Isotopic Method Using Xenon-133 for Assessing Placental Blood Flow and for Detecting Light-for-Dates Babies. M. R. Wolfson and K. C. H. Blake. *South African Med J* 49:117–119, 1975.

The authors describe a method for measuring uteroplacental blood flow by a noninvasive means. Thirty-two procedures were performed on 26 patients with gestations between 34 and 41 weeks, and all were delivered within 3 weeks of the procedure. Placentas were first localized by ultrasound techniques, and only patients with anteriorly or anterolaterally implanted placenta were examined. The estimation of uteroplacental flow was determined by the clearance of ^{133}Xe from the uteroplacental tissues. A relative saturation of the fetomaternal unit was obtained by continued breathing of xenon. At the end of the closed breathing period the circuit was abruptly opened to room air. During the washout period a low-energy scintillation probe was placed over the placental area, and changes in counting rate were recorded on a paper recorder. The normal gestation curve stripping revealed two compartments, one with a slow component and one with a fast one. The authors suggest that the fast component represented clearance of xenon from the uteroplacental region and the slow component represented clearance from skin and subcutaneous tissue. This supposition was verified by obtaining temporal recordings over the buttocks and the heart. For analysis the studies were divided into two groups based on the weight and light-for-date of the infant. When infants below the tenth percentile by weight were compared with normals, there was a statistically significant difference in their clearance time even though gestational ages and placental weights were almost identical. Hypertensive patients did not show any statistically significant difference. The $T_{1/2}$ clearance during the normal pregnancy was 1.38 ± 0.28 min. When infants were below the tenth percentile by weight the mean clearance rate during pregnancy was 1.78 ± 0.49 min. The authors state that the clearance rate of xenon is directly related to the perfusion of the uteroplacental unit and that a small placenta has a reduced rate of clearance.

Comparison of a Radioimmunoassay with an Enzymatic Assay for Gentamicin. Barbara H. Minshew, Randall K. Holmes, and Charles R. Baxter. *Antimicrob Agents Chemother* 7:107–109, 1975.

Since enzymatic assay and radioimmunoassay are highly specific, they are particularly useful for measuring gentamicin in the presence of other antibiotics. In the present study the authors compared a radioimmunoassay for gentamicin in their laboratory. Gentamicin sulfate was radioisotopically labeled and purified. It contained 17.8% of the radioactivity and the specific activity was 0.8 mCi/mg. Conjugated gentamicin was emulsified with Freund's complete adjuvant. New Zealand female rabbits received six subcutaneous injections at 10-day intervals and a booster dose 1 month after the last injection. The animals were bled 1 week later. Two or three rabbits produced satisfactory antibodies. The lowest concentration of gentamicin that could be measured quantitatively in serum was found to be 1 μg/ml. In 45 serum specimens the correlation coefficient for results of gentamicin assay performed by the radioimmunoassay method and the enzymatic assay method was 0.9.

Scanning and Angiography in the Diagnosis of Pulmonary Embolism. Antonio Rodriquez-Antunez, Thomas W. Hunter, Ralph J. Alfidi, and Gwynn L. Jelden. *Clin Orthop* 107:128–132, 1975.

This article reviews some basic facts about pulmonary embolism and lung scanning. The authors observe that pulmonary embolism results in pulmonary infarction in two circumstances: (A) when the lung has been previously damaged by inflammatory processes, pulmonary fibrosis, and so forth, and (B) when there is increased pulmonary venous pressure. Infarcts are also seen more frequently in the lateral areas of the lung in which the collateral circulation between the pulmonary circulation and the bronchial circulation presumably is poor. The remainder of the article covers the general facts related to indications for pulmonary angiography with respect to the lung scan, the specifics of the lung scan, and a few comments on the pathologic physiology.

Serum Alpha Fetoprotein Levels in Patients with Cystic Fibrosis and Their Parents and Siblings. R. K. Chandra, K. Madhavankutty, and R. C. Way. *Br Med J* 1:714–715, 1975.

Since cystic fibrosis is a multisystem involvement that includes the gut-associated organs, the authors hypothesized that this indicated a failure of embryologic development that could be associated with persistent production of proteins that are present in the fetus but not detectable in adults. They studied serum samples from 18 children with cystic fibrosis, 16 of their parents, and 14 of their siblings. Twenty-two additional healthy children were matched per age and sex with the cystic fibrosis patients. Seven children with other diseases and seven patients with bronchitis were also included in the investigation. Except for one patient all were over 1 year of age. The authors found that the serum alpha-fetoprotein (AFP) concentration in each of the 18 patients with cystic fibrosis was abnormally high. All of the parents except one had a moderate serum level of AFP. Values in siblings showed a wide scatter with two subpopulations: in seven there was a moderate rise (75–400 μg/liter) comparable with that found in the parents whereas in the others the serum AFP level was within the range of the healthy children. No correlation was found between serum AFP levels and the severity or nature of clinical manifestations. There was no liver cell dysfunction in any of the subjects. The patients with other diseases had serum AFP concentrations well within normal limits. The authors felt that the persistent presence of AFP may be an associated marker of cystic fibrosis genes. An estimation of serum AFP might help to detect carriers in families with histories of cystic fibrosis.

^{131}I-Hippuran Quantitative Scintillation Camera Studies in Evaluation and Management of Vesicoureteral Reflux. Blackwell Evans, Anton J. Bueschen, Alfred J. Colfry, Jr., and Jorgen U. Schlegel. *J Urol* 113:404–408, 1975.

The authors evaluated vesicoureteral reflux with conventional radiologic modalities by means of voiding cystourethrography and IVP in comparison to the 30-min qualitative scintillation camera studies in 226 renal studies on 136 patients. After intravenous administration of ^{131}I-Hip-

puran, renal function was followed from 5 to 25 min and again before and after voiding at 30 min. The voided specimen was collected and activity was measured. Residual urine was calculated from the prevoid and postvoid count and voided volume. In 77% of the patients the radiologic and radionuclide results agreed, for both normal and abnormal studies. In 37 of the studies only the radionuclide results were abnormal, showing either a double peak, a decrease in total return of Hippuran, or a difference in comparative renal function. Based on these results the study indicated that the IVP provided a rather poor index of renal function compared to the radionuclide study. In 11 cases only the IVP was abnormal, but the pyelographic abnormalities were not of surgical significance. Of the 136 patients 78 had unilateral reflux, and 29% of this group showed a relative decrease in renal function. Only eight patients demonstrated a secondary or double peaking to suggest reflux of the radionuclide into the kidney after having once drained into the bladder. Twelve of 136 patients eventually underwent ureteral reimplantation, and following surgery none of these patients showed evidence of residual reflux radiologically. Nine patients underwent bilateral reimplantation and none of the patients having surgery showed any change in the relative renal blood flow. The authors state that their studies indicate that most periodic re-evaluations with IVP can be eliminated in favor of the radionuclide study. They also feel that direct sequential radionuclide scintigraphy has been a successful diagnostic method for evaluating conservative management.

CSF Scannng in Achondroplastic Children with Cranial Enlargement. J. C. Depresseux, G. Carlier, and A. Stevenaert. *Dev Med Child Neurol* 17:224–227, 1975.

Achondroplasia is an inherited anomaly of endocranial bone formation and frequently causes neurologic complications in children. Cranial enlargement is usually present, and it may be necessary to evaluate hydrocephalus. The authors report an 18-month boy with achondroplasia and an abnormally increased head circumference (the mother was also achondroplastic). The child showed some degree of cranial/facial disproportion but no evidence of increased intracranial pressure. Neurologic examination was normal and the radiographs showed typical signs of neoplasm. The pneumoencephalogram revealed dilated ventricles and basal cisterns. A radionuclide cisternogram showed an entirely normal CSF flow pattern, and it was felt that no shunting procedures were indicated. The child was stabilized and showed no changes neurologically or mentally. It was felt that the radionuclide cisternogram remained the most valuable method for tracing cerebrospinal fluid flow in cases of communicating hydrocephalus in children with such abnormal developments and that it offered important information in understanding not only pathophysiology of such cases but also for the planning of therapy.

Bone Scanning: Principles, Techniques and Interpretations. Leon S. Malmud and N. David Charkes. *Clin Orthop* 107:112–122, 1975.

Before obvious lesions are detected in a specific bone by x-ray films, the size of the lesion must be 1.5 cm or greater in diameter, and 50–75% of the local calcium stores must be lost. In lesions of bone there is an osteoblastic and an osteoclastic phase, the latter being the one of importance for radionuclide imaging. The roentgenogram shows no radiodensities early in bone repair but positive scans are usually obtained at this time. As reactive bone matures, more tracer is deposited and roentgenographic densities may become obvious. When the osteoid has calcified completely, the scan becomes nearly normal and the roentgenogram now shows the opacities. This process occurs in both normal bones and malignant lesions. Fewer than 5% of patients with a normal scan have an abnormal roentgenogram. The authors tabulate the following as advantages of bone scanning in malignant diseases: greater extent of metastatic involvement, suitable biopsy sites, visualization of various regions difficult by usual radiologic techniques, differentiating pathologic from traumatic fracture, planning radiation therapy portals, grading of involvement to assist planning therapy, followup evaluation of therapy, differentiating "bone islands," judgment of possible surgery, detection of soft-tissue metastases of osteogenic sarcoma, and others.

^{18}F Scintimetric Diagnosis of Osteoid Osteoma of the Carpal Scaphoid Bone. H. O. Walther, David B. Levine, and John P. Lyden. *Clin Orthop* 107:156–158, 1975.

In a patient with an osteoid osteoma of the carpal scaphoid bone, the authors attempted to verify its presence by means of scintimetry. Roentgenologic findings were not typical. After administration of ^{18}F, scintimetry of both carpal scaphoid bones was performed with a focused collimator. The digital output that represented the scintillations per 5 sec was superimposed over a tracing of the scaphoid bones. The highest counts were found in the left scaphoid bone indicating a remarkably increased bone metabolism. The authors state that this represented the diagnosis of osteoid osteoma rather than that of a chronic secondary bone lesion such as degenerative joint disease. Surgery revealed an osteoid osteoma.

Fluoride-18 Scintigraphy in Avascular Necrotic Disorders of Bone. Robert D. D'Ambrosia, Richard S. Riggins, Sally J. DeNardo, and Gerald L. DeNardo. *Clin Orthop* 107:146–155, 1975.

Because radiographic changes may not be observed for 4–6 months in an avascular necrotic disorder of bone or may even be delayed until collapse occurs, the authors evaluated information provided by ^{18}F scintigraphy as a means for studying blood supply to bone in such cases. They reviewed 75 patients who had ^{18}F scintigraphy for perfusion to an area of bone that included hip, foot, knee, ankle, elbow, and wrist. In some cases tetracycline was administered prior to surgery and evaluated in the surgical specimens. In 25 patients with femoral neck fractures who underwent prosthetic replacements, 17 were studies with ^{18}F and tetracycline labeling. Radioactivity was absent in the femoral head of ten of these patients, increased in two, and normal in five. These results correlated with the tetracycline fluorescent labeling and confirmed that the ^{18}F distribution is an indicator of blood flow to bone. They found that generally in the initial avascular stage there was an associated decreased uptake of ^{18}F that persisted until revascularization occurred. Once revascularization began the ^{18}F scintigraphy revealed increasing uptake of the isotope and at the height of the revascularization the uptake was complete. The authors concluded that ^{18}F scintigraphy was useful in determining vascularity of the femoral head, for determining results of treatment, or for diagnosing a variety of avascular necrotic disorders of the bone.

Single Image Pericardial Effusion Evaluation with Technetium Compounds. C. Barrie Cook, George Duncan, Patricia McFarland, and Ira D. Godwin. *South Med J* 68: 392–394, 1975.

The authors evaluated the combined use of ^{99m}Tc-macroaggregated albumin (MAA) and ^{99m}Tc-human serum albu-

min (HSA) for a single radionuclide image that displayed heart, liver, and lung perfusion simultaneously. The patients received 1 mCi ^{99m}Tc-MAA and a lung perfusion image was obtained. Immediately thereafter, 3 mCi ^{99m}Tc-HSA was given and the second radionuclide image was obtained demonstrating heart, liver, and lung perfusion and their space relationships in a single view. The authors report three cases: pericardial perfusion was confirmed in two and ruled out as a possibility in the third.

^{35}S-Cyclamate Metabolism: Incorporation of ^{35}S into Proteins of Intestinal Bacteria in Vitro and Production of Volatile ^{35}S-Containing Compounds. A. A. Tesoriero and J. J. Raxon. *Xenobiotica* 5:25–31, 1975.

Whole cell suspensions of bacteria were prepared from rat feces. The rats had been regularly fed oral cyclamates. When the bacteria were challenged with ^{35}S-cyclamates, bacterial protein incorporated the ^{35}S. The control preparations that had not been challenged by the oral cyclamate originally showed a very low level of incorporation of the label. The challenged bacteria had approximately 30 times greater more label than the controls. Significant amounts of the ^{35}S from ^{35}S-cyclamate were converted to volatile sulfur compounds that were trapped in sodium hydroxide solution. When cysteine was added to the incubation mixtures, incorporation of ^{35}S into the protein was inhibited. This finding raised the possibility that cyclamate sulfur is being metabolized via an assimilatory reductive pathway controlled by a cysteine. The authors conclude that the bacterial conversion of cyclamate to the suspected bladder carcinogen, cyclohexylamine, is controlled by the prevailing sulfur metabolism of the intestinal bacteria.

A High-Sensitivity, High-Resolution, Diverging Collimator for use with Low Energy Isotopes. D. A. Causer and C. G. Taylor. *Phys Med Biol* 20:318–320, 1975.

The authors designed a diverging collimator (for ^{99m}Tc) that provides a field of view 34 cm in diameter at 10 cm from the face of the camera head. This has enabled both lungs to be imaged on all patients scanned to date. The high sensitivity of the collimator also permits it to be used for ^{133}Xe ventilation scans. The collimator was constructed from lead sheet, 0.356 mm thick, formed into tapered channels of square cross sections of 0.42 cm/side at the crystal face, and 0.46 cm/side at the patient face. The depth of the collimator was 5 cm and its overall diameter at the patient's face was 30 cm. There were approximately 2,800 holes. Line spread function measurements over the face of the collimator gave resolution indexes varying from 1.55 to 1.8 cm. Measurements in air at 15 cm gave a resolution of about 2 cm.

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