SUPPLEMENT TO

NEUROSURGERY

CLINICAL NEUROSURGERY

VOLUME 56



Education and Innovation

CLINICAL NEUROSURGERY



Education and Innovation

Health Wolters Kluwer Lippincott Williams & Wilkins

Copyright ©2009 THE CONGRESS OF NEUROLOGICAL SURGEONS



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 or retrieval system without written permission from the copyright holder.

Accurate indications, adverse reactions, and dosage schedules or drugs are provided in this book, but it is possible that they may have changed. The reader is urged to review the package information data of the manufacturer of the medications mentioned.

Printed in the United States of America (ISSN: 0069-4827)

CLINICAL NEUROSURGERY

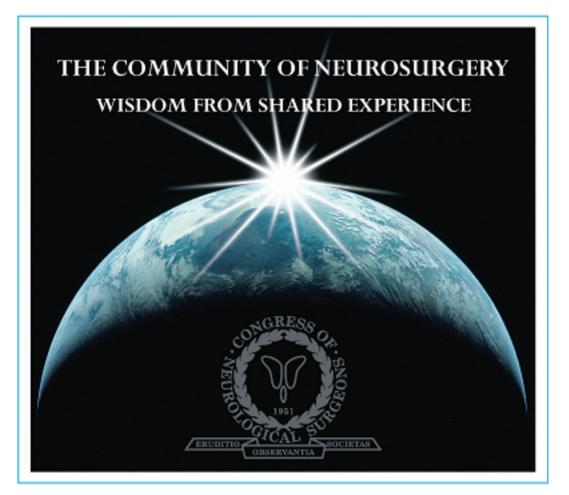
Volume 56

Proceedings

OF THE CONGRESS OF NEUROLOGICAL SURGEONS

> Orlando, Florida 2008





CONGRESS OF NEUROLOGICAL SURGEONS 2008 ANNUAL MEETING ORLANDO, FLORIDA SEPTEMBER 20 – 25, 2008

Preface

The 58^{th} Annual Meeting of the Congress of Neurological Surgeons was held at the Orlando Convention Center in Orlando, Florida from September 20–25, 2009. Volume 56 of *Clinical Neurosurgery* represents the official compilation of the invited scientific manuscripts from the plenary sessions, the Presidential address by Dr. Anthony Asher, and biographic and bibliographic information of the Honored Guest, Dr. William F. Chandler.

Dr. Gerald Rodts, Jr., Annual Meeting Chairman, and Dr. Nathan Selden and Dr. Ali Rezai, Scientific Program Chair and Vice-Chair, respectively, organized an excellent meeting, that was very well attended. The theme of this year's Annual Meeting was *The Community of Neurosurgery: Wisdom from Shared Experience*. This meeting was also a joint meeting with the Sociedade Brasileira de Neurocirugia (SBN).

Dr. Anthony Asher eloquently delivered his Presidential address entitled, "Enlightened Learning in a Knowledge Society," which challenged us all to lead the revolution in medical learning as members of a community of neurosurgery. Honored Guest, Dr. William Chandler, Past President of the CNS and Professor of Neurological Surgery at the University of Michigan, presented his pearls and scholarly wisdom from 30 years of pituitary surgery. He also discussed his philosophy on neurosurgery residency training as well as the regulation of the neurosurgical practice.

For the first year, all manuscripts in this volume of *Clinical Neurosurgery* were peer reviewed by scientific program committee members (see reviewer section) as well as the Editorial Board. We thank Dr. Michael Apuzzo for his unrelentless support, advice, and friendship throughout this transition. We thank Staff Editor, Veronica Pagan, as well as Jennifer Sollenberger at WoltersKluwer Health, Lippincott Williams and Wilkins, and Michele Lengerman and Laurie L. Behncke from the CNS Headquarters for their hard work, commitment, and dedication to this volume.

We welcome Dr. David Adelson as the new President of the Congress of Neurological Surgeons and look forward to seeing you all in New Orleans.

> Gerald A. Grant, M.D. Editor-in-Chief Duke University

Robert A. Mericle, M.D. Associate Editor Vanderbilt University

Reviewers

Manish K. Aghi, M.D., Ph.D. University of California at San Francisco San Francisco, California

Edward C. Benzel, M.D. Cleveland Clinic Cleveland, Ohio

Jeffrey N. Bruce, M.D. The Neurosurgical Institute New York, New York

E. Antonio Chiocca, M.D., Ph.D. The Ohio State University Medical Center Columbus, Ohio

Curtis A. Dickman, M.D. Barrow Neurological Institute; St. Josephs Hospital and Medical Center Phoenix, Arizona

E. Hunter Dyer, M.D. Carolina Neurosurgery & Spine Associates Charlotte, North Carolina

Gerald A. Grant, M.D. Duke University Medical Center Durham, North Carolina

John G. Golfinos, M.D. NYU Medical Center New York, New York

Patrick J. Kelly, M.D., F.A.C.S. NYU Medical Center New York, New York

Mark E. Linskey, M.D. University of California at Irvine Orange, California

Russell R. Lonser, M.D. National Institute of Neurological Disorders and Stroke Bethesda, Maryland

Dennis J. Maiman, M.D., Ph.D. University of Wisconsin Medical College of Wisconsin Milwaukee, Wisconsin

Robert A. Mericle, M.D. Vanderbilt University Nashville, Tennessee Alfredo Quiñones-Hinojosa, M.D. Johns Hopkins University Baltimore, Maryland

James T. Rutka, M.D., Ph.D., F.R.C.S., F.A.C.S. The Hospital for Sick Children Toronto, Ontario, Canada

Mick J. Perez-Cruet, M.D. Michigan Head and Spine Institute Southfield, Michigan

Mark E. Shaffrey, M.D. University of Virginia Charlottesville, Virginia

Ashwini D. Sharan, M.D. Thomas Jefferson University Philadelphia, Pennsylvania

Daniel L. Silbergeld, M.D. University of Washington Med Center Seattle, Washington

Philip A. Starr, M.D. University of California at San Francisco San Francisco, California

Michael Y. Wang, M.D. University of Miami Miami, Florida

Honored Guests

1952—Professor Herbert Olivecrona, Stockholm, Sweden

- 1953—Sir Geoffrey Jefferson, Manchester, England
- 1954—Dr. Kenneth G. McKenzie, Toronto, Canada
- 1955—Dr. Carl W. Rand, Los Angeles, California
- 1956—Dr. Wilder G. Penfield, Montreal, Canada
- 1957—Dr. Francis C. Grant, Philadelphia, Pennsylvania
- 1958—Dr. A. Earl Walker, Baltimore, Maryland
- 1959—Dr. William J. German, New Haven, Connecticut
- 1960—Dr. Paul C. Bucy, Chicago, Illinois
- 1961—Professor Eduard A.V. Busch, Copenhagen, Denmark
- 1962—Dr. Bronson S. Ray, New York, New York
- 1963—Dr. James L. Poppen, Boston, Massachusetts
- 1964—Dr. Edgar A. Kahn, Ann Arbor, Michigan
- 1965—Dr. James C. White, Boston, Massachusetts
- 1966—Dr. Hugh A. Krayenbühl, Zurich, Switzerland
- 1967—Dr. W. James Gardner, Cleveland, Ohio
- 1968—Professor Normal M. Dott, Edinburgh, Scotland
- 1969—Dr. Wallace B. Hamby, Cleveland, Ohio
- 1970-Dr. Barnes Woodhall, Durham, North Carolina
- 1971—Dr. Elisha S. Gurdjian, Detroit, Michigan
- 1972—Dr. Francis Murphey, Memphis, Tennessee
- 1973—Dr. Henry G. Schwartz, St. Louis, Missouri
- 1975—Dr. Guy L. Odom, Durham, North Carolina
- 1976—Dr. William A. Sweet, Boston, Massachusetts
- 1977—Dr. Lyle A. French, Minneapolis, Minnesota
- 1977—Dr. Richard C. Schneider, Ann Arbor, Michigan
- 1978—Dr. Charles D. Drake, London, Canada
- 1979—Dr. Frank H. Mayfield, Cincinnati, Ohio
- 1980-Dr. Eben Alexander, Jr., Winston-Salem, North Carolina
- 1981—Dr. J. Barber Galbraith, Birmingham, Alabama
- 1982—Dr. Keiji Sano, Tokyo, Japan
- 1983—Dr. C. Miller Fisher, Boston, Massachusetts
- 1984—Dr. Hugo V. Rizzoli, Washington, DC
 - Dr. Walter E. Dandy (posthumously), Baltimore, Maryland
- 1985—Dr. Sidney Goldring, St. Louis, Missouri
- 1986—Dr. M. Gazi Yaşargil, Zurich, Switzerland
- 1987—Dr. Thomas W. Langiftt, Philadelphia, Pennsylvania
- 1988—Professor Lindsay Symon, London, England
- 1989—Dr. Thoralf M. Sundt, Jr., Rochester, Minnesota
- 1990-Dr. Charles B. Wilson, San Francisco, California
- 1991—Dr. Bennett M. Stein, New York, New York
- 1992—Dr. Robert G. Ojemann, Boston, Massachusetts
- 1993—Dr. Albert L. Rhoton, Jr., Gainesville, Florida
- 1994-Dr. Robert F. Spetzler, Phoenix, Arizona
- 1995—Dr. John A. Jane, Charlottesville, Virginia
- 1996-Dr. Peter J. Jannetta, Pittsburgh, Pennsylvania
- 1997—Dr. Nicholas T. Zervas, Boston, Massachusetts
- 1998—Dr. John M. Tew, Cincinnati, Ohio
- 1999—Dr. Duke S. Samson, Dallas, Texas
- 2000—Dr. Edward R. Laws, Charlottesville, Virginia
- 2001-Dr. Michael L.J. Apuzzo, Los Angeles, California
- 2002—Dr. Volker K.H. Sonntag, Phoenix, Arizona
- 2003—Dr. Julian T. Hoff, Ann Arbor, Michigan
- 2004—Dr. Arnold H. Menezes, Iowa City, Iowa
- 2005—Dr. Roberto C. Heros, Miami, Florida
- 2006—Dr. Peter M. Black, Boston, Massachusetts
- 2007—Dr. L. Dade Lunsford, Pittsburgh, Pennsylvania
- 2008—Dr. William F. Chandler, Ann Arbor, Michigan

Officers of the Congress of Neurological Surgeons 2008

ANTHONY L. ASHER, M.D., F.A.C.S. President

P. DAVID ADELSON, M.D., F.A.C.S., F.A.A.P. President-Elect

CHRISTOPHER C. GETCH, M.D. Vice President CHRISTOPHER E. WOLFLA, M.D. Secretary

JOEL D. MACDONALD, M.D. Treasurer

DOUGLAS S. KONDZIOLKA, M.D., M.SC., F.R.S.C., F.A.C.S. Past President

EXECUTIVE COMMITTEE

SALEEM I. ABDULRAUF, M.D., F.A.C.S.
WILLIAM E. BINGAMAN, JR., M.D.
NICHOLAS M. BOULIS, M.D.
C. MICHAEL CAWLEY III, M.D.
E. HUNTER DYER, M.D.
ROBERT M. FRIEDLANDER, M.D.
ELAD I. LEVY, M.D.
MARK E. LINSKEY, M.D.
ZACHARY N. LITVACK, M.D.
CHARLES Y. LIU, M.D., PH.D.
RUSSELL R. LONSER, M.D.

GANESH RAO, M.D. DANIEL K. RESNICK, M.D. ALI R. REZAI, M.D. GERALD E. RODTS, JR., M.D. ALAN M. SCARROW, M.D. NATHAN R. SELDEN, M.D., PH.D., F.A.C.S., F.A.A.P. ASHWINI D. SHARAN, M.D. JASON P. SHEEHAN, M.D., PH.D. MICHAEL P. STEINMETZ, M.D. JAMIE SUE ULLMAN, M.D., F.A.C.S.

Congress of Neurological Surgeons Past Presidents

1951—Elmer E. Schultz, M.D. 1952—Hendrik J. Svien, M.D. 1953—Nathaniel R. Hollister, M.D. 1954—James R. Gay, M.D. 1955—Donald B. Sweeney, M.D. 1956-Bland W. Cannon, M.D. 1957—Frederick C. Rehfeldt, M.D. 1958—Raymond K. Thompson, M.D. 1959—Philip D. Gordy, M.D. 1960—Thomas M. Marshall, M.D. 1961-Martin P. Sayers, M.D. 1962—Richard L. DeSaussure, M.D. 1963—A. Roy Tyrer, Jr., M.D. 1964—Edward C. Weiford, M.D. 1965-Gordon van den Noort, M.D. 1966—William H. Mosberg, Jr., M.D. 1967—John R. Russell, M.D. 1968—John Shillito, Jr., M.D. 1969—Paul C. Sharkey, M.D. 1970—John M. Thompson, M.D. 1971-Donald F. Dohn, M.D. 1972—John N. Meagher, M.D. 1973—Bernard S. Patrick, M.D. 1974—George T. Tindall, M.D. 1975—James T. Robertson, M.D. 1976-Robert G. Ojemann, M.D. 1977—Bruce F. Sorensen, M.D. 1978—Albert L. Rhoton, Jr., M.D. 1979—David L. Kelly, Jr., M.D. 1980—Robert H. Wilkins, M.D. 1981—J. Fletcher Lee, M.D. 1982-Donald H. Stewart, Jr., M.D. 1983—John M. Tew, Jr., M.D. 1984—Edward R. Laws, Jr., M.D. 1985—Robert A. Ratcheson, M.D. 1986—Joseph C. Maroon, M.D. 1987-Donald O. Quest, M.D. 1988—Christopher B. Shields, M.D. 1989—J. Michael McWhorter, M.D. 1990—Hal L. Hankinson, M.D. 1991—Michael Salcman, M.D. 1992—William F. Chandler, M.D. 1993—Arthur L. Day, M.D. 1994-Richard Roski, M.D. 1995—Ralph G. Dacey, Jr., M.D. 1996—Stephen J. Haines, M.D. 1997—Marc R. Mayberg, M.D. 1998—William A. Friedman, M.D. 1999—H. Hunt Batjer, M.D. 2000—Daniel L. Barrow, M.D. 2001—Issam A. Awad, M.D. 2002—Stephen M. Papadopoulos, M.D. 2003—Mark N. Hadley, M.D. 2004—Vincent C. Traynelis, M.D. 2005—Nelson M. Oyesiku, M.D. 2006—Richard G. Ellenbogen, M.D. 2007—Douglas S. Kondziolka, M.D. 2008—Anthony L. Asher, M.D.

Editors-in-Chief Clinical Neurosurgery

Volume	Date	Editor-in-Chief
1	1953	Raymond K. Thompson, M.D.
2	1954	Raymond K. Thompson, M.D. & Ira J. Jackson, M.D.
3	1955	Raymond K. Thompson, M.D. & Ira J. Jackson, M.D.
4	1956	Ira J. Jackson, M.D.
5	1957	Robert G. Fisher, M.D.
6	1958	Robert G. Fisher, M.D.
7	1959	Robert G. Fisher, M.D.
8	1960	William H. Mosberg, Jr., M.D.
9	1961	William H. Mosberg, Jr., M.D.
10	1962	William H. Mosberg, Jr., M.D.
11	1963	John Shillito, Jr., M.D. & William H. Mosberg, Jr., M.D.
12	1964	John Shillito, Jr., M.D.
13	1965	John Shillito, Jr., M.D.
14	1966	Robert G. Ojemann, M.D. & John Shillito, Jr., M.D.
15	1967	Robert G. Ojemann, M.D.
16	1968	Robert G. Ojemann, M.D.
17	1969	Robert G. Ojemann, M.D.
18	1970	George T. Tindall, M.D.
19	1971	George T. Tindall, M.D.
20	1972	Robert H. Wilkins, M.D.
21	1973	Robert H. Wilkins, M.D.
22	1974	Robert H. Wilkins, M.D.
23	1975	Ellis B. Keener, M.D.
24	1976	Ellis B. Keener, M.D.
25	1977	Ellis B. Keener, M.D.
26	1978	Peter W. Carmel, M.D.
27	1979	Peter W. Carmel, M.D.
28	1980	Peter W. Carmel, M.D.
29	1981	Martin H. Weiss, M.D.
30	1982	Martin H. Weiss, M.D.
31	1983	Martin H. Weiss, M.D.
32	1984	John R. Little, M.D.
33	1985	John R. Little, M.D.
34	1986	John R. Little, M.D.
35	1987	Peter McL. Black, M.D., Ph.D.
36	1988	Peter McL. Black, M.D., Ph.D.
37	1989	Peter McL. Black, M.D., Ph.D.
38	1990	Warren R. Selman, M.D.
39	1991	Warren R. Selman, M.D.
40	1992	Warren R. Selman, M.D.
$41 \\ 42$	1993	Christopher M. Loftus, M.D.
42 43	$\begin{array}{c} 1994 \\ 1995 \end{array}$	Christopher M. Loftus, M.D. Christopher M. Loftus, M.D.
43	1995	M. Sean Grady, M.D.
45	1997	M. Sean Grady, M.D.
46	1998	M. Sean Grady, M.D.
40	1999	Matthew A. Howard III, M.D.
48	2000	Matthew A. Howard III, M.D.
49	2000	Matthew A. Howard III, M.D.
50	2001	Guy M. McKhann II, M.D.
51	2002	Guy M. McKhann II, M.D.
52	2004	Guy M. McKhann II, M.D.
53	2005	Guy M. McKhann II, M.D. & Gerald A. Grant, M.D.
54	2006	Gerald A. Grant, M.D.
55	2007	Gerald A. Grant, M.D.
56	2008	Gerald A. Grant, M.D.

Contributors

Mohamed Abou-Ghazal, M.D. Department of Neurosurgery The University of Texas M.D. Anderson Cancer Center Houston, Texas

Martin Adler, Ph.D. Center for Substance Abuse Research Temple University School of Medicine Pittsburgh, Pennsylvania

Deepak Agrawal, M.B.B.S., M.S., M.Ch. Department of Neurosurgery and Gamma-Knife All India Institute of Medical Sciences New Delhi, India

Peter Angelos, M.D., Ph.D. Department of Surgery The University of Chicago Chicago, Illinois

Gary E. Archer, Ph.D. Division of Neurosurgery Duke University Medical Center Durham, North Carolina

Anthony L. Asher, M.D., F.A.C.S. Carolina NeuroSurgery & Spine Charlotte, North Carolina

Frederick G. Barker II, M.D. Department of Surgery (Neurosurgery) Harvard Medical School Boston, Massachusetts

Darric E. Baty, M.D. Department of Neurosurgery Temple University Hospital Pittsburgh, Pennsylvania

James R. Bean, M.D. Neurosurgical Associates Lexington, Kentucky

Ian Beauprie, M.D. Department of Anesthesia Dalhousie University Halifax, Nova Scotia, Canada

Edward C. Benzel, M.D. Department of Neurosurgery Center for Spine Health Cleveland Clinic Cleveland, Ohio Nicholas Boulis, M.D. Department of Neurosurgery Emory University School of Medicine Atlanta, Georgia

Jeffrey Alan Brown, M.D. Neurological Surgery, P.C. Great Neck, New York

William F. Chandler, M.D. University of Michigan Health System Ann Arbor, Michigan

Clark C. Chen, M.D., Ph.D. Department of Radiation Oncology Division of Neurosurgery Dana Farber Cancer Institute Boston, Massachusetts

Alan D'Andrea, M.D. Department of Radiation Oncology Dana Farber Cancer Institute Boston, Massachusetts

Sabrina C. Desbordes, Ph.D. Developmental Biology Program Sloan-Kettering Institute for Cancer Research New York, New York

Evandro de Oliveira, M.D., Ph.D. Neurological Surgery Department University of Campinas Campinas, Brazil Institute of Neurological Sciences Sào Paulo, Brazil

M. Sam Eljamel, M.B.B.S., M.D., F.R.C.S. Department of Neurosurgery Ninewells Hospital and Medical School Dundee, Scotland

Gregory N. Fuller, M.D., Ph.D. Department of Pathology The University of Texas M.D. Anderson Cancer Center Houston, Texas

Doina Ganea, Ph.D. Department of Microbiology and Immunology Temple University School of Medicine Pittsburgh, Pennsylvania Rene Garcia, M.D. Division of Neurosurgery Department of Surgery Dalhousie University Halifax, Nova Scotia, Canada

John P. Gaughan, Ph.D. Department of Physiology Temple University School of Medicine Pittsburgh, Pennsylvania

Michael W. Groff, M.D. Harvard Medical School Boston, Massachusetts

Neil Harrison, Ph.D. Departments of Pharmacology and Anesthesiology Weill Medical College of Cornell University New York Presbyterian Hospital New York, New York

Amy Beth Heimberger, M.D. Department of Neurosurgery The University of Texas M.D. Anderson Cancer Center Houston, Texas

Joshua E. Heller, M.D. Department of Neurosurgery Temple University Hospital Pittsburgh, Pennsylvania

Nobuyoshi Hiraoka, M.D., Ph.D. Pathology Division National Cancer Center Research Institute Tokyo, Japan

Lauren Hu, M.S. Department of Radiation Oncology Dana Farber Cancer Institute Boston, Massachusetts

Jack I. Jallo, M.D., Ph.D., F.A.C.S. Department of Neurosurgery Temple University School of Medicine Pittsburgh, Pennsylvania

Fan Jia, Ph.D. Departments of Pharmacology and Anesthesiology Weill Medical College of Cornell University New York Presbyterian Hospital New York, New York Andrei Fernandes Joaquim, M.D. Neurological Surgery Department University of Campinas Campinas, Brazil

Santosh Kesari, M.D., Ph.D Department of Medical Oncology Dana Farber Cancer Institute Boston, Massachusetts

Ling-Yuan Kong, Ph.D. Department of Neurosurgery The University of Texas M.D. Anderson Cancer Center Houston, Texas

Andrew Kung, M.D., Ph.D. Department of Medical Oncology Dana Farber Cancer Institute Boston, Massachusetts

Fabien Lafaille, M.S. Developmental Biology Program Sloan-Kettering Institute for Cancer Research New York, New York

Hyojin Lee, Ph.D. Developmental Biology Program Sloan-Kettering Institute for Cancer Research New York, New York

Hongbo Li, M.D. Department of Physiology Temple University School of Medicine Pittsburgh, Pennsylvania

Christopher M. Loftus, M.D., F.A.C.S. Department of Neurosurgery Temple University School of Medicine Pittsburgh, Pennsylvania

Richard E. Mayer, Ph.D. Department of Psychology University of California, Santa Barbara Santa Barbara, California

Philippe Magown, M.D.C.M. Division of Neurosurgery Department of Surgery Dalhousie University Halifax, Nova Scotia, Canada Ivar M. Mendez, M.D., Ph.D. Division of Neurosurgery Department of Surgery Dalhousie University Halifax, Nova Scotia, Canada

Kimberly Ng, B.S. Department of Radiation Oncology Dana Farber Cancer Institute Boston, Massachusetts

Masayuki Nitta, M.D., Ph.D. Department of Radiation Oncology Dana Farber Cancer Institute Boston, Massachusetts

Dimitris G. Placantonakis, M.D., Ph.D. Department of Neurosurgery Sloan-Kettering Institute for Cancer Research Department of Neurological Surgery Weill Medical College of Cornell University New York Presbyterian Hospital New York, New York

Waldemar Priebe, Ph.D. Experimental Therapeutics The University of Texas M.D. Anderson Cancer Center Houston, Texas

Wei Qiao, M.S. Division of Quantitative Sciences The University of Texas M.D. Anderson Cancer Center Houston, Texas

Bethwel Raore, M.D. Department of Neurosurgery Emory University School of Medicine Atlanta, Georgia

Chantal Reina-Ortiz Department of Neurosurgery The University of Texas M.D. Anderson Cancer Center Houston, Texas

Jonathan Riley, M.D. Department of Neurosurgery Emory University School of Medicine Atlanta, Georgia

John H. Sampson, M.D., Ph.D., M.H.Sc. Division of Neurosurgery Duke University Medical Center Durham, North Carolina Scott Santos, B.A. Department of Neurological Surgery Keck School of Medicine University of Southern California Los Angeles, California

Raymond Sawaya, M.D. Department of Neurosurgery The University of Texas M.D. Anderson Cancer Center Houston, Texas

Robert J. Schmittling, B.S. Division of Neurosurgery Duke University Medical Center Durham, North Carolina

Nicholas D. Socci, Ph.D. Computational Biology Center Sloan-Kettering Institute for Cancer Research New York, New York

Paul Steinbok, M.B.B.S., M.Sc., F.R.C.S.C. Division of Pediatric Neurosurgery British Columbia Children's Hospital Vancouver, British Columbia, Canada

Lorenz Studer, M.D. Department of Neurosurgery Developmental Biology Program Sloan-Kettering Institute for Cancer Research New York, New York

Viviane S. Tabar, M.D. Department of Neurosurgery Sloan-Kettering Institute for Cancer Research New York, New York

Mark J. Tomishima, Ph.D. Developmental Biology Program SKI Stem Cell Research Facility Sloan-Kettering Institute for Cancer Research New York, New York

Ronald F. Tuma, Ph.D. Department of Physiology Temple University School of Medicine Pittsburgh, Pennsylvania

Agnes Viale, Ph.D. Molecular Biology Program Genomics Core Laboratory Sloan-Kettering Institute for Cancer Research New York, New York Michael A. Vogelbaum, M.D., Ph.D., F.A.C.S. Brain Tumor and Neuro-Oncology Center Department of Neurosurgery Cleveland Clinic/Neurological Institute Cleveland, Ohio

Jun Wei, Ph.D. Department of Neurosurgery The University of Texas M.D. Anderson Cancer Center Houston, Texas

David S. Yang, B.S. Department of Neurosurgery The University of Texas M.D. Anderson Cancer Center Houston, Texas

Ming Zhang, M.D., Ph.D. Department of Physiology Temple University School of Medicine Pittsburgh, Pennsylvania



WILLIAM F. CHANDLER

Honored Guest William F. Chandler, M.D.

Dr. William Chandler is the Richard C. Schneider Professor of Neurological Surgery at the University of Michigan. He is Codirector of the Multidisciplinary Pituitary and Neuroendocrine Clinic at the University of Michigan and Professor of Internal Medicine. Dr. Chandler has had a long-standing clinical and research interest in disorders of the pituitary. Along with these interests, he has maintained interest and expertise in cerebrovascular neurosurgery, brain tumor surgery, and general neurosurgery.

In 1980, Dr. Chandler and colleagues published one of the landmark articles on the use of intraoperative ultrasonography for brain tumor localization. Subsequent articles detailed the use of intraoperative ultrasonography for spinal cord tumors and intracranial vascular lesions. He was involved in the early work with intra-arterial radiosensitization for the treatment of malignant brain tumors. He was among the first surgeons at the University of Michigan to perform the microvascular bypass procedure and reported several innovative uses of these techniques. Dr. Chandler has worked closely with basic scientists to study the pathophysiology of pituitary tumors, including work with in situ hybridization and regulation of gene expression. He has worked with endocrinology colleagues to develop and test new drugs for the treatment of acromegaly.

A native of southeast Michigan, Dr. Chandler received his B.A. degree from Northwestern University. He received his medical degree from the University of Michigan and is member of AOA. He completed his internship and neurosurgery residency training at the University of Michigan. He received the VanWagenen Fellowship from the American Association of Neurological Surgeons (AANS) in 1977 and spent 6 months at the Karolinska Institute in Stockholm, Sweden. He worked there with Dr. Nicolas Zwetnow doing research in the field of elevated intracranial pressure. During this time, he also traveled to Paris to observe pituitary surgery by Dr. Gerard Guiot. He returned from Sweden to become an assistant professor of neurosurgery at Louisiana State University, with Dr. David Kline as the chairman. In 1979, he returned to the University of Michigan and rose through the ranks to become professor of neurosurgery. In 2003, because of his continued efforts in training fellows in endocrinology, Dr. Chandler was appointed professor of internal medicine. He did a sabbatical in 1986 with Dr. Alex Landoldt in Zurich, Switzerland, and also had the opportunity to work with Professor Yasargil.

In 1996, Dr. Chandler, along with Dr. Ariel Barkan from the Department of Endocrinology, started the Multidisciplinary Pituitary and Neuroendocrine Clinic. This clinic has been successful in attracting patients with a variety of pituitary-related diseases. The clinic has also served as a valuable opportunity for teaching both neurosurgery residents and endocrinology fellows the intricacies of pituitary disorders. Dr. Chandler has operated on nearly 2,000 patients with pituitary and parasellar tumors. He has participated in numerous practical courses on pituitary surgery at the major national neurosurgery meetings. Dr. Chandler has authored more than 130 peer-reviewed publications, three books, and numerous book chapters.

Dr. Chandler is very proudly a past president of the Congress of Neurological Surgeons (CNS). He also served as Annual Meeting Chairman and Scientific Program Chairman for the CNS. He was on the Board of Directors of the AANS and was Annual Meeting Chairman and Scientific Program Chairman for the AANS. Dr. Chandler was Chairman of the AANS-CNS Joint Section on Tumors. He was a director on the American Board of Neurological Surgery and served as chairman of the board in 2006. He served as chairman of the written examinations committee for the Board. He continues to serve on the Board of Directors of the American Board of Neurological Surgery. He was Vice President and Scientific Program Chairman for the American Board of Neurological Surgery. Dr. Chandler was President of the Michigan Association of Neurological Surgery. He is a member of the Society of Neurological Surgeons and of the International Society of Pituitary Surgeons. He is a fellow of the American College of Surgeons.

Dr. Chandler has been very happily married to Susan Chandler for 38 years. They have two sons, a daughter-in-law, and a beautiful granddaughter. Dr. Chandler has enjoyed family ski trips over the years and plays tennis all year round.

Selected Bibliography for William F. Chandler, M.D.

PUBLICATIONS

- 1. Feringa ER, Gurden GG, Strodel W, Chandler W, Knake J: Descending spinal motor tract regeneration after spinal cord transection. **Neurology** 23:599-608, 1973.
- 2. Chandler WF, Crosby EC: Motor effects of stimulation and ablation of the caudate nucleus of the monkey. **Neurology** 25:1160–1163, 1975.
- 3. Chandler WF, Kindt GW: Monitoring and control of intracranial pressure in non-traumatic encephalopathies. **Surg Neurol** 5:311–314, 1976.
- 4. Altenau LL, Kindt GW, Chandler WF: Effect of elevated serum ammonia on intracranial pressure. **Surg Forum** 27:490-491, 1976.
- 5. Chandler WF, Zwetnow NN, Löfgren J: Hysteresis in the relationship between cerebrospinal fluid absorption minus formation and cerebrospinal fluid pressure in the dog. **Neurosurgery** 5:349–353, 1979.
- Dakhil S, Ensminger W, Kindt G, Niederhuber J, Chandler, W, Greenberg H, Wheeler R: An implanted system for intraventricular drug infusion in central nervous system tumors. Cancer Treat Rep 65:401–411, 1981.
- 7. Swanson SE, Kocan MJ, Chandler WF: Flow regulated continuous spinal drainage: Technical note with case report. **Neurosurgery** 9:163–165, 1981.
- Greenberg HS, Ensminger WD, Seeger JF, Kindt GW, Chandler, F, Doan K, Dakhil SR: Intra-arterial BCNU chemotherapy for the central nervous system. A preliminary report. Cancer Treat Rep 65:803-810, 1981.
- Chandler WF, Ercius MS, Ford JW, LaBond V, Burkel WE: The effect of heparin reversal after carotid endarterectomy in the dog: A scanning electron microscope study. J Neurosurg 56:97–102, 1982.
- 10. Chandler WF, Dempsey RJ: Surg Neurol 16:390, 1981 (letter).
- 11. Knake JE, Chandler WF, McGillicuddy JE, Silver TM, Gabrielson TO: Intraoperative ultrasonography for brain tumor localization and ventricular shunt placement. AJNR Am J Neuroradiol 3:425–430, 1982 and AJR Am J Radiol 139:733–738, 1982.
- 12. Dauser RC, Chandler WF: Symptomatic congenital spinal stenosis in a child. **Neurosurgery** 11:61–63, 1982.
- 13. Chandler WF, Knake JE, McGillicuddy JE, Lillehei KO, Silver TM: Intraoperative use of real-time ultrasonography in neurosurgery. **J Neurosurg** 57:157–163, 1982.
- 14. Knake JE, Silver TM, Chandler WF: Intraoperative cranial sonography for neurosurgical procedures. **Semin Ultrasound** 2:200–208, 1982.
- 15. Shingleton BJ, Bienfang DC, Albert DM, Ensminger WD, Chandler WF, Greenberg HS: Ocular toxicity associated with BCNU. Arch Ophthalmol 100:1766–1772, 1982.
- Ercius MS, Chandler WF, Ford JW, Burkel WE: Early versus delayed heparin reversal after carotid endarterectomy in the dog. A scanning electron microscopy study. J Neurosurg 58:708-713, 1983.
- Lloyd RV, Gikas PW, Chandler WF: Prolactin and growth hormone producing pituitary adenomas. An immunohistochemical and ultrastructural study. Am J Surg Pathol 7:251– 260, 1983.
- Agha FP, Amendola MA, Shirazi KK, Amendola BE, Chandler WF: Abdominal complications of ventriculoperitoneal shunts with emphasis on the role of imaging methods. Surg Gynecol Obstet 156:473-478, 1983.
- 19. Lillehei KO, Chandler WF, Knake JE: Real time ultrasound characteristics of the acute intracerebral hemorrhage as studied in the canine model. **Neurosurgery** 14:48–51, 1984.
- Ercius MS, Chandler WF, Ford JW, Swanson DP, Burke JC: The effect of aspirin thrombosis following canine carotid endarterectomy: A scanning electron microscope and indium-111 labeled platelet study. Neurosurgery 14:198–203, 1984.
- Knake JE, Chandler WF, McGillicuddy JE, Gabrielsen TO, Latack JT, Gebarski SS, Yang PJ: Intraoperative sonography of intraspinal tumors: Initial experience. AJNR Am J Neuroradiol 4:1199-1201, 1983.

- 22. Gerke KF, Gebarski SS, Chandler WF, Phillips TW: External carotid-vertebral artery anastomosis for vertebrobasilar insufficiency. AJNR Am J Neuroradiol 6:33–37, 1985.
- Swanson SE, Chandler WF, Kocan MJ, Bogdasarian RS: Flow-regulated continuous spinal drainage in the management of cerebrospinal fluid fistulas. Laryngoscope 95:104–106, 1985.
- 24. Chandler WF, Knake JE: Intraoperative use of ultrasound in neurosurgery. **Clin Neurosurg** 31:550–563, 1983.
- 25. Dempsey RJ, Chandler WF: Abnormal serum melatonin levels in patients with intrasellar tumors. **Neurosurgery** 15:815–819, 1984.
- 26. Greenberg HS, Ensminger WD, Chandler WF, Layton PB, Junck L, Knake J, Vine AK: Intra-arterial BCNU chemotherapy for treatment of malignant gliomas of the central nervous system. **J Neurosurg** 61:423-429, 1984.
- 27. Yang PJ, Latack JT, Gabrielsen TO, Knake JE, Gebarski SS, Chandler WF: Rotational vertebral artery occlusion at C1-C2. AJNR Am J Neuroradiol 6:98–100, 1985.
- 28. Swanson SE, Chandler WF, Latack J, Zis K: Symptomatic Rathke's cleft cyst with pituitary adenoma. Case report. **Neurosurgery** 17:657–659, 1985.
- 29. McKeever PE, Laverson S, Oldfield EH, Smith BH, Gadille D, Chandler WF: Stromal and nuclear markers for the rapid identification of pituitary adenomas at biopsy. Arch Pathol Lab Med 109:509–514, 1985.
- 30. Black KL, Chandler WF, Abrams GD: Intraarterial vein graft—experimental technique to treat inaccessible carotid aneurysms of the cranial base. **Surg Forum** 36:485–487, 1986.
- 31. Chandler WF, Rubin JR: Intraoperative use of real-time ultrasound in neurosurgery. **Contemp Neurosurg** 8:1–8, 1986.
- 32. Chandler WF, Schteingart DE: Controversies in the management of Cushing's disease. Clin Neurosurg 33:553-562, 1986.
- 33. Bucci MN, Chandler WF, Gebarski SS, McKeever PE: Multiple progressive familial thrombosed arteriovenous malformations. **Neurosurgery** 19:401–404, 1986.
- 34. Schteingart DE, Lloyd RV, Akil H, Chandler WF, Ibarra-Perez G, Rosen SG, Ogletree R: Cushing's syndrome secondary to ectopic corticotropin releasing hormone-adrenocorticotropin secretion. J Clin Endocrinol Metab 63:770-775, 1986.
- 35. Chandler WF, Schteingart DE, Lloyd RV, McKeever PE, Ibarra-Perez G: Surgical treatment of Cushing's disease. J Neurosurg 66:204-212, 1987.
- 36. Lloyd RV, Chandler WF, McKeever PE, Schteingart DE: The spectrum of ACTH-producing pituitary lesions. **Am J Surg Pathol** 10:648-626, 1986.
- 37. Lloyd RV, Chandler WF, Kovacs K, Ryan N: Ectopic pituitary adenomas with normal anterior pituitary glands. Am J Surg Pathol 10:546-552, 1986.
- 38. Johnston MV, Silverstein FS, Greenberg H, Knutsen CA, Chandler W, Phillips T, Ensminger WD: Effects of intraventricular methotrexate on cerebrospinal fluid monoamine metabolites in Rhesus monkeys. **Cancer Treat Rep** 70:1205–1209, 1986.
- 39. Yaşargil MG, Chandler WF, Jabre AF, Roth P: Neurosurgical horizons. **Clin Neurosurg** 34:22–41, 1988.
- 40. Rubin JM, Dohrmann GJ, Chandler WF: Intraoperative spinal ultrasonography. Clin Neurosurg 34:282–312, 1988.
- 41. Schteingart DE, Chandler WF, Lloyd RV, Ibarra-Perez G: Cushing's syndrome caused by an ectopic pituitary adenoma. **Neurosurgery** 21:223–227, 1987.
- 42. Chandler WF, Rubin JM: The application ultrasound during brain surgery. **World J Surg** 11:558–569, 1987.
- 43. Rubin JM, Chandler WF: The use of ultrasound during spinal cord surgery. **World J Surg** 11:570–578, 1987.
- 44. Papadopoulos SM, Chandler WF, Salamat MS, Topol EJ, Sackellares JC: Recombinant human tissue-type plasminogen activator therapy in acute thromboembolic stroke. J Neurosurg 67:394–398, 1987.

- 45. Rubin JM, DiPietro MA, Chandler WF, Venes JL: Spinal ultrasonography. Radiol Clin North Am 26:1–27, 1988.
- Lloyd RV, Anagnostou D, Chandler WF: Dopamine receptors in immunohistochemically characterized null cell adenomas and normal human pituitaries. Mod Pathol 1:51–56, 1988.
- 47. Lloyd RV, Anagnostou D, Cano M. Barkan AL, Chandler WF: Analysis of mammosomatotropic cells in normal and neoplastic human pituitary tissue by the reverse hemolytic plaque assay and immunocytochemistry. **J Clin Endocrinol Metab** 66:1103–1110, 1988.
- 48. Black KL, Rubin JM, Chandler WF, McGillicuddy JE: Intraoperative color flow Doppler imaging of AVM's and aneurysms. **J Neurosurg** 68:635–639, 1988.
- 49. Chandler WF, Greenberg HS, Ensminger WD, Diaz RF, Junck LR, Hood TW, Gebarski SS, Page MA: Use of implantable pump systems for intra-arterial, intraventricular and intratumoral treatment of malignant brain tumors. **Ann N Y Acad Sci** 531:206–212, 1988.
- Platt JF, Rubin JM, Chandler WF, Bowerman RA, DiPietro MA: Intraoperative spinal sonography in the evaluation of intramedullary tumors. J Ultrasound Med 7:317-325, 1988.
- 51. Barkan AL, Lloyd RV, Chandler WF, Hatfield MK, Gebarski SS, Kelch RP, Beitins IZ: Preoperative treatment of acromegaly with long-acting sondostatin: Shrinkage of invasive pituitary macroadenomas and improved surgical remission rate. J Clin Endocrinol Metab 67:1040-1048, 1988.
- 52. Lloyd RV, Cano M, Chandler WF, Barkan AL, Horvath E, Kovacs K: Human growth hormone and prolactin secreting pituitary adenomas analyzed by in situ hybridization. **Am J Pathol** 134:605-613, 1989.
- 53. Jin L, Song J, Chandler WF, England BG, Smart JB, Barkan A, Lloyd RV: Hybridization studies of cultured human pituitary PRL and GH producing adenoma cells: Effects of thyrotropin-releasing hormone, somatostatin and phorbol ester. Endocr Pathol 1:26–36, 1990.
- 54. Mukhopadhyay SK, McKeever PE, Greenberg HS, Junck L, Chandler WF, Ensminger W: Random sampling by glitter drop method. **Life Sci** 46:507–512, 1990.
- 55. Song JY, Jin L, Chandler WF, England BG, Smart JB, Landefeld TD, Lloyd RV: Gonadotropin-releasing hormone regulates gonadotropin beta-subunit and chromogranin-B messenger ribonucleic acids in cultured chromogranin-A-positive pituitary adenomas. J Clin Endocrinol Metab 71:622-630, 1990.
- 56. Chandler WF: Craniopharyngiomas. Neurosurg Consult 1:1-8, 1990.
- 57. Hegarty TJ, Thornton AF, Diaz RF, Chandler WF, Ensminger WD, Junck L, Page MA, Gebarski SS, Hood TW, Stetson PL, Tankanow R, McKeever PE, Lichter AS, Greenberg HS: Intra-arterial bromodeoxyuridine radiosensitization of malignant gliomas. Int J Radiat Oncol Biol Phys 19:421-428, 1990.
- 58. Chandler WF: Sellar and parasellar lesions. Clin Neurosurg 37:514-527, 1991.
- 59. Lloyd RV, Jin L, Chandler WF: In situ hybridization in the study of pituitary tissues. Pathol Res Pract 187:552–555, 1991.
- 60. Hoff JT, Chandler WF, McGillicuddy JE: Development of Neurosurgery at the University of Michigan. J Neurosurg 77:962–963, 1992
- Lloyd RV, Jin L, Fields K, Chandler WF, Horvath E, Stefaneanu L, Kovacs K: Analysis of pituitary hormones and chromogranin A mRNAs in null cell adenomas, oncocytomas and gonadotroph adenomas by in situ hybridization. Am J Pathol 139:553–564, 1991
- 62. Jin L, Stone M, Chandler WF, Lloyd RV: Neural cell adhesion molecule (NCAM) in normal and neoplastic human pituitary tissues: Analysis by immunohistochemistry and in situ hybridization. **Endocr Pathol** 3:144–151, 1992.
- 63. Jin L, Maeda T, Chandler WF, Lloyd RV: Protein kinase C (PKC) and PKC messenger RNAs in human pituitary adenomas. **Am J Pathol** 142:569–578, 1993.
- 64. Jin L, Chandler WF, Smart JB, England BG, Lloyd RV: Differentiation of human pituitary

adenomas determined the pattern of chromogranin/secretogranin mRNA expression. J Clin Endocrinol Metab 76:728-735, 1993.

- 65. Haley EC Jr, Kassell NF, Torner JC: A randomized controlled trial of high-dose intravenous nicardipine in aneurysmal subarachnoid hemorrhage. A report of the Cooperative Aneurysm Study. **J Neurosurg** 78:537–547, 1993.
- 66. Haley EC Jr, Kassell NF, Torner JC: A randomized trial of nicardipine in subarachnoid hemorrhage: Angiographic and transcranial Doppler ultrasound results. A report of the Cooperative Aneurysm Study. **J Neurosurg** 78:548-553, 1993.
- 67. Lloyd RV, D'Amato C, Thiny MT, Jin L, Hicks S, Chandler WF: Corticotroph (basophil) invasion of the pars nervosa in the human pituitary: Localization of propiomelanocortin peptides, galanin and peptidylglycine a-amidating monooxygenase-like immunoreactivities. **Endocr Pathol** 4:86–94, 1993.
- 68. Lloyd RV, Jin L, Chandler WF, Horvath E, Stefaneanu L, Kovacs K: Pituitary specific transcription factor messenger ribonucleic expression in adenomatous and nontumorous human pituitary tissues. Lab Invest 69:570–575, 1993.
- 69. Pritz MB, Chandler WF: The transsylvian approach to middle cerebral artery bifurcation/ trifurcation aneurysms. **Surg Neurol** 41:217–220, 1994.
- 70. Hickstein DD, Chandler WF, Marshall JC: The spectrum of pituitary adenoma hemorrhage. West J Med 144:433-436, 1986.
- 71. Greenberg HS, Chandler WF, Ensminger WD, Junck L, Thornton A, Sandler H, Page MA, McKeever P, Gebarski S, Liang B: Radiosensitization with carotid arterial infusion of bromodeoxyuridine (BUDR) +/- fluorouracil (5FU) biomodulation with focal external beam radiation (FEBT) for malignant gliomas. **Dev Oncol** 66:217–719, 1991.
- 72. Ho PJ, Jaffe CA, Friberg RD, Chandler WF, Barkan AL: Persistence of rapid growth hormone (GH) pulsatility after successful removal of GH-producing pituitary tumors. J Clin Endocrinol Metab 78:1403–1410, 1994.
- Greenberg HS, Chandler WF, Ensminger WD, Sandler H, Junck L, Page MA, Crane D, McKeever P, Tankanow R, Bromberg J: Radiosensitization with carotid intra-arterial bromodeoxyuridine +/- 5-fluorouracil biomodulation for malignant gliomas. Neurology 44:1715-1720, 1994.
- Hald JK, Eldevik OP, Brunberg JA, Chandler WF: Craniopharyngiomas: The utility of contrast medium enhancement for MR imaging at 1.5 Tesla. Acta Radiol 35:520-525, 1994.
- Markert JM, Chandler WF, Deveikis JP, Ross DA: Use of the extreme lateral approach in the surgical treatment of an intradural ventral cervical spinal cord vascular malformation: Technical case report. Neurosurgery 38:412-415, 1996.
- 76. Doran SE, Deveikis JP, Chandler WF: Dolichoectasia of the anterior cerebral arteries in an adolescent. AJNR Am J Neuroradiol 16:1548–1550, 1995.
- 77. Chandler WF: State of the Union "The next generation." Clin Neurosurg 41:13-18, 1994.
- Eldevik OP, Blaivas M, Gabrielsen TO, Hald JK, Chandler WF: Craniopharyngiomas: Radiologic and histologic findings and recurrence. AJNR Am J Neuroradiol 17:1427– 1439, 1996.
- 79. Hald JK, Eldevik OP, Quint DJ, Chandler WF, Kollevold T: Pre- and postoperative MR imaging of craniopharyngiomas. Acta Radiol 37:806-812, 1996.
- 80. Samra SK, Chandler WF: Cerebral oximetry during circulatory arrest for aneurysm surgery. J Neurosurg Anesthesiol 9:154–158, 1997.
- 81. Barkan AL, Halasz I, Dornfeld KJ, Jaffe CA, Friberg RD, Chandler WF, Sandler HM: Pituitary irradiation is ineffective in normalizing plasma insulin-like growth factor I in patients with acromegaly. **J Clin Endocrinol Metab** 82:3187–3191, 1997.
- Park P, Chandler WF, Telian SA, Doran S: Spontaneous chronic epidural pneumocephalus due to hyperpneumatization of the cranium causing mass effect. Neurosurgery 42:1384– 1386, 1998.

BIBLIOGRAPHY

- 83. Barkan AL, Chandler WF: Giant pituitary prolactinoma with falsely-low serum prolactin: The pitfall of the high-dose hook effect. **Neurosurgery** 42:913–916, 1998.
- 84. Harrigan MR, Chandler WF: Abducens nerve palsy after radiofrequency rhizolysis for trigeminal neuralgia: Case report. **Neurosurgery** 43:623–625, 1998.
- Boulis NM, Armstrong WS, Chandler WF, Orringer MB: Epidural abscess: a delayed complication of esophageal stenting for benign stricture. Ann Thorac Surg 68:568-570, 1999.
- Boulis NM, Noordmans AJ, Barkan A, Hassing J, Chandler WF: Somatotropinoma infarction during octreotide therapy leading to bilateral cavernous sinus syndrome. Pituitary 3:185–188, 2000.
- 87. Orrego JJ, Chandler WF, Barkan AL: Rapid re-expansion of macroprolactinoma after early discontinuation of bromocriptine. **Pituitary** 3:189–192, 2000.
- 88. Orrego JJ, Chandler WF, Barkan AL: Pergolide as primary therapy for macroprolactinomas. **Pituitary** 3:251–256, 2000.
- 89. Youkilis AS, Park P, McKeever PE, Chandler WF: Parasagittal ependymoma resembling falcine meningioma. AJNR Am J Neuroradiol 22:1105–1108, 2001.
- 90. Dimaraki EV, Jaffe CA, DeMott-Friberg R, Chandler WF, Barkan AL: Acromegaly with apparently normal GH secretion: Implications for diagnosis and follow-up. J Clin Endocrinol Metab 87:3537–542, 2002.
- Chandler WF: Management of suprasellar meningiomas [editorial comment]. J Neuroophthalmol 23:1–2, 2003.
- 92. Chandler WF, Barkan AL, Schteingart DE: Management options for persistent functional tumors. **Neurosurg Clin N Am** 14:139–145, 2003.
- 93. Lang FF, Bruner JM, Fuller GN, Aldape K, Prados MD, Chang S, Berger MS, McDermott MW, Kunwar SM, Junck LR, Chandler W, Zwiebel JA, Kaplan RS, Yung WK: Phase I trial of adenovirus-mediated p53 gene therapy for recurrent glioma: Biological and clinical results. J Clin Oncol 21:2508–2518, 2003.
- 94. Park P, Chandler WF, Barkan AL, Orrego JJ, Cowan JA, Griffith KA, Tsien C: The role of radiation therapy after surgical resection of nonfunctional pituitary macroadenomas. Neurosurgery 55:100–107, 2004.
- 95. Rath TJ, Sundgren PC, Brahma B, Lieberman AP, Chandler WF, Gebarski SS: Massive symptomatic subependymoma of the lateral ventricles: Case report and review of the literature. **Neuroradiology** 47:183–188, 2005.
- 96. Surya S, Barkan A, Chandler W:. Craniopharyngioma: Outcome and quality of life—A single center study (abstract). **Pituitary** 7 [Suppl 1]:8, 2005.
- 97. Chugh R, Dunn R, Zalupski MM, Biermann JS, Sondak VK, Mace JR, Leu KM, Chandler WF, Laurence H, Baker LH: Phase II study of 9-nitro-camptothecin in patients with advanced chordoma or soft tissue sarcoma. J Clin Oncol 23:3597–3604.
- 98. Sakharova AA, Dimaraki EV, Chandler WF, Barkan AL: Clinically silent somatotropinomas may be biochemically active. J Clin Endocrinol Metab 90:2117–2121, 2005.
- 99. Dimaraki EV, Chandler WF, Brown MB, Jaffe CA, Kim SY, Taussig R, Padmanabham V, Barkan AL. The role of endogenous growth hormone-releasing hormone (GHRH) in acro-megaly. J Clin Endocrinol Metab 91:2185–2190, 2006.
- 100. Cowan JA Jr, Dimick JB, Wainess R, Upchurch GR Jr, Chandler WF, La Marca F: Changes in the utilization of spinal fusion in the United States. Neurosurgery 59:15–20, discussion 15-20, 2006.
- 101. Fox WC, Wawrzyniak S, Chandler WF: Intraoperative acquisition of 3-D imaging for frameless stereotactic guidance during transsphenoidal pituitary surgery using the Arcadis Orbic System. J Neurosurg 108:746–750, 2008.
- 102. Chandler WF, Barkan AL: Treatment of pituitary tumors: A surgical perspective. Endocrinol Metab Clin N Am 37:51–66, viii, 2008.
- 103. Todd MM, Hindman BJ, Clarke WR, Torner JC, Intraoperative Hypothermia for Aneurysm

Surgery Trial (IHAST) Investigators: Mild intraoperative hypothermia during surgery for intracranial aneurysm. **N Engl J Med** 352:135–145, 2005.

BOOKS

- 1. Chandler WF: Carotid Artery Injuries. Mt. Kisco, Futura Publishing Co., 1982.
- 2. Rubin JM, Chandler WF (eds): Ultrasound in Neurosurgery. New York, Raven Press, 1989.
- 3. Greenberg HS, Chandler WF, Sandler HM: Brain Tumors. New York, Oxford University Press, 1999.

CHAPTERS IN BOOKS

- 1. Kindt GW, Chandler WF, Gosch HH: The importance of preventing increased intracranial pressure in patients with cerebral edema not related to trauma, in Beks JWF, Brock MI (eds): Intracranial Pressure III. Berlin, Heidelberg, New York, Springer-Verlag, 1976, pp 331–335.
- 2. Schneider RC, Chandler WF: Spinal lesions: Herniated nucleus pulposus, cervical spondylosis, spinal stenosis, in *Correlative Neurosurgery*. Springfield, Charles C Thomas, 1982, ed 3.
- 3. Chandler WF: Pituitary surgery for endocrine disorders, in Thompson NW, Vinik AI (eds): *Endocrine Surgery Update*. New York, Grune and Stratton, 1984, pp 163–172.
- 4. Chandler WF, Greenberg HS, Ensminger WD: Intermittent and continuous regional chemotherapy for CNS tumors, in Amendola BE, Amendola MA (eds): *Recent Trends in Oncology and Related Fields*. New York, Elsevier, 1984, pp 95–100.
- Chandler WF, Phillips TW: Posterior circulation augmentation by external carotid to mid-vertebral artery anastomoses, in Spetzler RF, Carter LP, Selman WR, Martin NA (eds): *Cerebral Revascularization for Stroke*. New York, Thieme-Stratton, Inc., 1985, pp 318–324.
- 6. Chandler WF, Rubin JM: Sonography during neurosurgery, in Otto RC, Higgins CB (eds): *New Developments in Imaging*. New York, Thieme Medical Publishers, 1986, pp 107–113.
- 7. Dempsey RJ, Chandler WF, Sauder E: Surgically reversible hypothalamic hypopituitarism due to aqueductal stenosis, in Matsumoto S (ed): *Annual Review of Hydrocephalus*. Tokyo, Neuron Publishing Co., 1985, pp 56–57.
- 8. Chandler WF, Hoff JT: Central nervous system, in Davis JH (ed): *Clinical Surgery*. St. Louis, C.V. Mosby Co., 1987.
- 9. Greenberg HS, Chandler WF, Diaz RF, Ensminger WD, Junck L, Page MA, Gebarski SS, Hood TW, Stetson PL, Lichter AS: Radiosensitization with constant intra-arterial infusion of bromodeoxyuridine (BUdR) and focal external beam radiation in the treatment of malignant astrocytomas, in Ensminger WD, Selam JL (eds): *Infusion Systems in Medicine*. Mt. Kisco, Futura Publishing Co., 1987, pp 221–232.
- 10. Chandler WF, Rubin JM: Operative ultrasound during brain and spinal cord procedures, in Sigel B (ed): *Operative Ultrasonography*. New York, Raven Press, 1988, pp 175–201.
- 11. Chandler WF: Carotid artery trauma, in Wood JH (ed): Carotid Artery Surgery and Stroke. Philadelphia, Hanley and Belfus, 1988, pp 179–191.
- 12. Chandler WF: Trauma to the carotid artery and other cervical vessels, in Youmans JR (ed): *Neurological Surgery*. Philadelphia, WB Saunders Co., 1990, pp 2367–2378.
- 13. Chandler WF: Pituitary syndromes, in Friesen S, Thompson NW (eds): Surgical Endocrinology: Clinical Syndromes. Philadelphia, JB Lippincott Co., 1990, pp 381–404.
- 14. Greenberg HS, Chandler WF, Ensminger WD, Junck L, Page MA, Gebarski SS, Hood TW, Stetson PL, Diaz RF, Hegarty T, Thornton A, Lichter AS, McKeever P, Tankanow R: Radiosensitization with constant intra-arterial infusion of bromodeoxyuridine (BUdR) and focal external beam radiation in the treatment of malignant astrocytomas, in Ensminger WD (ed): *Infusion Systems in Medicine*, Mt. Kisco, Futura Publishing Co., 1989, pp 233–246.
- 15. Chandler WF, Hoff JT: Central nervous system, in Davis JH, Foster RS, Gamelli RL (eds): *Essentials of Clinical Neurosurgery*. St. Louis, Mosby Yearbook, 1991, pp 214–232.

- 16. Greenberg HS, Chandler WF, Ensminger WD, Junck L, Thornton A, Sandler H, Page MA, McKeever P, Gebarski S, Liang B, Tankanow R: Radiosensitization with carotid arterial infusion of bromodeoxyuridine +/- 5 fluorouracil. Biomodulation with focal external beam radiation for malignant gliomas, in Paoletti P (ed): *Neuro-oncology*. Dordrecht, Kluwer Academic Publishers, 1991, pp 217-219.
- Rubin JM, Chandler WF: Intraoperative ultrasonography of the brain, in Rumack C, Wilson S, Charboneau JW (eds): *Diagnostic Ultrasound*. St. Louis, Mosby-Year Book, Inc., 1991, pp 459–480.
- Chandler WF, Rubin JM: Intraoperative ultrasound imaging of the cervical spine, in Camins MB, O'Leary PF (eds): *Disorders of the Cervical Spine*. Baltimore, Williams & Wilkins, 1992, pp 115–121.
- 19. Chandler WF: Surgical treatment of pituitary adenomas, in Lloyd RV: Surgical Pathology of the Pituitary Gland. Philadelphia, WB Saunders, 1993, pp 235–245.
- Chandler WF, Lloyd RV: Surgical endocrinology: pituitary, in Greenfield LJ (ed): Textbook of Surgery: Scientific Principles and Practice. Philadelphia, JB Lippincott Co., 1992, pp 1224– 1235.
- 21. Chandler WF: Growth hormone: Regulation, disorders and clinical evaluation, in Barrow D, Selman (eds): *Neuroendocrinology*. Baltimore, Williams & Wilkins, 1992, pp 113–116.
- Chandler WF: Pterional approach for craniopharyngioma removal, in Neurosurgeons, Proceedings of the 13th Japanese Congress of Neurological Surgeons (Fukushima, Japan, May, 1993). Singapore, SciMed Publications, 1994, vol 13.
- 23. Chandler WF: Surgical management of Cushing's disease using the transsphenoidal approach, in Rengachary S, Wilkins RH (eds): *Neurosurgical Operative Atlas. American Association of Neurological Surgeons.* Baltimore, Williams & Wilkins, 1996, vol 4, no. 2.
- 26. Rubin JM, Chandler WF: Intraoperative ultrasonography of the brain, in Rumack C, Wilson S, Charboneau JW (eds): *Diagnostic Ultrasound*. St. Louis, Mosby-Year Book, Inc., 1997, ed 2.
- 27. Chandler WF, Lloyd RV: Surgical endocrinology: pituitary, in Greenfield LJ (ed): Surgery: Scientific Principles and Practice. Philadelphia, JB Lippincott Co., 1997, ed 2, pp 1347–1356.
- 28. Lloyd, RV, Jin L, Chandler WF: In situ hybridization studies, in Landolt AM, Vance ML, Reilly PL (eds): *Pituitary Adenomas*. New York, Churchill Livingstone, 1996. pp 47–58.
- 29. Chandler WF: Surgical approaches to the pituitary fossa, in Robertson J, Robertson J, Coakham H, (eds): *Cranial Base Surgery*. London, Churchill Livingstone, 2000, pp 163–170.
- 30. Chandler WF: Pituitary tumors. In Bernstein M, Berger M (eds): Neurooncology: The Essentials. New York, Thieme Medical Publishers, 2000, pp 399-408.
- 31. Chandler WF, Barkan AL, Schteingart DE: Management options for persistent functional tumors, in Weiss M, Couldwell W (eds): *Neurosurgery Clinics of North America*, 2002, pp.
- 32. Chandler WF: Current treatment of pituitary tumors, in Nagio S (ed): Brain Tumor Surgery. Surgery of Midline and Brain Stem Tumor with Modern Technology. Japan, 2002.
- 33. Barkan AL, Blank H, Chandler WF: Pituitary surgery: Peri-operative management, in Swearingen B, Biller BMK (eds): Contemporary Endocrinology: Diagnosis and Management of Pituitary Disorders. Totowa, Humana Press, 2008. pp 303–320.
- 34. Chandler WF, Barkan AL: Pituitary surgery: Techniques, in Swearingen B, Biller BMK (eds): Contemporary Endocrinology; Diagnosis and Management of Pituitary Disorders. Totowa, Humana Press, 2008, pp 289–301.