Comparison of ^{125}I-Fibrinogen Count Scanning with Phlebography for Detection of Venous Thrombi after Elective Hip Surgery. W. H. Harris, E. W. Salzman, C. Athanasoulis, A. Waltman, J. Baum, R. W. DeSanctis, M. S. Potsaid, and H. Sise. *N Engl J Med* 292: 665–667, 1975.

The authors studied 142 limbs in 83 patients by means of ^{125}I-fibrinogen count scanning and phlebography. None of these patients had a history of prior venous thrombosis and all had undergone total hip replacement. The radioactive fibrinogen was given prior to the hip surgery. An initial scan was performed before the operation and repeated 1 day after the injection of the fibrinogen. The next scan was taken on the first day after surgery and scanning was performed daily thereafter for 5 days and then on alternate days until 3 days after the phlebogram. Phlebography was not performed prior to surgery but usually 7–10 days after surgery. If the fibrinogen count or the clinical picture suggested development of venous thrombi before the seventh day, phlebography was performed at that time. Three questions were examined: the probability that a given "hot spot" represented a fresh thrombus; how accurate the scan was in identifying fresh thrombus formation (correlated by patients rather than by individual thrombi); and how accurate the fibrinogen scan was in identifying each thrombus. Phlebography was repeated in five patients because of clinical or imaging evidence of new thrombus formation after the initial postoperative phlebography was negative. Eleven fresh thrombi were found in four of these five patients. Of 29 areas with increased activity, 25 were associated with fresh thrombi. All four false-positive "hot spots" occurred in the calves of patients receiving dextran. The fibrinogen scan correctly identified patients with or without fresh thrombi in 76% of the cases. If the scan errors due to activity in areas of wound healing are excluded, the scan gave the correct interpretation 83% of the time. However, only 25 of 51 fresh thrombi were initially detected by fibrinogen count scanning and only 16 of the 40 fresh postoperative thrombi were apparent from the scan results. Of all the fresh thrombi revealed by the phlebography, the fibrinogen scan detected approximately 50%. The major reasons for failure to detect thrombi were the presence of a wound and the small size of some thrombi. The authors concluded that fibrinogen scanning is useful for patients after elective hip surgery, but less accurate than previously reported.

Technetium Bone Scanning as an Aid in the Diagnosis of Atypical Acute Osteomyelitis in Children. R. M. Letts, A. Fifi, and J. B. Sutherland. *SGO* 140: 899–902, 1975.

This investigation sought to evaluate the role of ^{99m}Tc-polyphosphate in the early assessment of acute pyogenic osteomyelitis. Twenty children with suspected but not clinically obvious acute bone infection were studied with bone scans. The patients ranged from 1 to 13 years of age with an average of 6.7 years. Symptoms had varied from 1 to 9 days prior to hospital admission, but most were within 4 days of onset. Roentgenograms and ^{99m}Tc-polyphosphate bone scans were performed within 24 hr of admission. Of the 20 children studied, 15 exhibited an increased count over the involved bone and 14 of these proved to have osteomyelitis. In all 15 children the radiologic findings were normal at the time of the abnormal scan. In the five children with normal radiologic and normal scan findings, an overlying soft-tissue infection rather than osteomyelitis proved to be the problem. Since osteomyelitis usually begins as a metaphyseal lesion, there is sometimes a clinical problem in differentiating it from septic arthritis in the child. The authors found the polyphosphate scans to be helpful in making this differentiation. Bone scanning was also effective in localizing the exact site of the osteomyelitis, thus facilitating both needle aspiration and subsequent surgical decompression. The authors concluded that technetium bone scanning was advantageous for determining bone infection in children unable to communicate adequately or in those children whose signs and symptoms had been modified by previous inadequate antibacterial therapy.

Radionuclide Imaging in Intrascrotal Lesions. N. S. Datta and F. S. Mishkin. *JAMA* 231: 1060–1062, 1975.

The authors report their experience in imaging a variety of intrascrotal lesions using a modification of previous techniques in a total of 23 patients. In all cases, the disease process was substantiated either by surgery or clinical followup. Ten millicuries of ^{99m}Tc-pertechnetate were injected and serial 5-sec images showing perfusion were obtained during the arrival of the bolus in the region of the external genital. A static image (300,000 counts) representing the tissue phase was taken. The entire procedure required less than 5 min. In ten cases of acute inflammation the perfusion and the tissue phases were increased; the tissue phase may present an area of central lucency. In four cases of subacute or chronic inflammation the examination did not appear to be of value. In traumatic orchitis both the perfusion and the peripheral tissue phases of activity increased. In three cases with torsion the perfusion and tissue phases were decreased. In seminoma both the perfusion and tissue phases were increased. In several other miscellaneous diseases, perfusion and tissue phases were within normal limits. The authors concluded that this type of examination might be helpful in the diagnosis of torsion, acute inflammatory lesions, abcess, and hematoma.

^{75}Se-Selenomethionine-Labeled Lipoproteins in Hyperlipidemic and Normolipidemic Humans. H. B. Stahelin, *Metabolism* 24: 505–516, 1975.

The authors investigated the feasibility of determining lipoprotein turnover using ^{75}Se-selenomethionine (Se-M) incorporation in lipoproteins in eight patients. Three of these patients had hyperlipidemic diabetes and five were normolipidemic but otherwise abnormal. The authors observed maximal activity in the very-low-density lipoprotein faction within 2–3 hr, followed by biexponential decay. The rate of incorporation into the low-density lipoprotein (1.006–1.019 μg/ml) correlated with the rapid decay rate of the very-low-density lipoprotein activity. The activity decay was single-exponential in the low-density lipoproteins both one and two, which suggested a unidirectional transfer of the label. High-density lipoproteins showed a rapid initial Se-M uptake, followed by a slow rise; this resulted in a complex time–activity curve. In the hyperlipidemic diabetic subjects, Se-M activity was significantly higher in the very-low-density lipoprotein faction and slightly lower in the low-density lipoprotein and high-density lipoprotein factions as compared to the normal lipidemic subjects. The very-low-density lipoprotein–apoprotein Se-M concentration increased by a significantly greater

amount in the lipidemic diabetic subjects than in the normal lipidemic subjects. The very-low-density lipoprotein–apoprotein turnover increased significantly in the presence of a factional turnover rate that was not significantly lower in the three hyperlipidemic subjects compared to the normal lipidemic control. In vivo ^{75}Se-selenomethionine labeling permits the estimate of the synthesis and the removal rates of apoprotein.

Placental Scanning with Computer Linked Gamma Camera to Detect Impaired Placental Blood Flow and Intrauterine Growth Retardation. W. R. Chatfield, T. G. H. Rodgers, B. E. W. Brownlee, and P. E. Rippon. *Br Med J* 2: 120–121, 1975.

The investigators sought to correlate placental blood flow as represented by radionuclide imaging with the clinical outcome of pregnancy and to determine if the information provided by imaging indicated possible intrauterine growth retardation. The current diagnosis is based on the direct measurement of fetal growth by clinical examination and sonar cephalometry and indirect measurement of placental function from its ability to produce enzymes and hormones. Sixty-five placental isotope-uptake patterns were studied. The pathology involved was quite variable, although in over half the studies the patient had had ante partum hemorrhage or possible placenta previa. The patients were administered 1 mCi of ^{99m}Tc-albumin and 4-sec sequential frames of the passage of the isotope through the placenta were taken for 2 min by a scintillation camera and stored on magnetic tape. The isotope uptake was determined by programming the computer to choose an area of interest consisting of 8 × 5 points from hottest placental image and including the central area of the scan. Calculations were performed for each frame and the maximum uptake at 2 min was taken for use in the study. A pregnancy was considered normal if the baby's weight at delivery was above the 25th percentile for gestational age. Intrauterine growth retardation was considered to be present when the weight was below the 25th percentile. The authors found no correlation between isotope uptake and the week of gestation in 50 pregnancies with a normal outcome. For normal-weight babies there was no statistical difference between the group of patients with bleeding and those without bleeding. The authors found that the anterior placental isotope uptake was reduced in those pregnancies that resulted in grossly retarded babies. The relative isotope uptake by placenta was not statistically related to the gestation of the pregnancy. The procedure was thought to have considerable potential clinical value because all available placental function tests depend on an accurate estimation of the maturity of the pregnancy, which is frequently impossible to determine. The authors concluded that if their results can be substantiated by a prospective study, then random single-sample tests of placental function and fetal well-being could be performed regardless of estimated gestational maturity.

Brain H^3-Catecholamine Metabolism in Experimental Cerebral Ischemia. M. H. Lauyne, M. A. McKowlitz, F. Larin, N. T. Zeruas, and R. J. Wurtmen. *Neurology* 25: 483–485, 1975.

The authors found that when one of the common carotid arteries in gerbils was ligated, a major depletion of brain dopamine occurred. The loss was most marked in those regions of the brain that are known to receive dopaminergic projections. To determine if the depletion reflected the release of stored dopamine, ^{3}H-catecholamine was introduced into the brain dopamine pools 4 hr prior to ligation of the common carotid artery. The authors found a profoundly depressed ipsilateral level of brain ^{3}H-catecholamine 24 hr after ligation in animals exhibiting the clinical findings of stroke. Common carotid ligation was also found to be associated with selective decrease in the concentration of ^{3}H-labeled deaminated metabolites within those regions of the brain known to receive dopamine projections. The authors concluded that cerebral ischemia was associated with the release of catecholamines as well as with impaired oxidative metabolism of catecholamines.

Ultrasonic Production of ^{131}I-HSA Particles Suitable for Liver Scintigraphy. V. Kutas, L. Kocsar, and J. Holland. *Int J Appl Radiat Isot* 26: 31–32, 1975.

The authors chose to make their RES agent from albumin macroaggregates instead of microspheres because of the difficulty in labeling microspheres, their slower metabolism, and expensive time-consuming production. They note that the isoelectric point of human serum albumin is 4.9. A macroaggregate is produced at pH 5.5 with a particle size of 20–50 μm. For the production of smaller particles, the pH has to be increased to about 7. Unfortunately, the further from the isoelectric point, the lower the yield. The authors chose a pH of 7, which is suitably distant from the point of macroaggregate production, and exposed their solution to 60 min of ultrasound at 4°C. The size of the particles is a function of the duration of the ultrasonic treatment. A bacteriostat is added. When the iodinated albumin is stored at 4°C, the value of free iodine stays below 5% for the first 15 days (two half-lives) after production. The particles produce a specific activity of 1.6 mCi/mg, with a protein content of 0.5 mg/ml. Their diameter is less than 5 μm. The liver-to-lung concentration ratio was over 48 in a series of 30 rats.

The Use of Auger and Conversion Electrons for the Detection of Emitting Radionuclides: Chromatographic Quality Control of Radiopharmaceuticals. M. Wenzel and A. A. Wahid. *Int J Appl Radiat Isot* 26: 119–124, 1975.

Extremely weak Auger and conversion electrons were measured by a windowless proportional counter in 2π geometry which had an external field attracting the negative-charge carriers into the counter volume. Only through this effect can beta-particles with energies less than 5 keV be detected. This equipment is typically used for ^{3}H- or ^{14}C-labeled biochemicals. Using gamma-emitting radionuclides, the authors showed a reasonable efficiency and a better resolution of narrow spots than was available when detecting electromagnetic radiation with a NaI(Tl) detector with slit collimator.

Vitamin B_{12} Absorption Evaluated by a Dual Isotope Test (Dicopac). L. Knudsen and E. Hippe. *Scand J Haematol* 13: 287, 1974.

The DICOPAC-TEST kit (Radiochemical Centre, Amersham, England) is evaluated for measuring gastrointestinal absorption of cyanocobalamin (vitamin B_{12}). The kit consists of capsules of tracer amounts of ^{57}Co-B_{12} with intrinsic factor and ^{58}Co-B_{12}, plus vials of injectable nonlabeled B_{12}. Fasting test subjects each received two capsules orally of ^{58}Co-B_{12} (total 0.5 μg) and two capsules orally of ^{57}Co-B_{12} with intrinsic factor (total 0.5 μg) followed by 1 mg of B_{12} injected intramuscularly. Food was allowed 2 hr later. All urine excreted for 24 hr was collected. Ten milliliters of heparinized blood was drawn 8 hr after test dose administration, and plasma was separated. Radioactivity in urine and plasma was determined using a well scintillation detector. The two-capsule dose of tracer was required to yield sufficient plasma radioactivity for counting purposes. Cobalt-58 radioactivity in urine and plasma from patients with per-

nicious anemia was lower than that from normal subjects, reflecting reduced absorption. In pernicious anemia patients, there was increased ^{57}Co in plasma and urine but the results were variable. A group of patients with general intestinal malabsorption showed reduced B_{12} absorption even in the presence of intrinsic factor. A group of patients with renal diseases exhibiting reduced renal function yielded low values of ^{57}Co as well as ^{58}Co in the urine. The plasma level of radioactivity of renal patients, however, resembled those of normal subjects in contrast to findings from subjects with intestinal malabsorption. The authors state that this dual-isotope test relegates patients into one of three groups: normal, pernicious anemia, and "malabsorption." A result placing a patient into the malabsorption category may be due to incomplete urine collection, lessened renal function, intestinal malabsorption due to B_{12} deficiency, or general intestinal malabsorption.

Carcinoembryonic Antigen. M. D. Turner. *JAMA* 231: 756–758, 1975.

In this short communication the author evaluates the current knowledge and implications of carcinoma embryonic antigen (CEA). The CEA assay is of little value as a mass screening test for early cancer and its main value appears to be in the follow up of patients with cancer after surgical resection. The assay may be useful in establishing prognosis before surgery if the high serum CEA suggests advanced disease in the absence of other explanations. Sequential measurements of serum CEA may prove helpful in the care of patients with chronic ulcerative colitis; an unexpected elevation of CEA in a patient with quiescent disease might possibly indicate the development of malignancy. The high frequency of elevated serum CEA in patients with known carcinoma of the pancreas may be useful in screening for this disease. However, since this disease usually presents in later stages, the high frequency of positive results may merely be related to the presence of extensive tumor, and further studies in this area are necessary. The author also stated that most tumors associated with CEA or similar substances develop from the epithelial surfaces of hollow viscera. Therefore, a more fruitful area of investigation of CEA as a screening test for cancer may lie in studies of the fluid and secretions associated with these organs. Evidence exists that the urine of patients with uroepithelial cancer may contain high levels of CEA or like substances, and the test for urine CEA may be valuable in detecting recurrences of bladder cancer. Conceivably, quantitative studies of CEA in feces, gastric juice, and sputum may yield more information than studies of serum CEA.

Significance of Non-Steady-State Digoxin Concentration. F. M. Walsh and J. Sodee. *Am J Clin Pathol* 63: 446–450, 1975.

The authors wished to define the optimal time for sample collection that would provide the most helpful clinical information from serum or urine digoxin levels. Six hospitalized patients on oral maintenance digoxin therapy of 0.25 or 0.50 mg per day participated in the study. Serial blood samples were obtained by means of an indwelling catheter 0.5 hr before, and 0.5, 1, 1.5, 2, 4, 6, and 8 hr after administration of the usual maintenance dose of digoxin. Timed urine samples were collected at 2-hr intervals following administration of the digoxin in the three of the six patients who were free from significant renal disease. Serum and urinary digoxin concentrations were measured by radioimmunoassay. In 45 patients on maintenance therapy with a single daily oral dose of digoxin, serum digoxin concentrations varied considerably among patients who received comparable doses of digoxin. Serum digoxin concentrations in patients suspected of having digoxin toxicity overlapped those who showed no clinical or electrocardiographic evidence of intoxication. Three patients on a maintenance dose of 0.50 mg per day of digoxin showed no evidence of toxicity in spite of serum digoxin levels of 3.8, 3.4, and 3.2 mg per ml, respectively, although these values were clearly in the accepted toxic range (3.0 mg per ml). Investigation revealed that serum samples were being drawn without regard to the time that had elapsed after administration of digoxin. For example, digoxin measurements in three clinically nontoxic patients were very high in the initial serum specimens. When the determinations were repeated 12 hr after administration of the maintenance dose, the serum digoxin concentrations were within the therapeutic range. The authors found that serum digoxin levels rose sharply after administration, peaked after 2 hr, and then rapidly declined. Expressed as a percent of the baseline value, serum digoxin values at 0.5, 1, 1.5, 2, 4, 6, and 8 hr after administration of the drug were 167, 185, 228, 256, 172, 145, and 134, respectively. Twenty-four hours after administration of the dose, serum digoxin levels were 104% of baseline. The average urinary excretion of digoxin in three patients showed a peak excretion during the first 2–4 hr after administration. Steady-state serum concentrations were not established until 6–8 hr after administration of the drug, and high serum values during the first 6 hr did not correlate with clinical or electrocardiographic evidence of digoxin toxicity. The authors concluded that when serum digoxin levels are utilized as an index of digitalization or toxicity in patients on maintenance therapy, the blood samples should be drawn just prior to the daily dose and no sooner than 6 hr after administration of the drug.

The Effect of the ^{51}Cr-Labelling Procedure on Platelet Aggregability. J. Bjornson. *Scand J Haematol* 13: 252, 1974.

The author reports on in vitro aggregation studies of plasma platelets labeled with ^{51}Cr-sodium chromate. Aggregation was initiated by treatment with adenosine diphosphate or collagen. The labeling procedure was not found to influence adversely the aggregation as measured by galvanometer. A reduction in pH of citrated platelet-rich plasma from 7.7 to 6.5 greatly reduced platelet aggregability. Readjustment of pH returned aggregability to normal. Platelet aggregation was also decreased by (A) centrifugation followed by platelet resuspension, (B) storage of citrated PRP for extended periods of time prior to use, and (C) increased calcium or citrate concentration or (D) increased ionic strength in the test medium. The author endorses the use of ^{51}Cr-labeled plasma platelets for quantifying platelet deposition in experimental thrombi.

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