## **ABSTRACTS OF CURRENT LITERATURE**

Predicting Loss of Pulmonary Function After Pulmonary Resection for Bronchogenic Carcinoma. M. Ali, C. F. Mountain, M. S. Ewer, D. Johnston, T. P. Haynie; Univ. of Texas System Cancer Center. *Chest* 77: 337–342, 1980

Studies of regional pulmonary blood flow, ventilation, and volume using Xe-133 and tests of overall pulmonary function (FVC and FEV<sub>1</sub>) were performed before and after unilateral pulmonary resection for lung cancer. Ninety-one patients were studied; 47 underwent total pneumonectomy and 44 lobectomy. At varying postoperative intervals 31 of these patients were evaluated serially. Eight scintillation detectors (four over each lung) were used. Regional pulmonary blood flow was determined by injecting intravenously 1-2 mCi of Xe-133 dissolved in saline. Regional ventilation was determined by inhalation of a tidal volume of a mixture of Xe-133 and air. The relative volume of lung viewed by each detector was provided by closed circuit equilibrium with Xe-133. The percentage of the total activity measured by each of the eight detectors was expressed as a numerical value for each variable. Good correlation (r) was found between the calculated expected loss of pulmonary function and the measured values (r = 0.87 and 0.59 for pneumonectomy and lobectomy, respectively). Since the values for r for the loss in function following right upper lobectomy were very low (r = 0.35), the calculation was considered unreliable for the removal of less than four segments. Initially, patients who undergo lobectomy lose considerably more function than would be anticipated by the amount of tissue resected, however, a gradual increase in function with time results in a final loss of less than half of the initial value. This early disproportionate loss of pulmonary function following lobectomy should be anticipated and preparations made for managing this transient deterioration of pulmonary function. This transient loss is in contrast to pneumonectomy, in which the overall pulmonary function is relatively stable postoperatively.

Intrathoracic Gastric Cyst Demonstrated by Tc-99m Pertechnetate Scintigraphy. I. Kamoi, H. Nishitani, Y. Oshiumi, Y. Ichiya, K. Matsuura, K. Ideda, M. Kajiwara, A. Kitano; Kyushu Uniy., Japan. *Am J Roentgenol* 134: 1080–1081, 1980

The authors describe a case of intrathoracic gastric cyst demonstrated by pertechnetate scintigraphy. A 5-month-old male inrant was admitted because of failure to thrive, fever, and a chronic cough. Admission chest radiograph showed a complete situs inversus and a right-sided posterior mediastinal mass. On the basis of a cystic pattern of the mass on ultrasonography, a neuroenteric cyst with lung abscesses was suspected. At surgery, the mass was not removed, but its contents were aspirated as completely as possible. The histologic diagnosis of the biopsy specimen was bronchogenic cyst. On learning of high chloride levels in the secretions from the mass, sequential thoracic and abdominal images were obtained using a gamma camera after the intravenous injection of 2 mCi Tc-99m pertechnetate. Abnormal activity was found in the mediastinal cyst mass, and the diagnosis of intrathoracic gastric cyst was confirmed by histologic study revealing gastric mucosa in the cyst.

Processing of Liver Dynamic Studies with Technetium-labelled Sulphur Colloid. A. S. Houston, M. A. Macleod; Dept. of Nuclear Medicine, Royal Naval Hospital; Haslar, Gosport, Hants. *Br J Radiol* 53: 87–92, 1980

Generalized or diffuse regions of diminished sulfur colloid are nonspecific signs that may be related to cirrhosis, hepatitis, or reticulosis. This study was undertaken to determine if the rate of colloid uptake in the liver would add significantly to the ability to differentiate between these diseases, as had been suggested previously. Following injection of 2 mCi of Tc-99m sulfur colloid, 30 frames, each of 30 sec, were collected with a scintillation camera and stored in a computer. A summed view of the study was used to delineate regions of interest around the liver and over the aorta for which time-activity curves were generated. From these curves maximum counts per minute per pixel were calculated over the liver, corrected for blood background, and an uptake rate constant. Comparison of these parameters between the various groups of patients-normal, cirrhotic, those with space-occupying lesions, reticulosis, or hepatitis-demonstrated some significant separations, but the results were not unambiguous. An alternative type of evaluation, principal-component analysis, showed similar results, provided that the first four frames thought to represent mixing, were not included. Although the data reported do not facilitate reliable separation of the pathological conditions investigated, it is hoped that further work with larger patient groups will establish the rate constant as a useful adjunct in the differential diagnosis of liver disease.

Mechanism of Hepatic Extraction of Gelatinized <sup>99m</sup>Technetium Sulfur Colloid. E. A. George, L. R. Hendershott, D. J. Klos, R. M. Donati; Saint Louis Univ., St. Louis, MO. *Eur J Nucl Med* 5: 241–245, 1980

The authors sought to study the hepatic zonal and cellular localization of gelatinized Tc-99m sulfur colloid in the rat liver. Thirty animals each received 8 mCi of Tc-99m sulfur colloid i.v. The animals were killed at 15 min, and at 2, 4, 6, and 24 hr after receiving the radionuclide. Five random blocks were taken from the liver of each animal, and from each block five sections were obtained. Each section was studied with autoradiography, stained with hematoxylin and eosin, and examined with light microscopy. Grain patterns were topographically located. Uptake was quantified in six high-power microscopic fields of each section. Transmission electron microscope studies were performed on specimens from six rat livers harvested 3 hr after i.v. injection of 2 ml osmium tetroxide stained Tc-sulfur colloid. The authors found conspicuous Kupffer cell associated intrasinusoidal radioactivity, often arranged in "sunburst" patterns. Grain cluster distribution was sparse, associated with less than half of the identifiable hepatic lobules of each liver section. Kupffer cell nucleus and cytoplasm appeared to be free of radioactivity. The electron microscopic sections of liver specimens from animals injected with the osmium-stained sulfur colloid demonstrated occasional intrasinusoidal particles, arranged in groups. These were focally attached and surrounded by villous projections and pseudopods of Kupffer

cells. The authors suggest that the topographic localization indicates that the hepatic extraction of the Tc-99m sulfur colloid and colloidal gold are not identical. The authors conclude that hepatic extraction of gelatinized technetium sulfur colloid depends on sinusoidal microcirculatory hemodynamics and that it does not depend on Kupffer cell phagocytosis.

## Wilson's Disease: Rapid Diagnosis and Differentiation of Heterozygous and Homozygous Carriers with <sup>64</sup>Cu Cl<sub>2</sub>. H. Wesch, H. Przuntek, D. Feist; Heidelberg, Germany. *Dtsch med Wschr* 105: 483–488, 1980

The authors sought to determine whether a modified radiocopper test permits dependable identification of Wilson's disease. Twenty-seven homozygous carriers, 30 parents, 33 siblings, 10 nonrelated persons with suspected disease, and 15 controls were studied. Eighty to one hundred twenty  $\mu$ Ci Cu-64 in 0.1 mg copper were prepared, brought into the chloride form, and dissolved in physiological saline for injection. The saline solution contined 0.05 mg copper/ml. The authors stressed that a constant quantity of copper was injected, not a constant radioactivity. Copper was administered according to body weight. Persons weighing up to 40 kg received 50  $\mu$ g, 40 to 80 kg 100  $\mu$ g, and above 80 kg 150  $\mu$ g copper. Eight milliliters of blood were obtained at 30 min, and after 3, 8, and 24 hr. The Cu-64 ceruloplasmin was separated, and the plasma Cu-64 determined in a scintillation well counter. Background subtraction and half-life correction were performed. The percentage of the injected dosage of Cu-64 per liter plasma was calculated. The authors demonstrated a rapid decline of Cu-64 in all persons during the first 3 hr after administration. Normal patients demonstrated a slight increase in activity beginning at 3-8 hr due to circulating Cu-64 ceruloplasmin. Homozygous carriers failed to demonstrate this rise in serum copper levels. Heterozygous carriers without symptoms had an initial drop similar to that seen in controls and the Cu-64 rise after 8 hr was smaller. At 24 hr after injection the homozygous carriers demonstrated about 6% in their plasma, heterozygous carriers 20%, and controls about 40% of injected activity. Incorporation of Cu-64 into ceruloplasmin can be demonstrated within 30 min in control patients. Three hours after injection 0.3% of the injected dosage per liter plasma was observed, rising to 1.2-1.8% at 24 hr. In heterozygous carriers the 3 hr value was 0.1%, and the 24 hr value 0.4-0.5% of the initial activity. Homozygous carriers had 0.1% of the initial dose bound to ceruloplasmin at 24 hr. The 24 hr urinary excretion in normals and heterozygous carriers was about 0.15% of the initial activity. Urinary excretion of Cu-64 in homozygous carriers reached values 3-10 times that of controls. The authors conclude that the modified <sup>64</sup>Cu Cl<sub>2</sub> test permits identification of Wilson's disease and a separation between homo- and heterozygous disease carriers.

Hepatobiliary Scanning in the Diagnosis of Acute Cholecystitis. R. E. Sziabick, J. A. Catto, D. Finkbennett, V. Vevtura; William Beaumont Hosp., Royal Oak, MI. Arch Surg 115: 540–544, 1980

Two hundred seventy-one consecutive hepatobiliary scans (HBS) using Tc-99m iproferin (PIPIDA) were correlated with ultrasonography, oral cholecystography, or i.v. cholangiography in the majority of cases. Definitive diagnoses were established on the basis of surgical findings in 117 patients. Most of the HBS were requested to identify the cause of a patient's acute abdominal pain. Scintigraphic images were obtained on a fasting patient at 10-min intervals for 1 hr following the i.v. injection of 5-10 mCi Tc-99m PIPIDA. Anterior and lateral views were routinely obtained with oblique views taken as needed to differentiate gallbladder from duodenal loop activity. An abnormal HBS was defined as one in which the gallbladder failed to visualize by 1 hr with adequate visualization of the biliary tree and proximal GI tract. Among Group 1 patients (normal HBS) and Group 2 patients (abnormal HBS meeting the criteria specified above), the diagnostic accuracy was 98.7%, sensitivity was 100%, and specificity was 97.6%. Repeatability was 99.2%. In the 76 patients with surgically established pathology, ultrasonography gave diagnostic results in only 20%; supportive results (cholelithiosis) were encountered in 57.5%, and 22.5% had misleading or equivocal results. In Group 3 patients (nonvisualized gallbladder and nonvisualization or delayed visualization of the extrahepatic biliary tree on HBS), ultrasonography yielded definitive or supportive information in 87.5% of cases. HBS was not a precise notability in this group. HBS is a highly accurate, rapid, and cost-effective procedure for the diagnosis of acute cholecystitis and may have limited application in the diagnosis of chronic cholecystitis.

The Role of H.I.D.A./P.I.P.I.D.A. Scanning in Diagnosing Cystic Duct Obstruction. C. A. Suarez, F. Block, D. Bernstein, A. Serafini, G. Rodman, R. Zeppa; Univ. of Miami, Miami Fl. Ann Surg 191: 391–396, 1980

Ninety-two patients with symptoms suggestive of acute gallbladder disease underwent Tc-99m PIPIDA or HIDA scans of the right upper quadrant within 24 hr of admission. Of the 92 patients, 67 with gallbladder disease underwent surgery, 18 were diagnosed as having nonbiliary tract disease, and seven had clinical, radiographic, ultrasonographic, and scintigraphic evidence of gallbladder disease without pathologic confirmation and were dropped. Each patient received 10 mCi of Tc-99m PIPIDA or HIDA i.v. Imaging was performed at 15-min intervals for 2 hr and at 12-24 hr if necessary. Failure to visualize this gallbladder despite the appearance of radioactivity in the common bile duct and duodenum was interpreted as cystic duct obstruction. Accuracy of 98% was obtained in the 44 patients who proved to have acute cholecystitis. The test was exceedingly unreliable in identifying patients with chronic gallbladder disease. Only 43% had a nonvisualized gallbladder, whereas 57% had a normal examination. The scan was very helpful in ruling out the possibility of acute cholecystitis. All 18 patients in this group had a normal scan. Ultrasonography had a diagnostic accuracy of 86.8% in patients with acute cholecystitis, stones were demonstrated in 81% of patients with chronic cholecystitis, and all patients with nonbiliary tract disease had a normal study. Hepatobiliary scanning using Tc-99m PIPIDA or HIDA is the investigative tool of choice when a patient may have acute cholecystitis secondary to cystic duct obstruction. The addition of ultrasonography resulted in 100% accuracy in establishing the diagnosis of acute cholecystitis. Ultrasonography and oral cholecystograms remain the investigative tools of choice in cholelithiasis and chronic cholecystitis.

Testicular Torsion and Usefulness of Radionuclide Scanning, R. J. Wasnick, K. R. Pohutsky, R. J. Macchia; SUNY Downstate Med. Center, Brooklyn, NY. Urology 15: 318–320, 1980

The authors report 33 patients (ages 14-33 yr, mean 21) who presented with symptoms of acute testicular torsion. Following i.v. injection of 10 mCi pertechnetate, gamma camera images were obtained in each patient with 4-sec frames (to show vascularity) followed by two 2-min static images to demonstrate vascularity and homogeneity. Of the 34 cases studied (one patient was studied on two separate occasions), 13 were explored surgically, and 21 were treated conservatively. There were 11 cases of torsion in the 13 patients treated surgically, one epididymo-orchitis, and one normal testicle. At surgery, four testicles that appeared viable were detorsed (but not tested for physiologic function), while eight nonviable testicles were removed, for an overall testicular salvage of 33%. In nine of the patients with surgically-proved torsion, time from the onset of symptoms to surgical treatment averaged two days. Radionuclide image interpretation agreed with the surgical findings in ten cases but yielded incorrect results in one and inconclusive in two cases, for an accuracy rate of 77%. Of the 21 cases treated nonsurgically, clinically 17 patients had an apparent epididymo-orchitis, three had traumatic hematoma, and one had torsion. In six of those patients, however, torsion was not detected until several days later (i.e., a false-negative initial scan), often after irreversible damage had occurred. Such missed torsion was demonstrated on later static image scan as a "halo sign"; a cold area surrounded by variable hyperemia. In some cases of missed torsion, orchiectomy was necessary. The authors advocate greater implementation of early surgical exploration to increase the testis salvage rate in acute testicular torsion.

The Effect of Various Background Protocols on the Measurement of Left Ventricular Ejection Fraction in Equilibrium Radionuclide Anglography. D. N. Taylor, N. W. Garvie, D. Harris, G. P. Sharratt, B. A. Goddard, D. M. Ackery; Depts. of Medical Physics, Nuclear Medicine and Cardiology; Southampton General Hospital, Southampton, England. *Br J Radiol* 53: 205–209, 1980

The use of multigated blood-pool equilibrium imaging for the measurement of left ventricular ejection fraction is now well established. There remains, however, some doubt as to the most accurate method of assessing the background, which is an integral part of the calculation. This study compares four different methods for background measurement in terms of ejection fraction (EF), accuracy, and reproducibility. The first part of the study consisted of carrying out single-plane cineangiographic EF and radionuclide EF in a carefully selected group of patients. The radionuclide EFs were calculated in each of four ways: (a) a fixed left ventricular region of interest with adjacent background; (b) separate enddiastolic and end-systolic areas and use as background of the region given by (end-diastolic area) - (end-systolic area); (c) regions of interest at both end diastole and end systole are selected, and each assigned an adjacent background region; (d) the left ventricular region of interest is delineated for each of the frames comprising the study. The background is taken along the lateral edge of the ventricle in the end systolic frame. The ejection fractions of 11 patients were calculated by five different observers according to each of the four methods, and the results were compared with those obtained from cineangiography. A systemic error was apparent with Method 1, but the remaining three methods produced results that were very close to cineangiographic values. The fourth method is preferred, since the manual intervention required by the operator in Methods 2 and 3 gives rise to substantial interobserver error.

The Effect of Gate Width on Thallium-201 Scintigraphy of the Myocardium. D. A. Causer, H. Singh.; Dept. of Clinical Physics and Bioengineering and Dept. of Cardiology; Walsgrove Hospital; Coventry, England. *Br J Radiol* 53: 142–146, 1980

Selection of optimal imaging techniques for TI-201 myocardial scintigraphy is important because of the relatively small activities administered (generally 1-2 mCi). The authors have investigated the effects of using spectrometer windows of 5 to 40% centered on the mercury x-ray photopeak at 75 keV. Line-spread functions (LSF) of TI-201 were made using a scintillation camera with a low energy, medium resolution collimator, and with 5 cm of scattering medium both behind and in front of the source. The source was 10 cm from the collimator face. Modulation transfer functions were calculated from the LSF as recorded for the various window widths. Sensitivity measurements were made using a large disc-shaped phantom filled with a TI-201 solution and placed 5 cm deep

in a scattering medium. A graph of counts per second per unit area of camera crystal plotted against window width shows the expected increase in sensitivity. MTV curves show decreasing resolution as the window width is increased. A figure of merit designed to combine resolution and sensitivity to predict imaging performance and described previously by Beck and Harper showed that the higher sensitivity at the 40% window opening was more significant than the slight loss of resolution. The figure of merit varied universely with the window widths over all important spatial frequencies. Comparative patient images in the LAO projection for both equal counts and for equal time using 5, 20, and 40% windows are shown. It is concluded that the use of a 40% window for TI-201 imaging does not markedly degrade image quality, probably because of the small amount of energy lost by 75 keV photons during Compton scattering. Conversely, the increased sensitivity may be of considerable value.

Comparison of Gated Radionuclide Scans and Chest Radiographs-Assessment of Left Ventricular Impairment in Patients with Coronary Disease. J. A. Bianco, D. B. Reinke, D. G. Makey, R. B. Shafer; Veterans Administration Hosp., Minneapolis, MN. *Chest* 77: 396–399, 1980

The diagnostic value of chest radiographs and gated cardiac scans in determining impaired LV function was compared in 41 male patients, ages 34-70 yr. The criterion for inclusion in the study was demonstration of an LVEF  $\leq 0.50$  by the radionuclide study. Signs and symptoms of congestive heart failure were present in 27 of 41 patients (66%), and 80% were taking digitalis, diuretics, and vasodilators at the time of the radionuclide gated study. All were diagnosed as having ischemic heart disease. Without prior knowledge of the radionuclide studies chest radiographs were interpreted by a senior radiologist. Scintigraphic measurements of LVEF were made after in vivo red cell labeling with Tc-99m with a gamma camera interfaced to a minicomputer. Qualitative evaluation of left ventricular and right ventricular wall motions were made during joint review by a nuclear medicine physician and a cardiologist. The mean LVEF was  $0.32 \pm \text{s.e.m.}$  0.01 and the mean cardiothoracic ratio (CTR) by radiography was  $0.53 \pm 0.01$ , and no correlation was present between these two parameters. Patients with normal chest films and/or CTR ≤0.50 were analyzed. The mean LVEF in this group was  $0.38 \pm 0.01$ . Those with CTR  $\leq 0.50$  had a calculated mean LVEF of 0.35  $\pm$  0.01 with a mean CTR 0.47  $\pm$  0.01. In all but two patients there was abnormal LV wall motion. In patients with ischemic heart disease and clinical manifestations of heart failure, a normal chest radiograph or CTR should prompt the performance of radionuclide cardiac study. Roentgenologic data cannot, in and of itself, exclude left ventricular dysfunction.

Scintigraphic Detection of Carotid Atherosclerosis with Indium-111-Labeled Autologous Platelets. H. H. Davis, B. A. Siegel, L. A. Sherman, W. A. Heaton, T. P. Naidich, J. H. Joist, M. J. Welch; Mallinckrodt Institute, St. Louis, MO. *Circulation* 61: 982–988, 1980

Platelet imaging studies using platelets labeled with In-111 complexed to 8-hydroxyquinaline (oxine) were performed in 34 adult patients with suspected cerebrovascular disease. The scintigraphic findings were correlated with angiographic evidence of vascular disease. Scintigraphic images of the head, neck, trunk, and thighs were obtained immediately, 4 hr and 18-24 hr, after the i.v. injection of 100-550  $\mu$ Ci autologous labeled platelets. Sequential blood samples were obtained in 52 patients over 5-7 days to estimate platelet survival, and the results compared with those obtained in ten normal control subjects. The sensitivity of

In-111 platelet imaging in the detection of carotid atherosclerotic lesion was 75%, with an apparent false-positive rate of 14% when analyzed for the presence or absence of focal abnormalities irrespective of site-by-site correspondence of findings on the scintigrams and angiograms. Lesions that resulted in less than 50% stenosis were detected scintigraphically with slightly (statistically not significant) greater frequency than lesions with higher degrees of stenosis. A true-positive rate of 70% was obtained in patients not on anticoagulant/antiplatelet drugs compared with 57% in drug-treated patients (not significant). There were no significant differences in platelet recoveries or survivals between normal subjects and the various subgroups of patients. The technique appears promising as a noninvasive test to detect carotid arterial lesions and as a means of evaluating the role of platelets in the pathogenesis of carotid atherosclerosis and cerebral ischemia.

Ga-67 Scintigraphy in Postoperative Synthetic Graft Infections. D. A. Causey, W. A. Fajman, G. D. Perdue, M. J. Constantino, P. J. Sones, Y. A. Tarcan; Emory Univ. Hosp., Atlanta, GA. *Am J Roentgenol* 134: 1041–1046, 1980

The potential of Ga-67 citrate imaging for the early detection of paraprosthetic infection in synthetic vascular grafts was demonstrated in five patients. All had the grafts placed weeks to years before evaluation. Most of the patients were imaged at 6, 24, and 48 hr after the injection of 2-3 mCi of Ga-67 citrate. Images were obtained with a gamma camera or rectilinear scanner. Surgical confirmation of the scintigraphic abnormalities was obtained in three patients. In the other two patients, radiographic, laboratory, and clinical findings were believed to confirm the findings on the Ga-67 citrate images. Four of the five patients had aortoenteric fistulas with infection and gastrointestinal hemorrhage. The fifth patient developed an exsanguinating hemorrhage through a sinus tract associated with infection and abscess formation at the site of a left femoral synthetic graft. Uptake of Ga-67 citrate was apparent at the site of infection 6 hr after injection in all patients in this series, and the scans accurately delineated the site and extent of infection in each. No false-positive or false-negative Ga-67 scans were seen in seven patients evaluated for suspicion of postoperative synthetic graft infections. Ga-67 scintigraphy is a noninvasive method that the authors hope will allow early diagnosis and treatment of paraprosthetic infections.

Preparation of Rhenium-186 Labelled EHDP and its Possible Use in the Treatment of Osseous Neoplasms. L. Mathieu, R. Chevalier, G. Galy, M. Berger; Centre de Medecine Nucleaire des Hospices Cevils de Lyon; France. Int J Appl Radiat Isot 30: 725–727, 1979

Phosphorus-32 as sodium orthophosphate has been used in the treatment of osseous neoplasms with only limited success, probably due to its low concentration at the tumor site. In contrast, HEDP is strongly concentrated by both primary and secondary bone lesions as evidenced by its use as a bone imaging agent when labeled with Tc-99m. However, reports in the literature show a difference in behavior between P-32 HEDP and Tc-99 HEDP, with bone marrow depression in humans at doses as low as 3 mCi of the P-32 HEDP. Potsaid et al. felt that a  $\beta$  particle energy less than that from P-32 might reduce the toxic effects on bone marrow and permit further evaluation of this therapeutic technique. The authors selected rhenium-186 as an alternative  $\beta$  emitter because of its chemical similarity to technetium. Beta particles of 1.07 Mev (77%) and 0.93 Mev (23%) are emitted together with photons of 137 keV (9%) and 61.5 and 63 keV that permit the distribution of the rhenium-HEDP to be imaged with conventional instrumentation. The physical half-life of 3-7 days is considered appropriate for therapeutic purposes. Ninety-five percent labeling of rhenium-186 in chlorhydric solution to HEDP was accomplished by an electrolytic technique. The rhenium-186 HEDP complex is suggested as a suitable therapeutic agent in bone lesions.

Bone Metastases of Prostatic Cancer in Relation to Tumor Size and Grade of Malignancy. H. J. Biersack, G. Wegner, W. Distelmaier, U. Krause; Bonn, Germany. *Nucl Med* (*Stuttg*) 19: 29–32, 1980

The authors compared the results of initial skeletal scintigraphy with tumor spread, and with the results of histology in patients with prostatic carcinoma. The initial scintigrams of 153 patients were the basis of the study. Skeletal scintigrams were done with either Tc-99m PPi or Tc-99m MDP. Total body scintigrams (obtained after 1975) were done in the ventral and dorsal projections with a gamma camera. Tumor spread was classified according to TNM. Malignancy was graded on a three step scale: low grade  $(G_1)$ , intermediate  $(G_2)$ , and high grade malignancy  $(G_3)$ . At the time of the initial diagnosis the authors found that 30% of all patients with prostatic carcinoma had bone lesions, 66% had no evidence of skeletal involvement, and 4% of patients had questionable findings. The frequency of bone lesions was dependent on the histologic findings. G<sub>1</sub> patients had skeletal involvement 7% of the time, whereas those with G2 and G3 malignancies had associated bone lesions about 40% of the time. Tumor size and skeletal involvement were similarly related. Bone lesions were seen with the following frequencies: T<sub>1</sub> 7%, T<sub>2</sub> 19%, T<sub>3</sub> 39%, and T<sub>4</sub> 65%. The authors found that the degree of malignancy increased with tumor size.

Rubella Immunity: Comparison of Hemagglutination Inhibition and Radioimmunoassay Antibody Methods. R. E. Harris, K. O. Smith, W. D. Gehle, H. J. Dupuy; San Antonio, TX. *Obstet Gynecol* 55: 603–607, 1980

In an effort to clarify the meaning of threshold hemagglutination inhibition (HAI) titers of rubella antibodies in obstetric patients, a comparative study of the HAI test and a solid-phase radioimmunoassay (RIA) for rubella virus antibody were performed. HAI titers were determined on the sera of 6537 obstetric patients in microtiter plates using standard methods. The solid-phase RIA was performed on randomly selected sera from patients with HAI titers ranging from less than 1:10 through 1:80. The assays were performed using a magnetic transfer device to transfer and wash simultaneously ferromagnetic spheres coated with purified rubella virus hemagglutinin (nonspecific proteins for controls). The beads were incubated overnight in a 1:100 dilution of test serum, removed, and washed six times in two separate water baths, and released into I-125-labeled rabbit antihuman globulin prepared by the chloramine T method. The beads were then incubated at 23°C for 1-3 hr, washed, released into test tubes, and the radioactivity counted. Sera from patients with HAI titers of 1:10 or less were also studied by HAI and RIA following rubella vaccination after delivery. Using RIA, 17% of sera with HAI titers of 1:10 were shown to be false positive. RIA gave positive results in 5 of 18 HAI-negative sera. In five sera obtained from patients with known HAI response to rubella virus infections, the sensitivity of RIA was shown to be 14-31 times that of HAI. The RIA appears to be a much more sensitive and specific test for rubella antibody than HAI. The data further show that low-titer HAI does not guarantee immunity to rubella.

Determination of Pertechnetate in Radiopharmaceuticals by High-Pressure Liquid Thin-Layer and Paper Chromatography. C. D. Russell, J. E. Majerik; Div. of Nuclear Medicine and Dept. of Diagnostic Radiology, V. A. Medical Center and Univ. of Alabama

ABSTRACTS OF CURRENT LITERATURE

Medical Center, Birmingham, AL. Int J Appl Radiat Isot 30: 753, 1979

Although technetium radiopharmaceuticals may be multicomponent mixtures, common analytic techniques generally identify only pertechnetate and "hydrolyzed-reduced" technetium. The quantitative determination of these two components appears to differ from the measurement technique used and as yet agreement as to which method is best is lacking. The authors have developed a technique involving high-pressure liquid chromatography (HPLC) that appears to be particularly suited to the accurate measurement of pertechnetate. HPLC, paper, and thin layer chromatography were compared using a number of different technetium-labeled radiopharmaceuticals. The HPLC results consistently demonstrated an absence of pertechnetate in freshly prepared tin-labeled preparations in contrast to the other techniques. The authors feel that the HPLC results are consistent with the chemical behavior of Sn(II) and that pertechnetate demonstrated by paper and thin layer chromatography in fresh solutions may well be an artifact resulting from oxidation during separation. It is suggested that pertechnetate as an impurity may be less important than is currently believed. Although HPLC is too complex for routine clinical laboratory use, it may well have a role as a reference technique against which other methods may be evaluated. Furthermore, it can provide much additional information on species that may be present in the compound.

The Ultrasound Spectrum of Prune-Belly Syndrome. J. Garris, H. Kangarloo, D. Sarti, W. F. Sample, L. E. Smith; U.C.L.A. School of Medicine, Los Angeles, CA. *J Clin Ultrasound* 8: 117–120, 1980

Sonographic examination of infants and children with the prune-belly syndrome allows categorization of the patients into one of three groups depending upon the severity of urinary tract involvement. In Group I bilateral fluid-filled sacs occupied the renal fossae with no identifiable renal parenchyma. The patients in this category were not salvageable. In Group II some measure of renal tissue was seen with tortuous ureters dilated out of proportion to normal or with only slightly dilated renal pelves. The patients in Group III had involvement ranging from the moderate findings, similar to those of Group II, to normal urinary tracts. The authors suggest that sonographic examination may be used instead of the cystogram as a convenient procedure to document the unsalvageable nature of the urinary tract in patients in Group I. Representative sonograms are provided.

**Parathyroid Sonography: A Useful Aid to Preoperative Localization.** P. Duffy, R. H. Picker, S. Duffield, T. Reeve, S. Hewlett; North Shore Hospital, Sydney, Australia. *J Clin Ultrasound* 8: 113–116, 1980

Successful sonographic identification of enlargement of the parathyroid gland was accomplished in 19 of 23 glands enlarged to over 5 mm in transverse diameter. An accuracy of 83% was obtained using the transverse scans. Glands less than 5 mm in diameter were not expected to be demonstrable by this method. Success of sonography also depends upon the parathyroid being in its normal retrothyroid location, and the study is rendered clearer if the thyroid gland is normal. A 5-MHz transducer focused at 1-3 cm is used for the studies. Recent development of newer equipment promises a still further improvement in the accuracy of the diagnosis of parathyroid enlargement by sonography.

Real-Time Sonography of the Pancreatic Duct: Application to Percutaneous Pancreatic Ductography. M. Ohto, N. Saotome, H. Saisho, Y. Tsuchiya, T. Ono, K. Okuda, E. Karasawa; Chiba University, Chiba, Japan. Am J Roentgenol 134: 647–652, 1980

In a study of 25 normal adults and 29 patients with pancreatic disease the authors were able to identify the pancreatic duct in 21 of the 25 normals and in 28 of the 29 patients with abnormalities. The normal duct was seen as a thin, sonolucent tube with echogenic walls and an internal diameter of less than 0.8 mm. Changes including dilatation, obstruction, and pancreatic lithiasis were identified with a high resolution real-time apparatus. Distinction between chronic pancreatitis and pancreatic carcinoma is not reliably accomplished by ultrasonography alone. All patients with carcinoma at the head of the pancreas demonstrated smooth or irregular dilatation of the duct corresponding well with those patterns identified in endoscopic cannulation. The authors caution that ultrasound measurements may underestimate the inner diameter of the pancreatic duct by virtue of apparent thickening of the walls resulting from the strong wall echoes. Percutaneous puncture of the pancreatic duct with contrast opacification is made possible by an aperture in the linear-array, real-time device. Aspiration biopsy can be accomplished in a similar fashion. Representative sonograms and pancreatic ductograms are provided.

Ultrasonography of Female Urethral Diverticula. J. S. Wexler, T. P. McGovern; Cornell Univ. Medical Center, New York, NY. Am J Roentgenol 134: 737–740, 1980

Supine scans, utilizing a full bladder technique, were used to identify small, simple, rounded cystic lesions caudal to the bladder base, interposed between the vaginal canal and the bladder wall. In one of the three cases presented, considerable internal debris was identified. The authors suggest that sonography is more accurate in demonstrating not only the external size of the diverticulum, but also the thickness of its wall as well as its contents. An inflamed diverticulum filled with debris may not be visualized at the contrast urethrography but can be outlined by ultrasound. Contrast urethrograms correlating with the ultrasound studies are presented.

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