

Radioimmunoassay Kits for Thyroid Hormones. P. Jackson, S. Lees, M. Pow, G. W. Willing, and D. Watson. *J Clin Pathol* 29: 902-907, 1976.

The authors described and evaluated commercial serum thyroxine (T4) and triiodothyronine (T3) radioimmunoassay (RIA) kits available in England. Data provided included manufacturer, cost per test, time necessary to perform 40-50 tests, equipment needed, number of precision pipettings required, method for separating bound from unbound antigen, and slope of the RIA curve.

Fairly straight line curves from minimal hormone levels to hyperthyroid were found for most kits. Some kits, however, showed lessened accuracy at higher hormone levels with near saturation of antibody. Every kit performed adequately on plasma and on turbid lipemic sera. Hypo- and hyperproteinemic sera as well as late pregnancy sera also did not interfere with the accuracy of any T4 test. Ambient climatic conditions did not adversely affect any kit performance, but after opening, the useful life of a kit varied greatly from one product to another despite following the manufacturer's storage directions implicitly.

Among different products, precision, as reflected by reproducibility of test results, varied from 3-8% (coefficient of variation) to 12-20% within batch and from 5-12% to 22% between batches. Comparative test performance on control sera and on standard sera were presented. Results were generally consistent from brand to brand.

Despite the generally favorable outcome of the evaluation, the authors felt that only a few of the kits tested were "sufficiently accurate, reliable, and economical" to deserve advocating their use in health screening.

Cancer Diagnosis: The Role of Tumor-Imaging Radiopharmaceuticals. E. B. Silberstein. *Am J Med* 60: 226-237, 1976.

The author provided an extensive review and analysis of the literature (109 references) on radiopharmaceuticals for tumor diagnosis. Gallium-67 was profusely described and the sensitivity of detection by Ga-67 for adenocarcinoma, squamous cell carcinoma, and lymphoma with respect to anatomic region involved was reported. The relative sensitivities for primary and metastatic tumors of lung, brain, and other organs were tabulated. The efficacy of separate employment of Ga-67 and pertechnetate for brain scintigraphy was described, and similar complementary studies for liver (gallium and colloid), thyroid (gallium, radioiodide, and pertechnetate) and breast (gallium and other radio-nuclides) were included. Gallium-67 was compared with lymphangiography for the detection of abdominal lymph node tumors and with chest roentgenography for bronchogenic carcinoma and Hodgkin's disease. Satisfactory treatment of malignancy reduced the concentration of gallium in the affected tissue; the author suggested a prognostic value for post-therapeutic Ga-67 imaging. Indium-111 as chloride plus bleomycin complexes of In-111, Co-57, and Tc-99m were also described. The author mentioned labeled nucleic acids, amino acid analogs (e.g., ⁷⁵Se-selenomethio-

nine), pyrimidines, and inorganic cations such as Cs-131, Bi-206, Hg-197, and Cu-67. Nonimmunologic as well as immunologic labeled proteins came under scrutiny as did numerous miscellaneous agents.

The author emphasized that mechanism(s) of tumor localization by these agents remain unknown. At present, no radiopharmaceutical (including Ga-67) used clinically in prospective diagnosis is tumor specific.

Indium-111 Bone Marrow Scintigraphy as an Aid in Selecting Marrow Biopsy Sites for Evaluation of Marrow Elements in Patients with Lymphoma. E. J. Gilbert, J. D. Earle, E. Glatstein, M. L. Goris, H. S. Kaplan, and J. P. Kriss. *Cancer* 38: 1560-1567, 1976.

One hundred and two previously treated lymphoma patients were studied with Indium-111 marrow scans and bone marrow biopsies. At 48 hr after the intravenous injection of 1.5 mCi of ¹¹¹InCl₃, scanning was performed with a dual detector whole-body rectilinear scanner. The biopsies were considered to represent sampling errors when the cellularity of the biopsy did not reflect the general state of the marrow organ cellularity as shown by the scan. In each instance where such an error was scored, the interpretation of the scan was confirmed by follow-up data and by repeat bone marrow biopsies. It was clear that, in the group of patients with normal counts who had never had marrow involvement with tumor, marrow biopsy sampling errors were infrequent (<2%). Errors were especially likely (17/51) in patients who had had marrow involvement or those who had anemia, leukemia, or thrombocytopenia. The demonstration that the In-111 marrow scan allows the clinician to avoid selecting a biopsy site with a high risk for sampling error (with the definition of the high and low risk groups of patients for such sampling errors), was the first presentation of a relatively simple, easily available method, that will allow confidence in the interpretation of bone marrow biopsies.

Experience in Staging Testis Tumors with Bleomycin 57 Cobalt and Present Role of ⁶⁷Ga Scan. M. G. Mukerjee and B. T. Mittelmeyer. *J Urology* 116: 467-468, 1976.

Fifteen patients with testicular tumors (seminoma, teratocarcinoma, embryonal carcinoma, and admixtures thereof) were evaluated. The authors employed Co-57 bleomycin (stated dosage evidently a typographical error) as well as Ga-67 citrate for imaging of nodal metastases. Results were compared with those from pedal lymphangiography, excretory urography, liver and spleen scans, chest X-ray, isotope bone survey, and supraclavicular node biopsy (not all tests were performed on each subject). Of three patients with unequivocally positive involvement of retroperitoneal lymph nodes by lymphangiography, only one showed a positive scan with Co-57 bleomycin, and all three had negative Ga-67 scans. Pathologic staging by lymphadenectomy was positive in the two patients on whom performed. Of three patients with equivocal lymphangiograms, one had a

questionable-positive Ga-67 study with all other tests negative. Of nine patients with negative lymphangiograms, one had a positive bleomycin image and positive chest lesions by X-ray but negative Ga-67 studies. Of the remaining eight subjects, all tests were negative.

The authors found that false-negative results with Ga-67 were a problem in this investigation and that the Co-57 bleomycin methodology used was ineffective. The investigators feel that pathologic staging (when applicable), lymphangiography, and supraclavicular node biopsy were the most dependable for staging retroperitoneal node involvement.

Indium-111 Labeled Leucocytes for Localization of Abscesses. A. W. Segal, M. L. Thakur, R. N. Arnot, J. P. Lavender. *Lancet* 2: 1056-1058, 1976.

The authors described a method for labeling leucocytes with Indium-111 and the patient imaging results following injection of the tagged cells. Carrier-free Indium-111 was complexed with 8-hydroxyquinoline. The resulting chelate (0.4-1.1 mCi) was incubated with leucocytes (isolated from heparinized blood) for 15 min, then mixed with autologous plasma, and injected in a peripheral vein. Images were obtained at 4, 24, and 48 hr after injection by gamma camera and whole-body scanner.

Three patients with postsurgical abdominal abscesses were evaluated at 5, 21, and 22 days after surgery, respectively. They found that radioactivity had concentrated at the site of the abscess in all three individuals. Because of a lack of labeled cell concentration, pyogenic infection was later excluded in a woman with suspected pelvic abscess, a man with suspected subphrenic abscess, and a woman with biliary colic. In the woman with negative pelvic abscess, radioactivity localization was observed in the buttocks at site of intramuscular injection of pentazocine. An elderly woman with chronic rheumatoid arthritis and exacerbation of symptoms in knees yielded "some concentration" of radioactivity in knees. In fluid aspirated from a knee at 24 hr following administration of labeled cells, 70% of radioactivity was associated with cellular elements: 95% of the activity was fixed to neutrophils and 5% to lymphocytes which comprised 60% and 30% of total cells, respectively. A boy with bacterial endocarditis on a congenitally deformed aortic valve showed patchy uptake of radioactivity in lungs, one area possibly being that of aortic valve.

No adverse effects from use of labeled cells were observed. The authors' results were felt to support the diagnostic use of individual indium-labeled blood components: neutrophils for nonpyogenic tissue necrosis (myocardial infarct), platelets for thrombi, and lymphocytes plus macrophages for tumors and metastases.

Differential Diagnostic Features of the Radionuclide Scrotal Image. F. S. Mishkin. *Am J Roentgenol* 128: 127-130, 1977.

Over a 3 year period 128 radionuclide studies of the scrotum on 122 patients were reviewed. Images of the perfusion phase (two 10 sec images) and the tissue phase (300,000 counts) following the intravenous injection of 10 mCi [^{99m}Tc] pertechnetate were obtained and correlated with clinical findings for the differential diagnosis of scrotal lesions. Torsion and orchietomy were the only pathologic processes encountered that showed a truly devoid center of activity on the tissue phase, compared to the normal side. Subacute torsion was associated with peripheral hyperemia

and could be mistaken for an inflammatory process. Other lesions such as acute inflammation, abscess, hematoma, and hemophagic tumor might superficially appear to lack central activity but invariably contained at least as much activity when compared to the normal side. Spermatic cord torsion affected young individuals, often before sexual maturity, and inflammatory diseases, with the exception of mumps orchitis, chiefly affected the sexually active group. It was also felt that a painless, persistent scrotal mass should raise suspicion of neoplasm.

Evaluation of ¹²⁵I-Fibrinogen Test for Venous Thrombosis in Patients with Hip Fractures: Comparison between Isotope Scanning and Necropsy Findings. G. K. Morris and J. R. A. Mitchell. *Br Med J* 1: 264-265, 1977.

To determine the limitation of the I-125 fibrinogen test and to calibrate the test, if possible, for use in patients with hip fractures, the results of I-125-fibrinogen leg scanning during life were compared with the findings at postmortem dissection of leg veins in 31 patients. These were cases of hip fracture patients who died during the period of isotope scanning or within 7 days of the last scan. The authors concluded that thigh scanning on the side of hip fracture was valueless, and thigh scanning, even on the uninjured side, was not a reliable means of diagnosing venous thrombosis. High counts were found to be due to hematomas within the thigh muscles and due to the proximity of the major vessels at the level of upper third of the thigh. In the lower leg a difference in uptake of 20% or more that persisted for 24 hr between adjacent positions on one leg or between corresponding positions on the two legs was consistently associated with the presence of venous thrombosis at necropsy.

A Quantitative Study of the EMI Values Obtained for Normal Brain Cerebral Infarction and Certain Tumors. F. Ambrose, M. R. Gooding, F. Griver, and A. E. Richardson. *Br J Radiol* 49: 827-830, 1976.

The authors reported the range of brain-tissue densities, expressed in EMI numbers which were similar for normal frontal (17.5) and temporal lobes (17.6) in 15 normal brain scans. The values for the basal ganglia and occipital lobes were 16.6 and 18.9. From the analysis of 10 cerebral infarctions and 30 cerebral tumors, it was shown that analysing representative areas was more informative than surveying the whole region. The mean EMI number for selected area (225 mm²) of infarction was 11.2. The enhancement of tumor density with sodium iothalamate showed a consistent and significant elevation of the EMI number for all tumors although only half of the scans of brain tumors had a significantly altered EMI number compared with that of normal brain. The value for enhanced meningiomas was almost double (21.3 → 36.4). However, it was not possible to differentiate quantitatively between astrocytomas and metastases.

Gray Scale Ultrasound and Isotope Scanning: Complementary Techniques for Imaging the Liver. K. W. Taylor, D. Sullivan, A. T. Rosenfield, A. Gottschalk. *Am J Roentgenol* 128: 277-281, 1977.

Recent advances in the technology of ultrasound now permit the imaging of the liver parenchyma and the utilization of the unique capability of ultrasound in distinguishing solid from cystic masses. Ultrasonographic imaging of focal defects identified on the Tc-99m sulphur colloid liver scan serve to identify such processes as a benign simple cyst of

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the liver, pyogenic abscess, and to confirm suggested metastatic disease. The previously reported accuracy of radio-nuclide imaging in patients with known hepatic metastases has varied from 72–90%; the current study demonstrated diagnostically useful results with ultrasound in 92% of patients, no equivocal results, and 8% incidence of false positive and false negative findings. Five representative cases were presented in two of which the scintigrams and sonograms are displayed and correlated.

Gastric Duplication Originating from the Tail of the Pancreas—Ultrasonically Demonstrated. I. Gorelik, S. M. Goldman, S. D. Minkin, S. J. Abrams, J. A. Salik. *J Clin Ultrasound* 4: 429–432, 1976.

Two previous reports of duplications of the stomach arising from the tail of the pancreas have appeared; ultrasonic visualization of bowel duplication has not previously been reported. The authors describe a 22-month-old asymptomatic black female in whom the left upper quadrant mass was palpated; upper gastrointestinal series and barium enema suggested the possibility of splenomegaly, but the liver-spleen radionuclide study was normal. The ultrasound findings showed a sonolucent sausage-shaped mass with no internal echoes identifying it as a cystic structure. The radiographic and ultrasonographic findings were used to make the preoperative diagnosis of enteric cyst or duplication. A differential diagnosis of cystic lesions of the upper abdomen was included as well as a discussion of gastric duplication.

Ultrasonic Aortography: Unexpected Findings. T. G. Lee, S. C. Henderson. *Am J Roentgenol* 128: 273–276, 1977.

In a series of 125 patients examined for clinically suspected abdominal aortic aneurysms, 15 were found to have abnormalities unrelated to the aorta. The most commonly discovered processes were tumors such as lymphoma, carcinoma of the pancreas, retroperitoneal sarcoma, etc. Fifty-four patients were, in fact, found to have aneurysms; in 19, subsequent confirmation was obtained. The three remaining abnormalities discovered included uterine myomata,

retroperitoneal lymphadenopathy secondary to lymphoma, and lymphadenopathy secondary to carcinoma of the colon. The authors suggest that ultrasonography be considered a routine procedure in the evaluation of patients suspected of having abdominal aortic aneurysms as the yield in this series was some 12% showing unrelated abnormalities. The false impressions of aortic size produced by angiography in the face of mural thrombus previously documented is discussed.

Ultrasound in the Evaluation of Adrenal Metastases. J. R. Forsythe, B. B. Gosnik, and G. R. Leopold. *J Clin Ultrasound* 5: 31–34, 1977.

Metastases to the adrenal glands have been reported to occur in as many as 33% of patients with bronchogenic carcinoma; the authors presented a series of 10 patients in whom a total of 15 adrenal metastases were revealed by ultrasound. Scans were obtained in the transverse and longitudinal planes in both the supine and prone positions. All of the masses identified were superior, anterior, and medial to the kidneys, displacing them posteroinferiorly, and most showed at least partial margination from the kidney. In all five patients examined with a gray scale unit, distinct margins between the kidney and the mass were delineated. The inferior displacement of the kidney and the lateral and posterior rotation of its upper pole were characteristic of the displacement produced by adrenal enlargement in this series. Necrotic adrenal metastases may be difficult to distinguish from such fluid-filled masses as adrenal cysts; low-level echoes are usually identified in metastatic disease as opposed to the completely echo-free adrenal cyst. Ultrasonographic evaluation of the normal adrenal glands has not met with great success because of their small size.

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