Fetal and Neonatal Brain Injury
Fetal and Neonatal Brain Injury

Fourth Edition

Edited by
David K. Stevenson
William E. Benitz
Philip Sunshine
Susan R. Hintz
Maurice L. Druzin
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Contributors

Reinaldo Acosta
Sacred Heart Women’s Health Center, Spokane, Washington, USA

Julie M. R. Arafeh
Stanford University Medical Center, Stanford, California, USA

Rebecca N. Baergen
New York Presbyterian Hospital, Weill Comell Medical College, New York, USA

Patrick D. Barnes M.D.
Lucile Packard Children’s Hospital at Stanford, Palo Alto, California, USA

Robert D. Barrett
The University of Auckland, Auckland, New Zealand

William E. Benitz
Stanford University Medical Center, Stanford, California, USA

Laura Bennet
The University of Auckland, Auckland, New Zealand

Jonathan A. Bernstein
Stanford University Medical Center, Stanford, California, USA

Yair Blumenfeld
Stanford University Medical Center, Stanford, California, USA

Theonia K. Boyd
Harvard Medical School, Boston, Massachusetts, USA

Ken Brady
Johns Hopkins School of Medicine, Baltimore, Maryland, USA

David P. Carlton
Emory University, Atlanta, Georgia, USA

Usha Chitkara
Stanford University Medical Center, Stanford, California, USA

Jane Chueh
Stanford University Medical Center, Stanford, California, USA

Ronald S. Cohen
Stanford University Medical Center, Stanford, California, USA

Justin Collingham
Stanford University Medical Center, Stanford, California, USA

Marvin Cornblath (deceased)
The Johns Hopkins University, Baltimore, Maryland, USA

Alexis S. Davis
Stanford University Medical Center, Stanford, California, USA

Justin Mark Dean
The University of Auckland, Auckland, New Zealand

Maurice L. Druzin
Stanford University Medical Center, Stanford, California, USA

Bonnie Dwyer
Stanford University Medical Center, Stanford, California, USA

Yasser Y. El-Sayed
Stanford University Medical Center, Stanford, California, USA

Gregory M. Enns
Stanford University Medical Center, Stanford, California, USA

Andrea Enright
Stanford University Medical Center, Stanford, California, USA

Heidi M. Feldman
Stanford University Medical Center, Stanford, California, USA

Donna M. Ferriero
University of California San Francisco, San Francisco, California, USA

Rayley A. Gans
Stanford University Medical Center, Stanford, California, USA

Hannah C. Glass
University of San Francisco, San Francisco, California, USA
Alistair J. Gunn  
The University of Auckland, Auckland, New Zealand

Kathleen Gutierrez  
Stanford University Medical Center, Stanford, California, USA

Jin S. Hahn  
Stanford University Medical Center, Stanford, California, USA

Louis P. Halamek  
Stanford University Medical Center, Stanford, California, USA

Rima Hanna-Wakim  
Stanford University Medical Center, Stanford, California, USA

William W. Hay, Jr.  
University of Colorado School of Medicine, Aurora, Colorado, USA

Israel Hendler  
Sheba Medical Center, Tel Hashomer, Israel

Susan R. Hintz  
Stanford University Medical Center, Stanford, California, USA

H. Eugene Hoyme  
Sanford Children's Hospital, Sioux Falls, South Dakota and Stanford Medical Center, Stanford, California, USA

Louanne Hudgins  
Stanford University Medical Center, Stanford, California, USA

Satish C. Kalhan  
Case Reserve University, Cleveland, Ohio, USA

John A. Kerner  
Stanford University Medical Center, Stanford, California, USA

Bea Latal  
University of British Columbia, British Columbia, Canada

Ronald J. Lemire (deceased)  
Stanford University Medical Center, Stanford, California, USA

Irene M. Loe  
Stanford University Medical Center, Stanford, California, USA

Deirdre J. Lyell  
Stanford University Medical Center, Stanford, California, USA

Yvonne A. Maldonado  
Stanford University Medical Center, Stanford, California, USA

Melanie A. Manning  
Stanford University Medical Center, Stanford, California, USA

Lee J. Martin  
Johns Hopkins University School of Medicine, Baltimore, Maryland, USA

Steven P. Miller  
University of British Columbia, British Columbia, Canada

Amen Ness  
University of California San Francisco, San Francisco, California, USA

William Oh  
Brown University, Providence, Rhode Island, USA

Donald M. Olson  
Stanford University Medical Center, Stanford, California, USA

Giles J. Peek  
Glenfield Hospital, Leicester, United Kingdom

Alistair G. S. Philip  
Stanford University Medical Center, Stanford, California, USA

Chandra Ramamoorthy  
Stanford University Medical Center, Stanford, California, USA

William D. Rhine  
Stanford University Medical Center, Stanford, California, USA

Ted S. Rosenkrantz  
University of Connecticut School of Medicine, Farmington, Connecticut, USA

Mark S. Scher  
Rainbow Babies and Children's Hospital, Cleveland, Ohio, USA

Robert Schwartz  
Brown University, Providence, Rhode Island, USA

Daniel S. Seidman  
Sheba Medical Center, Tel Hashomer, Israel

Avinash K. Shetty  
Wake Forest University Health Sciences, Winston-Salem, North Carolina, USA

David Sheuerman  
Sheuerman, Martini & Tabari, Attorneys at Law, San Jose, California, USA

Janet Shimotake  
University of California San Francisco, San Francisco, California, USA
Contributors

David K. Stevenson
Stanford University Medical Center, Stanford, California, USA

Philip Sunshine
Stanford University Medical Center, Stanford, California, USA

Trenna L. Sutcliffe
Stanford University Medical Center, Stanford, California, USA

Masoud Taslimi
Stanford University Medical Center, Stanford, California, USA

Krisa P. Van Meurs
Stanford University Medical Center, Stanford, California, USA

Zinaida S. Vexler
University of California San Francisco, San Francisco, California, USA

Linda S. de Vries
Wilhelmina Children's Hospital, Utrecht, the Netherlands

Thomas E. Wiswell
Center for Neonatal Care, Orlando, Florida, USA

Ronald J. Wong
Stanford University Medical Center, Stanford, California, USA

Ernlé W. D. Young
Stanford University Medical Center, Stanford, California, USA
Foreword

Neonatal–perinatal medicine emerged as a subspecialty in the 1960s, and the first certification examination by the American Board of Pediatrics took place in 1975. Prior to the application of intensive care, neonatal–perinatal medicine could be characterized as being anecdotally based, with benign neglect and a series of disastrous interventions. Great progress has been made, and evidence-based medicine is now the order of the day. The data base has expanded exponentially and we stand on the threshold of seminal therapeutic breakthroughs. The impossible is being made possible, and we anticipate that the ability to repair organs such as the brain and spinal cord will soon be part of our armamentarium.

There has been a dizzying proliferation of scientific knowledge related to the brain that has been incorporated into the fourth edition of *Fetal and Neonatal Brain Injury*. Whereas there is a general awareness that by the time a textbook is published it typically trails current knowledge, the editors have made every effort to remedy this. The fourth edition includes new authors or topic headings for 21 of the 50 chapters, and the text is as near to current as is humanly possible.

Simplifying neuroscience for non-neurologists is a daunting task. Yet somehow, through their choice of contributors, the editors have successfully assembled a book that is comprehensive, up to date, understandable, and interesting to read. The sections have been somewhat rearranged but they follow a logical sequence and new chapters and contributors blend seamlessly with those that have been updated. Although the text is mainly focused on the central and peripheral nervous system, because any disorder in the neonate may affect the brain, the reader is subjected to an excellent refresher course on general neonatology.

When I wrote the foreword to the third edition, we could anticipate the outcomes from the hypothermia for hypoxic ischemic encephalopathy trials – the data are available and encouraging. However, additional therapy is still needed as approximately half the treated group is still significantly harmed by the perinatal insult. Furthermore, there is a suggestion that the outcomes for extremely low-birthweight infants are improving. The developing brain is slowly revealing its secrets, and we can anticipate even better outcomes in the future.

The latest advances in genetics, neurobiology, and imaging as well as the therapeutic advances in the treatment of asphyxia and seizures, to mention a few, are well described. There are also a number of journeys that can be followed from bench to bedside. I came away with an optimistic feeling that we are on the brink of major breakthroughs in neuronal repair, as well as a deep respect for the plasticity of the brain. A Canadian psychiatrist, Norman Doidge, has called neural plasticity "one of the most extraordinary discoveries of the twentieth century." Neural plasticity permits the neonatal brain to move a given function to a different location as a consequence of normal experience or brain damage/recovery. Is it really possible that thinking, learning, and acting actually change the structure and function of the brain? Certainly there is every reason, based on the accumulating evidence, to believe this to be true. Better understanding of this remarkable ability will enable the maximum recovery from insults to the brain. Also the recognition and characterization of neuromodulators and neurotrophic factors, together with a better understanding of the genetic, hormonal, and cytokine control of the neurons, should result in the successful introduction of newer and better pharmacologic agents. Ultimately we can anticipate the implantation of cells genetically modified to secrete the appropriate cytokines, hormones, or therapeutic agents to modulate the brain.

Avroy A. Fanaroff
Gertrude Lee Tucker Professor and Chair
Eliza Henry Barnes Professor of Neonatology
Department of Pediatrics
Rainbow Babies & Children’s Hospital
Case Western Reserve University
Cleveland, Ohio
Preface

In preparing the fourth edition of our textbook, we have incorporated the newest data regarding the pathophysiology and cellular and molecular bases of neonatal encephalopathy. We have added the most recent data depicting the emergence of newer and promising forms of therapy, including the results of randomized clinical trials using hypothermia.

We have added two new editors for this edition, Dr. Maurice L. Druzin, who is the Chief of Maternal Fetal Medicine at Stanford University, and Susan R. Hintz, an Associate Professor of Pediatrics in the Division of Neonatal and Developmental Medicine. Dr. Druzin has reorganized the section on obstetrical factors that can contribute to fetal and neonatal brain injury and has recruited new contributors for this endeavor. Dr. Hintz, who has provided leadership in prenatal counseling and is the Director of our new Center for Comprehensive Fetal Health, has also focused on outcome studies in various disease processes in the neonate, and recruited new contributors to provide additional outcome data and recommendations.

We have added several new chapters, including ones addressing pregnancy-induced hypertension, HELLP syndrome and chronic hypertension, complications of multiple gestation, neurogenic disorders of the brain, pathogenesis of white-matter injury in the preterm infant, neonatal stroke, assessment and management of infants with cerebral palsy, the long-term outcome of neonatal events on speech, language development, and academic achievement, as well as the neurological outcome of infants with neonatal encephalopathy. We have expanded the chapters on the mechanism of brain damage in animal models of neonatal encephalopathy, the structural and functional imaging of the fetal and neonatal brain, and hemorrhagic lesion of the central nervous system.

As we noted in our previous editions, with any text that has multiple contributors, there is some overlap and repetition among the various presentations. Rather than editing these chapters to avoid such overlap entirely, we have elected to respect the authors’ unique presentations and styles, as different perspectives reflect the richness of their experiences. It also allows the contributors to express their opinions freely, and the variation of opinion in similar topics can be appreciated more fully.

We thank our collaborators, especially those who met their editorial deadlines, as well as the staff of Cambridge University Press for their support and expertise in preparing the text. We thank Cele Quaintance, who helped organize the content of the text, maintained contact with our contributors, and collected and collated the chapters as they were received. We also thank Mrs. Tonya Gonzales-Clenney, who helped edit many of the chapters to fit the format of the text, and maintained communications with our publishers.

Lastly, we owe a great deal to our spouses, Joan Stevenson, Andrea Benitz, Sara Sunshine, Elizabeth Hoffman, and Henry Rosack, for their support, encouragement, and infinite patience.