
The authors evaluated results of I-131 therapy for thyrotoxicosis in an attempt to identify parameters relevant to therapy results. Forty-five patients between 29 and 85 yr of age were included in the study. Thirty-eight patients had been treated unsuccessfully with antithyroid drugs; 13 had had unsuccessful surgical intervention. Before radiation treatment each patient had a thyroid clearance after oral application of I-131. Absolute iodine uptake (AIU) was calculated. I-131 half life in the thyroid was determined, and thyroid mass was estimated from scintigraphy. Serum T₄ was determined using a protein-binding assay, and T₃ and TSH were evaluated with RIA. Free fractions of T₃ and T₄ were measured by a dialysis method. Radiation dose to the thyroid was estimated. Each patient received an average dose of 8.6 mCi of I-131 per treatment. Twenty-nine patients had one treatment, seven received two, eight needed three, and one patient required four doses. Six to twelve months after the last therapy the patients were re-examined. On the basis of thyroid function, patients were placed into one of three groups: (a) Hypothyroid with need of hormone replacement (7); (b) euthyroid (13); and (c) hyperthyroid with need for antithyroid drugs (25). The authors found hypothyroidism to occur 3 mo following treatment if it appeared. Posttherapy hypothyroidism was seen in younger patients, so that an age difference existed in the other groups. Hyperthyroidism after therapy was associated with large gland size, and increased AIU. The authors were not able to correlate the severity of thyrotoxicosis with the radiation dose necessary to control the disease. The authors conclude that the results suggest that the response to radiation therapy is related to the absolute size of the gland and to the AIU.


The use of radionuclide brain scanning to detect cerebral pathology in neurologically symptomatic neonates was investigated in 85 newborns who met the following criteria: (a) admission age less than 48 hr; (b) gestation of 37 wk or greater; (c) absence of major congenital anomalies; (d) evidence of perinatal hypoxic/ischemic encephalopathy in an infant either severely asphyxiated at birth or the product of a complicated delivery; (e) at least one brain scan performed during the first 14 days after birth; and (f) neurological follow-up information to at least 6 mo of age. A posterior cerebral radionuclide angiogram was performed using a peripheral venous bolus injection of Tc-99m pertechnetate (with perchlrate blocking). Static images were obtained 2 to 4 hr later with a gamma camera or rectilinear scanner. Fifty-six infants had one or more abnormal scans. Radiopharmaceutical localization in the parieto-occipital area, either unilaterally or bilaterally, was the most common abnormal pattern. Diffuse uptake throughout all or part of either or both hemispheres was also common, similar to that seen with diffuse encephalitis. The peri-ventricular pattern was uncommon and was usually associated with other abnormal areas. Overlapping and mixed patterns were not infrequent. Disorders of perfusion without alternations in radionuclide uptake were seen in four infants. Seventy-two percent of infants with normal scans are developing without significant problems, whereas 76% of the infants with abnormal scans are seriously handicapped or have died. Persisting hypoxic/ischemic damage on repeat scanning was associated with a very poor prognosis in all 15 infants in whom this finding was documented.


A retrospective comparison between CT and scintigraphy with Tc-99m phosphate and Ga-67 citrate has been performed in eight children with malignant extracranial tumors and in nine children during concurrent control after treatment. Computerized tomography was superior to scintigraphy in the primary tumor (three neuroblastomas, two teratomas, one Wilms' tumor, one lymphosarcoma, and one unknown) evaluation with regard to size, type, and invasiveness of the tumor. Regression, progression, or local recurrence after treatment was also better visualized by CT. The authors conclude that in the detection of secondary spread of the tumor in children, CT is the most sensitive modality in the examination of the lungs, whereas Tc-99m phosphate scintigraphy still is the method of choice to study metastases in the skeleton. They also feel that the time of examination by CT is rather long and sedation or even general anesthesia is necessary in smaller children; Ga-67 scan is of minor help in patients with otherwise diagnosed malignant tumors.

(68Ga) Citrate Scintiscanning in Active Inflammatory Bowel Disease. OJ Rheingold, FJ Tedesco, FE Block, et al; University of Miami School of Medicine, Miami, FL. Digestive Diseases and Sciences 24: 363–368, 1979.

In the diagnosis and management of inflammatory bowel disease the role of gallium-67 citrate scintiscanning was assessed in a prospective study that involved nine patients with ulcerative colitis, seven patients with Crohn's disease, and five hospitalized patients without inflammatory bowel disease who served as controls. The scans were performed at 6 hr, 24–48 hr, 72 hr, and 5 days following an i.v. injection of 6 mCi Ga-67 citrate using either a tomographic scanner or a gamma camera. No bowel preparation was employed in the patients with inflammatory bowel disease. Scans were defined as positive if there was caloric localization of tracer that remained stable during the imaging period. All nine patients with ulcerative colitis had positive delayed (72 hr and 5 day) scans while six of the seven patients with active Crohn's disease had negative studies. The seventh patient had pseudo-obstruction of the small bowel that may have caused the positive scan. All control studies were negative. Antibiotics and corticosteroid therapy appeared to have no effect on tracer localization as long as active disease was present. Tissue/plasma activity ratios were determined in two patients with ulcerative colitis and were found to be elevated, whereas decreased ratios were found in two patients with Crohn's
disease. These findings confirmed that the tracer localized in the colonic mucosa rather than in the intraluminal contents. Ga-67 scanning appears to provide useful information about the activity of the disease process in ulcerative colitis and may provide assistance in differentiating active Crohn's disease from Crohn's disease with abscess. The extent of inflammatory bowel disease can be assessed and the response to treatment evaluated by Ga-67 scintiscanning.


An abnormal Ga-67 citrate image was noted in a 32-year-old black, alcoholic male during a work-up for persistent fever. Biopsy findings were consistent with the dry form of tuberculous peritonitis. Abdominal images at 48 hr following the i.v. administration of 5 mCi Ga-67 citrate and rigorous cleansing of the bowel showed marked homogenous uptake of the radioactivity throughout the entire confined area of the peritoneal cavity. The authors felt that the accumulation of Ga-67 was most probably due to the presence of histiocytes and other inflammatory cells present in the granulomas characteristic of tuberculosis. They also believe that Ga-67 scan may significantly shorten the diagnostic work-up of cases of tuberculous peritonitis.


The authors describe results of angiography and scintigraphy in four diabetic pancreate transplant recipients. Cadaver grafts were implanted into the iliac fossa. During angiography 20–25 ml of radiographic contrast media were injected at 6–12 ml/sec. One or two radiograms per sec were made during the initial 10 sec, after which exposures were made every 2–3 sec. Arterial circulation time and the appearance time of the radiographic contrast material in the vein was noted. Gamma camera scintigraphy with high sensitivity, low-energy collimator followed injection of 250 μCi Se-75 methionine, using a 30% window placed over the 136 keV peak. The camera was connected on-line with a minicomputer, and data were collected in 40-sec intervals for a total of 2400 sec. Regions of interest were placed over the graft and over a representative background area. Time-activity curves were generated for the duration of the study. Scintiphotoscans were made 1–2 hr after radionucile injection. Graft survival was between 1 and 48 days, and angiography and scintigraphy were carried out at irregular intervals. Two scintigraphic examinations and two angiograms were made in well-functioning grafts, and three angiograms and four tracer examinations during graft failure. The authors found that arterial circulation time in well-functioning grafts is short (2 and 3.5 sec, respectively); in graft failure the circulation time was prolonged. Scintigraphy in well-functioning grafts resulted in clear images and rapid tracer uptake. The superficial location of the transplant permitted clear visualization of the graft. The location of the graft eliminated liver interference, and the authors report that there was no interference from radionuclide accumulation from the intestine. During rejection, tracer uptake was reduced or absent. The authors conclude that serial angiograms and scintigrams give important information both on morphology and function of pancreatic allografts.

**Comparison of Scintigraphy, Sonography, and Computed Tomography in the Evaluation of Hepatic Neoplasms.** JH Snow, HM Goldstein, S Wallace; M. D. Anderson Hospital and Tumor Institute.


Scintigraphy, sonography, and transmission computerized tomography (TCT) were compared in a prospective study of 94 patients with suspected hepatic neoplastic disease. The three studies were performed in close temporal proximity and the diagnosis was proven either histologically or by unequivocal angiographic findings within 1 mo after the three imaging studies. TCT was found to have a sensitivity of 96%, a false-positive rate for neoplasia of 12%, and an accuracy of abnormal readings of 91%. The specificity of TCT was 86%; there were 4% false-negative results, and the accuracy of normal readings was 95%. Sonography showed a sensitivity of 75%, a false-positive rate of 15%, and an accuracy of abnormal readings of 85%. Specificity of sonographic findings was 50%, with false negatives in 10% of cases, and an accuracy of normal readings of 81%. Sonographic examinations could not be interpreted in 23% of cases due to excessive bowel gas. Scintigraphy demonstrated a sensitivity of 94%, a false-positive rate of 26%, and an accuracy of abnormal readings of 82%. The specificity of scintigraphy was 67%, with false-negative results in 6% of cases and an accuracy of normal readings of 90%. The authors conclude that TCT scanning is the best single examination for determination of both the presence and extent of mass lesions in the liver; the most accurate combination of studies is TCT and scintigraphy. Scintigraphy is used as the initial examination and to follow the course of the disease because it is very sensitive, least expensive, and can be performed on the largest number of patients daily. The nonspecificity of all these methods, even in combination, is emphasized, and hepatic angiography is critical when major therapeutic interventions are contemplated.


After acute myocardial infarction the prognostic value of Tc-99m pyrophosphate myocardial scintigraphy was assessed in 138 patients. Ambulatory outpatient follow-up scans were performed at 6 to 260 wk in patients who had: (a) a documented myocardial infarction 6 or more wk before the study; (b) clinical stability; and (c) no evidence of active myocardial necrosis at the time of scintigraphy. The myocardial scintigrams were graded according to the intensity and distribution of activity. Persistently positive scintigrams showed correlation with the presence of severe angina pectoris, compensated congestive heart failure, anterior location of acute myocardial infarction, Q waves or S-T segment elevation in the electrocardiogram, cardiomegaly, abnormal left ventricular ejection fraction, and severe abnormalities of segmental contraction. Statistical analysis showed that the persistently positive scintigram was the best single predictor of cardiac death and of the combined cardiac end points, cardiac death, nonfatal myocardial infarction, unstable angina pectoris, and decompensated congestive heart failure during the follow-up period of 11.6 ± 6.9 mo. A persistently positive scintigram also added significantly to the predictive ability of the other clinical variables including age, location of previous myocardial infarction, clinical status, electrocardiographic findings, and chest radiographic findings. Technetium-99m pyrophosphate scintigraphy has independent prognostic value in patients with acute myocardial infarction.

Eighteen dogs had saphenous vein-coronary venous bypass graft interposed between the aorta and the left anterior descending (LAD) vein to evaluate the long-term effectiveness of a retrograde coronary venous bypass graft (CVBG) to an ischemic left ventricle. The LAD vein was ligated cephalad to the CVBG to prevent an arteriovenous fistula, and the LAD artery was ligated at its origin to create anterior wall ischemia. Operative graft flow via Statham electromagnetic flow probe averaged 53 ml/min. The 14 surviving dogs were catheterized 3 to 5 mo later, and 10 of the 14 CVBGs were patent angiographically.

To measure myocardial flow to the anterior wall, 900,000 Ce-141 microspheres of the 15 µ size were injected into the left atrium. In the 10 dogs with patent grafts, transmural flow was 39 ± 1 ml/100 g tissue/min. The endocardial/epicardial flow ratio was 1.4:1, thereby indicating that retrograde venous perfusion effectively delivered blood to the subendocardium. After ligation of the CVBG, the flow measured with 900,000 Sr-85 microspheres dropped to 15 ± 1 ml/100 g/min. In 15 control dogs, anterior wall flow was 100 ± 3 ml/100 g/min, decreasing to 13 ± 2 ml/45 min after ligation of the LAD artery and vein. Histologic examination of the anterior wall of the left ventricle, the area supplied by the CVBGs for 3 to 5 mo, showed no venous sclerosis or thrombosis and no interstitial edema or hemorrhage.


The authors describe a method for rapid labeling of human serum albumin microspheres (HSAL) with Ga-68. The 68Ga, a 68Ge – 68Ga generator product is obtained as a gallium–EDTA complex. Halogenation follows with HCl. The 68GaCl3 is purified, and EDTA traces are eliminated. Before labeling pH is brought to 2, with an alkaline indicator consisting of a 2 M NaOH and a 0.1 M Na2HPO4 solution containing 40 mg/liter phenol red. Color change indicates passage of pH from 1.5 to 2.3. The radioactive solution is sterilized and brought together with HSAL. The Ga-68 and HSAM are heated to 60–65°C and stirred for 15 min. Labeling microspheres are separated, resuspended, and brought to pH 2.75 for use. Yield was determined with paper chromatography. Animal studies with ten rats followed to determine Ga-68 HSAM incorporation in various organs. After left ventricle catheterization, 50,000 Ga-68 HSAM were injected, and the animals were sacrificed after 5 min. A second group of six rats were given Ga-68-HSAM and Sr-85-labeled microspheres simultaneously. Heart, lungs, spleen, and kidneys were removed and tracer uptake was determined. The authors found 68GaCl4– ion formation to be highly dependent upon the HCl concentration of the medium. Lowered acidity and inadequate heating led to rapid reduction of Ga fixation. The described method gives labeling yields above 90%. Thirty-five percent of the initial activity obtained from the generator can be injected, the loss being mainly due to decay. Ninety-eight percent of the tracer is bound to HSAM. 2% being free Ga-68, and labeling is completed in less than 1 hr. The animal studies demonstrated greatest uptake of microspheres in the kidneys, followed by heart, spleen, and lungs. The distribution of the Ga-68 HSAM was similar to 3M carbonized microspheres labeled with Sr-85. The authors conclude that the Ga-68-labeled HSAM appears to offer an ideal vehicle for scanning organs by positron emission tomosцинтigraphy.


This article presents a reliable radiochemical method for the determination of serum angiotensin converting enzyme (SACE) activity and illustrates its usefulness in the diagnosis and management of adult patients with sarcoïdosis. This radiochemical assay is based on the quantification of (glycine 1-C-14) hippuric acid cleared from (glycine 1-C-14) hippuryl-L-histidyl-L-leucine by 10 µl of serum during a 30-min period of hydrolysis. One unit of SACE activity is defined as the amount of enzyme required to hydrolyze one nmol of the substrate per minute under the standard assay conditions. Serum specimens were analyzed from 60 adult normal subjects, 42 patients with active sarcoïdosis, ten patients with inactive sarcoïdosis, and 28 patients receiving prednisone therapy for sarcoïdosis. Assay of the control scan indicated a standard deviation of 5–7% in the values obtained from day to day; precision within one set of assays was 3%. Normal SACE activity was defined as 23–57 units/ml. 79% of patients with active sarcoïdosis had increased SACE activity. The diagnostic sensitivity of the measurement was lower for patients with Stage I disease than for those with Stage II or Stage III disease. SACE values obtained from children and teenagers were markedly higher than those for adults. No persons under 20 yr were included in the patient population and therefore the effect of sarcoïdosis on SACE activity in this age group is undetermined. Significant lowering of SACE activity in patients treated with prednisone suggested that SACE determinations are not only useful for diagnosis of sarcoïdosis in adults, but may also provide a simple, quantifiable index of the progress of the disease.


Biliary tract hemorrhage may occur after trauma or insult to the liver and result in serious gastrointestinal blood loss. Proper surgical management depends on preoperative anatomic localization of the intrahepatic bleeding site. Liver scintigraphy and roentgenograms of the chest and abdomen provide a screening procedure in the patient with suspected hemorrhagia. Transmission scintigraphy of the lung combined with emission scintigraphy of the liver may aid in identifying subcapsular hematomas. If the scintigram reveals findings consistent with hematoma, angiograms are indicated for further evaluation of the hepatic vasculature. A diagnostic decision diagram is presented as an aid in coordinating the diagnostic approach to the patient with this infrequent cause of gastrointestinal bleeding.


From a series of normal gallbladder specimens at autopsy or surgery the normal baseline thickness of the gallbladder wall was established as 1–2 mm. In a series of 117 patients studied by ultrasound, 77 were found to have abnormalities. In 17 of these, the gallbladder wall was measured as 3–10 mm in thickness, demonstrating a characteristic decrease in echogenicity of the gallbladder wall as compared with normal. Surgical confirmation of gallbladder wall thickening was obtained in nine patients. Possible pitfalls in measurement of gallbladder wall thickness include biliary sludge, beam width artifacts, and thickening of the walls secondary to contraction of the gallbladder. The decubitus position, perpendicularity of the beam to the gallbladder wall, and exclusion of gallbladders with internal diameters less than 2 cm are proposed as precautionary measures. Representative ultrasonograms are presented.

Three cases of transitional-cell carcinoma of the pelvocalyceal system are presented in which the ultrasonographic appearance was sufficiently distinctive to suggest that this method may be valuable in the assessment of such neoplasms. The finding of separation of the normally central pelvocalyceal echoes by a region of low-intensity echoes is sufficiently different from the totally anechoic appearance of hydronephrosis and the densely echogenic pattern of calculi to suggest transitional-cell carcinoma. Blood clots with the collecting system may produce a pattern similar to transitional-cell carcinoma but can be distinguished by their mobility and transitory nature. Representative ultrasonograms, retrograde studies, and intravenous urograms are presented.


Six cases are presented in which gas collections within solid organs were identified by ultrasonography. In the proper clinical setting, the finding of densely echogenic foci with or without acoustic shadowing should raise the suspicion of gas within that organ and hence abscess formation. Immediate confirmation with high-quality collimated radiographs is necessary. Such a sonographic appearance may be mimicked by parenchymal calcification, and therefore the plain film evaluation is crucial. Examples presented include renal and hepatic abscesses, gas-containing liver hematoma, and a pyometra. Sonograms and accompanying radiographs are presented.


For ultrasonographic purposes the inferior vena cava is divided into three sections along its longitudinal course. The upper or hepatic part extends from the diaphragm to the portal vein and is elevated by masses in the right adrenal gland or tumors of neurogenic or hepatic origin. The middle or pancreatic section extends from the portal vein to the most caudal portion of the pancreatic head and may be elevated or displaced by a right renal artery aneurysm, retroperitoneal lymphy nodes, masses in the right kidney, or deformities of the lumbar spine. The lower or small bowel segment extends from the lowest portion of the pancreas to the bifurcation of the inferior vena cava and is, in general, affected only by abnormalities in the lumbar spine and lymph nodes. Generalized distortion of the inferior vena cava is most commonly produced by retroperitoneal lymphadenopathy secondary to either metastatic disease or lymphoma. Tortuosity of the abdominal aorta can occasionally produce distortion of the upper division and cephalad parts of the middle divisions of the inferior vena cava.

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