

# Scientific Program Abstracts: Sixth Winter Meeting Technologist Section, Society of Nuclear Medicine Town and Country Hotel, San Diego, California

Friday, Feb. 9, 1979 3:30-5:50 p.m. Friars Room

## SUBMITTED PAPERS

*Moderator: John Reilley*

EXTRA-HEPATIC ABNORMALITIES DETECTED ON DYNAMIC HEPATIC SCINTIANGIOGRAPHY. Richard E. Smillie, Ramon S. Lao, Wilfrido M. Sy, and Cecilia McRae.

The usefulness of hepatic scintiangiography as an adjunct in diagnosing intrahepatic lesions has been well documented by DeNardo et al. Its value in detecting extrahepatic abnormal conditions has not been adequately emphasized.

Almost every patient referred for routine liver scan at our institution also underwent an initial hepatic scintiangiography. Three mCi <sup>99m</sup>TcSC was injected antecubitally. A 4-C camera equipped with all-purpose low energy collimator covered the abdomen, lower thorax and upper pelvis of the patient. A 16-frame transparency film, timed at 8 sec. intervals was used for recording data.

Clinically unsuspected abnormalities that were detected include: aortic and ventricular aneurysms, superior vena caval obstruction, pericardial effusion, subpulmonic loculated collection, and Paget's disease of pelvis. Ascitis and pleural effusions have also been detected. A large number of these abnormalities were not clinically suspected.

The incidental diagnosis of the above conditions is worth the time and effort in performing flow studies on routine liver scans, since there is no additional risk or discomfort to the patient.

INTERNAL MAMMARY LYMPHOSCINTIGRAPHY: A MODIFIED TECHNIQUE TO FACILITATE TANGENTIAL BEAM RADIATION THERAPY PLANNING. E.N. Dufresne\* and W.D. Kaplan, Harvard Medical School and Sidney Farber Cancer Institute.

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 1.0mCi 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. Anterior and cross-table lateral scintiphotos (100K) 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 simulate radiation therapy data for a more precise alignment of treatment fields.

A DYNAMIC HEART PHANTOM FOR SIMULATING LEFT VENTRICULAR IMAGING CHARACTERISTICS. James R. Carr, Jack R. Petty, Ayers T. Yates, Ralph W. Kyle, Robert J. Corcoran, and Robert J. Kaminski. Walter Reed Army Medical Center, Washington, DC.

The daily quality control testing procedures generally performed in Nuclear Medicine Clinics involve flood field and resolution pattern imaging. For left ventricular ejection fraction (EF) imaging we need to test the ECG trigger mechanism, the scintillation camera, and the computer system with their associated components.

Basically, the phantom consists of a motor driven piston pump. The piston displaces water, and alternately fills and empties a balloon. We use a one half horsepower AC motor that rotates at 1780 revolutions per minute (rpm). Its drive shaft is coupled to a gear box which yields a 25:1 speed reduction; this decreases the speed to a range that simulates a patient's pulse rate (71 rpm). The reducer is coupled to a drive wheel that moves the push rod and piston plunger. For the piston we use two 70 milliliter Toomey syringes driven in tandem. Their outputs are sealed to a plexiglas manifold which combines their flow into a single port. This port connects to a balloon through a short plastic tube.

The phantom has a variable EF that can be set by the operator between 30 and 100%. It also has its own "R" wave generator.

This dynamic heart phantom effectively acts as a totally external simulator of a patient undergoing left ventricular cardiac evaluation. The device was inexpensive to build and has given us additional confidence in interpreting these studies.

THE USE OF A GAMMA CAMERA WITH SYNCHRONIZED SCANNING TABLE TO QUANTITATE RIGHT-TO-LEFT SHUNT. Charles J. Armstrong, Terry F. Brown, Peter T. Kirchner, and Barry S. Brunsten. University of Chicago Hospitals and Clinics, Chicago, IL

We have developed a simple, rapid technique for right-to-left shunt quantitation that requires only a gamma camera with synchronized scanning table.

A Co-57 phantom was scanned with an LFOV camera in both static and dynamic modes. The factors which relate counts obtained in the static versus the dynamic scan mode were derived. These factors may be calculated directly from the scan speeds and format sizes for the dynamic mode.

A second phantom which simulates a patient with multiple areas of uptake was scanned using Tc-99m. From the previously derived relationships we were able to express the uptake in three areas as percent of the total dynamic scan counts.

In both phantom studies the difference between actual and calculated total counts was within  $\pm 4\%$ .

This technique was applied to two patients with known right-to-left shunts. Repeated measurements of the labeled microspheres distribution showed a high degree of reproducibility and close agreement with other means of shunt quantitation.

This simple and convenient technique for measuring regional versus whole body activity agrees well with accepted computer methods. In addition to shunt quantitation as described, it appears of potential clinical value for the detection of thyroid metastases and quantitation of colloid scans of the reticular-endothelial system.

EXERCISE RADIONUCLIDE VENTRICULOGRAMS: METHODS FOR ELIMINATION OF MOTION. Victor J. Wedel, Gerald E. Green and Raymond E. Thomas. University of Iowa Hospitals and Clinics, Iowa City, Ia.

To the Nuclear Medicine technologist, exercise

radionuclide ventriculograms present four problems not inherent in resting ventriculograms. They are:  
1) devising a method for simultaneous exercising and imaging, 2) decreasing patient chest motion, 3) stabilizing patient exercise table, and 4) eliminating motion induced by patient/camera contact.

Our department solved these problems with the following equipment: 1) bicycle ergometer for supine patient exercise, 2) harness for patient immobilization, 3) customized cart with four retractable leg locks, and 4) a smaller than usual detector head that does not interfere with patient's knees while pedaling.

Comparative illustrations are shown of cardiac images at rest and during exercise without measures to eliminate motion and during exercise with measures to eliminate motion. In addition, tests were conducted using a line source--taped to a subject's chest. Data was acquired on a Medical Data System's portable PAD computer using a Picker Dyna-4 portable camera. Processing of data was accomplished with a M.D.S. dual disc drive simultaneity computer. Profiles of the line source data and subsequent graphs were developed to demonstrate the effects of motion elimination techniques.

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A METHOD TO INDEX THYROID SIZE FOR ANGER CAMERA PINHOLE COLLIMATOR IMAGING. James R. Carr, James M. Wilk, Peter W. Blue, Robert J. Corcoran, and Robert J. Kaminski. Walter Reed Army Medical Center, Washington, DC.

Anger camera imaging of the thyroid gland using a pinhole collimator has rapidly replaced rectilinear scanning due to the marked superiority in image quality and lesion detectability. The principal drawback to the pinhole image is that there is no direct relationship between image size and actual thyroid size. We have devised a method that allows us to acquire an anterior image of the thyroid gland and simultaneously an index of its size.

Two Co-57 point sources were glued to the legs of a frog shaped finger splint which was adjusted to separate them by a distance of seven centimeters. With the device positioned on the patient's neck, the sources lie in the thyroidal plane lateral to the gland margins. Attenuation by the splint, lying between the gland and the camera, is insignificant due to its design. The pinhole collimator is positioned so that the two sources appear at the edges of the field of view on the persistence scope.

This device is used routinely on thyroid scans in our clinic. It establishes a size index that is relatively close to actual thyroid size. It is reproducible, easy to perform and requires only a single image.

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A NEW SYRINGE SHIELD DESIGN THAT IS LIGHT, EASY TO USE, AND IS RETRACTABLE. James R. Carr, Robert J. Corcoran, and Robert J. Kaminski. Walter Reed Army Medical Center, Washington, DC.

A variety of syringe shields are available from Nuclear Medicine accessory catalogs. However, they all exhibit to various degrees one or more of the following problems: 1. They are too heavy, 2. They are too bulky, 3. They tend to come loose from the syringe, 4. The technologist does not have the option of removing the shield when the needle is in the vein, 5. The shield must be removed before insertion into a dose calibrator.

We have designed a syringe shield that overcomes all of these problems. It is light in weight and compact (1/20th the weight of the others). It will not come loose from the syringe and it can be removed while the needle is in the vein. It can be retracted before insertion into a dose calibrator. Also, it is very easy to use in that it snaps on and off.

The weight was reduced three ways:  
1. This shield does not cover the entire length of the syringe barrel because we usually never draw more than

0.4 ml into the 1 ml syringes. Its length is 1.25 inches versus 3 inches for the others.

2. The shield does not wrap around the entire syringe circumference since the only person who requires shielding is the technologist. There is no requirement to shield the patient's arm from the radiation in the syringe.

3. It uses a smaller thickness of lead (1 to 2 mm Pb). We wished to further reduce the weight and at the same time reduce bulkiness and increase ease of use.

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COMPARISON OF HYGROSCOPIC, CRACKED, AND INTACT NaI(Tl) CRYSTAL SPECTRAL RESPONSE. James M. Wilk, James R. Carr, and Robert J. Kaminski. Walter Reed Army Medical Center, Washington, DC.

This investigation was undertaken to compare the spectral response of hygroscopic, cracked, and intact NaI(Tl) crystals in the CLEON Whole Body Imager which contains ten crystal/photomultiplier tube assemblies in both the upper and lower probes. After 28 months of operation it was discovered that of the 20 detectors three had hygroscopic crystals, three had cracked crystals, five exhibited a low output, and nine were operating properly. Two of the hygroscopic crystals had an elongated spectral response and of the two, one had a low output and the other had a normal output. The third hygroscopic crystal exhibited a normal spectrum. All of the cracked crystals had low output similar to one of the hygroscopic crystals, but erratic, non-symmetrical peaks about the 140 keV principal gamma energy from Tc-99m were present. The intact crystals showed a normal peak at 140 keV.

This test shows the importance of checking the spectrum produced by multicrystal/photomultiplier tube arrangements. This is particularly important in a system that subjects the crystals to physical stress such as the CLEON. Although a flood field may appear uniform, a definite, non-uniform sensitivity and response may be present, thus making use of the instrument sometimes questionable.

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IODINE-125-CORTISOL RADIOIMMUNOASSAY: Kit Performance Evaluation. R.A. Korona, W.F. Celcer, D.J. Battaqlia. Oscar B. Hunter Memorial Laboratory, Washington, D.C.

Four of the available I-125 cortisol RIA kits (Beckman, NEN, Clinical Assays, Diagnostic Products) were evaluated for accuracy, sensitivity dose variance, and serum interference.

Utilizing control sera spiked with 10, 30, and 80ug% of hydrocortisone, recovery varies in one assay from 70%, 105%, and 91% for the three concentrations, while another kit shows consistent recoveries of 113%, 114%, and 115% respectively. The least detectable dose determined by serial dilution varies from 0.6-1.7ug% from kit to kit.

One kit with an antibody coated tube system shows abnormally high C.V. values, especially in the 0-5ug% range (intra-assay ave. C.V.=44.6%), as well as doubling of the mean values of the control sera compared to values obtained from other kits; however, patient values are consistent with those from the other kits. Another assay shows loss of sensitivity at the low and high range and a corresponding loss in the recovery study. Parallelism with the standard curve by serial dilution is not conclusive in the assay with high C.V. values other assays evaluated show good parallelism.

The ease of reagent and sample preparation along with consistent recovery results from the low to high value range gives the Beckman kit an advantage over the other kits evaluated. The high C.V. values (NEN kit) were caused by a manufacturing problem with the antibody coated tubes.

## Scientific Exhibits

*Scientific exhibits were also presented during the Sixth Winter Meeting.  
Exhibit titles and authors are arranged below alphabetically by the  
last name of the first author.*

COMPUTER ASSISTED RADIOPHARMACEUTICAL QUALITY CONTROL. Patrick J. Barrett, Ross Compagner, Elizabeth Heystek. Bronson Methodist Hospital, Kalamazoo, MI

POST-OPERATIVE CHOLESCINTIGRAPHY OF THE BILIARY ATRESIA PATIENT USING Tc-99m PIPIDA. Dorothy J. Coldcleugh, John H. Miller, and Frank Sinatra. Childrens Hospital of Los Angeles, Los Angeles, CA.

COMPUTING INTRINSIC RESOLUTION FROM SYSTEM RESOLUTION FOR THE ANGER CAMERA. J. H. Dudek and E. L. Bialas. Searle Diagnostics Inc., Des Plaines, IL.

CLINICAL APPLICATION OF THE BILATERAL COLLIMATOR IN CARDIAC IMAGING. Ricky Fahrenkrug, Terry Garner, and John Carpenter. Mount Sinai Medical Center, Milwaukee, WI.

TESTICULAR PERFUSION IMAGING. Paul C. Hanson. Penrose Hospital, Colorado Springs, CO.

EVALUATION OF THYROID METASTASES UTILIZING IODINE-123 TOTAL BODY IMAGING. Debra P. Reynolds, Mary P. Enser, Joan M. Bekehrmes. Penrose Hospital, Colorado Springs, Co.

THE UTILITY OF A HIGH MAGNIFICATION COLLIMATOR IN PEDIATRIC BONE IMAGING. Nancy A. Thompson. Milwaukee Children's Hospital, Milwaukee, Wis.

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