

ABSTRACTS OF CURRENT LITERATURE

Radionuclide-Determined Changes in Pulmonary Blood Volume and Thallium Lung Uptake in Patients with Coronary Artery Disease. R. A. Wilson, R. D. Okada, C. A. Boucher, H. W. Strauss, G. M. Pohost; Massachusetts Gen. Hosp, Boston, MA. *Am J Cardiol* 51:741-749, 1983

Seventy-four patients (60 men and 14 women) underwent Tl-201 myocardial and lung imaging and Tc-99m gated-blood pool imaging for pulmonary blood volume (PBV) ratio determination. Among the 74 patients, 59 patients had sufficient coronary artery disease (CAD) and 15 did not. The patients were exercised supine with a bicycle twice on the same day and Tl-201 imaging was performed first. The upper limit of normal for Tl-201 lung:heart (L:H) ratio was above 0.545. The ratio of PBV between exercise and rest was considered abnormal if it was ≥ 1.06 . The PBV ratio and Tl-201 lung and heart ratios were abnormal in 71% and 36%, respectively, of patients with CAD. Both ratios were normal in all patients without CAD. Although the resting ejection fraction (EF) did not differ significantly in patients with normal compared with those with abnormal PBV ratios or Tl-201 L:H ratio, abnormal PBV ratios and Tl-201 L:H ratios were associated with an exercised-induced decrease in EF. Patients taking propranolol at the time of the study were found to have higher thallium L:H ratios than patients not receiving propranolol. No significant difference in propranolol use was present in patients with abnormal or normal PBV ratios. The authors concluded: (1) The prevalence of an abnormal Tl-201 L:H ratio is less than that of the PBV ratio in patients with CAD; (2) Both tests are normal in normal control subjects; (3) Propranolol may influence lung thallium uptake in patients with CAD; and (4) When both tests are abnormal, there is a high likelihood of multivessel disease.

Lung Uptake of ^{123}I -HIPDM in Man: An Index of Lung Metabolic Function. M. Pistolesi, F. Fazio, G. Marini, P. Gerundini, M. C. Gilardi, F. Colombo, M. Miniati, G. Taddei, P. Fazzi, C. Giuntini; University of Milano and Pisa, Milan, Italy. *J Nucl Med All Sci* 27:180-182, 1983

Iodine-123 HIPDM, an iodinated phenolic amine, has a considerable brain and lung uptake. The brain uptake correlates mainly with the perfusion, whereas the lung uptake is dependent on a specific saturable transport and/or binding mechanism. In order to assess this metabolic function, 12 normal volunteers received 5 mCi of I-123 HIPDM. Conventional and single photon emission computed tomography (SPECT) was used for imaging. The lung activity was monitored until 4 hr postinjection. A rapid I-123 HIPDM blood clearance was observed, and the venous activity was 10% of the peak value 30 min postinjection. The conventional and SPECT images demonstrated a homogenous radionuclide distribution in the lungs. I-123 HIPDM lung kinetics were adequately described by three compartments. Whereas the first and second compartments are related to radiotracer distribution and uptake within 30-40 min postinjection, the third compartment might be interpreted as the cellular binding of I-123 HIPDM (half-life 8.45 ± 2.4 hr). The authors conclude that I-123 HIPDM is a suitable tracer for static and dynamic studies of lung endothelial cell function. I-123 HIPDM might be useful for early detection of endothelial alterations; e.g., in the adult respiratory distress syndrome.

The Influence of Pulmonary Insufficiency on Ventricular Function Following Repair of Tetralogy of Fallot-Evaluation Using Radionuclide Ventriculography. E. L. Bowe, C. J. Byrum, F. D. Thomas, R. E. W. Kovey, H. M. Sandheimer, M. S. Blackman, F. B. Parker; SUNY Upstate Med. Ctr., Syracuse, NY. *Thorac Cardiovasc Surg* 85:691-696, 1983

Twenty of 39 patients late after repair of tetralogy of Fallot were selected for study dependent on the following criteria: no residual shunt, resting right ventricular peak systolic pressure of less than 60 torr, resting right ventricular pulmonary arterial peak systolic gradient of less than 30 torr, and no tricuspid insufficiency. Their ages at operation ranged from 2 yr to 14 yr. At a mean of 9 yr after repair these patients were evaluated by radionuclide ventriculography, 24-hr Halter monitoring, and M-mode echocardiography (ECHO). Patients were divided into groups as follows; Group 1 (eight patients), no clinical pulmonary insufficiency; Group 2 (12 patients), moderate to severe pulmonary insufficiency; Group 2a (six patients), transannular patch; Group 2b (six patients), no transannular patch. Serious ventricular dysrhythmia occurred in 38% of Group 1 and 50% of Group 2. The ECHO ratio of right-to-left ventricular end-diastolic dimension was greater in patients with pulmonary insufficiency than in those without pulmonary insufficiency, 0.85 ± 0.07 compared with 0.55 ± 0.15 . Right ventricular (RV) ejection fraction was 0.39 ± 0.08 in Group 1 and 0.53 ± 0.07 in Group 2. The development of dysrhythmias or ventricular dysfunction is a widely recognized late problem following repair of Fallot. The authors stated that radionuclide study was useful to identify RV dysfunction following repair of tetralogy of Fallot, and the dysfunction appeared significantly worse in patients with pulmonary insufficiency.

Late Prognostic Value of Scintigraphic Parameters of Acute Myocardial Infarction Size in Complicated Myocardial Infarction without Heart Failure. E. H. Botvinick, J. F. Perezgonzalez, R. Dunn, T. Ports, K. Chatterjee, W. Parmley; Univ. California, San Francisco, CA. *Am J Cardiol* 51:1045-1052, 1983

To evaluate scintigraphic parameters early after an acute myocardial infarct (MI) in relation to a late prognosis, 25 patients with MI, without evidence of heart failure presenting advanced ECG rhythm and conduction disturbance, underwent Tl-201 perfusion, Tc-99m pyrophosphate (Tc-PYP), and gated-cardiac blood pool studies. Among the 25 patients studied, 14 had an inferior MI and 11 an anterior MI; 22 were transmural MI; three, nontransmural. Scintigraphic findings during short-term hospitalization were related to late clinical follow-up performed an average of 14 mo later, where patients were grouped as symptomatic (eight), asymptomatic (nine), and deceased (eight). Patients in the deceased group had significantly larger Tc-PYP abnormalities, absolute Tl-201 perfusion abnormalities, and perfusion Tl-201 abnormalities expressed as a percentage of the projected LV area ($42 \pm 8\%$) than did the asymptomatic group. The percent Tl-201 perfusion abnormality was significantly larger in the deceased group than in either the symptomatic group ($35 \pm 13\%$) or the asymptomatic group ($20 \pm 9\%$). The authors concluded that a scintigraphic assessment of Tc-PYP and Tl-201 perfusion in patients with rhythm and conduction disturbances and without congestive heart failure during acute MI could provide an accurate

statistical probability of late prognosis; however, an EF could not differentiate among prognostic subgroups.

Exercise Versus Cold Temperature Stimulation During Radionuclide Cineangiography—Diagnostic Accuracy in Coronary Artery Disease. I. J. Jordan, J. S. Borer, M. Zullo, D. Hayes, S. Kubo, J. W. Moses, J. Carter; Cornell Univ. Med. Ctr., New York Hosp., NY. *Am J Cardiol* 51:1091–1098, 1983

Cutaneous cold stimulation is an alternative method for patients who cannot perform standard exercise procedures because of other physical infirmities. The cold stimulation may induce coronary artery spasm resulting in decrease in myocardial oxygen supply. Like exercise, cold increases myocardial oxygen demand. This study was undertaken to assess the diagnostic efficacy of cold stimulation during radionuclide cineangiography and to compare the accuracy of this approach with that obtained by bicycle exercise. Twenty normal subjects and 52 patients with coronary artery disease (CAD), (42 had not had myocardial infarction), were studied at rest, during exercise, and during cold stimulation using gated-cardiac blood pool imaging. Cold pressor testing was performed by immersion of the subject's right hand up to the wrist in a bucket of ice water at 4°C. The stimulation caused increases in heart rate and arterial pressure significantly less marked than those caused by exercise. Regional left ventricular (LV) dysfunction was induced by cold in 57% of patients without previous infarct and by exercise in 81% but was absent in all normal subjects during either stress. LV ejection fraction (LVEF) increased during exercise in all normal subjects but decreased during cold stimulation in 12 of 20 subjects. During exercise, patients with anatomically severe coronary artery disease manifested significantly greater reduction in LVEF than did patients with less severe stenoses; cold stimulation did not lead to similar separation. The authors concluded that exercise was no more effective than cold stress in separating normal subjects from patients with fixed obstructive CAD and in identifying patients with anatomically severe CAD.

Beat-to-Beat Left Ventricular Performance in Atrial Fibrillation—Radionuclide Assessment with the Computerized Nuclear Probe. J. Schneider, H. J. Berger, M. J. Sands, A. B. Lachman, B. L. Zaret; Yale Univ. School of Med., New Haven, CT. *Am J Cardiol* 51:1189–1195, 1983

Atrial fibrillation is characterized by an irregular ventricular response resulting in wide variations to beat-to-beat left ventricular function. Because of this, the applicability of left ventricular ejection fraction (LVEF) obtained from contrast ventriculography by analysis of a single beat or at most from three to five beats has been questioned. In this study, LVEF and relative LV volumes were evaluated on a beat-to-beat basis with a computerized nuclear probe, an instrument with sufficiently high sensitivity to allow continuous evaluation of the radionuclide time-activity curve. Eighteen patients (ages from 53 to 93, average age 67, 12 men and six women) with atrial fibrillation were studied. Five of the 18 had mitral stenosis, six had mitral regurgitation, and seven had coronary artery disease. Fifty consecutive beats were analyzed in each patient. The mean LVEF ranged from 17% to 50%. There was substantial beat-to-beat variation in cycle length and LVEF in all patients including those with marked LV dysfunction. In 14 of the 18 patients who also underwent gated-cardiac blood pool study, (GCBPS) by gamma camera, there was an excellent correlation between the mean LVEF derived from the nuclear probe and LVEF obtained by GCBPS. Based on beat-to-beat analysis, LV function was dependent on relative end-diastolic volume and multiple preceding cycle lengths, but not preceding end-systolic volumes. In patients with atrial fibrillation a single value for LVEF does not adequately characterize LV function. The mean LVEF

may underestimate beat-to-beat LV function in the resting state by as much as 14% in LVEF units using mean data.

Early Detection of Left Ventricular Dysfunction in Chronic Aortic Regurgitation as Assessed by Contrast Angiography, Echocardiography and Rest and Exercise Scintigraphy. R. L. Huxley, F. A. Gaffney, J. R. Corbett, B. J. Firth, R. Peshock, P. Nicod, J. S. Reilas, G. Curry, S. E. Lewis, J. T. Willerson; Univ. Texas Health Sci. Center, Houston, TX. *Am J Cardiol* 51:1554–1558, 1983

Disopyramide is a relatively new antiarrhythmic drug used for the treatment of supraventricular and ventricular arrhythmias. Recently there has been noted a high frequency of congestive heart failure even in patients with good renal function. To evaluate the effects of disopyramide on resting systolic left ventricular (LV) function and LV functional reserve, gated-cardiac blood pool study (GCBPS) was performed at rest and during exercise (range 44 yr to 88 yr). Each patient received 150 mg disopyramide four times daily for 5 to 10 days. The oral loading dose (average serum level $3.6 \pm 1.3 \mu\text{g/ml}$) produced a decrease in the average resting ejection fraction (EF) from $40 \pm 15\%$ to $33 \pm 11\%$. When the loading dose produced an average serum level of $2.5 \pm 0.8 \mu\text{g/ml}$ a small but significant decrease in EF was observed in three of 22 patients during the exercise phase only. For the group, however, there was no significant decrease in EF at rest or during exercise at this lower dose. Adverse effects of the medication on EF occurred even in patients with normal LV function at rest. The authors stated disopyramide may be associated with significant decreases in LV systolic function; however, sustained therapy with lower dosage and lower drug levels is also associated with less depression of LV function.

Rest and Exercise Right and Left Ventricular Function Late After the Mustard Operation—Assessment by Radionuclide Ventriculography. J. H. Murphy, W. M. Barlaikovach, R. A. Mathews, L. B. Beerman, S. C. Park, W. H. Neches, J. R. Zuberbuhler; Children's Hosp. Pittsburgh, PA. *Am J Cardiol* 51:1520–1529, 1983

To evaluate the long-term results of the Mustard operation with regard to ventricular function, rest and exercise radionuclide ventriculography was performed on a group of patients late after they had undergone Mustard's operation for transposition of the greater arteries. Twenty-six asymptomatic patients (17 males, nine females), ages 8–23 yr (mean 13), were studied 5 yr to 15 yr (mean 9) after the operation. Their age at the time of Mustard's operation ranged from 2 yr to 11 yr. The mean resting right (systemic) ventricular ejection fraction (RVEF) was $50 \pm 10\%$ and ranged from 32% to 69% in eight patients. With exercise the RVEF increased in nine patients and either failed to increase or decreased in 15. The mean resting left (pulmonary) ventricular (LV) EF was 0.58 ± 0.09 ; the LVEF was 50% in three patients. With exercise the LVEF increased in 14 patients and did not increase in ten (including three with resting values <0.50). The radionuclide findings were compared with results from exercise testing and 24-hr Halter monitoring. The presence of complex ventricular arrhythmia documented on Halter monitoring was a first predictor of failure of LVEF to increase with exercise, and the results suggested a decrease in myocardial reserve in patients with Mustard's operation. The authors stated that the patient's age, operative age, postoperative interval, residual arterial desaturation, preoperative large ventricular septal defect on pulmonary stenosis, postoperative pulmonary stenosis or superior vena cava obstruction, or a second surgical procedure was predictive of the rest to exercise LVEF and RVEF.

The Role of Nuclear Scanning in the Evaluation of Arterial Injuries. C. A. Suarez, D. M. Bernstein, J. H. Goldberger, M. H. Hourani, G. H. Rodman, Jr.; Colletta, Miami, FL. *Am Surg* 49:209–210, 1983

These authors evaluated 29 consecutive patients presenting to

hospital with isolated penetrating injuries to upper and/or lower extremities. All patients had injuries below the anterior axillary line or below the inguinal ligament and had a wound or missile trajectory in proximity to a major vascular structure. A radionuclide flow study was performed by gamma camera commencing immediately following bolus injection of 20 mCi of Tc-99m sulfur colloid into the right external jugular vein. For purposes of comparison, the opposite extremity was scanned simultaneously when the injury involved the lower extremity. An image showing rapid, uniform appearance of radioactivity along anatomically recognizable arterial paths was interpreted as normal. Delayed appearance of radioactivity or persistence of radioactivity in the area in question indicated an abnormal image. The venous phase of the study was disregarded. Each patient then underwent standard arteriography of the involved extremity. The radionuclide images were interpreted independently by an experienced reader (ER) and by an occasional reader (OR) without knowledge of arteriograph findings. The ER reported 22 normal images confirmed by arteriograph (88% true-negative radionuclide images). One patient with normal image was found to have a small pseudoaneurysm of left brachial artery after gunshot wound, confirmed at surgical repair. Three patients with normal arteriographs and normal clinical examination had abnormal images due to delayed flow and did not undergo surgery (12% false-positive images). An additional three patients with abnormal studies had normalities confirmed by arteriographs (75% true-positive images). In contrast, OR reported 76% true-negative radionuclide images, 75% false-negative images, 24% false-positive, and 25% true-positive (suggesting the importance of experience for accurate evaluation of images). The authors conclude that their study afforded a relatively simple and safe means of screening patients with penetrating injuries of the extremities who were considered "low risk" for vascular injury.

Mean Transit Time Image—A New Method of Analyzing Brain Perfusion Studies. Z. Szabó, F. Ritzl; Municipal Hospital, D-5600 Wuppertal 2, West-Germany. *Eur J Nucl Med* 8:201-205, 1983

Parametric images were used to assess brain perfusion. Thirty-eight patients with documented neurological status by electroencephalography, Doppler-sonography of the extracranial vessels, and transmission computed tomography were studied. After injection of 20 mCi Tc-99m pertechnetate, 100 images were acquired in the vertex view with a frequency of two frames/sec. The mean transit time (MTT) was determined for each image element based on a gamma function fit. Then a functional image was calculated by the MTT of every pixel. The frequency distributions of transit times within two regions of interest (ROI) placed over the hemispheres were analyzed by histograms. For further evaluation the ratio mean MTT right hemisphere to mean MTT left hemisphere was calculated. For the same ROIs the ratio of the integrals of the activities during the arterial interval of the time-activity curves (inflection point to two-thirds of peak activity) was determined. Differences in mean transit times were found to be less than side differences in arterial activities. Large variations in MTT existed in diffuse disorders such as organic psychosyndrome, diffuse peripheral neurological symptoms, encephalomyelitis disseminata, and ischemia. Despite the increased arterial activity in luxury-perfused regions, the MTT of both hemispheres were almost identical. The MTT was prolonged in cerebral ischemia (five of seven patients) and stroke (seven of seven patients). In a patient with left-side migraine the arterial activity was increased, and the MTT significantly decreased over the left hemisphere.

Congenital Renal Anomaly: Evaluation with ^{99m}Tc-Dimercaptosuccinic Acid Renal Scintigraphy. S. Hosokawa, J. Kawamura, T. Tomoyoshi, O. Yoshida; Kyoto Univ., Kyoto, Japan. *Am J Kidney Dis* 6:655-659, 1983

Ten patients (six males, four females) with horseshoe kidney and five patients (three males, two females) with unilateral fused

kidneys were studied with Tc-99m dimercaptosuccinic acid (DMSA). Creatinine and BUN were correlated with DMSA renal uptake. In the ten patients with horseshoe kidney, the average value of total DMSA was $35.4 \pm 13.4\%$, the average BUN was 20.6 ± 23.17 mg/100 ml, and creatinine was 1.54 ± 2.01 mg/100 ml. In five patients with unilateral fused kidneys, the average DMSA total uptake was $33.0 \pm 5.92\%$, BUN average was 13.6 ± 2.97 mg/100 ml, and creatinine average, 0.88 ± 0.39 mg/100 ml. The renal isthmus was shown by IVP in only six cases of horseshoe kidney but was seen in all ten cases by DMSA study. The authors stated that the visualization of renal isthmus is very essential for proper management of horseshoe kidney. The DMSA uptake provides an index for cortical functioning mass and can be an assessment of separate renal function in patients with horseshoe kidney.

β_2 -Microglobulin in Acute and Chronic Leukaemias. H. Bodenstein, N. Südkamp; Medizinische Hochschule Hannover, D-3000 Hannover 61, West-Germany. *Tumor Diagnostik* 4:80-85, 1983

β_2 -microglobulin (β -MG) was measured in 131 patients: 37 patients suffered from acute leukemia, 30 patients had chronic lymphatic leukemia, and 64 patients had chronic myelogenous leukemia. Multiple measurements at different stages of disease were performed. A significant difference was found between acute nonlymphoblastic leukemia (AnLL) and acute lymphoblastic leukemia (ALL). β -MG levels decreased during complete remission in AnLL patients but not in those with ALL. In chronic lymphocytic leukemia and in chronic myelogenous leukemia the mean plasma values were raised compared with normals. A linear relationship between β -MG and WBC was found, whereas the platelet counts as well as RBC and hemoglobin were inversely correlated with β -MG. The authors conclude that β -MG might be an useful diagnostic parameter for therapy monitoring of hematologic malignancies.

In Vivo/In Vitro Labeling of Red Blood Cells with ^{99m}Tc. R. Bauer, I. Haluszczynski, H. Langhammer, W. Bachmann; Universität München, D-8000 München 80, West-Germany. *Eur J Nucl Med* 8:218-222, 1983

Red blood cells (RBC) were labeled with Tc-99m in vitro after in vivo pretreatment with a stannous solution. Pretinning was performed by injection of 0.7 mg Sn and 6 mg DTPA or 5 mg pyrophosphate. Fifteen min postinjection 8-10 ml blood were withdrawn and 3 ml of the heparinized blood (40-60 IU/ml) were mixed with 5 ml isotonic NaCl solution and 30-40 mCi Tc-99m. After 10 min incubation at 32-35°C the plasma was separated by centrifugation at 500 g and the RBCs were washed with saline. Twenty to twenty-five mCi of Tc-99m-RBC were reinjected. The results in 1356 patients referred for radionuclide ventriculography were evaluated. The mean labeling yield was 89.7% after pretinning with Sn-DTPA and 88.2% following Sn-pyrophosphate pretreatment. Labeling was repeated twice in eight patients because the labeling efficiency was below 60%. A higher labeling yield was observed in these patients when the incubation time was increased to 20 min or the plasma was separated before labeling with Tc-99m. In two patients no improvement was achieved either by a prolonged incubation time or by plasma separation. The whole body scintigrams, obtained 1, 6, and 24 hr after reinjection, demonstrated that the distribution of radioactivity within the heart and the large vessels remained unchanged. Thyroidal, gastric, and gastrointestinal radioactivity was never observed; thus, detectable amounts of free Tc-99m were not released from the labeled RBC.

Radioimmunoassay of Human Ligandin. M. Sherman, N. M. Bass, J. A. H. Campbell, R. E. Kirsch; Univ. Cape Town Med. School, Cape Town, South Africa. *Hepatology* 3:162-169, 1983

Ligandin, a basic protein found in mammalian liver, has enzy-

matic activity characteristic of glutathione S-transferase (GSH-T). These authors isolated ligandin from liver tissue obtained within 12 hr of death from patients with no history of liver disease. For radioimmunoassay (RIA), ligandin was labeled with I-125 by the chloramine-T method to a specific activity of 30 $\mu\text{Ci}/\mu\text{g}$, and it retained immunoreactivity for up to 2 wk when stored at 4°C. Antiserum to purified ligandin was raised in rabbits. The double-antibody RIA used incubation first of antiserum, labeled ligandin, and 0.2 ml patient serum for 24 hr, followed by addition of donkey antirabbit gamma globulin to separate free from bound ligandin. Sensitivity of the RIA was less than 1 ng ligandin. Serum ligandin in normal volunteers was 3.78 ± 3.57 ng/ml (mean \pm s.d.) (range 0–12) with 12 ng/ml considered the upper limit of normal. Sixty-eight patients with documented acute viral hepatitis (48 cases of hepatitis A constituting Group 1 and 20 cases of hepatitis B constituting Group 2) were studied. All patients except three recovered clinically within 6 wk. In Group 1 patients in the first week of illness, 80% of all ligandin values and 100% of SGOT values were elevated. By week four, mean ligandin level was within normal limits (although 18% of values were still elevated), but mean SGOT and 90% of SGOT values were still elevated. Thereafter, mean ligandin level remained normal, while mean SGOT fell to normal only by week six. In Group 2 patients, 75% of ligandin values and 100% of SGOT values were elevated within the first week of illness. Mean ligandin level fell to normal by week six, whereas mean SGOT was still elevated at week eight. In chronic active hepatitis, serum ligandin concentration was positively correlated with disease activity (latter assessed histologically), whereas SGOT level was not correlated with disease activity. Serum ligandin level was rarely elevated in metastatic liver disease and was normal in all examined cases of cirrhosis (cryptogenic or alcoholic), extrahepatic obstructive jaundice, and disease not affecting liver. The authors conclude that RIA for ligandin may be useful for providing an early index of recovery from acute hepatitis.

Comparison of Observer Performance Reading from a Video CRT vs. Reading from Film. J. W. Keyes, Jr., R. C. Kline, W. W. Resinger, E. A. Rose, K. F. Koral, and W. L. Rogers; Univ. of Michigan Med. School, Ann Arbor, MI. *Invest Radiol* 18:2298–300, 1983

An increasing number of imaging procedures involves digitization of the image data. Since these digital images can be presented for interpretation either directly on a CRT or from some form of hard copy recording of the CRT image, it is important to determine which approach is diagnostically more effective. In an attempt to answer this question, scintigraphic examinations of the thyroid (218 cases: 189 digitized pinhole images and 109 coded-aperture tomograms) were independently graded by two observers as per the ROC format. No significant difference could be found between diagnoses made directly from the CRT images and diagnoses made from carefully controlled film recordings of the CRT images. This suggests, at least for these nuclear medicine thyroid images, that the decision to read from film or from CRT can be made on grounds other than observer performance.

Non-Circular Orbits for the Reduction of Uniformity Artefacts in SPECT. A. Todd-Pokropek; University College, London, England. *Phys Med Biol* 28, 309–313, 1983

Circular artifacts in single photon emission computed tomography (SPECT) may be produced by nonuniformities in rotating scintillation camera systems. When the rotation is circular, the artifact will depend on the square root of the distance from the nonuniformity to the axis of rotation and may amplify a planar nonuniformity by a factor of up to 20. Noncircular scanning methods, which simply move the camera head in or out along a radius, will improve resolution but will not affect the circular artifacts. This study introduces a new method of noncircular scan-

ning. While the camera head traverses a circular orbit, the patient bed is displaced from its center position by an amount that is a function of the angular position of the camera. Elliptical or other noncircular orbits may be selected by the proper choice of displacement function. Before image reconstruction, the data must be shifted to compensate for the displacement, which means that planar nonuniformity will produce a sinusoid-like pattern in the scintigrams rather than a vertical line. Thus the resulting artifact will be blurred over a large area of the image and make it less noticeable. Images of a uniform phantom demonstrated this artifact reduction.

A $^{195}\text{Hg}^m \leftrightarrow ^{195}\text{Au}^m$ Generator for Use in First-Pass Nuclear Angiocardigraphy. A. T. Eliot, D. S. Dymond, D. L. Stone, W. Flatman, R. Bett, J. G. Cuninghame, H. E. Sims, H. H. Willis; *Phys Med Biol* 28:139–147, 1983

Sequential first-pass nuclear angiocardigraphic studies require multiple injections of the radiopharmaceutical. The use of Tc-99m for repeated injections results in a progressively changing background and a significant radiation dose to the patient. A radionuclide with a shorter half-life would reduce these problems. Gold-195m obtained from a generator of Hg-195m is well suited to this application (a half-life of 30.5 sec and 262 keV gamma rays), and this paper reports a physical and biological study of such a generator. Generator columns were made of thiopropyl sepharose 6B and could be loaded with over 3.7GBq of mercury-195m. Elution with 1 ml of 2.5 mmol NaCN produced a mercury breakthrough of less than 0.01%. The column is stored under a 2% sodium nitrate solution to prevent radiation damage. Rabbit, pig, and greyhound dog studies were done to test for toxicity of the eluant containing mercury and cyanide. No ECG or blood pressure changes were noted. A human volunteer underwent three first-pass studies, all of which agreed well with a Tc-99m study. No heart rate, ECG, or blood pressure changes were detected. Thus, this generator appears to produce the small volume, high specific-activity bolus required for nuclear angiocardigraphy with a nuclide well suited for imaging with a thick-crystal, multicrystal camera.

A Physical Comparison of Two Fixed-Angle Emission Tomographic Cardiac Imaging Systems. B. Condon, J. Mills, R. Ardley, D. Taylor; Southampton General Hosp., Southampton, England and Guy's Hosp., London, England. *Phys Med Biol* 28:131–138, 1983

This study evaluated the imaging performance of commercially available, limited-angle, single photon emission computed tomographic systems. The instruments investigated included seven-pinhole collimators (7PH) on large- and small-field-of-view cameras as well as a rotating slant-hole collimator (RSH) on a small-field-of-view camera. The parameters studied were depth of the reconstructed planes, transverse resolution, depth resolution, field of view, and sensitivity. Both the RSH and the 7PH systems appear to have individual advantages. The RSH is less subject to variations in transverse or depth resolution at different depths than the 7PH. The presence of scattering material makes little difference with the RSH but may result in over a 100% increase in transverse and depth FWHM for the 7PH. The 7PH systems had higher sensitivities than the RSH, and clinical studies on the RSH took 25% to 100% more time than they did on the 7PH system.

Polyhydramnios Associated with Fetal Limb Abnormalities. W. S. Wong, B. A. Filly; University of California Medical Center, San Francisco, CA. *Am J Roentgenol* 140:1001–1003, 1983

The authors present four cases of fetal dwarfism and one of extremity shortening found in association with polyhydramnios. Fetal anomalies account for approximately 20% of cases of polyhydramnios, the most common causes being abnormalities of the neural axis, gastrointestinal obstructions, and nonimmune hydrops.

The currently reported cases, along with two cases of polyhydramnios associated with heterozygous achondroplasia seen by the authors previously and reports in the literature, point to an association between fetal dwarfism or limb abnormalities and excessive amniotic fluid. The cause of polyhydramnios in such cases remains obscure. If not sought directly, such conditions can be overlooked, and the authors recommend that fetal femoral length be measured and compared with expected normal values for the given biparietal diameter in any pregnancy in which polyhydramnios is discovered. Representative sonograms are provided.

Sonograph Findings in Clinically Unsuspected Acute and Chronic Scrotal Hematoceles. J. J. Cunningham, Medical College of Georgia, Augusta, GA. *Am J Roentgenol* 140:749-752, 1983

Three cases of scrotal hematoceles are reported, the lesions varying in age from days to years. The sonographic appearance common to all was that of a basically anechoic mass transversed by multiple, thick, irregular septations. A history of trauma was variable. In the acute case, the sonographic appearance of the lesion was seen to change over a 10-day interval, the margins becoming sharper and the septations largely regressing. A true hematocele of the scrotum consists of blood distending the tunica vaginalis. Hematomas may also occur within the scrotal wall or testicular substance. Although the sonographic appearance may suggest a multicystic tumor, hematocele should be considered in the differential diagnosis of a multicystic scrotal mass. Radiographs, gross pathologic specimen photographs, and sonograms are presented.

Sonographic Appearance of the Uterine Cervix in Pregnancy: The Vertical Cervix. J. D. Bowie, R. F. Andreotti, E. R. Rosenberg; Duke University Medical Center, Durham, NC. *Am J Roentgenol* 140:737-740, 1983

The authors successfully visualized the cervix in 30 of 50 consecutive pregnant patients with the maternal bladder empty. Visualization was best in the earlier stages of gestation (100% at less than 20 wk) diminishing as the pregnancy advanced. The mean length of the cervix was found to be 3.25 cm with no significant difference between primigravidas and multiparas. With the bladder partially filled, cervical length was 4.6 cm, a statistically

significant difference. The cervix assumes a nearly vertical orientation, forming a near right angle with the uterus when the bladder is empty. Repeated attempts and manipulation of the fetus may be required for visualization of the cervix with an empty bladder. The amniotic fluid becomes the window through which the cervix is scanned. The authors feel that, when possible, this method provides a more accurate evaluation of the cervix than with the maternal bladder even partially filled. Clinical applications include evaluation of third trimester hemorrhage and cervical incompetence. Representative scans are provided.

Ultrasound Identification of Lateral Ventricular Asymmetry in the Human Neonate. J. D. Horbar, K. A. Leahy, J. E. Lucey; University of Vermont College of Medicine, Burlington, VT. *J Clin Ultrasound* 11:67-69, 1983

In a study of 75 infants with no sonographic evidence of intracranial pathology, asymmetry of the bodies of the lateral ventricles was found in 37.9%. The infants ranged from 28 to 44 wk gestational age with an equal male/female distribution. The body of the left lateral ventricle was found to be larger than the right in 31.8% and the right greater than left in 6.1%. In the remaining 62.1%, the ventricles were equal in size. Intra- or extrauterine molding are considered as possible etiologic factors. Intrauterine compression or postpartum positional molding could cause asymmetric pressure on skull and brain. Persistence of the phenomenon is thought to cause edema, an unlikely explanation. Atrophy could not be excluded without postmortem evaluation.

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