transmission imaging does not adversely effect the emission data. Additionally, AC results in more individual segments and overall pt studies being interpreted as normal.

951-105 Quantitation of Regional Ejection Fractions Using Gated Tomographic Imaging With Tc-99m-Sestamibi

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Gated single photon emission computed tomographic (SPECT) sestamibi imaging allows simultaneous assessment of myocardial perfusion and left ventricular function. We evaluated a technique based upon edge detection to quantify regional ejection fractions (EF) in 15 subjects without cardiac pathology and 24 patients following myocardial infarction (MI). After tomographic reconstruction of gated short axis slices, identification of endocardial borders was made by a standard edge detection program in systole and diastole in each of five selected slices. Regional EF's were calculated for five regions within each slice. Myocardial perfusion was quantitated in the same regions. Ten patients underwent echocardiographic regional wall motion (RWM) analysis which was compared to corresponding regional EF results. *Results:* A high degree of interobserver reproducibility in the assessment of regional EF's was found with r values ranging from 0.94 to 0.98. In patients with anterior and inferior MI., regional EF's were abnormal in the anterior and septal, and inferior and lateral regions, respectively. Regional EF's correlated significantly with regional perfusion in anterior ($r = 0.63$, $p < 0.0001$), lateral ($r = 0.40$, $p < 0.0001$), and inferior walls ($r = 0.38$, $p < 0.0001$). There was a significant association between regional EF and echocardiographic RWM assessment at the base ($p < 0.0001$), mid ventricle ($p = 0.004$), and apex ($p = 0.0003$). Conclusions: Gated tomographic images with technetium-99m-sestamibi can provide reproducible quantitative segmental regional EF's for multiple left ventricular slices that are significantly associated with subjective RWM assessment by echocardiography.

951-106 Artificial Neural Network for Automatic Interpretation of Myocardial Perfusion SPECT

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Interpretation of myocardial perfusion SPECT (MPS) is mainly subjective, whereas quantitative programs (QP) are currently still not in widespread clinical use. We developed a novel, flexible, non-rule based artificial neural network (NN) which can uniquely "learn" from experience. A group of 140 pts who underwent exercise sestamibi SPECT comprised our training set (TRG), and a different group of 97 pts was used for testing (TSG). Defect extent and severity data were derived from raw circumferential profiles, produced by an optimized QP (CEqual), and used as NN inputs. Exercise scans were visually scored (2 experts) in 20 myocardial segments (5 point score: 0 to 4 = normal to no uptake) for use as NN and QP targets. Abnl scan was defined by a summed score of ≥ 2 for ≥ 2 segments. NN output scores were compared to visual scores. The NN results were also compared to CEqual outputs for the same TSG. The overall sensitivity/specificity for the NN and CEqual were 85/83% and 92/77%, respectively (p = ns). Overall accuracy results are as follows:

Accuracy (%)	Total	ant	ant-sept	inf-sept	inf	inf-lat	ant-lat	apx
NN	83	77	86	77	86	85	89	76
CEqual	81	86	82	76	86	78	77	78

ROC curves for the NNand for CEqual show comparably highvalues. Conclusion: these initial results suggest that our NN issuitable for accurate identification of MPS defects.

951-107 Accuracy and Reproducibility of Automated Tomographic Ventricular Function Measurements

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Both manual and automated methods for computing left ventricular (LV) end-diastolic (ED) volume, end-systolic (ES) volume and ejection fraction (EF) from scintigraphic gated tomograms have been developed but reproducibility and accuracy of measurements versus other methods are not well known, particularly since automated programs can be confounded by conditions such as reduced regional myocardial perfusion. In automated processing of horizontal and vertical long axis Tc-99m sestamibi gated myocardial perfusion tomograms of 145 patients (pts), experienced observers judged it necessary to alter: (1) ED or ES frames in 7% of pts, (2) endocardial borders in 14%, and (3) LV cavity center locations in 28%. Agreement among independent observers using the software demonstrated correlation by linear regression of $r = 0.92$, and compared to manual EF determinations as $r = 0.90$. Regression analysis yielded $r = 0.87$ for tomographic EF vs. first pass EF in 67 pts. Linear regression for tomographic EF vs. gated equilibrium EF in 77 pts was $r = 0.87$, and similar correlation coefficients were computed for these pts when subgrouped according to whether changes were or were not needed for LV center location ($r = 0.91$ vs. $r = 0.86$), or endocardial borders ($r = 0.87$ vs. $r = 0.89$); and were likewise similar for pts grouped according to ED volume greater or less than the median value of 87.5 ml ($r = 0.89$ vs. $r = 0.87$). We conclude that our automated algorithms are reproducible and accurate compared to independent EF methods, and that changes needed in LV center location for over 25% of pts cause no degradation in EF accuracy.

951-108 Absolute Right and Left Ventricular Volume and Ejection Fraction Measurements by Tomographic MUGA

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To validate tomographic radionuclide gated equilibrium blood pool scintigraphy (TMUGA) absolute volume and ejection fraction measurements, gradient-echo MRI, conventional first pass radionuclide (FP) and planar gated equilibrium blood pool (PMUGA) scintigraphy were performed. Ten patients with normal and abnormal ventricular function had TMUGA and MRI. Ten patients also had TMUGA and FP. TMUGA was acquired using a 3-headed camera and 16 gated intervals. TMUGA ventricular volumes were calculated by Simpson's rule with regions defined by 1) phase analysis to separate atria and ventricles 2) threshold to define ventricular free borders and 3) visual inspection to define interventricular septum. Cardiac phantom studies were performed to obtain appropriate volume threshold for patient TMUGA. As previously validated, MRI studies were acquired on a 1.5 Tesla system with a multiphase, breath-hold, segmented k-space technique. MRI volumes were calculated by Simpson's rule using 12–16 6 mm thick parallel short axis slices and regions defined by a semi-automatic contour tracking routine. Gated FP radionuclide angiography and PMUGA were performed for RVEF and LVEF.

Volume measurements at end-systole and end-diastole by TMUGA showed good correlation with MRI for RV ($r = 0.91$, slope = 0.90, SEE = 15.7) and LV ($r = 0.96$, slope = 0.88, SEE = 18.2). TMUGA also showed good correlation for both RVEF and LVEF.

	TMUGA RVEF				TMUGA LVEF		
	r	slope	SEE		r	slope	SEE
MRI	0.88	0.79	6.0	MRI	0.94	1.10	9.0
FP	0.86	1.2	7.9	PMUGA	0.97	1.23	6.2

TMUGA shows good accuracy in simultaneous measurements of absolute right and left ventricular volumes and ejection fractions.

952 Hypertension: Basic and Clinical

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Orange County Convention Center, Hall E
Presentation Hour: 10:00 a.m.–11:00 a.m.

952-109 Outcome in Medically Managed Second Opinion Patients With Coronary Artery Disease and Short Exercise Duration

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An exercise treadmill test (ETT) duration of less than 6 mins (standard Bruce protocol) is viewed as a poor survival predictor in patients with coronary artery disease (CAD). To determine the prognosis of short exercise duration (SED) in patients with documented CAD, referred for a second opinion prior to bypass grafting, we analyzed ETT and clinical data with a mean follow up period of 6.1 yrs (SD 5.7) in 50 consecutive pts (mean age was 69.3 yrs, 46 M), who received medical treatment. Clinical and ETT data revealed prior myocardial infarct (MI) n = 25, a mean EF of 45%, a peak HR of 113.3, mean resting BP of 134/75, peak BP of 139/74 and a mean ST segment depression of 1 mm. A cardiac event was defined as cardiac death, nonfatal myocardial infarct, congestive heart failure (CHF) or revascularization procedure: PTCA or CABG. *Results:* Cardiac events occurred in 22 pts, with nonfatal MI (n = 7), CHF (n = 6) and revascularization (n = 15). Cardiac mortality was 12% (n = 6), with fatal MI (n = 1), 2 death peri-angioplasty and 3 peri-operatively. Multivariate significant ($p < 0.05$) adverse prognostic predictors (Cox) were presence of rest angina, b-blocker therapy and pre ETT use of s.l. nitro.