ABSTRACTS OF CURRENT LITERATURE

Value of Additional Lateral Scans in Renal Scintigraphy. H. D. Köhn, A. Mostbeck, Vienna, Austria. *Eur J Nucl Med* 4: 21-25, 1979

The authors sought to demonstrate that additional lateral renal scans will aid in the identification of lesions, in the determination of kidney size, and in the interpretation of renograms. Gamma camera scintiphotoscans were made in a sitting position 1-3 hr after i.v. injection of 1-2 mCi of Tc-99m DTPA or DMSA. The study included 114 patients, 52 of whom had scintigraphic lesions. Thirty-two of the lesions were confirmed by urography, angiography, or surgery, while 20 of the lesions visible at scintigraphy were not confirmed. Sixty-two patients received dorsal scans that indicated the presence of a small kidney. The authors report that 13% of the identified lesions were visualized only in the lateral projection. Renal tilting was demonstrated in 24 of 62 scans as the cause of unilaterally reduced kidney size. The authors conclude that the dorsal scintiphotoscan should be followed by lateral views since these increase the diagnostic value of the scintigram.

Over-All Accuracy of ^{99m}Tc-Pertechnetate Brain Scanning for Brain Tumors-Study of 471 Patients. O. G. Björnsson, E. Pétursson, B. Sigurbjörnsson, D. Davidsson, Reykjavik, Iceland. *Nucl.-Med* 17: 249-253, 1978

The diagnostic reliability of radioisotope scanning for brain tumors was assessed. All patients referred for brain scintigraphy during a 12-mo period were included in the study, except those previously having surgery for brain tumors. Three to four yr after scintigraphy the patients were contacted to determine what medical consultation occurred since scintigraphy. Hospital and practitioners' records were examined and the diagnoses used in this study were based upon this follow-up. Autopsy records and death certificates were used to establish diagnosis of patients who had died since scintigraphy. Seven living patients failed to respond and were excluded from the study. Five to ten min after i.v. injection of 10-12 mCi [Tc-99m] pertechnetate antero-posterior and bilateral views were obtained with a rectilinear scanner. Scans were graded as: 1. positive, indicating tumor; 2. positive, not indicating tumor; 3. negative; and 4. equivocal. The negative scintigrams for brain tumor (439) were verified by autopsy, surgery, with radiograms, or with the results of the clinical follow-up. Twenty-five of the remaining 32 patients had primary brain tumors, seven had metastatic lesions. Seventeen of 25 (68%) of the primary brain tumors had positive scintigrams, indicating tumor; two other positive scans were incorrectly interpreted as not suggestive for brain tumor. Six false-negative scans were found, and eight positive scans were incorrectly interpreted as brain tumor scintigrams (false positive). True-negative brain tumor scans were seen 404 times. Of 29 equivocal scans two of the patients were later shown to have brain metastasis. Angiograms were obtained in 24 of the 25 patients with primary tumors and two false-negative angiograms were found. The authors conclude that brain scintigraphy has an over-all accuracy of 96%, a result largely due to the large number of true-negative scans. The scintigraphic detection of primary brain tumors occurred in only 68%, whereas angiography correctly identified 92% of the primary tumors.

Computerized Axial Tomography and Cerebral Scintigraphy in Leukodystrophy-Study of Two Boys Presumably Suffering from Lysosomal Disease. J. L. Willemse, J. G. Vandorssen, G. Dehaas, L. F. Blikkendaallieftinck, W. Straks, G. E. J. Staal, L. E. A. K. Vanwaveren. *Arch Neurol* 35: 603, 1978

Two unrelated boys, 12 and 9 years old, developed mental regression, loss of hearing and vision, spastic atoxic and pseudobulbar disturbances, and atrophy of the optic nerves. They suffered from a diffuse cerebral disease that followed a parallel, subacute course. Enzyme studies and the liver biopsy of one of the patients suggested a lysosomal disease. Liver and spleen scans with TC-99m sulfur colloid showed a splenomegaly with increased activity.

Cerebral scintigraphs with sodium pertechnetate revealed identical annular and crescent-shaped areas of increased radioactivity in parietal lobes. Computerized axial tomographic examinations (CT) also showed symmetrical, bilateral bands of elevated density in paraventricular white matter of parieto-occipital regions after contrast enhancement.

The neurologic symptoms and the localization of the alterations on brain scan and CT were compatible with leukodystrophy, which is the cerebral involvement of a general lysosomal disease with storage of lipid.

The authors suggest that cerebral scintigraphy and CT should be performed on a patient in whom the diagnosis of leukodystrophy is considered.

Thyroid Imaging with Iodine-125 and Technetium-99m. J. R. Prince, S. M. Zu'bi, B. L. Haag, Riyadh, Saudi Arabia, *Eur J Nucl Med* 4: 37-41, 1979

The authors compared the results of thyroid imaging with I-125 and Tc-99m in 88 consecutive patients referred for thyroid studies. Images were obtained on a 3 in. rectilinear scanner equipped with a 10 ml aluminum cover on the NaI crystal for increased sensitivity to I-125. A window setting of 21.4-49.4 keV was used for I-125 and from 130-150 keV for Tc-99m. Each scan pair was evaluated by two physicians and comparatively ranked on a five-scale system. The patients were classified as follows: hypothyroid, euthyroid, hyperthyroid, hypofunctioning nodules, Graves' Disease, hyperfunctioning nodules, multinodular nontoxic goiter, miscellaneous, and normal. For studies from both isotopes, scan quality was found to be comparable in patients categorized with the diagnosis of hypofunctioning nodules, Graves' Disease and miscellaneous abnormalities. In all other groups I-125 scintigrams were superior when compared with technetium scans. The authors conclude that their results are at variance with the findings of others, since the Tc-99m scintigram failed to be superior in any category of patient studied.

Solid Phase Radioimmunoassay for Prostatic Acid Phosphatase. J. F. Cooper, A. Foti, H. H. Herschman, W. Finkle. *J Urol* 119: 388-391, 1978

The sensitivity of a recently developed solid phase radioimmunoassay for human prostatic acid phosphatase was compared to that of an enzymatic method using *p*-nitrophenylphosphate as subtrate. Human prostatic acid phosphatase was purified from

the prostatic fluid of healthy men, and the prostatic acid phosphatase antiserum was produced by intramuscular inoculation of rabbits with the purified antigen. In the 109 prostatic malignancies the immunochemical method correctly classified 80 (73%) versus 34 (31%) for the *p*-nitrophenylphosphate enzymatic technique. In 44 stages I and II cancers confined to the prostate the radioimmunoassay was abnormally elevated in 19 (43%) with only four (0.1%) enzymatic elevations. In 65 stages III and IV extraprostatic cancers correct classifications were noted in 61 (94%) of the radioimmunoassays and 30 (46%) enzymatic tests. The radioimmunoassay in 200 male controls yielded 11 (5.6%) and the *p*-nitrophenylphosphate enzymatic test yielded seven (3.5%) false-positive results. In 90 nonprostatic human cancer sera 85 (94.5%) were correctly classified as negative by the radioimmunoassay for the prostatic acid phosphatase versus 66 (73%) as negative by the enzymatic method. The normal range of the radioimmunoassay for human prostatic acid phosphatase was 0.5 to 7.2 ng/0.1 ml serum, with a mean of 4.88 ± 0.8 ng/0.1 ml. An appraisal of the data demonstrates the relatively superior diagnostic sensitivity (73%) and high specificity (94.4%) of the radioimmunoassay for prostatic acid phosphatase over the enzymatic method in terms of significant discrimination of prostatic cancer patients from normal male controls, patients with benign prostatic hyperplasia, and patients with other forms of malignant disease.

Radioimmunochemical Measurement of Bone Marrow Prostatic Acid Phosphatase. J. F. Cooper, A. G. Foti, P. W. Shank. *J Urol* 119: 392–395, 1978

The authors present a preliminary experience with a promising radioimmunoassay for the specific measurement of prostatic acid phosphatase in the bone marrow and serum, since standard enzymatic assays do not discriminate accurately prostatic acid phosphatase from nonprostatic acid phosphatase, which is the majority of serum and bone marrow acid phosphatases. Bone marrow acid phosphatase was secured from the bone marrow of the 46 human subjects by slow needle aspiration of 5 to 7 cc marrow from the iliac crest or sacral prominence, and the bone marrow samples were secured from the same anatomic sites with a standard 14 to 16 bone marrow needle under local anesthesia. Serum samples for serum prostatic acid phosphatase determination by the standard *p*-nitrophenylphosphate enzymatic assay were secured by anticubital vein puncture. The concentration of prostatic acid phosphatase was determined in the original supernatant samples and in the supernatant of homogenized cells of whole blood and bone marrow by the immunochemical and *p*-nitrophenylphosphate enzymatic techniques. The homogenized bone marrow clots and whole blood clots consistently demonstrated 10-fold higher concentrations of prostatic acid phosphatase with the *p*-nitrophenylphosphate enzymatic method than bone marrow and whole blood sera. The radioimmunoassay-prostatic acid phosphatase in the same samples demonstrate lower average readings for both types of clots than in the serum samples, indicating that the prostatic acid phosphatase antibody is able to distinguish between acid phosphatase of prostatic and nonprostatic origin. In 27 patients with prostatic cancers the mean bone marrow levels for prostatic acid phosphatase by both assay methods were two to three times more elevated than the concentrations of the enzyme noted in the serum samples. A similar observation also was made in data for 19 patients with benign prostatic hyperplasia. The authors conclude that disruption and hemolysis of the bone marrow cell population during biopsy procedures may be responsible for the spurious results, and the radioimmunoassay prostatic acid phosphatase method can correctly and reproducibly classify and support the clinical diagnosis of cancer in samples of bone marrow and serum of suspected patients.

Bone Scans in Condensing Osteitis of Clavicle. C. D. Teates, A. C. Brower, B. R. J. Williamson, T. E. Keates, University of Virginia, *South Med J* 71: 736–737, 1978

Two cases of condensing osteitis of the clavicle with positive bone scans are reported. Both patients who had palpable breast masses showed increased activity in the medial end of the left clavicle on Tc-99m phosphate bone scans for metastatic evaluation. Chest radiographs and tomograms revealed sclerosis in the medial end of the left clavicle adjacent to the sternoclavicular joints that appeared normal. Biopsies of the clavicle showed focal bone sclerosis compatible with condensing osteitis but no evidence of tumor. Two patients did not have any known unusual stress to the clavicle, and one of the two patients had tenderness over the medial clavicle. The authors felt that clinical and radiographic manifestations may allow nonoperative diagnoses of this entity that mimics metastatic disease on bone scans.

Pancreatic Imaging in Prone Position Anterior Projection. Sanshin Hayashi, Kazuyuki Oyama, Ken Hirakawa, Akira Akaike, Takashi Kogure, *Nipp Acta Radial* 39: 107, 1979

Fifty-four cases were examined by "prone position anterior view pancreatic scintigram" in addition to the conventional supine position pancreatic scintigram. In this new position the patient lies prone, and the detector of the scintillation camera or scanner is set under the patient with the collimator face to the abdomen. Twenty-five out of 54 cases showed improvement of pancreatic images in prone position compared with conventional supine position. Thirteen cases were equivocal and the pancreas was not visualized in seven cases in either position. The pancreas was well visualized in only nine cases in supine position. As the pancreas tail in conjunction with spleen moves downward and anteriorly by gravity when the patient is turned from the supine to prone position, increased anatomical separation between the liver and pancreas and decreased distance between the pancreas and the detector occurs. The method described provides improved visualization of the pancreas by separating it from the hepatic image and increasing the counting rate by coming near the detector.

Serial Assessment of Doxorubicin Cardiotoxicity with Quantitative Radionuclide Angiocardiography. J. Alexander, N. Dainiak, H. J. Berger, L. Goldman, D. Johnston, L. Reduto, T. Duffy, P. Schwartg, A. Gottschalk, B. L. Zaret, Yale University *N Engl J Med* 300: 278, 1979

Sequential quantitative radionuclide angiocardiography was used to assess left ventricular ejection fraction in 55 patients receiving doxorubicin. Findings obtained early in this prospective study showed that the degree of cardiotoxicity could be accurately predicted by the magnitude of fall of the left ventricular ejection fraction from the initial level to the lowest level obtained. Doxorubicin cardiotoxicity was not seen below a threshold dose of 350 mg per square meter. At doses above this level, patients at risk for the development of congestive heart failure could be identified on the basis of a decline of the left ventricular ejection fraction by at least 15% to a final level of ≤ 45%. Discontinuation of doxorubicin when these indicators of moderate cardiotoxicity occurred resulted in stabilization of cardiac function with no cases of congestive heart failure during a follow-up period of 7 mo. Data obtained for assessment of cardiac function using clinical evaluation, electrocardiographic changes, and chest radiographs were neither sensitive nor specific in predicting cardiotoxicity.

A Study of Three-dimensional Image Expression of the Left Ventricle by Synchronous Dual Camera Recording and Analysis. Akira Asahara, Hideo Ueda, Shigeoki Wakabayashi, Katsuhiro Kinoshita, Motosada Kiri. *Jap J Nucl Med* 16: 220, 1979

In previous papers are described the basis and clinical studies of a method for collecting data synchronously from two different directions with dual scinticameras and for computerized analysis thereof. This paper describes results of a study in which three-dimensional scintigraphy was proved possible by means of examining the steric expression of the cardiac blood pool as an application of this method. Data on the cardiac blood pool were synchronously collected with dual scinticameras at 30° from the right anterior oblique direction and 60° from left anterior oblique direction; and from each gated image a three-dimensional image was constructed as an ellipsoid of three revolutions of the ventricle. In other words, the major axis of the ventricle was divided into n equal parts from each image to make the sliced plane. Four points on the XY were determined from the distance between the major axis and the margin; the quartan elliptical arc passing through these points was calculated; and one slice was made up by connecting the arcs. A three-dimensional image is made up by overlapping n slices, when the gradient of XYZ direction was modified from the difference between the gradient of two images and the length of the major axis. The three-dimensional image so made up well indicated the morphology of the blood pool and the gradient of the axis in the thoracic cavity, which quite unlike the conventional two-dimensional images, expressed organs sterically. This is a new image-expressing method of which much may be expected.

Physical Characteristics of Compton Scatter Tomography. Masahiro Endo, Toru Matsumoto, Takeshi A. Iinuma, Yukio Tateno, *Jap J Nucl Med* 16: 181, 1979

Compton scatter tomography (CST) is an imaging method by which acquiring tomographic distributions of the electron density. The authors have studied this method by phantom experiments. An object was irradiated by a rotating fan-shaped gamma ray and orthogonally scattered irradiations were detected by a conventional scintillation camera, which thereby imaged the irradiated section of the object.

^{192}Ir was selected as the gamma ray source, since the high disintegration rate (1-5 Ci) necessary for clinical use can be easily obtained, and it has a moderate half-life (74 days) and a peak energy (300 keV). The authors used 0.5-2.5 Ci source in this study, and objects were irradiated from four directions whose angular spacing was 90°. A Toshiba GCA-202 camera was used as a detector, and a Toshiba TOSBAC-3400 computer system was used for data collections. Each image was made of 64 × 64 pixels and the pixel width was 5 mm. The same computer was also used for image processings, which in this study concisted of a) superimposing of four images obtained by different directions, b) correction of the nonuniformity of the camera, and c) correction of the attenuation of the primary ray.

Some physical characteristics were measured by the phantom study. Counting rates agreed with calculations. There were a few percentage variations for images of a uniform object (water phantom). The resolution was 15 mm in FWHM and was limited by the camera's overall resolution. Measured values of the electron density agreed with expected values. Efficiency of the exposure dose of this method was considered in the context of the noise and the resolution and was shown much poorer than that of a CT-scanner. This was attributed partly to the very low efficiency of the conventional collimator. The author proposed a new collimator that was very effective for CST. Some clinical applications were suggested. Above all, an application to on-line dose monitoring of radiation therapy was emphasized.

I-125 Photon Absorptiometric Analysis of Bone Density in Patients on Regular Dialysis Treatment. Chr. Alberts, Amsterdam, Netherlands, *Eur J Nucl Med* 4: 27-31, 1979

In 38 patients on chronic intermittent hemodialysis bone density was measured with direct photon absorptiometry and the results were compared with clinical data. All were treated with aluminum hydroxide, vitamin D and calcium carbonate. All patients had iliac crest biopsies every 6 mo, and serum calcium, phosphorus, and alkaline phosphatase determinations at 6-wk intervals. Bone mineral content was also measured in an age-matched control group of 21 men and 25 women. The results were compared with the Wisconsin Bone Mineral Laboratory population. The mean bone density in normal males was found to be significantly higher than in women. The mean bone density in 19 female and 19 male dialysis patients was significantly reduced when compared to the values of the control group. No correlation was observed, however, between bone density and the severity of renal osteodystrophy in dialysis patients. Therapy induced improvement failed to be verified by altered bone density values. The authors conclude that I-125 photon absorptiometric analysis results should only be considered together with other clinical data, since improved calcium and phosphorus metabolism and histopathology may not be reflected in improved bone density values.

High Resolution Real Time Ultrasound of the Carotid Bifurcation. P. L. Cooperberg, W. D. Robertson, P. Fry, V. Sweeney. Vancouver General Hospital, Vancouver, B.C., Canada. *J Clin Ultrasound* 7: 13-17, 1979

Evaluation of real-time ultrasonography in the examination of 26 patients who subsequently underwent carotid angiography for transient ischemic attacks is presented. The instrument used is a high resolution, real-time mechanical scanner originally intended for cardiac imaging. The carotid bifurcation was successfully visualized in 98% of patients; 56% were found by ultrasound to have plaque formation and were confirmed at angiography. The normal carotid bifurcation described by ultrasound in 29% was confirmed as well. In 4% of studies small plaques demonstrated by ultrasonography were not apparent at angiography; conversely, in 8% small plaques were demonstrated by angiography and not by ultrasonography. Degree of stenosis and the presence of ulceration in a plaque were not well demonstrated by ultrasound. The authors feel that ultrasound provides a noninvasive means of establishing the need for carotid arteriography. A completely normal real time ultrasound B-scan of the bifurcation mitigates against the need for angiography in the patients suspected of having transient ischemic attacks secondary to extracranial carotid disease.

Ultrasonographic Evaluation of Pericholecystic Abscesses. Alan B. Bergman, Harvey L. Neiman, Bessie Kraut. Northwestern University Medical School, Chicago, Illinois. *Am J Roentgenol* 132: 201-203, 1979

The ultrasonographic findings in three surgically proven cases of pericholecystic abscess are presented. The findings ranged from a well-defined band of sonolucency around the gallbladder to multiple ill-defined hypoechoic masses that silhouetted and obscured the gallbladder lumen itself. The halo effect outlining the gallbladder wall tended to be associated with a well-contained, walled-off pericholecystic abscess whereas poor definition of the gallbladder with multiple sonolucent mass effects about the organ signified a more extensive pericholecystic in-

flammatory reaction. The authors suggest that perforation and abscess formation should be suspected in those patients with acute cholecystitis manifesting rapid deterioration or increasing toxicity for clinically unexplained reasons, and ultrasonography should be performed to determine if perforation has occurred.

Ultrasonic Demonstration of Myometrial Contractions in Intrauterine Pregnancy. Robert L. Wilson, Nancy J. Worthen. Harbor General Hospital, Torrance, California. *Am J Roentgenol* 132: 243-247, 1979

In a series of 881 patients, transient thickenings of a localized region of myometrium were identified in nearly all cases and seemed to change significantly in configuration within 30 min although all patients were completely asymptomatic. Some 60% of the observed contractions occurred on the opposite side of the placental implantation as opposed to 40% for ipsilateral contractions; the transient myometrial thickenings were more easily demonstrated at a gestational age greater than 20 wk. Differential diagnostic possibilities would include placental extension, although the difference in the character of echoes generated by myometrium and placenta should serve to make this differentiation. Submucous leiomyomata could produce a similar picture but would not be seen to change over a 30-min period.

Ultrasonography in the Diagnosis of Tumors of the Ovary, M. DeLand, A. Fried, J. R. Van Nagell, E. S. Donaldson, University of Kentucky, Lexington, Kentucky. *Surgery, Gynecology, & Obstetrics* 148: 346-348, 1979

A series of 60 patients with ovarian masses was examined with ultrasonography before surgical exploration. Benign tumors of the ovary were present in 46 patients and malignant neoplasms in 14. Ultrasonography accurately predicted carcinoma of the ovary in 13 of 14 cases. Only one of 38 tumors of the ovary with a purely cystic pattern was malignant; in contrast, more than 70% of the tumors with complex or solid patterns were malignant. Scanning dimensions were identical to specimen dimensions in more than 93% of patients. Representative ultrasonograms were presented.

PEGGY DOMSTAD
ANDREW FRIED
EUISHIN E. KIM

University of Kentucky
Medical Center and
VA Hospital
Lexington, Kentucky

JOHN H. CLORIUS
Deutsches Krebsforschungszentrum
Heidelberg, Germany

MASAHIRO IIO
Tokyo Metropolitan Geriatric Hospital
Tokyo, Japan