39TH ANNUAL MEETING

TECHNOLOGIST SECTION PROGRAM

**Proceedings of the 39th Annual Meeting of
The Society of Nuclear Medicine
June 9–12, 1992 · Los Angeles, CA**

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39TH ANNUAL MEETING PROGRAM INFORMATION

General Information

On-Site Registration

This year, in order to alleviate the lines on the first days of the meeting, the Society is instituting a new feature called Satellite Registration. This separate registration area will be at the Westin Bonaventure Hotel in the California Ballroom foyer and is open on Saturday and Sunday. Attendees will be able to pick up their pre-registration materials or register on-site as well. The Society will have its standard registration hours at the Convention Center. The hours of the satellite and standard registration areas are as follows:

Satellite Registration—Westin Bonaventure Hotel

Saturday, June 6, 1992 11:00 A.M.–4:00 P.M.
Sunday, June 7, 1992 10:00 A.M.–3:00 P.M.

Los Angeles Convention Center

Sunday, June 7, 1992
12:00 P.M.–5:00 P.M.
Monday, June 8, 1992
7:00 A.M.–5:00 P.M.
Tuesday, June 9, 1992
7:00 A.M.–5:00 P.M.
Wednesday, June 10, 1992
7:30 A.M.–4:00 P.M.
Thursday, June 11, 1992
7:30 A.M.–4:00 P.M.
Friday, June 12, 1992
7:30 A.M.–11:00 A.M.

Please note that name badges are required for admission into the Exhibit Hall, all educational meetings, and social events. Children under the age of 12 will not be admitted into the Exhibit Hall.

LOS ANGELES CITY INFORMATION DESK AND SNM MESSAGE CENTER

The Society of Nuclear Medicine and The Los Angeles Convention Center will staff two booths in the registration area to provide information regarding SNM activities at the Annual Meeting and to help attendees with any meeting problems or questions. Messages for meeting attendees will be posted daily, Monday, June 8 through Thursday, June 11, from 8:00 A.M. to 5:00 P.M. and on Friday, June 12 from 8:00 A.M. to 11:00 A.M.

SOCIETY AND TECHNOLOGIST SECTION COMMITTEE MEETINGS

Committee meetings will convene in the Westin Bonaventure Hotel, located only 6 blocks away from the Los Angeles Convention Center. All members are cordially invited to attend.

Technologist Section Meetings

Committees: Friday, June 5
National Council: Saturday, June 6
Business Meeting: Thursday, June 11

Society Meetings

Committees: Saturday, June 6 and Sunday, June 7
The following SNM committees are scheduled to meet on Saturday: National Biomedical Tracer Facility, Council Presidents/Committee chairs/Chapter Presidents, and Executive Committee.
Board of Trustees: Monday, June 8

SNM PUBLICATIONS AND MEMBERSHIP BOOTHS

Books and audiovisuals will be on sale from 10:00 A.M. to 5:00 P.M. Monday, 8:00 A.M. to 5:00 P.M. Tuesday through Thursday, and on Friday from 8:00 A.M. to 12:30 P.M.

There will be a *JNMT* booth to answer members' questions about the Journal and authors' questions about writing articles. Suggestions for topics to discuss in future issues are welcome and encouraged.

Members and nonmembers are encouraged to stop by the membership booth. Hours: 8:00 A.M.–5:00 P.M., Monday-Thursday; 8:00 A.M.–11:00 A.M., Friday.

SPECIAL EVENTS AND SOCIAL ACTIVITIES

Opening Night Cocktail Reception
Monday, June 8, 7:30 P.M. to 9:30 P.M. California Ballroom, Westin Bonaventure Hotel.

Awards Presentation, SNM Business Meeting, and Wine & Cheese Reception
Tuesday, June 9, 5:00 P.M. to 6:00 P.M. Room 502A, Los Angeles Convention Center.

Technologist Plenary Session, Scientific Award Presentation, and TS Business Meeting
Thursday, June 11, 12:10 P.M. to 1:50 P.M., Room 501A, Los Angeles Convention Center.
Awards will be presented for the best scientific papers, poster/exhibits, best student scientific papers, and the outstanding JNMT paper, as well as the Cardiovascular Council awards for best scientific papers.

1992 Technologist Party
Thursday, June 11, 8:00 P.M. to 11:00 P.M. Pool Deck, Westin Bonaventure Hotel.

Scientific Meeting Highlights
Friday, June 12, 3:15 P.M. to 5:00 P.M. Petree Hall D, Los Angeles Convention Center.

TECHNOLOGIST SECTION MATRIX

		ROOM 501A	ROOM 501C	ROOM 216 C	ROOM 208	ROOM 207
MONDAY	JUNE 8 8:00 to 3:00	**MANAGEMENT CATEGORICAL SEMINAR**	**PET CATEGORICAL: Clinical PET Workshop will be held at LAC-USC and UCLA Medical Centers, buses will leave the Convention Center at 8:00 and will return at 3:00**			**THE TEACHER IMPROVEMENT PROJECT SYSTEM (TIPS) SEMINAR**
	7:00 to 9:30	**Opening Cocktail Reception in the California Ballroom at the Westin Bonaventure Hotel**				
TUESDAY	JUNE 9 8:15 to 10:00	Formal Opening and Plenary Session **Petree Hall**, Followed by the Grand Opening of the Exposition				
	10:00 to 10:30	Coffee Break in the **Exhibit Hall**, Sponsored by **Medi-Physics, Inc.**				
	10:30 to 12:10	**RENAL I:** Renal Imaging and Functional Analysis	**PET I:** PET as a Clinical Reality	**SCIENTIFIC PAPERS:** Cardiac	**STUDENT DAY PROGRAM**	**PHYSICIAN RELATIONS:** Improving the Physician-Technologist Professional Relationship
	12:10 to 1:30	**TECHNOLOGIST ORIENTATION:** "Brown Bag" Luncheon	Visit Exhibits and have lunch in the **Exhibit Hall**		**STUDENT DAY LUNCH**	
	1:30 to 3:10	**RENAL II:** Renal Imaging and Functional Analysis	**PET II:** PET as a Clinical Reality	**SCIENTIFIC PAPERS:** Cardiovascular Technologist Investigator Competition	**GI IMAGING**	**PROFESSIONAL DEVELOPMENT:** Developing a Team Approach within the Nuclear Medicine Department
	3:10 to 3:30	Visit Exhibits in the **Exhibit Hall**				
	3:30 to 5:10	**RENAL II:** Renal Imaging and Functional Analysis (continued)	**3:30–4:20 THE FDA:** The Mission–The Message **4:20–5:10 – NRC:** Quality Management Program	**SCIENTIFIC PAPERS:** SPECT/Neurology	**GI IMAGING** (continued)	**PROFESSIONAL DEVELOPMENT:** Developing a Team Approach within the Nuclear Medicine Department (continued)
WEDNESDAY	JUNE 10 8:30 to 10:10	**CARDIAC I:** Myocardial Perfusion Imaging	**BRAIN I:** Fine Tuning Your Neuro SPECT Skills	**SCIENTIFIC PAPERS:** General/PET	**INFECTION CONTROL:** AIDS and Nuclear Medicine Technology	**8:30–9:20 PUBLIC RELATIONS WORKSHOP:** "Peaking" Interest in Nuclear Medicine
						9:20–10:10 "IS ANYONE OUT THERE?": Recruitment Retention and Reentry for the Nuclear Medicine Technologist
	10:10 to 10:30	Coffee Break in the **Exhibit Hall**, Sponsored by **Medi-Physics, Inc.**				
	10:30 to 12:10	**CARDIAC I:** Myocardial Perfusion Imaging (continued)	**BRAIN I:** Fine Tuning Your Neuro SPECT Skills (continued)	**SCIENTIFIC PAPERS:** Pediatrics/Gastroenterology/ General	**INFECTION CONTROL:** AIDS and Nuclear Medicine Technology (continued)	**PHYSICIAN RELATIONS:** Improving the Physician-Technologist Professional Relationship
	12:10 to 1:30	**Poster Session** in the Exhibit Hall/Visit Exhibits and have lunch in the **Exhibit Hall**				
	1:30 to 3:10	**CARDIAC II:** Ventricular Function Imaging and Agents on the Horizon	**BRAIN II:** Fine Tuning Your Neuro SPECT Skills	**SCIENTIFIC PAPERS:** Hematology/Infectious Disease/Pulmonary	**PEDIATRICS:** Clinical and Technical Considerations When Imaging the Pediatric Patient	**REIMBURSEMENT:** The "How To's" of Reimbursement
	3:10 to 3:30	Visit Exhibits in the **Exhibit Hall**				
	3:30 to 5:10	**CARDIAC II:** Ventricular Function Imaging and Agents on the Horizon (continued)	**BRAIN II:** Fine Tuning Your Neuro SPECT Skills (continued)	**SCIENTIFIC PAPERS:** Renal/Endocrine	**PEDIATRICS:** Clinical and Technical Considerations When Imaging the Pediatric Patient (continued)	**REIMBURSEMENT:** The "How To's" of Reimbursement (continued)
THURSDAY	JUNE 11 8:30 to 10:10	**SPECT I:** Basic Principles and Practical Applications of SPECT	**RADIATION SAFETY IN NUCLEAR MEDICINE I**	**SCIENTIFIC PAPERS:** Cardiac	**MONOCLONAL ANTIBODIES:** Practical Uses and Applications	**TOTAL QUALITY MANAGEMENT I:** An Overview
	8:30 to 12:10	**EDUCATORS FORUM** in the San Jose Room at the **Holiday Inn**				
	10:10 to 10:30	Coffee Break in the **Exhibit Hall**				
	10:30 to 12:10	**SPECT I:** Basic Principles and Practical Applications of SPECT (continued)	**RADIATION SAFETY IN NUCLEAR MEDICINE I** (continued)		**MONOCLONAL ANTIBODIES:** Practical Uses and Applications (continued)	**TOTAL QUALITY MANAGEMENT I:** An Overview (continued)
	12:10 to 1:50	**TECHNOLOGIST PLENARY SESSION/SCIENTIFIC AWARD/BUSINESS MEETING ROOM 501A**				
	1:50 to 3:30	**SPECT II:** Technical and Clinical Aspects of SPECT	**RADIATION SAFETY IN NUCLEAR MEDICINE II**	**NMTCB ITEM WRITERS WORKSHOP**	**1:50–2:40 JRC FORUM** **2:40–5:20 JRC SITE VISITORS WORKSHOP**	**TOTAL QUALITY MANAGEMENT II:** An Overview
	3:30 to 3:40	Break				
	3:40 to 5:20	**SPECT II:** Technical and Clinical Aspects of SPECT (continued)	**RADIATION SAFETY IN NUCLEAR MEDICINE II** (continued)	**NMTCB ITEM WRITERS WORKSHOP** (continued)	**JRC SITE VISITORS WORKSHOP** (continued)	**TOTAL QUALITY MANAGEMENT II:** An Overview (continued)
	8:00 to 11:00	**Don't Miss the SNM Technologist's Party at the Pool Deck at the Westin Bonaventure Hotel • The Technologist Party is Sponsored by All Exhibitors**				

Continuing Education **Scientific Papers**

ABSTRACTS OF SCIENTIFIC PAPERS

A Note on Scientific Papers

The Scientific and Teaching Sessions Committee of The Society of Nuclear Medicine—Technologist Section is pleased to present the abstracts of the scientific papers for the 39th Annual Meeting. The scientific papers will be presented commencing Tuesday, June 9, in sessions beginning at 10:30 A.M. Please note that on Wednesday, June 10, scientific papers will be presented in sessions beginning at 8:30 A.M.

TUESDAY, JUNE 9, 1992

FORMAL OPENING AND PLENARY SESSION

8:15 A.M.–10:00 A.M. PETREE HALL

Welcome and Opening Remarks:
Leon S. Malmud, MD
President, The Society of Nuclear Medicine

John W. Keyes, Jr, MD
Chairman, 1992 Scientific Program Committee

Cardiff, "Mickey" Williams, CNMT
President, The Society of Nuclear Medicine—Technologist Section

Special Presentation

The Thirteenth Annual Georg Charles de Hevesy Nuclear Medicine Pioneer Award Presentation:
Honoree: Michael J. Welch, PhD
Mallinckrodt Institute of Radiology
St. Louis, Missouri
Introduction: William C. Eckelman, PhD

The Ninth Annual SNM Lectureship:
Medical Imaging in the Nineties: New Directions for Nuclear Medicine
C. Douglas Maynard, MD
Bowman Gray School of Medicine
Winston-Salem, North Carolina

Opening of the 1992 SNM Exposition:
Exhibit Hall, Los Angeles Convention Center

TUESDAY, JUNE 9, 1992

Session I

Cardiac

10:30–12:10 **Room: 216C**

Moderators: Suzanne Bailey, CNMT and Donna Marciano, CNMT

No. 943

GATED SESTAMIBI TOMOGRAPHY FOR DETECTION OF MYOCARDIAL PERFUSION ABNORMALITIES. MG Morgan and F Mannting. University Hospital, Uppsala, Sweden.

Sestamibi makes gated SPECT perfusion imaging possible because of Tc-99's energy and counting statistics. The aim of this study was to analyze what additional information could be obtained by performing gated SPECT imaging while considering the investment in extra time and effort.

We studied 83 subjects (20 normals, 63 patients) using a 1-day protocol (6 mCi at rest, followed by 24 mCi at peak stress).Studies were acquired at 8 frames/RR interval over 180°, 32 angles, 32s/angle. Acquisition data were formatted to 1) a standard, non-gated study; 2) a study consisting of only diastolic frames (frames with constant LV cavity); and 3) dynamic studies for analysis of wall motion.

Camera time was approximately 40% longer and filtering and reconstruction 8 times longer than a standard SPECT study. Processing of diastolic (DIA) studies took approximately 5 min. Acquisition and reconstructed files occupy 8 times more storage space. High quality dynamic and DIA studies were obtained in 80/83 pts (2 had arrythmias, 1 had high interfering bowel uptake). The RV appeared more distinct on DIA studies than in non-gated studies($p<.01$). LV cavity was larger in DIA studies vs non-gated studies ($p<.001$) leading to more useful coronal slices with cavity ($p<.001$). A significant inverse relation between LV size and increase in number useful coronal slices with ventricular cavity in DIA studies was seen ($r= -0.87$, $p< .001$).

The cost in time and storage space required by gated SPECT is offset by additional diagnostic information in dynamic and DIA images, and clearer LV and RV visualization. Gated SPECT is particularly useful in pts with small hearts or in pts with LV hypertrophy. Reformatting acquisition data into various formats provides flexibility.

No. 944

RADIONUCLIDE ANGIOGRAM DOSE ADJUSTMENT BASED UPON PATIENT PHYSICAL PARAMETERS. R.B. Glynn, L.G. Narveson, J.C. Hung, and R.J. Gibbons. Mayo Clinic, Rochester, MN.

The standard 30-mCi Tc-99m equilibrium radionuclide angiogram (RNA) dose,used in the modified in-vivo RBC labeling technique, has long been a problem in two respects: 1) unnecessarily high doses in smaller patients, 2) poor count statistics in large patients. To rectify these problems, a dose chart was created based on height, weight, and sex to assist in the dispensing of an appropriate RNA dose. The chart created is based on the Metropolitan Weight and Height Table which states the normal ranges of weight for men and women according to their respective height. The 30-mCi dose is used for this normal range and 1 mCi is added or subtracted for every 10-pound deviation from this normal range. We retrospectively identified 12 patients (group A) who received the standard 30-mCi dose but would have received a reduced dose if our chart had been used. We prospectively applied our chart to 91 patients and calculated the counts per pixel within the left ventricular region. The study group was divided into three subgroups: B) patients who received 30 mCi (52±11 cts/pix, n=32), C) patients who received less than 30 mCi (56±8 cts/pix, n=28), D) patients who received greater than 30 mCi (54±12 cts/pix, n=31).

Statistical analysis shows that there is no significant difference (p=0.22) in counts per pixel among these three groups despite a very significant difference (p=0.001) in weight. Image quality remained consistently good throughout the study. In contrast, group A had significantly higher counts per pixel (78±17 cts/pix, p=0.001) when compared to the other groups, indicating a need for dose reduction. Evaluation of this data clearly demonstrates that dosage adjustment by our chart decreases the RNA dose in thin patients to avoid excess radiation and appropriately increases the RNA dose in heavy patients to ensure adequate counting statistics.

No. 945

MYOCARDIAL STUDIES AFTER UPRIGHT BICYCLE EXERCISE.
S.M. Hamblen, T.L. Sell, M.W. Hanson, T.C. Hawk, D.M. Coates, J.M. Hoffman, R.H. Jones,R.E. Coleman. Duke University Medical Center, Durham, NC

Myocardial viability studies using N-13 ammonia (NH3) and F-18 fluorodeoxyglucose (FDG) were evaluated in 26 normal subjects (21 rest & exercise, 5 exercise only). Thirteen subjects were glucose-loaded and 13 fasting. Patients were positioned in the ECAT III gantry, and selected body landmarks were marked and registered with the imaging bed. Transmission images for measured attenuation correction (MSATN) were acquired. Upright bicycle exercise was then performed off the imaging bed with 12-lead EKG and BP monitoring. NH3 or FDG was injected during exercise, and the patient was repositioned using the landmarks and gantry alignment data. Three image-plane NH3 and FDG studies were assessed for repositioning as adequate (AR) or inadequate (IR). Repositioning was evaluated by NH3/FDG image correspondence and detection of MSATN artifacts. Images were assessed by 3 observers blinded to clinical data.

	AR	IR
Ex. NH3	18	8
Ex. FDG	17	9
R. AMM	20	1
R. FDG	20	1

Problems encountered in repositioning after exercise include shoulder elevation due to increased muscle tone, peripherals (I.V. lines, BP cuff), and imaging bed/gantry misalignment. The multiple problems encountered with repositioning make upright bicycle exercise for cardiac PET restrictive for routine clinical use with existing technology.

No. 946

A NEW DUAL-HEADED SPECT SYSTEM FOR CARDIAC APPLICATIONS.
M.A. Worthy, R.L. Eisner, R.E. Patterson, P. Morrison, D.J. Nowak, D. Miles, and K. Sargent. Carlyle Fraser Heart Center/Crawford Long Hosp of Emory Univ; Departments of Medicine (Cardiology) and Radiology, EUSM, Atlanta, GA, and GE Medical Systems, Milwaukee, WI.

We have evaluated clinically a prototype dual-headed SPECT system for General Electric. The key feature of the system is that the camera heads are fixed at an angle of 90 degrees with respect to each other. The system was optimized for cardiac applications with a 350mm x 190mm (head-to-foot direction) rectangular field of view. To mimic a conventional 32 view, 180 degree single-headed SPECT acquisition dataset, SPECT myocardial perfusion images (Tl-201 and Tc-99m SESTAMIBI), 16 views over 90 degrees, were acquired simultaneously from each camera detector. The planar view data were shifted (translated) so that a common center of rotation was used in the filtered back-projection algorithm. Uniformity correction was applied to each dataset. The two 16 frame datasets then were merged into one planar 32 frame dataset for routine SPECT reconstruction and analysis.

In addition to their single-headed SPECT myocardial perfusion scans, 18 patients (14 males; 4 females) had an additional scan on the new system. We found that 1) The new system reduced SPECT acquisition time by a factor of two; 2) Patients preferred the two headed versus single headed system because of the reduced acquisition time in conjunction with the placement of the patients' arms in a more relaxed position; 3) Patient acquisition set-up with this two-headed system is very easy because of the fixed angle between the heads; 4) Only one, morbidly obese, male patient could not be imaged on the prototype system.

No. 947

ACCURACY AND REPRODUCIBILITY OF EJECTION FRACTION CALCULATION FROM GATED TOMOGRAPHIC BLOOD POOL IMAGES.
T. George, J. Machac, Mount Sinai Medical Center, New York, NY 10029.

Gated blood pool tomographic (GSPECT) imaging has been available for several years but a standard method of calculating the LV EF from the acquired data has not been established.

We compared the reproductibility and the accuracy of LVEFs from GSPECT image data with standard LAO planar (GBP) imaging. 41 patients referred for resting GBP imaging were imaged with both planar GBP and GSPECT techniques. Planar GBP images were analyzed with a standard EF program (Technicare QMICA). Gated LAO images were extracted from the GSPECT images and analyzed with a semiautomatic program (Elscint CEFS). Both methods were applied in duplicate. Reproductibility was measured by the root mean square (RMS) residual error (ANOVA). The mean GSPECT EFs were compared to standard planar GBP EFs by correlation.

METHOD	RMS ERROR (%)	
Planar	1.46	NS
GSPECT	1.79	

The EFs by the two methods were highly correlated, with R = 0.95 (P<0.0001). The reproducibility of the two methods was similar, despite a lower count density of the images used for GSPECT LVEF calculation.

Thus LVEF calculation from GSPECT data is comparable to conventional planar LVEF in accuracy and reproducibility. The necessity of additional planar images along with GSPECT acquisition for LVEF calculation can thus be avoided.

No. 948

THE EFFECT OF MILK ON POST EXERCISE HEPATIC AND CARDIAC CLEARANCE OF TECHNETIUM-99m SESTAMIBI
M.P. White, V.L. Perez, R.C. Fetterman, J.A. Mattera, B.L. Zaret, F.J.Th. Wackers, and A.J. Sinusas. Yale University, New Haven, CT

Milk administration has been recommended in conjunction with technetium-99m SESTAMIBI (MIBI) imaging to accelerate hepatobiliary clearance and thus improve the cardiac to background ratio, although the efficacy of this has not been established. Accordingly, 33 patients referred for exercise treadmill testing were prospectively randomized into two groups; the first group (MILK, n=21) received 8 fl. oz. of whole milk 15-20 minutes after the injection of 25 mCi of MIBI, the other (NPO, n=20) remained fasting. The mean age, sex ratios, workload and rate pressure product of the two groups were not significantly different. Planar imaging in the LAO projection was performed at 10 and 60 min after injection. Using a fixed point on background elipses as a reference, fixed size regions of interest (5x5 pixels) were positioned over the regions of maximal hepatic and cardiac activity. The decay corrected changes in liver and cardiac activity between 10 and 60 min were compared between the two groups, and hepatic/cardiac ratios computed. The hepatic and cardiac clearances for MILK (hepatic:33± 5 %; cardiac:14± 2 %) and NPO(hepatic:33 ± 7 %; cardiac:14± 3 %) patients were not different. At 60 min there was no significant difference in the hepatic/cardiac ratios (MILK: 85 ± 10 %, NPO: 83 ± 9 %). These ratios were favorable in both groups.

In conclusion, the administration of milk does not significantly enhance either hepatic or cardiac clearance. The usefulness of milk in cardiac MIBI imaging remains unproven.

Session II

Cardiovascular Technologist Investigator Competition

1:30-3:10 **Room: 216C**

Moderators: Terri Boyce, BS, CNMT and Lynne T. Roy, MS, CNMT

No. 949

QUANTITATIVE ANALYSIS OF Rb-82 PET IMAGES: INTRA AND INTEROBSERVER VARIABILITY.
CJ Allman, JM Rothley, S Yang, R Stewart, K Stafford, KC Allman, J Sitomer, M Schwaiger. University of Michigan, Ann Arbor MI.

Visual analysis of PET images is subjective. Although commonly employed in combination with SPECT, few quantitative programs have been introduced for analysis of PET myocardial blood flow images. The purpose of this study was to evaluate a new analysis software recently

developed at our institution. This software method employs a semiquantitative approach for determination of relative tracer distribution using a 3 dimensional radial activity search constrained to an expected shape of the heart. Regional values are expressed as % of maximal myocardial uptake, compared with a normal database and displayed as polar maps. The method was applied to 12 normal volunteers and 20 patients with varying degrees of Rb-82 perfusion abnormalities following pharmacological stress. Myocardial distribution of Rb-82 was related to vascular territories as defined on polar map display. The data of the normal population revealed homogenous Rb-82 uptake in the LAD (79.3±6.6%) RCA (80.7±7.1%) and LCX (82.5±6.3%) territories, reflecting attenuation correction provided by PET. All regional values obtained in volunteers fell within 2.5 SD of the normal data base. Two observers analyzed the patient data and results for intra and interobserver variability based on the % abnormality (<2.5 SD) in each vascular territory for the stress images are tabulated (r=corr. coef.).

	LAD	RCA	LCX	TOTAL
INTRA (r)	0.99	0.96	0.98	0.99
INTER (r)	0.98	0.85	0.96	0.99

The automated software allows quick analysis (< 5min) of cardiac PET studies with excellent intra and interobserver variability. This approach together with improved imaging technology of PET as documented by the homogeneity of normal tracer distribution may provide objective and accurate characterization of regional Rb-82 perfusion abnormalities.

No. 950

TC-99m SESTAMIBI MAY IDENTIFY MYOCARDIAL INFARCTION AT REST BETTER THAN TL-201. **LS Schmarkey, SE Martin, D Carey, RL Eisner, M Worthy, TS Chu, RE Patterson. Carlyle Fraser Heart Center/ Crawford Long Hospital of Emory University; Depts of Medicine (Cardiology) and Radiology, EUSM, Atlanta, GA.**

Previous work by us and others indicates that myocardial perfusion defects are less severe using technetium-99m SESTAMIBI (MIBI) than with thallium-201 (Tl-201) in mild to moderate coronary stenoses during stress, and equivalent in severe stenosis. The aim of the present study was to compare the two imaging agents in myocardial infarction (MI) at rest. We measured the severity of rest defects with 5 mCi Tl-201 followed by 30 mCi MIBI, one week after experimental MI in 7 dogs. MI was induced with percutaneous balloon inflation in the LAD for 2 hrs. Without moving the dog, we performed SPECT imaging in a 180° arc for 33.5 min with each agent. We compared defect severity using abnormal to normal ratios (Ab/Nl) of counts and defect size on the Bullseye display (%LV). For count ratio comparison, the defect and normal zones were held constant for both scans in each animal. The normal zone was an area anatomically remote from the site of infarction. The differences by paired t-test between MIBI and Tl-201 are shown below; values are means ± SD.

	Ab/Nl	%LV
Tl-201	**0.82 ± 0.11**	**2.9 ± 2.0**
MIBI	**0.69 ± 0.08***	**8.0 ± 6.3***
p value	**0.029**	**0.08**

Contrary to our previous results with stress stenosis, the present data indicate less contrast between infarcted and normal myocardium with Tl-201 than with MIBI and show that infarct size on MIBI tends to be larger than on Tl-201. Thus, MIBI may identify infarcted myocardium in rest, post-MI imaging better than does Tl-201.

No. 951

DOES THE USE OF MILK AFFECT THE QUALITY OF CARDIAC Tc-99m SESTAMIBI TOMOGRAPHIC SCANS?

Y. Allidina, K. Cheung, F. Toor, A. Kocken, A. Laprade, P. McLaughlin, P. Liu. Toronto Hospital, Univ of Toronto, Canada.

The clearance of Tc-sestamibi is mainly through the hepatobiliary system, which may concentrate the tracer and affect the quality of acquired images. To address the potential but unproven benefit of administering milk prior to image acquisition, we performed a blinded randomized study.

A total of 41 patients underwent routine exercise or dipyridamole sestamibi scan using a same day (rest-stress) protocol. All patients were NPO 4 hours prior to the scan. The rest scan (R) was performed first with 8 mCi of sestamibi. The patients were then randomized to received one glass (8 oz) of homogenized milk or no milk within 20 minutes following injection. Rest scans were acquired after a minimum of 60 minutes with an initial anterior static scan (2 min, 128x128), followed by tomographic (SPECT) acquisition. The stress protocol (St) was carried out in an identical routine manner with 22 mCi of sestamibi, followed by lunch with no restrictions.

The static images were analyzed blindly for total counts and presence of gallbladder (GB) at both rest and stress. The reconstructed SPECT images were also blindly rated for liver (Liv), GB activities and myocardial (Myc) scan quality on a scale of 0-3 (max). The results showed that there was no difference in pixel saturation, image counts or visualization of GB on the planar scan with respect to milk. The SPECT scores are (*p<.05):

(M±SD)	Liv-R	GB-R	Myc-R	Liv-St	GB-St	Myc-St
Milk (19)	1.5±.8	0.5±.9	2.9±.2	0.6±.5	0.0±0	3.0±0
No Milk(22)	1.3±.8	1.2±1*	2.9±.2	0.7±.6	0.2±.6*	3.0±0

We conclude that the administration of milk is effective in suppressing the *small amount* of GB activity present without effect on the excellence of myocardial image quality. However, the routine use of milk ingestion is unlikely to be cost-effective.

No. 952

QUANTITATIVE ANALYSIS OF Tc-99M SESTAMIBI REST/STRESS SAME DAY SPECT MYOCARDIAL TOMOGRAMS: INTER AND INTRA OBSERVER VARIABILITY. **GT Silagan, M Hyun, K Van Train, H Kiat, FP Wang, E Garcia, J Maddahi, CD Cooke, D Berman. Cedars-Sinai Med Ctr, LA, CA, Emory U, Atlanta, GA.**

Previously an automatic, quantitative program for analyzing rest/stress same day Tc-99m sestamibi SPECT myocardial tomograms utilizing gender matched nl limits was developed and shown to be accurate for detection of CAD. This study of 55 pts(44 CAD and 11 normals) was undertaken to determine the inter and intraobserver variability of the quantitative method. SPECT acquisition used optimized parameters consisting of 64 stops, 180° circular orbit, high resolution collimator, and 64x64 matrix. Optimized filters were defined for stress and rest and applied to the raw data prior to reconstruction. The method for quantitation involves automatic determination of the short axis tomograms to process, center of the cavity and radius of search for each tomogram. These parameters are then utilized to generate maximal count circumferential profiles using a spherical search for the apex and a cylindrical search for remainder of the left ventricle. Comprehensive polar maps including analysis for defect extent and severity are generated from these profiles. The r values for inter/intra observer variability for the quantitative results were:

	TOTAL	LAD	LCX	RCA
EXTENT	**.98/.96**	**.99/.97**	**.97/.96**	**.98/.94**
SEVERITY	**.98/.98**	**.99/.98**	**.98/.98**	**.98/.88**

p value <.0001 for all comparisons.

In conclusion, this quantitative method offers a highly reproducible technique for the automatic, objective quantitation of rest/stress same day Tc-sestamibi SPECT myocardial tomograms.

No. 953

EXPERIMENTAL METHOD FOR EVALUATION OF TECHNETIUM-99M SESTAMIBI INTERPOLATIVE BACKGROUND SUBTRACTION ALGORITHM

P. Vitols, R.C. Fetterman, Q.X. Shi, M.T. Salzberg, P. Maniawski, F.J.Th. Wackers, B.L. Zaret and A.J. Sinusas.
Yale University, New Haven, CT

The quantitative analysis of planar Technetium-99m Sestamibi (MIBI) imaging is complicated by the hepatobiliary excretion of this radiotracer. Interpolative background subtraction is often employed in conjunction with quantitative planar MIBI imaging to correct for transmitted and scattered background activity. A previously reported and widely employed background subtraction algorithm for MIBI has undergone testing in two separate clinical laboratories, however this algorithm has not been evaluated experimentally. The rapid change in hepatobiliary background following the administration of Cholecystokinin (CCK) provides a unique opportunity to test the efficacy of interpolative background subtraction, since dramatic changes in background occur during a period of time when cardiac activity is not significantly changing. Accordingly, we performed dynamic lateral planar imaging (30 sec/frame for 8 minutes) on four separate occasions in a closed chested anesthetized dog, following the injection of 30 mCi of MIBI. CCK was administered as a slow bolus (0.02 ug/kg) over 2 minutes, 30 min after the injection of MIBI. The administration of CCK resulted in a change in the hepatobiliary/cardiac activity ratio from 1.65 to 1.02 within 8 minutes of injection. The change in the values along the ellipse used for background subtraction and circumferential cardiac profiles were computed for each of the dynamic frames. This protocol produced marked changes in background activity adjacent to the heart, however the corrected cardiac profiles remained stable.

Thus, we have developed an intact canine model which permits the

evaluation of interpolative background subtraction. In the presence of marked changes in MIBI background activity the background corrected MIBI cardiac profiles remained stable. Further testing of this nature is necessary.

No. 954

64 VS. 32 PROJECTION SESTAMIBI SPECT: IS THERE A SIGNIFICANT DIFFERENCE? J.A. Mattera, K.Davis, P.Maniawski, A.Sinusas, F.J.Th. Wackers. Yale University, New Haven CT.

Tc-99m sestamibi (MIBI) has better physical characteristics than Tl-201 for SPECT imaging. To optimize MIBI SPECT imaging, modifications of the conventional Tl-201 protocol have been proposed such as: 64 stops @ 20 sec/stop over a 180 degree arc. Theoretically more stops are favored because reconstruction artifacts are less likely to occur, however acquisition and processing time, patient comfort and disk space, particularly when gating is performed, must also be considered. Consequently, our objective was to compare quality and diagnostic information of 64 vs. 32 stop MIBI SPECT studies. Twenty patients underwent separate day stress/rest SPECT imaging. A high resolution collimator, 180 degree arc, 64 projections, 20 sec/stop protocol was used. The data were prefiltered using a Butterworth filter. A second set of data was created by taking every other frame of the filtered 64 projection study thereby creating a 32 frame study. Each data set was reconstructed using the same parameters. Circumferential profile analysis was performed on the apical, mid and basal short axis slices. Hardcopies of the 64 and 32 stress/rest slices were coded for blinded reading. Two experienced readers compared and scored visually the quality as 1, 2, or 3 (3 = excellent). It was also noted if a diagnostic difference was seen between the two sets and if so which study was preferred for clinical reading.

The quality score of the 64 study was significantly better than that of the 32 (2.5 ± 0.6 vs.2.2 ± 0.5, p=0.01). The readers preferred the 64 study in 12/20 (60%), had no preference in 6/20 (30%) and favored the 32 study in 2/20 (10%). The differences were felt to be minimal. The 64 vs. 32 quantitative stress/rest defect sizes were not significantly different (1.6 ± 2.0 vs. 1.6 ± 1.9, p =ns) and at rest (1.0 ± 1.2, 0.9 ± 1.2, p = ns). In conclusion, the readers felt the 64 quality was only minimally better in 60% of the studies. There was no difference in diagnostic and quantitative results. Therefore, 32 stop MIBI SPECT shows similar diagnostic results and may be considered for clinical use.

Session III

SPECT/Neurology

3:30-5:10 **Room: 216C**

Moderators: Eileen Smith, CNMT and Chris Carlson, CNMT

No. 955

RELATIVE ERROR ESTIMATION OF REGIONAL ANALYSIS IN CEREBRAL PERFUSION SPECT STUDIES. M.C. DaCosta, P. Stritzke, M. Muzinic, V. Holan, M.L DeLaney, S. Vallabhajosula, S.J. Goldsmith. Mount Sinai Medical Center, New York, NY.

The use of SPECT in the evaluation of cerebral perfusion (CP) plays an important role in the investigation of various cerebral disease states. Regional analysis (RA) is used to assess presence and progression of disease, as well as effect of surgery and medication. Reproducibility of RA is a key aspect of the quantitative assessment of CP investigations. A study was undertaken to evaluate the reproducibility of RA on a dedicated head unit: 6 studies were performed on a phantom (PHA) within the same day; 7 nls had repeat studies, same day, no repositioning (RSD); another 7 nls had repeat studies, different days, (RDD). An RA algorithm was used to divide the brain cortex into 12 regions/slice. Average relative errors in % (ARE) were determined in each region of each slice. ARE (<lowest|**average**|highest>) were lowest in PHA which represents variation due to poisson noise. ARE were higher in RSD data, and slightly higher in RDD data. Slices at the cerebellum (CB) and vertex of the brain (TP) had much higher variation than slices at the level of the basal ganglia (BG).

	CB	BG	TP
PHA	<1|**2.9**|7>	<2|**2.6**|5>	no data
RSD	<5|**9.6**|30>	<2|**3.3**|6>	<2|**5.6**|8>
RDD	<5|**9.7**|30>	<2|**3.4**|7>	<4|**5.7**|8>

Assessing regional ARE permits establishing threshold levels and baselines for evaluating the significance of changes in the clinical setting.

No. 956

VOLUME AND SURFACE RENDERING FOR ADDED DIAGNOSTIC INFORMATION ON TC99M MDP BONE AND I 123 SPECTAMINE BRAIN SCANNING. **J. Ward, R. Taylor, N. Newlin. Herrick Memorial Health Care Center, Tecumseh, Michigan.**

In our institution, I 123 Spectamine brain scanning with surface and/or volume rendering has proven to be of value in assessing ischemia and infarction. Regular use of this technique for the past 2.5 years has led to excellent results. It is especially useful in assessing defects on the temporal lobe since these are often difficult to distinguish from positional artifacts on the normal coronal, saggital, and transverse slices. One program that I had designed for the Elscint Computer allows initial uptake and redristribution images to be visualized in two planes simultaneously. This program allows better visualization of the inferior and superior surfaces of the brain. Another program splits the image into right and left halves and rotates these images in matching views. This allows for better assessment of deep brain lesions. Used with volume rendering, this program can also be useful in bone scanning as it helps assess the femoral heads without the interference of bladder activity. Volume rendering of bone scans is also useful in showing the extent of spinal lesions and in confirming spondylolysis. Since these extra images are quickly generated on most newer SPECT systems, we recommend their routine use on all SPECT brain and bone scans.

No. 957

BRAIN SPECT ACCURACY USING DIFFERENTIAL DIAGNOSIS IN A DIVERSE PATIENT POPULATION WITH DEMENTIA. P. Nuechterlein, M. Ganske, M. Long, D. Fink-Bennett, J.E. Juni, J. Gilroy. William Beaumont Hospital, Royal Oak, MI

Prior studies have proven the accuracy of brain perfusion SPECT in the diagnosis of senile dementia of the Alzheimer's type (SDAT) and multi-infarct dementia (MID). These studies have not included the broad-based pt population encountered in clinical practice and thus might over-estimate diagnostic accuracy. When proper quality control and processing are performed, SPECT can retain high diagnostic accuracy. We performed 1 or 3-headed SPECT with Tc-99m HMPAO or I-123 IMP in 26 demented, 18 non-demented and 9 normal volunteers. Scans were interpreted blindly by consensus of 2 readers as either normal, single or multivessel cerebro-vascular disease, SDAT, MID or abnormal with non-specific pattern. Final clinical diagnosis was made without knowledge of scan findings using CT, MRI, EEG, Hashinski score and neuro assessment and outcome. SPECT correctly categorized 8/10 SDAT and 6/6 MID. SPECT correctly excluded SDAT and MID as cause of dementia in 6/6 other pts. An SDAT or MID pattern was seen in 1/16 non-demented pts and in 1/9 normal volunteers.

The sensitivity of SPECT in detecting SDAT and MID was 80% and 100% respectively. SPECT correctly differentiated all SDAT and MID from other causes of dementia except Parkinson's disease despite interpretation without clinical history. We conclude that SPECT's high diagnostic accuracy is preserved in a mixed pt population. SPECT brain perfusion imaging can and should be used to determine/differentiate the underlying etiology of dementia.

No. 958

TECHNICAL CONSIDERATIONS IN PERFORMING REPEATED BASELINE: ACTIVATION Tc-99m HM-PAO SPECT BRAIN SCANS. J.M. Harris, J.M. Mountz, J.G. Modell, G. Deutsch, M.V. Yester. Univ. of Ala. Med. Ctr., Birmingham, AL.

Measurement of state-induced changes in r-CBF with Tc-99m HM-PAO can be readily accomplished by comparison of tracer uptake during an activation paradigm with a baseline unstimulated scan. To determine the within-subject intra-regional cerebral/cerebellar uptake variance using this technique we studied 7 normal patients who underwent test:retest Tc-99m HM-PAO SPECT under identical conditions 48 hours apart. Testing was performed in a quiet environment, supine position, needle insertion 10 min prior to tracer injection, room dimmed, eyes closed. Injection of 30 mCi Tc-99m HM-PAO was followed by a 10 minute period of continued rest. The 48 hour repeat scan was performed under identical conditions. Scanning was performed on the ADAC dual head Genesys gamma camera equipped with a low-energy, high-resolution, parallel hole collimator. Acquisition parameters were 64 stops, 45 sec/stop obtaining ~16 million cts/scan. A reference system was used on each scan that enabled accurate alignment of the first scan with the second and reproducible selection of 12 equal angular cortical regions from sections at orbitomeatal (OM)+3cm, OM+5cm, and OM+7cm. Outer edge of cortex was demarcated at the 50% count per whole slice level and inner cortex was drawn at a radial extension inward to the center of maximum pixel density for a distance of 1.6 cm. Maximum cts/pixel in each ROI were normalized to maximum cts /pixel in the cerebellum.

Results showed the average within-subject intra-regional difference between the first and second scans was 2.4% (range 0-6%) for each of the 36 cortical region analyzed. The between-subject variation for each region (expressed as coefficient of variation: s.d./mean) averaged 10% (range 7-15%). We conclude that the relatively small (mean=2.4%) within-subject difference supports the utility of baseline:activation studies using Tc-99m HM-PAO brain SPECT.

No. 959

Tc-99m HMPAO ASSESSMENT OF CEREBRAL PERFUSION DURING INTERNAL CAROTID ARTERY OCCLUSION.

M Muzinic, CJ Palestro, M DaCosta, P Stritzke, C Sen, SJ Goldsmith. Mt. Sinai Medical Center, New York, NY.

A variety of neurosurgical procedures necessitate the occlusion or even the removal of an internal carotid artery. A simple, noninvasive procedure that accurately identifies those individuals in whom a revascularization procedure is necessary, due to insufficient collateral cerebral perfusion, would be a significant contribution to the management of these patients. We studied 7 pts with Tc-99m HMPAO brain spect during preoperative balloon occlusion of the internal carotid artery. 2 of the 7 had baseline pre-occlusion studies as well. All 7 pts had normal neurological examination during occlusion, and collateral flow to the affected cerebral hemisphere was considered adequate on angiography. 5 of the 7 pts demonstrated symmetrical distribution of radiotracer throughout both cerebral hemispheres. There was no change in perfusion from baseline to occlusion study in the 2 pts who underwent both studies. 1 pt demonstrated mildly diffusely decreased radiotracer in the ipsilateral hemisphere, and 1 pt demonstrated moderately diffusely decreased perfusion in the ipsilateral hemisphere. Neither of these 2 pts developed postoperative complications. Of the 5 pts whose occlusion studies were normal, 4 developed no postoperative complications. 1 pt, who had both a normal baseline and a normal occlusion study developed hemiplegia 24 hrs postoperatively and underwent successful emergent revascularization.

In summary, the results of this small series are less satisfactory than previously reported results, which suggests that further evaluation of this technique in a large series of pts is needed.

No. 960

BRAIN DEATH IMAGING WITH TECHNETIUM-99m HM-PAO. KM Wilson and L Gordon, Medical University of South Carolina, Charleston, SC

Technetium-99m hexamethyl-propyleneamine oxime (Tc-99m HM-PAO), which crosses the intact blood-brain barrier and is retained by brain tissue, was evaluated for use in the determination of brain death.

12 patients clinically suspected of brain death were injected with 5-15 mCi of Tc-99m HM-PAO. Flow, immediate, and delayed anterior and lateral planar images were compared and interpreted. These images were also compared to studies performed previously using Tc-99m Glucoheptonate, which does not cross the blood-brain barrier.

The Tc-99m HM-PAO images were more easily interpretable by both resident and attending physicians in comparison to the old technique. A single delayed image at 30-60 minutes was sufficient to make the diagnosis, and flow images were not necessary. No studies were found to be inconsistent with the final outcome of the patient.

We conclude that brain death studies using a single set of delayed images with Tc-99m HM-PAO are preferable to flow studies using agents that do not cross the blood-brain barrier.

Session IV

Student Oral Presentations

10:30-12:10 **Room: 208**

Moderators: Lynn T. Roy, MS, CNMT and Shirley Ledbetter, CNMT

No. 961

A COMPARISON OF ANALOG VERSUS DIGITAL PRESENTATION FORMATS FOR BONE SCANS OBTAINED ON A TWO-HEADED WHOLE BODY GAMMA CAMERA SYSTEM. F Ziaii-Maleki, D. Marciano, C. Hoh, G. Harris, S. Khanna, RA Hawkins. UCLA School of Medicine, Los Angeles, CA.

Most gamma camera systems now have optional analog or digital image presentation formats, available either on a CRT screen or on film. It was our purpose in this study to evaluate the diagnostic utility and user preference of analog and digital presentation formats for a Siemens Body Scan system, a dual rectangular detector type gamma camera. Low energy all purpose collimators were used for all acquisitions. The digital data was obtained by continuously scrolling acquisition data on a 256x1280 matrix from the scan mode. A Siemens MicroDELTA computer was used for processing all digital images. 20 patients with primary malignancies and possible metastatic disease were injected with 25 mCi 99m Tc methylenediphosphonate (MDP) and underwent whole imaging following a two hour uptake period. Three presentation formats were evaluated: 1) whole body analog, 2) whole body digital, and 3) magnified digital images. Five observers blinded to the clinical history viewed the studies and graded them based upon two criteria: assigned a score of 1 (best) to 3 (worst) by observers. Paired t-tests were used to assess the significance of differences between average scores for each presentation format. In this series, the analog presentation format was preferred for both categories 1 and 2 ($p < 0.03$) compared to both whole body digital and magnified digital images. No significant difference existed between the two digital formats. We conclude that while digital bone scans have clear advantages in terms of storage, retrieval and processing options inherent to PACS systems, the image quality itself, while competitive with analog formats, usually will not be better than analog presentations. When both options are available simultaneously, users may benefit by having access to both presentation formats.

No. 962

COUNTING EFFICIENCY AND MINIMUM DETECTABLE ACTIVITY OF A NaI WELL-COUNTER

R. D. Forget

Counting efficiency was determined for a NaI well-counter to enable contamination wipe testing results to be reported in activity. Minimum Detectable Activity (MDA) was determined for this instrument to verify our ability to measure the Canadian Atomic Energy Control Board's maximum allowable level for loose contamination (5 Bq/100 cm^2) on normally accessible surfaces.

Standardized sources of Tc-99m, Ga-67 and I-131 were used in order to include all clinical energy ranges of the various radiopharmaceuticals utilized in Nuclear Medicine.

Counting windows were set at 40% for photon energies of 140 KeV, 93 KeV and 364 KeV in which the counting efficiencies were determined to be 70%, 29% and 43% respectively. These efficiencies produced a MDA at the 95% confidence level of < 1 Bq which confirmed our ability to detect the regulatory limit for loose contamination in a Nuclear Medicine Facility.

No. 963

EFFECTS OF PRONE VERSUS SUPINE POSITIONING ON ATTENUATION IN REST/STRESS TECHNETIUM-99m SESTAMIBI MYOCARDIAL TOMOGRAPHY. C.T. Purvis, M. Aung, T.D. Ruddy, University of Ottawa Heart Institute at the Ottawa Civic Hospital, Ottawa, Canada

Prone positioning has been introduced as a method of reducing image artifacts caused by diaphragmatic attenuation and respiration in patients undergoing stress thallium-201 myocardial perfusion imaging. A comparison of prone versus supine positioning was carried out with Tc-99m sestamibi, to determine the effects on image artifacts due to attenuation by the patient and by the imaging table.

Five normal volunteers, aged 24 ± 4 years, underwent rest/exercise Tc-99m sestamibi myocardial tomography. Tomographic images were acquired using a high resolution collimator over 180° (-45° to +135° for supine and +135° to - 45° for prone) for 64 projections at 25 seconds per view into a 64 x 64 word matrix. Transverse and oblique reconstructions were performed followed by regional analysis of the oblique projections. Six regions were placed within the myocardial wall for 9 to 11 slices for each of the prone and supine rest and stress acquisitions. The prone image data were decay corrected to allow comparison to the corresponding supine data. Statistical testing, using analysis of variance, was performed to determine the effect of prone versus supine imaging. The prone regions had less counts ($p=0.0001$) than the supine regions by 8.7%. For both the prone and supine studies, there was significant variation in activity between the slices ($p=0.005$) and between regions ($p=0.004$).

Therefore, significant attenuation occurs with prone Tc-99m sestamibi myocardial perfusion imaging and is most likely due to the imaging table. Image heterogeneity is similar with prone vs supine imaging and may be related to the distance between the myocardium and gamma camera.

No. 964

MEASURING CARDIAC VOLUMES WITH TRANSAXIAL AND RESLICED OBLIQUE IMAGES FROM 201-THALLIUM SPECT STUDIES. D. Osborne, C. Hoh, R. Brunken, K. Ishihara, M. Martinez, D. Marciano, RA Hawkins. UCLA School of Medicine, Los Angeles, CA.

We have previously reported a method to obtain cardiac left ventricular volumes (LVV) from SPECT myocardial perfusion images (1). The method is based on the measurement of mid-myocardial wall (MMW) volume. The method employs a derivative edge detection technique (DEDT) applied from the center of the LV to determine the MMW. In this study our purpose was to evaluate the precision and accuracy of the method in directly processed transaxial images of the heart with 201-Tl and SPECT, compared to resliced short axis views. 22 patient studies were analyzed. All subjects received 3 mCi 201-Tl intravenously at the peak of an exercise treadmill study, and were imaged immediately after exercise and again 4 hours later. Each acquisition set consisted of 32 images at 40 seconds per view over a 180 degree arc using a Siemens Orbiter camera. The LVV values were smaller in the transaxial studies compared to the resliced short axis views. The ratios of transient ischemic dilation (TIDR) (defined as the stress/redistribution LVV) were, however, similar with the two methods (r=0.83). Causes for the underestimation of LVV on the transaxial images include operator dependent and independent factors. We conclude that measuring LVV with this method, which is applicable to thallium, sestamibi and other myocardial perfusion studies, is technically feasible in routine clinical practice, and that the best results are obtained with resliced short axis views of the heart.

(1) C. Hoh et al. J Nucl Med 32:946, 1991 (abstract).

WEDNESDAY JUNE 10, 1992

Session V

General/PET

8:30-10:10 **Room: 216C**

Moderators: Francine R. Aguilar, CNMT and Miriam Miller, CNMT

No. 965

CRITERIA FOR DETECTING AREAS WITH TOTAL ABSENCE OF RADIOACTIVITY IN SCINTIGRAMS. M. Shryock, G. Simmons, U.Y. Ryo. University of Kentucky & VA Medical Center, Lexington, KY.

Accurate assessment of the presence or absence of tracer is critical in the interpretation of certain scintigrams such as presence of intestinal activity on hepatobiliary scans or peripheral activity (stripe sign) on perfusion lung scans.

Phanton studies were performed to determine the count-density threshold for detecting the presence of significant activity versus the total absence in scintigraphic images. Lead absorbers were used to create low-count areas in Tc-99m flood images. The lead discs were 6 cm in diameter and of sufficient thickness to attenuate essentially 100% of the 140 keV photons. Areas of different count-density were created by varying the fraction of the total acquisition time.

The threshold count-density on transparency images depends on the number of counts collected and on the intensity of the recording device. Defects with no more than 10% of the surrounding count density appeared as totally cold areas at all count levels using routine intensity settings. As the number of counts increased to 1 million, defects with less than or equal to 15% of the background count-density appear totally cold. A similar result is observed if the recording intensity is lowered. At higher than normal intensities even the 10% defects presented as areas of significant count-density compared to a total absence of activity. Defects with at least 50% of the surrounding count-density were discernible as containing activity regardless of the intensity setting. In studies such as hepatobiliary and lung perfusion scans recording images at other than routine intensity levels may help avert erroneous interpretations.

No. 966

HAND EXPOSURES FROM PET RADIOPHARMACEUTICALS CAN BE REDUCED EASILY AND ECONOMICALLY J. C. W. Richmond, R. D. Hichwa, and G. L. Watkins. PET Imaging Center, University of Iowa Hospitals and Clinics, Iowa City, IA.

Hand exposures can be quite elevated to those individuals who handle radioactivity. In particular, the level of exposure to the technologist responsible for administering PET radiopharmaceutical doses can exceed acceptable levels. However, by taking into effect the fundamental principles of time, distance, and shielding hand exposures can be lowered easily and economically. No shield was used for our first series of studies. Several changes were then applied in our department to reduce hand exposures over the next three month period. First, and foremost, was the use of a shielded injector system. The lead syringe shield measured ~25 mm in radius (4mm Pb = 1 HVL of 511 KeV photons) yielding approximately the equivalent of six HVL's. Next, we had the radiopharmaceutical doses drawn up into the lead shielded injector system in the radiochemistry area and then delivered to the scanning room. (O-15) labeled H2O accounted for >99% of all activity injected. 75 mCi was used for each injection, and as much as 250 mCi was drawn up for each injection. The new procedure lowered the exposure to the person responsible for injecting by spreading the radiation burden over more individuals. Last, the time spent in the proximity to the patient was minimized. The person injecting the radiopharmaceutical doses was initially two feet from the patient and directly alongside the radiopharmaceutical dose, now with the addition of four extra feet of tubing the individual injecting connects the injector to the IV tubing and then stands approximately six feet from the patient and the radiopharmaceutical dose.

Over the first two full months of operation the primary individual responsible for drawing up and injecting the radiopharmaceuticals had total hand exposures of 6330 mR on the left hand and 7580 mR on the right hand from 93 injections totalling 5850 mCi. Over the next two month period the same individual had hand exposures totalling 1590 mR on the left hand and 820 mR on the right hand from 89 injections totalling 5270 mCi. The ring badges were worn for one month periods and were used in variety of activities within our PET center including during patient studies.

Although the hand exposures were a combination of all daily routine activities it is evident that the three changes made greatly reduced the hand exposures from handling and administering of the radiopharmaceutical dose.

No. 967

ENHANCED TECHNIQUE TO "ARTERIALIZE" VENOUS BLOOD FOR USE IN QUANTITATIVE POSITRON EMISSION TOMOGRAPHY. D.M. Coates, T.L. Sell, M.F. Dailey, T.C. Hawk, S.M. Hamblen, J.M. Hoffman and R.E. Coleman. Duke University Medical Center, Durham, NC.

Non-invasive arterial blood sampling can be accomplished by the previously validated technique of heating a hand with a warm water bath to 44° C and drawing venous blood. We designed a handwarmer for use in quantitative PET applications. Our handwarmer consists of a piece of 6" PVC pipe with an internal 1/4" od copper coil. The coil is connected by compression fittings to 3/8" od polyethylene tubing attached to a constant temperature circulator pump operating at a rate of 15 l/min. Two half-filled 2000 ml bags, held together at both edges by wide velcro strips, conduct heat from the coil to the hand. The bag volume can be adjusted through 3-way stopcocks attached by 5" extension tubing. These bags are preheated in a microwave oven and are then maintained at 44° C by the heated coil. After placing an 18-gauge catheter retrograde into a dorsal hand vein, the hand is wrapped in a cloth and placed between the warm water bags. A small, self-adhesive thermocouple, placed between the hand and bag, allows digital temperature monitoring. The two bags and hand are placed inside the PVC pipe, the exterior wrapped with a towel and the end capped with 2" foam for insulation. This system has been used both at rest and during bicycle exercise. The handwarmer is placed by the subject's side during imaging on the tomograph. An input function for F-18 FDG was generated from 1 ml blood samples drawn at a rate of 12 samples in 2 min; and 1 sample each at 3, 4, 5, 7, 10, 20, 30, 45, and 60 min. Blood gas analysis was performed on the arterialized venous samples obtained from 46 patients, 18 during exercise and 28 at rest. Blood gas values, listed as mean ±SD, were: pH 7.39 ± 0.03; PCO_2 40 ± 3.5 torr; PO_2 84 ± 15.5 torr; O_2 saturation (%) 93.8 ± 8.4. A single unusually low value was associated with line occlusion. We conclude that our method provides a viable alternative to arterial blood sampling in quantative FDG-PET studies and is adaptable for use in a variety of clinical and research applications.

No. 968

QUALITY ASSURANCE FOR PET FROM ROUTINE DATA ACQUISITION. T.C. Hawk, S.M. Hamblen, C.C. Harris, J.M. Hoffman and R.E. Coleman. Duke University Medical Center, Durham, NC.

Positron emission tomography (PET) depends on the detection of paired events (trues) for the acquisition of data. In our laboratory, we use these true events, acquired under control conditions, for the quality assurance of our scanner (GE 4096 plus). The routine clinical scanning day is begun with a 10 minute blank scan which can be applied to any measured attenuation reconstructed scans acquired that day. The source, a sealed aluminum pin loaded with 10 mCi of Ge-68 (Dupont), is placed in the field of view, perpendicular to the slice planes, and rotated. At the end of acquisition, the true events for each imaging plane are extracted, exported to a personal computer, and entered into a spreadsheet. The count rates from day one are corrected for decay, based on days elapsed, and the expected counts are compared to the observed counts. We then calculate the percent change. For visual interpretation, our spreadsheet is designed to display the change for each plane by date as less than 1%, less than 2%, or greater than 2%. If any plane shows a large variation in count rate, the sinograms may be checked for distortions. All data are saved as a permanent record. On our scanner we see the greatest variability in counts at the outside planes, most likely due to variation in pin source placement. This technique of data extraction and analysis gives us assurance of our scanner's reliability in a quick and easy manner with a daily constancy and accuracy check and a continuous record of performance over time.

No. 969

TECHNICAL CONSIDERATIONS FOR THE QUANTITATIVE MEASUREMENT OF REGIONAL CEREBRAL METABOLIC FUNCTION WITH PET. T. F. Brown, M.A. Nathan, N.J. Yasillo, M.T. Dowd, J. -S. Chou, J.T. Metz, C.-T. Chen and M.D. Cooper. University of Chicago, Chicago, IL.

The unique information provided by positron emission tomography (PET) is the quantitative measurement of regional metabolic rates and the study of how these rates are affected by disease, cognitive activity and drugs. The regional cerebral metabolic rate for glucose (rCMRglu) can be measured in units of milligrams of glucose consumed per 100 grams of brain tissue per minute (mg/100g/min) using 2-[F-18]fluoro-2-deoxy-D-glucose (F-18-2DG) and a modification of the mathematical model for this process developed by Sokoloff (Hutchins, G.D.et al. J Cereb Blood Flow Metabol 1984;4:35-40). This measured metabolic rate can be compared in multiple studies of the same subject or to other subjects studied under similar conditions.

We have identified a number of technically controllable factors that can adversely affect this "autoradiographic" method for quantitative measurement of rCMRglu. These include: well counter and scanner calibration; subject's behavioral state and blood sugar level at time of injection; subject positioning and immobilization; and blood sampling and processing techniques. Failure to ensure that these factors are standardized for subsequent studies of the same subject or other subjects being used for comparison will result in erroneous values.

It is important that technologists working in PET centers be familiar with the technical skills and procedures necessary to ensure valid intra- and inter- subject comparisons of regional cerebral metabolic function. In addition, we believe that a knowledge of the factors necessary to maintain accuracy in quantitative measurements with PET will also be applicable to techniques currently being developed for quantitative modeling studies with single photon emitting radiopharmaceuticals.

No. 970

QUALITY CONTROL IN VOLUME IMAGING PET SCANNER USING ANGER-TYPE DETECTORS. S. L. Riggin, R. J. Smith, J. S. Karp, D. Dines, University of Pennsylvania, Philadelphia.

This investigation was carried out to determine the required quality control procedures for the PENN-PET scanner used in a variety of configurations. Quality assurance may be separated into two stages: 1) daily checks and 2) calibration of the scanner to extract quantitative measures of tissue activity concentration. The PENN-PET scanner consists of 6 NaI(Tl) Anger type position-sensitive detectors arranged hexagonally. Daily quality assurance involves: 1) baseline collection to correct for electronic drift of each of 180 channels, 2) triple point source collection to assess linearity in the sinogram data, and 3) fluid filled cylinder collection to test reconstructed image uniformity. These measures provide an easily reproducible means of gathering information which can identify subtle trends or obvious degradations in scanner performance.

Calibration of the scanner, performed quarterly, includes photomultiplier tube gain matching, spatial distortion corrections, detector efficiency normalization, and axial normalization which corrects for the variation in sensitivity from the edge of the axial field-of-view (FOV) to the center where sensitivity is greatest. The multiuse nature of our facility requires different normalizations to ensure the most accurate quantification for differing transverse FOV sizes and sinogram sizes. Camera sensitivity is measured monthly: the acitivity calibration factor, ACF is 165±6 cpm/voxel/μCi/ml where a voxel represents $8mm^3$. The camera is cross calibrated with a NaI(Tl) well counter which is used to count patient blood samples. This well counter is itself cross calibrated with an NBS traceable Ge-68 source (efficiency varies ±0.3%). The PET camera vs. well counter cross calibration has been determined to be within 6% for high countrate O-15 studies and within 3% for studies using F-18.

Session VI

Pediatrics/Gastroenterology/General

10:30–12:10 **Room: 216C**

Moderators: Kim Maas, CNMT and Barbara Jara, CNMT

No. 971

IS THE VOLUME OF FLUID INSTILLED INTO THE BLADDER FOR NUCLEAR CYSTOGRAMS DEPENDENT ON THE TEMPERATURE OF THE FLUID? D.S.Lahti, G.M.Moon, J.M. Murley, B.L. Shulkin. University of Michigan Mott Children's Hospital, Ann Arbor, Michigan

Voiding cystograms are used commonly for the evaluation of patients with suspected urinary reflux. The detection of reflux is in part related to the volume of fluid administered into the bladder. The purpose of this study was to determine the effects of temperature on the quantity of fluid that could be instilled and whether warming the fluid to body temperature, i.e., the temperature of urine in the bladder, would allow instillation of greater volumes than administering the fluid at room temperature.

Twenty four pediatric patients (ages 6 months to 13 years) have undergone nuclear cystograms using a temperature variant method. 250cc bags of normal saline were stored at room temperature (75°F) or in a water bath maintained at 98°F. Each patient was assigned to a warm-room temperature (N=11) or room temperature-warm (N=13) sequence. The order of instillation was changed at the beginning of each week, then maintained for all patients studied in a particular week. Tc-99m Pertechnetate in normal saline was infused through a bladder catheter and serial 15-second images were obtained during the filling and voiding phases. Total bladder and reflux volumes were recorded for each study.

Volumes instilled were 142 ±85 ml with the warm solution and 136 ±68 ml with the room temperature saline. In 11 patients, the amount of saline tolerated was greater (>10cc) with room temperature fluid, and in 13 patients with the warm saline. Reflux was noted in 7 patients on both warm and room temperature studies, in 3 patients on room temperature saline only and in 2 on warm saline. Reflux was not related to the sequence of the examinations.

We conclude that the volume of fluid instilled into the bladder is not dependent on temperature and that saline maintained at room temperature and saline heated to body temperature are equally well tolerated.

No. 972

BONE MALIGNANCY LOCALIZATION USING THALLIUM IMAGING.
Ford K, Maas K, Mandell GA, Harcke HT.
Alfred I. duPont Institute, Wilmington, DE

Children with suspected malignant bone tumors were studied with sequential bone and thallium scans. It has been suggested that presence of thallium uptake can differentiate viable tumor from reparative osteoblastic bone.

The patient received a standard dose of thallium (50 uCi per kg.) with a 250 uCi minimum dose and a 3mCi maximum dose. Images were taken using the general all-purpose collimator. Early phase (First 15 minutes) and delayed phase (greater than one-half hour) images were acquired. Trunk images are acquired for 300 K counts. Head and extremity images require 150 K counts. Anterior images of the patient are taken of the head, trunk and extremities to look for other areas of tumor that may not have appeared on the bone scan.

We tested six patients pre-chemotherapy comparing Tc-99m MDP uptake with thallium uptake. Four patients were positive with thallium uptake at the bone lesion site. One of those four showed a second area of artificially induced increased uptake. These four patients who were positive for bone malignancy will be thallium tested post-chemotherapy to measure the effectiveness of the chemotherapy in necrosing the tumor. Two patients of the six were negative for malignancy and showed no thallium uptake in the lesion. The final diagnosis for all patients was confirmed through biopsy.

The use of the thallium bone imaging to diagnose and follow bone malignancy open new possibilities for scintigraphy in the management of these tumors.

No. 973

OPTIMUM CONCENTRATION OF ACD IN THE PREPARATION OF TECHNETIUM-99M RED BLOOD CELLS WITH THE ULTRATAG® RBC KIT.
J.C. Hung and M.E. Wilson. Mayo Clinic, Rochester, MN.

The package insert of the recently approved UltraTag® RBC kit recommends using either heparin or ACD (anticoagulant citrate dextrose) as an anticoagulant for collecting the blood sample. It has been found that the recommended dosage of ACD (0.15 ml ACD per ml whole blood) is unsuitable for use with Tc-99m eluate from a long ingrowth time (~72 hr) generator. Although labeling efficiency (LE) problems have not been noted with heparin, imaging of Tc-99m RBC prepared with heparin has demonstrated distinct renal and bladder activity as compared to those using ACD. In addition, the wide range in concentrations of heparin complicates the determination of proper dosage for a blood sample. This study was undertaken to find an optimum ACD concentration for use with the UltraTag® RBC kit. Since the citrate in ACD solution diminishes stannous ion uptake in the RBC and the UltraTag® RBC kit already contains 0.0125 mmol citrate, the addition of ACD should be reduced to a minimum. We collected 3-ml whole blood samples from a volunteer group using various amounts of ACD (0.45, 0.40, 0.35, 0.30, 0.25, 0.125, 0.0625 ml) diluted to 1 ml with 0.9% NaCl. Forty millicuries of 12-hr old sodium pertechnetate Tc-99m obtained from a 3-Ci Tc-99m generator with a 72-hr ingrowth time were added to the UltraTag® RBC kits. LE was then determined at 1 min and 30 min post preparation. The anticoagulant properties of the different ACD concentrations were observed during the entire preparation procedure and LE assay. Our results indicate that an ACD volume of 0.125 ml per 3-ml whole blood not only provided the highest LE (1 min: 95.01±0.71%, n=3; 30 min: 99.02±0.18%, n=3) but also maintained its anticoagulant property. By employing our suggested ACD concentration, an acceptable LE can be achieved for preparing Tc-99m RBC with the UltraTag® RBC kit even when using 12-hr old Tc-99m eluate from a long ingrowth time generator.

No. 974

THE ADVANTAGES OF USING ULTRATAG RBC KITS COMPARED TO COLD PYROPHOSPHATE (PYP) LABELING.
S.J. Rappaport, T.U. Sepeda, G.L. Schall. Saint Francis Memorial Hospital, San Francisco, CA.

The purpose of this study was to demonstrate, from a technologist's viewpoint, the superior results of UltraTag with regard to its ease and simplicity of preparation, labeling specificity, and diagnostic quality of its scans.

Previously we used cold pyp and a modified in-vitro technique which required many steps. Initially, we injected the patient with 1-1.5 ml of cold pyp. 20 minutes later, an IV system with a butterfly through a stop cock was set up with a syringe containing 20 mCi of Tc-99m. A 20 ml syringe was attached and 10 ml of whole blood withdrawn, mixed with the technetium, and allowed to incubate for 10 minutes (still attached to the patient) before scanning could be started.

UltraTag RBC kits come with a 10 ml reaction vial with two prepared syringes to which 20 mCi of Tc-99m is added. Withdraw 1-3 ml of whole blood from the patient, add this to reagent vial, wait 5 minutes, add syringe 1 and mix, add syringe 2 and mix, add 20 mCi of Tc-99m and mix and after 20 minutes, inject into the patient. The technologist's time involved in labeling the cells is approximately 5-10 minutes compared to the pyp method which requires approximately 45 minutes. The labeling efficiency of UltraTag is greater at approximately 97% compared to in-vivo labeling efficiency of 75% and the modified in-vitro method of approximately 90%.

In our laboratory, we have done many GI bleeding studies and cardiac wall motion studies with both agents. We shall demonstrate the superior diagnostic quality of the scintiphotos using the UltraTag technique.

No. 975

HEPARIN VS. ACD ANTICOAGULANT EFFECT ON Tc99M RBC INVITRO LABELING. A QUANTITATIVE ANALYSIS:
J. Bonacorrsi, J.K. Russell, A. Rodriguez, G. Snyder, S. Abraham, J. Murphy. Likoff Cardiovascular Institute, Philadelphia, PA. 19116

Invitro Tc99m RBC labeling, using either Heparin (H) or ADC as anticoagulant, has been reported to give ≥95% RBC tagging efficiency. ACD within the reaction vial sequesters residual extracellular stannous ion, rendering it more available for oxidation by sodium hypochlorite, but H has no effect on stannous ion.

To examine whether anticoagulant choice has any effect on image quality, 22 patients (Pts) underwent invitro Tc99m RBC labeling, 11 using ADC and 11 using H for anticoagulation. Standard gated blood pool scans were obtained in all, and a target to background ratio was calculated using the counts/pixel (c/p) in the end systolic (ES) and background (B) regions as follows: ES c/p ÷ B c/p. The target to background ratio was significantly better with H as an anticoagulant: H=2.43 ± 0.71; ACD = 1.98 ± 0.32; P = 0.016.

In conclusion, H as anticoagulant in invitro Tc99m RBC labeling gives a significantly better target to background ratio than does ADC, resulting in better

No. 976

IN-VITRO STABILITY OF THREE Tc-99m LABELLED EGG FORMULATIONS FOR GASTRIC EMPTYING TIME (GET) STUDIES.
D.M. Wilson, J. Polihronis, R.M. Reilly, D.E. Newall, S. Houle. The Toronto Hospital, Toronto, Ont., Canada

GET studies are commonly carried out using Tc-99m Sulphur Colloid (SC) labelled egg. To determine if the preparation of SC labelled egg could be made more convenient, we decided to investigate the possibility of labelling powdered egg with SC and compare its stability *in-vitro* with two other SC labelled formulations. The other formulations were 1) SC added to a previously cooked egg and 2) raw egg labelled with SC then cooked. *In-vitro* stability of the formulations was measured by incubation at 37 degrees Celsius in simulated human gastric juice (USP XXI) with/without pepsin. After incubation for 15, 60 or 120 minutes, the egg formulation was filtered through a wire mesh, washed with water and the radioactivity of the filtrate and unfiltered solid measured. Without pepsin, the powdered egg and raw egg cooked with SC maintained 98-100% of their associated radioactivity up to 120 minutes while the cooked egg labelled with SC lost about 27% of its radioactivity. In the presence of pepsin, about 80% of the radioactivity was lost from the previously cooked egg labelled with SC, 91% from the raw egg labelled with SC then cooked whereas the powdered egg formulation lost only 14% of its radioactivity over a 2 hour period. We conclude that powdered egg labelled with SC was the most stable formulation for GET studies. It is more readily available and convenient to prepare than the other formulations.

Session VII

Hematology/Infectious Disease/Pulmonary

1:30-3:10 **Room: 216C**

Moderators: Don Hamilton, CNMT and Frances Neagley, CNMT

No. 977

THE SEDIMENTATION METHOD FOR LEUKOCYTE LABELING.
B.M Brown, K.T. Cheng, L. Gordon, W.A. Patterson, T. Rogers and Z.W. Tou. Medical University of South Carolina, Charleston, SC.

One of the major problems in radiolabeled leukocyte (WBC) studies is the presence of radiolabeled red blood cells (RBC). The most common method of leukocyte radiolabeling with In-111 utilizes centrifugation to separate the plasma from the leukocytes. This method produces final preparations with significant amount of RBC. Recently, a method which utilizes a rocking motion to sediment the leukocytes has been used. In this study, we compared these two methods in randomly selected patients. The WBC/RBC ratios were obtained using the hemocytometer from the final preparations of In-111 WBC. The liver/spleen uptake ratios were obtained from the posterior whole body images using the ROI techniques. The results showed that the sedimentation method produced a significantly better WBC/RBC ratio of 2.77 (+/-1.39, N=5). The liver to spleen uptake ratios were 0.72 (+/0.45, N=5, positive cases) and 1.01 (+/0.50, N=5, negative cases). The centrifugation method produced a WBC/RBC ratio of only 0.85 (+/-0.34, N=5). The liver to spleen uptake ratios were 0.35 (+/-0.28, N=5) and 0.45 (+/-0.12, N=5). We conclude that the new sedimentation method produces a better pharmaceutical preparation with potentially better clinical images.

No. 978

IN-111 LABELED LEUKOCYTES VS. GA-67: AN OVERVIEW OF INFECTION IMAGING.
I.S. Zolty, C.J. Palestro and M.L. DeLaney.
Mount Sinai Medical Center, New York, New York.

A comparison of the two most widely used radionuclide techniques for infection was undertaken to determine the diagnostic utility of each method.

The identification of sites of infection is becoming increasingly dependent on imaging techniques. We compared In-111 labeled autologous leukocyte scans with Ga-67 scans in 50 patients presenting with suspected infections. All patients received 500uCi of In-111 autologous leukocytes labeled according to Thakur et al. Scans were performed 18-24 hours post injection. In addition, the same patients received 5-10mCi of Ga-67 within 7 days of the In-111 WBC scans, and were imaged 48-72 hours post injection. All scans were performed on LFOV gamma cameras with medium energy, parallel hole collimators.

Results show that In-111 labeled leukocyte imaging was most useful in infectious processes that elicit a neutrophilic response such as abscess, colitis, acute osteomyelitis and bacterial pneumonia. Ga-67 was most useful in conditions that elicit a monocyte macrophage response such as PCP, tuberculosis and sarcoid. Neither study was useful for the diagnosis of endocarditis. In conclusion, In-111 WBC and Ga-67 have complementary roles in the patient with suspected infection. Knowledge of which conditions are best suited to imaging with each of these techniques will greatly enhance not only the utility of each of these procedures, but also the radionuclide localization of infection in general.

No. 979

Comparison of Ga-67 citrate, In-111 oxine and Tc-99m HMPAO in infection diagnosis.
K.D. Hurm, C.L. Puckett. University of Virginia Health Sciences Center, Charlottesville, VA.

An accurate method which provides results without significant delay is important in diagnosing infections and inflammation. This paper compares and contrasts two existing methods and one new method, the use of Tc-99m labeled white blood cells (WBC). A patient presenting an elevated WBC count after a postoperative procedure is at high risk for serious complications which tend to have high morbidity and mortality associated. It is pertinent to the care of the patient that a diagnosis be rendered as quickly as possible.

Ga-67 citrate, a non-specific radiopharmaceutical, has been used to detect infection, inflammation, and neoplastic processes. The major drawback to using Ga-67 citrate is that a diagnosis cannot be rendered for 48 to 72 hours. In another method, WBC's are labeled (traditionally with In-111 oxine) through a series of sedimentations, centrifugations and washings to separate WBC's from plasma and other components. This separation is needed because of the preferential binding of to plasma transferrin and the competitive labeling of platelets, red blood cells, and other cellular components.

In the last several years, new techniques have been developed to label WBC's with technetium. Technetium-labelled WBC's may identify the site of infection in 1-4 hours which can add valuable information to the management of the patient. One labeling technique has been accomplished by the same lipid soluble agent used to perform cerebral blood flow scans, HMPAO (hexamethylpropyleneamine-oxine). HMPAO labelled WBC's have many advantages over In-111 oxine labelled WBC's primarily due to a reduction in radiation dose (0.8 vs 27 rad/mCi to spleen), allowing for higher administered activity (5 mCi vs. 500 μCi). More activity plus lower energy provides better image quality so that the extremities can be properly imaged. Other advantages include the integrity of the cell is maintained since no saline washing is needed, kit availability, and possibly shorter hospital stays. These many advantages of the Tc-99m HMPAO labeled WBC's make it attractive for use in diagnosis of infection and inflammation.

No. 980

METHODOLOGY FOR COMBINED QUANTITATIVE Tc-99m DTPA AEROSOL AND Tc-99m MAA PERFUSION LUNG IMAGING.
PJ Reder, RJ Ackermann, R Greenough, RL Wahl. University of Michigan, Ann Arbor, MI

Sequential, quantitative assessments of pulmonary ventilation and perfusion are assuming increasing clinical importance as single lung transplants are performed to treat advanced lung disease. We have developed a technique for precisely quantifying aerosol and

perfusion studies in a single scanning session. All images are acquired on a dedicated gamma camera/computer system. Immediately post-inhalation of Tc-99m DTPA aerosol, anterior and posterior static images are acquired for equal time, followed by standard lateral and oblique views. Due to the relatively short half-life of the aerosol in the lungs, repeat anterior and posterior views are obtained immediately prior to the injection of the perfusion agent. These images are required for the subsequent subtraction of aerosol contribution from the perfusion images. Following administration of 5 mCi of Tc-99m MAA, posterior and anterior perfusion images are acquired for the equivalent time of the pre-injection aerosol images. The remaining perfusion views are obtained as usual. Quantitative ventilation is determined as the geometric mean of the initial anterior and posterior aerosol images and is expressed as a Right/Left split-function percentage. Total counts are derived from the pre-perfusion injection anterior and posterior aerosol images and are subsequently subtracted from the perfusion anterior and posterior images. Quantitative perfusion is obtained from the geometric mean of the aerosol-subtracted pulmonary perfusion anterior and posterior images and is also expressed as a split function percentage. This technique was successfully applied on 21 lung scans for 6 single lung transplant patients who were studied sequentially. Precision of the technique was good (+/- 5%). Increased perfusion was generally seen in well-functioning transplanted lungs while a progressive decrease in perfusion was evident in patients with rejection or severe pneumonia. Precise quantitative ventilation and perfusion determinations utilizing Tc-99m DTPA aerosol and Tc-99m MAA are possible with this simple technique. This method may prove clinically useful in the management of single lung transplant patients.

No. 981

AN IMPROVED METHOD FOR REDUCING PARTICLE NUMBER IN A TECHNETIUM-99m MACROAGGREGATED ALBUMIN INJECTION. D.M. Bolstad, T.B. Valley, M.E. Wilson, and J.C. Hung. Mayo Clinic, Rochester, MN.

For patients with a left-to-right cardiac shunt or pediatric lung scan patients who are to receive a Tc-99m macroaggregated albumin (MAA) dose, it is optimal to reduce the number of MAA particles given. Previous literature* has introduced a method to reduce particle number. The major drawback with this method is that the proposed volume to be injected is not practical (0.1 ml). If the injected volume were increased to a more acceptable volume (e.g., 0.5-1.0 ml) and the Tc-99m MAA dose is not increased, the tin level in the pre-divided MAA kit may not be enough to reduce the Tc-99m and allow for an acceptable binding efficiency (BE) (≥90%). Since the vendor of the MAA kit was not specified in the paper, this speculation cannot be verified. The goal of our experiment was to reduce the number of particles contained in a Tc-99m MAA unit-dose to ~40,000 particles per pediatric patient and ~100,000 particles per adult shunt patient. Our method involved adding a small volume (0.5-1.0 ml) of sodium pertechnetate Tc-99m to a pre-diluted 1-ml Mallinckrodt TechneScan® MAA vial, incubating for 10 min, then diluting the Tc-99m to the desired volume once ≥90% BE was achieved. Our method increased the amount of Tc-99m MAA injected to a more acceptable volume of 0.5 ml for pediatric patients and 1.0 ml for shunt patients. The average BE of Tc-99m MAA preparations for the pediatric portion (n=20) and shunt portion (n=16) were ≥97% up to 60 min after dilution. Particle size and number were confirmed using a hemacytometer and light microscope. By initial incubation of a small volume of Tc-99m with the reduced level of tin in a pre-divided MAA vial, we were not only able to achieve greater BE but also an adequate volume and particle number compared with the previous method.

*Levine, EK et al. *J Nucl Med Technol* 1989;17:143-144.

Session VIII

Renal/Endocrine

3:30-5:10 **Room: 216C**

Moderators: Nellie Kelty, CNMT and Victoria Walton, CNMT

No. 982

LOW DOSE RENAL SCINTIGRPHY FOR SERIAL FOLLOW-UP EVALUATION OF RENAL ALLOGRAFT. M.L. Greenwell, S.R. Yonts, J.S. Coon, E.A. Nugen, U.Y. Ryo. University of Kentucky Medical Center, Lexington, KY.

Radiation absorbed dose to the body and renal system from routine renal scintigraphy with Tc-99m-DTPA or Tc-99m-MAG_3 is relatively low due to rapid clearance of the radiopharmaceuticals from the body. In renal transplant patients, however, the clearance may not be as rapid and renal parenchymal uptake may be higher than normal. Frequent follow-up studies are usually required in transplant patients, and their renal and total body radiation burden may reach significant levels.

We have attempted to reduce the radionuclide dose for renal scintigraphy. The DTPA dose was reduced from 10 mCi to 6 mCi, and the MAG_3 dose from 5-10 mCi to 2-2.5 mCi. A high sensitivity parallel hole collimator was used with the 2 mCi dose studies, and a low energy high resolution collimator was used for the 6 mCi dose studies.

The quality of images and computer generated curves for renal flow and filtration/excretion with the low dose was comparable to that with higher doses. Counts generated from a renal region of interest were significantly lower with the 2 mCi dose only during the early arterial phase. During the equilibrium phase, 2 mCi of Tc-99m-MAG_3 produced counts similar to those from 10 mCi Tc-99m-DTPA. In some patients, during the filtration/excretion phase, counts from the smaller MAG_3 dose became significantly higher than with the larger DTPA dose.

For serial evaluation of renal allograft, radionuclide doses may be reduced to less than one-half of the routine dose without compromising the study.

No. 983

QUANTIFICATION OF RENAL BLOOD FLOW AND FUNCTION USING A CONVECTION DIFFUSION MODEL IN THE TRANSPLANTED KIDNEY. J.W. Hart, P.J. Webner, N.C. McManus, M.L. DeLaney, P.H. Stritzke, S. Kupfer, C.J. Palestro. Mount Sinai Medical Center, New York, New York.

The classical Tc-99m-DTPA renal scan is an important test for the surgeon to evaluate post-operative performance of the transplanted kidney. The renal scan could provide additional information if the data could be quantified with respect to blood flow and function. A potential benefit could be gained for the patient through earlier detection of possible complications.

Sixty five studies on twenty five renal transplant recipients were performed for suspicion of renal complications. The patients were injected with 15mCi of Tc-99m-DTPA and traditional blood flow and function images were obtained. In addition, a warm venous compress was applied to the patient's arm and a blood sample was obtained. We used a convection-diffusion model (CDM) to generate a linear response function (LRF) for the kidney. Counts were normalized to activity/unit volume using an eighty milliliter renal phantom to simulate geometric tissue attenuation and by comparison to the counts/ml in the blood sample. According to CDM the peak of the LRF represents the perfusion of the kidney and the plateau of the LRF represents the GFR. To compare the model's results with independent clinical interpretation we ranked each study by blood flow and GFR (normal = 0, slightly impaired = 1, moderately impaired = 2, severely impaired = 3). Correlation between clinical interpretation and the model's results were very strong for blood flow and GFR ($p < .001$).

In summary, the CDM provides a means to quantitate renal blood flow and function by a noninvasive two minute scintigraphic study. The CDM is preferred over other models because it calculates perfusion and GFR simultaneously. In addition, this study is accurate in low flow states, and only requires a single blood sample.

No. 984

HIGH RESOLUTION RENAL SCINTIGRAPHY: AN IMPROVED TECHNIQUE. T.L. Jump, M. Tulchinsky, E. Barlow, and D.F. Eggli. Division of Nuclear Medicine, Milton S. Hershey Medical Center, Hershey, PA.

The standard renal scintigraphy (RS) is typically acquired using 64x64 Word mode. This crude matrix was required in the past because of limited memory on older computer systems. We took advantage of the large memory typical for newer computers, and performed high resolution RS (HRRS) in 128x128 Word mode.

The HRRS acquisition parameters were 60 frames for 1 sec each in phase 1 and 120 frames for 15 sec each in phase 2. Analysis of the renal blood flow was performed using a protocol written in-house for determining kidney-to-aorta flow (K/A) ratio. The differential renal function was determined by regions of interest (ROI) outlining the kidneys, using a circumferential background correction. This

was applied to a composit image from 61 sec to (but not including) the first appearance of renal pelvis activity. The same kidney ROIs were used for time-activity curve generation but crescent-shaped background ROIs were used.

The HRRS has been used routinely at our institution since September of 1989 and experience has been obtained in over 600 patients. Our clinical observations in HRRS, as compared with the standard RS, are as follows: 1. significant improvement in image quality for assessment of renal parenchyma; 2. significantly greater cursor control for outlining the ROIs; 3. improved reproducibility in determination of differential renal function, whether processed by the same or another operator; 4. reduced processing time because of increased confidence in ROI selection.

In conclusion, HRRS is easily performed on the state-of-the-art Nuclear Medicine equpment, rendering significant advantages in image processing and study interpretation.

No. 985

MEASUREMENT OF RESIDUAL URINE VOLUME: A POTENTIAL SOURCE OF ERROR BASED ON A PHANTOM STUDY USING ANTERIOR AND GEOMETRIC MEAN COUNTS. M.E. Jones, A. Taylor, Emory University Hospital, Atlanta, Ga.

Determination of residual bladder volume can be calculated by the formula: residual volume = (postvoid counts x voided urine volume) / (prevoid - postvoid counts). These measurements are often based on anterior counts over the bladder but the use of anterior counts assumes the center of mass of urine remains the same on the postvoid image. If the center moves anteriorly or posteriorly, errors may be introduced. To estimate the potential magnitude of these errors, phantom studies were conducted using three containers filled with water to yield the following dimensions: 56x30x20cm, 36x23x20cm, 23x36x20cm. Two imaging sessions followed. First, a bag containing 450 ml of a uniform solution of saline and 1 mCi of Tc-99m was immersed in each container. The bag was positioned at 3 distances along the length of each container and anterior and posterior counts were collected. Next, 250 ml were removed from the bag and anterior and posterior counts were again collected at each distance. All images were acquired for 60 seconds, using a 128x128 matrix, and a LEAP collimator and then decay corrected. The residual volume in the bag was calculated for each distance and container with anterior counts and geometric mean counts. In addition, we evaluated the effect of 3 cm displacement of the bag anterior or posterior to the original "prevoid" imaging session.

Results: With the center of mass constant, anterior and geometric mean calculations gave similar results. However, a 3 cm anterior or posterior displacement of the "postvoid" bag resulted in errors in residual volume measurements ranging from 54-150% using anterior imaging whereas geometric mean errors ranged from 1% to 15% and were probably within experimental error. The greatest errors were associated with the largest phantom suggesting that errors in measuring urine volume are likely to be larger in obese patients. Conclusions: Use of the geometric mean technique will minimize errors in the measurement of residual urine volume.

No. 986

CALCULATING THE GLOMERULAR FILTRATION RATE USING THE LOTUS 1-2-3® BUSINESS SPREADSHEET. D.R. Gravelle, and J.E. Powe. University of Western Ontario and Victoria Hospital, London, Ontario, Canada.

There are various methods of calculating the Glomerular Filtration Rate (GFR) following an i.v. injection of Tc-99m-DTPA. A highly accurate method exists that requires a blood sample to be taken at exactly 3 hours post injection. Otherwise, samples at 1,2 and 3 hours can accurately estimate the GFR. However, in all cases, sophisticated equations are required when calculating the GFR and often result in error because pocket calculators and operators cannot effectively deal with these complex equations. Programmable calculators have somewhat alleviated this problem, however programming is tedious and the program is often not user friendly. Furthermore, human error cannot be monitored (punching in the wrong value).

LOTUS 1-2-3® , a business spreadsheet program, is an excellent tool that can be used to calculate the GFR once plasma counts, standard counts and sample times have been entered in the spreadsheet by the operator. The various equations to calculate GFR are permanantly stored in cells within the spreadsheet. Data entry and data manipulation are controlled using Lotus 1-2-3 ® Macros, curve fitting is performed using Lotus 1-2-3 ® 's Regression Analysis whereas LOTUS 1-2-3® 's Logical functions are used to check the values entered by the operator and will flag the user should it detect an incorrect entry or value.

LOTUS 1-2-3® is a valuable tool when calculating GFR since the equations are pre-stored in the spreadsheet, errors are flagged, and data entry is controlled. Furthermore, LOTUS 1-2-3® allows for the calculation of GFR using various methods simultaneously, reduces errors and can be programmed by a novice user.

No. 987

USE OF POST I-131 METASTATIC THYROID CANCER THERAPY SCANNING TO HELP VISUALIZE SITES OF UNDETECTED DISEASE.

P.J. Webner, C.J. Palestro, J.W. Hart, M.L. DeLaney. Mount Sinai Medical Center, New York, NY.

We performed 36 post ablative I-131 total body scans on 25 patients with thyroid carcinoma. All 25 patients were initially scanned using a low dose of I-131 (1mCi). Whole body, pinhole, and turnover studies were performed to help calculate the therapeutic dose. Treatment doses ranged between 75 and 300mCi of I-131. Scans were performed between 48 and 96 hours after treatment, when residual patient dose was between 6 - 12mCi.

Of the 36 post ablative scans performed, 20 showed metastatic deposits not evident on the low dose pretreatment study. A total of 64 additional metastatic sites were seen. 16 scans showed no additional lesions when compared to the baseline study.

With only the initial low dose whole body scan distant metastatic sites may not be visualized. The primary site accumulates the greatest portion of the radiotracer. Secondary sites also concentrate radiotracer, but may go undetected because of poor count statistics. Following a therapeutic dose, there is considerably more radiotracer available for uptake by secondary, often less iodine avid, lesions. With the higher dosage, we achieve a higher target to nontarget ratio and can better visualize secondary metastatic sites. By using this technique, which takes only 20 minutes, one can better document extent of disease. Using this information, the referring physician can better plan future patient management.

THURSDAY JUNE 11, 1992

Session IX

Cardiac

8:30-10:10 **Room: 216C**

Moderators: Chris Carlson, CNMT and Kim Maas, CNMT

No. 988

TECHNICAL ASPECTS OF GATED PLANAR SESTAMIBI IMAGING FOR THE EVALUATION OF REGIONAL CARDIAC WALL MOTION DURING DOBUTAMINE STRESS TESTING. M.T. HACKETT, J. BALSEIRO, J.H. ARTHUR. DEPARTMENT OF VETERANS AFFAIRS MEDICAL CENTER, RICHMOND, VIRGINIA

Tc-99m Sestamibi [Cardiolite(R)] with its superior imaging properties, permits the assessment of cardiac perfusion and resting wall motion which Thallium-201 does not. Studies have shown that Dobutamine (DOB) Thallium studies can be an alternative test in patients who cannot undergo treadmill or dipyridamole stress testing. We have developed a gating protocol to assess regional wall motion during DOB infusion (DI) (pharmacologic stress) along with perfusion.

Initially, the patient is injected intravenously (IV) with 10 mCi Sestamibi at rest. Rest planar perfusion images using standard views are obtained after one hour delay using a SFOV gamma camera equipped with a high resolution collimator. This is followed by four minute gated planar acquisitions during 5 minute increments of DOB infusion (0,5,10,20,30,40 mcg/kg/min). Each acquisition is composed of 12-64x64 frames, zoom of x1.5 using a SFOV gamma camera equipped with a high sensitivity collimator. The optimal view used during DI is selected by review of the rest perfusion images, previous cardiac studies and/or patient history. The patient's HR, BP and EKG is monitored during DI. At peak DI, 30 mCi of Sestamibi is injected IV and DI is stopped two minutes after radiotracer injection. Planar images representing peak stress perfusion are obtained after a 45 minute delay using the same imaging parameters as the initial rest images. The rest/stress perfusion data is quantified. The gated studies during DI are displayed in cine format for the assessment of regional wall motion during DOB stress testing.

The quality of images both during normal perfusion imaging and during DI are highly adequate for assessing both cardiac perfusion and regional wall motion during DOB stress testing. This added data gives physicians additional diagnostic information in the detection of coronary artery disease (CAD). In our lab, DOB gated planar Sestamibi wall motion imaging has been demonstrated as a superior method of detecting CAD compared to perfusion imaging alone.

No. 989

DUAL ISOTOPE IMAGING WITH THALLIUM-201 TC-99m AND SESTAMIBI. D. Cassel, K. McLain, B. Iskandrian, V. Cave, J. Heo, A.S. Iskandrian. Philadelphia Heart Institute, Presbyterian Medical Center.

The conventional method of myocardial imaging with thallium or technetium labeled imaging agents is time consuming and may delay decision making process; increase hospital stay and thus add to the medical cost at a time when cost containment is necessary. This is certainly true in a subset of patients (pts) in whom despite the availability of the results of coronary angiography, physiologic assessment of the severity of the stenosis is deemed necessary to determine whether no surgical revascularization, percutaneous transluminal coronary angioplasty (PTCA) or laser angioplasty should be performed. This study examined a new dual isotope protocol used in our laboratory. In such pts the imaging is usually done the day after coronary angiography and on the morning of interventional procedure is scheduled. Initially adenosine SPECT thallium imaging is done and as soon as the imaging is completed and while the patient is still supine on the imaging table, a 20 - 25 mCi of Tc-99m sestamibi is injected. The SPECT imaging of sestamibi is then done 30 to 60 min later. The entire imaging protocol takes 90 to 120 min, allowing subsequent intervention to be performed on that same day (if necessary). This protocol has been tested so far in 8 pts. The images are of high quality. In these pts the perfusion pattern was normal in 1 pt, and showed reversible defects in 3 pts, and fixed defects in 4 pts.

Thus, dual isotope imaging using thallium and sestamibi is an attractive alternative to single isotope imaging, and permits a high quality imaging in a much shorter period of time. This protocol used in this study in pts potentially requiring interventional procedures may also prove to be useful in other pt population including outpatients.

No. 990

Evaluation of acquisition parameters effects on localization of regional photopenic defects in 99mTechnetium myocardial perfusion imaging using SPECT. Gagnon A.* Taillefer R.** Bavaria G. ** : *Du Pont Pharma, Canada **Hotel Dieu de Montréal, Canada.

In order to evaluate the effects of different acquisition and processing protocols on myocardial perfusion defect detectability, multiple SPECT acquisitions were performed using a Rh-2 Cupintec heart phantom. The different cavities were filled with a concentration of 99mTc replicating biodistribution of 15 mCi injection of 99mTc-SESTAMIBI; 2% heart uptake with 2 to 1 heart/lung ratio, 6 to 1 heart/mediastinum ratio. Total surface perfusion defects of 5.5% and 8.3% were created using 10cc and 15cc balloons. These were filled with 99mTc in order to obtain a defect-to-normal myocardium ratio of .6. The 15cc and 10cc defects were positioned in the antero-septal and postero-lateral wall respectively. The phantom was covered with half-inch gelatine to reproduce body tissue and the left pectoral muscle attenuation. SPECT acquisitions were performed using different combinations of high resolution and GAP collimators, 64 and 32 frames, 20 seconds/frame , 3 and 6 inches away from the detector. Acquisitions were reconstructed using a Ramp reconstruction filter. Three pre-reconstruction filters were evaluated; Butterworth with an order of 5 and frequency cutoff at .2, .3 and .5. Regions of interest (7x7 pixels) were drawn over normal wall, antero-septal and postero-lateral wall defects. Defect-to-normal wall ratio were calculated to evaluate defect detectability. Results are as follows:

			Ratio					
			antero-septal			postero-lateral		
Acquisition	PROXIMITY	Cutoff	0.20	0.30	0.50	0.20	0.30	0.50
1 high res. 64x20	3 INCHES		0.63	0.50	0.53	0.93	0.69	0.56
2 high res. 64x20	6 INCHES		0.64	0.58	0.44	0.95	0.91	0.74
3 high res. 32x20	3 INCHES		0.67	0.57	0.67	1.01	0.76	0.76
4 high res. 32x20	6 INCHES		0.66	0.49	0.48	1.03	0.86	0.77
5 GAP 64x20	3 INCHES		0.66	0.60	0.55	0.96	0.88	0.78
6 GAP 64x20	6 INCHES		0.54	0.46	0.50	0.86	0.73	0.70
7 GAP 32x20	3 INCHES		0.65	0.52	---	0.90	0.79	---
8 GAP 32x20	6 INCHES		0.60	0.50	0.49	0.92	0.77	0.65

The study showed that the 15cc defect positioned in the antero-septal wall was detected by all acquisition/processing protocols. The 10cc postero-lateral defect was either undetected or much less apparent with non-optimal acquisition/processing protocols.

No. 991

SIMULTANEOUS DUAL ISOTOPE MYOCARDIAL PERFUSION SCINTIGRAPHY. J. Patel, J. Zhang, C.H. Park and S. Kim. Thomas Jefferson University Hospital, Philadelphia, PA.

Stress myocardial perfusion scintigraphy (SMPS) plays an important role in the diagnosis and in the follow-up of patients with coronary artery disease (CAD). Unfortunately, the procedure requires two sets of stress and resting imagings. In order to simplify the test, a simultaneous dual isotope (stress and rest) scintiscan (SDIS) was evaluated using 99mTc MIBI and Tl-201 chloride. SDIS was obtained utilizing a small field of view planar camera (CX 250, Picker) and a triad SPECT system (Trionix). The following factors were evaluated for SDIS;

Sequence of injection - 99mTc MIBI was administered at rest first followed by Tl-201 injection at stress several minutes before the SDIS. The reason for this sequence is to avoid an additional Tl-201 uptake during exercise.

Ratio of doses - To limit downscatter from 99mTc into Tl-201 window, we have optimized 99mTc/Tl-201 ratio after trying out varying ratios of the two radionuclides.

Energy peaks and windows - For both planar and SPECT imagings, we have used 140 kev, 20% window for 99mTc and 75 kev, 15% window for Tl-201.

Imaging - For planar imaging, anterior, LAO-40, LAO-60 views were performed for 5 minutes each. For SPECT, 120 projectional images were acquired for 30 seconds per projection using 3 detectors.

From this study, we optimized a technique for successful SDIS. The technique, however, could underestimate myocardial ischemia due to differences in attenuation from 99mTc and Tl-201 in obese patients or in patients with large breast size.

No. 992

I-123 BMIPP AND TL-201 SPECT AS A MARKER OF LONG-TERM OUTCOME IN ACUTE MYOCARDIAL INFARCTION. T. Mori, Y. Yasaka, H. Kurogane and Y. Yoshida, Hyogo Brain and Heart Center at Himeji, Himeji, Japan

To evaluate the relationship between myocardial perfusion and fatty acid metabolism in acute myocardial infarction, twelve patients who suffered from first anterior infarction with reperfusion therapy were studied using Tl-201 SPECT (8±2 days) and I-123 BMIPP SPECT (7±1 days). Tl-201 SPECT was repeated in 1.5 month after the onset. Left ventricular ejection fraction (LVEF) was calculated by Tc-99m ventriculography in 7±3 days, 2.7±0.5 months and 1±0.2 year. On Tl-201 and I-123 BMIPP SPECT, Tl-201 and I-123 BMIPP uptake index on left anterior descending artery region were calculated. Group 1 consisted of eight patients who had lower I-123 BMIPP uptake index than Tl-201 uptake (Mismatch of I-123 BMIPP and Tl-201 uptake). Group 2 consisted of four patients who had the same I-123 BMIPP uptake as Tl-201. I-123 BMIPP uptake index was not significantly different between two groups (Group 1: 8.3±3.5, Group 2: 5.0±0.5). On the other hand, Tl-201 index on 8 days was higher in group 1 than in group 2 (Group 1: 11.8±3.9, Group 2: 4.5±0.6, p<0.01). In Group 1, on 1.5 months Tl-201 uptake index increased compared with those on 8 days (13.8±3.5; vs 8 days p<0.05). However, in Group 2 Tl-201 uptake index did not change on 1.5 month (4.5±0.6). LVEF in two groups were as follows:

LVEF	7 days	2.7 months	1 year
Group 1	47±9%*	50±6%*	54±7%*†
Group 2	29±10%	36±10%	36±10%

*: vs Group 1 p<.01
†: vs 7 days p<.05

Thus, mismatch of I-123 BMIPP and Tl-201 uptake on early phase in acute myocardial infarction indicates successful myocardial salvage shown by Tl-201 uptake restoration and good contractile function in one year. We conclude that combination of I-123 BMIPP and Tl-201 SPECT will be useful for assessment of myocardial viability and will give critical information for early detection of effect of therapy.

No. 993

DETECTION OF ISCHEMIA USING DIPYRIDAMOLE TL-201 MYOCARDIAL SPECT IMAGING: EFFECT OF TIME INTERVAL FROM TL-201 INJECTION TO IMAGE ACQUISITION. S.A. Herzog and A.F. Jacobson. DVA Medical Center, Seattle, WA

Although detection of exercise-induced ischemia with thallium-201 (Tl) can be reduced if image acquisition is substantially delayed, a similar observation has not been made following pharmacologic stress. As patients undergoing dipyridamole Tl studies in our department are not transferred to the imaging room until stable symptomatically and electrocardiographically, there is a variable delay between Tl injection (5 minutes following completion of 4-minute 0.56 mg/kg dipyridamole infusion) and initiation of image acquisition. To determine if the length of this acquisition delay (AD) affected detection of ischemia, we recorded these time intervals for 39 sequential patients and correlated them with Tl imaging results. Clinical Tl results were categorized as: 1. Normal; 2. Complete redistribution; 3. Fixed defect plus redistribution; 4. Fixed defect.

AD ranged from 6-27 minutes, >10 minutes in 18 patients and ≤10 minutes in 21. Of the former group, redistribution was noted in 10 (55%), including 6/8 with AD≥14 minutes. Of the 21 patients with AD≤10 minutes, 9 showed redistribution (43%) (p=n.s.).

Mean AD was not significantly different for the 4 image result groups:

Result:	1	2	3	4
Mean AD (min):	10.1	11.4	11.0	11.5.

There was no difference in the identification of ischemia for ADs ranging from 6-27 minutes. The long duration of the effect of intravenous dipyridamole may be responsible for this finding.

CONTINUING EDUCATION

ACCREDITATION STATEMENTS

The Society of Nuclear Medicine is approved by the American Council on Pharmaceutical Education (ACPE) as a provider of continuing pharmaceutical education.

The Society of Nuclear Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians.

The Society of Nuclear Medicine designates all SNM 39th Annual Meeting continuing medical education activity for 212.75 credit hours in Category I of the Physician's Recognition Award of the American Medical Association (AMA).

Continuing Pharmaceutical Education Credit

Reporting Forms are available in the registration packet. Complete the Certification of Continuing Pharmaceutical Education Participation and deposit the top portion in the receptacle located in the Continuing Education Office, Room 102, or mail it to the address indicated on the form. Retain the lower portion for your records. ACPE certificates will be mailed after the meeting.

The courses and seminars in the Technologist Program approved for ACPE credit are as follows: Genitourinary: Renal Imaging and Functional Analysis; PET as a Clinical Reality; Gastrointestinal Imaging; NRC: Quality Management Program; Nuclear Cardiology I: Myocardial Perfusion Imaging; Infection Control: AIDS and Nuclear Medicine Technology; Nuclear Cardiology II: Ventricular Function Imaging and Agents on the Horizon; Pediatrics: Clinical and Technical Considerations when Imaging the Pediatric Patient; Monoclonal Antibodies: Practical Uses and Applications; SPECT II: Technical and Clinical Aspects of SPECT.

CME and VOICE Credit

This year, the Technologist Section of the SNM is offering Continuing Medical Education (CME) credits for its Continuing Education Sessions. All physicians are invited to participate.

Physicians please note: You must fill out the Annual Meeting General Evaluation Form enclosed in your registration packet, along with the individual evaluation forms for the sessions you attend, in order to receive CME credit. Please return completed continuing education packets to Room 102 and the individual evaluation forms to the appropriate course organizers.

All Continuing Education courses are approved for VOICE credit.

MONDAY, JUNE 8, 1992

LEADERSHIP SKILLS FOR EXCEPTIONAL PEOPLE MANAGING IN NUCLEAR MEDICINE

Time: 8:00–3:00 **VOICE: 0.72** **CME: 6.00**
Room: 501A

Organizers: Lynne T. Roy, MS, CNMT and James J. Wirrell, MS, CNMT

Educational Objective:
After attending this workshop, the participants will be able to:
1. Identify eight qualities of exceptional leaders and assess where they stand on each one and how to strengthen the qualities in themselves and their people.
2. List three barriers to creativity and risk taking and develop strategies for overcoming these barriers.
3. Describe eight skills to increase one's leadership and ability to motivate others.
4. List three specific techniques for handling the people and things that can push our buttons on a day-to-day basis.
5. List four methods for contributing to being an exceptional organization in times of severe competition, rapid change, and limited resources.
6. Propose how to get results and enjoy the trip.

Summary:
Today's busy nuclear medicine administrator has often not received adequate training in human resource development. This workshop will examine the qualities of exceptional leaders and allow the attendees to assess their own individual leadership style. Techniques for motivating staff and obtaining quality results will be stressed. Dr. Arthur Lange is a renowned psychologist and consultant and has devoted much of his career to developing exceptional managers.

8:00–3:00	**Leadership Skills for Exceptional People Managing in Nuclear Medicine.** Arthur Lange, EdD, Consultant, Balboa Island, CA.

PET: CLINICAL PET WORKSHOP

Time: 8:00–2:00 **VOICE: 0.6** **CME: 5.0**
Location: LAC-USC and UCLA Medical Centers

Organizers: Donna Marciano, CNMT and Francine Aguilar, CNMT

Educational Objective:
This course is intended for the nuclear medicine technologist currently involved in planning or operating a clinical PET site. The participant will learn the issues involved in project planning and clinical procedures. Upon completion of this course, the participant should be able to define how to:
1. Plan a PET facility.
2. Understand and implement the requirements necessary for physical space buildout.
3. Select equipment.
4. Operate his or her facility in compliance with regulatory and radiation safety requirements.
5. Assess the staffing and budgeting needs of a facility.
6. Develop imaging protocols.

Summary:
To provide the nuclear medicine technologist currently involved in planning or operating a clinical PET site, with an opportunity to visit two operating PET centers and discuss issues in project planning and clinical procedures. At site I, a tour of the PET Imaging Center and cyclotron operation will be conducted. At Site II, a tour of the PET Imaging Center and PET radiopharmacy will be conducted. There will be a presentation and open panel discussion at each site.

9:00–10:00	**Facility Planning for Clinical PET.** Donna Marciano, CNMT, UCLA Medical Center, Los Angeles, CA.
10:00–11:00	**Imaging Protocols/Regulatory Issues.** Francine Aguilar, CNMT, UCLA Medical Center, Los Angeles, CA.
11:00–12:00	**Staffing and Budgeting for Clinical PET.** Jennifer Keppler, Administrative Director, USC PET Imaging Science Center, Los Angeles, CA.
1:00–2:00	**Tour of PET Scanners and Cyclotron.** Donna Marciano, CNMT, UCLA Medical Center, Los Angeles, CA.
1:00–2:00	**Tour of PET Scanners and Cyclotron.** Francine Aguilar, CNMT, UCLA Medical Center, Los Angeles, CA.

1:00–2:00 **Tour of PET Scanners and Cyclotron.** Jennifer Keppler, Administrative Director, USC PET Imaging Science Center, Los Angeles, CA.

TEACHER IMPROVEMENT PROJECT SYSTEM (TIPS) SEMINAR

Time: 8:00–3:00 **VOICE: 0.68** **Room: 208**

Moderators: Shirley Ledbetter, BS, CNMT and Kathy Thompson, CNMT

Educational Objective:
Upon completion of this seminar the nuclear medicine technology educator will be able to:
1. Discover his or her own learning style.
2. Recognize the aspects of and roadblocks to creativity.
3. Utilize the creative problem-solving process in personal and professional life.

Topics:
Sister Madeline Smith, of Gwynedd-Mercy College, will be returning for her third year as our TIPS instructor. She will be presenting the seminar on the creative problem-solving process.

Summary:
This seminar is designed for program directors, educational coordinators, didactic faculty, clinical supervisors, and instructors of nuclear medicine technology programs. It will address the basic knowledge necessary for developing instructional objectives.

TUESDAY, JUNE 9, 1992

GENITOURINARY I: RENAL IMAGING AND FUNCTIONAL ANALYSIS

Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75** **Room: 501A**

Moderator: Nellie L. Kelty, BS, CNMT

Educational Objective:
After attending this course, the participant should be able to:
1. Identify the major anatomic components of the kidney and the primary function of glomeruli and tubules.
2. Match the appropriate radiopharmaceutical to the assessment of glomerular and tubular function.
3. List four key elements in the radionuclide determination of GFR and ERPF.
4. Identify pharmaceuticals used for interventional radionuclide renal imaging.

Summary:
This session will include a review of nuclear medicine's role in evaluating renal disease. Participants will acquire the necessary information to perform, analyze, and evaluate the procedures appropriately.

10:30–11:20 **Nuclear Medicine Imaging in the Evaluation of Renal Diseases.** Lalitha Ramanna, MD, Cedars Sinai Medical Center, Los Angeles, CA.

11:20–12:10 **Technetium-99m Mag_3 Quantification and Clinical Applications.** Andrew Taylor, MD, Emory University Hospital, Atlanta, GA.

GENITOURINARY II: RENAL IMAGING AND FUNCTIONAL ANALYSIS

Time: 1:30–4:50 **VOICE: 0.36** **CME: 3.00** **Room: 501A**

Moderators: Nellie L. Kelty, BS, CNMT and Patricia A. Sheehan, CNMT

Educational Objective:
See Genitourinary I.

1:30–2:20 **Comparison of Technetium-99m MAG_3 and Iodine-131 OIH ERPF Results Using the Camera Technique.** Alberto Arroyo, BS, CNMT, St. Vincent Medical Center, Toledo, OH.

2:20–3:10 **Renal Function Measured by GFR.** Gary Gates, MD, St. Vincent Hospital, Portland, OR.

3:30–4:20 **Pharmacologic Intervention in Renal Scintigraphy.** Donald R. Neumann, MD, PhD, Cleveland Clinic Foundation, Cleveland, OH.

4:20–4:50 **Everything You Have Ever Wanted to Know About DMSA Imaging.** Diane Becerra, BA, CNMT, Children's Hospital of Los Angeles, Los Angeles, CA.

PET AS A CLINICAL REALITY

Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75**
Time: 1:30–3:10 **VOICE: 0.2** **CME: 1.75**
Room: 501C

Moderators: Francine R. Aguilar, BA, CNMT and Jennifer S. Keppler, BS, CNMT

Educational Objective:
After attending this course, the participant should be able to:
1. In setting up a clinical PET facility, list the major considerations associated with each of the following:
   a. Site selection.
   b. Equipment selection.
   c. Radiopharmaceutical production.
   d. Patient throughput.
   e. Cost effectiveness.
   f. Reimbursement.
2. List three major clinical roles for PET in the evaluation of the cardiac patient.
3. List three major clinical roles for PET in the evaluation of the patient with neurological disorders.
4. List three clinical roles of PET for the staging, monitoring of therapeutic response, and follow up of the oncologic patient.

Summary:
This tract will provide a general overview of the use of PET as a clinical modality. The topics will include the setting up of a PET facility: instrument, radiopharmaceutical, and financial considerations. In addition, specific clinical applications of PET in cardiology, neurology, and oncology will be presented.

10:30–11:20 **Setting up a Clinical PET Facility.** Michael A. Lawson, MD, Good Samaritan Regional Medical Center, Phoenix, AZ.

11:20–12:10 **PET in the Diagnosis of Cardiovascular Disease.** Jamshid Maddahi, MD, FACC, UCLA School of Medicine, Los Angeles, CA.

1:30–2:20 **Neurological Applications of PET.** Scott T. Grafton, MD, USC School of Medicine, Los Angeles, CA.

2:20–3:10 **PET as a Tool in Clinical Oncology.** Carl K. Hoh, MD, UCLA, Los Angeles, CA.

THE FDA: THE MISSION—THE MESSAGE

Time: 3:30–4:20 **VOICE: 0.1** **CME: 0.75** **Room: 501C**

Moderator: Francine R. Aguilar, BA, CNMT

Educational Objective:
At the completion of this lecture, the participant will be able to describe in detail the three-phase analysis required by the FDA to support and demonstrate safety and efficacy for new drug approval.

Topics:
Current requisites for new drug approval, including problems in new drug review.

Summary:
This lecture will review the early laws and significant milestones of change which established the present FDA regulations. Discussion for current requisites for new drug approval will review Phase I, II, and III requirements and associated problems and pitfalls. Concluding remarks will provide an outlook for the future including changes within the agency and a collaborative approach for future drug approval.

3:30–4:20 **The FDA: The Mission—The Message.** David H. Woodbury, MD, FACNP, Food and Drug Administration, Rockville, MD.

NRC: QUALITY MANAGEMENT PROGRAM

Time: 4:20–5:10 **VOICE: 0.1** **CME: 0.75** **Room: 501C**

Moderator: Sharon Surrel, CNMT

Educational Objective:
At the completion of this session, the attendee should be able to:
1. List the key elements of 10 CFR-35 as they pertain to the Quality Management Rule.
2. Describe a sample Quality Management Program which could be implemented in a clinical unit.

Summary:
The Nuclear Regulatory Commission (NRC) will review the purpose and objective of implementing the Quality Management Rule. The NRC has provided a basic outline for participants to discuss implementation of their respective facilities' plans to comply with this rule. At the conclusion of this program, the nuclear medicine technologist should have an understand-

ing of what the Quality Management Rule is, why it has been implemented, and how to best comply with this rule.

4:20–5:10 **Quality Management Progam.** Larry W. Camper, MBA, MS, U.S. Nuclear Regulatory Commission, Washington, DC.

STUDENT DAY

Time: 10:30–1:30 **VOICE: 0.12** **Room: 208**

Moderators: Lynne Roy, MS, CNMT and Shirley Ledbetter, BS, CNMT

10:30–10:40 **Welcome and Introductions**
10:40–11:00 **Society of Nuclear Medicine.** Mickey Williams, President, SNM-TS
11:00–12:00 **Student Scientific Papers**
12:00–12:15 **Lunch**
12:15–12:45 **Future of Nuclear Medicine.** Alan Waxman, MD
12:45–1:15 **Interviews and Resume Preparation.** Dana Zinderman, Medical Recruiter
1:15–1:30 **Outstanding Student Paper Award**

GASTROINTESTINAL IMAGING

Time: 1:30–3:10 **VOICE: 0.2** **CME: 1.75**
Time: 3:30–5:10 **VOICE: 0.2** **CME: 1.75**
Room: 208

Moderators: Miriam K. Miller, MA, CNMT and Victoria Walton, CNMT

Educational Objective:
At the completion of the track, one should be able to:
1. List the basic anatomy and physiology, as well as the primary radionuclide imaging procedures available for the evaluation of the gastrointestinal tract.
2. Explain the specific techniques and procedures used to image gastroesophageal reflux in infants and children.
3. Apply the computer techniques necessary to analyze hepatobiliary and other gastrointestinal studies.

Summary:
This continuing education tract on the gastrointestinal organs is an attempt to present the fundamentals of GI Imaging to technologists who need or want an overall review. In addition, we would like to present the computer techniques for GI studies and for calculating the ejection fraction of the gallbladder along with the administration of CCK.

1:30–2:20 **Uses of CCK in Hepatobiliary Imaging.** Darlene Fink-Bennett, MD, William Beaumont Hospital, Royal Oak, MI.
2:20–3:10 **Fundamentals of GI Imaging.** Vincent Cherico, CNMT, Temple University Hospital, Philadelphia, PA.
3:30–4:20 **Gastroesophageal Reflux in Infants and Children (The "Milk" Scan).** Nayan Pandya, CNMT, Children's Hospital National Medical Center, Washington, DC.
4:20–5:10 **Computer Applications in GI Studies.** Stephen D. Streker, BS, RT(N), George Washington University Medical Center, Washington, DC.

PROFESSIONAL DEVELOPMENT IMPROVING THE PHYSICIAN-TECHNOLOGIST PROFESSIONAL RELATIONSHIP

Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75**
Room: 207

Moderators: Martha Pickett, CNMT and Lynette Fulk, CNMT

Educational Objective:
Upon completion of this seminar, participants should be able to:
1. Define five problems associated with physician-technologist professional relationships.
2. Develop two strategies and tactics to address such problems.
3. List four steps to promote mutual respect for co-workers within the nuclear medicine department, recognizing and appreciating the knowledge and expertise of both the physician and the technologist.

Summary:
The conflict that arises between the physician and the technologist is often a result of differences in the expectations of each party. The purpose of this seminar is to identify common sources of conflict and discuss means of managing and resolving the conflict. Physicians and technologists are invited to present their own solutions.

10:30–12:10 **Improving the Physician-Technologist Professional Relationship.** Peter McLoughlin, Du Pont Merck, North Billerica, MA.

PROFESSIONAL DEVELOPMENT: DEVELOPING A TEAM APPROACH WITHIN THE NUCLEAR MEDICINE DEPARTMENT

Time: 1:30–3:10 **VOICE: 0.2** **CME: 1.75**
Time 3:30–5:10 **VOICE: 0.2** **CME: 1.75**
Room: 207

Moderators: James Connaughton, CNMT and Evelyn Merritt, CNMT

Educational Objective:
Upon completion of this seminar, participants should be able to perform the following:
1. Recognize differences in the way people react to situations, handle problems, and prefer to do things.
2. Explore standards of excellence as they apply to the nuclear medicine department; then, as a group, set and adhere to high standards of performance.
3. Use the "Framework for Improvement" as presented in the seminar to address issues within the workplace.

Summary:
The purpose of this seminar is to recognize that people within a department react to situations and handle problems in a variety of ways. Using suggestions from the Du Pont Nuclear Medicine Technologist Advisory Board workbook, the seminar is presented in workshop fashion and features short presentations, films, and hands-on activities for the participants.

1:30–3:10 **Developing a Team Approach within the Nuclear Medicine Department.** Peter McLoughlin, Du Pont Merck, North Billerica, MA.
3:30–5:10

WEDNESDAY, JUNE 10, 1992

NUCLEAR CARDIOLOGY I: MYOCARDIAL PERFUSION IMAGING

Time: 8:30–10:10 **VOICE: 0.2** **CME: 1.75**
Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75**
Room: 501A

Moderators: Jennifer A. Mattera, BS, CNMT and Gerald Guidry, CNMT

Educational Objective:
After attending this session, the participant will be able to:
1. Describe the physiologic principles associated with myocardial perfusion and reperfusion following myocardial infarction.
2. List the indications and applications of three alternatives to exercise.
3. Define the mechanisms of myocardial tracer uptake and identify the most appropriate SPECT reconstruction filters for thallium-201, technetium-99m sestamibi, and technetium-99m teboroxime.

Summary:
The session begins with a presentation on the physiology of myocardial perfusion under normal and abnormal conditions, such as acute MI and reperfusion. The session continues with a discussion on the physiological properties and technical considerations regarding three alternatives to exercise when used in association with myocardial perfusion imaging. The next presentation addresses the mechanisms of myocardial uptake, including flow characteristics, washout/washin, reinjection, and indicators of viability when using thallium-201, technetium-99m sestamibi, technetium-99m teboroxime, and PET. This is immediately followed with a presentation on using a combination of the perfusion agents to optimize the characteristics of each. Finally, technical considerations for myocardial perfusion imaging and optimal SPECT reconstruction filters will be examined with respect to thallium, sestamibi, and teboroxime. An expert panel discussion will follow the morning session.

8:30–9:20 **The Physiology of Myocardial Perfusion, Acute MI, and Reperfusion.** John J. Mahmarian, MD, Baylor College of Medicine, Houston, TX.
9:20–9:40 **Alternatives to Exercise Physiological Properties.** Mario S. Verani, MD, Baylor College of Medicine/The Methodist Hospital, Houston, TX.
9:40–9:50 **Alternatives to Exercise: Technical Considerations of Dipyridamole.** Julia S. Blust, BS, CNMT, St. Lukes Episcopal Hospital, Houston, TX.
9:50–10:00 **Alternatives to Exercise: Technical Considerations of Adenosine.** Gerald W. Guidry, CNMT, The Methodist Hospital, Houston, TX.
10:00–10:10 **Alternatives to Exercise: Technical Considerations of Dobutamine.** Angela Cochran, CNMT, The Methodist Hospital, Houston, TX.
10:30–11:00 **Myocardial Perfusion Imaging: Mechanisms of Myocardial Uptake: Thallium-201, Sestamibi, and Teboroxime PET.** Jeffrey Leppo, MD, University of Massachusetts Medical Center, Worcester, MA.

11:00–11:20	**Myocardial Perfusion Imaging: Combined Perfusion Imaging with Thallium-201 and Sestamibi.** Denny D. Watson, PhD, University of Virginia Health Sciences Center, Charlottesville, VA.
11:20–11:50	**Technical Considerations for Myocardial Perfusion Imaging: Thallium-201, Sestamibi, and Teboroxime.** Lynne T. Roy, MS, CNMT, Cedars/Sinai Medical Center, Los Angeles, CA.
11:50–12:10	**Technical Considerations for Myocardial Perfusion Imaging: SPECT Filter Reconstruction Consideration.** Jonathan M. Links, PhD, Johns Hopkins Medical Center, Baltimore, MD.
	Expert Panel Discussion

NUCLEAR CARDIOLOGY II: VENTRICULAR FUNCTION IMAGING AND AGENTS ON THE HORIZON

Time: 1:30–3:10 **VOICE: 0.2** **CME: 1.75**
Time: 3:30–5:10 **VOICE: 0.2** **CME: 1.75**
Room: 501A

Moderators: Terri M. Boyce, BS, CNMT and Lyne T. Roy, MS, CNMT

Educational Objective:
After attending the afternoon session, the technologist will be able to:
1. Describe factors that affect ventricular function.
2. Differentiate and utilize a suitable ECG gate.
3. Describe new red blood labeling techniques and technical considerations regarding diastolic function.
4. Distinguish between two methods of first-pass radionuclide angiocardiography (FPRNA) and two methods of exercise associated with FPRNA.
5. Identify new nuclear cardiac agents currently under investigation.

Summary:
This session begins with a discussion on the physiology of ventricular function and ECG gating, to develop an understanding of the rationale behind our approach to ventricular function tests. A discussion regarding new red blood cell labeling techniques and technical considerations of diastolic function assessment will provide an update to the well-founded procedure, equilibrium radionuclide angiocardiography. The session will also address methods of acquiring FPRNA on single- and multi-crystal cameras, followed by a dialectic of associated exercise techniques, using a bicycle versus treadmill for FPRNA. Finally, new agents on the horizon for nuclear cardiology will be discussed, among these: antimyosin and more new technetium-99m perfusion agents. The afternoon session will close with an expert panel for an interactive discussion with the audience.

1:30–2:20	**The Physiology of Ventricular Function and ECG.** Joseph R. Logic, MD, PhD, University of Alabama Medical Center, Birmingham, AL.
2:20–2:50	**Equilibrium Radionuclide Angiocardiography Update on Red Blood Cell Labeling Techniques.** Ronald J. Callahan PhD, Harvard University and Massachusetts General Hospital, Boston, MA.
2:50–3:10	**Equilibrium Radionuclide Angiocardiography Diastolic Function Assessment—Technical Considerations.** Stephen L. Bacharach, PhD, National Institutes of Health, Bethesda, MD.
3:30–4:00	**First-Pass Radionuclide Angiocardiography Multi-Crystal and Single-Crystal First-Pass RNA.** John Carpenter, BS, CNMT, Mobile Cardiac/Pulmonary Testing, Milwaukee, WI.
4:00–4:20	**First-Pass Radionuclide Angiocardiography Comparison of Bicycle/Treadmill Exercise.** Steven C. Port, MD, University of Wisconsin Medical School, Milwaukee, WI.
4:20–4:50	**New Agents on the Horizon: Myocardial Infarction Imaging with Antimyosin.** Lynne L. Johnson, MD, Columbia University, New York, NY.
4:50–5:10	**New Agents on the Horizon: More New Technetium-99m Myocardial Perfusion Agents.** Jennifer A. Mattera, BS, CNMT, Yale New Haven Hospital, New Haven, CT.
	Expert Panel Discussion

BRAIN: FINE TUNING YOUR NEURO-SPECT SKILLS

Time: 8:30–12:10 **VOICE: 0.4** **CME: 3.50**
Time: 1:30–4:25 **VOICE: 0.3** **CME: 2.5**
Room: 501C

Moderators: Colleen Buchanan, CNMT, Lorie A. Overbey, CNMT, and Eileen O. Smith, BS, CNMT

Educational Objective:
After attending this course, the participant should be able to:
1. List five major technical essentials needed for optimized SPECT brain imaging.
2. List the three major advantages of (a) general and (b) dedicated SPECT systems for brain imaging.
3. Given an image of a SPECT generated artifact, identify the etiology and describe the most appropriate corrective measure.
4. Describe two major clinical uses for coregistered brain MRI and SPECT images.
5. List five clinical examples of a disease process with its associated SPECT brain perfusion abnormality.

Summary:
This session deals with radiopharmaceuticals, patient management, dedicated SPECT instrumentation, and coordination with other imaging modalities. Attendees will acquire specific information which will allow them to improve the quality of their neuro-SPECT and have a better understanding of the possible clinical applications of the technique.

8:30–9:20	**Quality Control: Radiopharmaceuticals, Cameras, and More.** Eileen O. Smith, BS, CNMT, Yale University School of Medicine, New Haven, CT.
9:20–10:10	**Dedicated SPECT Systems.** I. George Zubal, PhD, Yale New Haven Hospital, New Haven, CT.
10:30–11:20	**The SPECT Reconstructed Brain.** Gary Wisniewski, Yale-New Haven Hospital, New Haven, CT.
11:20–12:10	**What Can Be Done with NMR Imaging in an Attempt at Improving Co-Registration to Neuro-SPECT.** Robin A. Greene, CNMT, ARRT(N), Yale University School of Medicine, New Haven, CT.
1:30–2:20	**The Technologist's Input to Neuro-SPECT Images of Stroke, Dementia, and Trauma.** Ronald S. Tikofsky, PhD, Medical College of Wisconsin, Milwaukee, WI and Ann M. Voslar, BS, CNMT, Froedtert Memorial Lutheran Hospital, Milwaukee, WI.
2:45–3:35	**Clinical Applications of SPECT Imaging in Psychiatric Disorders.** Thomas C. Hill, MD, New England Deaconess Hospital, Boston, MA.
3:35–4:25	**The Role of Neuro-Receptor SPECT Imaging and Its Future Clinical Applications.** John Seibyl, MD, Yale University School of Medicine, New Haven, CT.

INFECTION CONTROL: AIDS AND NUCLEAR MEDICINE TECHNOLOGY

Time: 8:30–10:10 **VOICE: 0.2** **CME: 1.75**
Time: 10:30–12:00 **VOICE: 0.18** **CME: 1.50**
Room: 208

Moderators: Donald R. Hamilton, MBA and James Connaughton, CNMT

Educational Objective:
At the completion of this program, the participant should be able to:
1. Describe the HIV transmission vectors in the nuclear medicine setting and the current extent of the patient population.
2. Describe risk-reduction measures, including the most appropriate universal precautions useful to the nuclear medicine technologist.
3. Formulate basic protocols for the imaging of AIDS patients using the variety of radiopharmaceuticals and instrumentation available.

Summary:
The program has been designed around two principal topics: understanding the epidemiology of the AIDS virus and protective measures; and the development of imaging protocols. The first speaker will discuss understanding the extent of the AIDS epidemic and the method of virus transmission and the availability of appropriate techniques, including universal precautions, to prevent the transmission of the virus to staff. The second topic will be the presentation of imaging protocols by four speakers on imaging the AIDS patient using a specific radionuclide (gallium-67 or indium-111) in a radiopharmaceutical dosage form or using a specific instrumentation (SPECT or PET).

8:30–9:15	**Overview of the Epidemic and the Technologist's Role.** Donald R. Hamilton, MBA, Center for Devices and Radiological Health, FDA, Rockville, MD.
9:15–10:10	**Gallium-67 Imaging of the AIDS Patient.** Frances L. Neagley, CNMT, Davies Medical Center, San Francisco, CA.
10:30–11:00	**Indium-111 Imaging of the AIDS Patient.** Christopher J. Palestro, MD, Long Island Jewish Medical Center, New Hyde Park, NY.
11:00–11:30	**SPECT Studies of AIDS Dementia.** Elissa Kramer, MD, New York University Medical Center, New York, NY.
11:30–12:00	**PET Studies of AIDS Dementia.** Steven M. Larson, MD, Memorial Sloan-Kettering Cancer Center, New York, NY.

PEDIATRICS: CLINICAL AND TECHNICAL CONSIDERATIONS WHEN IMAGING THE PEDIATRIC PATIENT

Time: 1:30–3:10 **VOICE: 0.2** **CME: 1.75**
Time: 3:30–4:20 **VOICE: 0.1** **CME: 0.75**
Room: 208

Moderators: Kimberly W. Maas, CNMT and Barbara Jara, CNMT

Educational Objective:
After attending this course, the participant should be able to:
1. Identify the advantages and indications for each agent used for infection imaging in the pediatric patient.
2. Given a specific pediatric renal abnormality, select the most appropriate renal radiopharmaceutical to assess the problem.
3. Differentiate between diagnostic and therapeutic doses of MIBG.

Summary:
This session will help the technologist to understand the importance of pediatric nuclear medicine to the clinician; specifically, selecting the proper nuclide for infection imaging, renal imaging, and oncologic imaging. Also, there will be discussions on different imaging positions and techniques specific to pediatric scintigraphy.

1:30–2:20 **Pediatric Infection Imaging.** John Miller, MD, Los Angeles Childrens Hospital, Los Angeles, CA.

2:20–3:10 **MIBG for Therapy and Diagnostic Use.** Sidney Heyman, MD, Children's Hospital of Philadelphia, Philadelphia, PA.

3:30–4:20 **Renal Imaging Using Technetium-99m MAG_3.** Gerald A. Mandell, MD, E.I. Du Pont Institute Hospital for Children, Wilmington, DE.

PUBLIC RELATIONS WORKSHOP: PEAKING INTEREST IN NUCLEAR MEDICINE

Time: 8:30–9:20 **VOICE: 0.1** **CME: 0.75**
Room: 207

Moderators: Joni Herbst, CNMT and Kathy Seifert, RPh, BCNP, Professional Development, Syncor International.

Educational Objective:
Upon completion of this course, the participant should be able to:
1. Describe the use of a press packet to develop community awareness about nuclear medicine.
2. Use the material presented to organize a model recruitment program.
3. Address retention issues within his or her own nuclear medicine department.
4. Identify the issues surrounding re-entry of candidates into the field of nuclear medicine technology.

Summary:
Public relations, recruitment, retention, and re-entry in the field of nuclear medicine technology will be addressed. Suggestions and ideas will be presented to the course attendees regarding participation in local job fairs and career days.

8:30–9:20 **Peaking Interest in Nuclear Medicine.** Joni Herbst, CNMT, Chatsworth, CA.

IS ANYONE OUT THERE: RECRUITMENT RETENTION AND RE-ENTRY OF THE NUCLEAR MEDICINE TECHNOLOGIST

Time: 9:20–10:10 **VOICE: 0.1** **CME: 0.75**
Room: 207

Moderator: Joni Herbst, CNMT

Educational Objective:
See Public Relations Workshop: Peaking Interest in Nuclear Medicine.

9:20–10:10 **Recruitment Retention of the Nuclear Medicine Technologist.** Joni Herbst, CNMT, Chatsworth, CA.

PROFESSIONAL DEVELOPMENT: IMPROVING THE PHYSICIAN-TECHNOLOGIST PROFESSIONAL RELATIONSHIP

Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75**
Room: 207

Moderators: Martha Pickett, CNMT and Lynette Fulk, CNMT

Educational Objective:
Upon completion of this seminar, participants should be able to:
1. Define five problems associated with physician-technologist professional relationships.
2. Develop two strategies and tactics to address such problems.
3. List four steps to promote mutual respect for coworkers within the nuclear medicine department, recognizing and appreciating the knowledge and expertise of both the physician and the technologist.

Summary:
The conflict that arises between the physician and the technologist is often a result of differences in expectations of each party. The purpose of this seminar is to identify common sources of conflict and discuss means of managing and resolving the conflict. Physicians and technologists are invited to attend the seminar and present their own solutions.

10:30–12:10 **Improving the Physician-Technologist Professional Relationship.** Peter McLoughlin, Du Pont Merck, North Billerica, MA.

REIMBURSEMENT: THE "HOW TO"S OF REIMBURSEMENT

Time: 1:30–3:10 **VOICE: 0.2** **CME: 1.75**
Time: 3:30–5:10 **VOICE: 0.2** **CME: 1.75**
Room: 207

Moderators: Lynn L. Fulk, CNMT and Gracia Garrido, CNMT

Educational Objective:
At the completion of this course, participants should be able to:
1. Recall terms for CPT4/IC09-M/A/CPCS Coding.
2. Interpret a sample communication from third-party payers.
3. Differentiate between Part A and Part B of Medicare.
4. Comprehend a billing cycle and A/R days.
5. Using Medicare as an example, explain the steps involved in the reimbursement process.
6. Apply coding to procedures performed.

Summary:
The participants of this workshop will be taken through a billing cycle. The participants will learn how a billing cycle functions, operates, and where the pitfalls are. Terms will be presented so that course participants will understand the process involved. Examples used in this workshop will be CPT coding and ICD9M coding. HCPCS coding will also be reviewed.

1:30–3:10; 3:30–5:10 **Definition of Terms, How to Fill out Paperwork, Understanding/Reading an Explanation of Benefits, Trouble Shooting, and Staying Within the Law.** Becky M. Cacciatore, CNMT, M.B.R. and Associates, Inc., Tampa, FL. Carol V. Bonanno, CNMT, Medi-Physics, St. Petersburg, FL.

THURSDAY, JUNE 11, 1992

EDUCATOR'S FORUM: GRANT WRITING IN THE NINETIES

Time: 8:30–12:10 **VOICE: 0.4** **CME: 3.0**
Location: Holiday Inn, San Francisco Room

Moderators: Miriam Miller, CNMT and Wanda Mundy, EdD, CNMT

Educational Objective:
This 3½ hour seminar conducted by Eunice Gils Morgan, MSN, CNAA, JD, an avid and successful grant writer, is designed to explore with the participant the basic methodology of responding to an R.F.P. (request for proposal) from governmental or private agencies. Utilizing a pragmatic approach to grant writing, the participant will be guided in the writing of a mini-grant during the workshop period. At the conclusion of this seminar, the participant should be able to:
1. Define the methods involved in structuring a grant proposal.
2. Apply these methods and the skills presented during the workshop toward writing a grant proposal.

SPECT I: BASIC PRINCIPLES AND PRACTICAL APPLICATION OF SPECT

Time: 8:30–10:10 **VOICE: 0.2** **CME: 1.75**
Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75**
Room: 501A

Moderators: Michelle Ganske, CNMT and Rosemarie S. McGraw, CNMT

Educational Objective:
After completing this course, the participant should be able to:
1. Evaluate a SPECT camera system, whether a first-time buyer or planning for the future needs of the department.
2. Once a SPECT system has been purchased, perform quality control and acceptance testing pertinent to each specific system.
3. Recognize how data is handled; step and shoot/continuous acquisition/table index/circular versus eliptical/time per stop.
4. Determine which collimator should be used.
5. Demonstrate how attenuation can affect the data.
6. Recognize operator created artifacts.

Summary:
This session includes a basic understanding of the principles of SPECT. Emphasis will be on acceptance testing and quality control as well as instrumentation, reconstruction theory, and general tomographic application.

8:30–9:20	**Acceptance Testing of SPECT Systems.** L. Stephen Graham, PhD, Veterans Administration Medical Center, Sepulveda, CA.
9:20–10:10	**Which Camera/Computer System is Right for Your Department?** James E. Carey, MS, University of Michigan Medical Center, Ann Arbor, MI.
10:30–11:20	**Acquisition of SPECT Studies.** Richard A. Ponto, BS, William Beaumont Hospital, Royal Oak, MI.
11:20–12:10	**Processing of SPECT Data—What and Why.** Jack E. Juni, MD, William Beaumont Hospital, Royal Oak, MI.

SPECT II: TECHNICAL AND CLINICAL ASPECTS OF SPECT

Time: 1:50–3:30 **VOICE: 0.2** **CME: 1.75**
Time: 3:40–5:20 **VOICE: 0.2** **CME: 1.75**
Room: 501A

Moderators: Rosemarie S. McGraw, CNMT and Michelle Ganske, CNMT

Educational Objective:
After completing this course, the participant should be able to:
1. Determine the most effective options for his or her working environment when presented with several different brain imaging techniques and list protocols and radiopharmaceuticals for brain SPECT imaging.
2. Describe the current application of SPECT and radiopharmaceuticals regarding brain imaging.
3. List protocols and radiopharmaceuticals for cardiac SPECT imaging when presented with several different cardiac imaging techniques for his or her working environment.
4. Describe the current application of SPECT radiopharmaceuticals regarding cardiac SPECT imaging.

Summary:
This session includes an understanding of how to acquire brain SPECT studies, what these brain studies can show clinically, how to acquire rest and stress cardiac SPECT studies, and what the different cardiac studies are used for in the clinical setting.

1:50–2:40	**Practical Brain SPECT.** B. David Collier, MD, Medical College of Wisconsin, Milwaukee, WI.
2:40–3:30	**Brain SPECT—Technologist's Perspective.** LisaAnn Trembath, BA, CNMT, Medical College of Wisconsin, Milwaukee, WI.
3:40–4:30	**Cardiac SPECT: 1992.** John E. Freitas, MD, William Beaumont Hospital, Royal Oak, MI.
4:30–5:20	**Cardiovascular Nuclear Medicine: The University of Michigan Experience.** Kathy A. Stafford, CNMT, University of Michigan Medical Center, Ann Arbor, MI.

RADIATION SAFETY IN NUCLEAR MEDICINE I

Time: 8:30–10:10 **VOICE: 0.2** **CME: 1.75**
Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75**
Room: 501C

Moderators: Debbie G. Merten, CNMT and Tracy I. King, MS

Educational Objective:
Upon completing this course, the participant should be able to:
1. Describe the biological effects of exposure to low-dose, low-LET ionizing radiations.
2. Discuss the stochastic "risks" associated with the occupational exposures typically received in nuclear medicine and compare these with other sources of occupational and nonoccupational risks.
3. Relate the major conceptual factors associated with the concept of ALARA.
4. Describe three methods for exposure reduction.
5. Discuss the employment issues involved in nuclear medicine during pregnancy including: relative risk, regulations, and employer/employee responsibility in exposure reduction.
6. Describe the nursing considerations involved in the care of patients who have received diagnostic and therapeutic dosages of radiopharmaceuticals.
7. List the JCAHO nuclear medicine radiation safety, quality control, and dosimetry standards.
8. Explain how patient internal doses are calculated and list the errors associated with these doses.

Summary:
Risk from radiation exposure of patients, technologists, nurses, and the general public from the practice of nuclear medicine continues to be a topic of concern for health care professionals. The program will review the probability of harmful effects (i.e., risks) associated with nuclear medicine exposures, considering the current understanding of the biological effects of ionizing radiations. Sources of exposure (including the patient) will be identified and quantified. Methods to keep exposures ALARA will be identified and special areas of current interest will be discussed, including exposure during pregnancy. Recommendations for meeting the requirements of the JCAHO as they apply to radiation safety, patient absorbed dose, and instrumentation performance testing/quality control will be presented.

8:30–9:20	**Basic Radiation Biology.** Stanley H. Benedict, MD, University of California at Los Angeles, Los Angeles, CA
9:20–10:10	**Radiation Risk and the Nuclear Medicine Technologist.** Robert T. Anger, MS, Methodist Hospital, Indianapolis, IN.
10:30–11:20	**Exposure Reduction and ALARA in Nuclear Medicine.** James E. Carey, MS, University of Michigan Medical Center, Ann Arbor, MI.
11:20–12:10	**Pregnancy and Nuclear Medicine.** Anthony R. Benedetto, PhD, University of Texas Medical Branch, Galveston, TX.

RADIATION SAFETY IN NUCLEAR MEDICINE II

Time: 1:50–3:30 **VOICE: 0.2** **CME: 1.75**
Time: 3:40–5:20 **VOICE: 0.2** **CME: 1.75**
Room: 501C

Moderators: Debbie G. Merten, CNMT and Tracey I. King, MS

Educational Objective:
See Radiation Safety in Nuclear Medicine I.

Summary:
See Radiation Safety in Nuclear Medicine I.

1:50–2:40	**Nursing Considerations for Patients Who Have Received Radioactive Materials.** John J. Reilley, CNMT, Hospital of the University of Pennsylvania, Philadelphia, PA.
2:40–3:30	**JCAHO—Policy and Procedures for Radiation Safety, Equipment Performance, and Patient Dosimetry.** James E. Carey, MS, University of Michigan Medical Center, Ann Arbor, MI.
3:40–4:30	**The Patient as a Source of Low-Level Radioactive Waste.** Ralph P. Lieto, MS, Henry Ford Hospital, Monroe, MI.
4:30–5:20	**Panel Discussion—Audience Participation—Radiation Safety at Your Hospital.**

NMTCB ITEM WRITERS WORKSHOP

Time: 1:30–3:20 **VOICE: 0.22** **CME: 1.75**
Time: 3:40–5:20 **VOICE: 0.2** **CME: 1.75**
Room: 216C

Moderators: Jacqueline A. Bridges, CNMT and Mark Crosthwaite, CNMT

Educational Objective:
Upon completion of this workshop, participants will be able to perform the following:
1. Develop multiple-choice questions following the principles and conventions of multiple-choice item writing.
2. Recognize common problems associated with multiple choice questions.
3. Apply skills learned in the workshop to the classroom or to writing items for the NMTCB.

Summary:
This presentation is made by members of the board of directors of the NMTCB and is intended to provide educators and NMTCB item writers

guidance for improving multiple-choice item writing. Following an overview of the NMTCB examination development, including a discussion on task analysis, the strengths and limitations of multiple-choice items will be reviewed. Various formats for multiple-choice questions will be discussed along with the "how tos" for actually writing a question. Participants will then have an opportunity to practice writing items for the NMTCB. Handouts will include (1) examples of both good and poor multiple-choice questions, (2) a review sheet of common problems associated with this type of question, (3) the Components of Preparedness (COP) statements that are used as guidelines for writing items for the NMTCB, and (4) actual test questions used on recent exams. Educators who use multiple-choice questions on examinations will find this workshop particularly useful.

1:30–3:20; 3:40–5:20	**Item Writers Workshop.** Martha W. Pickett, CNMT, University of Arkansas, Little Rock, AR.

MONOCLONAL ANTIBODIES: PRACTICAL USES AND APPLICATIONS

Time: 8:30–10:10 **VOICE: 0.2** **CME: 1.75**
Time: 10:30–12:10 **VOICE: 0.2** **CME: 1.75**
Room: 208

Moderators: Gerald Guidry, CNMT, AAS and Carleton Brown, CNMT

Educational Objective:
After attending this session, the participant should be able to:
1. List four potential clinical advantages of radiolabeled monoclonal antibodies over standard radiopharmaceuticals.
2. Describe three clinical settings in which labeled monoclonal antibodies have shown efficacy.
3. List three applications of beta emitting radiolabeled monoclonal antibodies to the therapeutic setting.

Summary:
As the need for new and improved diagnostic and therapeutic measures increases, so does the popularity of monoclonal antibodies. This session, planned with the technologist in mind, is designed to provide insight into the use of monoclonal antibodies and some of their diagnostic and therapeutic applications. Some of the leading experts in this field will share with us their knowledge and experience in this growing discipline.

8:30–9:20	**Diagnostic Uses of Antimyosin.** Lynne Johnson, MD, Columbia University, New York, NY.
9:20–10:10	**Prognostic Uses of Antimyosin.** Robert Hendel, MD, Northwestern University Medical Center, Chicago, IL.
10:30–11:20	**Utility of Technetium Fab-Fragments in the Follow-up of Post OP Patients with Rising CEA.** Donald A. Podoloff, MD, UT/MD Anderson Cancer Center, Houston, TX.
11:20–12:10	**Imaging of Monoclonal Antibodies Used in Treatment and Diagnosis of Lymphoma.** Gerald Denardo, MD, University of California at Sacramento, Sacramento, CA.

JRC FORUM

Time: 1:50–2:40 **VOICE: 0.1** **Room: 208**

Moderators: Wanda Mundy, EdD, CNMT and Miriam Miller, CNMT

Objective:
After attending this session, the nuclear medicine technology educator will be able to discuss major changes in the revised 1991 Essentials.

Topic:
Elaine J. Cuklanz, MS, MT(ASCP)NM, Executive Director, Joint Review Committee on Educational Programs in Nuclear Medicine Technology and Maria V. Nagel, PhD, CNMT will review the major changes in the revised 1991 Essentials.

JRC SITE VISITORS WORKSHOP

Time: 2:40–5:20 **VOICE: 0.28** **Room: 208**

Topic:
See JRC Forum.

TOTAL QUALITY MANAGEMENT—AN OVERVIEW

Time: 8:30–12:10 **VOICE: 0.4** **CME: 3.50**
Time: 1:50–5:20 **VOICE: 0.38** **CME: 3.0**
Room: 207

Moderator: Marcia R. Boyd, MPA, CNMT

Educational Objective:
Attendance at the seminar will allow the participant the opportunity to:
1. Define total quality (TQ) management and illustrate how it can be implemented in a service organization such as a health care organization.
2. Differentiate QC, QA, and CQI.
3. Identify expectations of managers and aspects of a TQ culture.
4. Relate involvement of employees in training, team development, and communication.
5. Recognize the conditions necessary for empowerment.
6. Identify methods of rewards and recognition for teams and individuals.
7. Measure the cost of quality.
8. Apply problem solving tools: brainstorming, flow charts, Pareto, fishbone diagrams, to a specific management question.
9. Determine appropriate measurement using basic statistical process control (SPC).
10. Apply benchmarking to improve operations.
11. Review projected changes in JCAHO requirements.
12. Identify internal and external customers; measure their satisfaction and determine expectations.
13. Develop service (customer/supplier) agreements, set quality indicators, and write action plans.

Summary:
The fastpaced presentation will provide an overview of TQM in health care and how it is currently being implemented. Areas of concentration will be employee involvement, measurement, and customer relations. The commitment by management to successfully create a cultural change will be discussed. The cost of quality in health care will be evaluated. The participants will use problem-solving techniques, statistical process control (SPC), and benchmarking to evaluate appropriate measurements for planning and executing change. Projected future requirements of JCAHO will be included.

8:30–12:10; 1:50–5:20	**Total Quality Management—An Overview.** Marcia R. Boyd, MPA, CNMT, Baptist Memorial Hospital, Memphis, TN.

POSTER SESSIONS

The following scientific papers will be presented as poster presentations. Posters may be viewed throughout the meeting in the Exhibit Hall on the Main Level of the Los Angeles Convention Center. Authors will be present on Wednesday, June 10 from 12:10 P.M.–1:30 P.M.

Bone and Joint

Posterboard No. 994

THE VALUE OF RADIONUCLIDE ANGIOGRAM AND BLOOD POOL IMAGING IN EVALUATION OF BONE DISEASE IN ADULTS.

D.L. Milko, M. Charron. University of Pittsburgh Medical Center, Pittsburgh, PA.

The goal of this study was to determine if the radionuclide angiogram provides any supplemental information to the blood pool and three hour delayed images. We retrospectively studied fifty, adult, three phase Technetium-99m MDP bone scans. The number of abnormal studies was twenty nine with disease processes including fractures, osteomyelitis, trauma, undefined bone pain and avascular necrosis.

The criteria of uptake intensity was graded focal or diffuse, and a four degree scale of very mild, mild, moderate or severe was employed. The average uptake score for the blood pool imaging was 2.4, and 1.0 for the radionuclide angiogram. In no case did the radionuclide angiogram provide information not contained in the blood pool images. The degree of uptake in the blood pool images was always superior to the images of the radionuclide angiogram. In addition, only one region of interest can be studied at a time with the radionuclide angiogram, unlike the blood pool images.

In the population we studied, the radionuclide angiogram reveals no useful clinical information. With todays increasing cost of health care, the elimination of the radionuclide angiogram of a three phase bone scan is warranted.

Cardiovascular Basic

Posterboard No. 995

EFFECT OF HEPATIC COUNT DENSITY ON Tc99M TEBOROXIME REST VS. Tc99M SESTIMIBI STRESS: A QUANTITATIVE ANALYSIS: **J.K. Russell, A. Rodriguez, G. Snyder, K. Ayala, S. Abraham, J.H. Murphy. Likoff Cardiovascular Institute, Philadelphia, PA. 19116**

Greater liver activity is seen with both Tc99m sestimibi (MIBI) and Tc-99m teboroxime (TEBO) than with thallium-201. Inferior wall defects on SPECT imaging, without evident coronary artery disease, have been noted in a few patients (pts) with both TC-99m perfusion agents, thought related to high liver activity. To assess the effect of liver activity on inferior (IW) and anterior (AW) wall counts, we acquired rest TEBO SPECT and exercise MIBI SPECT images in 25 pts, and analyzed the summed short axis slices for percent change in AW and IW count density, and for the difference in hepatic count (HC) density, for the two images sets. We visually assessed proximity of liver and IW. Although AW and IW count density change was similar for the two agents overall (AW 31+/- 11.5% MIBI to TEBO, IW 34 +/- 10.5% MIBI to TEBO), IW activity increased by 15% or more, compared to AW activity, with MIBI in 5 pts. Each of these patients had either very high HC density with TEBO, or close proximity of liver to IW, or both.

In conclusion, HC density and proximity to IW can cause decreased IW counts.

Cardiovascular Clinical

Posterboard No. 996

MYOCARDIAL COUNT DENSITY WITH TC-99M SESTAMIBI, EVALUATION OF STRESS IMAGING TIMES. S.F. Grant J.R. Galt, N.P. Alazraki, V.A. Medical Center and Emory University School of Medicine, Atlanta, GA.

Tc-99m Sestamibi (MIBI) has proven itself to be an effective radiotracer for the detection of coronary artery disease. The optimal imaging protocol for this agent has yet to be determined and recent reports indicate that contrary to initial reports MIBI does redistribute in the myocardium and imaging should begin as early as possible. The purpose of this study is to compare the count densities in various organs achieved in stress imaging while beginning the tomographic acquisition at 30 minute and 60 minutes post injection.

Eight patients referred for evaluation of CAD had stress (exercise or pharmacologic) MIBI scans. 22-26 mCi intravenous MIBI was administered at peak stress or at 2 minutes after the infusion of intravenous dipyridamole. SPECT imaging was performed at 30 minutes and at 60 minutes post injection (180° orbits for 64 stops at 20 seconds per stop). Resting studies were similar with 8-26 mCi of MIBI administered and imaging beginning at 60 minutes post injection. Either 8oz of whole milk or 2oz of Neo-Cholex were given 15 minutes post injection. Regions of interest (ROI) were placed in the highest count myocardial area, lung area, liver area, and gallbladder on an anterior planar projection. Maximum pixel counts from each ROI were compared between the 30 and 60 minute images. Ratios of cardiac (heart) counts to organ counts were used for the other regions to minimize the effects of variation in injected dose and radioactive decay.

The results show the mean maximum pixel ± one standard deviation:

	30 min	60 min	Resting
Heart counts (/mCi)	6.7±3.1	5.9±2.9	5.1±1.3
Heart/Lung ratio	2.2±0.8	2.2±0.8	2.0±0.6
Heart/Liver ratio	1.1±0.4	1.2±0.5	0.9±0.4
Heart/Gallbladder ratio	0.7±0.4	0.5±0.4	0.4±0.4

The data indicate that imaging at 60 minutes post injection versus 30 minutes should not have a significant impact on cardiac imaging.

Posterboard No. 997

PATIENT PROTOCOL AND COMPUTER METHODS FOR ACQUISITION, PROCESSING, QUANTIFICATION AND REVIEW OF Tc-99m SESTAMIBI GATED SPECT. R.D. Folks, C.D. Cooke, E.V. Garcia, Emory University, Atlanta, Ga.

Multiple ECG gated SPECT imaging of Tc-99m sestamibi has the potential of providing new ways of evaluating cardiac status. Thus, a patient protocol and computer programs were developed to standardize the acquisition, processing, quantification and review of gated SPECT.

Patients undergoing rest/stress sestamibi studies at our institution are imaged with a 1-day protocol. A baseline rest study with 8-9 mCi of Tc-99m sestamibi is followed 3-4 hours later by a stress study with 22-25 mCi. All studies are done supine, using a high resolution collimator. Count yields from the high-dose stress study allow ECG gating of SPECT using 8 frames per cardiac cycle. An open (100%) R-R window is used, ensuring a consistent gating signal, and minimizing differences in the number of heartbeats acquired at each projection. Reconstruction is first carried out on a composite image set, created by summing the 8 sets of tomographic projections. User-determined reconstruction parameters are stored and used to automatically reconstruct and reorient image sets from each of the 8 gates. Reconstruction filter is a Butterworth, cutoff = .4 cycles/cm, power = 10. Short axis (SA), vertical (V) and horizontal (H) long axis images are spatially and

temporally smoothed, and are reframed 2-by-1. Assessment of wall motion/thickening is by visual review of cine images, constructed by choosing a single SA, V or H slice, then extracting and combining slices from 8 gates. Stored images from the 8 gates can be used for count-based quantitative analysis of wall thickening, an important indicator of myocardial viability.

Posterboard No. 998

SPECT TEBOROXIME SCINTIGRAPHY DURING PHARMACOLOGICAL STRESS: RAPID ACQUISITION WITH SINGLE HEADED CAMERA. A. Sood, M.J. Henzlova, G. Voulgaris, A.E. McIntosh, J. Machac, Mount Sinai Medical Center, New York, NY.

Feasibility of a new protocol for Adenosine (A) and Dobutamine (D) stress Tc-99m Teboroxime (TEBO) scintigraphy was tested in 25 pts (9M/16F). Up to 170 μg/kg/min of A was infused for 5 min, 24 mCi of TEBO was injected at 4.5 min. Four minute continuous circular counterclockwise acquisition was started 90 sec after injection using a single-headed Elscint camera. A second "redistribution" scan was acquired immediately in the same fashion. The rest TEBO dose (27 mCi) was injected 15 min after the first dose, and a resting scan was acquired 90 sec later. D was infused up to 40 μg/kg/min, TEBO was injected immediately after the infusion. Stress-rest imaging sequence and TEBO doses were identical to the A protocol. All tests were completed in <30 minutes. A standard SPECT processing was used. After reconstruction of the transaxial slices, a volume masking background interpolative program was applied.

The quality of the scans was very good in 20 pts, good in 3. In 2 pts, a repeat rest injection was necessary because of camera malfunction. The scan interpretation was not altered by the volume masking. Thus, using the protocol, rapid acquisition of diagnostic myocardial perfusion scans is feasible.

Posterboard No. 999

PHARMACOLOGICAL STRESS TESTING USING TECHNETIUM 99M TEBOROXIME AND INTRAVENOUS DIPYRIDAMOLE: TECHNICAL TIPS AND CLINICAL PITFALLS. M. Kramer, R. Carretta, F. Weiland, Roseville Hospital, Roseville, CA.

Thallium 201 has been used extensively in pharmacological stress testing in conjunction with intravenous dipyridamole. The recent approval of Technetium 99m teboroxime (TEBO) has afforded us the opportunity to use a technetium labeled myocardial perfusion agent in conjunction with dipyridamole, thus providing high quality SPECT images with a significantly shorter imaging time and improved patient throughput. Patients are infused with 0.57 mg/kg of dipyridamole over a four minute period under constant ECG monitoring, blood pressure and pulse are monitored every minute, and 15-18 millicuries of TEBO are injected intravenously at the cessation of dipyridamole administration. Since the volume of TEBO injected is quite small, a tuberculin syringe is used followed by a saline flush. SPECT images are obtained over 4-6 minutes using either continuous acquisition or stop and shoot. Camera set-up is 180 degree rotation, LPO to RAO, 32 stops at 6-8 seconds per stop for single detector SPECT cameras. Multi-detector systems can be used and data is acquired over 360 degrees using six minutes of continuous data acquisition. TEBO/dipyridamole imaging in over 200 patients has resulted in similar sensitivity and specificity as with thallium/dipryidamole. TEBO/dipryidamole provides a significant advantage over thallium/dipryidamole in that the study is completed in 90 minutes, enhancing patient acceptance without sacrificing image quality or diagnostic accuracy.

Endocrine

Posterboard No. 1000

INCREASING PATIENT COMFORT IN NATCO4 THYROID IMAGING BY USE OF SEMI-UPRIGHT PINHOLE IMAGING IN A RECLINING CHAIR. J. Ward, N. Newlin, S. Updike. Herrick Memorial Health Care Center, Tecumseh, Michigan.

Most thyroid imaging is done supine with the pinhole collimator positioned over the patient's hyperextended neck. This may be an uncomfortable position for some patients with trouble swallowing, arthritis, or claustrophobia. In addition, patients with pulmonary and/or cardiac disease may breathe easier in an upright position. In our institution we routinely use a reclining chair for imaging the pinhole acquisitions. This increases patient comfort and reduces anxiety. After injection with 10 MCi NaTcO4, patients are imaged seated upright at 5 to 6 minutes and a visual estimate of thyroid function is performed. Thyroid size is then measured with a radioactive ruler held parallel to the gland. Twenty minutes post injection, the patient is seated in a reclining chair with a high back. The pinhole camera is positioned parallel to the thyroid. The patient and camera are adjusted for optimum views. The patients express comfort with this method and, since it creates less anxiety, even claustrophobic patients are relaxed and cooperative. Since the angle of the recliner can be adjusted, patients with back discomfort and/or scoliosis are imaged comfortably. We have used this method on all our Technetium thyroid scans for the last seven years with excellent results.

Gastroenterology

Posterboard No. 1001

HEPATOBILIARY SCINTIGRAPHY: IMPACT ON SCAN INTERPRETATION BY A PROTOCOL CHANGE IN THE NUMBER OF IMAGES PROVIDED IN THE FIRST HOUR. C. Campbell, D. Meier, C. Nagle. William Beaumont Hospital-Troy, MI.

The current hepatobiliary scintigraphy protocol with 5 mCi Tc-99m Disofenin used by the authors requires an anterior image at 5 minutes for 1000 k counts with additional images at 10, 20, 30, 40, 50 and 60 minutes for the same time. Delayed imaging after the first hour varies per patient as ordered by the nuclear physician at 60 minutes. A retrospective study of the biliary scans of 50 patients compared the original interpretations to the interpretations by two physicians provided only with the same 5 minutes 1000 k counts anterior image, the same 60 minute image for time and all images after 60 minutes.

49/50 (98%) of the interpretations by at least one physician using the 2 view (1st hour) study protocol were the same as the original interpretations based on the existing protocol with 7 images during the first hour. For one study (1/50 or 2%) the scan descriptions agreed but the interpretations did not because the original interpretation was in error. For 5 studies reviewed by one physician there was disagreement in interpretation of delayed biliary to bowel transit.

This pilot study suggests that a new imaging protocol for hepatobiliary scintigraphy with only 2 images during the first hour may not adversely affect scan interpretation. If corroborated by a larger series, this protocol might be less burdensome for ill patients and allow more patients scanned by a technologist.

Instrumentation and Data Analysis: General

Posterboard No. 1002

TECHNICAL ASPECTS OF A FIRST PASS FRAMING PROGRAM. **K.L. Rowell, M.V. Yester, and E.M. Stokely. Division of Nuclear Medicine, Nuclear Medicine Technology Program, and the Department of Biomedical Engineering, University of Alabama at Birmingham, Birmingham, Alabama.**

First pass studies were used widely in the past, but over the years gated radionuclide ventriculograms became the dominant mode of acquisition. With the recent influx of heart-lung transplants in our department, we needed to be able to acquire a first pass study on one manufacturer's camera and process it with our central processing computer made by another manufacturer. The preferred method of processing is to frame the first pass using the available beats into 16 or 32 frames per beat. By adding several beats together one attains a "pseudo-gated" study. In this manner the general gated cardiac processing routine can be used. We had the choice of moving all the frames of the study which often is over 500 or to reframe the data at the acquisition site. The latter option was chosen and a protocol was set up to automate the process to the extent possible. The process consists of drawing a representative ROI around a chosen frame and forming a histogram over the total duration of the acquisition. The phase of the acquisition of interest (right or left ventricle) is selected. The histogram peaks represent the heartbeats which occurred during data acquisition. The user chooses the beats that are to be used to process the study. The frames which represented each beat chosen are then grouped and added together to form a small group of frames that are used for processing in the central computer.

Posterboard No. 1003

UTILIZATION OF A BAR-CODE VERIFICATION SYSTEM IN A NUCLEAR PHARMACY. W.M. Oswald, M.E. Wilson, T.J. Herold, and J.C. Hung. Mayo Clinic, Rochester, MN.

The use of bar codes in a hospital setting has become an effective means for improving both the accuracy and efficiency of providing health-care products to patients. The need for positive identification and validation of administered radiopharmaceuticals is especially important in nuclear pharmacies. The effects of implementing a bar-code system for the verification of radiopharmaceuticals were evaluated in our nuclear pharmacy. The bar-code system was incorporated with du Pont's Nuclear Medicine Manager® software run on an IBM Personal System/2™ Model 70 computer. Four bar-code readers placed at the various compounding/ dispensing workstations were inter-communicated with the centrally located computer station. All cold kits and lead pigs were pre-affixed with bar-code labels. When preparing a kit, all of the various components used in the preparation must be individually verified with the bar-code scanner. If an incorrect component is accidently chosen, the computer will alert the technologist with a warning beep and message. In much the same manner, if the wrong radiopharmaceutical is selected when drawing a patient dose, the computer will alert the individual of the mistake. Since implementing this bar-code system in our nuclear pharmacy, we have eliminated misadministrations caused by selecting the wrong radiopharmaceuticals. As personnel became more adept with using the bar coding system, there was an increase in throughput in the nuclear pharmacy, demonstrating that the system is not only accurate, but cost-effective. One possible disadvantage that has not been fully determined is whether people using the bar-code system will become so dependent upon the system that they may neglect the responsibility of verifying their work. The biggest disadvantage of the system is the large amount of time a technologist must spend affixing a bar code label to each cold kit/vial. The manufacturers of the cold kits and radiopharmaceuticals should be encouraged to include bar codes on the drug labels as the need for accuracy in the performance of nuclear medicine procedures will most assuredly call for broader application of bar coding in nuclear pharmacies.

Posterboard No. 1004

FULFILLING J.C.A.H. PEER REVIEW REQUIREMENTS IN THE RURAL HOSPITAL. J. Ward, N. Newlin, M.D. Gross. Herrick Memorial Health Care Center, Tecumseh, Michigan.

In the rural hospital there is often only one general radiologist to interpret CT, X-ray, Ultrasound and Nuclear Medicine scans. Due to time limitations, expertise in all areas is not possible. We realized this seven years ago and established a method of peer review to assure optimum scan interpretation. We arranged for consultation services of a Nuclear Medicine physician from a large institution. In exchange for an honorarium, this physician attended quarterly Radiation Safety Committee meetings and reviewed a percentage of scans to assess adequacy of interpretation. He was also available for consultation on difficult and unusual scans. His services, along with attendance of the Annual Convention by the supervisor of Nuclear Medicine allowed us to keep abreast of developments in the Nuclear Medicine field. As the department expended it was more difficult to review an adequate percentage of patients during the quarterly peer review. Therefore, we researched better ways of communication. Since many of the scans needed dynamic review, a tele-radiology system would not meet our requirements. We therefore installed an Elscint Apexview system which offers transmission and manipulation of data through a Modem. These methods of peer review have met J.C.A.H. requirements during inspections and have allowed us to offer our patients the best possible diagnosis.

Instrumentation and Data Analysis: PET

Posterboard No. 1005

QUALITY CONTROL OF THE NIH PET SCANNERS. SL Green and ME Daube-Witherspoon. NIH, Bethesda, MD.

Regular quality control (QC) is essential for PET to ensure both image quality and quantitative accuracy. The type and frequency of QC required is determined by the use of the scanner; qualitative imaging requires less QC than those applications for which quantitation is important. At the NIH, where quantitative PET is used in clinical research, we have developed a series of measurements carried out at regular intervals to assess the performance of the three NIH PET scanners (Scanditronix PC1024-7B and PC2048-15B brain systems and Posicam 6.5 whole-body system). The QC measurements selected are intended to reveal, at an early stage, problems which will have the greatest impact on patient data. On a daily basis, a uniformity and calibration check using a cylindrical phantom is performed. This measurement is a rapid check that all aspects of scanner operation are functioning properly before patient studies are performed. The calibration factors obtained from the phantom are also monitored for changes in scanner sensitivity. Detector normalization is carried out weekly (Posicam) or monthly (Scanditronix). At quarterly intervals, the tests originally performed at scanner acceptance are repeated. These consist of measurements of (1) sensitivity, (2) uniformity, (3) spatial resolution (transverse and axial), (4) intrinsic scatter fraction, (5) count rate performance, including deadtime and random coincidence rates, (6) accuracy of corrections for attenuation, deadtime, random coincidences, and scatter, and (7) image quality. The results of all measurements are checked for consistency with previous tests. While some aspects of scanner performance are not expected to change (e.g., axial resolution), others are subject to drifts (e.g., sensitivity) and require careful monitoring. Through this program of regular QC, a number of potential problems such as bad detectors and drifts in coincidence windows have been identified and corrected before they could affect the patient data.

Posterboard No. 1006

USE OF IMAGE PLANE COUNT RATE TO ASSIST POSITIONING OF BRAIN CLINICAL FDG-PET PATIENTS. T.C. Hawk, S.M. Hamblen, C.C. Harris, R.E. Reiman, J.M. Hoffman, R.E. Coleman. Duke University Medical Center, Durham, NC.

Proper patient positioning is a problem in clinical brain PET scanning because the field of view in the longitudinal (Z) axis is 103 mm, which does not cover the entire intracranial contents. The use of external landmarks allows only relative positioning. In our laboratory, the routine clinical patient is scanned 30 min. after injection of FDG, and the images are reconstructed using calculated attenuation correction. The data are acquired in the transverse planes. At the time of positioning, the amount of activity in the brain is assumed to be constant, but the amount of tissue in each slice varies, especially at the base of the cerebellum and vertex of the cerebrum; thus, at these levels there is a variation in counts per slice, and this variation can be used to assist in positioning the patient in the scanner (GE 4096 plus). To evaluate the accuracy of this technique, we chose 15 patients with minimal structural variation, no major metabolic abnormalities (tumors, dementia), and similar positioning (head tilt, etc.). We then extracted the total true events for each slice, normalized for plane efficiency and to the slice with the highest trues rate, and matched by position. At the level of the temporal lobes, pons, cerebellar hemisphere and vermis, 4th ventricle, brachium pontis and gyri recti, we observed a count rate 54.6 ± 7.1 % of the slice with the highest count rate. At the level of the base of the cerebellum we observed a count rate of 33.3 ± 1.2 % of the slice with the highest count rate. This information can be used to increase the accuracy for positioning the patient to assure imaging of the brainstem or vertex, when appropriate. Any major metabolic abnormality can change the image plane count rate; therefore, data obtained from image count rates should only be used in conjunction with previously existing positioning techniques.

Instrumentation and Data Analysis: SPECT

Posterboard No. 1007

OPTIMIZATION OF RECONSTRUCTION PARAMETERS FOR MULTI-HEADED BRAIN SPECT IMAGING. J.M. Harris, J.M. Mountz, M.V. Yester. Univ. of Ala. Med. Ctr., Birmingham, AL.

The improved spatial resolution theoretically possible from modern multi-headed Anger gamma camera brain SPECT imaging devices necessitates a greater emphasis on optimization of reconstruction parameters. One important reconstruction parameter is proper selection of the back-projection filter.

The aim of this study is to determine the optimal Butterworth filter for the ADAC dual head gamma camera operating at conditions producing its maximum resolution for brain SPECT. Eight patients undergoing routine brain SPECT following an I.V. injection of ~25 mCi Tc-99m HM-PAO were analyzed. None of the scans showed gross abnormalities. Acquisition parameters were: 128 stops, 128x128 matrix, and a 25 cm field of view employing a low-energy, high-resolution parallel-hole collimator. Count statistics from brain images were obtained from an average of the maximum cts/pixel from six equally spaced cortical regions on the anterior projection image. Four patients with low count images (500-750 cts/square-cm/stop) and four patients with high count images (750-1100 cts/square-cm/stop) were reconstructed at cutoff frequencies (Fc) ranging from 0.15 to 0.4 Nyquist, with orders ranging from 1 to 6 at each frequency cutoff. Optimal image selection was determined by subjective assessment by three Nuclear Medicine personnel familiar with brain SPECT quality.

Results demonstrated that for low count images optimum Butterworth parameters were Fc = 0.15-0.2, order 4-5. For high count images optimum parameters were Fc = 0.2-0.25, order 3-4. As Fc increased there was a smaller effect on image quality by reconstructing at higher orders. In conclusion, although these parameters were acquired on the ADAC dual head camera they should provide a useful guide for other multi-headed units as well.

Pediatrics

Posterboard No. 1008

SCINTIGRAPHIC DETECTION OF TRACHEAL ASPIRATION IN CHILDREN. Maas K, Ford K, Mandell GA, Harcke HT Alfred I. duPont Institute, Wilmington, DE

Aspiration in the pediatric population is a common cause of either. The usual aspiration can be secondary to either gastroesophageal reflux or secondary to poor laryngeal closure. This technique is quite effective in detecting tracheal aspiration of saliva. The dose used is 200uCi 99m Tc sulfur colloid in 0.3ml volume. This small volume is placed in the patient's mouth and is allowed to mix with the saliva for 5 minutes. The neck, chest, and upper abdomen are then imaged from posterior with the patient supine. The patient's mouth should be at the top of the field of view. A general all-purpose collimator is used with analog images taken for 120 seconds at 5,10,20, 30,45 and 60 minutes. Dynamic computer acquisition is acquired on a 64x64 byte matrix, 30 seconds for 120 images and a X1 zoom. If the patient has a tracheostomy, secretions can be suctioned and the container imaged at the end of one hour for the presence of activity. If at the end of one hour it has been determined that the patient has not swallowed a sufficient amount of activity, then 2ml of water can be given and static images acquired every 15 minutes for an additional hour.

This method has proved to be very helpful for detecting the chronic tracheal aspiration of saliva in profoundly handicapped children. Pediatric specialists are using these scintigraphic studies to determine candidates for surgical tracheal diversion.

Radiopharmaceutical Chemistry: General

Posterboard No. 1009

EFFECTS OF HEATING ON THE COMPOSITION AND BIODISTRIBUTION IN RATS OF RHENIUM RE-186 ETIDRONATE INJECTION. M. Bushman, D. Pipes, R. Wolfangel, J. MacDonald, J. Harris, J. Coveney. Mallinckrodt Medical, Inc., St. Louis, MO.

Rhenium Re-186 Etidronate Injection (Re-186 HEDP) is used for the alleviation of pain from metastatic bone cancer. Re-186 HEDP is formulated by reacting a sodium Re-186 perrhenate solution with stannous etidronate at elevated temperature. The pH of the solution is adjusted with an acetate buffer. The effects of the temperature and the heating time used during formulation of Re-186 HEDP were explored by examining radiochemical purity and biodistribution. The formulation temperature varied from 20°C to 121°C. The length of time of heating varied from 0 to 20 minutes. Labeling efficacy was determined by paper chromatography. Biodistribution data in rats (n=4) were obtained at 3 hours post injection. Some data are presented in the table below for 4 preparations.

			Ave. %Dose/Gm		
HeatingTime	$\%^{186}$Re-HEDP	$\%^{186}ReO_4^-$	Femur	Blood	Kidney
0 min.	83.2	16.8	1.22	0.21	2.29
3 min.	99.0	1.0	1.49	0.18	2.34
6 min.	99.4	0.6	1.96	0.12	1.43
15 min.	99.9	0.1	2.06	0.07	0.86

An increase of Re-186 HEDP on bone and a decrease in non-target soft tissues is seen as time increases. Heating at higher temperatures (121°C) for shorter times gives similar results to longer heating times at lower temperatures. Re-186 HEDP has been described as an equilibrium mixture of several polymeric complexes. Using higher heat profiles during formulation appears to drive the equilibrium to a potentially better agent which exhibits higher bone uptake and lower soft tissue localization. Additional studies are planned to further characterize this heat related phenomenon.

Radiopharmaceutical Chemistry: Technetium

Posterboard No. 1010

A STUDY TO INVESTIGATE PREPARATION PARAMETERS OF TC-99M SESTAMIBI. B.M. Brown, K.T. Cheng, M.S. Sheppard, D. Haymond. Medical University of South Carolina, Charleston, South Carolina.

Our objective in performing this study was to establish the effect that varying volume of diluent and millicuries of Tc-99m Pertechnetate had on the labeling efficiency of Tc-99m Sestamibi. Tc-99m Sestamibi was prepared in accordance with the manufacturer's instructions that include a boiling time of 10 minutes. After preparation, the radiochemical purity was measured up to 6 hours using "Baker-Flex" Aluminum Oxide 1B-F chromatography strips according to the package insert. 150mCi, 200mCi, 300mCi, and 450 mCi amounts of pertechnetate were added in 3ml. The results of radiochemical purity(mean +/- S.D.,N=3) at 6 hours after preparation were 98.23(+/-0.50), 98.01(+/-0.40), 95.88(+/-0.49), and 99.37(+/-0.47) respectively. We also added 150 mCi of pertechnetate in 4 and 5 ml. The results showed 96.51(+/-0.97), and 97.44(+/-0.26) respectively.

We conclude that Tc-99m Sestamibi up to 450 mCi of pertechnetate can be used to prepare in a volume of 3ml. We also found that 150 mCi of pertechnetate could be used to prepare a kit in up to 5ml of volume.

Renal/Electrolyte/Hypertension

Posterboard No. 1011

TECHNICAL ASPECTS IN QUANTIFICATION OF RENAL FUNCTION WITH GAMMA CAMERA RENOGRAPHY. J.A. Pires Jorge, A. Bischof Delaloye, B. Delaloye. Cantonal School of Radiology Technicians and Nuclear Medicine Division, University Hospital, Lausanne, Switzerland

Besides complete intravenous tracer injection, measurement of injected activity and delineation of the areas for background correction are the most crucial parameters for valid quantification of separate renal function. We have chosen 4 background regions: left and right circular (c), semilunar (s), below and between both kidneys. The most consistent results in normal and abnormal kidneys were obtained with s

and c, the 2 other methods were not useful. Concerning estimation of injected activity ($cpm.10^4$) we have tested several methods: measure of pre- and post-injection activity (1mCi I-123 OIH, 5mCi Tc-99m MAG_3 in 0.5ml) in the syringe (sy) either at collimator surface (sy 0cm) or in a syringe holder at a distance of 24cm (sy 24cm) or of a phantom (ph) containing a known activity (0.2mCi I-123, 1mCi Tc-99m) in 100ml, immersed in water and separated from collimator surface by perspex plates at common adult kidney distances (ph 5cm, ph 7cm):

	sy 0cm	sy 24cm	ph 5cm	ph 7cm
I-123	19.92	9.38	10.80	7.75
Tc-99m	119.46	82.58	90.24	61.93

Due to saturation sy 0cm cannot be recommended, sy 24cm gives reasonable results in adults (after depth correction of renal counts), ph probably best mimicks in vivo conditions.

Posterboard No. 1012

GUIDELINES FOR PERFORMING SINGLE SAMPLE Tc-99m MAG3 RENAL PLASMA CLEARANCE CALCULATIONS. P. Corrigan, D. Faulkner, A. Taylor. Department of Radiology, Emory University, Atlanta, GA.

Multiple studies in our laboratory have identified several potential pitfalls in calculating the single sample MAG3 clearance. These are summarized below:

1. Dose Extravasation: May overestimate clearance due to continuous uptake of tracer into the blood from the extravasated site. In a series of 25 patients, dose extravasation was usually less than 0.1%, however, 2 patients had approximately 5% extravasation.
2. Blood Drawing Technique: Enough blood must first be drawn to clear the line of saline or earlier heparized blood before the sample is obtained.
3. Dilution Errors: Incorrect standard preparations and poor laboratory technique will produce erroneous results.
4. Pipetting errors: Pipette tips must be flushed first so that the full specimen is delivered. Errors in pipetting affect the clearance values.
5. Timing: Timing is critical since the renal curves are based on a 43 minute post-injection sample. The regression equation can accommodate slightly earlier or later samples but the time must be accurately recorded.

We have developed a flow chart to be completed by the technologist when performing plasma sample clearances. Awareness of the potential pitfalls, use of a flow chart and standardization of department routine for calculating MAG3 renal plasma clearances are important factors in obtaining reliable measurements.

Posterboard No. 1013

DMSA RENAL SCINTIGRAPHY FOR FOCAL CORTICAL DEFECTS: IMPACT ON INTERPRETATION BY TECHNICAL CHANGES IN LENGTH OF TIME TO DELAYED IMAGING. M. Ganske, C. Nagle, J. Freitas, H. Dworkin. William Beaumont Hospitals, Royal Oak and Troy, MI

Does two hour delayed static DMSA imaging improve detection of renal cortical defects? Two hour delayed imaging for acutely ill patients, sedated children and patients traveling a distance may be difficult and/or lead to suboptimal images related to the total length of time and two department visits. Earlier static imaging would reduce patient inconvenience, allow more effective sedation and possibly more patients could be scanned.

Twenty-eight kidneys of 14 patients were prospectively studied at 5, 30 and 90 to 120 minutes post 5 mCi (fractionated for peds) Tc-99m DMSA injection. Three physicians, blinded to name and scan time, reviewed the kidney images in random order for number of cortical defects and acceptability of image resolution. 21/28 kidneys (75%) had the same number of defects early and delayed. 3/28 kidneys (11%) had more defects early. Interobserver variability occurred for 4/28 kidneys (14%). Resolution was generally acceptable for early images and better on delayed images.

This pilot study suggests that it may be acceptable for selected patients to perform earlier static DMSA imaging for cortical defect detection. A larger series is required before use of early imaging is routinely performed.

Student Posters

Posterboard No. 1014

VALIDATION OF QUALITY CONTROL METHODS FOR Tc-99m HMPAO.
K. Young, and G. Matte. Ottawa Civic Hospital, Ottawa, Ontario, Canada.

Due to the vial instability, Technetium-99m hexamethylpropyleneamineoxime (HMPAO) has only a half hour shelf life in which to perform quality control. As a result, the method must be simple, fast, and accurate. In this investigation three methods of quality control were used: centrifugation and 2 chromatographic procedures (3-strip and 1-strip). The pertechnetate used was less than 4 hours old and from a generator that had been eluted in the previous 24 hours. Quality control was performed immediately, 1, 2, 3, and 6 hours post reconstitution. As expected the percent bound was decreasing with time. Specific impurities could only be determined from the 3-strip method and showed that the secondary complex accounted for the greatest proportion of the impurity as time passed. When compared to the manufacturer's method, the bound percentages (at time 0) obtained by centrifugation did not corroborate as well as the result from the single strip chromatography.

Posterboard No. 1015

EVALUATION OF BACKGROUND SUBTRACTION VALUES IN THE ASCERTATION OF ACCEPTABLE LIMITS FOR A STRESS THALLIUM (201-THALLOUS CHLORIDE) STUDY.
M. Demirer, J. Brantley, R. Driver, S. Cain, Z. Travis.
Gloucester County College.

The Stress Thallium Study background ratios are 2.1 to 2.7 to 1. Because of the background ratio, the performance of background subtraction greatly enhances the visual clarity of the image. Ascertation of an adequate background subtraction percentage is imperative to the specificity of images. Subtraction of background percentages too great could result in magnification of a normal variation into a questionable photopenic defect. Subtraction of inadequate values could result in disappearance of any deficient Thallium uptake images to within visual acceptable limits.

Evaluation of the correct background subtraction percentage was performed. Background of 0, 5, 15, 30, 60 and 100 percent values were subtracted from stress and delayed images. After visual evaluation the 15 percent background subtraction was concluded to be the best background subtraction for a Tl-201 study. By visualizing and comparing 0 percent and 15 percent background subtracted images, an accrued ascertation of the myocardial perfusion may be obtained without fear of distorting the data.

Posterboard No. 1016

DETERMINATION OF ATTENUATION CORRECTION VALUES FOR VARYING PHANTOM CIRCUMFERENCES.
M.S Gibson, R. Jammal. Ottawa Civic Hospital.

The purpose of this study is to determine if different attenuation correction factors are required for varying circumferences. To determine the best attenuation coefficient value, a Jaszack phantom with uniform distribution of Tc-99m was acquired using a 64 x 64 matrix, acquired on 128 frames at 10 sec/frame on a 360^0 clockwise rotation.

Using Chang's theory and analysis of image count profiles generated through the centre of transverse slices, an attenuation value of μ=0.10 was determined to be the best for a circumference of 74 cm. Other μ values applied to the same circumference caused either under or over corrected reconstructed images.

A more comprehensive study using the Tc-99m water filled phantoms of varying circumferences, acquired with the same parameters as the Jaszack phantom, is used to determine appropriate values for attenuation correction.

SCIENTIFIC EXHIBITS

All Scientific Exhibits are listed in alphabetical order by category. The number above each title refers to the exhibit location.

Scientific Exhibit Hours

Tuesday	10:00 A.M.–7:00 P.M.	Thursday	10:00 A.M.–7:00 P.M.
Wednesday	7:00 A.M.–7:00 P.M.	Friday	7:00 A.M.–12:30 P.M.

Bone and Joint

Posterboard No. 1017

EVALUATION OF HAND AND WRIST PAIN THROUGH THE USE OF THREE PHASE RADIONUCLIDE BONE IMAGING. L.A. Cole, P.A. Sheehan, L.E. Holder. The Union Memorial Hospital, Baltimore, Md.

Three Phase Radionuclide Bone Imaging of the hand and wrist has become a standard diagnostic tool in the armamentarium of the hand surgeon. Routine bone imaging of the hand and wrist has taken several directions. This exhibit will address the following applications. Three Phase Bone Imaging permits: (1) noninvasive evaluation of vascular and/or soft tissue lesions, such as arteriovenous malformations; (2) recognition or exclusion of osseous disease entities such reflex sympathetic dystrophy, tumors, and pain of uncertain etiology; (3) evaluation of bone pain secondary to trauma, cysts, inflammatory disease or occult fractures when radiographs are non-diagnostic. Three Phase Bone Imaging consists of a dynamic blood flow study, initial blood pool and 4 hour delay images. In this exhibit the technique as applied to the hand will be introduced and the physiology underlying the images described.

Cardiovascular Clinical

Booth No. 1018

EFFECT OF DIFFERENT SPECT FILTERING TECHNIQUES ON TECHNETIUM-99m TEBOROXIME CARDIAC IMAGES. M.K. Hobai, J.M. Joyce, S.J. Grossman, J. Acierno. West Penn Hospital, Pittsburgh, PA.

This exhibit will demonstrate the effect of different SPECT filters, filtering parameters and sequential filtering on the quality of Teboroxime images acquired on the Siemens Orbiter. The following SPECT filtering techniques were used: Ramp (cutoff=.1), Hanning (cutoff=.2), and Butterworth (cutoff=.35/order 5; cutoff=.35/order 10; cutoff=.45/order 5; cutoff=.45/order 10). Using Siemens interactive filtering, each of the four Butterworth filtered images obtained was refiltered or "double filtered" using the .35 and .45 cutoffs and the orders of 5 and 10 resulting in sixteen more filtered images.

Examples of images from each of these different SPECT filtering techniques will be displayed. The observer of the exhibit will be able to compare the quality of the images using the different filters (Ramp vs. Hanning vs. Butterworth), the different filtering parameters (Butterworth .35 vs. .45 cutoff, 5 vs. 10 order), and the "double filtering" with the Butterworth filter using the .35 and .45 cutoffs, and 5 and 10 orders.

Both physicians and technologists will find reviewing these images helpful in learning the advantages and disadvantages of different SPECT filtering techniques when processing Teboroxime cardiac images.

Pediatrics

Viewbox No. 1019

ASSESSMENT OF VESICOURETERAL REFLUX IN PAEDIATRIC PATIENTS. D. Pesme, D. Gilday, and J. Ash. The Hospital for Sick Children, Toronto, Canada.

The ability to demonstrate vesicoureteral reflux is important in the management of paediatric patients.

Nuclear Medicine can offer alternatives to conventional radiographic voiding cystourethrograms (VCUG). Direct Radionuclide Cystograms (DRCs) permit lower radiation dose to the patient while allowing longer imaging of the urinary tract during both filling and voiding phases. In patients where catheterization is contra-indicated, Indirect Radionuclide Cystograms (IRCs) using 99mTc MAG-3 allow visualization of renal function and excretion as well as the voiding phase to determine if reflux is present.

This exhibit will present examples of both DRCs and IRCs. Special consideration involving paediatric patients, acquisition parameters and analysis will also be included.

Author Index: Scientific Papers, Posters, and Exhibits