

第 4 版

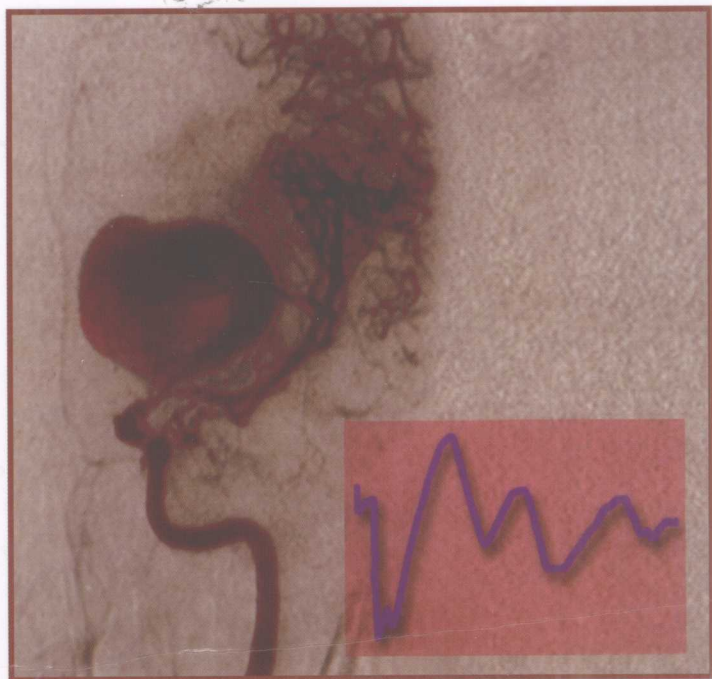
神经外科麻醉手册

Handbook of Neuroanesthesia

原 著 Philippa Newfield

James E. Cottrell

主 译 王保国 韩如泉



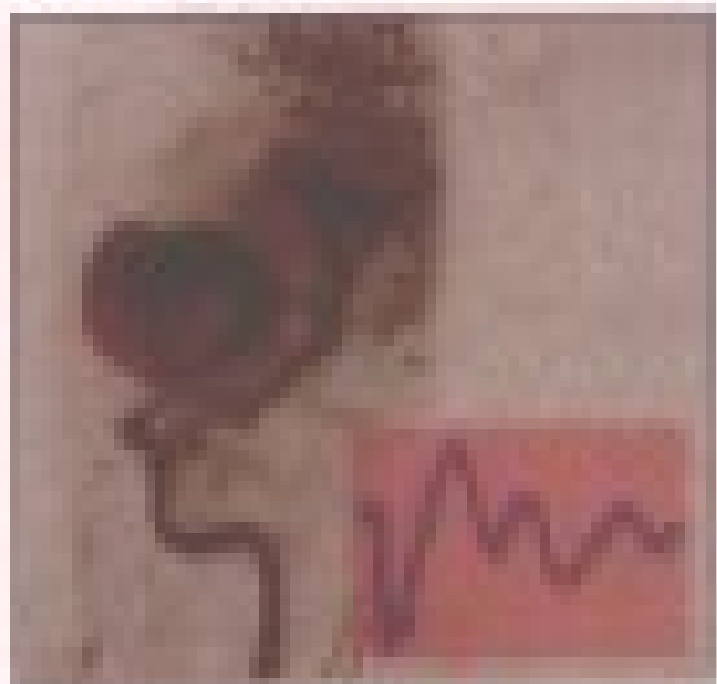
人民卫生出版社

神经外科麻醉手册

Handbook of Neuroanesthesia

主 编 Philippe Brocard
副主编 James R. Steward

主 译 王卫 魏斌



人民卫生出版社

神经外科麻醉手册

Handbook of Neuroanesthesia

第4版

原 著 Philippa Newfield, MD
James E. Cottrell, MD

作 序 Stephen Onesti, MD

主 译 王保国 韩如泉

译 者 (以姓氏汉语拼音为序)

安立新 程 灏 董 佳
金海龙 景龙年 阚 清
李 艳 梁 辉 林 楠

人民卫生出版社

Handbook of Neuroanesthesia, 4th ed.

By Philippa Newfield, et al.

Copyright © 2007 by LIPPINCOTT WILLIAMS & WILKINS

Published by arrangement with Lippincott Williams & Wilkins, U. S. A.

All rights reserved. This book is protected by copyright. No part of this book may be reproduced in any form or by any means, including photocopying, or utilized by any information storage and retrieval system without written permission from the copyright owner, except for brief quotations embodied in critical articles and reviews. Materials appearing in this book prepared by individuals as part of their official duties as U. S. government employees are not covered by the above-mentioned copyright.

神经外科麻醉手册 第4版 王保国等译

中文版版权归人民卫生出版社所有

图书在版编目(CIP)数据

神经外科麻醉手册/王保国等主译. —北京:

人民卫生出版社, 2009. 7

ISBN 978-7-117-11869-9

I. 神… II. 王… III. 神经外科手术-麻醉学-手册 IV. R651-62

中国版本图书馆 CIP 数据核字(2009)第 082460 号

门户网: www.pmph.com	出版物查询、网上书店
卫人网: www.hrhexam.com	执业护士、执业医师、 卫生资格考试培训

图字: 01-2008-1701

神经外科麻醉手册

主 译: 王保国 韩如泉

出版发行: 人民卫生出版社(中继线 010-67616688)

地 址: 北京市丰台区方庄芳群园 3 区 3 号楼

邮 编: 100078

E - mail: pmph@pmph.com

购书热线: 010-67605754 010-65264830

印 刷: 中国农业出版社印刷厂

经 销: 新华书店

开 本: 850×1168 1/32 印张: 15 字数: 382 千字 插页: 4

版 次: 2009 年 7 月第 1 版 2009 年 7 月第 1 版第 1 次印刷

标准书号: ISBN 978-7-117-11869-9/R · 11870

定 价: 37.00 元

版权所有, 侵权必究, 打击盗版举报电话: 010-87613394

(凡属印装质量问题请与本社销售部联系退换)

前 言

著名的神经外科麻醉医生 Harvey Cushing 为麻醉学作出了众多的贡献,建立了神经外科医生与神经外科麻醉医生之间的密切合作关系,并使我们受益至今。1894年,当时是哈佛医学院一名普通医学生的 Cushing 和他的朋友 E. Amory Codman 用病房的体温-脉搏-呼吸单记录患者手术过程中的脉搏、体温以及呼吸,从而诞生了世界上第一张麻醉单。曾有一个未经证实的故事,Cushing 和 Codman 还就麻醉的实施水平而进行竞赛,赌注是一顿晚餐,根据患者的术后状态来评定胜负。完美的麻醉状态是患者术后充分清醒、回到病房后能够服从指令并且无恶心、呕吐。1898年,Cushing 在肩、臀部和疝的手术中应用可卡因作局部麻醉剂,用气压装置测量血压,并经意大利的 Scipione Riva-Rocci 于 1902 年返回波士顿时得到发展。他所进行的神经外科手术几乎没有严重的术后感染病例,这主要归因于他习惯先在伤口周围应用局部麻醉,用敷料覆盖伤口并每天亲自更换。

在神经外科麻醉医生、神经外科医生、神经监护医生、神经病理医生、神经放射以及神经介入医生的通力合作下,诞生了这样一本可以为神经外科麻醉以及术后加强监护提供简明纲要性指导的第四版《神经外科麻醉手册》。该手册的内容针对清醒开颅、神经介入诊断和治疗、急慢性疼痛的治疗、监测形式、急性颅脑损伤和蛛网膜下腔出血以及其他方面的进展均作了相应的更新。每章后均列有指导进一步学习的参考文献。

正因为广大致力于为神经外科手术患者提供更好的医疗服务的医生的聪明才智、创造性、充沛的精力以及坚定的决心,才有过去数年中神经外科麻醉以及神经监护学的极大进展。我们真诚地感谢那些通过教学、研究以及临床工作为神经外科麻醉

的发展做出贡献的麻醉医生,更要对为本书的出版做出慷慨奉献的人们致以特别的谢意。

我们还要对负责第3版和第4版的总体规划、撰写、编辑以及出版全过程的 Anne Minaidis 女士致以特别诚挚的谢意。在手册的出版过程中,她在编者、作者和出版者之间的联络、沟通以及协调中发挥着不可替代的作用。我们感谢她在第四版出版的全过程中表现出的组织能力、幽默、高效、机智以及优雅。

Philippa Newfield, MD

James E. Cottrell, MD

(王保国 译)

作 者

Steven J. Allen *Chief Executive Officer, Columbus Children's Hospital, Columbus, Ohio*

Miguel F. Arango, MD *Assistant Professor, Department of Anesthesia & Perioperative Medicine, The University of Western Ontario, Anesthesia Consultant, Department of Anesthesia & Perioperative Medicine, London Health Sciences Centre, London, Ontario*

Audrée A. Bendo, MD *Professor, State University of New York, College of Medicine, Vice Chair for Education and Program Director, Department of Anesthesiology, Downstate Medical Center, Brooklyn, New York*

Nicolas J. Bruder, MD *Professor, Department of Anesthesiology and Intensive Care, CHU Timone, Chief, Department of Neuroanesthesiology and Neuro-Intensive Care, CHU Timone, Marseille, France*

Jean G. Charchafieh, MD, MPH *Associate Professor, Department of Clinical Anesthesiology, State University of New York, College of Medicine, Co-Director Medical / Surgical Intensive Care Unit and Program Director, Critical Care Fellowship Program, Department of Anesthesiology, Downstate Medical Center, Brooklyn, New York*

Daniel J. Cole, MD *Professor, Department of Anesthesiology, Mayo Clinic College of Medicine, Scottsdale, Chair, Department of Anesthesiology, Mayo Clinic Hospital, Phoenix, Arizona*

James E. Cottrell, MD, FRCA *Distinguished Service Professor, State University of New York, College of Medicine, Chairman, Department of Anesthesiology, Downstate Medical Center, Brooklyn, New York*

Gregory Crosby, MD, SM *Associate Professor, Harvard Medical School, Department of Anesthesiology, Brigham & Women's Hospital, Boston, Massachusetts*

Deborah J. Culley, MD *Assistant Professor, Department of Anesthesiology, Harvard Medical School, Assistant Professor, Department of Anesthesiology, Perioperative and Pain Medicine, Brigham and Women's Hospital, Boston, Massachusetts*

Timothy R. Deer, MD, DABPM, FIPP *President and CEO, The Centre for Pain Relief and Clinical Professor of Anesthesiology, West Virginia University School of Medicine, Charleston, West Virginia*

Karen B. Domino, MD, MPH *Professor, Department of Anesthesiology and Neurological Surgery (Adjunct), University of Washington School of Medicine, Associate Chief of Anesthesiology, Department of Anesthesiology, University of Washington Medical Center, Seattle, Washington*

Lawrence H. Feld, MD *Attending Anesthesiologist, Vice-Chairman, Department of Anesthesiology, Director of Pediatric Anesthesiology, California Pacific Medical Center, San Francisco, California*

Elie Fried, MD *Clinical Associate Professor, Department of Anesthesiology, State University of New York, College of Medicine, Downstate Medical Center, Brooklyn, New York*

Adrian W. Gelb, MD *Professor, Department of Anesthesia and Perioperative Care, University of California San Francisco, San Francisco, California*

Joseph P. Giffin[†]

Rukaiya K. A. Hamid, MBBS, FFARCS, MD *Department of Pediatric and Adult Anesthesiology, Cedars Sinai Medical Center, Los Angeles, California*

Ian A. Herrick, MD *Associate Professor, Department of Anesthesia and Perioperative Medicine, and Department of Medicine, Division of Clinical Pharmacology, University of Western Ontario, Chief of Staff, London Health Sciences Centre, London, Ontario, Canada*

Rosemary Hickey, MD *Professor, Department of Anesthesiology, University of Texas Health Science Center at San Antonio, San Antonio, Texas*

Shailendra Joshi, MD *Assistant Professor, Department of Anesthesiology, Columbia University, Assistant Attending Anesthesiologist, Department of Anesthesiology, New York Presbyterian Hospital, New York, New York*

[†]Deceased

- Ira S. Kass, PhD** *Professor, Departments of Anesthesiology and Pharmacology, State University of New York, College of Medicine, Downstate Medical Center, Brooklyn, New York*
- M. Sean Kincaid, MD** *Acting Assistant Professor, Department of Anesthesiology, University of Washington, Attending in Anesthesia and Critical Care Medicine, Department of Anesthesiology, Harborview Medical Center, Seattle, Washington*
- Arthur M. Lam, MD** *Professor, Departments of Anesthesiology and Neurological Surgery, University of Washington, Anesthesiologist-in-Chief, Department of Anesthesiology, Harborview Medical Center, Seattle, Washington*
- Melissa A. Laxton, MD** *Assistant Professor, Department of Anesthesiology, Wake Forest University School of Medicine, Staff Anesthesiologist, Department of Anesthesiology, Wake Forest University Baptist Medical Center, Winston-Salem, North Carolina*
- Linda Liu, MD** *Associate Professor, Department of Anesthesia and Perioperative Care, University of California San Francisco, San Francisco, California*
- Sundeep Mangla, MD** *Visiting Associate Professor, State University of New York, College of Medicine, Director of Interventional Neuroradiology, Director of Radiology Research, Departments of Radiology, Neurosurgery and Neurology, Downstate Medical Center, Brooklyn, New York*
- Pirjo Hellen Manninen, MD, FRCPC** *Associate Professor, Department of Anesthesia, University of Toronto, Director of Neuroanesthesia, Department of Anesthesia, Toronto Western Hospital, University Health Network, Toronto, Ontario, Canada*
- Seth Manoach, MD** *Assistant Professor, Department of Emergency Medicine, State University of New York, College of Medicine, Attending Emergency Physician, Department of Emergency Medicine, Kings County Hospital Center / Downstate Medical Center, Brooklyn, New York*
- M. Jane Matjasko, MD** *Professor Emeritus, University of Maryland, Baltimore, Maryland*

Myrna I. Morales, MD *Clinical Assistant Instructor, Department of Anesthesiology, State University of New York, College of Medicine, Downstate Medical Center, Brooklyn, New York*

Philippa Newfield, MD *Assistant Clinical Professor, Department of Anesthesia and Neurosurgery, University of California San Francisco, Attending Anesthesiologist, Department of Anesthesiology, California Pacific Medical Center, San Francisco, California*

Stephen Onesti, MD *Professor and Chairman, Department of Neurosurgery, State University of New York, Downstate Medical Center, College of Medicine, Brooklyn, New York*

C. Lee Parmley, MD *Professor of Anesthesiology, Department of Anesthesiology, Vanderbilt University Medical Center, Director, Division of Critical Care, Department of Anesthesiology, Vanderbilt University Medical Center, Nashville, Tennessee*

Patricia H. Petrozza, MD *Department of Anesthesiology, Wake Forest University School of Medicine, Wake Forest University Baptist Medical Center, Winston-Salem, North Carolina*

Janet Pittman, MD *Attending Anesthesiologist, Department of Anesthesiology, Lutheran Medical Center, Brooklyn, New York*

Patrick A. Ravussin, MD *Professor, Département d'anesthésiologie et de réanimation, Centre Hospitalier Universitaire Vaudois, LAUSANNE, Switzerland, Head, Département d'anesthésiologie et de réanimation, Réseau Santé Valais, CHCVs, site de Sion, SION, Switzerland*

Irene Rozet, MD *Assistant Professor, Department of Anesthesiology, University of Washington, Attending Anesthesiologist, Department of Anesthesiology, Harborview Medical Center, Seattle, Washington*

Takefumi Sakabe, MD *Professor and Chairman, Department of Anesthesiology, Yamaguchi University school of Medicine, Chief, Department of Anesthesiology, Yamaguchi University Hospital, Ube, Yamaguchi, Japan*

David L. Schreiber, MD *Assistant Professor, Department of Anesthesiology, University of Maryland, Director, Neuroanesthesiology, Department of Anesthesiology, University of Maryland Hospital, Baltimore, Maryland*

- Jee Jian See, MBBS, MMed** *Clinical Teacher, Clinical Research Centre, Yong Loo Lin School of Medicine, National University of Singapore, Consultant, Department of Anesthesiology, Tan Tock Seng Hospital, Singapore*
- Gary R. Stier, MD** *Associate Professor, Department of Anesthesiology, Loma Linda University School of Medicine, Medical Director-Surgical Trauma ICU, Department of Anesthesiology, Loma Linda University Medical Center, Loma Linda, California*
- John M. Taylor, MD** *Assistant Clinical Professor, Department of Anesthesia and Perioperative Care, University of California San Francisco, San Francisco, California*
- Concezione Tommasino, MD** *Associate Professor, Institute of Anesthesiology and Intensive Care, University of Milano, Head of Unit, Department of Anesthesia and Intensive Care San Paolo Hospital, Milano, Italy*
- Lela D. Weems, MD** *Clinical Assistant Professor, State University of New York, College of Medicine, Downstate Medical Center, Director, Department of Obstetric Anesthesiology, Long Island College Hospital, Brooklyn, New York*
- Deborah M. Whelan, MD** *Department of Anesthesiology, Wake Forest University School of Medicine, Wake Forest University Baptist Medical Center, Winston-Salem, North Carolina*
- David J. Wlody, MD** *Clinical Associate Professor, Department of Anesthesiology, State University of New York, College of Medicine, Chairman, Department of Anesthesiology, Long Island College Hospital, Vice Chair for Clinical Affairs, Department of Anesthesiology, Downstate Medical Center, Brooklyn, New York*
- Samrat H. Worah, MD** *Clinical Assistant Professor, Department of Anesthesiology, State University of New York-Downstate Medical Center, Attending Anesthesiologist, Department of Anesthesiology, University Hospital of Brooklyn, Brooklyn, New York*
- William L. Young, MD** *Professor and Vice Chair, Department of Anesthesia and Perioperative Care, University of California San Francisco, San Francisco, California*

目 录

I. 总 论

1. 脑和脊髓的生理与代谢 3
2. 麻醉对脑和脊髓生理的影响 26
3. 神经生理学监测 41
4. 脑保护和脑复苏 61
5. 神经外科手术患者的疼痛处理 84

II. 麻 醉 管 理

6. 颅脑创伤的麻醉处理 101
7. 幕上肿瘤的麻醉处理 121
8. 后颅窝手术麻醉 147
9. 颅内动脉瘤的麻醉处理 158
10. 缺血性脑血管疾病 188
11. 神经内分泌肿瘤:病理生理学 202
12. 癫痫及其外科治疗、肿瘤外科清醒开颅和术中
磁共振成像 212
13. 脊髓:损伤与手术 232
14. 小儿神经外科麻醉 271
15. 妊娠期神经外科手术的麻醉处理 294
- 16A. 治疗性神经放射介入手术的麻醉处理 311
- 16B. 神经放射学诊断的麻醉处理 331

III. 麻醉后监护及重症监护治疗

17. 麻醉后监护治疗室内出现的术后并发症 343
18. 神经外科患者的呼吸管理 361

19. 心血管治疗	381
20. 液体管理	397
21. 危重症患者的营养支持	415
22. 颅脑损伤、脑卒中和脑死亡	436
索引	465

I

总 论



脑和脊髓的生理与代谢

Ira S. Kass

I. 脑和脊髓的生理学

为便于理解麻醉和手术对神经系统的影响,首先需要了解细胞神经生理学以及在器官水平的神经生理功能。本节简要介绍神经生理学的基本原理。

A. 细胞神经生理学

细胞膜电位的变化是神经元兴奋性的基础,达到阈电位时可触发一次动作电位。动作电位传至轴突末梢并释放神经递质,进而影响下一个神经元的膜电位水平。

1. 膜电位是由细胞膜内外离子的浓度差形成的。每个离子的平衡电位和细胞膜对它的电导(通透性)决定了该离子对膜电位的影响。

a. 如果已知细胞内离子(如钾离子, K_i)浓度和细胞外离子浓度(K_o),则该离子的平衡电位(E)可用 Nernst 公式计算。如果一个离子仅带一个正电荷,那么在 37°C 时,这个公式可以简化为 $E_K = -61\log[K_i/K_o]$,由此可以推算出通常情况下神经系统中钾离子的平衡电位大约是一 90mV ,钠离子大约是 $+45\text{mV}$ 。

(1)神经细胞膜对不同离子的通透性决定了它的膜电位,而细胞膜对每个离子的通透性(g)也因进入不同的细胞膜和跨膜时间不同而异。神经元在某一时间点的膜电位水平可以用以下公式来计算:

$$E_m = [g_K(E_K) + g_{Na}(E_{Na}) + g_x(E_x)] / (g_K + g_{Na} + g_x)$$
 g_x 是代表 x 离子的通透性, E_x 代表该离子的等电位值。神经元的静息膜电位水平大约是一 70mV , 它更接近于 E_k (-90mV) 而不是 E_{Na} ($+45\text{mV}$), 这是因为神经元在静息情况下 g_K 远远大于 g_{Na} 。

- (2) 浓度相关和电场相关的驱动力决定了特定离子的移动方向是进入细胞内还是移出细胞外。这就是这个离子的一个电化学梯度平衡。
2. 在神经元细胞膜上, 由于神经元兴奋, 膜电位去极化超过一定的阈值后产生动作电位。在动作电位产生期间, g_{Na} 先是快速增加, 随后恢复到基础水平, 同时钾离子 g_K 缓慢增加, 这种通透性的改变导致短时快速去极化和复极化, 有时在动作电位后还会发生超极化(图 1-1)。
- a. Na 离子通透性的改变, 是由于细胞膜上选择性通过 Na 离子的蛋白通道的开放造成的, 这个通道有一个激活门和一个失活门, 两个门均需处在开放状态 Na 离子才可通过。这个通道的快速开放及关闭也就导致了动作电位的短暂性。
- b. 在静息状态下, 钾离子通道的开放较钠离子多。动作电位时, 钠通道大量开放, g_{Na} 大于 g_K , 从而使神经元去极化, 膜去极化又会引起 K 通道的开放, 使 $g_K > g_{Na}$ 而产生复极。在动作电位后, 当钠通道失活时, 增加的 g_K 会造成静息水平以下的超极化, 这就是所谓的“后超极化”, 这在神经元上较为常见。