38th ANNUAL MEETING

TECHNOLOGIST SECTION PROGRAM

Proceedings of the 38th Annual Meeting of
The Society of Nuclear Medicine
June 11–14, 1991 · Cincinnati, Ohio

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38TH ANNUAL MEETING PROGRAM INFORMATION

General Information

On-Site Registration
Cincinnati Convention Center

Preregistrants are urged to pick up their badges and packets on Sunday, June 9, 1991. The registration hours for Sunday, as well as the remainder of the week, are listed below.

Registration Hours

Sunday, June 9	12:00 pm to 5:00 pm
Monday, June 10	7:00 am to 5:00 pm
Tuesday, June 11	7:00 am to 5:00 pm
Wednesday, June 12	7:30 am to 4:00 pm
Thursday, June 13	7:30 am to 4:00 pm
Friday, June 14	7:30 am to 11:00 pm

Please note that name badges are required for admission into the Exhibit Hall, all educational meetings, and social events. There will be a replacement charge of $5.00 for lost badges. No refunds will be given even if the original badge is found. Children under the age of 12 will not be admitted into the Exhibit Hall.

SNM INFORMATION DESK AND MESSAGE CENTER

The Society will staff a booth in the registration area to provide information regarding SNM activities at the Annual Meeting and to help attendees with any meetings problems. Messages for meeting attendees will be posted daily from 8:00 am to 5:00 am Monday, June 10–Friday, June 14.

SOCIETY AND TECHNOLOGIST SECTION COMMITTEE MEETINGS

Committee meetings will convene in the Hyatt Regency Cincinnati Hotel, located directly across the street from the Convention Center. All members are cordially invited to attend.

Technologist Section Meetings

Committees:	Friday, June 7
National Council:	Saturday, June 8
Business Meeting:	Thursday, June 13

Society Meetings

Committees*:	Saturday, June 8 and Sunday, June 9
Board of Trustees:	Monday, June 10

* The following SNM committees are tentatively scheduled to meet on Saturday: Practice Policies, Finance Committee, and Council Presidents and Committee Chairs.

SNM PUBLICATIONS AND MEMBERSHIP BOOTHS

Books and audiovisuals will be on sale during the hours that meeting registration is open.

Members and nonmembers are encouraged to stop by the Membership Booth. Hours: 8:00 am–5:00 pm, Monday through Thursday; 8:00 am–11:00 am, Friday.

SPECIAL EVENTS AND SOCIAL ACTIVITIES

Opening Night Reception
Monday, June 10, 7:00 pm to 9:00 pm. Regency Ballroom, Hyatt Regency Hotel.

Awards Presentation, SNM Business Meeting, and Wine & Cheese Reception
Tuesday, June 11, 5:00 pm to 6:00 pm, Room 202, Cincinnati Convention Center.

1991 Technologist Party
Thursday, June 13, 8:00 pm to 11:00 pm, Regency Ballroom, Hyatt Regency Hotel.

Scientific Meeting Highlights
Friday, June 14, 3:00 pm to 5:00 pm, Ballroom C, Cincinnati Convention Center.

TECHNOLOGIST SECTION MATRIX

		ROOMS 210–211	ROOMS 204–214	ROOM 208	ROOM 207	ROOM 215
MONDAY	JUNE 10 8:30 to 2:30	**MANAGEMENT CATEGORICAL SEMINAR**			**THE TEACHER IMPROVEMENT PROJECT SYSTEM (TIPS) SEMINAR**	
	7:00 to 9:00	**Opening Cocktail Reception in the Regency Ballroom at the Cincinnati Hyatt Regency**				
TUESDAY	JUNE 11 8:30 to 10:00	Formal Opening and Plenary Session **Ballrooms A & B** Followed by the Grand Opening of the Exposition				
	10:00 to 10:30	Coffee Break in the **Exhibit Hall**, Sponsored by **Nordion International Inc.**				
	10:30 to 12:10	**BRAIN I:** Neuro-SPECT Imaging	**SCIENTIFIC PAPERS:** Cardiovascular Technologist Investigator Competition	**MRI/PET:** Basics	**STUDENT DAY:** Student Investigator Competition	**GENITOURINARY:** Techniques in Renal Scintigraphy
	12:10 to 1:30	**Poster Session** in the Exhibit Hall/Visit Exhibits and have lunch in the **Exhibit Hall**			**STUDENT DAY LUNCH** With Guest Speaker	
	1:30 to 3:10	**BRAIN II:** Neuro-SPECT Imaging	**SCIENTIFIC PAPERS:** Pulmonary/Oncology	**PET:** Recent Advances	**2:00–3:00 – FDA:** Medical Device Problems–New User Reporting Legislation and Guidelines	**PEDIATRICS:** New Techniques in Pediatric Imaging
	3:10 to 3:30	Visit Exhibits in the **Exhibit Hall**				
	3:30 to 5:10	**BRAIN II:** Neuro-SPECT Imaging (continued)	**SCIENTIFIC PAPERS:** Hematology/ Infectious Disease	**PET:** Recent Advances (continued)	**SCIENTIFIC PAPER AND PRESENTATION TECHNIQUES**	**3:30–4:20 – PEDIATRICS:** New Techniques in Pediatric Imaging (continued) **4:20–5:10 – PUBLIC RELATIONS WORKSHOP:** "Peaking" Interest in Nuclear Medicine
WEDNESDAY	JUNE 12 8:30 to 10:10	**RADIATION SAFETY IN NUCLEAR MEDICINE I**	**NUCLEAR CARDIOLOGY I:** Cardiovascular Physiology and Stress Testing	**SCIENTIFIC PAPERS:** SPECT	**NMTCB ITEM WRITERS WORKSHOP**	**FUNDAMENTALS I:** Fundamental Nuclear Medicine
	10:10 to 10:30	Coffee Break in the **Exhibit Hall**, Sponsored by **McNeil Pharmaceutical**				
	10:30 to 12:10	**RADIATION SAFETY IN NUCLEAR MEDICINE I:** (continued)	**NUCLEAR CARDIOLOGY I:** Cardiovascular Physiology and Stress Testing (continued)	**SCIENTIFIC PAPERS:** PET/Neurology	**NMTCB ITEM WRITERS WORKSHOP** (continued)	**FUNDAMENTALS I:** Fundamental Nuclear Medicine (continued)
	12:10 to 1:30	**Poster Session** in the Exhibit Hall/Visit Exhibits and have lunch in the **Exhibit Hall**				**12:30–1:20 – PUBLIC RELATIONS WORKSHOP:** "Peaking" Interest in Nuclear Medicine
	1:30 to 3:10	**RADIATION SAFETY IN NUCLEAR MEDICINE II**	**NUCLEAR CARDIOLOGY II:** Myocardial Perfusion Viability and Function	**SCIENTIFIC PAPERS:** General/Bone	**GI IMAGING**	**FUNDAMENTALS II:** Fundamental Nuclear Medicine
	3:10 to 3:30	Visit Exhibits in the **Exhibit Hall**				
	3:30 to 5:10	**RADIATION SAFETY IN NUCLEAR MEDICINE II** (continued)	**NUCLEAR CARDIOLOGY II:** Myocardial Perfusion Viability and Function (continued)	**SCIENTIFIC PAPERS:** Technetium	**GI IMAGING** (continued)	**FUNDAMENTALS II:** Fundamental Nuclear Medicine (continued)
THURSDAY	JUNE 13 8:30 to 10:10	**PROFESSIONAL DEVELOPMENT I:** Communication and Teamwork in Nuclear Medicine	**SPECT I:** Basics of Single Photon Emission Computed Tomography	**SCIENTIFIC PAPERS:** Renal/Pediatrics/ Gastroenterology	**MONOCLONAL ANTIBODIES:** Diagnostic and Therapeutic Uses in Nuclear Medicine	**NON-ROUTINE IMAGING**
	10:10 to 10:30	Coffee Break in the **Exhibit Hall**, Sponsored by **McNeil Pharmaceutical**				
	10:30 to 12:10	**PROFESSIONAL DEVELOPMENT I:** Communication and Teamwork in Nuclear Medicine (continued)	**SPECT I:** Basics of Single Photon Emission Computed Tomography (continued)	**SCIENTIFIC PAPERS:** Renal/Pediatrics/ Gastroenterology (continued)	**MONOCLONAL ANTIBODIES:** Diagnostic and Therapeutic Uses in Nuclear Medicine (continued)	**NON-ROUTINE IMAGING** (continued)
	12:10 to 1:30	Visit Exhibits and have lunch in the **Exhibit Hall**			**JRC FORUM**	
	1:30 to 3:10	**PROFESSIONAL DEVELOPMENT II:** Communication and Teamwork in Nuclear Medicine	**SPECT II:** Advanced Topics in Single Photon Emission Computed Tomography		**EDUCATOR'S FORUM**	**1:30–2:20 – PUBLIC RELATIONS WORKSHOP:** "Peaking" Interest in Nuclear Medicine
	3:10 to 3:30	Visit Exhibits in the **Exhibit Hall**				
	3:30 to 5:10	**PROFESSIONAL DEVELOPMENT II:** Communication and Teamwork in Nuclear Medicine (continued)	**SPECT II:** Advanced Topics in Single Photon Emission Computed Tomography (continued)		**EDUCATOR'S FORUM** (continued)	
	5:10 to 6:10	**TECHNOLOGIST BUSINESS MEETING**				
	8:00 to 11:00	**Don't Miss the SNM Technologist's Party in the Regency Ballroom at the Cincinnati Hyatt Regency • The Technologist Party is Sponsored by All Exhibitors**				

Continuing Education **Scientific Papers**

ABSTRACTS OF SCIENTIFIC PAPERS

A Note on Scientific Papers

The Scientific and Teachings Sessions Committee of The Society of Nuclear Medicine—Technologist Section, is pleased to present the abstracts of the scientific papers for the 38th Annual Meeting. The scientific papers will be presented commencing Tuesday, June 11, in sessions beginning at 10:30 am. Please note that on Wednesday, June 12, scientific papers will be presented in sessions beginning at 8:30 am.

TUESDAY, JUNE 11, 1991

Formal Opening and Plenary Session

8:15–10:00 Ballrooms A & B

8:15 Welcome and Opening Remarks:
Naomi P. Alazraki, MD
President, The Society of Nuclear Medicine
John W. Keyes, Jr, MD
Chairman, 1991 Scientific Program Committee
Bradley K. Pounds, CNMT
President, The Society of Nuclear Medicine—Technologist Section

8:30 Special Address:
Congressman Willis D. Gradison, Jr.
Second District Ohio
Ranking Minority, Ways and Means Subcommittee on Health

8:50 The Twelfth Annual Georg Charles de Hevesy Nuclear Medicine Pioneer Award Presentation:
Honoree: Alfred P. Wolf, PhD
Brookhaven National Laboratories
Upton, New York
Introduction: Joanna S. Fowler, PhD

9:05 Presentation of The Benedict Cassen Memorial Fund to the Education and Research Foundation of The Society of Nuclear Medicine, by William H. Blahd, MD and Miriam Blahd

9:15 Presentation of Special Recognition Award to Joseph Ross, MD, President, The American Board of Nuclear Medicine

9:20 The Eighth Annual SNM Lectureship:
Clinical PET Today, Tomorrow, or Never
David E. Kuhl, MD
University of Michigan
Ann Arbor, Michigan

10:00 Opening of the 1991 SNM Exposition:
South & West Halls, Cincinnati Convention Center

TUESDAY, JUNE 11, 1991

Session I
Cardiovascular Technologist Investigator Competition

10:30–12:00 **Rooms 204–214**

Moderators: *Victor W. Hall, CNMT and Gerald W. Guidry, CNMT*

No. 1000

FIRST PASS LVEF BY GATED LIST MODE TECHNIQUE USING SINGLE CRYSTAL GAMMA CAMERA ALLOWS ADDITIONAL ASSESSMENT OF FUNCTION WITH Tc-99m MYOCARDIAL PERFUSION AGENTS.
M.A. Saari, J.A. Mattera, D.J. Errico, F.J.Th. Wackers.
Yale University, New Haven, CT.

The higher dose given for myocardial perfusion imaging with the Tc-99m-labeled myocardial perfusion imaging agents allows for the additional assessment of function by acquiring first pass (FP) radionuclide angiocardiography (RNA). FP RNA were not done routinely on single crystal gamma cameras (SCGC) because of poor count statistics and lack of validated FP ejection fraction (EF) software. Newer generation SCGC with improved count sensitivity (120-200K counts/s) and more sophisticated computer systems and software can acquire FP gated list mode studies (GLMS). Our purpose was to evaluate the LVEF of FP GLMS as compared with equlibrium (E)RNA. Thirty eight (38) pts had a FP GLMS using 25-30 mCi of Tc-99m labeled RBC's followed by ERNA study. The left ventricular (LV) phase of the FP GLMS was reformatted into a gated study and the LVEF was calculated using the same EF software as used for ERNA studies. Mean FP GLMS LVEF was 46±18 (range 14-80%), mean ERNA LVEF was 47±18(range 14-82%) p=ns, r=0.86. Three pts with abnormal (≤ 50%) FP GLMS LVEF had normal ERNA LVEF, two pts with normal FP GLMS LVEF had abnormal ERNA LVEF. In fourteen pts with ≥10 absolute % difference between FP GLMS and ERNA LVEF the mean ED counts were 1807±715. In contrast, the mean ED counts in 24 pts with <10 absolute % difference were 2469±1103 ($p<0.05$). Excluding 20 pts with <2000 counts in ED frame, correlation between FP GLMS and ERNA was r=.91.

In conclusion: FP GLMS LVEF correlates well with ERNA LVEF, especially when the FP GLMS has adequate LV ED counts (>2000), and can be easily performed using a SCGC and standard ERNA LVEF software.

No. 1001

DOBUTAMINE THALLIUM-201 TOMOGRAPHY: A NEW METHOD FOR EVALUATING PATIENTS WITH SUSPECTED CORONARY ARTERY DISEASE. A.J. Cochran, J.T. Hays, J.J. Mahmarian, and M.S. Verani. The Methodist Hospital/Baylor College of Medicine, Houston, TX.

We prospectively investigated whether a dobutamine (DOB) infusion in conjunction with thallium-201 (Tl-201) single-photon tomography (SPECT) could detect coronary artery disease (CAD) in 27 patients (pts) unable to perform an exercise test. Most pts had reactive airway disease and so could not undergo pharmacologic vasodilation with adenosine or dipyridamole. DOB was infused intravenously at 5, 10, 20, 30, and 40 μg/kg/min for 3 minutes/dose. All pts had continuous ECG monitoring and vital signs assessed every 3 minutes. Tl-201 was injected after 1 minute of the maximally tolerated DOB dose, and the infusion continued for an additional 2 minutes. The total infusion time was a maximum of 15 minutes prior to starting SPECT. SPECT images were acquired, reconstructed and reoriented in a standard fashion as previously described from our laboratory. Twenty-two of 27 pts (81%) tolerated the maximal DOB dose, but in 4 pts the infusion was stopped prematurely at a dose of 30 μg/kg/min due to the development of nonsustained ventricular tachycardia (N=2), marked ST segment depression (N=1) or shortness of breath (N=1). Although most pts (70%) had transient side effects during the DOB infusion, no pts developed serious or life-threatening complications. The hemodynamic effects of DOB were directionally similar to those of exercise, with significant increases in heart rate, systolic blood pressure and the rate-pressure product.

Eighteen of the 27 pts (66%) had an abnormal SPECT study, as did all 10 pts with CAD by angiography. Thus, DOB SPECT appears to be a safe and feasible new method for evaluating pts with suspected CAD and warrants further investigation.

No. 1002

ESTIMATION OF LEFT VENTRICULAR EJECTION FRACTION USING GATED Tc-99m ISONITRILE MYOCARDIAL PERFUSION IMAGES C Smith, TD Ruddy, University of Ottawa Heart Institute, Ottawa, Canada

Gating of Tc-99m isonitrile myocardial perfusion images allows regional evaluation of left ventricular function as myocardial thickening measured as an increase in regional counts in systole vs diastole. We determined a quantitative measurement of global left ventricular function as an increase in LV systolic counts, called contraction fraction (CF), and correlated CF to left ventricular ejection fraction (EF) from Tc-99m gated blood pool scans. Twenty-one patients were injected with Tc-99m isonitrile at rest (280 MBq) and imaged one hour later with gated (16 frames/cycle) planar acquisitions. The Tc-99m isonitrile gated wall motion images were temporally and spatially smoothed. The images were added together and a region of interest (ROI) was drawn around the left ventricle. The average counts per pixel per image was calculated to provide a threshold of counts to be subtracted from each of the wall motion images. End-diastole (ED) was considered to be frame 1. End-systole (ES) was determined by applying the original ROI to the subtracted images. The frame with the ROI containing the most counts was chosen as ES and always occurred in frames 5, 6 or 7. CF was measured using 3 methods: 1. (ES counts - ED counts)/ES counts; 2. (ES pixels - ED pixels)/ES pixels using an isocontour program to calculate the number of pixels remaining in the ROI; 3. (ES pixels - ED pixels)/ES pixels by manually counting the pixels remaining in the ROI. Within 1 week, all patients had gated (28 frames/cycle) blood pool images. EF was calculated with a standard semiautomatic program. The isocontour measurement of CF in the LAO projection provided the best correlation to EF ($r=0.73$, $p<0.01$; EF = 0.763 (CF) + 28.06. Thus, estimation of global left ventricular function is possible using gated Tc-99m isonitrile myocardial perfusion images.

No. 1003

CLINICAL VALUE OF ADENOSINE THALLIUM-201 SPECT: UNIVERSITY OF MICHIGAN EXPERIENCE. L. Sucharski, W. J. Wysor, N.A. Petry, M. Schwaiger. University of Michigan, Ann Arbor, MI.

Intravenous adenosine (AD) in combination with Thallium-201 (Tl-201) imaging has been recently introduced as alternative to exercise testing. Between April and October 1990, 790 AD Tl-201 SPECT studies have been performed in patients with suspected or proven coronary artery disease at the University of Michigan. 3 mCi Tl-201 was injected at 3 minutes during a 6 minute infusion of adenosine (140 µg/kg/min) with continuous monitoring of blood pressure and ECG. Tomographic data acquisition commenced within 15 minutes after tracer injection using 32 angles 40 sec each. The stress test was supervised by ACLS trained technologists with a physician available for the management of complications. During the above time interval, there were no serious complications such as death or myocardial infarction associated with the adenosine infusion. Mild side effects were common (86%) primarily in form of flushing (48%) and shortness of breath (40%). Lightheadedness/dizziness and headache occurred only in 10% and 11%, respectively. Adenosine infusion was stopped prematurely in 2% and slowed (100 µg/kg/min) in 11% of studies. Chest discomfort was reported in 24%, ST depression (>1mm) in 3% and arrythmia in 4%. Hypotension (<85 mmHg) was rare (<1%), but transient AV conduction abnormalities were present in 7%. All side effects resolved quickly due to the short biological halftime of adenosine. 109 of 790 patients underwent coronary angiography at the University of Michigan. 96 patients had significant coronary stenoses (>50%), while 13 were considered free of disease. 92 (94%) patients with disease had an abnormal Tl-201 SPECT study, but there were 9 patients (11%) with a positive scintigraphic study without evidence for significant CAD yielding a positive predictive value of 92%. In patients without history of prior infarction, the predictive value was 84%. Thus, adenosine Tl-201 SPECT represents a safe and practical alternative to stress testing, but the relative high incidence of side effects requires close monitoring of the patient during adenosine infusion. The high predictive value renders this test clinically very useful in the diagnostic work-up of patients with suspected CAD, but limited exercise capacity.

No. 1004

EJECTION FRACTION (EF) DETERMINATION IN PATIENTS WITH ENLARGED LEFT VENTRICLE (LV); TECHNICAL CONSIDERATIONS. J.K. Russell, M. Tulchinsky, A. Rodriguez, and J.H. Murphy. Likoff Cardiovascular Institute, Philadelphia, PA.

In left anterior oblique (LAO) view, 80% of LV base counts are attenuated by periapical blood pool on the gated radionuclide ventriculogram. Our study evaluated whether this under-representation of LV base can cause significant LVEF under-estimation in patients with dilated LV who have best wall motion at the base. Utility of anterior (ANT) view LVEF in these patients is considered.

We studied 66 patients: 15 with normal LV size (Group I), 26 with dilated LV (Group II), and 25 cases of dilated LV cavity with periapical dyskinesia (Group III). All the studies (modified in vitro RBC labeled with Tc 99m) allowed adequate separation of LV from RV in LAO and ANT views. Analysis of images was done in both views and compared by paired t-test.

	LAO EF(%)	ANT EF(%)	p	↑ (%)
Group I	62±6	65±6	0.03	5
Group II	44±2	50±2	<0.0001	13
Group III	30±1	37±1	<0.0001	23
↑ (%) = [(ANT EF-LAO EF)/LAO EF]x100%				

We found that in patients with dilated LV the EF obtained from ANT images is significantly greater than from LAO images, especially if there is periapical dyskinesia present. Our results call for further studies to determine whether in case of dilated LV ANT images provides more accurate EF than LAO images.

Session II
Pulmonary/Oncology

1:30-3:00 **Rooms 204-214**

Moderators: Katherine Richmond-Cox, CNMT and Angela Cochran, CNMT

No. 1005

PHYSIOLOGIC CHANGES FOLLOWING SINGLE LUNG TRANSPLANTS. P.C. Hanson and H.D. Royal. Washington University School of Medicine, St. Louis, MO.

Single lung transplantation causes unique changes in cardiac and pulmonary physiology. We have reviewed the results of radionuclide ventriculography (RVG) and quantitative perfusion studies (QP) (relative perfusion to transplanted lung) in patients who had single lung transplantation performed in the last 3 years.

76 RVGs (31 pre-transplant; 45 post-transplant) and 210 QP studies (29 pre-transplant; 181 post-transplant) were obtained in 20 patients (14 female; 6 male; age 48.0 ± 10.5 yrs) with emphysema (n=14) and primary pulmonary hypertension (PPH; n=6).

RVG	Pre-Op		6 Month	
	LVEF(%)	RVEF(%)	LVEF(%)	RVEF(%)
Emphysema	67.7 ± 7.7	47.4 ± 7.9	70.4 ± 7.8	54.0 ± 10.1
PPH	54.5 ± 16.7	25.8 ± 14.6	67.7 ± 7.5	53.8 ± 6.8

QP (%Flow)	Pre-Op	1 Week	3 Month
Emphysema	37.4 ± 14.7	72.4 ± 12.5	75.4 ± 12.7
PPH	54.0 ± 7.5	91.3 ± 5.0	85.7 ± 8.7

Single lung transplants greatly affect cardiopulmonary physiology. Patients with PPH are more likely to have right ventricular dysfunction pre-operatively and this dysfunction improves post-operatively. Right ventricular dysfunction is not a contraindication to lung transplantation. Patients with emphysema rarely have pre-operative right-heart dysfunction.

Post-operatively the blood flow to the transplanted lung increases when compared to the blood flow to the native lung. This increase in blood flow is more marked in patients with PPH.

No. 1006

PERSONNEL CONTAMINATION DURING Tc-99m DTPA AEROSOL VENTILATION PROCEDURES. M. Dean, P. Galantowicz, P. Corning, J. Dean, L.

Redlinski, P. Cunningham, J. Dudkiewicz, M. Waller, J. Gona. Veterans Administration Medical Center and State University of New York at Buffalo School of Medicine and Biomedical Sciences, Buffalo, New York.

The potential for personnel contamination is always a consideration with any nuclear medicine procedure. Significant contamination has been noted during patient administration of Tc-99m DTPA aerosol for routine ventilation procedures. Following ventilation, wipe testing of personnel resulted in radioactivity readings as high as 38 times background.

A study of this problem was conducted over a ten month period and involved 48 patients. Aerosol units were loaded with 25-35 mCi Tc-99m DTPA and nebulized with 10 liters of oxygen for approximately 5 minutes. Personnel swipes were then taken of the hair, clothing and nostrils. To determine the source of contamination the aerosol unit was sealed in plastic. pledgets were placed at openings of aerosol unit and counted. Also mouthpieces and aerosol units from various manufacturers such as Cadema and Mallinkrodt, were evaluated. The resulting data indicated no substantial decrease in contamination. Limiting patient leakage through the use of negative pressure system, a wet washcloth over the mouthpiece and protective clothing and mask worn by personnel, allowed a reduction in contamination to near background levels.

In conclusion, it has been determined that the patient is a primary source of contamination. By using the precautions mentioned above contamination can be limited. Also, thorough instruction and evaluation of the patient are necessary to induce the highest degree of cooperation from the patient, thereby reducing personnel contamination.

No. 1007

PULMONARY VENTILATION SCINTIGRAPHY OF THE RESPIRATOR ASSISTED PATIENT. J.W. Hart, I.S. Zolty, M.L. DeLaney, C.J. Palestro, S.J. Goldsmith. Mount Sinai Medical Center, New York, NY

Tc-99m-DTPA aerosol studies are routinely performed in patients pre or post perfusion scan to rule out pulmonary embolism. The diagnostic quality of radioaersol lung ventilation studies is often suboptimal due to the accumulation of the radiotracer in central and peripheral airways (trachea, mainstem bronchi and alveoli). This phenomenon is caused by high pressure utilized in the ventilating apparatus. In order to improve the quality of the image we evaluated a technique which involved removing the Tc-99m activity deposited in the central airways.

10 patients were found to have central deposition of the radioaerosol on the ventilation study. The activity deposited in the trachea was suctioned and the patients were reimaged. Pre and post suction images were evaluated by the department physicians and the quality of post suction images were found to be far superior in all 10 patients because of removal of high intensity foci from central airway and better information density in lung parenchyma. This technique is now incorporated in our clinical protocol for ventilator assisted patients.

No. 1008

DOSIMETRIC CONSIDERATIONS FOR THE TECHNOLOGISTS IN THE ADMINISTRATION OF TECHNETIUM-99M DTPA AEROSOL TO PATIENTS UNDERGOING PULMONARY VENTILATION. P. Galantowicz, M. Dean, J. Dean, P. Corning, L. Redlinski, M. Waller, J. Dudkiewicz, J. Gona. Veterans Administration Medical Center, State University of New York at Buffalo School of Medicine and Biomedical Sciences, Buffalo, New York.

Technetium 99m DTPA ventilation studies require a high degree of patient cooperation. In difficult or uncooperative patients, problems such as aerosol leakage can occur. To assess the magnitude of this problem, the following study was conducted.

Forty-eight patients procedures were documented over a period of 10 months in which Tc-99m DTPA aerosol was administered for pulmonary ventilation. Room air samples were obtain during the ventilation with the use of an air sampler moving a measured quantity of air through filter paper. Technologists performing tests were instructed to wear protective clothing such as masks, caps, gloves and gowns. Post-test swipes were then taken of gown and nasal passages. Paper masks and caps were cut-up and counted.

The findings showed that masks accumulated significant contamination, from a background level of 312 dpm to a high of 1.7×10^6 dpm. Nasal counts in 26 of the 48 studied were double background counts or greater. Cap and gown counts showed corresponding levels of contamination. The room air samplings demonstrated that while levels did not exceed the maximum permissible concentration for Tc-99m found in NRC REG.20.203 (D) Appendix B, they were significant enough to warrant protective measures by the technologist to limit exposure.

In conclusion the air concentration of Tc-99m DTPA aerosol when performing routine studies were elevated enough to cause contamination to the room and technologist.

No. 1009

TREATMENT OF BONE METASTASES WITH STRONTIUM-89 FOR PALLIATION OF PAIN. T. Malekian, R. Carretta, M. Featherstone, P. Matin. Roseville Hospital, Roseville, CA.

Strontium-89, a beta emitting isotope with a 50.5 day half life, has been an effective isotope in treating patients with bone carcinoma secondary to prostate, breast and lung metastases. Patients that had post radiation and chemotherapy, had not received any relief from their skeletal pain, and were on high doses of pain medication were selected for this study.

One hundred and forty-one doses were dispensed on 102 patients. Thirty-two patients expired prior to completion of their study and were excluded from the study. Seventy-seven percent of the patients treated received mild to dramatic improvement in their bone pain. In few patients after the completion of a three month bone scan showed some improvement in their bone metastases. Strontium-89, being a calcium analog, is not taken up directly by bone marrow, therefore, severe hematological side effects are not detected. Ninety percent of the patients did not have any significant change in their white cell or platelet counts. Strontium-89 is an effective isotope and has a dramatic effect on patients with severe bone pain. It adds quality of life and also helps patients minimize the use of narcotics for their skeletal pain. Patients can be treated on an outpatient basis, can be retreated if necessary and well tolerated with minimal to no side effects.

No. 1010

TECHNICAL ASPECTS OF SCANNING WITH I-123 OCTREOTIDE. R.J. Hayostek, M.K. O'Connor, M.L. Brown, L.K. Kvols. Mayo Clinic and Foundation. Rochester, MN.

I-123 Octreotide (SMS 204-090), a somatostatin analog, was studied in a group of 30 patients with known neuroendocrine tumors. All patients were given Lugols prior to and throughout the study in order to maintain thyroid blockade. I-123 octreotide was injected into antecubital vein. Patients experienced symptoms of flushing similar to a carcinoid syndrome and/or burning at the site of injection which resolved in 3 minutes. By injecting patient over 3-5 minute time frame, the side affects were avoided.

Sequential limited images were obtained for 1 hour over the upper abdomen and total body images were obtained with dual headed whole body gamma camera (Siemens) at 1 hr, 2 hr, 4 hr, 24 hr and 48 hr after injection. Scan speed of 10 cm/minute was used for the first three whole body images. This was then slowed to 5 cm/minute for 24 and 48 hr images. Whole body images were obtained on a dedicated Nuclear Medicine computer (pinnacle Medasys, Ann Arbor, Michigan) in 256x1024 matrix for further analysis. SPECT imaging of the liver was obtained in all patient , occasionally SPECT of skull and chest were also obtained. There was significant gallbladder activity following fatty meals or CCK

administration. In order to get adequate SPECT reconstruction of the liver, a subtraction technique was used to remove the gallbladder activity.

The extensive and multiple imaging modalities used in the study allowed for evaluation of I-123 SMS for localization of neuroendocrine tumors as well as quantification of the pharmacokinetics. Examples of individual cases and techniques will be presented.

Session III
Hematology/Infectious Disease

3:30-4:15 **Rooms 204-214**

Moderators: Katherine Richmond-Cox, CNMT and Angela Cochran, CNMT

No. 1011

THE SIGNIFICANCE OF A ONE HOUR 99m-Tc HmPAO LEUKOCYTE SCAN OF THE ABDOMEN. L. Karalasingam, S.D.Ripley,M.D., Metropolitan General Hospital, Windsor, ON

The following study was designed to assess the usefulness of 99m-Tc HmPAO labeled WBCs for abdominal imaging.

It has been previously demonstrated that unlike Indium labeled WBCs 99m-Tc HmPAO or a by-product is frequently identified in the right lower quadrant at 4 hours and is therefore of little value in ascertaining the presence or absence of inflammatory bowel disease, appendiceal abscesses or other inflammatory process in this area. Consequent to the nonspecificity of the 4 hour imaging of the abdomen using 99m-Tc labeled HmPAO WBCs, a prospective study was done to evaluate the presence or absence of tracer in the right lower quadrant at 1 hour. All patients were referred for evaluation of osteomyelitis in the extremities. Routinely images of the abdomen and the extremities were done at 1 hour. The leukocytes were labeled using a modified Hammersmith Protocol. 40ml of whole blood was collected, separated, washed and labeled with 1.2GBq of 99m-Tc HmPAO. The labeling efficiency was 51% (±9%). Of the 36 patients 92% showed no evidence of activity in the right lower quadrant at 1 hour. Three of the 36 patients (8%) demonstrated questionable or slight activity in the right lower quadrant at 1 hour.

In conclusion a negative 1 hour abdominal image likely rules out the possibility of an active inflammatory process. Abdominal activity at 1 hour warrants further investigation and consequently 99m-Tc HmPAO white cells could potentially replace Indium 111 as a means of evaluating abdominal or pelvic inflammatory disorders. At 1 hour this procedure may be particularly useful in situations where Indium 111 oxine is not readily available for labeling WBCs.

No. 1012

SEPARATION AND LABELING OF HUMAN LEUKOCYTES BY TWO METHODS FOR THE DETECTION OF INFECTIOUS, INFLAMMATORY DISEASE AND GRAFT INFECTION. S. Chowdhury, L. Thorson, D. Jenkins, and T. Herold. Mayo Clinic, Rochester, MN.

The procedure of separation and labeling human leukocytes with Indium-111 oxine in ethanol for imaging was introduced into nuclear medicine practice sometime ago. Mayo Clinic studies demonstrate how leukocytes are separated and labeled utilizing two different techniques; i.e., a) the standard volex sedimentation method which yields a mixed cell population and b) Ficoll-Hypaque (in-house preparation) pure granulocyte (PMN) gradient method. The Mayo Clinic cell distribution in quality control has shown minimum contamination, higher labeling efficiency, a greater total number of WBC, and less labeling time. We inject less than 0.5 mCi (18 MBq) of Indium-111 labeled WBC's into the patient. Each cell labeling is performed practicing sterile technique in a Laminar flow hood. Crucial steps to ensure proper procedure include sedimentation, centrifugation, incubation, and a general close attention to detail. Blood cells may be damaged by higher centrifugation and time. Based on our experience, a high contamination of red cells and platelets increases blood pool activity and may affect the outcome of clinical studies. With increased tracer uptake in a low cell population, imaging has a comparatively high clinical reliability. Imaging of Indium-111 labeled WBC's is safe, simple, sensitive, specific and clinically reliable. Nowadays this is a study commonly performed in nuclear medicine practice, however our study shows improved consistency in scan results and quality control.

No. 1013

AFFECT OF ANTICOAGULANT, HEPARIN VS. ACD, ON THE BINDING OF Tc-99m TO HEMOGLOBIN AND RED CELL MEMBRANE-PROTEINS. S. Chowdhury, *M.K. Dewanjee, J.C. Hung, and L. Thorson. Mayo Clinic, Rochester, MN and *University of Miami School of Medicine, Miami, FL.

Both heparin and ACD (NIH-A) are used as anticoagulants (AG) for cell labeling studies; no information is available on their affect upon the distribution of Tc-99m between hemoglobin and membrane-proteins. Blood samples (10 ml) from human volunteers were collected in heparin (6 units/6 ml blood) and ACD-AG (1 ml/6 ml blood); packed RBC's were pretinned with Sn-PYP (5 µg of Sn) and incubated with 15 mCi of Tc-99m pertechnetate for 15 minutes and washed three times with sterile saline. Labeled washed RBC's were lysed with water and radioactivity in washed membrane-proteins, and hemoglobin was determined with the ionization chamber. The results of distribution are tabulated as follows:

	Heparin n=10	ACD n=10	p Value
Labeling Efficiency (%)	89.62 ± 3.91	92.19 ± 5.48	0.15
Hemoglobin (%)	87.82 ± 3.42	62.77 ± 6.94	0.0005
Membrane (%)	12.11 ± 3.45	37.23 ± 6.94	0.005

In spite of similar labeling efficiency, membrane-binding in heparin is significantly lower than with ACD. Since membrane-proteins have a higher turnover rate than hemoglobin, this study suggests a lower Tc-elution rate of RBC's which were labeled in heparin when compared with ACD anticoagulant.

WEDNESDAY, JUNE 12, 1991

Session IV
SPECT

8:30-10:00 **Room 208**

Moderators: Donna Marciano, CNMT and Beth Harkness, CNMT

No. 1014

RADIOACTIVE DECAY AND PALLET ARTIFACTS IN SPECT IMAGING. M. J. Feldkamp, M. L. Allen, D. F. Preston, R. G. Robinson, W. W. Mohr. University of Kansas Medical Center, Kansas City, Kansas.

Our purpose is to discuss two types of corrections for count loss while performing SPECT studies that will improve image quality. Radioactive decay correction should be considered with the development of new short-lived radiopharmaceuticals for SPECT imaging, such as Tc-99m HM-PAO. The count rate is reduced by approximately 8.3% from radioactive decay of Tc-99m during a standard 45-minute SPECT acquisition. This can easily be corrected by multiplying each frame in the raw data by the decay factor.

Count loss also occurs due to the attenuation of the pallet as the camera rotates under the patient. Pallet attenuation can be visualized and calculated by doing a 360° acquisition of a SPECT phantom filled with Tc-99m. We have evaluated the

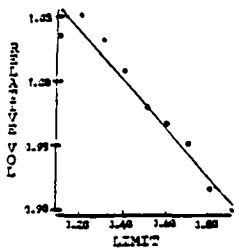
attenuation from different manufacturer's pallets and head holders. There is as much as a 12.6% loss in count rate from the Siemens heavy-duty pallet and as little as 3.5% from G.E.'s attachable head holder. A computer algorithm could be developed to correct for pallet attenuation, but the problem can be avoided by changing the system design for different types of SPECT acquisitions, especially when scanning the brain or heart.

Some departments begin their SPECT acquisition in the posterior or lateral position and thereby compound the decay and pallet attenuation problems by causing the last few frames of the study to be acquired directly beneath the pallet where maximum attenuation will occur during maximum decay loss. Both the decay and pallet attenuation problems can combine to create as much as a 15-20% loss of counts from the first to last image in a given Tc-99m SPECT study.

No. 1015

THE EFFECT OF VARYING THRESHOLD LIMITS FOR SLICE SELECTION ON LEFT VENTRICULAR VOLUMES USING GATED BLOOD POOL TOMOGRAPHY S Sarlos, C Smith, TD Ruddy, KY Gulenchyn, University of Ottawa Heart Institute, Ottawa, Canada.

Gated single photon emission tomographic (GSPECT) blood pool imaging can now be used to determine left ventricular volumes. We determined the effect of varying the number of tomographic slices used for calculation of end-diastolic left ventricular volume (EDV). GSPECT studies on four patients were acquired using 180° rotation and 16 frames/cardiac cycle. EDV was calculated using a semi-automated program. The slice threshold limit option sets the percentage of the middle slice count density below which no edge is to be considered present in the current slice. The slice threshold limit nulls low count apical and basal slices limiting the number of slices used to calculate EDV. Using a threshold edge detection method, optimal regions of interest were determined by stepping through all raw end-diastolic short axis oblique slices. EDV was computed by varying the slice threshold limit from 10 to 90%. A previously validated count ratio method was employed on planar data to compute reference EDV for normalization of GSPECT EDV.



Mean percent reference volume was plotted against slice threshold limit demonstrating an inverse linear relationship ($r=0.98$, $p<0.001$, figure). Relative EDV varied by 15% over the range of limits.

In conclusion, varying the slice threshold limit percentage has a small but significant effect on EDV measured with GSPECT.

No. 1016

SCATTER CORRECTION FOR DUAL ISOTOPE IMAGING OF THALLIUM-201 AND TECHNETIUM-99m. B. Simpson, C. Smith, R.A. Davies, T. Ruddy, K.Y. Gulenchyn, University of Ottawa Heart Institute at the Ottawa Civic Hospital, Ottawa, Canada.

Dual isotope imaging of Tl-201 and Tc-99m compounds has been performed, for example, using Tc-99m PYP to detect myocardial salvage after thrombolytic therapy for acute myocardial infarction. However, down scatter correction from Tc-99m (140 keV) into the Tl-201 acquisition window (70 keV) has not been determined.

Dual isotope tomographic imaging of a cardiac phantom (Data Spectrum Corp.) was performed using 0.2 mCi Tl-201 alone and with 0.2, 0.3, 0.4 and 0.6 mCi of Tc-99m. 20% windows were used for each isotope. Oblique angle slices were reconstructed and 5 regions of interest were applied to all slices.

A paired comparison of counts in the Tl-201 window with Tl-201 alone and with Tc-99m present was different ($p = 0.0001$) at all Tc-99m doses indicating a need for down scatter correction. There was a linear relationship between Tc-99m dose and down scatter in the Tl-201 window (8 ± 9% of counts in the Tl-201 window with 0.2 mCi Tc-99m to 30 ± 2% with 0.6 mCi Tc-99m). Regression analysis established that subtraction of 5% of counts recorded in the Tc-99m window from counts recorded in the Tl-201 window corrected for this down scatter ($r = 0.96$, $p = 0.0001$).

Thus, down scatter correction may be required for dual isotope myocardial imaging with Tl-201 and Tc-99m compounds.

No. 1017

SUPINE VERSUS PRONE Tc-99m SESTAMIBI SPECT IN NORMALS: EFFECT OF CORRECTING FOR TABLE ATTENUATION. R. Folks, E. Garcia. Emory University School of Medicine, Atlanta, Ga.

Cardiac tomography in the prone position exhibits reduced diaphragmatic attenuation but increased table attenuation as compared to supine imaging. Thus we have developed a method to correct prone studies for table attenuation. The purpose of this abstract is to compare the corrected (C) prone studies in 11 normal volunteers (NLS) to supine and to uncorrected (UC) prone studies to determine which is a better indicator of normality.

All studies were acquired using 64, 64x64 projections over a 180° orbit and a high resolution collimator. Transmission tomography used a Tc-99m-04 flood source imaged through a scanning table and in free air. Correction matrices were determined as count ratios (table/no table) at each pixel position for each projection. These matrices were 2D filtered, stored and later applied to patient projections acquired prone. Short axis slices were used to generate maximal count profiles. These profiles were combined in NLS to generate the mean normal profiles (MNP). The uniformity of the MNPs was determined as = standard deviation/mean.

RESULTS: Uniformity by mid-cardiac region

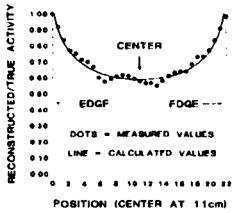
	stress		rest	
	apex half	base half	apex half	base half
SUPINE	.062	.067	.065	.070
PRONE UC	.066	.053	.077	.063
PRONE C	.068	.068	.079	.053

CONCLUSIONS: Uniformity measurements exhibited no clear advantage for any of the sets of mean normal profiles. Thus there is no overall advantage to imaging in the prone or supine position even when the prone study is corrected for table attenuation.

No. 1018

QUANTITATIVE SPECT: RECONSTRUCTION ERROR CAUSED BY SELF ATTENUATION OF Tc-99m. M. Sobczak, W.H. Smith, G.A. Beller, D.D. Watson. University of Virginia Health Sciences Center, Charlottesville, VA.

Most SPECT reconstruction does not correct for attenuation during the reconstruction process. The resulting images will have reduced activity with depth resulting from self attenuation. The amount of this artifact is not simply related to linear tissue attenuation because SPECT uses data from multiple angles giving somewhat the effect of opposed detectors that modify the tissue depth response curve from that of a single detector. We measured the depth response using a uniform cylindrical phantom with Tc-99m. Data is shown in the Fig. The solid line is a theoretical calculation giving a depth response $\propto (1-e^{-\mu d})/\mu d$, with d the depth and μ the linear attenuation coeff. Choice of reconstruction filter did not significantly alter the depth response. 180° vs 360° acquisition did not affect depth response for the uniform cylinder. This response curve accounts quantitatively for the artifact observed in cardiac SPECT in the basilar-septal and posterior myocardial regions and shows it will be significant with the new Tc-99m myocardial imaging agents.



No. 1019

SIMULTANEOUS DUAL ISOTOPE (DI) SPECT WITH TC-99m HMPAO AND I-123 IOFETAMINE-METHOD AND VALIDATION. P.M. Nuechterlein, J.E. Juni, R. Bernstein, R.A. Ponto. William Beaumont Hospital, Royal Oak, MI.

Simultaneous imaging is desirable in the comparison of brain tracers in order to avoid differences in patient (pt) positioning and pt mental state. We have developed a method where both tracers can be injected and scanned simultaneously. Since both isotopes have peaks of similar energies, crosstalk (XTK) from each isotope had to be removed. On-the-fly photopeak energy correction was found to prevent separation of overlapping energy windows. Fixed energy windows must be preset and dynamic photopeak energy correction must be disabled. Known activities of Tc-99m and I-123 were scanned using DI acquisition on a Siemens Orbiter and XTK coefficients for the Tc-99m and I-123 windows (each 15%) were determined. Ratios of the isotopes could then be quantitated allowing separation into Tc-99m only and I-123 only images. To validate this technique phantom studies were performed which revealed that calculated ratios of Tc-99m and I-123 correlated highly with actual concentrations (r=0.97). To determine XTK coefficients in humans, 40 pts injected with one tracer only were scanned with both windows open. The I-123 to Tc-99m XTK ratio was 0.66 (std dev=0.04) and Tc-99m to I-123 was 0.032 (std dev= 0.0039). Pts were scanned using SPECT after simultaneous injection of Tc-99m HMPAO and I-123 Iofetamine and XTK was removed from each image. The HMPAO and Iofetamine images could then be compared slice for slice. Initial studies showed marked differences in distribution in some pts. In conclusion, 1. This method produces Tc-99m and I-123 DI images which yield quantitatively correct ratios in phantom studies. 2. The study revealed that XTK coefficients are remarkably uniform from pt to pt.

Session V
PET/Neurology

10:30–12:00 **Room 208**

Moderators: Donna Marciano, CNMT and Beth Harkness, CNMT

No. 1020

Effect of Positron-Emitting Markers on Routine Data Acquisition in PET. T. C. Hawk, S. M. Hamblen, M. F. Dailey, D. M. Coates, C. C. Harris and R. E. Coleman. Duke University Medical Center, Durham, NC.

We investigated the impact on PET data acquisition of positron-emitting marker sources. Several factors were evaluated: shape, structure and activity of the markers, the utility of the marker's presence during data acquisition, and effect of measurable activity on: transmission rectilinear (TR), emission rectilinear (ER), transmission transaxial (TT), and emission transaxial (ET) images. A point marker allows exact positioning while a line marker provides continuity between planes. An X-shaped marker of 16 gauge stainless steel was constructed, and effectively created both line and point markers in one design. The stainless steel functions as annihilation mass. While a marker's visibility is dependent on its activity concentration, the effect of concentration is dependent on the method of data acquisition. TR scans 1) require activity in the marker at least equal in concentration to the activity of the associated transmission source (per unit volume) and 2) show an area of apparent low density associated with the marker, with minimal effect on surrounding structures. ER scans 1) are not affected by varying levels of measurable marker activity and 2) show the marker clearly, but show no surrounding structures that may assist in positioning. TT images acquired with a marker in the field of view reveal a ring of apparent low counts surrounding the marker, distorting the normal transmission pattern; however, this artifact may facilitate an ROI overlay for localization. A second TT scan with the marker removed is needed for attenuation data. ET images acquired with a marker in the field of view may distort image reconstruction and scaling, and have yet to prove profitable. Positron-emitting markers can be beneficial, although their configurations and activity concentrations are dependent on the needs of the studies.

No. 1021

DIFFICULTIES WITH MOTION ARTIFACTS IN SPECT IMAGING OF THE BRAIN. M. Shryock, S. Yonts, and U.Y. Ryo. University of Kentucky Hospital, Lexington, KY.

It is more difficult to recognize artifacts in SPECT images than it is in planar images. The artifact caused by movement of patient is relatively easy to recognize on planar images. On the other hand, motion artifacts may be impossible to recognize on SPECT images.

In order to study the effect of patient's motion on SPECT images we obtained brain scans using a dual head SPECT system on a patient who gave consent to repeat SPECT imagings. SPECT brain images were acquired with intentional movement of the head position. When SPECT acquisition was 50% (90°) completed the patient turned his head 45° to the right. The SPECT images showed distorted anatomy and markedly decreased activity in the right hemisphere. During the next acquisition from 90° to 135° (25%), the head was turned 22.5° to the left then returned to the straight position during the final 45° acquisition. This SPECT brain scan showed findings attributable to multiple infarct without anatomical distortion. Downward movement for 25% of acquisition period and return to original position caused a small distortion and multiple areas of decreased or increased activity. These motions could not be detected on series of raw images, sinogram or reconstructed 3-D cine-mode display. Downward movement of approximately 1 inch was the only motion that could be detected on cine-mode display of raw images.

Minor movement of head may cause artifacts on brain SPECT image that mimics brain infarct. Such artifacts may be impossible to detect even with thorough review of raw and processed images in various display modes.

No. 1022

Rapid Detection of Unsuspected Neurospect Head Malalignment. M. Afriyie, W. Abel and A. Strashun. S.U.N.Y. Health Science Center at Brooklyn, Brooklyn, N.Y.

Unsuspected skewed (malaligned) head positions occur frequently during neurospect acquisitions leading to potential misinterpretation of data. This method represents a check procedure by which the smallest skew may be quickly recognized.

Patient acquisitions were done with intentionally varying degrees of head skew from 0-10 degrees. All studies were acquired using a three headed camera system (TRIAD) utilizing standard clinical neurospect acquisition and processing protocols. The procedure was later repeated on those patients (n=20) with normal symmetric hemispheric distribution of Tc99m HMPAO activity at zero axis (no skew). Orthogonal transverse, coronal and sagittal reconstructions were mathematically analyzed by comparing left vs. right hemispheric counts slice by slice stacked sequentially in all orientations.

In all cases, all orthogonal plane right vs. left hemispheric activity stacked curves predictably crossed maximum and minimum in a characteristic pattern typical of a skewed orientation. This method was used to analytically realign data to compensate for skewed acquisition artifact. We urge its use for routine neurospect quality assurance.

No. 1023

ACCURATE CORRELATION BETWEEN SPECT AND TRANSMISSION COMPUTED TOMOGRAPHIC BRAIN SCANS USING A UNIQUE REFERENCE SYSTEM. J.M. Harris, J.M. Mountz, P.K. Kaila, M.W. Wilson. University of Alabama Hospital, Birmingham, AL.

A method to provide accurate correlation of SPECT brain images with computed tomography is useful for development of a neuroanatomical based selection of regions-of-interest. We have designed and tested a reference system that provides accurate correlation between neuroanatomy on cranial CT and brain SPECT. The reference system geometry is configured as two isosceles triangles. Thin I.V. tubing coursing the edges and center of the triangles provide a linear array of fiduciary reference points visible on all scan planes after injection with the appropriate contrast agent. Stethoscope type ear plugs at the base of the triangles provide a pivot point by which the anterior aspect of the base is aligned adjacent to the lateral canthus. The system was tested on six patients undergoing ^{99m}Tc-HM-PAO SPECT brain scans and

cranial computed tomography. The I.V. tubing was filled with 1.2 ml of 60 uCi/ml ^{99m}Tc sodium pertechnetate, and 1.2 ml Angiovist 280 for visualization on SPECT or CT, respectively. SPECT was performed after the intravenous injection of 30 mCi ^{99m}Tc-HM-PAO using the ADAC Genesys gamma camera equipped with a low energy high resolution collimator. Imaging parameters were 360° rotation, 64 stops, 25 sec/stop yielding ~90,000 counts/stop. CT was performed on the GE-9800 using 5mm thick slices. Transverse sections from the SPECT and CT scans displayed the contrast filled I.V. tubing as three dot on either side of the head. The relative configuration and separation of the dots provided reference information for re-orientation (pitch, rotation, tilt, and image plane selection) of the SPECT image data set to the CT image data set. SPECT scans performed before and after the application of the radiotracer filled system showed no significant alteration of regional brain counts. This system is patient specific and thus avoids errors associated with brain atlases and anatomic or disease variation in brain anatomy. In conclusion the device provided an efficient, accurate, non-invasive, and reproducible method for image correlation between SPECT and CT.

No. 1024

TECHNICAL ASPECTS OF ESTABLISHING A QUANTITATIVE NORMAL FILE FOR I-123 IODOAMPHETAMINE SPECT BRAIN IMAGING.
M. Jones, J. Galt, E. Garcia, N. Alazraki, Emory University Hosp. and V.A. Medical Center, Atlanta, Ga.

A quantitative normal file for I-123 Iodoamphetamine (IMP) SPECT brain imaging was developed to provide a reference for regional and global IMP brain uptakes. Twenty-one MRI and neuropsychologically normal subjects, ages 41-75, (15 females and 6 males) were selected for SPECT brain imaging. Pre and post (decay corrected) syringe images were made to measure injected dose. SPECT brain imaging was started 20-30 minutes post injection and repeated at 3 hours. Images were acquired with a single-headed SPECT camera over 360°, with a 15 cm orbit and a 1.6 zoom. SPECT image reconstruction used filtered-backprojection, a Butterworth pre-filter (critical frequency: 0.4 1/cm, power factor: 10) and attenuation correction (Sorenson's method). Lung and liver counts were recorded on images at 15 and 180 minutes. Blood was drawn and counted at 85 and 220 minutes. Global brain uptake was measured by geometric mean counts of lateral views relative to injected dose. Regional brain uptake was calculated by placing 20 regions of interest (ROIs) (5 X 5 pixels) over cortical areas and left and right basal ganglia in two axial slices. ROIs were also set over the cerebellar hemispheres of a coronal slice. Cortical to cerebellar ratios were measured using the maximum count pixel of each ROI. Results of the global brain uptake and regional cortical to cerebellar ratios were averaged for each male and female group for both the initial and delay SPECT scans. This normal file provides a quantitative reference for I-123 IMP SPECT brain imaging.

No. 1025

TECHNETIUM-99m HMPAO AND IODINE-123 IOFETAMINE DO NOT SHOW THE SAME PATTERN OF BRAIN UPTAKE USING DUAL ISOTOPE BRAIN SPECT.
P.M. Nuechterlein, J.E. Juni, D. Fink, M. Maddens, R. Bernstein, J. Seitz, M.A. Hatahet. William Beaumont Hospital, Royal Oak, MI.

I123 Iofetamine (IMP) and Tc99m HMPAO (HMPAO) are often considered diagnostically equivalent. Our goal was to compare the diagnostic usefulness of these brain imaging tracers. Simultaneous imaging is necessary to avoid differences in patient positioning and patient mental state. We developed a method in which both tracers could be injected and scanned simultaneously. 42 clinical patients underwent dual isotope imaging. Each was dosed with 6mCi IMP and 20mCi HMPAO IV. SPECT analysis was performed on all dual isotope patients after which crosstalk from the second energy window was removed. Two trained Nuclear Medicine Physicians blinded to name, isotope, and diagnosis scored each of 26 brain segments as normal, moderate or severely abnormal by consensus. The diagnostic confidence for each scan was graded on a 1-5 scale, 1 being certainly normal, 3 being equivocal, and 5 being certainly abnormal. Results show that more abnormalities are seen with IMP than with HMPAO despite count differential. The average number of segments abnormal with HMPAO was 3.9/26 (std dev=5.5) compared to IMP 5.9/26 (std dev=5.3) (p=0.0002 paired t test). The level of diagnostic confidence was significantly higher with IMP than HMPAO (p=0.0005) allowing a diagnosis to be arrived at in substantially more patients. This investigation revealed that IMP may have increased clinical sensitivity as compared to HMPAO.

Session VI
General/Bone

1:30-2:30 **Room 208**

Moderators: Debbie Merten, CNMT and Carleton Brown, CNMT

No. 1026

COUNT RATE CAPABILITY COMPARISON OF A CLINICAL GAMMA CAMERA EMPLOYING PULSE PILE-UP RESOLVING ELECTRONICS USING Tc-99M AND I-131.
L.D. Durack, A.N. Bice and J.F. Eary. University of Washington Medical Center, Seattle, WA.

Our group previouly presented data from NEMA recommended count rate performance studies using Tc-99m and a gamma camera equipped with special high count rate electronics (1). This camera (GE 3000 XC/T) is of great interest to us for its potential use in quantitative planar and SPECT imaging studies of radioimmunotherapy patients. At our hospital these patients routinely receive 100-600 mCi of I-131 labeled monoclonal antibodies for therapy. Therefore, the biodistribution is only measurable under very high count rate conditions. We were concerned that our previous Tc-99m count rate measurements may not be indicative of the camera's I-131 high count rate performance primarily because I-131 pile-up events can exceed the upper energy limit of the analog-to-digital converter and confuse the pile-up resolving electronics. We performed multiple count rate tests on the GE 3000 XC/T camera using separate Tc-99m and I-131 sources in air. Significant differences between Tc-99m and I-131 were found. Tc-99m count rate performance was similar to that previously reported (1), with a maximum total system counting rate of ~450 kcps with ~30% event loss at this rate. I-131 had a higher maximum system counting rate of ~540 kcps and a lower apparent system data loss (<5%) at this maximum rate. Count rate losses in photopeak windows also were different. These results indicate that: 1) it may be valuable to evaluate camera count rate performance with more than just Tc-99m, and 2) the behavior of the 3000 XC/T camera and its unique pulse-tail extrapolation electronics should be carefully evaluated if quantitative high count rate applications are anticipated.

1. Lewellen TK, Pollard KR, Bice AN, Zhu JB.: A new clinical scintillation camera with pulse tail extrapolation electronics. IEEE Trans Nuc Sci 37(2):702, 1990.

No. 1027

DOSE CALIBRATOR LINEARITY TESTING USING AN IMPROVED ATTENUATOR SYSTEM.
W. Oswald, M. Wilson, and J.C. Hung. Mayo Clinic, Rochester, MN.

It is a Nuclear Regulatory Commission (NRC) guideline which states that dose calibrators must be tested for linearity upon installation and quarterly thereafter over a range of activities from 10 µCi to the highest dose administered to the patient (300 mCi for therapy at our institution). The attenuator method of linearity testing is the most commonly used to cover the full range of activities required by the NRC, however, the test has to be performed twice - once with a high activity source and a second time with a source of lower activity. We have designed two additional accessory tubes (A1 and A2) used in conjunction with commercial attenuator systems, thereby extending the range of measurable activity from a single source. The dose calibrator used in our study proved to be linear when tested using the decay method. The commercial attenuator kit has six attenuator tubes (C1-C6) plus a central tube that remains in the dose calibrator during the entire testing process. This eliminates any discrepancies due to variations in geometry of the radioactive source. In our study, linearity testing was

performed eleven times with initial activities ranging from 409 mCi-452 mCi of Tc-99m. The thickest commercial tube (C6) was only able to attenuate the source to 900 µCi, an amount exceeding the NRC requirement. When the accessory attenuators were used in combination with the commercial attenuators (i.e., C1/A1, C3/A2) the initial activity was decreased to the required 10 µCi. Our accessory attenuators enable linearity testing to be performed over the required range of activity using a single source of Tc-99m.

No. 1028

DOSE CALIBRATOR LINEARITY TESTING: A NEW PERSPECTIVE. W.M. Oswald, M.E. Wilson, and J.C. Hung. Mayo Clinic, Rochester, MN.

Nuclear Regulatory Commission (NRC) guidelines state that dose calibrators must be tested for linearity upon installation and quarterly thereafter over a range of activities from 10 µCi to the highest dose administered to the patient (300 mCi for therapy at our institution). The NRC does not specifically define which radioisotope should be used for the linearity testing. The question can be raised as to whether it is acceptable to use 300 mCi Tc-99m to perform linearity checks, given a maximum patient dose of 300 mCi I-131. Due to the impracticality of using I-131 for linearity testing, we feel that an adjusted Tc-99m dose needs to be utilized to remain in compliance with the NRC guidelines. The aim of our study was to determine what that adjusted dose should be. The dose calibrator used in this study had previously been checked for accuracy and constancy using NIST (National Institute of Standards and Technology) standards. Linearity of the dose calibrator has been confirmed using the decay method and is within the limits specified by the NRC. Eighty samples of Tc-99m and 50 samples of I-131 with activities ranging from 8 µCi to 464 mCi were measured on the Tc-99m setting and the I-131 setting of the dose calibrator. A conversion factor (Tc-99m/I-131) was calculated to be 1.43 + 0.01. Therefore, if the highest patient dose is 300 mCi of I-131, nearly 430 mCi of Tc-99m should be used to perform linearity testing on the dose calibrator. This adjusted dose should be used with both the attenuator and decay methods of linearity testing.

No. 1029

DIAGNOSING ARTHROPLASTY INFECTION USING IN-111 LEUKOCYTE AND TC-99m SULFUR COLLOID SCINTIGRAPHY. P.J. Webner, M.L. DeLaney, C.J. Palestro, S.J. Goldsmith. Mount Sinai Medical Center, New York, N.Y.

Although In-111-leukocyte(WBC) imaging accurately diagnoses osteomyelitis, identification of the infected arthroplasty (hip or knee replacements) is somewhat more difficult, due to changes in marrow distribution following insertion of prostheses. While both WBC and Sulfur Colloid(SC) accumulate in marrow, infection exerts opposite effect on these two tracers causing increased uptake of WBC, while resulting in decreased uptake of SC. To detect arthroplasty infection, imaging was performed as follows: 6 minute anterior and posterior images of the region of interest are performed 24 hrs after injection of 500uCi of WBC, on an LFOV equipped with a medium energy collimator, using 20% windows centered over the 174 and 247 keV photopeaks of In-111. Immediately after imaging, the patient is injected with 10mCi Tc-99m SC, and 6 minute images are acquired 1-2 hrs later on an LFOV, equipped with a low energy high resolution parallel hole collimator, using a 10% window centered over the 140 keV photopeak of Tc-99m. If WBC and SC images demonstrate identical distribution of radiotracer the study is interpreted as negative for infection. If activity is present on WBC without corresponding activity on SC, the study is considered positive for infection. A review of 69 such studies (50 hip and 19 knee replacements) yielded a sensitivity of 94%, specificity of 98%, and an overall accuracy of 97%. The positive predictive value was 94%, to the negative predictive value 98%. In summary, WBC/SC imaging is a highly accurate method for diagnosis of arthroplasty infection.

Session VII
Technetium

3:30–4:15 **Room 208**

Moderators: Debbie Merten, CNMT and Carleton Brown, CNMT

No. 1030

A MODIFIED SULFUR COLLOID KIT FOR LYMPHOSCINTIGRAPHY. C.S. John, J. Tall, W. Edwards, M.L. Cianci, V.M. Varma, J.G. McAfee, and R.C. Reba. George Washington University, Washington, DC.

There is currently a need for a radiopharmaceutical (RP) for lymphoscintigraphy due to the limited availability and IND status of various products (Tc-99m- antimony trisulfide colloid, Tc-99m-human serum microcolloid etc.). We have devised a modified sulfur colloid kit using a particle sizing method which can be easily performed in a radiopharmacy. The effect of boiling time on the colloid formation was studied. A two min boiling time proved critical to obtain the optimal particle size. Size selectivity was achieved by passing the contents through a sterile 0.45 micron filter. The labeling efficiency was found to be >95% before and after the filtration but only approximately 50% of original activity passed through the filter for patient administration. 1.0 mCi of filtered microcolloid was injected between the first and third web spaces of both feet and whole body scans were obtained at 2 to 6 hours postinjection. All patients studied exhibited microcolloid uptake in regional lymph nodes. In conclusion, a simple and inexpensive RP is presented for lymphoscintigraphy.

No. 1031

A KINETIC STUDY OF THE STABILITY OF Tc-99m DISIDA AND Tc-99m GHA COLD UNIT DOSES. K.T. Cheng, B.M. Brown, F.P. Xue. Medical University of South Carolina, Charleston, South Carolina.

Cold unit doses (CUDs) are prepared from reconstituting a reagent kit with 0.9% NaCl, divided into 4-8 single doses and stored at freezing temperature for future radiolabeling. This method is very efficient and economical. However, the radiochemical stability of these CUDs may vary significantly with the storage time. In this study, CUDs of DISIDA and GHA (N=4) were prepared and radiolabeled with Tc-99m on different days after preparation (DISIDA-CUDs: 1,5,10,17,24 and 38 days; GHA-CUDs: 1, 8, 13, 19 and 25 days). The radiochemical purity was studied by the ITLC at 5 min, 1, 2, 3, 4, 5 and 6 hours after radiolabeling. The results showed that although the CUDs of DISIDA and GHA produced acceptable radiolabeled products immediately after radiolabeling (up to 38 days and 19 days respectively), their decomposition rates were significantly accelerated in CUDs with longer storage time. The Kd (hr-1) values for the Tc-99m DISIDA-CUDs on different days: 0.0145, 0.0267, 0.246, 0.0348, 0.0629 and 0.0872 respectively and the Tc-99m GHA CUDs were: 0.0187, 0.0150, 0.0148, 0.0295 and 0.0534 respectively. We concluded that Tc-99m DISIDA and Tc-99m GHA could be successfully prepared from CUDs. However, their stability kinetics is dependent on the CUD storage time.

No. 1032

EVALUATION OF A SINGLE-STRIP CHROMATOGRAPHY QUALITY CONTROL PROCEDURE TO ASSESS RADIOCHEMICAL PURITY OF TECHNETIUM-99m CERETEC. D.L. Webber, A. M. Zimmer, W.G. Spies, S.M. Spies. Northwestern Memorial Hospital, Chicago, IL.

The radiochemical purity of Tc-99m labeled Ceretec must be determined prior to patient administration. The conventional quality control method used to assess this purity utilizes three different chromatography strip/solvent systems. As a result, the conventional quality control methodology is relatively time-consuming. This study was conducted to determine if a more rapid, single-strip chromatography system would accurately determine the lipophilic component in Tc-99m labeled Ceretec. Various chromatography systems, including Whatman 31ET, Whatman 17, and Gelman ITLC-SG, with ethyl acetate and chloroform, were evaluated. The results were compared to the conventional quality control system, as outlined by the manufacturer. The 1x7 cm Whatman 17 paper in ethyl acetate system results closely paralleled the conventional quality control methodology results in evaluating the lipophilic component. In the one-strip system described, the lipophilic Tc -99m Ceretec component migrates with the solvent front whereas free Tc-99m pertechnetate, hydrolyzed reduced Tc-99m, and the non-lipophilic component remain at the origin. Additional experimentation demonstrated that spot drying time had an adverse effect on evaluating the lipophilic component; spot drying times greater than 15 seconds prior to strip development falsely underestimated the lipophilic component when compared to the conventional chromatography system.

The single-strip chromatography method described utilizes a miniaturized 1x7 cm Whatman 17 paper with ethyl acetate. The system is rapid (60 second developing time) and accurate in assessing the lipophilic component of Tc-99m labeled Ceretec.

THURSDAY, JUNE 13, 1991

Session VIII
Renal/Pediatrics/Gastroenterology

8:30–10:00 **Room 208**

Moderators: Marianne Gaskill, CNMT and Kimberly Maas, CNMT

No. 1033

COMPARATIVE MEASUREMENTS OF GLOMERULAR FILTRATION RATE (GFR) AND ESTIMATED CREATININE CLEARANCE (ECrCl) IN PATIENTS DEPENDENT UPON TOTAL PARENTERAL NUTRITION. C Carlson, D Marciano, AL Buchman, ME Ament, Y Choi, C Hoh, RA Hawkins.UCLA School of Medicine

GFR estimation has shown to be a highly sensitive measurement in the evaluation of tubular renal function. Previous investigation has demonstrated that GFR levels have been useful in determining the effects of renal impairment due to cyclosporin (CsA) dosage in pediatric liver transplant recipients. GFR levels were obtained in 33 adult patients (20F, 13M) who have been on long term TPN (treatment duration 8.3±4.4 years.) None of the patients had histories of hypertension, diabetes, connective tissue disorders, or glomerulonephritis. Each subject was injected with indium-111 DTPA (3 microcuries/kilogram body weight) by perpherial venous access. The syringe activity was assayed before and immediately following the injection . Plasma samples were drawn at 2, 3, and 4 hours, avoiding use of the initial injection site. The net activity of indium-111 in each sample was analyzed in an scintillation well counter. The rate constant in units of reciprocal time (min) for single compartmental clearance of the radionuclide from plasma as well as the y intercept (uCi/ml) of plasma activity were determined by regression technique. Results were reported milliliters/minute/ 1.73m^2 (GFR). Estimated ECrCl was derived from the standard formula using the parameters of weight, serum creatinine, and age. Linear regression between GFR values and ECrCl yielded a slope of 0.7, a y intercept of 16 and a correlation coefficient (cc) of 0.71. The cc increased to 0.87 when 4 outlying points were deleted (slope and intercept not changed). The values are consistent with a generally good agreement between GFR and ECrCl in TPN patients, although at low GFR values ECrCl tends to overestimate renal function, as previously reported by us. The method to measure GFR is simple and appropriate for this patient population when timed urine samples are difficult to obtain.

No. 1034

DETERMINATION OF DIFFERENTIAL FUNCTION IN SPECT DMSA RENAL IMAGING. C.M. Battisti. B.A. Harkness. H.A. Ziessman. F.H. Fahey. Georgetown University Hospital. Washington. DC

Determination of differential function from the posterior projection or the geometric mean is a routine procedure in patients undergoing planar DMSA renal studies. In our institution. SPECT has become the routine method for acquisition of DMSA renal studies. A method for determining the differential renal function from the SPECT data without acquiring additional planar images is desired. Twenty patients (age 2 months to 26 years. mean 5.98 years) were injected with 1.85 MBq/kg Tc-99m DMSA intravenously and imaged 1.5 hours post injection using a high resolution three-headed tomographic scanner. SPECT images were obtained for 40 sec/image for 120 images/360 degrees. Additional anterior and posterior planar images were obtained for 3 minutes each. Differential functions were obtained from the posterior planar (PP). geometric mean of the anterior and posterior planar images (GM). the posterior ECT (PE). and the geometric mean of the anterior and posterior ECT projection images (GE). Correlation coefficients were calculated between the posterior planar. geometric mean. and each of the ECT data methods.

	GM	PE	GE
GM	-	0.932	0.904
PP	0.935	0.95	0.911

None of the methods proved to be different using the paired Student's t test (p>0.1). The ECT data may be used for calculation of differential function using either the posterior ECT projection or the geometric mean of the anterior and posterior projections.

No. 1035

TECHNETIUM-99m MERCAPTOACETYLTRIGLYCINE (MAG3) USE IN PEDIATRIC PATIENTS. O.A. Hicklin, L. Gordon. Medical University of South Carolina, Charleston, South Carolina.

Renal imaging with Tc-99m MAG3 was performed in 10 patients aged 2 weeks to 16 years and compared to intravenous pyelograms (IVP) and/or Ultrasound (US).

Tc-99m MAG3 studies revealed anatomical, as well as functional information, superior to IVP especially in neonates. In one patient, Tc-99m MAG3 demonstrated a duplex collecting system confirmed by IVP. Hydronephrosis was seen in 3 patients and a duplicated system with obstruction of an upper pole and reflux demonstrated by Tc-99m MAG3 and confirmed by IVP. In one patient, the IVP was uninterpretable due to bowel gas and Tc-99m MAG3 showed no renal obstruction.

Hydronephrosis was seen on both US and Tc-99m MAG3 in 4 patients, but Tc-99m MAG3 demonstrated functional activity of tubular stasis which was helpful to the clinicians.

Lasix renograms were performed to exclude obstruction in 3 patients, one of which was positive and confirmed by US.

In conclusion, Tc-99m MAG3 provides useful information both functionally and anatomically which is superior to other modalities such as IVP or US. This agent appears very suitable for use in the pediatric population.

No. 1036

IMPROVED METHOD FOR DETERMINING RENAL FUNCTION BY MULTIPLE SAMPLING. R. Pauly, W.H. Smith. University of Virginia Health Sciences Center, Charlottesville, VA.

A multiple blood sampling technique for determining glomerular filtration rate (GFR) with Technetium-99m-DTPA is improved by finding the relationship of the percent of the total dose in a late sample to function.

Multiple blood samples are taken to 90 minutes after a single injection of Tc-99m-DTPA. The blood disappearance curve is reduced to a fast and slow component and the slope and intercepts of these lines are used to determine the function value using Sapirstein's model.

This method does rely on the disappearance curve being relatively smooth so there is an occasional study where the data can not be analyzed accurately by this method. To obtain more accurate values in these cases, the following analysis was performed.

The renal function values obtained with the multiple sampling technique from 50 patient studies were plotted against the percent of total dose left in the 90 minute sample. A least squares exponential curve fitted to the data is shown below (r=.89):

$$GFR = 368.533 * X^{-1.155}$$

(where X = percent of total dose in 90 minute sample)

The results show that one can accurately estimate the renal function of these patients by using the equation above.

No. 1037

Tc-99m MAG3 RENAL FUNCTIONING IMAGING. S. Weiss, J. Everett, M. Maizels, J. Conway. The Children's Memorial Hospital, Chicago, IL.

Renal functional imaging with Tc-99m MAG3 allows the acquisition of comparable functional data and superior image quality, decreasing the radiation dose to the patient when compared with other renal radiopharmaceuticals. We have devised an imaging protocol which includes the acquisition of angiographic images as well as dynamic renal function images and quantitative data. This protocol also provides for diuretic renography as well as differential renal function measurements.

The standard protocol utilizes 50 uCi/kg of Tc-99m MAG3 with a minimum dose of 1.0 mCi. All patients are intravenously hydrated for 15 minutes prior to injection of the radiopharmaceutical, with 15 ml/kg of D5 0.25 NS. After 30 minutes maintenance hydration of 200 ml/kg/24 hr is continued to the completion of the study. Angiographic images are obtained at 2 second intervals on computer for 60 frames. Sequential analog images at 2 minute intervals are obtained for 24 minutes. Digital data is acquired at 15 sec/frame for 88 frames. If diuretic renography is required, furosemide (lasix) is then administered and images are obtained for another 24 minute interval. Quantitative data is derived on computer following completion of the study.

No. 1038

EXVIVO INTRAOPERATIVE IMAGING AND LOCALIZATION OF GASTROINTESTINAL BLEEDING. I.S. Zolty, J.W. Hart, C.J. Palestro, M.L. DeLaney and S.J. Goldsmith. Mount Sinai Medical Center, New York, NY

Gastrointestinal (GI) bleeding scintigraphy using Tc-99m tagged red blood cells (RBC's) is a widely accepted method for localizing internal bleeding sites as small as 5 ml. Due to the overlapping of small bowel segments it is difficult to accurately identify a bleeding site for surgical resection. Following a routine RBC scan, intraoperative endoscopy is generally performed to identify bleeding site(s). This procedure, however, is time consuming and very tedious for the patient.

We evaluated the utility of intraoperative small bowel imaging studies in order to avoid the endoscopy procedure. In 7 patients suspected of GI bleed, RBC's were labeled in vitro with Tc-99m. The patients were imaged in the department and scans were read by the nuclear medicine physician. All patients had a positive scan. They were taken to the operating room. During surgery, the surgeon clamps segments and delivers the bowel through the incision. Each segment was imaged (using a portable camera) in sequence. Following identification of the probable bleeding site, the segment was resected.

This technique of exvivo imaging of the bowel intraoperatively clearly identified the bleeding site in all seven patients.

Session IX
Renal/Pediatrics/Gastroenterology (continued)

10:30-12:00 **Room 208**

Moderators: Marianne Gaskill, CNMT and Kimberly Maas, CNMT

No. 1039

Can A Single LAO View Replace Anterior-Posterior Imaging to Simplify Acquisition and Processing of Gastric Emptying Studies? L. Boshko, V. Cherico, L.C.Knight, R.A.Vitti, N.D. Charkes, , A. H. Maurer. Temple University Hospital, Philadelphia, PA.

The use of a single left anterior oblique(LAO) view has been proposed to correct for the attenuation changes that occur as a radiolabled meal moves from the fundus to the antrum of the stomach. The purpose of this study was to evaluate the use of an LAO view to characterize all parameters needed to define solid food gastric emptying(GE). A standardized meal of two large eggs labeled with 500 µCi of Tc-99m sulfur colloid,two pieces of toast, and 300 cc of water was given to 22 patients(pts). The pts were imaged after an overnight fast. Anterior, posterior, and LAO images for 60 sec were acquired every 10-15 min for 120 min. After decay correction, the %'s of initial gastric activity were plotted for the GM and LAO data and were fit using a least squares regression to the power exponential function, $y=(1-(1-\exp(-kt))^{\beta}$. From the fitted curves the rate of GE(k), length of the lag phase (TLAG=(lnß)/k), and the time to 50% emptying (T1/2), were computed. There were no significant differences (GM vs LAO, mean ± SEM) for k (0.013±0.002 vs 0.014±0.002) (p=0.5) or the T1/2 (128±20 vs 131±15)(p=0.77). There was a significant difference in TLAG(46+/-6 vs 60±8)(p<0.01). While there was no signifcant difference in the mean T1/2 values the overestimation of TLAG resulted in conversion of 6/21(28%)pts from normal to abnormal based on a T1/2 measurement compared to 14 controls (T1/2 max ≤110min). We conclude that an LAO method simplifies acquistion and processing of GE studies and can be used to measure the rate of GE but because of overestimation of TLAG significant errors will occur if T1/2 values only are used to evaluate GE.

No. 1040

Gastric Emptying Measurement: Effect of Body Habitus, Imaging Orientation, Radiotracer Amount and Gastric Location of Radiolabeled Meal. S. Sarkar, M. Afriyie, R. Kappes, and A. Strashun. S.U.N.Y. Health Science Center, Brooklyn

The literature cites a bewildering and widely discrepant range of normal values of gastric emptying times using a radiolabeled meal. We attempted to determine the causes of such discrepancies using a phantom model.

A life size stomach phantom (375 ml) was mounted within a standard anthropomorphic abdominal phantom filled with water. Two detachable jackets were constructed and filled

with water to serve as an attenuating substitute for adipose tissue over the anterior aspect of the 'abdomen'. Varying amounts of Tc-pertechnetate ranging from 50-600uCi mixed with water were introduced into the stomach and the % total stomach activity was determined by established methods (anterior, posterior and LAO view and anterior-posterior geometric mean). Counts were obtained without the attenuating jackets ('lean' habitus), with one jacket ('normal' habitus) and with two jackets ('obese' habitus). Counts were obtained both with a full stomach (radiotracer mixed with water filling entire stomach) and with a 'near-empty' stomach (radiotracer mixed with 30 ml of water in antrum of stomach).

Our results show that counting efficiency (a) in obese habitus varies with imaging method, significantly lower with LAO and anterior orientations; (b) in all habiti with a 'near-empty' stomach is lower with 600uCi than with 50 uCi, but not significantly different in the 100-400 uCi range; (c) in a full stomach is not significantly affected by the amount of radiotracer.

No. 1041

EFFECT OF THE GASTROINTESTINAL PEPTIDE MOTILIN ON THE PROXIMAL AND THE DISTAL STOMACH IN PATIENTS W...H DIABETIC GASTROPARESIS.
V. Vandenmaegdenbergh, J.L Urbain, T.Peeters,R. Bouillon,E. Muls,G. Vantrappen, J. Janssens,E. Vancutsem & M. De Roo. Gasthuisberg University Hospital. Leuven.

We have shown that the intravenous administration of Erythromycin (ERY) dramatically accelerates gastric emptying of solids (GES) and liquids (GEL) in patients with diabetic gastroparesis and abolishes the so-called solid - liquid discrimination. There has also been strong evidence that Erythromycin and some of its derivatives are Motilin agonists and binds to antral and duodenal Motilin receptors. The purpose of this study was to evaluate the effect of Motilin on the total, proximal and distal stomach in patients with diabetic gastroparesis. Six diabetic patients with severe complaints of gastroparesis were investigated in a double-blind crossover study. After an overnight fast and on two separate occasions with a three day interval the six patients underwent the same test procedure with an intravenous perfusion of physiological saline or an infusion of the synthetic analog of porcine Motilin.GES and GEL were determined using Tc-99m-SC scrambled eggs and In 111-DTPA in water, respectively. Images of the stomach were recorded for 2 hours using a dual-headed gamma camera and corrected for Tc-99m. decay and Indium downscatter. ROIS were manually drawn around the total, proximal and distal stomach for each Tc-99m and In-111 image and solid and liquid geometric mean data were generated. Percentages of each isotope retained in the total, proximal and distal stomach after 60 and 120 min. are summarized below:

	SOLIDS (mean ± SEM)		LIQUIDS (mean ± SEM)	
PLACEBO	60'	120'	60'	120'
Total Stomach	68±9	45±6	45±7	24±6
Proximal Stomach	41±10	20±6	33±8	11±5
Distal Stomach	27±10	25±5	32±6	13±3
IV MOTILIN				
Total Stomach	39±20**	31±18**	35±10**	16±8**
Proximal Stomach	27±13**	16±11**	18±11**	7±3**
Distal Stomach	12±14**	15±6**	17±4**	9±5**

** p< 0.05 IV versus Placebo

GES and GEL were significantly accelerated by the IV infusion of Motilin. This effect was accounted for by a faster emptying of both phases from the proximal stomach as well from the distal stomach. The acceleration of GES and GEL by the IV infusion of Motilin enforces the hypothesis that ERY is a Motilin agonist. The fact that Motilin is effective on both the proximal and distal stomach suggests that, besides its antral motor activity, Motilin affects also the tone of the proximal stomach.

No. 1042

INFLUENCE OF PATIENT POSITIONING ON THE ESOPHAGEAL EMPTYING OF A SEMI- SOLID BOLUS TEST MEAL.
J. Van Cauteren, J.L Urbain, V. Vandenmaegdenbergh, M. Duquesnes, Th. Genart, G. Bataille & M. De Roo. C.H.G.H. Hornu and Gasthuisberg University Hospital. Leuven. Belgium.

The radionuclide esophageal transit study is a convenient and noninvasive alternative to manometry to study the motor activity of the esophagus and its sphincters. However, patient positioning for this test is not yet standardized mainly because the effects of the body posture on the esophageal motility are still controversial in the literature. The purpose of this study was to evaluate the effect of three different positions on the esophageal emptying of a semi-solid test meal in 10 normal subjects. After an overnight fast, each volunteer underwent the same test procedure consisting of 3 swallows of 9 gr. of mash potatoes labeled with 200 μCi of Tc-99m-Sc in the 3 following positions: Trendelenbourg with 10° angle (TREND), supine and upright. Computerized data were obtained at 0.2 sec intervals for 50 sec after each swallow. Time activity curves were then generated for the proximal,medial,distal and entire esophagus. Percentages of retention (PR) were determined for each region. Progression of the contraction wave of the esophageal body was also characterized using a parametric algorithm.PR in % of the maximum activity are summarized below for the entire esophagus, 2, 4, 6, 8, 20, 30, 40 and 50 sec after swallowing (mean ± SEM):

	PR								
	2	4	6	8	10	20	30	40	50
TREND	66±3	58±4	49±4	49±6	45±7	36±6	38±7	39±7	31±7
SUPINE	74±3	64±5	61±5	53±6	43±5	33±5	26±5#	20±4#	19±4#
UPRIGHT	73±13	53±3	42±4'	37±5"'	26±5"'	19±4"'	17±3"'	14±3"'	15±2"'

# p<0.05 supine versus trend " p<0.05 up versus trend. and ' p<0.05 up versus supine

The time to peak activity in the esophagus i.e.the arrival of the bolus test meal was prolonged in the Trendelenbourg positioning compared to the supine and upright positions.The semi-solid bolus test meal was emptied faster from the entire esophagus in the upright position. This was accounted for by a faster early clearance and a minimal late retention in the distal portion of the esophagus and reflects , in part, the gravity effect.Parametric images of the esophagus demonstrated the slowdown of the progression of the contraction wave in the distal esophagus in the TREND and the supine positions.Our study confirmed that patient positio ning is very important while studying and interpreting esophageal transit scintigraphy.The suppression of the gravity effect by the supine and the anti-physiological TREND positions seems to stress out more intensively the esophageal motility particularly in the distal body .

No. 1043

ASSESSING BILIARY DYSKINESIA IN THE SMALL RURAL HOSPITAL, A RETROSPECTIVE STUDY.
J. WARD, N. NEWLIN, M. D. GROSS. Herrick Memorial Health Care Center, Tecumseh, Mich.

A study was conducted of 56 patients referred for biliary scanning over the last four years. All but six of these patients had normal HIDA phase I scans with gallbladder and small bowel visualizing by 1.5 hours. Phase II studies were then conducted on these patients by injecting .04 mcg/kg CCK analog over a period of five to seven minutes. Patients were dynamically imaged from one minute pre-injection to 24 minutes post injection (total time 30 minutes). Gallbladder curves were generated and ejection fraction calculated. Twenty-four of the fifty patients had EF measurements below 35%. As of this date 14 patients with ejection fractions from 6 to 33 percent underwent surgery in this or other institutions. Surgical data and pathology reports show that all 14 had either calculus or acalculus chronic cholecystitis. In our rural hospital, the use of CCk analog injections for calculating biliary function has been shown to be an efficacious and easily performed procedure. Also shown in this paper will be cases involving spasm of the sphincter of Oddi, jejunal obstruction, and two cases of retrograde ejection from the neck into the fundus of the dyskinetic gallbladder. This paper will also discuss the importance of proper liver clearance prior to CCK injection to avoid false positive scans.

No. 1044

METHODOLOGY FOR BILIARY EMPTYING DIAGNOSIS WITH ENDOSCOPIC RADIONUCLIDES.
R Ackermann, J Ellis, G Elta, J Barnett, R Wahl, University of Michigan Medical Center, Ann Arbor, Michigan.

Direct evaluation of biliary drainage following endoscopic retrograde cholangiography (ERC) is limited to qualitative analysis of the iodinated contrast clearance from the biliary system based on ductal filling and relative intensity changes on radiographs. We have developed a technique to quantify biliary emptying utilizing a radionuclide administered via ERC.

4mCi of Tc99m sulfur colloid is mixed with 50% hypaque to a total volume of 20cc. Following per-oral endoscopic placement of a catheter into the common bile duct, 5-10 cc of the combined solution is injected into the biliary tree. Utilizing a portable, small field of view gamma camera, equipped with a general all-purpose parallel hole collimator and interfaced with a computer, sequential, quantitative, posterior 30 second static images are acquired every 5 minutes with the patient in a prone position. Imaging is continued until near-complete radionuclide clearance from the biliary system is observed, up to a maximum of one hour. Time activity curves are generated from regions of interest drawn over the entire duct system, excluding the bowel. 50% emptying time (T1/2) is calculated based upon maximum counts in the first images.

We have performed the scan in 15 subjects. In comparison to qualitative radiographic determinations of T1/2, the radionuclide technique yielded more precise values of the T1/2. In contrast, the differences between radiographic images meant that several images could be characterized as "half-full", resulting in a range for T1/2 rather than a fixed time point. This was especially true in patients that exhibited longer duct emptying times.

In conclusion, the concurrent use of radionuclides in the endoscopic evaluation of the biliary system allows for more precise quantification of biliary drainage. The appropriate clinical implementation of this technique will require more extensive prospective evaluation in patients with suspected biliary drainage abnormalities.

Continuing Pharmaceutical Education Credit

The Society of Nuclear Medicine is approved by the American Council of Pharmaceutical Education (ACPE) as a provider of continuing pharmaceutical education. Reporting forms are available in the registration packet. Complete one of these forms and deposit the top portion in Room 242 or mail it to the address indicated on the form. Retain the lower portion for your records.

The courses and/or seminars in the Technologist Program approved for ACPE, , credit are as follows:

MRI/PET: Basics; FDA Medical Device Problems—New User Reporting Legislation Guidelines; Pediatrics: New Techniques in Pediatric Imaging; Nuclear Cardiology I: Cardiovascular Physiology and Stress Testing; Nuclear Cardiology II: Myocardial Perfusion Viability and Function; Gastrointestinal Imaging; Fundamentals II: Fundamental Nuclear Medicine; Monoclonal Antibodies: Diagnostic and Therapeutic Uses in Nuclear Medicine; Non-Routine Imaging.

MONDAY, JUNE 10, 1991

TECHNOLOGIST SECTION MANAGEMENT CATEGORICAL SEMINAR

8:30–2:30 **VOICE .57** **Rooms 210/211**

Educational Objective:
The field of nuclear medicine is entering a critical phase of its evolution. Without proper managerial skills, professional survival will be difficult. This course will provide technologists with the strategies necessary for effective management.

Organizers: Marianne Gaskill, CNMT, Victor Hall, CNMT, Jim Wirrell, MS, CNMT, and Robert Schlepman, MA, CNMT

Moderators: Marianne Gaskill, CNMT and Victor Hall, CNMT

Summary:
Nuclear medicine managers will be called upon to play key leadership roles in guiding their institutions through the adjustments necessary to accommodate changes in the demand for service, technologic growth, and personnel issues. Keeping these key points in mind, the faculty members of this conference offer a vast amount of experience and knowledge in their respective fields.

8:30–10:10 **Relevant Financial Concerns for Projects and Equipment.** Dr. John Rogers, Xavier University, Cincinnati, OH.

10:10–10:25 **Break**

10:25–11:20 **Workload Units: Survival in an Age of Limited Resources.** Debra Higgins, Central Imaging Services, Inc., Pittsburgh, PA.

11:20–12:20 Lunch

12:20–1:10 **Health Care Human Resources Mangement.** Walter J. Flynn, MBA, Children's Hospital Medical Center, Human Resources Department, Cincinnati, OH.

1:10–2:00 **Recruitment/Retention as Resources Shrink and Technology Expands.** Marcia Boyd, MPA, CNMT, Baptist Memorial Hospital, Memphis TN.

2:00–2:30 **Analysis of a Recruitment and Retention Study at a Major Teaching Hospital.** James J. Wirrell, MS, CNMT, Methodist Hospital of Indiana, Indianapolis, IN.

THE TEACHER IMPROVEMENT PROJECT SYSTEM (TIPS) SEMINAR

8:30–2:30 **VOICE .6** **Room 207**

Moderators: Sharon S. Ward, CNMT and Laura J. Meyers, CNMT

Presenter: Sr. Madlyn Smith, Gwynedd Mercy College, Gwynedd Valley, PA

Educational Objectives:
1. To identify the purpose and need for instructional objectives.
2. To identify elements of an instructional objective.
3. To develop instructional objectives at the cognitive, psychometric and affective domains.

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

TUESDAY, JUNE 11, 1991

BRAIN I

10:30–12:10 **VOICE .2** **Rooms 210/211**
Neuro-SPECT Imaging

Moderators: Eileen O. Smith, CNMT and Connie Malkowski, CNMT

Educational Objectives:
To provide an overview on brain imaging and to evaluate the variety of SPECT instruments available. Psychiatric and neurologic applications along with the "usual" CBF scans will be discussed to inform the participant of the current uses of the art. MRI will be explained and applied to SPECT imaging.

Summary:
The decade of the brain has opened an arena of information to the clinician previously unavailable. Instrumentation and radiopharmaceuticals allow us to look at the physiology of the brain. With this new information, clinicians and surgeons are evaluating interventions into brain disorders and are able to monitor the effects of their procedures in vivo. The faculty will share with the participants the active role of nuclear medicine in future clinical applications of normal and abnormal brain physiology.

10:30–11:20 **An Overview of Neuro-SPECT Imaging. Pharmaceuticals, Imaging Techniques, and Expected Results.** Eileen O. Smith, CNMT, Yale University School of Medicine, New Haven, CT.

11:20–12:10 **Current Applications for NMR/SPECT in the Evaluation of Neuropsychiatric Disorders.** Robin A. Greene, CNMT, Yale University, School of Medicine, New Haven, CT.

BRAIN II

1:30–5:10 **VOICE .4** **Rooms 210/211**

Neuro-SPECT Imaging

Moderators: Eileen O. Smith, CNMT and Connie Malkowski, CNMT

Educational Objective:
See Brain 1.

Summary:
See Brain 1.

1:30–2:20 **SPECT Systems: Single-Headed, Triple-Headed, and Dedicated Cameras.** Robert E. Zimmerman, MDEE, Brigham and Women's Hospital, Boston, MA.

2:20–3:10 **Neuropsychiatric Correlates for Functional Imaging of the Brain.** Branch Coslett, MD, Temple University School of Medicine and Hospital, Philadelphia, PA.

3:10–3:30 **Break**

3:30–4:20 **Brain Imaging in Psychiatry.** Karen Berman, MD, National Institutes of Mental Health, Bethesda, MD

4:20–5:10 **Clinical Applications of Neuro-SPECT Imaging.** Zachary Rattner, MD, Yale University School of Medicine, New Haven, CT.

MRI/PET: BASICS

10:30–12:10 **VOICE .2** **Room 208**

Moderators: Donna Marciano, CNMT and Roy Aldridge, CNMT

Educational Objective:
To provide an overview of MRI and PET for technologists currently involved in these imaging modalities.

Summary:
A general overview of MRI will be presented, which includes basic designs available and clinical applications. The discussion on PET also will focus upon cyclotron- and generator-produced radiopharmaceuticals, basics of instrumentation, quality control, data processing, clinical applications, and the technologist's perspective.

10:30–11:20 **MRI: Overview and Applications.** Warren Moore, MD, Baylor College of Medicine, St. Luke's Episcopal Hospital, Houston, TX.

11:20–12:10 **PET: An Overview.** Paul Baldwin, RT, National Institutes of Health, Bethesda, MD.

PET: RECENT ADVANCES

1:30–5:10 **VOICE .4** **Room 208**

Moderators: Donna Marciano, CNMT and Roy Aldridge, CNMT

Educational Objective:
See MRI/PET: Basics

Summary:
The discussion on PET also will focus upon: cyclotron- and generator-produced radiopharmaceuticals, basics of instrumentation, quality control, data processing, clinical applications, and the technologist's perspective.

1:30–1:55 **PET Instrumentation: Design and Quality Control.** Magnus Dahlbom, PhD, UCLA School of Medicine, Los Angeles, CA.

1:55–2:20 **PET Data Processing.** Magnus Dahlbom, PhD, UCLA School of Medicine, Los Angeles, CA.

2:20–2:45 **PET Radiopharmaceutical Production.** Jorge Barrio, PhD, UCLA School of Medicine, Los Angeles, CA.

2:45–3:10 **Setting Up a Clinical PET Site.** Donna Marciano, CNMT, UCLA School of Medicine, Los Angeles, CA.

3:10–3:30 **Break**

3:30–3:55 **PET Applications—Cardiology.** Jamshid Maddahi, MD, UCLA School of Medicine, Los Angeles, CA.

3:55–4:20 **PET Applications—Neurology and Oncology.** Randall A. Hawkins, MD, PhD, UCLA School of Medicine, Los Angeles, CA.

4:20–4:45 **PET Applications: Rubidium-82 Versus Triple-Detector SPECT Thallium-201 Imaging.** David C. Hickey, MD, Humana Medical City, Dallas, TX.

4:45–5:10 **PET: The Technologist Perspective.** Mitch Lyle, CNMT, Memorial PET Scan Center, Jacksonville, FL.

STUDENT DAY

10:30–1:30 **VOICE .22** **Room 207**

Student Investigator Competition

Moderators: Miriam Miller, CNMT and Shirley Ledbetter, CNMT

Educational Objective:
To provide an opportunity for students to meet with colleagues as an introduction to the technologists' professional environment.

10:30–11:00 **Introduction**

11:00–12:10 **Student Paper Presentations**

12:10–1:30 **Lunch and Guest Speaker**

1:30 **Awards Announcement**

GENITOURINARY

10:30–12:10 **VOICE .2** **Room 215**

Techniques in Renal Scintigraphy

Moderators: Barbara Jara, CNMT and Ken Lafferty, CNMT

Educational Objective:
To provide an overview of the applications of renal scintigraphy.

Summary:
The genitourinary presentation will include a discussion of current renal scintigraphic parameters associated with the most frequently encountered disease entities. Acquisition and analysis parameters as well as radiopharmaceutical selection and diagnostic criteria will be discussed.

10:30–11:20 **Introduction to Scintigraphy: Congential Renal Anomalies of the Urinary Tract.** George N. Sfakianakis, MD, University of Miami School of Medicine, Jackson Memorial Hospital, Miami, FL.

11:20–12:10 **Acquired Renal Disorders (Infection, Renal Vascular, Obstructive, Parenchymal, and Space-Occupying Lesions.)** George N. Sfakianakis, MD, University of Miami School of Medicine, Jackson Memorial Hospital, Miami, FL.

FDA: MEDICAL DEVICE PROBLEMS—NEW USER REPORTING LEGISLATION AND GUIDELINES

2:00–3:00 **VOICE .1** **Room 207**

Moderator: James E. Carey, Jr., MS

Presenter:
Donald R. Hamilton, Director, Division of Technical Development, U.S. Department of Health and Human Services, Food and Drug Administration.

Educational Objectives:
1. To educate individuals about the Safe Medical Device Amendments of 1990, which places the responsibility of medical device problem reporting on the individual hospitals, extended care facilities, and ambulatory and urgent care centers.
2. To describe and give examples of the Problem Reporting Program (PRP) and the Medical Device Reporting (MDR) Program.

Summary:
A function of the United States Food and Drug Administration (FDA) is to ensure that medical devices used in hospitals, nursing homes, practitioner's offices, and in the home are safe and effective. In order to carry out its job effectively, the FDA must receive information from health professionals when medical devices do not work properly.

PEDIATRICS

1:30–4:20 **VOICE .4** **Room 215**
New Techniques in Pediatric Imaging

Moderators: Barbara Jara, CNMT, Kim Maas, CNMT, and Terri Oudinot, CNMT.

Educational Objective;
To present the technical parameters associated with pediatric scintigraphy.

Summary:
The program will convey the technical parameters associated with new pediatric imaging techniques, specifically the imaging criteria for brain SPECT using thallium-201 as thallous chloride and technetium-99m-HMPAO. The nuclear cardiology session will detail the acquisition and analysis characteristics for cardiac shunt detection, gated blood-pool scintigraphy, ejection fraction determination, and myocardial imaging. The thyroid imaging session will discuss the dosimetry of the nuclides, iodine-123 and technetium-99m-pertechnetate, proper selection for the clinical situation, acquisition parameters, positioning specifics, and diagnosis.

1:30–2:20 **Pediatric Brain SPECT with HMPAO and Thallium-201.** James S. Ulanski, CNMT, Children's Hospital Boston and the Harvard Medical School, Boston, MA.
2:20–3:10 **Pediatric Nuclear Cardiology.** Lorcan O'Tuama, MD, Children's Hospital Boston and the Harvard Medical School, Boston, MA.
3:10–3:30 **Break**
3:30–4:20 **Thyroid Treatment and Imaging of the Pediatric Patient.** I. Ross McDougall, MD, PhD, Stanford Medical Center, Stanford, CA.

SCIENTIFIC PAPER AND PRESENTATION TECHNIQUES

3:30–5:10 **VOICE .2** **Room 207**
Author a Paper—Give a Presentation . . . Who Me!

Moderator: Susan Gilbert, CNMT

Educational Objective:
1. To provide attendees with the specific information needed to prepare scientific articles and presentations.
2. To give attendees the confidence and assurance that they are all capable and potential authors of scientific presentations and publications.

Summary:
Working in such a dynamic and growing field as nuclear medicine provides many interesting cases and experiences. Many of these can and should be shared with your colleagues. Attending this session will give technologists insight on how to prepare and submit scientific journal articles and abstracts. In addition, helpful hints will be discussed on how to give scientific presentations.

3:30–4:20 **Get Your Name in Print the Easy Way.** Susan C. Weiss, CNMT, Children's Memorial Hospital, Chicago, IL.
4:20–5:10 **How to Talk and Say Something at the Same Time.** George Alexander, CNMT, E.L. Saenger Radioisotope Laboratory, University of Cincinnati Hospital, Cincinnati, OH.

WEDNESDAY, JUNE 12, 1991

RADIATION SAFETY IN NUCLEAR MEDICINE I

8:30–12:10 **VOICE .4** **Rooms 210/211**

Moderators: Kathleen S. Thomas, CNMT and Nellie L. Kelty, CNMT

Educational Objective:
To provide the technologist with good, sound, and realistic operating guidelines for radiation safety in nuclear medicine with regards to safety, minimizing exposure, and compliance with regulating agencies.

Summary:
Radiation exposure and its consequences continue to be topics of concern for health care professionals. This program will provide participants with in-depth, practical information, tips, and guidelines that can be utilized to provide a safe working environment for those exposed to ionizing radiation.

8:30–9:20 **Ionizing Radiation-Radiation Biology: Back to Basics.** Samuel Benedict, PhD, UCLA Medical Center, Los Angeles, CA.
9:20–10:10 **Radiation Risk and the Nuclear Medicine Technologist.** Robert T. Anger, PhD, Methodist Hospital, Indianapolis, IN.
10:10–10:30 **Break**
10:30–11:20 **Exposure Reduction and ALARA in Nuclear Medicine.** James E. Carey, Jr., MS, University of Michigan Hospital, Ann Arbor, MI.
11:20–12:10 **Pregnancy . . . Before, During, and After.** Anthony Benedetto, PhD, University of Texas Medical Branch, Galveston, TX.

RADIATION SAFETY IN NUCLEAR MEDICINE II

1:30–5:10 **VOICE .4** **Rooms 210/211**

Moderators: Kathleen S. Thomas, CNMT and Nellie L. Kelty, CNMT

Educational Objective:
See Radiation Safety I.

Summary:
See Radiation Safety I.

1:30–2:20 **Nursing Considerations for Patients Who Have Received Radioactive Materials.** John J. Reilly, CNMT, Univ. of Penn. Hospital, Philadelphia, PA.

2:20–3:10 **JCAHO—Policy and Procedures for Radiation Safety, Equipment Performance, and Patient Dosimetry.** James E. Carey, Jr., MS, Univ. of Michigan Hospital, Ann Arbor, MI.

3:10–3:30 **Break**

3:30–4:20 **Patient Radiation Safety Instructions—How Much?** Wanda M. Mundy, CNMT, Medical College of Georgia, Augusta, GA.

4:20–5:10 **Panel Discusssion—Problems/Considerations in Your Hospital Environment.** All Speakers.

NUCLEAR CARDIOLOGY I

8:30–12:10 **VOICE .4** **Rooms 204/214**

Cardiovascular Physiology and Stress Testing

Educational Objective:
To provide a review of cardiac physiology, pathophysiology, and principles of ECG stress testing, alternative stress testing methods, and acquisition techniques.

Summary:
This session offers a review of cardiovascular physiology and pathophysiology as it applies to nuclear cardiology imaging. The basic principles of ECG and stress testing and their application to stress myocardial perfusion imaging will be reviewed. The last half of the session reviews the latest alternative methods of stress testing, including dipyridamole and adenosine myocardial perfusion imaging.

Moderators: Jennifer Mattera, RT(N) and Lynne Roy, MS, CNMT

8:30–9:20 **Cardiovascular Physiology and Pathophysiology.** Alan Rozanski, MD, St. Luke's-Roosevelt Hospital, New York, NY.

9:20–10:10 **Principles of ECG and Exercise Testing.** Hosen Kiat, MD, Cedars-Sinai Medical Center, Los Angeles, CA.

10:10–10:30 **Break**

Moderators: Jennifer Mattera, RT(N) and Gerald Guidry, CNMT

10:30–10:55 **Mental Stress Testing.** Diwakar Jain, MD, Yale University, New Haven, CT.

10:55–11:25 **Principles of Pharmacologic Stress Testing.** Jack Ziffer, MD, Emory University, Atlanta, GA.

11:25–11:40 **Technical Aspects of IV Dipyridamole Myocardial Perfusion Imaging.** Lynne Roy, MS, CNMT, Cedars-Sinai Medical Center, Los Angeles, CA.

11:40–11:55 **Technical Aspects of IV Adenosine Myocardial Perfusion Imaging.** Gerald Guidry, CNMT, Methodist Hospital, Houston, TX.

11:55–12:10 **Question and Answer Period.** All Speakers.

NUCLEAR CARDIOLOGY II

1:30–5:10 **VOICE .4** **Rooms 204/214**

Myocardial Perfusion Viability and Function

Moderators: Lynne Roy, MS, CNMT and Jennifer Mattera, RT(N)

Educational Objective:
To provide an update on myocardial imaging in the 1990s, including PET, 24-hr thallium-201 imaging, and imaging with the technetium-labeled perfusion agents.

Summary:
This session will provide the nuclear medicine technologist with the latest techniques for assessing myocardial perfusion viability and function. There will be an overview of the technetium-99m-labeled myocardial perfusion agents and the technical considerations for the imaging protocols. First-pass imaging techniques will be reviewed as they apply to rest/exercise function assessment with technetium-labeled perfusion agents. Lastly, the current protocols being used at various hospitals will be reviewed followed by a discussion session.

1:30–2:00 **Technetium-99m Myocardial Perfusion Agents.** Daniel Berman, MD, Cedars-Sinai Medical Center, Los Angeles, CA.

2:00–2:30 **Myocardial Viability and PET Imaging.** Jamshid Maddahi, MD, UCLA Medical Center, Los Angeles, CA.

2:30–3:00 **Will Thallium-201 Imaging have a place in the Future?** Frans J. Th. Wackers, MD, Yale University, New Haven, CT.

3:00–3:10 **Panel Discussion**

3:10–3:30 **Break**

3:30–3:55 **Rest/Exercise First-Pass Imaging with Technectium-99m-Labeled Perfusion Agents.** Lindsey Lambe, CNMT, Duke University, Durham, NC.

3:55–4:10 **Technetium-99m-Sestamibi Imaging Techniques.** Andre Gagnon, NMT, Hotel Dieu Hospital, Montreal, Canada.

4:10–4:25 **Routine Imaging with Sestamibi: Clinical Experience.** Katherine L. Richmond-Cox, CNMT, Toronto General Hospital, Toronto, Canada.

4:25–4:40 **Combined Function and Perfusion Imaging with Teboroxime.** Jennifer Mattera, RT(N), Yale-New Haven Hospital, New Haven, CT.

4:40–5:10 **Technetium-99m-Teboroxime SPECT Imaging Techniques.** Raye Bellinger, MD, USAF Medical Center, Travis Air Force Base, CA.

Panel Discussion to follow

NMTCB ITEM WRITERS' WORKSHOP

8:30–12:10 **VOICE .4** **Room 207**

Moderators: Martha W. Pickett, CNMT, Jacqueline A. Bridges, CNMT, and Mark Crosthwaite, CNMT.

Educational Objectives:
To teach the principles and conventions of multiple-choice item writing and to train persons wishing to participate in the NMTCB exam process to become proficient in item writing.

Summary:
The steps involved in examination development are reviewed. These steps include determining a task list, developing an exam matrix, and then writing questions to fill this matrix. The principles and conventions of multiple-choice item writing will be reviewed. Problem items containing the most common errors will be reviewed in order to point out the correct form.

FUNDAMENTALS I

8:30–12:10 **VOICE .4** **Room 215**
Fundamental Nuclear Medicine

Moderators: Kimberly W. Maas, CNMT and Miriam Miller, CNMT

Educational Objective:
To provide fundamental nuclear medicine information to technologists on a variety of topics.

Summary:
Fundamentals I will discuss techniques for gastrointestinal, brain SPECT, and thyroid imaging as well as pediatric cystography and helpful hints for the technologist whose experience is limited in these particular procedures.

8:30–9:20 **Fundamental GI Imaging.** Vincent Cherico, CNMT, Temple University Hospital, Philadelphia, PA.
9:20–10:10 **Fundamental Brain SPECT Imaging.** John Reilley, CNMT, Hospital University of Pennsylvania, Philadelphia, PA.
10:10–10:30 **Break**
10:30–11:20 **Thyroid Imaging.** Pablo Dibos, MD, Franklin Square Hospital Center, Baltimore, MD
11:20–12:10 **The How Tos of Pediatric Cystography.** Kimberly W. Maas, CNMT, A.I. DuPont Institute, Wilmington, DE.

FUNDAMENTALS II

1:30–5:10 **VOICE .34** **Room 215**
Fundamental Nuclear Medicine

Moderators: Kimberly W. Maas, CNMT and Miriam Miller, CNMT

Educational Objective:
See Fundamentals I.

Summary:
Protocols for cardiac, schilling test, and aerosol lung imaging are discussed. Each topic will be discussed in detail.

1:30–2:20 **Fundamental Cardiac Scintigraphy.** Gerald Guidry, CNMT, The Methodist Hospital, Houston, TX.
2:20–3:10 **Schilling Test.** Diane Sweeney, MD, Georgetown University Hospital, Washington, DC.
3:10–3:30 **Break**
3:30–4:20 **Fundamentals of Aerosol Lung Imaging.** Don Hixon, CNMT, Georgetown University Hospital, Washington, DC.

GASTROINTESTINAL IMAGING: CLINICAL AND TECHNICAL CONSIDERATIONS

1:30–5:10 **VOICE .4** **Room 207**

Moderators: Laura Meyers, CNMT and Rosemarie McGraw, CNMT

Educational Objective:
To provide practicing physicians and technologists with clinical and technical information on current techniques for evaluating the gastrointestinal tract.

Summary:
This session will encompass quantitative liver imaging, the role of technetium-99m-labeled WBCs, gastrointestinal bleed localization, and SPECT imaging of the liver.

1:30–2:20 **The Role of Radionuclide Imaging in the Detection/Location of Acute Gastrointestinal Bleeding.** Darlene Fink-Bennett, MD, and Paul Neuchterlein, RT, William Beaumont Hospital, Royal Oak, MI.
2:20–3:10 **Radioleukocyte Imaging in the 1990s.** Shawn Ripley, MD, Metropolitan Hospital, Windsor, Ontario, Canada.
3:30–4:20 **Quantitation of Liver Function and Blood Flow.** Jack E. Juni, MD, and Gina Gora, CNMT, William Beaumont Hospital, Royal Oak, MI.
4:20–5:10 **Clinical and Technical Factors in Liver SPECT.** Robert E. Henkin, MD, and Susan Popovski, CNMT, Loyola University Medical Center, Maywood, IL.

THURSDAY JUNE 13, 1991

PROFESSIONAL DEVELOPMENT I

8:30–12:10 **VOICE .44** **Rooms 210/211**
Communication and Teamwork in Nuclear Medicine

Moderators: Martha Pickett, CNMT and Lynnette Fulk, CNMT

Educational Objectives:
To assess attendees' communication skills and to identify methods of improving skills for better communication with physicians, staff, patients and visitors.

Summary:
Recognizing the need and desire for professional development for nuclear medicine technologists, the DuPont Nuclear Medicine Technologist Advisory Board has put together a workbook with ideas on workshops and seminars covering a variety of topics such as communication skills, patient relations, and standards of excellence. "Communication and Teamwork in the Nuclear Medicine Department" is designed as two half-day professional development seminars based on the that workbook.

8:30–10:10 **Communication and Teamwork in Nuclear Medicine.** Peter McLoughlin, E.I. DuPont De Nemours and Company Inc. North Billerica, MA.
10:10–10:30 **Break**
10:30–12:10 **Communication and Teamwork in Nuclear Medicine** (continued).

PROFESSIONAL DEVELOPMENT II

1:30–5:10 **VOICE .4** **Rooms 210/211**
Communication and Teamwork in Nuclear Medicine

Moderators: Martha W. Pickett, CNMT and James Connaughton, CNMT

Educational Objectives:
To provide personal development in communication skills and to provide attendees with a working outline and materials for use in their own departments.

Summary:
See Professional Development I

1:30–3:10 **Communication and Teamwork in Nuclear Medicine.** Peter McLoughlin, E.I. DuPont De Nemours and Company, Inc., North Billerica, MA.

3:10–3:30 **Break**

3:30–5:10 **Communication and Teamwork in Nuclear Medicine** (continued).

SPECT I

8:30–12:10 VOICE .4 Rooms 204/214

Basics of Single-Photon Emission Computed Tomography

Moderators: Peggy Burwinkel, CNMT and Robert Ackerman, CNMT

Educational Objective:
To give technologists an understanding of the basic principles of SPECT.

Summary:
Basic applications of SPECT, including acceptance testing, quality control and techniques for obtaining high quality SPECT images, are discussed.

8:30–9:20 **Acceptance Testing of SPECT Cameras.** L. Stephen Graham, PhD, VAMC/UCLA, Sepulveda, CA.

9:20–10:10 **Components of an Effective SPECT Quality Control Program.** Frederic H. Fahey, DSc, Georgetown University Hospital, Washington, DC.

10:10–10:30 **Break**

10:30–11:20 **SPECT Reconstruction and Filtering.** Michael A. King, PhD, University of Massachusetts, Worcester, MA.

11:20–12:10 **Factors Affecting the Acquisition of High Quality SPECT Images.** Beth A. Harkness, CNMT, Georgetown University Hospital, Washington, DC.

SPECT II

1:30–5:10 VOICE .4 Rooms 204/214

Advanced Topics in Single-Photon Emission Computed Tomography

Moderators: Beth A. Harkness, CNMT and Madonna R. Burroughs, CNMT.

Educational Objective:
To focus on specific areas of single-photon tomography.

Summary:
This program will go into greater detail on several applications of current interest in SPECT imaging. It will be assumed by the speakers in this session that attendees have an understanding of the basics of single photon tomography.

1:30–1:55 **Brain SPECT I.** Thomas M. Joestgen, CNMT, Froedert Memorial Lutheran Hospital, Milwaukee, WI.

1:55–2:20 **Brain SPECT II.** B. David Collier, MD, Medical College of Wisconsin, Milwaukee County Medical Complex, Milwaukee, WI.

2:30–3:10 **Three-Dimensional Display in Nuclear Medicine.** Jerold W. Wallace, MD, Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, MO.

3:10–3:30 **Break**

3:30–4:20 **SPECT Imaging of Tumors.** Lamk M. Lamki, MD, University of Texas Medical School, Houston, TX.

4:20–5:10 **Technical Aspects of SPECT Myocardial Imaging: Acquisition, Reconstruction, and Quantitation.** Kenneth Van Train, CNMT, Cedars-Sinai Medical Center, Los Angeles, CA.

MONOCLONAL ANTIBODIES

8:30–12:10 VOICE .4 Room 207

Diagnostic and Therapeutic Uses in Nuclear Medicine

Moderators: Gerald W. Guidry, CNMT and Carleton Brown, CNMT

Educational Objective:
To provide technologists with an overview of monoclonal antibodies, including tumor imaging therapeutic uses and applications in nuclear cardiology.

Summary:
As the need for new improved diagnostic and therapeutic measures increase, 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.

8:30–9:20 **Introduction to Monoclonal Antibodies and Imaging.** Richard L. Wahl, MD, University of Michigan Medical School, Ann Arbor, MI.

9:20–10:10 **Problems in Radioimmunoimaging of Tumors.** Lamk Lamki, MD, FRCPC, University of Texas Medical School at Houston, Houston, TX.

10:10–10:30 **Break**

10:30–11:20 **Radiodiagnosis and Therapy of Lymphoma.** Sally J. DeNardo, MD, University of California at Sacramento, Sacramento, CA.

11:20–12:10 **Antimyosin Antibody Imaging: Technical Aspects and Clinical Applications.** Jamshid Maddahi, MD, FACC, UCLA School of Medicine, Los Angeles, CA.

NON-ROUTINE IMAGING: CLINICAL AND TECHNICAL CONSIDERATIONS

8:30–12:10 VOICE .4 Room 215

Moderators: Evelyn Schane, CNMT and Mary Simpson, CNMT

Educational Objective:
To provide practicing physicians and technologists with a review of select, less commonly performed procedures.

Summary:
Select, less commonly performed procedures are discussed. Recent pharmacologic agents currently used for diagnostic and therapeutic intervention are presented.

8:30–9:20 **Radionuclide Evaluation of CNS Shunts and Dacroscintigraphy.** David C. Gregg, MD, Children's Hospital of Wisconsin, Milwaukee WI.

9:20–10:10 **MIBG for Neuroblastoma.** Brahm Shapiro, MD, CHB, PhD, and Laura Meyers, CNMT, University of Michigan Hospitals, Ann Arbor, MI.

10:10–10:30 **Break**

10:30–11:20 **Strontium-89 Therapy: A Novel Approach to the Treatment of Metastatic Disease.** Arthur Porter, MA, MD, FRCPC, Ontario Cancer Treatment and Research Foundation, and Suzanne Quirk, RT, Victoria Hospital, London, Ontario, Canada.

11:20–12:10 **Update: Nuclear Medicine Imaging of Osteomyelitis.** Arthur Z. Krasnow, MD, and David C. Peck, CNMT, Medical College of Wisconsin, Milwaukee County Medical Complex, Milwaukee, WI.

JRC FORUM

12:10–1:30 **VOICE .16** **Room 207**

Moderators: Elaine Cuklanz, MS, MTN(ASCP), Sheila Rosenfeld, CNMT, and Maria V. Nagel, MS, CNMT.

Educational Objective:
To review and discuss the final draft of the revised "Essentials."

Summary:
Representatives from the Joint Review Committee on Educational Programs in Nuclear Medicine Technology will present changes in the revised "Essentials," discuss implementation of changes, and answer questions relative to the interest of participants.

EDUCATOR'S FORUM

1:30–5:10 **VOICE .4** **Room 207**

Moderators: Wanda Mundy, EdD, CNMT and James Langan, CNMT

Presenters: Elaine Cuklanz, MS, MTN(ASCP) and Maria V. Nagel, MS, CNMT

Educational Objectives:
1. To consider the options available to measure outcomes.
2. To describe the purpose and selection of pre-admission tests.
3. To discuss topics relative to the interest of participants.

Summary:
This forum will address outcome assessment, including what is available and the advantages and disadvantages of each. Areas to consider when choosing a pre-admission examination will also be presented along with one institution's experience with a specific pre-admission exam in nuclear medicine technology. A discussion of topics relative to the interest of educators will also be included.

PUBLIC RELATIONS WORKSHOP

Tuesday, 4:20–5:10 **VOICE .1** **Room 215**
Wednesday, 12:30–1:20
Thursday, 1:30–2:20
"Peaking" Interest in Nuclear Medicine

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

Educational Objective:
The acute shortage of Nuclear Medicine technologists has required the nuclear medicine community to address this issue. This course will provide the participant with the skills and materials to promote nuclear medicine technology as a career, develop their own media kit for community presentations, and create a strategic recruitment program.

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 Exhibit Level of the Cincinnati Convention Center. Authors will be present on Tuesday, June 11 and Wednesday, June 12 from 12:10-1:30 pm.

Posterboard No. 1050

ACCEPTANCE TESTING AND QUALITY CONTROL OF A DUAL ENERGY X-RAY ABSORPTIOMETRY (DEXA) SYSTEM IN MULTICENTER STUDIES. W.L. Dunn and H.W. Wahner. Mayo Clinic, Rochester, MN.

Presently, uniform procedures for acceptance testing and quality control of DEXA instrumentation have not been proposed. This study presents routines for both and expected results obtained with Hologic Inc. QDR-1000 and QDR-1000-W units.

Acceptance testing: Accuracy and linearity are evaluated by scanning at least three ash bone samples in 20 cm water. A linear regression analysis should yield a slope close to 1.0 and correlation coefficient approximately equal to 1.0.

To test the effect of a change in absorber or patient abdominal thickness on bone mineral density (BMD), a bone specimen is scanned in water depths of 10 to 30 cm. In the range of 15 to 25 cm, the BMD should vary less than + 3%.

Calibration: should be checked with a single Hologic spine phantom which should be rotated between centers. All units should be calibrated to within 1% (BMD).

Reproducibility tests are performed with a spine phantom, a femur phantom, total body phantom and patients. The following table lists expected results for BMD and body composition.

		Femur		
	Spine	Neck	Trochanter	Ward's Triangle
Phantom	0.5% CV	2.9% CV	0.7% CV	1.5% CV
Patients	1.0% MPD*	2.8% MPD	1.9% MPD	4.5% MPD

	Total Body		
	BMD	Lean Mass	Fat %
Phantom	0.6% CV	1.0% CV	4.5% CV

*MPD - mean percent difference

Posterboard No. 1051

QUANITATIVE EVALUATION OF BONE LOSS USING DUAL PHOTON DENSITOMETRY. T. MOLL, D. PLASMEIER. LANKENAU HOSPITAL, WYNNEWOOD, PA.

Dual photon densitometry enables quanitative evaluation of bone loss in regions of the body that was previously inaccessible. It is a safe, effective means of screening patients at risk of osteoporosis and monitoring patients during treatment.

The bone densitometer is a rectilinear scanner, uses a radioactive source of Gd-153 with dual photon peaks of 44 and 100 kev. The exposure to a patient is approximately 12-15 mrem, comparative to one chest x-ray. The patient lies supine, a preprogrammed computer scans over the spinal area in a rectilinear pattern for 20 minutes.

To date a total of 1,175 patients were seen, 1,144 females and 29 males. 62 patients returned for follow up studies and 16 patients had more than 2 follow up tests. The results are reported in percentage of the normal population with the range as: Normal(120%-90%), Mild(89%-80%), Moderate(79%-70%), Marked(69%-60%), Extreme(59% and less). Of the total patients seen, 30% were in the normal range, 27% mild, 23% moderate, 12% marked, 4% extreme. The 62 patients that returned had 56% with no change in their results, 35% showed improvement and 3% demonstrated a decrease in bone mineral content.

In conclusion, the bone densitometry study is a non-invasive means of screening patients at risk of developing osteoporosis. It is an effective way of monitoring patients undergoing treatment for osteoporosis due to minimal scanning time and low radiation exposure.

Posterboard No. 1052

MYOCARDIAL UPTAKE AND CLEARANCE OF Tc-99m LABELED PERFUSION IMAGING AGENTS: IMAGING PROTOCOL AND TECHNICAL CONSIDERATION. D Cassel, J Heo, AS Iskandrian. Philadelphia Heart Institute, Presbyterian Medical Center, Philadelphia, PA.

Thallium-201 has been widely used as myocardial perfusion imaging agents since its introduction in 1973 in the areas of diagnosing coronary artery disease, risk stratification , evaluation of therapeutic interventions and muscle viability. However, due to its poor physical characteristics, such as low photon energies, long half- life and its cyclotron production, there has been a long search for Tc-99m based myocardial perfusion imaging agents, which are ideal for gamma camera imaging, dosimetry and readily available. There are two such agents under investigation i.e., Tc-99m Sesta-MIBI (Cardiolite®) and Tc-99m Teboroxime (Cardiotec®).

These two agents have different myocardial uptake and clearance mechanism, therefore, imaging protocols are different. This study describes our experience with Cardiolite® using a separate day protocol, and two versions of one-day protocol (stress-rest and rest-stress) and with Cardiotec® imaging with either exercise or adenosine infusion. SPECT imaging was done in the vast majority of patients and all patients also had exercise thallium studies to permit comparison between these different agents.

Our results suggest that the newer technetium labelled perfusion imaging agents are important additions to our armamentarium in the diagnostic work-up of patients with ischemic heart disease.

Posterboard No. 1053

TECHNICAL ASPECTS OF DUAL ISOTOPE MYOCARDIAL IMAGING WITH TECHNETIUM-99m TEBOROXIME AND THALLIUM-201. B.A. McSherry, H. Weinstein, R.C. Hendel and J.A. Leppo. U. Mass. Medical Center, Worcester, MA.

Dual isotope imaging of simultaneously injected Tc-99m teboroxime (TEBO) and Tl-201 (Tl) was evaluated in 15 myocardial perfusion studies. Ten pts. were studied 1-7 days prior to coronary angioplasty. Repeat studies on 5 pts. were performed 1-6 days post angioplasty. Each pt. underwent exercise treadmill testing and received simultaneous injections of Tl (3 mCi) and TEBO (mean dose,10.8 mCi) at peak exercise. Dual energy imaging was performed with 140 keV(±15%) Tc-99m (Tc) and 70 keV(±15%) Tl windows. Upright TEBO images were acquired using a rapid dynamic protocol immediately post-exercise. Static Tl images (6 min. per view) were then acquired. Delay Tl imaging was performed 3 hrs. later. A second dose of TEBO (mean dose,12.7

mCi) was injected and rest images were acquired. Tl and Tc standards were used in a heart phantom to determine cross-over ratios and optimal doses for the dual imaging windows. The phantom study showed 8.1% crossover of Tl into the Tc window and 17.9% crossover of Tc into the Tl window. In the pt. studies, contamination of the 140 keV images by Tl was negligible. Despite TEBO's rapid myocardial clearance, there was some contamination of the 70 keV image by residual Tc.

The TEBO and Tl imaging protocols both resulted in diagnostic quality studies, and further evaluation of this promising technique is clearly warranted.

Posterboard No. 1054

TECHNICAL CONSIDERATIONS FOR BRAIN TUMOR IMAGING WITH Tl-201 SPECT AND CORRELATION WITH X-RAY CT STUDIES D Marciano, CK Hoh, C Carlson, T Emerick, A Huda, KL Black, DP Becker, JC Mazziotta, RA Hawkins. UCLA School of Medicine, Los Angeles, CA.

We have previously evaluated the utility of Tl-201 SPECT for brain tumor imaging. We undertook this study to evaluate the relationship of contrast enhancement on x-ray CT to Tl-201 SPECT results and to assess the relationship of presurgical Tl-201 uptake indices to prognosis and histologic grades of tumors. 213 patients received scans after injection of 4 mCi Tl-201 chloride. Data was acquired on a Siemens orbiter camera, and transaxial (64x64) images were reconstructed with a Butterworth filter and corrected for attenuation with the Chang method. The thallium index (TI) was calculated for each lesion as the ratio of average counts per pixel in the lesion ROI divided by the average counts per pixel in the contralateral background ROI. TI for 15 patients with low grade gliomas (I and II) was 1.36 ± 0.55, and for 39 high grade (III and IV) gliomas was 2.27 ± 0.86 ($p<0.0004$). For patients receiving serial Tl studies postoperatively, we determined the rate of change of TI and correlated results to prognosis: patients with an increase of TI $\pm 0.475 \pm 0.278$ per month survived 5.93 ± 2.25 months, while those with TI increase of 0.069 ± 0.063 per month survived 17.93 ± 5.25 months. Of 28 patients with postoperative Tl and contrast enhanced CT scans, concordant results (positive or negative) were found in 24, while 2 patients had positive Tl with non contrast enhancement CT and 2 had negative Tl with contrast enhancement CT.

Tl studies are useful for evaluating histology and prognosis of brain tumor patients, and, because results may differ from contrast enhanced CT scans, are complementary to that anatomic modality.

Posterboard No. 1055

POTENTIAL PROBLEMS IN THE USE OF WELL-COUNTERS FOR PET QUANTITATION. G.P. Leisure, B.J. Landmeier, A.D. Nelson, E.S. Ellert and F. Miraldi. University Hospitals of Cleveland, Cleveland, OH.

Well-counters are routinely used in PET to quantitate the amounts of radioactive substrate present in blood or other samples of interest. Current state-of-the-art well-counters have valuable features such as programmable isotopic decay correction and automatic dead-time correction. Our data indicates, however, that the dead-time correction algorithm used in some instruments undercorrects for dead time, and thus, underestimates true sample activity levels. Counting errors of 5% exist at recorded dead-time levels of only 28.2%, and errors of 60% or greater are possible at recordable dead-time levels exceeding 90%. Accordingly, care should be taken to ensure accurate counting of quantitative samples, and automatic dead-time compensation in commercial instruments should not be assumed correct. Additional correction of samples for dead-time may be necessary. In addition, due to the high energy of positron-emitting isotopes (511 keV) and the geometry of the counting chamber, sample activity levels and dead-times can be adversely affected by the radioactivity present in adjacent samples. A potential for counting errors also exists with sample volume. A 7.6% total increase in recorded C-11 activity was noted when 100 µl samples were diluted to 4 ml.

Posterboard No. 1056

SELECTION OF ATTENUATION COEFFICIENTS FOR BRAIN SPECT IMAGING USING A BRAIN PHANTOM. D.F. Sacker, C.T.C. Wong, D.A. Weber, M. Ivanovic, Brookhaven National Laboratory, Upton, NY.

The correction of projection data containing Compton scattered photons with the true attenuation coefficient will overestimate the activity in central regions of tomographic slices; no attenuation correction will yield an underestimate of activity. We report on a method to experimentally determine an attenuation correction coefficient for brain SPECT imaging which will give a more accurate estimate of activity. Two compartments of a Hoffman brain phantom are filled with activity concentrations proportional to the expected gray-white matter activity distribution in the brain. SPECT projections are obtained with the same acquisition parameters (energy window, matrix size, zoom, angular sampling, orbit) used for clinical studies. A static image with the phantom's long axes placed parallel to the collimator is acquired as a reference image of the activity distribution. Ratios of the counts in ROIs near the central axis and the edges of the planar image are calculated and compared with the corresponding ratios calculated on the reconstructed transverse slices. The attenuation coefficient is varied until the same ratios are obtained on planar and reconstructed images. In our laboratory, an attenuation coefficient of 0.09 cm^{-1} is needed to obtain a flat profile through the reconstructed image of a cylindrical phantom 22 cm in diameter filled with a uniform distribution of I-123. The same attenuation coefficient underestimates activity in the central regions of the SPECT brain phantom. An attenuation coefficient of 0.12 cm^{-1} is required to achieve the correct activity ratios obtained on the planar image. Since different acquisition parameters and hardware variables will effect the determination of the optimum attenuation coefficient, it is recommended that each nuclear medicine clinic doing brain SPECT repeat this exercise.

(Research supported by U.S. DOE Contract DE-ACO2-76CH00016)

Posterboard No. 1057

VOLUME RENDERING IN 3-DIMENSIONAL DISPLAY OF TC-99M ALBUMIN COLLOID LIVER-SPLEEN, TC-99M HMDP BONE, TC-99M RBC LIVER, AND TC-99M MAA LUNG SPECT IMAGES. B. Wierzbinski, V. Stipp, W.J. Shih, S. Magoun, K. Gross, S. Brandenburg. Department of Veterans Affairs Medical Center and University of Kentucky Medical Center, Lexington, KY

The advantage of single photon emission tomography is to improve image contrast by separating overlapping structure, and 3-dimensional volume rendered display enhances continuity of structures and understanding of spatial relationships. Using a triple head gamma camera (Picker) interfaced with a 64 bit super computer, we studied 30 patients' Tc-99m HMDP bone SPECT images, 4 patients' Tc-99m MAA pulmonary images, 2 patients' Tc-99m albumin colloid liver-spleen SPECT images and 1 patients' Tc-99m labeled RBC liver. The bone SPECT images involved lumbar vertebra-pelvic region, thoracic lumbar region, and/or skull. The Tc-99m labeled RBC liver SPECT study was for a hemangioma of the liver. Planar images, SPECT images, and volume 3D display were compared. 3-dimensional display provides exact location and extension of disease process involvement. The lesion(s) would be much easier to appreciate on the volume-rendered display. The enhancement of 3-dimensional perception by motion appears to be an inherent characteristic of the human perceptual system. It is concluded that 3-dimensional display enhances interpretation of SPECT images.

Posterboard No. 1058

CLINICAL USEFULNESS OF THE CINE DISPLAY OF THE REPROJECTED DATA IN SPECT STUDIES. J. Patel, C.H. Park, S.M. Kim, C.M. Intenzo and J. Zhang. Thomas Jefferson University Hospital, Philadelphia, PA.

The purpose of this presentation is to evaluate clinical value of the cine display of the reprojection technique (volume rendered as opposed to surface rendered) in various SPECT studies.

High-resolution SPECT studies of various organs were performed using a three-headed rotating gamma

camera (Triad, Trionix Research, Inc., Twinsburg, Ohio) and a high resolution collimator system. The cine display of the reprojection data is obtained by stacking up tomographic slices of particular orthogonal plane (usually transverse). This was used to supplement the transverse, sagittal and coronal tomographic images in clinical SPECT studies.

Clinical conditions studied using this method include seizure, stroke, occlusion of the transverse sinus, aortic aneurysm, hepatic cavernous hemangioma, regenerating hepatic nodule, TMJ and orbital abnormalities.

In conclusion, we feel that routine use of 3-D display in cine mode in addition to the simultaneous display of three orthogonal tomographic planes enhances clinical diagnostic capabilities in SPECT studies.

Posterboard No. 1059

CLINICAL PET: CEREBRAL PERFUSION IMAGING WITH O-15 WATER. S. M. Hamblen, J. M. Hoffman, C. C. Harris, J. L. Need, T. C. Hawk, D. M. Coates, M. F. Dailey, V. D. Dew and R. E. Coleman. Duke University Medical Center, Durham, NC

Cerebral blood flow (CBF) imaging following bolus administration of O-15 water is being increasingly used in our facility. The 2 min. half-life of O-15 is ideal for doing serial studies and for monitoring the effects of physiologic and therapeutic interventions but necessitates careful coordination between imaging, cyclotron and radiopharmaceutical personnel. All patients for O-15 water studies have inserted an intravenous line which is large- bore to assure patency for multiple bolus injections. For a quantitative study, an arterial line is placed in the radial artery of the limb contralateral to the intravenous line. Cyclotron production of O-15 is accomplished with a 10 min. bombardment which yields 100 mCi at saturation; 50-70 mCi is administered. Radiopharmaceutical quality control is performed on each batch of O-15 water. The image acquisition protocol used with our three-plane CTI 911/2 scanner requires a total of 5 min. and is comprised of twelve 10 sec. image frames followed by three 60 sec. frames to give 15 frames at each of three levels. Data workup includes blood sample radioactivity data processing and image summing to obtain an autoradiographic image of CBF distribution, or absolute CBF. A 15 min. period between serial studies allows for data acquisition, radioactive decay, data transfer (5 min.), computer set-up for the next acquisition, dose preparation, and intervention.

SCIENTIFIC EXHIBITS

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

Scientific Exhibit Hours

Tuesday	10:00 am–7:00 pm	Thursday	7:00 am– 7:00 pm
Wednesday	7:00 am–7:00 pm	Friday	7:00 am–12:30 pm

BONE/JOINT

Posterboard No. 1065

REFLEX SYMPATHETIC DYSTROPHY IN THE FEET: CLINICAL AND SCINTIGRAPHIC CRITERIA.
L.A. Cole, L.E. Holder, M.S. Myerson. The Union Memorial Hospital and Children's Hospital and Center for Reconstructive Surgery, Baltimore, MD

The precise clinical criteria for reflex sympathetic dystrophy of the hands and the characteristic scintigraphic pattern associated with this syndrome, which we reported in 1984, has received widespread confirmation and subsequent application. This exhibit presents our findings in a group of 60 patients referred to us, early during their clinical course, in whom the diagnosis of RSD was even a remote possibility. Utilizing both prospective and retrospective analysis, and long term patient follow-up we have been able to establish and validate clinical criteria for the diagnosis of a clinical RSD syndrome in the foot, which can be related to RSD in the hand. These criteria include diffuse pain in a non-anatomic distribution, autonomic or vasomotor dysfunction, and limitation of movement or function. A sensitive and specific scintigraphic pattern was found to be associated with this clinical syndrome. It is characterized by diffuse increased accumulation throughout the hind, mid, and forefoot when compared to the normal extremity. On delayed images, this abnormal activity accentuates all of the MTP and IP joints.

Posterboard No. 1066

TECHNICAL CONSIDERATIONS FOR OPERATING ROOM BONE SCANS. A.S. Huston. Central Imaging Services Inc., University of Pittsburgh Medical Center, Pittsburgh, PA.

Osteoid osteomas are a rare benign tumor of bone composed of sheets of osteoid tissue partially calcified and ossified. These tumors most commonly occur in the extremities of children compromising the bones structural integrity producing severe pain.

The imaging of an osteoid osteoma in the operating room assists a surgeon by assessing the precise location of the tumor with the placement of sterile lead markers. Comparison of the pre and post excision images provide immediate evaluation of the tumors evacuated site thereby reducing destruction of the surrounding bone.

Special considerations of a bone scan in the operating room include procedure times averaging three hours, awareness of sterile field technique, computer protocols to aid with image comparison, and space confinements of a typical operating room.

With the aid of a gamma-camera and computer monitor, Nuclear Medicine is able to provide immediate and accurate bone images in the operating room while evaluating tumor removal.

CARDIOVASCULAR CLINICAL

Posterboard No. 1067

ACCURATE AND FAST HEART MOTION DETECTION AND CORRECTION PROGRAM IMPROVES THE IMAGE QUALITY OF Tl-201 SPECT STUDIES. J. Schwartz, G. McCormick, J. Langan, K. Durski and A.C. Civelek. The Johns Hopkins Medical Institutions, Baltimore, Maryland.

During the image acquisition, motion of the patient degrades the Tl-201 SPECT image quality and therefore, accuracy of the study. We have developed a new method for detection and correction of the misalignment of the heart in Tl-201 SPECT imaging which takes 15 seconds for completion. In a single projection image, by placing a box, the region of the heart was identified manually. Then, the difference between this chosen ROI and same size area in the adjacent projection image was minimized. This position was accepted as a new position of the ROI and subsequently compared with the next image. The same steps were repeated for the whole study. The detected motion was displayed as a sinogram for horizontal and a linogram for vertical motion. Accuracy of the program was determined by phantom studies with 15 different motion artifacts. The program was applied to 37 randomly selected Tl-201 SPECT myocardial perfusion studies. Corrected and uncorrected final images were scored by three observers as O: no change, 1: probable, 2: definite, 3: marked change. The images were divided into two groups according to their scores: GroupI: 0 and 1 (25 studies), GroupII: 2 and 3 (12 studies). The total standard deviation of the image shift from sinograms and linograms was used to express the magnitude of the motion before (SD) [0.80±0.35 for GroupI; 0.99±0.31 for GroupII] and after correction (SDc) [0.20±0.07 for GroupI; 0.14± 0.06 for GroupII]. Absolute change in detected motion (SD-SDc) for these 2 groups was statistically significant at 5% level ($p<0.05$) In these random studies, after motion correction, image quality and interpretation significantly improved in 12 studies (32%). Thus, in routine studies, patient motion is a correctable problem. However, not all motion artifact affects the final image quality, especially when they occur over the last few frames of the study.

GASTROENTEROLOGY

Posterboard No. 1068

QUANTITATIVE GASTRIC EMPTYING HALF-TIME CLEARANCE USING DYNAMIC AND STATIC IMAGES. B. Rowe, L. Zager, M. Decorah, D. Fiers. UW Hospital & Clinics, Madison, WI.

We have developed a method of calculating gastric emptying (GE) half-time clearance (T-1/2) using a combination of dynamic and static gamma camera images.

Our protocol requires a 4-hour fast followed by a meal including scrambled eggs containing 0.5 mCi Tc-99m sulfur colloid, which is eaten within ten minutes. The patient is positioned supine beneath a General Electric XRC gamma camera with LEAP collimator and the stomach area is imaged as a 128x128 dynamic study for 15 one-minute frames. The patient is then removed from the camera but returns every 15 minutes for a one-minute 128x128 static image for up to two hours (maximum of seven images). No effort is made to reposition the patient the same for each image.

A region of interest is drawn over the stomach area on the 15 minute dynamic study and the maximum count image located. GE T-1/2 is the time from the maximum count image to the image with one half the maximum counts. On each of the one minute static images a ROI is drawn around the stomach and the counts stored. An artificial curve is created containing the maximum count (from the dynamic study) and the counts from each of the static images (15 minute intervals). T-1/2 is calculated from the least squares fit of this data which allows us to accurately interpolate to the nearest minute.

We studied 19 normals and calculated a mean T-1/2 of 88 minutes and a normal upper limit of 118 minutes. This technique allows us to: 1) free the camera for other images during the 2-hour acquisition; 2) extrapolate T-1/2 past the data collection time; 3) terminate the study prematurely if T-1/2 is less than two hours; and 4) use less computer storage than the 2-hour dynamic technique. This technique incorporates the advantages of both dynamic and static acquisition methods.

INSTRUMENTATION AND DATA ANALYSIS: GENERAL

Posterboard No. 1069

QUANTITATIVE ANALYSIS OF THIN LAYER CHROMATOGRAPHY ON A GAMMA CAMERA. R. Hovey-Andersen, L. Korth, L. Zager, R. Hammes. UW Hospital & Clinics, Madison, WI.

We have developed a method to quickly and accurately quantitate the radiochemical purity of clinical radiopharmaceuticals using equipment found in most nuclear medicine departments.

We perform thin layer chromatography by placing 1x10 cm strips of TLC paper in a test tube containing an appropriate solvent which is allowed to migrate up the strip. The strip is removed from the test tube and allowed to dry. Up to 12 strips are placed on a Lucite positioning phantom which is placed on a GE XCT gamma camera. The phantom is labeled for radionuclide, solvent, and origin. Positioning of the phantom on the collimator face is extremely important, as the computer program assumes a predetermined placement.

A 128x128 static image of the phantom is acquired for one minute. The computer program generates a vertical profile curve for each strip. Each curve is divided into thirds. The percentage of free Tc is calculated as the ratio of counts in the third of the curve containing the expected free Tc to the total curve counts. For each radionuclide, the hard copy contains an image of the strip, the resulting profile curve, percent binding (% bound = 100 - % free) and appropriate identifying labels. Analysis is completed automatically within one minute.

The advantages of this system compared to conventional cut and count techniques include: the automated processing of multiple samples saves time and eliminates operator variability; the high sensitivity count rate capability of gamma cameras allows the use of small spots thus optimizing chromatographic resolution and reducing artifacts; the hard copy curve and image facilitate the recognition of inadequate technique and allow permanent documentation for quality assurance reviews. This easily implemented method of radionuclidic QC allows us to assure that every preparation is satisfactory before patient injection.

Posterboard No. 1070

TEAM APPROACH TO QA PROGRAM. J. Imhoff, L. Lind, M. Wilson, B. Rowe. UW Hospital & Clinics, Madison, WI.

An effective Quality Assurance Program involves all Nuclear Medicine personnel. Each person is vital to the cooperative effort of monitoring and evaluating patient care. We have developed forms for effective data collection (clerical staff), documentation, problem identification and solving, education, and peer review (technical, radiopharmacy, and physician staff). In this presentation we show how clear concise forms are used by our Nuclear Medicine Department to identify problems that can be solved by systemic review.

Our method of updating procedure manuals makes use of a standard format. Yearly, or as necessary, protocols are updated including indications, patient preps, radiopharmaceutical, imaging device, procedure, and interpretation. In our team approach the Department Chief reviews, clerical staff edits, technical and radiopharmaceutical staff revises, and clerical staff does final composing. This structured process allows for improved patient service.

We've developed a patient scheduling form used by the clerical staff to record indications and set up a timely appointment. The physician reviews the form for appropriate clinical criteria, and takes immediate corrective action if problems are identified. At this time, the physician alerts the technical staff to any modifications of established protocols. This form, which remains in the film jacket, is used to record the preliminary findings and used for peer review to document that the appropriate study was performed and that the final report and peer review were uniform.

Documentation and analysis are important in the delivery of high quality nuclear medicine studies. Forms can be used for collecting and systematically reviewing data, identifying and solving problems, and educating staff. This ultimately involves all personnel as a team in the QA process, assesses performance, and improves the quality of care provided to our patients.

Posterboard No. 1071

NUCLEAR MEDICINE TECHNOLOGY STUDENT RECRUITMENT: INITIAL SUCCESS OF JOINT VENTURES. M. Gaskill, D. Klosinski, N. Sawyer, P. Wenk, T. Trost Price, William Beaumont Hospital, Royal Oak, Michigan

The issue of recruiting students for the Nuclear Medicine Technology Program was addressed jointly by program officials in Nuclear Medicine as well as three other allied health clinical education programs in one hospital. With student populations diminishing significantly since the mid-eighties, concerns about recruitment were examined by a Student Recruitment Task Force. A proposal for funding major combined activities and a part-time student recruitment coordinator (.3 FTE) was approved.

In March of 1990, Beaumont Schools of Allied Health (BSAH) came into being with a Coordinator and a 12 member Advisory Committee. Twenty objectives were identified that dealt with student recruitment and other student issues which we felt would enhance recruitment efforts. During the first six months, activities (8 objectives) were undertaken. Hospital-wide promotion about BSAH brought recognition of shortages of allied health personnel and that we had openings in our programs for students. Initial achievement of the goal of more students is indicated with an increase in applicants and students in the Nuclear Medicine Program. The 4 hospital sponsored CAHEA accredited programs in Histotechnology, Medical Technology, Nuclear Medicine Technology, and Radiography were all favorably affected. Applicants in 1990 for the 4 programs averaged an increase of 30% (131 total). Students in the 4 programs of the 1990-1991 year reflect a 27% increase (37 total out of 42 accredited positions). Partial fulfillment of 5 more objectives has been planned for 1991 to maintain these numbers.

Posterboard No. 1072

Tc-99m-MAG3 ERPF STANDARD COUNTING: WELL COUNTER MEASUREMENT WITHOUT SAMPLE DILUTION. K.W. LOGAN, R.E. POELLING, W.H. OLIVE, K.G. HOFFMAN. NUCLEAR MEDICINE SERVICE, HARRY S TRUMAN VETERANS HOSPITAL AND UNIVERSITY OF MISSOURI HOSPITAL AND CLINICS, COLUMBIA, MO.

Effective renal plasma flow (ERPF) estimates using Tc-99m Mertiatide (MAG3) requires a measured Tc-99m standard for quantitation of residual plasma activity. Direct well counter measurement of a calibrated standard requires approximately 10,000 to 1 dilution after dose calibrator assay of the Tc-99m standard. This process would be repeated each day ERPF measurements are made. We have developed and tested a simple attenuation system which will allow millicurie activities of Tc-99m to be

accurately counted without prior dilution, eliminating daily physical dilution steps and potential dilution errors. This device maintains a constant geometry, distance, and attenuation between the standard sample and the well counter detector. Calibration factors are determined for each well counter, sample volume, and range of standard activities to be used. A simple worksheet is used to calculate the sub-microcurie activity of patient plasma samples which are directly counted in the well counter.

ONCOLOGY

Posterboard No. 1073

THALLIUM-201 CHLORIDE APPLICATIONS IN ONCOLOGICAL PROBLEMS CORRELATION WITH RADIOLOGICAL AND PATHOLOGICAL FINDINGS. R. Jennings, L. Kostakoglu, C. Caluser, H. Abdel-Dayem, S.D.J. Yeh, S.M. Larson. Memorial Sloan-Kettering Cancer Center, New York, NY.

Recent reports confirm that Tl-201 chloride scans reflect tumor viability, and is therefore gaining recognition in solving certain clinical problems in the management of patients (pts) with malignant disease. It is of value in characterizing the nature of the lesions. It is of limited value in the clinical staging of the malignant diseases because of technical problems related to Tl-201 energy, size of malignant tumor and grade of malignancy.

The purpose of this presentation is to demonstrate: 1) the technical parameters for acquisition and processing of dynamic, static and SPECT Tl-201 scans. 22 pts with various problems related to malignant disease were studied. All findings were correlated with radiographic modalities and confirmed pathologically. 2) examples from Tl-201 studies in the following a) differentiating benignity from malignancy in bone, soft tissue, brain and breast lesions b) recurrence of thyroid carcinoma undetected by 10mCi I-131 whole body scans c) differentiating necrotic from recurrent brain tm after adequate therapy d) differentiating post-operative changes from local recurrence in bone tms.

Tl-201 uptake was interpreted as positive or negative by comparison to contralateral sites. Quantitative analysis was performed with drawing the region of interest over the highest area of uptake in the tm and the corresponding contralateral site. Pathologically confirmed malignant tms had a ratio of more than 2.4 whereas normal or benign lesions had ratios less than 2.0.

We conclude that thallium applications in oncology should be more widely utilized in the clinical practice.

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