, John` Barbetseas, Iason Kotrogiannis, Karmen Vasiliadou, Stella Brili, Nikos Alexopoulos, Georgios Metallinos, Panagiotis Aggelopoulos, Christodoulos Stefanadis, 1st Cardiology Clinic, University of Athens, Athens, Greece

Background: Persistent inflammation has been recognized to play a significant role in the development, as well as in the progression of heart failure. Among other diagnostic methods which determine the severity of heart failure, the six-minute corridor walk test has been revealed as a useful clinical predictor for mortality and morbidity in patients with systolic heart failure and has been used as a noninvasive tool to evaluate the efficacy of new therapies. In this study we aimed to evaluate the relationship between circulating cytokine levels and six minute corridor walk test performance in patients with newly diagnosed systolic heart failure.
Methods: We enrolled 99 consecutive patients (mean age 65+/- 13 years old) with newly-diagnosed systolic heart failure, who were hospitalized in our institute. We measured plasma levels of interleukin-6 (IL-6), soluble tumor necrosis factor receptor 1, CD-40 and CD-14, in all patients during their third day of hospitalization. Linear regression models were used to evaluate the association between inflammatory markers and distance of walking during the six-minute walk test, after adjustment for several confounders, including age, sex, BMI, cardiac output, diabetes mellitus, arterial hypertension and smoking habits.
Results: It was found that the six-minute walking performance was inversely correlated with plasma levels of CD-14 (r=-0.423, p=0.05) and with plasma levels of IL-6 (r = -0.514, p = 0.035). The aforementioned relationships remained even after controlling for potential confounders.
Conclusions: This study reveals that increased plasma levels of IL-6 and CD14 are significantly correlated with decreased 6-minute walking capacity, which reflects physical-cardiovascular performance. These findings may suggest an alternative pathway which connects subclinical inflammation with reduced cardiovascular performance and adverse clinical outcome.

E-POSTER SESSION

916

E-Poster Session 916

Monday, March 26, 2007, 4:00 p.m.-5:00 p.m.
Hall H

4:00 p.m.

916-221   Reappraisal of the use of IVC for Estimating Right Atrial Pressure

J. Matthew Brennan, John Blair, Sascha Goonewardena, Adam Ronan, Dipak Shah, Samip Vasaiwala, James N. Kirkpatrick, Kirk T. Spencer, University of Chicago, Chicago, IL

Background: Estimation of right atrial pressure (RAP) using the inferior vena caval (IVC) size along with its respiraphasic variation is commonly performed. However, there is a paucity of data that establishes cutoff values or their accuracy. Methods: We evaluated 102 patients undergoing right heart catheterization using ROC analysis to establish cutoffs for 8 different IVC parameters and then examined their ability to predict an elevated RAP. IVC maximal (IVCmax) and minimum size with passive respiration (IVCmin) and sniff (IVCsniff), IVC sizes indexed to body surface area (BSA) and IVC collapsibility during passive respiration

Diagnostic Testing

(IVCCImin) and sniff (IVCCIsniff). Results: The cutoffs with optimum predictive utility for RAP >10 mmHg are shown in the table, as are accuracies. Traditional classification of RAP into 5 mmHg ranges based on IVC size and collapsibility performed poorly (43% accurate) and a new classification scheme is proposed.1) High collapsibility with a small/normal IVC - RAP < 5 mmHg. 2) High collapsibility with a large IVC or normal collapsibility with a small/ normal IVC - RAP 0-10 mmHg. 3) Normal collapsibility with large IVC - RAP 10-15 mmHg. 4) Low collapsibility with a large IVC - RAP 10-20+ mmHg. Conclusion: All parameters had moderate accuracy to predict an RAP >10 mmHg and excellent ability to predict RAP <10 mmHg. Evaluation of the traditional classification of RAP into 5 mmHg ranges demonstrates limited accuracy and suggests the need for a modified classification.

Variable	Cutoff	Sen	Spec	PPV	NPV	Acc
IVC$_{max}$ (cm)	2.0	73	85	62	90	82
IVC$_{min}$ (cm)	1.5	91	79	59	96	82
IVC$_{sniff}$ (cm)	1.2	91	94	83	97	93
IVC$_{max}$/BSA	1.1	82	85	64	93	84
IVC$_{min}$/BSA	0.7	91	79	59	96	82
IVC$_{sniff}$/BSA	0.6	91	88	71	97	88
IVCCI$_{min}$ (%)	20	73	82	57	90	80
IVCCI$_{sniff}$ (%)	40	73	84	62	90	81

4:00 p.m.

916-222   **Importance of Left Ventricular End-Systolic Volume as a Predictor of Heart Failure Hospitalization in Patients with Coronary Heart Disease: Data from the Heart and Soul Study**

David D. McManus, Sanjiv J. Shah, Mary Rose Fabi, Nelson B. Schiller, Mary A. Whooley, University of California San Francisco, San Francisco, CA, University of Massachusetts, Worcester, MA

B: Increased attention to left ventricular (LV) volumes has been proposed in the assessment of patients with heart failure (HF). Measurement of LV end-systolic volume utilizing the biplane method of discs during echocardiography is accurate and readily available. Although LV end-systolic volume index (ESVI) has been shown to predict mortality after myocardial infarction (MI), it is unclear whether ESVI is associated with increased HF in outpatients with established coronary heart disease.
M: In a cohort of 989 outpatients with coronary heart disease, we examined the association of ESVI with subsequent MI, HF, sudden cardiac death, and all-cause mortality. We divided the study population into quartiles of ESVI and used a Cox proportional-hazards model to compare cardiovascular events among the quartiles. We adjusted for potential confounders, including baseline cardiovascular risk factors, medication use, body mass and echocardiographic variables. We then evaluated the association of ESVI with cardiovascular events in participants with an Ejection Fraction (EF) ≥ 50%.
R: Of the 989 participants, 110 (11%) developed HF. Among participants in the highest ESVI quartile (ESVI > 24 ml/m²), 67 (27%) developed HF, compared with 8 (3%) among those in the lowest ESVI quartile (HR 9.7, 95% CI 4.6-20.1; p<0.001). The association of ESVI with HF was unchanged after adjustment for potential confounders (HR 8.4, 95% CI 2.2- 31.1; p=0.002). Among the 880 participants with EF ≥ 50%, 37 (17%) participants in the highest ESVI quartile developed HF, compared with 7 (3%) participants in the lowest ESVI quartile (HR 5.4, 95% CI 2.4-12.2; p<0.001). The association of ESVI with MI, sudden cardiac death, and all-cause mortality did not persist after multivariable adjustment.
C: In this prospective cohort study of patients with coronary heart disease, we found that LV ESVI > 24 ml/m² was independently associated with an 8.4-fold increased rate of HF. The association between ESVI and HF was present even among those with an EF ≥ 50%. Our findings suggest that ESVI is an independent predictor of HF in patients with coronary heart disease and underscores the importance of LV enlargement in the pathogenesis of HF in these patients.

4:00 p.m.

916-223   **Feasibility and MRI Comparison of Right Ventricular Volume Assessment by Matrix Array Three-Dimensional Echocardiography in Combination with Semiautomatic Endocardial Border Detection**

Martin Hoch, Brian Soriano, Tal Geva, Heinrich Netz, Gerald R. Marx, Children's Hospital Boston, Boston, MA, Ludwig-Maximilians-Universität, Muenchen, Germany

Introduction: Measurement of RV volumes (RVV) by three- dimensional echocardiography (3DE) in combination with summation of discs (SOD) method is feasible yet time consuming. Recent software advantages have developed a novel semiautomatic border detection (SBD) algorithm to measure RVV by 3DE. The purpose of this study was to measure RVV by SBD in pediatric patients and compare results to MRI and SOD.
Methods: 12 ped pts (median age was 40 month (range 11-94) with congenital heart disease (CHD) undergoing cardiac MRI under general anesthesia were prospectively enrolled. To ensure similar loading conditions, matrix array 3DE (Sonos 7500, Philips) acquisitions using sub-costal probe placement were performed immediately after MRI. 3DE datasets were analyzed using SBD (Tomtec) by two blinded observers and compared to SOD (Tomtec) and MRI.

Results: SBD was feasible in 10 of 12 patients. Results are reported below as mean +/- SD.

	RV EDV (ml)	RV ESV (ml)	RV EF (%)
3DE SBD mean	48.7 +/- 16.9	24.6 +/-24.5	55.4 +/- 9.0
MRI mean	67 +/- 44.9	33 +/- 36.4	56.8 +/- 13.2
Mean difference SBD-MRI (limits of agreement)	-18.5 +/- 16.9 (-51.5 , 14.5)	-10.2 +/- 19.8 (-48.8 , 28.4)	-3.2 +/- 8.7 (-20.2, 13.8)
p- value	<0.05	<0.05	ns
Correlation (r)	0.93	0.96	0.87
3DE sod mean	54.4 +/- 34.5	24.9 +/- 23.6	57.1 +/- 9.5
Mean difference SBD-SOD (limits of agreement)	-4.5 +/- 7.8 (-19.7, 10.7)	-1.8 +/- 5.2 (-11.9, 8.3)	-1.8 +/- 7.1 (-15.6, 12)
p- value	ns	ns	ns
Correlation (r)	0.93	0.99	0.74

Conclusions: 3DE semiautomated border detection for assessment of RVV is feasible. RVV by SBD correlated well with MRI but were consistently lower. RVEF also correlated well with good agreement. Good correlation and agreement was found for comparison with SOD method.
RVV assessment by SBD took approximately 5 minutes as compared to 20 minutes by SOD. SBD will be a clinically useful method for the serial assessment of RVV in pediatric patients with CHD and less time consuming than SOD.

4:00 p.m.

916-224   **Left Atrial Maximum Volume, Assessed By Real Time Three Dimensional Echocardiography In Healthy Volunteers And Patients With Various Cardiovascular Disorders**

Stefano De Castro, Stefano Caselli, Sara Del Colle, Daria Santini, Emanuele Di Angelantonio, Elena Cavarretta, Natesa G Pandian, La Sapienza University, Rome, Italy, TUFTS University, New England Medical Center, Boston, MA

Background: Left atrial (LA) enlargement is a negative prognostic factor for survival in patients with stroke, congestive heart failure and myocardial infarction. In the absence of mitral valvular disease it is also a marker of chronic elevated left ventricular filling pressures. We investigated the influence of demographic, clinical and echocardiographic (2DE) parameters on left atrial maximum volume (LAVmax) assessed by RT3DE, in healthy volunteers and consecutive patients with various cardiovascular disorders.
Methods: Two-hundred-thirty-one patients (mean age 57,2 ± 15,2 y., 112 male) were studied. Of these, 68 were healthy volunteers and 163 were consecutive patients with more than 3 cardiovascular risk factors (111), documented coronary artery disease and normal systolic function (29), ischaemic and non ischaemic systolic dysfunction (16). Two-dimensional Doppler and TDI echocardiographic parameters and LAVmax, assessed by RT3DE were analyzed. For the statistical analysis LAVmax was divided into tertiles and correlated with clinical, 2DE and Doppler findings. Oneway ANOVA statistic analysis was used to compare variables, t value was corrected by age and body surface area.
Results: see table.

	Left Atrial Maximum Volume (ml/m²)			*t value*	*p value*
	13.1 - 29.5	29.6 - 36.9	37.0 - 92.2		
Age, *years (SD)*	49.3 (14.4)	58.2 (13.9)	64.4 (16.6)	6.01	< 0.001
Sex, *male (%)*	32 (45.1)	33 (46.1)	40 (56.3)		N/S
E wave, *cm (SD)*	70.7 (20.5)	69.3 (13.0)	72.9 (21.4)	5.73	< 0.001
A wave, *cm (SD)*	70.6 (15.4)	78.5 (20.8)	72.9 (22.8)	-1.78	N/S
E / A *(SD)*	1.06 (0.43)	0.96 (0.39)	1.08 (0.68)	5.88	< 0.001
E / E' *(SD)*	6.6 (2.2)	7.9 (3.7)	9.6 (4.3)	4.21	< 0.001
LVMass, g/*m² (SD)*	60.9 (9.7)	69.7 (15.4)	83.6 (20.0)	8.38	< 0.001
LV EF, % *(SD)*	58.7 (5.4)	58.2 (4.2)	49.8 (11.9)	-7.27	< 0.001
Diastolic function				6.01	< 0.001
Normal, *n (%)*	37 (52.1)	18 (25.4)	7 (9.9)		
Stage I, *n (%)*	33 (46.5)	49 (69.0)	45 (63.4)		
Stage II, *n (%)*	0 (0)	4 (5.6)	13 (18.3)		
Stage III - IV, *n (%)*	1 (1.4)	0 (0)	6 (8.5)		
Group				7.13	< 0.001
Normal, *n (%)*	36 (50.7)	20 (28.2)	5 (7.1)		
Risk factors, *n (%)*	30 (42.3)	40 (56.3)	35 (49.3)		
CAD, *n (%)*	5 (7.1)	7 (9.9)	17 (24.0)		
Systolic dysf., *n (%)*	0 (0)	2 (2.8)	14 (19.7)		

Conclusion: A progressive left atrial volume increase is directly correlated with age, LV mass and diastolic dysfunction and inversely correlated with left ventricular function.

4:00 p.m.

916-225 Feasibility of Myocardial Perfusion and Wall Motion Analysis With Real Time Perfusion Echocardiography During Treadmill Exercise Stress

Saritha Dodla, Feng Xie, Edward O'Leary, Thomas R. Porter, University of Nebraska Medical Center, Omaha, NE

Background: Real time myocardial perfusion echocardiography (RTMPE) is utilized to detect coronary artery disease during pharmacologic stress echocardiography. It's feasibility and efficacy during treadmill exercise stress echocardiography (TESE) is unknown.
Methods: In 70 patients (mean age 56±13 years) with normal resting ejection fraction undergoing symptom-limited TESE, RTMPE (>20 Hertz frame rate) was performed using a continuous infusion of intravenous ultrasound contrast (3% Definity; Bristol Myers Squibb) and low mechanical index (MI) real time perfusion (Power Modulation; Philips Medical). Contrast (2-4 milliliters per minute) was administered at rest, and re-initiated 30 seconds prior to treadmill termination. Intermittent high MI impulses (14-20 frames) were administered in each of the apical windows in an attempt to destroy capillary microbubbles and allow for the visual assessment of myocardial contrast replenishment (MCR). The feasibility of analyzing segmental and regional wall motion (WM), plateau myocardial contrast enhancement (PMCE), and MCR were determined by an independent reviewer in each coronary artery territory. A defect was defined as a new regional delay in MCR(relative to other regions), a relative reduction in PMCE, or a WM abnormality.
Results: The feasibility of analyzing segmental WM, PMCE, and MCR were 99.8%, 90.2%, and 74.7%, respectively (p <0.001 MCR versus WM and PMCE). However, regional analysis of MCR was still possible in at least two apical windows in 57 patients (81.4%). In 10 patients who had quantitative coronary angiography following their TESE, there were 12 territories subtended by >50% diameter stenoses. WM, PMCE, and MCR were abnormal in 8, 4, and 10 territories, respectively(p=0.02 MCR compared to PMCE). In the 18 territories subtended by <50% diameter stenoses, WM, PMCE, and MCR were normal in 12,18, and 14 territories, respectively.
Conclusions: Myocardial perfusion imaging with RTMPE is feasible in most patients undergoing TESE. Analysis of MCR during exercise is important in the detection of coronary artery disease, but less feasible due to difficulties in destroying capillary microbubbles.

4:00 p.m.

916-226 Predicting Long-term Effect Of Cardiac Resynchronization Therapy: Comparison Between Tissue Doppler Imaging And Speckle Tracking Imaging

Azusa Furugen, Naoki Matsuda, Tsuyoshi Shiga, Kyomi Tanimoto, Kouhei Tanizaki, Naoko Ishizuka, Morio Syohda, Nobuhisa Hagiwara, Hiroshi Kasanuki, Tokyo Women's Medical University, Tokyo, Japan

Usefulness of assessment with circumferential dyssynchrony using speckle tracking imaging in selecting patient for cardiac resynchronization therapy
Recent studies have demonstrated that the septal-to-posterior motion delay (SPWMD) assessed by M-mode echo and the longitudinal intra-LV dyssynchrony assessed by tissue Doppler imaging (TDI) can predict chronic effects of cardiac resynchronization therapy (CRT). A newly developed 2D speckle tracking imaging (STI) has enabled assessment of not only longitudinal but circumferential regional strain of LV. We investigated the usefulness of STI in selecting patients for CRT. **Methods:** Forty-two patients with heart failure symptoms and QRS duration>120 ms underwent standard echocardiography, TDI and STI before CRT. Time to peak systolic velocity was measured in 12 basal and mid LV segments in apical views by TDI. The time difference between the basal septal and the basal lateral segments was calculated (TDI-S-to-L).The standard deviation of those among 12 segments was calculated (TDI-SD). Time to peak circumferential strain and longitudinal strain were measured in basal segments in parasternal short axis and apical views by STI. The time difference between the septal and the lateral segments was calculated (CS-S-to-L, LS-S-to-L). A responder to CRT was defined as a patient whose NYHA class improved by >1 class and whose LVESV reduced by >10% at 6 months after CRT. **Results:** Thirty-one patients (74%) responded to CRT. CS-S-to-L showed high sensitivity (81%) and specificity (91%) for predicting the responders at a cut-off point of 120 ms. The area under the ROC curve (AUC) of CS-S-to-L (0.89) was larger than that of QRS duration (0.76), SPWMD (0.70), TDI-S-to-L (0.83), TDI-SD (0.73) and LS-S-to-L (0.69). **Conclusion:** Assessment of circumferential dyssynchrony using STI seems useful in selecting patients for CRT.

4:00 p.m.

916-227 Color-Coded Dual-frequency Intravascular Ultrasound Imaging with use of Radio-frequency Ultrasound Signals : A Novel Modality of Tissue Characterization of Coronary Plaque

Genta Hashimoto, Takafumi Hiro, Takashi Fujii, Takayuki Okamura, Jutaro Yamada, Yusaku Fukumoto, Tatsuhiro Fujimura, Hiroko Kanou, Masunori Matsuzaki, Division of Cardiology, Department of Medicine and Clinical Science, Yamaguchi University, ube, Japan

Background and Purpose: Visualization of tissue characteristics within atherosclerotic plaque is now being greatly needed as a modality for approaching to the plaque vulnerability. We previously reported that the digital subtraction of intravascular ultrasound (IVUS) video-images between two different ultrasound frequencies was useful for detecting fibrous cap within atherosclerotic coronary plaques (J Am Coll Cardiol, 2006). Based upon this data, we recently developed a new color-coded dual-frequency IVUS (DF-IVUS) imaging system with use of radio-frequency ultrasound signals. This study investigated the feasibility of this novel DF-IVUS system in identifying tissue characteristics of plaques especially for determining the thickness of fibrous cap.
Methods and results: Thirty formalin-fixed human atherosclerotic plaque segments obtained from necropsy were imaged in vitro by DF-IVUS using both 40MHz and 50MHz at the same time. The radio-frequency signals of 512 vectors around the imaging core were then sampled for each of the two frequencies. The subtraction between the power of the two signals was performed, which were matched in terms of position within the plaque. The results were color-coded as a two-dimensional cross-sectional view of plaque. A clearly bordered area with large variation in the power between the two frequencies was revealed for each plaque surface in the colorized IVUS image. The thickness (x, mm) of this area correlated significantly with that of fibrous cap (y, mm) measured from histologically prepared sections as y=1.01x+0.01 (r=0.89, p<0.0001).
Conclusions: This novel technique for color mapping of plaque with dual-frequency intravascular ultrasound imaging using radiofrequency signal provided an accurate representation of the thickness of the fibrous cap in atherosclerotic plaque. This method may be useful in assessing plaque vulnerability to rupture in atherosclerosis.

4:00 p.m.

916-228 Coronary Calcium Scanning Before Cardiac Computed Tomographic Angiography Reduces The Total Effective Radiation Dose

Matthew J. Budoff, Shahrzad Shareghi, Khawar M. Gul, Kaneez Hasina, Jessica Ramirez, Christina Seifert, Song S. mao, Ambarish Gopal, Los Angeles biomedical Research Institute, Torrance, CA

Background: The performance of coronary calcium scanning (CCS) before cardiac computed tomography angiography (CTA) is not uniform, primarily due to radiation concerns. We sought to determine whether a routine prospective CCS acquisition could reduce the total effective radiation dose to the patient by precisely defining the upper and lower limits of scanning for the subsequent CTA.
Methods: One hundred consecutive CTA case studies were performed with a CCS prior to each study, but the choice of the top and the bottom of the studies was based on the scout film rather than the axial data. Use of the scout film is routine, starting 1 cm below the carina. We then applied a more exact methodology to derive the start scan from the CCS study (direct visualization of the left main and left anterior descending), and created a model, giving a margin of 10 mm above and below the CCS-determined locations to account for any variations that might occur due to breath hold inconsistencies. With this data, we were able to calculate the radiation exposure and subsequent savings associated with additional unnecessary slices above and below the scans derived from the scout film.
Results: Unnecessary slices from using the scout film were 28± 9% of the total slices of the study. Calculating the exposure from the CTA based on the more accurate ROI, the savings in radiation exposure measured 4±2 mSv, after offsetting the dose given for the CCS (1.2 mSv). The average percentage reduction in mSv was 22±10%.
Conclusion: The strategy of routine CCS before CTA reduces radiation exposure by accurately limiting the CTA to a more accurate ROI. The initial radiation exposure from the pre-CTA CCS was offset by the larger reduction of radiation exposure from a precise CTA acquisition done subsequently. This method of reducing radiation exposure is incremental to dose modulation as well as reducing the mA or kV during the image acquisition.

4:00 p.m.

916-229 Coronary Artery Image Quality using Multidetector Computed Tomography to Simultaneously Evaluate for Coronary Artery Stenosis, Aortic Dissection, and Pulmonary Embolism

Michael Shapiro, Joe Hsu, Sanjeeva Kalva, Khurram Nasir, John H. Nichols, Mannudeep Kalra, Ricardo C. Cury, Thomas J. Brady, Udo Hoffmann, Massachusetts General Hospital, Boston, MA

Background: The fast volume coverage of 64-slice multidetector computed tomography (64-MDCT) may allow simultaneous evaluation for coronary artery stenosis, aortic dissection, and pulmonary embolism (CAP) using a single contrast bolus and breath hold. We sought to determine whether the necessary CT protocol adjustments for CAP maintain image quality comparable to conventional coronary MDCT.
Methods: We studied 40 patients (22 males, mean age 53 ± 9 years, BMI 29 ± 4.3 kg/m2) who presented to the emergency department with a chief complaint of chest pain, normal or non-diagnostic ECG, and negative CK-MB and troponin. All patients underwent ECG-gated 64-MDCT (120 Kvp, slice thickness 0.75mm, flow rate 5ml/sec). In 20 age, sex, BMI, and heart rate matched patients, a dedicated coronary or CAP CT protocol was performed. We qualitatively determined overall image quality (IQ), contrast enhancement (CE), and the presence and severity of motion artifacts (MA) in each of the 17 coronary segments using a 3-point scale. We also measured the CT attenuation of the coronary lumen, the surrounding connective tissue, and the standard deviation in the aortic root to calculate the contrast to noise ratio (CNR) in 9 coronary segments per patient. Differences in IQ, CE, MA, and CNR between the two CT protocols were determined using chi-square and Wilcoxon rank-sum tests.
Results: Scan time, contrast volume, and tube current for the dedicated coronary and CAP protocols were 14.8±2.3 vs. 20.1±1.7 seconds; 78±7 vs. 107±25 ml; and 835±76 vs. 814±31 mAs, respectively. Overall IQ, CE, and MA were not significantly different between the dedicated coronary and CAP protocols (p=0.88; p=0.22; p=0.13, respectively). Moreover, CNR was similar for the standard and CAP protocols in most coronary segments (1,3,5,6,9,11,15) (interquartile range: 10.7-13.8 vs. 10.0-13.1,

Diagnostic Testing

p>0.26; respectively) and was not lower in the CAP protocol in only two segments (8,12) (interquartile range: 10.7-13.8 vs. 10.0-13.1, p>0.06; respectively).

Conclusions: A CAP protocol is safe and feasible in the acute care setting. In addition, our data suggest that IQ, CE, MA, and CNR of the coronary arteries are comparable to a conventional coronary CT protocol.

4:00 p.m.

916-230   **Clinical Impact of 64-Multi-detector Computed Tomography (MDCT) on Percutaneous Coronary Intervention (PCI) of Chronic Total Occlusion (CTO): Focus on Regional Calcium Score**

Jung Rae Cho, Young Jin Kim, Jae-Youn Moon, Jung-Sun Kim, Dong-Yeon Kim, Hyun-Soo Kim, Young-Guk Ko, Donghoon Choi, Yangsoo Jang, Namsik Chung, Kyu-Ok Choe, Won-Heum Shim, Seung-Yun Cho, Yonsei Cardiovascular Center, Seoul, South Korea

Background: The main reason for failure of PCI in CTO is calcified plaque, which either prevents passage of guide wire or ruptures after balloon inflation. MDCT can accurately evaluate location and amount of calcium in occluded segment, as well as lesion length. We sought to evaluate multiple MDCT parameters which can affect procedural outcome in CTO patients.

Methods: A total of 39 patients (pts, aged 54.7±9.8 years, 37 males, 42 lesions) who have CTO (duration > 1 month) at least 1 major coronary artery in conventional angiography were studied. All pts underwent MDCT (Somatom Sensation 64, Siemens, Germany) prior to PCI. The lesions were divided into 2 groups: Group I (PCI-success, 34 lesions) was defined as successful PCI, whereas group II (PCI-failure, 8 lesions) was defined as guide wire passage failure or coronary rupture during PCI. Three calcium-related parameters - regional calcium volume(CaV), regional calcium equivalent mass(CaEm), regional calcium score(CaS) - were calculated using dedicated software. The clinical, angiographic and MDCT parameters were assessed.

Results: Procedural success rate was 81.0%. There were no significant differences of age, gender, hypertension, diabetes, history of MI, presence of multi-vessel disease, LVEF and lipid profiles between two groups. The duration of CTO was shorter in group I than group II (months, 2.80±2.59 vs 24.00±21.53, p<0.01). Although statistically not significant, there was a trend toward higher hsCRP in group II than group I (2.2±2.7 vs 3.4±3.3). Calcium-related parameters - CaV(mm3, 9.05±16.01 vs 99.05±66.36, p<0.01), CaEm (mgCaHA, 2.76±4.61 vs 29.75±15.37, p<0.01), CaS (9.60±17.64 vs 133.22±95.77, p<0.01) - in occluded segment was higher in group II than group I. The length of the occluded segment was shorter in group I than group II(mm, 20.68±18.93 vs 45.24±23.80, p<0.01). Regressional analysis showed that CaS was significant predictor of PCI-success (O.R. 1.05, p=0.01).

Conclusions: Regional calcium score can be useful to predict procedural outcome in PCI of CTO. By accurately identifying the length of the CTO segment and quantitatively evaluating amount of the calcified plaque, MDCT can be a useful preprocedural tool in PCI of CTO.

4:00 p.m.

916-231   **Non-Cardiac Findings in Patients Undergoing Coronary Multislice Computed Tomography - Preliminary Results from the Core64 International Multicenter Trial**

Ilan Gottlieb, Mark Dewey, Julie Miller, Melvin Clouse, Carlos Rochitte, Edward Shapiro, Armin Arbab-Zadeh, Hiroyuki Niinuma, Jeff Brinker, Joao A.C. Lima, Narinder Paul, Johns Hopkins University, Baltimore, MD

Background: Cardiac multislice computed tomography (MSCT) is increasingly being used for detection of coronary artery disease. Despite the restricted field of view with Cardiac MSCT, extra-cardiac structures are visualized. Our aim was to determine the frequency and clinical importance of extra-cardiac findings, on patients enrolled in a multi-center international prospective study comparing coronary MSCT to conventional coronary angiography (CCA), the Core 64 trial.

Methods: 192 patients referred for CCA underwent cardiac MSCT. A radiologist read the MSCT images, the report included extra-cardiac findings. The findings were categorized as: 1: No abnormal findings; 2: Potential clinical consequences, but no additional MSCT follow-up recommended (i.e. lung blebs); 3: Potential clinical consequences, additional imaging follow-up indicated (i.e. lung or hepatic nodules); 4: serious disorder requiring immediate attention (i.e. pulmonary embolism, aortic dissection).

Results: Of 192 patients (mean age 60±9 years), 143 (74%) had no abnormalities (category 1); 17 (9%) had abnormal findings that did not require follow up (category 2); 32 (17%) had findings that required additional follow up (category 3) and no patients had a disorder that required immediate attention (category 4). Of 192 patients, 43% never smoked (NS), 38% are former smokers (FS) and 19% are current smokers (CS); the indication for follow up increased from 11% in NS, 16% in FS, and 26% in CS patients (p<0.05). The prevalence of non-cardiac findings ranged from 2.9% to 50% amongst contributing centers.

Conclusions: Non-cardiac MSCT findings are frequent among patients with suspected coronary artery disease. Current smokers are at higher risk of needing follow up. Additional studies are required to determine the clinical consequences of these findings in this group of patients, as most of the published papers on incidental lung nodules are based on patients at high risk for lung cancer, and not on subjects undergoing cardiac MSCT.

4:00 p.m.

916-232   **Cardiac Magnetic Resonance Imaging Permits Visualization of Coronary Microembolization in Swine**

Frank Breuckmann, Kai Nassenstein, Ina Konietzka, Christina Bucher, Torleif Sandner, Gernot Kaiser, Christoph Naber, Thomas Konorza, Michael Haude, Andreas Skyschally, Petra Gres, Stephanie Aker, Raimund Erbel, Gerd Heusch, Joerg Barkhausen, University Duisburg-Essen, Essen, Germany

Background: Morphological alterations of coronary microembolization (ME) include perifocal inflammatory edema and focal infarct/scar formation. However, to date ME in humans can only be detected using post-mortem histology. Our study aimed to assess whether the effects of ME can be visualized using cardiac magnetic resonance imaging (cMRI).

Methods: In 12 minipigs a microcatheter was placed into the distal portion of the left anterior descending coronary artery and ME was performed by injection of microspheres. First, only ex vivo measurements (n=3) of the explanted heart were performed 8 hours after ME. Second, ME was performed shortly prior (n=6) or within the magnetic resonance (MR) system after baseline cardiac exam (n=3) followed by repetitive in-vivo cardiac exams up to 8 hours after ME. Finally, the heart was explanted and additional ex vivo MR measurements were performed. All experiments were followed by histomorphological analysis.

Results: In vivo cine MRI (SSFP, resolution 1.9 x 1.9 x 6 mm) demonstrated regional wall motion abnormalities of the target area in all but one animal (8 hours: 3/3, 4 hours: 3/3, 2 hours: 2/3), whereas myocardial edema (T2 TSE, resolution 1.3 x 1.7 x 5 mm) was detected in 6 animals (8 hours: 2/3, 4 hours: 3/3, 2 hours: 1/3). In vivo visualization of late enhancement (IR-turboFLASH, resolution 1.3 x 1.7 x 5 mm) could be observed in 2 animals only (8 hours: 0/3, 4 hours: 2/3, 2 hours: 0/3). Ex vivo measurements (IR-turboFLASH sequences, 0.5 x 0.5 x 3 mm) showed patchy and streaky areas of late enhancement in the target segments in 11 of 12 pigs (8 hours: 6/6, 4 hours: 3/3, 2 hours: 2/3). Corresponding histology confirmed regular patchy microinfarcts with leukocyte infiltration after 8 hours and beginning evidence of oncoming microinfarction with infiltration after 2 and 4 hours.

Conclusions: Our data suggest that high-resolution ex vivo cMRI may be able to visualize ME even prior to histologic demarcation. By contrast, in vivo imaging solely provided evidence of ME in terms of myocardial dysfunction and/or edema without feasible late enhancement. Thus, high-field MRI with an improved spatial resolution might be helpful to characterize ME myocardial damage in vivo more reliably.

4:00 p.m.

916-233   **30-day Results Of A Novel, Balloon Expandable Endovascular Stent With An Integrated Resonance Circuit For Active Visualization In MRI In A Porcine Model**

Christoph K. Naber, Frank Breuckmann, Erwin Immel, Gernot Kaiser, Stephanie Aker, Andreas Melzer, Holger Eggebrecht, Sebastian Philipp, Igor Kordish, Raimund Erbel, Harald H. Quick, West German Heart Center Essen, Essen, Germany, Dpt. of Radiology, University of Essen, Essen, Germany
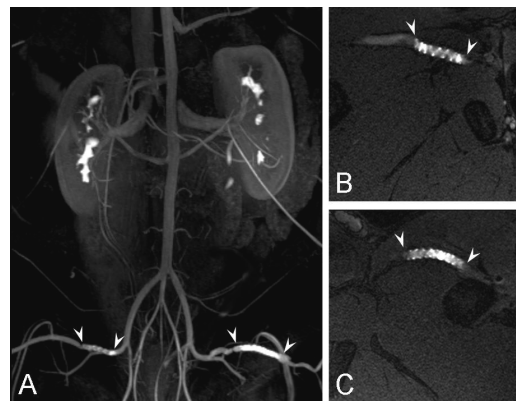
Background: Magnetic resonance imaging (MRI) as method for instrument guidance and follow-up of vascular interventions is limited by the failure to visualize metallic structures such as endovascular stents. We aimed to develop a stent that functions as intravascular antenna in the MRI.

Methods: We used an open stent design on the basis of a gold-platinum alloy with siliziumcarbid coating. The stent formed a self-resonant circuit matching the resonance frequency of the 1.5 Tesla Magnetom Avanto (Siemens, Germany). The stent diameter was 6 mm with a length of 40 mm. Resonant stent prototypes were tested in vitro, and were implanted into the iliac arteries of domestic pigs (N=4), and of Goettinger Minipigs (N=5). Implantation was immediately followed by in vivo evaluation of the stent imaging properties in MRI. In the Minipig model stents were again followed up after 30 days.

Results: The resonance of the stents allowed for active visualization of the implants, facilitating localization of the stents immediately and after 30 days (Fig. 1A). Moreover, the increased in-stent signal allowed for detailed visualization of the stent lumen (Fig. 1B,C).

Conclusions: Active resonance is an effective tool for the visualization of metallic structures in the MRI. This technique can significantly forward the utilization of MRI for instrument guidance and follow-up of vascular interventions.

Fig. 1: Active visualization of resonant stents in MRI (A) and detailed display of the stent lumen in TrueFISP images (B and C).

4:00 p.m.

916-235   **The Shifting Paradigm of SPECT MPI Utilization: Comparative Analysis of Clinical Practice Guidelines vs. Appropriateness Criteria**

Rubens S. Ribeiro, Eric M. Dandes, Tudor Scridon, Bruce TS Kuo, Abdur Baig, Gian M. Novaro, Craig R. Asher, Howard S. Bush, Jason B. Nolan, Michael Drew, Michael Y. H. Shen, Cleveland Clinic Florida, Weston, FL

BACKGROUND: SPECT MPI Appropriateness Criteria (AC) is the 1st document established by the ACC to guide cardiac imaging utilization by combing clinical practice and reimbursement guidelines. The AC is more restrictive in judging the appropriate use of MPI. Little data exist in implementing the new AC in clinical practice.
OBJECTIVE: We sought to quantify the difference in SPECT appropriateness using the new AC compared to currently utilized ACC/AHA/ASNC 2003 Clinical Practice Guidelines (CPG) and Medicare Reimbursement Guidelines (MRG) in real world practice.
METHODS: This retrospective study evaluated 516 consecutive outpatients. Indicated referrals for MPI were defined as those meeting both 2003 CPG and MRG guidelines. Appropriate (A), Inappropriate (I), and Uncertain (U) referrals were defined using the AC indications.
RESULTS: A total of 505 patients (age 55±15 yrs, 19% with coronary disease, 16% diabetic) were included. Of the 95 Indicated, 35 (37%) were Appropriate, 33 (35%) Inappropriate, and 27 (28%) Uncertain. Only 41% of Indicated (56) by CPG/MRG are Appropriate (95) by AC.
CONCLUSION: This is the 1st study analyzing the impact of AC on cardiac imaging. Nuclear cardiology may undergo a paradigm shift with dramatic decrease in MPI utilization as the new AC is applied. Further studies are needed to evaluate clinical outcomes related to AC implementation.

	2005 Appropriateness Criteria			
2003 CPG MRG	Total (n=505)	A (56)	I (363)	U (86)
	Indicated (n=95)	35 (37%)*Δ	33 (35%)	27 (28%)
	Not Indicated (n=410)	21 (5%)	330 (81%)	59 (14%)

* vs. Indicated: 56/505 vs. 95/505 p=0.01 and Δ 35/95 vs. 56 (35+21)/95, p<0.001

4:00 p.m.

916-236   **Reducing Psychosocial Stress: A Novel Mechanism of Improving Survival From Exercise Training**

Richard V. Milani, Carl J. Lavie, Jr., Ochsner Health System, New Orleans, LA

Background - Exercise training reduces mortality in patients with coronary artery disease (CAD). Behavioral characteristics including depression, hostility, and overall psychosocial stress (PSS) have been shown to be independent risk factors for recurrent myocardial infarction and death in CAD patients. Exercise training can reduce these high-risk behaviors, but it remains uncertain as to what extent the health benefits of exercise training can be attributed to improving PSS. **Methods -** We evaluated the impact of exercise training during cardiac rehabilitation upon mortality in 53 CAD patients with high levels of PSS and in 469 CAD patients with low levels of PSS and compared them to 27 control patients with high PSS who did not undergo formal cardiac rehabilitation and exercise training. **Results** - High PSS patients had a nearly 4-fold high mortality than low PSS patients (22% versus 5%; p=0.003). Exercise training lowered the prevalence of PSS from 10% to 4% (p<0.0001) and improved peak VO_2 similarly in high and low PSS patients. Mortality in patients who improved peak VO_2 by ≥ 10% (high VO_2 change) was 60% lower than in patients who had < 10% improvement in peak VO_2 (low VO_2 change) (p=0.009). Mortality was markedly lower in high PSS patients with high VO_2 change than high PSS patients with low VO_2 change (0% versus 19%; p=0.009). In contrast, there was no significant improvement in mortality in high versus low VO_2 change patients with low PSS (4% versus 8%; p=0.14). **Conclusions** - PSS is an independent risk factor for mortality in patients with CAD and exercise training can effectively reduce its prevalence. Exercise training reduces mortality in patients with CAD, and this effect appears to be primarily related to the beneficial affects of exercise upon PSS.

E-POSTER SESSION

917

E-Poster Session 917

Tuesday, March 27, 2007, 9:00 a.m.-10:00 a.m.
Hall H

9:00 a.m.

917-221   **Sequential Changes in Left Atrial Function After Pulmonary Vein Isolation in Patients with Atrial Fibrillation**

Hirosuke yamaji, hiroshi kawakura, takashi murakami, masaaki murakami, keizo yamamoto, atsushi hirohata, yuusuke kawai, toshimasa kita, kazuyoshi hina, Cardiovascular Center Sakakibara Hospital, Okayama, Japan
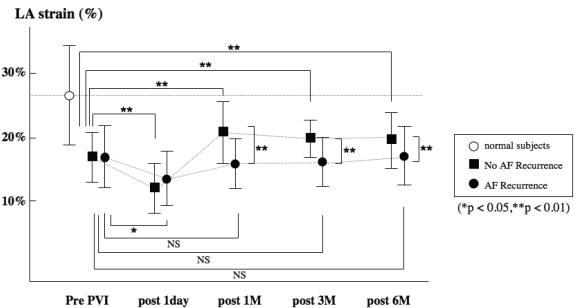
Backgrounds: Strain Doppler imaging (SDI) can measure regional left atrial (LA) contraction. There has been no study on LA function using SDI after pulmonary vein isolation (PVI).
Objectives: To evaluate sequential changes in LA function using SDI after PVI.
Methods: SDI was performed in 60 consecutive patients who underwent PVI for paroxysmal atrial fibrillation (AF). On the apical four-chamber view, peak strain was measured in the lateral LA (LLA) and septal LA (SLA) just before PVI, one day, 1, 3 and 6 months after PVI. LA strain (%) is defined as average values of LLA and SLA strain.
Results: Forty patients had no AF recurrence after PVI without anti-arrhythmic drugs (Group1). Twenty patients had AF recurrence (Group2). LA strain was significantly decreased one day after PVI (Group1. 17.5 ± 4.3% to 12.3% ± 4.0%; Group2, 17.4 ± 5.5% to 13.4 ± 4.5%) and returned to the values before PVI one month after PVI in both groups (20.7 ± 4.5%, 16.6 ± 4.8%, respectively). LA strain was significantly lower 1,3 and 6 months after PVI in gourp2 than group 1. LA strain after PVI were, however, significantly lower than those (26.0 ± 7.9%) in age- and gender-matched controls in both groups.
Conclusions: The present results disclosed that LA function returned to pre-PVI function level one month after PVI, but not recovered to that of normal controls 6 months after PVI in Group1 patients. The present findings suggest that LA dysfunction in patients with AF could be irreversible despite elimination of AF.

9:00 a.m.

917-222   **Left Ventricular Dyssynchrony As A Predictor Of Outcome In Heart Failure Patients With Narrow QRS**

Hema Korlakunta, Xuedong Shen, Huagui Li, Mark J. Holmberg, Curt Estell, Tim Farkas, David Cloutier, Tom Hee, Aryan N. Mooss, Syed M. Mohiuddin, The Cardiac Center of Creighton University, Omaha, NE, Minnesota Heart Clinic, Edina, MN

Background: Left ventricular dyssynchrony (LVD) detected by echocardiography is recognized as an important predictor of response to cardiac resynchronization therapy (CRT). The role of LVD in predicting outcome of heart failure in patients with narrow QRS duration (QRSD) is largely unknown. **Methods:** We studied 99 consecutive patients (men 55, women 44, age 64.5± 14.5 years) with NYHA class III-IV, left ventricular ejection fraction (LVEF) ≤ 35% (26.5±7.2%), and narrow QRS (QRSD <120 ms, 95.7±12.6ms). All patients experienced the optimal pharmacologic treatment for heart failure after first echo from 2003 through to the end point of the study. The patients with any type of pacemaker or CRT were excluded. LVD was defined as the septal-to-posterior wall motion delay (SPWMD) ≥ 130ms. **Results:** Twenty patients (20%) had LVD (Group I) and 79 patients (80%) did not (Group II). LVEF at baseline in Group I was less than Group II (Table). During follow-up of 15.2±9.8 months, LVEF increased in both groups (p= 0.005), but the amplitude of LVEF improvement in Group I was greater than Group II. Patients with LVEF improvement ≥ 15% and < 15% in Group I was 40% and 60% respectively. There was no significant difference in mortality between Group I and II (10%, 2/20 vs. 9%, 7/79, p= 1.0).
Conclusion: Heart failure patients with narrow QRS and LVD have greater improvement of cardiac function than those without LVD during medical therapy. The impact of CRT on heart failure patients with narrow QRS duration deserves serious investigation.

Groups	LVEF at baseline	LVEF during follow-up	p
I	22.8± 7.7%	33.5± 15.2%	**0.005**
II	27.4± 6.8%	31.8± 11.8%	**0.005**
p	**0.02**	0.60	

Diagnostic Testing

917-223   **Left Ventricular Free Wall and Interventricular Septum Show Different Normal and Shear Strains Even in Healthy Subjects**

Lijun Yuan, Katsu Takenaka, Kansei Uno, Aya Ebihara, Kazuno Sasaki, Takako Komuro, Makoto Sonoda, Yasuhiro Ito, Ryozo Nagai, the University of Tokyo Hospital, Tokyo, Japan

Background: Animal studies have shown that shearing deformation in transmural planes of left ventricular (LV) wall is an important mechanism for systolic wall thickening, and normal strain (perpendicular length change) as well as shear strain (angle change) of the LV free wall (LVFW) differs from those of the interventricular septum (IVS). We aimed to assess normal and shear strain of LVFW and IVS non-invasively in healthy human subjects.
Methods: Normal radial and shear strain of IVS and LV posterior wall (LVPW) were measured in parasternal LV long- and short-axis views (LAX, SAX) at basal, mid and apical levels by speckle tracking system (Aloka). Thirty healthy subjects (age 34±6 years) were included. LV endocardial shear toward the apex relative to the epicardium (the RV endocardium for IVS) was defined as positive.
Results: In LVPW, normal radial strain is higher and the peak strain occurs later than IVS (Table). In LAX, LV endocardium slid towards the apex in LVPW and towards the base in IVS at mid and apical LV level and the shear angle was significantly different.
Table: Data in healthy subjects (mean±SD)

		Base	Mid	Apex
Normal radial strain	IVS	0.37±0.11	0.32±0.15	0.25±0.11
	LVPW	0.59±0.18	0.51±0.16	0.35±0.14
	p	<0.00001	<0.01	<0.01
Time to peak normal strain (ms)	IVS	341±35	343±23	361±35
	LVPW	412±43	384±37	385±47
	p	<0.00001	<0.00001	<0.01
Shear strain (degree)	IVS	6.4±7.9	-1.6±6.2	-4.6±7.1
	LVPW	7.5±11.9	8.6±10.6	11.6±9.6
	p	ns	<0.00001	<0.00001

Conclusions: LVPW strain is asynchronous with IVS strain even in healthy human subjects. LVPW showed different normal radial strain and shear strain from those of IVS, suggesting "myocardial sheets" theory also holds for intact human LV.

917-224   **Levosimendan Echocardiography Allows Detection of Contractile Reserve in Post-Myocardial Infarction Patients That do not Improve Function With Dobutamine**

Cinzia Cianfrocca, Francesco Pelliccia, Antonio Auriti, Vincenzo Pasceri, Sabina Ficili, Christian Pristipino, Giuseppe Richichi, Massimo Santini, San Filippo Neri Hospital, Rome, Italy

Background: Detection of contractile reserve with dobutamine echocardiography in chronic ischemic LV systolic dysfunction is limited by the use of beta-blockers and the occurrence of side effects. Levosimendan is a new drug with positive inotropic and vasodilatory effects which does not cause adrenergic stimulation. We hypothesized that levosimendan echocardiography may identify contractile reserve in pts that do not improve with dobutamine.
Methods: We studied 22 pts (age: 60±8 yrs) with post-myocardial infarction LV dysfunction who had no evidence of contractile reserve at dobutamine echocardiography and therefore underwent levosimendan challenge (24 µg/Kg in 10 min) prior to revascularization. LV function was assessed by TDI echocardiography before and 6 months after coronary angioplasty. Contractile reserve was diagnosed if LV ejection fraction increased ≥10%.
Results: Contractile reserve with levosimendan was found in 10 pts (Gr. A) but was not seen in 12 pts (Gr.B). With levosimendan, LV ejection fraction increased and wall motion score decreased significantly in Gr. A (from 30±7% to 45±8%, p<0.001, and from 1.98±0.45 to 1.57±0.42, p<0.05), but slightly in Gr. B (from 31±9% to 37±8%, NS, and from 1.91±0.43 to 1.75±0.55, NS). Similarly, mean mitral annular plane excursion and peak systolic mitral annular motion velocity increased in Gr. A (from 6.2±3.3 to 9.4±3.5 mm, p<0.05, and from 5.4±3.1 to 8.9±4.2 cm/s, p<0.05) but not in Gr. B (from 6.3±3.4 to 7.5±4.4 mm, NS, and from 5.3±3.8 to 6.7±3.4 cm/s, NS). After revascularization, contractile reserve was seen in 8 Gr.A pts but in only 4 Gr.B pts (80% vs 33%, p=0.08), with resting LV ejection fraction and wall motion score becoming significantly different between Gr. A and Gr. B (49±9% vs 35±10%, p<0.005, and 1.40±0.41 vs 1.82±0.47, p<0.04). Mean mitral annular plane excursion and peak systolic mitral annular motion velocity were significantly higher in Gr. A than in Gr. B (10.3±3.7 vs 6.9±3.5 mm, p<0.04, and 9.1±3.3 vs 6.0±3.4 cm/s, p<0.05).
Conclusions: Levosimendan echocardiography can identify contractile reserve in post-myocardial infarction pts with LV dysfunction that do not show a substantial functional improvement with dobutamine.

917-225   **Relative Value of Electrocardiogram, Magnetic Resonance Imaging, Angiography and Contrast Echocardiography for Analyzing Microcirculation After Reperfused Myocardial Infarction**

Vicente Bodi, Juan Sanchis, Maria P. Lopez-Lereu, Julio Nunez, Luis Mainar, Cristina Gomez, Francisco J. Chorro, Angel Llacer, Hospital Clinico y Universitario, Valencia, Spain, ERESA, Valencia, Spain

Background: The ideal technique for analyzing microcirculation after myocardial infarction (MI) has not been clarified. We evaluated the merits of ECG, cardiovascular magnetic resonance imaging (CMR), myocardial blush grade (MBG) and intracoronary myocardial contrast echocardiography (MCE).
Methods: We analyzed 63 patients with a first reperfused ST-elevation MI, single-vessel disease and sustained TIMI 3 flow. At the end of cardiac catheterization we quantified MBG (normal: 2-3) and MCE (17-segment model: 0=lack of contrast uptake, 1=normal perfusion); a perfusion score was defined as the average in segments of the infarcted area (normal >0.75). CMR (7±1 and 183±11 days after MI) was used to quantify end-diastolic volume (EDV, ml/m²) and ejection fraction (EF). The CMR-derived perfusion score was analyzed in first-pass perfusion imaging (normal >0.75). At pre-discharge (7±2 days) we analyzed ECG (normal perfusion if <2 leads with ST-elevation >0.2 mV in Q waves).
Results: In the multivariate linear regression analysis, including MBG, MCE, CMR and ECG, the only independent predictor of EDV-6 months (p=0.001) and of EF-6 months (p <0.0001) was MCE. Abnormal perfusion by MCE was detected in 20 patients (32%). Sensitivity (S), Specificity (Sp) and area under ROC curve (AUC) to detect normal perfusion by MCE (>0.75) were as follows: MBG 2-3: 93% S, 45% Sp, AUC=0.75. CMR >0.75: 84% S, 55% Sp, AUC=0.75. ECG <2 leads: 74% S, 80% Sp, AUC=0.80.
Conclusions: Intracoronary MCE seems to be the most reliable perfusion technique to predict late systolic function and late remodeling; this could be a gold standard in selected protocols. MBG and first-pass CMR display an acceptable agreement with MCE. ECG offers at least similar information to that provided by angiography and CMR to assess microvascular perfusion in subacute phase after MI.

917-226   **Atrial Pacing Induces Atrial Mechanical Dyssynchrony Resulting In Reduced Left Ventricular Performance in Heart Failure Patients On Cardiac Resynchronization Therapy.**

Hsin-Yueh Liang, Alan Cheng, Ronald Berger, Kunal Agarwal, Patrick Eulitt, David Kass, Theodore P. Abraham, Johns Hopkins University, Baltimore, MD

Background: Atrial sensing (AS) may be superior to atrial pacing (AP) in heart failure (HF) patients on cardiac resynchronization (CRT). We measured left ventricular (LV) filling, LV systolic function, and LV and atrial mechanical synchrony using conventional, tissue Doppler and strain echocardiography.
Method and Results: We enrolled 42 HF patients (age: 61±13 years; LV ejection fraction 29±13%; 29 men) on CRT for a mean 5.6±8.9 months. All had atrio-ventricular and inter-ventricular pacemaker optimization (during AS & AP) using LV outflow tract (LVOT) time velocity integral (TVI) as the endpoint. The final settings were those that yielded the maximum LVOT TVI with 100% ventricular pacing. After optimization, echocardiography was performed during AS and AP (10 bpm >sinus rate). Atrial contraction was timed by the atrial wave on strain imaging (SRa). Atrial synchrony was defined as the time delay in SRa between right and left atrial free walls. LV synchrony was assessed by septal to lateral wall time delay by tissue velocity and strain. Mitral valve inflow TVI was used to assess LV diastolic filling. LVOT TVI and global longitudinal strain were used to assess LV global systolic function. AS was associated with better diastolic filling and global LV function (Table). There was a significant increase in right to left SRa time delay with AP suggesting atrial mechanical dyssynchrony with no change in LV synchrony.
Conclusions: AS is associated with superior LV hemodynamics and interatrial mechanics compared to AP.

Echocardiographic variable (all values are mean±standard deviation)	Atrial sensing (AS)	Atrial pacing (AP)	p value
Mitral TVI (cm)	20.8± 6.9	17.5± 5.1	<0.0001
LVOT TVI (cm)	22.0± 7.3	19.9± 7.1	<0.0001
Global LV longitudinal strain (%)	-28.2± 21.4	-22.1± 19.3	0.0012
Septal to lateral time delay by strain (ms)	19± 67	29± 84	0.73
Septal to lateral time delay by tissue velocity (ms)	2± 66	10± 56	0.38
Right to left atrial time delay in SRa (ms)	62± 29	82± 35	0.0001

9:00 a.m.

917-227   2D Speckle Tracking Strain Analysis Compared with Sonomicrometry in a New in Vitro Pig Heart Model Which Rotates, Expands and Contracts Synchronously
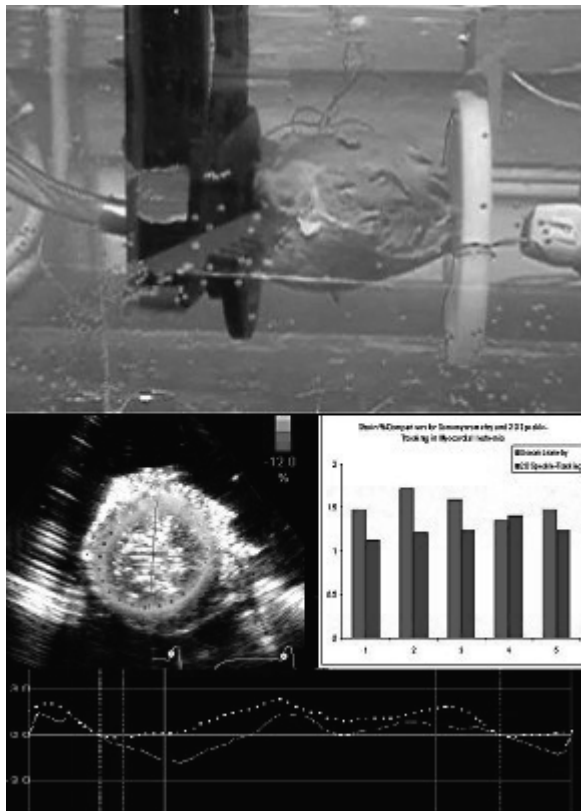
Galym Imanbayev, Xiao Yue Han, Tommy Tee, Tara Gu, Petra S. Niemann, Muhammad Ashraf, David J. Sahn, Oregon Health & Science University, Portland, OR

Background: We compared 2D echocardiographic speckle tracking (ST) to the gold standard of sonomicrometry in an in vitro ischemic porcine heart model.
Methods: We studied 5 fresh pig hearts by isolating the left ventricle (LV) and positioning sonomicrometry crystals at 4 short axis locations and one on the apex. A 23cm balloon was inserted into the heart, which was positioned in a water bath and attached to a servomotor pump providing continuous coordinated apical twisting and expansion. We applied 3 stroke volumes (SV, 20, 40 and 60 cc at a stroke rate of 50/min) to produce different cardiac dynamics. 2D echocardiographic short and long axis images were obtained with a 7 MHz probe GE Vivid 7 ultrasound system at >150 fr/sec. To produce as simulation of "ischemia", 3.5ml of glutaraldehyde was injected into one wall segment.
Results: In the nonischemic hearts, the systolic mean circumferential strain using sonomicrometry was -2.84% ± 0.43; 2D ST strain was -2.81% ± 0.18. With ischemia, the mean systolic circumferential strain using sonomicrometry was -1.35% ± 0.14; 2D ST showed a similar decrease, -1.13% ± 0.1. Strain within the ischemic segment was -0.3 ± 0.05 (p<0.05). For 15º and 30º actual rotation, 2D ST was within 1º of actual with ischemic segments tethered and rotating similarly.
Conclusions: In this new dynamic rotating and contracting in vitro heart model despite complex motion, 2D circumferential strain was measured accurately in normal and ischemic segments by the 2DS method when compared to sonomicrometry.

9:00 a.m.

917-228   Coronary CT Angiography and Myocardial Perfusion Imaging In Patients With Known or Suspected Coronary Artery Disease

Mark Goldman, Regina S. Druz, Lawrence Boxt, North Shore University Hospital, Manhasset, NY

Background: Coronary CT angiography (CTA) is a new imaging modality. Myocardial perfusion imaging (MPI) is established in diagnosis and risk stratification of coronary artery disease (CAD). The role of CTA in patients with suspected or known CAD who are stratified by MPI is not defined.
Methods: Dual-isotope MPI and CTA (64-slice GE Lightspeed) were performed in 74 patients (74± 13 yrs; 26 female; 22 with known CAD; none with bypass grafts) within 1 year; median interval=29 days). 58/74 MPI were performed before CTA; 16/74 MPI were performed after CTA. Summed stress scores (SSS) were based upon a 5-point/20-segment model. Total coronary calcium score (CAC) (if no previous intervention performed) and 15-segment AHA model CTA analysis were performed. MPI was normal if SSS=0-1, mildly abnormal if SSS=2-8 and markedly abnormal if SSS=/>9. CTA-identified luminal coronary stenosis was reported as non-obstructive (<50%), moderate (50-70%), and severe (>70%). Chi-square and Kruskal-Wallis tests were used

to compare CTA across MPI results.
Results: 56/74 patients were referred with chest pain and/or dyspnea. Framingham risk scores were 6-11% in patients with suspected CAD. In patients with normal MPI (n=18), average CAC=211 and 7/18 (39%) had coronary stenosis on CTA (5/7 mild; 2/7 moderate or severe). In patients with mildly abnormal MPI (n=24), average CAC=214 and 14/24 (58%) had coronary stenosis (5/14 mild; 9/14 moderate or severe). In patients with markedly abnormal MPI (n=32), average CAC=804 (p=0.04) and 21/32 (66%) had coronary stenosis (6/21 mild; 15/21 moderate or severe; p=0.03).
Conclusion: Severity of CAD as defined by CTA correlates with MPI findings: with increasing SSS, there was greater prevalence of moderate or severe coronary stenosis on CTA. In patients with normal or mildly abnormal MPI, CTA demonstrated moderate or severe CAD not reflected by SSS thus identifying false-negative MPI patients. In patients with abnormal MPI, CTA identified false-positive MPI patients. Thus, we conclude that MPI and CTA are complimentary. Patients at high risk or with known CAD in whom MPI is normal or mildly abnormal, and patients at low risk with abnormal MPI would benefit from CTA.

9:00 a.m.

917-229   Accuracy of 64-slice CT for Evaluating Bypass Grafts and Corresponding Peripheral Coronary Arteries

Ayako Yamada, Yasuhiro Ishii, Yoshiko Kakizawa, Akiko Ishige, Chikaya Omichi, Hideki Ueno, Hirotaka Nagashima, Katsuo Kanmatsuse, Masahiro Endo, Tokyo Heart Center, Tokyo, Japan

Background: CT angiography (CTA) performed by former generations of CT has been described as a reliable non-invasive tool to evaluate the patency of coronary artery bypass grafts (CABGs). However, it has been still limited to evaluate the degree of the narrowing at the anastomosis and in distal native arteries.
Purpose: We compared the accuracy of the 64-slice CTA with invasive coronary angiography (ICA) for the patency of CABGs and the degree of the narrowing both in grafts and in corresponding peripheral coronary vessels.
Methods: A total of 36 patients with 92 bypass grafts underwent both 64-slice CTA (0.5mm-slice, Aquilion 64, Toshiba) and ICA. The CTA was analyzed by two experienced cardiologists who were unaware of the ICA results. The relevant stenosis was defined as diameter stenosis > 50%.
Results: Mean age of the CABGs was 10.4 years. The evaluated grafts were 53 internal mammary arteries, 28 saphenous vein grafts, 6 gastroepiproic arteries, 5 radial arteries. Two grafts were excluded from the analysis because of insufficient image quality due to poor opacification in ICA and in-stent restenosis. In evaluable 90 grafts, evaluation of graft occlusion by CTA yielded a sensitivity of 97% (29/30) and a specificity of 98% (59/60). Similarly, the evaluation of relevant stenosis in grafts by CTA yielded a sensitivity of 97% (37/38) and a specificity of 94% (49/52). In corresponding 52 peripheral arteries, the assessment of relevant stenosis by CTA resulted in a sensitivity of 100% (8/8) and a specificity of 86% (38/44).
Conclusions: Multi-detector 64-slice CT is a reliable tool to visualize not only the graft patency but the degree of the graft narrowing, probably due to less calcification in the grafts. Furthermore, it is possible to evaluate corresponding peripheral coronary arteries with high diagnostic accuracy.

9:00 a.m.

917-230   Effect Of Patient Age On The Presence Of Soft Plaque In Patients Without Evidence Of Coronary Calcification On 64-detector Cardiac Computed Tomography

Jason H. Cole, Joseph M. Glass, Ralph S. Buckley, Gerry M. Phillips, Cardiology Associates, Mobile, AL, University of South Alabama, Mobile, AL

Background: Coronary calcium and coronary artery disease (CAD) increase with age. 64-detector CT angiography (CTA) provides advantages over coronary calcium scoring, including the abilities to identify soft plaque and to identify areas of potential obstruction. The interaction between age and soft plaque on CTA remains incompletely described.
Methods: Patients were referred for CTA because of chest pain or an abnormal functional test. Calcium scoring was performed on all patients by the Agatston method. CTA was completed, and experienced readers evaluated each study for soft, calcified, and/or obstructive plaque. Data were stored in a deidentified database. Results were stratified by age (over or under 45 years). Comparisons of soft and calcified plaque between age groups were made by chi-square analysis.
Results: Of 1365 patients undergoing CTA, 653 had Agatston scores of 0. Most subjects without coronary calcium also had no soft plaque. However, an appreciable percentage (15% in young patients, 40% in older patients) did have nonobstructive soft plaque. In younger patients, 3.8% with calcium scores of 0 had potentially obstructive plaque while in older individuals, fewer than 0.5% without calcium had potentially obstructive plaque (p<.001).
Conclusion: Soft plaque can often be identified in individuals without coronary calcium; however, in those over 45 years old, this rarely appears obstructive. In younger individuals, coronary calcium alone may not be satisfactory to rule out obstructive CAD.

Age≤45				
	Plaque Characterization			
	None	Nonobstructive	Potentially obstructive	Total
Calcium Score=0	169	31	8	208
Calcium Score>0		30	11	41
Age>45				
	Plaque Characterization			
	None	Nonobstructive	Potentially obstructive	Total
Calcium Score=0	260	183	2	445
Calcium Score>0		261	410	671

9:00 a.m.

917-231   **Low Calcium Score Predicts Absence of Significant Coronary Artery Disease in Patients With Indeterminate SPECT Myocardial Perfusion Imaging**

Hitender Jain, Kate Brag, Bangalore V. Deepak, Stuart Zarich, Jay L. Meizlish, Adam E. Schussheim, Bridgeport Hospital/ Yale New Haven Health System, Bridgeport, CT

Introduction: Single photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI) is often indeterminate and leads to potentially unnecessary studies. Coronary calcium score (CAC) reflects total atherosclerotic plaque burden and correlates with future prognosis. We investigated the role of a low calcium score to rule out significant CAD in patients with indeterminate SPECT MPI.

Methods: Symptomatic patients (n=77), without a prior history of CAD, with indeterminate SPECT MPI scans had CAC scoring performed (Agaston Scoring System) utilizing a 16 slice multi-detector CT, as well as dipyridamole stress test using Rubidium-82 positron emission tomography (RbPET, GE DST), within 90 days follow-up (mean 27.4 days) of SPECT MPI. As RbPET has a superior predictive value for ischemia as compared to SPECT imaging it was considered the gold standard for excluding CAD along with coronary angiography.

Results: The average age of subjects was 61 years (range 36-85 years) with a mean body mass index of 30.1 (range 21-50). Demographics: females 35%, hyperlipidemia in 66%, hypertension in 61%, family history of CAD in 55%, diabetes in 21%, and current smoking in 10% of patients. The average calcium score was 331 (range 0-3825). All 20 subjects (26%) with a CAC score of 0 had normal RbPET. Eleven subjects had a CAC >0 and ≤10; 10 had normal RbPET and the one subject with an abnormal RbPET had non-obstructive CAD on coronary angiography. Hence, a CAC score of ≤10 had a negative predictive value of 100% for ruling out significant CAD in symptomatic subjects with a prior indeterminate SPECT MPI. Conversely, 58.8 % (10/17) with CAC score ≥400 had evidence of ischemia on their RbPET as compared to 9.1% of subjects with a CAC score <100 (p< 0.001).

Conclusion: A CAC score ≤10 was present in 40% of symptomatic subjects with an indeterminate SPECT and had a negative predictive value of 100% for obstructive CAD. CAC scoring should be included in diagnostic algorithms for the evaluation of subjects with indeterminate SPECT MPI.

9:00 a.m.

917-232   **Comparison of Cardiac Magnetic Resonance Imaging and Echocardiography for Identifying Left Ventricular Noncompaction Cardiomyopathy in a Referral Center**

Timothy Dirks, Marc T. Ellingson, Matt Thielman, Terrence Longe, Robert Hauser, Robert Hauser, Abbott Northwestern Hospital, Minneapolis, MN

Background: Isolated left ventricular noncompaction (LVNC) is an inherited cardiomyopathy characterized by numerous trabeculations and deep recesses of the left ventricle (LV) endomyocardium in patients without other cardiac malformations. The recognition of LVNC is important because patients may be at risk for sudden cardiac death, heart failure, and thromboembolism. The aim of this study was to assess the efficacy of transthoracic echocardiography (ECHO) compared to cardiac magnetic resonance imaging (CMRI) for diagnosing LVNC.

Methods: Consecutive patients from a community-based referral center were included for analysis if diagnosed with isolated LVNC by CMRI and a routine ECHO was performed prior. The diagnostic criteria for each study type included a LV with a noncompacted endocardium, having prominent trabeculations and deep recesses in continuity with only the LV cavity, in a ratio > 2:1 to the compacted epicardial layer at end systole with no other cardiac malformations. CMRI images were acquired with a Siemens 1.5 Tesla magnet with gadolinium enhancement and interpreted by 3 CMRI-qualified cardiologists. ECHO images were acquired with standard views, optional contrast, and interpreted by certified cardiologists.

Results: From 2002 to 2006, 39 patients (20 men) aged 11-81 years old (median age 52) were diagnosed with isolated LVNC by CMRI. Median ejection fraction by CMRI was 58% (range 21-79%) with EF<50% in 36% and LV dilatation in 54%. 35 patients had an ECHO performed 35 ± 54 days before the diagnostic CMRI. 18 (51%) ECHO reports made no mention of LVNC. Of the first 18 patients diagnosed, 8 (44%) of the ECHO reports did not mention LVNC while of the most recent 17 patients, 10 (59%) reports did not mention LVNC.

Conclusion: Compared to CMRI, routine transthoracic echocardiography appears to be less capable of detecting isolated left ventricular noncompaction even as awareness of LVNC increases. While prospective studies are needed to accurately measure the sensitivity and specificity of CMRI and ECHO for detecting LVNC, physicians should perform CMRI to assess patients who may have this cardiomyopathy.

9:00 a.m.

917-233   **Diagnostic Accuracy of Gated Myocardial Perfusion SPECT for Detection of Left Main Coronary Artery Disease**

Xingping Kang, Daniel S. Berman, Ling de Yang, Piotr J. Slomka, Aiden Abidov, Sean W. Hayes, John D. Friedman, Guido Germano, Rory Hachamovitch, Cedars-Sinai Medical Center, Los Angeles, CA

Background: Pts with left main (LM) coronary artery (CA) disease (D) benefit from revascularization. The accuracy of gated myocardial perfusion SPECT (MPS) for detecting pts with LM CAD as high risk has not been fully explored.

Methods: In 1,327 consecutive pts with no known CAD who underwent exercise or adenosine stress gated MPS and coronary angiography within 3 months of MPS, 100 (7.5%) had LM CAD (≥50% stenosis). We studied 89/100 pts recommended for revascularization (performed in 80). Pts were divided into four groups based on the

combinations of LM with other coronary D (≥70% stenosis): LM alone (n=11), with any left vessel D (n=20); with RCA D but not 3-vessel D (n=35); and with 3-vessel D (n=23). Normalized summed stress scores (visual) were categorized as normal (<5%). Stress perfusion defects (PD) were categorized as mild (5-10%) and moderate to severe (>10%). Automated quantitative MPS was available in 70 pts. Non-perfusion abnormalities ("other") included LVEF <45%, TID or increased lung uptake. "High risk" MPS patterns included >10% PD, 5-10% PD +"other", or visual or quantitative "LM pattern" (LAD+LCX PD).

Results: MPS results by angiographic categories are in the Table. While normal MPS was uncommon (10%), PD frequently underestimated risk (34% mildly abnormal, 20-31% LM pattern). However, 85% manifested "high risk".

Conclusions: While PD alone frequently underestimates risk in LM CAD, the combination of perfusion and non-perfusion abnormalities on gated MPS identifies high risk in most LM pts.

	Overall	LM only	+LAD/LCX	+RCA	+3VD
Normal	10%	9%	20%	9%	4%
5-10% PD	34%	36%	35%	37%	26%
5-10% PD + "other"	27%	27%	20%	31%	26%
>10% PD	56%	55%	45%	54%	70%
LM pattern visual	20%	18%	15%	23%	22%
LM pattern quant	31%	33%	29%	36%	25%
"High risk"	85%	91%	70%	86%	96%

9:00 a.m.

917-235   **Myocardial Perfusion Imaging in Patients With New-Onset Atrial Fibrillation: Cardiac Risk Factors and Coronary Artery Disease Predict Perfusion Findings**

Lawrence M. Phillips, Keyoor Patel, Regina S. Druz, North Shore University Hospital, Manhasset, NY

Background: New-onset atrial fibrillation (AF) is common and often results in referral for myocardial perfusion imaging (MPI) to assess for coronary artery disease in otherwise asymptomatic patients. We investigated age, cardiac risk factors (CRF: hypertension, diabetes, dyslipidemia, family history, smoking), gender, known CAD and persistence of AF in predicting MPI findings.

Methods: 246 patients (68±12 y/o; 134 male) with new-onset AF were identified retrospectively from MPI database records. Age, gender, CRF, baseline heart rate, baseline blood pressure and resting electrocardiogram rhythm were known for all patients. Non-gated MPI was performed as per dual-isotope protocol. MPI findings were classified as: normal; fixed perfusion defect; reversible perfusion defect; fixed and reversible perfusion defects. Linear regression was used to determine the role of age, gender, CRF, known CAD and persistence of AF for MPI findings.

Results: 33 patients had known CAD, and 114 had no known CAD. 101 patients were in AF at the time of stress (persistent AF). MPI findings were normal in 180 patients, fixed defects in 16 patients, reversible defects in 41 patients, fixed and reversible defects in 10 patients. Patients with known CAD and persistent AF were older than patients with no CAD, and those in sinus rhythm at stress time (77±8y vs. 67±13y, and 71±12y vs. 66±13y, respectively, p=0.001). Hypertension was more common in patients with known CAD (p=0.006), and those with persistent AF (p=0.02). Dyslipidemia was more common in patients with CAD (p=0.003). Baseline heart rate was higher in the persistent AF group (83±18/min vs. 70±12/min, p<0.0001). Age, female gender, and CRF were predictive of MPI findings (R=0.29, p=0.003). Known CAD was the strongest independent predictor of MPI results (R=0.40, P<0.0001).

Conclusions: In patients with new-onset AF and no other symptoms, age, female gender and CRF modestly predict findings on MPI while known CAD is the strongest independent predictor. This has important implications for selecting appropriate patients for MPI testing.

9:00 a.m.

917-236   **Association of Neighborhood Socioeconomic Status with Physical Fitness in Healthy Young Adults: the CARDIA Study**

Mehdi Shishehbor, Michael S. Lauer, Penny Gordon-Larson, Catarina I. Kiefe, David Litaker, Cleveland Clinic Foundation, Cleveland, OH

Background: Poor physical fitness, a contributor to obesity and cardiovascular disease, has been associated with both an individual's socioeconomic status (SES) and with residence in disadvantaged neighborhoods. However, the extent to which neighborhood SES is associated with fitness, independent of individual-level SES is unknown.

Methods: Cross-sectional analysis of 2505 participants 25-42 years old examined in the Coronary Artery Risk Development in Young Adults (CARDIA) study in 1992-1993. Physical fitness, based on symptom-limited exercise stress testing, was poor if metabolic equivalents (METs) were in the lowest gender-specific quintile. Neighborhood SES was assessed using a validated composite score from U.S. 1990 Census tract data. Serial models assessed the association between the Neighborhood SES score and physical fitness, before and after adjustment for individual SES, and then for other sociodemographic and clinical characteristics. General estimating equations accounted for clustering within census tracts.

Results: Individuals in disadvantaged neighborhoods had lower educational attainment and income, and were more likely unemployed, black, and uninsured. The unadjusted odds ratio (OR) (95% confined interval) of 1st versus 3rd tertile of Neighborhood SES was 5.8, (3.7-7.3). These became 3.9 (2.7-5.7) after adjusting for individuals' educational attainment, personal income, employment status, and ability to pay for basic needs; and 1.9 (1.2-2.9) after additional adjustment for other sociodemographic and clinical factors.

Conclusions: Socioeconomic context likely contributes to health. A health policy perspective that looks beyond an individual's characteristics may therefore be useful in identifying more effective interventions to reduce the prevalence of low physical fitness and its consequences in young adults.

E-POSTER SESSION

918

E-Poster Session 918

Tuesday, March 27, 2007, 10:00 a.m.-11:00 a.m.
Hall H

10:00 a.m.

918-221   Prediction of Transition to Chronic Atrial Fibrillation in Elderly Patients With Nonvalvular Paroxysmal Atrial Fibrillation by Transthoracic Doppler Echocardiography

Koichi Sakabe, Nobuo Fukuda, Yamato Fukuda, Satofumi Morishita, Hisanori Shinohara, Yoshiyuki Tamura, National Hospital Organization, Zentsuji National Hospital, Kagawa, Japan

Background: Nonvalvular atrial fibrillation (AF) becomes common arrhythmia in elderly people. It is well known that paroxysmal AF (PAF) often precedes the establishment of chronic AF (CAF). However, it remains difficult to predict the transition from PAF to CAF in elderly people. The purpose of this study was to determine prospectively whether transthoracic echocardiography is useful for the prediction of the transition to CAF in elderly patients with nonvalvular PAF.
Methods: To evaluate the ability to predict the transition to CAF, 42 consecutive elderly patients (≥ 65 years) with nonvalvular PAF (22 males; 73 ± 8 years) were prospectively followed after general transthoracic echocardiography. The study endpoint was the transition to CAF (persistent or permanent AF; ≥ 6 months) during the follow-up period.
Results: During a follow-up of 32 ± 24 months, 12 patients acquired CAF. Patients with CAF, compared with those without, showed significantly lower peak A velocity (A) (57 ± 19 vs 76 ± 18 cm/sec, p = 0.005) and higher E/A ratio (1.46 ± 0.66 vs 0.91 ± 0.27, p = 0.0004) of transmitral inflow (TMF) such as "pseudonormalization pattern", and lower peak atrial reversal wave velocity (20 ± 5 vs 27 ± 7 cm/sec, p = 0.01), higher peak diastolic wave velocity (D) (52 ± 16 vs 40 ± 10 cm/sec, p = 0.01), and lower peak systolic/diastolic wave velocity ratio (S/D ratio) (1.04 ± 0.33 vs 1.46 ± 0.39, p = 0.003) of pulmonary venous flow (PVF). No significant differences were found with respect to other parameters. Kaplan-Meier analysis revealed that the transition to CAF was significantly observed more often when A ≤ 70cm/sec (mean value) (p = 0.03) and E/A ratio ≥ 1.07 (p = 0.04) of TMF, and D ≥ 44 cm/sec (p = 0.02) and S/D ratio ≤ 1.34 (p = 0.02) of PVF. All patients acquired CAF when E/A ratio ≥ 1.15 (n = 6) or S/D ratio ≤ 0.75 (n = 3).
Conclusions: This prospective study suggests that (i) elderly patients at high risk for the transition to CAF seem to have "pseudonormalization pattern" of TMF and "diastolic dominant pattern" of PVF, and that (ii) transthoracic Doppler estimation of TMF and PVF could be useful to identify elderly patients at risk for the transition from nonvalvular PAF to CAF, and could be attractive because of the ease of acquiring the data.

10:00 a.m.

918-222   Improvement of Cardiac Function Early After Circumferential Pulmonary-Vein Ablation for Atrial Fibrillation, Serial Observation by Echocardiography

Miki Horigome, Jun Koyama, Mitsuaki Horigome, Kazunori Aizawa, Hiroki Kasai, Takeshi Tomita, Setsuo Kumazaki, Hiroshi Tsutsui, Yoshikazu Yazaki, Osamu Kinoshita, Uichi Ikeda, Shinshu University, Matsumoto, Japan

Background: Recently the circumferential pulmonary-vein ablation has been reported to be effective for restoring sinus rhythm in patients with atrial fibrillation (AF). Although it was reported that sinus rhythm and atrial contraction recovered several months after the maze procedure, no data exist regarding atrial and left ventricular functional recovery early after ablation.
Methods: Thirteen consecutive patients were studied with echocardiography before and after the circumferential pulmonary-vein ablation for AF (before, day 2, day3, day4, day 7, and day 30). Standard 2 dimensional and Doppler flow echocardiography (transmitral, pulmonary venous, and LV outflow tract records) were performed.
Results: Peak velocity of the early diastolic wave (E wave) had significant reduced and peak velocity of the left ventricular diastolic filling wave (A wave) had significant increased at day 7 compared with just after ablation. Deceleration time of E wave and velocity time integral of left ventricular outflow tract had significant increased at day 30 after ablation.
Conclusions: Atrial contraction and cardiac output recovered early after circumferential pulmonary-vein ablation. However left atrial and ventricular diameter didn't decrease in this observation period unlike previous reports.

Echocardiographic parameters *:P<0.05 vs day2

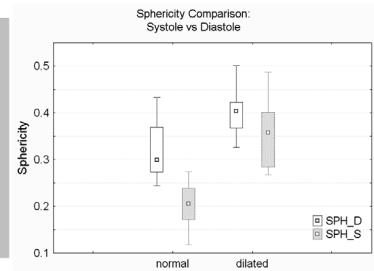|	before	day2	day3	day4	day7	day30
Left atrial diameter(mm)	45±5	44±5	48±5	46±4	46±5	44±4
Left ventricular end-diastolic diameter(mm)	47±6	47±6	48±3*	48±6	47±3	47±5
Fraction Shortening(%)	39±7	39±8	41±6	39±10	39±5	38±7
Transmitral flow-E(m/s)	0.87±0.20	0.85±0.19	0.91±0.20	0.88±0.18	0.76±0.10*	0.74±0.25*
Transmitral flow-E-deceleration time(ms)	190±56	180±34	180±30	183±45	192±34	225±35*
Transmitral flow-A(m/s)	-	0.39±0.12	0.40±0.13	0.38±0.17	0.43±0.12*	0.63±0.24*
Pulmonary venous flow-D/S	1.9±1.2	1.3±0.5	1.5±0.6	1.4±0.4	1.6±0.5	1.0±0.2*
Pulmonary venous flow-A(m/s)	-	0.18±0.05	0.21±0.09	0.17±0.09	0.20±0.06	0.22±0.06*
Left ventricular outflow tract-velocity time integral(cm)	16.3±4.1	17.5±2.9	18.0±2.8	18.7±3.5	19.0±3.1	19.6±3.2*

10:00 a.m.

918-223   3D Dynamic Shape Parameters Stratify Functional Myocardial Performance Better than Diastolic Sphericity: A 3D Echocardiographic Assessment

Ivan S. Salgo, William B. Ackerman, Roberto M. Lang, University of Chicago, Chicago, IL, Philips Medical Systems, Andover, MA

Introduction. Progression of heart failure is important in stratifying patient response to therapy. Methods used to assess LV remodeling include 2D echocardiography derived LV volume and the end-diastolic sphericity index. We developed new parameters to measure dynamic 3D LV shape throughout the cardiac cycle and hypothesized that they would aid in stratifying LV function better than diastolic sphericity alone.
Methods. We studied 12 normal subjects and 9 dilated cardiomyopathic patients using real-time 3D echocardiography (Philips SONOS7500/iE33). Endocardial surface was segmented using semi-automated border detection without geometrical assumptions (3DQ-Adv, QLAB). We computed numerically global measures of shape including sphericity, mean, Gaussian, maximum, minimum, circumferential and longitudinal curvatures at each point in the cardiac cycle.
Results. Traditional diastolic sphericity index (SPH_D) correlated poorly with ejection fraction (r=-.50, p=.02), whereas systolic sphericity (SPH_S) correlated better (r=-.79, p=.00002). Mean systolic curvature of the LV surface (r=.78) was superior to the mean diastolic one (r=.53). Maximum systolic curvature (r=0.84) was superior to the maximum diastolic one (r=.54). **Conclusion.** Traditional static diastolic shape assessment of LV remodeling alone is inferior to dynamic assessment 3D LV shape. Complete dynamic 3D shape assessment may be useful in following post-infarction patients and those undergoing CRT.

Sphericity Comparison: Systole vs Diastole

Diastolic Sphericty 0.42

10:00 a.m.

918-224   Diagnosis of Coronary Artery Disease by Detection of Post-Ischemic Diastolic Dyssynchrony after Treadmill Exercise Using Strain Image Derived from 2D Speckle Tracking

Katsuhisa Ishii, Takahiro Sakurai, Kazuaki Kataoka, Makoto Imai, Takeshi Aoyama, Kunihisa Miwa, Kansai Denryoku Hospital, Osaka, Japan, Hamamatsu Rousai Hospital, Shizuoka, Japan

Background: Regional left ventricular (LV) diastolic dysfunction has been suggested to be a sensitive marker of coronary ischemia and may persist after transient myocardial ischemia. Strain image (SI) derived from 2D speckle tracking technology enables quantification of regional myocardial function without tethering effect and Doppler angle dependency with high temporal resolution. Coronary artery disease (CAD) can be diagnosed accurately by the detection of post-ischemic regional LV diastolic dyssynchrony after treadmill exercise stress test using SI.
Methods: Consecutive 114 patients (73 men; 66±8years) with diagnosed effort angina (CCS class II: 83 and class III: 31) were studied. Prior to coronary angiography (CAG) Strain images (Aplio, Toshiba) were acquired before and 5 minutes after the treadmill exercise stress test in the short-axis, apical long-axis, two-chamber and four-chamber views. Radial/transversal strain curves were obtained at each segment, and the end systolic values of strain at the closure of aortic valve(A) and at the one third of diastolic duration(B) were measured. The SI-diastolic index (SI-DI) was determined as (A-B)/A×100%. The ratio of SI-DI before and after exercise was defined as the SI-DI ratio and was used to identify regional LV diastolic dyssynchrony.
Results: A total 684 segments were evaluated. SI-DI decreased from 61±12 to 18±11 % (p<0.001) in the perfusion territories of significant coronary stenoses (≥75% luminal diameter) after exercise, whereas it remained unchanged from 64±12 to 60±13 % (NS) in those of no significant stenosis. Regional LV diastolic dyssynchrony (SI-DI ratio with a cut off value of 0.5) after exercise was detected in 217 (sensitivity: 90%) of 241 areas perfused by significant stenotic coronary arteries and in 58 (specificity: 87%) of 443 areas perfused by non-stenotic arteries. In the same study population Exercise Single Photon Emission Computed Tomography using Thallium-201 gave a sensitivity of 82% and a specificity of 84% for the diagnosis of CAD. **Conclusion:** Detection of post-ischemic regional LV diastolic dyssynchrony after treadmill exercise using SI is a readily available, sensitive method for the diagnosis of CAD.

Diagnostic Testing

10:00 a.m.

918-225   Gene Delivery for Therapeutic Angiogenesis is More Effective by Ultrasound-Mediated Destruction of Carrier Microbubbles than by Direct Intramuscular Injection

Jeremy Kobulnik, Michael A. Kuliszewski, Jonathan R. Lindner, Michael Lekas, Alexander L. Klibanov, Duncan J. Stewart, Howard Leong-Poi, St. Michael's Hospital, Toronto, ON, Canada, Oregon Health Sciences University, Portland, OR

Gene delivery for therapeutic angiogenesis is most commonly performed by direct intramuscular (IM) injection. Ultrasound-mediated (UM) destruction of carrier microbubbles represents an alternative method of gene delivery. The objective of our study was to compare the efficacy of $VEGF_{165}$ delivery by IM injection to that by UM delivery of intravenous plasmid-bearing microbubbles, in a rat ischemic hindlimb model. **Methods:** A plasmid vector was constructed for the co-transfection of human $VEGF_{165}$ and GFP. Hindlimb ischemia was produced by iliac artery ligation in 48 rats. At day 14 post ligation, microvascular blood flow (MBF) in the proximal hindlimb muscles were assessed by contrast-enhanced ultrasound (CEU). In 24 rats, $VEGF_{165}$/GFP plasmid (500 µg DNA) was injected IM into the ischemic hindlimb adductor muscles at 5 sites. The remaining 24 rats underwent UM delivery of $VEGF_{165}$/GFP plasmid (500 µg DNA) coupled to 1×10^9 cationic microbubbles. Perfusion was re-assessed by CEU at days 17, 28 and 54 (n=8 for each time point/treatment group). Transfection was assessed by the extent of GFP positive cells on confocal microscopy and real time PCR. **Results:** Prior to plasmid delivery, normalized MBF for the ischemic muscle were similarly reduced in both treatment groups. Both IM and UM delivery of $VEGF_{165}$ produced a significant increase in normalized MBF (0.56±0.16 v 0.38±0.13, p<0.005, and 0.91±0.30 v 0.44±0.15, p<0.001 respectively), with a trend to a greater improvement in MBF for UM vs IM delivery. By day 54, MBF was significantly greater in UM-treated animals as compared to IM (0.63±0.15 v 0.47±0.13, p<0.05). GFP/$VEGF_{165}$ mRNA expression by real-time PCR was detected at days 17 and 28, and was greater for IM. Fluorescent confocal microscopy demonstrated a robust GFP signal for both treatment groups at day 17, being localized predominantly within the vascular endothelium for UM delivery, and in focal perivascular and interstitial regions for IM delivery. **Conclusions:** Transfection of VEGF by UM delivery is more effective than direct IM delivery, with a more persistent increase in tissue perfusion. UM delivery results in directed vascular transfection, which may account for the more efficient angiogenesis.

10:00 a.m.

918-226   Prediction of Myocardial Viability with Tissue Doppler Imaging in Patients with Acute Anterior Myocardial Infarction after Primary Reperfusion Therapy

Seong-Mi Park, Leann M. Lepa, Charles J. Bruce, Krishnaswamy Chandrasekaran, Abhiram Prasad, Charanjit Rihal, Malcolm R. Bell, Jae K. Oh, Mayo Clinic, Rochester, MN

Bakground In patients with acute myocardial infarction (AMI), it is clinically important and advantageous to distinguish akinetic, but viable from nonviable The purpose of this study was to determine whether Tissue Doppler Imaging can predict the recovery from AMI after reperfusion with percutaneous coronary intervention (PCI). **Methods** Consecutive patients with the following inclusion criteria were enrolled: 1) first confirmed acute ST elevation MI, 2) requiring primary PCI to thelrft anterior descending (LAD) with post PCI TIMI flow grade 3, and 3) akinetic apical walls and normal basal walls on conventional 2-dimensional echocardiography. Tissue velocity imaging (TVI) and strain rate imaging (SRI) values were obtained from the ventricular septum and lateral wall at the basal and apical walls, using apical 4 chamber view at day 1 (within 24 hours of PCI) and more than 5 weeks later. The presence of positive value of TVI and the negative value of SR during isovolumic contraction period (TVI_{IVC} and SR_{IVC}, respectively) at 1 day were determined. **Results** Twenty AMI patients (63±16 years) were enrolled and their follow-up studies were done at 9 ± 4 weeks. Of 40 akinetic apical walls, 19 walls improved to normal wall motion and the other 21 walls remained akinesia. There were no differences of all TVI and SRI values except early diastolic SR at day 1 between recovered and not recovered apical walls (0.64±0.25 vs 0.43±0.25 1/s, p=0.04). For prediction of recovery, with the presence of TVI_{IVC}, the sensitivity , the specificity and diagnostic accuracy were 79%, 33% and 55%, respectively. With SR_{IVC}, the sensitivity, the specificity and diagnostic accuracy were 84%, 63% and 74%, respectively. All basal walls had normal wall motion and showed TVI_{IVC} and SR_{IVC}. **Conclusion** The akinetic, but recovered myocardium from AMI showed better preserved early diastolic function and had more isovolumic contraction. These two parameters can be predictors for myocardial viability and SRI can identify a viable myocardium better than TVI which might be due to tethering effect from normal basal wall.

10:00 a.m.

918-227   Diastolic and Systolic Asynchrony in Patients with Diastolic Heart Failure-A Common but Ignored Condition

Cheuk-man Yu, Qing Zhang, Gabriel WK Yip, Alex Pui-wai Lee, Leo CC Kum, Yat-yin Lam, Jeffery WH Fung, The Chinese University of Hong Kong, Hong Kong, People's Republic of China

Background: This study examined the presence and prevalence of diastolic and systolic asynchrony in diastolic heart failure (DHF), and compare with that of systolic heart failure (SHF). Methods: Echocardiography with tissue Doppler imaging was performed in 373 heart failure patients (92 with DHF and 281 with SHF) and 100 normal subjects. Standard deviation of the time to myocardial peak systolic (Ts-SD) and peak early diastolic (Te-SD) velocities among 12 left ventricular segments were measured for systolic and diastolic asynchrony. Results: Both heart failure groups had prolonged Te-SD (DHF Vs SHF Vs Controls: 32.2±18.0 Vs 38.0±25.2 Vs 19.5±7.1ms) and Ts-SD (31.8±17.0 Vs 36.7±15.2 Vs

17.6±7.9ms) compared to the control group (all p<0.001 vs controls). However, DHF group had less systolic asynchrony than SHF group (39.1% vs 56.9%; χ2=8.82, p=0.003), though diastolic asynchrony was comparable between the 2 groups (35.9% vs 43.1%; χ2=1.48, p=NS). Normal synchrony, isolated systolic, isolated diastolic, and combined asynchrony were observed in 39.1%, 25.0%, 21.7% and 14.1% of DHF patients respectively and these were 25.6%, 31.3%, 17.4% and 25.6% correspondingly in SHF (χ2=10.01, p=0.019). The correlation between systolic and diastolic asynchrony, and between myocardial dysfunction and mechanical asynchrony appeared weak in both groups. A wide QRS duration (>120ms) was rare in DHF (10.9% vs 37.7% in SHF; χ2=16.69, π<0.001). Conclusions: Mechanical asynchrony was observed in 61% of DHF patients despite narrow QRS complex. The presence of asynchrony was not related to myocardial systolic or diastolic function. Isolated diastolic dysfunction was more common in DHF, while isolated systolic asynchrony and co-existing systolic and diastolic asynchrony were more prevalent in the SHF. Systolic and diastolic asynchrony were not tightly coupled, implying distinct mechanisms.

10:00 a.m.

918-228   Predisposition to Acute Angle Take-Off and Narrow Ostial Coronary Artery Orifice Areas in Patients with Anomalous Coronary Arteries Identified on 64-Detector Coronary Angiography

Keyoor Patel, Perwaiz Meraj, Amgad Makaryus, Lawrence M. Boxt, North Shore University Hospital at Manhasset, Manhasset, NY, Columbia University Medical Center, New York, NY

Background: Prior reports suggest that the presence of anomalous coronary arteries (ACA) may be associated with myocardial ischemia and sudden cardiac death. The mechanisms by which blood flow is restricted in ACA include acute angle take-off and narrow slit-like orifice with potential for closure during increased blood flow. We examined these mechanisms using 64-detector CT angiography. **Methods:** A total of 1818 consecutive patients were evaluated with 64-CT (GE Light Speed VCT®). The take-off angles (TOA) and ostial areas of patients found to have ACA were measured and compared with normal coronary arteries of 12 controls. **Results:** Twenty-seven patients (16 M/11 F; ages 23-60 yrs) were identified with ACA. Nine (33%) had a separate origin of the left anterior descending artery (LAD) and the circumflex artery both originating from the left sinus of valsalva (LSOV). Six (22%) had a single coronary originating from the right sinus of valsalva (RSOV). Five (18.5%) had origination of the right coronary artery from the LSOV. Three (11%) had circumflex artery originating from the right coronary. The remaining four (14.8%) had individual anomalies: right coronary originating above the RSOV, left main originating from the right lateral aspect of LSOV, LAD originating from the RSOV, and left main arising at the junction of the left and non-coronary cusps. The mean TOA of right coronary of ACA was significantly less than normals (22.4º vs. 61.5º, p<0.0001). The mean TOA of left main was more acute than normals (22.2º vs. 63.2º, p<0.0001). The mean ostial area of the right coronary was smaller than in normals (12.5 mm² vs. 19.5 mm², p=0.07). The mean ostial area of the LCA of ACA was significantly narrower than in normals (13.3 mm² vs. 20.8 mm², p=0.004). Regression analysis identified a significant association between small ostial areas and acute TOA (p =0.008). **Conclusions:** Patients with ACA have acute TOA and narrower ostial areas compared to normal patients. Acute TOA correlates with narrow ostial areas. 64-CT is an accurate non-invasive method for assessing patients with ACA. Further prospective studies are indicated to evaluate the clinical significance of these findings with respect to sudden cardiac death.

10:00 a.m.

918-229   Diagnostic Accuracy Of Noninvasive Coronary Angiography Using 64-slice Multidetector Computed Tomography In The Evaluation Of Significant Coronary Artery Disease

June Namgung, Sung Uk Kwon, Jun Hyung Do, Sung Yun Lee, Gham Hur, Won Ro Lee, Ilsan Paik Hospital, Goyang-si, South Korea

Background: The aim of this prospective study was to determine the diagnostic accuracy of multidetector computed tomography (MDCT) coronary angiography using 64-slice technique in the detection of significant coronary stenoses. **Methods:** We studied 101 patients (63men, 38 women; mean age 63.7±10.5 years) undergoing elective invasive coronary angiography. The diagnostic performance of MSCT for detection of significant lesions (≥50% diameter reduction) was compared with that of quantitative coronary angiography (QCA). Results were analyzed for significant coronary stenoses by segment, by vessel, and by patient. **Results:** 1,352 segments could be assessed quantitatively by both MDCT and QCA. Specificity, sensitivity, and positive and negative predictive values for the presence of significant stenoses were: by segment (n=1,352), 96%, 97%, 85% and 99%, respectively; by vessel (n=419), 99%, 94%, 87%, and 99%, respectively; by patient (n=101), 100%, 89%, 94%, and 89%, respectively. **Conclusions:** This study demonstrated that 64-slice MDCT coronary angiography is as reliable as coronary angiography at detecting significant coronary artery disease. In selected groups of patients, it may replace the invasive conventional coronary angiography.

10:00 a.m.

918-230   64 Multidetector CT Coronary Angiography: Effect of Sublingual Nitroglycerin on Coronary Luminal Diameter and Image Quality

Piet K. Vanhoenacker, Isabel Decramer, Giovanna Sarno, Lieven R. Van Hoe, William Wijns, Dept. of Radiology OLV Ziekenhuis, Aalst, Belgium, Cardiovascular Center, Aalst, Belgium

Background: To assess the influence of sublingual nitroglycerin (SLN) on luminal diameter, number of visualised side branches, contrast to noise ratio (CNR) and signal to noise ratio (SNR) of the coronary arteries with multidetector computed tomographic angiography (CTA).

Methods: 34 patients were included. 17 patients were examinated without SLN (group A), while 17 patients were examinated after administration of SLN (GroupB). Sex-, age- and weight- matched patients out of our database were blindly selected in a retrospective way. In group B, SLN was administrated 5 to 10 minutes before initiation of the scan and given as a sublingual spray (0.4 mg). CTA was performed using a Multidetector computed tomographic scanner (Somatom 64, Siemens, Forcheim, Germany) with 64-x 0.6-mm collimation and 330-ms gantry rotation, after injection of contrast. In all patients one reader quantitatively assessed luminal diameter in the proximal segments of the left main (LM) and the right coronary artery (RCA) and the luminal volume of both the entire RCA and left anterior descending artery (LAD). In all patients the number of septal branches was counted. The SNR and CNR in the proximal RCA and LAD were calculated in both groups.
The number of clinical side effects was evaluated in both groups

Results: The luminal diameters were significantly larger in group B than in group A . The average diameters for left main artery (LM) were 3.3+/-0.8 mm (group B) vs. 2.6 +/- 0.6 mm (group A) (p < 0.05), and for the RCA 3.4 +/- 0.8 mm (group A) vs. 2.6 +/- 0.5 mm (group B) (p < 0.005). The average volumes of the LAD was 0.62 +/- 0.4 cm³ (group B) vs. 0.37 +/- 0.2 cm³ (group A) (p = 0.03), and for the RCA 0.95 +/- 0.4 cm³ (group B) vs. 0.6 +/- 0.5 cm³ (group A) (p = 0.019). The number of septal branches in group B was significantly larger than in the control group 2.7 +/- 1.03 vs. 1.7 +/- 0.9 (p = 0.006). No statistically significant difference in SNR and CNR between the two groups was demonstrated. In both groups, no side effects related to SLN were noted.

Conclusions: SLN significantly dilates the coronary arteries and visualises more septal branches without diminishing image quality or causing a higher number of side effects.

10:00 a.m.

918-231   When Should We Repeat A Coronary Calcium Scan With An Initial Coronary Artery Calcium Score <100?

naser ahmadi, Amelia Young, nicole Weinberg, Joseph J. Thomas, Sandy T. Liu, Emily Young, Christopher Wong, Song S. Mao, Ambarish Gopal, Matthew J. Budoff, Los Angeles Biomedical Research Institute, Torrance, CA

Background: SHAPE (Screening for Heart Attack Prevention and Education) guidelines place coronary artery calcium scores (CACS) ≥ 100 in a high risk category for atherosclerosis where the low-density lipoprotein cholesterol (LDL-C) levels are targeted to < 70. In this study, we sought to determine the CAC progression rates in individuals with an initial CACS of 1-99 to help decide on when it would be suitable to repeat a CAC scan for promptly changing the LDL-C therapeutic goal.

Methods and results: We evaluated 145 physician-referred participants (38 women and 107 men, mean age = 62 ± 10 years [range = 40 to 75]) with an initial CACS of 1-99. All participants underwent a 1-year and 3-years' follow-up scan after their initial scan. The median CACS change/year in the participants was 27 and 21 at the1st year and 3rd year scans, respectively. Also, 46.2% and 38.6% of them had >15% CAC Progression/year in their 1st year and 3rd year scans, respectively. Multivariate regression analysis included age, gender, time between scans and cardiac risk factors. The only variables that were significant were diabetes (OR=2.2) and time. Time between scans demonstrated that 33.8% of participants became high risk, CACS 100-399, and 2.1% had scores >400 (OR=7.8, 95% CI=6.4-9.2, p=0.000) at one-year follow up, and an additional 13.8% and 4.1% of participants respectively developed scores 100-399, and >400, respectively (OR=5.1, 95% CI=3.9-7.2, p=0.000) on their 3rd year scan. Repeated multivariate analysis showed that participants' compliance to lipid lowering agents and diet modification increased between the 1st and 3rd year follow-up (OR=2.5, 95% CI=2.3-3.35, P=0.03) and (OR=3.7, 95% CI=1.49-5.4, P=0.01), respectively.

Conclusion: Individuals with an initial CACS 1-99 have a higher risk of atherosclerotic progression during both 1st year and 3rd year of their follow-up scans. Thus in individuals with an initial CACS of 1-99, a repeat CAC scan could be considered as early as one year after the initial scan, to potentially change targets of therapy.

10:00 a.m.

918-232   Comparison of Magnetic Resonance Imaging and Doppler Echocardiography Derived Metrics of Mechanical Dyssynchrony
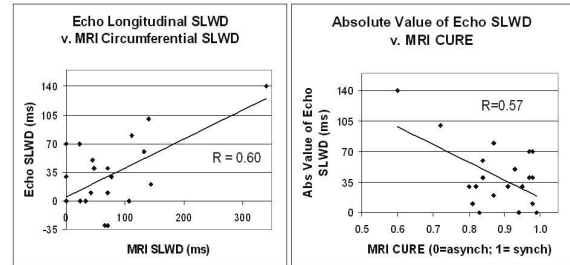
Kenneth C. Bilchick, Robert H. Helm, Kristy Kessler, Anne R. Capriotti, Kimberly Karli, Gail Hefter, Daniel P. Judge, Stuart D. Russell, Nael Osman, David A. Kass, Theodore Abraham, Albert C. Lardo, Johns Hopkins Medical Institutions, Baltimore, MD

Background: Echocardiographic (EC) indices of mechanical dyssynchrony (MD) are based largely upon longitudinal strain, whereas magnetic resonance imaging (MRI) assessment is based on circumferential strain, the latter being the primary direction of myocardial contraction. We sought to compare EC and MRI metrics of MD.

Methods: EC and cardiac MRI studies were performed in 21 subjects. Absolute strain, time to peak strain in 6 segments and septal-to-lateral wall delay (SLWD) were measured and compared to a previously validated MRI metric (circumferential uniformity ratio estimate, CURE; 0-1, 0=asynchrony, 1=perfect synchrony).

Results: Subjects included 10 with ejection fraction < 30% (age 55 ± 14, QRS 111 ± 35 ms), 2 with heart failure/normal ejection fraction (age 70 ± 8.5, QRS 90 ± 14.9 ms), and 9 normals (age 44 ± 13). Normals had less MD (greater CURE) compared to cardiomyopathy subjects (CURE 0.96 +/- 0.01 v. 0.82 +/- 0.03; p < 0.001). MRI and EC peak strains were similar (-22.6 ± 0.61 v. -24.5 ± 0.96; p NS). There was a significant correlation between the EC longitudinal septal-lateral wall delay (SLWD) and the MRI circumferential SLWD (Figure; R=0.60), as well as between the absolute value of EC SLWD and MRI CURE (Figure; R=0.57). EC SLWD of at least 100 ms (versus the standard cutoff of 70 ms) was most predictive of MD by MRI CURE (Figure).

Conclusions: MRI assessment of circumferential MD is complementary to standard EC measures and may help better risk stratify patients for cardiac resynchronization therapy.

Echo Longitudinal SLWD v. MRI Circumferential SLWD — R = 0.60
Absolute Value of Echo SLWD v. MRI CURE — R=0.57

10:00 a.m.

918-233   Absolute Quantification of Myocardial Blood Flow with 13-N Ammonia and 3-Dimensional PET
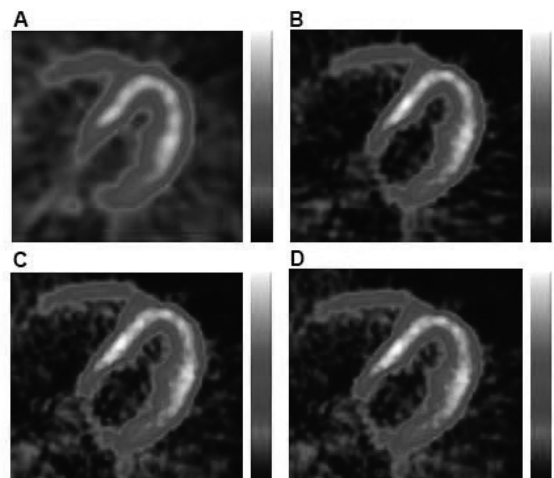
Tiziano Schepis, Oliver Gaemperli, Valerie Treyer, Ines Valenta, Cyrill Burger, Pascal Koepfli, Mehdi Namdar, Itaru Adachi, Hatem Alkadhi, Alfred Buck, Philipp A. Kaufmann, Cardiovascular Center, University Hospital Zurich, Zurich, Switzerland, Institute of Diagnostic Radiology, University Hospital Zurich, Zurich, Switzerland

Background: The aim of this study was to compare 2-dimensional (2D) and 3D dynamic PET for the absolute quantification of myocardial blood flow (MBF) with ¹³N-labeled NH3.

Methods: Comparative 2D and 3D MBF measurements were collected in 21 cardiac patients at rest (n = 14) and during standard adenosine stress (n = 7) on a PET/CT system with retractable septa. All 2D studies were performed by injecting 700 to 900-MBq of ¹³N-NH3. For two thirds of the patients, 3D studies were performed with the same injected ¹³N-NH3 dose and in the remaining 7 patients with a lower dose (500-MBq). 2D images reconstructed with filtered backprojection (FBP) provided the reference standard for MBF measurements. 3D images were reconstructed using FORE + FBP (FORE = Fourier rebinning), FORE + ordered-subsets expectation maximization (FORE-OSEM), and with the reprojection algorithm (RP).

Results: 3D PET using FORE-FBP (r = 0.969), FORE-OSEM (r = 0.968), and RP (r = 0.968) derived global MBF correlated well to 2D FBP (all P < 0.0001). Mean difference for global MBF between 2D FBP and 3D FORE-FBP, 3D FORE-OSEM, and 3D-RP were 0.01 ± 0.14, 0.01 ± 0.15, and 0.00 ± 0.16 mL/min/mL, respectively. For the subgroup of patients, in whom the low dose 3D protocol was used, correlation between 2D and 3D PET was best for 3D FORE-FBP (r = 0.946, P < 0.001).

Conclusions: For this scanner type, quantitative measurements of MBF with 3D PET and ¹³N-NH3 provided similar results to those obtained with the 2D technique, even when a lower activity was injected.

10:00 a.m.

918-235   End Systolic Volume (ESV): Best Predictor of Mortality in 1,898 Elderly Dual Isotope Pharmacologic Stress Patients.

Deborah H. Kwon, Michael S. Lauer, Manuel D. Cerqueira, Wael A. Jaber, Cleveland Clinic Foundation, Cleveland, OH

Background: The prognostic value of myocardial gated SPECT pharmacologic stress in the elderly is unclear. We sought to validate preliminary findings from small studies in a large, diverse patient population.
Methods: We identified 1898 consecutive patients, age > 65 (74.6, interquartile range 67, 82, 53% male) who underwent rest thallium 201/adenosine stress technetium 99m sestamibi gated SPECT between October 2004-July 2006. Median follow-up time was 11 months (range <1 to 20.2). Clinical variables (age, gender, smoking history, presence of diabetes, insulin use, hypertension, history of CABG), nuclear variables (stress EF, summed difference score [SDS], summed rest score [SRS], stress ESV), & overall physician's impression of the test (normal, equivocal, abnormal) were prospectively recorded. The primary end-point was all-cause mortality.
Results: There were 105 deaths. In a univariable analyses, stress ESV was the strongest nuclear predictor of death ($\chi 2$score 13.9, p=0.003). Other nuclear variables that predicted death were: stress EF ($\chi 2$ 9.2, p=0.027);SDS $\chi 2$ 5.1, p=0.078);SRS ($\chi 2$ 9.8, p=0.007); & overall impression ($\chi 2$ 12.4, p=0.03). In multivariable analyses, (Table 1) the only independently predictive nuclear variable was stress ESV.
Conclusion: Stress ESV provides incremental independent risk stratification in older patients. In the elderly, ESV is a stronger predictor of death than EF & summed stress score, which have been established as the best predictors in younger patients.

Table 1

Risk Predictor	χ^2 Score	Hazard Ratio	Confidence Interval	P value
Age	8.52	1.58	1.16-2.15	0.004
Smoking History	6.64	1.98	1.18-3.34	0.01
Insulin Use	9.84	2.23	1.35-3.68	0.002
Stress ESV	16.82	1.18	1.09-1.27	<0.001

10:00 a.m.

918-236   Achieving High Cardiac Workload During Exercise Predicts Good Cardiac Function and a Low Risk of Abnormalities on Myocardial Perfusion Imaging in a Symptomatic Population with Significant Cardiac Risk Factors.

Jamieson M. Bourque, Denny D. Watson, Hasan K. Kabul, Benjamin H. Holland, George A. Beller, University of Virginia, Charlottesville, VA

Background: The sequelae of coronary artery disease continue to impose significant clinical and economic burdens, and improved risk stratification is essential to reduce adverse cardiac events and expensive unnecessary testing. Exercise capacity may help predict clinical risk. The purpose of our study was to identify the clinical characteristics and incidence of electrocardiographic and myocardial perfusion and function abnormalities in patients achieving high cardiac workload during exercise stress testing.
Methods: We studied 304 consecutive patients (mean age 54.0 years, 71.4% male) who achieved ≥10 metabolic equivalents (mets) during an exercise stress study using Bruce protocol and gated ^{99m}Tc-sestamibi SPECT myocardial perfusion imaging. Visual and quantitative scan analysis was used to determine the prevalence of regional perfusion and function abnormalities.
Results: Our population had a high incidence of cardiovascular comorbidities and prior coronary artery disease, including 48.1% with hypertension, 53.0% with hyperlipidemia, 12.2% with diabetes mellitus, 22.7% with tobacco use, 14.2% with prior myocardial infarction, and 21.8% with prior coronary revascularization. Beta-blockers were used by 26.0%. Despite having significant clinical risk and a high frequency of symptoms, only 11.5% had an abnormal myocardial perfusion scan, 3.3% had a borderline abnormal scan, 8.2% had reversible changes, and 72.1% had a normal stress electrocardiogram. They had excellent overall cardiac function. Only 1.6% had an ejection fraction <50%, and 5.9% had an end systolic volume index >25. Thirty-four patients (11.2%) did not achieve 85% of their maximum predicted heart rate.
Conclusions: These findings suggest that the ability to achieve a high workload is a surrogate marker for normal cardiac function and a low risk of abnormal perfusion scans. The prognostic weight of increased exercise capacity should be substantial, and the incremental prognostic value of imaging in such patients who achieve ≥10 mets will await long-term follow-up. We can already conclude that the incidence of abnormal SPECT studies in this symptomatic patient population with many cardiac risk factors is very low.

919

E-Poster Session 919

Tuesday, March 27, 2007, 11:00 a.m.-Noon
Hall H

11:00 a.m.

919-221   Obstructive Sleep Apnea is Associated with Impaired Right Ventricular Myocardial Performance Despite Normal Diurnal Pulmonary Pressure

Abel Romero-Corral, Francisco Lopez-Jimenez, Patricia A. Pellikka, Eric J. Olson, Kent R. Bailey, Josef Korinek, Marek Orban, Virend K. Somers, Mayo Clinic, Rochester, MN

Background: Right ventricular function has significant prognostic implications in many disease states. The effect of obstructive sleep apnea (OSA) on right ventricular function is controversial. Only robust and poor reproducible techniques have been mainly used.
Objective: To determine right ventricular function using the myocardial performance index (MPI) and fractional area change (FAC) in patients with suspected OSA with normal estimated pulmonary systolic pressure (EPSP).
Methods: A cross-sectional design of 85 subjects with suspected OSA who had their first polysomnography (PSG) and a complete echocardiographic study performed within 2 months of the PSG with no use of continuous positive airway pressure and EPSP < 45 mmHg. Subjects were divided according to the apnea hypopnea index in: < 5 (controls), 5-14 (mild OSA) and ≥ 15 (moderate/severe [M/S] OSA). ESPS was derived using standard techniques. MPI was calculated using the Doppler signal as (isovolumic contraction time + isovolumic relaxation time) / pulmonary ejection time. FAC was calculated in the 4-apical chamber view as (end-diastolic area - end-systolic area)/ end-diastolic area. Analyses were performed blinded to the PSG results.
Results: We excluded 26 patients without optimal Doppler signals and an estimated EPSP ≥ 45mmHg. Intraobserver and interobserver variability of the MPI was 7.5% and 6.1%. The mean age was 60 ± 15 years and 17% were women. The right ventricular function was significantly impaired across OSA severity; 0.23 ± 0.10 controls, 0.26 ± 0.16 mild OSA and 0.37 ± 0.11 in M/S OSA (p-value for trend <0.001). The results remained significant (p <0.01) after adjustment for age, gender, body mass index, EPSP, chronic obstructive pulmonary disease and smoking. ESPS was similar across groups (34.0 ± 9, 33.6 ± 12 and 33.9 ± 8, p = NS). The right ventricular systolic, dyastolic dimensions and FAC were similar across groups.
Conclusions: In patients with normal diurnal pulmonary pressure, OSA was associated to an impaired right ventricular function beyond what would be expected by the known effects of OSA in pulmonary pressures. The MPI is a sensitive and reproducible technique to assess the complex anatomy of the right ventricle.

11:00 a.m.

919-222   Development And Validation Of A Simple Score To Help Identify Echocardiographic Left Ventricular Hypertrophy In Patients With Overt Vascular Disease

Donald SC Ang, Gary A. Wright, Tom P. Fahey, Allan D. Struthers, University of Dundee, Dundee, United Kingdom

Background: Echocardiographic left ventricular hypertrophy (LVH) is an independent predictor of mortality. Despite this, screening for LVH in secondary prevention patients is not usual practice. To help target echo screening for LVH in secondary prevention patients, we developed and validated a simple clinical score to help identify those likely to have echo LVH.
Methods: We performed two studies. The development cohort consisted of 267 patients with angina. The validation cohort consisted of 227 patients with peripheral arterial disease (PAD). We identified variables which were independently associated with LVH and weighted them to create a predictive score.
Results: The prevalence of echo LVH in both patient cohorts was 50%. Six independent predictors of LVH were identified in the development cohort: age>65 years (1point), BMI> 30kg/m^2 (1point), history of hypertension (1 point), previous MI (1 point), clinic BP >130/80 mmHg (1 point) and bundle branch block (BBB) on ECG (4 points). Our clinical score was strongly associated with the presence of LVH in the validation cohort. Our clinical score also showed a significant continuous positive relationship (p trend <0.001 in males and p trend = 0.006 in females) with increasing quartiles of LV mass in both cohorts. In those without BBB, a modified clinical score performed equally well.
Conclusion: We have developed an accurate simple clinical score which quantifies the chance that any individual secondary prevention patient has the added risk factor of LVH. Apart from aiding the identification of LVH, this could potentially lead to better risk stratification and facilitate research into how best to regress LVH in secondary prevention patients.

11:00 a.m.

919-223   Identifying The Origin of Ventricular Arrhythmias Using 3D-Echocardiographic Tissue Tracking Imaging

Konomi Sakata, Shinobu Yamane, Mitsufumi Furuya, Norihide Mizuno, Kazuki Satou, Toshinori Minamishima, Hiroki Tguchi, Kentarou Nakamura, Takanori Ikeda, Hideaki Yoshino, Second Department of Internal Medicine, Kyorin University School of Medicine, Tokyo, Japan

Background: Several noninvasive modalities have been used to predict ventricular tachycardia (VT) and premature ventricular contractions (PVC) origin before catheter ablation. We sought to clarify the origin of ventricular arrhythmia (VA: VT and PVC) using 3D-echocardiographic tissue tracking imaging (3D-TTI).
Methods: We studied 32 patients with VA. 3D-TTI studies were performed during appearance of PVC in all patients with Vivid 7 (GE-Vingmed, Horten, Norway). In this technique, the origin of the VA could be recognized as the site where the earliest color-coded signal appeared on the myocardium at the onset of the VA.
Results: Twenty-seven of 32 patients had monomorphic type PVC, and 5 patients had polymorphic type PVC. There were 37 origins in 32 patients, and 33 of 37 origins (89%) were detected by 3D-TTI. The origin of monomorphic type PVC was detected by 3D-TTI in 25 of 27 patients (93%). In 2 of 5 patients with polymorphic type PVC, the one origin of PVC couldn't be detected, but in the other 3 patients, all origins of PVC could be detected (80%). In thirteen of 32 patients without structural heart disease, left bundle-branch block type idiopathic VA appeared, and 3D-TTI could detect the origin of PVC in the right ventricular outflow tract (RVOT) in all 13 patients (100%). The remaining 19 patients had structural heart disease (3 patients with arrhythmogenic right ventricular cardiomyopathy, 8 patients with dilated cardiomyopathy, 3 patients with hypertrophic cardiomyopathy , and 5 patients with myocardial infarction). Fourteen of 19 patients had monomorphic type PVC, and 5 patients had polymorphic type PVC. There were 24 origins of PVC in 19 patients, and 20 of 24 origins (83%) were detected by 3D-TTI in the RVOT (n = 4), the RV free wall (n = 3), the RV and LV septum (n = 4), the left ventricular (LV) apex (n = 4), LV free wall (n =5).
Conclusion: 3D-TTI is a useful non-invasive method for determining the origin of VA in patients with and without structural heart disease.

11:00 a.m.

919-224   Exercice-Induced Changes in the Severity of Mitral regurgitation among Patients with Chronic Left Ventricular Ischemic Dysfunction: Prevalence and Clinical Significiance.

Jean-Benoit le Polain de Waroux, Pierre-Vladimir Enneza, Anne-Catherine Pouleur, Julie Darchys, Agnès Pasquet, David Vancraeynest, Bernard L. Gerber, Jean-Louis J. Vanoverschelde, Cliniques Universitaires Saint Luc, Bruxelles, Belgium, Hopital cardiologique de Lille, Lille, France

Background: In patients (pts) with left ventricular (LV) ischemic dysfunction, increase in the severity of mitral regurgitation (MR) with exercise has been shown to trigger episodes of acute lung edema and to negatively impact on prognosis. Because exercise-induced worsening of MR is best detected by exercise echo (ExE), a broad use of this test in patients awaiting bypass surgery or recovering from acute lung edema has been advocated. Before recommending to perform ExE in every pts awaiting bypass surgery or having suffered from an acute lung edema, we sought to determine the prevalence of significant ExE-induced worsening of MR in pts with LV ischemic dysfunction and to precise its clinical correlates.
Methods: 104 pts (90 males, mean age: 62±11 years) with coronary disease, a mean LV ejection fraction of 30% and only mild MR at baseline were prospectively recruited. Thirty-eight pts were awaiting bypass surgery, 42 were in NYHA class III/IV and 26 had recently suffered from an acute lung edema. No pt had organic valve disease. During ExE, MR was quantified using the PISA method. As previously suggested, an increase in regurgitant orifice (ERO) ≥ 13 mm^2 was considered significant.
Results: During exercise, heart rate rose from 71±14 to 111±24 bpm and systolic blood pressure from 126±25 to 146±30 mmHg (p<0.001, both). On average, MR ERO and regurgitant volume (RV) increased respectively from 7±6 to 10±8 mm^2 (p<0.001) and from 12±10 to 14±12 mL (p=ns). Significant ExE-induced ERO increase (≥ 13 mm^2) occured in only 9 pts (8.6%). The prevalence of such ExE-induced ERO increase was similar among pts with (3/26, 11%) and without (6/78, 8%) recent history of acute lung edema, in those awaiting bypass surgery (5/38, 13%) and in those in NYHA class III/IV (4/42, 10%). By contrast, it was more likely to occur in the presence (6/31, 19%) than in the absence (3/73, 4%, p=0.015) of ExE-induced wall motion abnormalities.
Conclusions: During exercise, significant worsening of MR is rare and only correlates with the presence of exercise-induced ischemia. Given the low prevalence of ExE-induced worsening of MR in pts with LV ischemic dysfunction, it does not seem appropriate to recommend a widespread use of ExE in this population.

11:00 a.m.

919-225   The Extent of Residual Contrast Perfusion and not Left Ventricular Function Predicts late Recovery of Global Contractile Function After Acute Myocardial Infarction and Reperfusion Therapy

Girish Dwivedi, Rajesh Janardhanan, Jonathan Swinburn, Kim Greaves, Sajad A. Hayat, Roxy Senior, Northwick Park Hospital, Harrow, United Kingdom

Background: Following acute myocardial infarction (AMI) and reperfusion therapy, there is often persistent wall thickening (WT)abnormalities & perfusion defects due to variable degree of myocardial stunning and necrosis. We hypothesised that the extent of residual perfusion assessed by myocardial contrast echocardiography (MCE) and not the extent of WT predicts susbsequent global recovery of left ventricular (LV) function, an important marker of prognosis.
Methods: Accordingly, 112 patients underwent simultaneous assessment of WT and perfusion using MCE 7±2 after AMI and reperfusion therapy. Both WT (1=normal;2=r educed;3=absent;4=dyskinetic) and perfusion (2=normal;1=reduced; 0=absent) were scored on a 16 segment LV model. Contrast perfusion index (CPI), a measure of extent of myocardial perfusion and global LV function was calculated by adding the respective scores in the 16 LV segments divided by 16. Echocardiography was repeated 12 weeks after the reperfusion therapy to assess recovery of LV function.
Results: Follow up echocardiography was available in 98 patients.Of these 66(69%) demonstrated improvement in LV function. The area under the receiver operator characteristic curve for predicting recovery of LV function by MCE and by LV function at baseline were 0.79 and 0.59 respectively. Furthermore, CPI was significantly higher (P<0.0001) in the 66 patients, which showed late recovery of LV function(1.67±0.27) compared to who did not(1.27±0.04). No significant difference was noted in the indices of baseline LV function inpatients with (1.67±0.32) and without (1.80±0.36) recovery of LV function. The multivariable predictors of recovery of function were MCE (p=0.02), diabetes (p=0.02) & peak creatine kinase (p=0.01). Of the 62 patients with minimal perfusion defect (CPI>1.5), 54 (87%) showed recovery of LV function, conversely, 22 (64%) out of 32 patients with significant perfusion defect failed to recover function. Recovery of function was markedly reduced if the percentage of perfused myocardium (scores 1 & 2) was below 40%.
Conclusions: The extent of residual contrast perfusion and not LV function predicts late recovery of global LV function after AMI & reperfusion therapy

11:00 a.m.

919-226   Strain Rate Analysis and Levosimendan Improve Detection of Myocardial Viability by Dobutamine Echocardiography in Patients With Post-Infarction Left Ventricular Dysfunction

Cinzia Cianfrocca, Francesco Pelliccia, Vincenzo Pasceri, Antonio Auriti, Vincenzo Guido, Christian Pristipino, Mario Staibano, Giuseppe Richichi, San Filippo Neri Hospital, Rome, Italy

Background: Assessment of myocardial viability is usually based on wall motion score (WMS) analysis during dobutamine echocardiography. This strategy, however, is said to be subjective and to provide suboptimal results. We verified if prediction of functional recovery can be improved by combining strain rate imaging and levosimendan.
Methods: We studied 30 pts (65±10 years) with a previous myocardial infarction. All underwent, off-drugs, dobutamine (5 and 10 µg/Kg/min by 5 min intervals) and then levosimendan (24 µg/Kg in 10 min) echocardiography before revascularization. WMS, tissue Doppler imaging and strain rate analyses were performed in all segments. Regional LV functional recovery was defined by side-by-side comparison of echocardiographic images before and 6 months after coronary angioplasty (N=24) or surgery (N=6) and was identified by ≥1 point improvement in wall motion in at least two LV regions.
Results: Of 215 segments with abnormal resting function, 102 (47%) showed regional recovery after revascularization. WMS analysis predicted recovery in 60 segments with dobutamine and in 76 segments with levosimendan (sensitivity: 59% vs 75%, p=0.026) and failure to recover in 93 segments with dobutamine and in 90 segments with levosimendan (specificity: 82% vs 80%, NS). Comparison of tissue Doppler velocity parameters between segments with or without functional recovery did not show any significant difference neither with dobutamine nor with levosimendan. Strain rate, conversely, improved slightly with dobutamine (from -0.69±0.49 to 0.79±0.41 s^{-1}, NS) and significantly with levosimendan (from -0.58±0.41 to -0.99±0.55 s^{-1}, p=0.0001) in segments with functional recovery, but not in viable regions. Notewhorty, prediction of regional recovery by a change in peak systolic strain rate>-0.25 s^{-1} had a higher sensitivity with levosimendan than with dobutamine (91% vs 78%, p=0.019), while showing similar specificity (81% vs 85%, NS).
Conclusions: The combination of a newer quantitative echocardiographic techniques (strain rate analysis) and a newer agent (levosimendan) improves the sensitivity of viability assessment as compared with conventional dobutamine echocardiography.

11:00 a.m.

919-227   Preserved LV Twist but Impaired Longitudinal Myocardial Deformation In Patients With Diastolic Heart Failure
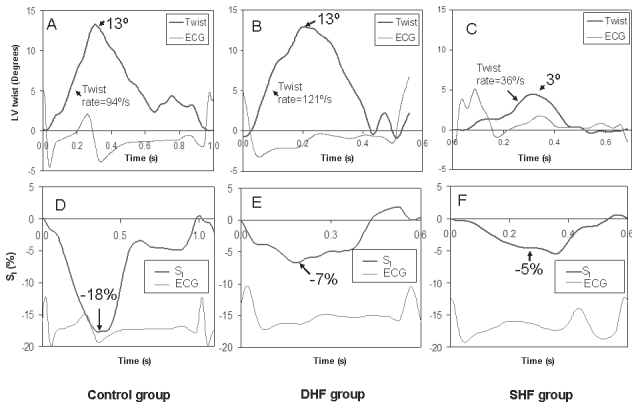
Jianwen Wang, Yong Yue, William A. Zoghbi, Miguel A. Quinones, Guillermo Torre-Amione, Sherif F. Nagueh, The Methodist DeBakey Heart Center, Houston, TX

Background: LV twist is reduced in systolic heart failure (SHF). However, it is unknown whether LV twist and global myocardial deformation (strain) are impaired in diastolic heart failure (DHF).
Methods: Sixty one patients (age: 59±16ys) undergoing right heart catheterization and 20 healthy subjects (age: 31±10ys) were studied with transthoracic echo. Rotation and strain were analyzed using 2D speckle tracking. LV twist was calculated as the difference between apical and basal LV rotation. Global longitudinal (S$_l$) and circumferential strains (S$_c$) were calculated from 3 apical views and mid-LV short axis respectively.
Results: Pulmonary wedge pressure was elevated (≥12mmHg) in 27 patients with EF < 50% (SHF) and 16 patients with EF ≥ 50% (DHF). LV twist correlated well with EF, S$_l$ and S$_c$ (r=0.72, 0.60, 0.73 respectively, all p<0.001). LV twist, twisting rate, S$_l$ and S$_c$ were all significantly reduced in SHF group (5.1±3.0º, 50±17º/s, -6±4% and -5±4% respectively) compared to DHF and controls (both p<0.001, Fig A-F). S$_l$ was lower in DHF group compared to controls (-12±3% vs -18 ±2% respectively, p<0.01). LV twist, twisting rate and S$_c$ were similar in DHF group (11.7±3.4º, 111±32º/s and -17±7% respectively)

and controls (11.5±6.4º, 96±29º/s and -18±3% respectively)(p>0.05).

Conclusions: Despite a lower global longitudinal strain when compared to normal controls, patients with diastolic heart failure show preserved LV twist and circumferential strain, which may account for the preserved ejection fraction.

Control group   DHF group   SHF group

11:00 a.m.

919-228   **A Combination Of Multislice Computed Tomography And Coronary Flow Reserve Measured By Doppler Echocardiography Improves The Diagnostic Accuracy In The Left Anterior Descending Coronary Artery Stenosis With Severe Calcification**

Takashi Masho, Takashi Kubo, Akio Kuroi, Hironori Kitabata, Shigeho Takarada, Toshio Imanishi, Yoshiaki Tomobuchi, Takashi Akasaka, wakayama madical college, department of cargiorogy, wakayama, Japan

Background: Although multislice computed tomography(MSCT) is useful noninvasive modality in the assessment of coronary artery disease, the degree of stenosis could not be estimated correctly if there was severe calcification of coronary artery. On the other hand, coronary flow reserve (CFR) measured by transthoracic Doppler echocardiography(TTDE) is noninvasive physiological assessment method of coronary stenosis regardless of coronary calcification.The purpose of this study was to evaluate the clinical value of a combination of MSCT and CFR in the diagnosis of the left anterior descending coronary artery(LAD) stenosis.

Methods: We enrolled 30 patients with suspected coronary artery disease. They underwent 40-or 64-MSCT. Patients who were considered to have stenosis (diameter stenosis>50% in MSCT) in the LAD or to have inappropriate image due to severe calcification underwent both CFR and invasive quantitative coronary angiography (QCA) within two weeks period. CFR was calculated a ratio of hyperemic to basal peak flow velocity in the LAD.

Results: Twenty-three of 30 LAD were evaluated, and there were 8 LAD with stenosis>50%, and 6 LAD with stenosis>75% in MSCT. But 7 LAD were not of diagnostic image quality due to severe calcification. 15 patients with stenosis>50% or with poor images underwent both CFR and QCA. CFR was successfully measured in 13 of 15 patients. CFR<2 were shown in 8 of 13 patients. Only 1 patient did not have available result both in MSCT and in CFR. There were 9 of 15 LAD with stenosis>75% in QCA. A combination of MSCT and CFR improved diagnostic accuracy, and showed a sensitivity of 100 %, a specificity of 67%, a positive predict value of 78%, and a negative predict value of 100%.

Conclusion: Although severe calcification of coronary artery reduce diagnostic accuracy in MSCT, Combining MSCT with CFR provide high sensitivity and high negative predict value for diagnosis of the LAD stenosis.

11:00 a.m.

919-229   **Coronary Artery Plaque Composition Identified by Multidetector Computed Tomography Predicts Stress-Induced Myocardial Ischemia**

Fay Lin, Vishal Tandon, Richard B. Devereux, Franklin J. Wong, Massimiliano Szulc, Jonathan W. Weinsaft, James K. Min, Weill Medical College of Cornell University, New York, NY

Background: Multidetector computed tomography (MDCT) can differentiate non-calcified, calcified and mixed (non-calcified and calcified) plaques. Stress myocardial perfusion imaging (MPI) permits detection and prognosis of coronary heart disease (CHD). We determined the association between plaque composition and findings on stress MPI which predict CHD prognosis.

Methods: 119 consecutive patients without known CHD underwent both MPI and MDCT. CHD by MPI was defined as mild [summed stress score (SSS) > 4] or severe (SSS>8). Coronary arteries by MDCT were analyzed based on a 16-segment model. MDCT plaque composition scores were calculated by adding the total number of segments exhibiting non-calcified, calcified or mixed plaque.

Results: The frequency of both mild and severe ischemia by MPI was higher in patients with greater numbers of segments exhibiting mixed plaque (2.7 vs 1.6 and 3.0 vs 1.4, respectively, p<0.01 for both). In contrast, patients with greater numbers of segments with calcified or non-calcified plaque did not have higher rates or degrees of ischemic MPI (Figure 1). In multivariate analysis adjusting for CHD risk factors, severe ischemia by MPI was more likely in individuals with more mixed plaque (OR 4.7, 95% CI 1.8-12.2, p<0.001).

Conclusions: Mixed coronary artery plaque composition is an independent predictor of ischemic MPI. These results suggest that MDCT assessment of coronary arteries should include consideration of plaque composition, which may be prognostically valuable.

11:00 a.m.

919-230   **Metabolic Syndrome Is Independently Associated With Increased Coronary Atherosclerotic Plaque Burden**

Javed Butler, Eline AQ Mooyaart, Fabian Moselewski, Michael D. Shapiro, Thomas Brady, Udo Hoffmann, Massachusetts General Hospital, Boston, MA

Background: Although metabolic syndrome (MetSyn) is associated with adverse cardiovascular outcomes, its independent association with presence and extent of coronary atherosclerotic plaques and plaque characteristics is not well described.

Methods: Coronary plaques were assessed in 77 patients (age 54±12 years, 79% Caucasians and 36% females) who underwent 64-slice multi-detector computed tomography (MDCT) for chest pain, and compared among those who did (n=35, 45%) and did not (n=42, 55%) have MetSyn.

Results: Any coronary atheroscleroctic plaque was present in 32/35 (91%) patients with and 20/42 (46%) without MetSyn (p<0.001). Both non-calcified plaque (77% vs. 40%, p=0.001) and calcified plaque (74% vs. 45%, p=0.01) were more common in MetSyn patients. Similarly, the extent of atherosclerosis defined as the number of coronary segments with plaques was higher in MetSyn patients (5.8±3.7 vs. 2.1±3.3, p<0.001). MetSyn was independently associated with both presence and extent of plaques after the data were adjusted for either the Framingham risk score (OR 6.7, 95% CI 1.6-28.8, p<0.01 for presence and β coefficient 3.59, SE 0.88, p=0.009 for extent) or for individual risk factors including age, gender, smoking, body mass index, and history of hypertension, diabetes, hyperlipidemia, and coronary disease (OR 8.4, 95% CI 1.7-42.5, p=0.008 for presence and β coefficient 2.35, SE 0.86, p=0.007 for extent).

Conclusions: : Coronary atherosclerotic plaques burden is significantly higher in patients with than those without MetSyn independent of other risk factors, which may explain the higher risk for adverse cardiovascular events in these patients

11:00 a.m.

919-231   **Multidetector Computed Tomography for the Detection of Left Atrial Appendage Thrombus - A Comparative Study with Transesophageal Echocardiography**
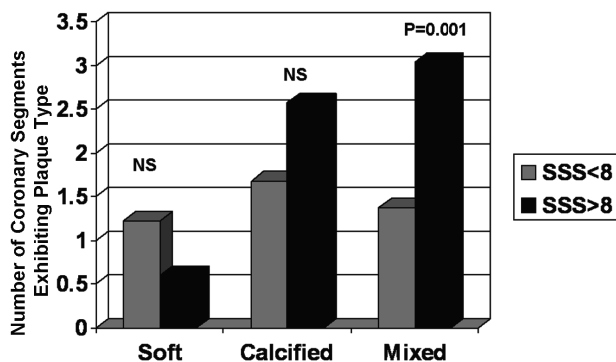
Michael Shapiro, Thomas G. Neilan, Davinder S. Jassal, Bharat Samy, Khurram Nasir, Udo Hoffmann, Thomas J. Brady, Ricardo C. Cury, Massachusetts General Hospital, Boston, MA

Background:Given its potential morbidity, accurate detection of left atrial appendage (LAA) thrombus is of utmost importance. While the utility of CT for the detection of LAA thrombus has been explored, these studies did not specifically analyze patients with isolated spontaneous echo contrast (SEC) and therefore did not determine if CT can discriminate between these two entities. Therefore, we evaluated the diagnostic performance of multidetector CT (MDCT) to 1) detect LAA thrombus and 2) determine if MDCT could differentiate between LAA thrombus and isolated spontaneous echo contrast (SEC).

Methods: Forty-three patients were studied to determine the diagnostic characteristics of MDCT for detection of LAA thrombus. Results were compared with transesophageal echocardiography (TEE). For quantitative analysis, a ratio of the mean CT attenuation in the LAA apex to the mean CT attenuation in the aortic root was calculated and a sensitivity analysis was performed to determine the threshold at which this ratio optimized the diagnostic characteristics of MDCT for distinguishing patients with and without LAA thrombus.

Results: A filling defect visualized in the LAA by MDCT corresponded to a sensitivity of 70%, a specificity of 82%, and a negative predictive value of 90% for detection of LAA thrombus. We found that in all cases where MDCT detected a filling defect in which there was no LAA thrombus on TEE (e.g., false positive MDCT), the TEE demonstrated SEC. When using quantitative parameters, a ratio of the mean CT attenuation in the LAA apex to the mean CT attenuation in the aortic root of <0.7 demonstrated a sensitivity of 80%, a specificity of 73%, and a negative predictive value of 92%. MDCT was not able to differentiate LAA thrombus

from SEC by either visual evaluation or by quantitative parameters.

Conclusions: Non-invasive MDCT has a moderate sensitivity and specificity to detect LAA thrombus in a clinical population. The utility of MDCT for this purpose is limited by its inability to differentiate between LAA thrombus and isolated SEC. However, as demonstrated by our findings, the high negative predictive value is potentially helpful in ruling out these diagnoses in patients undergoing MDCT scanning.

11:00 a.m.

919-232   Can Improvements in Dyssynchrony Occur via Non-Pacemaker Techniques; Utilization of a Minimally Invasive LV Wrap: Detection of Dyssynchrony by CMR

Robert W. Biederman, Frank Grothues, Helmut Klein, Ronald Williams, June Yamrozik, Geetha Rayarao, Diane A. Vido, Christof Huth, Mark Doyle, Allegheny General Hospital, Pittsburgh, PA

Introduction: In pts presenting with dilated cardiomyopathy (CMX), the efficacy of dyssynchrony reduction by placing a Nitinol wrap around the heart is unknown.

Hypothesis: We hypothesize that the HeartNetTM (Paracor Medical Inc, Sunnyvale, CA) surgically placed in pts with severe dilated CMX reduces dyssynchrony.

Methods: At baseline, 18 subjects, 8 pts (47±9 yrs) with mean NYHA Class 2.3±0.5 on optimal medical therapy and 10 controls (44±7 yrs) underwent 3D cardiovascular MRI to assess LV function. Using Medis Mass software (Leiden, The Netherlands), endocardial and epicardial boundaries were outlined in contiguous short-axis slices. Circumferentially, the myocardium was divided into 16 equally spaced segments and end-systolic (ES) time automatically identified as time of maximal wall thickening. End-systolic times were measured for each segment and the dyssynchrony index taken as the dispersion of ES times. All treated pts underwent minimally invasive L thoracotomy with deployment of the HeartNet™ designed to conform to the epicardium. FU MRI was performed at 6 mo in all pts.

Results: All pts survived HeartNet™ placement and were available for FU. NYHA class decreased to 1.9±0.6 (p<0.04). Global LV wall thickening improved (129±29% vs 136±35%, p<0.001) but remained lower than controls (169±39%, p<0.001) and ES wall thickness increased (10.2±2.7mm vs 10.8±3.0mm, p<0.001). For the mid and apical regions, indices of ES dyssynchrony showed no significant change pre to post. The basal region demonstrated a reduction in the LV dyssynchrony index (254ms vs 220ms, p<0.05, f = 12.8). At baseline, the ES time of the base was higher than controls (363±254ms vs. 311±75ms, p< 0.0001) and at FU, ES time at the base was comparable to controls (331±220ms vs. 311±75ms, p=0.09).

Conclusion: Given the general paucity of novel therapies available for treatment in dilated CMX, placement of the HeartNet™ LV wrap improved global myocardial function, basal ES time was restored to near normal values with a concomitant improvement in synchrony. A major advantage of this approach is that it is minimally invasive. A registered clinical trial (PEERLESS) in USA and Europe is now under way.

11:00 a.m.

919-233   Coronary Artery Calcium Score and Non-Invasive Angiography with Multi-Slice Computed Tomography; Comparison to Myocardial Perfusion Imaging in Asymptomatic Diabetics.

Arthur Scholte, Joanne Schuijf, Antje Kharagjitsingh, Marcel Stokkel, Wouter Jukema, Albert de Roos, Ernst van der Wall, Jeroen Bax, Leiden University Medical Center, Department of Cardiology, Leiden, The Netherlands

Background: In patients with type 2 diabetes, detection of coronary artery disease (CAD) is difficult as the disease often has progressed to an advanced stage prior to complaints and diagnosis. For early detection, single photon electron computed tomography (SPECT) perfusion imaging which detects ischemia has been proposed; while more recently, also direct visualization of atherosclerosis has become possible with computed tomography (CT) techniques. Aim of the study was to compare the presence of atherosclerosis and ischemia in asymptomatic patients with type 2 diabetes.

Methods: A total of 45 asymptomatic patients with type 2 diabetes, aged 34-72 years, and one or more risk factors for CAD were prospectively recruited from a specialized outpatient diabetes clinic. In all patients the presence and extent of atherosclerosis was assessed by coronary artery calcium (CAC) scoring and coronary angiography (CTA) using 64-slice multi slice CT, while the presence of ischemia was evaluated by SPECT myocardial perfusion imaging using adenosine stress.

Results: Coronary calcium was detected in 27 (60%) patients, while 32 (71%) showed evidence of atherosclerosis on CTA with at least 1 significant (≥50% luminal narrowing) lesion in 13 (29%). Abnormal SPECT studies were obtained in 21 (46%) patients. In patients without calcium a normal SPECT was obtained in 12 (67%), whereas ischemia was observed in all 7 patients with a calcium score >400. In patients with an abnormal SPECT, atherosclerosis was observed on CTA in the majority (n=17, 81%) of patients with 11 (52%) showing significant CAD. Importantly, an abnormal CTA was also encountered in the majority of patients (n=15, 62%) without ischemia on SPECT.

Conclusions: A high prevalence of atherosclerosis (detected by CAC and CTA) was observed in asymptomatic patients with type 2 diabetes. However, not all atherosclerotic lesions resulted in ischemia (as determined by SPECT), indicating that the techniques provide different information. To determine the potential prognostic value of observed atherosclerosis in this population, follow-up data are highly needed.

11:00 a.m.

919-235   Where is Best Pacing Site to Decrease Dyssynchrony for Complete Atrioventricular Block? - Study of Electrocardiographically Gated Myocardial Single Photon Emission Computed Tomography -

Hitoshi Yamaguchi, Masami Nishino, Kiyoshi Yamagami, Akihito Hashimoto, Ken Matsuoka, Takahito Tamai, Hiroyasu Kato, Yasuyuki Egami, Ryu Shutta, Kenjiro Tanaka, Jun Tanouchi, Yoshio Yamada, Osaka Rosai Hospital, Sakai, Japan

Background: It has been reported that left ventricular dyssynchrony decreased cardiac output in patients with heart failure and right ventricular apical pacing (RVAP). Three-dimensional analysis of dyssynchrony by electrocardiographically gated myocardial single photon emission computed tomography (SPECT) may be useful for evaluate left ventricular dyssynchrony. Methods: To elucidate the difference between RVAP and right ventricular outflow tract pacing (RVOT) in consecutive 20 patients with complete atrioventricular block, we compared left ventricular ejection fraction (EF) and dyssynchrony from 16-frame gated technetium 99m tetrofosmin perfusion tomograms using quantitative gated SPECT (QGS) software. Result: The average time of acquisition of SPECT and analyzing QGS was 25 min. We defined dyssynchrony index (DysI) as difference of frame number of endsystole of septum and that of lateral wall. There were 10 patients with RVAP and 10 patients with RVOT (all DDD pacemaker). Results are shown at a table. Conclusions: With gated myocardial SPECT, we could evaluate LV dyssynchrony in patients of RVOT pacing and RVAP pacing quantitatively. RVOT pacing may be superior than RVAP pacing for cardiac synchronization. Gated myocardial SPECT has high reproducibility and easy software to use, thus this modality may be useful to evaluate regional dyssynchrony.

Dyssynchrony Index & LV Ejection Fraction

	RVAP	RVOT	P
DysI	19±0.8	1.3±0.9	0.04
LVEF	54±11%	59±10%	0.08

11:00 a.m.

919-236   Determination of the VE/VCO2 Slope From a Constant Work Rate Exercise in Cardiac Patients

Masayo Hoshimoto, Akira Koike, Osamu Nagayama, Kaori Yamaguchi, Akihiko Tajima, Ayumi Goda, Tadanori Aizawa, The Cardiovascular Institute, Tokyo, Japan

Background: The slope of the increase in ventilation to the increase in CO_2 output (VE/VCO2 slope) is a valuable index reflecting the severity of heart failure and is useful for predicting a prognosis in cardiac patients. Traditionally, an incremental exercise testing to a symptom-limited maximum has been performed to obtain this slope. In the present study, we studied whether the VE/VCO2 slope can be determined through a constant work rate exercise of mild intensity in cardiac patients.

Methods: Twenty-three consecutive patients with a history of anterior myocardial infarction (59±9 years, LVEF=34±5 %) underwent low-intensity (below the anaerobic threshold: 39±8 W) and high-intensity (above the anaerobic threshold: 69±15 W) constant work rate exercise for 6 min, in addition to an incremental exercise test to a symptom-limited maximum. From the incremental exercise, the slope was calculated from the start of incremental exercise to the respiratory compensation point by the least squares linear regression. From the constant work rate exercise, the VE/VCO2 slope could be similarly calculated from the start of exercise until the 4th min of exercise.

Results: The VE/VCO2 slope determined from incremental exercise was 33.8±5.9 on average, ranging from 20.9 to 42.8. The slope obtained from low-intensity exercise was 32.1±5.9 on average, ranging from 20.1 to 46.1. The slope obtained from high-intensity exercise was 32.9±5.7 on average, ranging from 23.0 to 44.4. The VE/VCO2 slopes obtained from the 3 exercise tests did not significantly differ each other. The slopes obtained from low and high-intensity exercise were significantly positively correlated with the slope obtained form the incremental exercise (r=0.58, p=0.003 and r=0.84, p<0.0001, respectively).

Conclusions: The VE/VCO2 slope has been traditionally determined from the incremental exercise test to the symptom-limited maximum. However, it is suggested that the slope might be determined from constant work rate exercise even at a mild to moderate intensity, perhaps because the relationship between ventilation and CO_2 output during exercise is consistent and independent of the modes of exercise testing.

Diagnostic Testing