

围术期神经系统监测

Monitoring the Nervous System for Anesthesiologists
and Other Health Care Professionals

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Tod B. Sloan
J. Richard Toleikis

主 译: 韩如泉 乔 慧



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中文版序

When the field of neurophysiological intraoperative monitoring (NIOM) first evolved, it did so as a result of the desire to enhance the ability to preserve neurological function placed at risk during various surgical procedures. Despite the use of the wake-up test, surgeons performing spine surgery recognized that there was a need for the development of additional methodologies in order to decrease postoperative deficits. Surgeons working in the area of the posterior fossa recognized a similar need. Soon it became apparent that as new methodologies were developed, the help of anesthesiologists was critical for making their implementation successful and that the addition of a trained neurophysiologist or technologist was also essential to forming an effective monitoring team.

In the early days of monitoring the editors of this book (two anesthesiologists and one neurophysiologist) worked in very close cooperation with several technologists and the surgical services to provide monitoring to many patients. While watching the growth and evolution of the field, this team was able to publish 29 papers in about ten years and realized the importance of each member's contribution to the monitoring.

During those early years, anesthesiologists were very much involved in the development and utilization of monitoring. However, as the specialty of NIOM has matured, their participation in the monitoring team has become less prominent at many medical centers. Despite an ever expanding array of monitoring procedures and applications, the specialized role of each member of the operating room team has de-

clined from a fully integrated team. Therefore, the primary goal of this book was to help bring all of the monitoring team members back to a common knowledge base where their efforts could be most effective. To achieve this goal, the book offers insight into the monitoring techniques and the kinds of factors which can result in changes in the monitoring signals. It also provides insight into how anesthesia, physiological, and positioning factors can affect the monitoring. Finally, the book provides information about the surgical procedures so that there is a clear understanding of the neurological risks involved and how monitoring is used to facilitate decision making to reduce the risks of neurological injury.

The conviction of the editors of the need for a team approach, and for enlisting the help and contribution of every member of the team, was the guiding principle in choosing authors and producing the book. We have seen the incorporation of new technologies for monitoring, the rapid expansion of its utilization, and the gradual drifting apart of many of the team members from a patient centered monitoring team effort. For this reason we have assembled authors, many of which are other anesthesiologists, who remain actively engaged in intraoperative monitoring. Our goal is to cross-fertilize each of the monitoring team members with the knowledge to work most effectively together for the patients' benefit. We believe that the anesthesiologist's participation is central to many of the aspects of monitoring and can contribute to making it more effective in reducing the risks of neurological injury. In addition, a partnership between all the members of the monitoring team is essential for productive research and for refining and enhancing the field of NIOM.

The book is designed in three sections. The chapters of the first section detail the basic monitoring techniques and discuss the relevant anatomy and physiology of the monitoring. The second section discusses the implications for the anesthesia management. The third, and main section of the book, is a case based section discussing the proce-

dures where monitoring is utilized. It includes case examples of monitoring in order to give insights into the monitoring and the kinds of factors that can lead to monitoring changes that have important implications for patient care.

We are grateful for the work of the Anesthesiology department and the administration of the Tian Tan hospital. Led by Dr. Ruquan Han, they have taken the lead to expand the knowledge base regarding NIOM in China. Clearly, the more we share our experiences and grow our knowledge, the more effective all of our efforts will be to improve the care of our patients.

Antoun Koht, Tod B. Sloan, and J. Richard Toleikis

译者前言

近年来,神经外科学的发展已经从传统的解剖学模式转变为现代解剖-功能模式,在尽可能切除病灶的同时最大限度地保护脑和脊髓功能,显著提高了手术质量。神经电生理学监测,特别是体感诱发电位和运动诱发电位已广泛应用于神经外科、脊柱脊髓外科、血管外科等手术,不仅极大程度改善了患者预后,还有效降低了手术对神经系统的损伤。术中神经生理学监测有赖于外科医师、麻醉科医师、神经电生理医师的多学科团队合作。由 Antoun Koht、Tod B. Sloan、J. Richard Toleikis 教授主编的《Monitoring the Nervous System for Anesthesiologists and Other Health Care Professionals》是神经生理监测领域非常重要的一部参考书。该书基于术中神经生理学监测的团队工作性质,重点面向麻醉科医师、神经电生理医师及相关专业人员,具有内容详实、重点突出、实用性强的特点。

该书的第一部分重点阐述了应用解剖、神经生理学基础和各种神经生理监测技术。第二部分主要介绍术中神经生理监测相关的麻醉管理要点。第三部分针对各类手术应用神经生理监测提供典型病例,阐述该类手术的解剖学特点、神经生理和病理学特点,并重点讨论神经监测过程典型变化的原因以及解决方案。

Antoun Koht、Tod B. Sloan 教授是该领域国际著名的麻醉学专家,曾多次在国际会议组织神经电生理监测的培训,并多次参加天坛国际神经外科麻醉论坛。原版专著出版之际,为将此项技术惠及更多国内专业人员及更多患者,我们将其翻译成了中文版,原著作者也欣然为中文版作序。参加本书翻译的人员主要来自首都医科大学附属北京天坛医院麻醉科和北京市神经外科研究所神经电生理室。为保证翻译内容的准确无误,我们针对跨学科内容进行了交互的审校把关。本书得以顺利出版得益于北京大学医学出版社王智敏老师的辛勤劳动,

在此对原著作者、所有参与本书翻译、审校及出版人员表示诚挚的感谢。

虽然在本书的翻译出版过程中我们尽可能做到精益求精,但由于水平所限,错误在所难免,敬请广大读者批评指正。

韩如泉 乔慧

2013年4月于北京

序言 脊柱畸形外科医生的视角

三十多年前，部分神经生理学家、外科医生、麻醉科医生等来自多个国家的多学科研究人员开创了术中神经监测，旨在为患者提供更好的监护手段，保证神经功能的完整性。他们相继举办了很多国际会议，推动了专业协会的建立和发展，引起了人们对术中监测（intraoperative monitoring, IOM）越来越大的关注。如果没有那些将大部分时间奉献于 IOM 领域的众多人的贡献和支持，就不会有今天的成绩。谨以此书献给 IOM 开创者以及为本领域做出贡献的每一个人。

原著序一：脊柱矫形外科医生的视角

20 世纪 60 年代后期，为了发展脊柱侧凸矫形手术中的脊髓功能监测系统，我们促使凯斯西储大学（Case Western Reserve University, CWRU）启动了该项目。在哈氏棒（Harrington Rods）矫治脊柱弯曲的手术过程中，脊髓功能监测可以提示脊髓所存在的危险。最初，我们以团队工作的形式着手建立监测系统。大学的附属医院和 CWRU 拥有足够的专业技术来解决这个极具难度的挑战。20 世纪 50 年代 Dawson 报道了一位名叫 Jerald Brodkey 的年轻神经外科医生拥有刺激周围神经远端而在皮质记录信号的技术。同时还有一位非常睿智年轻的生物医学工程师 Richard Brown，他在 CWRU Victor Frankel 和 AI Burstein 的生物医学工程研究所工作。Richard 获得的是电子工程的学士学位，他利用业余时间研究脊髓监测项目，并且作为他博士论文的课题。

实验室所采用的方法是研究狗的胸髓不同节段脊髓将刺激从肢体末端传递到皮质的能力的影响因素。很显然在这些研究的过程中，压强、时间和血压都会对其产生关键影响。随后拥有商业性价值的神经监测系统投入使用，但是从一开始 Rich Brown 就认识到它们不能应用到手术室这种高电场的环境中。因此他开始着手研究一种独立的、能够在手术室环境中准确记录到微小皮质信号的脊髓监测系统。Rich 最初配置了四个通道，但是很快扩展到了八个通道，并且所有数据可以存储到磁带中以供日后分析。“实时”记录评估以屏幕上输出的基线作为背景，根据当前所记录的输出曲线的起伏，来直观地判断潜伏期和波幅的变化。筛选适当刺激频率、刺激方式、电压都是需要解决的影响因素。尽管如此，潜伏期及波幅改变的“报警信号”只有 10%~50% 可以成为有指导意义的证据。Rich 的目标就是建立一个能提供有效数据的系统。