Principles and Practice of Transplant Infectious Diseases

Amar Safdar
Editor

Principles and Practice of Transplant Infectious Diseases

Springer

Editor
Amar Safdar
Clinical Associate Professor of Medicine
Texas Tech University Health Sciences Center El Paso
Paul L. Foster School of Medicine
El Paso, TX
USA

ISBN 978-1-4939-9032-0 ISBN 978-1-4939-9034-4 (eBook)
https://doi.org/10.1007/978-1-4939-9034-4

This Springer imprint is published by the registered company Springer Science+Business Media, LLC part of Springer Nature.
The registered company address is: 233 Spring Street, New York, NY 10013, U.S.A.

This book is dedicated to my parents, Taj & Safdar, for enduring inspiration and tenacity of purpose.

Preface

In pursuit of recognizing the risk of infection in patients undergoing transplantation, prescient cognizance requires sagacious understanding of hosts' home and healthcare environment, factors pertaining to the level of immune suppression that may have accumulated overtime, and, importantly, recent alterations in immune function resulting from additional immunosuppressive treatments such as donor lymphocyte transfusion, antineoplastic therapy, and immune modulatory biologic drugs and medical disorders like graft-versus-host disease, donor allograft rejection, posttransplant opportunistic malignancies, recrudescent or newly acquired cytomegalovirus infection, and relapsed hematologic neoplasms.

It is prudent to establish a targeted approach toward diagnosis, an approach which portends recognition of the true etiology with the help of assiduous investigation based on patient-specific vulnerability for infection. Special consideration needs to be placed upon the possibility of noninfectious processes that clinically are often difficult to distinguish from infection or sepsis-like syndrome. Toxicity due to commonly used drugs in the posttransplant period, thromboembolic events, acute engraftment syndrome, postsurgical deep tissue and body cavity hematoma, tissue ischemia and necrosis, opportunistic malignancies, and the potential for less common paraneoplastic disorders including tumor fever may initially present as a nonspecific acute febrile illness, with or without features suggestive of systemic inflammatory response syndrome. Similarly, a host of noninfectious maladies involving the skin and skin structures, brain, orointestinal tract, liver, kidneys, and lungs may clinically resemble infection. It is important to take into account that such processes may occur concurrently or sequentially in patients with a known infection diagnosis. Furthermore, in immunosuppressed patients after hematopoietic or solid organ allograft transplantation, plurality of simultaneously occurring infections makes selection of targeted, pathogen-specific empiric therapy a daunting task.

Individuals' genetic haecceity and its influence on susceptibility or inherent resistance to certain infections is evolving. Once validated and available for clinical use, this has the potential to reliably identify select subgroups of transplant recipients that are additionally vulnerable to specific infection(s). Infection prevention and empiric or preemptive treatment strategies in such patients may advance from the putative and arbitrary risk profiles presently in use.

This volume aims to provide a comprehensive and in-depth review of the issues pertaining to infectious diseases in patients undergoing transplantation.

El Paso, TX, USA — Amar Safdar, MD

Contents

Contributors

Cybele Lara R. Abad Section of Infectious Diseases, Department of Medicine, University of the Philippines, Philippine General Hospital, Manila, Philippines

Peter Abrams MedStar Georgetown University Hospital, MedStar Georgetown Transplant Institute, Washington, DC, USA

Samuel L. Aitken Infectious Diseases, The University of Texas MD Anderson Cancer Center, Division of Pharmacy, Houston, TX, USA

Barbara D. Alexander Duke University Medical Center, Departments of Medicine and Pathology, Division of Infectious Diseases and International Health, Durham, NC, USA

Jerry Altshuler The Mount Sinai Hospital, Department of Pharmacy, New York, NY, USA

Donald Armstrong Infectious Disease Service, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

Cornell University Medical College (ret), New York, NY, USA

Infectious Disease Society of America, Albuquerque, NM, USA

Robin K. Avery Division of Infectious Disease, Johns Hopkins, Baltimore, MD, USA

Jenny S. Ayala Hospice and Palliative Medicine, Hospital Medicine, White Plains Hospital, White Plains, NY, USA

N. Esther Babady Department of Laboratory Medicine, Clinical Microbiology Service, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

Lindsey R. Baden Division of Infectious Diseases, Brigham and Women's Hospital, Dana-Farber Cancer Institute, Harvard Medical School, Boston, MA, USA

Merav Bar Fred Hutchinson Cancer Research Center, Clinical Research Division, Seattle, WA, USA

Gerard R. Barber Department of Pharmacy Services, University of Colorado Hospital, University of Colorado, Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO, USA

Maura Barry University of Vermont College of Medicine, University of Vermont Medical Center, Division of Hematology & Oncology, Burlington, VT, USA

Brian G. Blackburn Stanford University Medical Center, Palo Alto, CA, USA

Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine, Stanford, CA, USA

Emily A. Blumberg Division of Infectious Diseases, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA

Hospital of the University of Pennsylvania, Perelman School of Medicine at the University of Pennsylvania, Department of Medicine, Philadelphia, PA, USA

Michael Boeckh Fred Hutchinson Cancer Research Center, University of Washington Medical Center, Washington, DC, USA

Justin M. Broyles Department of Plastic and Reconstructive Surgery, The Johns Hopkins Hospital, Baltimore, MD, USA

Richard E. Champlin MD Anderson Cancer Center, Department of Stem Cell Transplantation and Cellular Therapy, Houston, TX, USA

Sunandana Chandra Northwestern University Feinberg School of Medicine, Division of Hematology & Oncology, Chicago, IL, USA

Pearlie P. Chong Division of Infectious Diseases, Department of Medicine, and the William J. von Liebig Transplant Center, Mayo Clinic College of Medicine, Mayo Clinic, Rochester, MN, USA

University of North Carolina at Chapel Hill, Division of Infectious Diseases, Chapel Hill, NC, USA

Sunwen Chou Oregon Health and Science University, Division of Infectious Diseases, Portland, OR, USA

Ana Ciurea Department of Dermatology, The University of Texas, MD Anderson Cancer Center, Houston, TX, USA

Heather E. Clauss Section of Infectious Diseases, Department of Medicine, Temple University School of Medicine, Philadelphia, PA, USA

Temple University, Philadelphia, PA, USA

Temple University Hospital, Department of Infectious Diseases, Philadelphia, PA, USA

Valerie Cluzet Division of Infectious Diseases, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA

Health Quest Medical Practice, Department of Infectious Diseases, Poughkeepsie, NY, USA

Matthew Cooper MedStar Georgetown Transplant Institute, Washington, DC, USA

Scott Cutro Department of Infectious Disease, The Southeast Permanente Medical Group, Kaiser Permanente, Atlanta, GA, USA

Charles L. Daley Division of Mycobacterial and Respiratory Infections, National Jewish Health and University of Colorado, Denver, CO, USA

Lara Danziger-Isakov Pediatric Infectious Diseases, Immunocompromised Host Infectious Disease, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

William K. Decker Department of Pathology and Immunology, Baylor College of Medicine, Houston, TX, USA

Stan Deresinski Stanford University School of Medicine, Department of Medicine, Division of Infectious Diseases and Geographic Medicine, Stanford, CA, USA

Burton F. Dickey Department of Pulmonary Medicine, University of Texas MD Anderson Cancer Center, Houston, TX, USA

Yanina Dubrovskaya NYU Langone Medical Center, NYU Langone Health, Department of Pharmacy, New York, NY, USA

Simon Frédéric Dufresne Hôpital Maisonneuve-Rosemont, Université de Montréal, Department of Infectious Diseases and Medical Microbiology, Montréal, QC, Canada

Herbert L. DuPont, MD Baylor St. Luke's Medical Center, Department of Research, Houston, TX, USA

Program in Infectious Diseases, University of Texas School of Public Health, Houston, TX, USA

Kelsey Research Foundation, Houston, TX, USA

Baylor College of Medicine, Houston, TX, USA

University of Texas School of Medicine Houston, Houston, TX, USA

Marlene L. Durand Department of Ophthalmology, Harvard Medical School, Massachusetts Eye and Ear Infirmary, Boston, MA, USA

Department of Medicine, Infectious Disease Unit, Massachusetts General Hospital, Boston, MA, USA

Infectious Disease Service, Massachusetts Eye and Ear Infirmary, Boston, MA, USA

Thomas M. Fishbein Georgetown University Hospital, Transplant Institute, Washington, DC, USA

Graeme N. Forrest Division of Infectious Diseases, Portland VA Medical Center and Oregon Health and Science University, Portland, OR, USA

Alison G. Freifeld Infectious Diseases Division, University of Nebraska Medical Center, Omaha, NE, USA

Benjamin E. Gewurz Brigham and Women's Hospital, Division of Infectious Diseases, Department of Medicine, Boston, MA, USA

Raffaele Girlanda Georgetown University Hospital, Department Transplant Surgery, Washington, DC, USA

Chad R. Gordon Department of Plastic and Reconstructive Surgery, The Johns Hopkins Hospital, Baltimore, MD, USA

David E. Griffith University of Texas Health Science Center, Tyler, TX, USA

Heartland National TB Center, Tyler, TX, USA

Chadi A. Hage Indiana University School of Medicine, Pulmonary-Critical Care, Thoracic Transplantation Program, Methodist Professional Center-2, Indianapolis, IN, USA

Morgan Hakki Oregon Health and Science University, Division of Infectious Diseases, Portland, OR, USA

Matthew M. Halpert Department of Pathology and Immunology, Baylor College of Medicine, Houston, TX, USA

Christopher N. Hampton Department of Pathology and Immunology, Baylor College of Medicine, Huffington Center on Aging, Houston, TX, USA

Stephen Harold, MD, MPH Baylor St. Luke's Medical Center, Department of Research, Houston, TX, USA

Andrés F. Henao-Martínez Division of Infectious Diseases, Department of Medicine, University of Colorado Denver, Aurora, CO, USA

Dora Y. Ho Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine, Stanford, CA, USA

Harold W. Horowitz New University School of Medicine, Division of Infectious Diseases and Immunology, New York, NY, USA

Weill Cornell Medicine, New York—Presbyterian—Brooklyn Methodist Hospital, Department of Medicine, Division of Infectious Diseases, Brooklyn, NY, USA

Shirish Huprikar The Mount Sinai Hospital, Icahn School of Medicine at Mount Sinai, New York, NY, USA

Kenneth B. Hymes Hematology, Coagulation, and Medical Oncology, Laura and Isaac Perlmutter Cancer Center, NYU Langone Health, New York, NY, USA

Sharon Hymes Department of Dermatology, The University of Texas, MD Anderson Cancer Center, Houston, TX, USA

Samantha E. Jacobs Transplantation-Oncology Infectious Diseases Program, Division of Infectious Diseases, Weill Cornell Medicine, New York, NY, USA

Transplant Infectious Diseases Program, Division of Infectious Diseases, Icahn School of Medicine at Mount Sinai, Department of Medicine, New York, NY, USA

Alexander Z. Jow Division of Gastroenterology, Mid-Atlantic Kaiser Permanente Medical Group, Springfield, VA, USA

Aspasia Katragkou Transplantation-Oncology Infectious Diseases Program, New York-Presbyterian/Weill Cornell Medical Center, New York, NY, USA

3rd Department of Pediatrics, Aristotle University, Hippokration Hospital, Thessaloniki, Greece

Nationwide Children's Hospital, Department of Pediatric Infectious Diseases, Columbus, OH, USA

Carol A. Kauffman University of Michigan Medical School, Infectious Diseases Section, Veterans Affairs Ann Arbor Healthcare System, Ann Arbor, MI, USA

Partow Kebriaei MD Anderson Cancer Center, Department of Stem Cell Transplantation and Cellular Therapy, Houston, TX, USA

Vanaja Konduri Department of Pathology and Immunology, Baylor College of Medicine, Houston, TX, USA

Robert M. Kotloff Department of Pulmonary Medicine, Respiratory Institute, Cleveland Clinic, Cleveland, OH, USA

Camille Nelson Kotton Transplant and Immunocompromised Host Infectious Diseases, Division of Infectious Diseases, Massachusetts General Hospital, Travelers' Advice and Immunization Center, Division of Infectious Diseases, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

Carrie L. Kovarik Departments of Medicine and Dermatology, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA

Yeon Joo Lee Department of Internal Medicine, Infectious Diseases Service, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Weill Cornell Medical College, Cornell University, New York, NY, USA

Dan Liang Department of Pathology and Immunology, Baylor College of Medicine, Houston, TX, USA

Catherine Liu Fred Hutchinson Cancer Research Center, University of Washington Medical Center, Washington, DC, USA

Ann-Marie Lobo Department of Ophthalmology and Visual Sciences, Illinois Eye and Ear Infirmary, University of Illinois at Chicago, Chicago, IL, USA

Bennett Lorber Section of Infectious Diseases, Department of Medicine, Temple University School of Medicine, Philadelphia, PA, USA

Temple University, Philadelphia, PA, USA

Temple University Hospital, Department of Infectious Diseases, Philadelphia, PA, USA

Joseph Lowy NYU Langone Health, NYU Medical School, Department of Medicine, New York, NY, USA

Nell S. Lurain Rush University Medical Center, Department of Immunology/Microbiology, Chicago, IL, USA

Johan Maertens Department of Hematology, Acute Leukemia and Stem Cell Transplantation Unit, University Hospital Gasthuisberg, K. U. Leuven, Leuven, Belgium

Dennis G. Maki Section of Infectious Diseases, Department of Medicine, University of Wisconsin-Madison, School of Medicine and Public Health, and the William S. Middleton Memorial Veterans Hospital, Madison, WI, USA

Kieren A. Marr Johns Hopkins University, Department of Medicine, Baltimore, MD, USA

Melanie Maslow New York University School of Medicine, New York, NY, USA

Matthew W. McCarthy Weill Cornell Medicine, Department of General Internal Medicine, New York, NY, USA

Man Yee Merl Smilow Cancer Hospital at Yale-New Haven Health, Department of Pharmacy, New Haven, CT, USA

Jonathan Merola Department of Surgery, Yale School of Medicine, Yale-New Haven Hospital, New Haven, CT, USA

Robert G. Micheletti Departments of Medicine and Dermatology, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA

Benjamin A. Miko Columbia University Medical Center, Division of Infectious Diseases, Department of Medicine, New York, NY, USA

Elizabeth Ann Misch University of Wisconsin Hospital, Department of Medicine, Division of Allergy and Infectious Disease, Madison, WI, USA

University of Wisconsin-Madison, School of Medicine and Public Health, Department of Medicine, Madison, WI, USA

Sheila Mitsuma Massachusetts General Hospital, Division of Infectious Diseases, Boston, MA, USA

Robert M. Mocharla Division of Gastroenterology, NYU School of Medicine, Department of Internal Medicine, New York, NY, USA

B. Sharmila Mohanraj MedStar Georgetown University Hospital, Department of Infectious Diseases and Travel Medicine, Washington, DC, USA

José G. Montoya Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine, Stanford, CA, USA

Palo Alto Medical Foundation Toxoplasma Serology Laboratory, National Reference Center for the Study and Diagnosis of Toxoplasmosis, Palo Alto, CA, USA

Stanford University Medical Center, Palo Alto, CA, USA

Megan K. Morales University of Maryland School of Medicine, Institute of Human Virology/ Department of Infectious Diseases, Baltimore, MD, USA

Scott W. Mueller Department of Clinical Pharmacy, University of Colorado Hospital, University of Colorado, Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO, USA

Lior Nesher Infectious Disease Institute, Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer Sheba, Israel

Soroka University Medical Center affiliated with Faculty of Health Sciences Ben-Gurion University of the Negev, Infectious Disease Institute, Beer Sheba, Israel

Marcio Nucci University Hospital, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil

Hospital Universitário Clementino Fraga Filho, Department of Internal Medicine – Hematology, Rio de Janeiro, RJ, Brazil

Lucy O'Connor Transplantation-Oncology Infectious Diseases Program, New York-Presbyterian/Weill Cornell Medical Center, New York, NY, USA

University of Manchester School of Medicine, Manchester, UK

John Papadopoulos Department of Pharmacy, Division of Pharmacotherapy, NYU Langone Medical Center, New York, NY, USA

Genovefa Papanicolaou Department of Internal Medicine, Infectious Diseases Service, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Weill Cornell Medical College, Cornell University, New York, NY, USA

Memorial Sloan Kettering Cancer Center, Memorial Hospital, Department of Medicine, New York, NY, USA

Marcus R. Pereira Department of Medicine – Infectious Diseases, Columbia University Medical Center, New York, NY, USA

John R. Perfect Duke University Medical Center, Departments of Medicine and Pathology, Division of Infectious Diseases and International Health, Durham, NC, USA

David S. Perlin Public Health Research Institute, Rutgers Biomedical and Health Sciences, Rutgers New Jersey Medical School, Newark, NJ, USA

Jennifer A. Philips Division of Infectious Diseases, Department of Medicine, Washington University School of Medicine, St. Louis, MO, USA

Julie V. Philley University of Texas Health Science Center at Tyler, Department of Pulmonary and Critical Care Medicine, Tyler, TX, USA

Michael Phillips New University School of Medicine, Division of Infectious Diseases and Immunology, New York, NY, USA

Didier Pittet Infection Control Programme and WHO Collaborating Centre on Patient Safety, University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland

Michelle Limei Poon National University Hospital, Department of Hematology Oncology, Singapore, Singapore

Cynthia Portal-Celhay Division of Infectious Diseases, Department of Medicine, NYU Langone Medical Center, NYU School of Medicine, New York, NY, USA

Stephanie M. Pouch Division of Infectious Diseases, Emory University, Atlanta, GA, USA

Amol S. Rangnekar MedStar Georgetown University Hospital, MedStar Georgetown Transplant Institute, Washington, DC, USA

Raymund R. Razonable Division of Infectious Diseases, Department of Medicine, and the William J. von Liebig Center for Transplantation and Clinical Regeneration, College of Medicine, Mayo Clinic, Rochester, MN, USA

Emmanuel Roilides 3rd Department of Pediatrics, Hippokration Hospital, School of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece

Kenneth V. I. Rolston Department of Infectious Diseases, Infection Control & Employee Health, The University of Texas MD Anderson Cancer Center, Houston, TX, USA

Axel Rosengart Cedars-Sinai Medical Center, Departments of Neurology, Neurosurgery and Biomedical Sciences, Los Angeles, CA, USA

Amar Safdar Clinical Associate Professor of Medicine, Texas Tech University Health Sciences Center El Paso, Paul L. Foster School of Medicine, El Paso, TX, USA

Nasia Safdar Section of Infectious Diseases, Department of Medicine, University of Wisconsin-Madison, School of Medicine and Public Health, and the William S. Middleton Memorial Veterans Hospital, Madison, WI, USA

Michael J. Satlin Transplantation-Oncology Infectious Diseases Program, Division of Infectious Diseases, Weill Cornell Medicine, New York, NY, USA

Jennifer L. Saullo Duke University Medical Center, Department of Medicine, Division of Infectious Diseases and International Health, Durham, NC, USA

Joanna M. D. Schaenman Division of Infectious Diseases, David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

Kelly E. Schoeppler Department of Pharmacy Services, University of Colorado Health, University of Colorado, Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO, USA

Marco R. Scipione Department of Pharmacy, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Brian Scully Columbia University Medical Center, Division of Infectious Diseases, Department of Medicine, New York, NY, USA

Susan K. Seo Department of Medicine, Infectious Disease Service, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

Shmuel Shoham Johns Hopkins University School of Medicine, Department of Infectious Diseases, Baltimore, MD, USA

Amy Sievers Dana-Farber Cancer Institute, Division of Medical Oncology, Boston, MA, USA

Samuel H. Sigal Division of Gastroenterology and Hepatology, Department of Medicine, Albert Einstein College of Medicine, Montefiore Medical Center, Bronx, NY, USA

Maria Simitsopoulou Research Infectious Disease Laboratory, 3rd Department Pediatrics, Aristotle University School of Medicine, Hippokration Hospital, Thessaloniki, Greece

Lucia Sobrin Department of Ophthalmology, Harvard Medical School, Massachusetts Eye and Ear Infirmary, Boston, MA, USA

Kevin M. Soriano Georgetown University Hospital, Department of Infectious Diseases, Washington, DC, USA

Brad Spellberg Los Angeles County+University of Southern California (LAC+USC) Medical Center, Los Angeles, CA, USA

Division of Infectious Diseases, Keck School of Medicine at USC, Los Angeles, CA, USA

Lynne Strasfeld Oregon Health and Science University, Division of Infectious Diseases, Portland, OR, USA

Susanna K. Tan Stanford University School of Medicine, Department of Medicine, Division of Infectious Diseases and Geographic Medicine, Stanford, CA, USA

Yi-Wei Tang Department of Laboratory Medicine, Clinical Microbiology Service, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

Weill Cornell Medical College, Cornell University, New York, NY, USA

Joseph G. Timpone Jr. MedStar Georgetown University Hospital, Division of Infectious Diseases and Travel Medicine, Washington, DC, USA

Gaurav Trikha Division of Infectious Diseases, University of Florida College of Medicine, Gainesville, FL, USA

University of Florida Health Shands Hospital, Division of Hematology/Oncology, Department of Medicine, Gainesville, FL, USA

Nicholas Vander Els Pulmonary Service, Memorial Sloan- Kettering Cancer Center, New York, NY, USA

Pascalis Vergidis University Hospital of South Manchester, University of Manchester, Department of Medicine, Manchester, UK

Jesse J. Waggoner Emory University School of Medicine, Department of Medicine, Division of Infectious Diseases, Atlanta, GA, USA

Thomas J. Walsh Transplantation-Oncology Infectious Diseases Program, New York-Presbyterian/Weill Cornell Medical Center, New York, NY, USA

Department of Pediatrics, New York-Presbyterian/Weill Cornell Medical Center, New York, NY, USA

Department of Microbiology and Immunology, New York-Presbyterian/Weill Cornell Medical Center, New York, NY, USA

Transplant Infectious Diseases Program, Division of Infectious Diseases, Icahn School of Medicine at Mount Sinai, New York, NY, USA

David M. Weinstock Dana-Farber Cancer Institute, Harvard Medical School, Division of Medical Oncology, Boston, MA, USA

L. Joseph Wheat MiraVista Diagnostics, Indianapolis, IN, USA

Kathryn Whitaker Division of Infectious Diseases, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA

Hospital at the University of Pennsylvania, Philadelphia, PA, USA

John R. Wingard University of Florida, Division of Hematology/Oncology, Department of Medicine, Gainesville, FL, USA

Belinda Yen-Lieberman Pathology and Laboratory Medicine Institute, Cleveland Clinic, Department of Laboratory Medicine, Cleveland, OH, USA

Jasmine Zain City of Hope National Medical Center, Department of Hematology/Hematopoietic Cell Transplantation, Duarte, CA, USA

Sara A. M. Zerbel UnityPoint Health-Meriter, Department of Performance Improvement, Madison, WI, USA

Walter Zingg Infection Control Programme and WHO Collaborating Centre on Patient Safety, University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland