Extraction of ^{125}I-Albumin Microaggregates from Portal Blood—An Index of Functional Portal Blood Supply in Cirrhotics. P. M. Huet, D. Marleau, P. Lavoie, A. Viallet. *Gastroenterology* 70: 74–81, 1976.

In this study a mixture of I-125 albumin microaggregates (I-125 AMA) of 1–5 nm diameter and of Cr-51 labeled red blood cells was injected into the mesenteric artery of normal dogs. After one pass through the hepatic reticuloendothelial system, the efficiency of extraction of microaggregates from the portal blood was assessed. The labeled erythrocytes (which are completely recovered in hepatic veins) were used as a vascular reference substance. Ninety-two percent of the radiocolloid that passed through the portal vein was subsequently extracted by the hepatic reticuloendothelial cells. Fifteen patients with severe portal hypertension who were undergoing combined umbilicoportal, hepatic vein, and superior mesenteric artery catheterization were studied with the mixed radionuclide preparation. These subjects showed no evidence of alcoholic hepatitis by laboratory and histologic analysis and jaundice and ascites were absent. Eleven of these patients who had alcoholic cirrhosis demonstrated an I-125 AMA extraction efficiency of 5.2–100% (mean 45.1%). In four of the patients who had idiopathic noncirrhotic portal hypertension, the extraction values were 81.5–100% (mean 93.2%). Extraction values in normal humans were not described. The degree of hepatic extraction of radiocolloid in these patients correlated directly and very significantly with both hepatic extraction and relative clearance of intravenously administered indocyanine green determined separately. In patients with cirrhosis, diminished hepatic extraction of radiocolloid can be attributed to a fraction of the portal blood that bypasses the Küpffer cells (intrahepatic portohepatic shunts) and/or to structural changes in sinusoidal cells that result in ineffective phagocytosis. The application of this radiocolloid extraction technique was advocated for estimating functional portal blood supply to the liver in patients with cirrhosis.

Kinetics of (C-14) Cholic Acid in Fulminant Hepatic Failure: A Prognostic Test. W. Horak, R. Waldram, I. M. Murray-Lyon, et al. *Gastroenterology* 71: 809–813, 1976.

In this study the authors evaluated the metabolism of a bile acid in 14 patients with either drug-induced hepatitis (acetaminophen or isoniazid-rifampin) or acute viral hepatitis with associated fulminant hepatic failure and in five healthy volunteers. From 24 to 36 hr after the onset of Grade IV coma, each patient received a single dose of 10 μCi [^{14}C]-carboxyl-cholic acid intravenously. Serial blood samples were obtained for 24 hr thereafter and total plasma radioactivity was measured by liquid scintillation counting. Labeled bile acids were extracted from plasma, separated by thin layer chromatography (TLC), and assayed as above. Data obtained from labeled taurocholate and glycocholate fractions were combined and expressed as the conjugated cholic acid fraction. Total and individual plasma bile acid concentrations were measured both enzymatically and fluorometrically after extraction by ion-exchange resin and TLC.

Total plasma bile acid concentration was greater in patients with hepatitis than in the healthy individuals. In healthy subjects plasma total radioactivity rapidly dropped to low levels, but it remained high in the patients with hepatitis. After injection of [^{14}C] cholate, taurine and glycine conjugates of labeled cholic acid were present in plasma. In the normal subjects, 13% of the plasma radioactivity was present as conjugates at 1 hr. All patients who had greater than 70% of their plasma radioactivity in the conjugated fraction at 3 hr survived, while all those who had less than 55% conjugated at that time subsequently died. The authors felt that the 3-hr measurement of conjugated bile acid fraction was a useful indicator of residual hepatic function in liver failure and could be used as a guide for prognosis and for the evaluation of new forms of therapy.

Value of Perfusion Lung Scans in Selection of Patients for Vena Cava Interruption. N. Harlaftis, A. C. Gonzalez, W. J. Waldo, P. N. Symbas. *Chest* 71: 680–681, 1977.

Sixty-seven patients with clinical findings compatible with pulmonary embolus were studied with chest roentgenogram examinations, perfusion lung scans, and pulmonary arteriography. The lung scans were performed with 3 mCi of Tc-99m microspheres or 300 mCi of I-131 macroaggregated albumin, and anterior, posterior, and both lateral views were obtained. Contrast angiogram using Seldinger's technique was performed within 24 to 48 hr after the scan.

The perfusion lung scan was considered positive if one or more perfusion defects were present in an area normal on radiographic examination. In patients with abnormal chest radiography, the perfusion scan was interpreted as questionable if defects were evident. The angiogram was considered positive when one or more arterial cutoffs and/or intraluminal filling defects were observed.

In 48 of 67 patients the scans were interpreted as positive for pulmonary emboli and in 19, questionable. The pulmonary arteriogram showed no evidence of pulmonary emboli in 11 of the 48 patients with positive findings on lung scan and no evidence in 12 of the 19 patients with questionable lung scan. Because of the high false-positive rate of the perfusion lung scan, the authors strongly recommended angiographic confirmation of pulmonary embolism when interruption of inferior vena cava is contemplated for the prevention of recurrence of pulmonary embolism.

Radioactive Phosphorus Uptake Testing of Choroidal Lesions. D. M. Robertson. *Brit J Ophthal* 60: 835–839, 1976.

This report described the P-32 uptake test in two patients with suspected malignancy of the eye. Two to six days after the oral administration of 750 μCi P-32 phosphate, the concentration of radioactivity over each eye was determined by means of a scintillation probe and scaler. The presence of tumor was indicated by a count that was 75% greater than that obtained over a control site. By clinical evaluation each patient studied had a suspected primary malignant melanoma of the choroid later documented by biopsy. The P-32 uptake test was negative in both of these patients. Several possible reasons for the negative results were offered: a) hemorrhagic choroidal detachment that occurred in one patient elicited thickening of the choroidal layer and may have increased the tumor-to-detector distance, thus

reducing the radiation reaching the detector; b) a 6-day lapse between administration of P-32 and measurement in one patient may have permitted excessive radioactive decay; c) necrosis within the tumor was reflected by depressed radionuclide uptake; or d) the test was performed at a time of minimal metabolic activity within the tumor. Subsequent P-32 uptake studies have been performed using i.v. radionuclide administration to eliminate the possibility of subtotal gastrointestinal absorption. With these false-negative results in mind, the author cautions against underestimating the value of a careful clinical evaluation for the detection of tumors in the posterior globe of the eye.

Radioimmunoassay of Myelin Basic Protein as an Index of Demyelination. S. R. Cohen, R. M. Herndon, G. M. McKhann. *New Eng J Med* 295: 1455–1457, 1976.

Myelin basic protein or MBP (a degradation marker for the lipoprotein membrane, myelin) can be determined in cerebrospinal fluid (CSF) by an existing radioimmunoassay (RIA). In 303 patients with neurologic diseases, 0.5 ml CSF were tested by the RIA method (requires incubations totaling 17–41 hr). From this patient sample three categories of MBP concentration were defined: > 17 ng/ml CSF, positive; 5–16, weakly positive; and < 4, negative. Sensitivity of the assay was 2 ng.

Nineteen patients with multiple sclerosis that was clinically inactive had no measurable MBP. Eleven of 13 patients with chronically active disease demonstrated low levels of MBP, while all 15 patients with acute exacerbations demonstrated high levels. Exacerbation and regression of symptomatology in the few patients with multiple sclerosis studied were directly related to MBP levels. Only two of 252 patients with nondemyelinative neurologic disease were positive for MBP. Four patients with myelinopathy—a demyelinative process other than multiple sclerosis—had positive MBP determinations. The authors believe that this is a useful indicator of active demyelination in the assessment of clinical multiple sclerotic activity.

Xylose-1-^{14}C Absorption Test: The Use of Urine, Serum and Breath Analysis, and Comparison with a Colorimetric Assay R. K. Roberts, C. B. Campbell, S. J. Bryant, and L. Adames. *Austr New Zeal J Med* 6: 532–536, 1976.

The authors were seeking a potential screening test to diagnose mucosal disease of the small intestine. Nine patients with untreated celiac disease and 15 control patients (fasting state) received 25 gm D (+) xylose that contained 10 μCi [^{14}C]-1-xylose in 250 ml of water orally with a like amount of water later to enhance urine volume. In order to assess gastrointestinal absorption, serum and urine samples were collected subsequently at intervals during a 5-hr period and were assayed for xylose by a colorimetric procedure and by liquid scintillation spectrometry. In some subjects, exhaled breath was measured for $^{14}CO_2$ also by scintillation spectrometry. After dosing, serum xylose levels rose rapidly to a peak at 1.5–2 hr in both the controls and in patients with celiac disease. The serum levels in normal subjects were significantly higher by both assay methods. Mean urinary excretion of xylose at 5 hr was significantly lower in patients with celiac disease than in controls. There was considerable overlap of test results, however, between the celiac and control groups. Average 5-hr breath radioactivity (corrected for subject body weight) was higher in patients with celiac disease than in the control subjects, but the diagnostic value of the test was hampered by considerable overlap of results between the two groups.

While a combination of the 30-min serum and 5-hr urine levels yielded the sharpest delineation between normal patients and those with faulty xylose absorption, numerous false-positives were observed. Per-oral jejunal biopsy remains superior to the xylose absorption test as determined by the procedures described in the study.

Drugs and Breast Feeding—A Review. P. O. Anderson. *Drug Intel Clin Pharm* 11: 208–223, 1977.

The author reviewed the published reports on diagnostic radiopharmaceuticals that are excreted in human milk: Ga-67 citrate, I-125 human serum albumin, I-131 iodide, [^{131}I] iodohippurate, Tc-99m, and I-131 and Tc-99m macroaggregated albumin. Following a single i.v. injection for each drug, the peak or average radioactivity concentration in breast milk of lactating mothers is listed. Recommendations for the periods of discontinuance of breast feeding following administration of the radiopharmaceuticals is given. Also provided are similar data for the "environmental agents" ^{137}Cs, ^{89}Sr, ^{90}Sr, and radioactive sodium ingested by the nursing mother.

Three Dimensional Imaging in the Positron Camera Using Fourier Techniques. G. Chu and K. Tam. *Physics Med Biol* 22: 245–265, 1977.

The authors described a mathematical algorithm for three dimensional reconstruction of data from the positron camera. Fourier transform techniques were used in the reconstruction. The problems arising from limited detector configurations and noise instabilities were discussed, and analytical approaches to their solutions were described. Computer-generated phantoms were used to test the algorithms. The problem of reconstructing images with data that contain compton scattering events was discussed but not included in the computer-generated phantom images.

Imaging ^{123}I with a Scintillation Camera: A Study of Detection Performance and Quality Factor Concepts. M. S. Bolmsjo, R. R. Person, and S. Strand. *Phys Med Biol* 22: 266–277, 1977.

High purity I-123 was used to generate line spread functions, MTFs, image quality factors and figures of merit for various collimators that are used in conjunction with a scintillation camera. Septal penetration of low energy collimators by the high energy photons of I-123 degraded the image quality according to the criteria of "figures of merit:" $Q_B = Sa|MTF|^2$, where Sa is plane sensitivity; and $Qc = S^2/(S + B)$, where S is the true signal from the object and B is the total background due to septal penetration and scatter. Q_B was highest for a medium energy collimator.

A Comparison of Techniques for the Filtering of Noise in the Renogram. J. S. Fleming and R. W. Kenny. *Phys Med Biol* 22: 359–364, 1977.

Five different methods for filtering the renogram of statistical noise and certain unwanted physiologic variations in time-activity histograms are compared in this technical note. The methods are: conventional smoothing, data bounding, polynomial fitting, smoothing by spline functions, and manual graphical fitting. Renograms were simulated by taking them to be the convolution of the input function from the blood to the kidney and the impulse response function of the kidney (approximated by a three-exponential decaying function). Statistical and physiologic noise were added to the simulated renogram. The authors concluded that all the methods studied improved noisy renogram data in terms of the RMS error and that all could be used advantageously

in deconvolution of the renogram. For filtering statistical and physiologic noise, the most useful technique was judged to be the cubic spline function.

A Comparison of Gray Scale Ultrasound and Radionuclide Imaging for the Detection of Focal Hepatic Lesions: Open Shutter Technique. L. M. Zatz, J. A. Gouldin, and G. A. Hanley. *J Clin Ultrasound* 5: 178–184, 1977.

The purpose of this study was to evaluate ultrasound scanning of the liver as a screening technique and to determine if it might be of more value than radionuclide imaging as a survey method. In those patients in whom biopsy or autopsy confirmation was obtained, the ultrasound diagnosis was accurate in 73% of the cases and the radionuclide in 83%. The combined accuracy of the two studies was 93%. Problems encountered with the use of ultrasound as a screening device included sampling errors inherent in any tomographic technique, problems with the contours of the abdominal wall (such as scars or wounds), and inaccessibility of portions of the liver underneath the rib cage. In addition complete examination of the organ would require some twenty or more pictures which would be costly and time-consuming. The authors concluded that ultrasound was very useful for the evaluation of defects identified on radionuclide scans and served both to confirm their validity and characterize their nature. The two examinations in concert produced a significantly better accuracy rate than either one alone. Increasing application of ultrasound to examination of the liver is anticipated with the more sophisticated equipment that is now commercially available.

The Volume of the Uterus in Normal and Abnormal Pregnancy. J. F. Phillips, D. W. Goodwin, S. B. Thomason, and P. J. Dempsey. *J Clin Ultrasound* 5: 107–110, 1977.

Estimations of uterine volume were made using the midline longitudinal section for length and height and a transverse section at the widest portion of the uterus for width. The calculation of uterine volume as a product of these three measurements (a three-dimensional rectangle) produced an overestimation of the actual uterine volume by a factor of 1.5 to 2.0. When this product was plotted against the fetal biparietal diameter, however, the relationship was a straight line. To determine the normal range of uterine volume, measurements were made in single and multiple pregnancies, and values that were greater than one standard deviation above normal for a single pregnancy were considered suspicious for multiple gestations or polyhydramnios; those that were greater than one standard deviation below normal indicated oligohydramnios or hydrocephalus. This study represents the first objective method for the assessment of fluid volume. The authors found it difficult to estimate uterine volume below 20 wk gestation because of the small size and rounded contours of the uterus.

The Gray Scale Appearance of the Normal Pregnancy from 4 to 6 weeks of Gestation. B. Ghorashi and K. R. Gottesfeld. *J Clin Ultrasound* 5: 195–201, 1977.

Gray scale ultrasonography has permitted continued evaluation of early pregnancy in the first trimester without the "blind periods" initially described for bistable imaging. The recognizable gestational sac can be clearly defined at 5–6 wk and internal echoes within the sac representing fetal parts can be observed at 7 wk. Doppler identification of fetal heart tones can frequently be made at 8 wk of gestation and the exact site of early placental development can frequently be identified by 9 wk. Gestational age in the first 12 wk of pregnancy is determined fairly accurately by adding 2 wk to the conceptional age (measurement of the gestational sac in centimeters). By 13 wk of gestation a definite fetal head and chest can be detected and measured and the specific boundaries determined for the placenta. An ill-defined gestational sac within the uterus may indicate an imminent abortion; doubling of the gestational sac may also suggest early demise or early twinning. With improved detail provided by gray scale imaging, continuous monitoring of progress of the pregnancy can be obtained, eliminating the previously described "blind period" between the 11th and 15th week of gestation.

Ultrasonic Evaluation of the Superior Mesenteric Artery. B. B. Goldberg and G. Perlmutter. *J Clin Ultrasound* 5: 185–187, 1977.

The angle of the origin of the superior mesenteric artery (SMA) from the abdominal aorta was measured in both patients and cadaver specimens, and the size of the SMA lumen was determined at the same time. The mean aortomesenteric angle was found to be 14° and widening of the angle was observed in patients with abdominal aortic aneurysms and enlarged para-aortic lymph nodes. Narrowing of the angle recognized in patients with symptoms of duodenal ileus was found with equal frequency in a similar group of clinically healthy individuals of the same age, sex, and body habitus. From this study the significance of the narrowing of the angle between the SMA and abdominal aorta with respect to the pathogenesis of duodenal ileus must be questioned. In general, the older and heavier the patient, the greater the angle between the two vessels. The lumen of the SMA had an average diameter of 7 mm which corresponded well with previous arteriographic measurements of that vessel. Evaluation of the SMA and its take off from the abdominal aorta may prove of value in: a) the detection of masses between the vessels, and b) for the determination of the angle, position, and diameter of the SMA prior to catheterization.

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