The YEAR BOOK of

Diagnostic Radiology

1982

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Publisher's Note

The 1982 edition of the YEAR BOOK OF DIAGNOSTIC RADIOLOGY marks the 50th year of continuous, successful publication of this series, known until 1975 as the YEAR BOOK OF RADIOLOGY (including radiation therapy). In this age of growth and mobility, specialization of medicine, and fast-paced social and technologic change, we believe that a Golden Anniversary of any sort is a noteworthy achievement. And we take this opportunity to congratulate and thank every YEAR BOOK OF RADIOLOGY Editor, past and present, for his hard work, foresight, and wisdom.

The character of the present-day YEAR BOOK OF DIAGNOSTIC RADIOLOGY has evolved during the past 35 years under the able direction of the radiology faculty at the University of Michigan. The Editors of the 1982 edition, all faculty or faculty-alumni of the University of Michigan, collectively have contributed more than 100 work-years to the YEAR BOOK and, regrettably, make this their last edition. We are sincerely grateful for their effort and skill, are proud of their achievement, and are honored to have had the opportunity to publish their fine work for so long.

Year Book Medical Publishers
February, 1982

Introduction

With the preparation of this volume, the current group of editors will step down from their duties and will resume roles of interested readers of the future material to be assembled by our replacements. Dr. John Holt has completed 35 years of association with this review of the literature, with 11 of these years as chief editor before limiting himself to reviewing Pediatric Radiology up to the present. Your chief editor of the past 11 volumes has been associated with the YEAR BOOK for 24 years. Our nucleus of other subspecialty associate editors was set up for the 1972 volume, when Dr. J. J. Bookstein (Angiocardiography), Dr. T. O. Gabrielsen (Neuroradiology), Dr. W. Martel (Skeletal and Gastrointestinal Radiology), and Dr. J. R. Thornbury (Uroradiology) came aboard, joined by Dr. A. H. Wolson (1975) and Dr. T. M. Silver (1978) as Ultrasound needed separate space, and by Dr. D. F. Adams (1981) as Computerized Tomography was accorded a separate section.

From their vantage point of editorial responsibility, this group has been privileged to review and summarize diagnostic radiologic progress in a rapidly changing, accelerating, and very exciting period in radiologic history. Leafing through these volumes, we can identify the highlights of the passing decades. A few to be mentioned are: the forties with early angiography, film changers, and early image intensification; the fifties with rapid progress in cardioangiography, image intensification, xeroradiography, lymphangiography, and newer contrast mediums, with increased concern over radiation hazards; the sixties with further progress in reduction of radiation dosage, refinements in subtraction and cerebral angiography, the burgeoning of ultrasound, the interest in exotic diseases, information theory, and modulation transfer function; the seventies with its increasing interest in efficacy studies, computer applications, and the dawning of the new age of computerized tomography; and the early eighties with nuclear magnetic resonance on the clinical horizon, increasing computer application to digital methods, and widespread interest in comparative studies of cost-effectiveness of various radiologic methods.

This past year has brought interesting developments in refinement of criteria for selecting the most useful type of examinations for different clinical circumstances, with the resultant recognition of the need for cost-benefit education of test-ordering medical personnel. Computerized tomography has continued to expand, with further applications in both neutron and microwave technology; continued experience with positron emission tomography and photon emission imaging; further refinements in control of radiation scatter; and a tantalizing forecasting of future departmental designs and workload as technology changes. Of special interest was the publication of the Nobel Prize address of Mr. Hounsfield as he rightfully received this recognition for the revolutionary changes that computerized tomography have brought to radiology.

Undergirding all of the four decades is the steady progressive accumulation of detailed information on the roentgen characteristics of differential diagnosis of increasing numbers of pathologic entities.

Our entire editorial group is indebted to the YEAR BOOK publishers for making the world's medical literature available to us for our review; the editor has been fortunate in having the capable and interested group of associate editors to handle the complexities of their own fields of interest. We are all indebted to our readers and reviewers, who have been helpful with their criticisms, suggestions, and generous accolades.

With the publication of this volume, it is time to turn these editorial duties and privileges over to a new group headed by Dr. David Bragg. We are confident that they will proceed with vigorous enthusiasm and further innovative ideas that will continue to improve the documentation and summarization of progress in our specialty. They have our best wishes for continued success in effectively covering the rapid expansion of radiologic knowledge in the year ahead.

W.M.W.

1. Computerized Axial Tomography of the Body

1-1 **Computed Medical Imaging** is discussed by Godfrey N. Hounsfield (London). Computed tomography measures the attenuation of x-ray beams passing through body sections from many different angles. A computer reconstructs images of the interior of the body from these measurements. Soft tissues are clearly differentiated, and the values of x-ray absorption of tissues are accurately estimated, permitting studies of the nature of tissues. A clinical prototype brain scanner was first used on a patient in 1972. A larger, faster body scanner subsequently was developed. Present computed tomography methods utilize nearly all of the available photon information that can be extracted from the x-ray beam, indicating that there is little room for further improvement in grain reduction.

The future is expected to bring the development of methods of obtaining useful images of the heart and of visualizing the coronary arteries. Methods of measuring tissue variation that do not require x-ray exposure include the nuclear magnetic resonance (NMR) technique in which nuclei resonate at different frequencies across the body according to the magnitude of the field gradient pressure. Fat, readily discriminated with respect to tissue in CT scans, is poorly discriminated by the NMR method. Image resolution appears to be considerably better with CT, and images can be obtained in a considerably shorter time. Work on NMR imaging remains in its early developmental stages. The techniques of CT and NMR might at present be viewed as complementary methods, the former providing a means of visualizing the position and shape of tissues and latter providing information on their chemical composition.

▶ [Nobel Prizes are rare enough in radiology to warrant the review in this YEAR BOOK of Hounsfield's Nobel lecture. The Nobel lecture by Alan M. Cormack accompanies that by Hounsfield in the same journal (Cormack, A. M.: Early two-dimensional reconstruction (CT scanning) and recent topics stemming from it, *J. Comput. Assist. Tomogr.* 4:658–664, 1980). It is exciting to live in an age when the Nobel lecture by Hounsfield honoring an achievement only 8 years old is dedicated in large measure to the already emerging "new technology," nuclear magnetic resonance. An article by Edelstein et al. (Human whole body NMR tomographic imaging: Normal sections, *Br. J. Radiol.* 54:149–151, 1981) confirms the astounding speed with which nuclear magnetic resonance is developing.] ◀

1-2 **Renal Consequences of Rapid High-Dose Contrast Computed Tomography.** Use of an 80-gm iodine dose of contrast medium appreciably improves the computed tomography (CT) display of clinically useful information. L. Anne Hayman, Robert A. Evans, Linda

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(1–1) J. Radiol. 61:459–468, July 1980.
(1–2) AJR 134:553–555, March 1980.

TABLE 1.—Renal Deterioration in Nondiabetics After Diatrizoate Meglumine Infusions

Patient Group*	No. Patients (Deterioration/Group Total) (%)	
	43 g Iodine [11]	80 g Iodine
I	4/264 (1.5)	2/232 (0.9)
II	2/66 (3.0)	1/39 (2.6)
III	5/16 (31.0)	3/4 (75.0)
Totals	11/346 (3.2)	6/275 (2.2)

*Preinfusion serum creatinine levels for group I = <1.5 mg/dl; group II = 1.5–4.5 mg/dl; group III = >4.5 mg/dl.

M. Fahr, and Vincent C. Hinck (Baylor College of Medicine, Houston) assessed the occurrence of renal dysfunction after rapid intravenous administration of such a dose of contrast material in a prospective study of 35 patients who were closely monitored and in a retrospective series of 286 patients. The prospective series included 35 nondiabetic adults who underwent cranial CT scanning with the rapid infusion of diatrizoate meglumine containing 80 gm of iodine. Seven patients had impaired renal function. Eleven patients in the retrospective series had diabetes. Group I patients had normal renal function, whereas group II patients had a preinfusion serum creatinine level of 1.5–4.5 mg/dl, and group III patients had values exceeding 4.5 mg/dl before contrast infusion.

Renal tubular function was unchanged in all patients but 1 in the prospective series. One patient experienced acute renal deterioration after contrast infusion, but he had been exposed to other nephrotoxic factors including gentamicin. Eight patients in the retrospective series showed renal deterioration after contrast infusion. Six had a return of the serum creatinine level to baseline within 2 weeks. One of the 8 severely dehydrated patients had transient oliguria. Results in nondiabetic and diabetic patients are shown in Tables 1 and 2, respectively.

These findings do not indicate that larger doses of contrast medium increase the risk or severity of permanent renal injury. The clinical

TABLE 2.—Renal Deterioration in Diabetics After Contrast Medium Infusions

Patient Group*	No. Patients (Deterioration/Group Total)				
	43 g Iodine				80 g Iodine (%)
	[11]	[12]	[13]	Total (%)	
I	0/19	0	2/2	2/21 (10)	1/8 (13)
II	5/10	7/11	6/7	18/28 (64)	1/3 (33)
III	2/2	15/18	3/3	20/23 (87)	0

*Preinfusion serum creatinine levels for group I = <1.5 mg/dl; group II = 1.5–4.5 mg/dl; group III = >4.5 mg/dl.

course in patients having renal deterioration after an 80-gm dose of iodine was identical to that reported after infusion of 43 gm of iodine. In nondiabetics having a serum creatinine level less than 4.5 mg/dl, the rate of renal injury was unaffected by the contrast dose in the range of 43–80 gm. Caution is indicated when giving contrast medium in any dose to patients with renal impairment and diabetes.

▶ [This study suggests that the current feeling that contrast agents should not be used in patients with renal failure may not be well founded. Perhaps more careful studies of this question are in order.] ◀

1–3 **Computed Tomographic Detection of Portal Vein Thrombosis.** Prehepatic portal hypertension due to portal vein thrombosis usually is diagnosed only by angiography. Ivan Vujic, Charles I. Rogers, and Harry H. LeVeen (Med. Univ. of South Carolina, Charleston) report findings in a patient with portal vein thrombosis detected by computed tomographic (CT) scanning and confirmed by indirect splenoportography.

Woman, 54, with a long history of alcohol abuse, had hematemesis, increasing ascites, and hepatic encephalopathy. A LeVeen shunt was inserted, resulting in marked improvement, but ascites persisted and liver function was abnormal. Mild thrombocytopenia and abnormal clotting were observed. The patient became increasingly symptomatic from splenomegaly, with a progressive fall in platelet counts. A CT scan of the abdomen showed ascites,

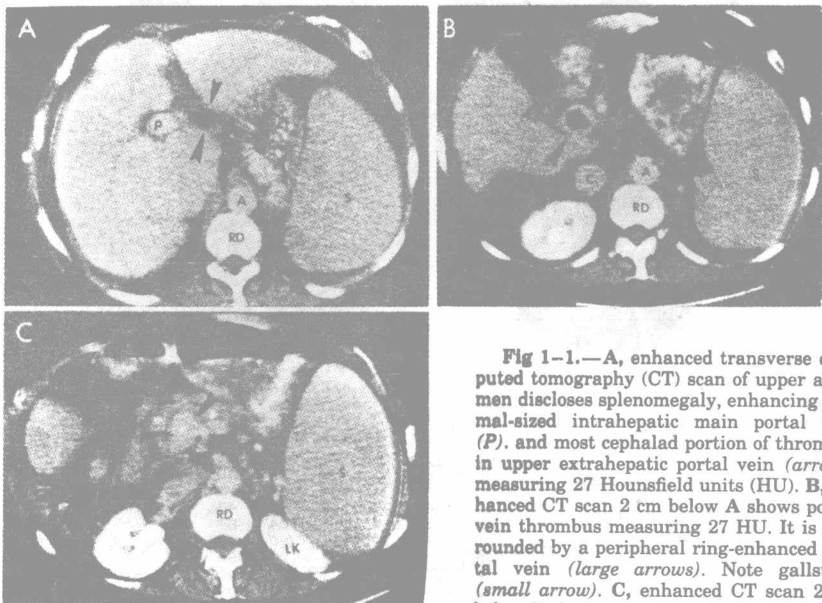

Fig 1–1.—A, enhanced transverse computed tomography (CT) scan of upper abdomen discloses splenomegaly, enhancing normal-sized intrahepatic main portal vein *(P)*. and most cephalad portion of thrombus in upper extrahepatic portal vein *(arrows)* measuring 27 Hounsfield units (HU). **B,** enhanced CT scan 2 cm below **A** shows portal vein thrombus measuring 27 HU. It is surrounded by a peripheral ring-enhanced portal vein *(large arrows)*. Note gallstone *(small arrow)*. **C,** enhanced CT scan 2 cm below **B** shows an enlarged patent superior mesenteric vein below thrombus *(arrows)*. *S*, spleen; *A*, aorta; *LK*, left kidney. (Courtesy of Vujic, I., et al.: Radiology 135:697–698, June 1980.)

(1–3) Radiology 135:697–698, June 1980.