SNM 25th Annual Meeting

A Note from the Chairman...

In preparation for the Society of Nuclear Medicine's Silver Anniversary Meeting, the Scientific Program Committee of the Technologist Section has developed an exceptional program that will appeal to all nuclear medicine technologists. We have designed the program both to augment the technologist's basic knowledge and to expand the technologist's expertise into new and rapidly expanding areas of interest.

A record number of abstracts were submitted to the Technologist Section Scientific Program Committee for the 25th Annual Meeting, and, in turn, more papers than ever before will be presented by technologists. The abstracts of the submitted papers contained on the following pages are evidence of the growth of the profession of nuclear medicine technology, reflecting not only the growth of the number of technologists, but their increasing sophistication and ability to do state-of-the-art work as well.

Likewise, the Scientific Program Committee encourages all meeting attendees to participate in the Continuing Education sessions that are a feature of the physician's section of the Program. These sessions will consist of invited speakers on a wide range of nuclear medicine topics and all technologists are urged to consult the physicians' section of the program for the subjects, time, and dates to select appropriate sessions.

The titles and authors of the Technologist Section's Scientific Exhibits are also to be found on the following pages and they, too, should be of interest to all levels of technologists. Additionally, the authors of these exhibits have been asked to be present in the Scientific Exhibit area on Wednesday and Thursday, June 28 and 29, from noon to 1 p.m. to encourage informal discussions of their work.

As we prepare to meet in Anaheim and celebrate the 25th Anniversary of the Society, we can also take pride in the coming of age of the nuclear medicine technology profession. All technologists, at all levels, should benefit from this program.

MICHAEL L. CIANCI
Chairman, 1978 Scientific Program Committee
Technologist Section
Society of Nuclear Medicine

SNM 25th ANNUAL MEETING: ANAHEIM

• The Meeting at a Glance •

MONDAY

9:00 to **5:00** **National Council Delegates Meeting** (South Pacific Ballroom, Disneyland Hotel)

2:00 to **8:00** ***REGISTRATION OPEN*** (Convention Center)

6:30 to **8:30** **Ice-Breaker Cocktail Party** (California Room, Convention Center)

TUESDAY, JUNE 27

7:30 to **5:30** ***REGISTRATION OPEN***

8:00 to 8:25 **Nuclear Medicine Milestones** (Santa Ana Room)

8:30 to 10:30 — **OPENING SESSION: Keynote Address, Aebersold Award, Task Group Report** (Anaheim Room)

10:30 to 10:45 ***GRAND OPENING OF EXHIBITION HALL***

10:45 to **2:00** — ***LUNCH/VISIT THE EXHIBITS***

2:00 to **3:30** — **Submitted Papers I: Instrumentation** (California C/D Rooms) 3 PARS

3:30 to **4:00** ***VISIT THE EXHIBITS***

4:00 to **5:30** — **Submitted Papers II: Radioassay/In Vitro** (California E Room) 3 PARS

6:30 to **11:30** ***EVENING PARTY AT KNOTT'S BERRY FARM***

WEDNESDAY, JUNE 28

7:30 to **5:30** ***REGISTRATION OPEN***

9:00 to 11:30 **RIA Workshop A** (Huntington Beach Room) **RIA Workshop B** (Orange Country Room 18)

8:30 to 10:00 — **Submitted Papers III: Clinical Science I** (California E Room) 3 PARS; **"If Life is Short...": Karen Clark** (California C/D Rooms)

10:00 to 10:30 ***VISIT THE EXHIBITS***

10:30 to **12:15** — **Submitted Papers IV: Cardiovascular** (California C/D Rooms) 3 PARS; **Exhibit Rounds** (North Exhibition Hall)

12:15 to **2:00** ***LUNCH/VISIT THE EXHIBITS***

2:00 to **3:30** — **Submitted Papers V: Clinical Science II** (California C Room) 3 PARS; **Submitted Papers VI: Vascular/Hematology** (California D Room) 3 PARS

3:30 to **3:45** ***VISIT THE EXHIBITS***

3:45 to **5:15** — **Submitted Papers VII: Pulmonary/Renal** (California C Room) 3 PARS; **Submitted Papers VIII: Adrenal/Bone** (California D Room) 3 PARS

5:30 to **6:30** **Technologist Section Business Meeting** (California E Room)

FOOTNOTES

**Cardiovascular I:* Those attending all sessions and successfully completing the take-home examination earn 0.7 CEU hours (70 CEU points). Those attending all sessions but not completing the exam receive 7 hours of PAR credit (14 PAR points). Individual sessions may be taken for the number of points listed for each session in this schematic.

***Cardiovascular II:* Those attending all 5 sessions and successfully completing the take-home examination earn 0.5 CEU hours (50 CEU points). Those attending all sessions but not completing the exam receive 5 hours of PAR credit (10 PAR points). Individual sessions may be taken for the number of PAR points listed for each session in this schematic.

†*Education I:* Those attending all sessions (no repeats) and successfully completing the CEU course project earn 0.5 CEU hours (50 CEU points). Those attending all sessions but not completing the project earn 5 PAR hours (10 PAR points). Those attending morning sessions only are eligible for 3 VUE hours (30 VUE points) upon successful completion of the determined method of evaluation. Individual sessions may be taken for the number of PAR points listed for each session in this schematic.

‡*Education II:* Those attending all 3 sessions and successfully completing the required method of evaluation earn 0.5 CEU hours (50 CEU points). Those attending all sessions but not completing the evaluation earn 5 PAR hours (10 PAR points). Individual sessions may be taken for the number of PAR points listed for each session in this schematic.

§*Management I and II:* Those attending all 6 sessions and successfully completing the required evaluation project earn 0.9 CEU hours (90 CEU points). Those attending all sessions but not completing the evaluation earn 9 PAR hours (18 PAR points). Those attending one day of the course are eligible for VUE credit upon successful completion of an evaluation at the end of that day's activities. Individual sessions may be taken for the number of PAR points listed for each session in this schematic.

RIA Workshops (see pp. 97-98 of this program): Those attending all 3 workshops and successfully completing the CEU project earn 0.7 CEU hours (70 CEU points). Individual workshops may be taken for 5 PAR points.

NOTE: In this schematic, times printed in lightface type are a.m.; those printed in boldface type are p.m.

THURSDAY, JUNE 29

8:00 to **5:30** ***REGISTRATION***

9:00 to 11:30 **RIA Workshop A** (Huntington Beach Room) **RIA Workshop C** (Orange County Room 18)

8:30 to 10:00	***Cardiovascular I** (California C Room) 3 PARS	**Clinical/ Instrumentation I** (California D Room) 3 PARS	†**Education I** (Fullerton Room) 3 PARS	§**Management I** (California E Room) 3 PARS
10:00 to 10:30	***VISIT THE EXHIBITS***			
10:30 to **12:00**	***Cardiovascular I (continued)** (California C Room) 3 PARS	**Clinical/ Instrumentation (continued)** (California D Room) 3 PARS	†**Education I (continued)** (Fullerton Room) 3 PARS	§**Management I (continued)** (California E Room) 3 PARS
12:00 to **1:30** ***VISIT THE EXHIBITS***	**12:00** to **1:00 Exhibit Rounds** (North Exhibition Hall)			
1:30 to **3:00**	***Cardiovascular I (continued)** (California C Room) 3 PARS	**Clinical/ Instrumentation (continued)** (California D Room) 3 PARS	†**Education I (continued)** (Fullerton Room) 3 PARS	§**Management I (continued)** (California E Room) 3 PARS
3:00 to **3:15**	***VISIT THE EXHIBITS***			
3:15 to **4:45**	***Cardiovascular I (continued)** (California C Room) 3 PARS		†**Education I (repeat)** (Fullerton Room) 3 PARS	§**Management I (continued)** (California E Room) 3 PARS
4:45 to **5:00** ***VISIT THE EXHIBITS***	**5:00** to **5:30** **Nuclear Pioneer Lecture** (Anaheim Room)			
6:30 to **8:30**			**Educator's Forum** (Fullerton Room)	

FRIDAY, JUNE 30

8:00 to **4:00** ***REGISTRATION***

9:00 to 11:30 **RIA Workshop B** (Huntington Beach Room) **RIA Workshop C** (Orange County Room 18)

8:30 to 10:00	****Cardiovascular II** (California C Room) 3 PARS	**Clinical/ Instrumentation II** (California D Room) 3 PARS	‡**Education II** (Fullerton Room) 3 PARS	§**Management II** (California E Room) 3 PARS
10:00 to 10:30	***VISIT THE EXHIBITS***			
10:30 to **12:00**	****Cardiovascular II (continued)** (California C Room) 2 PARS	**Clinical/ Instrumentation II (continued)** (California D Room) 3 PARS	‡**Education II (continued)** (Fullerton Room) 3 PARS	§**Management II (continued)** (California E Room) 3 PARS
12:00 to **2:00**	***LUNCH/VISIT THE EXHIBITS***			
2:00 to **3:30**	****Cardiovascular II (continued)** (California C Room) 2 PARS	**Clinical/ Instrumentation II (continued)** (California D Room) 3 PARS	‡**Education II (continued)** (Fullerton Room) 3 PARS	
3:30 to **3:45**	***BREAK***			
3:45 to **5:15**	****Cardivascular II (continued)** (California C Room) 2 PARS	**Clinical/ Instrumentation II (continued)** (California D Room) 3 PARS		
5:15 ***MEETING ADJOURNS***				

NOTE: The Exhibition Hall closes at 2:15 p.m. Friday.

Abstracts for Technologist Scientific Program: SNM 25th Annual Meeting—Anaheim

TUESDAY, JUNE 27
2:00 p.m.-3:30 p.m.

CALIFORNIA C/D ROOMS

SUBMITTED PAPERS I

INSTRUMENTATION

Moderator: Michael Cianci

EFFECTS OF DIFFERENT WINDOW SETTINGS ON SENSITIVITY AND RESOLUTION IN THALLIUM-201 COMPUTER-IMAGING. A. Rodewald and J.K. Langan. The Johns Hopkins Medical Institutions, Baltimore, MD.

An evaluation was made of the differences in sensitivity and resolution in Thallium-201 computer-imaging as studied in relation to the various window settings used.

With defects of various sizes positioned within the phantom, a heart phantom, containing Tl-201, was placed inside a simulant of the human body, with its characteristic background activity and backscatter. Using window settings of 20%-40% in 5% intervals, two sets of data were acquired: one with total counts as a constant, the other with time as a constant. Data was acquired using a gamma camera with computer system.

When total count was held constant, images were acquired in 33% less time at 40% window than at 20% window, without a significant loss in resolution. With time as the constant, images at window settings of 30% and 35% appeared to be superior to the others. Computerized smoothing emphasized the defects, but distorted their size.

Thus, in Tl-201 computerized images, while a wider window setting results in slight loss of resolution, the gain in sensitivity using computerized image-processing offsets any loss in resolution. Furthermore, using the same acquisition time necessary for a 20% window image, images acquired at 30% and 35% window provide superior resolution.

FACTORS INFLUENCING SCINTILLATION CAMERA FIELD UNIFORMITIES. W.R. Montgomery, E.L. Nickoloff, E. Raab, G. Schindledecker, D. Koller, W. Kasecamp, R.D. Burow and L. Becker. The Johns Hopkins Medical Institutions, Baltimore, MD

Although new scintillation cameras with sophisticated electronics and uniformity corrections are becoming available, the problem with non-uniform fields in scintillation camera images has not been eliminated. We have examined factors which introduce flood field non-uniformities in the images. The percentage (2σ) non-uniformities of scintillation camera images were compared at various PHA window settings. For 20% PHA window settings, the non-uniformities were the order of ±10% to ±15% (2σ). These values were observed to increase the smaller PHA window settings; larger PHA settings resulted in an improved field uniformity. The addition of lucite scatter material around the flood field source modified the detected gamma ray spectrum of the photopeak due to the inclusion of Compton scattered photons. The presence of Compton scatter photons resulted in a deterioration of field uniformity. Uniformity and uniformity corrections were compared for sources with different gamma ray energies: T&-201, Tc-99m, In-111 and In-113m. It was determined that the field uniformity is both energy and count rate dependent. Non-uniformities progressively increased at high counting rates. Finally, the two main methods for checking uniformity were evaluated. The uniformity measured with a flood field phantom placed in front of the scintillation camera with collimator attached was compared with point sources of activity placed at a distance from the camera crystal with the collimator removed. Differences were observed in the count rate profile.

THE UTILITY OF MAGNIFICATION AND ROTATION FOR IMPROVED ACQUISITION, MANIPULATION, AND DISPLAY OF GAMMA CAMERA IMAGES. P.H. Murphy, E.L. Bialas, M.W. Groch, and G.D. Myers. Baylor College of Medicine, St. Luke's Episcopal/Texas Children's Hospitals, Houston, TX, Group Research, Searle Diagnostics, Inc, Des Plaines, IL.

Evaluation of regional myocardial wall motion using computer enhanced gated diastolic and systolic blood pool images can be facilitated if the limited digital matrix of many small computers can be utilized to view only the central region of the camera field. Also, some cardiovascular studies involve quantitative analysis of data obtained during cardiac flows or multigated images, requiring high frame rate digital data collection. The capacity of most computers limits them to rather coarse matrices for this purpose. Subsequent precise delineation of the left ventricle becomes difficult due to a lower matrix cell density. By centering and magnifying the region of interest before data collection, a greater cell density is in effect created, increasing the spatial sampling frequency. To provide this capability, an inexpensive image magnifier/rotator was developed to modify gamma camera positional signals before display or storage.

This device has been found useful in several other applications. Small organs, imaged with large-field-of-view cameras, can be magnified for viewing in a more interpretable size without the distracting influence of non-target activity. Image rotation provides flexibility in data manipulation for aligning rectangular ROI's through any portion of a patient image or resolution pattern to generate count profiles. Also, image magnification has been found useful in matching the size of images obtained with converging and parallel-hole collimators.

MOIRE EFFECT AND BAR PHANTOM IMAGES. D. M. Gibbons and R. E. Johnston. University of North Carolina, Chapel Hill, NC.

The use of bar phantoms is the most common approach to check the resolution of camera systems. For most camera-collimator-bar phantom combinations it appears to be a satisfactory method for quality control. However, there are camera-collimator-bar phantom combinations in which spatial frequency interference patterns generate useless and sometimes false information. A series of resolution studies for different camera-collimator-phantom systems has been made. The resolution of each system as determined by clinical phantoms, bar phantoms and FHM of line source resolution measurements are compared.

PORTABLE GAMMA CAMERA IMAGING: PRACTICAL CONSIDERATIONS AND USAGE WITHIN THE HOSPITAL. S.K. Russell. Lutheran General Hospital, Park Ridge, IL.

This study was undertaken to present practical considerations for the incorporation of portable gamma camera capabilities into a Nuclear Medicine laboratory.

Basic information on how to organize portable imaging with nursing personnel, and coordination of imaging techniques was gathered from the author's personal experience of portable gamma camera usage, and with statistics gathered from eight Chicago area medical institutions. These statistics include: number of portable requests per week, type of portable in use, the most frequent portable procedures requested, institutional bed size, and area of hospital most often utilizing portable facilities.

The assemblage of data shows that usage of portable gamma camera capabilities can allow for internal and hospital-wide growth of Nuclear Medical services, with the dual versability of utilization within the department, and also on critical care units.

QUANTITATIVE DETERMINATION OF RESOLUTION AND SENSITIVITY OF A MULTIPLANE TOMOGRAPHIC SCANNER. A. H. Koorji, A. E. Inglis, Jr., E. V. Garcia, A. Miale, Jr., A. N. Serafini, Jackson Memorial Hospital, Miami, Fl.

The multiplane tomographic scanner developed by Anger (Pho/Con-Searle Radiographics) was interfaced to a nuclear medicine computer system (32k Modumed Medical Data Systems). The data was acquired and reconstructed to quantitatively determine resolution and sensitivity characteristics.

Line source measurements of Tc-99m (2 mCi) were used to evaluate the resolution of the scanner's low energy standard resolution (10 mm) and high resolution (6 mm) collimators. The measurements were performed both in air and tissue equivalent medium (TEM) at depths from 1 to 6 in. at 1/2 in. intervals. A 35X35 cm. format, at 700 cm/min. speed was used for all depths. Transverse cuts of each experiment were reconstructed to determine the depth at which the line source was in focus. Line spread function were obtained and plotted by taking a cross section of the line source at focus. Full Width Half Max (FWHM) and Full Width Tenth Max (FWTM) were measured. Evaluation of the relative sensitivity (RS) of the collimators was determined by recording the total counts acquired for a fixed amount of time at the geometrical focal plane in air and TEM.

Results

Collimators/Depth(ins.)	1.5	*3.5	6.0	RS%
10 mm air (FWHM) (FWTM)	(10.8) (20)	(11.1) (25)	(15.8) (55)	100
6 mm air (FWHM) (FWTM)	(9.6) (17)	(9.1) (18)	(11.8) (44)	45
10 mm TEM (FWHM) (FWTM)	(10.9) (23)	(11.5) (20)	(19.8) (30)	34
6 mm TEM (FWHM) (FWTM	(9.1) (18)	(9.9) (15)	(13.8) (22)	18

*Focal point

TUESDAY, JUNE 27 CALIFORNIA E ROOM
4:00 p.m.-5:30 p.m.

SUBMITTED PAPERS II

RADIOASSAY/IN VITRO

Moderator: Christie Burkhead

MEASUREMENT OF CATECHOLAMINES BY RADIOENZYMATIC ASSAY AND CLINICAL APPLICATION. Vernon M. Camp, Bahjat A. Faraj, Yavuz Tarcan, Woodfin B. Cobbs, Jr. and Steve Heymsfield. Departments of Radiology (Division of Nuclear Medicine) and Medicine, Emory University School of Medicine, Atlanta, Ga.

Increasing interest in catecholamines (CA) metabolism and biosynthesis both in healthy and disease conditions (Hoeldtke, R. Metabolism 23: 663, 1974) has led to an emphasis on developing reliable, sensitive methods for CA determination. This report describes a radioenzymatic assay for the analysis of CA in plasma. It is based on the conversion of norepinephrine (NE), epinephrine (E) and dopamine (DA) to their O-methylated tritiated derivatives (3-H-normetanephrine, 3-H-metanephrine and 3-H-3-O-methyldopamine) by the incubation of plasma (50 µl) in the presence of catechol-O-methyltransferase (COMT, Cat-A-Kit Upjohn) and 3-H-S-adenosylmethionine (5 µci, sp. act. 8 ci/mmole, NEN) at 37°C for 1 hr. The reaction is stopped by the addition of borate buffer (pH 11) and the methylated products were extracted into toluene: isoamyl alcohol (3:2 v/v) and then into acetic acid (0.1M). The identity of the products was characterized by radiochromatographic analysis. The method was found to be simple, specific and sensitive to about 5 picograms. The assay was used (a) to monitor the effective blood levels of DA in patients with hypertrophic cardiomyopathy following the oral administration of L-dopa (6 grams), (b) to assess the effect of diet on sympathetic nervous system activity by measuring plasma norepinephrine in starving, malnourished and fasting obese patients and (c) to ascertain the biochemical diagnosis of pheochromocytoma by analyzing for plasma NE in these patients, NE was elevated significantly in pheochromocytoma (1.2 ng/ml) as compared to plasma NE in control subjects (0.350 ng/ml). This assay for CA has clinical and diagnostic value.

USE OF A SERUM ESTRIOL RADIOASSAY KIT FOR MEASURING URINE ESTRIOLS. J.E. Busher, S.J. Gombosh and S.N. Wiener. The Mount Sinai Hospital, Cleveland, OH.

Total urine estriol levels can be measured accurately and simply by use of a commercial serum estriol radioassay in order to provide clinical information needed to serve in the management of problem pregnancies. Upon measuring the total volume of the 24hr urine specimen, a 100ul aliquot is diluted by a factor of 200 using an estriol-free commercial serum. Routine radioassay of the sample is then performed using the Amersham serum protocol found in kit IM.82. The ng/ml result obtained is converted to the conventional mg/24hr designation:

$$\text{mg/24hr} = \frac{\text{ng/ml} \times \text{D.F.} \times \text{ml/24hr}}{1{,}000{,}000 \text{ ng/mg}}$$

The correlation of 25 samples sent over a two month period to a reference lab was excellent, having a correlation coeffecent of r = .97. More importantly, abnormal results on five problem pregnancies encountered in subsequent testing confirmed the admitting diagnosis of fetal distress. Technical evaluation revealed an intra-assay C.V. of +3.9% for high normal levels of estriol (38mg/24hr) and of +6.3% for low estriol values (11mg/24hr). Inter-assay variation on ten successive runs was 6.0%. Non-specific binding for diluted urine was equivalent to that found in serum, namely 6.5% of Bt and thus was not a contributing factor in computing results. Successful recovery of serum estriol diluted with male urine further supported that the serum assay is capable of measuring estriol from a urine background.

The estriol antibody employed in the assay is indifferent to the source of the estriol as long as the proper chemical environment is maintained for the enzyme hydrolysis and for the immunological binding. Finally, this protocol provides a savings of time and money to the department that must assay both serum and urine estriol levels.

AN EVALUATION OF A SERUM FERRITIN RADIOASSAY. J.E. Busher and S.J. Gombosh. Mount Sinai Hospital, Cleveland, OH.

This evaluation was performed to ascertain the reliability and practicality of a radioassay kit for serum ferritin levels. The radioassay of ferritin according to the commercial protocol established by Ramco Laboratories yielded results which correlated very well with a clinical group of fifty hematology patients diagnosed by other parameters.

The methodology appears simple, being a 2-site radiometric assay performed as a two stage reaction. In reality, however, quality control, especially in the area of intra- and inter-assay reproducibility can be difficult without extending the manufacturer's instructions. One must be careful in preparing homogenous standards and patient samples, insulating the incubation tubes from heat expelled by the shaking unit, and to gently and completely aspirate the antibody labeled beads with a Pasteur pipette. Adherence to careful pipetting, using the proper sized incubation tubes, and gamma counting each sample a minimum of four minutes are also critical. It is necessary to establish a low and a normal control from pooled patient sera for quality control purposes. Finally, the patients ages and sex are relevent as to the expected ferritin level.

In conclusion, comparison of data and graphs early and late in this investigation substantiate the importance of meticulous technique in attaining precise quantitative results. Ramco Laboratory did revise the dilution of the standards and computation of the data as this evaluation was completed. However the methodology remains the same and therefore the recommendations above still pertain in order to achieve optimum results in this assay for iron deficient anemia or iron overload.

COMPARATIVE STUDIES OF SERUM B12 LEVELS AND DUAL ISOTOPE VITAMIN B12 ABSORPTION STUDIES IN THE LABORATORY DIAGNOSIS OF PERNICIOUS ANEMIA. W.R. Kasecamp, E.L. Nickoloff, H.H. Mikesell, D.A. Housholder, and P.A. McIntyre. The Johns Hopkins Hospital, Baltimore, MD.

Several patients suspected of having pernicious anemia were studied using the in-vitro competitive protein binding serum Vitamin B12 assay and the in-vivo method of determining Vitamin B12 absorption using the Schilling test with dual isotopic tracers (Dicopac).

Over a two year period, fourteen patients, who were strongly suspected of having pernicious anemia based on hematological studies and clinical findings, were studied. Of these fourteen patients, eleven had serum Vitamin B12 levels performed, and eight of these were abnormally low. All fourteen patients had dual isotopic Schilling tests which were abnormally low, and showed a marked response to intrinsic factor. At present all fourteen patients studied are on Vitamin B12 therapy and all are responding to treatment.

We therefore conclude that using serum Vitamin B12 levels as the only test for the diagnosis of pernicious anemia could possibly be invalid, but when combined with the in-vivo method of the dual isotope Vitamin B12 absorption is an accurate method for confirming the diagnosis of pernicious anemia.

EVALUATION OF FOUR GENTAMICIN ASSAY SYSTEMS. E.G. James and R.L. Mitchell. Washington Hospital Center, Department of Nuclear Medicine, Washington, DC.

The toxicity of aminoglycosides in general, as well as their increasing use in therapy, has made accurate, rapid monitoring of their serum levels desirable. To meet this need, several assay systems have been introduced commercially. In this study we evaluated four assay systems for Gentamicin which differed primarily in separation technique. A pre-reacted double antibody method, a polyethylene glycol enhanced double antibody method, a conventional double antibody method, and an antibody coated tube method were all studied. These systems were evaluated for precision, accuracy, sensitivity, and ease of performance. All systems showed near equivalent precision with the conventional double antibody method demonstrating the greatest accuracy of the four--recovering between 93.8% and 102.11% over three ranges. The polyethylene glycol enhanced method showed the greatest sensitivity with a least detectable dose of 0.1 mcg/ml., while the solid phase system was least sensitive with a least detectable dose of 0.6 mcg/ml. The pre-reacted double antibody method required the fewest pipettings and had the shortest incubation time. The data showed all systems to be clinically useful; however, the increased accuracy of the conventional double antibody method may make it preferable.

THE EFFECTS OF ABNORMAL HEMATOCRITS ON WHOLE BLOOD FILTER PAPER THYROXINE VALUES. Christine A. Auerbach. Washington Hospital Center, Washington, D.C.

Congenital hypothyroidism which is found in about 1:6000 neonates can be easily treated by replacement therapy. With the development of a thyroxine radioimmunoassay which utilizes dried blood spots on filter paper, mass screening to detect hypothyroidism is being performed on increasing numbers of neonates. Since the thyroxine screening assay utilizes whole blood the hematocrit of the neonate will affect the assayed thyroxine level, and can lead to false positive or false negative results. This study is an attempt to determine the effect the neonatal hematocrit exerts on the thyroxine level. Whole blood was obtained from the blood bank and the serum was separated from the red blood cells by centrifugation. Eleven hematocrits ranging from 0% to 98.5% were then formulated by mixing differing proportions of red blood cells and serum. Filter papers were spotted with each solution, and thyroxine values were determined on each by using a commercially available whole blood filter paper thyroxine radioimmunoassay which is designed to work optimally with normal neonatal hematocrits of 55%. The results show that abnormal hematocrits do cause false thyroxine results: a high hematocrit gives false low thyroxine values and a low hematocrit yields false high thyroxine values. Therefore, the diagnostician should be wary in interpreting whole blood thyroxine levels on neonates suspected of or proven to have abnormal hematocrits.

WEDNESDAY, JUNE 28 CALIFORNIA E ROOM
8:30 a.m.-10:00 a.m.

SUBMITTED PAPERS III

CLINICAL SCIENCE I

Moderator: John Reilley

POTENTIAL ERRORS DUE TO VARIABLE RADIONUCLIDIC PURITY OF IODINE-123. J.A. Hughes, C.C. Williams, S.R. Thomas, H.R. Maxon, R.H. Basiewicz and W.J. Love. University of Cincinnati Medical Center, Cincinnati, OH.

Iodine-123 has been produced by a variety of nuclear reactions. The I-127(p,5n)Xe-123→I-123 reaction produces a high purity product but is not currently feasible for large scale production of I-123. Until a few months ago commercial I-123 was produced by the Te-122(d,n) I-123 method which introduced a variety of radionuclidic impurities in the resultant product. Very recently the Te-122 reaction method has been replaced by Te-124(p,2n)I-123 reaction method which, while decreasing the variety of radionuclidic contaminants present, increases the relative level of those remaining in the resultant product. Potential problems in these varying types and levels of radiocontaminants were investigated and comparisons made between the two commercial products. Although no observable differences were seen in thyroid scintigraphs performed on the gamma camera using I-123 produced by the "new" Te-124(p,2n)→I-123 reaction method, modifications were required in the following two areas:

1. A change in dose calibrator setting from those recommended by the manufacturers for pure I-123.
2. Corrections in decay factors used for uptake calculations, especially when the I-123 is administered 24 hours after calibration date.

Methods to correct these potential errors are illustrated.

TECHNETIUM 99m PYRIDOXYLIDENE GLUTAMATE (PG): A New Gallbladder Imaging Agent. J.K. Monk, R.F. Carretta, D. Schuetz. Roseville Community Hospital, Roseville, CA.

Until recently, hepatobiliary imaging has been limited to use of I-131 Rose Bengal. This radiopharmaceutical has been less than ideal for hepatobiliary imaging for several reasons. Microcurie amounts are used since I-131 is a Beta as well as Gamma emitter, low photon flux yields poor resolution images, and its availability is limited. We have recently evaluated the use of a Technetium labeled hepatobiliary agent, Technetium 99m-PG, for the evaluation of cholecystitis, bile duct obstruction, and hepatocellular disease. This new agent is readily available, can be used in millicurie amounts, and has a high photon flux yielding superior quality images. It compares well with conventional radiographic techniques such as oral or intravenous cholangiograms and can be used in patients who are allergic to iodide containing contrast media. The high clinical correlation, availability for emergency studies, and superior image resolution make Tc99m-PG the agent of choice when compared to I-131 Rose Bengal for hepatobiliary imaging.

A CORRELATIVE EVALUATION OF GEL-COLUMN CHROMATOGRAMS AND SCAN QUALITY. K.T. Study, and J.H. Gallagher. Kansas University Medical Center, Kansas City, KS.

The scan quality obtained from various manufacturers radiopharmaceuticals can accurately be assessed.

A means is herein described whereby an institution can evaluate the various parameters of a radiopharmaceutical which affect scan quality. Such as, whose kit to buy, the time interval between preparation and administration that a radiopharmaceutical can be used, and radiochemical purity.

To quantitate radiochemical purity Sephadex G-25 Gel-Columns are developed after radiopharmaceutical kit preparation, and are imaged on a scintillation detector. These images were then analyzed by a computer and a resultant radiochromatogram obtained, which shows the activity in the column due to radiochemical impurities.

Scan quality is determined by having the Nuclear Medicine physician rate a number of images obtained from the radiopharmaceutical in question. After accumulating a large data base the scan quality of a radiopharmaceutical and its radiochromatogram were compared.

After a correlation is found between scan quality and its characteristic radiochromatogram a radiopharmaceutical may be deemed acceptable or unacceptable before the injection of patients by simple evaluation of its radiochromatogram.

AN EVALUATION OF THE METHODS USED TO PERFORM RADIOCHEMICAL QUALITY CONTROL. P.D. Reznikov, C. D. Teates. University of Va. Medical Center, Charlottesville, Va.

A comparison was made of several methods which check radiochemical purity of Technetium-99m compounds. The choice of the method to implement will be an easier one with a more complete understanding of each method.

Three instruments and two chromatography systems were compared over a one month period. The instruments were: an automated analyzer; a scintillation well counter; and a multichannel analyzer in both a pulse height and multichannel sweep mode. The chromatography methods were: a 20cm. I.T.L.C. strip with varying solvents (Gelman system); and a 5cm. paper strip with 2 solvents (A miniaturized Tech system).

The largest difference observed due to instrument error was between the automated analyzer and MCS (2.86% average difference); while the smallest % difference was (.95%) between automated analyzer and PHA mode. The two chromatography systems differed widely. The average % difference between the Gelman and Tech systems was 7.19% for Pyrophosphate and 6.61% for MDP. The particulate radiopharmaceuticals were separated well by both systems with MAA the highest at 3.1%, and the Sulfur Colloid the lowest at .77%.

Each of the instruments gave close results with differences just above statistical counting error. The MCS mode seemed to be the best instrument method because it gave qualitative information about the separation as well as quantitative results. The 20cm. I.T.L.C. strips were less delicate due to greater length and gave better, more consistent results with Phosphates. The Tech and Gelman (I.T.L.C.) systems separate particles with consistent % bound results.

TECHNICAL ASPECTS OF PERFORMING EMISSION TOMOGRAPHY. R.D. Lovett, T.C. Hill. New England Deaconess Hospital, Boston, MA.

During the initial clinical investigation of the Cleon 710 Tomographic Brain Imager various technical factors were found to affect the quality of the image. Single photon emission tomography was performed on patients and phantoms graphically demonstrating the wide variety of technical factors that influence the resultant image. Scan time and slice spacing set prior to the examinations. Photo density, background subtract, upper cutoff, and enhancement were varied after the data was obtained. The interaction of these various settings will demonstrate the improved diagnostic quality of the examination.

AN APPROACH TO QUANTITATION OF IMAGES OBTAINED BY POSITRON EMISSION TOMOGRAPHY. W. D. Gibbs, Sue Holloway, H. D. Hodges. Oak Ridge Associated Universities (ORAU), Oak Ridge, TN

Quantitative analysis of scans obtained with short-lived positron emitters such as C-11 (T-1/2 20.8m), Ga-68 (T-1/2 68 min.) and others is difficult because of the significant decay which occurs during the acquisition of the scan. We have developed a method for quantitative analysis of emission tomographic scans that provides quantitative results within the range of ±7% error. This approach uses a syringe filled with a known fraction of the dose placed in the field of view of the ECAT throughout the period of time that scans are being performed. The resulting scans contain both the image of the syringe and the patient. Using the region of interest (ROI) feature of the ECAT, it is possible to compare the counts from the syringe with counts from selected areas of the patient scan such as pancreas, liver, etc., and determine the fraction of the dose contained in these areas. Phantom studies with known distributions and concentrations show that accuracy of results is within ±7%. Since the reference source (syringe) is in the field of view throughout the entire study, no precise timing or decay corrections are required in the calculations. Quantitative analysis of scans can provide more information about physiologic function than is presently possible. The method described in this paper can, with modifications, be applied to other imaging modalities if they are or can be equipped with a region of interest (ROI) feature. (Operates under under contract Number EY-76-C-05-0033 with the U. S. Department of Energy. This article is based on work supported by the Division of Biomedical and Environmental Research and USPHS Research Grant CA-14669 from NCI.

WEDNESDAY, JUNE 28 CALIFORNIA C/D ROOMS
10:30 a.m.-12:15 p.m.

SUBMITTED PAPERS IV

CARDIOVASCULAR

Moderator: John Kozar

RADIONUCLIDE CINEANGIOGRAPHY: IMAGING VARIATIONS BETWEEN NORMAL AND ABNORMAL PATIENTS WITH HEART DISEASE. B.A. Mack, J.S. Borer, M.V. Green, S.P. Farkas, S.L. Bacharach, and G.S. Johnston. National Institutes of Health, Bethesda, MD.

Real time, multi-image ECG-gated scintigraphy permits rapid assessment of regional and global left ventricular function at rest and during the physiologic stress of maximal exercise. These studies also permit assessment of various pharmacologic interventions in rapid sequence. Performance of radionuclide cineangiography requires the technologist to possess a comprehensive knowledge of normal and abnormal cardiac anatomy and function.

To assist the technologist in gaining this information, we present a film with a series of radionuclide cineangiograms obtained in normal subjects, and in patients with common and uncommon cardiac abnormalities. From these movies the proper position of the patient during the study will become apparent, as will the types of abnormalities which must be recognized by the technologist in order that dysfunctional cardiac structures are properly included within the field of view. It should be noted that such structures often are inapparent during contrast angiography, and, since unexpected, can be inadvertently excluded during angiography and first-pass radionuclide studies.

In addition to common abnormalities noted in patients with coronary artery disease, aortic regurgitation, and aortic stenosis, uncommon and unexpected abnormalities in patients with mitral valve prolapse, asymmetric septal hypertrophy, left atrial myxoma, and left ventricular pseudoaneurysm will be demonstrated.

FOUR IMAGE CYCLIC GATED TECHNIQUE WITH HIGH SPATIAL RESOLUTION. V.R. Reed. Analytical Development Associates Corporation, Sunnyvale, CA.

This investigation was undertaken to study a cyclic gated multiple image acquisition technique employing a 4 image cyclic study in a 128x128 matrix. These blood pool function studies are performed usually by dividing the cardiac cycle into a large number of segments, typically 12, 14, 16, 28, or 32. In order to achieve high temporal resolution, compromises in spatial resolution are made by using a 64x64 or 32x32 matrix. The advantage of 4 image study in a 128x128 matrix is the high spatial resolution for the detection of wall motion defects.

To acquire a 4 image cyclic study, the operator can select one desired window width which is used for all 4 images, and place them anywhere in the cardiac cycle as long as overlap is avoided. In the 15 Tc-99m HSA patient studies within this report, both a 4 segment in a 128x128 matrix as well as a 16 segment in a 64x64 matrix cyclic study were done. The 4 segments were placed evenly throughout the entire cardiac cycle, evenly throughout the contraction phase of the cycle, or one at end diastole and the other three to determine the best estimate of end systole. The 16 segment cyclic study was divided throughout 90% of the cardiac cycle.

When compared with the 16 segment cyclic gated study, the 4 image gating technique resulted in improved evaluation of wall motion.

FIRST PASS DETERMINATION OF BIVENTRICULAR FUNCTION FROM A SINGLE INJECTION IN THE RAO PROJECTION. D.S. Gawles, K.H. Douglass, P.O. Alderson, and H.N. Wagner, Jr. Johns Hopkins Medical Institutions, Baltimore, Md.

First pass studies of right and left ventricular function using a multicrystal camera normally require two injections; one in the RAO projection and the other in the LAO. To determine if the same information could be obtained from a single injection, we compared the results of 30 degree RAO first pass determinations of left ventricular ejection fraction (LVEF) with LVEF determinations made from blood pool images in 30 patients. For the blood pool studies, ECG-synchronized data were acquired in the 40 degree LAO view by a standard Anger camera-computer system and EF was calculated from a background subtracted LV time-activity curve. Using an automated ventricular function program normally used with the multicrystal camra, the RAO LVEF correlated poorly with that obtained by the Anger camera system ($r=0.71$, $p < .01$, $n=20$). These problems were apparently caused by oversubtraction of background in the automated mode. When the LVEF was calculated by manually outlining the ventricle and a subtracting a horseshoe shaped periventricular area, values obtained by the two systems were comparable and the correlation was significantly better ($r=0.80$, $p < .01$, $n=30$). LVEF values obtained from paired RAO and first pass LAO studies agreed closely in 4 patients. The RAO projection is normally used for right ventricular (RV) first pass function analysis. The results demonstrate that both RV and LV function studies can be obtained during first pass from a single RAO injection. This shortens and simplifies combined first pass RV-LV function studies, and lowers patient and technologist radiation exposure.

MYOCARDIAL SCANS AND WALL MOTION STUDIES USING Tc-99m PYROPHOSPHATE IN SUSPECTED ACUTE MYOCARDIAL INFARCTIONS. K. Wilkins and L. Reese, St. Joseph's Hospital, London, Ont.

Two different radionuclide procedures were performed in an attempt to diagnose acute myocardial infarction.

Fifty-three patients suspected of having acute myocardial infarctions were referred for myocardial scans. Utilizing a bolus injection of Tc-99m Pyrophosphate for the scan, first pass wall motion studies were carried out with the Baird-Atomic Multi-Crystal camera. A conventional Anger camera was used for the delayed myocardial scans. Using the information obtained from these studies,16 patients were reported to have had acute myocardial infarctions.

Clinical Diagnosis	Positive Scan	Abnormal Wall Motion
Normal	10	0	0
Acute Myocardial Infarctions	20	15	20
Coronary Heart Disease	23	1	23

Upon subsequent analysis of the data we found that the myocardial scan showed a sensitivity of 75%(15/20) with 3% false positives(1/33), and accuracy of 90%(48/53).

The wall motion studies had a sensitivity of 100%(20/20) and an accuracy of 100%(53/53).

From these data we concluded that a negative myocardial scan with a normal wall motion study rules out an acute myocardial infarction.

A positive myocardial scan and an abnormal wall motion study confirms an acute myocardial infarction.

A negative myocardial scan with an abnormal wall motion study suggests old disease but cannot completely rule out an acute myocardial infarction.

VISUAL OBSERVATION OF THE CARDIAC WALL MOTION STUDY FOR AN EVALUATION OF CARDIAC FUNCTION. I. Kim, A.S. Johnston, C. Youngstrum, U.Y. Ryo, and S.M. Pinsky. Michael Reese Medical Center, Chicago, IL.

In order to evaluate reliability of visual observation of cardiac contractility in movie mode, visual estimation of left ventricular ejection fraction (E.F.) was made in 27 randomly distributed patients and was compared to the value obtained by computer calculation.

Gated cardiac blood pool images were obtained 5 min. after I.V. injection of 15 mCi Tc-99m-HSA at 45° LAO position using scintillation camera and PDP-11 computer system.

THE E.F. values for 27 patients varied from 10 to 80%. From 11 frames/beat gated image we generated two modes of visual playback: (1) a set of non-processed original images; (2) computer processed boundary line images; both of which were presented in movie-like playback.

Cardiac functions were estimated by two staff physicians by visually looking at images in movie mode, without knowledge of other clinical or angiographic data from randomly mixed playback data.

Estimated E.F. values were compared with values computed by background subtracted method. Correlation coefficient between the computed values of E.F. and the visually estimated E.F. were: (1) original data playback, 0.92; (2) boundary line playback, 0.88

The data playback method tends to overestimate ejection fraction data throughout the whole range.

We conclude that the two E.F. estimation methods have substantially the same results. However, boundary line methods show regional ventricular wall motion studies better than non-processed original images.

TECHNIQUES FOR THALLIUM-201 MYOCARDIAL IMAGING. R.H. Jones, D.D.Watson, C.D.Teates. University of Virginia, Charlottesville, VA.

Myocardial imaging with Thallium-201(Tl) is being increasingly utilized for pts with suspected coronary artery disease. This study was undertaken to determine optimum imaging techniques and to evaluate the use of computer processing as an aid to interpretation.

Patients were injected at rest or following peak exercise stress. Images were obtained in the ANT and 30,45,70° LAO projections. Delayed ANT and 45 LAO images were obtained at approx. 1 and 3 hours post injection. Images were obtained with an Ohio Nuclear mobile camera and the data was processed on a Gamma-11 computer system. The left ventricle was divided into 5 zones of interest with an area of background adjacent to each zone. Computer analysis was used to determine Tl count rate in each zone.

A total of 50 studies have been performed either at rest or at peak exercise stress. Of these 50 studies, 15 consecutive pts with unstable angina underwent resting scans. Within this group, 13 pts showed an area of decreased uptake in the initial views. Of these, 11 demonstrated redistribution into the area of decreased uptake.

Redistribution was confirmed by computer measurements. All 15 pts had cardiac catheterizations from which comparison of results were made. All positive scans were confirmed. There were 2 false negatives.

The use of the delayed imaging technique provided useful additional information on a high % of the patients studied. Computer measurements have provided more sensitive differentiation between ischemic and infarcted areas by comparing initial and delayed Tl uptake. This protocol has been found to be useful on analysis of Tl scans performed both at rest or at peak exercise stress.

THE EFFECT OF BREAST ATTENUATION ON THALLIUM-201 MYOCARDIAL IMAGING (TMI) IN FEMALE PATIENTS. D.C. Deatrich, W.J. Kostuk and J.P. Mamacos. University Hospital, London, Ont.

With TMI in the supine position, we have noted perfusion defects on the left lateral view that are not present in the lateral decubitus position in some females with normal coronary angiograms. Likewise, in some females "false" perfusion defects were seen in the 45° left anterior oblique (LAO) view. Accordingly, we evaluated the possible effect of photon attenuation by breast tissue. Exercise TMI was performed on 13 females (group (Gr) 1) and 10 males (Gr 2) with normal coronary and left ventricular (LV) angiograms. Gr 1 was subdivided on the basis of breast size (judged from chest radiograms) into Gr 1A - small or medium (7) and Gr 1B - large (6). Regions of Interest (ROI) were placed over the anterolateral and diaphragmatic walls of the LV in the anterior (ANT) view and over the anteroseptal and posterior walls in the LAO view. For each view the ratio of the background corrected ROI's was derived by Greater Activity/Lesser Activity. Myocardial ratios were similar for all groups (1A, 1B and 2) for ANT view (1.07 ± .04, 1.11 ± .06, 1.11 ± .08 respectively, mean ± S.D.). In the LAO view, however, the ratio in Gr 1B was slightly higher (1.28 ± .12) as compared to Gr 1A (1.07 ± .06) and group 2 (1.09 ± .04). This data suggests that in large-breasted female patients, TMI in the LAO view may be affected by breast attenuation, and caution is urged in image interpretation in these patients.

WEDNESDAY, JUNE 28 CALIFORNIA C ROOM
2:00 p.m.-3:30 p.m.

SUBMITTED PAPERS V

CLINICAL SCIENCE II

Moderator: Jane Christie

TECHNOLOGIST GROUP PROJECT-CALIBRATION OF DOSE CALIBRATORS IN GREATER OKLAHOMA CITY. L. A. Proctor, D.R. Patrick, and V.J. Ficken, co-ordinators. Central Oklahoma Section-Society of Nuclear Medicine.

The Central Oklahoma Section-Society of Nuclear Medicine(COS-SNM) has developed a project to achieve joint participation and mutual benefits among the technologists of the fifteen Nuclear Medicine Services in Greater Oklahoma City. These services range from small(one technologist) to large teaching facilities.

A committee of the COS-SNM designed the project which would be within the capabilities of all services and be of benefit to all of them. The project chosen was a comparison check of accuracy and calibration factors for the dose calibrator of each of the services. Detailed protocals were developed and distributed to each participating service together with an accurate source of a commonly used radionuclide, I-131. Parameters measured include effects of geometry, volume, instrument range, and linearity over seven weeks. Data were collected from each service weekly according to the protocals.

The goals of this project were: 1) to encourage continued or increased support of the COS-SNM by the technologists in area hospitals and provide objective advantages of participation in the chapter; 2) to develope I-131 correction factors for geometry, volume, instrument range, and linearily for the dose calibrator of each service; 3) to provide quality control mechanism for these dose calibrators by comparison of an accurate secondary source with multiple other units.

COST CONTROL IN THE RADIOPHARMACY. J. P. Capuzzi, S. Dessel, H. P. Rotheberg. Crozer-Chester Medical Center, Chester, Pa. and Temple University Health Sciences Center, Philadelphia, Pa.

Recent state and federal regulations which limit expenditures and regulate purchases, along with closer scrutiny of hospital business practices by third-party organizations, together with consumer advocates have forced the hospital administrator and physicians to become more cognizant of the necessity to control expenditures. Major causes of budget overruns and unnecessary costs in nuclear medicine are mismanagement or misinformation with respect to radiopharmaceutical purchases. Lack of proper fiscal responsibility and poor inventory control often necessitating erratic purchasing procedures contribute significantly to unnecessary costs. Therefore, the need to institute controls and adopt procedures to determine cost effectiveness should be evident. We have adopted and are presently utilizing several uncomplicated, but effective business practices in order to cut costs, to limit increases, and to maintain a reasonable operating budget. Among our changes are consolidating deliveries, creating par levels, inviting bids, and evaluating all radiopharmaceuticals and kits prior to selection. The overall results in our institution have been a significant cost reduction, the virtual elimination of unwanted inventories, and the proper utilization of personnel with regard to handling, preparing, and administering radiopharmaceuticals. This has enabled us to maintain our present billing structure, as well as given us the ability to purchase items not originally structured into our operating budget. Adopting these practices to the radiopharmacy operation may allow one to achieve similar results and benefits without sacrificing quality.

COMMON SENSE RADIATION PROTECTION IN A RADIOPHARMACY. UTILIZATION OF EXISTING RESOURSES. W.J. Baker, P.C. Christian, M.E. Deyman, J.B. Slater University of Utah Medical Center, Salt Lake City, Ut.

Inexpensive innovations utilizing commercially available lead delivery containers are presented. Xenon and Gallium delivery containers can be joined to make syringe holders for use during radiopharmaceutical manufacturing.

Generator shields can be cut and joined to make decay pots, syringe and glove receptables, and vial containers. These containers are utilized on lazy susan bearings to rotate the opening away from the technologist when not in use.

Quarter inch lead sheet can be held in place by homemade supports to formulate side shields for drawing stations.

Generator cores can be formulated into unit dose delivery containers for transportation of doses to the floors or other institutions. These cores can also be formulated into lead bricks for shielding.

The combination of these shielding devices and common sense has resulted in our personnel receiving lower whole body radiation doses than the technologists working in Diagnostic Radiology, even though we handle an average of two curies of activity daily.

UTILIZATION OF SURGICAL CONCEPTS IN RADIOACTIVE CONTAMINATION CONTROL. J.W. Hall, R.J. Van Tuinen, and J.B. Kruger. Radioisotope Laboratory, University of Cincinnati Medical

Center and FDA, Nuclear Medicine Laboratory, Cincinnati, OH.

As a result of the growth in nuclear medicine, an increase in radioactive contamination of facilities would be expected simply because more radioactive materials are being handled by more personnel and, in many cases, without benefit of increased working area. In practice decontamination of areas helps avoid, but does not prevent, recontamination. Consequently, a plan of contamination control needed to be established. Our plan was constructed around basic infection control concepts and involved all technical laboratory personnel and all aspects of radionuclide handling. Personnel training was comprised of classroom explanation and laboratory demonstration of good technique, including observation of infection control procedures in surgery and development of good technique proficiency. Within the context of these basic principles, methods for using contamination control apparatus in preparing patient dosages, transporting dosages, and disposal of materials used for injection of radiopharmaceuticals were devised and implemented in the role of confining or minimizing contamination. Through the teaching of basic surgical infection control concepts to all personnel and utilization of contamination control apparatus, we were able to effectively control the amount and extent of radioactive contamination found in our clinical nuclear medicine environment.

AN EXAMINATION OF PHYSICIAN-TECHNOLOGIST-PATIENT COMMUNICATIONS. M. Heyert. George Washington University Hospital, Washington, D.C.

This investigation was undertaken to determine the affect of education on the concerns, feelings, and level of cooperation of nuclear medicine patients and the appropriate role for the Nuclear Medicine Technologist in the complex area of patient sensitivities and patient education. The writer is a "second careerist" new to the health care field, and to nuclear medicine.

A total of 100 patients were interviewed.

The initial level of most patient's knowledge was found to be minimal; resulting, often, in a restless, anxious, and uncooperative presenting patient. Usually, a few minutes of the technologist's time spent talking with the patient visibly eased the obvious anxieties and led to a more relaxed and a more cooperative patient.

As a result, suggestions are made on the need for humanizing our approach to patient care and the manner in which this may be accomplished. A proposal is made that we include training in listening to and talking with patients; that communications between the physician and the technologist be upgraded considerably; and that the technologist begin to undertake educational, informational, and, especially, caring kinds of functions in preparing the patient for what is to happen and alleviating patient anxieties viz-a-viz the examination. It is suggested that this patient-technologist relationship need not interfere with nor impede upon the patient-physician relationship if there is adequate dialogue between the physician and the technologist.

AN EVALUATION OF NONFINANCIAL JOB REWARDS FOR A NUCLEAR MEDICINE TECHNOLOGIST. M.D. Sinclair. Mayo Clinic and Foundation, Rochester, MN.

Nonfinancial job rewards are important factors in job satisfaction. Administrators and laboratory directors generally place emphasis only on financial compensation (salary and fringe benefits); while nonfinancial rewards are often uncontrolled and coincidental sources for job satisfaction. Economic resources are wasted by failing to give enough attention to these rewards. Nonfinancial rewards may originate from the employing institution while others are derived from the specific training in Nuclear Medicine.

Nonfinancial job rewards most likely to be of importance to nuclear medicine technologists were selected from the literature. These were job status, job importance, job familiarity, job dedication, emotional significance of the job, variety of the job, job as a cause, job responsibility and job independence.

1) These rewards were defined as they relate to the actual situation in a nuclear medicine department.
2) The amount of individual involvement or institutions effort was evaluated for each reward.
3) Twelve technologists in our department were given questionnaires to rank the importance of these rewards to them. Seventy-five percent ranked job variety, 50% ranked job familiarity, responsibility and independence among the first three most important nonfinancial rewards.

The defined nonfinancial job rewards may be used to supplement or replace economic rewards and to motivate employee performance. Nonfinancial rewards are becoming more important with the increasing sophistication of the technologists.

WEDNESDAY, JUNE 28 CALIFORNIA D ROOM
2:00 p.m.-3:30 p.m.

SUBMITTED PAPERS VI

VASCULAR/HEMATOLOGY

Moderator: Christie Burkhead

COMPARISON OF SIMULTANEOUSLY DETERMINED PLASMA VOLUMES USING TECHNETIUM-99m AND IODINE-131 HUMAN SERUM ALBUMIN. H.H. Mikesell, S.L. Yang, E.L. Nickoloff, W.R. Kasecamp, W.C. Maddrey and P.A. McIntyre. The Johns Hopkins Hospital, Baltimore, MD.

A simultaneous comparative study using Tc-99m H.S.A. and I-131 H.S.A. was performed for the measurement of total plasma volume in 16 patients. Due to the short half-life of Tc-99m, its use as a blood pool agent is desirable for clinical situations involving repeat studies on individual patients.

Nine patients recovering from coronary artery bypass surgery and seven patients with alcoholic liver disease were studied. Simultaneous injections of 10 uCi I-131 H.S.A. and 40 uCi Tc-99m H.S.A. were made. Total plasma volumes were then calculated as milliliters per kilogram body weight. The results calculated from both the Tc-99m H.S.A. and I-131 H.S.A. were compared and a correlation coefficient of 0.987 was obtained.

Using I-131 H.S.A. as the reference method for obtaining the total plasma volume, the mean difference between the two methods was 3.8 ± 2.3%. Comparable results were obtained over the entire range of plasma volumes present in these 16 patients (26.8 to 75.0 ml/kg), even though the Tc-99m H.S.A. was removed from the circulation at a faster rate than the I-131 H.S.A. The percent tagging of the Tc-99m to H.S.A. was calculated using thin-layer chromatography. The amount of tagged Tc-99m H.S.A. was never less than 96.5% and averaged 98.6 ± 1.0%.

It has been shown that Tc-99m H.S.A. gives accurate measurements when used as a blood pool agent and can be useful in repeat plasma volume determinations in indivual patients.

RADIONUCLIDE ANGIOGRAPHY FOR VASCULAR PATENCY STUDIES. Paul J. Klosowski, John Kulczak and M.A. Sein. Little Company of Mary Hospital, Evergreen Park, IL.

With the use of technetium-99m pertechnetate and wide field gamma cameras, in recent years, isotope angiography has become a rapid, simple and safe method for primary evaluation of peripheral arterial integrity and arterial graft patency studies. Human serum albumin combined with technetium-99m will remain in circulation for an extended period of time and is equally as simple, rapid and safe to perform. Thirty cases were studied and compared surgically, radiologically and clinically,

and were found to have excellent correlation with radionuclide studies. Isotope angiography as a primary study offers no morbidity risk, low radiation exposure and the ability to repeat the exam due to the characteristic of the radionuclide. This procedure can also be done when radiographic angiography is contraindicated.

ABNORMAL BLOOD FLOW PATTERNS WITH SUPERIOR VENA CAVAL OBSTRUCTION. L.L. Nicol, M.S. McVey, and M.R. Tetalman
Ohio State University Hospitals, Columbus, OH.

Patients with superior vena caval obstruction (SVCO) exhibit abnormal venous collateral pathways. These abnormal venous channels may be demonstrated with the aid of a dynamic radionuclide flow study. The abnormal blood flow will follow definite patterns, traversing through or around the liver. Most commonly, the flow bypasses the liver and the anterior liver image appears normal. Rarely, the flow is through the liver, and will be represented by a "hot spot" on the inferior edge of the anterior liver image at the area of the porta hepatis. Therefore, a "hot spot" on a routine anterior liver image is indicative of SVCO and a flow study should be obtained.

Tc-99m sulfur colloid (≈10 mCi) is the radiopharmaceutical of choice for the flow study. The preference of Tc-99m sulfur colloid is twofold: 1) it permits performing the flow study and liver scan the same day; 2) if a repeat flow study is necessary due to technical/mechanical difficulties, it permits repeating the flow as all the activity from the initial injection will be localized in the liver-spleen and not dispersed throughout the body.

Thus, certain distinct flow pattern abnormalities are associated with SVCO, which may, rarely, in addition, be detected as a "hot spot" abnormality on the liver scan. These abnormal flow patterns are easily demonstrated by a simple, safe radionuclide bolus flow study using Tc-99m sulfur colloid, obtainable either before or after routine liver imaging.

INTERNAL MAMMARY LYMPHOSCINTIGRAPHY: A MODIFIED TECHNIQUE TO FACILITATE TANGENTIAL BEAM RADIATION THERAPY PLANNING. E.N. Dufresne and W.D. Kaplan. Joint Program in Nuclear Medicine, Harvard Medical School and Sidney Farber Cancer Institute, Boston, MA.

Internal mammary lymphoscintigraphy is an accurate method of delineating parasternal lymph nodes for determining the location of portal boundaries in patients receiving radiation therapy for carcinoma of the breast. We have developed a technique for a more precise lymph node localization which has optimized radiation therapy planning.

Patients are placed in the supine position for a subcostal intramuscular injection of from 500μCi to 1.0mCi of Tc-99m-antimony sulfide. Imaging at 3 hours following injection will demonstrate the migratory pattern of the radiocolloid and uptake by the parasternal lymph nodes. Gamma camera scintiphotos (100K) are obtained using a low energy all purpose collimator and a standard field of view camera. Anterior and cross-table lateral images with anatomical landmarks identified by radioactive markers allow accurate quantitative information regarding the precise location of the nodes with respect to the midline, depth and relationship to ribs and interspaces.

An analysis of radiation therapy treatment plans performed prior to and following lymphoscintigraphy indicated that without a radionuclide study, 39% of treatment plans underdosed one or more lymph nodes. Of importance, when using tangential beam technique, 10/90 nodes (11%) in the 2-4th interspaces were underdosed.

By employing these refined techniques for lymphoscintigraphy, we have been able to transpose scintigraphic data to simulated radiation therapy data for a more precise alignment of treatment fields.

NUCLEAR HEMATOLOGY: ASPECTS OF ISOLATING AND LABELING CELLULAR BLOOD COMPONENTS WITH 111-IN-OXINE. J.T. Bushberg, and M.L. Thakur. Yale University School of Medicine, New Haven, CT.

Indium-111 oxine has been found to be an effective agent for labeling neutrophils (PMN), lymphocytes (L), and platelets (P). The ability of the labeled cells to take part in pathological processes has been evaluated in animals and autologous 111-In-labeled PMN, L, and P has been shown to be clinically useful for detecting abscesses, lymphomas and thrombogenic lesions respectively.

Labeling with 111-In-oxine however necessitates that the cells be separated from each other and suspended in a suitable medium. Several methods for isolating cellular blood elements have been described. The functional ability of the PMN's isolated by different techniques and labeled with 111-In has been evaluated in vitro by phagocytosis. 75% PMN's for example have been shown to be viable when separated by Methyl Cellulose sedimentation compared to 45% when separated by Ficoll/Hypaque density gradient techniques. The functional ability of the cells can also be impaired by exposure to excessive radiation, oxine, or ethanol. The chemotactic ability of PMN's has been measured in vitro in a Boyden chamber in response to activated serum. Results comparable to control cells were obtained when 10 million PMN were suspended in 1 ml 0.9% NaCl and exposed to 15 μl ethanol, 62 μg oxine and 200 μCi In-111. These represent a several fold excess of all reagents used in the routine preparation. It has also been shown that blood collected in 14% ACD A solution followed by selective centrifugation yields more viable platelets than other methods reported in the literature. This paper will report on the methodology for isolating and labeling cells that we have found to be the most adequate and reliable.

EVALUATION OF HYPERSPLENISM AS A CAUSE OF THROMBOCYTOPENIA, USING GAMMA CAMERA AND COMPUTER. J. Lee, I. Kim, U.Y. Ryo, and S. Pinsky. Michael Reese Medical Center, Chicago, IL.

Hypersplenism is a well described disease, however, an accurate evaluation of hypersplenism as primary cause of thrombocytopenia in many patients is sometimes difficult, since half-life of the platelet measured by means of Cr-51-platelet is normal in these patients.

Conventional method for detection of hyper-sequestration of Cr-51 platelet uses a surface probe acquiring radioactivity count over the region of liver and spleen and calculate spleen/liver ratio. This method may cause erroneous results due to: 1) inaccurate positioning, 2) focal defects in spleen or in liver, or 3) diffuse liver disease with hepatomegaly, etc.

We developed a new method for evaluation of hypersplenism using a gamma camera, large field of view, and a computer.

Platelets were labeled with Cr-51-sodium chromate and infused into the patient. Posterior view of liver and spleen is obtained at 24, 48 and 72 hours. Immediately after the last imaging, Tc-99m-sulfur colloid is injected without moving the patient and Tc-99m image of liver and spleen is taken. All images are stored on a computer disc and Tc-99m image is used to accurately delineate liver and spleen as regions of interest. Then Cr-51 counts over the entire spleen, liver, heart and sacrum as well as average cell count are obtained using the computer.

The average count is used for calculation of spleen/liver, spleen/heart or spleen/bone marrow ratio.

The method, gamma camera imaing for evaluation of hypersplenism, is simple yet eliminate probable errors.

WEDNESDAY, JUNE 28 CALIFORNIA C ROOM
3:45 p.m.-5:00 p.m.

SUBMITTED PAPERS VII

PULMONARY/RENAL

Moderator: Jane Christie

COMPARISON OF REGIONS-OF-INTEREST IN DETERMINING KIDNEY-BACKGROUND RATIOS IN RENAL TRANSPLANTS. R. Bontemps, S. Heller, D. Bhat, and L. M. Freeman - Montefiore Hospital-Albert Einstein College of Medicine, Bronx, N.Y.

Determination of the kidney to background ratio (K/B) has been suggested as an easily performed, quantitative technique for evaluating transplant status. There are, however, many techniques used for determination of both renal and background Regions-of-Interest (ROI). The present study was undertaken to evaluate these techniques.

Each patient was examined using 3 different size rectangular renal ROI's using the first 2 studies performed on the patient as standards; a 2.5 X 2.5 cm. intrarenal ROI, an ROI as large as possible but totally intrarenal, and an ROI bordering on and including the entire kidney. For background determination the same size ROI's as used for the kidney were placed medially and 2 concentric perirenal ROI's were also evaluated. ROI's and K/B's were determined from the summation of the initial 3 minutes of each hippuran study.

The most consistent indicator of changing clinical status appears to be the extrarenal:outer perirenal ROI ratio. The renal ROI, chosen to just encompass the whole organ, makes it extremely easy and simple to duplicate for serial studies. The selected perirenal ROI is always a fixed distance outside the renal ROI thereby eliminating placement problems. Therefore, the patient is evaluated by his previous studies and not by an absolute K/B. Criteria for a clinical status change is a 10-15 percent ratio shift over a 3-4 day period.

We find that evaluating the patient in this way eliminates inter-patient physiological differences. By having a fixed size kidney and background ROI for each patient quantitation is simplified and artefacts eliminated.

ROUTINE POST-PERFUSION XE-133 VENTILATION LUNG SCANNING. T. Malekian, R. W. Myers. Herrick Memorial Hospital, Berkeley, CA.

Ventilation lung scanning (VLS) with Xe-133, while valuable, has been reported to be limited by dependence on patient cooperation and inability to be performed immediately after Tc-99m perfusion lung scanning (PLS). A modification of standard Xe-133 VLS employing a computer interfaced large field of view scintillation camera (LFOV) with parallel hole collimation has alleviated these problems in the study of 259 pts. The appropriate view for VLS was chosen on the basis of PLS. After a 30-second background image (BCG) on the Xe-133 peak, a bolus of Xe-133 gas (5-20 mCi) was administered via closed system during deep inspiration for a 10- to 30-second first breath holding image (FB). A three minute equilibration image (EQ) was followed by four to eight 30-second room-air washout images (WO). FB, EQ and WO were corrected for Tc-99m interference by subtracting BCG adjusted for collection time and assessed along with the original photographic LFOV data for adequacy of study, ventilatory dynamics plus relative size and location of defects.

Diagnostically useful VLS studies were obtained in 90% of pts. Adequacy of studies appeared to be improved with increased Xe-133 dosage. Computer processing was most helpful when Xe-133 counts were low due to suboptimal cooperation or dose less than 10 mCi.

The success of this modification in performing Xe-133 VLS after PLS in the large majority of pts. was due to: (1) higher sensitivity of the parallel hole collimated LFOV compared to diverging collimated small field cameras, (2) computer processing to correct for background (Tc-99m scatter into Xe-133 window) and improve low count images and (3) increased Xe-133 dosage.

TECHNICAL CONSIDERATIONS IN XENON-127 AND KRYPTON-81m VENTILATION STUDIES. S.L. DerMotta, J.K. Langan, and P.O. Alderson. Johns Hopkins Hospital, Baltimore, MD.

The introduction of Krypton-81m and Xenon-127 gases to clinical nuclear medicine requires the reevaluation of the technical aspects of lung ventilation studies.

Phantom studies were done with Xenon-127 using the summed peaks of 175 and 205 keV with a 140 keV collimator, a 280 keV collimator and a 400 keV collimator. With the 400 keV collimator, studies were also done including the 380 keV peak. Phantom studies demonstrated that the 280 keV collimator provided the best combination of resolution and sensitivity for combined Xenon-127-Tc-99m or Kr-81m-Tc-99m ventilation-perfusion studies. The patient studied confirmed that high resolution and sensitivity images could be obtained using the 280 keV collimator.

Since Xe-127 and Kr-81m have energies higher than Tc-99m ventilation studies, including long washouts with Xe-127 can be performed selectively after perfusion.

Results of this study show that the best approach utilizes the 280 keV collimator and allows the studies to be performed with high resolution and sensitivity and no collimator change.

MOTION ARTIFACTS IN VENTILATION-PERFUSION STUDIES: IMPORTANCE, APPEARANCE, AND PATIENT BRACE DESIGN. J.F. Wilson, B.R. Line, C.B. Vermess, and G.S. Johnston. National Institutes of Health, Bethesda, MD.

The ventilation-perfusion (V/Q) ratio is a clinically useful measure of lung disease. High values may indicate the presence of pulmonary emboli, while low values reflect lung tissue which is not oxygenating blood properly. Because the V/Q ratio depends on the regional comparison of ventilation and perfusion, it is critically important to maintain a fixed patient position during the 15-20 minute V/Q study. When motion occurs, artifacts appear in V/Q ratio images as margins of increased V/Q ratio along both the medial edge of one lung and the lateral edge of the opposite lung.

Because of anxiety, inattention, or physical incapability, patient cooperation is often insufficient to maintain stationary upright posture. Thus, to ensure properly positioned V/Q studies, a restraint system was designed which supports the patient through the shoulder girdle. This allows normal tidal respiration, because the chest is left unrestricted in lateral and outward expansion. The system is lightweight, easy to assemble, and is mounted to the camera yoke to provide stability without hindering motion of the camera head. It is constructed from aluminum tubing and sliding joints with hand tightened locking screws to permit rapid adjustment to torso size and immediate patient release.

The support system has been used routinely in over 300 patient studies and, by eliminating motion artifacts, has made V/Q ratio determinations a more accurate reflection of abnormal lung function.

BREATHING NEW LIFE INTO XENON DEVICES - A COST CUTTING ANALYSIS. M. Costanza and A. Conrad. Presbyterian-University Hospital and Magee-Womens Hospital, Pittsburgh, PA.

Cost consciousness is a major concern in most nuclear medicine laboratories. This paper presents two methods of reducing the cost of rebreathing components for xenon-133 ventilation procedures.

It is suggested in one manufacturer's catalog that xenon rebreathing units may be either disposable or reusable. If this unit is used, an inexpensive disposable bacteria filter can be attached to the exhalation component during each use so only the Y connector need be washed and sterilized. If the filter is not used, the unit, minus the soda lime absorber, must be washed and then sterilized by ethylene oxide gas. The actual number of uses per system is limited by the flexible plastic tubing's resistence to cracking during the cleaning process and/or the deterioration of the rubber valves of the Y connector parts. We have used both methods and have achieved a savings of up to 50% per unit.

This paper describes how one laboratory is succeeding in reducing the cost of rebreathing systems to a minimum without sacrificing quality care to the patients.

WEDNESDAY, JUNE 28 CALIFORNIA D ROOM
3:45 p.m.-5:15 p.m.

SUBMITTED PAPERS VIII

ADRENAL/BONE

Moderator: L. David Wells

I-131-6-BETA-IODOMETHYLNORCHOLESTEROL ADRENAL GLAND IMAGING TECHNIQUE. Pauline L. Bayer. Harrisburg Hospital, Harrisburg, PA.

The technique described is an easily performed, non-invasive procedure for imaging the adrenal glands on a gamma camera using I-131-6-Beta-Iodomethylnorcholesterol (NP-59). The anatomy and physiology of the adrenal gland will be reviewed as an introduction to the technique.

SSKI is administered orally to block thyroidal accumulation of I-131.

A 2 mCi dose of NP-59 is slowly injected intravenously. Adrenal imaging is performed on days 3, 5 and 7 post injection with the scintillation camera equipped with a medium-energy or high-energy collimator.

The day three adrenal image is performed with the patient in a seated posterior position. After completion of the adrenal exposure the procedure requires the performance of a Tc-99m DTPA renal scan. This is used to localize the kidneys and ascertain positioning parameters for obtaining the adrenal images on days 5 and 7.

The renal image and adrenal images are superimposed in order to verify the adrenal accumulation in relationship to the kidneys.

The adrenal scintiphotos obtained with NP-59 provide diagnostic studies which show the structure and state of function of the normal and diseased adrenal gland, i.e. localizing adrenal remnants after total adrenalectomy, Cushing's syndrome, aldosternoism, pheochromocytoma, adrenal tumors, etc.

(NP-59 manufactured by Nuclear Pharmacy, University of Michigan Hospital, Ann Arbor, MI)

OPTIMUM TECHNIQUE IN ADRENAL SCANNING. J. Clare, J. Thrall, W. Beierwaltes. University of Michigan Medical Center, Ann Arbor, MI.

In the seven years since the introduction of adrenal scanning, the technique has steadily evolved to increase the value of the procedure. Originally a single posterior view was obtained with the rectilinear scanner at a fixed time after the radiotracer injection. Currently, multiple views (posterior, lateral and anterior) are obtained on a gamma camera - computer system with the option of imaging at several time intervals to allow adequate background clearance. The adrenal percent uptake of tracer is calculated in a manner similar to radioiodine thyroid uptake.

Patients receive 1 mCi I-131-6β-iodomethyl-19-norcholesterol and initial imaging is performed at 3-5 days. Each view is obtained for 20 min. or a minimum of 50 k. The posterior view is obtained first. If there is significant asymmetry, an anterior view is acquired to rule out a depth related anatomical variant. If neither adrenal is visualized, a renal agent is given to confirm the proper area for imaging. The lateral view is obtained with a line source (Ba-133) on the back to determine adrenal depth for soft tissue attenuation correction in calculating the adrenal percent uptake. The computer is necessary for calculation of the radiocholesterol uptake. This is accomplished by a region interest technique and the value is used to aid in the distinction of normal from hyperplastic glands. Since adrenal activity is only a small percentage of that in the camera field of view, the computer also facilitates image optimization which is difficult a priori in analogue displays. Obtaining multiple views, calculation of percent uptakes, and computer image enhancement are significant aids in adrenal scan interpretation.

IMPROVED ADRENAL IMAGING USING MULTIPLANE TOMOGRAPHY (PHO-CON). T.C. Hammell, M.V. McCormick, and H.W. Wahner. Mayo Clinic and Foundation, Rochester, MN.

Information from adrenal images includes estimation of adrenal (or tumor) size and adrenal (or tumor) uptake.

We have successfully used the Pho-Con Multiplane Imager (Searle Radiographics Inc.) for visualization of individual adrenal glands in 25 patients (5 normal, 9 aldosteronoma, 5 aldosteronism and bilateral hyperplasia, 1 Cushing's Disease and 5 miscellaneous diseases). Adrenal scans were also performed with an LFOV camera on line with a dedicated computer (MDS) for comparison. Time was from 24 to 120 hours after 1.0-2.0 mCi of I-131-6-methyl iodocholesterol. All images were reviewed to study the anatomy in different Pho-Con planes. Uptake by liver, gallbladder, colon, spleen and small bowel was recorded at different times and in different planes. The depth of the adrenal gland was determined from the tomoplanes using a clock phantom for standardization. Using water phantoms with sources of I-131, depth could be calculated with an accuracy depending on plane distance (1.5-2.0 cm) ranging between ±0.5-2.0 cm. Adrenal depth (posterior skin to adrenal distance) ranged from 5.4 to 10.1 cm. Maximal difference noted between right and left adrenal was 2 cm. Satisfactory adrenal images were obtained 48-72 hours after the dose, significantly earlier than with I-131-19-iodocholesterol, previously used. Adrenal gland images on 2 or 3 posterior tomoplanes were superior in all instances to LFOV posterior images even if computer enhancement was used. The uptake of I-131 by individual adrenal glands was quantified using depth information from the Pho-Con images and adrenal count rate from LFOV images. The data indicate that the Pho-Con Multiplane Imager is a superior instrument for adrenal scanning.

QUALITATIVE EVALUATION OF BONE JOINT FUNCTION. A.H. Koorji and R.D. Altman. University of Miami, Miami, Fla.

Dynamic and static images of the knee joint were acquired to differentiate different stages of abnormalities of the knee joint function.

Groups of clinically normal, rheumatoid arthritis and osteoarthritis patients were scanned anteriorly using a Gamma camera and a Computer. Technetium-99m Pyrophosphate (20 mCi) was injected as a bolus. The computer acquired the dynamic flow at 15 sec/frame and serial statics at 30, 60, 120 and 180 min. intervals, for 90 sec. Markers were placed for reproducible positioning of the static images. To follow the uptake of the radionuclide, 90 sec/frame composites of the dynamic flow were grouped with the static images and played in a continuous display loop at 1 sec. intervals (Cine mode).

The normal knees, demonstrated minimal localization of radionuclide in the synovial structures in 15 min. From 15 to 180 min. the radionuclide slowly localized to the subchondral bone, clearly outlining the patella, condyles, and tibial plateau. In both of the arthritic groups, initial increase in peripheral synovial blood flow was indicated. The thickened synovium localized the radionuclide within 15 min. and distinctly in 2 hrs. Also between the 15 min. to 2 hrs. images, uptake with radionuclide was recognized adjacent to the bone, coinciding with clinically palpable effusions. The 2-3 hrs. images showed uptake in the bone, higher than in the normal group. This differentiated earlier abnormalities of flow and effusion from abnormal uptake of subchondral bone.

Combining dynamic and static imaging allows a rapid qualitative review of bone joint dynamics. It allows recognition of thickened synovium from effusion and the status of the subchondral bone in one study.

TECHNICAL ASPECTS OF JOINT IMAGING. F.Kontzen, T. Namey, M. Tobin, E.V. Dubovsky, and W.N.Tauxe. V.A. Hospital and University of Alabama, Birmingham, AL.

Joint imaging with Tc-99m-Phosphates is becoming a routine procedure in the evaluation of the arthritides. We

have adopted the following protocol and used it in 320 studies. 2-3 hours after injecting 20mCi of the labeled phosphates (methylene and etidronate diphosphonate or pyrophosphate), images were begun using Ohio Nuclear LFOV or Picker 3C cameras. Each joint had to be positioned on the surface of the collimator in precise symmetry to permit comparative analysis. 200K counts were collected over the right shoulder and time was preset for elbow, wrist and hand imaging. If the count rate was less than 50K counts, the preset time was doubled. The reference joint in the lower extremity was the knee. Special attention was paid to sacroiliac region, where 300K counts were accumulated, background subtracted and a joint to sacrum ratio calculated. This approach seems to maximize the diagnostic localization of the agent whether in synovium, joint surface, tendon, bone, or in the fluid. This survey has proven to be useful in (1) screening patients with arthralgias for the presence of inflammatory disease, (2) documenting the pattern and extent of inflammatory articular disease, (3) disclosing affected joints not clinically suspected, (4) detecting extension of disease during follow up, and (5) ruling out inflammatory disease.

"THREE PHASE BONE SCANNING" OF THE FACE AND SKULL

W.D'Souza, N.D.Greyson, A.M.Noyek, Mt. Sinai Hospital, Toronto, Ontario.

This paper describes a method and the value of bone imaging in the diagnosis of disease involving bony structures of the face and skull by using a "three phase" approach.

Of 293 referrals from the E.N.T. Clinic, 95 bone scans of the face and skull were requested. In these patients detailed studies were performed employing a gamma camera, straight hole and converging collimators and Tc-99m Methylene Diphosphonate (M.D.P) as the radiopharmaceutical.

15mCi of Tc-99m M.D.P. is injected I.V. and a dynamic blood flow and immediate static blood pool images are obtained. 2hrs later, the bony structures are viewed with the converging collimator. These 3 aspects of the study comprise the "three phase bone scan".

The flow, blood pool and delayed images may show different aspects of the disease. Hyperemia and bone changes showed in healing fractures of the mandible and maxilla, mastoiditis and primary tumors. Bone changes without hyperemia were seen in O.A. of the T.M. joints and some metastatic calvarial lesions. Soft tissue tumors were seen on the blood flow and blood pool phases only.

The three phase bone scan and the enhanced resolution obtained with the converging collimator improves diagnosis of small bone structures. The blood flow and blood pool imaging helps characterize the disease, indicates the stage of healing fractures and delineates soft tissue involvment.

Author Index: Technologist Abstracts

Technologist Scientific Exhibits

Technologist Scientific Exhibits for the SNM 25th Annual Meeting will be located in the North Exhibition Hall of the Anaheim Convention Center. Full exhibit abstracts and information on times of showings may be found in the Exhibit Program for the meeting. Exhibit titles and authors are arranged below alphabetically by last name of first author.

VALUE OF GRAVITATIONAL CHANGES IN LIVER SCAN INTERPRETATION. T.P. Amato, R. Davis, and V. Custer, St. Barnabas Medical Center, Livingston, NJ.

INTERPRETATION OF INSTANT THIN LAYER CHROMATOGRAPHY USING TWO DATA SOURCES. S.J. Ashley, Flushing Hospital and Medical Center, Flushing, NY.

MATRIX SIZE AND ITS EFFECT ON CLINICAL PROCEDURES. A. Azami, Norwalk Hospital, Norwalk, CT.

SUSTAINED INSPIRATION--PRACTICAL USE IN ROUTINE LIVER AND LUNG IMAGING. H.P. Ballough, R.H. Brait, and J.G. Saylor, Henry Ford Hospital, Detroit, MI.

PULMONARY RADIONUCLIDE ANGIOGRAPHY--AN ADDED BONUS. M. Berner, Grand View Hospital, Dayton, OH.

VENTILATION AND CLEARANCE OF THE SINUSES AND MIDDLE EARS UTILIZING XENON-133. J.H. Christie, R.G. Robinson, F.R. Kirchner, D.F. Preston, and A.V. Wegst, University of Kansas Medical Center, Kansas City, KS.

RADIOMETRIC ASSESSMENT OF BACTERIAL CONTAMINATION IN THE CLINIC. J. Coleman, R. Robinson, and E. Buddemeyer, University of Maryland Hospital, Baltimore, MD.

RADIONUCLIDE EVALUATION OF TRANSPLANT KIDNEYS. J.B. Cooper and L.J. McKenney, Parkland Memorial Hospital, Dallas, TX.

THE TECHNIQUE OF BONE IMAGING AND SOME VARIATIONS OF EPIPHYSEAL PLATE UPTAKE. P. Denhartog, The Hospital for Sick Children, Toronto, Ontario, Canada.

A TECHNIQUE FOR EVALUATION OF LE VEEN SHUNT PATENCY. L.H. Emond and A.A. Doran, New England Deaconess Hospital, Boston, MA.

GALLIUM-67 OPTIMIZATION OF IMAGING TECHNIQUES. L.H. Emond, New England Deaconess Hospital, Boston, MA, and R.F. Lavoice, Nashua Memorial Hospital, Nashua, NH.

EXERCISE RADIONUCLIDE VENTRICULOGRAMS: METHODS FOR ELIMINATION OF MOTION. G.E. Green, V.J. Wedel, and R.E. Thomas, University of Iowa Hospitals and Clinics, Iowa City, IA.

TESTICULAR PERFUSION IMAGING. P.C. Hanson and S.L. Pasternak, Penrose Hospital, Colorado Springs, CO.

HOW CRITICAL IS PATIENT POSITIONING IN NUCLEAR IMAGING? T. Hernandez, Central Community Hospital, Chicago, IL.

QUALITY CONTROL IN THE COMMUNITY HOSPITAL. N.L. Kelty, J.L. Machin, and L.E. Holder, Union Memorial Hospital, Baltimore, MD.

TECHNICAL ASPECTS OF JOINT IMAGING. F.N. Kontzen, T.C. Namey, C.D. Gilliam, M. Tobin, E.V. Dubovsky, and W.N. Tauxe, V.A. Hospital and University of Alabama, Birmingham, AL.

ABNORMAL BLOOD FLOW PATTERN WITH SUPERIOR VENA CAVAL OBSTRUCTION. M.S. McVey, M.R. Tetalman, and L.L. Nicol, Ohio State University Hospital, Columbus, OH.

INITIATION OF PROCEDURE UTILIZING NONCOMMERCIAL AVAILABLE RADIOPHARMACEUTICAL. J.K. Monk, D.F. Wolczak, T.A. Persico, and R.F. Carretta, Roseville Community Hospital, Roseville, CA.

LFOV CAMERA OPTIONS. D. Mosley, C. Doran, and K. Bujnowski, Cooper Medical Center, Camden, NJ.

ARE YOU A PROFESSIONAL? THE DECISION IS UP TO YOU. M. Osborn, University of California Medical Center, San Francisco, CA.

CAN YOUR RIA KIT MAKE THE GRADE? L.A. Proctor, D.R. Patrick, Jr., and R.G. Needham, V.A. Hospital, Oklahoma City, OK.

COMPUTER ENHANCEMENT: RELATIONSHIP TO THALLIUM-201 MYOCARDIAL PERFUSION IMAGING. K. Sheldon, D. Shames, and E. Botvinick, University of California Medical Center, San Francisco, CA.

A SIMPLIFIED, LOW COST METHOD OF EVALUATING--LEFT VENTRICULAR FUNCTION. K. Soria, N. Andrizzi, and S. Pasternak, Penrose Hospital, Colorado Springs, CO.

THE UPGRADING OF A SCINTILLATION CAMERA--A COMPARATIVE STUDY. H. Strauss, D. Faulkner, M. Garone, M. Roman, J. Giel, M.J. Zarzycki, and E. Nikawitz, V.A. Hospital, East Orange, NJ.

HISTORICAL REVIEW OF BONE IMAGING. D. Wolf, Penrose Hospital, Colorado Springs, CO.