

ABSTRACTS OF CURRENT LITERATURE

Magnetic Resonance Imaging: Effects of Magnetic Field Strength. L. E. Crooks, M. Arakawa, J. Hoenninger, B. McCarten, J. Watts, L. Kaufman; University of California and the Radiologic Imaging Laboratory, San Francisco, CA. *Radiology* 151:127-133, 1984

As field strength increases, the number of nuclei available for resonance and the amount of energy radiated in each transition increases. This advantage is offset, however, by an increase in noise in the radiofrequency (RF) coil and the subject. The signal-to-noise ratio (SN) is also influenced by changes in the relaxation times, T1 and T2. From the standpoint of SN, longer T2 and shorter T1 times give larger values. In general terms both T1 and T2 decrease as field strength increases. Still another consideration in image quality is spatial resolution. It is independent of main magnetic field but depends on the strength of the field gradient and on encoding and sampling times. Improvements in SN may have some effect on imaging time, but there are considerations that establish minimum values. In summary, the relationship between SN and field strength is very complex, involving body organ and volume considerations as well as the conductivity of the tissues within the sensitive volume of the antenna and the relaxation times. A 100-cm bore super-conducting magnet was used to generate field strengths ranging from 1.42 to 4.72 kgauss. Three different antennas, matched to the head, pelvis, and abdomen, were used. Signal intensities were measured using operator-defined regions of interest. Noise levels were determined by measuring the signal intensity in air, outside of the body. As field strength was increased, T2 values remained essentially constant except at the lowest value. By contrast, T1 values increased, which reduced contrast for a fixed-pulse repetition rate. This finding indicates that relaxation time changes partially offset improvements in SN obtained by increasing the magnetic field strength. Computed SN ratios improved markedly up to field strengths of around 3.0 kgauss, but beyond that value the gains were more modest. Expert radiologists viewed three sections and rated them according to SN, anatomic resolution, and overall image quality. They preferred head images obtained at intermediate field strengths even though the SN values were not maximized. In the body and pelvis, they preferred the images generated with the highest magnetic field. This choice may have been due to improvement in fat-to-muscle contrast. For systems similar to the one used in this study, these results indicate that field strengths of 3.0 to 4.0 kgauss provide most if not all of the gains possible.

Some Particular Scintigraphic Features of Craniosynostosis. G. De Rossi, C. Focacci, C. di Rocco, F. Velardi; Università Cattolica del Sacro Cuore Roma, I-00168 Rome, Italy. *NucCompact* 15:4-5, 1984

Seventy patients with cranial malformations underwent bone scintigraphy (0.2 mCi/kg body weight, Tc-99m MDP). Normal sutural uptake was observed in most cases. Decreased or absent radiotracer accumulation was found in patients suffering from microcephaly. The same pattern was seen in those with craniosynostosis. The decreased radionuclide accumulation in the pathologic sutures was frequently associated with increased Tc-99m MDP uptake in normal sutures. In some cases a significantly high

radionuclide activity was observed even in synostosed sutures. Bone samples were analyzed in these patients, and a reduced radiotracer concentration was found, whereas the bone thickness was increased.

Hemisphere Cross Talk and Signal Overlapping in Bilateral Regional Cerebral Blood Flow Measurements using Xenon 133. M. Bolmsjö; University of Lund, Lund, Sweden. *Eur J Nucl Med* 9:1-5, 1984

The accuracy of bilateral regional cerebral blood flow (rCBF) measurements with Xe-133 was investigated using the depth-response performance data of an rCBF detector and a computer model of the human brain. Four different cerebral blood flows were simulated (0.5, 0.6, 1.0, 1.2 ml/min/g), and the xenon concentrations in the voxels were estimated using the formula developed by Kety (*Meth Med Res* 8:223-236, 1960). The calculated xenon concentrations were multiplied with the appropriate detector coefficients and summed to give the total detector signals. The biexponential deconvolution procedure, evaluated by Obrist et al. (*Stroke* 6:245-256, 1975), was applied to the data for rCBF calculations. These calculations were performed for a small and large brain model and for different collimators. The author obtained a hemisphere signal cross talk between 22% and 29%. The total elimination of xenon from the gray matter had no significant effect on the cross talk, since the white matter hemisphere cross talk was in the order of 25-30%. Flow differences between the hemispheres did influence the rCBF calculations. The estimation error for the regional gray matter flow was 9-42% when flow asymmetries existed. A higher spatial resolution was obtained using a fine-hole collimator, but its low sensitivity deteriorated the accuracy of the rCBF estimations.

Intracoronary Thallium-201 Scintigraphy as an Immediate Predictor of Salvaged Myocardium following Intracoronary Lysis. H. J. Krebber, J. Schofer, D. Mathey, R. Montz, P. Kalmar, G. Rodewald; Univ. Hamburg, Dept. Cardiovasc Surg., Hamburg, W. Germany. *J Thor Cardiovasc Surg* 87:27-34, 1984

The objective of coronary artery bypass grafting (CABG) following intracoronary lysis is to prevent reinfarction and further loss of viable myocardium. The operation is indicated only in patients who have viable myocardium remaining in the reperfused area. To assess the value of an intracoronary sequential Tl-201 scintigram as a reliable indicator of the salvageability of myocardium following intracoronary lysis, 23 patients underwent the sequential Tl-201 studies before and after lysis. All these patients had had symptoms of acute myocardial infarction (MI) for less than 3 hr. These 23 patients also underwent left ventricular angiography. Initial Tl-201 (LAO and RAO) images were obtained after intracoronary injection of 0.3 to 0.5 mCi Tl-201 into both coronary arteries. Sequential images (after lysis) were obtained after injection of 0.3-0.5 mCi Tl-201 into the infarcted vessel. Results of thrombolysis and Tl-201 scintigraphy was divided into three groups: 1. unsuccessful thrombolysis (N = 5); 2. successful thrombolysis—no or poor thallium uptake (N = 6), and 3. successful thrombolysis—good thallium uptake (N = 12). Those patients in Group 3 were considered ideal candidates for CABG.

The mean regional ejection fraction of Group 1 before and after thrombolysis had been changed from 19.9% to 16.5%, 19.1% to 17.3% in Group 2, and 20.1% to 51% in Group 3. The authors concluded that intracoronary Tl-201 scintigraphy is a valuable predictor of the salvageability of myocardium immediately following intracoronary lysis and the most valuable tool in assessing those patients suitable for early coronary revascularization.

Left Ventricular Function in Patients with Coronary Heart Disease in the Presence or Absence of Angina Pectoris During Exercise Radionuclide Ventriculography. A. S. Iskandrian, A. H. Hakki; Hahnemann University Hospital, Philadelphia, PA. *Am J Cardiol* 53:1239-1243, 1984

The implications of asymptomatic episodes of ischemia in patients with coronary artery disease (CAD) are not well known, and this study was undertaken to compare left-ventricular (LV) function in patients in whom chest pain developed during exercise testing with those not developing chest pain during the test. First-pass radionuclide ventriculograms were obtained at rest and at peak upright exercise using a multicrystal gamma camera system in 74 patients with angiographically proven CAD referred for evaluation of chest pain syndromes. The patients were divided into two groups: Group I, angina pectoris during exercise (31) and Group II, those terminating exercise because of excessive fatigue, dyspnea, or leg weakness (43). Resting parameters of LV function were comparable in the two groups, as were the exercise heart rate, exercise systolic blood pressure, exercise duration, and exercise work load. No significant difference was found in the incidence of positive exercise ECG (48% in Group I, 40% in Group II). The two groups differed significantly in the response to exercise in EF ($p < 0.01$), end-systolic volume ($p < 0.005$), systolic blood pressure-end-systolic volume ratio ($p < 0.05$), and wall-motion score ($p < 0.05$), with worse LV functions in Group I. Abnormal EF response to exercise was seen in 14 of 15 Group I patients with abnormal exercise ECG compared with 11 of 17 in Group II ($p < 0.05$). The occurrence of positive exercise ECG or abnormal exercise LV function in most of the patients in Group II indicates the presence of silent ischemia during the test, and such studies may prove useful in defining the prognosis in these patients.

Prospectively Gated Cardiac Computed Tomography. S. C. Moore, P. F. Judy, J. D. Garnic, G. X. Kambic, F. Margosian, W. McCroskey, F. Foote; Harvard Medical School, Boston, MA and Technicare Corporation, Solon, OH. *Med Phys* 10:846-855, 1983

There are two strategies for obtaining a complete set of transmission computed tomographic (TCT) projection data for one phase of the cardiac cycle. Either all the data may be acquired during a fraction of the cardiac cycle, or gating may be used to combine the data from a number of cycles, as in nuclear medicine. This paper reports the investigation of the use of a prospective gating method for obtaining the projection data. With this method, a computer program uses past ECG periods and an assessment of current data available to predict when to initiate the next scan in a series, so that the source will fill gaps in the gated projection data. By computer simulation, it was determined that this method is generally more than twice as efficient as arbitrarily starting the acquisition of subsequent scans in a series. Image noise was reduced by averaging together any redundant projection data, and a temporal smoothing technique was used to suppress reconstruction artifacts due to sorting inconsistent projection data. The system was tested with dogs and produced cross-sectional images of all phases of the cardiac cycle. It was found that eight to ten scans per series were sufficient to obtain reproducible images of each transverse section at end diastole and end systole. A problem with application of this technique to human patients was noted in the form of patient motion, especially respiration, making the data from different cardiac cycles inconsistent.

Effects on Ventricular Function of Disopyramide, Procainamide, and Quinidine as Determined by Radionuclide Angiography. G. Wisenberg, A. G. Zawadowski, V. A. Gebhardt, E. S. Prato, M. D. Goddard, P. M. Nichol, P. A. Reichtzer, B. Gryfe-Becker; Univ. of Western Ontario, London, Ontario. *J Cardiol* 53:1292-1307, 1984

The effects of the three most commonly used antiarrhythmic agents—quinidine, procainamide, and disopyramide—on left-ventricular (LV) function was assessed using radionuclide angiography in 17 patients, each of whom received all three drugs in random sequence in a triple crossover design. The patients ranged in age from 34-73 yr (mean 57 ± 11). There were 11 men and six women; five had one or more previous myocardial infarctions, six had evidence of coronary artery disease without infarction, and nine were in clinical heart failure at the time of the study. All demonstrated serious ventricular ectopic activity on 24 hr ambulatory Holter monitoring. The majority had routine gated equilibrium radionuclide angiograms using in vivo labeled red cells, although a few required direct data acquisition with reformatting to determine the ejection fraction (EF). Control studies were obtained before initiation of therapy with repeat EF and repeat 24 hr ambulatory Holter monitoring after therapeutic drug levels were obtained. An 85% reduction in ventricular ectopic beats was found in 10 of 17 patients on disopyramide compared with 5 of 17 with procainamide therapy ($p < 0.05$) and 9 of 17 during quinidine therapy ($p < 0.05$). No statistically significant differences were found in resting EF or in the EF response to exercise among the three drugs or between any drug and the control state, although disopyramide produced the lowest mean EF at rest and during exercise. All patients in this study had only mild or moderate LV dysfunction with the lowest resting control EF 41%. Caution should be observed with all three agents, especially in patients with severe LV impairment.

Sequential Radionuclide Angiographic Assessment of Left and Right Ventricular Performance and Quantitative Thallium-201 Scintigraphy following Acute Myocardial Infarction. G. S. Hirsowitz, J. B. Lakier, D. S. Marks, T. G. Lee, A. D. Goldberg, S. Goldstein; Henry Ford Hospital, Detroit, MI. *Am Heart J* 107:934-939, 1984

The study included 20 patients with sustaining first acute myocardial infarction (AMI) consisting of typical symptoms of severe chest discomfort, ECG changes, rise and fall of serum creatine kinase diagnostic of MI. Tc-99m labeled red blood cell gated study and quantitative Tl-201 scintigraphy were performed. The left and right ventricular ejection fraction (LVEF, RVEF) and percentage of abnormally contracting regions (% ACR) were obtained from the gated study. Quantitative Tl-201 perfusion area was expressed as a percentage of the total 28 regions of interest areas. All studies were obtained 24 to 36 hr (means 29.4 hr) after admission. Anterior infarction had greater impairment of LV performance in terms of EF and %ACR in addition to large Tl-201 defects. At the time of the late study, evidence of Tl-201 perfusion of infarcted area was seen in 14 of 20 patients, five of whom demonstrated improvement of regional wall motion. The remaining patients in the reperfused group and all of the patients in the nonperfused group failed to show evidence of LV functional improvement. This study demonstrated that following first AMI, sequential quantitative Tl-201 scintigraphy reperfusion occurs, and it also indicates that reperfusion as demonstrated by Tl-201 scintigraphy occurs spontaneously in 70% of patients with AMI and that only in those patients with established reperfusion is there any potential for improvement in LV performance.

Absolute Left Ventricular Volume by an Iterative Build-Up Factor Analysis of Gated Radionuclide Images. J. A. Siegel, A. H. Maurer, R. K. Wu, K. M. Blasius, B. S. Denenberg, A. K. Gash, B. A. Caro-

bello, J. F. Spann, L. S. Malmud; Temple University Hospital, Philadelphia, PA. *Radiology* 151:477-481, 1984

Absolute left-ventricular volumes are an important parameter in characterizing cardiac function. The technique described in this article calculates cardiac volumes by making use of the build-up factor, which reflects the increases in observed count rate that occur due to the presence of scatter. Thus geometrical assumptions concerning shape, as involved in contrast ventriculography, are avoided. Thirty-four consecutive patients were studied in this investigation and received contrast ventriculography within 24 hr of the nuclear medicine study. The patient's red blood cells were labeled in vivo with 20 mCi of Tc-99m. Imaging consisted of a first-pass right posterior oblique (RPO) dynamic study on the prone patient. Following the first-pass study, a gated RPO study was performed. The patient was then moved to the supine position for a left anterior oblique (LAO) gated study. After these imaging procedures, a blood sample was withdrawn and counted, and the thickness of the patient was measured. End-diastolic and end-systolic counts were obtained from regions of interest (ROIs) generated by a semi-automated computer program and were corrected for background. Values of the build-up factor as a function of depth were determined using a tissue-equivalent phantom. These data were used in an iterative procedure to calculate the end-diastolic volume. The Dodge area-length formula was used to process the data from the contrast ventriculograms. The iterative build-up factor method gave less than a 4% error. When this method was compared with the area-length method, the correlation coefficient was 0.97. No significant intraobserver difference was noted in the selection of RPO count rates for ten randomly selected patients. Enlargement of the left atrium makes all count-based volume determinations difficult. This method can be performed as a part of routine gated blood-pool imaging.

Ventricular Postextrasystolic Potentiation in the Dog: A Study Using List Mode Radionuclide Ventriculography. J. F. Polak, P. J. Podrid, B. Lown, and B. L. Holman; Brigham and Women's Hospital and Harvard Medical School, Boston, MA. *Invest Radiol* 18:530-535, 1983

This study attempts to assess the effects of induced ventricular extrasystoles in dogs on the first and second postextrasystolic sinus beats (PESB). Ventricular extrasystoles were induced 150 msec after QRS complex with electrodes located in two to five ventricular sites. Data were acquired by the list mode technique with a nuclear medicine computer system, and special software was used to isolate and analyze the first and second PESB. There were marked increases in stroke volume ($+51.6 \pm 6.8\%$); first PESB compared with control sinus beat ($p < 0.001$) and left ventricular ejection fraction ($41.5 \pm 4\%$ vs. $56.8 \pm 3.9\%$); control beat vs. first PESB ($p < 0.001$). Concomitant decreases in end-systolic volumes ($-16.2 \pm 5.2\%$); first PESB vs. control beat ($p < 0.001$) confirmed the increase inotropy seen during these beats. During the second PESB, there was a slight increase in the ejection fraction ($+1.6 \pm 1.6\%$); second PESB vs. control beat ($p < 0.01$) despite a small decrease in end-diastolic volume ($-2.8 \pm 2.5\%$); second PESB vs. control beat ($p < 0.01$). In the dog, postextrasystolic potentiation affects primarily the first PESB and produces only a slight inotropy of the following beat. List mode radionuclide ventriculography is a useful and reproducible method for assessing changes in ventricular function following ventricular ectopics that have a fixed relation to the preceding QRS complex. Special software is required, however, that is capable of extracting and analyzing data from each logically distinct class of beats following induced extrasystoles.

Measurement of Free Thyroxine and Free Triiodothyronine in Asymptomatic Subjects with High Concentrations of Serum TSH and a History of Radiiodine Therapy. J. A. Franklyn, M. C. Shep-

pard, D. B. Ramsden, R. Hoffenberg; University of Birmingham, Birmingham, England. *Clin Endocrinol* 20:527-530, 1984

These authors compared: (a) 17 patients with a history of radioiodine treatment for thyrotoxicosis, presently without any clinical features of hypothyroidism but with a high serum thyroid stimulating hormone (TSH, >7.5 mU/l) level; with (b) 25 age- and sex-matched healthy control subjects. Serum TSH, total thyroxine (T_4), and total triiodothyronine (T_3) were measured by in-house radioimmunoassay (RIA). Thyroxine binding globulin (TBG) was measured by rocket immunoelectrophoresis, and free T_4 (FT $_4$) and free T_3 (FT $_3$) were measured by commercially available kit. Total T_4 in the patients at a median 85 nmol/l (range 72-102) was not significantly lower than the 88 nmol/l (range 67-122) in controls and in all subjects was within the normal range (63-128 nmol/l). Total T_3 in patients at 1.7 nmol/l (range 1.3-2.2) was not lower than the 1.7 nmol/l (range 1.4-2.6) in the controls, and in all subjects was within the normal range (1.25-2.65 nmol/l). Serum TBG in the patients at 13.6 mg/l (range 10.1-16.5) was higher than the 10.4 mg/l (range 9.3-14.5). Value in the controls and in all subjects was within the normal range (6.2-16.6 mg/l). The T_4 /TBG ratio in patients (median 5.7, range 4.8-8.1) was lower than that in controls (7.8, 5.1-11.6), but in all cases was within the normal range (4.8-13.4). Concentrations of FT $_4$ and FT $_3$ were lower in patients than in controls, with nine patients having subnormal FT $_4$ (NR 9.5-24.5 pmol/l) and seven patients having subnormal FT $_3$ (NR 3.8-10.4 pmol/l). All subjects with FT $_3$ below normal also had reduced FT $_4$, but two subjects had low FT $_4$ alone. Free T_4 and free T_3 in the patients were also lower than corresponding measurements in a second euthyroid control group matched biochemically with the patients for T_4 /TBG ratio. These authors conclude that levels of free thyroid hormones appear to be a more sensitive index of thyroid failure than measurement of total hormones, T_4 /TBG ratio, or the clinical state in the subjects studied.

Comparison of Gallium-67 Scanning, Bronchoalveolar Lavage, and Serum Angiotensin-Converting Enzyme Levels in Pulmonary Sarcoidosis—Predicting Response to Therapy. R. P. Baughman, M. Fernandez, C. H. Bosken, J. Mantil, P. Hurtubise; Univ of Cincinnati Medical Center, Cincinnati, OH. *Am Rev Respir Dis* 129: 676-681, 1984

These authors evaluated 16 patients (ten female), mean age 31 yr (range 23-54), of whom 13 were black. All had biopsy-confirmed, active pulmonary sarcoidosis. Each patient underwent bronchoalveolar lavage (BAL), gallium-67 imaging, and/or serum angiotensin-converting enzyme (ACE) level determination before therapy with 40 mg prednisone daily. Gallium-67 uptake in the lungs was measured and expressed as a percent of radioactivity in the injected dose. Thirteen of the patients having Ga-67 study showed lung uptake of more than 6% of dose, the upper limit in patients without pulmonary disease (the observed range of lung uptake was 5-17.5%). Pulmonary vital capacity measured before and after 2 mo of corticosteroid therapy increased in all subjects as a result of therapy. The improvement in vital capacity (from 40-1,030 ml) was directly related to pretherapy lung uptake of Ga-67 (correlation coefficient $r = +0.95$, $p < 0.001$). Fourteen of the 15 patients undergoing BAL had more than 10% lymphocytes in BAL fluid (mean 39%; range 10-73%). A maximum of 10% lymphocytes is found in BAL fluid in patients without interstitial lung disease. Improvement in vital capacity was not related to lymphocytic concentration in BAL fluid. In 12 patients, albumin concentration in lavage fluid was measured and found to be directly related to the improvement in vital capacity ($r = +0.76$, $p < 0.01$), but improvement in vital capacity was not related to pretreatment ACE level. These authors conclude that the quantitative Ga-67 technique is a good predictor of response to steroid therapy in patients with active sarcoidosis.

Gallium-67 Scintigraphy, Bronchoalveolar Lavage, and Pathologic Changes in Patients with Pulmonary Sarcoidosis. S. Abe, M. Munakata, M. Nishimura, V. Tsuneta, T. Terai, I. Nakano, Y. Ohsaki, Y. Kawakami; Hokkaido Univ. School of Medicine, Hokkaido, Japan. *Chest* 85:650-655, 1984

The relationship between the findings obtained by bronchoalveolar lavage, Ga-67 scintigraphy, and serum angiotensin-converting enzyme levels as compared with lung biopsy was studied in 26 untreated patients (14 women, 12 men; age 18-60 yr, mean 34) with pulmonary sarcoidosis. All studies were carried out within a period of 2 wk. Biopsy results showed that in the 14 patients with radiographic Stage I disease, alveolitis was seen more frequently than granuloma (6 of 14 compared with 3 of 14, $p < 0.05$). In Stage 2 disease, granulomas were more frequent 8 of 10 compared with 5 of 10, $p < 0.01$). In Stage 1 disease, bilateral hilar-positive Ga-67 scintigraphy was seen in 93% and in 100% of those with Stage 2 disease. Ga-67 uptake in lung parenchyma was seen in all eight patients having granulomas by biopsy, and was significantly more frequent ($p < 0.01$) in Stage 2 disease. Enzyme levels above 50 μ /ml were seen in 69% of patients with either alveolitis or granulomas, but there was no significant difference between levels of Ga-67 uptake and serum enzyme levels ($p > 0.05$). The percentage of lymphocytes in the bronchoalveolar lavage fluid was significantly greater in those patients with high-intensity alveolitis but had no relationship to intensity of Ga-67 uptake. It is concluded that Ga-67 uptake in the pulmonary parenchyma in sarcoidosis reflects mainly the presence of granuloma whereas the lymphocyte count in the bronchoalveolar lavage fluid reflects the intensity of alveolitis.

A Comparison between 180° and 360° Data Reconstruction in Single Photon Emission Computed Tomography of the Liver and Spleen. R. J. Ott, M. A. Flower, O. Khan, T. Kalirai, S. Webb, M. O. Leach, V. R. McCready; Institute of Cancer Research and Nuclear Medicine, Royal Marsden Hospital, Surrey, United Kingdom. *Br J Rad* 56:931-937, 1983

The authors compare 180° with 360° reconstructions of a liver phantom and of liver-spleen images of ten patients. They use a GE400T rotating scintillation camera and Star computer system. Although both types of reconstruction yielded images of fairly comparable quality, the 180° reconstructions provided significantly enhanced contrast, which they have evaluated quantitatively. The improvement was observed whether or not correction was made for photon attenuation. The authors recommend data acquisition and reconstruction in 360° routinely. If a lesion is suspected, they suggest 180° reconstruction with the arc centered at a line through the lesion. Only a few slices at the region of interest require such added reconstruction, which adds little to the processing time.

Nephrosonography and Renal Scintigraphy in Evaluation of Newborn with Renomegaly. R. L. Chevalier, F. Campbell, A. Norman, A. G. Brenbridge; Univ. of Virginia School of Medicine, Charlottesville, VA. *Urology* 24:96-103, 1984

Prompt diagnosis of renomegaly in the newborn is necessary for appropriate medical or surgical management to insure rapid and maximal recovery of renal function. Significant hazards of injection of radiopaque media in newborns and infants include induction of hyperosmolarity, severe acidosis, and direct renal toxicity. To investigate both renal structure and function without resorting to iodinated contrast infusions, combined ultrasonography (US) and scintigraphy were used to evaluate 17 newborns with renomegaly and 6 infants with cystic renal abnormalities detected in utero. Both static and real-time US were performed on all patients. Following US, at least one renal scintigram was performed in each patient. Radiopharmaceutical agents used were Tc-99m DTPA (nine patients), glucoheptonate (nine patients), and I-131 hippu-

rate (six patients). Delayed images were obtained between 4-24 hr on patients with poor renal visualization within the first 30 min. Delayed clearance of tracer from the collecting system and the site of obstruction was diagnosed as obstructive uropathy. A large nonfunctioning kidney was suggested by the presence of an area of reduced activity in the renal bed surrounded by high uptake in adjacent tissue. This pattern may be seen in severe hydronephrosis or multicystic kidney. In 18 patients, intravenous pyelography (IVP) and/or voiding cystourethrography (VCUG) were performed subsequently. Ten patients were found to have ureteropelvic junction or high ureteral obstruction, three had posterior urethral valves, three had multicystic dysplastic kidney, and one each had vesicoureteral reflux, ureterocele, thrombosis, unilateral renal agenesis, congenital nephrotic syndrome, and acute renal failure due to ischemia. US and scintigraphy provided the major diagnosis in 48% and 30% of the patients, respectively; the combined studies provided the major diagnosis in 87%. Intravenous pyelography or VCUG was less informative than combined US and scintigraphy. The authors concluded that the initial evaluation of the newborn with renomegaly should include US followed by scintigraphy, which yielded the diagnosis in nearly 90% of cases without subjecting the infants to the risks of contrast media or higher doses of radiation.

Whole Body Distribution of Radioactivity after Intraperitoneal Administration of ³²P Colloids. E. Boye, M. W. Lindegaard, E. Paus, A. Skretting M. Davy, and E. Jakobsen; The Norwegian Radium Hospital, Montebello, Oslo 3, Norway. *Br J Rad* 57:395-402, 1984

The distribution of P-32 was studied in 21 Stage I or II ovarian carcinomas following the intraperitoneal administration of P-32 labeled colloids. Imaging of the Bremsstrahlung was performed with a Siemens ZLC gamma camera using a parallel-hole medium energy collimator. With multiple analyzer windows the spectrum was acquired between 40 and 180 keV. Whole blood activity was evaluated with liquid scintillation counting and chromatography. Bone marrow aspirates from the sternum were processed and measured in the liquid scintillation counter. In order to obtain a reasonably uniform distribution through the peritoneal cavity, it was essential to infuse the tracer through a catheter with multiple holes near the end, at the upper medial abdomen. There was irregular activity often seen in the thorax. P-32 activity reaches a peak in the blood at about 6 days and results from physiologic degradation of the particles into forms of low molecular weight. Therapeutic doses ranged from 7-10 mCi (260 to 370 MBq). Surface doses to the serosal lining from 10 mCi (370 MBq) deliver 1200-2700 rads (12-27 Gy), depending on the thickness of the layer (0.1-1 mm). The dose delivered to blood averaged 1.2 rad (0.012 Gy). Bone marrow activity measured 2-5 times that of blood. It was concluded that no significant level of deleterious activity was accumulated in organs outside the peritoneum.

Indium-111 WBC Scan in Local and Systemic Fungal Infections. M. K. Haseman, K. Blake, I. R. McDougall; Stanford University Med. Ctr., Stanford, CA. *Arch Intern Med* 144:1462-1463, 1984

Although In-111 WBC scintigraphy in detecting acute infection has been well recognized, there are no reports of the use of In-111 WBC study for detection of fungus infections. The authors described two patients—one with a systemic fungal infection (mucormycosis) and one with a local fungus infection (aspergillosis)—who had strikingly abnormal In-111 WBC images. In the patient with mucormycosis, the image showed abnormally high uptake in lungs, mediastinum, kidneys, and numerous lesions in soft tissue. There was a focal, intense uptake in the left sphenoid sinus region in the patient with aspergillosis. The authors stressed that an abnormal WBC study does not automatically indicate bacterial infection. Fungus disease should still be considered,

particularly in patients with impaired immunologic status such as in the two patients who had undergone chemotherapy for acute lymphoblastic leukemia and for lymphocytic lymphoma.

The Spatial Resolution of a Rotating Gamma Camera Tomographic Facility. S. Webb, M. A. Flower, R. J. Ott, M. O. Leach, R. Inamdar; Royal Marsden Hospital and Institute for Cancer Research, Surrey, United Kingdom. *Br J Rad* 56:939-944, 1983

The authors compared the measured spatial resolution of a rotating scintillation camera SPECT system with the theoretical performance of a number of frequency filters. They used a General Electric 400T and Star camera-computer to image a 1 mm diameter line source containing Tc-99m, both in air and within a 20 cm diameter cylindrical water phantom. The eight reconstruction filters: the Hanning and seven variations of the Butterworth for both 64 and 128 view data. In most cases the camera performance limits the achievable spatial resolution, and the choice of filter is often a trade-off between noise and spatial resolution. However, because of the inherent limitation of the imaging system, one can afford to accept considerable noise suppression in the selected filter. The presence of the water phantom caused no significant loss of resolution. In an appendix the authors present a mathematical discussion of the theoretical resolution from four filter functions: General rectangular window, Hanning and generalized Hanning, Parzen, and Butterworth.

Gamma Camera Energy Windows for Tc-99m Bone Scintigraphy: Effect of Asymmetry on Contrast Resolution. B. D. Collier, D. W. Palmer, J. Knobel, A. T. Isitman, R. S. Hellmaw, J. S. Zielonka; Medical College of Wisconsin, Milwaukee, WI. *Radiology* 151: 495-497, 1984

Elevation of the pulse-height analyzer baseline can be used to decrease the number of scattered photons present in an image. However, in some scintillation cameras the maneuver produces an unacceptable loss of field uniformity. In this study, symmetrical (126-154 keV) and asymmetrical (high, 135-154 keV) analyzer windows were used in bone scintigraphy to evaluate the effects of off-peak imaging in a state-of-the-art camera with automatic tuning. Up to ± 10 keV changes in the window settings produced a change in useful field-of-view uniformity from 3.7 to 4.5%. Three nuclear medicine physicians independently evaluated 500k count anterior views of the abdomen and lumbar spine on the basis of clarity and contrast resolution of the lumbar vertebrae. In addition, bone-to-soft tissue ratios were calculated from computer images using regions-of-interest (ROIs) set at L4 and in the soft tissue below the kidneys. In 29 of the 33 examinations the ratio was higher with the asymmetric window with mean bone-to-soft tissue

ratios of 5.23 and 4.66 for the asymmetric and symmetric windows, respectively. For the clinical studies, images taken with the asymmetric windows were preferred 69% of the time, for the symmetric 7% of the time; there was no preference in the remainder. In no case was the symmetric window selected by all three observers of the same study. These results demonstrate the efficacy of asymmetric windows despite the increased imaging time. These results were for a particular camera, however, and cannot necessarily be generalized to all cameras.

Use of Specific Antibody for Rapid Clearance of Circulating Blood Background from Radiolabeled Tumor Imaging Proteins. D. Goodwin, C. Meares, C. Diamanti, M. McCall, C. Lai, F. Torti, M. McTigue, B. Martin; Veterans Administration Medical Center, Stanford University Medical Center, Stanford, CA. *Eur J Nucl Med* 9:209-215, 1984

BALB/c mice with subcutaneous implanted KHJJ adenocarcinoma were used for the study. Eighteen to 24 hr after injection of 10 μ Ci of In-111-transferrin or In-111-IgG, the animals were killed. Samples of blood, tumor, lung, liver, spleen, and kidney were obtained and assayed for radionuclide activity. Antitransferrin or anti-IgG antibodies were injected 2 hr or 18 hr after the radionuclide application. The In-111-transferrin blood level was 1:6 and the tumor concentration 1:3 of the corresponding values in the control group if anti-transferrin antibodies were injected 2 hr after radiotracer application. A significant improvement of the tumor-to-background ratio was obtained when the antibodies were injected 18 hr later. The In-111-transferrin blood level decreased to 1:48 of the control values, and the concentration in the tumor tissue was not significantly different from that of the control levels. As a result, the tumor-to-blood ratio increased from 1.4:1 to 78:1. Similar results were obtained for In-111-IgG and anti-IgG antibodies. The tumor-to-blood ratio increased from 0.7:1 to 17:1.

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