

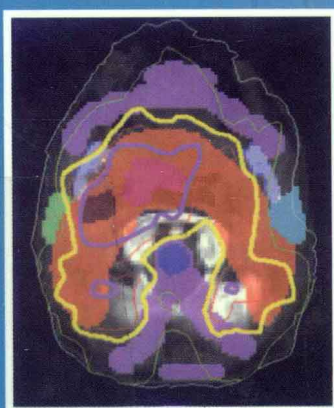
临床调强放射治疗学

Intensity Modulated Radiation Therapy
A Clinical Perspective

主编 Arno J. Mundt, MD
John C. Roeske, PhD

主译 姜 炜 崔世民

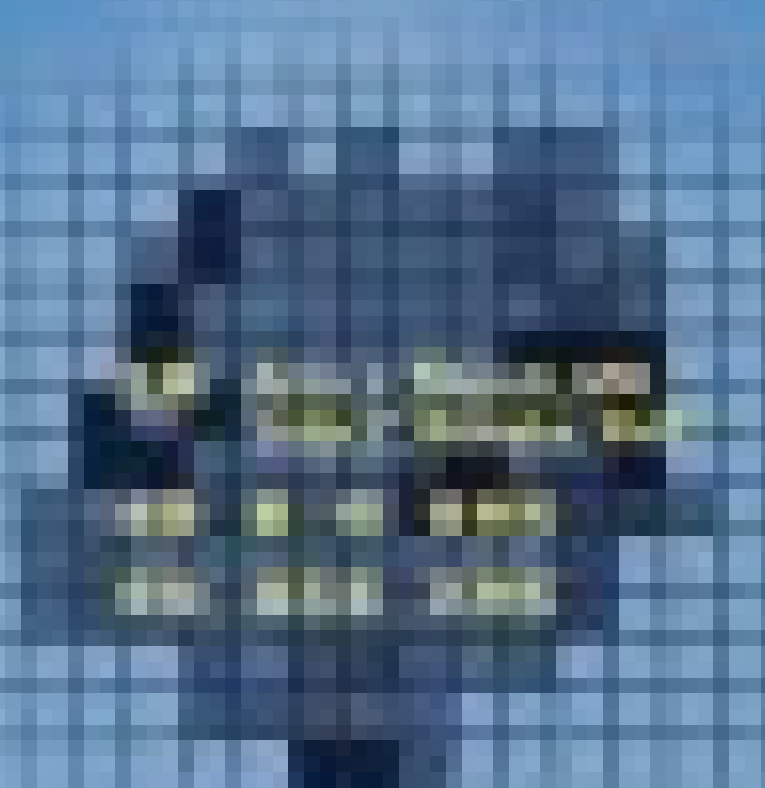
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临床调查数据治疗学

Interventions Based on Clinical Research Data

by Lawrence J. Schneider, PhD



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译者(以姓氏笔画为序)

丁 晶 王 政 丛 征
宋 彬 张春智 郭 阳

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编者名录

KALED M. ALEKTIAR, MD
Department of Radiation Oncology
Memorial Sloan-Kettering Cancer Center
New York, New York

JAVIER ARISTU, MD, PhD
Department of Radiation Oncology
University of Navarre
Pamplona, Spain

BENJAMIN ARMBRUSTER, BS
Department of Mathematics
University of Arizona
Tucson, Arizona

DOUGLAS ARTHUR, MD
Department of Radiation Oncology
William Beaumont Hospitals
Royal Oak, Michigan

KOMANDURI M. AYYANGAR, PhD
Department of Radiation Oncology
University of Nebraska Medical Center
Omaha, Nebraska

JUAN D. AZCONA, MSc
Department of Radiation Oncology
University of Navarre
Pamplona, Spain

JAMES BALTER, PhD
Department of Radiation Oncology
University of Michigan
Ann Arbor, Michigan

STANLEY H. BENEDICT, PhD
Department of Radiation Oncology
Virginia Commonwealth University Medical Center
Richmond, Virginia

ANTHONY M. BERSON, MD
Department of Radiation Oncology
Saint Vincent's Comprehensive Cancer Center
New York, New York

STEPHEN BILTON, CMD
Department of Radiation Oncology
M.D. Anderson Cancer Center
Houston, Texas

YERKO BORGHIERO, MD
Department of Radiation Oncology
M.D. Anderson Cancer Center
Houston, Texas

ARTHUR L. BOYER, PhD
Department of Radiation Oncology
Stanford University School of Medicine
Stanford, California

BROOKE BROOKS, RT, CMD
Department of Radiation Oncology
M. D. Anderson Cancer Center
Houston, Texas

PHILIP M. BRUCH, MS, CMPE
Department of Radiation Oncology
University of Nebraska Medical Center
Omaha, Nebraska

JOHN M. BUATTI, MD
Department of Radiation Oncology
Roy J. and Lucille A. Carver College of Medicine
University of Iowa
Iowa City, Iowa

ELIZABETH BUTKER, MS
Department of Radiation Oncology
Emory University School of Medicine
Atlanta, Georgia

E. BRIAN BUTLER, MD
Department of Radiation Oncology
Baylor College of Medicine
Houston, Texas

LUIS CANOVAS, CPC
Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

ROBERT M. CARDINALE, MD
Department of Radiation Oncology
Princeton Medical Center
Princeton, New Jersey

PHILIP CHAN, MBBS

Department of Radiation Oncology
Princess Margaret Hospital
University Health Network
Toronto, Ontario, Canada

K. S. CLIFFORD CHAO, MD

Department of Radiation Oncology
M. D. Anderson Cancer Center
Houston, Texas

GEORGE T. Y. CHEN, PhD

Department of Radiation Oncology
Massachusetts General Hospital
Boston, Massachusetts

STEVEN J. CHMURA, MD, PhD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

CARMELITA CHOTIPRADIT, RN

Department of Radiation and Cellular Oncology
University of Chicago Hospitals
Chicago, Illinois

WILLIAM W. CHOU, MD

Department of Radiation Oncology
Memorial Sloan-Kettering Cancer Center
New York, New York

CATHARINE CLARK, PhD, MIPeM

Department of Radiotherapy
Royal Marsden Hospital
London, England

FILIP CLAUS, MD, PhD

Department of Radiation Oncology
Ghent University Hospital
Ghent, Belgium

PHILIP P. CONNELL, MD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

DÖLF CORAY, PhD

Department of Radiation Medicine
Paul Scherrer Institute
Villigen PSI, Switzerland

WILFRIED DE NEVE, MD, PhD

Department of Radiation Oncology
Ghent University Hospital
Ghent, Belgium

DAVID P. DEARNALEY, MD, MRCP, FRCR

Department of Radiotherapy
Royal Marsden Hospital
London, England

JOSEPH O. DEASY, PhD

Department of Radiation Oncology
Siteman Cancer Center
Washington University
St. Louis, Missouri

JÜRGEN DEBUS, MD, PhD

Department of Radiation Oncology
University of Heidelberg
Heidelberg, Germany

XIAO-WU DENG, PhD

Department of Radiation Oncology
Sun Yat-sen University
Guangzhou, China

J. KEITH DEWYNGAERT, PhD

Department of Radiation Oncology
New York University School of Medicine
New York, New York

LEI DONG, PhD

Department of Radiation Physics
M. D. Anderson Cancer Center
Houston, Texas

KENNETH J. DORNFELD, MD, PhD

Department of Radiation Oncology
Roy J. and Lucille A. Carver College of Medicine
University of Iowa
Iowa City, Iowa

WIM DUTHOY, MD

Department of Radiation Oncology
Ghent University Hospital
Ghent, Belgium

AVRAHAM EISBRUCH, MD

Department of Radiation Oncology
University of Michigan
Ann Arbor, Michigan

ERIC ELDER, PhD

Department of Radiation Oncology
Emory University School of Medicine
Atlanta, Georgia

BAHMAN EMAMI, MD, FACR

Department of Radiation Oncology
Loyola University Medical Center
Maywood, Illinois

RICHARD EMERY, MS, DABR

Department of Radiation Oncology
Saint Vincent's Comprehensive Cancer Center
New York, New York

NATIA ESIASHVILI, MD

Department of Radiation Oncology
Emory University School of Medicine
Atlanta, Georgia

KARL FARREY, MS

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

STEVEN J. FEIGENBERG, MD

Department of Radiation Oncology
Fox Chase Cancer Center
Philadelphia, Pennsylvania

JOHN B. FIVEASH, MD

Department of Radiation Oncology
University Hospital
Birmingham, Alabama

SILVIA C. FORMENTI, MD

Department of Radiation Oncology
New York University School of Medicine
New York, New York

KENNETH M. FORSTER, PHD

Department of Radiation Oncology
University of Texas Southwestern
Dallas, Texas

JACK F. FOWLER, DSc, PhD

Department of Human Oncology
University of Wisconsin-Madison
Madison, Wisconsin

TIM FOX, PhD

Department of Radiation Oncology
Emory University School of Medicine
Atlanta, Georgia

ANTHONY W. FYLES, MD

Department of Radiation Oncology
Princess Margaret Hospital
University Health Network
Toronto, Ontario, Canada

MICHAEL C. GAROFALO, MD

Department of Radiation Oncology
University of Maryland
Baltimore, Maryland

JASON GENG, PhD

Genex Technologies Inc.
Kensington, Maryland

ELI GLATSTEIN, MD

Department of Radiation Oncology
University of Pennsylvania
Philadelphia, Pennsylvania

GUDRUN GOITEIN, MD

Department of Radiation Medicine
Paul Scherrer Institute
Villigen PSI, Switzerland

MARIA T. GUERRERO URBANO, FRCR, MRCPI

Department of Radiotherapy
Royal Marsden Hospital
London, England

THOMAS GUERRERO, MD, PhD

Department of Radiation Oncology
M.D. Anderson Cancer Center
Houston, Texas

NATHAN C. HALL, MD, PhD

Department of Radiology
University of Tennessee
Knoxville, Tennessee

RUSSELL J. HAMILTON, PhD

Department of Radiation Oncology
University of Arizona
Tucson, Arizona

STEVEN L. HANCOCK, MD

Department of Radiation Oncology
Stanford University Medical Center
Stanford, California

DANIEL J. HARA, MD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

ROBERT HEATON, PhD

Department of Radiation Oncology
Princess Margaret Hospital
Toronto, Ontario, Canada

MARTIN J. HESLIN, MD

Department of Radiation Oncology
University Hospital
Birmingham, Alabama

LINDA HONG, PhD

Department of Radiation Oncology
Memorial Sloan-Kettering Cancer Center
New York, New York

RICHARD T. HOPPE, MD, FACR

Department of Radiation Oncology
Stanford University
Stanford, California

ERIC M. HORWITZ, MD

Department of Radiation Oncology
Fox Chase Cancer Center
Philadelphia, Pennsylvania

GEOFFREY HUGO, PhD

Department of Radiation Oncology
William Beaumont Hospital
Royal Oak, Michigan

MOHAMMAD ISLAM, PhD

Department of Radiation Physics
Princess Margaret Hospital
Toronto, Ontario, Canada

WELLS JACKSON, MS, CMD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

ASHESH B. JANI, MD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

HAZIM A. JARADAT, PhD

Department of Human Oncology
University of Wisconsin-Madison
Madison, Wisconsin

MARTIN JERMANN

Department of Radiation Medicine
Paul Scherrer Institute
Villigen PSI, Switzerland

ANUJA JHINGRAN, MD

Department of Radiation Oncology
M. D. Anderson Cancer Center
Houston, Texas

STEVE JIANG, PhD

Department of Radiation Oncology
Harvard Medical School
Boston, Massachusetts

BRAD KAHL, MD

Department of Medicine
University of Wisconsin
Madison, Wisconsin

SHALOM KALNICKI, MD

Department of Radiation Oncology
UPMC Cancer Centers
Pittsburgh, Pennsylvania

JOHNNY KAO, MD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

BRIAN D. KAVANAGH, MD

Department of Radiation Oncology
University of Colorado Hospital
Denver, Colorado

LARRY KESTIN, MD

Department of Radiation Oncology
William Beaumont Hospitals
Royal Oak, Michigan

JAE HO KIM, MD, PhD

Department of Radiation Oncology
Henry Ford Hospital
Detroit, Michigan

CHRISTOPHER KING, MD, PhD

Department of Radiation Oncology
Stanford University Medical Center
Stanford, California

STEPHANIE KING, CMD

Department of Radiation Oncology
Loyola University Medical Center
Maywood, Illinois

ERIC E. KLEIN, MS, FAAPM, FACMP

Department of Radiation Oncology
Washington University
St. Louis, Missouri

MARY KOSHY, MD

Department of Radiation Oncology
Emory University School of Medicine
Atlanta, Georgia

KOMANDURI V. KRISHNA, PhD

Department of Radiation Oncology
UPMC Cancer Centers
Pittsburgh, Pennsylvania

JONG H. KUNG, PhD

Department of Radiation Oncology
Massachusetts General Hospital
Boston, Massachusetts

PATRICK KUPELIAN, MD

Department of Radiation Oncology
M.D. Anderson Cancer Center
Orlando, Florida

MARTIN E. LACHAINE, PhD

Department of Radiation Oncology
University of Arizona
Tucson, Arizona

PETER LAI, MD, PhD

Department of Radiation Oncology
Lakeland Hospital
St. Joseph, Michigan

JEROME LANDRY, MD

Department of Radiation Oncology
Emory University School of Medicine
Atlanta, Georgia

ROBERT S. LAVEY, MD, MPH
 Department of Pediatrics
 Department of Radiation Oncology
 University of Southern California
 Los Angeles, California

QUYNH-THU LE, MD
 Department of Radiation Oncology
 Stanford University Medical Center
 Stanford, California

NANCY Y. LEE, MD
 Department of Radiation Oncology
 Memorial Sloan-Kettering Cancer Center
 New York, New York

NORMAN LEHTO, MS
 Advanced Radiotherapy Consulting, Inc.
 Kalamazoo, Michigan

SHIDONG LI, PhD
 Department of Radiation Oncology
 John Hopkins University
 Baltimore, Maryland

X. ALLEN LI, PhD
 Department of Radiation Oncology
 Medical College of Wisconsin
 Milwaukee, Wisconsin

EUGENE P. LIEF, PhD
 Department of Radiation Oncology
 New York University School of Medicine
 New York, New York

TONY LOMAX, PhD
 Department of Radiation Medicine
 Paul Scherrer Institute
 Villigen PSI, Switzerland

BILLY W. LOO JR, MD, PhD
 Department of Radiation Oncology
 Stanford University
 Stanford, California

DANIEL A. LOW, PhD
 Department of Radiation Oncology
 Barnes Jewish Hospital
 Washington University School of Medicine
 St. Louis, Missouri

TAI-XIANG LU, MD
 Department of Radiation Oncology
 Sun Yat-sen University
 Guangzhou, China

ANTHONY E. LUJAN, PhD
 Department of Radiation Oncology
 Northwestern University
 Chicago, Illinois

STELLA C. LYMBERIS, MD
 Department of Radiation Oncology
 New York University School of Medicine
 New York, New York

C.-M. CHARLIE MA, PhD
 Department of Radiation Oncology
 Fox Chase Cancer Center
 Philadelphia, Pennsylvania

GIKAS S. MAGERAS, PhD
 Department of Medical Physics
 Memorial Sloan-Kettering Cancer Center
 New York, New York

WEI-YUAN MAI, MD
 Department of Radiation Oncology
 Baylor College of Medicine, Houston, Texas
 Sun Yat-sen University, Guangzhou, China

RAFAEL MARTÍNEZ-MONGE, MD, PhD
 Department of Radiation Oncology
 University of Navarre
 Pamplona, Spain

NEIL MEHTA, MD
 Department of Radiation and Cellular Oncology
 University of Chicago
 Chicago, Illinois

LOREN K. MELL, MD
 Department of Radiation and Cellular Oncology
 University of Chicago
 Chicago, Illinois

MICHAEL T. MILANO, MD, PhD
 Department of Radiation and Cellular Oncology
 University of Chicago
 Chicago, Illinois

STEFANIE MILKER-ZABEL, MD
 Department of Clinical Radiology
 University of Heidelberg
 Heidelberg, Germany

MICHAEL MILOSEVIC, MD
 Department of Radiation Oncology
 Princess Margaret Hospital
 University Health Network
 Toronto, Ontario, Canada

RADHE MOHAN, PhD
 Department of Radiation Physics
 M. D. Anderson Cancer Center
 Houston, Texas

MARTA MORENO, MD
 Department of Radiation Oncology
 University of Navarre
 Pamplona, Spain

REGINALD MUNDEN, MD

Department of Diagnostic Radiology
M.D. Anderson Cancer Center
Houston, Texas

ARNO J. MUNDT, MD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

MICHAEL T. MUNLEY, PhD

Department of Radiation Oncology
Wake Forest University School of Medicine
Winston-Salem, North Carolina

MARC W. MÜNTER, MD

Department of Radiation Oncology
University of Heidelberg
Heidelberg, Germany

BRENT MURPHY, MS

Advanced Radiotherapy Consulting Inc.
South Bend, Indiana

YASUMASA NISHIMURA, MD, PhD

Department of Radiology
Kinki University School of Medicine
Osaka-Sayama, Japan

CHRIS M. NUTTING, MD, MRCP, FRCR,
ECMO

Department of Radiotherapy
Royal Marsden Hospital
London, England

MASAHIKO OKUMURA, MP

Department of Radiology
Kinki University School of Medicine
Osaka-Sayama, Japan

ARTHUR J. OLCH, PhD

Department of Pediatrics
Department of Radiation Oncology
University of Southern California
Los Angeles, California

GUSTAVO OLIVERA, PhD

Department of Medical Physics
University of Wisconsin
Madison, Wisconsin

BRIAN O'SULLIVAN, MD, FRCPC

Department of Radiation Oncology
Princess Margaret Hospital
Toronto, Ontario, Canada

JANET PATERSON, MRT(T), CMD

Department of Radiation Oncology
Princess Margaret Hospital
University Health Network
Toronto, Ontario, Canada

TODD PAWLICKI, PhD

Department of Radiation Oncology
Stanford University Medical Center
Stanford, California

EROS PEDRONI, PhD

Department of Radiation Medicine
Paul Scherrer Institute
Villigen PSI, Switzerland

CHARLES A. PELIZZARI, PhD

Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

CHRISTOPHER PETERSON, MD

Department of Human Oncology
University of Wisconsin
Madison, Wisconsin

GUY PETRUZZELLI, MD, PhD

Department of Otolaryngology
Loyola University Medical Center
Maywood, Illinois

ANDREA PIRZKALL, MD

Department of Radiation Oncology
University of California
San Francisco, California

ALAN POLLACK, MD, PhD

Department of Radiation Oncology
Fox Chase Cancer Center
Philadelphia, Pennsylvania

RICHARD A. POPPLE, PhD

Department of Radiation Oncology
University Hospital
Birmingham, Alabama

ROBERT A. PRICE JR, PhD

Department of Radiation Oncology
Fox Chase Cancer Center
Philadelphia, Pennsylvania

RAMANI RAMASESHAN, PhD

Department of Medical Physics
Peel Regional Cancer Centre
Mississauga, Ontario, Canada

GREGORY M. RICHARDS, MD

Department of Radiation Oncology
Saint Vincent's Comprehensive Cancer Center
New York, New York

JOHN C. ROESKE, PhD
Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

SAMUEL RYU, MD
Department of Radiation Oncology
Henry Ford Hospital
Detroit, Michigan

JOSEPH K. SALAMA, MD
Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

MOHAMMAD SALEHPOUR, PhD
Department of Radiation Physics
MD Anderson Cancer Center
Houston, Texas

ROBERTO J. SANTIAGO, MD
Department of Radiation Oncology
University of Pennsylvania
Philadelphia, Pennsylvania

CHENG B. SAW, PhD
Department of Radiation Oncology
UPMC Cancer Centers
Pittsburgh, Pennsylvania

TRACEY E. SCHEFTER, MD
Department of Radiation Oncology
University of Colorado Comprehensive Cancer Center
Aurora, Colorado

THOMAS M. SCHROEDER, MD
Department of Radiation Oncology
Baylor College of Medicine
Houston, Texas

ANIL SETHI, PhD
Department of Radiation Oncology
Loyola University Medical Center
Maywood, Illinois

DANNY SONG, MD
Department of Radiation Oncology and Molecular
Radiation Sciences
John Hopkins University School of Medicine
Baltimore, Maryland

YULIN SONG, PhD
Department of Medical Physics
Memorial Sloan-Kettering Cancer Center
New York, New York

GEORGE STARKSCHALL, MD
Department of Radiation Oncology
M.D. Anderson Cancer Center
Houston, Texas

CRAIG W. STEVENS, MD, PhD
Department of Radiation Oncology
M.D. Anderson Cancer Center
Houston, Texas

VOLKER W. STIEBER, MD
Department of Radiation Oncology
Wake Forest University School of Medicine
Winston-Salem, North Carolina

MINORU SUZUKI, MD, PhD
Department of Radiation Oncology Research
Kyoto University
Kumatori-cho, Osaka, Japan

CHET SZERLAG, MBA, FACHE, CMPE
Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

RAYMOND TAN, MD
Department of Radiation Oncology
Stanford University Medical Center
Stanford, California

SCOTT P. TANNEHILL, MD
Department of Radiation Oncology
Columbia-St. Mary's Hospital
Milwaukee, Wisconsin

BIN S. TEH, MD
Department of Radiation Oncology
Baylor College of Medicine
Houston, Texas

JOSEPH TING, PhD
Carolinas Healthcare System
Charlotte, North Carolina

DAVID W. TOWNSEND, PhD
Department of Medicine and Radiology
University of Tennessee
Knoxville, Tennessee

FRANK A. VICINI, MD
Department of Radiation Oncology
William Beaumont Hospitals
Royal Oak, Michigan

JIAN Z. WANG, PhD
Department of Radiation Oncology
University of Maryland
Baltimore, Maryland

STEVE WANG, PhD
Department of Radiation and Cellular Oncology
University of Chicago
Chicago, Illinois

x / 编者名录

JAMES S. WELSH, MS, MD
Department of Human Oncology
University of Wisconsin
Madison, Wisconsin

TWYLA WILLOUGHBY, MS
Department of Radiation Oncology
M.D. Anderson Cancer Center
Orlando, Florida

JOHN W. WONG, PhD
Department of Radiation Oncology
William Beaumont Hospital
Royal Oak, Michigan

SHIAO Y. WOO, MD, FRCP, FACR
Department of Radiation Therapy
Baylor College of Medicine
Houston, Texas

ANDREW WU, PhD
Department of Radiation Oncology
UPMC Cancer Centers
Pittsburgh, Pennsylvania

QIUWEN WU, PhD
Department of Radiation Oncology
William Beaumont Hospital
Royal Oak, Michigan

BRENDA WYMAN, RTT
Santa Fe Cancer Center
Santa Fe, New Mexico

LEI XING, PhD
Department of Radiation Oncology
Stanford University School of Medicine
Stanford, California

YULONG YAN, PhD
Department of Radiation Oncology
University of Arkansas for Medical Sciences
Little Rock, Arkansas

THOMAS YANG, MD
Department of Radiation Oncology
M. D. Anderson Cancer Center
Houston, Texas

YONG YANG, PhD
Department of Radiation Oncology
Stanford University School of Medicine
Stanford, California

JEFFREY T. YAP, PhD
Department of Medicine and Radiology
University of Tennessee
Knoxville, Tennessee

INHWAN YEO, PhD
Department of Radiation Oncology
Princess Margaret Hospital
University Health Network
Toronto, Ontario, Canada

FANG-FANG YIN, PhD
Department of Radiation Oncology
Wayne State University
Detroit, Michigan

ELLEN D. YORKE, PhD
Department of Medical Physics
Memorial Sloan-Kettering Cancer Center
New York, New York

PIOTR ZYGMANSKI, PhD
Department of Radiation Oncology
Brigham and Women's Hospital
Boston, Massachusetts

译者序

近二十年是放射治疗日新月异的时期,新技术层出不穷。调强放射治疗就是近十年兴起的放射治疗新技术之一,可以在以往三维适形照射的基础上增加靶区的剂量适形度,同时减少正常组织的高剂量照射,为肿瘤的治疗提供了新的契机。

调强放射治疗的普及速度不可谓不迅速,甚至超过了当初的放射治疗,短短的十年间,国内能够开展此项技术的中心已有近百家。本书的出版可谓及时,因为在本书出版之前,无论国外国内都没有一本关于调强放射治疗技术的专著。本书不仅从理论上对调强放射治疗给予了系统的阐述,而且在相关技术细节上的论述也十分细致,即使一些至今尚未应用于临床的原型技术也有论及,而且为今后放射治疗技术的发展提供了方向,是指导调强放射治疗应用不可多得的一本好书。本书为我们阐明了许多在调强放射治疗应用过程中的误区,译者即使在繁杂的编译过程中也感觉非常解渴。

在本书的翻译过程中,我们翻阅了大量的国内外文献和相关资料,力求做到翻译准确无误,并忠实于原著。但水平有限,不免会有错误和不足,希望医学专家和读者提出批评和建议,我们深表谢意!

译者

2010年5月25日

于天津环湖

英文版序

这是一本关于调强放射治疗(intensity modulated radiation therapy, IMRT)的最全面而又最及时有效的书。写一本关于某个迅速变化的成熟领域的书是相当困难的。然而,实现 IMRT 可能要借助许多新技术;我们必须对这些技术中正在发展的重要问题与原则,给予特别关注并及时做出评估。它好似一列永不停歇甚至不会减速的火车,现在正是登上这列火车的最佳时机。

IMRT 是医学技术革命的一部分。我相信技术革新对医疗产生的影响要远远超过肿瘤学与分子生物学领域的革新对医疗产生的影响。IMRT 引领技术新观念。如同本书中提及的,它代表了影像与基于计算机的放射治疗这两个方面中飞跃性技术的完美结合。IMRT 与进行个体化最佳肿瘤评价下计算机控制的治疗相比,具有更广泛的现实应用能力及潜在的示范作用。

这本书建议我们重新考虑许多当前已被接受的放疗基本原则,包括肿瘤体积的定义及其与放射体积的关系。我们需考虑肿瘤体积剂量分布的均一性问题。超分割放疗是使正常组织耐受限度最大化的理想方法,以此提高治疗比。以上是传统放疗的核心思想,但在 IMRT 中则完全不同。在某些情况下,单分割放疗或大分割放疗可能是治疗的理想方式。

有关靶体积外的额外受照问题的考虑也很重要。IMRT 体积-剂量配置与许多常规治疗方法中所见的情况有很大区别。IMRT 中所受低剂量照射的体积相应增大。这种独特的剂量分布形式意义重大,因而必须建立相应的功能性模型。在骨髓叠加剂量最小化方面的卓越成就,依赖于在治疗计划中使用辩证制约的模式。因此降低了放疗所引起的造血功能受损,从而保证给予患者有效的化疗剂量。另一方面,值得关注的是,与大多数传统放射治疗相比,IMRT 中接受潜在致癌辐射的组织体积更大,因此 IMRT 潜在地增加了患继发性肿瘤或白血病的风险。最后,与传统方式相同,它必须对治疗目的进行重新评估:哪些患者是可治愈的?哪些患者是为减轻痛苦而接受治疗的?更进一步,IMRT 在影像及放射治疗技术上的优势,可使为缓解症状而接受 IMRT 的中期癌症患者的长期生存可能性增大。并且对于该人群中转移较少的患者来说,IMRT 提供了治愈的可能性。在当前这个有效系统治疗方法不断涌现的时代,IMRT 越发显得重要。

需要重新考虑 IMRT 肿瘤体积的新原则,包括提高勾画靶区的精确性;确定靶体积内肿瘤细胞的聚集程度的尝试;不同解剖区域内肿瘤的生物学性状,例如氧合状态、血管形成状态、增殖状态和放射引起的损伤修复状态。这些数据为靶体积内剂量塑型提供了必要的基础。

IMRT 中,我们需要思考如何和为何在可确认的肿瘤范围外扩大治疗体积。是为了治疗浸润的肿瘤细胞?是用来补偿多次治疗或单次治疗过程中的体位变化?是否必须消除摆位误差或诸如呼吸和肠道内的气体运动之类生理学误差?固定、门控、基准标记、实时反馈和控制能否降低受照射体积?我们必须考虑分割的基本原则,而它是在放疗发展的早期建立的。自从这些原则形成以来,许多内容已经发生了变化。在那个时代,用于治疗放射能量既不能穿透很深的组织,也不能保护皮肤不受伤害。肿瘤位置的评估能力有限,治疗的精准性和重复性也是不确定的,由此疗程延长、分割方法、肿瘤体积和限制剂量的正常组织都必须用新的眼光来分析。IMRT 为这样的重新评价提供了动力,而本书则讨论了这些原则,因为这些原则会应用于技术的革新。各解剖区域的 IMRT 实际应用情况,正通过不同诊所的个案而处于探索之中。本书刊登了大多数重要问题及其尝试性的答案。显而易见,现在已经能得到精确的、可重复的放射剂量模型。IMRT 将开辟一个高效低毒性的治疗新天地,但它同时带来了放射肿瘤学前所未有的问题与困难。

Samuel Hellman, MD

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虽然 IMRT 仍处于相对初级阶段,但它通过改善许多患者的临床预后,已经对放射肿瘤学产生相当大的影响。《临床调强放射治疗学》一书阐明了这项新奇的技术在开发、利用和应用中的理论背景和实践状况,本教材以全面回顾 IMRT 物理学和生物学基础以及靶区勾画的医学方面的考虑作为起点。作为一名基础科学研究人员,

我尤为欣赏涉及有关 IMRT 放射生物学问题的一章,IMRT 放射生物学是一个令人关注的重要领域。尽管其中许多主题很复杂,但这一部分的章节(以及全书从头到尾)都写得十分清晰;便于初学者理解的同时,也让专家冥思苦想。

有关 IMRT 计划、实施和临床利用的许多技术在第二部分,对所有商用逆向计划与治疗系统进行了无偏见的总结回顾。理论性的问题被置于开头部分,它与 IMRT 临床应用的实际方面相结合,包括模拟定位、固定和患者定位。此外,看上去较为深奥的论题,诸如图像融合和 PET-CT 在 IMRT 计划中的应用也在讨论之列。事实上,这些论题算不上深奥,已显现在 IMRT 研究的前沿。呼吸运动和管理及其收益和潜在缺陷的描述是极优秀的一章。有关试运行和质量保证,这样有关 IMRT 临床成功应用的重要问题的章节以及有关付款和偿还以及社区安装 IMRT 的绝佳篇章也全部在这一部分中,拓宽了本书涉及的放射肿瘤学实践的范围。

第三部分给读者提供一个覆盖全部临床领域 IMRT 应用的概述,每种疾病都通过分析治疗计划和回顾已发表 IMRT 文献进行详细的讨论。这一部分表明,执业放射肿瘤学家对实际操作过程的临床、放射生物学和物理学问题特别感兴趣。作为本书作者的著名 IMRT 专家通过个案研究,详细描述模拟定位、固定、靶区勾画、计划优化和实施及质量保证,来介绍他们独特见解,这是尤其珍贵的。在某些章节,这些个案提供了分类解决方案;在另一些章节,则强调了特定的临床问题。

最后一部分由 IMRT 中特定的主题的论述组成,包括质子 IMRT 和 IMRT 与生物调节剂的联合应用。这部分以对 IMRT 中利与弊最新思考为结束,强调对特定疾病应用 IMRT 的现状和潜在的问题和缺陷。

在我看来,这就是一本上乘的教科书,它包括了 IMRT 最新理论与实践基础。这本书注定成为该领域的标准教材,其编者也定会因这个非同寻常的工作受到人们的褒扬与祝贺。

Ralph R. Weichselbaum, MD

英文版前言

尽管十年前只有极少数的机构使用 IMRT,但如今在世界范围内,IMRT 正被日益增多的中心所使用。有关对这项技术逐渐浓厚的兴趣,在涵盖它主要的放射学与肿瘤学新版本教科书中被充分体现出来。因此我们认为,现在是出版一本新的全面的 IMRT 教材的最好时机。与众多美国国内外的医师和医学物理学家的交谈传达给我们一个信息,就是传统的教材格式实用价值有限,取代它需要的是一类同时传达“如何”与“为何”的教材,即 IMRT 的艺术性和科学性。《临床调强放射治疗学》一书如能达到目标,便是我们真诚的祈盼。

这本教材本分成四个独立的(但有内在联系的)部分。第一部分介绍了 IMRT 总体“进程”并包括了 IMRT 物理学、生物学和医学上深层次的概述,说明了开展这种技术的基础原理。概念和问题的扩充被安排在第一部分,第二部分系统地探究 IMRT 的计划和实施中的不同步骤和技术,包括成像、器官活动及其管理、计划优化、治疗实施和质量保证。鉴于实用需要,社区 IMRT 设施和购买与偿还为重点的章节也一起被置于这一部分。按器官解剖学顺序,第三部分提供了 IMRT 临床应用的完整概述。在每一部分内,概述章节都与个案研究搭配,以强调 IMRT 在特定疾病中的用途。尊敬的 IMRT 专家躬亲执笔,使包括模拟定位、固定、靶区勾画、计划优化、实施和质量保证的在内的每个部分,均通过真实患者进行了细致入微的描述。将所有主要商用计划与实施系统治疗的案例都包含其中,以此说明其特性的目标得以实现。为反映 IMRT 迅速进化的自然进程,新显现的技术报道也包含在其中,表明前沿研究的方向,一些前沿技术目前已得到应用,其他技术仍处于发展阶段。第四部分由特定论题的特邀评论组成,包括质子 IMRT 和生物调节剂。

从 IMRT 的概念出发,编写一本说明 IMRT 深度与广度的教科书,是我们诚挚的愿望。尽管我们之中的纯粹主义者可能会争辩 IMRT 与逆向计划是同一词,但我们仍选择采纳一个更为宽泛、且能接受正向计划的方式的定义。我们的目标是提供该领域当前知识水平的一个概述,其形式易为参与 IMRT 计划和治疗广大的个人所接受,这些个人包括放射肿瘤医师、医学物理学家、放射治疗师、护士和行政人员以及学生和住院医师。

编写关注于单一机构使用特定的计划系统所持观点的教科书,从来就不是我们的宗旨,因此我们恳求来自众多机构对各种计划和治疗系统具有丰富经验的作者来编写本书。实际上,即使是特定部位的疾病,我们也请来自不同机构的专家向读者阐明不同的措施。仅在前列腺癌与头颈部癌症部分,就有来自 14 个中心 49 位的作者。我们还渴望提高 IMRT 的国际口味,这样本书的作者就遍及全球。全部 178 位作者来自 43 个中心,他们分别来自比利时、加拿大、中国、德国、英国、日本、西班牙、瑞士及美国 9 个国家,仅美国就有来自 35 个机构的 143 位作者,其中包括许多利用 IMRT 主攻癌症的中心。

这样一个规模巨大的工程,十分明显必定不能缺少众多个人的帮助,我们从 Ralph Weichselbaum 和 Samuel Hellman 那里获益匪浅。我们的感恩延及许多作者,他们所著远超过当初的约定,特别要感谢 Todd Pawlicki 和慷慨地弥补我们不足之处的那些人,在简短的名单中,他们包括 John Buatti, Tim Fox, Ashesh Jani, Russell Hamilton, Eugene Lief, Shidong Li, Anthony Lomax, Yulin Song, Allen Li, Fang-Fang Yin, Wei-Yuan Mai 和 Brian O'Sullivan。由于设定成非常格式,我们想要感谢所有的作者,容忍我们通过电子邮件和电话提出的无尽的变更与附加要求。热忱感激 Eli Glatstein,为他同意讲述 IMRT “另一面”的故事。我们从未打算制作宣传手册,而他理由充分的争论提供了不可或缺的平衡。

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我们为最终成果而感到极其欣慰,并且真诚希望 IMRT 不仅能满足我们读者的要求,而且能对整个放射生物学界的长足进步做出不可磨灭的贡献。

主 编 Arno J. Mundt, MD University of Chicago
John C. Roeske, PhD University of Illinois at Chicago

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