

Radiological Aspects of the Liver and Biliary Tract

X-Ray and Radioisotope Diagnosis

KUNIO OKUDA, M.D., Ph.D.

MASAHIRO IIO, M.D., Ph.D.

66534

Radiological Aspects of the Liver and Biliary Tract

X-Ray and Radioisotope Diagnosis

KUNIO OKUDA, M.D., Ph.D.

*Professor of Medicine, Chiba University School of Medicine:
Chairman and Physician-in-Chief
The First Department of Medicine and Gastrointestinal
Division, Chiba University Hospital, Chiba, Japan*

MASAHIRO IIO, M.D., Ph.D.

*Director, Department of Nuclear Medicine and
Radiological Science, Tokyo Metropolitan Geriatric
Medical Center, Tokyo.*

*Instructor, Department of Internal Medicine
Faculty of Medicine, University of Tokyo
Tokyo, Japan*

2816.5
3

(内部交流)



© First edition, 1976 by IGAKU SHOIN LTD. All rights reserved. No part of this book may be reproduced in any form by print, photograph, microfilm, or any other means without written permission from the publisher.

Printed in Japan. Composed and printed by Shogakukan Printing Co., Ltd., Tokyo. Bound by Kojima Binding Co., Ltd., Tokyo. The names for the publisher were made by Gakushin Photocopying Co., Ltd., Tokyo.



IGAKU SHOIN LTD. TOKYO

Radiological Aspects of the Liver and Biliary Tract

X-Ray and Radioisotope Diagnosis

KUNIO OKUDA, M.D., Ph.D.

Professor of Medicine, Chiba University School of Medicine,
Department of Radiology and Radioisotope
The First Department of Medicine and Gastroenterology,
Chiba University Hospital, Chiba, Japan

MASAHITO ITO, M.D., Ph.D.

Director, Department of Radiology and
Radioisotope, Tokyo Metropolitan Cancer
Hospital, Tokyo

© First edition, 1976 by IGAKU SHOIN LTD., 5-24-3 Hongo Bunkyo-ku, Tokyo.
All rights reserved. No part of this book may be translated or reproduced in any form
by print, photoprint, microfilm, or any other means without written permission from
the publisher.

Printed in Japan. Composed and printed by Sanposha Printing Co., Ltd., Tokyo and
Bound by Kojima Binding Co., Ltd., Tokyo. The blocks for the illustrations were made
by Gakujutsu Photoengraving Co., Ltd., Tokyo.

IGAKU SHOIN LTD. TOKYO

Foreword

Hepatology, the study of liver diseases, is a newly recognized discipline, particularly in the Anglo-American and Germanic countries. This development can be traced to the confluence of three different trends. One is the study of the biology of the liver, in which the organ serves as a model for many functional and structural investigations, an approach mainly pursued in the Anglo-American and central European countries. The second is the emphasis on clinical manifestations of the diseased liver, mainly emphasized in the Latin countries. The third is the concern with liver disorders, especially cirrhosis, carcinoma and parasitic diseases, as great health hazards in the developing countries. The improvement of communications after the Second World War led to the combination of these approaches and resulted in the present upsurge of hepatology and the interest in all aspects of liver disease all over the world. While radiologic and subsequently, radionuclide investigations have been carried out all along, they were only recently adopted as an integral part of the activities of the hepatologist. This book represents a milestone in this development.

When I received the gracious invitation of the authors to write a foreword, I accepted with enthusiasm because the basic philosophy of the book indeed appealed to me. I have claimed for many years that the progress in physical methods, particularly radiologic and radionuclide techniques, will eventually attain superiority in many aspects of the differential diagnosis of liver disease where they will partly replace the presently used biochemical and immunologic methods in liver function tests or the histologic diagnosis by liver biopsy. This superiority does not only hold true for the diagnosis of focal hepatic diseases and especially of tumors, but is now becoming also a fact in the differential diagnosis of jaundice, where the visualization of the biliary tract either by retrograde cholangiography or by transhepatic cholangiography with the "skinny needle" has proven to be far more informative than anything that the laboratory procedures can provide. A second thesis expressed in the book, namely the importance of gross abnormalities, agrees with my old conviction that gross pathological observations correlate better with clinical manifestations than the microscopic and even fine-structural analysis. Of course this does not minimize the astonishing progress made in the pathogenesis of liver disease, resulting from biochemical, immunological, and morphologic studies.

There are several reasons why Japanese contributions are of special importance to Western medicine besides the philosophical appeal of the book. The Japanese investigators have been pioneers in endoscopic studies. They have, moreover, greater experience than Western clinicians can acquire in hepatic cancer as well as in many parasitic diseases. Although I cannot claim any expertise in radiologic and radio-

isotope studies, the presented investigations are based on excellent techniques applied to an unusually large and diversified clinical material. The correlation with manifestations in the different liver diseases offered in the second part of the book will be a useful supplement to observations coming from the Occident. There one finds many clinical pearls not emphasized anywhere else. It is also an asset that in the references much emphasis is given to Japanese investigations.

The field with which the book deals is at present in flux and in the next five years computerized tomography, mentioned only briefly, will probably revolutionize the diagnosis of liver disease even more. I hope that this area, which at present is still in an embryonic stage, will receive the emphasis it deserves in a second edition of this book. The rapidly changing attitude in the diagnosis of liver disease is also reflected in the preference which now many give to hepatic angiography over splenoportography. Nevertheless, it is not only of historic interest to have a detailed account of the splenoportographic experiences.

The authors, well known researchers in the field of liver disease, are to be congratulated for their courage as well as for their efforts to present in English the vast correlated experience which they have accumulated and thus make it available to a wider audience in Anglo-American and other countries where English books are read.

March, 1976

HANS POPPER

Mount Sinai School of Medicine
of the City University of New York

Foreword

A remarkable feature of this excellent monograph is that it integrates the various radiological approaches to the diagnosis of diseases of the liver and gall bladder. Conventional radiography, body section tomography, angiography, cholecystography, and radioactive tracer studies are first considered separately and then together in the light of specific diseases and diagnostic problems.

Until recently the disciplines of diagnostic radiology and nuclear medicine have been disparate. Recent technological advances in both fields have resulted in a philosophical rapprochement from which great benefits in patient care are likely to result.

Throughout history one or the other of two views of disease have been dominant: The first considers disease as an entity that occupies a previously healthy individual; the second views disease as a deviation from normal structure or function in which a large number of factors combine to make a person sick. TEMKIN has called these the "ontological" and the "physiological" views of disease. An extreme example of the ontological view is the old concept of demonic possession: The demon enters the person's body, causes him to perform strange acts and suffer pain. Today's demon is a bacterium or a clone of cells that has become cancerous. Ontologists have a strong inclination toward structurally oriented disciplines, such as pathology and surgery. If the pathologist can identify a disease process at autopsy, perhaps the surgeon might have extirpated it during life, provided the diagnosis were made soon enough by the clinician and his structurally-oriented colleague, the diagnostic radiologist. Until recently conventional radiography was limited to those structures whose absorption of X-rays was sufficiently different that anatomic detail could be ascertained, i.e., bone, air, and fat, augmented by the injection of iodinated media to enhance contrast. Nuclear medicine techniques were rapidly accepted to "visualize" organs and lesions that could not be seen radiographically, as in the case of liver and spleen scanning. Although regional function, such as phagocytosis, was being examined, emphasis was placed on the structural information, such as the size, shape, position, and consistency of organs such as the liver. The most remarkable thing about nuclear imaging techniques is that they permitted study in man himself of the two complementary aspects of biological systems: Differentiation of structure and integration of function. As KOESTLER has pointed out, in complex biological systems such as the human body, progress is achieved by the development of specialized body structures and of elaborate ways of coordinating their function. These are two aspects of a unitary process, not two processes. According to KOESTLER, "structure and function are abstractions derived from imaginary crosssections along the spatial or

temporal axis of indivisible spatio-temporal events". Nuclear medicine brings together these two concepts, as, for example when we inject a radioactive tracer designed to examine a specific body function and measure its spatial distribution within the body by means of serial images over a period of time.

Whereas diagnostic radiology, together with pathology and surgery, is structurally oriented, nuclear medicine is based upon biochemistry, physiology, and pharmacology in its functional approach to disease. Perhaps the term "anatomical physiology" would be appropriate to describe the role of nuclear imaging in modern diagnostic medicine.

Most procedures performed using nuclear medicine techniques today involve measurement of the temporal as well as spatial distributions of radioactive tracers. The nature of disease is viewed as a dynamic process. By measuring a host of body functions that cannot be adequately evaluated by the patient's nervous system or by the natural senses of the physician, the nuclear physician helps solve patients' problems with increasing precision and certainty by measuring body functions that in the past could not even be measured in experimental animals. By making regional measurements, comparing the function of paired organs and the distribution of function within a given organ, he helps solve the problem of biological variation that has plagued diagnostic medicine for so long. For example, a focal lesion of the liver can be detected by mapping the regional phagocytic function of the liver to detect small abnormalities that do not affect the over-all phagocytic function of the liver.

The advent of transaxial tomographic techniques—in the process of revolutionizing diagnostic radiology—is likely to have three major effects: (1) Diagnostic radiology will become more quantitative since the basic data are obtained in digital form with computer techniques, an integral part of the data processing; (2) television display systems of the type used in nuclear medicine will become commonplace in axial tomography as well; and, (3) nuclear medicine will concentrate on regional physiology and biochemistry rather than compete in low resolution structural imaging of the type that can be done better by transmission axial tomography.

I am honored to have been invited by my Japanese colleagues to contribute a foreword to their eclectic approach to the diagnosis of liver and gall bladder disease. This volume should be most helpful to students, practitioners and specialists in gastroenterology, radiology and nuclear medicine.

March, 1976

HENRY N. WAGNER, JR.

The Johns Hopkins Medical Institutions

Preface

The liver, an organ of functional and structural complexity, has long been a baffling subject for the medical profession. With recent remarkable progress in the methodology of biochemistry and physiology the approach to the diagnosis of liver disease has become much more detailed, if not more exact. Consequently in present day practice an irrationally laborious study is often made in what is actually a relatively simple case. All too often, the physician attempts to mobilize every possible source of information even after the diagnosis should already have been obvious. It is probably due to the more attractive features of laboratory studies that less attention has been paid to the study of gross alterations of this enormous mass of cells than to functional and microscopic studies.

Through many years of clinical experience with liver patients the authors have come to realize that gross changes of the liver and its vessel structure as visualized by radioisotope scintigraphy and radiographic procedures provide us more often than not with a direct clue to diagnosis and prognostic assessment. It is our belief that the radiological data are utilized fully only when they are interpreted in direct comparison with the physical signs demonstrated by the patient and other available information, *e.g.* that obtained on rounds when the physician holds a film in his left hand and palpates the liver with his right. Specialization seems to have deprived the physician of his capacity to read films and scans while seeing patients—a deplorable trend in modern medicine.

With the improvement and increasing availability of radioisotope scintigram equipment as represented by the conventional scanner and the faster imaging device of gamma-camera we are approaching an era in which the liver of a patient is almost visible at the examining table. Inaccuracy in imaging may be compensated for by roentgenologic procedures. Although its advances may be less impressive than those of nuclear medicine, radiographic technology has also made steady progress as exemplified by selective angiography, television controlled fluoroscopy, computerized tomography, etc. It seems opportune to reevaluate the old art of roentgenology that has in the past had little role in the diagnosis of liver diseases. It is the authors' contention that radiological information should be interpreted by the physician himself in addition to his referring to the routine report, and that the laboratory data should be considered on the basis of firmly comprehended gross structural changes of the liver. Certain radiographic changes and particular results of radioisotope studies which are of diagnostic significance to the hepatologist may not interest the general radiologist.

The advantage of nuclear technology lies in its simplicity. Imaging is made externally without any traumatic procedure to the patient, yet it provides a broad range of information, *e.g.* liver size, location of space occupying lesions, liver blood flow, portal pressure,

hepatic shunt, liver cell function, reticuloendothelial function, and biliary patency. Complex uses of different labels often make differential diagnosis possible, thus circumventing biopsy, laparoscopy, etc.

In addition to the conventional imaging there are included some traumatizing applications of radioisotopes in cases where the existence of intra- and extrahepatic shunting is to be determined. All analytic procedures of radioisotope imaging, *i.e.* functional, spatial and temporal, are illustrated in several ways. Because of the purpose of this book biochemical and functional studies in spite of their growing importance have not been included.

Finally, this book aims at familiarizing the reader with visible radiological alterations of the liver structure and with essentials for improving diagnostic accuracy in hepatobiliary disease. Since photographic representation most effectively accomplishes this end, the major portion of the book has been given to photographs with a necessary limiting of the discussion of individual diseases and the biliary system itself. For the same reason the technical details of various methods and procedures have also been abbreviated.

Authors

ACKNOWLEDGMENTS

The authors are deeply indebted to their colleagues and staff members of the First Department of Medicine, Chiba University Hospital, the Second Department of Medicine, Kurume University Hospital, the Second Department of Medicine, University of Tokyo Hospital, Department of Nuclear Medicine, Tokyo Metropolitan Geriatric Medical Center and Kofu Municipal Hospital where most of the materials have been secured, and to other collaborators who are listed below. This book would have been impossible without their assistance and contributions.

The authors would like also to express their appreciation to Prof. Telfer B. REYNOLDS, University of Southern California School of Medicine, for permission to print rare radiographs of his own cases, to Toshimichi NAKAYAMA, M.D., Kurume University Hospital for permission to print his rare angiograms, to Dr. W.C. CACCAMISE, Rochester, N.Y. for advice in the preparation of manuscript, to Yasuhito SASAKI, M.D., St. Marianna Medical School for the cases in the chapters of space occupying lesion and cirrhosis, to Tohru MIGITA, M.D., Tokyo Metropolitan Police Hospital for the cases of tuberculoma, to Masahiko IUCHI, M.D., Kofu Municipal Hospital and Makoto IWATARE, Social Insurance Chiba Hospital for the schistosomiasis cases, to Tohru IWASE, M.D. Institute for Adult Disease, Asashi Life Foundation for the cases of cholelithiasis, to Prof. Toshiro NAKASHIMA, Department of Pathology, Kurume University School of Medicine for kind advice and permission to use his material, to the co-authors of Nuclear Hepatology (Igaku Shoin Ltd., 1973) for the fine illustrations that have been transferred to this atlas, to the staff of Igaku Shoin Ltd. for editing, and finally to Mr. Takahiro INAMASU, Photo-center of Kurume University for his devoted reproduction of numerous radiographs from which only a fraction has been selected for this book.

COLLABORATORS

Masao OHTO, M.D., Yoshihiro KANDA, M.D., Yoshio FUKUYAMA, M.D., Hiromitsu SAISHO, M.D., Hirotaka MUSHI, M.D., Hiromichi MORI, M.D., Yukihiro TSUCHIYA, M.D., Masanori MISONO, M.D., Toshio SUMIKOSHI, M.D., Kunio KIMURA, M.D., Koji SUZUKI, M.D.: First Department of Medicine, Chiba University Hospital.

Kyuichi TANIKAWA, M.D., Takeshi EMURA, M.D., Yutaka SHIMOKAWA, M.D., Yasuhiko KUBO, M.D., Naiki SOMEYA, M.D., Masatake YASUMOTO, M.D., Fusakuni YAKUSHIJI, M.D., Tadahiko KUNISAKI, M.D., Atsuro GOTO, M.D., Mikio MORIYAMA, M.D., Tetsuro KITASAKI, M.D., Kazuki URABE, M.D., Shigenobu JINNOUCHI, M.D.: Second Department of Medicine, Kurume University Hospital.

Kasuyoshi SAKAMOTO, M.D., Masamichi KOJIRO, M.D.: Department of Pathology, Kurume University School of Medicine.

Toshimichi NAKAYAMA, M.D., Yoshinori FUJISE, M.D.: Second Department of Surgery, Kurume University Hospital.

Yasuhiko MATSUURA, M.D., Yoshio KUNIYASU, M.D.: Department of Radiology, Chiba University Hospital.

Takeshi YAMASAKI, M.D., Sadao UYEMATSU, M.D.: Departments of Surgery, Chiba University Hospital.

Mitsuo TAKAHARA, M.D.: Ikebukuro Roentgen Clinic.

Hideo YAMADA, M.D., Kazuo CHIBA, M.D., Kengo MATSUI, M.D.: Department of Nuclear Medicine and Radiological Sciences, Tokyo Metropolitan Geriatric Medical Center.

Yasuhito SASAKI, M.D.: Third Department of Medicine, St. Marianna Medical School.
 Masahiko IUCHI, M.D.: Department of Medicine, Kofu Municipal Hospital.
 Makoto IWATARE, M.D.: Social Insurance Chiba Hospital.
 Tohru IWASE, M.D.: Institute for Adult Diseases, Asahi Life Foundation.
 Tohru MIGITA, M.D.: Tokyo Metropolitan Police Hospital.
 Hideo UEDA, M.D.: Director, Central Hospital of Japanese National Railways, Tokyo.
 Satoru MURAO, M.D., Tadao TAKEA, M.D.: Second Department of Medicine, University of Tokyo School of Medicine.
 Haruo KAMEDA, M.D.: First Department of Medicine, Tokyo Jikeikai Medical School.
 Ken-ichi KITANI, M.D.: Tokyo Metropolitan Institute of Gerontology.
 Masakazu UENO, M.D.: Chiba Rosai Hospital.

The authors would like also to express their appreciation to Prof. Teller H. Reynolds, University of Southern California School of Medicine, for permission to print the radiographs of his own cases, to Toshinichi NAKAYAMA, M.D., Kurume University Hospital for permission to print his rare angiograms, to Dr. W.C. GAGGAMISE, Rochester, N.Y. for advice in the preparation of manuscript, to Yasuhito SASAKI, M.D., St. Marianna Medical School for the cases in the chapter of space occupying lesion and cirrhosis, to Tohru MIGITA, M.D., Tokyo Metropolitan Police Hospital for the cases of tuberculosis, to Masahiko IUCHI, M.D., Kofu Municipal Hospital and Makoto IWATARE, Social Insurance Chiba Hospital for the schistosomiasis cases, to John IWASE, M.D., Institute for Adult Diseases, Asahi Life Foundation for the cases of cholelithiasis, to Prof. Toshio NAKASHIMA, Department of Pathology, Kurume University School of Medicine for kind advice and permission to use his material, to the co-authors of Nuclear Hepatology (Igakai Shinoin Ltd., 1973) for the fine illustrations that have been transferred to this atlas, to the staff of Igaku Shinoin Ltd. for editing, and finally to Mr. Takahito IMAHARA, Photo-center of Kurume University for his devoted reproduction of numerous radiographs from which only a fraction has been selected for this book.

COLLABORATORS

Masao OHTO, M.D., Yoshitaka KANDA, M.D., Yoshio KOBAYASHI, M.D., Hiromasa SANO, M.D., Hirotaka MURA, M.D., Hiromichi MORI, M.D., Yoshitaka ICHIMURA, M.D., Masanori MAENO, M.D., Toshiro SUMIYOSHI, M.D., Kenji KIMURA, M.D., Koji SUZUKI, M.D.: First Department of Medicine, Chiba University Hospital.
 Kyushu TAKAWA, M.D., Tetsuo KURA, M.D., Yusaku SUMIYOSHI, M.D., Yasuhiko KURO, M.D., Naoki SUMIYAMA, M.D., Masahiko YAMAMOTO, M.D., Fumihiko YAMAGUCHI, M.D., Tadashi KUNIKIDA, M.D., Akio GOTO, M.D., Shiro MORIMOTO, M.D., Tetsuo KIMURA, M.D., Kazuo OKADA, M.D., Shigenobu HANNOUCHI, M.D.: Second Department of Medicine, Kurume University Hospital.
 Kazuo SAKAMOTO, M.D., Masamichi KOBAYASHI, M.D.: Department of Pathology, Kurume University School of Medicine.
 Toshinichi NAKAYAMA, M.D., Yoshinori FURUKAWA, M.D.: Second Department of Surgery, Kurume University Hospital.
 Yasuhiko MATSUDA, M.D., Yoshio KUNIKIDA, M.D.: Department of Radiology, Chiba University Hospital.
 Tetsuo YAMASAKI, M.D., Sadao UYAMATSU, M.D.: Department of Surgery, Chiba University Hospital.
 Mitsuo TAKAHARA, M.D.: Ichikawa Reptogen Clinic.
 Hideo YAMADA, M.D., Kazuo CHUGA, M.D., Kazuo MATSU, M.D.: Department of Nuclear Medicine and Radiological Sciences, Tokyo Metropolitan Geriatric Medical Center.

Contents

Section I. Principles and Methods	1
Chapter 1. Conventional Radiography	3
Survey Radiography.....	3
Contrast Hepatography.....	4
Pneumoperitoneum and Retroperitoneum.....	6
Peritoneography.....	9
Body Section Radiography.....	11
Barium Examination of the Proximal Digestive Tract.....	12
Esophageal varices.....	12
Gastric varices.....	16
Hypotonic Duodenography.....	21
References.....	22
Chapter 2. Angiography	25
Celiac Angiography.....	25
Principle and technique.....	25
Interpretation of angiograms.....	28
Portography (Portal venography).....	50
Splenoportography (Transsplenic portal venography).....	50
Umbilico-portography (Transumbilical portography).....	56
Operative portography and percutaneous transhepatic portography.....	61
Other techniques in antegrade portography.....	66
Hepatic Venography and Retrograde Portal Venography.....	67
Intrahepatic Phlebography by Parenchymal Deposition and Functional Hepatography.....	72
Hepatic Lymphography.....	73
References.....	80
Chapter 3. Cholecysto-Cholangiography (Cholegraphy)	85
Indirect Methods.....	85
Direct Methods.....	89
Percutaneous transhepatic cholangiography.....	89
Our technique—the so-called “Chiba method”.....	91
Endoscopic retrograde cholangiography (cholangio-pancreatography) (ERCP).....	100
Peritoneoscopic and other direct cholangiographic procedures.....	105
References.....	106
Chapter 4. Radioisotope Studies	110
Instrumentation.....	110
Radiopharmaceuticals.....	113
Scintigraphic Diagnosis.....	123
References.....	126

Chapter 5. Interpretation of Gross Changes	128
Shape, Size and Position of the Liver	128
Normal anatomy	128
Determination of the liver size	134
Liver size and age	136
Roentgenologic diagnosis	137
Right diaphragm as reflection of liver surface	140
Abnormalities in liver size, shape and position	148
Changes of the diaphragm	156
Eventration	156
Hernia	168
Calcification and Air in the Liver	173
Calcification of the liver	173
Air	181
References	185
 Section II. Diseases of the Liver and Biliary System	189
 Chapter 6. Portal Hypertension and Hepatic Cirrhosis	191
Portal Hypertension	191
Anatomy of the portal venous system	191
Diagnosis of portal hypertension	191
Collateral routes of circulation	192
Clinical features of portal hypertension	199
Diseases associated with portal hypertension	199
Cirrhosis of the Liver	204
Idiopathic Portal Hypertension (Hepatoportal Sclerosis)	210
Roentgenologic Features and Diagnosis	214
Size and shape of the liver and spleen	214
Roentgenologic findings related to ascites	218
Hydrothorax in liver cirrhosis	218
Varices	222
Collateral venous channels	230
Arteriographic and portographic changes in cirrhosis and idiopathic portal hypertension	231
Reversal of portal blood flow	238
Hepatic lymph	238
Radioisotope Diagnosis	239
Hepatic cirrhosis	239
Idiopathic portal hypertension (Hepatoportal sclerosis)	250
Diagnosis of splenomegaly	251
Spleen score as an index of portal hypertension	254
Partition of celiac arterial blood flow between the liver and spleen	256
Evaluation of portal systemic shunts by shunt-scintigram	258
References	263
 Chapter 7. Space Occupying Lesions of the Liver	267
Tumors	267
Primary epithelial carcinomas	267
Metastatic carcinomas	269
Other tumors	271
Radiographic Aspects of Liver Neoplasms	272
Angiographic characteristics of liver neoplasms	277
Hepatocellular carcinoma	279
Cholangiocarcinoma	307
Metastatic carcinomas	307

Other neoplasms	318
Radioisotope Diagnosis	318
Tumor scanning radiopharmaceuticals	319
Hepatocellular carcinoma	322
Perfusion scan	327
Alpha-fetoprotein	332
Metastatic liver carcinomas	336
Other space occupying lesions	337
False-positive scans mimicking space occupying lesions	338
The so-called "hot spot" in the liver	344
Cysts of the Liver	344
Sequential liver imagings in the diagnosis of the nature of focal lesions	360
References	361
Chapter 8. Infections and Parasitic Diseases	366
Hepatitis	366
Specific Infections of the Liver	378
Pyogenic Abscess of the Liver	380
Pylephlebitis	395
Perihepatitis	395
Parasitic Liver Diseases	395
Amebiasis	395
Echinococcosis	395
Clonorchiasis	397
Hepatic ascariasis	397
Schistosomiasis (Bilharziasis)	402
Schistosomiasis in Japan and our studies	412
References	417
Chapter 9. Constitutional Jaundice and of Cholestasis	421
Constitutional Hyperbilirubinemias	421
Sequential scanning in differential diagnosis	421
Study of a Dubin-Johnson family	427
Metabolic considerations	430
Differential Diagnosis of Cholestasis	434
References	446
Chapter 10. Miscellaneous Liver Diseases	447
Wilson's Disease (Hepatolenticular Degeneration)	447
Vascular Diseases	449
Arteriosclerosis and aneurysms	449
Arteriovenous fistulas	455
Hepatic rupture	457
Circulatory Disturbances of the Liver	460
Liver in congestive heart failure	460
Budd-Chiari syndrome (Hepatic veno-occlusive disease)	460
Liver in constrictive pericarditis	461
Infarction of the liver	461
Thorotrast Liver Disease	461
References	468
Chapter 11. Gallbladder and Biliary Tract Diseases	471
Gross Anatomy and Anomalies	471
Cholelithiasis	479
Milk of calcium bile (Lime-water bile)	485
Choledocholithiasis	490
Disappearance and dissolution of stones	495

317	Intrahepatic gallstones	498
318	Cholecystitis and Complications of Gallstones	505
319	Chronic cholecystitis	514
320	Calcified gallbladder or "Porcelain gallbladder"	515
321	Tumors of the gallbladder	516
322	Bile Duct Diseases	527
323	Cholangitis	527
324	Organic acquired stricture of the bile duct and remnant cystic duct	532
325	Tumors of the bile ducts	337
326	Carcinoma of the ampulla of Vater	543
327	References	548
328	Index of Authors	553
329	Index of Subjects	558
330	Chapter 9. Constitutional Jaundice and of Cholestasis	421
331	Constitutional hyperbilirubinemia	421
332	Segmental scanning in differential diagnosis	421
333	Study of a Dubin-Johnson family	427
334	Atrophic cholangitis	430
335	Differential Diagnosis of Cholestasis	434
336	References	440
337	Chapter 10. Miscellaneous Liver Diseases	447
338	Wilson's Disease (Hepatolenticular Degeneration)	447
339	Vascular Diseases	449
340	Arteriosclerosis and aneurysms	449
341	Arteriovenous fistulas	450
342	Hepatic tumors	457
343	Circulatory Disturbances of the Liver	460
344	Liver in congestive heart failure	460
345	Budd-Chiari syndrome (hepatic veno-occlusive disease)	460
346	Liver in congestive portal cirrhosis	461
347	Ischemia of the liver	464
348	Phagocytic liver disease	467
349	References	469
350	Chapter 11. Gallbladder and Biliary Tract Diseases	471
351	Gross Anatomy and Anomalies	471
352	Cholelithiasis	479
353	Milk of calcium bile (lime-water bile)	483
354	Cholelithiasis	490
355	Disappearance and dissolution of stones	495

Section I

Principles and Methods

