

*Western
Neurosurgical
Society
62nd Annual
Meeting*



Friday, September 9th, 2016

12pm – 4pm	Executive Committee Meeting	Goldfinch
2pm – 5:30pm	Registration	Avalon Foyer
2pm – 5:30pm	Exhibit Setup	Laviana
6pm – 9:30pm	Opening Reception w/Exhibitors	Laviana & Palm Courtyard

Saturday, September 10th, 2016

6am – 7:45am	Breakfast w/Exhibitors (members/guests)	Laviana/Laviana Terrace
6:30am - 12:30pm	Registration	Avalon Foyer
7:20am – 8:40am	Scientific Session 1	Avalon
8am – 10am	Spouses Breakfast	Vivace
8:40am – 9:30am	Special Lecture	Avalon
9:30am – 10am	Coffee Break with Exhibitors	Laviana
10am – 11:15am	Scientific Session 2	Avalon
11:15 – 12pm	Special Lecture 2	Avalon
12:30pm – 5pm	Craft Beer Tour	Meet in Lobby for bus
1pm - 5pm	Tennis	Tennis Courts
1pm – 5pm	Golf	Golf Course
5:15pm - 5:50pm	Bus for Safari Park Dinner	Meet in Lobby for bus
6pm – 10pm	Dinner & Exotic Animal Show	Safari Park

Sunday, September 11th, 2016

6:30am – 8am	Business Meeting (Members)	Kingfisher
7:15am – 8am	Breakfast w/Exhibitors (guests/members)	Laviana/Laviana Terrace
6:30 - 12:30pm	Registration	Avalon Foyer
8am – 8:45am	Resident Awards	Avalon
8am – 10am	Spouses' Breakfast	Vivace
8:45 – 10am	Scientific Session 3	Avalon
10am – 10:25am	Coffee Break with Exhibitors	Laviana
10:25am – 11am	Ablin Lecture	Avalon
11am – 11:35am	Cloward Award Lecture	Avalon
11:35 – 12:10pm	Presidential Address	Avalon
12:30pm – 5pm	Wine/Sculpture Garden Tour	Meet in Lobby for bus
1pm – 5pm	Golf	Golf course
1pm – 5pm	Tennis	Tennis Courts
6pm – 7pm	Formal Reception	Grand Foyer B
7pm – 10pm	Black Tie Dinner/Dancing	Grand Ballroom/Foyer B

Monday, September 12th, 2016

6:45am – 7:30am	Breakfast with Exhibitors	Laviana/Laviana Terrace
7:30am – 12pm	Registration	Avalon Foyer
7:30am – 9:05am	Mini Symposium 1	Avalon
8am – 10am	Spouses Breakfast	Vivace
9:05am – 10:05am	Scientific Session 4	Avalon
10:05am – 10:30am	Coffee Break with Exhibitors	Laviana
10:30am – 12pm	Mini Symposium 2	Avalon
12pm	Meeting Adjourns	

Western Neurosurgical Society

62nd Annual Meeting

2016 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:

Objective 1: Review the neurocritical care of patients with a traumatic brain injury and subarachnoid hemorrhage

Objective 2: Review the neurocritical care of patients with a deep venous thrombosis and pulmonary hemorrhage

Objective 3: Gain understanding in the potential impact of bundled payments and obligatory outcome registries for spinal neurosurgery

Objective 4: Understand the indications for intra-operative spinal imaging for instrumentation cases

Objective 5: Understand the origins of the science of human memory

Jointly Provided by AANS

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The Western Neurosurgical Society would like to thank
Michi Wohns Carlson
2016 Exhibitor Coordinator

2016 Officers & Committees

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David Pitkethly, MD, Vice President
Marc Vanefsky, MD, Secretary-Treasurer
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Moustapha Abou-Samra
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Ciara Harragher
William Ganz

MEMBERSHIP COMMITTEE

Marco Lee, Chair

Frederick Edelman
John McVicker

EXHIBITORS

The Western Neurosurgical Society would like to thank the following exhibitors for their generous support in 2016

PLATINUM SUPPORT

Medtronic Spine

www.medtronic.com/for-healthcare-professionals/products-therapies/spinal/

EDUCATIONAL GRANT/ GOLD SUPPORT

The Western Neurosurgical Society thanks the following company for their educational grant for the 2016 Annual Meeting.

Arbor Pharmaceutical

<http://www.arborpharma.com>

SILVER SUPPORT

DePuy Synthes

<http://www.depuyshnthes.com/>

Haag-Streit

<https://www.haag-streit.com/haag-streit-diagnostics/>

EXHIBITORS

The Western Neurosurgical Society would like to thank the following exhibitors for their support in 2016

Aspen Medical Products <http://www.aspenmp.com/>

BK Ultrasound <http://bkultrasound.com/>

BrainLab <http://www.brainlab.com>

Centinel Spine <http://www.centinelspine.com/>

ExamWorks <https://www.examworks.com/>

Globus Medical <http://www.globusmedical.com/>

Imris <http://www.imris.com/>

KLS Martin <http://klsmartinnorthamerica.com>

LDR <http://www.ldr.com>

Monteris Medical <http://www.monteris.com>

Nextism <http://www.nextism.com/>

Orthofix <http://www.orthofix.com/>

Osteomed <http://www.osteomed.com/>

Samsung NeuroLogica <http://www.neurologica.com/>

Sophysa USA, Inc <http://www.sophysa.com/>

Specialty Care <http://www.specialtycare.net/>

Spine Wave <http://www.spinewave.com>

Surgical Theatre <http://www.surgicaltheater.net/>

Surgical West <http://surgicalwest.com/>

Synaptive Medical <http://synaptivemedical.com>

Synergy Medical Corp <http://www.>

Varian Medical Systems <http://www.varian.com>

Zimmer Biomet <http://www.zimmerbiomet.com>

2016 SOCIETY MEETING GUESTS

NAME	STATUS	SPONSOR/S
Tarun Arora	Member Candidate	Linda Liau
Nicholas Au Yong	Resident Award	
Garni Barkhoudarian	Member Candidate	Linda Liau
Donald Becker	Cloward Award	
Sharona Ben-Haim	Member Candidate	Bob Carter
Harsimran Brara	Member Candidate	Marvin Bergsneider
Colleen Carter	Society Guest	
Sam Cheshier	Member Candidate	Drs. Grant, Steinberg & Edwards
Andrew Dailey	Member Candidate	Drs. McVivker, McDonald & Hood
Justin Dye	Member Candidate	Marvin Bergsneider
Aria Fallah	Member Candidate	Marvin Bergsneider
Gary Goplen	Member Candidate	Drs. Siddiqi, Kissel & Schwartz
William Gerwick	Invited Speaker	Guest of Marvin Bergsneider
Casey Halpern	Member Candidate	Marco Lee
Melanie Hayden-Gephart	Provisional Member	Drs. Steinberg, Shuer & Edwards
Gregory Helbig	Guest of Member	Moustapha Abou-Samra
Jean-Phillippe Langevin	Member Candidate	Marvin Bergsneider
Lewis Leng	Provisional Member	Drs. Andrews, McDermott
Gordon Li	Member Candidate	Drs. Harraher, Edwards & Steinberg
Luke Macyszyn	Member Candidate	Marvin Bergsneider
Claudia Martin	Member Candidate	Marco Lee
Lisa Mulligan	Guest of Member	Moustapha Abou-Samra
Priscilla Pang	Resident Award	
Nader Pouratian	Member Candidate	Linda Liau
Shayan Rahman	Member Candidate	Marvin Bergsneider
John Ratliff	Member Candidate	Lawrence Shuer
Edward Schilowitz	Invited Speaker	Guest of Marvin Bergsneider
Mark Sedrak	Member Candidate	Linda Liau
Christine Smith	Guest of Member	Randall Smith
Laura Snyder	Provisional Member	Drs. Little, Harrington & Weinand
Larry Squire	Ablin Lecture	
Phil Taussky	Member Candidate	William Couldwell
Christopher Taylor	Member Candidate	Drs. Yonas, Turner & Shin
Shelly Timmons	Speaker	
Jon Vangilder	Guest of Member	Moustapha Abou-Samra
David Westra	Guest of member	Moustapha Abou-Samra
Libby Wright	Society Guest	
Isaac Yang	Member Candidate	Drs. Liau, Lawton & Martin

CONTINUING MEDICAL EDUCATION ACCREDITATION

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the AANS and 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 11.00 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity. Joint Providership Disclaimer The material presented at the 61st annual meeting of the Western Neurosurgical Society has been made available by the WNS and the AANS for educational purposes only. The material is not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed, but rather it is intended to present an approach, view, statement, or opinion of the faculty, which may be helpful to others who face similar situations. 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 provided 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 the annual 60th meeting of the Western Neurosurgical Society. 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
Tarun Arora	Yes	Consultant Fee
Thomas Chen	Yes	Share/Stockholder
Mark Hamilton	Yes	Consultant Fee, Share/Stockholder, Honorarium
Gordon Li	Yes	Consultant Fee
Andrew Little	Yes	Honorarium, Share/Stockholder
Neil Martin	Yes	Stock/Shareholder, Speaker's Bureau
Nader Pouratian	Yes	Industry Grant, Consultant Fee
John Rattliff	Yes	University Grant, Consultant Fee, Fiduciary Position
Gerald Silverberg	Yes	University Grant, Stock/Shareholder, Fiduciary Position
Gary Steinberg	Yes	University Grant, Consultant Fee, Stock/Shareholder
Phil Taussky	Yes	Consultant Fee
Suzanne Tharin	Yes	Other Financial
Shelly Timmons	Yes	Consultant Fee, Honorarium, Fiduciary Position, Other Financial
Richard Wohns	Yes	Consultant Fee, Stock/Shareholder, Fiduciary Position
Isaac Yang	Yes	University Grant, Consultant Fee

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:

***educational content planner of this meeting**

Nicholas Au Yong, MD, PhD
Garni Barkhoudarian, MD
Donald Becker, MD
Joel Beckett, MD
Sharona Ben-Haim, MD
Marvin Bergsneider, MD*
Harisman Brara, MD
John Burke, MD
Justin Dye, DO
Aria Fallah, MD
William Gerwick, MD, PhD
Steven Gianotta, MD
Casey Halpern, MD
Ciara Harraher, MD
Michael Huang, MD
Hector James, MD

J. Patrick Johnson, MD
Jean-Phillippe Langevin, MD
Linda Liaw, MD *
Luke Macyszyn, MD
Geoffrey Manley, MD
Claudia Martin, MD
Charles Nussbaum MD *
Priscilla Pang, MD
Rahman Shayan, MD
Ian Ross, MD
Edward (Ted) Schliowitz
Mark Sedrak, MD
Larry Squire, MD, PhD
Martin Weinand
Marc Vanefsky, MD*

The Western Neurosurgical Society
extends its sincere appreciation to the
Neurosurgery Research and Education Foundation

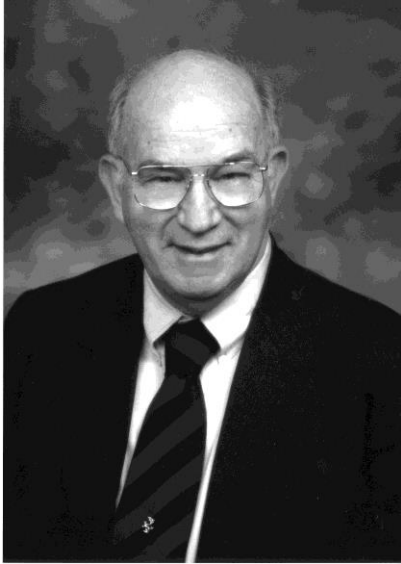
NREF is sponsoring the costs of providing speakers for our Mini-Symposium 1 on Neurocritical Care to be presented Monday morning at 7:30 AM.

This sponsorship reflects the commitment of the Foundation to not only support research but also to support the continuing education of the practicing neurosurgeon.

The Western Neurosurgical Society is one of the organizations contributing to NREF in furtherance of their goals and our Society encourages its members to also support the foundation.

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.

2016 ABLIN LECTURER



Larry R. Squire, Ph.D.

Dr. Larry R. Squire is Distinguished Professor of Psychiatry, Neurosciences, and Psychology at the University of California School of Medicine, San Diego, and Research Career Scientist at the Veterans Affairs Medical Center, San Diego. Born in Cherokee, Iowa, he received his undergraduate degree from Oberlin College (Psychology), his Ph.D. degree from the Massachusetts Institute of Technology (Brain and Cognitive Sciences), and did postdoctoral study at the Albert Einstein College of Medicine before coming to UCSD in 1970 to join the nascent Psychiatry Department.

Dr. Squire investigates the organization and neurological foundations of memory. His work involves the study of neurological patients and rodents and combines the traditions of cognitive science and neuroscience. His publications include more than 500 research articles and two books: Memory and Brain (Oxford Press, 1987) and Memory: From Mind to Molecules with Eric Kandel (W.H. Freeman, 1999). He is also Senior Editor of the textbook, Fundamental Neuroscience, now in its 4th Edition and Editor-in-Chief of The History of Neuroscience in Autobiography (now in eight volumes). In 1993-1994, he served as President of the Society for Neuroscience. He is an elected member of the National Academy of Sciences and served on its governing Council (2009-2012). He is also an elected member of the American Academy of Arts and Sciences, the American Philosophical Society, and The National Academy of Medicine. He is also a William James Fellow of the American Psychological Society and is a recipient of the Distinguished Scientific Contribution Award from the American Psychological Association, the William Middleton Award from the Department of Veterans Affairs, the Charles A. Dana Award for Pioneering Achievements in Health, the McGovern Award (American Association for the Advancement of Science), the Metropolitan Life Award for Medical Research, the Karl Lashley Award (American Philosophical Society), the Herbert Crosby Warren Medal (Society of Experimental Psychologists), the Award for Scientific Reviewing (National Academy of Sciences), and the Goldman-Rakic Prize (Brain and Behavior Research Foundation).

Dr. Squire has a number of avocations led by his interest in the history of polar exploration.

His topic for our 2016 meeting will be: "The Legacy of Patient H.M. The Cognitive Neuroscience of Memory"

PRIOR 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”*

2012 Robert Schrier, MD, Professor of Medicine, University of Colorado. *“Illnesses in the US Presidents in the 20th Century: Potential Impact on History”*

2013 Samuel Eric Wilson, MD, Professor, Department of Surgery, University of California, Irvine. *“Between Scylla and Charybdis: Can Academic Surgery Survive?”*

2014 Jon H. Robertson, MD, Professor of Neurosurgery, University of Tennessee. *“The challenge of the Future Neurosurgical Education”*

2015 David Piepgras, MD, Professor of Neurosurgery, Mayo Clinic. *“Frontier Surgery: Lessons for Today from Beaumont and St. Martin”*

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 Ralph and his devoted wife Florence, our former president and first lady, both treasured friends who have enriched the Western.

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 subsequently at the University of Utah and 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 practicing neurology and neurosurgery in the Territory of Hawaii in 1938.

His academic accomplishments include Professor and Chair of Neurosurgery at the University of Chicago, 1954-55, and visiting professorships at the University of Oregon, University of Southern California, and Rush Medical School. He served long-term as Professor of Neurosurgery at the John A. Burns School of Medicine at the University of Hawaii. He authored numerous papers and book chapters.

Dr. Cloward's inspired, pioneering quantum leaps encompassed 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 the operation at a meeting of the Hawaiian Territorial Medical Association in 1945 and publishing it in the *Journal of Neurosurgery* in 1953. His unique approach for treating hyperhidrosis 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 operations he devised. He performed them throughout the United States and in 41 cities within 27 countries of the world and in the process healed patients of their painful conditions. Hundreds of thousands of patients benefited both directly and indirectly from his creativity, technical genius, insight and enthusiasm as a teacher and medical evangelist.

In first recognizing all lesions of the spine to be in the province of neurosurgeons, Dr. Cloward engendered controversy and endured severe criticism from upsetting the environment of establishment neurosurgeons by his pioneering breakthroughs. He demonstrated that even in a complex technological world with large research efforts, budgets, and bureaucracies, the individual is key. Engraved on the Medal are words the Cloward legacy epitomizes, which honors recipients "For Epochal Innovation and Pioneering Application."

2016 CLOWARD AWARD RECIPIENT



Donald P. Becker, M.D.
Professor Emeritus,
University of California, Los Angeles

Dr. Becker was the W. Eugene Stern Professor of Neurosurgery at UCLA (1985 – 2001) and Senior Associate Dean for Academic Affairs in the David Geffen School of Medicine at UCLA (2001-2007). He served as UCLA Chief of Neurosurgery from 1985 until 2001. He obtained his M.D. from Case Western Reserve University and completed his neurosurgical residency at the University Hospitals of Cleveland. Previous to his position at UCLA, Dr. Becker was Professor and Chairman at the Medical College of Virginia from 1972 to 1985. At UCLA, Dr. Becker developed a multidisciplinary clinical and investigative state-of-the art program aimed at improving cellular

recovery in patients suffering from brain injury from cerebrovascular disease, trauma and brain tumors. Dr. Becker has earned many prestigious awards including the Fitts Award in 1985 from the American Association of Neurological Surgeons, the Grass prize and medal from the Society of Neurological Surgeons in 1986, the William Caveness Award from the National Head Injury Foundation in 1988, the Distinguished Service Award from the National Neurotrauma Society in 2003, the UCLA Neurosurgery Visionary Award in 2005 and, was named Legend of the Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center in 2007. He has authored numerous articles and chapters and has written two books on neurotrauma and recovery. He served as President of the Neurosurgical Society of America, served on the Board of Directors of the American Board of Neurological Surgery and the Journal of Neurosurgery Editorial Board. He was the former Director of the UCLA Brain Tumor Program, until he retired in 2007.

Presently, he is now domiciled in central Virginia (between Richmond and Charlottesville), but has a small appointment at UCLA as an Emeritus Professor. He lives on a Horse Farm with his wife Maria. He travels to California about 4 times per year as a consultant for a private company (Samitaur Medical Technologies) in Los Alamos. In Virginia, his hobbies are horses--race horses, trail horses and hunter/jumpers. He is a member of the Deep Run Hunt Club, and still belongs to 2 Western Riding Groups (Rancheros Visitadores which meets in May in Santa Ynax Valley, and the Charlie Russell Riders which meets in September in Montana). In addition to horses, he has a passion for golf and plays as often as possible. His children are all grown, and he has 7 grandchildren.

His topic for our meeting: Brain Trauma and Beyond: A Career in Neurosurgery

PRIOR CLOWARD AWARD RECIPIENTS

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”*

2012 John R. Adler, Jr., MD Professor of Neurosurgery. Stanford University. *“Stepping-Out of the OR: A Surgeon’s Foray into Entrepreneurship”*

2014 Andres M. Lozeno, MD, Professor of Neurosurgery, University of Toronto. *“Taming Dysfunctional Brain Circuits”*

2015 Edward Oldfield, MD, Professor Neurosurgery, University of Virginia. *“The origin of concepts in neurosurgery: One neurosurgeon’s perspective”*

INVITED SPECIAL LECTURERS



Ted Schilowitz, Futurist, 20th Century FOX

“The Augmented Human”

Ted Schilowitz was the first employee and founding team member at RED Digital Cinema and Co Founder of G-Tech. His current roles are as Futurist for 20th Century Fox, where he works directly with Fox studios executives on the next generation of visual storytelling, such as the Martian VR experience that premiered at CES and Sundance this year, and as Chief Creative Officer at Barco where he's been spearheading the Barco Escape cinema project, that adds immersive right and left screens to movie theaters. Barco Escape launched with the Fox movie The Maze Runner, then brought Maze Runner 2, Scorch Trials to the format, and are in production on a number of new theatrical features currently. @VirtualTedS



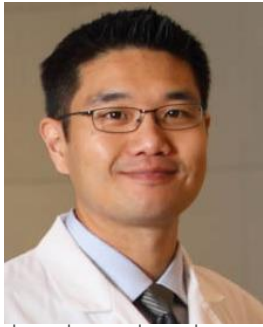
William H. Gerwick, Ph.D., Professor, Skaggs School of Pharmacy and Pharmaceutical Sciences. Scripps Institution of Oceanography

“The Search for Novel Neurotherapeutics From the Ocean Floor”

Dr. Gerwick's research focuses on exploring the unique natural products of marine algae and cyanobacteria for useful biomedical properties. These chemically prolific organisms are sources of numerous highly unusual metabolites, and the Gerwick group has been involved in their discovery and evaluation in the areas of cancer, inflammation, infectious disease including tropical diseases such as malaria, chagas' disease, leishmaniasis, neurochemical pathways, as well as agricultural uses. The Gerwick group has also examined the pathways of biosynthesis of many of the compounds they have discovered over the years, and pioneered the characterization of their origins at the molecular genetic and genomic levels. More recently, his group has also applied their chemical and genetic approaches to the goal of obtaining biofuels from cultured microalgae.

2016 RESIDENT AWARD RECIPIENTS

Basic Science Award



Nicholas Au Yong, M.D., Ph.D. UCLA

Nicholas Au Yong, a sixth year resident at UCLA, began life in Malaysia but moved to Brodheadville, Pennsylvania at the age of nine. He developed an early interest in both neurosurgery and engineering, and chose to attend the University of Rochester for its nice balance of a well-regarded medical school and biomedical engineering research in a quaint small city. There he completed his bachelors of electrical engineering and masters in biomedical engineering. During the summers, he performed research in spinal cord injury at Drexel University in Philadelphia where he developed a deep scientific interest in the neural control of movement and spinal cord injury. He continued his education at Drexel University College of Medicine as part of the M.D., Ph.D. program for its rich tradition and long-standing spinal cord injury research group. He received his MD and PhD in Neuroscience in 2011.

He was elated to match at the University of California Los Angeles for Neurosurgery residency as he was drawn to the program for its world-class interdepartmental neurosurgery and engineering research efforts. He is interested in the growing concept of restorative neurosurgery, which draws from his background as an engineer and a neurophysiologist. He is planning an academic career in functional neurosurgery and spinal disorders.

Nick is married to Chantal McMahon, a native of upstate New York. She also attended the University of Rochester and they met at Drexel University during graduate school. They both enjoy traveling and exploring southern California. Nick enjoys playing and watching soccer, running and is considering golf. We hope he will come to his senses regarding golf.

Clinical Science Award



Priscilla Pang, M.D. OHSU

Born and bred in Texas, Dr. Pang parlayed her high school science performance into a Goldwater scholarship at John Hopkins where she received her BA in Neuroscience in 2005 and then graduated with a combined MD/MS (Applied Anatomy) degree from Case Western Reserve University in 2010. While at Case Western she got hooked by neurosurgery because "it is functional anatomy at its finest, but more importantly, it's being able to help people remain themselves - preservation of the soul, if you will. I can't imagine a higher calling."

She was accepted into the neurosurgery program at Oregon Health and Science University and is currently chief resident and scheduled to finish next July. Her academic interests are in quality and process improvement projects, as well as stem cell research and she is applying for a pediatric neurosurgery fellowship.

Dr. Pang's spare time activities include yoga, rock climbing (she has been a climbing instructor) and hiking the trails of the Pacific Northwest with her husband Jon Witten (a urologist) and their dog Taggart (a sheepadoodle). Neither of them sheds.

WNS 2016 SCIENTIFIC PROGRAM

Park Hyatt Aviara Resort, Carlsbad, September 9-12, 2016

Saturday, September 10, 2016

6:45-7:20 **Breakfast with Exhibitors**

7:20-7:25 Welcome: Linda M. Liaw

7:25-8:40 **Scientific Session 1**

Moderators: Andrew Little, Isaac Yang

1. *Endovascular Approaches to the Cavernous Sinus in the Setting of Dural Arteriovenous Fistula.* Justin Dye (candidate member)
2. *Basolateral Amygdala Deep Brain Stimulation for Post-Traumatic Stress Disorder.* Jean-Philippe Langevin (candidate member)
3. *CT Perfusion Imaging in Endovascular Therapy for Wake-up Stroke: A Single Center Experience.* Ian Ross (member)
4. *Cost Utility Analysis of Competing Treatment Strategies for Drug-Resistant Epilepsy in Children with Tuberous Sclerosis Complex.* Aria Fallah (candidate member)
5. *Tubular Brain Tumor Resection: Multimodality Surgery Augmenting Maximal Safe Tumor Resection.* Garni Barkhoudarian (candidate member)

8:40-9:30 **Special Lecture 1**

Introduction: Marvin Bergsneider

- *The Augmented Human.* Ted Schilowitz. Futurist. 20th Century Fox

9:30-10:00 **Coffee Break with Exhibitors**

10:00-11:15 **Scientific Session 2**

Moderators: Ian Ross, Gordon Li

1. *How Does Sagittal Imbalance Affect the Appropriateness of Surgery in Degenerative Lumbar Scoliosis?* Harsimran Brara (candidate member)
2. *Magnetic Resonance Imaging-Guided Focused Ultrasound Compared to Deep Brain Stimulation and Stereotactic Radiosurgery for Essential Tremor.* Casey Halpern (candidate member)
3. *Randomized, Double-Blinded, Placebo-Controlled Trial Comparing Two Multimodal Opioid-Minimizing Pain Management Regimens Following Transsphenoidal Surgery.* Andrew Little (member)
4. *Microsurgery to Endovascular and Endovascular to Microsurgery Cross-Over in a Modern Cerebrovascular Case Series.* Phil Taussky (candidate member)
5. *Reducing Ventriculoperitoneal Shunt Failure in the Adult Patient.* Mark Hamilton (member)

11:15-12:00 **Special Lecture 2**

Introduction: Marvin Bergsneider

- *The Search for Novel Neurotherapeutics From the Ocean Floor.* William Gerwick, Ph.D. Scripps Institution of Oceanography

Sunday, September 11, 2016

6:30-8:00 **Business Meeting (members)**

7:15-8:00 **Breakfast with Exhibitors (nonmembers)**

8:00-8:45 **Resident Awards**

Moderator: Marvin Bergsneider

- **Basic Science Resident Award**
 - *Movement Modulation of Interhemispheric Corticopallidal Oscillations.* Nicholas Au Yong, UCLA
- **Clinical Science Resident Award**
 - *External Retrospective Validation of Brain Injury Guidelines Criteria as a Component of a Plan-Do-Study-Act Cycle for Improved Care Value in the Management of Low-Risk Neurotrauma Patients.* Priscilla Pang, OHSU

8:45-10:00 **Scientific Session 3**

Moderators: Ciara Harraher, Gary Steinberg

1. *Neurosurgery Telemedicine Clinics to Provide Care to Geographically Underserved Areas of USA and Its Territories: A Potential Form of Addressing Physician Shortage.* Hector James (member)
2. *Connectivity Guided Targeting for Central Neuromodulation for Essential Tremor and Depression.* Nader Pouratian (candidate member)
3. *NEO212: A New Drug For Temozolomide Resistant Malignant Gliomas.* Thomas Chen (member)
4. *Neuromodulation for Cranio-Facial Pain.* Mark Sedrak (candidate member)
5. *Development of a Normal Pressure Hydrocephalus Program - Pearls and Pitfalls in the Quest to Treat this Under Diagnosed Problem.* Claudia Martin (candidate member)

10:00-10:25 **Coffee Break with Exhibitors**

10:25-11:00 **Ablin Lecture**

Introduction: Charles Nussbaum

- *The Legacy of Patient H.M. – Cognitive Neuroscience of Memory.* Larry R. Squire, PhD, Professor, UCSD

11:00-11:35 **Cloward Award Lecture**

Introduction: Linda Liau

- *Brain Trauma and Beyond: A Career in Neurosurgery.* Don Becker, MD, Professor Emeritus, UCLA

11:35-12:10 **Presidential Address**

Introduction: Neil Martin

- *Fighting Brain Cancer: Against All Odds.* Linda Liau, MD, PhD, MBA, Professor, UCLA

Evening Event: **Black tie Banquet**

Aviari Resort

Special talk

- *"David L. Reeves, A Historical Vignette."* Moustapha Abou-Samra: Historian

Monday, September 12, 2016

6:45-7:30 **Breakfast with Exhibitors**

7:30-9:05 **Mini Symposium 1 – Neurocritical Care Update**

Sponsored by the Neurosurgical Research & Education Foundation

Moderator: Shelly Timmons

1. *Common Issues in Neurocritical Care: DVT/VTE Prophylaxis and Reversal of Antithrombotics.* Shelly Timmons
2. *Modern Care of Vasospasm in Aneurysmal Subarachnoid Hemorrhage.* Michael Huang
3. *ICU Management Strategies for Traumatic Brain Injury.* Geoffrey Manley
4. *Moderated Q&A.* Shelly Timmons

9:05-10:05 **Scientific Session 4**

Moderators: Martin Weinand, Hector James

1. *Aging Alters Mrna Expression of the Amyloid Transporter Genes at the Blood-Brain Barrier.* Gerald Silverberg (member)
2. *Implementation of a Prospective Spine Registry: A Single Health Care System Experience.* Shayan Rahman (candidate member)
3. *Deep Brain Stimulation for Status Dystonicus: Case Series and Review of the Literature.* Sharona Ben-Haim (candidate member)
4. *Convexity Meningioma En Plaque Presenting with Shunt Refractory Intracranial Hypertension Managed with Resection and Intracranial Volume Expansion: A Case Report.* Tarun Arora (candidate member)

10:05-10:30 **Coffee Break with Exhibitors**

10:30-12:00 **Mini Symposium 2 – Spinal Neurosurgery: Looming Questions**

Moderator: Larry Shuer

1. *Should All Spine Surgeons be Required to Participate in Registry Databases?* John Ratliff (member candidate)
 2. *Spine Surgery Bundled Payments – Do We Want This?* Richard Wohns (member)
 3. *Will Image Guidance Become Standard-Of-Care for Instrumentation Cases?* Luke Macyszyn (candidate member)
 4. *Should Neurosurgery Do Away With Spine Fellowships?* Steve Giannotta (member)
 5. *Is There Over-Utilization of Spinal Instrumentation?* J Patrick Johnson (member)
- 12:00 Meeting Adjourn

Abstracts

Endovascular Approaches To The Cavernous Sinus In The Setting Of Dural Arteriovenous Fistula

Justin Dye, Gary Duckwiler. San Diego CA

Purpose – The evaluation and management of patients with carotid cavernous fistulas (CCF) has primarily become the responsibility of the endovascular neurosurgeon. The current report describes anatomic and technical aspects of endovascular routes to the cavernous sinus (CS).

Methods – A retrospective review of patients with CCFs treated at a single institution was performed.

Results – Inferior petrosal sinus (IPS) via the internal jugular vein (IJV): The IPS is selected from the IJV and provides a direct route to the posterior CS. The most common route, however the IPS is not always accessible. Superior ophthalmic vein (SOV) via the angular vein: The angular vein connects the facial vein to the SOV, which connects to the anterior CS. SOV via the middle temporal vein: The middle temporal vein is a superficial scalp vein which is commonly approached from the external jugular vein (EJV). Gentle pressure on the skin can be used to manually 'milk' the microcatheter distally in this approach. Superior petrosal sinus (SPS) via the transverse sinus (TS): The SPS can be selected from the TS and connects to the superior/posterior aspect of the CS. The SPS is often approached from the contralateral IJV. Pterygoid plexus via the maxillary vein: The pterygoid plexus is one of the major egresses of the CS. This venous plexus can be navigated with a microsystem to reach the inferior/anterior CS. Direct percutaneous or surgical access of the ophthalmic veins: The ophthalmic veins can be accessed directly by placing a needle through the inferior/lateral aspect of the orbit. Alternatively, the SOV can be surgically exposed and then cannulated. Surgical exposure of the CS: In rare cases, it may be necessary to expose the CS through a frontotemporal craniotomy and intradural/pretemporal approach.

Conclusions – The complex venous anatomy associated with CCFs makes a detailed knowledge of CS vasculature essential for safe and effective management.

Basolateral Amygdala Deep Brain Stimulation for Post-Traumatic Stress Disorder

Jean-Philippe Langevin, R Koek, H Schwartz, JWY Chen, D Sultzer, M Mandelkem, A Kulick, SE Krahl. VA Greater Los Angeles/UCLA

Background: Neuronal activity in the basolateral nucleus of the amygdala (BLn) mediates fear persistence and fear extinction. Post-traumatic stress disorder (PTSD) is characterized by failure of fear extinction in which the amygdala can only elicit fear persistence. Deep brain stimulation (DBS) may functionally modulate the amygdala to permit fear extinction. We have previously shown that BLn DBS can relieve PTSD-like behavior in a rodent model. We are now conducting an early-phase trial for patients with severe treatment-refractory PTSD.

Methods: One patient has been enrolled in this proof-of-concept and safety trial. After baseline evaluations, he underwent bilateral BLn DBS electrodes placement using a transfrontal trajectory. The primary outcome measure, the clinician-administered PTSD scale (CAPS) is administered monthly. A fluorodeoxyglucose (FDG) PET scan is completed at rest and under symptomatic conditions. This PET is performed at baseline and one year post-operatively.

Results: Our subject experienced significant benefits. His CAPS score improved by nearly 50%, his severe nightmares have resolved and his sleep is now more restful. There have been no device-

related serious adverse events and his monthly EEGs have revealed no seizures or epileptiform discharges. His FDG PET studies showed that DBS prevented the amygdala activation during symptom-provocation where he was presented with trauma reminders. Subjectively, the patient describes the ability to experience a broader range of positive emotions and to display more empathy.

Conclusions: Failure of fear extinction is the main barrier to treatment in patients with intractable PTSD. We hypothesize that DBS can modulate the neuronal activity in the BLn to permit fear extinction. Once the ability for fear extinction is reestablished, psychotherapy may be deployed. More research is needed to verify these concepts.

CT Perfusion Imaging in Endovascular Therapy for Wake-up Stroke: A Single Center Experience

Ian B. Ross, AA Konstas. Huntington Memorial Hospital, Pasadena, CA

Background: Late treatment of stroke, when there is an established infarct, can lead to reperfusion hemorrhage. Timing is therefore critical and for intravenous thrombolysis is based on the concept of “last known well” (LKW). IV thrombolysis is not given more than 4.5 hrs after LKW. In the setting of wake-up stroke (WUS), LKW is taken as the time the patient was last seen, before they went to sleep. Clearly, few patients qualify for iv thrombolysis in this setting. Mechanical thrombectomy (MT) is perhaps safer from a reperfusion hemorrhage perspective, as a fibrinolytic drug is not given. CT perfusion imaging (CTPI), with the generation of cerebral blood volume (CBV) and cerebral blood flow (CBF) maps, allows for the differentiation of salvageable from irreversibly infarcted brain. We devised an algorithm for the delivery of MT in patients with WUS, based upon CTPI data.

Methods: Between January, 2015 and April, 2016, WUS patients were submitted to CTPI. These studies were performed on a 320 slice Toshiba Aquilion Scanner, with conventional CT imaging and CT angiography included. If there was deemed to be significant mismatch between the CBV and CBF maps, suggesting the presence of viable “penumbra”, MT was attempted. Stent retriever technology was used to perform all thrombectomies.

Results: A total of 8 patients with WUS underwent MT. This represented 13.3% of the total number of MT cases during the study period. There were no clinically significant brain hemorrhages, though 2 patients had microhemorrhages. All vessels were recanalized to a level of TIC12B (complete filling of the expected vascular territory, but slower than expected) or better. There were no major complications, and indeed all patients improved clinically. All MTs were in the anterior circulation.

Conclusion: CTPI provides pathophysiologic data that allows for safe selection of patients for MT in the setting of WUS.

Cost utility analysis of competing treatment strategies for drug-resistant epilepsy in children with Tuberous Sclerosis Complex

Aria Fallah, Alexander G Weil, Shelly Wang, Evan Lewis, Christine B. Baca, Gary W. Mathern. David Geffen School of Medicine at UCLA. Los Angeles, California

Background: The management of drug-resistant epilepsy in children with Tuberous Sclerosis Complex (TSC) is challenging due to the multitude of treatment options, wide range of associated costs, and uncertainty of seizure outcomes. The most cost-effective approach for children who have failed first-line medical therapy is uncertain.

Methods: A review of MEDLINE from 1990 to 2015 was conducted. A cost utility analysis, from a third-party payer perspective, was performed for children with drug-resistant epilepsy who have

failed 2 anti-seizure drugs (ASDs), across a time-horizon of 5 years. Four strategies were included: (1) Resective epilepsy surgery; (2) Vagus nerve stimulator (VNS) implantation; (3) Ketogenic diet; and (4) Addition of a third ASD (specifically, carbamazepine). The incremental cost per quality-adjusted life-year (QALY) gained was analyzed.

Results: Given a willingness-to-pay (WTP) of \$100,000 per QALY, the addition of a third ASD (\$6,600 for a gain of 4.14 QALYs) is the most cost-effective treatment strategy. In a secondary analysis, if the child has failed 3 ASDs, ketogenic diet, the addition of a fourth ASD, and resective epilepsy surgery are incrementally cost-effective treatment strategies. VNS implantation is more expensive yet less effective than alternative strategies, and should not be prioritized.

Conclusions: The addition of a third ASD is an universally cost-effective treatment option in the management of children with drug-resistant epilepsy who have failed 2 ASDs. For children who have failed 3 ASDs, the most cost-effective treatment depends on the health care resources available reflected by the WTP.

Tubular Brain Tumor Resection: Multimodality Surgery Augmenting Maximal Safe Tumor Resection.

Garni Barkhoudarian, MD; Walavan Sivakumar, MD; Fan Zhao, MD; Daniel F. Kelly, MD. St. Johns Medical Center, Santa Monica, CA

Introduction: There are various surgical approaches for deep intraparenchymal tumors, depending on the location relative to eloquent structures. These include the transfalcine, transtentorial, interhemispheric transcallosal and transcortical, transventricular approaches. Tubular retraction systems have been helpful for transventricular approaches, utilizing neuronavigation to reach the lesion while minimizing normal tissue damage from flat-blade retractors.

Hypothesis: Addition of additional imaging and visualization modalities can help improve the efficacy and safety of deep tumor resection

Index case: A 65-year-old woman presented with headaches and an MRI revealed a right lateral ventricle contrast-enhancing mass. The patient was neurologically intact, including no subjective or objective memory loss. Given the deep location of the tumor, a frontal, transsulcal approach was elected with a brain-port tubular retractor. This was augmented by transcortical 2D ultrasonography for tumor localization. Tumor resection was performed utilizing fluorescein dye visualization. Pathology was confirmed to be glioblastoma multiforma (GBM). The ventricle was sealed with collagen sponge and a ventricular catheter was placed, which was removed on POD 2. Maximal safe tumor resection was achieved with deliberate residual left along the fornix. The patient awoke well, without new neurological deficit.

Conclusion: The combination of advanced imaging and visualization techniques may not have changed overall survival for tumors such as GBM, but the ability to achieve maximal safe tumor resection has been improved. Appropriate utilization of intra-operative imaging, ultrasound, Doppler, fluorescein dye, endoscopy and brain mapping / monitoring helps achieve this goal.

How Does Sagittal Imbalance Affect the Appropriateness of Surgery in Degenerative Lumbar Scoliosis?

Harsimran S. Brara, Michael Daubs. Southern California Permanente Medical Group, Los Angeles, CA

Summary: We used a variation of the RAND/UCLA Appropriateness Method, which included a systematic review of the literature and a multidisciplinary modified-Delphi panel process. The

presence of sagittal imbalance strongly influenced the panelists ratings of the appropriateness of surgery, especially the selection of the surgical procedure. Complex procedures that include deformity correction are often most appropriate for patients with degenerative lumbar scoliosis (DLS) and sagittal imbalance.

Hypothesis: Sagittal imbalance influences surgical decision-making in DLS.

Design: RAND/UCLA Appropriateness Method Introduction The appropriateness of various surgical procedures for the treatment of DLS has been reported. The degree of scoliosis, stenosis, symptoms, and sagittal alignment were identified as important factors in surgical decision making.

Methods: We used a variation of the RAND/UCLA Appropriateness Method, which includes a systematic review of the literature and a multidisciplinary modified-Delphi panel process. This panel included neurosurgeons, orthopedic surgeons, physiatrists, researcher/physical therapist, and geriatrician. We developed 260 scenarios based on 7 different clinical characteristics, including imbalance. Panelists discussed the balance of risks and benefits and then rated the appropriateness of five surgical procedures (decompression alone, fusion alone, decompression and fusion, fusion and deformity correction, decompression and fusion and deformity correction) for each scenario. Imbalance was defined as +5 cm or greater SVA on full length, weight-bearing, lumbar lateral radiographs, or spino-pelvic imbalance and clinical evidence on physical exam. Deformity correction included interbody devices; rod maneuvers; posterior column osteotomy; pedicle-subtraction osteotomy; and/or vertebral column resection.

Results: The presence of sagittal imbalance influenced the panelists ratings of the appropriateness of surgery, especially the selection of the surgical procedure. In patients with moderate to severe symptoms, panelists rated one or more of the surgical procedures as appropriate or necessary when sagittal imbalance is present, except when patients have severe risk factors for complications and only mild or moderate stenosis. In general, for patients with sagittal imbalance, the procedure most often rated appropriate and necessary was decompression and fusion with deformity correction. *Conclusion:* The presence of sagittal imbalance in patients with DLS strongly influences the appropriateness of surgical intervention. Further, complex procedures that include deformity correction are often most appropriate for patients with sagittal imbalance

Magnetic resonance imaging-guided focused ultrasound compared to deep brain stimulation and stereotactic radiosurgery for essential tremor

Casey H. Halpern, Vinod Ravikumar, Jonathan Parker, Sherman Stein. Stanford University, Stanford, CA

Background/Aims: Essential Tremor (ET) is one of the most common neurologic conditions, and many patients remain ineffectively managed by medications. Recent outcomes data from a multi-institution, randomized controlled trial that substantiate precursor pilot and smaller scale studies, demonstrate that MRI-guided focused ultrasound thalamotomy (MRgFUS) improves upper limb tremor and quality of life in medically refractory ET patients. The present study assesses the relative cost-effectiveness of this novel therapeutic in comparison to exiting procedural options.

Methods: PubMed and Cochrane Library searches were performed for available clinical studies of unilateral MRgFUS, deep brain stimulation (DBS), and stereotactic radiosurgery (SRS) for ET. Pre- and post-operative tremor scores were collected from thirty studies involving pooled data from 935 patients. Utility of each treatment was calculated, and their national Medicare reimbursement rates were collected as a proxy for measuring societal costs. A decision and cost-effectiveness analysis was constructed implementing meta-analytic techniques to analyze and compare differences in both utility values and costs.

Results: MRgFUS was found to provide significantly higher utility and lower costs compared with both DBS and SRS in the treatment of ET (p-values < 0.001).

Conclusions: Based on initial data obtained from recent MRgFUS trials, it is not only significantly more effective than both alternatives, but it is also significantly less expensive. It thus may “dominate” DBS and SRS as a more cost-effective alternative for medically refractory ET. Our findings support further investigation of MRgFUS and broad adoption.

Randomized, Double-Blinded, Placebo-Controlled Trial Comparing Two Multimodal Opioid-Minimizing Pain Management Regimens Following Transsphenoidal Surgery

Andrew S. Little, MD, Barrow Neurological Institute

Object: Pain control is an important clinical consideration and quality-of-care metric. No studies have examined postoperative pain control following transsphenoidal surgery for pituitary lesions. The study goals were to 1) report postoperative pain scores following transsphenoidal surgery, 2) determine if multimodal opioid-minimizing pain regimens yielded satisfactory postoperative pain control, and 3) determine if intravenous ibuprofen improved postoperative pain scores and reduced opioid use compared to placebo.

Methods: This study was a single-center, randomized, double-blinded, placebo-controlled intervention trial involving adult patients with planned transsphenoidal surgery for pituitary tumors randomized into two groups. Group 1 patients were treated with scheduled intravenous ibuprofen, scheduled oral acetaminophen, and rescue opioids. Group 2 patients were treated with intravenous placebo, scheduled oral acetaminophen, and rescue opioids. The primary endpoint was patient pain scores (Visual Analog Scale [VAS], rated 0-10) for 48 hours after surgery. The secondary endpoint was opioid use as estimated by oral morphine equivalents (OME).

Results: Of 136 patients screened, 62 were enrolled (28 group 1, 34 group 2). The study was terminated early because the primary and secondary endpoints were achieved. Baseline characteristics between groups were well matched except for age (group 1, 59.3 ± 14.4 yr; group 2, 49.8 ± 16.2 yr; $p = .02$). Mean pain scores were significantly lower with a 43% reduction in group 1 compared to group 2 (1.7 ± 2.2 vs. 3.0 ± 2.8 , respectively, $p < .0001$). Opioid use was significantly lower with a 58% reduction in group 1 compared to group 2 (26.3 ± 28.7 mg vs. 62.5 ± 63.8 mg OME, respectively, $p < .0001$).

Conclusions: Multimodal opioid-minimizing pain-management protocols resulted in acceptable pain control following transsphenoidal surgery. Intravenous ibuprofen resulted in significantly improved pain scores and significantly decreased opioid use compared to placebo (level-1 evidence). Postoperative multimodal pain management including a nonsteroidal anti-inflammatory medication should be considered after surgery to improve patient comfort and limit opioid use.

(ClinicalTrials.gov NCT02351700)

Disclosure: Cumberland supplied the study drug at no charge to our institution for the study. Cumberland had no role in study design, study implementation, data interpretation, or abstract preparation. None of the authors have any financial relationship with Cumberland.

Microsurgery to Endovascular and Endovascular to Microsurgery Cross-Over in a Modern Cerebrovascular Case Series

Phil Taussky, Min S. Park, William T. Couldwell, University of Utah, Dept. of Neurosurgery, Salt Lake City, Utah.

Introduction: Both open vascular microsurgery and endovascular treatment options exist for the treatment of cerebrovascular disease entities, such as aneurysms, AVMs or intracranial stenoses. Typically, these treatment modalities are perceived as mutually exclusive in terms of optimal surgical planning. In this case series, we present cases that crossed-over from microsurgery to endovascular treatment and vice versa to achieve the best treatment outcome for the individual patient.

Methods: We retrospectively analyzed a prospectively kept cerebrovascular database of cases that were initially treated by microsurgery and then crossed over to endovascular treatment, and patients that were initially treated by endovascular modalities and then crossed over to microsurgery.

Results: We present a series of 15 patients who crossed over from one treatment modality to another in the course of their management. Patients exhibit the following pathologies: Aneurysms (7) AVMs and AVFs (4), Supra-aortic stenoses (4). A detailed patient analysis will be presented.

Conclusion: Commonly, microsurgery and endovascular therapies for cerebrovascular disease were seen as mutually occlusive or microsurgery was perceived as a salvage therapy for endovascular failures. In this modern case series we present patients that crossed over for salvage therapy both from microsurgery to endovascular and endovascular to microsurgery therapy to achieve optimal outcome.

Reducing Ventriculoperitoneal Shunt Failure in the Adult Patient

Mark Hamilton, Geberth Urbaneja, Aaron Hockley, Chad Ball, Richard Holubkov, Albert Isaacs. University of Calgary/Foothills Hospital, Calgary, Alberta, Canada

Background: Treatment of adult patients with hydrocephalus is often undertaken with a ventriculoperitoneal shunt (VPS). Failure rates have been reported as high as 50% in the first year and reflects malfunction of any part of the shunt system (but with a predominance of peritoneal catheter obstruction) or infection.

Methods: A Quality Improvement (QI) model was used to evaluate and modify VPS-insertion techniques to improve outcome. Malfunction was defined as a change in neurological shunt-related function with correlated diagnostic imaging studies that resulted in surgical revision. Infection was defined by the Hydrocephalus Clinical Research Network (HCRN) criteria. Prospectively collected data from January 2012-December 2015 was reviewed.

Results: 146 patients underwent a new VPS insertion. Diagnoses were: normal pressure hydrocephalus 101 patients, acquired hydrocephalus 28 patients and chronic-congenital hydrocephalus 17 patients. 103 patients had traditional insertion of a ventricular catheter using surface landmarks with 2 catheter misplacements requiring surgery. Image guidance with electromagnetic tracking was instituted with 0 catheter misplacements in 43 consecutive patients. 121 patients had traditional mini-laparotomy/trocar placement of the peritoneal catheter with 59/121 (49%) experiencing shunt malfunction and 35/59 (59%) experiencing a second malfunction requiring surgery. Laparoscopic insertion of the peritoneal catheter was instituted in 25 consecutive patients with 3 (12%) distal obstructions. Laparoscopy was also used in 13 patients undergoing VPS revision with 2 (15%) experiencing subsequent malfunction. A Quality Improvement style standardized infection reduction protocol for shunt surgery was instituted in July 2014. The VP shunt infection rate prior to this was 6% and in the 18 months of the study period after starting the protocol was reduced to 3.8%.

Conclusions: Changes to standard VPS surgical treatment including the addition of image-guidance and laparoscopic surgical techniques and an infection reduction protocol were

associated with a significant decrease in shunt malfunction requiring surgery and shunt surgery-related infection.

Movement Modulation of Interhemispheric Corticopallidal Oscillations

Nicholas Au Yong¹, Mahsa Malekmohammadi², Soroush Niketeghad², Nader Pouratian¹⁻⁴.
¹Department of Neurosurgery, ²Bioengineering, ³Neuroscience Interdepartmental Program & ⁴Brain Research Institute, UCLA, Los Angeles, CA 90095

Previous neurophysiological studies following Deep Brain Stimulation (DBS) electrode placement in subjects with Parkinson's Disease (PD) have demonstrated cortical and subcortical local field potentials (LFPs) with abnormal expression of beta "akinetetic" (10–35 Hz) and gamma "prokinetic" (35–100 Hz) band oscillations within ipsilateral cortical and subcortical circuits. In this study, comparison of LFP modulation between bilateral globus pallidus interna (GPI) and right frontoparietal motor/premotor cortical LFPs was carried out during left hand self-paced grasping and rest. Movement modulation of intra- and interregional oscillations and functional connectivity were explored. Intraoperative LFPs were recorded from DBS electrodes bilaterally in the GPI and an electrocorticographic (Ecog) strip overlying the right motor/premotor cortices in 14 PD subjects. Left hand activity was also captured via a sensor-embedded glove (Fig. 1B, Data Glove 5 Ultra, 5DT Inc., Santa Clara, CA). LFP recordings in the GPI were obtained from the lead's four ring electrode contacts (Fig. 1C, Medtronic, Model 3387, length 1.5mm, inter-contact distance 1.5mm) at their target coordinates for therapeutic stimulation. Unilateral LFP recordings in the frontoparietal cortex of the right hemisphere were obtained using a subdural Ecog strip (Fig. 1A, platinum-iridium 4 mm contacts with 1 cm spacing, AdTech Medical) with eight electrode contacts. Signal acquisition with a sampling rate of 2400 Hz was performed using BCI2000 v6.2 connected to an amplifier (g.Tec, g.USBamp 2.0). Results demonstrate that movement-related global Beta suppression and enhancement of Gpi-specific Very-high Gamma oscillations together may potentially serve as biomarkers of motor performance and/or disease state.

External Retrospective Validation of Brain Injury Guidelines (BIG) Criteria as a Component of a Plan-Do-Study-Act (PDSA) Cycle for Improved Care Value in the Management of Low-Risk Neurotrauma Patients

Priscilla S. Pang, Ahmed M Raslan, Justin S Cetas, Oregon Health & Science University; Portland, OR

Introduction: Conventional management of neurotrauma patients consists of routine repeat head computed tomography at preordained intervals with intensive care unit (ICU)-level monitoring, regardless of injury severity. This conservative approach ensures that no progression is overlooked, but results in unnecessary radiation exposure and considerable hospital costs for patients with nominal injuries. The Brain Injury Guidelines (BIG) project (Joseph et al., 2014) was designed to stratify patients into severity/risk categories (BIG 1-3, with ascending risk) based on clinical and radiographic findings. In the BIG 1 category, patients exhibited no radiographic progression, while 2.6% of patients in the BIG 2 category showed minimal radiographic progression (with no clinical correlation).

Objective: Institutional validation of BIG criteria as the "Plan" step of a Plan-Do-Study-Act (PDSA) cycle for value and care improvement in management of low-risk neurotrauma patients.

Methods: A 2-year retrospective cohort review of consecutive neurotrauma patients (n=590) at our institution was performed. Patients were classified per BIG guidelines and evaluated for radiographic progression or development of neurologic decline.

Results: No patients in the BIG 1 category (n=88) demonstrated any progression. In the BIG 2 category (n=116), 14.5% of patients developed mild radiographic progression, but with no clinical correlate or need for additional medical intervention; these were deemed “clinically insignificant.”

Conclusion: Results validated the BIG criteria at our institution. For the Joseph et al., and our institutional study, combined BIG 1 and 2 categories comprised approximately 35% of all neurotraumas – implying a predictable and substantial subset of clinically low-risk patients who may safely defer routine repeat imaging and/or ICU admission. Following this validation, an institutional practice change will be implemented and evaluated. The predicted and estimated cost saving of this new protocol will lead to improved care value.

Neurosurgery Telemedicine Clinics To Provide Care To Geographically Underserved Areas Of USA And Its Territories: A Potential Form Of Addressing Physician Shortage

Hector E. James, Jacksonville, Florida

Introduction: We describe the creation, structuring and development of a pediatric neurosurgery telemedicine clinic to provide telehealth across geographic, social and cultural barriers.

Methods: In July 2009 the University of Florida Division of Pediatric Neurosurgery received a request from the Southeast Georgia Health District (Area 9-2) to provide a telemedicine clinic (TMC) to meet regional needs. Meeting all privacy and HIPAA requirements the Georgia Children's Medical Services (CMS) installed telemedicine equipment and site-to-site connectivity in the CMS Clinic in Waycross, GA. Audiovisual connectivity was completed in the Lucy Gooding Pediatric Neurosurgery Center at Wolfson Children's Hospital, in Jacksonville, FL. Administrative steps were completed with documentation of onsite training of secretarial and nursing personnel. Patient pre-registration and documentation was completed as required by the UF College of Medicine Jacksonville. The first TMC was held in February 2011. Sessions are initiated with CMS nursing personnel presenting pertinent patient clinical history to the pediatric neurosurgeon in the presence of the patient and parent/caregiver. Physical findings and diagnostic studies are discussed and management decisions are then jointly made.

Results: Through January 2016 a total number of 40 TMC sessions have been held during which 43 patients have been evaluated: one patient has been seen eight times; three patients, seven times; five patients, six times; seven patients, five times; 10 patients, four times; 18 patients, three times; and 31 patients have been seen twice. The parents/caregivers uniformly expressed their appreciation for the TMC and not having to arrange transportation to Jacksonville. The TMC staff are very appreciative of the service provided to their patients and families, and acknowledge with each clinic they acquire new knowledge.

Conclusions: Pediatric patients in the USA and its territories with limited access to pediatric neurosurgery services could benefit from this model if other pediatric neurosurgery centers provided telehealth services.

Connectivity Guided Targeting for Central Neuromodulation for Essential Tremor and Depression

Nader Pourafian, Evangelia Tsolaki, Won Kim, Randall Espinoza. UCLA Neurosurgery

Introduction: Enthusiasm for recent neuromodulation trials has been tempered by failure to meet primary endpoints. Moreover, non-invasive therapies, such as stereotactic radiosurgery (SRS), have not gained mainstream acceptance due to the risk of neurologic deficits. The success of these therapies and the minimization of unwanted side effects relies critically on precise and accurate targeting. We have developed and describe a methodology based on non-invasive structural connectivity (MR diffusion tractography) to develop tomographic maps for targeting neuromodulatory therapy.

Methods: We build upon on our prior multi-institutional work demonstrating that MR diffusion tractography can be used to identify the optimal site of thalamic stimulation for deep brain stimulation (DBS) for tremor. To assess the method's prospective utility, we use MR tractography to identify the region of the thalamus with the highest probability of connectivity with premotor cortices to target unilateral SRS thalamotomy (140 Gy using frameless LINAC) in a patient with tremor-dominant Parkinson's disease. In addition, we expand the use of this mapping methodology to identify the putative optimal site of subgenual cingulate (Area 25) stimulation (based on connectivity with 4 targets: bilateral medial prefrontal cortices, ventral striatum, and dorsal anterior cingulate region) in 2 subjects treated with DBS for treatment resistant depression (TRD).

Results: For SRS thalamotomy, the connectivity-guided target differed from the classic stereotactic target by 3 mm. Follow-up at 1 year revealed a well-defined lesion at the planned target with >50% tremor improvement. For TRD patients, tractography identified a single region in each subject with the highest probability of connectivity with the 4 remote brain regions. The subject whose DBS was closer to this putative target remitted while the other had persistent disease.

Discussion: Tractography-guided targeting of neuromodulation holds promise for improving the efficacy and minimizing the side-effects of neuromodulation and expanding indications for other neuropsychiatric conditions.

Neuromodulation for Cranio-Facial Pain

Mark Sedrak, Arsani William, Tej Azad, Eliezer Brecher, Taissa Cherry, Ivan Bernstein, Diana Bruce, Stacey Rohrer, Zachary Smith, Mary William, Eric Sabelman, Gary Heit, Patrick Pezeshkian. Kaiser Permanente – Redwood City

Introduction: Facial pain is often debilitating and can be characterized by a sharp, stabbing, burning, aching, and dysesthetic sensation. Specifically, trigeminal neuropathic pain (TNP), anesthesia dolorosa, and persistent idiopathic facial pain (PIFP) are difficult diseases to treat, can be quite debilitating and an effective, enduring treatment remains elusive.

Methods: We retrospectively reviewed our early experience with stimulation involving the trigeminal and sphenopalatine ganglion stimulation for TNP, anesthesia dolorosa, and PIFP between 2010 and 2014. Seven patients received either trigeminal and/or sphenopalatine ganglion stimulation with or without peripheral nerve stimulation, having failed multiple alternative modalities of treatment. The treatments were tailored on the physical location of pain to ensure regional coverage with the stimulation.

Results: Fluoroscopy or frameless stereotaxy was utilized to place the sphenopalatine and/or trigeminal ganglion stimulator. All patients were initially trialed before implantation. Trial leads implanted in the pterygopalatine fossa near the sphenopalatine ganglion were implanted via transpterygoid (lateral-medial, infrazygomatic) approach. Trial leads were implanted in the trigeminal ganglion via percutaneous Hartel approach, all of which resulted in masseter contraction. Patients who developed clinically significant pain improvement underwent implantation. The trigeminal ganglion stimulation permanent implants involved placing a grid electrode over Meckel's cave via subtemporal craniotomy, which offered a greater ability to

stimulate subdivisions of the trigeminal nerve, without muscular (V3) side effects. Two of the seven overall patients did not respond well to the trial and were not implanted. Five patients reported pain relief with up to 24- month follow-up. Several of the sphenopalatine ganglion stimulation patients had pain relief without any paresthesias. There were no electrode migrations or post-surgical complications.

Conclusions: Refractory facial pain may respond positively to ganglionic forms of stimulation. It appears safe and durable to implant electrodes in the pterygopalatine fossa via a lateral transpterygoid approach. Also, implantation of an electrode grid overlying Meckel's cave appears to be a feasible alternative to the Hartel approach. Further investigation is needed to evaluate the usefulness of these approaches for various facial pain conditions

Development of a Normal Pressure Hydrocephalus Program - Pearls and Pitfalls in the Quest to Treat this Under Diagnosed Problem

Claudia Martin. Legacy Hospital System, Portland, Oregon

The development of a Normal Pressure Hydrocephalus (NPH) Program within a large hospital system is presented. Up to 15% of seniors develop NPH yet it is notoriously under diagnosed as the classic symptom triad of memory loss, gait instability and urinary incontinence/urgency are often attributed to other problems of aging. With the increase in the senior demographic in the United States, the failure of adequate diagnosis and treatment of NPH results in a large human, as well as economic, cost to society. Establishing an integrated program increases awareness of this entity and allows streamlining and standardization of the workup, treatment and follow up care of these patients. The elements of developing a program, including coordination with neurology, geriatrics, radiology and tailored physical therapy, are discussed as is the approach and data required to bring hospital administrators on board. Our clinical experience over the last 18 months, including patient outcomes as well as a discussion of current and new technologies, including the role of CSF flow studies and advances in assessing shunt patency after placement, will be presented. Finally, the potential for increasing statewide awareness of NPH based on the Virginia experience will be discussed.

Aging alters mRNA expression of the amyloid transporter genes at the blood-brain barrier.

Doreen Osgood, Miles C. Miller, Arthur A. Messier, Liliana Gonzalez, Gerald D. Silverberg. Brown University

Decreased clearance of potentially toxic metabolites, due to aging, likely plays a significant role in the accumulation of amyloid-beta peptides (A β) and other macromolecules in the brains of the elderly and in Alzheimer's disease (AD). A β transport receptor proteins expressed at the blood-brain barrier (BBB) are significantly altered with age: efflux transporter expression, the low density lipoprotein receptor-related protein 1 (LRP-1) and P-glycoprotein (P-gp) are reduced, whereas the influx transport receptor, the receptor for advanced glycation end-products (RAGE) is increased. These receptors transport a wide variety of macromolecules and play an important role in maintaining brain biochemical homeostasis. We now report that, in a rat model of aging, gene transcription is altered in aging, as measured by A β receptor gene mRNA at 3, 6, 9, 12, 15, 20, 30 and 36 months. Gene mRNA expression was measured by qPCR from isolated cerebral microvessels. LRP-1 and P-gp mRNA were reduced in aging and RAGE was increased ($p < 0.0001$). LRP-1 was markedly decreased from 3 to 36 months. P-gp also showed a marked decrease, both early and late, with a partial recovery between. RAGE mRNA expression rose with age to 30 months. Epigenetic factors may be a major determinant in these age-dependent changes. Understanding these epigenetic factor and the ligands and signaling pathways that cause them may be a path to treating AD and other age-related cognitive loss.

Implementation of a prospective spine registry: a single health care system experience.

Shayan U Rahman, Sergei Terterov, Joslyn Woodard, Alex Tucker, J Harris, KH Guppy, JA Bernbeck. Kaiser Permanente, Los Angeles, CA

In today's ever-changing healthcare climate, there is a need for outcome driven high-value care provision. Increasingly, the value of care delivered is impacting practitioner and hospital reimbursements. It is becoming especially important in the field of instrumented spine surgery, which has frequently fallen into the limelight of public and national regulatory scrutiny. There is an emerging body of literature demonstrating that registry data is a valid means of measuring the safety, cost, effectiveness, and health care value across various care episodes. It has been shown that registries based on secondary proxies of outcome do not yield clinically meaningful patient outcome data. Thus, much work has been done, by various centers, in recent years to implement prospective spine registries. One of the common limitations, of the approximately dozen existing spine registries, is the lack of robust follow up, with follow up rates ranging from 22-80%. It has been shown that registries with longer longitudinal prospective outcomes are more effective at accurately evaluating patient outcomes after spine surgery, due to issues of gain/loss of benefit from surgery at longer follow ups. In 2009, Kaiser Permanente, a large, integrated, health care system with 9 million members, developed a spine registry to track instrumented spinal fusions. Using electronic medical record data as well as chart review, patients who underwent instrumented spinal fusion were identified and tracked. Adjudication via chart review was used to identify complications and other relevant data. The registry is updated by the treating physicians as part of the EMR workflow. The registry has already been instrumental in answering several clinically meaningful questions. The Kaiser registry has a unique advantage of being in a closed medical system, and as such, patient follow up rates are unusually high. Future work will focus on implementing the registry in the outpatient setting.

Deep Brain Stimulation for Status Dystonicus: Case Series and Review of the Literature

Sharona Ben-Haim, UCSD

Background: Status Dystonicus (SD) is a rare and potentially life-threatening complication of primary or secondary dystonia characterized by acute worsening of dystonic movements. There is no consensus regarding optimal treatment, which may be medical and/or surgical.

Methods: We present our experience with pallidal deep-brain stimulation (DBS) in five DYT1 positive patients with SD and provide a review of the literature to examine optimal management.

Results: Of the five patients treated with pallidal DBS, all experienced a post-operative resolution of their dystonic crisis within a range of 1-21 days. Long-term follow-up resulted in one patient returning to pre-operative baseline, three patients improving from baseline, and one patient making a complete recovery. Of the 28 SD patients (including our five patients) reported in the literature who were treated with deep brain stimulation or ablative surgery, 26 experienced cessation of their dystonic crisis with a return to baseline function and in most cases, clinical improvement. .

Conclusion: Deep brain stimulation is an effective therapeutic modality for the treatment of status dystonicus. In addition to the long-term benefits of stimulation, early and aggressive treatment may improve overall outcome.

Convexity meningioma en plaque presenting with shunt refractory intracranial hypertension managed with resection and intracranial volume expansion: A case report.

Tarun Arora, MD University of California, San Francisco and Marin General Hospital

We report on the successful treatment of convexity meningioma en plaque associated with intracranial hypertension refractory to shunting and maximal medical management. A 45 y/o Female who, two years prior experienced the spontaneous onset of postural headaches. Lumbar puncture had demonstrated intracranial hypotension and an MRI demonstrated diffuse dural enhancement with normal position of the cerebellar tonsils. She was treated with a blood patch. Her headaches continued, but were no longer postural. She also experienced partial vision loss associated with papilledema. A repeat lumbar puncture demonstrated elevated pressures and relief of symptoms with drainage, concerning for pseudotumor cerebri and prompted neurosurgical consultation. A repeat MRI now demonstrated low lying cerebellar tonsils, decreased ventricular size, and bowing of the floor of the third ventricle. Dural enhancement was now limited to the right cavernous sinus, a focal non-obstructive area along posterior 1/3 of the sagittal sinus, and throughout the left convexity with associated hyperostosis consistent with an en-plaque meningioma. Her symptoms, papilledema, and tonsillar decent persisted, despite 6 months of ventriculoperitoneal shunting and adjustments of her programmable valve. She was taken for a left sided hemicranial resection of the en plaque meningioma and intracranial expansion via resection of the hyperostotic inner table and cancellous bony calvarium. Her contralateral VP shunt remained in place and functional. With this, she experienced complete resolution of her symptoms, stabilization of her vision, resolution of papilledema, and reversal of the tonsillar decent. She is no longer on diuretics and has returned to full time work. Cephalocranial disproportion due to en plaque meningioma is a rare presentation that should be considered in patients referred for pseudotumor cerebri and/or Chiari malformation for which a VP shunt alone may prove insufficient. Added benefit may be obtained from tumor resection with concurrent cranial expansion.

ORGANIZATIONAL COMMITTEE

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Edwin B. Boldrey*
Howard A. Brown*
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John Raaf*
Rupert B. Raney*
David L. Reeves*
C. Hunter Sheldon*

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W. Eugene Stern Frank Turnbull*
Karl O. Von Hagen* Arthur A. Ward, Jr.*
Delbert Werden* Ward W. Woods*
*deceased

DECEASED SOCIETY MEMBERS

(expired while a member, non-officers or founder)

Kenneth H. Abbott, Eben Alexander, Jr., James R. Atkinson, Thomas S. Bennett, Irvin H. Betts Jr., David Brown, John D. Camp, Norman L. Chater, Cyril B. Courville, John B. Doyle, Charles W. Elkins, Hal Pittman, John C. Oakley, Carl W. Rand, Aidan Raney, Nat, D. Reid, Ted Roberts, Adolf Rosenauer, Alan W. Rosenberg, Robert L. Scanlon, Harry F. Steelman, A. Earl Walker, W. Keasley Welch, William Wright, Eric Yuhl, Edward Zapanta, Michael Robbins, Peter Allen, Deane B. "Skip" Jacques, William Hyman, Lester B. Lawrence, Grant Levin, Frank W. Lusignan, John S. Marsh, Robert Morelli, Richard Newquist, Charles Needham, Michael Mason, Sam Assam, Benjamin L. Crue, Jr., Justin Renaudin, O. W. Jones, Alexander Johnson, Ralph Kamm, John C. Kennady, Peter A. Lake, James Lansche, Atilla Felsoory, Robert D. Fiskin, Anthony Gallo, Leslie Geiger, John W. Hanbery, Hale A. Haven, William A Newsom

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Herbert. Crockett*	1955, 1956, 1957
Ernest W. Mack*	1958, 1959, 1960
Samuel W. Weaver*	1961, 1962, 1963
James R. St. John*	1964, 1965, 1966
Robert W. Porter	1967, 1968, 1969
William A. Kelly	1970, 1971, 1972
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, 2012, 2013
Deborah C. Henry	2014, 2015

PAST HISTORIANS

Henry M. Cuneo*	1962-1966
Ernest W. Mack*	1967-1971
Donald B. Freshwater*	1972-1976
George Ablin*	1977-1982
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	2009-2013
Moustapha Abou-Samra	2014-2016
*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
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, Kawaihe, 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, HI	Sept. 10-13, 2011
58. Broadmoor Hotel, Colorado Springs, CO	Sept. 7-10, 2012
59. Ritz Carlton Half Moon Bay, Half Moon Bay, CA	Sept. 15-18, 2013
60. The Lodge, Sun Valley, ID	Aug. 16-19, 2014
61. Grand Hyatt Kauai Hotel, Kauai, HI	September 10-13, 2015

FUTURE MEETINGS

Fairmont Banff Springs Hotel, Banff, Alberta, Canada	September 7-11, 2017
Fairmont Orchid Resort, Kohala Coast, HI	September 14-17, 2018

PAST VICE-PRESIDENTS

John Raaf*	1955	Philip Weinstein	2007
Frank Turnbull*	1956	Betty MacRae	2008
Howard A. Brown*	1957	Linda Liau	2009
Rupert R. Raney*	1958	David W. Newell	2010
Edmund J. Morrissey*	1959	J. Paul Muizelaar	2011
C. Hunter Sheldon*	1960	Richard Wohns	2012
Ernest W. Mack*	1961	Marc Vanefsky	2013
Hale A. Haven*	1962	Marvin Bergsneider	2014
Frank M. Anderson*	1963	Thomas Scully	2015
Edwin B. Boldrey*	1964	*deceased	
Herbert C. Crockett*	1965		
Karl O. Von Hagen*	1966		
Samuel W. Weaver*	1967		
Chester B. Powell*	1968		
Peter O. Lehman*	1969		
Charles W. Elkins*	1970		
Nathan C. Norcross*	1971		
James R. St. John*	1972		
Edward K. Kloos*	1973		
Ralph B. Cloward*	1974		
Thomas K. Craigmile*	1975		
Lyman Maass*	1976		
Gale C. Clark*	1977		
William A. Kelley	1978		
Byron C. Pevehouse*	1979		
Robert W. Rand*	1980		
Theodore S. Roberts*	1981		
Ulrich Batzdorf	1982		
George Ablin*	1983		
George A. Ojemann	1984		
Gale C. Clark*	1985		
Robert Weyand	1986		
Robert Florin	1987		
John A. Kusske	1988		
Basil Harris*	1989		
W. Ben Blackett	1990		
Ronald F. Young	1991		
Edward Reifel	1992		
Grant E. Gauger	1993		
Ralph F. Kamm	1994		
Steven L. Giannotta	1995		
Randall W. Smith	1996		
Gail A. Magid	1997		
Donald Prolo	1998		
Lawrence Shuer	1999		
John C. Oakley*	2000		
L. Philip Carter*	2001, 2002		
William L. Caton III	2003		
Gerald Silverberg	2004		
Kim Burchiel	2005		
John Adler	2006		

PAST PRESIDENTS

David L. Reeves*	1955	John P. Slater	2005
John Raaf*	1956	Moustapha Abou-Samra	2006
Frank Turnbull*	1957	Kim Burchiel	2007
Howard A. Brown*	1958	Gerald Silverberg	2008
Rupert R. Raney*	1959	Lawrence Shuer	2009
Edmund G. Morrissey*	1960	L. Philip Carter*	2010
C. Hunter Sheldon*	1961	David W. Newell	2010
Ernest W. Mack*	1962	Austin R.T. Colohan	2011
Hale A. Haven*	1963	John T. Bonner	2012
Frank M. Anderson*	1964	Jeffery L. Rush	2013
Edwin B. Boldrey*	1965	Richard Wohns	2014
John R. Green*	1966	Gary Steinberg	2015
Arthur A. Ward, Jr.*	1967		
Lester B. Lawrence*	1968	*deceased	
John D. French*	1969		
Chester B. Powell*	1970		
Robert W. Porter	1971		
Henry M. Cuneo*	1972		
Charles W. Elkins*	1973		
Edward K. Kloos*	1973		
W. Eugene Stern	1974		
Ralph B. Cloward*	1975		
James R. St. John*	1976		
Eldon L. Foltz*	1977		
John Tytus*	1978		
Donald B. Freshwater*	1979		
William A. Kelly	1980		
Byron C. Pevehouse*	1981		
Robert W. Rand*	1982		
Theodore S. Roberts*	1983		
Thomas K. Craigmile*	1984		
Ulrich Batzdorf	1985		
Gale C. Clark*	1986		
Lyman Maass*	1987		
Gordon B. Thompson	1988		
George Ablin*	1989		
Robert Weyand	1990		
Basil Harris*	1991		
W. Ben Blackett	1992		
Francis E. LeBlanc	1993		
Ronald F. Young	1994		
John A. Kusske	1995		
Melvin L. Cheatham	1996		
Robert Florin	1997		
Frank P. Smith*	1998		
Ralph F. Kamm	1999		
Steven L. Giannotta	2000		
Donald J. Prolo	2001, 2002		
Grant E. Gauger	2003		
Randall W. Smith	2004		

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Ralph Kamm, OHSU**	1966
Jerry Greenhoot, UW	1968
L. Philip Carter, BNI**	1971
Ronald J. Ignelzi, U. of Colorado	1972
Henry G. Fieger, Jr., U. of Colorado	1973
Peter F. Schlossberger, UCLA	1974
Paul Steinbok, UBC	1975
Arden F. Reynolds, Jr., UW	1976
John W. Hutchison, UCI	1977
Kim J. Burchiel, UW**	1978
Roy A.E. Bakay, UW	1979
Herbert Fried, UCLA	1980
Linda M. Liau, UCLA **	1997
Sean D. Lavine, USC	1998
Soocho Choi, USC	1999
Michael Y. Wang, USC	2000
Odette Harris, Stanford**	2001
Raymond Tien, OHSU	2002
Michael Sandquist, OHSU	2003
Iman Feiz-Erfan, BNI**	2004
Johnathan Carlson, OHSU	2005
Mathew Hunt, OHSU	2005
Kiarash Golshani, OHSU	2006
Edward Chang, UCSF	2006
Jonathan Miller, OHSU	2007
Kenneth Liu, OHSU	2007
Justin Cetas, OSHU	2008
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
Walavan Sivakumar, U. of Utah	2012
David Stidd, U. of Arizona	2012
Allyson Alexander, Stanford	2013
Anand Veeravagu, Stanford	2013
Terry Burns, Stanford	2014
Karam Moon, BNI	2014
Achal Achral, Stanford	2015
Jesse Skoch, Tucson	2015

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