Thallium-201 Myocardial Perfusion Imaging at Rest and during Exercise—Comparative Sensitivity to Electrocardiography in Coronary Artery Disease. I. K. Bailey, L. S. C. Griffith, J. Rouleau, H. W. Strauss, and B. Pitt. *Circulation* 55: 79–87, 1977.

Twenty subjects without evidence of coronary artery disease and 63 patients with angiographically proven coronary artery disease (70% or greater narrowing) were studied with rest-and-stress myocardial perfusion imaging and with electrocardiography to compare the sensitivity of each for the detection of transient ischemia. Myocardial imaging was performed 10 min after 1.5–2 mCi thallium-201 had been administered intravenously and images obtained in the anterior and left anterior oblique views. No significant perfusion defect or ECG change was observed on either the rest or exercise studies in the normal subjects. Of those patients with coronary artery disease, 56% developed new perfusion defects with exercise compared with 38% who developed ischemic ST-segment depression. When chest pain or ST-depression were considered indices of ischemia, however, the sensitivity of exercise testing by ECG and thallium imaging was similar. In patients with single vessel disease the myocardial perfusion imaging was more sensitive than the ECG. Analysis of the exercise results revealed a progressive increase in both positive myocardial imaging and ECG results with the number of vessels involved. The combination of the rest and exercise ECG, rest and exercise myocardial imaging, and chest pain during exercise failed to identify 11% of patients with coronary artery disease.

The authors felt that the exercise thallium myocardial imaging was a useful adjunct to conventional exercise testing particularly when evaluating patients with abnormal resting ECGs.

Radionuclide Imaging of Airway Obstruction Following Assisted Ventilation. G. F. Gates, E. K. Dore, M. Markarian, and J. Takanaka. *Am J Dis Children* 130: 1222–1227, 1976.

Five infants who developed obstructive airway complications following assisted ventilation were studied by means of radioaerosol lung scintigraphy. One to two million particles of Tc-99m albumin or Tc-99m colloid (stannous or sulfur) were produced by ultrasonic nebulization and administered under positive pressure for 10 min through each patient's tracheostomy tube. Although 3 mCi of the radiopharmaceutical were aerosolized in each case, only 10% was retained by the patient. The remaining 90% was exhaled into a hood through an exhaust line.

Pulmonary images showed excess nuclide deposition in the carinal–hilar areas indicating severe obstruction of the large airway passages following tracheostomy. Perfusion lung scintigrams revealed areas of diminished or redistributed pulmonary blood flow. Marked expiratory collapse of major airways was evident roentgenographically and was manifest clinically. Three case reports were presented. The authors concluded that radionuclide scintigraphy provides useful information not obtained by other means. For elucidating the functional lung changes that followed prolonged assisted ventilation, scintigraphic results were complementary to the roentgenographic studies.

Computer Tomography in the Evaluation of Pulmonary Asbestosis—Preliminary Experiences with the EMI General Purpose Scanner. L. Kreel. *Acta Radiologica J* 17: 405–412, 1976.

Thirteen patients known to have been exposed to asbestos for intervals ranging from 1 to 40 years were studied by transmission computerized axial tomography (CT). Comparison of the CT scans with routine chest roentgenograms showed that the effects of the asbestos inhalation were seen more clearly on the CT scan than on the routine chest studies. The abnormalities detected included pleural plaques and calcification, mediastinal pleural irregularity, parenchymal abnormalities including irregular honeycomb appearance, fine nodules, lesser fissure abnormalities, subpleural infiltrates, bullae reformation, abnormal proximal and peripheral pulmonary vessels, loss of the normal increased perfusion due to gravity, and transpulmonary "bands." The authors conclude that CT scanning may reveal pleural abnormalities when routine chest radiographs appear normal.

Ga-67 Scanning for Carcinoma of Lung. T. R. Demeester, C. Bekerman, J. G. Joseph, M. S. Toscano, H. Golomb, J. Bitran, and N. H. Gross. *J Thorac Cardiovasc Surg* 72: 699–708, 1976.

Gallium-67 citrate scanning was prospectively evaluated in 55 patients with lung lesions suspected to have primary carcinoma by chest radiographs and in whom subsequent histologic diagnosis was obtained. Of the patients with histologically proven carcinoma of the lung, 94% (44/47) had positive gallium scans. No benign lesions were found in the patients with positive scans, and of the eight patients with benign lesions, all had negative scans. Three patients with malignant lesions, however, had negative scans. The gallium scan showed about the same sensitivity for all tumor cell types encountered and for peripheral and central lesions The authors concluded that the gallium-67 citrate scan is competitive with mediastinoscopy for the assessment of mediastinal lymph node metastases, and the study offers a noninvasive method for evaluating hilar lymph node metastases. Based on a chest roentgenogram and gallium scanning, good correlation was found between the clinical staging of patients with lung cancer and the staging determined after surgical treatment based on the histology of the resected specimens.

Direct and Indirect Radionuclide Cystography. J. J. Conway, A. B. Belman, L. R. King, and R. B. Filmer. *J Urol* 113: 689–693, 1975.

The authors believe that direct radionuclide cystography, using short half-life radiopharmaceuticals, is more reliable for detecting vesicoureteral reflux than conventional roentgenographic techniques. In addition to the detection of vesicoureterial reflux, other parameters that can be determined include the bladder volume when reflux occurs, calculation of the fluid volume that has refluxed, accurate calculation of residual urine volume, estimation of reflux drainage time, and the visualization in diagnosis of gross anatomic abnormalities. The major problem with the procedure is poor resolution that negates the possibility of

detecting small bladder defects or uretheral abnormalities. The major portion of this article is devoted to techniques and comparisons with other procedures. For an overall view of this subject, this concise communication provides an excellent background.

Scintiphotography in Early Diagnosis of Urine Leakage Following Renal Transplantation. J. H. Texter, Jr. *J Urol* 116: 547–549, 1976.

Scintigraphic studies were performed on 58 adult males who had had renal transplantation to evaluate the effectiveness of this procedure for the early diagnosis of urinary extravasation. Fifty-six of the transplants were of cadaveric origin, and two were from living related donors. Either 150 μCi of [^{131}I] Hippuran or 10 mCi of Tc-99m Sn-DTPA were administered intravenously. Six urinary leaks were documented, using both the scintigraphic study and routine contrast studies (IVP or cystourethrogram). In three of the six leaks, the studies were positive by the scintigraphic study prior to visualization on the contrast study. The authors conclude that, when carefully performed, radionuclide scintigraphy appears to be the method of choice for the early detection of post-transplant urinary extravasation.

Assessment of Bone Viability by Scintiscanning in Frostbite Injuries. R. Lisbona and L. Rosenthall. *J Trauma* 16: 989–992, 1976.

In three patients with severe frostbite of the extremities, the authors obtained radionuclide bone imaging with Tc-99m methylene-diphosphate. The images identified the demarcation line between viable and nonviable bone with distal absence of the radionuclide uptake and slight increased activity in the proximal portion. The increased activity in the adjacent viable bone implied a reactive hyperemia since the degree of accretion of the radionuclide in bone is dependent on the integrity of the vascular supply. Bone imaging proved to be an accurate and simple method to differentiate between viable and necrotic bone. The authors also suggested a combined technique of infusing bradykinin to distinguish vasospasm from true vessel damage.

Radioisotopic Bolus Technique as a Test to Detect Circulatory Deficit Associated with Cerebral Death: 142 Studies on 80 Patients Demonstrating the Bedside Use of an Innocuous IV Procedure as an Adjunct in the Diagnosis of Cerebral Death. J. Korein, P. Braunstein, I. Kricheff, A. Lieberman, and N. Chase. *Circulation* 51: 924–939, 1975.

The authors developed a portable radioisotopic technique for the purpose of showing cerebral circulatory deficit, as part of a correlative study to define and diagnose cerebral death in a simple and rapid manner in comatose, apneic patients with electrocerebral silence. The investigators used a simple probe with a thallium activated sodium iodide crystal and a flat-field collimator. The detector output was recorded by means of a rate meter and a strip chart recorder. The lower edge of the collimator was placed half-way along the acanthomeatal line and angled about 15 degrees cephalad so that the lower edge of the field of view encompassed only the cranial cavity. The probe was placed alongside the head and sequential scintillation camera flow images obtained simultaneously from the anterior projection. In the ten patients studied no spontaneous respirations or cerebral response had been observed. Five of the patients had evidence of cerebral activity as determined by documentation of EEG activity while the other five had no evidence of cerebral activity. In the five patients with absent EEG activity there was a slow gradual linearized characteristic to the time–activity curve tracing; while in the five patients who had EEG activity, there was clear-cut bolus effort. Based on this experience the authors modified the study to include two collimated detectors. One was oriented towards the forehead to view the brain only, and the other one, termed the control detector, was placed over a pulsating artery for evaluation of the adequacy of the intravenous injection. One hundred and forty two bolus studies were performed in 80 patients to assess their cerebral blood flow. The studies were classified as Type I, Type II, and Intermediate: Type I showed transient curves through the brain similar to the typical bolus type; Type II displayed a gradual, low-magnitude, linear increase in radioisotopic activity with no bolus effect in the head but with a normal arterial control. Of the 27 patients who had evidence of bolus type flow, all but three had clear evidence of electrical activity on EEG. The EEG's of the exceptions were not acceptable for technical reasons. Five of these 27 patients survived and are now neurologically normal. Thirty-seven patients, all of whom died, had no bolus effect following injection of the radiopharmaceutical and all had adequate control studies. Thirty-one of these 37 patients had technically satisfactory EEGs and showed electrical activity on the EEGs prior to the radioisotope tests. In four patients with an intermediate type of radionuclide curve, all had electrical activity on the EEG and all of these patients died with findings compatible with cerebral death. The authors believe that these results indicate that the absence of a bolus tracing from the head is indicative of significant cerebral circulatory deficit. The test may be used as an adjunct for confirming the diagnosis of cerebral death.

Selective Damage to Erythroblasts by ^{55}Fe. U. Reincke, H. Burlington, E. P. Cronkite, M. Hillmann, and J. Laissue. *Blood* 45: 801–810, 1975.

The purpose of this investigation was to evaluate the damage to erythroblasts by the radiations of Fe-55. In mice the low energy and short range of Fe-55 Auger electrons were utilized to deliver cellular radiation to iron incorporating erythropoietic precursors with minimal radiation damage to other bone marrow cells. The ensuing intramedullary selective erythropoietic death was documented by absolute and differential bone marrow cells counts and by the decreased blood uptake of Fe-59. Dose dependent decrease of red cell numbers was observed by the administration of Se-75. The decrease in other marrow cell lines was much less, showing that Fe-55 has a greater effect on the erythroblasts than on granulopoiesis or other cell lines. The decreased number of colony-forming units in the spleen colony assay and the decreased ability of transplanted bone marrow to protect fatally radiated mice indicated that the bone marrow was partially depleted of plenipotential stem cells. These data were interpreted as increased plenipotential stem cell utilization in response to an increased demand for differentiation of stem cells along the erythropoietic pathway.

The Sonolucent "Light Bulb" Sign of Fluid Collections. M. R. Conrad, R. C. Sanders, and A. E. James. *J Clin Ultrasound* 4: 409–415, 1976.

Since the criteria developed for bistable imaging to distinguish a cystic mass from a solid one is somewhat more difficult to apply to gray-scale imaging in which a higher power output is used, the authors described a sign that may aid in the differentiation. In properly adjusted gray-scale

images, a cyst or fluid collection appears as a pure white area in contrast to the grayish, grainy appearance of adjacent organ parenchyma. A homogeneous collection of low-level echoes that produce a grayish appearance on the sonogram characterize solid parenchyma as opposed to the strikingly white and frequently well-circumscribed appearance of a cystic or fluid collection. The "light bulb" sign proves useful in the interpretation of renal masses where differentiation between cystic and solid processes is of paramount importance; differentiation between diffuse enlargement of the pancreatic parenchyma in acute pancreatitis and pseudocyst formation can also be made more readily with the application of this sign. The authors cautioned that appropriate technical factors must be carefully adjusted, including output, TGC settings, and video display brightness. False-positive results were encountered only in the presence of large masses which are attributed to the attenuation of the sound beam as it traverses the solid tissue. The attenuation gave the false impression of a cystic area within the central portion of a large solid homogeneous mass.

The Anatomic Splenic Flexure: An Ultrasonic Renal Imposter. R. L. Teele, A. T. Rosenfield, and G. S. Freedman. *Am J Roentgenol* 128: 115–120, 1977.

As has been previously documented in patients with agenesis or ectopia of the left kidney, the anatomic splenic flexure of the colon lies in the left renal fossa. In the ultrasonographic search for a left kidney, the fluid-filled splenic flexure of the colon, occupying the left renal bed, may be mistaken for the left kidney. Comparison of the ultrasound study with a barium enema will frequently be of value in clarifying the findings. Ultrasonographic signs that suggest the colonic pseudomass include poor definitions of its borders, especially inferiorly. Random dense echoes within the mass are frequently produced by gas within the splenic flexure; on prone transverse views the colonic mass is comma-shaped in contradistinction to a kidney. Since hypertrophy of the right kidney on intravenous urography suggests either absence or long standing nonfunction of the left kidney, the search for an ectopic kidney is essential. In the patient who has had a left transabdominal radical nephrectomy, the splenic flexure will be found in the left renal bed and may produce similar ultrasonic findings. Estimates of the frequency of renal agenesis range from one in 552 to one in 1,286 and most often involve the left kidney.

Correlation of Ultrasonic and Soft Tissue X-ray Placentography in 300 Cases. L. Badria and G. B. Young. *J Clin Ultrasound* 4: 403–407, 1976.

The authors report a series of 300 patients in whom placentography was performed by both soft tissue x-ray and ultrasound. Routine use of the established radiographic method by the obstetric staff provided the opportunity for correlation of the two procedures. Radiographs were obtained in the posteroanterior and lateral positions with the patient recumbent; erect views were made when placenta previa was suspected. Sonographic studies were performed in the standard method. The combined accuracy rate was 95% with 2% erroneous diagnoses and 3% uncorrelated. Hydramnios posed the single greatest problem for the x-ray studies; in such cases the placenta was easily outlined by ultrasonography. The most frequent cause of noncorrelation between the two methods was found in those patients with fundal placenta, and the authors attribute this in large part to the differences in patient position during the examination. The phenomenon of the ascending placenta, i.e., the placenta moves toward the fundus away from the internal os, was observed in seven cases in which serial ultrasound studies were obtained. There is widespread awareness of this phenomenon but little documentation in the literature.

B-Mode Ultrasound and the Nonvisualizing Kidney in Pediatrics. A. Shkolnik. *Am J Roentgenol* 128: 121–125, 1977.

The author presents 28 patients in whom ultrasonography was employed to delineate kidneys that were found to be nonfunctional by intravenous urography. In three cases of congenital multicystic kidney, ultrasonography was considered diagnostic. A sonic pattern of multiple small cystic areas with septations of solid tissue was used to differentiate the multicysts from severe degrees of hydronephrosis with a single large sonolucent collection identified as the dilated renal pelvis. Renal vein thrombosis was interpreted on the basis of a large kidney with a normal appearing collecting system. Since the method is not function-dependent, anatomic delineation of the size and configuration of the nonfunctioning kidney can be made readily. Percutaneous biopsy of the nonfunctioning kidney can also be guided by ultrasound in the absence of urographically demonstrable function for purposes of localization. The author also described ten patients with renal failure in whom intravenous urography was not attempted; the presence and relative severity of hydronephrosis was established in these cases as well. Six representative cases are discussed.

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