ABSTRACTS OF CURRENT LITERATURE

Effect of Cosmic Rays on Computer Memories. J. F. Ziegler and W. A. Lanford; IBM-Research, Yorktown Heights, NY and SUNY, Albany, NY. *Science* 206: 776–788, 1979

With the advent of computers have come questions about the operating environment for the computer and the best storage conditions for archived data. With experience we have learned that heat and stray magnetic fields are the enemies of memory and data, and we speculate regarding the question that ionizing radiation and computers really mix. The authors of this paper have extensively evaluated the potential effects of cosmic rays on computer memories. The paper examines the interaction of protons, electrons, neutrons, and muons with silicon and the sensitivity of the silicon in three different silicon dynamic-memory device components. The error rate per chip using all available data and assumptions can be graphed against the device's critical charge, a threshold for any effect; the error rate is high for low critical charge. The newer computer devices have lower critical charges, so the consideration of damage to memory contents could become more important in the future. Also, of course, cosmic-ray fluxes vary in kind and amount with altitude, sun spot activity, geomagnetic latitude, and shielding. Altitude is a very strong factor, so flying computers are more error prone. Concrete shielding is more effective for devices of higher critical charge, and, therefore, less effective for the newer devices. A solar flare may increase cosmic-ray flux by five orders of magnitude, causing significant error rates at higher altitudes. The authors conclude that cosmic ray effects are and will continue to be significant at high altitudes and that concrete shielding will not help. The failure rates are on the order of 8 to 3000 errors per 1000 hr per chip at sea level; a large computer might have as many as 1000 of these chips, so the error rates become significant. Now we need to study with the same thoroughness the effects of gamma rays on silicon.

Right and Left Ventricular Dysfunction in Patients with Chronic Obstructive Lung Disease—Assessment by 1st-Pass Radionuclide Angiography. R. A. Slutsky, W. Ackerman, J. S. Karliner, W. L. Ashburn, K. M. Moser; Univ. of California, San Diego, San Diego, CA. *Am J Med* 68: 197–205, 1980

The relationship of right and left ventricular dysfunction in patients with chronic obstructive pulmonary disease (COPD) was reassessed in this study involving 20 normal subjects (NS) and 37 patients with COPD. All subjects underwent first-pass radionuclide angiography using a bolus i.v. injection of 15 mCi Tc-99m DTPA with imaging and data processing done with a single crystal mobile gamma camera and a dedicated minicomputer system. Pulmonary function tests in all subjects included determinations of MMEF, FEV_1, RV: TLC, pO_2, and pCO_2. Blood pressure and heart rate were evaluated, and data were analyzed by appropriate statistical methods. Normal ranges for the right (RVEF) and left (LVEF) ventricular ejection fraction as well as for the first-third LVEF were obtained from the 20 NS. Nine patients with mild COPD all had normal LVEF, RVEF, and first-third LVEF. Among 20 patients with severe COPD, 11 had depressed RVEF whereas only three had a depressed LFEF, but eight of the 11 (73%) who had depressed RVEF had depressed first-third LVEF. The more depressed the RVEF was, the more severely depressed was the first-third LVEF. The variation between these first-pass studies performed in the same patient more than 1 wk apart was less than 0.04 EF units. Intra- and interobserver variability was only 0.03 ± 0.03 EF units. The authors conclude that there is depression of right ventricular function only in patients with severe COPD. There is a subtle decrease in left ventricular function, as assessed by first-third LVEF, in patients with severe COPD and right ventricular dysfunction. Radionuclide assessment of LVEF, RVEF, and first-third LVEF may be useful in evaluating patients with advanced COPD.

^{32}P—Therapy for Malignant Pericardial Effusion. N. Firusian; Essen, Germany. *Onkologie* 3: 12–17, 1980

Results of P-32 radioisotope therapy in pericardial effusion are presented. Eleven patients, seven having carcinoma of the breast, two with bronchogenic carcinoma, and two suffering from Hodgkin's disease, received therapy. All developed pericardial effusion while receiving chemotherapy, and all had symptoms of right heart failure. The diagnosis of pericardial tamponade was based on clinical findings, ECG, thorax radiograms, and ultrasound. The diagnosis was verified when effusion was drawn. A catheter inserted into the pericardial cavity remained 2 wk. Effusion was evacuated completely. Intracavitary instillation of 5 mCi ^{32}P-$Cr(OH)_3$ in physiological saline followed. The authors found ten of the 11 patients to have had complete remission, defined as termination of effusion, remission of right heart insufficiency, and normalized cardiac silhouette. The ^{32}P-$Cr(OH)_3$ therapy failed once. Remission lasted from 3 to 22 mo. Recurrence of effusion was seen once, following an 11-mo period of remission. Death unrelated to cardiac tamponade was seen four times, occuring at 3, 4, 5, and 7 mo following P-32 therapy, without prior recurrence of pericardial effusion. Five patients had continuing remission surviving 3, 6, 9, 10, and 22 mo after therapy. The authors attribute the high rate of therapeutic success to the indwelling catheter that permits complete evacuation of effusion before instillation of ^{32}P-$Cr(OH)_3$. It was concluded that the results obtained were superior to those reported with Au-198, or those following intracavitary cytostatic therapy.

Primary Right Cardiac Tumor—Detection of Echocardiographic and Radioisotopic Studies. D. G. Caralis, H. L. Kennedy, I. Bailey, B. H. Bulkley; US PHS Hosp, Baltimore, MD. *Chest* 77: 100–101, 1980

This case report details the findings in a patient with a malignant myocardial tumor recognized by combined noninvasive techniques. A 17-year-old, male sailor, who had passed the physical examination for induction into the U.S. Coast Guard 3 mo earlier, had the sudden onset of fever, periorbital edema, heart murmur, hepatomegaly, and distention of the superficial abdominal veins. Chest radiograph showed borderline cardiomegaly, and the ECG showed right axis deviation. Arterial blood gas levels indicated mild hypoxemia and hypocapnia. An M-mode echocardiogram revealed a mass posterior to the tricuspid valve. A cardiac blood-pool gated study using Tc-99m showed obstruction of the superior and inferior

vena cavae and development of collateral venous channels. The right ventricular image usually seen during systole was absent, and the heart appeared disproportionately small compared with the chest radiograph. Left ventricle size and wall motion were normal with an ejection fraction of 55%. Myocardial scan with Tl-201 showed abnormal activity near the apex of the right ventricle. Subsequent angiograms were confirmatory. At thoractomy, the tumor (histologically a poorly differentiated sarcoma) was extensive, invading the myocardium and pericardium, extending beyond the epicardial surface of the right ventricle, encompassing the entire ascending aorta, and obstructing both vena cavae. Although rare, sarcomas are the second most common primary tumors of the heart, after myxomas, and are the major primary malignant neoplasm affecting the heart.

The Non-Invasive Evaluation of Regional Myocardial Ischemia Studied by a "Stress-injected" Thallium-201 Myocardial Imaging and a Radionuclide Left Ventriculography. Takeshi Kobayashi, Atsushi Miyamoto, Jouji Ando, Masayori Furudate, and Hisakazu Yasuda. *Jpn Circ J* 44: 209, 1980

This investigation was undertaken to determine the location and extent of the myocardial ischemia during exercise-induced angina and secondarily to study the alterations in left ventricular function during angina by multigated equilibrium cardiac pool imaging. Forty-six patients with angina who had proven coronary artery lesion by coronary angiography and eight normal subjects were investigated.

Exercise scintigrams were obtained 7 days after the rest scintigram and two studies were compared. Exercise was performed using bicycle ergometer. Endpoint for the normal subject was at 80% of age-adjusted target heart rate as determined by the Scandinavian Committee. In patients, exercise was continued until the appearance of angina or the appearance of ST changes on ECG, at which time thallium-201 was injected and, the same level of exercise was maintained another 1-2 min. Scintigrams were obtained immediately after the termination of exercise.

Segmental perfusion ratio (SPR) was calculated from the count of activity of each corresponding area. This ratio was utilized to determine the location and extent of myocardial ischemia in relation to coronary pathology. Objective evaluation of the scintigram was thus possible.

Theoretically, the segmental perfusion ratio should be 1.0 in normal subjects. In patients with coronary artery lesions, defects appeared on the scintigram with exercise and SPR in these instances were 0.76 ± 0.1 ($n = 17$). When this method was compared with the findings of coronary angiographic studies that demonstrated greater than 75% stenosis, sensitivity was 79% and the specificity was 95%. For the left anterior descending artery lesion with greater than 75% stenosis, sensitivity was 92% and specificity 88%. For the right coronary lesion, sensitivity was 90% and specificity was 100%. However, for the lesion of the left circumflex artery, sensitivity was 50% and specificity was 95%. Objective evaluation, in addition to the visual inspection of the images, is very helpful for the diagnosis of myocardial ischemia.

Gastroesophageal Scintigraphy to Assess the Severity of Gastroesophageal Reflux Disease. R. A. Menin, L. S. Malmud, R. P. Petersen, W. P. Maier, R. S. Fisher; Temple Univ., Philadelphia, PA. *Ann Surg* 191: 66-71, 1980

Thirty-six men and women with symptomatic gastroesophageal (GE) reflux were evaluated by five diagnostic procedures to select subjects likely to benefit from antireflux surgery (Nissen fundoplication). A clinical symptom score computed on each patient revealed nine subjects with mild esophagitis, 16 with moderate esophagitis, and 11 with severe disease. In the one radioisotopic procedure, serial GE images by gamma camera were performed on each subject after he/she swallowed 200 μCi Tc-99m sulfur colloid in 300 ml water and then experienced abdominal compression elicited by an external binder. A GE reflux index (in percent) was then computed from scintimages. In normal subjects, the mean reflux index was $2.1 \pm 1.2\%$ (s.e.m.) Patients who required surgery (for intractable symptoms, sometimes accompanied by esophageal hemorrhage or stricture) had preoperative indices of $18.5 \pm 2.9\%$, which declined to normal postoperatively. The nonoperated GE reflux patients had indices of $8.5 \pm 1.4\%$. A linear relationship ($r = +0.73$) existed between severity of clinical symptoms and radioisotopic index. Such index exceeded 10% in all subjects with severe clinical symptoms and in 11 of the 12 patients requiring surgery. The radioisotopic index correlated better with the degree of clinical symptoms than did results from the acid reflux test, esophagogastroscopy, endoscopic biopsy, or esophageal manometry. These authors state that although no single diagnostic test can predict which patients require or may benefit from antireflux surgery, their data indicate that surgical candidates had: (a) endoscopic esophagitis, (b) resting lower esophageal sphincter pressure below 10 mm Hg, and (c) a GE reflux index of over 10%.

Radiolabeled Fiber—Physiologic Marker for Gastric Emptying and Intestinal Transit of Solids. J. R. Malagelada, S. E. Carter, M. L. Brown, G. L. Carlson; Mayo Clinic and Foundation, Rochester, MN. *Digest Dis Sci* 25: 81-87, 1980

These authors labeled fibers of alpha-cellulose (a vegetable product derived from plant cell walls) with I-131 to a specific activity of 1-5 μCi/mg. The resulting strands of 1-5 mm length retained their fibrous appearance, texture, and mechanical resilience and were unaffected by pH conditions found within the gastrointestinal tract. A food ration containing 200 μCi of I-131 fiber was consumed by each of two dogs untreated with nonradioactive iodide. By 96 hr postingestion, 81-92% of radioactive dose appeared in feces and 0.6-1.3% appeared in urine. Blood samples taken daily during the period had no radioactivity, and the thyroid gland from one animal killed at 96 hr revealed 0.002% of the original I-131 dose. Two other dogs fed similarly and imaged by gamma camera revealed almost all radioactivity in the abdomen at 1 and 24 hr after injection but negligible amounts remained by 48 hr. Two other dogs with duodenal fistulas fasted for at least 12 hr and then ate a mixture of 200 g solid food and 200 ml water containing polyethylene glycol 4000 (PEG, a water-soluble marker) and 200 μCi of I-131 fiber. Gut contents aspirated over the ensuing 3 hr revealed 50% of ingested PEG reached the duodenum in less than 40 min, but less than 50% of ingested radiolabeled fiber was recovered in the duodenum at 2 hr. When the latter study was repeated using 1 mCi Tc-99m instead of PEG and the animals were imaged by gamma camera, Tc-99m was detected filling up the duodenum and proximal jejunum within a few minutes of ingestion, whereas I-131 fiber emptied slowly from the stomach, and relatively little activity was seen in small bowel by 4 hr. Twenty-four hours after injection, I-131 fiber filled the lower colon and rectum. Separately, I-131 fiber incubated anaerobically in vitro with fresh human stool at 37°C released a significant amount of soluble I-131 after Day 6 only and presumably through action of normal colonic flora. The authors feel that I-131 fiber (representative of natural fiber present in common vegetables) offers potential for measuring gastric emptying, intestinal transit, and fate of dietary fiber in nonruminant animals and man.

Scintigraphic Skeletal Changes in Non-dialyzed Patients with Advanced Renal Failure. K. Ølgaard, S. Madsen, J. Heerfordt, M.

Hammer, and H. Jensen; Copenhagen, Denmark. *Clin Nephrol* 12: 273–278, 1979

Tc-99m polyphosphate bone scintigraphy in nondialyzed uremic patients was assessed for detection of metabolic bone disease. Fifty-one patients were examined. Total body scintigraphy with a rectilinear scanner followed 2 hr after i.v. injection of 12 mCi Tc-99m PPi. Data recorded on tape were visualized on videodisplay and documented on scintiphotos. Thirty percent background subtraction was used. Standard radiographic examinations were done; magnification techniques were not used. Scintigrams were graded on a 4-step scale, from 0 to 3. Group 0 had normal scintigrams. Group 1, nine patients, had abnormal symmetrical isotope uptake of the femor head. Group 2, seven patients, showed additional uptake in the proximal half of the tibial shaft, with a clear maximum at the tibial tuberosity. Group 3, 18 patients, demonstrated highly elevated radiotracer uptake in the femoral head, the femoral and tibial condyles, the tarsus, and the proximal part of the metatarsus. Also recorded were sites of focal, abnormal radiotracer uptake. Normal scintigrams were found in 17 of 51 patients. The investigation demonstrated that 66% of uremic nondialyzed patients with creatinine clearance values below 40 ml/min had abnormal skeletal scintigrams. The creatinine clearance was significantly lower ($p < 0.005$) for Groups 2 and 3 than for Group 0. Focal abnormalities were recorded in 11 patients, most commonly in the tarsal (six) and knee joint region (four). Radiograms of 13 patients indicated presence of halisteresis. More than half of these patients were in Group 3. The authors conclude that Tc-99m PPi skeletal scintigraphy offers a sensitive, but nonspecific, method for the identification of renal osteodystrophy, even in uremic nondialyzed patients.

Technetium-99m Glucoheptonate Renal Scan: Its Place in Diagnosis of Acute Renal Injury. R. T. Chopp, H. Hekmat-Ravan, R. Mendez; Los Angeles City General Hosp., Los Angeles, CA. *Urology* 15: 201–206, 1980

Twenty-four patients with suspected renal injury were prospectively evaluated using high-dose IVP, Tc-99m glucoheptonate study, and selective renal arteriography. All patients had either gross or microscopic hematuria. A high-dose (100 cc of contrast medium) IVP with tomograms was followed by the radionuclide scan using 20 mCi of Tc-99m glucoheptonate. The dynamic phase of the study was displayed by 3-sec serial films for eight to nine frames, and two to three sequential static images accumulating 300,000 counts were then performed. Delayed images at 30 and 60 min after injection were then obtained using the high resolution converging collimator. Each kidney was imaged separately in posterior and both oblique projections. The patients were then studied by transfemoral selective renal angiography by the method of Halpern. The IVP showed only a 64% (11 of 17) sensitivity compared with 94% (16 of 17) for the renal scan. The one negaitve scan was in a patient who was found on angiography to have a 2 cm pericapsular hematoma. The authors feel that if the scan shows a peripheral lesion and the patient is stable, or if the scan is negative with an equivocal IVP, angiography is not necessary.

Clinical Evaluation of Scrotal Scanning. Kyung-Il Lee and Sadao Watanabe. *Nipp Act Radiol* 40(2): 1351, 1979

Following the concept of Nadel's work in 1973, 22 patients with a variety of intrascrotal lesions were evaluated by scrotal scanning, a simple, rapid, and safe radionuclide procedure. The scans of testicular torsion showed no abnormality on the arterial phase but did denote a photon-deficient area on the tissue phase, consistent with infarcted testicle. On the other hand, acute epididymitis demonstrated marked hyperemia on the side of the pathology and marked increase in radioactivity corresponding to the inflamed mass. Therefore, it was possible to differentiate testicular torsion from acute epididymitis by scrotal scanning. In addition, scrotal scanning was helpful in the diagnosis of testicular abscess and hydrocele of the testis as an adjuvant diagnostic tool.

Radioisotope Lymphadenectomy in Testicular Tumors. W. Kuber, S. Leodolter; Vienna, Austria. *Urologe A* 19: 25–31, 1980

The authors report results of improved lymph-node localization for radical lymphadenectomy after subcutaneous injection of Tc-99m-labeled antimony sulfide colloid before surgery in 11 patients. Surgery followed 12 hr after injection of 500 μCi Tc-99m antimony sulfide colloid. Colloid spheres varied from 3 to 30 nm. At survery a gamma camera detector was located beneath the operating table. Patients were placed to bring iliac, aortal, and paracaval lymph nodes into view of the camera. A TV monitor was used to supplement the gamma camera display unit. Following standard lymph node extirpation, the tagged, visualized, and remaining nodes were extirpated during a second examination. To aid in lymph-node localization, a Tc-99m-labeled probe was used. The authors report that seven of 11 patients had complete extirpation of labeled lymph nodes during surgery. Two patients, both lacking radiographic and histologic signs of malignant lymph node infiltration, demonstrated poor radioisotope uptake. The authors believe that radiographic contrast media application during lymphangiography interferred with radiotracer uptake. Lymph nodes were not seen in four patients, and all were found to be inoperable. Five patients demonstrated good radiocolloid uptake. The histologic examination failed to find evidence of tumor infiltration in four of these patients. The authors conclude that initial results indicate that the radioisotope procedure improves localization of retroperitoneal lymph nodes when radical extirpation due to testicular tumors is required.

Longterm Results of ^{131}I Treatment of Hyperthyroidism—Factors Influencing the Incidence of Hypothyroidism. Noboru Hamada, Kunihiko Ito, Takashi Mimura, Naoko Momotani, Yoshihiko Nishikama, Eiji Ino, Yoshio Ban, and Takehiko Tsuchiya; *Jap J Nucl Med* 16(8): 1343, 1979

The results of I-131 treatment were analyzed in 512 of 1,620 cases of hyperthyroid patients treated with I-131 from 1963 to 1967 at Ito Hospital, Tokyo. The incidence of hypothyroidism diagnosed clinically and by reference to serum T_3, T_4, and metabolic index was 28.5%; euthyroidism 66.4%; and hyperthyroidism 5.1%. Forty-one percent of the euthyroid cases had high levels of serum TSH. Although TRH tests were performed in 11 euthyroid cases with normal TSH levels, TSH response was normal in only three of the cases. Since there was no difference in the incidence of hypothyroidism among patients receiving a single dose of 6,001-7000, 7,001-8,000, or 8,001-9,000 rads, the relationship between the results of therapy and various factors that might influence the outcome of therapy was investigated in these cases. The incidence of hypothyroidism was higher in patients who experienced shorter intervals between the onset of hyperthyroid symptoms and I-131 therapy, previous therapy with external irradiation, small goiter, severe exophthalmus, or shorter effective half-life of I-131 at the time of treatment. Three cases of thyroid cancer and two cases of leukemia were observed in 823 patients that included 311 cases followed up only by inquiry.

Tumor Location Detected with Radioactively Labeled Monoclonal Antibody and External Scintigraphy. B. Ballou, G. Levine, T. R. Hakala, and D. Solter; University of Pittsburgh and Wistar Institute, Philadelphia, PA. *Science* 206: 844–847, 1979

The authors induced a subcutaneous teratocarcinoma in mice and imaged them with I-131-labeled teratocarcinoma-specific antibody. The teratocarcinoma-specific antibody is derived from lymphocyte hybridoma. The mice also had induced melanomas, which did not concentrate the antibody. Much of the labeled antibody was still in the circulation, thyroid, and liver 50 hr after injection when the imaging was performed. Lugol's solution was given to the animals in their drinking water. Some of the mice were also injected with an indifferent (not tumor-specific) antibody labeled with I-123. The I-123 image was subtracted from the I-131 image in order to remove blood and organ background. Adequate localization occurs in the mice between 24 and 48 hr if background subtraction is used. If not, then 4 or 5 days may be needed for a good image, by which time much of the label has been excreted. Details of the production of the antibody are given. There remains the question of whether antitumor hybridomas against most tumors can be prepared. One must also be certain that the isotope spillup and spilldown corrections are correctly carried out when the subtraction technique is used.

Target Cells for 1,25-Dihydroxyvitamin D_3 in Intestinal Tract, Stomach, Kidney, Skin, Pituitary, and Parathyroid. W. E. Stumpf, M. Sar, F. A. Reid, Y. Tanaka, and H. DeLuca; Universities of North Carolina and Wisconsin. *Science* 206: 1188–1190, 1979

Mature vitamin D_3-deficient rats were injected with tritium-labeled 1,25-dihydroxyvitamin D_3, killed, and sectioned for autoradiography. The radioactive vitamin D_3 was highly concentrated in the gastrointestinal tract. It was contained in the epithelial cells of villi and crypts of the duodenum, jejunum, and ileum, and epithelial cells of luminal surface and crypts of the colon. Intestinal contents were radioactive in a rat who received nonradioactive vitamin D_3 before the labeled material, suggesting excretion. The liver contained label, possibly in the Kupffer cells or lipocytes. Parts of the kidney were labeled, as were parts of the skin. Certain pituitary cells were labeled—in the parathyroid the nuclei of the parenchymal cells were labeled, providing evidence for the direct action of vitamin D_3 on the parathyroid hormone system and calcium metabolism. Several parts of the calcium homeostatic system were labeled. The roles of all these labeled cells are not known. This kind of study points to sites that must be considered when a particular compound, such as vitamin D_3 in this case, is under consideration as a functional and/or imaging agent.

Legionnaires' Disease: Concentrations of Selenium and Other Elements. J. R. Chen and J. M. Anderson; SUNY, Genesco, NY. *Science* 206: 1426–1427, 1979

The mysterious appearance and lethal nature of Legionnaires' disease led to the performance of a number of unusual analyses on material from the victims. This study reports the results of elemental analyses for Se, Ni, Cu, Br, Rb, Pb, Ba, and Ti in 17 paired samples of serum from acute and convalescent Legionnaires' disease patients and in ten sets of serum samples from patients with pneumonia. Thirty-microliter samples were measured by proton-induced x-ray emission. The x-rays were detected by Si(Li). All the elements were detected simultaneously. The Legionnaires' disease cases were selected at random from among those whose indirect fluorescent antibody titer was increased, and the controls came from a group of pneumonia patients originally suspected of having Legionnaires' disease. The only element in the list above to show an abnormal value was selenium, which was significantly lower in the acute Legionnaires' disease patients' sera than when they were convalescent, and the values had returned to the range of those of the pneumonia patients. The interpretation of the lowered selenium levels is not known. The significance for nuclear medicine is that altered levels of elements and compounds in disease states may make their measurement using radiotracers a method for studying function in disease. This kind of "shotgun" study may unearth useful pathways and compounds to study.

Serum Gentamicin Assay by a Radiometric Procedure. B. A. Gunn, S. L. Brown, C. S. Otey, C. A. Gaydos, J. F. Keiser, F. A. Meeks, and R. G. Trahan; Walter Reed Army Medical Center, Washington, DC. *Am J Clin Pathol* 73: 259–262, 1979

Gentamicin, an aminoglycoside antibiotic widely used for treatment of gram-negative infections, has potential nephrotoxic and atoxic actions when peak serum concentrations exceed 12 μg/ml. Among the most commonly used gentamicin assays for monitoring serum levels are nonradiometric microbiologic diffusion methods and RIA. A new radiometric instrument for microbiologic assay, BACTEC (registered trade name), utilizes a C-14-labeled urea substrate and a Proteus species culture to determine the concentration of gentamicin in serum. This study compared the results of the BACTEC and three nonradiometric microbiologic assays with an RIA to determine the suitability of each for use in the clinical laboratory. Eighty-eight serum samples were obtained from patients receiving parenteral gentamicin; 11 of the samples contained additional antibiotics. All specimens were frozen after collection at −20°C until ready for assay. Diffusion assays used included an 18–24 hr multiple-antibiotic-resistant *S. epidermidis* (JHH 12) and a *B. subtilis* (ATCC 6633) assay with added Penase, read after 6 hr and 18–24 hr incubation at 35°C. The BACTEC method was performed as directed by the manufacturer and utilized 0.2 ml of a patient's serum. The *S. epidermidis* and two *B. subtilis* assays showed no significant difference ($p < 0.005$) from the RIA method at low, medium, and higher gentamicin concentrations. The BACTEC mean obtained from samples containing less than 4 μg/ml of gentamicin was not significantly different from the RIA mean at the same concentration ($p < 0.005$), but BACTEC underestimated the gentamicin concentration in 90% of sera containing 4 g/ml. BACTEC had a within-run mean coefficient of variation (CV) of 6.9%. The between run CV was 13.5%. BACTEC has an advantage over the *B. subtilis* assay in not being affected by additional antibiotics other than tetracyclines and aminoglycosides. Times required to obtain gentamicin levels by RIA, BACTEC, and nonradiometric microbiologic methods were 3.5 hr, 7.5 hr, and 6 hr, respectively. Based on cost analysis of the three types of assays, the BACTEC assay was less expensive than RIA but more expensive than the in-house prepared nonradiometric microbiologic assay kit methods used in this study. The BACTEC assay is best used for assaying large batches of sera for gentamicin content and would be most appropriately used in a laboratory that already has the necessary radiometric equipment.

Improved Economics of HBsAg Screening with Commercial Radioimmunoassay Reagents. R. Hopkins, S. Ross, T. Jordan, A. Watt; Royal Infirmary of Edinburgh, Scotland. *J Clin Pathol* 33: 19–23, 1980

These authors modified a component of a commercially available solid-phase "sandwich" radioimmunoassay (RIA) kit for hepatitis B surface antigen (HBsAg). They diluted and rapidly purified the I-125 anti-HBs antibody reducing its radioactivity concentration. Separately, they coated polystyrene beads (also commercially available) with horse anti-HBs. The resulting altered RIA (mod-RIA) test was then compared with two reverse passive hemagglutination (RPHA) tests (1 and 2), enzyme-immunoassay (EIA), and unmodified RIA on coded test panels of hepatitis standards. Mod-RIA, RPHA-2, and EIA detected all 14 HBs Ag-positive samples on one panel, whereas RPHA-1 detected only nine. Mod-RIA detected all the weakly positive and three of four

borderline-positive samples in one panel and yielded identical results with RIA in the other three panels. Also, mod-RIA and RPHA-1 were used for 11.5 mo in testing 71,200 freshly drawn blood samples from potential donors and found 297 (0.42%) nonrepeatable positives by RPHA-1 but only 47 (0.077%) by mod-RIA. Of the 71,200 total, repeatable confirmed positives were nine and 11 by RPHA-1 and mod-RIA, respectively. The authors state that their mod-RIA is sensitive and specific in detecting HBsAg at a cost per test of 19% of that of detection by RIA and is comparable in cost to the less sensitive but widely used RPHA-1, thus encouraging adoption of mod-RIA by busy blood donor centers.

Ultrasonic Psuedocalculus Effect in Postcholecystectomy Patients. Vassilios D. Raptopoulos; University of Massachusetts, Worcester, MA. *Am J Roentgenol* 134: 145–148, 1980

In a series of 26 postcholecystectomy patients a strongly echogenic focus in the gallbladder bed with distal shadowing was identified. Only one of these patients proved to have retained bile duct calculi. Such an effect can presumably be produced by surgical clips used in the cholecystectomy, but 60% of the patients in the current series showed a similar phenomenon in the absence of surgical clips. The author assumes this pseudocalculus effect to be caused by postoperative scar at the site of the gallbladder bed. Caution is advised in the diagnosis of retained biliary calculi in the postcholecystectomy patient by virtue of this pseudocalculus sign.

Left Lateral Decubitis Sonography of Gallstones in the Contracted Gallbladder. Melvyn R. Conrad, Julia Leonard, and Michael Landay; University of Texas Health Science Center, Dallas, Tex. *Am J Roentgenol* 134: 141–144, 1980

A prospective study of 91 patients was undertaken to assess the reliability of diagnosing gallstones in a contracted gallbladder when the lumen of the gallbladder was not visualized. A dense collection of echoes was identified in the expected gallbladder bed that produced shadowing and the same configuration persisted on longitudinal, transverse, and left lateral decubitus views. Of 70 patients in whom follow-up studies or surgery was obtained 69 patients with this configuration were found to have cholelithiasis and the seventieth, chronic cholecystitis. The authors caution that the diagnosis of gallstones in a contracted gallbladder should not be made unless the configuration and location of the characteristic echo complex are seen on the left lateral decubitus view as well as on the supine longitudinal and transverse views. Bowel gas can produce a similar picture on the supine views but will change on the decubitus scan. Air in the biliary tree, the falciform ligament, and metal clips in the porta hepatis can be differentiated from the stone-filled gallbladder by position or multiplicity. Representative scans are provided.

Sonographic Evaluation of the Nonfunctioning Kidney. Michael Behan, David Wixson, and Elias Kazam; The New York Hospital-Cornell University Medical Center, New York, NY. *J Clin Ultrasound* 7: 449–458, 1979

In a review of 113 consecutive patients with unilateral renal nonfunction the authors established sonographic findings consistent with the final diagnosis in 92% of the cases. A spectrum of pathologic entities producing renal nonfunction is presented, including hydronephrosis, glomerulonephritis, transplant rejection, renal cystic disease, vascular obstruction, renal tumors, atrophy or dysplasia, and infection. Obstruction is the most common cause of renal nonfunction; the establishment of demonstrable connection between dilated calyces and a central renal pelvis serves to differentiate hydronephrosis from cystic disease. Parapelvic cysts could not be differentiated from hydronephrosis, and cysts in either renal pole could not be distinguished from obstructed calyces. Coronal sections were useful in the demonstration of continuity between dilated renal pelves and calyces. If the kidney appears completely normal on coronal and transverse views, obstruction is excluded as the cause of renal nonfunction. Glomerulonephritis produces increased renal cortical echoes with somewhat prominent medullary pyramids. The findings are not pathognomonic for this entity. Renal enlargement with swollen hypo-echoic pyramids is characteristic of acute transplant rejection. Chronic rejection is manifested by thinning of the renal cortex. When renal failure is due to polycystic renal disease, renal enlargement is always present. Examination of the liver is mandatory since approximately 43% of patients with polycystic kidneys in an autopsy series also had liver involvement. The differentiation between polycystic renal disease and severe hydronephrosis is made by the demonstration of continuity of the dilated calyces with the central lucent renal pelvis in hydronephrosis. Acute renal venous obstruction produces enlargement of the kidney. Chronic renal vein thrombosis as well as arterial occlusions produce diminution in renal size. In end-stage renal disease the usefulness of sonography is limited to the exclusion of obstruction and the determination of renal size.

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