A NEW PORTABLE COMPUTERIZED MULTIWIRE GAMMA CAMERA AND AUTOMATED FIRST PASS SOFTWARE

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We have evaluated a new compact, portable multiwire gamma camera (MWGC) developed for first pass radionuclide angiography (FPRA). The system consists of a 10" pressurized xenon multiwire detector, high speed digital interface and Intel 80286 processor with high resolution color graphics system integrated into a compact portable unit. On board first pass process software is provided for both LV and RV. The camera demonstrated a peak count rate of 900,000 cps, image uniformity of ± 3 % and resolves a 2 mm bar phantom with high contrast at 600,000 cps. The MWGC and software were applied in a catheterization laboratory study (78 patients) utilizing a portable tantalum-178 generator. Studies were analyzed at the bedside in a mean time of 4 minutes per ventricle. A four fold improvement in ventricular counts with a ten fold reduction in patient radiation dose compared with conventional cameras using technetium-99m was achieved. In 93 patient studies inter/intra observer variabilities were determined for ejection fraction, peak ejection rate, and peak filling rate. The r values for the LV were .994/.997, .992/.994 and .984/.990, respectively, and for the RV were .990/.992, .985/.989 and .931/.955, respectively. Thus, this camera package provided convenient portable FPRA studies with exceptional statistical quality which were also highly reproducible.

DOES THE PATHOPHYSIOLOGY OF MYOCARDIAL ISCHEMIA DURING MENTAL STRESS DIFFER FROM EXERCISE?

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Although both mental and physical stress are recognized triggers of myocardial ischemia in coronary artery disease patients, systematic comparative data are lacking on accompanying clinical and physiologic features. Accordingly, 20 men with reversible perfusion defect by exercise thallium (18 with ≥50% stenosis or previous myocardial infarction) underwent a 4 hour session of continuous radionuclide monitoring with exercise test (EX) and 2 standardized mental stress tasks (MS) ie. alternating mental arithmetic and Stroop color-word task (MAST) and a personally relevant speech. Comparing EX to MS, there was more frequent chest pain (6/20 vs 0/20, p<.005) and ≥1 mm ST depression (12/20 vs 3/20, p=.02) Mean baseline ejection fraction (EF) by nuclear VEST was 60±7%. Significant myocardial dysfunction (EF fall ≥5%) occurred with EX in 19/20 and with MS in 19/20; EF response did not differ in the 9 patients with previous myocardial infarction. The table shows change (▲) from baseline in heart rate (HR), systolic blood pressure (SBP), diastolic BP (DBP), rate pressure product (RPP - ie HR X SBP) and EF during MAST, Speech, Stages 1 and 2 of exercise (EX1, EX2).

	MAST	SPEECH	EX1	EX2
▲HR	3.7±6.9	9.7±5.5	40.3±11.3	60.3±16.7 *
▲SBP	20.0±12.6	33.5±14.8	10.9±16.5	15.5±24.9 #
▲RPP	2059±1948	4039±1934	7024±2738	10548±3978 *
▲DBP	7.8±6.8	19.4±7.8	-3.2±10.5	-1.6±10.5 @
▲EF	-8.3±7.0	-8.6±5.1	-5.1±5.7	-11.9±7.0 $

*: p=.0001, MAST vs Speech vs EX1 vs EX2, #: p=.01, Speech vs Other Tasks, @: p=.0001, MAST vs Speech vs Both stages of EX, $: p=.007, Stage1 of EX versus Other Tasks, Repeated Measures ANOVA

These data show marked disparity in incidence of ST shift despite similar decreases in EF, thus indicating "super silent" ischemia with MS. Given similar fall in EF, MS evoked smaller increase in RPP but larger increase in DBP compared to EX. This suggests that decreased oxygen supply may contribute to the development of myocardial ischemia during MS.

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Wednesday, March 6, 1991
Poster Displayed: 2:00PM–5:00PM
Author Present: 2:00PM–3:00PM
Hall F, West Concourse
Coronary Disease

USEFULNESS OF MAGNETIC RESONANCE IMAGING FOR ASSESSING REJECTION AFTER HETEROTOPIC HEART TRANSPLANTATION

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RV biopsies are difficult to perform in Pts with heterotopic heart transplantation (HHT). Magnetic resonance imaging (MRI) should be useful for detecting myocardial changes resulting from cardiac rejection since tissue inflammation results in increased T_2 relaxation time. Seven Pts with HHT (1 Pt had 2 donor hearts in place) underwent 17 MRI studies (1-7 months post-HHT) within 24 hours of RV biopsy (total=22 donor hearts imaged). Selective donor heart ECG-gating and use of a unique velocity-compensated long-echo MRI sequence enhanced tissue contrast. A change in the biopsy score of ≥3 on the McAllister scale was considered clinically significant rejection. MRI myocardial/skeletal muscle signal intensity ratio (M/S) (TE=90 ms) correlated best with biopsy-determined rejection. Variability among 6 normal subjects for M/S was high (1.2;±2SD). However, for the same subjects imaged at monthly intervals, variability was low (0.13;±2SD). Therefore, relative changes in M/S, not absolute values, correlated best with rejection by biopsy. A change in M/S of ≥0.25 corresponded to a change of ≥3/10 by biopsy. Using these criteria, sensitivity, specificity and accuracy for detecting significant change in the biopsy score by MRI was 100%, 86% and 89%, respectively. One Pt with strong clinical evidence of rejection and a low biopsy score (3/10) had a large change (+0.58) in the M/S ratio. Steroid therapy produced clinical improvement and a favorable change in M/S (-0.8). Thus, MRI can be readily performed in Pts with HHT; rejection can be detected when Pts are imaged serially, and it may be more useful than RV biopsy in some cases.

SERIAL QUANTITATIVE ANGIOGRAPHY MAY NOT IMPROVE THE DETECTION OF CORONARY ARTERIOPATHY AFTER HEART TRANSPLANT

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Accelerated allograft atherosclerosis (AGAS) has an insidious onset. Routine coronary angiography is used to screen for AGAS but is problematic. To determine if serial quantitative arteriography using the Cardiovascular Angiography Analysis System (CAAS, a computerized edge detection program) would increase the detection of AGAS, we serially evaluated 28 Pts after heart transplant. Catheters, views and vessel segments were standardized using reproducible methods. Mean measurement variability ± 1 SD was .17 ±.08mm (range .01-.26mm). All Pts underwent 2 studies approximately 1 year apart (mean 368 days). Studies were done at 6 weeks and 1 year in 12/28 Pts, 1 and 2 years in 10/28, 2 and 3 years in 2/28, and 3 and 4 years in 3/28. Mean mid left anterior descending coronary (LAD) diameter was 3.17 ± 0.6mm on the first study and 3.06 ± 0.7mm on the second, p>0.05. Use of nitroglycerin to standardize basal tone at a maximally dilated state did not alter the analysis (3.56 ± 0.7mm and 3.50 ± 0.7mm 1st vs 2nd study, p>0.05). No difference was noted for distal LAD analysis. Diameter increase or decrease ≥ measurement variability was only seen in 1 pt each. AGAS by visual assessment was present in 7/28 Pts but when these studies were analyzed separately, no significant LAD diameter reduction was noted by CAAS. We conclude that quantitative arteriography with a CAAS system may offer no advantage over conventional arteriography in the detection of AGAS.