

主编

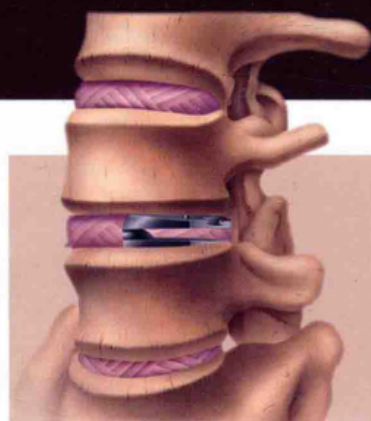
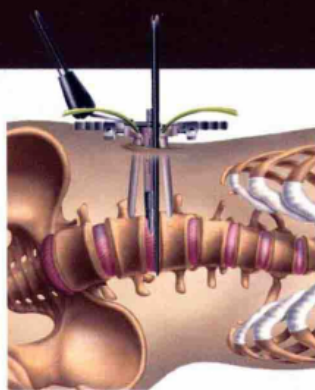
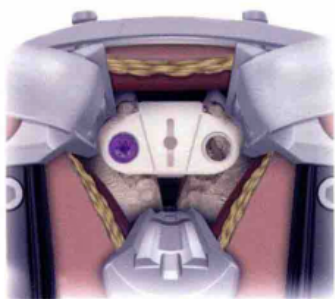
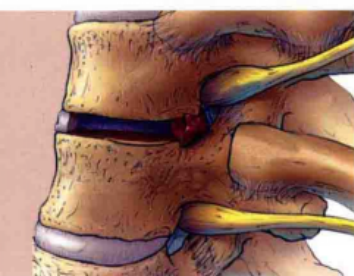
Frank M. Phillips [美]

Isador H. Lieberman [美]

David W. Polly Jr. [美]

微创脊柱外科学

Minimally Invasive Spine Surgery



主译

赵杰 马辉



上海科学技术出版社

微创脊柱外科学

Minimally Invasive Spine Surgery

主 编

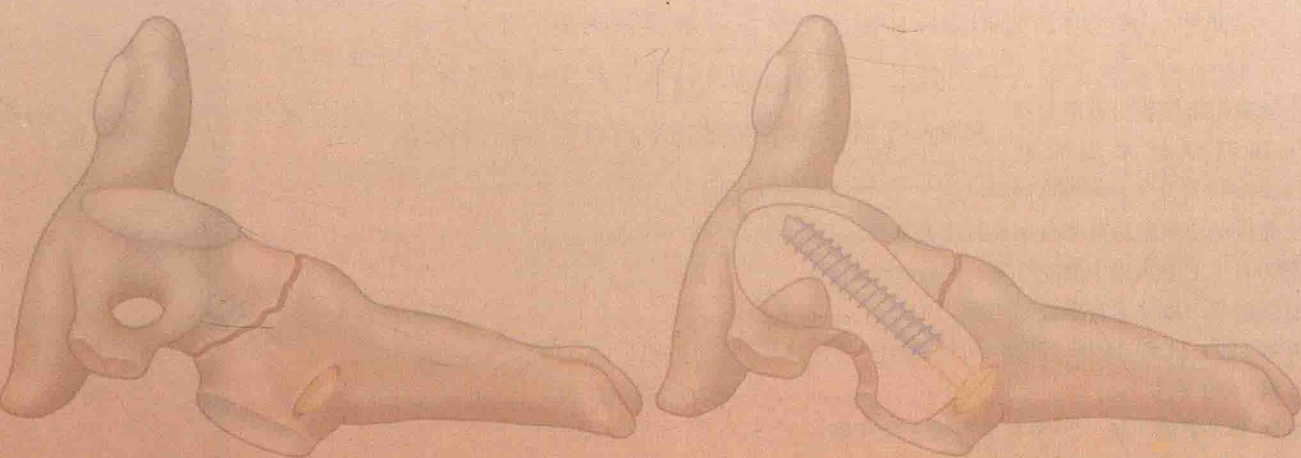
Frank M. Phillips [美]

Isador H. Lieberman [美]

David W. Polly Jr. [美]

主 译

赵 杰 马 辉



上海科学技术出版社

图书在版编目 (CIP) 数据

微创脊柱外科学 / (美) 菲利普斯(Phillips, F. M.), (美) 利伯曼(Lieberman, I. H.), (美) 波利(Polly, D. W.) 主编; 赵杰, 马辉主译. —上海: 上海科学技术出版社, 2016.1

ISBN 978-7-5478-2835-9

I. ① 微… II. ① 菲… ② 利… ③ 波… ④ 赵… ⑤ 马… III. ① 脊柱病—显微外科学 IV. ① R681.5

中国版本图书馆 CIP 数据核字 (2015) 第 244946 号

Translation from English language edition:

Minimally Invasive Spine Surgery

by Frank M. Phillips, Isador Lieberman and David Polly

Copyright © 2014 Springer New York

Springer New York is a part of Springer Science+Business Media

All Rights Reserved

微创脊柱外科学

主 编 Frank M. Phillips [美] Isador H. Lieberman [美] David W. Polly Jr. [美]

主 译 赵 杰 马 辉

上海世纪出版股份有限公司 出版

上海科学技术出版社

(上海钦州南路 71 号 邮政编码 200235)

上海世纪出版股份有限公司发行中心发行

200001 上海福建中路 193 号 www.ewen.co

浙江新华印刷技术有限公司印刷

开本 889×1194 1/16 印张 29.5 插页 4

字数: 650 千字

2016 年 1 月第 1 版 2016 年 1 月第 1 次印刷

ISBN 978-7-5478-2835-9/R · 1009

定价: 298.00 元

本书如有缺页、错装或坏损等严重质量问题,
请向承印厂联系调换

内容提要

过去十年间，微创技术在脊柱外科领域获得了快速发展与广泛应用。随着相关技术的发展，微创脊柱外科已包括专门设计的脊柱牵开通道系统、术中影像和导航技术以及实时神经监测技术等，并已具有安全、有效及重现性好的特点，大量研究也证实了此类技术的临床价值和优势。《微创脊柱外科学》一书详细讨论了相关的研究进展、外科技术（包括后路减压和融合技术）、特定疾病的手术方法，以及微创脊柱外科特有风险和并发症的处理策略。虽然先进的技术使微创脊柱外科表现出安全、可靠、重现性良好的优点，但是应用过程中仍然存在学习曲线。开放手术中容易的操作在微创条件下可能不会再那么容易。因此，读者应该意识到学习微创脊柱外科是一个不断获得知识和技能的过程。在本书中，除了强调外科技术和手术过程，还汇集了本领域的著名专家学者评价各种微创脊柱外科手术技术的优劣，并专注于不同微创技术在解决常见和罕见脊柱疾病中的临床决策和应用。因此，本书是骨科尤其是脊柱外科研究生、住院医师，中、高年资医师学习微创脊柱外科学较好的参考资料。

译者名单

主 译 赵 杰 马 辉

副 主 译 谢幼专 张 凯

翻译委员会 (按姓氏笔画顺序排序)

马 辉 (上海市第一康复医院)

叶晓健 (第二军医大学附属长征医院)

冯世庆 (天津医科大学总医院)

吕飞舟 (复旦大学附属华山医院)

刘新宇 (山东大学齐鲁医院)

杨惠林 (苏州大学附属第一医院)

吴小涛 (东南大学附属中大医院)

宋跃明 (四川大学华西医院)

张西峰 (中国人民解放军总医院)

陈伯华 (青岛大学附属医院)

陈其昕 (浙江大学医学院附属第二医院)

罗卓荆 (第四军医大学西京医院)

赵 杰 (上海交通大学医学院附属第九人民医院)

姜建元 (复旦大学附属华山医院)

贺石生 (同济大学附属第十人民医院)

徐华梓 (温州医科大学附属第二医院)

梁 裕 (上海交通大学医学院附属瑞金医院)

谢幼专 (上海交通大学医学院附属第九人民医院)

翻译人员 (按姓氏笔画顺序排序)

丁 伟 王洪立 田乃峰 田永昊 田建平

宁广智 刘希麟 米 杰 孙 伟 孙晓江

李 华 李 波 李 康 李 琰 杨 曦

杨兴华 杨建伟 杨维杰 肖宇翔 何雨舟

张 帆 张 军 张 锋 张兴凯 陈志明

周唐峻 赵 龙 赵 鑫 赵长清 相宏飞

原所茂 阎 峻 韩 辰 楼 超

编者名单

主 编

Frank M. Phillips, MD Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, USA

Isador H. Lieberman, MD, MBA, FRCSC Scoliosis and Spine Tumor Center, Texas Back Institutes, Texas Health Presbyterian Hospital Plano, Plano, TX, USA

David W. Polly Jr., MD Department of Orthopedic Surgery, University of Minnesota, Minneapolis, MN, USA

编 者

Behrooz A. Akbarnia, MD Department of Orthopaedic Surgery, University of California, San Diego, San Diego, CA, USA

Hussein Alahmadi, MD Department of Neurosurgery, Hartford Healthcare Medical Group, New Britain, CT, USA

R. Todd Allen, MD, PhD Department of Orthopaedic Surgery, UC San Diego Health System and San Diego VA Medical Center, San Diego, CA, USA

Neel Anand, MD Orthopedic Spine Surgery, Cedars-Sinai Spine Center, Los Angeles, CA, USA

D. Greg Anderson, MD Departments of Orthopaedic Surgery and Neurological Surgery, Rothman Institute, Thomas Jefferson University, Philadelphia, PA, USA

Neil M. Badlani, MD, MBA Director of Spine Surgery, The Orthopedic Sports Clinic, Houston, TX, USA

Kelley E. Banagan, MD Department of Orthopaedics, University of Maryland, Baltimore, MD, USA

Eli M. Baron, MD Department of Neurosurgery, Cedars-Sinai Medical Center, Los Angeles, CA, USA

Sigurd H. Berven, MD Department of Orthopaedic Surgery, University of California San Francisco, San Francisco, CA, USA

Randal R. Betz, MD Department of Orthopaedics, Shriners Hospitals for Children—Philadelphia, Philadelphia, PA, USA

Scott L. Blumenthal, MD Texas Back Institute, Plano, TX, USA

Scott D. Boden, MD Department of Orthopaedic Surgery, Emory School of Medicine, The Emory Spine Center, Atlanta, GA, USA

Darrel S. Brodke, MD Faculty, Department of Orthopaedics, University of Utah Medical Center, Salt Lake City, UT, USA

Patrick J. Cahill, MD Department of Orthopaedics, Shriners Hospitals for Children—Philadelphia, Philadelphia, PA, USA

Alexandra Carrer, BA Department of Orthopaedic Surgery, University of California, San Francisco, San Francisco, CA, USA

Daniel L. Cavanaugh, MD Department of Orthopaedics, UNC School of Medicine, Chapel Hill, NC, USA

Thomas D. Cha, MD, MBA Department of Orthopaedic Surgery, Massachusetts General Hospital, Boston, MA, USA

Jonathan D. Choi, MD Division of Neurosurgery, Department of Surgery, Duke University Medical Center, Durham, NC, USA

Dean Chou, MD Department of Neurological Surgery, University of California San Francisco, San Francisco, CA, USA

G. Bryan Cornwall, PhD, PEng Clinical Operations and Research, NuVasive, Inc., San Diego, CA, USA

Elias Dakwar, MD Department of Neurosurgery and Brain Repair, University of South Florida, Tampa, FL, USA

Alan B. C. Dang, MD Department of Orthopaedic Surgery, University of California, San Francisco, San Francisco, CA, USA

Justin M. Dazley, MD Division of Spine Surgery, Department of Orthopedic Surgery, Massachusetts General Hospital, Boston, MA, USA

Gurvinder S. Deol, MD Department of Orthopaedics, University of North Carolina School of Medicine, Wake Medical Health and Hospitals, Raleigh, NC, USA

Harel Deutsch, MD Department of Neurosurgery, Rush University Medical Center, Chicago, IL, USA

Vedat Deviren, MD Department of Orthopaedic Surgery, University of California San Francisco, San Francisco, CA, USA

Richard G. Fessler, MD, PhD Department of Neurosurgery, Rush University

Medical Center, Northwestern University, Chicago, IL, USA

Kevin T. Foley, MD Departments of Neurosurgery and Orthopaedic Surgery, University of Tennessee Health Sciences Center and Semmes-Murphey Clinic, Memphis, TN, USA

Sapan D. Gandhi, BS Drexel University College of Medicine, Philadelphia, PA, USA

Steven R. Garfin, MD Department of Orthopaedic Surgery, University of California San Diego, San Diego, CA, USA

Peter Grunert, MD Department of Neurological Surgery, New York Presbyterian Hospital – Weill Cornell Medical College, New York, NY, USA

Lance F. Hamlin, PA-C Department of Orthopedics, Spine Colorado, Durango, CO, USA

Roger Härtl, MD Department of Neurological Surgery, New York Presbyterian Hospital, Weill Cornell Medical College, New York, NY, USA

Justin B. Hohl, MD Department of Orthopaedics, University of Utah Medical Center, Salt Lake City, UT, USA

David C. Holt, MD Department of Orthopaedics, University of Utah, Salt Lake City, UT, USA

Xiaobang Hu, MD, PhD Scoliosis and Spine Tumor Center, Texas Back Institute, Plano, TX, USA

Xue Yu Hu Institute of Orthopedics, Xijing Hospital, Fourth Military Medical University, People's Republic of China

Andrew A. Indresano, MD Department of Orthopaedic Surgery, University of California San Diego, San Diego, CA, USA

Robert E. Isaacs, MD Division of Neurosurgery, Department of Surgery, Duke University Medical Center, Durham, NC, USA

Pawel P. Jankowski, MD Department of Neurosurgery, University of California San Diego, San Diego, CA, USA

Siddharth B. Joglekar, MD Orthopaedic Residency Program, UCSF Fresno, Fresno, CA, USA VAMC Fresno, Fresno, CA, USA

Ian Johnson University Neurosurgery Associates, Fresno, USA

Nima Kabirian, MD Department of Spine Surgery, San Diego Center for Spinal Disorders, La Jolla, CA, USA

Safdar N. Khan, MD Department of Orthopaedics, The Ohio State University,

Columbus, OH, USA

Larry T. Khoo, MD The Spine Clinic of Los Angeles, Neuroscience Center at Good Samaritan Hospital, University of Southern California, Los Angeles, CA, USA

Choll W. Kim, MD, PhD Spine Institute of San Diego, Center for Minimally-Invasive Spine Surgery, San Diego, CA, USA

Paul D. Kim, MD Spine Institute of San Diego, Center for Minimally-Invasive Spine Surgery, San Diego, CA, USA

Rohan R. Lall, MD Department of Neurological Surgery, Northwestern University, Chicago, IL, USA

Carl Laurysen, MD Department of Neurological Surgery, Olympia Medical Center, Beverly Hills, CA, USA
Laurysen Neurosurgical Spine Institute, Los Angeles, CA, USA

Jeffrey A. Lehmen, MD Department of Spine Surgery, Spine Midwest, Inc., Jefferson City, MO, USA

Isador H. Lieberman, MD, MBA, FRCSC Scoliosis and Spine Tumor Center, Texas Back Institutes, Texas Health Presbyterian Hospital Plano, Plano, TX, USA

Steven C. Ludwig, MD Department of Orthopaedics, University of Maryland Medical System, Baltimore, MD, USA

Kevin Macwan, BHSc Division of Orthopaedics, University of Toronto, Toronto, ON, Canada

Kyle T. Malone, MS Department of Research, NNI Research Foundation, Las Vegas, NV, USA
Clinical Resources, NuVasive, Inc., San Diego, CA, USA

Luis Marchi, MS Department of Minimally Invasive Surgery, Instituto de Patologia da Coluna, Sao Paulo, Brazil

Alejandro Marquez-Lara, MD Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, USA

Beck D. McAllister, MD UCLA Spine Center, UCLA School of Medicine, Santa Monica, CA, USA

Isaac L. Moss, MDCM, MASC, FRCSC Department of Orthopaedic Surgery, New England Musculoskeletal Institute, University of Connecticut Health Center, Farmington, CT, USA

Gregory M. Mundis Jr., MD Department of Spine Surgery, San Diego Center for Spinal Disorders, La Jolla, CA, USA

Sreeharsha V. Nandyala, BA Department of Orthopaedic Surgery, Rush

University Medical Center, Chicago, IL, USA

Ngoc-Lam M. Nguyen, MD Department of Orthopaedics and Rehabilitation,
Loyola University Medical Center, Maywood, IL, USA

Richard A. O'Brien, MD, FRCP(C), MBA Impulse Monitoring, Inc., Columbia,
MD, USA

John E. O'Toole, MD, MS Department of Neurosurgery, Rush University
Medical Center, Chicago, IL, USA

Donna D. Ohnmeiss, DrMed Texas Back Institute Research Foundation, Plano,
TX, USA

Leonardo Oliveira, BS Department of Minimally Invasive Surgery, Instituto de
Patologia da Coluna, Sao Paulo, Brazil

Douglas G. Orndorff, MD Department of Orthopedics, Durango Orthopedic
Associates, PC/Spine Colorado, Durango, CO, USA

Jong G. Park, BS Department of Medicine, Duke University School of
Medicine, Durham, NC, USA

Alpesh A. Patel, MD, FACS Department of Orthopaedics and Rehabilitation,
Loyola University Medical Center, Maywood, IL, USA
Department of Orthopaedic Surgery, Northwestern University School of
Medicine, Chicago, IL, USA

Catherine A. Patty, MS Department of Orthopedics, Durango Orthopedic
Associates, PC/Spine Colorado, Durango, CO, USA

Pablo R. Pazmiño, MD Department of Orthopaedics, SpineCal, Santa Monica,
CA, USA

Murat Pekmezci, MD Department of Orthopaedic Surgery, University of
California San Francisco, San Francisco, CA, USA

Miguel A. Pelton, BS Department of Orthopaedic Surgery, Rush University
Medical Center, Chicago, IL, USA

Frank M. Phillips, MD Department of Orthopaedic Surgery, Rush University
Medical Center, Chicago, IL, USA

Luiz Pimenta, MD, PhD Department of Minimally Invasive Surgery, Instituto
de Patologia da Coluna, Sao Paulo, Brazil

David W. Polly Jr., MD Department of Orthopaedic Surgery, University of
Minnesota, Minneapolis, MN, USA

Steven M. Presciutti, MD Department of Orthopaedic Surgery, University of
Connecticut Health Center, Farmington, CT, USA

Hannah L. Price, BS Department of Orthopedics, Durango Orthopedic Associates, PC/Spine Colorado, Durango, CO, USA

Y. Raja Rampersaud, MD, FRCSC Division of Orthopaedics and Neurosurgery, Department of Surgery, Toronto Western Hospital, University of Toronto, Toronto, ON, Canada

Brandon J. Rebholz, MD UCLA Spine Center, UCLA School of Medicine, Santa Monica, CA, USA

John J. Regan, MD Spine Group Beverly Hills, Beverly Hills, CA, USA

W. B. Rodgers, MD Spine Midwest, Inc., Jefferson City, MO, USA

Amer F. Samdani, MD Department of Orthopaedics, Shriners Hospitals for Children—Philadelphia, Philadelphia, PA, USA

Edward Rainier G. Santos, MD Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, MN, USA

William W. Schairer, BA Department of Orthopaedic Surgery, University of California, San Francisco, San Francisco, CA, USA

Alexandra K. Schwartz, MD Department of Orthopaedic Surgery, University of California, San Diego, San Diego, CA, USA

James D. Schwender, MD Department of Orthopaedics, Twin Cities Spine Center, Minneapolis, MN, USA

Morgan A. Scott, MS Department of Orthopedics, Durango Orthopedic Associates, PC/Spine Colorado, Durango, CO, USA

Jonathan N. Sembrano, MD Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, MN, USA

Kern Singh, MD Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, USA

William D. Smith, MD Department of Neurosurgery, University Medical Center of Southern Nevada and Western Regional Center for Brain & Spine Surgery, Las Vegas, NV, USA

Zachary A. Smith, MD Department of Neurological Surgery, Northwestern University, Chicago, IL, USA

Omar N. Syed, MD Department of Neurosurgery, Mount Kisco Medical Group, Mount Kisco, NY, USA

William R. Taylor, MD Division of Neurosurgery, Department of Surgery, UC San Diego Health System, La Jolla, CA, USA

Per D. Trobisch, MD Department of Orthopaedics, Spine Division, Otto-von-Guericke Universität, Orthopaedische Klinik Berlin, Berlin, Magdeburg, Germany

Juan S. Uribe, MD Spine Division, Department of Neurosurgery, University of South Florida, Tampa, FL, USA

Jeffrey C. Wang, MD USC Spine Center, Los Angeles, CA, USA

Albert P. Wong, MD Department of Neurosurgery, Northwestern University Memorial Hospital, Chicago, IL, USA

Praveen K. Yalamanchili, MD Seaview Orthopaedic and Medical Associates, Ocean, NJ, USA

Anthony T. Yeung, MD Department of Orthopedic Spine Surgery, Desert Institute for Spine Care, PC, Phoenix, AZ, USA

Christopher A. Yeung, MD Department of Orthopedic Spine Surgery, Desert Institute for Spine Care, PC, Phoenix, AZ, USA

Jim A. Youssef, MD Department of Orthopedics, Durango Orthopedic Associates, PC/Spine Colorado, Durango, CO, USA

Sharon C. Yson, MD Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, MN, USA

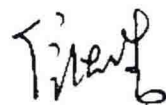
中文版序一

近十年来，尽管脊柱外科治疗的许多原则仍然没有改变，但微创脊柱外科作为脊柱治疗的最新发展趋势，其研究和临床应用取得了很大的进步，临床随访结果令人振奋，得到了越来越多的患者和脊柱外科医师的认可。随着脊柱基础理论和器械的发展与进步，与开放手术相同，目前脊柱治疗也能实现微创下的神经减压，脊柱稳定与融合，以及脊柱畸形的矫正，脊柱外科技术进入前所未有的微创时代。虽然微创手术创伤较小，但并不代表手术的风险更小，在微创脊柱外科学习的最初阶段，外科医师必须准备经历高并发症和延长手术时间两个难关。因此，每个脊柱微创医师需要认真总结和思考手术中的风险性操作、关键步骤以及处理措施，以减少手术并发症和缩短手术时间。希望高年资医师在提高自身技术熟练度的同时，将自身经验分享予他人。Frank M. Phillips 教授等编著的《微创脊柱外科学》(*Minimally Invasive Spine Surgery*)正是为了实现这个目的而编写的。本书的其他作者都是国际上微创脊柱外科的领军人物，许多作者在微创脊柱外科的发展过程中起了关键作用。

本书的内容包含了成熟的和最新的微创脊柱外科技术，如脊柱内镜技术、影像导航技术、机器人辅助技术、通道减压技术、脊柱微创融合技术、脊柱经皮螺钉技术、脊柱畸形、脊柱肿瘤的微创治疗技术、非融合微创技术以及微创技术的并发症等。同时，本书详细讲解了各种微创脊柱外科技术和操作过程，重点关注不同微创技术在解决常见和罕见脊柱疾病中的临床决策和应用，同时本书鼓励对所推荐方法的证据基础进一步讨论，汇集了微创脊柱外科争议的热点，保证了本专著具有非常高的

参考价值。

未来，随着微创理念的创新和医学思维模式的进步，脊柱外科医师理应涉足更多的手术方法，并在临床实践中不断总结经验。我相信，随着新技术、新方法的积极应用以及诊疗设备和手术器械的不断革新，脊柱微创手术治疗在国际上必将推动一场新的微创脊柱外科手术革命，也必将出现来自中国医师的创新性成果。希望本书的出版对实习医师和高年资脊柱外科、神经外科医师有所帮助。



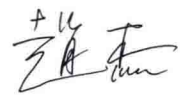
2015 年 11 月

中文版序二

随着现代医学科技的发展和医疗设备的进步，近年来微创脊柱外科技术获得蓬勃发展，越来越受到脊柱外科医师的青睐，也为广大脊柱疾病患者带来福音。然而，我国微创脊柱外科技术起步较晚，发展不平衡，该技术的开展要求脊柱外科医师突破传统观念的束缚，不断学习掌握新理论、新技术。微创脊柱外科技术的发展给脊柱疾病的诊治带来机遇与挑战，新技术在提高临床诊疗水平的同时，相关并发症的出现也引起广大脊柱外科医师的关注。所有新技术在发展推广过程中常会出现这样或那样的问题，同样的，微创脊柱外科技术在发展过程中也有很多问题值得我们关注和思考，诸如微创脊柱外科的涵义理解、适应证的选择以及能否替代传统的开放手术等。为推动脊柱微创技术在中国的普及与规范发展，提高我国脊柱微创技术水平，我们特邀国内该领域的著名专家协作将 Springer 公司出版的 *Minimally Invasive Spine Surgery* 翻译成中文出版（《微创脊柱外科学》）。

《微创脊柱外科学》全书共计 39 章，旨在对最新的微创脊柱外科技术相关问题予以较为系统全面的介绍，历述了微创脊柱外科的发展历史、相关技术、具体疾病的治疗方法及相关并发症等。本书内容涉及脊柱外科微创技术基本理论、基本技术的讲解，同时将临床常见的脊柱外科疾病的微创治疗方法予以详细介绍。希望本书能够展现脊柱微创技术的无限魅力和巨大发展空间，也期待本书的问世能让更多的脊柱外科医师更加便捷地学习微创脊柱外科相关技术知识，并在临床实践中运用和发展，充分发挥微创脊柱外科技术的优势，提高我国脊柱微创外科技术的应用水平，惠及广大脊柱疾病患者。

本书的原著是国际上微创脊柱外科的著名专家多年临床实践经验和理论的总结，在翻译及审校过程中，我们也参阅了大量的相关文献资料，力求忠实于原著，但对某些专业术语的理解难免存在个人倾向性，同时与我国国情可能会有某些差异，诚请广大同道在阅读过程中予以批评指正。同时，本书的翻译及审校工作均是各位专家在繁忙的临床、教学及科研工作之余完成的，向为此付出艰辛劳动的各位专家表示衷心的感谢。



2015 年 11 月

英文版序

尽管过去十年间微创脊柱外科获得了快速发展，但其确切定义在脊柱外科医师之间仍没有达成共识。能将微创脊柱外科定义为切口小、组织损伤小、康复快、手术风险小、并发症少的手术技术吗？事实上，这是所有外科医师在保证最终手术目的的情况下所努力追求的目标。很多高质量的研究表明，微创脊柱外科技术能够减少围手术期并发症、减少术中失血、缩短手术时间和住院时间，同时带来一定的经济价值。在当今的医疗环境下，评估外科技术的价值已成为一个重要指标，此过程中越来越依赖外科医师、纳税人、政策制定者和患者的知情同意。

虽然先进的技术（或辅助技术）使微创脊柱外科表现出安全、可靠、重现性良好的优点，但是应用过程中仍然存在学习曲线。开放手术中较容易的操作，在微创条件下可能不会那么容易。重要的是要意识到微创脊柱外科并非能快速掌握，而是一个不断获得知识和学习技能的过程。在 *Minimally Invasive Spine Surgery* 中，我们将尝试应对以上挑战。除了强调外科技术和手术过程，我们还专注于不同微创技术在解决常见和罕见脊柱疾病中的临床决策和应用。我们还汇集了本领域的著名专家学者批判性地评价各种微创脊柱外科手术技术。我们鼓励对所推荐方法的证据基础做进一步讨论。

我们编写本书的目标就是提供全面的参考资料，包含成熟的及最新的微创脊柱外科技术。本书是所有作者集体知识和智慧的结晶，他们中许多人在微创脊柱外科发展进步过程中起了关键作用。希望本书对实习医师和高年资脊柱外科医师有所帮助。

Frank M. Phillips

Isador H. Lieberman

David W. Polly Jr.