
Encyclopedia of Pathology

Series Editor

J. H. J. M. van Krieken

The scope of this 15–20-volume set encompasses the entire field of pathology ranging from general pathological terms to specific diseases to diagnostic methods. Published as print edition and online version (eReference) in the Springer Reference Program each topical volume sticks out by clearly and homogenously structured entries. A team of international experts guarantee that the essays and definitions are scientifically sound. The A-Z format of each topical volume allow readers to quickly and easily find the information they need. The major advantage of the encyclopedia is the way it makes relevant information available not only to pathologists, but also to all clinicians and researchers of the neighboring disciplines working together with pathologists who occasionally might wish to look up terms online.

More information about this series at <http://www.springer.com/series/14876>

Timothy Craig Allen • Saul Suster
Editors

Pathology of the Pleura and Mediastinum

With 264 Figures and 9 Tables

 Springer

Editors

Timothy Craig Allen
Department of Pathology
The University of Mississippi
Medical School, The University of
Mississippi Medical Center
Jackson, MS, USA

Saul Suster
Department of Pathology
Medical College of Wisconsin
Milwaukee, WI, USA

ISBN 978-3-319-66795-9 ISBN 978-3-319-66796-6 (eBook)
ISBN 978-3-319-66797-3 (print and electronic bundle)
<https://doi.org/10.1007/978-3-319-66796-6>

Library of Congress Control Number: 2018938663

© Springer International Publishing AG, part of Springer Nature 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by the registered company Springer International Publishing AG part of Springer Nature.
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

“To my pulmonary pathology mentors, S. Donald Greenberg and Philip T. Cagle”

Timothy Craig Allen

“To my wife, Jenny, and our children, David and Dana, with love and appreciation”

Saul Suster

Series Preface

When Denis Diderot started the first encyclopedia in the eighteenth century, it was a groundbreaking and timely event. It was the time of the Enlightenment, and knowledge was seen as something which was to be spread to many and to build upon by creating new knowledge. His ambition was to bring all available knowledge together in one series of books so that every person who could read has access to all there is to know. Nowadays, in a time of easily accessible knowledge, the question is whether there is still need of an encyclopedia. It is obvious that the amount of knowledge is such that it is not possible to bring it all together in one encyclopedia. One may argue that the Internet is the encyclopedia of today, but that misses an important point of Diderot, a point that is probably even more valid today. He created a team that valued information and selected what was worth to be presented in the encyclopedia. He recognized that science is not a democratic process where the majority decides what is true and valuable, but rather a growing body of knowledge in which radical ideas from individuals may bring about huge changes, even though most would reject these new ideas in the beginning. Indeed, the Internet lacks such authority and it is not easy to select valuable information from nonsense, especially when one is not an expert in a certain field.

It is therefore that an encyclopedia is only as good as the team that creates it. It goes without saying the team that is responsible for the Encyclopedia of Pathology consists of recognized experts in the field. Pathology is a growing medical discipline in which the amount of information is probably already more than that the whole encyclopedia of Diderot contained. For experts in subspecialties within pathology, it is already almost impossible to keep an overview on new developments and to select relevant from less relevant new information. There are plenty of textbooks for every disease group, and scientific literature is available for most pathologists through PubMed or GoogleScholar. What is lacking is a systematic overview of what we know in an alphabetical order, easily accessible to all. The encyclopedia of pathology fills that gap. It is written by experts with the general pathologist in mind and also specialist from other disciplines. It will consist of a series of volumes on subspecialties, and when it is completed there will be an online version combining these. Yearly updates from the online version is foreseen and readers are welcome to provide suggestions for improvement. These will be judged by the editorial team in order to keep the encyclopedia authoritative yet using the expertise of many.

Finally, it is my hope that the encyclopedia will grow into a reliable body of knowledge in pathology, enabling communication through a common language, and that it will grow and adapt to new developments.

Nijmegen, the Netherlands

J. H. J. M. van Krieken

Volume Preface

Pleural and mediastinal diseases may at first blush appear to be an odd pairing for a book; however, in fact they work quite well together. Both are in intimate association with the lung, and with lung disease, make up what is traditionally termed “pulmonary pathology.” Yet as the generally more-common lung diseases often take center stage in the study of pulmonary pathology, education of the generally less-common pleural and mediastinal diseases may get less than full attention. This book’s entries are intended to provide complete attention to these two areas of pulmonary pathology. The editors wish to gratefully acknowledge our esteemed predecessors and colleagues whose expertise in pleural disease and mediastinal disease has contributed much to these entries.

Jackson, USA
Milwaukee, USA
15 April 2018

Timothy Craig Allen, M.D., J.D.
Saul Suster, M.D.

About the Editors



Timothy Craig Allen, M.D., J.D., obtained his medical degree from Baylor College of Medicine in 1984 and completed his residency in anatomic and clinical pathology, subsequently serving on the faculty of Baylor College of Medicine until 1995. He then attended the University of Chicago Law School and graduated with the degree of Doctor of Law with Honors in 1998, subsequently practicing health care law and litigation. Dr. Allen completed a 2-year fellowship in pulmonary pathology in the Texas Medical Center in 2004. He was a Professor of Pathology and Director of Anatomic Pathology at the University of Texas Medical Branch. In 2018, Dr. Allen began Professor and Chair of the Pathology Department at University of Mississippi Medical Center in Jackson, Mississippi. Dr. Allen is certified by the American Board of Pathology in anatomic and clinical pathology, with added qualification in cytopathology. He is an Associate Editor of the *Archives of Pathology and Laboratory Medicine*. Dr. Allen is the Immediate Past-President of the Pulmonary Pathology Society and President of the Texas Society of Pathology. He is Governor of the College of American Pathologists Board of Governors, and is chair, vice-chair, or member of several CAP councils and committees. He has authored and coauthored numerous articles and book chapters on pulmonary pathology and medicolegal issues and has coauthored and co-edited several books on pulmonary pathology. Dr. Allen is series coeditor of the *Advances in Surgical Pathology* series.



Dr. Saul Suster, M.D., took his training in anatomic pathology at the Sheba Medical Center of the University of Tel-Aviv Sackler School of Medicine, in Tel-Aviv, Israel. In 1984, he immigrated to the United States to continue his training at the Mount Sinai Medical Center of Greater Miami under Dr. Arkadi M. Rywlin. He then completed a 2-year fellowship in research and surgical pathology at the Yale University School of Medicine, New Haven, CT, under the supervision of Dr. Juan Rosai. In 1990, he joined the staff at Mount Sinai Medical Center of Greater Miami where he served as Director of Surgical Pathology and was appointed Clinical Professor of Pathology at the University of Miami School of Medicine. In 1998, Dr. Suster was recruited to head the Division of Anatomic Pathology at the Ohio State University Medical Center in Columbus, OH, until 2007. Since 2007, Dr. Suster has served as Professor and Chairman of the Department of Pathology and Laboratory Medicine at the Medical College of Wisconsin, Milwaukee, WI. Dr. Suster is the author of more than 300 publications, 40 book chapters, and 5 books. He is one of the editors of the pathology textbook, *Modern Surgical Pathology*. He serves as a member of the editorial board in several pathology journals and is co-Editor-in-Chief of the *Annals of Diagnostic Pathology*. Dr. Suster is a frequent guest speaker at major national and international meetings and has served as course director for many subspecialty workshops. Dr. Suster's research work has centered on the pathology of tumors of the lung, pleura, and mediastinum, as well as tumors of soft tissue, skin, and thyroid.

Series Editor Biography



J. H. J. M. van Krieken is a pathologist with special expertise in the fields of hematopathology and the pathology of the gastrointestinal tract. He was Professor for tumor pathology since 1999 and kept from 2005 to 2015 the Chair of pathology at the Radboud University Nijmegen Medical Centre in Nijmegen. He furthermore served as Chairman of the Board of the Oncology Institute of the Radboud University, Nijmegen, from 2008 to 2016. Since 2016, he is the Rector Magnificus (Vice Chancellor) of the Radboud University.

He was the Treasurer/Secretary of the European Association for Hematopathology from 2000 to 2008, from 2003 to 2011 the Treasurer, from 2013 to 2015 the President of the European Society for Pathology (ESP), and from 2015 to 2017 the past-President of the ESP. Furthermore, he coordinates the ESP quality assessment program and is the chair of IQN path. He is (co) author of more than 600 papers in peer-reviewed journals (H-index 85), has written chapters in books on pathology and oncology, is editor of a Dutch textbook on oncology, and serves on the editorial board of the American Journal of Surgical Pathology, was managing editor of Virchow's Archive from 2012–2016, and was the chief editor of the Journal of Hematopathology from 2008–2018. Since 2011, he is member of the German Academy of Sciences Leopoldina, and since 2014 of Academia Europea and Honorary Fellow of the Royal Society of Pathology of Great Britain and Ireland.

Contributors

Timothy Craig Allen Department of Pathology, The University of Mississippi Medical School, The University of Mississippi Medical Center, Jackson, MS, USA

Andrea Valeria Arrossi Cleveland Clinic, Cleveland, OH, USA

Sunil Badve Department of Pathology and Laboratory Medicine, Indiana University School of Medicine, Indianapolis, IN, USA

Adam Beattie Department of Pathology, Northwestern Memorial Hospital, Chicago, IL, USA

Melanie Bois Mayo Clinic, Rochester, MN, USA

Adam L. Booth Department of Pathology, University of Texas Medical Branch, Galveston, TX, USA

Alain C. Borczuk Columbia University Medical Center, New York, NY, USA

Iva Brcic Institute of Pathology, Medical University of Graz, Graz, Austria

Luka Brcic Institute of Pathology, Medical University of Graz, Graz, Austria

Yasmeen M. Butt Parkland Health and Hospital System, Dallas, TX, USA

Philip T. Cagle Department of Pathology, University of Texas, MD Anderson Cancer Center, Houston, TX, USA

Shaoxiong Chen Department of Pathology and Laboratory Medicine, Indiana University School of Medicine, Indianapolis, IN, USA

Cecilia Clement University of Texas Medical Branch, Galveston, TX, USA

Jorge F. Cruz University of Texas Medical Branch, Galveston, TX, USA

Ivan Damjanov Department of Pathology, University of Kansas School of Medicine, Kansas City, KS, USA

Linh M. Dang Path Advantage Associated, Dallas, TX, USA

Alessandro De Pellegrin General University Hospital “Santa Maria della Misericordia”, Udine, Italy

Todd DeJulio Department of Pathology, Northwestern Memorial Hospital, Chicago, IL, USA

Sara Faiz University of Texas Medical Branch at Galveston, Galveston, TX, USA

Giovanni Falconieri Department of Pathology, School of Medicine, University of Trieste, Trieste, Italy

Michelle A. Foshat Department of Pathology, University of Texas Medical Branch at Galveston, Galveston, TX, USA

Masaharu Fukunaga Department of Pathology, The Jikei University School of Medicine, Tokyo, Japan

Daniel Gehlbach UT Southwestern Medical Center/Parkland Hospital and Health System, Dallas, TX, USA

Carmen Gomez-Fernandez University of Miami, Miami, FL, USA

Donald Guinee Jr. Department of Pathology, C6-PTH, Virginia Mason Medical Center, Seattle, WA, USA

Pamela Hayes University of Texas Medical Branch, Galveston, TX, USA

Jing He Department of Pathology, University of Texas Medical Branch, 301 University Blvd Galveston, TX, USA

Akira Hebisawa National Hospital Organization Tokyo Hospital, Kiyose, Tokyo, Japan

Emma Henrie Department of Pathology, University of Texas Medical Branch, Galveston, TX, USA

Adam Hoffhines University of Texas Southwestern Medical Center, Dallas, TX, USA

Koichi Honma Department of Pathology, Dokkyo University School of Medicine, Mibu, Tochigi, Japan

Aliya N. Husain Department of Pathology, University of Chicago, Chicago, IL, USA

Jaishree Jagirdar University of Texas Health Science Center at San Antonio, San Antonio, TX, USA

Jaclyn L. Jerz Department of Pathology and Genomic Medicine, Houston Methodist Hospital, Houston, USA

Merce Jorda Department of Pathology and Laboratory Medicine, University of Miami Miller School of Medicine, Miami, FL, USA

Department of Urology, University of Miami Miller School of Medicine, Miami, FL, USA

Toshiaki Kawai Department of Pathology, National Defense Medical College, Tokorozawa, Saitama, Japan

Mohamed Khalil University of Texas Medical Branch in Galveston, Galveston, TX, USA

Christina M. Kovacs University of Miami, Miami, FL, USA

Oleksandr N. Kryvenko Departments of Pathology and Urology, University of Miami Miller School of Medicine, Miami, FL, USA

Nenad Kunac Institute of Pathology, University of Split School of Medicine, Split, Croatia

Brandon T. Larsen Mayo Clinic, Rochester, MN, USA

Rodolfo Laucirica Department of Pathology and Immunology, Baylor College of Medicine, Houston, TX, USA

Christopher P. Marquez Department of Pathology, University of Texas Medical Branch, Galveston, TX, USA

Elizabeth McQuitty University of Texas Medical Branch, Houston, TX, USA

M. Kamran Mirza Department of Pathology, University of Chicago, Chicago, IL, USA

Cesar A. Moran MD Anderson Cancer Center, Houston, TX, USA

Ivana Mrklic Institute of Pathology, University of Split, Split, Croatia

Adriana Olar Department of Pathology, University of Texas MD Anderson Cancer Center, Houston, TX, USA

Horatiu Olteanu Medical College of Wisconsin, Milwaukee, WI, USA
Department of Pathology, Mayo Clinic, Rochester, MN, USA

Ryan Romano Mayo Clinic-Rochester, Rochester, MN, USA

Heather Ruff The University of Texas Medical Branch, Galveston, TX, USA

Ronda Sanders Department of Pathology and Laboratory Medicine, University of Miami Miller School of Medicine, Miami, FL, USA
Department of Urology, University of Miami Miller School of Medicine, Miami, FL, USA

Michael P. Sedrak Department of Pathology, University of Texas Medical Branch, Galveston, TX, USA

Deepika Sirohi University of Texas Health Science Center at San Antonio, San Antonio, TX, USA

Jessica Zarah Sugianto Medical University of South Carolina, Pathology and Laboratory Medicine, Charleston, SC, USA

David Suster Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, MA, USA

Saul Suster Department of Pathology, Medical College of Wisconsin, Milwaukee, WI, USA

Melissa Van Dellen Department of Pathology, University of Texas Medical Branch, Galveston, TX, USA

Paul VanderLaan Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, MA, USA

Celina Villa Anatomic and Clinical Pathology, Feinberg 7-325 Northwestern University, Chicago, IL, USA

Helen C. Wainwright Division of Anatomical Pathology, UCT Faculty of Health Science, Cape Town, South Africa

Rebecca Waters Department of Pathology, University of Texas Medical Branch, Galveston, TX, USA

Annikka Weissferdt MD Anderson Cancer Center, Houston, TX, USA

Clayton Wilburn University of Texas Medical Branch at Galveston, Galveston, TX, USA

Michelle Xia Department of Pathology, University of Texas Medical Branch, Galveston, TX, USA

Anjana Yeldandi Department of Pathology, Northwestern Memorial Hospital, Chicago, IL, USA

Sandra Zekic Tomas Department of Pathology, University Hospital Split, School of Medicine, University of Split, Split, Croatia

Riyam T. Zreik Department of Pathology, Scott and White Healthcare and Texas A&M Health Science Center College of Medicine, Temple, TX, USA