



Western
Neurosurgical
Society



American
Association of
Neurological
Surgeons

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CALENDAR OF EVENTS

Friday, September 7, 2012

1:00PM – 4:00PM	Executive Committee Meeting	Gaylord Boardroom
2:00PM – 5:30PM	Registration	Rocky Mtn Ballroom Foyer
7:00PM – 9:30PM	Opening Reception and Buffet	Mountain View Terrace

Saturday, September 8, 2012

6:30AM – 7:30AM	Breakfast Members / Professional Guests	Rocky Mt C,D
6:30AM – 12:00PM	Exhibitors	Rocky Mt C,D
6:30AM – 12:00PM	Registration	Rocky Mtn Ballroom Foyer
7:30AM – 12:30PM	Scientific Session	Rocky Mt A,B
8:00AM – 10:00AM	Breakfast Spouses	Mountain View Terrace
10:00AM – 10:30AM	Break – Visit Exhibits	Rocky MT C,D
1:20PM – 6:00PM	Golf	East Course
1:30PM – 4:30PM	Tennis	Tennis Courts
1:30PM – 5:30 PM	Air Force Academy/Garden of the Gods Tour	Meet in West Lobby-1:15
6:30PM – 10:00PM	Local's night - Transportation Provided	Meet in West Lobby-6:15

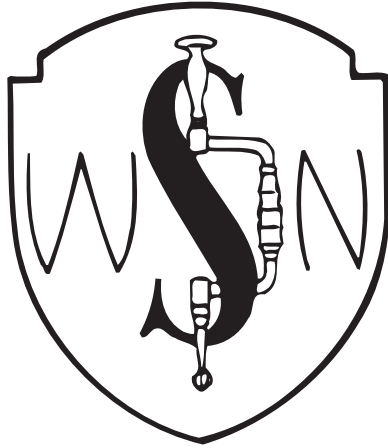
Sunday, September 9, 2012

6:30AM – 7:30AM	Members Business Meeting & Breakfast	West Ballroom
6:30AM – 7:30AM	Breakfast Professional Guests	Rocky Mt C,D
6:30AM – 12:30PM	Exhibitors	Rocky Mt C,D
7:00AM – 12:00PM	Registration	Rocky Mtn Ballroom Foyer
7:30AM – 12:30PM	Scientific Session	Rocky Mt A, B
9:10AM – 10:40AM	Break – visit exhibits	Rocky Mt C, D
8:00AM – 10:00AM	Breakfast Spouses	Mountain View Terrace
1:30PM – 6:00PM	Golf - Shuttle Departs Main Club 1:15	Mountain Course
1:30PM – 4:30PM	Tennis	Tennis Courts
1:30PM – 5:30 PM	Mountain Bike Ride	Meet in West Lobby-1:10
6:30PM – 7:30PM	Formal Reception	Pompeiiian Room
7:30PM – 11:00PM	Formal Banquet / DanceMain Ballroom	

Monday, September 10, 2012

6:30AM – 7:30AM	Breakfast Members / Professional Guests	Rocky Mt C,D
6:30AM – 11:30AM	Exhibitors	Rocky Mt C,D
6:30AM – 11:30AM	Registration	Rocky Mtn Ballroom Foyer
7:30AM – 11:30AM	Scientific Session	Rocky Mt A,B
8:00AM – 10:00AM	Breakfast Spouses	Mountain View Terrace
10:00AM – 10:30AM	Break – Visit Exhibits	Rocky Mt C,D
11:30 AM	Scientific Meeting Adjourned	

See you at the 59th Meeting of the WNS
The Ritz-Carlton, Half Moon Bay
September 15-18, 2013



Western Neurosurgical Society

58th Annual Meeting

2012 Learning Objectives

The purpose of this meeting is to provide an update in the basic and clinical sciences underlying neurosurgical practice through lectures, discussions, interactive sessions with neurological surgeons, neurologists, neuroradiologists, and other allied health personnel.

Upon completion of this program, participants should be able to:

1. Provide an update regarding modern neurocritical care.
2. Analyze options and outcomes for patients in whom spinal surgery may be a treatment option.
3. Discuss advances in the treatment of CNS neoplasms.

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2012 Guests

John Adler	Society - Cloward Award
Rein Anton	Member Candidate
Henry Aryan	Member Candidate
Kerry Brega	Society
Justin Brown	Member Candidate
Andrew Dailey	Robert Hood
Michael Finn	Ken Yonemura
Gordon Li	Michael Edwards
Steven Murk	Society
Kamran Parsa	Resident Guest
Robert Schrier	Society - Ablin Lecture
CAPT Dave Shiveley	Guest Speaker
Walavan Sivakumar	Resident Award, Clinical Science
David Stidd	Resident Award, Basic Science
Eric Thompson	Resident Guest
Shelly Timmons	Society - Minisymposium speaker
Amir Vokshoor	Member Candidate
Corbett Wilkinson	Society

2012 Officers and Committees

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President - John Bonner, MD
 President Elect - Jeffery L. Rush, MD
 Vice President - Richard Wohns, MD
 Historian - Randall Smith, MD
 Secretary-Treasurer - Charles Nussbaum, MD
 Past President - Austin R.T. Colohan, MD

EXECUTIVE COMMITTEE

President - John Bonner, MD	Program Chairman - Michael Lemole, MD
President Elect - Jeffery L. Rush, MD	Membership Chairman - Tom Scully, MD
Vice President - Richard Wohns, MD	Site Selection Chairman - Jeff Rush, MD
Historian - Randy Smith, MD	By-Laws Chairman - Moustapha Abou-Samra, MD
Secretary-Treasurer - Charles Nussbaum, MD	Awards Chairman - Jeff Rush, MD
Past President - Austin R.T. Colohan, MD	

COMMITTEES

<p style="text-align: center;"><u>Program</u></p> <p>Michael Lemole, MD, Chairman Charles Nussbaum, MD Thomas Scully, MD Martin Weinand, MD,</p> <p style="text-align: center;"><u>Membership</u></p> <p>Thomas Scully, MD, Chairman Paul Muizelaar, MD, PhD Javed Siddiqi, MD, PhD</p> <p style="text-align: center;"><u>Awards</u></p> <p>Jeffery Rush, MD, Chairman Kim Burchiel, MD David Newell, MD Lawrence Shuer, MD Gerald Silverberg, MD</p> <p style="text-align: center;"><u>Site Selection</u></p> <p>Jeffery Rush, MD, Chairman Grant Gauger, MD David Pitkethly, MD</p> <p style="text-align: center;"><u>Web Master</u></p> <p>Randy Smith, MD, Chairman</p>	<p style="text-align: center;"><u>By-Laws</u></p> <p>Moustapha Abou-Samra, MD, Chairman Deborah Henry, MD Richard Wohns, MD,</p> <p style="text-align: center;"><u>Audit</u></p> <p>Marshal Rosario, MD, Chairman Ben Blackett, MD Tim Steege, MD Kimberly Page, MD</p> <p style="text-align: center;"><u>Nominating</u></p> <p>Austin Colohan, MD, Chairman David Newell, MD Lawrence Shuer, MD Gerald Silverberg, MD</p> <p style="text-align: center;"><u>Local Arrangements</u></p> <p>John McVicker, MD, Chairman Charles Nussbaum, MD, J. Paul Muizelaar, MD, PhD Tom Scully, MD</p> <p style="text-align: center;"><u>CME</u></p> <p>Charles Nussbaum, MD, Chairman Michael Lemole, MD</p>
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Special Guest Lecturer



David L. Shiveley
Captain, Medical Corps, U.S. Navy
Command Surgeon

NORAD/USNORTHCOM

2010 Oceans Photography Award Winner

Captain David L. Shiveley is the Command Surgeon for both North American Aerospace Defense (NORAD) Command and United States Northern Command (USNORTHCOM) at Peterson Air Force Base, Colorado. In this role, he serves as principle medical advisor to the commander and staff and is responsible for the integration of DOD medical assets internally and with other agencies in support of military response to civilian disasters, combating terrorism and protecting Americans.

CAPT Shiveley was born in Putnam, Connecticut on June 14, 1955. After receiving a Bachelor of Arts Degree from St. Michael's College in Winooski, Vermont in 1977, he attended St. George's University School of Medicine in Grenada and received his Medical Degree in 1982. He did his Internship in Internal Medicine at Mount Sinai Hospital in Hartford, Connecticut from July 1982 to June 1983. He was commissioned on 19 March 1983 and commenced active duty. He received a Master of Public Health and Tropical Medicine from the Tulane School of Public Health and Tropical Medicine in New Orleans, Louisiana in July 1990.

His first tour of duty was with the Marines as Battalion Surgeon of the Third Battalion, 9th Marines, 1st Marine Division at Camp Pendleton, California from August 1983 to August 1985. Subsequent tours included duty as a General Medical Officer at the Branch Medical Clinic, Naval Air Station, Miramar, California and Senior Medical Officer aboard USS San Jose (AFS-7) WESTPAC. From January to June 1987, he attended Flight Surgeon School at the Naval Aerospace Medical Institute (NAMI), Naval Air Station, Pensacola, Florida. In June 1987, he reported for a 2 year tour as Wing Flight Surgeon for TRAWING SIX in Pensacola, Florida. From June 1989 to June 1992 he attended the Aerospace Medicine Residency at NAMI. From July 1992 to July 1994 he held the position of Senior Medical Officer aboard USS America (CV-66) and Battle Force Medical Officer for Carrier Group Six. His next position was Deputy Force Medical Officer, Commander Naval Air Force, Atlantic Fleet, which he held from August 1994 to August 1997. Following AIRLANT, he assumed the position as Fighter Wing Atlantic Senior Medical Officer (SMO) with additional duty as Strike Fighter Wing Atlantic SMO, where he served from September 1997 to July 2000. Next, he was Second Fleet/Striking Fleet Atlantic Surgeon where he served from August 2000 to March 2003. He was the senior advisor for Health Services Doctrine in the Navy, Joint, and NATO environment, responsible for all medical plans, operations, and intelligence for Second Fleet and Striking Fleet. From April 2003 to October 2005 he was the Officer-in-Charge of the Naval Ambulatory Care Center, New Orleans, Louisiana, managing 3 Clinics, serving 30,000 beneficiaries. After that he moved to United States Transportation Command, in the role of Command Surgeon, where he was the DoD Executive Agent for Global Patient Movement and the first ever Navy physician to hold this important Combatant Command office, from November 2005 to May 2007. From June 2007 to June 2009 he was the Executive Officer for Naval Health Clinic, Quantico, Virginia. And from July 2009 to June 2011, he was the Commanding Officer of Naval Hospital Lemoore, NAS Lemoore, California. CAPT Shiveley is currently the NORAD/USNORTHCOM Command Surgeon General where he is the chief medical advisor to the Commander on all Homeland Defense and Defense Support to Civil Authorities issues.

CAPT Shiveley is board certified by the American Board of Preventive Medicine (Aerospace Medicine) and is a Fellow in the American College of Healthcare Executives. He also holds certification as a trained Joint Task Force Surgeon. He is authorized to wear Kuwaiti Liberation Medal, National Defense Service Medal with one star, Southwest Asia Medal with two stars, Armed Forces Expeditionary Medal, Navy Achievement Medal, Navy Commendation Medal, Meritorious Service Medal (Silver Star in lieu of 6 awards), Legion of Merit Medal, Defense Superior Service Medal, Navy Unit Commendation Ribbon, Meritorious Unit Commendation Ribbon, Sea Service Deployment Ribbon with one star, FMF Ribbon, Rifle Ribbon and Expert Pistol Medal.

CONTINUING MEDICAL EDUCATION ACCREDITATION

This Activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the AANS and the Western Neurosurgical Society. The AANS is accredited by the ACCME to provide continuing medical education for physicians.

The AANS designates this live activity for a maximum of 12.25 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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Neither the content (whether written or oral) of any course, seminar or other presentation in the program, nor the use of a specific product in conjunction therewith, nor the exhibition of any materials by any parties coincident with the program, should be construed as indicating endorsement or approval of the views presented, the products used, or the materials exhibited by the WNS and jointly sponsored by the AANS, or its Committees, Commissions, or Affiliates.

Neither the AANS nor the WNS makes any statements, representations or warranties (whether written or oral) regarding the Food and Drug Administration (FDA) status of any product used or referred to in conjunction with any course, seminar or other presentation being made available as part of 2012 Western Neurosurgical Society Annual Meeting. Faculty members shall have sole responsibility to inform attendees of the FDA status of each product that is used in conjunction with any course, seminar or presentation and whether such use of the product is in compliance with FDA regulations.

DISCLOSURE INFORMATION

The AANS controls the content and production of this CME activity and attempts to ensure the presentation of balanced, objective information. In accordance with the Standards for Commercial Support established by the Accreditation Council for Continuing Medical Education (ACCME), speakers, paper presenters/authors and staff (and the significant others of those mentioned) are asked to disclose any relationship they or their co-authors have with commercial interests which may be related to the content of their lecture. The ACCME defines “relevant financial relationships” as financial relationships in any amount occurring within the past 12 months that create a conflict of interest.

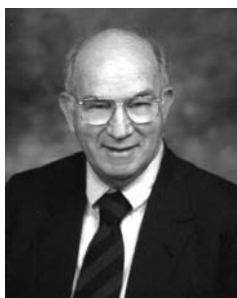
Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have disclosed a relationship* with commercial interests whose products may have a relevance to their presentation are listed below.

Name	Disclosure	Type of relationship
John Adler	Varian Medical Systems	Stockholder/Employee
Justin Brown	Checkpoint Surgical	Consultant
Andrew Dailey	Biomet	Consultant
G. Michael Lemole	AO Spine, Stryker	Honorarium
	Brainlab	Consultant
	Community Foundation of Southern AZ	University Grants
Mark Hamilton	Lanx	Stockholder
	Codman-Depuy	Stockholder
	Codman Canada	Honorarium
Andrew Little	Karl Storz Endoscopy	Grant Support
Bruce McCormack	Johnson and Johnson	Honorarium
	Providence Medical Technology	Shareholder
Robert Schrier	Otsuka Pharmaceutical USA	Consultant
Thomas Scully	Stryker Spine, Lifespine, BrainLab	Consultant
David Stidd	Lifespine	Shareholder
	NIH, U. Arizona	Grant Support
Eric Thompson	NIH, Med Research foundation of OR	Grant Support
Shelly Timmons	Synthes	Honorarium
Amir Vokshoor	Lanx, Alphatec, Paradigm	Consultant
	Stryker, Lanx	Speaker's Bureau
	Lanx	Grant Support
Martin Weinand	Inst. Of NeuroInnovation	Fiduciary position
	NIH	Grant Support
Richard Wohns	Rainier Technology	Consultant
	Thompson MTS, LDR	Consultant
	Orthofix, Nuvasive, NOC2	Consultant
	Rainier Technology, NOC2	Stockholder
	Nuvasive	Stockholder

*Relationship refers to receipt of royalties, consultantship, funding by research grant, receiving honoraria for educational services elsewhere, or any other relationship to a commercial interest that provides sufficient reason for disclosure.

Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have reported they do not have any relationships with commercial interests:

Rein Anton	Gordon Li	John Slater	Walvalan Sivakumar
Henry Aryan	Michael Edwards	Marc Schwartz	Moustapha Abou-Samra
Jeffery Rush	John Bonner	John McVicker	Kamran Parsa
Austin Colohan	David Newell	J. Paul Muizelaar	Donald Prolo
Randall Smith	Lori Shutter	Charles Nussbaum	CAPT David Shiveley



Dr. George Ablin 1923-1999

In 2000, the members of the Western Neurosurgical Society inaugurated a new lectureship designed to honor, in a tangible and enduring manner, one of the Society's most outstanding members. In its long history, the Society has had no more devoted contributor than Dr. George Ablin. He brought to the group stunning ability and experience, especially in matters of local, national, and international organization, in which he had few peers. He contributed through service in many areas including a memorable term as President. He was a wise and thoughtful counselor whose advice concerning many professional and personal questions always included a careful analysis, given with words of encouragement. There was no more active and engaged participant in all of the Society's affairs.

George Ablin was raised in Chicago, received his BS and MD from the University of Michigan, interned at Charity Hospital, New Orleans, Louisiana, did his residency at the University of Wisconsin, later was Instructor at the University of Michigan, and also became a Clinical Professor at California State University, Bakersfield. Dr Ablin was Board Certified in Neurological Surgery, a Fellow of the American College of Surgeons, and a Diplomat of the National Board of Medical Examiners.

Dr Ablin began practice in neurosurgery in Bakersfield, California, in 1953, was President of the Kern County Medical Society in 1984, and was very active in the California Medical Association in various leadership positions. He was Treasurer of the California Medical Review Board and received Distinguished Service awards from the Congress of Neurological Surgeons and the American Association of Neurological Surgeons. He was named Honorary President of the World Neurological Society and in 1989 he was selected as the Kern County Physician of the Year. George was the devoted father of seven children, three of whom became physicians.

George combined an exceptionally perceptive understanding of others, including hundreds of fellow neurosurgeons, with warmth and gentleness and lively humor. He loved his colleagues and friends, and he loved this Society. With this permanent lectureship, the members of the Western Neurosurgical Society honor George Ablin and his cherished wife, Millie.



**2012 Ablin Lecturer
Robert W. Schrier, MD**

Dr. Robert Schrier, Professor of Medicine, was formerly Chairman of the Department of Medicine at the University of Colorado School of Medicine for 26 years and Head of the Division of Renal Diseases and Hypertension for 20 years. In 1989 he was elected a member of the Institute of Medicine of the National Academy of Sciences. He has been President of the Association of American Physicians, American Society of Nephrology, National Kidney Foundation, and International Society of Nephrology. Dr. Schrier is a Master of the American College of Physicians and Honorary Fellow of the Royal College of Physicians. He has authored over 1000 scientific papers and edited numerous books including editions in internal medicine, geriatrics, drug usage, and kidney disease. His research contributions center on autosomal dominant polycystic kidney disease, pathogenesis of acute renal cell injury, hypertension and diabetic nephropathy, and renal and hormonal control of body fluid volume in cirrhosis, cardiac failure, nephrotic syndrome, and pregnancy. Dr. Schrier's research has been funded by the National Institutes of Health for over 40 years.

During Dr. Schrier's 26 years as Chairman of Medicine at the University of Colorado the full-time faculty increased from approximately 75 to 500. The annual research grants by the Department's full-time faculty rose from approximately \$3 to \$100 million, including the faculties' contributions to the General Clinical Research and Cancer Centers. The housestaff and fellow training programs also became nationally prominent. Thirty endowed research chairs between \$1.5-2.0 million each were established. For these contributions, Governor Owens and Mayor Wellington Webb announced an Honorary Proclamation designating May 4, 2002 Robert W. Schrier Day in Colorado. In 2002, Dr. Schrier also received the prestigious Belle Bonfils-Stanton Award for Contributions in Science and Medicine.

Dr. Schrier has received honorary degrees from DePauw University, the University of Colorado, the University of Silesia, the University of Toledo, and the National Academy of Medicine of Belarus. He has received the highest awards of the American College of Physicians (John Phillips Award), the National Kidney Foundation (David Hume Award), the American Society of Nephrology (John Peters Award), the International Society of Nephrology (Jean Hamburger Award), the German Society of Nephrology (Franz Vollhard Award), the Western Society of Clinical Investigation (Mayo Soley Award), the Association of Professors of Medicine (Robert H. Williams Award), the American Kidney Fund (National Torchbearer Award), the Association of American Physicians (Francis Blake Award), Acute Renal Failure Commission (Bywaters Award), the New York Academy of Medicine (The Edward N. Gibbs Memorial Award), the University of Strasburg (Louis Pasteur Medal), the American Association of Kidney Patients (Medal of Excellence), the Grand Hamdan International Award for Medical Sciences, and the Alexander von Humboldt Research Award for his contributions in biomedical research, education, and clinical medicine.

Ablin Lectures

- 2000 Arthur L. Day, MD, Professor of Neurosurgery, University of Florida
“Unruptured Intracranial Aneurysms and Sports Medicine in Neurosurgery”
- 2002 Tom Campbell, JD, PhD, Professor of Law, Stanford University
Former Congressman
“Is Freedom Possible in Medicine”
- 2003 Frederic H. Chaffee, PhD, Director, WM Keck Observatory, Hawaii
“The WM Keck Observatory at the Dawn of the New Millennium”
- 2004 Gerald Kooyman, PhD, Research Professor, Scripps Institute of Oceanography, San Diego
“Emperor Penguins: Life at the Limits”
- 2005 Lt. Col. Rocco Armonda, MD, Neurological Surgeon, U.S. Army Bethesda, Maryland
“The Modern Management of Combat Neurotrauma Injuries: Battlefield to the Medical Center”
- 2006 August Turak, Spiritual and Business Consultant
“Spirituality and the Neurosurgeon”
- 2007 Donald Trunkey, MD, Internationally Renowned Trauma Surgeon
“The Crisis in Surgery with Particular Emphasis on Trauma”
- 2008 Michael Bliss, PhD, Emeritus Professor, University of Toronto
“Working Too Hard and Achieving Too Much? The Cost of Being Harvey Cushing”
- 2009 Michael A. DeGeorgia, MD, Professor of Neurology
Case Western Reserve University, Cleveland, Ohio
“Struck Down: The Collision of Stroke and World History”
- 2010 Chris Wood, PhD, Vice President for Administration, Santa Fe Institute
“What Kind of Computer Is The Brain?”
- 2011 Volker Sonntag, MD, Vice Chairman, Division of Neurological Surgery
Barrow Neurological Institute, Phoenix, Arizona
“Cervical Instrumentation: Past, Present & Future”



Ralph B. Cloward 1908-2000

In 2002, the Western Neurosurgical Society established a Medal and Lecture to honor one of its most innovative and pioneering members, Ralph Bingham Cloward. With the gracious support of the Cloward family, this award honors both Ralph and his devoted wife, Florence.

Ralph Cloward was born in Salt Lake City, Utah, in 1908. He completed his undergraduate studies at the Universities of Hawaii and Utah and his medical education at the University of Utah and then at Rush Medical School in Chicago. He interned at St Luke's Hospital, Chicago, and then trained to become a neurosurgeon under Professor Percival Bailey, at the University of Chicago. He began his practice of neurology and neurosurgery in the Territory of Hawaii in 1938.

His academic accomplishments include visiting professorships at the University of Chicago, University of Oregon, University of Southern California, and Rush Medical School. He was Professor of Neurosurgery at the John A Burns School of Medicine at the University of Hawaii. He is the author of numerous papers and book chapters and has lectured and operated all over the world.

Dr Cloward's pioneering contributions encompass many areas of neurosurgery, but his enduring interest was the spine, where he devised three major operations. He first performed the posterior lumbar interbody fusion in 1943, reporting it in the Hawaiian Territorial Medical Association in 1945 and publishing it in the *Journal of Neurosurgery* in 1953. His unique approach for treating hyperhydrosis was reported in 1957. Independently, he conceived an anterior approach to the cervical spine, devised instruments for its implementation, and published his classic paper in the *Journal of Neurosurgery* on anterior cervical discectomy and fusion in 1958. He designed over 100 surgical instruments which continue to be used today by practicing neurosurgeons.

Throughout his career he educated the international community of neurosurgeons in the performance of the operations he devised. He contributed his time generously to patients who have been healed by his operations in the US and throughout the world. Hundreds of thousands of patients have benefited both directly and indirectly from his technical genius, insight, and enthusiasm as a teacher. Ralph loved the Western Neurosurgical Society and it's fitting that the WNS can now honor him with this Medal.



2012 Cloward Award Lecturer

John R. Adler, Jr., MD

John Adler was raised in rural Connecticut. He graduated magna cum laude from Harvard College in 1976, and received his MD degree (1980) and neurosurgical training (1987) at from Harvard Medical School.

From 1985-6 Dr. Adler spent a seminal one year fellowship with Professor Lars Leksell at the Karolinska Institute in Stockholm. It was during this time that he became intimately involved with stereotactic radiosurgery, a field of neurosurgery towards which he would direct much of his career. In 1987, John joined the neurosurgery faculty at Stanford University. Over time his clinical practice centered increasingly on the surgical management of broad spectrum of brain tumors, especially as pertains to the application of radiosurgery. Meanwhile, his scholarly interests have overwhelmingly focused on translational research and included the development of instruments for computerized surgical navigation that enabled a new class of minimally invasive procedures for brain tumor. Dr. Adler is best known for his work in stereotactic radiosurgery and in particular for his involvement in creating the field of image-guided radiosurgery. His research has been instrumental to the application of radiosurgical ablation for tumors (and other lesions) involving the head and neck, spine, chest, abdomen and pelvis.

In 1998, Dr. Adler was promoted to Professor of Neurosurgery and Radiation Oncology. He is an author of more than 180 peer-reviewed publications and book chapters, serves as an editor for seven medical journals, and is a named inventor on 9 United States patents. In 2009, Dr. Adler started the online peer reviewed medical journal and social network named peerEmed.com and currently serves as the journal's President and CEO.

In 1991, Dr. Adler founded the company, Accuray Inc, to commercialize his concept for image-guided radiosurgery, The CyberKnife. During a leave of absence from Stanford between 1999 and 2002 he served as the Chairman and CEO of Accuray, remaining on the company's board of directors until 2009. In March 2010, Dr. Adler took a second leave of absence to join Varian Medical Systems, Inc., as Vice President, Chief of New Clinical Applications.

Outside his profession, John Adler is married and a father of 2 grown children. Though thoroughly unrealistic, John yearns to live the life of a big wave surfer.

CLOWARD AWARD

- 2003 George Ojemann, MD, Professor of Neurosurgery
University of Washington
“Investigating Human Cognition during Epilepsy Surgery”
- 2005 Donald Prolo, MD, Clinical Professor of Neurosurgery
Stanford University
“Legacy Giants in the Treatment of Spinal Disorders: Ralph Cloward and Marshall Urist”
- 2006 Martin Weiss, MD, Professor of Neurosurgery
University of Southern California
“A Historical Walk through Pituitary Surgery”
- 2007 Charles Wilson, MD, Past Chairman, Department of Neurosurgery
University of California, San Francisco
“The Future of Neuroscience”
- 2008 Peter Jannetta, MD, Past Professor and Chairman
Department of Neurosurgery, University of Pittsburgh
“Vascular Compression in the Brainstem: Main Streaming Neurosurgery”
- 2009 L. Nelson Hopkins, MD, Professor and Chairman of Neurosurgery
University at Buffalo, State University of New York
“Neurosurgeons and Stroke: From Prevention to Treatment”
- 2010 Sean Mullan, MD, Professor Emeritus of Neurosurgery
University of Chicago
“Some Neurosurgical Fossils”
- 2011 John A. Jane, Sr., MD, PhD, Professor of Neurosurgery
University of Virginia Health System
“Anterior vs Posterior Approaches to the Cervical Spine”

SCIENTIFIC PROGRAM

Saturday, September 8, 2012

Day 1, Session I

Moderators: Charles Nussbaum, Tom Scully

- 7:30–7:35 *Welcome*, John T. Bonner, WNS President 2012
- 7:35–7:50 1 ***“Central Cord Syndrome: Review of Treatment at a Level One Trauma Center”***
Rein Anton, Tucson, AZ (Member Candidate)
- 7:50–7:55 Discussion
- 7:55–8:10 2 ***“Stereotactic Navigation with the O-arm for Placement of S2 Alar-Iliac Screws in Pelvic-Lumbar Fixation”***
Andrew T. Dailey, Salt Lake City, UT (Guest)
- 8:10–8:15 Discussion
- 8:15–8:30 3 ***“Posterior Approach for Thoracolumbar Corpectomies with Expandable Cage Placement and Circumferential Arthrodesis: a Multicenter Case Series of 67 Patients”***
Henry E. Aryan, Fresno, CA (Member Candidate)
- 8:30–8:35 Discussion
- 8:35–8:50 4 ***“Incidence of Vertebral Artery Injury with Traumatic Cervical Spine Subluxations”***
Kamran Parsa, Colton, CA (Guest Resident)
- 8:50–8:55 Discussion
- 8:55–9:10 5 ***“The Role of Peripheral Nerve Surgery in Restoring Motor Control Following Neurotrauma”***
Justin M. Brown, San Diego, CA (Member Candidate)
- 9:10–9:15 Discussion
- 9:15–9:30 6 ***“Radiographic Evaluation of Interspinous Fusion in Minimally Invasive Lumbar Surgery”***
Amir Vokshoor, Marina del Rey, CA (Member Candidate)
- 9:30–9:35 Discussion
- 9:35–9:50 7 ***“Glioblastoma Cells Expressing EGFRvIII are more sensitive to CK2 Inhibition”***
Gordon Li, Stanford, CA (Member Candidate)
- 9:50–9:55 Discussion
- 9:55–10:30 **Break - Visit Exhibits**

SCIENTIFIC PROGRAM

Day 1, Session II

Moderators: Richard Wohns, Randy Smith

- 10:30–10:45 8 ***“Incidence and Prevalence of Hydrocephalus: A Systematic Review and Meta-analysis”***
Mark G. Hamilton, Calgaary, Alberta (Member)
10:45–10:50 Discussion
- 10:50–11:05 9 ***“Arterial Spin Labeling Cerebral Blood Flow as a Correlate of Clinically Significant Hydrocephalus in Children with Brain Tumors”***
Michael S.B. Edwards, Stanford, CA (Member)
11:05–11:10 Discussion
- 11:10–11:25 10 ***“Inhibition of SURI Decreases Blood Tumor Barrier Permeability”***
Eric M. Thompson, Portland, OR (Resident Guest)
11:25–11:30 Discussion
- 11:30–11:35 Introduction of Cloward Award Winner
Donald Prolo

11:35–12:30 **Cloward Lecture**

***“Stepping-Out of the OR:
A Surgeon’s Foray into Entrepreneurship”***
John Adler

SCIENTIFIC PROGRAM

Sunday, September 9, 2012
Day 2, Session III

Moderators: Moustapha Abou-Samra, Jeff Rush

7:30–7:45 11 ***“Percutaneous Posterior Cervical Fusion with DTRAX Facet System for Single Level Radiculopathy - Results in 60 Patients”***
Bruce M. McCormack, San Francisco, CA (Member)
7:45–7:50 Discussion

7:50–8:05 12 ***“Resection of Small Acoustic Neuromas via the Translabyrinthine Approach”***
Marc S. Schwartz, Los Angeles, CA (Member)
8:05–8:10 Discussion

8:10–8:25 13 **Resident Award – Clinical Science**
“Submandibular High-Flow Bypass in the Treatment of Skull Base Lesions: Longterm Outcome”
Walavan Sivakumar, Salt Lake City, UT
8:25–8:30 Discussion

8:30–8:45 14 **Resident Award – Basic Science**
“Amygdala DBS is Superior to Paroxetine in a Rat Model of PTSD”
David Stidd, Tucson, AZ
8:45–8:50 Discussion

8:50–9:05 15 ***“Biomechanical Evaluation of the Craniovertebral Junction After Anterior Unilateral Condylectomy: Implications for Endoscopic Endonasal Approaches to the Cranial Base”***
Andrew S. Little, Phoenix, AZ (Guest)
9:05–9:10 Discussion

9:10–9:40 **Break - Visit Exhibits**

SCIENTIFIC PROGRAM

Sunday, September 9, 2012
Day 2, Session IV

Moderators: John Bonner, John McVicker

9:40–9:45 Introduction of Ablin Lecturer
John T. Bonner

9:45–10:35 **Ablin Lecture**

*“Illnesses in the US Presidents in the 20th Century:
Potential Impact on History”*
Robert Schrier

10:35–10:40 Introduction of CAPT Dave Shiveley, M.D.
John McVicker

10:40–11:30 **Special Lecture**

*“Current Health Service Support Issues for Homeland
Defense, Defense Support to Civil Authorities, and Theater Security Cooperation”*

CAPT Dave Shiveley, M.D.
NORAD/USNORTHCOM Command Surgeon

11:30–11:35 Introduction of WNS President, John Slater

11:35–12:30 **Presidential Address**

“Personal Reflections on the Development and Change of Neurosurgery”
John T. Bonner

SCIENTIFIC PROGRAM

Monday, September 10, 2012

Day 3, Session V

Moderators: Michael Lemole, Austin Colohan

7:30–10:30 **Mini Symposium - Neurosurgical Critical Care**

Neurocritical Care: Clinical Management Issues

“Theoretical and Practical Underpinnings of ICP Management”

Paul Muizelaar

“Temperature Management in Neurocritical Care”

John McVicker

“The Potential for Therapeutic Ultrasound in Neurocritical Care”

David Newell

Changes in the Neuro-ICU Environment: Impact on Neurosurgeons

“Logistics of the Modern Neuro-ICU”

Lori Shutter

“Optimizing Neurosurgical Involvement in the Neuro-ICU”

Shelly Timmons

10:00–10:30 **Break - Visit Exhibits**

SCIENTIFIC PROGRAM

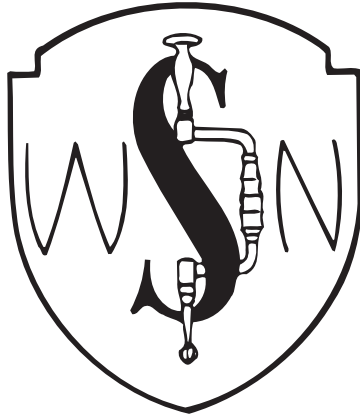
Monday, September 10, 2012

Day 3 , Session VI

Moderator: Charles Nussbaum

- 10:30–10:45 16 ***“MR-Guided Laser-Induced Thermal Ablation of Mesial Temporal Sclerosis***
David Stidd, Tucson, AZ (Resident Guest)
- 10:45–10:50 Discussion
- 10:50–11:10 17 ***“Carpal Tunnel Release Using the MANOS CTR System: Preliminary Results in 52 Patients”***
Bruce M. McCormack, San Francisco, CA(Member)
- 11:10–11:15 Discussion
- 11:15–11:25 18 ***“Some Thoughts on Healthcare in the United States”***
Jeffery L. Rush, Breckenridge, CO (Member)
- 11:25–11:30 Discussion
- 11:30 Meeting Adjourn

**59th Annual Meeting to be held September 15-18, 2013
The Ritz-Carlton, Half Moon Bay, California**



Abstracts

1. *Central Cord Syndrome: Review of Treatment at a Level One Trauma Center*

Mandana Behbahani, B.S.,² Jesse Skoch, M.D.,¹ Milad Behbahania, B.S.E.,²

Vernard S. Fennell, M.D.,¹ Tracy L. Ansay, M.D.,¹ Rein Anton, M.D., PhD¹

1 University of Arizona Medical Center, Division of Neurosurgery

2 University of Arizona College of Medicine

Introduction: Traumatic central cord syndrome can have devastating social, occupational, and economic consequences that can range from relatively transient to permanent. Understanding interventional outcome modifiers to maximize functional neurological recovery is paramount, however treatment protocols remain controversial. Time of surgery and patient age are variables that have repeatedly surfaced in the literature as possible predictors of outcome, but their importance remains poorly understood.

Methods: The University of Arizona Trauma database was used to retrospectively review patients from 2006 to 2011. Fifty patients in this database met clinical criteria for a diagnosis of central cord syndrome. Patients were evaluated on type of intervention (medical vs. surgical), timing of surgical intervention, age, and functional outcome using a modified Frankel Classification. We also analyzed outcome differences between the elderly (>65 years) and younger patients (<65). A one-way ANOVA analysis with Mann-Whitney posttest was used to search for statistically significant differences between surgically treated patients that underwent intervention within 24h from presentation vs. after 24h from presentation. A student's T-test was used to compare singular variables on interval data.

Results: The combined median age was 46 years with males and females being 49.5 and 35.5 years old respectively. Seventy four percent underwent surgery while 26% were treated non-operatively (medical). The median age for the surgical intervention group was 46 years and 44 in the medical group. Forty-three percent, of the surgery group, presented with a score of one or two (quadriplegia or paraplegia) and upon follow up that was reduced to 40%. The remaining 57% had a score of three or four (impairment or weakness), which was reduced to 38%, with 22% returning to normal function. In the medically treated group, only 8% returned to normal function with almost no improvement in patients who presented with a score of two or three (paraplegia or impairment). There was no significant differences found between the early (<24h) surgery and late surgery groups. The mean improvement in Frankel score was 0.31 in the early surgery group and 0.57 in the late group (p=0.29). Patients under the median age of 46 had significantly better (p=0.0485) improvements in their Frankel Scores (0.75 vs. 0.35).

Conclusions: In this retrospective review of 50 cases of acute traumatic central cord syndrome treated at our level one trauma center over a five year period, our data appears consistent with previously reported series in relation to demographics, outcomes, and superiority of surgical to medical management. Our data shows a trend towards greater improvement in functional outcomes with late (>24h) surgical management. This small retrospective study may be underpowered, but in light of modern and historical literature still failing to demonstrate a clearly superior

management strategy, we posit that the “early” category may often contain data points confounded by variable delays in patient presentation and that even a cutoff of 24h from patient presentation to surgery may be too generous. We intend to prospectively study ultra-early intervention (<24h after symptom onset) in attempt to more definitively answer this question.

2. *Stereotactic Navigation with the O-arm for Placement of S2 Alar-Iliac Screws in Pelvic-Lumbar Fixation*

Wilson Z. Ray, Vijay Ravindra, Meic H. Schmidt, Andrew T. Dailey

Introduction: Fixation to the pelvis is a crucial adjunct to many lumbar fusions to avoid L5-S1 pseudarthrosis. Pelvic fixation is useful for treatment of kyphoscoliosis, high-grade spondylolisthesis, L5-S1 pseudarthrosis, sacral tumors, lumbosacral dislocations, and osteomyelitis. The most popular method, iliac fixation, has drawbacks including hardware prominence, the need for extensive muscle dissection, and the need for connection devices. S2 alar-iliac fixation provides a useful primary or salvage alternative. We describe our techniques using stereotactic navigation for screw placement

Methods: Eighteen patients had computer-assisted S2 alar-iliac fixation over an 18-month period. The O-arm Imaging System (Breakaway Imaging) allowed for CT-quality multi-planar reconstructions of the pelvis, and registration to a Stealth Treon Station (Medtronic) provided intraoperative guidance. Ten patients had a diagnosis of kyphoscoliosis, 3 had osteomyelitis, 2 had L5-S1 pseudarthrosis revision, 1 had tumor, 1 had salvage of failed iliac screws, and 1 had distal adjacent segment degeneration.

Results: All patients had successful bilateral placement of the screws of lengths ranging from 80 to 100 mm. All placements were confirmed with a second multiplanar reconstruction. One screw was moved because of an apparent anterior breach of the ilium. There were no immediate or delayed (1–27 months) neurological or vascular complications from screw placement. The length of the screws required additional instruments including a longer pedicle finder and tap.

Conclusions: Stereotactic guidance to navigate the placement of distal pelvic fixation with bilateral S2 Alar-Iliac fixation can be safely performed in patients with a variety of pathologic conditions. Crossing the SI joint, choosing trajectory, and ensuring adequate screw length can all be enhanced with three-dimensional image-guidance.

3. *Posterior Approach for Thoracolumbar Corpectomies with Expandable Cage Placement and Circumferential Arthrodesis: A Multicenter Case Series of 67 Patients*

Henry E. Aryan MD

Sierra Pacific Orthopedic & Spine Center

Object: The purpose of this multicenter trial was to investigate the outcome and durability of a single-stage thoracolumbar corpectomy using expandable cages via a posterior approach.

Methods: The authors conducted a retrospective chart review of 67 consecutive patients who underwent single-stage thoracolumbar corpectomies with circumferential reconstruction for pathological, traumatic, and osteomyelitic pathologies. Circumferential reconstruction was accomplished using expandable cages along with posterior instrumentation and fusion. Correction of the sagittal deformity, the American Spinal Injury Association score, and complications were recorded.

Results: Single-stage thoracolumbar corpectomies resulted in an average sagittal deformity correction of 6.2° at a mean follow-up period of 20.5 months. At the last follow-up, a fusion rate of 68% was observed for traumatic and osteomyelitic fractures. Approximately one-half of the patients remained neurologically stable. Improvement in neurological function occurred in 23 patients (38%), whereas 7 patients (11%) suffered from a decrease in lower-extremity motor function. The deterioration in neurological function was due to progression of metastatic disease in 5 patients. Five constructs (7%) failed—3 of which had been placed for traumatic fractures, 1 for a pathological fracture, and 1 for an osteomyelitic fracture. Other complications included epidural hematomas in 3 patients and pleural effusions in 2.

Conclusions: Single-stage posterior corpectomy and circumferential reconstruction were performed at multiple centers with a consistent outcome over a wide range of pathologies. Correction of the sagittal deformity was sustained, and the neurological outcome was good in the majority of patients; however, 18% of acute traumatic fractures required revision of the construct.

4. *Incidence of Vertebral Artery Injury with Traumatic Cervical Spine Subluxations*

Javed Siddiqi, M.D., DPhil (Oxon), FRCSC, FACS, FAANS, Kamra Parsa, D.O.,
Omid R. Hariri, D.O., MSc., Farid Jamshidian, PhD., Dan Miulli, D.O.
Arrowhead Regional Medical Center, Colton, CA

The incidence of vertebral artery injuries in traumatic cervical spine subluxations has been reported to be highly variable, 3%-88%. The purpose of this study was to investigate the incidence of vertebral artery injuries at our institution, the second busiest trauma center in southern California. Retrospective data analysis was collected from our institution's trauma registry from January 2000-June 2011 to analyze the incidence of vertebral artery injury. A total 852 patients (mean age: 40.2 ± 1.30, 582 male, 270 female) presented with traumatic cervical spine fractures. 102 (12%) patients had cervical spine subluxation injuries. 13 patients had subluxed cervical spine injuries with vertebral artery injuries. This is 1.5% [P < 0.01, 95% confidence interval (CI) of 0.00-0.02] of all cervical spine fractures presenting to ED, and 12.7% of all traumatically cervical subluxation patients. As far as we can tell, this is the largest study that specifically evaluates incidence of vertebral artery injuries in traumatic fracture-subluxations of cervical spines. At our institution over the past 11.5 years, our data suggests that we have a 12.7% incidence of vertebral artery injury in patients with traumatic fracture-subluxations of the cervical spine. We found no VA injuries secondary to isolated linear or chip fractures into the foramen transversarium (which has traditionally been our most common indication for CTA to rule out VA injury). All of the vertebral artery injuries in our data were due to fracture-subluxations, except for gunshot wounds (n=2). All vertebral artery injuries were unilateral. Occlusion (Grade IV) was the most common form of vertebral artery injury associated with traumatic subluxation. Our frequency of VA injury by location in the C-spine varies from classical teaching. VA injury seems to be more common in patients older than 20 yrs, than those younger (despite the fact that younger patients are disproportionately represented in our trauma cohort).

5. *The Role of Peripheral Nerve Surgery in Restoring Motor Control Following Neurotrauma*

Justin M. Brown, MD
University of California, San Diego

While the role of nerve reconstruction in the setting of peripheral nerve trauma is generally well understood, application of peripheral nerve manipulations to the impaired motor control that results from spinal cord injury or brain injury is less familiar to most neurosurgeons. Methods of peripheral nerve reconstruction have evolved from the original approach of rebuilding the original peripheral anatomy via the use of grafts to what is now a more targeted intervention directed at particular key functions. Often times a nerve transfer offers a better functional outcome than might otherwise be obtained through graft reconstruction. The plasticity of the nervous system provides useful incorporation of these new "designs" and excellent function can often be achieved. Cervical spinal cord injury, while not amenable to nerve reconstruction, is often amenable to similar nerve transfer strategies. Additional

levels of function can be gained which may provide, for example, a patient with a C5/6 level deficit the ability to now grasp and release. Brain injury or stroke often leaves an arm with a spectrum of control within the individual muscles. Overly spastic muscles may at times conceal other muscles with adequate control. Additionally, proximal muscles may have better control than those distal. Developing a surgical plan of neurotomies, to reduce the contribution of particular spastic muscles, with nerve transfers from synergistic donors, can often provide a more functional limb. A number of peripheral nerve procedures are now available that can augment function in a number of different nervous system injuries not formerly considered to be amenable to these procedures.

6. Radiographic Evaluation of Interspinous Fusion in Minimally Invasive Lumbar Surgery

Amir Vokshoor, M.D.

Institute of Neurosurgical Innovation

Introduction: Interspinous Process (ISP) fixation for fusion has gained recent attraction as a less invasive option for patients undergoing lumbar fusion surgery for the treatment of degenerative disc disease, spinal stenosis, spondylolisthesis and/or instability of the lumbar spine. ISP fixation can be used in a variety of fusion constructs. Their actual fusion success rate has yet to be determined in a large case series.

Methods: 47 patients who underwent ISP fixation over a 36-month period were evaluated. All patients underwent lumbar fusion with an ISP fixation device (Aspen, LANX, USA). Thin slice CT images obtained between 2 and 23 month post-operatively were assessed for interspinous fusion and interbody fusion when applicable. These images were reviewed by an independent radiologist to evaluate success of fusion for the ISP space using the following scale: Grade 1 indicates small islands of bone; Grade 2 shows larger islands of coalescence with bridging to the surrounding anatomy; Grade 3 indicates some solid incorporation and bridging bone; Grade 4 shows solid fusion, with incorporation and obvious stability and maturity. Fusion of the intervertebral space was assessed using the Burkus criteria.

Results: 39 patients represented a total of 45 lumbar levels with ISP fixation for fusion. 91% of levels demonstrated Grade 3 or 4 ISP fusion based on the aforementioned scale. 61% of solid ISP fusions also underwent placement of an interbody cage. 84% of these levels showed solid interbody fusion (BSF-3). Two of these patients went on to re-exploration and explantation due to post-operative pain secondary to fracture of the spinous process and/or lamina.

Conclusion: Interspinous process fixation is a safe and effective minimally invasive technique in lumbar fusion surgery utilizing a less invasive approach than traditional fixation.

7. *Glioblastoma Cells Expressing EGFRvIII are More Sensitive to CK2 Inhibition*

Gordon Li,

Stanford University Department of Neurosurgery, Stanford CA

Glioblastoma (GBM) is the most common and fatal primary brain tumor with an overall life expectancy of 14 months. Since no cure exists it is essential novel therapies are developed to treat this devastating disease. Previous research has shown that an oncogenic kinase, casein kinase 2 (CK2) may be a promising therapeutic target for GBMs. CK2 has enhanced expression or activity in a wide variety of cancers including GBM and it was demonstrated that inhibitors to CK2 regressed tumor growth in GBM xenograft mouse models. Through our own work we demonstrate that GBM patients with high expression of CK2 had a much worse prognosis than patients with low levels. Currently the mechanisms enabling enhanced expression or activity of CK2 is still unknown. Our studies demonstrate that a deletion mutant of the EGF receptor (EGFRvIII) is involved in CK2 dependent tumorigenesis in GBM cell lines. We have generated GBM cell lines (U87-MG, U138) that stably express EGFRvIII and have shown that these cells are more sensitive to depletion of CK2. Initial studies showed that siRNAs specific to a specific CK2 subunit (CK2alpha) decreased GBM cell growth ~2-fold in the control GBM cells. Interestingly, expression of EGFRvIII sensitized the GBM cells to growth arrest since cell growth was reduced 5-7 fold with reduced expression of CK2alpha. In addition, inhibition of CK2alpha activity using commercially available inhibitors (TBB, TBBz) also reduced GBM cell growth (1.5-2 fold), but we observed a more dramatic reduction (4-5 fold) in EGFRvIII overexpressing cells. We have also conducted preliminary studies demonstrating that CK2alpha kinase activity *in vivo* is enhanced with EGFRvIII expression. Together our study suggests that EGFRvIII may play an important role in GBM tumorigenesis by regulating CK2 activity and that a combination treatment targeting both EGFRvIII and CK2alpha might be more efficacious than each one individually.

8. *Incidence and Prevalence of Hydrocephalus: A Systematic Review and Meta-analysis*

Mark G Hamilton, MD

University of Calgary, Calgary, Alberta

Introduction: Hydrocephalus is a chronic disease with multiple etiologies presenting at varying ages from birth to old age. However, the incidence of hydrocephalus is typically described as ranging between 200-400 per 100,000 live births, usually with no reference to prevalence or age range.

Methods: A systematic review of the medical literature was performed using a search strategy for population-based studies reporting the incidence and or prevalence of hydrocephalus in all ages. Two reviewers independently reviewed all abstracts, full text articles and abstracted data using standardized forms.

Results: The search identified 1485 abstracts of which 137 were reviewed as full text articles and 34 met all eligibility criteria. Prevalence and incidence data were

predominantly treatment-based (shunt insertion) and poorly reported for adults. Prevalence data was more commonly reported. The mean incidence of hydrocephalus in infants (n=6 studies) was 94 per 100,000 (95% CI 53-166). The mean prevalence of hydrocephalus in infants (n=13 studies) was 111 per 100,000 (95% CI 72-170). The incidence of hydrocephalus in all children was only reported in 2 studies and ranged from 5.5 to 315 per 100,000. The mean prevalence of hydrocephalus in all children (n=6 studies) was 73 per 100,000 (95% CI 47-113). The incidence (5.5 per 100,000) and prevalence (21.9 per 100,000) of hydrocephalus in adults less than 60 years of age was reported in only 1 study. The incidence of hydrocephalus in adults over 60 years of age was not reported. The mean prevalence of hydrocephalus in adults over 60 years of age (n=3 studies) was 239 per 100,000 (95% CI 146-389).

Conclusions: The prevalence of hydrocephalus is reasonably described for infants and children, ranging from 73-111 per 100,000. The incidence of hydrocephalus for infants was 94 per 100,000. There is inadequate information available regarding the incidence and prevalence of hydrocephalus in adults.

9.. Arterial Spin Labeling Cerebral Blood Flow as a Correlate of Clinically Significant Hydrocephalus in Children with Brain Tumors

Michael S.B. Edwards, MD

Lucile Packard Children's Hospital, Stanford, CA

Introduction: Intracranial pressure (ICP) does not necessarily correlate with ventricular size, but is theoretically inversely proportional to cerebral blood flow (CBF). Arterial spin labeling (ASL) is a magnetic resonance imaging (MRI) perfusion technique which uses inversion of proton spins in blood to quantify CBF. We hypothesized that ASL CBF is reduced in pediatric patients with symptomatic hydrocephalus from brain tumors.

Methods: ASL studies were performed using a pseudocontinuous labeling period of 1500 ms, followed by a 1500 ms post-label delay on 3T MRI. CBF was retrospectively measured in specific regions of interest in control patients and in brain tumor patients with hydrocephalus during and out of periods of symptomatic hydrocephalus. Patients were classified as symptomatic if they required surgical intervention for hydrocephalus (tumor resection or cerebrospinal fluid diversion) within seven days after the ASL MRI.

Results: Normative data were obtained from 26 control patients (median age 10.5 years, 11 under propofol anesthesia). Anesthesia was associated with decreased CBF only in the medial frontal lobes (53 ± 9 ml/100 g/min vs. 66 ± 9 ml/100 g/min, $p < 0.004$), and there were no effects of end-tidal CO₂ or mean arterial blood pressure on CBF under our conditions. Eleven brain tumor patients were identified, with median age eight (range 0.2 to 17) years, including six boys and five girls. CBF was globally decreased during symptomatic hydrocephalus (median 22.7 ml/100 g/min), compared with asymptomatic scans (median 39.3 ml/100 g/min; Wilcoxon Signed Rank Test, $p < 0.005$). CBF in areas of periventricular edema was further reduced to a mean of 44% of parenchymal CBF.

Conclusions: ASL CBF was reduced during symptomatic hydrocephalus in patients with brain tumors. Future prospective studies will determine whether ASL CBF perfusion MRI may serve a role in the noninvasive evaluation of hydrocephalus.

10. *Inhibition of SUR1 Decreases Blood Tumor Barrier Permeability*

Eric M. Thompson¹, Gregory L. Pishko², Edward A. Neuwelt^{1,2}

Departments of ¹Neurological Surgery and ²Neurology,
Oregon Health & Scienc University, Portland Oregon

Background: Inhibition of sulfonylurea receptor 1 (SUR1) by glyburide has been shown to decrease edema in stroke and subarachnoid hemorrhage putatively by preventing disruption of the blood brain barrier protein, zona occludens 1 (ZO-1). We explored the role of inhibiting SUR1 to control edema due to cerebral metastases.

Methods: Nude rats were intracerebrally implanted with small cell lung carcinoma LX1 cells. Animals (n = 6 per group) were administered vehicle, glyburide (4.8 µg twice, orally), or dexamethasone (0.35 mg, intravenously). Permeability was evaluated before and after treatment using dynamic contrast enhanced magnetic resonance imaging (DCE-MRI). Transfer coefficient (Ktrans) and extravascular extracellular space volume fraction (ve) of tumor vasculature were calculated. SUR1 and ZO-1 expression were evaluated using immunofluorescence and Western blots.

Results: SUR1 expression was significantly increased (P < 0.001) in brain tumors compared to the contralateral basal ganglia where there was no constitutive expression. Treatment with glyburide or dexamethasone did not affect SUR1 expression. Both glyburide (mean Ktrans ± standard error: -21.4% ± 14.2, P < 0.01) and dexamethasone (-14.2% ± 13.1, P < 0.01) significantly decreased blood tumor barrier (BTB) permeability compared to vehicle (101.8% ± 36.6). There was also a trend (P = not significant) of decreased ve conferred by glyburide. Administration of glyburide resulted in a significant increase (P < 0.001) in expression of ZO-1 compared to vehicle and dexamethasone. Neither agent reduced tumor size. Post-gadolinium T1-weighted MRI tumor size was correlated with survival (r = -0.650, P = 0.016) while permeability was not.

Conclusions: SUR1 is overexpressed in cerebral metastases. Inhibiting SUR1 decreased BTB permeability with efficacy equal to dexamethasone, likely by facilitating increased expression of ZO-1. Glyburide has the potential to improve quality of life by reducing tumor-related vasogenic edema with substantially less adverse side effects compared to dexamethasone and substantially less cost compared to bevacizumab.

11. *Percutaneous Posterior Cervical Fusion with DTRAX Facet System for Single Level Radiculopathy - Results in 60 Patients*

Bruce M. McCormack, MD

University of California San Francisco

Background: The authors present one-year results of 60 patients with cervical radiculopathy due to spondylosis and stenosis treated with a bilateral percutaneous facet implant. Clinical and radiologic results are analyzed.

Methods: 60 patients were treated with DTRAX Facet System in a multicenter prospective single arm study. All patients had symptomatic clinical radiculopathy and failed conservative management. Patients were assessed preoperatively with neck disability index (NDI), visual analogue scale (VAS), quality of life questionnaire (SF-12v2), CT, MRI, and dynamic films. Surgery was percutaneous posterior bilateral facet implants consisting of a screw and expandable washer and iliac crest bone aspirate. Patients underwent post-operative assessments at 2 weeks, 6 weeks, 3 months, 6 months and one year with validated outcome questionnaires. Alterations of segmental and overall cervical lordosis, foraminal dimensions, device retention and fusion criteria were assessed up to one year with CT reconstructions and x-ray. Fusion criteria was defined as bridging trabecular bone between the facets, translational motion < 2 mm, and angular motion < 5°.

Results:All patients were followed to one year. Age ranged from 40 to 75 with a mean of 53. Forty-one patients were treated at C5-6, eight at C6-7, eight at C4-5, and 3 at C3-4. NDI, SF-12v2 and VAS scores were significantly improved at two weeks and remained significantly improved up to one year. At the treated level, 93% had intra-facet bridging trabecular bone on CT, translational motion was < 2 mm in 100% and angular movement was less than 5° in 83% at one year follow-up. There were no reoperations, surgery or device related complications including implant failure or retrained hardware.

Conclusions: Results indicate DTRAX Facet System to be safe and effective for treatment of cervical spondylotic radiculopathy.

12. *Resection of Small Acoustic Neuromas via The Translabyrinthine Approach*

Marc S. Schwartz, MD
House Clinic, Neurosurgery
Los Angeles, CA

Options for treatment of small acoustic neuromas include microsurgery, stereotactic radiation, and, at least initially, observation. The availability of multiple options has elevated outcome standards. The translabyrinthine route provides a safe and effective means of resecting small acoustic neuromas that maximizes all outcomes, except hearing, since the inner ear is traversed.

Between January 2008 and June 2011, 68 patients underwent translabyrinthine resection of acoustic tumors smaller than 1 cm in the cerebellopontine angle. There were 28 males and 40 females. Age ranged from 9 to 76 (mean 56.1). Preoperatively, 67 patients (99%) had normal facial function. 16 patients (24%) retained serviceable hearing (Gardner-Roberson A or B).

There were no major complications, and all patients were discharged directly to home. The patient with abnormal facial nerve function was found to have a meningioma. Her facial nerve function improved (House-Brackmann 5/6 to 3/6) after gross total resection. Another patient was found to have metastatic carcinoma. Biopsy was carried out, and her facial nerve function deteriorated from 1/6 to 2/6. Of the other 66 patients, 65 were found to harbor 8th nerve schwannomas, and one additional patient had a meningioma. Gross total resection was carried out in each of these cases, and all had normal facial nerve function at last follow-up. 6 patients (9%) had developed temporary, mild facial nerve weakness (2-3/6) that recovered entirely by 3 months. There was one post-operative CSF leak treated via blind sac closure of the external auditory canal and direct packing of the eustachian tube.

Translabyrinthine resection of small acoustic neuromas provides a safe and effective means of treatment. Facial nerve outcomes compare favorably with any other option. If properly presented, many patients may find translabyrinthine resection to be a very attractive option. We would recommend translabyrinthine resection especially for patients with poor preoperative hearing, for those with significant vestibular dysfunction, and for younger patients.

13. *Submandibular High-Flow Bypass in the Treatment of Skull Base Lesions: Longterm Outcome*

Philipp Taussky, MD, Walavan Sivakumar, MD, William T. Couldwell, MD, PhD
Department of Neurosurgery, University of Utah, Salt Lake City, Utah

Background: Extracranial-intracranial bypass techniques remain an integral part of the treatment of complex skull base tumors and unclippable aneurysms. Specifically, giant and fusiform aneurysms that are amenable to neither clipping nor endovascular treatment may require proximal vessel occlusion and a bypass procedure for revascularization purposes. Skull base tumors involving the carotid artery may be

treated with the goal of gross total resection by internal carotid artery (ICA) sacrifice. In these instances, an extracranial-intracranial bypass offers revascularization of the distal vascular tree. Previous bypass techniques have predominantly required subcutaneous tunneling of the vein graft, thereby impacting long-term bypass patency. The senior author previously described a direct submandibular-infratemporal bypass technique that eliminates the need for tunneling.

Objective: The investigators retrospectively analyzed a single-surgeon experience using a high-flow submandibular-infratemporal saphenous vein graft bypass technique after carotid artery sacrifice in the resection of complex skull base tumors and carotid isolation in unclippable aneurysms.

Methods: Data on indications, surgical technique, bypass patency, complications, and outcome were collected for patients treated with adjunctive submandibular high-flow bypass for skull base lesions.

Results: Eleven patients (age range: 13-77 years) were treated for various skull base lesions: 4 patients were treated for skull base tumors with resection of the ICA, 6 were treated for aneurysms not amenable to clipping, and one was treated for invasive Mucor infection. Using a saphenous vein graft, a high-flow bypass was created from the high cervical internal carotid artery (ICA) or external carotid artery to ICA or middle cerebral artery by means of a submandibular- infratemporal route. Postoperative computed tomography angiography indicated bypass patency in 10/11 patients. There was no operative mortality. Follow-up of up to 12 years (mean 57 months) was achieved.

Conclusions: Direct high-flow submandibular-infratemporal interpositional saphenous vein bypass graft is an effective and durable technique for the treatment of complex skull base lesions where internal carotid artery revascularization is indicated.

14. *Amygdala DBS is Superior to Paroxetine in a Rat Model of PTSD*

David Stidd, MD; Kimberly Vogelsang; Scott E. Krahl, PhD;

Jean-Marc Fellous, PhD; Jean-Philippe Langevin, MD

Division of Neurosurgery

University of Arizona

Introduction: Posttraumatic stress disorder (PTSD) is a very debilitating disease refractory to current treatment with selective serotonin reuptake inhibitors (SSRIs) in up to 30 percent of patients, illustrating the need for new treatments of PTSD. Neuroimaging studies have shown increased activity of the amygdala of patients with PTSD. We demonstrate that amygdala deep brain stimulation (DBS) as novel treatment for PTSD is superior to current treatment with a commonly used SSRI, paroxetine, in a rat PTSD model.

Methods: A PTSD model was created by subjecting rats to inescapable foot shocks in the presence of a conspicuous ball. Response to treatment was measured as a decreased burying behavior when presented with the same ball one and two weeks after the shocks. Rats were treated with either daily intraperitoneal paroxetine injections or amygdala DBS via an electrode implanted one week prior to shocks. Generalized anxiety was assessed using an elevated plus maze.

Results: Animals treated with amygdala DBS showed less ball burying at two weeks relative to the animals treated with paroxetine. The animals treated with paroxetine, however, had a lower anxiety level compared to the DBS treated group.

Conclusions: While paroxetine did decrease the measured general anxiety level of the rats in this study, amygdala DBS was found to have a lower burying time in the PTSD model. This suggests that SSRIs only provide symptomatic relief of PTSD symptoms without addressing a cause. DBS is a promising novel treatment of PTSD refractory to current treatment.

15. *Biomechanical Evaluation of the Craniovertebral Junction after Anterior Unilateral Condylectomy: Implications for Endoscopic Endonasal Approaches to the Cranial Base*

Andrew S. Little, MD², Luis Perez-Orribo, MD^{1,4}, Richard D. Lefevre, BS¹, Phillip R. Reyes, BSE¹, Anna GU Sawa, MS¹, Daniel M. Prevedello, MD³, Hector Roldan, MD, PhD⁴, Peter Nakaji, MD², Curtis A. Dickman, MD², Neil R. Crawford, PhD¹

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Objective: Endoscopic endonasal approaches to the craniovertebral junction (CVJ) and clivus are becoming more commonly performed for ventral skull base pathology. These approaches may require disruption of the occipitocondylar joint to gain access to the lesion. Our goal was to study the biomechanical implications at the CVJ of progressive unilateral condylectomy as would be performed through an endonasal exposure.

Methods: 7 upper cervical human cadaveric specimens (C0-C2) underwent non-destructive biomechanical flexibility testing during flexion-extension, axial rotation, and lateral bending at C0-C1 and C1-C2. Each specimen was tested intact, after an inferior one-third clivectomy, and after stepwise unilateral condylectomy using an anterior approach. The hypoglossal canal was used as the landmark for 50% condyle resection. Angular range of motion, lax zone, and stiff zone were determined and compared to the intact state.

Results: At C0-C1, the range of motion and lax zone in flexion-extension and lateral bending increased significantly for each step, with dramatic instability observed at 100% condylectomy. There were no statistically significant increases in range of motion or lax zone in lateral bending, except at 100% condylectomy. At C1-C2, substantial hypermobility was observed at 100% condylectomy in flexion-extension and lateral bending, but not in lateral rotation. Changes in range of motion were largely caused by changes in the lax zone.

Conclusions: Lower-third clivectomy and unilateral anterior condylectomy as would be performed in an endonasal approach results in progressive hypermobility at the CVJ. Based on biomechanical criteria, craniocervical fusion is indicated in patients in whom greater than 75% anterior condylectomy has been performed. The hypoglossal canal may be a useful intraoperative landmark to prevent unintentional excessive condylar resection.

16. *MR-Guided Laser-Induced Thermal Ablation of Mesial Temporal Sclerosis*
David Stidd, MD; Jean-Philippe Langevin, MD; Martin E. Weinand, MD
Division of Neurosurgery, University of Arizona

Introduction The response rate to temporal lobectomy for patients with medically intractable epilepsy with concordance of 3 diagnostic studies implicating the mesial temporal lobe as the epileptic focus is approximately 80%. This response rate, however, is not without potential perioperative morbidity and long-term neurologic deficit. The first MR-guided laser-induced thermal ablation of mesial temporal sclerosis is reported as a minimally invasive alternative to temporal lobectomy for intractable epilepsy.

Methods: A 48 year-old male with medically intractable complex partial epilepsy was selected as a candidate for laser ablation. The patient had 3-4 seizures per month despite maximal medical therapy and a vagal nerve stimulator. Continuous video EEG monitoring localized a seizure focus to the left temporal lobe. MRI brain imaging demonstrated left mesial temporal sclerosis and a PET scan demonstrated left temporal hypometabolism. A Leksell stereotactic head frame was to insert a laser probe into the left mesial temporal lobe through a burr hole made in the left occiput. Laser energy was applied under continuous MRI thermal imaging to measure thermal ablation in real-time under general anesthesia.

Results: The patient tolerated the procedure well and was discharged home on the following day with only a mild headache and a 1-cm incision over the left occiput.

Conclusions: MR-guided laser-induced thermal ablation mesial temporal sclerosis is demonstrated as a safe alternative to temporal lobectomy. Non-published seizure control of this procedure is 80%, implicating that this minimally invasive technique is also effective. Further long-term follow up studies are warranted.

17. *Carpal Tunnel Release Using the MANOS CTR System: Preliminary Results in 52 Patients*

Bruce M. McCormack, MD
University of California San Francisco

Background: To describe a carpal tunnel release technique using the MANOS Carpal Tunnel Release device, with preliminary results in 52 patients.

Methods: The MANOS Carpal Tunnel Release device is a blade that divides the transverse carpal ligament using wrist and palm skin punctures. The awake patient provides feedback as the surgeon navigates a 2.1-mm-diameter blunt probe across the undersurface of the ligament from a wrist incision with standard disposable nerve stimulator monitoring. The leading tip of the blunt probe is uninsulated and conducts 2 mA. The surgeon converts the blunt insulated probe into an uninsulated blade by advancing a 0.9-mm needle through the palm with a thumb-activated deployment feature. The surgeon saws the ligament through the 2 skin punctures. We used a validated outcome questionnaire to assess postoperative symptoms at 3 months.

Results: Symptom severity and functional status scores compare favorably with literature controls for open and endoscopic surgery at 3 months. One patient required reoperation for incomplete release. There were no tendon or nerve injuries.

Conclusions: Preliminary results suggest the MANOS Carpal Tunnel Release device to be safe and effective.

18. *Some Thoughts on Healthcare Delivery in the United States*

Jeffery L Rush, MD, FACS
Breckenridge, CO

Even though the Patient Protection and Affordable Care Act (PPACA) and Health Care and Education Reconciliation Act finally passed in congress in 2010 and were signed into law by President Obama, many still remain without insurance; republican legislators are endeavoring to overturn these laws and the US Supreme Court will rule on the legality of the PPACA. This presentation will review some of the medical benefits of these acts, whether or not we accept health care as a “right”, and will look closely at the pros and cons of universal health care in general.

It is important to distinguish between universal health care and socialized medicine. Under universal health care, everyone has coverage to pay for access to health care; it does not mean that the government pays for that access. Under socialized medicine, the whole industry is run by the government. The US is the only industrialized nation without universal health care and spends more on health care as a percentage of GDP than any other country. If you have the ability to “pay”, US health care is the probably the best in the world but overall, the US ranks poorly statistically in quality relative to other countries.

At this time, the US is not ready to adopt a single payer system such as that in Canada or France because of their “presumed deficiencies”. A comparison of medical care in 12 industrialized countries will be reviewed which includes the US, the “single payer system”, and the model in the Netherlands and Switzerland of “universal coverage” with regulated competitive insurance markets. Finally, any health delivery system must look at cost control; the factors driving the ever increasing costs will be reviewed along possible measures to control them.



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John Raaf*
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David L. Reeves*
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Delbert Werden*	Ward W. Woods*

*deceased

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John S. Marsh	

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Robert W. Porter	1967, 1968, 1969
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John S. Tytus	1973, 1974, 1975
Theodore S. Roberts*	1976, 1977, 1978
Ulrich Batzdorf	1979, 1980, 1981
John A. Kusske	1982, 1983, 1984
W. Ben Blackett	1985, 1986, 1987
Francis E. LeBlanc	1988, 1989, 1990
Melvin L. Cheatham	1991, 1992, 1993
Grant E. Gauger	1994, 1995, 1996
Randall W. Smith	1997, 1998, 1999
Moustapha Abou-Samra	2000, 2001, 2002
Hector E. James	2003
Austin R. T. Colohan	2004, 2005, 2006
Jeffery L. Rush	2007, 2008, 2009
Charles E. Nussbaum	2010, 2011

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Gale C. Clark*	1983-1984
Robert Rand	1985-1990
Frank P. Smith*	1991-1995
John C. Oakley*	1996-1999
John P. Slater	1999-2002
John T. Bonner	2002-2008
Randall Smith	2009-2011

*deceased

PAST MEETINGS OF THE SOCIETY

1. Biltmore Hotel, Santa Barbara, CA	Nov 25-26, 1955
2. Timberline Lodge, OR	Dec 9-11, 1956
3. Holiday Hotel, Reno, NV	Sept 29-Oct 1, 1957
4. Del Monte Lodge, Pebble Beach, CA	Oct 19-22, 1958
5. La Valencia Hotel, La Jolla, CA	Sept 27-30, 1959
6. Del Monte Lodge, Pebble Beach, CA	Oct 23-26, 1960
7. Bayshore Inn, Vancouver, BC	Oct 29-Nov 1, 1961
8. Camelback Inn, Phoenix, AZ	Oct 28-31, 1962
9. El Mirador Hotel, Palm Springs, CA	Oct 20-23, 1963
10. Fairmont Hotel, San Francisco, CA	Oct 18-21, 1964
11. Olympic Hotel, Seattle, WA	Oct 3-6, 1965
12. Hotel Utah, Salt Lake City, UT	Nov 6-9, 1966
13. Kona Kai Club, San Diego, CA	Oct 15-18, 1967
14. Mauna Kea Beach Hotel, Kamuela, HI	Nov 16-19, 1968
15. Del Monte Lodge, Pebble Beach, CA	Oct 15-18, 1969
16. Bayshore Inn, Vancouver, BC	Oct 4-7, 1970
17. The Broadmoor, Colorado Springs, CO	Oct 31 -Nov 3, 1971
18. The Skyline Country Club, Tucson, AZ	Oct 29-Nov 1, 1972
19. Airport Marina Hotel, Albuquerque, NM	Sept 16-19, 1973
20. Santa Barbara Biltmore Hotel, CA	Oct 27-30, 1974
21. Mauna Kea Beach Hotel, Kamuela, HI	Sept 28-Oct 1, 1975
22. Harrah's Hotel, Reno, NV	Sept 26-29, 1976
23. La Costa Resort Hotel, Carlsbad, CA	Sept 18-21, 1977
24. The Lodge, Pebble Beach, CA	Oct 8-11, 1978
25. Camelback, Inn, Scottsdale, AZ	Sept 23-26, 1979
26. Mauna Kea Beach Hotel, Kamuela, HI	Sept 21-24, 1980
27. The Empress Hotel, Victoria, BC	Sept 20-23, 1981
28. Jackson Lake Lodge, Jackson Hole, WY	Sept 12-15, 1982
29. Hotel del Coronado, Coronado, CA	Oct 2-5, 1983
30. The Broadmoor, Colorado Springs, CO	Sept 9-12, 1984
31. Silverado Country Club & Resort, Napa, CA	Sept 22-25, 1985
32. Maui Intercontinental, Wailea, Maui, HI	Sept 28-Oct 1, 1986

PAST MEETINGS OF THE SOCIETY

33. Banff Springs Hotel, Banff, AB	Sept 6-9, 1987
34. The Ritz-Carlton, Laguna Niguel, CA	Sept 11-14, 1988
35. The Lodge, Sun Valley, ID	Sept 10-13, 1989
36. Mauna Lani Bay Hotel, Kawaihae, HI	Sept 9-12, 1990
37. The Pointe, Phoenix, AZ	Sept 22-25, 1991
38. The Whistler, Whistler, BC	Sept 20-23, 1992
39. Mauna Lani Bay Hotel, Kawaihae, HI	Sept 19-22, 1993
40. Le Meridien Hotel, San Diego, CA	Sept 18-21, 1994
41. Salishan Lodge, Gleneden Beach, OR	Sept. 9-12, 1995
42. Manele Bay, Island of Lanai, HI	Sept 14-17, 1996
43. Ojai Valley Inn, Ojai, CA	Sept 20-23, 1997
44. Silverado Resort, Napa, CA	Sept 12-15, 1998
45. Coeur d'Alene Resort, Coeur d'Alene, ID	Sept 18-21, 1999
46. Mauna Lani Bay Hotel, Hawaii, HI	Sept 9-11, 2000
47. Ocean Pointe Resort, Victoria BC (Cancelled)	Sept 15-18, 2001
48. Delta Victoria Resort, Victoria, BC	Oct 12-15, 2002
49. Hapuna Beach Prince Hotel, Kamuela, HI	Sept 20-24, 2003
50. Rancho Bernardo Inn, San Diego, CA	Sept 11-14, 2004
51. Squaw Creek Resort, Lake Tahoe, CA	Sept. 17-20, 2005
52. Semiahmoo Resort & Spa, Blaine, WA	Sept. 16-19, 2006
53. Mauna Lani Bay Hotel, Kawaihae, HI	Sept. 8-11, 2007
54. Hotel Captain Cook, Anchorage, AK	Aug. 16-19, 2008
55. Sun River Resort, Bend, OR	Sept. 11-14, 2009
56. Eldorado Hotel, Santa Fe, NM <i>In Memory of L. Philip Carter</i>	Oct 8-11, 2010
57. The Grand Hyatt Kauai Resort & Spa, Island of Kauai, Hawaii	Sept. 10-13, 2011

FUTURE MEETINGS

Ritz-Carlton, Half Moon Bay, CA	September 15-18, 2013
Sun Valley, Idaho	August 16-19, 2014
The Grand Hyatt Kauai Resort & Spa, Island of Kauai, Hawaii	September 11-14, 2015

PAST VICE-PRESIDENTS

John Raaf*	1955	Ulrich Batzdorf	1982
Frank Turnbull*	1956	George Ablin*	1983
Howard A. Brown*	1957	George A. Ojemann	1984
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Edmund J. Morrissey*	1959	Robert Weyand	1986
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William A. Kelley	1978	John Adler	2006
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Robert W. Rand	1980	Betty MacRae	2008
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		David W. Newell	2010
		J. Paul Muizelaar	2011

*deceased

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Edward K. Kloos*	1973	Donald J. Prolo	2001, 2002
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Ralph B. Cloward*	1975	Randall W. Smith	2004
James R. St. John*	1976	John P. Slater	2005
Eldon L. Foltz	1977	Moustapha Abou-Samra	2006
John Tytus*	1978	Kim Burchiel	2007
Donald B. Freshwater*	1979	Gerald Silverberg	2008
William A. Kelly	1980	Lawrence Shuer	2009
Byron C. Pevehouse*	1981	L. Philip Carter*	2010
		David W. Newell	2010
		Austin R.T. Colohan	2011

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Kenneth Liu, OHSU	2007
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Edward Chang, UCSF	2008
Zachary Litvack, OHSU	2009
Kiran Rajneesh, UCI	2009
Justin Dye, UCLA	2010
Isaac Yang, UCSF	2010
Terry Burns, Stanford	2011
Gabriel Zada, USC	2011

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Western Neurosurgical Society
59th Annual Meeting
September 15-18, 2013



The Ritz-Carlton, Half Moon Bay
Half Moon Bay, California

58th Annual Meeting
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Colorado Springs, Colorado

