1141-34 **Assessment of Left Ventricular Diastolic and Systolic Function in Patients With Heart Failure Using Steady State Cine Magnetic Resonance Imaging: Validation Study Using Conductance Catheter**

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Background: Left ventricular systolic and diastolic functions have been recognized as important factors in cardiovascular diseases. Conductance catheter has high temporal resolution and can provide accurate measurements of cardiac functions. However, it has been difficult to obtain an accurate assessment of left ventricular function by using noninvasive techniques. Steady state cine MR imaging is a new MR imaging technique that can demonstrate improved temporal resolution in the cardiac cycle. In addition, high blood-to-myocardial contrast can be obtained in patients with heart failure. The purpose of this study was to evaluate the accuracy of steady state cine MR imaging for assessing left ventricular volumes and functions by using a conductance catheter method as a gold standard. Methods: Fourteen patients (9 men, mean age 60.4±11.3 years) with heart failure (7 with dilated cardiomyopathy, 5 with old myocardial infarction, 2 with constrictive pericarditis) were studied. Left ventricular time-volume curves were obtained with steady state free precession cine MR imaging and with a single-field conductance catheter using a micromanometer. End-diastolic volume (EDV), end-systolic volume (ESV) and ejection fraction (EF) were calculated. In addition, peak ejection rate (PER), time to PER, peak filling rate (PFR) and time to PFR were assessed by the first derivative curve of the left ventricular time volume curve. Temporal resolutions was 26 msec by MR imaging and 3 msec by conductance catheter. Results: Excellent cine MR images were acquired in all patients by using steady state cine MR imaging. Significant linear correlation between the measurements by MR imaging and conductance catheter was found for EDV (r=0.98, p<0.001), ESV (r=0.99, p<0.001), EF (r=0.97, p<0.001), PER (r=0.76, p<0.01), time to PER (r=0.78, p<0.01), PFR (r=0.66, p<0.05) and time to PFR (r=0.77, p<0.01). Conclusion: MR measurements of LV volume, EF, PER and PFR obtained by using a steady state cine MR imaging demonstrated good correlations with those assessed by conductance catheter. Cardiac MR imaging is a noninvasive method that can provide detailed analysis of the cardiac performance in patients with LV dysfunction.

POSTER SESSION

1142 Nuclear

Monday, March 31, 2003, 3:00 p.m.-5:00 p.m.
McCormick Place, Hall A
Presentation Hour: 4:00 p.m.-5:00 p.m.

1142-35 **Higher First-Pass Extraction of ^{99m}Tc-N-NOET Enhances Magnitude of Reversible Defects: Validation of Animal Model in Humans**

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Background: ^{99m}Tc-N-NOET (NOET) is a lipophilic neutral molecular tracer being developed for myocardial perfusion imaging. It differs from the ^{99m}Tc-labeled charged molecules in that it redistributes similarly to ^{201}Tl. We have found in a dog model that the first-pass myocardial extraction was higher for NOET compared to other ^{99m}Tc-labeled tracers. Hypothesis: If this is true in humans, it would imply greater contrast between normal myocardium and stress-induced defects for NOET compared to ^{99m}Tc-sestamibi (MIBI). Methods: Quantitative SPECT studies were obtained on 26 patients (19 males; 60±13 years old; 12 with prior myocardial infarction). Same-day MIBI studies were performed followed within 3 days by exercise-delayed NOET studies. Bruce protocol was used and the same level of exercise was achieved in both tests. Results: In 364 segments quantitatively measured at rest there was good correlation (Pearson r=0.89) and mean segmental uptake was not different (81.08% versus 81.09%, p=0.98). There was a small difference in mean uptake of all 364 segments with stress (80.8% for NOET and 81.6% for MIBI, p=0.01). The difference was greater for 89 reversible defects with averages of 68.4% for NOET versus 71.0% for MIBI (p<0.001). The Gosselin-Stibetz capillary diffusion model was used previously (Glover et al.) to fit the animal data of tracer extraction versus myocardial blood flow. We used the same model with parameters obtained from the animal studies to derive a theoretical relationship for the defect ratio of NOET versus MIBI as a function of defect magnitude. The model prediction, obtained from animal data, fits our human data with p=0.88. Conclusion: This study provides experimental verification that the non-linearity of extraction versus flow is similar in humans and the dog model. The higher ^{99m}Tc-N-NOET extraction results in greater defect contrast and greater magnitude of reversibility in reversible defects. This is in accordance with animal studies measuring tracer extraction as a function of myocardial blood flow.

1142-36 **Comparison Between the Myocardial Uptake of ^{99m}TcN-DBODC5 and ^{201}Tl During Vasodilator Stress in a Canine Model of a Critical Coronary Stenosis**

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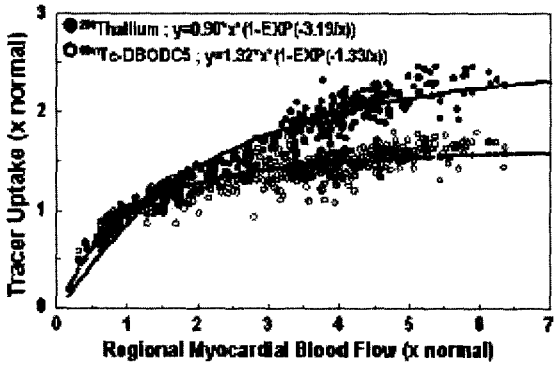
Background: ^{99m}TcN-DBODC5 (DBODC5) is a new lipophilic, cationic myocardial perfusion imaging agent. Previous rat studies from our lab demonstrated high initial heart to background ratio (2.6) and slow washout combined with very rapid liver clearance. **Methods:** The goal of this study was to compare the myocardial extraction of DBODC5 with ^{201}Tl over a wide range of regional myocardial blood flows. Accordingly, 8 anesthetized dogs with critical LAD stenoses were given an i.v. infusion of an adenosine A_{2A} receptor agonist (ATL-146e; 0.3 μg/kg/min) that induced a 4-fold increase in normal LCX zone regional flow (p<0.01) with no change in flow in the stenotic LAD zone. DBODC5 (8 mCi), ^{201}Tl (0.75 mCi), and radioactive microspheres were co-injected at peak flow and the dogs were euthanized 5 min later. Flow and tracer activities in myocardial segments were assessed by gamma well counting. **Results:** As shown below, the myocardial extraction of both DBODC5 and ^{201}Tl plateaued as flow increased, with higher extraction of ^{201}Tl at hyperemic flows. Both tracers underestimated the extent of the flow disparity as the DBODC5 (0.59±0.07) and ^{201}Tl (0.44±0.05) LAD/LCX activity ratios were higher than the microsphere flow ratio (0.25±0.03) at the time of injection. **Conclusions:** The flow-extraction relationship for DBODC5 was comparable to other cationic ^{99m}Tc tracers. The more rapid liver clearance, however, could give it an advantage over other ^{99m}Tc-labeled tracers for clinical imaging.



1142-37 **Myocardial Perfusion Cold Pressor Test ^{99m}Tc MIBI-SPECT Detects Both Microvascular and Epicardial Abnormal Reactivity in Patients With Endothelial Dysfunction and Angiographically Normal Coronary Arteries With Intracoronary Acetylcholine Vasoconstriction**

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Background: Since invasive methods to evaluate endothelial function have important limitations, studies should attempt to assess it in a noninvasive way. We previously reported a close correlation between myocardial perfusion defects ^{99m}Tc MIBI-SPECT and abnormal intracoronary acetylcholine (ACH) response. Other authors showed correlation between Cold pressor test (CPT) and ACH. Objective: To correlate ACH vasoconstriction response with CPT-SPECT myocardial perfusion abnormalities in patients with endothelial dysfunction and angiographically normal coronary arteries. Methods: 18 patients (aged 45±10, 8 males) with angiographically normal coronary arteries and vasoconstriction response to ACH were studied with CPT ^{99m}Tc MIBI SPECT imaging perfusion. Vasomotor response to intracoronary increasing doses of ACH and a single dose of nitroglycerin (NTG) was assessed with digital quantitative angiography. Regional myocardial perfusion was evaluated at rest and after CPT by a semiquantitative score analysis in a 17 segment model. Correlation curves between: Epicardial Basal Lumen diameter (BL), ACH L, NTG L, and myocardial perfusion score (PS) were obtained. Results: all patients had regional perfusion defects. Myocardial perfusion score was at CPT 7±3.8, rest 1.3±4.2 (p<0.00001). Mean BL was: 3.4±0.9mm, ACH L 2.3±0.7, decreased 30% (p<0.00003). NTG L 3.6± 1mm vs. ACH L p<0.00001. Positive correlation was found between:1) BL and ACH L (r = 0.83 p< 0.002). 2) BL and NTG L (r = 0.87 p< 0.001). No correlation was found between:1) CPT-PS and ACH L (p:ns). 2) CPT- PS and BL (p:ns). Conclusions: These results suggest that CPT SPECT perfusion abnormalities may be related to epicardial and microvascular coronary reactivity in patients with endothelial dysfunction and angiographically normal coronary arteries.

1142-38 **Myocardial Perfusion Imaging With a Novel Selective A2a Adenosine Receptor Agonist (CVT-3146): Important Differences in Radiotracer Behavior**

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Background: Use of a selective A2a adenosine receptor agonist, CVT-3146 (CVT), for perfusion imaging may reduce side effects, however, the effects of CVT on radiotracer myocardial uptake is undefined. Methods: To determine myocardial uptake of thallium-201 (TL) and Tc99m-sestamibi (MIBI) in relation to coronary flow (FL) during CVT stress, a proximal LCX stenosis was created in anesthetized open chest dogs (n = 6), using a hydraulic occluder, which was adjusted to blunt reactive hyperemia without reducing rest FL. FL was measured with FL probes and radiolabeled microspheres (mSPH). CVT (2.5 ug/kg) was administered as a 30 sec i.v. bolus, followed 10 sec later by simultaneous i.v. injection of TL (1.5 mCi), and MIBI (25 mCi), and left atrial injection of a second mSPH for determination of stress FL. At 5 min after tracer injection, hearts were excised and cast for ex vivo SPECT imaging. Images were quantified using circumferential count profile