Western Neurosurgical Society

60th Annual Meeting
August 16-19, 2014
Sun Valley Lodge

American Association of Neurological Surgeons
Joinly Provided by the AANS

CALENDAR OF EVENTS

SATURDAY, AUGUST 16, 2014

12:00PM-4:00PM	Executive Board Meeting	Lupine Room
12:30PM-5:00PM	Registration	Limelight B Promenade
6:00PM-7:00PM	Opening Reception	Limelight C & Terrace
7:15PM	Buffet Dinner & Skating Show	Skating Rink/Sun Valley Lodge

SUNDAY, AUGUST 17, 2014

6:00AM-7:10AM	Breakfast Members/Professional Guests	Limelight C
6:00AM-12:10PM	Exhibitors	Limelight C
6:00AM-12:10PM	Registration	Limelight B Promenade
7:10AM-12:10PM	Scientific Session	Limelight B
8:00AM-10:00AM	Guest/Spouse Breakfast	Columbine Room
9:55AM -10:30AM	Break-Visit Exhibits	Limelight C
1:00PM-6:00PM	Golf - Trail Creek Course	Meet at Lodge Bell Desk 12:30PM
2:00PM-4:00PM	Tennis	Tennis Courts
1:00PM-5:00PM	Fly Fishing	Meet at Baldy Bus Loop 12:50PM
2:00PM-5:00PM	Hemingway Tour	Meet in Lodge Lobby 1:50PM
6:30PM-10:00PM	Western Night	Trail Creek Grounds

Hay Ride p/u is 5:45pm at Inn Lobby Lounge
Van p/u begins 6:15pm Badly Bus Loop

MONDAY, AUGUST 18, 2014

6:30AM-8:00AM	Members Business Meeting & Breakfast	Limelight A
6:30AM-8:00AM	Breakfast Professional Guests	Limelight C
6:30AM-12:30PM	Exhibitors	Limelight C
6:30AM-12:30PM	Registration	Limelight B Promenade
8:15AM-12:30PM	Scientific Session	Limelight B
8:00AM-10:00AM	Guest/Spouse Breakfast	Columbine Room
9:15AM -9:40AM	Break-Visit Exhibits	Limelight C
2:00PM-4:30PM	Golf - White Cloud Course	Meet at Lodge Bell Desk 1:30PM
2:00PM-4:00PM	Tennis	Tennis Courts
2:00PM-4:00PM	Trap Shooting	Meet at Lodge Bell Desk 1:45PM
2:00PM-5:30PM	Art and Wine Tour	Meet in Lodge Lobby 1:50PM
6:00PM-10:00PM	Children's Pizza Party	Bald Mountain Pizza & Pasta
6:00PM-7:00PM	Cocktail Reception	Limelight Terrace
7:00PM-10:00PM	Formal Banquet	Continental Room

TUESDAY, AUGUST 19, 2014

6:30AM-7:30AM	Breakfast Members/Professional Guests	Limelight C
6:30AM-12:00PM	Exhibitors	Limelight C
6:30AM-12:00PM	Registration	Limelight B Promenade
7:30AM-12:00PM	Scientific Session	Limelight B
8:00AM-10:00AM	Guest/Spouse Breakfast	Columbine Room
9:30AM -10:00AM	Break-Visit Exhibits	Limelight C
12:00 noon	Scientific Meeting Adjourned	

See you at the 61st Annual Meeting of the WNS
September 10-13, 2015
Grand Hyatt Kauai Resort & Spa
Kauai, Hawaii

Western Neurosurgical Society

60th Annual Meeting

2014 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. Review the care and prognosis of patients with a traumatic brain injury.
2. Describe the updates regarding medical legal issues as they affect the practice of neurosurgery.
3. Review recent advances in the care of patients with spinal disorders.
4. Discuss management options for patients with CNS neoplasms.

American Association of Neurological Surgeons

Jointly Provided by AANS

The Western Neurosurgical Society would like to thank
Michi Wohns Carlson
2014 Exhibitor Coordinator

Facts About Idaho

Population:	1,567,582 (2010 Census)
Land Area:	83,557 square miles
Capital City:	Boise
Date of Statehood:	July 3rd, 1890
Highest Elevation:	12,662 ft. (Mt. Borah)
Lowest Elevation:	738 ft. (Lewiston, ID)
Water Area:	823 square miles
River Miles:	3,100 miles (more than any other state)
State Flower:	The Syringa (Philadelphus lewisli)
State Bird:	The Mountain Bluebird (Sialia arctcia)
State Tree:	The Western White Pine (Pinus Monticola pinaceae)
State Horse:	Appaloosa
State Fruit:	Wild Huckleberry
Fish:	Cutthroat Trout
Gem:	Star Garnet
Dance:	Square Dance
Motto:	“Esto Perpetua” meaning “It is perpetual.”

2014 Officers and Committees

OFFICERS

President - Richard Wohns
President Elect - Gary Steinberg
Vice President - Marvin Bergsneider
Secretary-Treasurer - Deborah Henry
Historian - Randall Smith
Past President - Jeff Rush

EXECUTIVE COMMITTEE

Richard Wohns, Chairman
Gary Steinberg
Marvin Bergsneider
Deborah Henry
Randy Smith
Jeff Rush
Martin Weinand
Charles Nussbaum
Moustapha Abou-Samra
John McVicker
David Pitkethly
Marc Vanefsky

COMMITTEES

Program
Martin Weinand, Chairman
Debbie Henry
Marco Lee
David Newell
Andrew Little
Joel McDonald

Membership
John McVicker, Chairman
Jeff Chen
Mike McDermott
Ciara Harraher
Mark Hamilton

Awards
Gary Steinberg, Chairman
Larry Shuer
Grant Gauger
Don Prolo
John Kusske

CME
Debbie Henry & Charles Nussbaum, Co-Chairmen
Greg Gerras
Fred Williams

Communications and Website
Randall Smith, Chairman
Bill Louden
Ciara Harraher
Rick Chua

By-Laws
Moustapha Abou-Samra, Chairman
Ben Blackett
Tom Scully
Mike Lemole
Austin Colohan
Brian Andrews

Audit
Marc Vanefsky, Chairman
Odette Harris
Larry Shuer
Carter Beck

Nominating
Jeff Rush, Chairman
Jay Morgan
Laligham Sekhar

Local Arrangements
Rich Wohns & Jeff Rush, Co-Chairmen
Debbie Henry
Austin Colohan
Ken Yonemura

Site Selection
David Pitkethly, Chairman
Charlie Nussbaum
Debbie Henry
Marc Belza
Patrick Rhoten

Amedica
http://www.americacorp.com

Arbor Pharmaceuticals, LLC
http://www.spinewave.com

Bacterin
http://www.bacterin.com

BioMet
http://www.biomet.com/regions/northAmerica/unitedStates.cfm

Brainlab
https://www.brainlab.com

Codman Neuro
http://www.depuy.com/about-depuy/depuy-divisions/codman-and-shurtleff

DePuy Synthes
http://depuysynthes.com

Globus Medical
http://www.globusmedical.com

Imris
http://www.imris.com

K2 Medical
http://www.k2m.com

KLS Martin Group
http://www.klsmartinnorthamerica.com

LDR
http://www.ldr.com

Mazor Robotics
http://www.mazorrobotics.com

Medtronic (NAV/ST, Spine, AE, ENT & Neuro)
http://www.medtronic.com

Monteris Medical
http://www.monteris.com

Nexstim
http://www.nexstim.com

NICO Neuro and Spine
http://www.niconeuro.com

OsteoMed
http://www.osteomedcorp.com

RosmanSearch
http://www.rosmansearch.com

Spine Wave
http://www.spinewave.com

Stryker Spine
http://www.stryker.com/en-us/products/Spine/index.htm

The Medicines Company
http://www.the medicinescompany.com

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

Visualase
http://www.visualaseinc.com

The Western Neurosurgical Society appreciates that the following guest neurological surgeon invited guest speakers have deferred their honorarium in order to help support resident registration and travel:

Scott Lederhaus
Joseph Maroon
Shelly Timmons

2014 Guests

Richard Adler	Society-Guest Speaker
Farbod Asgarzadie	Member Candidate
Ali Baaj	Martin Weinand
James Bean	Moustapha Abou-Samra
Terry Burns	Resident Award, Basic Science
Travis Dumont	Martin Weinand
Phil Dyer	Society-Guest Speaker
William Ganz	Member Candidate
Robert Gellatly	Society-Guest Speaker
Gary Goplen	John McVicker
Gerald Grant	Member Candidate
Scott Lederhaus	Society-Guest Speaker
Marie Long	Betty MacRae
Andres Lozano	Cloward Award Winner
Joseph Maroon	Society-Guest Speaker
Karam Moon	Resident Award, Clinical Science
Katie Orrico	Society-Guest Speaker
Jon Robertson	Society-Albin Speaker
Shelly Timmons	Society-Guest Speaker
Patrick Wade	Member Candidate

Idaho grows 27 billion potatoes annually.

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 Neurosugical 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.

Joint Providership Disclaimer

The material presented at the 60th 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
Richard Ellenbogen	NIH / NCI	Grants/Research
	NFL, GE	Consultant
	Blaze BioScience	Stock Shareholder
	Visiting Professor	Honorarium
Mark Hamilton	Medtronic Canada, Codman Canada	Consultant
*Andrew Little	Barrow Neurological Foundation	Grants/Research
	Kogent Surgical	Stock Shareholder
Andres Lozano	Medtronic, Boston Scientific, St. Jude	Consultant
	Ceregane, Functional Neuroscience Inc	Consultant
	Functional Neuroscience Inc	Stock Shareholder
Joe Maroon	ImPACT Applications Inc	Stock Shareholder
*David Newell	Cerevast Corporation	Stock Shareholder
Gary Steinberg	NIH, CIRM	Grants/Research
	Medtronic	Consultant
Shelly Timmons	ADNeuro - Resident Course	Honorarium
*Martin Weinand	NIH, Visualase Corp	Grants/Research
*Richard Wohns	Aqueduct Neurosicnece	Consultant
	Ranier Technology	Consultant
	Nuvasive, Inc.	Consultant
	Precision Image Analysis	Consultant
	The Orthopaedic Implant Company	Consultant
	Medtronic Streamlined Designed Systems	Consultant
	Symbion	Consultant
Howard Yonas	Innerspace Neuron Solutions	Stock Shareholder

*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:

Richard Adler	Farbod Asgarzadie	Ali Baaj	Ben Blackett
Terry Burns	Travis Dumont	Phil Dyer	Michael Edwards
William F. Ganz	Robert Gellatly	Gerald Grant	*Debbie Henry
Scott Lederhaus	*Marco Lee	*Joel McDonald	Karam Moon
Katie Orrico	Jon Robertson	Lily Talan	Patrick Wade

***educational content planner of this meeting**

The deepest river gorge in the North American Continent is Idaho's Hells Canyon. 7,900 feet deep. Yes, it's deeper than the Grand Canyon.

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.

Jon H. Robertson, MD

Dr. Jon Hobson Robertson attended Southwestern College (now Rhodes) in Memphis, Tennessee, receiving his BA degree in 1968. He graduated from the University of Tennessee Medical School in 1971. After completing an internship and a year of General Surgery at the City Of Memphis Hospitals, he worked as an ER physician and in general practice for several years before beginning his residency in Neurosurgery in 1975 at the University of Tennessee Center for the Health Sciences.

Immediately following completion of his residency training in 1979, Dr. Robertson became a member of the Semmes-Murphey Clinic and Assistant Professor in the Department of Neurosurgery at the University of Tennessee Center for Health Sciences. He was promoted to Associate Professor in 1984, served as Interim Chairman 1995-1996, and assumed the Chairmanship of the Department of Neurosurgery at the University of Tennessee in 1997. He retired from the University of Tennessee in July, 2011. Dr. Robertson has continued a limited practice with the Semmes-Murphey Clinic, and enjoyed his role as a senior faculty member in the UT Neurosurgical Department.

Dr. Robertson has been active in numerous national and local neurosurgical organizations. He was President of the North American Skull Base Society in 2002, President of the Society of University Neurosurgeons in 2005, President of the American Association of Neurological Surgeons in 2008, and served as a Director on the American Board of Neurological Surgeons 2000-2006. Over the past two decades he has served on the Board of Directors of Semmes-Murphey Neurologic & Spine Institute and the Medical Education & Research Institute (MERI) in Memphis, Tennessee.

Each year, the American Association of Neurological Surgeons recognizes a neurosurgeon who has made significant contributions to the neurosurgical specialty through leadership, service and dedication. In April 2013, the AANS bestowed Jon H. Robertson, FAANS, with its highest member honor, the Harvey Cushing Medal.

In addition to his volunteer and academic activities, Dr. Robertson has maintained an active practice in neurological surgery with the Semmes-Murphey Neurologic & Spine Institute for the past 35 years. His clinical practice has focused on the surgical management of tumors affecting the cranial base of the skull. Parents of five children and grandparents of twelve, Dr. Robertson and his wife, Carol Ann, have been married for 46 years. Dr. Robertson enjoys fly-fishing and spending time with his family.

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?"

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"

2012 John R. Adler, Jr., MD
Stanford University
"Stepping-Out of the OR: A Surgeon's Foray into Entrepreneurship"

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 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 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."

Dr. Andres Lozano

RR Tasker Professor and Chairman of Neurosurgery

University of Toronto and the Toronto Western Hospital

Andres Lozano is Professor and Chairman of Neurosurgery at the University of Toronto and holds both the RR Tasker Chair in Functional Neurosurgery and a Tier 1 Canada Research Chair in Neuroscience.

He is best known for his work in Deep Brain Stimulation (DBS). His team has mapped out cortical and subcortical structures in the human brain and have pioneered applications of DBS for various disorders including Parkinson's disease, depression, dystonia, anorexia, Huntington's and Alzheimer's disease.

Dr. Lozano has over 400 publications, serves on the board of several international organizations and is a founding member of the scientific advisory board of the Michael J Fox Foundation. He has received a number of awards including the Margolese National Brain Award, Olivecrona medal and the Pioneer in Medicine award, has been elected a Fellow of the Royal Society of Canada and the Canadian Academy of Health Sciences and has received the Order of Spain.

SCIENTIFIC PROGRAM

Sunday, August 17, 2014
Day 1, Session I

Moderators: Debbie Henry, Marco Lee

7:10-7:15		**Welcome, Richard Wohns,** WNS President, 2014
7:15–7:30	1	***"Development of a Sophisticated DBS Program in a Community Hospital"*** William Ganz, Coeur d'Alene, ID (Member Candidate)
7:30–7:35		Discussion
7:35–7:50	2	***"A Current, Critical Evaluation of Minimally Invasive Spine Surgery: Strengths, Limitations, and Pitfalls"*** Ali Baaj, Tucson, AZ (Guest)
7:50–7:55		Discussion
7:55–8:10	3	***"Submaximal Angioplasty for Symptomatic Intracranial Atherosclerosis - A Prospective, Phase I Study"*** Travis Dumont, Tucson, AZ (Guest)
8:10–8:15		Discussion
8:15–8:30	4	***"Chiari Malformation and Sleep Apnea Syndrome: Case Report and Anatomic Considerations"*** Farbod Asgarzadie, Loma Linda, CA (Member Candidate)
8:30–8:35		Discussion
8:35–8:50	5	***"Metastatic Pilocytic Astrocytoma in Children at Presentation"*** Gerald Grant, Stanford, CA (Member Candidate)
8:50–8:55		Discussion
8:55–9:10	6	***"The Importance of MICRA (Medical Injury Compensation Reform Act)"*** Patrick Wade, Glendale, CA (Member Candidate)
9:10–9:15		Discussion
9:15–9:30	7	***"Free Hand Thoracic Pedicle Screw Technique Using a Uniform Entry Point and Trajectory for All Levels: Preliminary Clinical Experience"*** Ali Baaj, Tucson, AZ (Guest)
9:30–9:35		Discussion
9:35–9:50	8	***"A Socioeconomic Analysis of Intraoperative Neurophysiologic Monitoring in Spine Surgery: National Utilization, Regional Variation, Costs and Outcomes"*** Travis Dumont, Tucson, AZ (Guest)
9:50–9:55		Discussion
9:55–10:30		Break - **Visit Exhibits**

SCIENTIFIC PROGRAM

Sunday, August 17, 2014
Day 1, Session II

Moderators: David Newell, Andrew Little

10:30–10:45	9	***"Intracranial Neuroendoscopic Experience and Complication Rates in 273 Adult and Pediatric Patients: A Population-based Study with Long-term Followup"*** Mark Hamilton, Calgary, AB (Member)
10:45–10:50		Discussion
10:50–11:05	10	***"Diffusion Tensor Tractography for Localization of Motor and Sensory Pathway Fibers in Relation to Brainstem Lesions in Children"*** Michael Edwards, Stanford, CA (Member)
11:05–11:10		Discussion
11:10–11:25	11	***"A Novel Phase 1/2 Study of Intraparenchymal Transplantation of Human Modified Bone Marrow Derived Cells in Patients with Stable Ischemic Stroke"*** Gary Steinberg, Stanford, CA (Member)
11:25–11:30		Discussion
11:30–11:45	12	***"Comparison of Direct Surgical Costs in the Perioperative Period Between Microscopic and Endoscopic Pituitary Surgery Techniques"*** Andrew Little, Phoenix, AZ (Member)
11:45–11:50		Discussion
11:50–12:05	13	***"Therapeutic Neurosonology: A New Emerging Technology in the Neurosciences"*** David Newell, Seattle, WA (Member)
12:05–12:10		Discussion

Butch Cassidy, a.k.a. George Leroy Parker, robbed the bank in Montpelier, Idaho, on August 13, 1896. He got away with $7,165, allegedly to hire a lawyer for his partner Matt Warmer, who was awaiting trial for murder in Ogden, Utah.

SCIENTIFIC PROGRAM

Monday, August 18, 2014
Day 2, Session III

6:30AM - 8:00AM Members Business Meeting

Moderators: Martin Weinand, Andrew Little

8:15–8:30 14 **Resident Award – Basic Science**

"Transcriptional Signature of Irradiated Microglia - Implications for Cognition and Tumor Migration"
Terry Burns
Stanford University, Stanford, CA

8:30–8:35 Discussion

8:35–8:50 15 **Resident Award –Clinical Science**

"The Myth of Restenosis after Carotid Artery Stenting"
Karam Moon,
Barrow Neurological Institute, Phoenix, AZ

8:50–8:55 Discussion

8:55–9:10 16 **Special Lecture**

"Neuropraxia in Professional Athletes: Implications and Surgical Treatment"
Joe Maroon, Pittsburgh, PA (Guest)

9:10–9:15 Discussion

9:15–9:40 Break - **Visit Exhibits**

SCIENTIFIC PROGRAM

Monday, August 18, 2014
Day 2, Session IV

Moderators: Martin Weinand, Andrew Little

9:40–9:45 Introduction of Cloward Award Recipient
Gary Steinberg

9:45–10:35 **Cloward Award Lecture**

"Taming Dysfunctional Brain Circuits"
Andres M. Lozano

10:35–10:40 Introduction of Ablin Lecturer
Richard Wohns

10:40–11:30 **Ablin Lecture**

"The Challenge of Future Neurosurgical Education"
Jon Robertson

11:30–11:35 Introduction of WNS President
Ben Blackett

11:35–12:30 **Presidential Address**

"Neuroeconomics"
Richard Wohns

Idaho became the 43rd State on July 3, 1890.

SCIENTIFIC PROGRAM

Tuesday, August 19, 2014

Day 3, Session V
Moderators: Martin Weinand, David Newell

7:30–9:30 **Mini Symposium - Traumatic Brain Injury**

Introduction of Speakers - Martin Weinand

"Concussion: Education and Advocacy for Youth Athletes: An NFL Perspective"
Richard Ellenbogen

"The Evolution of Sports Concussion Management— Diagnosis and Treatment"
Joseph Maroon

"Prognostic Factors in Traumatic Brain Injury"
Shelly Timmons

"Neurophysiological Monitoring in Traumatic Brain Injury: Past, Present & Future"
Howard Yonas

9:30–10:00 Break - **Visit Exhibits**

Sun Valley was created in 1936 as America's first destination ski resort.

SCIENTIFIC PROGRAM

Tuesday, August 19, 2014

Day 3 , Session VI
Moderators: Debbie Henry, Marco Lee

10:00–12:00 **Mini Symposium - Medical Legal Considerations in Neurosurgery**

Introduction of Speakers - Debbie Henry

"Traumatic Brain Injury and Youth Sports: State of the Laws in the USA"
Richard Adler, JD

"Closed Claims Data: A Profile of Neurosurgical Professional Liability"
Katie O. Orrico, Director, AANS Washington Office

"Emerging Liabilities as a Result of Healthcare Reforms"
Phil Dyer

"Plaintiff Attorney Perspective on Medical Malpractice"
Robert Gellatly, JD

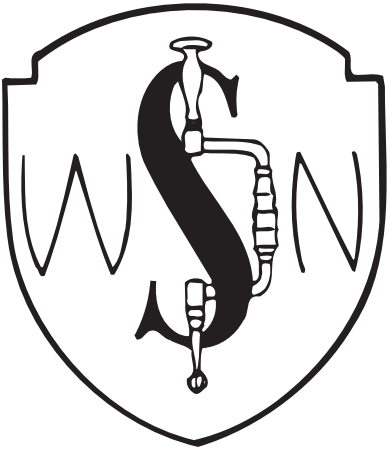
"Physician Owned Distributorships"
Scott Lederhaus

12:00 Meeting Adjourn

61st Annual Meeting to be held September 10-13, 2015
Kauai, Hawaii

In Idaho law forbids a citizen to give another citizen a box of candy that weighs more than 50 pounds.

Abstracts



Ernest Hemingway's house in Key West, Florida, where he wrote a good deal of his literature, is now a museum in his honor. One other interesting note about the house is that the lineage of cats that live there hereditarily have six toes on each foot, going back to Hemingway's own cats.

1. *"Development of a Sophisticated DBS Program in a Community Hospital*
   William F. Ganz, MD, FACS; Coeur d'Alene, Idaho

In this talk I will discuss the process of determining the need for developing a movement disorder program and surgical deep brain stimulation program in Coeur d'Alene, Idaho. I will discuss the launch and early results from this community based program based in Northern Idaho. Coeur d'Alene, and specifically Kootenai Medical Center, serve a catchment area of approximately 325,000 people with potential essential tremor and Parkinson's disease population of approximately 2000 people; conservatively estimating a potential operative population of approximately 200 patients, combined, for both diseases. This need is not met in our community. With commitment from Kootenai Medical Center capital purchases were made for equipment, training was obtained for neurosurgeon, neurologists, neurophysiology lab technician, and hospital personnel.

I will discuss the process of determining candidacy for deep brain stimulation, the process of the diagnostic workup, and performance of the procedure. All treatment plans are simulated just prior to surgery using merged CT and MRI imaging on the stereotactic computer. All patients were treated awake with neurophysiologic recording for optimal placement of the stimulating electrodes. All electrode placements were verified after the procedure by merging pre and postoperative CT and MRI scans.

So far, since 2011, we have treated eighteen patients {16 essential tremor patients and 2 Parkinson's disease patients). The patients have noted significant improvement in performance score after deep brain stimulation. There has been one significant complication which was an infection requiring complete removal of the electrode and pulse generator for treatment of the infection. This was replaced six months later without complication. There have been no intracerebral hemorrhages. We have performed one battery replacement.

I will also discuss outreach with rural communities in Northern Idaho including the nascent use of telemedicine for follow-up evaluations and adjustments of the stimulating electrode frequencies.

2. *"A Current, Critical Evaluation of Minimally Invasive Spine Surgery: Strengths, Limitations and Pitfalls"*
   Ali A. Baaj, University of Arizona

Background: Interest in minimally invasive spine (MIS) surgery has soared in the last two decades. The ability to perform spinal decompression and stabilization with smaller incisions, less blood loss and shorter hospitalization stays is an appealing alternative to traditional techniques. The objective of this work is to present a balanced review of the current state of MIS surgery through a literature review and through the author's own experience with these techniques.

Methods: A PubMed search of the pertinent literature on MIS surgery is performed. Analysis is limited to case series and trials assessing comparative effectiveness of these techniques. A critical assessment of the utility, limitations and complications is presented. The author also reviews and discusses his own experience with MIS surgery through surgical cases.

Results: MIS techniques are gaining popularity with more published literature dedicated to this topic. MIS is currently utilized in all fields of spine surgery, including: basic degenerative disease, deformity, trauma, tumor and infections. Most prospective and randomized clinical trials are limited to basic degenerative conditions. The area of most current interest is deformity and whether MIS techniques can allow for sagittal and coronal realignment of the spine. Steep learning curves and technology costs seem appear to be the major impediments to advancement of MIS surgery.

Conclusions: Interest in MIS surgery continues to be widespread among surgeons and patients alike. Only recently have prospective and randomized trials surfaced in the literature confirming the effectiveness of MIS techniques. Studies proving sustainable efficacy remain limited, largely due to the fact that the field remains in its infancy. There are real impediments to advancing MIS, including costs and technical challenges.

3. *"Submaximal Angioplasty for Symptomatic Intracranial Atherosclerosis – A Prospective, Phase I Study"*
   Travis M. Dumont, MD University of Arizona

Introduction: Intracranial atherosclerotic disease (ICAD) accounts for approximately 10% of ischemic strokes. A recent study (SAMMPRIS) displayed high incidence of perioperative complications (15%) for treatment of ICAD with stenting. Although incidence of stroke was lower in the medical arm, recurrent stroke was found in 12% of patients despite aggressive medical management, suggesting intervention may remain a viable option for ICAD if perioperative risk is minimized. Angioplasty without stenting represents an alternative and understudied revascularization treatment for ICAD. A submaximal angioplasty (SA) limits the risk of thromboembolism, vessel perforation, and reperfusion hemorrhage frequently reported with stenting in the SAMMPRIS trial.

Methods: This prospective study for treatment of symptomatic ICAD with SA was approved by the local institutional review board. Demographic and clinical data were prospectively collected. Angioplasty was performed for patients with symptomatic ICAD (stenosis $\geq$ 70%) with a balloon undersized to approximately 50-70% of the nondiseased vessel diameter. The

primary outcome measure is incidence of perioperative complications (combined endpoint includes death, stroke, and hemorrhage).

Results: Among 48 patients screened with symptomatic intracranial atherosclerosis, 21 had significant stenosis on angiography to be included in the study. Among these 21 patients, the mean age was 65 years, most were men (67%), and most white (71%). Many patients had concomitants of vascular disease including hypertension (95%), hyperlipidemia (70%), history of smoking (57%), and diabetes mellitus (45%). Most patients had anterior circulation stenoses (76%). The mean preoperative stenosis was 79% (range 91-69%), with successful angioplasty performed in all patients with a mean post-angioplasty stenosis of 55% (range 32-78%). A single perioperative event (transient ischemic attack) was noted, with no long-term neurological sequelae in this patient. No patients had a primary outcome event.

Conclusion: This study displays safety of the submaximal angioplasty technique, with no perioperative complications in 21 treated patients.

4. *"Chiari Malformation and Sleep Apnea Syndrome: Case Report and Anatomic Considerations"*
   Farbod Asgarzadie, MD Loma Linda, CA

This case describes a 21 year old male with newly diagnosed Type 1 Chiari Malformation with syringomyelia and a one year history of positional headaches and progressive myelopathic symptoms, but also with a several year history of quite debilitating daytime somnolence and polysomnographic evidence of sleep apnea syndrome requiring CPAP. After decompression and duroplasty, the patient had resolution of his syrinx, significant improvement of his headaches and myelopathy. He also reported significantly decreased daytime somnolence and was able to be weaned off his CPAP.
Given the anatomic location of the respiratory centers in the medulla, compression of these structures in Chiari Malformation with or without syringomyelia can be associated with sleep disordered breathing. When Type 1 Chiari Malformation typically presents in adulthood, it is most frequently associated with headache, neck pain, and myelopathic symptoms. Although it remains unclear how frequent sleep apnea is in Chiari Malformation, its recognition is usually associated with other neurological manifestations and remains underreported. Here, we review similar case series from the literature and define the pathoanatomy associated with sleep apnea syndrome in the setting of craniocervical junction disorders.

5. *"Metastatic Pilocytic Astrocytoma in Children at Presentation"*
Gerald Grant, MD Stanford, California

The diagnosis of pilocytic astrocytoma in the pediatric population is usually benign and rarely spreads along the neuroaxis. In rare cases, these Grade I tumors have been reported to demonstrate aggressive behavior and are associated with metastatic dissemination to the leptomeninges. We identified four children at our institution who had biopsy proven pilocytic astrocytomas and who were found to have leptomeningeal spread or non contiguous lesions at presentation. The ages of these children ranged from age 3-16 yrs (average 10 yrs) with an average follow up of seven years. Two of the four children presented with precocious puberty and the other two children presented with headaches due to hydrocephalus. All four children presented with enhancing disease in the brain and spine. In three of four children, the largest lesion at presentation was in the suprasellar/hypothalamic region. In one child the largest lesion was in the thoracic cord (intra/extramedullary). Three of four children underwent CSF diversion (two VPS and one ETV). Three of four children underwent chemotherapy and three of four underwent craniospinal radiation. One child underwent chemotherapy alone and one child underwent only craniospinal radiation. One child suffered a large intraventricular hemorrhage and died 10 years after diagnosis. The remaining 3 children have stable disease at the time of last follow up. The incidence of leptomeningeal seeding in children with the diagnosis of pilocytic astrocytomas is rare. All four children presented with metastatic seeding of their tumor prior to surgical intervention. The optimal treatment for this subgroup of children is unknown and a detailed molecular genetic analysis of these tumors may lead to a better understanding of their propensity to metastasize.

6. *"The Importance of MICRA (Medical Injury Compensation Reform Act)"*
Patrick J. Wade, Glendale, CA

MICRA (Medical Injury Compensation Reform Act) was passed nearly 40 years ago in California. Most practicing physicians today were not in practice then, many not even born when it was passed. The paper reviews the seven primary tenets of MICRA. The advantages including prompt, complete payment for injuries as a result of medical negligence, a stable medical liability insurance market essential for access to care, reduction of defensive medical practices and reasonable insurance costs. Experience in other States and Nationally will be compared and the Texas liability experience discussed

7. *"Free Hand Thoracic Pedicle Screw Technique Using a Uniform Entry Point and Trajectory for all Levels: Preliminary Clinical Experience"*
Vernard S. Fennell, MD, Sheri Palejwala, MD, Jesse Skoch, MD,
David A. Stidd, MD, MS, Ali A. Baaj, MD
Tucson, AZ

Background: Experience with free-hand thoracic pedicle screw placement is well described in the literature. Published techniques rely on various starting points and trajectories for each level or segment of the thoracic spine. Furthermore, few provide specific guidance on sagittal and axial trajectories. The goal of this study is to propose a uniform entry point and sagittal trajectory for all thoracic levels during free-hand pedicle screw placement and determine the accuracy of this technique.
Methods: We retrospectively reviewed post-operative computed tomography (CT) images of thirty-three consecutive patients who underwent open, free-hand thoracic pedicle screw fixation using our uniform entry point and trajectory technique for all levels. The entry point is always 3 mm caudal to the lateral margin of the superior articulating facet- transverse process (LSAF-TP) junction and the sagittal trajectory is always orthogonal to the dorsal curvature of the spine at that level (Fig 1.). The medial angulation (axial trajectory) is approximately 30o degrees at T1 and T2, and 20 o from T3-T12. Breach was defined as greater than 25% of the screw diameter residing outside of the pedicle or vertebral body.

Results: 219 consecutive screws were evaluated and there were no screws that were excluded. Screws were placed for a variety of spinal pathology: 61% for trauma, 12% infection, 18% tumor, 9% deformity (Fig 2). The distribution was as follows; 23 screws (10.5%) at T1, 27 screws (12.3%) at T2, 11 screws (5%) at T3, 13 screws (5.9%) at T4, 10 screws (4.6%) at T5, 8 screws (3.7%) at T6, 15 screws (6.8%) at T7, 23 screws (10.5%) at T8, 23 screws at T9 (10.5%) at T9, 25 screws (11.4%) at T10, 19 screws (8.7%) at T11, and 22 screws (10%) at T12 (Fig 3). There were 9 total lateral breaches (4.1%) and no medial breaches. (Fig 4). There was no evidence of supra- or infra-pedicular breaches. There were no neurovascular or hardware related complications and no screws had to be repositioned. Medial angulation was measured post-operatively and was determined to be, on the average, 30 degrees at T1 and T2, and 20 degrees from T3-T12 (Fig 5a/b).

Conclusion: It is feasible to place free-hand thoracic pedicle screws using a uniform entry point and sagittal trajectory for all levels. The entry point does not have to be adjusted for each level as reported in existing studies. While other techniques are effective and widely employed, this particular method provides more specific parameters and may be easier to learn, teach and adopt.

Hemingway finished his book, "For Whom the Bell Tolls," in Room 206 at the Sun Valley Lodge

8. *"A Socioeconomic Analysis of Intraoperative Neurophysiologic Monitoring in Spine Surgery: National Utilization, Regional Variation, Costs and Outcomes."*
Travis M Dumont MD, Anand I Rughani MD, Whitney Sheen MD
Tucson, AZ

Object: Anecdotal observations have suggested that there has been a dramatic increase in the use of intraoperative neurophysiology for spine surgery. There have been myriad reasons proposed, but no clear evidence to indicate that this is occuring and to what extent the occurence is regional. This project aims to answer this question.

Methods: The Nationwide Inpatient Sample (NIS) was queried for the years 2007-2011 for all spine procedures performed. Utilization of intraoperative neurophysiological monitoring (IONM; ICD-9 00.94) was compared between years and geographic regions. Mean hospital charges, independence at discharge, and iatrogenic nerve injury were compared with and without use of IONM.

Results: A total of 443,194 spine procedures were identified, including 85% elective and 15% non-elective procedures. Intraoperative neurophysiological monitoring (IONM) was reported in 31,680 cases. Utilization of IONM was noted to increase in each calendar year from a low of 1% of all cases in 2007 to 12% of cases in 2011. Use of IONM ranged from a regional low of 8% of cases in the northeast region to 21% of all cases in the west in 2011. Utilization of IONM was noted in 6% of elective cervical and lumbar microdiskectomy cases. This includes 6% of cervical microdiskectomy cases in the absence of myelopathy. IONM was utilized in 7% of anterior cervical fusion cases, including 20% of cases in the absence of myelopathy. Mean hospital costs were greater with IONM for both elective ($94,043 ± $490 versus $62,601 ± $102, $p < 0.001$) and nonelective ($128,049 ± $2,426 versus $99,090 ± $522, $p < 0.001$) admissions. Furthermore, iatrogenic nerve or spinal cord injury was extraordinarily rare, occurring in less than 1% of cases, with no decrease in cases where IONM was employed.

Conclusions: In the NIS, there has been a dramatic increase in use of IONM in spinal surgery over recent years, with some marked regional variation. Interestingly the utilization increased steadily even in the context of simple spine procedures such as lumbar discectomy and anterior cervical fusion without myelopathy. The reasons for this trend and the financial implications of this warrant further exploration.

9. *"Intracranial Neuroendoscopic Experience and Complication Rates in 273 Adult and Pediatric Patients: A Population-based Study with Long-term Followup"*
Mark G Hamilton MDCM, FRCSC; University of Calgary; Calgary, Alberta

Objective: Neuroendoscopy is often thought of as a pediatric hydrocephalus procedure. We examine and contrast the role of intracranial neuroendoscopy in both a pediatric and adult population with minimum 5-year post-procedure followup.

Methods: A retrospective review was conducted for patients in the two hospitals that manage neurosurgical care for Southern Alberta undergoing neuroendoscopic surgery between 1994 and 2008. The pediatric group was defined as age ≤ 17 and the adult group as age ≥ 18 years.
Results: 273 patients were identified who underwent a total of 330 procedures with a mean post procedure followup of 12.9 years. There were 161 adult and 112 pediatric patients. The

most common procedure was endoscopic third ventriculostomy (ETV) accounting for 55% of procedures, followed by cyst fenestration (16%), colloid cyst removal (10%), tumor biopsy (8%), and septostomy (5%). One postoperative death occurred in an adult patient. ETV success one-year post procedure was 81% with only 3 late-term failures. Postoperative infection was the most common serious complication (2 pediatric/4 adult), followed by permanent neurologic deficit (1 pediatric/3 adult), permanent endocrine dysfunction (3 pediatric), and subdural hematoma (2 pediatric). Although adult and pediatric patients had similar major complication rates (4.2% vs. 5.7%, $p = 0.712$), there was a significant trend toward lower complication rates as patient age increased ($R2 = 0.32$, $p = 0.021$).

Conclusion: Neuroendoscopy overall has a similar role in both the pediatric and adult patient neurosurgical populations with a higher percentage of pediatric patients undergoing cyst fenestration, while a higher percentage of adults underwent ETV, colloid cyst removal, and tumor biopsy. ETV success was 81% at one year and late ETV failures are uncommon. The most common complication associated with neuroendoscopy was infection, and complication rates significantly trended downwards with increasing patient age. Neuroendoscopy should be considered as a potential therapeutic modality in the management of appropriate adult patients.

10. *"Diffusion Tensor Tractography for Localization of Motor and Sensory Pathway Fibers in Relation to Brainstem Lesions in Children"*
    Michael S.B. Edwards, MD, Lucile Packard Children's Hospital at Stanford, CA

Introduction: Surgery within the brainstem is challenging due to proximity to critical structures. We hypothesized diffusion tensor tractography can be used to localize motor and sensory pathway fiber projections in relation to brainstem lesions. Methods: Data of 18 consecutive children with brainstem masses were acquired using an eight-minute imaging sequence with 3T MRI and retrospective correction for motion and artifacts. Fiber tracts were calculated with two seed regions for motor fibers: 1) precentral gyrus and 2) pyramidal tract at normal brainstem not occupied by the tumor; and two seed regions for sensory fibers: 1) medial lemniscus at pons and 2) postcentral gyrus.

Results: The cohort consisted of 18 children (age 2 to 17 years), with pontine lesions in 39% and pilocytic astrocytomas in 50%. Presenting features included cranial neuropathy (61%), ataxia (56%), head tilt (17%), hemiparesis (11%), and sensory complaints (11%). For diffuse intrinsic pontine glioma (DIPG) in five children, eight of ten motor fibers traversed tumor along pontine pyramidal tracts. For pilocytic astrocytoma (9), ganglioglioma (1), and giant cavernous malformations (CM) (2) in 12 children, 23 of 24 motor fiber projections were identified, showing variable displacement patterns in relation to tumor. In one case, motor fibers traversed enhancing tumor. Sensory projections at the brainstem were identified in all except two cases of DIPG and CM. Overall, 19% of corticospinal tracts and 18% of sensory fibers were degraded (<50% of normal fractional anisotropy), interrupted, or untraceable. There were no cases in which corticospinal tracts were normal in which there was corresponding corticospinal tract dysfunction identified. Interrupted or untraceable fibers in the corticospinal tract were noted in the two children presenting with hemiparesis.

Conclusions: Tractography is helpful in patients with brainstem lesions, as it provides information regarding the motor and sensory fiber arrangements and can be incorporated into surgical navigation

11. *"A Novel Phase 1/2A Study of Intraparenchymal Transplantation of Human Modified Bone Marrow Derived Cells in Patients with Stable Ischemic Stroke"*
Gary K. Steinberg, MD, PhD, Stanford University, Stanford, CA

Introduction: No treatment exists to restore lost brain function after stroke. Animal studies demonstrate that brain transplantation of SB623, a human bone marrow derived stromal cell with transient transfection of Notch-1 gene, after experimental stroke can improve neurologic outcome. This clinical study is the first North American trial of intraparenchymal transplantation of bone marrow derived cell therapy for chronic stroke patients.

Methods: This is a two center (Stanford University and the University of Pittsburgh) open label safety and dose escalation feasibility study. Stereotactic transplantation is targeted to the subcortical peri-infarct area. Inclusion criteria include 18–75 yo, 6–60 mos post subcortical MCA ischemic stroke, mRS 3–4 and NIHSS > 7. Safety endpoints include WHO toxicity scale, MRIs and clinical follow-up to 2 years. The primary efficacy endpoint is European Stroke Scale (ESS) at 6 mos; secondary efficacy measures are ESS, NIHSS, Fugl-Meyer, mRS, cognitive scores up to 2 years, and FDG-PET at 6 months.

Results: Eighteen patients (33-75 yo; 7-36 mos post-stroke) have been treated (6 each with 2.5M, 5M and 10M cells). Follow-up is currently 6 mos in 15 pts, 9 mos in 12 pts and 12 mos in 9 pts. There were 5 adverse events related to the surgery, but not to the cells (seizure, asymptomatic subdural hematoma, pneumonia, transiently worsened neurologic symptoms, urinary tract infection). Cytokine levels, HLA antibody levels, and PBMC function did not change from baseline. Three measures of efficacy (NIHSS, ESS, Fugl-Meyer) all demonstrated a statistically significant improvement at 6 months after treatment. Two patients showed remarkable improvement in their motor (2) and language function (1) within 24 h of surgery, effects which have been sustained during follow-up (24 and 12 mos). These were the only 2 patients with new FLAIR lesions (DWI neg) in the motor cortex that resolved at 2 mos.

Conclusions: Intraparenchymal transplantation of human modified bone marrow derived stromal cells in chronic stroke patients is safe, feasible, and shows significant neurologic improvement at 6 months following treatment. Larger studies and longer followup are being initiated to further assess clinical efficacy.

12. *"Comparison of Direct Surgical Costs in the Perioperative Period Between Microscopic and Endoscopic Pituitary Surgery Techniques"*
Jakub Godzik BS, Hasan A. Zaidi MD, Heidi Jahnke RN, MSN,
William L. White MD, Andrew S. Little MD
Barrow Neurological Institute, St. Joseph's Hospital and Medical Center,
Phoenix, AZ

Introduction: Two transsphenoidal approaches for pituitary adenomas are commonly utilized, the endonasal endoscopic approach and the direct endonasal microscopic approach. Even though the endoscopic approach is becomingly increasingly performed, the healthcare economics of this trend have not been investigated. The objective of this study was to compare direct surgical costs between endoscopic and microscopic surgical approaches in the perioperative period.

Methods: A cost analysis of a prospective surgical cohort enrolled in a multicenter quality of life study at a single institution between 2011 and 2013 was performed (NCT01504399). Direct surgical costs were calculated by reviewing inpatient hospital billing records and outpatient follow-up records for a period of six months after surgery.

Results: One-hundred and seven patients were eligible for the analysis, of whom 46 underwent endoscopic pituitary surgery and 61 underwent microscopic surgery. Demographic and tumor characteristics were similar between groups. Mean total direct surgical costs in CY2012 dollars were $27,176 + 6463 for patients undergoing endoscopic surgery and $26,937 + 4373 for patients undergoing microscopic surgery (p=0.821). Inpatient costs and follow-up costs attributed to neurosurgery and endocrinology clinic visits were similar between groups, but outpatient nasal debridement costs were significantly higher in the endoscopic group. The most important driver of cost during the 6 month perioperative period was the inpatient stay for the surgical procedure. Inpatient costs were strongly associated with length of stay ($R=0.539$, $p<0.001$).

Conclusion: While the endoscopic surgery technique is associated with greater postoperative nasal debridement costs, total direct surgical costs do not appear to differ significantly between endoscopic and microscopic transsphenoidal surgery techniques in the perioperative period. The primary driver of total cost is length of stay during the surgical admission.

The world's first alpine skiing chairlift was (and still is) located in Sun Valley. Built by Union Pacific Railroad engineers, it was designed after a banana-boat loading device.
The 1936 fee: 25 cents per ride.

13. *"Therapeutic Neurosonology: A New Emerging Technology in the Neurosciences"*
David W. Newell MD FAANS, Swedish Neuroscience Institute, Seattle Washington

Introduction: Ultrasound has been used for many years during the late 20th century for medical diagnostic purposes. It has also been used for therapeutic purposes in the body for a variety of conditions including lithotripsy for renal calculi as well as other applications.

Methods: A literature review was conducted to identify important uses of ultrasound for the treatment of brain conditions that have entered clinical trials.

Results: Three important technologies have emerged that offer the potential for therapeutic applications in the neurosciences and are now being evaluated in clinical trials for the treatment of neurological diseases. These three unique technologies include:
1) Ultrasound mediated sonothrombolysis for acute stroke
2) Ultrasound mediated sonothrombolysis for intracerebral hemorrhage
3) MRI-directed focused ultrasound for the treatment of a variety of brain lesions
Sonothrombolysis for acute stroke has been employed with two different modalities: catheter based therapy with a micro-ultrasound transducer on the tip of the catheter and externally directed transcranial ultrasound for thrombolysis of intracranial vascular occlusions combined with intravenous t-PA.
MRI-directed focused ultrasound has been used to treat brain lesions by combining accurate MRI imaging with an array of multiple intersecting beams. The beams pass through the tissue but reach a point of convergence and have a profound effect through energy deposition in the form of thermal as well as mechanical effects. This approach has been used in humans recently by creating stereotactic functional lesions for treating essential tremor, Parkinson's disease tremor, chronic pain, and also obsessive-compulsive disorder, and experimentally to treat intracerebral hemorrhage, as well as trigeminal neuralgia and intra-arterial thrombus.

Conclusions: The use of therapeutic ultrasound in the brain to treat a variety of conditions has progressed to the point of clinical testing. We believe these technologies will provide a new opportunity to produce therapeutic effects in the nervous system for a variety of conditions.

14. *"Transcriptional Signature of Irradiated Microglia—Implications for Cognition and Tumor Migration"*
Terry Burns, Stanford University, California

Brain irradiation remains important in the management of brain tumors, though is associated with cognitive impairment in long-term survivors. A chronic inflammatory state characterized by microglial activation has been implicated in the pathophysiology of radiation-induced cognitive decline and alters the microenvironment for residual tumor cells. However, no molecular characterization of irradiated microglia has previously been undertaken. CD11b+ microglia were FACS-isolated from the hippocampi of 10 week old C57Bl/6 and Balb/C mice 1 month after 10Gy or sham cranial irradiation and comprehensive transcriptome analysis was performed using Affymetrix gene arrays. Linear modeling and rank product analyses were used to determine the conserved signature of irradiation across strains. One month after irradiation 448 and 85 genes were differentially up- and down-regulated, respectively, revealing a signature distinct from previously described microglial states. Gene set enrichment analysis

demonstrated enrichment for inflammation-related gene sets including a subset of genes characteristic of M1 macrophage polarization, but further revealed an unexpected enrichment for extracellular matrix and coagulation-related gene sets. Weighted gene co-expression network analysis revealed 3 distinct modules that accounted for 95% of the upregulated genes and further implicated mitochondrial dysregulation after irradiation. Remarkably, one of these modules was consistently enriched in public data sets of brain aging, suggesting shared mechanisms underlying aging- and irradiation-induced cognitive decline. Analysis of human glioma datasets revealed that patients with the lowest enrichment for the irradiated microglia signature survived over twice as long as those with the highest enrichment. Consistent with this, implanted stem cells from parallel work showed dramatically enhanced migratory behavior in mouse brains pre-irradiated with 15Gy. Ingenuity pathway analysis identified CEBPA and the aryl hydrocarbon receptor as key upstream regulators of the microglial irradiation response. These data suggest that insights from the irradiated microglia transcriptome could inform strategies to improve cognitive outcomes and slow recurrence following brain irradiation.

15. *"The Myth of Restenosis After Carotid Artery Stenting"*
Karam Moon, M.D. Division of Neurosurgery
Barrow Neurological Institute, Phoenix, AZ

Introduction: Based on the CREST results, carotid endarterectomy and stenting have been shown to have similar safety and efficacy. Endarterectomy is associated with an 8-19% rate of restenosis. Restenosis rates after endovascular treatment of carotid artery stenosis have been found to be between 1% and 75%. We analyzed our experience with restenosis after carotid artery stenting.

Methods: A retrospective chart review was conducted between 1995 and 2010. Symptomatic and asymptomatic patients were selected for stent placement based on NASCET and ACAS criteria. These patients underwent stenting followed by angioplasty with embolic protection. The risk factors, indications, rates of technical success, intraoperative and perioperative complications, restenosis (>70%) rate, and clinical outcome were evaluated.

Results: One-hundred seventy five patients were treated, but 24 were lost to follow-up. One hundred fifty one patients with 165 lesions were treated. Seventy five percent of lesions were symptomatic. Indications for stent placement included patients who were poor surgical candidates, prior endarterectomy, prior radiation, those randomized to stent placement as part of a study, acute occlusions, tandem stenosis, high bifurcation, and contralateral laryngeal nerve palsy. Procedures were technically successful in all but one case. Intraoperative and peri-operative stroke occurred in 4 patients. Follow-up ranged from six months to 10 years (mean 1 year). Seven patients (4.2%) developed a restenosis greater than 70%. Only four patients developed a symptomatic restenosis (2.4%). The highest risk factor for developing restenosis was prior history of radiation (33%) and prior endarterectomy (20%). Average time to restenosis was longer for the former (14 months) and short for the latter (6 months).

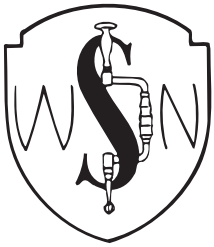
Conclusions: The rate of restenosis after carotid stent placement is low and compares favorably to that of endarterectomy. Patients who undergo stenting after radiation or endarterectomy are at higher risk for restenosis.

16. "*Neuropraxia in Professional Athletes: Implications and Surgical Treatment"*
Joe Maroon, Pittsburg, PA

Neurapraxia is defined as a transient posttraumatic paralysis of the motor and/or sensory tracts in the cervical spinal cord. In athletes there is typically an associated high velocity blow resulting in hyperflexion or –extension of the cervical spine. In the majority of cases the athletes have a pre-existing compromised or stenotic cervical spinal canal. Stenosis may be due to DDD with osteophyte formation, a herniated disc, congenital narrowing of the canal, or combinations of these elements. The occurrence of neurapraxia in athletes is not necessarily a harbinger of a future catastrophic spinal cord injury but can in some cases be a career-ending event due to the presence of underlying cervical spine pathology with or without surgical intervention.

Neurapraxic symptoms are generally transient and are not associated with fracture dislocation or spinal instability. The prevalence is estimated to be seven per 10,000 football participants. There are few injury management guidelines for athletes with spinal stenosis who have experienced transient symptoms of neurapraxia. This presentation will detail the features that necessitate surgery, the type of surgery(s) recommended, postoperative care and return-to-play decisions. Several case reports of elite athletes with neurapraxia will be reviewed along with discussion of risks of continued play with or without corrective surgery compared with outright retirement.

63% of Idaho is public land managed by the federal government.



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A. Earl Walker

W. Keasley Welch

William Wright

Eric Yuhl

Edward Zapanta

Michael Robbins

Peter Allen

Deane B. "Skip" Jacques

Charles Needham

Michael Mason

PAST SECRETARY-TREASURERS

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

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

*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, SanDiego, 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 *In Memory of L. Philip Carter*	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

FUTURE MEETINGS

The Grand Hyatt Kauai Resort & Spa, Island of Kauai, Hawaii	September 10-13, 2015
Park Hyatt Aviara Resort, Carlsbad, CA	September 9-12, 2016
Fairmont Banff Springs Hotel, Banff, Alberta, Canada	September 7-11, 2017

PAST VICE-PRESIDENTS

John Raaf*	1955
Frank Turnbull*	1956
Howard A. Brown*	1957
Rupert R. Raney*	1958
Edmund J. Morrissey*	1959
C. Hunter Sheldon*	1960
Ernest W. Mack*	1961
Hale A. Haven*	1962
Frank M. Anderson*	1963
Edwin B. Boldrey*	1964
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
Philip Weinstein	2007
Betty MacRae	2008
Linda Liau	2009
David W. Newell	2010
J. Paul Muizelaar	2011
Richard Wohns	2012
Marc Vanefsky	2013

*deceased

PAST PRESIDENTS

David L. Reeves*	1955
John Raaf*	1956
Frank Turnbull*	1957
Howard A. Brown*	1958
Rupert R. Raney*	1959
Edmund G. Morrissey*	1960
C. Hunter Sheldon*	1961
Ernest W. Mack*	1962
Hale A. Haven*	1963
Frank M. Anderson*	1964
Edwin B. Boldrey*	1965
John R. Green*	1966
Arthur A. Ward, Jr.*	1967
Lester B. Lawrence*	1968
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
John P. Slater	2005
Moustapha Abou-Samra	2006
Kim Burchiel	2007
Gerald Silverberg	2008
Lawrence Shuer	2009
L. Philip Carter*	2010
David W. Newell	2010
Austin R.T. Colohan	2011
John T. Bonner	2012
Jeffery L. Rush	2013

*deceased

PAST RESIDENT AWARD RECIPIENTS

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
Sooho 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

**WNS Member

Western Neurosurgical Society

61st Annual Meeting

September 10-13, 2015

Grand Hyatt Kauai Resort & Spa

Island of Kauai

Hawaii

Sun Valley, Idaho