ABSTRACTS OF CURRENT LITERATURE

Retrospective Comparison of Radionuclide Scans and Computed Tomography of Liver and Pancreas. R. L. MacCarty, H. W. Wahner, D. H. Stephens, P. F. Sheedy, R. R. Hattery. *Amer J Roent* 129: 23–28, 1977.

The authors retrospectively compared computed tomography (CT) and radionuclide studies of the liver and pancreas in 50 patients. Of three patients with pancreatic carcinoma all were demonstrated by CT, and of five normal patients three were correctly demonstrated. [^{75}Se]-selenomethionine pancreatic scans were correctly normal in one case and correctly positive in one case. True negatives were demonstrated in 22 of 25 normal livers by CT imaging and in 18 of the 25 by Tc-99m sulfur colloid scans. There were more false positive Tc-99m sulfur colloid scans (16% compared to 4%) in the detection of liver masses. CT was also superior for the detection of biliary obstruction and ascites and for assessing the status of adjacent organs. In some cases, those masses with attenuation coefficients similar to that of the surrounding parenchyma were difficult to distinguish by CT; these masses were more obvious on the radionuclide studies. Tc-99m sulfur colloid scans were more sensitive for the detection of diffuse non-neoplastic liver diseases (cirrhosis, hepatitis, and cholangitis). The diagnostic information obtained from the simultaneous interpretation of CT and radionuclide scans was frequently more valuable than the information obtained from either one alone. Therefore, the authors felt that the two techniques are complementary.

Abnormal Scintigrams in Demyelinating Diseases of the Brain. I. Podreka, W. D. Heiss, and K. Jellinger. *Fortschr Rontgenstr* 127, 6: 550–554, 1977.

Brain scintigraphy was performed in nine patients with demyelinating disease, and the authors were able to obtain positive scintigraphic findings in eight of these. The examinations were made during an acute or exacerbating phase of the disease. After administration of K-perchlorate, each patient received 8–20 mCi of pertechnetate i.v., and was imaged with a gamma camera. Scintiphotograms each containing 300,000 cts were obtained in the A-P, P-A and right and left lateral positions. The pathologic foci were verified in four cases by autopsy, and in one patient during surgery. Histologic material was thus obtained in five of the nine patients. The authors demonstrated that in cases of demyelinating disease the scintigrams will be positive if the patients are scanned during an acute stage of the disease. Although the scintigram initially may be suggestive of a neoplastic disease, subsequently there is a rapid change in the size and location of the lesions. The scintigrams of two patients became normal 7 days after the initial scintigraphic examination, and in one patient became negative after 14 days. The authors emphasized that the scintigraphic examinations be carried out during periods of acute clinical deterioration.

Diagnostic Exploration of Biliodigestive Anastomoses with Isotopes. H. G. Reichelt and R. Pichlmayer. *Fortschr Rontgenstr* 127: 567–571, 1977.

Anastomoses between the bile duct and duodenum or the bile duct and jejunum are difficult to evaluate radiographically. Using Tc-99m HIDA the authors attempted to evaluate the patency of the anastomoses with sequential scintigraphy. Twenty-five patients with anastomoses were imaged with a gamma camera after the i.v. injection of 5 mCi of the radiopharmaceutical. Scintiphotoscans, each containing 500,000 cts, were made at 5-min intervals during the initial 45 min following administration of the tracer. The authors demonstrated six typical results to document their contention that the described method can be advantageously used in the localization of bile duct stenosis, and in the evaluation of postoperative results. The procedure was also considered valuable where secondary liver parenchymal abnormality precluded concentration of sufficient radiographic contrast media for good quality radiographs.

Comparison of Brain Scans Obtained with [^{99m}Tc] Pertechnetate and Tc-99m Citrate. W. D. Sager, M. Thalhammer, and G. F. Fueger. *Nucl Med* 16: 257–259, 1977.

The authors compared the quality of brain scans obtained with [^{99m}Tc] pertechnetate and Tc-99m citrate in a study of 28 patients. The radioactivity administered was determined according to the following formula: Body weight $\times$ 0.18 = mCi of activity of Tc-99m citrate, and each patient received 20% more [^{99m}Tc] pertechnetate than the administered dose of Tc-99m citrate. The two examinations occurred within a period of one to 17 days. Twenty-three patients were examined with a rectilinear scanner, and five were studied with a gamma camera. The authors report that nine out of ten neoplastic lesions were more clearly visualized with Tc-99m citrate and that eight out of ten vascular lesions were more clearly demonstrated with pertechnetate. Eight examinations failed to present a definite pathologic scintigram in either study. The authors conclude that Tc-99m citrate be given preference when neoplastic lesions are suspected.

Tc-99m Diphosphonate Scanning as an Aid to Diagnosis of Infection in Total Hip Joint Replacements. E. D. Williams, R. J. Tregonning, P. J. Hurley. *Brit J Rad* 50: 562–566, 1977.

Twenty-seven patients with a total of 34 replacements of hip joints were scanned (a 1.27 cm detector scanner) 4 hr after an i.v. injection of 15 mCi Tc-99m diphosphonate to diagnose infection in patients who developed pain following total hip joint replacements. The hip joint was imaged from the posterior view. From quantitative data obtained, uptake ratios and visual scores in four regions (acetabulum, neck of the prosthesis, trochanteric and shaft portions of the prosthesis) were compared with normal bone. All patients had received Charnley prosthesis except for the control group who had a Muller prosthesis. In patients with definite evidence of infection, a greater concentration of activity was observed than in the control patients. The clearest distinction in radioactive uptake between the two groups was in the femoral shaft region. Based on the data from these two groups of patients, diagnostic criteria were proposed for detecting abnormalities on radionuclide scans. The authors concluded that a quantitative evaluation of hip joint scans permits a proportion of them to be classified as normal or abnormal, and can thus provide supporting evidence for or against a diagnosis of infection.

Relative Roles of Galliuc-67 Citrate Scanning and Lymphangiography in Current Management of Malignant Lymphona. R. A. Rudders, J. A. McCaffrey, P. C. Kahn. *Cancer* 40: 1439–1443, 1977.

Fifty-three patients with Hodgkin's disease and nonhodgkin's lymphomas were studied to determine the usefulness of gallium-67 citrate scanning and lymphangiography in the detection of iliac and paraaortic lymph node involvement. Each patient had a gallium scan performed 4 days following injection, and all patients had multiple biopsies of iliac and paraortic nodes at laparotomy. Thirty-two patients had lymphangiography followed by surgical evaluation. In Hodgkin's disease, the results with lymphangiography, true-positive (71%) and false-negative (29%), were superior to the results from radionuclide studies, reflecting the tendency of imaging to underestimate the presence of disease. The accuracy of lymphangiography for detection of Hodgkin's disease is somewhat higher (89% against 82%). but the accuracies of the procedures are nearly identical (88% against 87%) for the combined group of patients. Lymphangiography tends to overestimate the presence of disease (higher false-positive rate). The authors conclude that gallium scanning should be an integral part of the staging of lymphomas, and a schema based on the use of gallium scanning early in the diagnostic sequence is proposed for their clinical staging.

Continued Incorporation of Circulating Radiolabeled Fibrinogen into Preformed Coronary Artery Thrombi. A. Salimi, G. C. Oliver, J. Lee, L. A. Sherman. *Circulation* 56: 213–217, 1977.

Fibrinogen, isolated from dog plasma, was labeled with I-125 or I-131. In 17 mongrel dogs coronary artery thrombosis was induced by application of an electrical current to the left anterior descending or circumflex coronary artery during left coronary artery catheterization. All animals had received I-125 fibrinogen intravenously 24 hr prior to thrombus induction to measure fibrin deposition in the initially formed thrombi. Group A animals received I-131 albumin 24 hr after thrombus formation to estimate contamination of the thrombus by soluble protein. Groups B, C, and D animals received I-131 fibrinogen (I-131-F) at 24, 48, and 72 hr postthrombosis, respectively. Animals were killed 24 hr after the second radiolabeled injection; thrombi were extracted, sectioned, dried, and assayed for radioactivity. A thrombus-to-blood ratio or TBR (based upon respective specific activities) was computed to reflect thrombus uptake. Thrombi in group A animals demonstrated substantial I-125 fibrinogen activity throughout, but negligible I-131 albumin. Appreciable deposition of I-131-F was observed in sections of the thrombi in group B. These results indicate that the radioactive concentration in the thrombus represents incorporation of fibrinogen as fibrin rather than mere diffusion of a soluble protein into the thrombus. Groups C and D thrombi contained I-131-F in all sections similar to that in group B and dramatically greater than in the control group A. These findings suggest that incorporation of fibrin proceeds past 24 hr and up to 72 hr after the initial formation. The authors felt that the results of this study had implications for anticoagulant and thrombolytic therapy.

Radioimmunoassay of Bile Acids: Development, Validation, and Preliminary Application of an Assay for Conjugates of Chenodeoxycholic Acid. S. W. Schalm, G. P. van Berge-Henegouwen, A. F. Hofmann, A. E. Cowen, and J. Turcotte. *Gastroenterol* 73: 285–290, 1977.

The authors described a radioimmunoassay (RIA) for glycine and taurine conjugates of chenodeoxycholic (chenic) acid in human serum. The RIA procedure involves: (a) addition of antibody to a mixture of patient serum and H-3 chenylglycine, followed by a 1 hr incubation, and (b) precipation of the bound antigen with ammonium sulfate in the cold which is followed by a 25 min cold centrifugation. Free H-3 chenylglycine in the supernate is assayed in a liquid scintillation spectrometer. The RIA sensitivity was 0.4 μmole/l. Only chenic acid and ursodeoxycholylglycine (both thought present in serum in minimal concentrations) exhibited cross-reactivity in the assay. In 56 fasting healthy subjects (age 13–66 yr) the mean chenyl conjugate level was 1.1 μmoles/l (range 0.3–3.8) with 2.3 μmoles/l considered the upper limit of normal. Conjugated chenic acid levels in sera from fasting patients with cholestasis were related ($r = +0.99$) to total conjugated and unconjugated chenic acid, measured by gas-liquid chromatography. A five- to ten-fold increase in chenyl conjugate levels were observed after a liquid meal in normal subjects. Within 1 hr the peak levelwas reached in three of the four subjects and remained elevated after 4 hr. The authors feel their assay permits clinical evaluation of the dynamics of enterohepatic circulation of chenic acid.

Effect of Aluminum Impurities in the Generator-Produced Pertechnetate-99m Ion on Thyroid Scintigrams. S. K. Shukla, G. B. Manni, and C. Cipriani. *Eur J Nucl Med* 2: 137–141, 1977.

The authors investigated the effect of elevated aluminum concentrations on the [^{99m}Tc] pertechnetate thyroid scintigram. The influence of generator impurities on the quality of scintigrams has not received extensive attention in the past. The authors used the technetium-99m generators DRN Stercow ^{TM}99m of Philips-Duphar, B.V., Petten, Holland. The radionuclidic purity of the eluate was examined by gamma-spectrometry and half-life determinations; and the radiochemical purity of the pertechnetate ion in the eluate was determined by paper chromatography and low-voltage electrophoresis. The authors found that in the presence of aluminum, aluminum-pertechnetate species are formed, reducing the free pertechnetate-99m ion in the solution with a resultant lowered thyroid uptake of the free pertechnetate-99m ion. The authors demonstrate that eluates with elevated aluminum concentrations, reaching or exceeding 4 μg/cm^3, cannot be used for thyroid scintigraphy since the images are of very low quality. As a control, the patients were reexamined 24 hr after the initial study using sodium pertechnetate-99m with no detectable aluminum impurities. High quality scans were obtained in the second examination.

A Facility for In-Vivo Measurement of Kidney and Liver Cadmium by Neutron Capture Prompt Gamma Ray Analysis. D. Vartsky, K. J. Ellis, N. S. Chen, S. H. Cohn. *Phys Med Biol* 22: 1085–1096, 1977.

A facility has been constructed that uses a ^{238}Pu-Be neutron source to irradiate the liver and kidney in vivo that produces (n,r) reactions in the cadmium contained in the organs. Be(Li) detectors are used to measure the resulting photon flux. The sensitivity for cadmium is 2.5 mg for the left kidney and 1.8 μg/g (wet weight) for the liver for a localized radiation dose of 670 m rem. The effects of patient positioning, organ geometry and liver-kidney interference as determined from Alderson phantom measurements are discussed.

The Early Detection of Osteoporosis by Compton Gamma Ray Spectroscopy. G. Hayan, I. Leichter, E. Loewinger, A. Weinreb, G. C. Robin. *Phys Med Biol* 22: 1073–1084, 1977.

The authors report a method of determining bone density

that measures the intensity of compton scattered photons from a 500 mCi ^{137}Cs source. The rationale of the method is based on the fact that the intensity of the compton scattered beam is proportional to the absolute density of the scatterer in materials for which z/a is constant. The intensity of the 90° compton scatter from a collimated beam of photons was measured and the exact point of measurement was determined by a two-dimensional scanning technique. Corrections for absorption and backscatter from the surrounding tissue were determined from water phantom measurements. In 50 subjects a good correlation was observed between the density of the radius and the degree of morphological change in the vertebrae. In a number of cases a low bone density was discovered without signs of osteoporosis in the spine. The method may be of value in patient followup and in controlling the effects of treatment schedules.

Radiation Dose to the Lungs from Ventilation Studies with ^{133}Xe. Evelyn E. Watson, Roger J. Cloutier and Barbara Y. Howard. *Medical Physics* 4: 521, 1977.

Kinetic models were used to study the effect of Xe-133 retention on cumulated concentration in lung air. The models were a) equal exponential washin and washout rate constants, b) unequal exponential washin and washout rate constants, and c) single compartment washin and two compartment washout. The results demonstrated that the radiation dose was markedly dependent on the model chosen. In five of eleven patients studied unequal washin and washout half-times were observed. Tables were presented that provided radiation dose estimates as a function of the half-times for modes (2) and (3). The method was purported to be applicable to radioactive gases other than Xe-133.

A Simple Magnifier Rotator for Enhanced Visualization of Nuclear Medicine Images. Edward L. Bialas, Mark W. Groch, George K. Lewis. *Phys Med Biol* 22: 1202–1206, 1977.

A device was constructed that rotates and/or magnifies the images from large field of view scintillation cameras as they are viewed on the conventional CRT displays. The device was found useful for viewing images of small organs that do not fill the entire sensitive area. Prior to digitization the magnification was done in the analog mode thereby avoiding the rostering effect that occurs when magnification is performed in digitized images. Examples of the use of this device for gated cardiac blood pool images were presented.

Horseshoe Kidney: Ultrasonic Demonstration. H. J. Mindell, E. A. Kupic. *Am J Roentgenol* 129: 526–527, 1977.

The authors present the first gray scale demonstration of horseshoe kidney to appear in the literature. On the transverse scan a homogeneously solid band of tissue is seen traversing anterior to the great vessels and the vertebral shadow. On longitudinal scan an ovoid homogeneous solid tissue mass is seen anterior to the lower portion of the aorta. Differential diagnostic possibilities may include enlargement of the pancreas; this organ should, however, appear in more cephalad sections. Retroperitoneal lymphadenopathy would not be likely to show the smooth lateral extensions seen from the isthmus to the kidneys in a horseshoe kidney.

Renal Sonography in Pediatric Patients: A Comparative Study between Sonography and Urography. D. Weitzel, J. Troger, E. Straub. *Pediatr Radiol* 6: 19–26, 1977.

In a study of 260 children, the results of the ultrasonography were compared with those of the i.v. urogram. In 92.3% of cases corresponding diagnoses were arrived at by both methods. Error rates for ultrasonography were 5.2% and for urography 2.3%. The authors describe a multiplicity of lesions amenable to diagnosis by ultrasound including obstruction, duplication, rupture with perirenal hematoma, and absent kidney. In cases of space-occupying lesions outside the kidney, the sonogram provided particularly valuable information complementary to the urogram. Evaluation of the internal consistency of a renal mass (cytsic vs. solid) applies to the pediatric population as well as to the adult. The authors suggest that by virtue of its noninvasive nature and the increased ease of applicability of the procedure to the patient of smaller dimensions, sonography should be the primary investigation performed for the suspicion of a malformation of the urinary tract. Exclusion of an underlying malformation in cases of simple pyelonephritis can also be accomplished by ultrasonography. The combination of both methods provides increased accuracy in the diagnosis of renal disease.

The Atrophic Postmenopausal Uterus. E. I. Miller, R. H. Thomas, P. Lines. *J Clin Ultrasound* 5: 261–263, 1977.

In five normal postmenopausal females the authors found uterine thicknesses from 1.2–1.8 cm and lengths of 3.5–6.5 cm. Failure to recognize that the postmenopausal uterus can revert to near "infantile" size may lead to the misdiagnosis of a pelvic mass as being within the uterus rather than in the adnexa. Single sweep longitudinal scans proved most useful in identifying the atrophic uterus; rather low gain settings were valuable in outlining this organ. Oblique views may also be helpful in demonstrating a mass arising in an atrophic uterus. The authors caution that a pelvic mass in the postmenopausal patient should not be considered to be within the uterus unless a careful search has excluded identification of an atrophic uterus.

The Prenatal Diagnosis of Lower Urinary Tract Obstruction Using B-scan Ultrasound: A Case Report. T. A. Okulski. *J Clin Ultrasound* 5: 268–270, 1977.

The author describes the incidental finding of a large sonolucent mass within the lower fetal abdomen discovered on routine obstetrical scanning and followed with sequential studies. The mass, initially measuring some 7 cm in diameter, was found on subsequent scans to remain unchanged, decrease slightly and ultimately decrease in diameter significantly. The diagnosis of obstruction of the lower urinary tract was made antepartum and ultimately confirmed by radiography and autopsy as being secondary to the Eagle-Barrett ("prune belly") syndrome.

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