Noninvasive Detection of Regional Myocardial Ischemia Using Rubidium-81 and the Scintillation Camera: Comparison with Stress Electrocardiography in Patients with Arteriographically Documented Coronary Stenosis. D. S. Berman, A. F. Sabel, G. L. DeNardo, and D. T. Mason. *Circulation* 52: 619–626, 1975.

Using scintillation camera imaging of intravenously administered rubidium-81, this investigation compared the sensitivity of rest and stress myocardial perfusion studies with that of stress electrocardiography for the detection of myocardial ischemia. The authors studied 40 patients in whom the degree of stenosis had been determined by coronary contrast arteriography. Significant stenosis was defined as greater than 75% luminal diminution in at least one of the three major coronary vessels. Rest and stress ^{81}Rb imaging detected ventricular ischemia in 29 of 33 patients with significant stenosis, while simultaneous stress electrocardiography was positive in only 19 of the same patients. When the two methods were combined, positive results were obtained in 31 of the 33 patients. Seven patients were studied in which the narrowing of a major coronary vessel, as determined by coronary arteriography, was less than 50%. The stress scintigrams were negative in all seven patients, while the stress electrocardiograms were positive in two of the seven. The authors concluded that for the detection of myocardial ischemia rest and stress ^{81}Rb imaging with a scintillation camera provides greater sensitivity and specificity, compared to stress electrocardiography.

Limitations of Thallium-201 Myocardial Perfusion Scintigrams. T. M. Mueller, M. L. Marcus, J. C. Ehrhardt, F. Chauduri, and F. M. Abbound. *Circulation* 54: 640–646, 1976.

By occluding the left anterior descending coronary artery in 16 closed-chest dogs, the authors assessed the reliability of myocardial perfusion scintigrams with ^{201}Tl for the detection of areas of hypoperfusion. Cardiac scintigrams were obtained from four projections and graded from 0 (no defect) to 4 (large defect). The level of perfusion was measured in each of 96 segments of the left ventricle. In studies with a plastic phantom of the left ventricle, smaller perfusion deficits could be detected than in the hearts of dogs. In ischemic segments of the myocardium there was a good correlation in the concentration of radioactivity between ^{201}Tl and ^{99m}Tc-labeled microspheres. Seven of 12 ischemic hearts had abnormal scintigrams; each hypoperfused zone weighed more than 4.9 gm and the perfusion in the zone was less than 45% of normal. Small perfusion deficits may not be detected on scintigrams. The authors conclude that one of the problems with ^{201}Tl myocardial scintigrams in humans will be false-negative results.

Quantitative Radionuclide Angiocardiology—Determination of Left Ventricular Ejection Fraction in Children. D. Kurtz, T. S. Ahnberg, M. Freed, C. G. LaFarge, and S. Treves. *Br Heart J* 38: 966–973, 1976.

To overcome the problem of empirical choice of background area, the authors developed a method for estimating left ventricular ejection fraction by radionuclide angiocardiography. Data were obtained from mechanical phantom model experiments by high-frequency computer recording and venous injection of sodium pertechnetate to show the feasibility of their method, which was also validated by comparison with contrast angiography in 12 patients (correlation coefficient $r = 0.01$). The procedure differs from the area–length method in that the counts, rather than the areas, are used in the calculation; this provides the area with a third dimension (count density). It differs from the background-subtraction method since no area is used for determination of background; instead, different areas are used for end-systole and end-diastole rather than a single area for both. For children aged 2 to 18 years, a normal range of 0.66 ± 0.065 was found, and for children 2 years and under the average was 0.70 ± 0.05. There was good correlation between this method and another radionuclide method with the background subtraction in nine patients without left-to-right shunts. In patients with left-to-right shunts, however, the ejection fractions from the background subtraction technique averaged 0.077 above those from this technique and the significance of this variation has not yet been explained.

Gastric Emptying in Control Subjects and Patients with Duodenal Ulcer before and after Vagotomy. P. J. Howlett, H. J. Shiner, D. C. Barber, A. S. Ward, C. A. Perez-Avila, and H. L. Duthie. *Gut* 17: 542–550, 1976.

By means of a solid meal labeled with ^{113m}In-DTPA, gastric-emptying studies were performed in 26 normal subjects, 27 patients with duodenal ulcer, 41 patients following truncal vagatomy and pyloroplasty, and 38 patients who had had highly selective vagotomies. Gastric emptying times ($T_{1/2}$) were of little or no value in differentiating between control and duodenal ulcer subjects. Application of principal component analysis to the data did reveal differences between these two groups, as well as two probable subgroups of duodenal ulcer. Patients studied after highly selective vagotomy exhibited a more normal pattern at 1 month after surgery than those with truncal vagotomy and pyloroplasty (TV). By 6 months, however, no significant difference in overall emptying rate was found, although changes in the pattern of gastric emptying persisted in some patients following TV.

Scintillation Splenoportography: Hemodynamic and Morphological Study of the Portal Circulation. A. Syrota, J. M. Vinot, A. Paraf, and J. C. Roucayrol. *Gastroenterology* 71: 652–659, 1976.

The authors performed scintillation splenoportography (SSP) in 110 patients by the intrasplenic injection of ^{99m}Tc-microspheres, followed 30 sec later by an injection of erythrocytes labeled with ^{99m}Tc, and recorded the distribution of the two radionuclides. Scintillation imaging showed splenoportal obstruction in eight subjects and intrahepatic obstruction with collateral circulation in 53 cases, 14 of whom had umbilical reflux. The patency of surgical portocaval anastomoses was verified in 13 cases. By means of activity–time curves in areas of interest, splenoportal bloodflow velocity was assessed and no significant difference was observed between patients with cirrhosis and subjects with normal splenic–portal circulation ($V = 13.2$ cm/sec). There was, however, a significant difference between mean transit time (MTT) of RBCs in those patients with cirrhosis ($\bar{t} = 12.2$ sec) and those without cirrhosis ($\bar{t} = 19.9$ sec). A positive

correlation was observed between MTT and serum albumin and between MTT and prothrombin time. The authors concluded that SSP is a useful technique for the assessment of hepatic hemodynamics and for the detection of intrahepatic circulatory abnormalities, without the necessity of resorting to multiple catheterizations.

Transfer of I-125 Albumin from Blood into Brain and Cerebrospinal Fluid in Newborn and Juvenile Rats. O. Amtorp. *Acta Physiol Scand* 96: 399–406, 1976.

This study was undertaken to explain the relatively high concentration of protein in cerebrospinal fluid (CSF) in certain fetal or newborn mammals. The question was, Is it due to higher penetrability of the blood–brain barrier by protein or to a low production rate of CSF at that stage of life? A single intraperitoneal injection of ^{125}I-albumin was performed in rats at birth, at 5 days, or at 30 days of age. Sequential samples of CSF and blood were obtained during the subsequent 24-hr period. After decapitation, the animal was exsanguinated to minimize vascular blood in the brain. Brain tissue was analyzed in a scintillation spectrometer. Iodinated albumin in the brain was always less than 10% of the blood concentration. With increasingly older test animals, a decrease in the relative concentration of iodinated albumin in brain over blood was observed. The author found a qualitatively similar result for CSF and blood. Radioiodinated albumin is extracellular in brain. The concentration of iodinated albumin in brain interstitial fluid reached an age-independent maximum of 11–18% of blood activity at 24 hr. Corresponding 24-hr data for CSF were 16% in newborns, 6% for 5-day-olds, and 2% in 30-day-olds.

The concentration of a solute in CSF and brain is controlled by its volume of distribution and differences between its entrance rate from plasma into the brain plus CSF and its exit rate through arachnoid villi. The experimental data indicated that it was a decreased production of CSF in neonatal rats leading to a depressed flow of CSF through the arachnoid villi which produced a higher concentration of protein in CSF of immature rats than in older ones.

Radioisotope Choroid Plexography: A Preliminary Report. R. Oberson and F. Azam. *Neuroradiology* 11: 249–260, 1976.

Radionuclide plexography was evaluated as a morphologic method in 15 patients utilizing pretreatment with Solcocitran (containing 17 mg of stannous citrate) 24 hr before the injection of 15 mCi of $Na^{99m}TcO_4$. Anterior, posterior, and lateral projections were obtained immediately, 1, and 3 hr after intravenous administration. The choroid plexuses of the lateral ventricles, which are anatomically useful landmarks, were clearly delineated. The choroid plexus of the third ventricle was difficult to separate from that of the lateral ventricle, and the plexus of the fourth ventricle appeared smaller. The active principle of stannous citrate in this application remains unknown. Both the carrier molecule (citrate) and the Sn(II) are thought to be diffusely distributed in the body but with greater concentration in the vascular areas, such as plexus of dilated vessels that form the choroid bodies. Plexography may be valuable for the detection of an expanding lesion that deforms the ventricle and its plexus, for the visualization of an active papilloma of the plexus, and for the differentiation of thalamic tumor.

Computerized Tomography in the Diagnosis of Cerebral Atrophy. M. A. Roberts, F. I. Caird, K. W. Grossart, and J. L. Steven. *J Neurol* 39: 909–915, 1976.

Computerized tomograms were studied in 67 adults who had pneumoencephalograms that were normal or showed ventricular dilatation with or without widening of the sulci. A highly significant statistical relationship was found between the ventricular span on the pneumoencephalogram and the maximum ventricular area on the computerized tomogram. The results suggested that it was reasonable to regard a maximum ventricular area of less than 10 cm^2 as normal and greater than 18 cm^2 as severe dilatation. On the computerized tomogram the apparent width of the widest sulcus related well to marked cortical atrophy as shown on the pneumoencephalogram, but the correlation with lesser degrees was not so clearly demonstrated. The study provided a simple but objective measurement of ventricular size by computerized tomograms and provided quantitative values for the diagnosis of cortical atrophy. The method for evaluating sulcal widening was less precise.

Computerized Tomography (CT) in Acute Head Trauma. J. Merino-deVillasanten and M. Taveras. *Am J Roentgenol Radium Ther Nucl Med* 126: 765–778, 1976.

This study was a retrospective evaluation of the value of computerized tomography (CT) in 100 cases of head trauma. The authors concluded that (A) CT and routine radiographs of the skull should be the first neuroradiologic procedures performed; (B) angiography (after CT) may be necessary in relatively few patients with head trauma if the CT studies are technically limited and if an associated vascular lesion of the cervical or intracranial vessels is suspected; (C) sedation may be required in many cases to obtain technically satisfactory CT scans; and (D) a direct relationship exists between the severity of clinical presentation and the CT detection of abnormality. In the population studied essentially 100% of the patients who had trauma more severe than contusion and 70% of the patients who were clinically diagnosed as contusion had abnormal CT scans. The authors predict that the usefulness of CT in the diagnosis of head trauma will give impetus to the development of faster scanners.

A Comparison of Clinical Results in Brain Scanning Using Germanium Semiconductor Detectors and Sodium Iodide Detector. M. Beham, F. R. Hudson, S. T. Ostrowski, and R. E. Johnston. *Br J Radiol* 49: 618–623, 1976.

An analysis of 165 brain scans performed with a Ge(Li)-detector rectilinear scanner and either an Ohio-Nuclear rectilinear scanner or Searle Radiographics scintillation camera was presented. Twenty millicuries of $^{99m}TcO_4^-$ was injected. There were 20 positive NaI(Tl) scans and 31 positive Ge(Li) scans. Nineteen of the 20 patients with positive NaI(Tl) scans also had positive Ge(Li) scans. In three of these, the Ge(Li) scans were believed to have shown the abnormality more effectively. The remaining 12 patients with positive Ge(Li) scans had normal NaI(Tl) scans. Details of the 12 cases were given in the paper. The overall true-positive detection was 12% for NaI(Tl) detectors and 18% for Ge(Li) detector. The difference was attributed to better rejection of scattered photons by the Ge(Li) system.

Radiation Doses to Staff in a Department of Nuclear Medicine. E. A. Harbottle, R. P. Parker, and R. Davis. *Br J Radiol* 49: 612–617, 1976.

This study presents the results of a survey of radiation protection data in the Nuclear Medicine Department and

associated sections of the Physics Department at the Royal Marsden Hospital (Surrey Branch) for the period 1972 to 1975 inclusive. Results of routine film monitoring and whole-body counting were presented. The average monthly doses for the radionuclide dispensary staff ranged from 50 to 100 mrad with a maximum of 245 mrads. Routine dispensing of ^{99m}Tc accounted for 5–10 mrad per week to the technicians, and 10–20 mrad per week were received in setting up the new generator and dismantling the old one. Radiographers, who do in vivo scanning but no dispensing or injections, received 20–40 mrad per month from the close proximity to patients. The dose to the fingers of the physicians performing the injections ranged from 30 mrad per 100 injections to the right little finger to 160–690 mrad per 100 injections to the right thumb. Whole-body counting revealed body burdens of ^{99m}Tc to be very low ($<$100 nCi). The authors recommend that the injection workload be shared among several people if possible.

Anterior Position of the Lower Pole of the Right Kidney: Potential Confusion with Right Upper Quadrant Mass. L. Bree. *J Clin Ultrasound* 4: 283–285, 1976.

Three cases were reported in which a palpable right upper quadrant mass led to ultrasonographic examination. All three patients were thin, and enlargement of the gallbladder was seriously considered in each. In each case supine sagittal scans showed that anterior location of a morphologically normal right kidney was in fact responsible for the clinically palpable mass. This phenomenon was presented as a normal variant worthy of mention and, in selected instances, a logical explanation for a palpable right upper quadrant mass. (*NB:* The experience of this reviewer has been similar in two recent cases.)

Echoencephalographs of 100 Consecutive Acute Psychiatric Admissions. H. Daum, W. M. McKinney, C. Proctor, W. Barnes, and P. Potter. *J Clin Ultrasound* 4: 329–333, 1976.

In a series of 100 consecutive acute short-term psychiatric admissions, the authors found a 12% incidence of abnormalities by echoencephalographic examination. Eleven patients were found to have enlargement of the lateral ventricles (greater than 20 mm), two had enlargement of the third ventricles (greater than 10 mm), and two had significant midline shifts (greater than 3 mm). The two midline shifts (2%), an incidence comparable to other studies, were confirmed by pneumoencephalography and cerebral angiography in one patient and at autopsy in the second. Using length of hospitalization as an index of treatment response, the authors found a significant correlation between treatment response and the size of the third ventricle; no such relationship could be established between treatment response and size of the lateral ventricles.

Expanded Criteria for the Ultrasonic Diagnosis of Gallstones. C. Crow, R. J. Bartrum, Jr., and S. R. Foote. *J Clin Ultrasound* 4: 289–292, 1976.

Previous reports have indicated a high false-negative rate for the ultrasonic identification of calculi in the gallbladder (in one series, as high as 50%). The authors presented 21 cases of documented cholelithiasis, observing that the classic ultrasonic appearance of stones was present in only 12 of these patients. The "classic" appearance of gallstones on the ultrasound examination was described, demonstrating the internal echoes within an anechoic gallbladder and the accompanying sonic shadow distally. Layering of numerous small stones may produce a level of calculi across the gallbladder, dividing it into two parts. This corresponds rather closely to the appearance of such small stones on oral cholecystography. To avoid confusion, shifting position of the stones on the upright view was recommended. Small stones that do not float may also cause confusion; again, scanning the patient in the upright position allows them to reach the dependent portion of the gallbladder and become distinguishable from the posterior wall of the gallbladder. When the gallbladder is completely filled with stones, the easily recognizable lumen of the gallbladder is not available as a landmark, and the diagnosis may be missed. The collection of stones will, however, produce a sonic shadow, thus pointing to the correct diagnosis. Caution is advised in that the "shadow sign" of cholelithiasis is valid only when it occurs beneath the right lobe of the liver. A false shadow sign is commonly encountered just caudal to the liver edge and can be attributed to gas-containing transverse colon. With these expanded criteria for the diagnosis of cholelithiasis, the authors achieved a 92% accuracy rate in a series of 50 examinations. The remaining four cases were interpreted as equivocal.

Evaluation of Malfunctioning Ventriculoperitoneal Shunts with Gray Scale Echography. J. Cunningham. *J Clin Ultrasound* 4: 369–370, 1976.

Two patients were presented in whom the cause of nonfunctioning ventriculoperitoneal shunt was documented by ultrasonography. Identification of a sizeable sonolucent mass in the abdomen at the distal end of the shunt catheter permitted diagnosis of cerebrospinal fluid pseudocyst and led to shunt revisions. In one case the end of the peritoneal catheter was clearly identified in the center of the pseudocyst. The authors advise that formation of a pseudocyst is a poor prognostic sign in that revision of such an abdominal shunt may again fail after a brief interval, as was seen in the second patient presented. Pseudocyst formation can be distinguished from cerebrospinal fluid ascites in which the peritoneal cavity fails to absorb spinal fluid as rapidly as it is discharged into the abdomen.

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