Serial Measurements of Left Ventricle Ejection Fraction by Radionuclide Angiography Early and Late After Myocardial Infarction. H. R. Schelbert, H. Henning, W. L. Ashburn. *Am J Cardiol* 38: 407–415, 1976.

The authors determined the left ventricular ejection fraction with radioisotope angiography in 63 patients with acute myocardial infarction. As the bolus of 10–14 mCi of sodium pertechnetate passed rapidly through the heart, precordial activity was recorded with a scintillation camera, and all image data were initially stored on a magnetic tape and then transferred to a digital computer. The ejection fraction was calculated from the high frequency left ventricular time–activity curve. Early after infarction, the left ventricular ejection fraction was normal (more than 0.52) in 15 of the 63 patients, and averaged 0.52 ± 0.05 in the 27 patients with an uncomplicated infarct. The ejection fraction was reduced in 24 patients with mild to moderate left ventricular failure (0.44 ± 0.05) and in the 12 patients with overt pulmonary edema (0.33 ± 0.07). In 15 patients with normal left ventricular wall motion by heart-motion videotracking, the ejection fraction was significantly higher (0.53 ± 0.08) than in the 26 patients with regional left ventricular dysfunction (0.41 ± 0). During the early postinfarction period, the left ventricular ejection fraction improved in 55% of patients and a further increase in the ejection fraction was noted in 61% of patients during the late follow-up period. Patients with an initially low or decreasing ejection fraction had a significantly greater incidence of early mortality and left ventricular dysfunction ($p = 0.02$) than those whose ejection fraction was normal or improved to normal early after infarction. These findings suggest that the early serial measurements of ejection fraction are helpful in predicting early morbidity and mortality. Furthermore, serial measurements of the left ventricular ejection fraction during the immediate postinfarction period appeared to be a better measure of the functional state of the left ventricle than serial measurements of the pulmonary arterial wedge pressure or the stroke volume.

Noninvasive Myocardial Imaging with Potassium-43 and Rubidium-81 in Patients with Left Bundle Branch Block. R. L. McGowan, T. G. Welch, B. L. Zaret. *Am J Cardiol* 38: 422–428, 1976.

Using either 2 mCi ^{81}Ru or 1 mCi ^{43}K myocardial imaging was performed in 27 patients with documented left bundle branch block at rest and after exercise with use of graded maximal treadmill protocol. Of the 16 patients with left bundle branch block subjected to selective coronary angiography, 11 presented entirely normal coronary arterial and left ventricular anatomy. Two patients had inconsequential angiographic evidence of nonobstructive coronary atherosclerosis and normal left ventricular contraction, and the remaining three patients had severe coronary obstructive lesions angiographically. Regardless of the presence or absence of coronary artery disease, myocardial imaging with ^{43}K or ^{81}Rb at rest and during exercise in 25 of the 27 patients with LBBB showed decreased septal cation uptake consistent with anteroseptal myocardial infarction. Although the image defect was routinely shown at rest in patient with LBBB, this defect was generally normalized or less distinct with exercise in patients with no anatomic heart disease. In contrast, with exercise a larger, more distinct or new image defect correctly identified the presence of significant obstructive coronary disease. In the clinical application of noninvasive myocardial imaging, the image defects observed at rest can lead to the false-positive interpretation of anteroseptal myocardial infarction.

Technetium Stannous Pyrophosphate Myocardial Scintigrams in Patients with Chest Pain of Varying Etiology. T. Willerson, W. Parkey, J. Bonte, S. L. Meyer, J. M. Atkins, E. M. Stokely. *Circulation* 51: 1046–1052, 1975.

Myocardial imaging with Technetium-99m stannous pyrophosphate was performed in 202 patients admitted to the hospital with chest pain of uncertain etiology. Ninety-six of the 101 patients with clinical and evolved electrocardiographic and enzymatic evidence of acute myocardial infarction had increased myocardial uptake of the technetium stannous pyrophosphate and positive myocardial scintigrams. The correlation between the ECG and myocardial imaging localization of the infarcted area was very high for acute transmural myocardial infarction. Five patients who were studied scintigraphically seven or more days postinfarction had negative myocardial images. No clinical, ECG, or enzymatic evidence of infarction developed in the remaining 101 patients. Ninety-two of these patients had negative myocardial scintigrams; seven who were admitted with "unstable angina pectoris" demonstrated faintly positive scintigrams despite the absence of ECG and enzyme evolution; and the remaining two patients had positive scintigrams but no other evidence of acute myocardial infarction. The authors concluded that the technetium pyrophosphate imaging technique was safe and inexpensive, correlated well with ECG and enzyme indication of infarction and also correlated with ECG localization of myocardial infarction. In addition the positive myocardial scintigrams in some patients with "unstable angina" suggested that limited myocardial necrosis is ordinarily undetected by ECG and enzymes.

Combination of Isotope Venography and Lung Scanning. L. Vlahos, A. F. MacDonald, D. A. Causer. *Brit J Radiol* 49: 840–851, 1976.

Seventy patients with the provisional diagnosis of pulmonary embolism or deep vein thrombosis, or both, were examined by combined isotope venography and lung scan. One mCi of ^{99m}Tc human serum albumin as macroaggregates or microspheres, diluted in 20 ml of saline was injected simultaneously into a dorsal vein in each foot below ankle tourniquets. During the injection, a 50-sec exposure was performed with the scintillation camera over the calf, thigh, and pelvis, and the information stored on magnetic tape. Standard lung scan views were then performed and the three previous areas were again examined by imaging each area for 100 sec. In 54 of these patients, 52 pelvic, and 98 conventional ascending x-ray contrast venograms were performed, and 93% showed good correlation. There were 2% false positive and 1% false negative isotope examination.

The authors consider that isotope venography, even in its present stage of development, can be considered as a safe and reliable substitute.

Liver and Gall Bladder Imaging with Technetium-99m Dihydrothioctic Acid and Technetium-99 Pyridoxylide Glutamate—A Study in the Young Pig. R. E. Jenner, M. B. Clarke, E. R. Howard. *Brit J of Radiol* 49: 852–857, 1976.

A preclinical assessment of two biliary imaging agents, (^{99m}Tc-DHT and ^{99m}Tc-PG) was made on ten young pigs whose hepatic physiology is similar to the human. There was about 3.8% free pertechnetate in the ^{99m}Tc-DHT preparation and 1% free pertechnetate in the ^{99m}Tc-PG preparation. Sequential camera images of the liver, gall bladder, and intestine revealed a better defined liver with ^{99m}Tc-DHT at 10–15 min after injection, whereas ^{99m}Tc-PG produced more rapid and intense gall bladder activity within 35 min of injection. An average of 4% of the injected dose of the ^{99m}Tc-DHT and 36% of the ^{99m}Tc-PG were recovered from hepatic bile during the 2 hr following injection. The amount of radioactivity excreted in the urine during the 2 hr was 19% and 25% for ^{99m}Tc-DHT and ^{99m}Tc-PG, respectively. This study showed satisfactory liver and gall bladder images as well as extrahepatic biliary tract patency. The authors proposed an assessment of ^{99m}Tc-PG in neonates with prolonged obstructive jaundice.

Radionuclide Scanning of Spleen: Technical Modifications, Normal Variants and Dimensions. M. A. Razzak, G. Zidda, N. A. Hassaballa. *Strahlentherapie 152*: 52–56, 1976.

Heat and increased concentration of ACD solution were used to shorten the preparation time of thermally damaged erythrocytes for spleen scanning. Chromium-51-labeled red cells were heated in a water bath at 50°C for 15 min in the presence of ACD solution in the ratio of 1 ml ACD to three ml of blood. Twenty normal subjects were studied with this labeled preparation. The dimensions of the spleen were measured. The average dimensions were 10.5 × 7.1 cm with a circumference of 29.8 cm. The average surface area was measured by planimetry to be 59 ± 12.4 cm^2 (1 s.d.). In six subjects studied, the area of the lateral projection averaged 40% larger than the posterior area.

^{125}I-Fibrinogen Uptake Test. J. R. Louden. *Br Med J* 2: 793, 1976.

A comparison was made between the diagnostic efficacy of radiologic venography and ^{125}I-fibrinogen localization for the detection of venous thrombosis following surgery of the leg. In 40 patients who had undergone total hip replacement 77 limbs were evaluated by both procedures. Iodine-125 fibrinogen (100 μCi) was injected on the day of surgery. At 1, 2, 3, 5, 7, and 9 days after surgery external measurements of radioactivity were taken at 7 points on each leg, (ankle to midthigh), with the foot of the bed elevated. The findings were considered positive if the point count (at the same point) was 20% above the precordial count for 2 days or was 20% greater than the same point on the contralateral leg. Bilateral ascending venography was performed 6–9 days after surgery and was interpreted without knowledge of the radionuclide study. Of the 77 limbs studied, 40 revealed negative fibrinogen concentration and normal venograms. Of the 37 limbs that were positive by the radioisotope method, only 24 positive venograms were observed. In the 13 patients with negative radiologic findings, only 5 thrombi were found on the operative side which suggested that the surgical procedure *per se* was not a major cause. In 7 cases, the fibrinogen test was positive above the knee which may have reflected a thrombus in the smaller venous tributaries of the thigh; but thrombi were absent in the popliteal and superficial femoral veins as well as the origins of the profunda veins. The authors conclude that their results suggest that either the fibrinogen test is too sensitive or that radiologic venography is too insensitive. It may be surmised that a thrombus, which is either very small or in a calf vein and cannot be seen by venography, is not worth preventing or treating. With the 'high "false positive" rate,' the author stated that venous thrombosis detection following hip surgery is not feasible by means of the fibrinogen alone: contrast venography should be employed as a confirmatory procedure. A negative fibrinogen finding alone, however, is strong evidence that no thrombosis has occurred.

Measurements of Free and Total Serum T_3 and T_4 in Pregnant Subjects and in Neonates. T. W. AvRuskin, T. Mitsuma, L. Shenkman, K. Sau, C. S. Hollander. *Am J Med Sci* 271: 309–315, 1976.

In vitro measurements of thyroid function were performed on 120 women in the first, second, or third trimester of pregnancy. None of the subjects had thyroid disease, and none were receiving antithyroid or iodine drugs. In addition paired maternal and cord blood were studied at term. The authors found that total serum thyroxine (T_4) levels increased progressively throughout pregnancy. In contrast, total serum triiodothyronine (T_3) was elevated in the first trimester and remained essentially unchanged till term. Thyroxine binding-globulin T_4-binding capacity increased during pregnancy, whereas thyroxine binding-prealbumin capacity decreased. Serum-free T_3 declined progressively during pregnancy, while free T_4 was unchanged.

At term, total T_3 concentration in maternal blood was higher than in the corresponding cord blood which was actually in the low normal nonpregnant adult range; while there was no difference in T_4 values. Thyroid stimulating hormone (TSH) levels were normal and constant throughout pregnancy and in cord blood. When maternal and cord serum were compared, no differences were observed in either free T_3 or free T_4 levels. The authors advise the use of various thyroid function tests on both the mother and the newborn to assess thyroid gland activity.

Carcinoembryonic Antigen (CEA), Smoking, and Cancer in a Longitudinal Population Study. K. J. Cullen, D. P. Stevens, M. R. Frost, I. R. Mackay. *Aust NZ J Med* 6: 279–283, 1976.

The authors report a followup study on cancer incidence in an Australian population that had been tested for carcinoembryonic antigen (CEA). In 1969 serum CEA was measured by radioimmunoassay in 1416 subjects aged 40–59 yr and 956 subjects aged 60 and over. Increasing CEA levels were seen in nonsmokers and smokers with increasing age and 73 of the subjects demonstrated CEA levels of 5 ng/ml or greater. The subsequent health status of 90% of the participants was reviewed between 1969 and 1974. In 2299 subjects with initially normal CEA levels, "CEA-associated cancers" (i.e., histologically confirmed tumors of colon, stomach, lung, pancreas, and breast) were found in 25, an incidence of 1%: lung and breast tumors predominated. Of the 73 patients with initially elevated CEA, 9 developed cancers, an incidence of 13%: lung cancer predominated which suggested that these cancers were more likely to occur in smokers with elevated CEA. The authors stated that it appeared likely that an elevated level of CEA may be predictive of lung, colon, or stomach cancer in people with no clinical evidence of disease and that the test is useful for the identification of those persons at future risk.

Comparative Metabolism of Radionuclides in Mammals—XI. Retention of ^{113}Sn in the Mouse, Rat, Monkey, and Dog. J. E. Furchner, G. A. Drake. *Health Phys* 31: 219–224, 1976.

The purpose of this study was to evaluate the metabolism of a single administration of tracer ^{113}Sn as stannous chloride given intraperitoneally, intravenously, or orally to several species and breeds of animals. Following parental injection, whole-body retention of radioactivity in all of the species was found to be similar and could be described by four-component exponential equations with half-times of 0.26–0.94, 2.8–5.4, 19.7–28.4, and 88–100 days. Since greater than 95% of the administered dose was excreted in 2–3 days, 5% was considered a conservative estimate of gastrointestinal absorption. Tissue distribution of ^{113}Sn was determined after a single intraperitoneal injection of the radionuclide in rats. The largest quantity and greatest concentration of ^{113}Sn was found in bone. Muscle, pelt, liver, kidney, and bone were the only organs with over 1% of body burden.

The radiation protection guides promulgated by the ICRP for the content of ^{113}Sn in drinking water (with total body or bone as target organ) were felt to be compatible with the experimental data derived from this study.

Ultrasonography as an Aid in the Diagnosis and Management of Surgical Diseases of the Pelvis. W. H. Boyce, W. McKinney, M. I. Resnick, J. W. Willard. *Ann Surg* 184: 477–489, 1976.

The authors discussed the applications of ultrasound in the early diagnosis of cancer, especially the prostate gland, staging of cancer of the bladder and prostate, and monitoring the response of the process to therapy. The studies were performed by the combined use of intrarectal and contact abdominal scanners. The transrectal probe was coupled to the rectal wall by inflation of a water balloon and scanned in a circular fashion. For assessment of size and configuration of the gland, echoes from the rectal wall, the capsule of the prostate gland, and the prostatic urethra served as landmarks. Estimates of volume of such processes as a prostatic adenoma correlated closely with the findings at pathologic examination. Prostatic adenoma correlated closely with the findings at pathologic examination. Prostatic hyperplasia produced a "gray" pattern of symmetrically distributed internal echoes; the signals were apparently quite weak and faded with relatively small increases in gain. Carcinoma of the prostate produced high density echoes, an asymmetric mass, and no fading was observed with changes in gain. Severe infections and prostatic calculi may mimic a small nidus of early carcinoma; no false-negative sonographic studies were produced. In no cases did the surgical biopsy demonstrate extension of tumor beyond the region indicated by ultrasonography and staging of bladder carcinoma by this means was also possible. Though time-consuming, transrectal ultrasonography produced a degree of accuracy unequaled by other diagnostic techniques in the authors' experience. "Ghost" reflections were common in scans of bladder tumors but were easily recognizable as such and apparently resulted from reflection of waves focused by the convex walls of the bladder.

Ultrasonic Evaluation of Intraperitoneal Fluid. B. B. Goldberg. *JAMA* 235: 2427–2430, 1976.

The experimentally established sensitivity of ultrasound in the detection of intra-abdominal fluid shows that as little as 100 ml of ascitic fluid can be seen in cadavers and 300 ml in patients. Ultrasound can also differentiate between free and loculated fluid by simply changing the patient's position. Since ascites tends to collect in the most dependent portions of the abdominal cavity, the transducer must always be positioned at this most dependent part. The flanks are examined in the supine position and then in both decubital positions; free fluid will fall away from the superiorly located transducer and the echo-free zone of ascites will disappear. Changes in the patient's position have no significant effect on the echo-free zone in loculated fluid collections. Displacement of bowel loops in the presence of ascites is central; air-containing loops will float centrally and those which are not air-containing will become dependent, surrounded both laterally and anteriorly by the ascitic fluid. A giant ovarian cyst or distended urinary bladder, on the other hand, may well displace bowel loops laterally. Malignant ascitic fluid tends to collect in irregular fluid pockets whereas nonmalignant fluid tends to demonstrate a more uniform distribution. Intra-abdominal hemorrhage may produce a pattern similar to that seen in ascites; localized fluid collections in a traumatized region or the finding of sudden splenic enlargement may lead to the diagnosis of hematoma. Abscesses can usually be differentiated from normal fluid-containing structures by virtue of their more irregular outlines; the frequent presence of debris that produces internal echoes is also helpful. Ultrasonography may be used to monitor the progress of therapy in the regression of intraperitoneal fluid; the ultrasonic aspiration transducer may be employed to facilitate paracentesis.

Diagnostic Ultrasound in the Management of Patients Using Intrauterine Contraceptive Devices. B. K. Wittmann, T. T. S. Chow. *Br J Obstet Gynaec* 83: 802–808, 1976.

In a group of 80 patients, position of the Copper-T and Copper-7 intrauterine contraceptive devices was evaluated, length of the endometrial cavity measured and presence or absence of acute uterine flexion determined. The length of the endometrial cavity was considered small when the measurement was 40 ml or less and acute ante- or retroflexion of the uterus judged present when the angle between the uterine and cervical axes exceeded ninety degrees. When the IUCD was not in fundal position after insertion, removal was necessary in 83% of patients. Patients with small and/or acutely flexed uteri have only a 50% chance of retaining the IUCD. Both longitudinal and transverse scans were presented to show normal and abnormal positions of the devices.

The Value of Ultrasound in Hypovascular Hypernephromas. P. H. Arger. *J Clin Ultrasound* 4: 371–373, 1976.

Three cases were presented in which a renal mass was studied by nephrotomography, renal angiography, and ultrasound. Nephrotomographic examination suggested a radiolucent mass in one patient and was somewhat equivocal in a second. Selective renal arteriography revealed hypovascular masses in all three cases; ultrasonography showed all three to be solid masses. The author suggests that ultrasonography is a valuable adjunctive method of differentiating solid renal masses from cystic lesions. Under ultrasound guidance aspiration of a renal mass with analysis of the aspirate is offered as a means of further clarifying the nature of the process.

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