

BOYD'S TEXTBOOK OF PATHOLOGY



ninth edition

VOLUME II

A.C. Ritchie



Boyd's Textbook of Pathology

A.C. RITCHIE

M.B., Ch.B., D.Phil., F.R.C.P.C., F.R.C.Path., F.R.C.P.A., F.A.C.P.

Professor Emeritus of Pathology, University of Toronto

*Consulting Pathologist: Mt. Sinai Hospital; The Hospital for Sick Children;
The Toronto Hospital
Toronto, Canada*

Volume II

Ninth Edition



Lea & Febiger
Philadelphia / London
1990

Lea & Febiger
200 Chester Field Parkway
Malvern, Pennsylvania 19355
U.S.A.
1-800-444-1785

Lea & Febiger (UK) Ltd.
145a Croydon Road
Beckenham, Kent BR3 3RB
U.K.

Library of Congress Cataloging-in-Publication Data

Ritchie, A.C.

Boyd's textbook of pathology.—9th ed. / A.C. Ritchie.

p. cm.

Rev. ed. of: A textbook of pathology / William Boyd. 8th ed. 1970.

Includes bibliographical references.

ISBN 0-8121-0726-8

I. Pathology. I. Boyd, William, 1885–

Textbook of pathology.

II. Title. III. Title: Textbook of pathology.

[DNLM: 1. Pathology. QZ 4 R599]

RB111.R57 1990

616.07—dc20

for Library of Congress

89-13747

CIP

First Edition, 1932

Reprinted 1933

Second Edition, 1934

Reprinted 1934, 1935, 1936

Third Edition, 1938

Reprinted 1938, 1939, 1940, 1941

Fourth Edition, 1943

Reprinted 1943, 1944, 1945, 1946

Fifth Edition, 1947

Reprinted 1947, 1948, 1949, 1950, 1951, 1952

Translated into Portuguese

Sixth Edition, 1953

Reprinted 1954, 1955, 1956, 1957, 1958

Seventh Edition, 1961

Reprinted 1961, 1962, 1963, 1964, 1965, 1967

Translated into Spanish

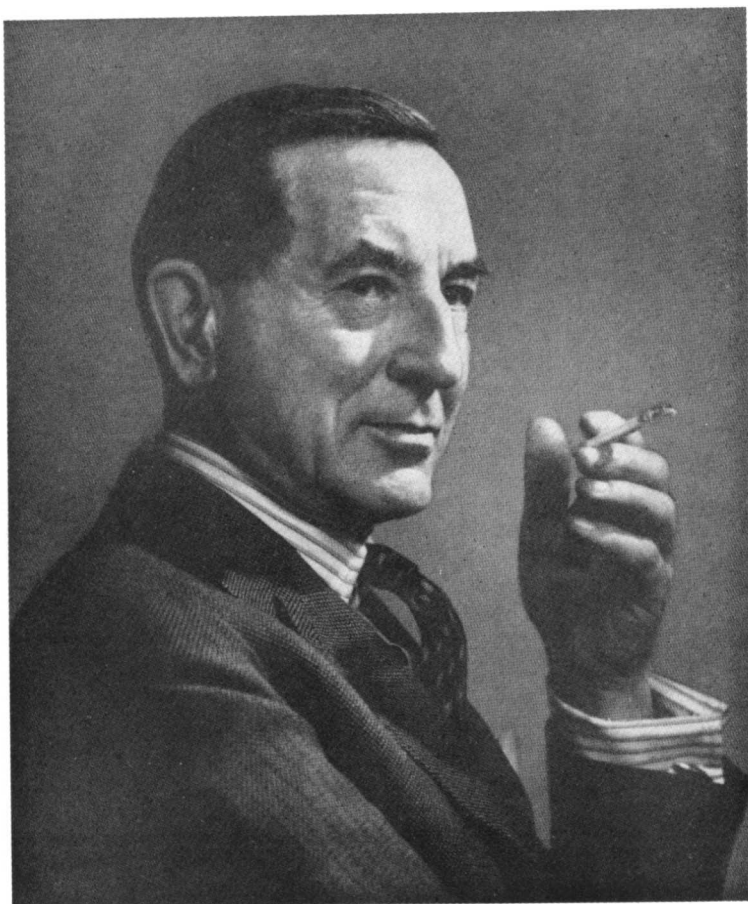
Eighth Edition, 1970

Reprinted 1970, 1973, 1975, 1976, 1979, 1980

Ninth Edition, 1990

Copyright © 1990 by Lea & Febiger. Copyright under the International Copyright Union. All Rights Reserved. This book is protected by copyright. *No part of it may be reproduced in any manner or by any means without written permission from the publisher.*

Print number: 5 4 3 2 1



WILLIAM BOYD
M.D., M.R.C.P., F.R.C.P., F.R.C.S.
(1885-1979)

Publisher's Foreword

Dr. William Boyd, whose textbooks enlivened the study of pathology for many a student, was born in Portsoy, Scotland in 1885. He received his M.D. from Edinburgh in 1908. He displayed an early interest in psychiatry, but found his true métier in pathology. Recruited for the University of Manitoba medical faculty, Boyd, after a year of service with a field ambulance in France, took up his chairmanship in pathology in 1915.

Turning away many attractive offers, Boyd stayed in Manitoba until 1937, when he followed his good friend, the anatomist John Grant, to the University of Toronto.

Boyd's greatest achievements as a pathologist were his lucid, highly readable publications. *Surgical Pathology*, later retitled *Pathology for the Surgeon*, was published by W.B. Saunders Co. in 1925. His later books, *Pathology of Internal Diseases*, renamed *Pathology for the Physician* (1st edition, 1931 and 7th edition, 1965), *Textbook of Pathology* (1st edition, 1932 and 8th edition, 1970), and *Introduction to Medical Science*, renamed *Introduction to the Study of Disease* (1st edition, 1937 and 9th edition, 1980) were published by Lea & Febiger.

Boyd was a formidable lecturer, possessing both lucidity and a keen wit. The hematologist, Maxwell Wintrobe, one of Boyd's pupils, wrote that Boyd "... was our most stimulating teacher. He was devoted to the development of a museum of pathology and could take a jar containing a preserved specimen and bring the clinical problem to life. For him pathology was fascinating and in his Scottish brogue and, often in flowery language, his

lectures always were exciting and memorable."

As a person he was devoid of affectation and ill humor. He was quick to praise those who deserved praise and had a rare ability to rebuke without giving offense. Though relaxed and easily approachable, he liked to maintain a degree of formality in his department.

After retiring from the University of Toronto, he was appointed Professor of Pathology at the University of British Columbia and, thereafter, spent many winters as a visiting professor at the University of Alabama. During the Prohibition days in the United States he often traveled from Canada to lecture; the popularity of his lectures was enhanced by the fact that he always brought Scotch whisky with him carefully hidden under layers of pathologic specimens. That which he did not dispatch was shared with his hosts.

Boyd received many honors in his long life, including honorary degrees from Edinburgh, Saskatchewan, Oslo, Manitoba, Queen's University, and the College of Surgeons of Canada. Especially notable was his award of the gold-headed cane of the American Association of Pathologists and Bacteriologists—he was the only Canadian to be so honored.

Those of us who had the pleasure of working with him shall not forget his unfailing good humor and his courtesy. Nor shall we forget his lovely wife, Enid, whose warm and cheerful nature made her the perfect companion for William Boyd.

R. KENNETH BUSSY
for
Lea & Febiger

Preface

Boyd's Textbook of Pathology is concerned with the science of pathology. It describes the cause, development, and lesions of the diseases that afflict us, their effect on the patient, the functional and secondary changes they cause, their course and complications, and the kind of treatment appropriate to overcome them. The practice of pathology, the techniques used, the problems that arise, will not be discussed except insofar as is relevant to our understanding of the disease processes.

The book falls into three parts. First is discussed what is often called general pathology, the processes like inflammation or neoplasia underlying many kinds of disease. Then the infectious diseases are considered, and the diseases caused by other factors that can affect many organs. In the third section of the book are described the diseases of the various organs.

To each chapter is appended a list of ref-

erences. First comes a list of specialized textbooks that discuss in detail the topics considered in that chapter. If further information is sought, it is usually best to consult first these specialized texts. They review the topics discussed and have long lists of references. Also cited are recent reviews relevant to the matters discussed in each chapter. In general, the most recent review is listed. It is not necessarily the best, but does give entry to the current literature. At the end of Chapter 1 is a list of standard textbooks that discuss matters relevant to many of the chapters.

I would like to thank Sonia Duda, Librarian of the Banting Library, for help with the references. I would also like to thank Richard Leung of the Department of Pathology and Mark Sawyer of the Instructional Media Services of the University of Toronto for help with the illustrations.

Toronto, Ontario

A.C. RITCHIE

Contents

VOLUME I

Chapter 1.	Pathology	3
	The Science of Pathology.....	3
	Clinical Pathology.....	7
Chapter 2.	The Cell	10
	The Sick Cell	10
	The Dead Cell	22
	Degenerations	22
Chapter 3.	The Internal Environment.....	24
	Electrolytes	24
	Water.....	37
Chapter 4.	Necrosis.....	46
	Causes.....	46
	Types.....	47
	Reaction to Necrosis	50
	Death.....	56
Chapter 5.	Inflammation	60
	Definition	60
	Causes.....	60
	Types.....	60
	Terminology.....	66
	The Inflammatory Process.....	66
	Mediators of Inflammation	73
	Varieties of Inflammation	81
Chapter 6.	Repair.....	83
	Regeneration	83
	Wound Healing	84
	Healing of Epithelium	89
	Healing of Specialized Tissues	90
	Abnormal Repair.....	95
Chapter 7.	General Responses to Injury.....	98
	Fever.....	98
	Leukocytosis	100

	Leukopenia.....	102
	Pain	104
	Malaise and Toxemia	104
	Shock.....	104
Chapter 8.	Vascular Disorders	109
	Congestion	109
	Ischemia.....	111
	Hemorrhage.....	112
	Hemostasis	112
	Coagulation	114
	Fibrinolysis.....	117
	Thrombosis.....	117
	Embolism	121
	Infarction.....	127
Chapter 9.	Metabolic Disorders.....	133
	Hemosiderosis	133
	Porphyria.....	138
	Jaundice.....	143
	Hepatolenticular Degeneration.....	146
	Ochronosis	148
	Amyloidosis	148
	Heterotopic Calcification	156
Chapter 10.	Immunologic Disorders	161
	Immunologically Mediated Injury.....	161
	Transplantation Reactions	172
	Immunodeficiency Diseases	181
	Deficiency of Complement	189
	Hypergammaglobulinemia.....	191
	Shwartzman-Sanarelli Reaction.....	192
	Autoimmune Disorders.....	193
Chapter 11.	Genetics and Disease	206
	Chromosomal Abnormalities	206
	Abnormal Genes	216
	HLA Antigens and Disease.....	219
Chapter 12.	Disorders of Growth	222
	Size and Growth	222
	Too Little Growth	222
	Too Much Growth	224
	Wrong Kind of Growth.....	227
	Malformations.....	231
Chapter 13.	Neoplasia	234
	Terminology.....	234
	Classification	235

Properties of Tumors	243
Properties of Tumor Cells	259
Structure of Tumors	265
Staging and Grading	274
Multiple Tumors	275
Diagnosis of Tumors	276
Cachexia	278
 Chapter 14. Etiology of Tumors	 281
Chemical Carcinogenesis	281
Hormonal Carcinogenesis	285
Physical Carcinogenesis	285
Viral Carcinogenesis	286
Deoxyribonucleic Acid Viruses	287
Ribonucleic Acid Viruses	288
Other Carcinogenic Infections	292
Genetics and Carcinogenesis	292
Theories of Carcinogenesis	296
 Chapter 15. Infection	 300
Sources of Infection	300
Transmission of Infection	300
Defenses of the Body	302
Failure of the Defenses	303
Spread of Infection within the Body	304
 Chapter 16. Bacterial Infections	 306
Staphylococcal Infections	306
Streptococcal Infections	308
Pneumococcal Infections	312
Neisserian Infections	314
Enterobacteriaceal Infections	319
Pseudomonal Infections	330
Bacteroidaceal Infections	333
Vibrial Infections	334
Acinetobacterial Infections	336
Moraxellar Infections	336
Corynebacterial Infections	336
Hemophilial Infections	339
Gardnerellar Infections	341
Bordetellar Infection	341
Brucellar Infections	342
Francisellar Infections	343
Calymmatobacterial Infections	345
Listerial Infections	346
Clostridial Infections	347
Anthrax	353
Mycobacterial Infections	354
Spirochetal Infections	372

Spirillaceal Infections	388
Streptobacillary Infections	388
Legionellosis	389
Pasteurella	390
Erysipelothrix Rhusiopathiae	390
Lactobacilli	391
Whipple's Disease	391
Cat Scratch Fever	391
Sago Palm Disease	392
 Chapter 17. Mycoplasmal, Rickettsial, Chlamydial, and Related Infections	396
Mycoplasmal Infections	396
Rickettsial Infections	398
Coxiellar Infections	401
Rochalimaeae Infection	402
Bartonellar Infection	402
Chlamydial Infections	404
 Chapter 18. Viral Infections	410
Poxviridial Infections	410
Herpetoviridial Infections	413
Adenoviridial Infections	425
Papovaviridial Infections	426
Orthomyxoviridial Infections	427
Paramyxoviridial Infections	429
Picornaviridial Infections	434
Norwalk Viral Infections	439
Coronaviridial Infections	440
Parvoviridial Infections	440
Arboviral and Related Infections	440
Hepatitis Viruses	456
Retroviridial Infections	456
Diseases Probably Caused by Viruses	456
Diseases Caused by Prions	457
 Chapter 19. Fungal Infections	461
Actinomycosis	461
Nocardiosis	462
Mycetoma	463
Blastomycosis	465
Paracoccidioidomycosis	467
Coccidioidomycosis	468
Cryptococcosis	471
Histoplasmosis	472
African Histoplasmosis	475
Candidiasis	476
Torulopsosis	478
Aspergillosis	478
Mucormycosis	480

Chromomycosis	481
Sporotrichosis	482
Subcutaneous Phycomycosis	484
Rhinophycomycosis	484
Lobomycosis	484
Rhinosporidiosis	485
Dermatophytosis	485
Rare Mycotic Infections	489
Protothecosis	490
 Chapter 20. Protozoal Diseases	 492
Amebiasis	492
Malaria	496
Toxoplasmosis	502
Trypanosomiasis	503
Leishmaniasis	508
Giardiasis	513
Trichomoniasis	514
Pneumocystis Carinii	515
Cryptosporidiosis	516
Isosporiasis	517
Sarcocystosis	518
Balantidiasis	518
Babesiosis	518
 Chapter 21. Metazoal Diseases	 520
Nematodes	520
Cestodes	536
Trematodes	542
Arthropods	550
 Chapter 22. Nutritional Diseases	 554
Protein-Calorie Deficiency	554
Vitamin Deficiency and Excess	556
Essential Elements	562
 Chapter 23. Physical Injury	 564
Mechanical Injury	564
Heat	567
Cold	570
Light	572
Ionizing Radiation	576
Electricity	581
Sound	583
Asphyxia	583
Drowning	584

Chapter 24. Poisoning	587
Corrosives	587
Metals	588
Inhalants	594
Drug Abuse	597
Alcohols	599
Halogenated Hydrocarbons	601
Pesticides	603
Other Poisons	604
Poisonous Plants	606
Venomous Animals	607
Chapter 25. Vessels	612
Arteriosclerosis	612
Vasculitis	624
Angiopathy	634
Angiospastic Disorders	642
Vascular Purpura	643
Aneurysm	645
Congenital Malformations	652
Hypertension	653
Diseases of Veins	661
Tumors	664
Chapter 26. Heart	674
Ischemic Heart Disease	674
Hypertensive Heart Disease	689
Rheumatic Disease	690
Valvular Disease	697
Endocardial Disease	706
Myocardial Disease	713
Pericardial Disease	723
Congenital Heart Disease	726
Tumors	735
Heart Failure	737
Chapter 27. Kidneys	743
Glomerulonephritis	743
Tubular Disease	776
Interstitial Disease	792
Vascular Disease	801
Renal Injury Secondary to Other Disease	805
Congenital Anomalies	820
Tumors	825
Renal Failure	830
Chapter 28. Lungs	840
Pneumonia	840
Mycobacterial Infections	853

	Mycotic Infections	857
	Other Infections	858
	Pneumoconiosis	861
	Inhalation of Toxic Fumes and Liquids	870
	Immunologically Mediated Disease	871
	Other Forms of Pneumonitis	881
	Circulatory Disturbances	897
	Chronic Obstructive Lung Disease	901
	Overinflation	907
	Atelectasis	909
	Bronchial and Bronchiolar Disease	910
	Pleural Disease	913
	Congenital Anomalies	915
	Tumors	918
Chapter 29.	Upper Respiratory Tract	944
	Infections	944
	Hypersensitivity	945
	Other Inflammatory Disorders	946
	Tumors	947
Chapter 30.	Ears	959
	Inflammation	959
	Other Non-Neoplastic Disorders	961
	Tumors	962
Chapter 31.	Mouth and Pharynx	964
	Infections	964
	Other Inflammatory Diseases	967
	Systemic Disease	968
	Developmental Anomalies	970
	Tumors	974
Chapter 32.	Salivary Glands	986
	Functional Disorders	986
	Inflammation	986
	Tumors	991
Chapter 33.	Esophagus	1000
	Infection	1000
	Disorders of Motility	1000
	Chemical Injury	1004
	Rupture of the Esophagus	1005
	Esophageal Varices	1006
	Hiatus Hernia	1007
	Diverticula	1008
	Congenital Anomalies	1009
	Cysts	1010
	Tumors	1011

Chapter 34. Stomach.....	1016
Gastritis	1016
Peptic Ulcer.....	1020
Other Non-Neoplastic Disorders	1029
Tumors	1032

VOLUME II

Chapter 35. Intestine	1045
Inflammatory Disease.....	1045
Diverticula	1061
Vascular Disorders	1064
Mechanical Disorders.....	1067
Malabsorption.....	1070
Congenital Anomalies.....	1078
Other Non-Neoplastic Conditions.....	1080
Tumors	1082
Obstruction	1101
Chapter 36. Liver.....	1106
Viral Hepatitis	1106
Alcoholic Liver Disease	1122
Toxic and Drug-Induced Liver Disease.....	1127
Other Forms of Chronic Hepatitis	1135
Cirrhosis of the Liver.....	1139
Portal Hypertension	1147
Metabolic Disorders	1149
Vascular Disorders.....	1156
Disorders of the Intrahepatic Biliary System	1158
Other Non-Neoplastic Hepatic Diseases.....	1163
Structural Anomalies.....	1167
Tumors	1168
Hepatic Failure	1181
Chapter 37. Extrahepatic Biliary System.....	1190
Cholelithiasis.....	1190
Cholecystitis	1193
Diseases of the Extrahepatic Bile Ducts.....	1196
Congenital Anomalies.....	1197
Tumors	1198
Chapter 38. Pancreas	1202
Pancreatitis.....	1202
Cystic Fibrosis	1209
Diabetes Mellitus.....	1211
Other Non-Neoplastic Diseases	1220
Congenital Anomalies.....	1220
Tumors	1221

Chapter 39. Urinary Tract	1235
Infection	1235
Obstruction	1238
Neuromuscular Dysfunction	1241
Stone	1242
Other Non-Neoplastic Lesions	1245
Congenital Anomalies	1248
Tumors	1250
Chapter 40. Male Reproductive Tract	1261
Inflammation	1261
Prostatic Hyperplasia	1266
Other Non-Neoplastic Diseases	1268
Congenital Anomalies	1271
Tumors	1274
Chapter 41. Female Reproductive System	1294
Inflammation	1294
Endometriosis, Adenomyosis and Endosalpingosis	1298
Other Nonneoplastic Diseases	1301
Congenital Anomalies	1315
Tumors	1317
Chapter 42. Pregnancy	1385
Abortion	1385
Ectopic Pregnancy	1386
Disorders of the Placenta, Amnion and Umbilical Cord	1388
Preeclampsia and Eclampsia	1395
Other Non-Neoplastic Diseases	1396
Tumors	1397
Chapter 43. Breasts	1404
Inflammation	1404
Hyperplasia	1406
Congenital Anomalies	1412
Tumors	1413
Chapter 44. Pituitary Gland	1434
Non-Neoplastic Disorders	1434
Congenital Anomalies	1437
Tumors	1439
Hyperpituitarism	1446
Hypopituitarism	1449
Chapter 45. Pineal Gland	1456
Calcification	1456
Tumors	1456

Chapter 46.	Adrenal Glands	1458
	Infection	1458
	Enzyme Deficiency	1458
	Hyperplasia and Atrophy	1461
	Other Non-Neoplastic Disorders	1463
	Congenital Anomalies	1466
	Tumors	1466
	Adrenocortical Hyperfunction	1474
	Adrenocortical Hypofunction	1475
Chapter 47.	Thyroid Gland	1482
	Thyroiditis	1482
	Hyperplasia	1488
	Other Non-Neoplastic Diseases	1496
	Congenital Anomalies	1496
	Tumors	1498
	Hyperthyroidism	1511
	Hypothyroidism	1513
Chapter 48.	Parathyroid Glands	1519
	Hyperplasia	1519
	Other Non-Neoplastic Disorders	1522
	Tumors	1522
	Hyperparathyroidism	1524
	Hypoparathyroidism	1528
Chapter 49.	Erythrocytes	1532
	Anemia	1532
	Polycythemia	1606
	Methemoglobinemia	1611
Chapter 50.	Granulocytes	1614
	Granulocytopenia	1614
	Granulocytosis	1618
	Abnormal Granulocytes	1619
	Myelofibrosis	1621
	Tumors	1624
Chapter 51.	Monocytes	1635
	Monocytosis	1635
	Storage Diseases	1635
	Histiocytosis X	1639
	Tumors	1641
Chapter 52.	Platelets	1643
	Thrombocytopenia	1643
	Thrombocytosis	1649
	Abnormal Platelets	1651

Chapter 53. Disorders of Coagulation.....	1656
Hereditary Disorders.....	1656
Acquired Disorders.....	1660
Chapter 54. Spleen.....	1668
Splénomegaly.....	1668
Trauma.....	1671
Cysts.....	1672
Congenital Anomalies.....	1672
Tumors.....	1673
Chapter 55. Lymph Nodes and Lymphocytes.....	1674
Lymphadenitis.....	1674
Hyperplastic Lymphadenopathy.....	1678
Immune Deficiency Diseases.....	1680
Tumors.....	1680
Chapter 56. Thymus.....	1729
Hyperplasia.....	1729
Immunologic Deficiency Diseases.....	1730
Congenital Anomalies.....	1730
Tumors.....	1731
Chapter 57. Nervous System.....	1736
Infection.....	1736
Vascular Disease.....	1747
Trauma.....	1763
Metabolic Disorders.....	1772
Demyelinating Diseases.....	1782
Degenerative Diseases of Neurons.....	1786
Peripheral Neuropathy.....	1796
Epilepsy.....	1799
Disturbances in Hydration.....	1801
Congenital Anomalies.....	1806
Tumors.....	1814
Chapter 58. Skeletal Muscles.....	1848
Myositis.....	1848
Muscular Dystrophy.....	1853
Congenital Myopathy.....	1857
Other Myopathies.....	1859
Neuromuscular Disorders.....	1863
Vascular Disorders.....	1865
Congenital Anomalies.....	1867
Tumors.....	1868
Chapter 59. Bones.....	1873
Infection.....	1873
Physical and Chemical Injury.....	1875