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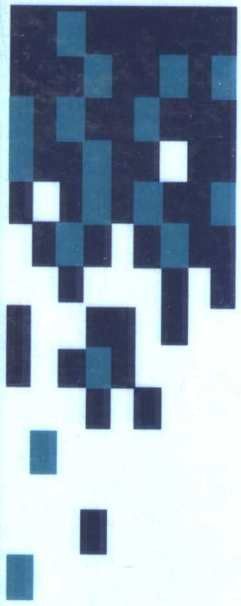

Herbert Lepor, MD

前列腺疾病

Prostatic Diseases

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Herbert Lepor, MD

Professor and Martin Spatz Chair of Urology
Professor of Pharmacology
New York University School of Medicine

Urologist-in-Chief
New York University Medical Center
New York, New York

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To my wife, Ellen, for making my life whole and always being the wind beneath my wings; to my daughter, Abbey, for bringing new joy to my life every day; and to my parents, Dr. Patrick C. Walsh, and Dr. Donald S. Coffey, for all their nurturing, teaching, and guidance.

NOTICE

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CONTRIBUTORS

Karl-Erik Andersson, MD, PhD
Professor and Chairman, Department of Clinical Pharmacology, Lund University, Lund, Sweden
Neuroanatomy and Physiology of the Prostate

Michael J. Barry, MD
Associate Professor of Medicine, Harvard Medical School; Chief, General Medicine Unit, Massachusetts General Hospital, Boston, Massachusetts
The Natural History of Benign Prostatic Hyperplasia

Betsy D. Bennett, MD, PhD
Professor, Department of Pathology, University of South Alabama College of Medicine, Mobile, Alabama
Histopathology and Cytology of Prostatitis

Richard Bihrle, MD
Professor of Urology, Indiana University School of Medicine, Indianapolis, Indiana
High-Intensity Focused Ultrasound

Michael L. Blute, MD
Professor of Urology, Mayo Medical School; Consultant, Department of Urology, Mayo Clinic, Rochester, Minnesota
Transurethral Microwave Thermotherapy

Maarten C. Bosland, DVSc, PhD
Associate Professor, New York University School of Medicine, New York, New York
Animal and Tissue Culture Models of Prostate Cancer

Jay Bosworth, MD
Associate Professor of Clinical Radiology (Radiation Oncology), New York University School of Medicine, New York; Attending and Chief, Division of St. Francis Hospital, Roslyn, New York
Brachytherapy for Prostatic Cancer

Alison F. Brading, PhD
Professor, Department of Pharmacology, Oxford University, Oxford, United Kingdom
Experimental Models of Bladder Outlet Obstruction

Michael K. Brawer, MD
Director, Northwest Prostate Institute, Northwest Hospital, Seattle, Washington
Prostate-Specific Antigen

Scott L. Brown, MD
Chief Resident, Department of Urology, Case Western Reserve University, University Hospitals of Cleveland, Cleveland, Ohio
Transrectal Ultrasound and the Prostate Biopsy: Clinical and Pathologic Issues

Reginald C. Bruskewitz, MD
Professor of Surgery, University of Wisconsin, Madison, Wisconsin
Clinical Manifestations and Indications for Treatment; Transurethral Incision of the Prostate

Wade Bushman, MD, PhD
Assistant Professor, Department of Urology, Northwestern University Medical School; Director, Center for Bladder Health, Northwestern Memorial Hospital, Chicago, Illinois
Etiology of Prostatitis

Peter R. Carroll, MD, FACS
Professor and Chairman, Department of Urology, University of California, San Francisco, San Francisco, California
Cryosurgical Ablation of Prostate Cancer

Paul J. Chuba, MD, PhD
Assistant Professor and Interim Residency Program Director, Wayne State University School of Medicine; Staff Physician, Barbara Ann Karmanos Cancer Institute and The Detroit Medical Center, Detroit, Michigan
Radiotherapy of Prostate Cancer: Photon and Neutron Treatments

E. David Crawford, MD
Professor of Surgery and Professor of Radiologic Oncology, University of Colorado Health Science Center; Associate Director, University of Colorado Cancer Center, Denver, Colorado
Treatment of Advanced (Stage T1–4, NXM+) Prostate Cancer

Christopher M. Dixon, MD
Assistant Professor, Department of Urology, New York University School of Medicine, New York, New York
Lasers for the Treatment of Benign Prostatic Hyperplasia; Radiofrequency Applications for Benign Prostatic Hyperplasia

M. Fathy El Etreby, DVM, PhD
Professor Emeritus, Medical College of Georgia, Augusta, Georgia
Aromatase Inhibitors in the Management of Benign Prostatic Hyperplasia

Richard S. Foster, MD
Professor of Urology, Indiana University School of Medicine, Indianapolis, Indiana
High-Intensity Focused Ultrasound

Jackson E. Fowler, Jr., MD
Professor of Surgery, University of Mississippi School of Medicine; Chief of Urology, University of Mississippi Hospital and Clinics, and Veterans Affairs Medical Center, Jackson, Mississippi
Diagnosis and Treatment of Bacterial Prostatitis

William A. Gardner, Jr., MD
Chair, Department of Pathology, University of South Alabama College of Medicine, Mobile, Alabama
Histopathology and Cytology of Prostatitis

Cynthia J. Girman, Dr PH
Visiting Scientist, Department of Health Sciences Research, Mayo Clinic and Mayo Foundation, Rochester, Minnesota
Epidemiology of Benign Prostatic Hyperplasia

John T. Grayhack, MD
Professor of Urology, Department of Urology, Northwestern University Medical School, Chicago, Illinois
Endocrinology of the Prostate

Harry A. Guess, MD, PhD
Adjunct Professor of Epidemiology and Biostatistics, University of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, North Carolina; Executive Director, Epidemiology Department, Merck Research Laboratories, Blue Bell, Pennsylvania
Epidemiology of Benign Prostatic Hyperplasia

Christopher A. Haas, MD
Assistant Professor of Urology, Case Western Reserve University, Cleveland, Ohio
Imaging of the Prostate

Michael F. Hoey, PhD
Professor, Department of Physiology, University of Minnesota, Minneapolis, Minnesota
Radiofrequency Applications for Benign Prostatic Hyperplasia

H. Logan Holtgrewe, MD
Associate Professor of Urology, Department of Urology, James Buchanan Brady Urological Institute, Johns Hopkins University, Baltimore, Maryland
Transurethral Resection of the Prostate

Lynn Janulis, PhD
Postdoctoral Fellow, Department of Urology, Northwestern University Medical School, Chicago, Illinois
Endocrinology of the Prostate

Jan V. Jepsen, MD
Resident, Department of Urology, KAS Herlev, Herlev, Denmark
Clinical Manifestations and Indications for Treatment; Transurethral Incision of the Prostate

Jeffrey M. Kamradt, MD
Fellow, Oncology, Department of Internal Medicine, University of Michigan, Ann Arbor, Michigan
Management of Androgen-Independent Prostate Cancer

Norbert Kaula, MS
Senior Instructor, Division of Urology, University of Colorado Health Sciences Center, Denver, Colorado
Radiofrequency Applications for Benign Prostatic Hyperplasia

Judy A.C. King, MD, PhD
Assistant Professor, Department of Pathology, University of South Alabama College of Medicine, Mobile, Alabama
Histopathology and Cytology of Prostatitis

Arnon Krongrad, MD
Chief of Urology, Veterans Affairs Medical Center; Director, South Florida Prostate Cancer Project, Miami, Florida
Prostate Anatomy

Paul H. Lange, MD
Professor and Chairman, Department of Urology, University of Washington, Seattle, Washington
The Epidemiology and Natural History of Prostate Cancer

Chung Lee, PhD
Professor of Urology, Department of Urology, Northwestern University Medical School, Chicago, Illinois
Endocrinology of the Prostate

Herbert Lepor, MD
Professor and Martin Spatz Chair of Urology and Professor of Pharmacology, New York University School of Medicine; Urologist-in-Chief, New York University Medical Center, New York, New York
The Pathophysiology of Lower Urinary Tract Symptoms in the Aging Male Population; α-Adrenergic Blocker for the Treatment of Benign Prostatic Hyperplasia; Selecting Candidates for Radical Prostatectomy

Robert M. Levin, PhD
Professor of Pharmacology and Director of Research, Division of Basic and Pharmaceutical Sciences, Albany College of Pharmacy; Adjunct Professor of Pharmacology, Albany Medical College; and Pharmacologist, Veterans Affairs Medical Center, Albany, New York
Experimental Models of Bladder Outlet Obstruction

Ronald W. Lewis, MD
Professor and Chief of Urology, Medical College of Georgia, Augusta, Georgia
Aromatase Inhibitors in the Management of Benign Prostatic Hyperplasia

Daniel W. Lin, MD
Senior Resident, University of Washington, Seattle, Washington
The Epidemiology and Natural History of Prostate Cancer

Penelope A. Longhurst, PhD
Research Associate Professor, Division of Basic and Pharmaceutical Sciences, Albany College of Pharmacy, and Division of Urology, Albany Medical College, Albany, New York
Experimental Models of Bladder Outlet Obstruction

Bernard Lytton, MB, FRCS
Donald Guthrie Professor of Surgery/Urology, Yale University School of Medicine; Attending Urologist, Yale New Haven Hospital and West Haven Veterans Hospital, New Haven, Connecticut
Open Prostatectomy

John D. McConnell, MD
Professor and Chairman of Urology, University of Texas Southwestern Medical Center, Dallas, Texas
Androgen Suppression in the Management of Benign Prostatic Hyperplasia

James B. Meigs, MD, MPH
Instructor of Medicine, Harvard Medical School; Assistant in Medicine, Massachusetts General Hospital, Boston, Massachusetts
The Natural History of Benign Prostatic Hyperplasia

Ian W. Mills, MA, BCH, FRCS
Specialist Registrar, Chelsea/Westminster Hospital, London, United Kingdom
Experimental Models of Bladder Outlet Obstruction

Timothy D. Moon, MB, ChB
Associate Professor of Surgery (Urology), University of Wisconsin; Assistant Chief of Surgery, Veterans Affairs Medical Center, Madison, Wisconsin
Management of Nonbacterial Prostatitis and Prostatodynia

Robert P. Myers, MD
Professor of Urology, Mayo Graduate School of Medicine; Consultant in Urology, Mayo Clinic, Rochester, Minnesota
The Surgical Management of Prostate Cancer: Radical Retropubic and Radical Peritoneal Prostatectomy

Victor W. Nitti, MD
Assistant Professor, Department of Urology, and Director of Neurology and Female Urology, New York University Medical Center, New York, New York
Diagnosis of Obstructive Uropathy

Joseph E. Oesterling, MD
Director, Midwest Prostate Institute, and Attending Urologist, Saint Mary's Hospital, Saginaw, Michigan
Watchful Waiting as a Management Option for Prostate Cancer

Alan W. Partin, MD, PhD
Associate Professor of Urology, The Johns Hopkins Medical Institute, Baltimore, Maryland
Etiology of Benign Prostatic Hyperplasia

Kenneth J. Pienta, MD
Professor of Medicine and Surgery, University of Michigan, Ann Arbor, Michigan
Management of Androgen-Independent Prostate Cancer

Arthur T. Porter, MD
Professor and Chairman, Radiation Oncology Department, Wayne State University School of Medicine; Executive Vice President and Chief Operating Officer, The Detroit Medical Center, and Associate Dean, Health Care Initiatives at Wayne State University School of Medicine, Barbara Ann Karmanos Cancer Institute, and The Detroit Medical Center, Detroit, Michigan
Radiotherapy of Prostate Cancer: Photon and Neutron Treatments

Louis Potters, MD
Clinical Associate Member, Memorial Sloan Kettering Cancer Center, New York; Chief, Department of Radiation Oncology, Memorial Sloan Kettering Cancer Center at Mercy Medical Center, Rockville Centre, New York
Brachytherapy for Prostatic Cancer

Martin I. Resnick, MD
Professor of Urology, Case Western Reserve University School of Medicine; Lester Persky Chairman of Urology, University Hospitals of Cleveland, Cleveland, Ohio
Imaging of the Prostate; Transrectal Ultrasound and the Prostate Biopsy: Clinical and Pathologic Issues

Claus G. Roehrborn, MD, FACS
Associate Professor of Urology, Department of Urology, The University of Texas Southwestern Medical Center; Chief, Section of Urology, Department of Surgery, North Texas Veterans Health Care System, Dallas Veterans Affairs Medical Center, Dallas, Texas
The Role of Guidelines in the Diagnosis and Treatment of Benign Prostatic Hyperplasia

Mark Rosenblum, MD
Fellow, Urologic Oncology, University of Colorado Health Sciences Center, Denver, Colorado
Treatment of Advanced (Stage T1–4, NXM+) Prostate Cancer

Nirit Rosenblum, MD
House Staff, Postgraduate Year 4, Department of Urology, New York University School of Medicine, New York, New York
Management of Persistent and Recurrent Disease After Initial Definitive Therapy

Narendra T. Sanghvi, MSEE
Focus Surgery, Indianapolis, Indiana
High-Intensity Focused Ultrasound

Paul F. Schellhammer, MD, FACS
Professor and Chairman, Department of Urology, Eastern Virginia Medical School, Norfolk; Sentara Health System (Active Staff)–Norfolk General, Leigh Memorial Hospital and Bayside, Norfolk and Virginia Beach, Virginia
Androgen Deprivation Therapy

Ellen Shapiro, MD
Professor of Urology, and Director, Pediatric Urology, New York University School of Medicine, New York, New York
The Embryology and Development of the Prostate

Scott W. Shelfo, MD
Urologic Oncology Fellow, University of Miami School of Medicine, Miami, Florida
Management of Locoregionally Advanced (Stage T3) Cancer

Ofer Shenfeld, MD
Hadassah Medical School, Hebrew University; Senior Physician, Department of Urology, Hadassah University Hospital, Jerusalem, Israel
Androgen Deprivation Therapy

Katsuto Shinohara, MD
Associate Adjunct Professor, Department of Urology, University of California, San Francisco; Staff Surgeon, Department of Veterans Affairs Medical Center, San Francisco, California
Cryosurgical Ablation of Prostate Cancer

Demetrios N. Simopoulos, MD
Fellow in Urology, Mayo Clinic, Rochester, Minnesota
Transurethral Microwave Thermotherapy

Mark S. Soloway, MD
Professor and Chairman, Department of Urology, University of Miami School of Medicine; Chief of Service, Urology, Jackson Memorial Hospital, Miami, Florida
Management of Locoregionally Advanced (Stage T3) Cancer

William Steers, MD
J.Y. Gillenwater Professor and Chair, Department of Urology, University of Virginia School of Medicine, Charlottesville, Virginia
Neuroanatomy and Physiology of the Prostate

Mitchell S. Steiner, MD
Professor of Urology and Pharmacology, Director of Urologic Oncology, and Director of Urologic Research, University of Tennessee, Memphis, College of Medicine, Memphis, Tennessee
The Embryology and Development of the Prostate; Molecular Biology of Prostate Growth Regulation

Juan I. Stenner, MD
Urologic Oncology Fellow, University of Colorado Health Sciences Center, Denver, Colorado
Treatment of Advanced (Stage T1–4, NXM+) Prostate Cancer

John D. Strandberg, DVM, PhD
Division of Comparative Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland
Comparative Pathology of Benign Hyperplasia

Samir Taneja, MD
Assistant Professor, Department of Urology, New York University School of Medicine; Co-director, Urologic Oncology, and Director, Advanced Genitourinary Oncology Program, New York University Medical Center, New York, New York
Animal and Tissue Culture Models of Prostate Cancer; The Rationale for Early Detection of Prostate Cancer

Pablo L. Torre, Jr., MD
Assistant Professor of Clinical Urology, New York University School of Medicine; Chief of Urology, Department of Veterans Affairs, New York Harbor Healthcare System, New York, New York
Management of Persistent and Recurrent Disease After Initial Definitive Therapy

Robert Waldbaum, MD
Clinical Professor of Urology, Cornell University Medical College, New York; Chief, Division of Urology, Department of Surgery, North Shore University Hospital, Manhasset, New York
Brachytherapy for Prostatic Cancer

Paul D. Walden, PhD
Assistant Professor, New York University School of Medicine, New York, New York
Animal and Tissue Culture Models of Prostate Cancer

John T. Wei, MD
Lecturer and Robert Wood Johnson Clinical Scholar, and American Foundation for Urologic Disease Scholar, The University of Michigan; Attending Urologist, The University of Michigan Health System and The Ann Arbor Veterans Administration Medical Center, Ann Arbor, Michigan
Watchful Waiting as a Management Option for Prostate Cancer

Alan J. Wein, MD
Professor and Chair, Division of Urology, University of Pennsylvania School of Medicine; Chief of Urology, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania
Criteria for Assessing Outcome Following Intervention for Benign Prostatic Hyperplasia

PREFACE

It is hard to believe that seven years have elapsed since the publication of my earlier text on prostate diseases in 1993. During this relatively short interval of time, clinical and laboratory research has greatly expanded our knowledge and understanding of the pathophysiology, etiology, natural history, diagnosis, and treatment of prostate diseases. Therefore, the timing is optimal for another text on the subject. I made a concerted effort to assemble a table of contents that incorporates the latest advances and invited internationally recognized authors to prepare comprehensive manuscripts that present this new information.

The overall objective of *Prostatic Diseases* is to serve as a comprehensive and authoritative state-of-the-art reference for the clinician treating prostate diseases. The organizational structure of the book includes four major sections: general information, benign prostatic hyperplasia, prostate cancer, and prostatitis. The general information section includes a presentation of the embryology of the prostate, and a chapter on neuroanatomy and physiology of the prostate has been added to this section. The section on benign prostatic hyperplasia includes chapters on epidemiology, natural history, and pathophysiology. The medical therapy chapters include the latest relevant clinical information derived from multicenter randomized double-blind trials, and the chapters on microwave thermotherapy, laser prostatectomy, high-intensity focused ultrasound, and radiofrequency reflect the great deal of interest in the development of minimally invasive treatment options for benign prostatic hyperplasia. The prostate cancer section includes the latest advances in diagnosis and treatment of the disease. Chapters on screening, early detection, and watchful waiting incorporate the results of the latest studies. The chapter on radical prostatectomy presents a detailed description of the surgical procedure and highlights many pearls and technical maneuvers that will be of clinical utility for all surgeons who perform the procedure. A chapter focusing on the selection of candidates for radical prostatectomy should be of great utility for the practicing clinician. Two chapters are devoted to radiotherapy in order to reflect advances in both external beam and brachytherapy. Prostatitis represents the last frontier of prostate diseases. There is a paucity of definitive information related to its pathophysiology, diagnosis, and treatment. Recently, the NIH has allocated significant funding for prostatitis research, and industry is showing some interest in developing therapies for the disease. This has attracted young investigators into the field. There is little doubt that in future editions of *Prostatic Diseases*, the section on prostatitis will be greatly expanded.

The contributors to *Prostatic Diseases* represent a diverse background, including radiotherapists, medical oncologists, epidemiologists, internists, genitourinary pathologists, veterinary pathologists, basic research scientists, and urologists. We are grateful that all the contributors completed their assignments in a timely manner to ensure that the textbook is truly a state-of-the-art reference. I am also grateful for the time, effort, and creativity that each of the contributors put forth on behalf of the textbook. It has been a pleasure to work with the entire staff of the W.B. Saunders Company. They shared our commitment to excellence, and their guidance and technical expertise were invaluable. I would also like to thank my administrative assistant, Ms. Patricia Kramer, for all of her efforts related to this project.

Herbert Lepor, MD

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SECTION I

Introduction

CHAPTER 1

The Embryology and Development of the Prostate

ELLEN SHAPIRO, MD, and MITCHELL S. STEINER, MD

EMBRYOLOGY OF THE PROSTATE

The terminal end of the hindgut is termed the *cloaca*, which is Latin for sewer. Septation of the cloaca by the urorectal septum begins at about 28 days of gestation.[1] The rectum and primitive urogenital sinus (UGS) are evident by the 44th day of development. The primitive urogenital sinus proximal to the mesonephric duct becomes the vesicourethral canal, whereas the region distal to the mesonephric duct develops into the definitive UGS. The UGS adjacent to the bladder (pelvic urethra) is narrow and develops into the lower portion of the prostatic and membranous urethra.[2] Embryologically, the cranial half of the pelvic urethra is derived from the endodermal UGS. Posteriorly, a component of mesonephric mesoderm originating from the bladder becomes incorporated into the pelvic urethra (superficial layer of the trigone). Later in development, this mesenchyme becomes smooth muscle (SM) that is continuous with the bladder (trigone). The caudal half of the pelvic urethra originates entirely from the UGS.[3, 4]

At about the 10th week of gestation, the ductal network within the prostate originates from solid epithelial outgrowths, or prostatic buds. These prostatic buds emerge from the endodermal UGS immediately below the bladder and penetrate into the müllerian mesoderm, which develops into the utricle, and the mesonephric mesoderm, which develops into the ejaculatory ducts.[5–9] The prostatic ducts rapidly lengthen, arborize, and canalize. By 13 weeks, 70 primary ducts are present and exhibit secretory cytodifferentiation.[9] Prostate growth and development are dependent on androgen production by the fetal testes, which begins at about the eighth week of gestation.[10–14] Unlike development of the wolffian duct (WD) derivatives, which are dependent solely on testosterone, the differentiation of the UGS is dependent on the reduced form of testosterone, dihydrotestosterone (DHT). DHT is essential to the mediation of growth and development of the prostate from the pelvic portion of the UGS.[12, 15–17]

PROSTATE MORPHOLOGY

Classic Studies

Much of our understanding of prostatic ductal development has been derived from the detailed anatomical descriptions of Lowsley[9] in 1912. Lowsley serially sectioned the human fetal prostate, and noted that by 12 weeks the branching ductal system consisted of five distinct groups. These lobes were termed the posterior, lateral (two), anterior, and middle lobes. The ducts of the posterior lobes originate from the floor of the prostatic urethra distal to the openings of the ejaculatory ducts and grow posteriorly. The epithelial buds of the two lateral lobes branch lateral to the verumontanum. The ducts of the middle lobe originate on the posterior urethra proximal to the openings to the ejaculatory ducts. The anterior lobe buds branch anterior to the verumontanum. The anterior lobe is prominent until the 16th week and then involutes to become an insignificant structure by 22 weeks.

Although Lowsley's work in the fetus was meticulous, it cannot be extrapolated to explain the morphology of the adult prostate gland. The distinct boundaries between the five prostate lobes that Lowsley defined cannot be identified 2.5 months postnatally, nor do the five distinct lobes exist in the prepubertal or normal young adult prostate.[5, 18, 19] Nonetheless, the terms posterior, lateral, middle, and anterior continue to be used to describe the lobes of the prostate, even though the middle and lateral lobes exist only in the aging male. Although Lowsley's study emphasized the structural changes in the fetal prostate gland, Zondek and