

Ventricular Size after Shunting for Idiopathic Normal Pressure Hydrocephalus. H. A. Shenkin, J. O. Greenberg, and C. B. Grossman. *J Neurol Neurosurg Psychiatry* 38: 833-837, 1975.

The authors state that one cannot always be certain that a shunt is accomplishing ventricular decompression even after clearance of the injected radioactive isotope from the ventricle through the shunt has been demonstrated. Thus, they imaged the ventricles after shunting to determine whether or not the shunt was accomplishing its objective of ventricular decompression. This information was then related to the clinical results achieved from the surgical procedure. Nineteen patients had ventriculograms performed at various times after surgery (7 days to 3 years after shunting) by injecting 15-20 ml of air directly into the ventricles through the Rickham reservoir. The pressure in the right lateral ventricle was determined before injection. The span across both lateral ventricles at the junction of the frontal horn and body was measured on a frontal radiographic projection, and measurements and subjective observations of ventricular size were recorded in each case. The measurement of the cortical mantle from the bregma to the closest border of the lateral ventricle was found to correlate poorly with ventricular span and subjective estimation of change in ventricular size. In 14 patients who showed decreased ventricular size, improved clinical response was found in seven patients and no clinical response in seven. Of five patients in whom the ventricles did not decrease, improved clinical response was noted in two patients and no response in three. The authors found no consistent relationship between clinical improvement after shunting and the reduction in ventricular size. In 15 of the 19 patients the pressures measured at the reservoir were below 60 mm H₂O. In the remaining four patients with high ventricular fluid pressures (up to 110 mm H₂O), two had no decrease in the size of the ventricles in spite of excellent clinical results; in the two patients with poor clinical results, one had a 37% reduction in ventricular size and the other a 7% reduction in size. The authors conclude that the obstructive factor, as reflected by ventricle size, may not be critical in a significant number of patients with a clinical picture of pressure hydrocephalus.

Regional Cerebral Blood Flow Studies Following Superficial Temporal-Middle Cerebral Artery Anastomosis. M. P. Heilbrn, O. H. Reichman, R. E. Anderson, and T. S. Roberts. *Neurosurgery* 43: 706-716, 1975

The anastomosis of the superficial temporal artery to the cortical branches of the middle cerebral artery can be useful in providing additional collateral circulation to the brain. These new channels remain patent and enlarge with time. The procedure is useful for the treatment of transient ischemic attacks, completed strokes followed by incomplete resolution, and completed strokes. The authors attempted to evaluate cerebral bloodflow studies as a means of selecting patients for the anastomotic procedure and as a means of assessing the increased collateral circulation. Regional cerebral bloodflow studies were performed postoperatively on 16 patients with internal carotid occlusion and inaccessible stenoses or middle cerebral artery occlusion and stenoses who had undergone superficial temporal artery-middle

cerebral artery (STA-MCA) anastomoses. Xenon was administered selectively through both the internal carotid artery and the newly established superficial temporal channel, thus providing a comparison of flow between the pathologic input and the new input. The results show that initial cerebral blood flow (rCBF_i) was globally reduced in all patients to a mean of 28.4 ± 11.9 ml/100 gm/min at a mean pCO₂ of 29.6 ± 9.55 mm Hg.

Patients with transient ischemic attacks and minor strokes with incomplete resolution had a mean rCBF_i of 30.4 ± 11.6 ml/100 gm/min at a mean pCO₂ of 30 ± 10 mm Hg, while patients with completed strokes had a mean rCBF_i of 25.0 ± 12.4 ml/100 gm/min at a mean pCO₂ of 29.1 ± 8.8 mm Hg. There was no significant difference between these two groups. This finding suggests that in this small group of patients with transient ischemic attacks and strokes with incomplete resolution, the cause of the stroke was probably decreased perfusion rather than embolus, which may explain why these patients' symptoms improved after STA-MCA anastomosis. The results of this study suggest that, in addition to an inaccessible lesion, globally or focally decreased cerebral blood flow is a necessary criterion in the definition of indications for intracranial revascularization procedures.

Liver Scans in Cystic Fibrosis. M. C. Goodchild, A. J. Banks, Z. Droic, and C. M. Anderson. *Arch Dis Child* 50: 813-814, 1975.

The authors investigated 16 patients with cystic fibrosis (nine males and seven females), aged 7-18 years. The Shwachman score, a measure of the degree of fibrosis, was 51-90. Liver-spleen scans were performed with ^{113m}In-colloid, and simultaneous blood samples were taken to evaluate liver function. The liver scans were evaluated by one of the authors, two radiotherapists, one radiologist, and one consultant in nuclear medicine: 86% of the patients' livers were thought to be either normal or small in size, 72% were thought to show nonhomogeneous distribution of radioactivity, and in the final assessment 78% of the studies were considered to be abnormal. Only four of the patients with abnormal liver scans had convincing evidence of liver dysfunction on the basis of clinical examination or chemical tests. The authors found that the scans did not reveal liver disease with sufficient clarity to be of any help in modification of treatment. Since no correlation was found between the appearance of livers on the scans and the ages of the patients or their Shwachman scores, the authors felt that scanning would not contribute substantially to the assessment or prognosis in cystic fibrosis.

Trials to Differentiate Thyroid Tumours by the Use of ^{99m}Tc-Solcocitran. G. Lundell and S. Casseborn. *Acta Radiol [Diagn] (Stockh)* 14: 462-464, 1975.

Recently, a ^{99m}Tc-Sn-citrate compound (Solcocitran) has been introduced for the detection of malignant lesions in bone or brain. This compound, it was stated, had a high selective uptake in neoplastic tissue and had not given any false-positive or false-negative scans in cases examined for possible bone or brain lesions. This investigation sought to evaluate ^{99m}Tc-Solcocitran as an agent for the differentiation of thyroid lesions. The authors selected three groups of patients: (A) seven patients with thyroid malignancy (three

anaplastic, two follicular, and two papillary carcinomas); (b) three patients with benign thyroid adenomas, and (c) six patients with diffuse or nodular goiter. Images were obtained after administration of 1 mCi of ^{99m}Tc -pertechnetate or 50 μCi of ^{131}I . Subsequently, 10 mCi of ^{99m}Tc -Solcocitran was injected intravenously, and images were obtained, usually 2–4 hr after administration of the pharmaceutical. Preparations of ^{99m}Tc -Solcocitran were examined by thin-layer chromatography and no free ^{99m}Tc -pertechnetate or reduced ^{99m}Tc contaminant was found. The uptake of ^{131}I or ^{99m}Tc -pertechnetate was decreased in all primary tumors. In the patient with bone metastases (follicular carcinoma), increased ^{131}I uptake was found. No uptake of the ^{131}I was observed in lymphnode metastases from two patients with papillary carcinoma. The relative uptake of ^{99m}Tc -Solcocitran was neither decreased or increased in any of the areas examined, regardless of the interval between radiopharmaceutical injection and scanning. The authors concluded that ^{99m}Tc -Solcocitran was of no value in the differentiation of benign from malignant thyroid lesions. Furthermore, no increased uptake was observed in the patient with bone metastases from follicular carcinoma.

Thyroidal Radioiodine Exposure of the Fetus. S. A. Book and M. Goldman. *Health Phys* 29: 874–876, 1975.

The thyroid glands of developing fetuses are highly susceptible to radiation damage resulting from maternal assimilation of radioiodines from nuclear fission or from medical diagnostic or therapeutic procedures. The easy transport of radioiodine across the placenta and the initiation of thyroid function of the unborn young results in fetal thyroid concentration of radioiodine. In smaller animals thyroid function begins late in gestation, but in most larger mammals function begins from the first trimester to about midway through fetal development. As gestation progresses, accumulation of radioiodine increases. The fetal-to-maternal concentration ratio exceeds unity as parturition approaches. Fetal-to-maternal thyroid ^{131}I ratios determined 1–2 days after a single dose to the mother are generally higher than those associated with chronic exposure. The ^{131}I concentration in the fetal thyroid resulting from chronic exposure does not exceed that of the maternal gland until the last third of the pregnancy. The fetal-to-maternal ratio after a single dose of ^{131}I is about 1.2 by the end of the first trimester, about 1.8 during the second trimester, and 7.5 in the third trimester. Low-level long-term exposure, obtained from continuous feeding of radioiodine or radioactive fallout, commonly produced ratios of about 3 or less near the end of gestation. In areas of fallout the fetal-to-maternal ratios averaged about 3.3 in several women, ranging from 1.3 to about 8. Investigators have estimated the dose to thyroid precursors during the first trimester to be about 1 mrad per millicurie of ^{131}I ingested by the mother, while the fetal thyroid gland receives about 0.7 and 6 mrad/mCi at 13 and 22 weeks, respectively. When birth is imminent, the fetal thyroid might be expected to receive a mean dose of about 8 mrad/mCi administered, about 4–5 times the adult dose.

Radioiodine (^{131}I) in Animal Thyroids during Nuclear Tests in Both Hemispheres. L. Van Middlesworth. *Health Phys* 29: 861–864, 1975.

Radioiodine is selectively accumulated in the thyroids of grazing animals to the extent of 10^2 – 10^4 times the concentration on the exposed forage. Radioiodine is therefore a sensitive index of relatively fresh fission products injected

into the atmosphere and incorporated into animal tissue. Fresh ovine and bovine thyroid glands were collected at different sites and mailed to the University of Tennessee every 1–4 weeks. The glands were weighed and the 0.310–0.410-MeV gamma radiation was measured with a 5-in. NaI crystal. Measurements were made in duplicate on each sample for a 1-hr period. When the activity exceeded 10 times that of the background, gamma spectra were determined to confirm the presence of ^{131}I . The thyroid tissue from Nigeria contained significant quantities of radium which interfered with ^{131}I measurements. These glands were counted at 3 weeks and again at 6–8 months later in order to determine the quantity of ^{214}Pb and ^{226}Ra . The latter were subtracted from the original measurements in order to obtain the representative ^{131}I in the specimen.

During the months of September and October of 1974, an unexpected widespread increase in ^{131}I in sheep thyroids was collected in Texas (32°N) and in England (52°N). The concentration at that time exceeded that observed earlier the same year following atmospheric nuclear tests reported from China on June 17th. The greatest concentrations of radioiodine from Nigeria were found during August and September and exceeded those found in thyroid tissue obtained from Taiwan. In New Zealand (40°S) and Australia (37°S) the maximum concentrations of ^{131}I were found during September and October and were reasonably related to nuclear tests conducted in the southern hemisphere during June to October of 1974.

The authors were not sure of the source of the ^{131}I found in the northern hemisphere during September through November. If it originated from the June tests, then tropospheric mixing had delayed the ^{131}I by 10–14 half-lives before it appeared in animal thyroid tissue. If that was the source, then the original tropospheric burden in July must have been at least 1,000 times greater. This hypothesis would suggest that most of the original radioactive debris in June was deposited in the lower stratosphere and that a fraction returned to the troposphere by September. The data from New Zealand, Australia, and Nigeria suggested that most of the ^{131}I had originated in the southern hemisphere and that rapid and massive interhemispheric mixing of fission products from south to north from July to September might account for part or all of the ^{131}I observed in the thyroid tissue from animals in the northern hemisphere during late 1974.

Image Generation and Display Techniques for CT Scan Data—Thin Transverse and Reconstructed Coronal and Sagittal Planes. W. V. Glenn, R. J. Johnston, P. E. Morton, and S. J. Dwyer. *Invest Radiol* 10: 403–414, 1975.

This project sought to evaluate computer-based image processing and display techniques that might potentially contribute additional anatomic information and efficiency to the interpretation of CT studies. The authors describe a method for taking several overlapped 8-mm-thick CT transverse scans and then constructing a larger number of thin nonoverlapping tissue planes by a deconvolution process. They not only obtained improved resolution in terms of thinner sections, but were also able to reconstruct image planes that were perpendicular to the original transverse plane, either coronal or sagittal. They verified their deconvolution technique by means of phantom experiments. Illustrative transverse image planes that had been deconvoluted into thin 1-mm sections are included.

In a case of recent massive left cerebral infarction the authors were able to visualize the associated area of sur-

rounding edema, obliteration of one lateral ventricle, and the grossly normal other lateral ventricle. From reconstructed planes they observed the compressed anterior horn of a lateral ventricle to be displaced across the midline. Reconstructed sagittal planes were able to show both the normal and abnormal anatomy. A saw-tooth edging artifact was introduced into the deconvoluted planes, currently under investigation by the authors. The authors state that, given the proper program, the computer could display image information as it is rotated about a perspective or observation point.

Computerized Axial Tomography: The Normal EMI Scan. J. Gawler, J. W. D. Bull, G. H. du Boulay, and J. Marshall. *J Neurol Neurosurg Psychiatry* 38: 935-947, 1975.

This paper describes the intracranial anatomy as shown by computerized axial tomography. The composite illustration given in the presentation was built from experience with 2,500 patients investigated for intracranial disease. Since the size and shape of the skull varies from person to person, the appearance and relationships of normal structures were considered in the transverse plane. The authors present appreciable detail on the appearance of the ventricular system, the subarachnoid regions, the cerebral hemispheres, the cerebellum and brain stem, and the orbital compartment. The information and illustrations presented in this article should be beneficial to all persons interested in computerized axial tomography.

Use of Computerized Tomography in Senile Dementia. J. H. Fox, J. L. Topel, and M. Huckman. *J Neurol Neurosurg Psychiatry* 38: 948-953, 1975.

Computerized tomography (CT) was used to evaluate 35 patients with senile dementia. For the authors' purposes, senile dementia was defined as the presence of impaired orientation, judgment, and intellectual function for at least 1 month in an elderly patient; patients with a clear history of stroke and those who had major focal findings by neurologic examination were excluded. Initially 60 years of age was the lower limit accepted; this was later changed to 65 years. Each patient had skull radiograph, electroencephalogram, brain scan, and a lumbar puncture. On the basis of CT measurement of ventricular size, patients were placed in one of six categories: (A) normal if the ventricles measured 15 mm or less and the cortical sulci were 15 mm or less, (B) questionable atrophy if the ventricles were 16-20 mm and the sulci 5 mm or less or if the ventricles were 15 mm or less but the sulci were 6-9 mm, (C) mild atrophy if the ventricles measured 16-20 mm and the sulci 6-9 mm, (D) moderate atrophy if the ventricles were greater than 20 mm and the sulci measured 6-9 mm; or if the ventricles measured 16-20 mm and the sulci were greater than 9 mm, (E) severe atrophy if the sulci were greater than 9 mm and ventricles greater than 20 mm, and (F) enlarged ventricles, greater than 20 mm, without enlarged cortical sulci.

The authors divided the patients into two categories, those with no atrophy, questionable atrophy, or mild atrophy and those with moderate atrophy, severe atrophy, or enlarged ventricles. In the normal-to-mild group, which consisted of 11 patients (seven women and four men), the average age was 77 years and the average length of history of dementia was 28 months. Followup studies in ten of these 11 patients showed them to be relatively unchanged. The moderate-to-severe group consisted of 24 patients (6 women and 18 men) and the average age was 74 years. The average length

of dementia was 24 months, but 13 had had dementia for less than a year. Followup studies were available in 22 of the 24 patients, seven of whom had died. Of the remaining 15 most appeared to be unchanged. Of those patients with little atrophy by computerized tomography, two had potentially treatable illnesses (hypothyroidism and pernicious anemia). The authors felt that these patients could be a unique group with a better prognosis but that they would require particularly careful evaluation for a potentially treatable illness.

Hepatic Echography. G. Hebert and C. Gelinus. *Am J Roentgenol Radium Ther Nucl Med* 125: 51-59, 1975.

The authors describe two echographic signs that may be useful for evaluating hepatic disease: (A) the attenuation sign, indicating a fibrotic process and therefore, most likely, a cirrhotic liver; and (B) the posterior echo accumulation sign, indicating the cystic nature of a localized sonolucent pattern. The normal liver parenchyma is sonolucent at usual sensitivity levels (standard bistable). The marked increase in echogenicity of the cirrhotic liver was seen as characteristic; areas of necrosis and partial regeneration are thought to be causative. A miliary pattern of fine diffusely scattered echoes in cirrhosis was also noted.

The attenuation sign represents the finding of echoes mostly in the superficial parts of the liver, with the deepest portions being more sonolucent. The twofold explanation of this sign involved the heterogeneity of cirrhotic livers, producing several interfaces, and the prevention of good transmission by increased absorption in areas of fibrosis. The characteristics of ascites were noted and two patterns of liver carcinomatosis, miliary and nodular, were described; these admittedly were not specific. Hepatoma produced an echogenic mass with ill-defined contours, and a multicystic liver produced scattered areas of great sonolucency, sharp boundaries, and the well-established accumulation of echoes posteriorly due to very low attenuation of the beam by fluid. At increased gain settings, the sonolucent ring-like areas which did not persist were considered pseudohomogeneous and raised the question of carcinomatosis. If they persist unchanged, true cystic disease is considered more likely. Essentially the same pattern behavior was applied to the single sonolucency in the differentiation of cysts from abscesses or single metastases. The posterior echo accumulation sign was applied here as well. Flow diagrams were presented for the logical progressive evaluation of both diffuse and localized patterns.

Antenatal Detection of Fetal Structural Defects with Ultrasound. L. Morgan, A. Haney, A. Christakos, and J. Phillips. *Clin Ultrasound* 3: 287-290, 1975.

Antenatal ultrasonographic diagnosis of central nervous system defects, such as anencephaly and forms of spina bifida cystica, have been previously described. Branchial cleft cysts and hemangiomas are among those structural defects which may be recognized by ultrasonography. The authors present a case of cystic hygroma diagnosed antenatally by ultrasound and suggest that several other non-neurologic entities are amenable to such in utero diagnosis. This case report describes the identification of a cystic mass in the occipital region thought to represent a neural tube defect. The information obtained led to a confirmatory amniogram and a therapeutic abortion. On gross examination, the fetus appeared to have an encephalocele, but the histologic pattern of the mass was that of a hygroma. Acoustically, cystic hygroma and branchial cleft cysts, like neural tube defects,

are likely to appear as echo-free cysts with or without internal septation. The authors suggest in utero screening for structural defects in high-risk patients (several spontaneous abortions, previous offspring with neural tube defects). Scans should be taken at 1-cm intervals in both longitudinal and transverse planes with identification of all intrauterine contents. Such extensive scanning procedures would be impractical for routine application in uncomplicated pregnancies.

Ultrasound in the Management of Elective Abortion. R. C. Sanders, M. J. Curtin, and A. J. Tapper. *Am J Roentgenol Radium Ther Nucl Med* 125: 469-473, 1975.

In addition to the well-established applications of ultrasonography to the management of normal or complicated pregnancies, its specific uses in elective abortion are discussed. Since curettage abortion is considered unsafe after 12-14 weeks and other methods are illegal after 26 weeks, precise staging of the duration of the pregnancy is of obvious value. Ultrasonography has previously been established as being more accurate than palpation for estimation of gestational age. The discovery of ovarian cysts or dermoids in association with pregnancy is cited as an occasional cause for clinical overestimation of gestational stage. The ultrasonographic discovery of twins could also explain discrepancies in dates and uterine size. In the performance of midtrimester abortions, proper placement of the amniocentesis needle, allowing a clear exchange of fluid and saline, is facilitated by ultrasonography, particularly in obese patients in whom palpation is somewhat difficult to perform.

After most suction and saline abortions some retained products probably remain in the form of blood clots. Ultrasonographic examination, particularly sequential sonograms, may be of considerable value in the several days following the abortion to differentiate between simple blood clots, which regress, and true retained products of conception.

Ultrasound B-Scans for Clinical Evaluation of Neoplastic Neck Nodes. A. L. Wiley, Jr., J. A. Zagzebski, D. D. Tolbert, and R. A. Banjavic. *Arch Otolaryngol* 101: 509-511, 1975.

In an attempt to establish more objective and accurate quantitative and qualitative criteria for staging, the authors describe a method for the evaluation of neoplastic neck nodes in patients with head and neck cancer by means of pre- and post-treatment ultrasonograms. Standard leading-edge and gray-tone sonograms were presented to show regression in the size of a jugular node following radiotherapy. Besides showing other structures in the neck more clearly, the gray-scale technique tends to define the lymph node boundaries more discreetly. Computerized calculations permit estimation of the volume of the neoplastic nodes. A case is presented to show a reduction in node volume following radiotherapy to approximately one-third its original volume. Computer processing of the ultrasound signals is proposed as a useful advance in the near future.

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