Western Neurosurgical Society

54th ANNUAL MEETING

Hotel Captain Cook
Anchorage, Alaska

August 16 – 19, 2008
www.westnsurg.org

Jointly sponsored by

American Association of Neurological Surgeons

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Michael Bliss	Shokei Yamada	John Borchers
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The AANS and the Western Neurosurgical Society acknowledge an educational grant in support of this activity from Abbott Laboratories.

WESTERN NEUROSURGICAL SOCIETY

54th ANNUAL MEETING
2008 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) Determine the best treatment strategies for CNS tumors.
2) Explain new advances and treatment of spinal disorders.
3) Analyze current concepts in cardiovascular disease.
4) Discuss the best methods for pain management.

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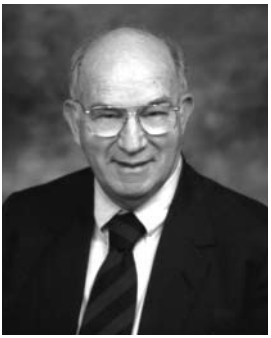
2008 GUESTS

Michael Bliss	Society
Peter Jannetta	Society
John Zhang	Austin Colohan
Virany Hillard	David Pitkethly
Edward Chang	Resident Award
Justin Cetas	Resident Award
Frank Hsu	Austin Colohan
Behnam Badie	Rick Batzdorf
Joshua Dusick	John Frazee
Rod Oskouian	David Newell



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 B.S. and M.D. 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 Surgery. 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.

MICHAEL BLISS, Ph.D.

Ablin Lecturer

Michael Bliss held the elite title of University Professor when he retired in 2006 after 38 years at the University of Toronto. Formally University Professor Emeritus, he continues to write and lecture to audiences throughout North America and Europe. He specializes in the history of medicine and the history of Canada. His twelve books (including *A Canadian Millionaire*, *The Discovery of Insulin*, *Banting*, *Northern Enterprise*, *Plague, Right Honourable Men*, *William Osler*, *A Life in Medicine*, and *Harvey Cushing: A Life in Surgery*) have received numerous honours, including all the major prizes awarded by the Canadian Historical Association, two City of Toronto Book Awards, three Jason Hannah Medals for medical history from the Royal Society of Canada, the Welch Medal of the American Association for the History of Medicine, and the National Business Book Award. He has presented numerous scholarly papers and has lectured throughout Canada and the world.

Professor Bliss was appointed a Member of the Order of Canada in 1999, and elected a Fellow of the Royal Society of Canada in 1984. The Royal Society has awarded him its Tyrrell Medal "for outstanding work in the history of Canada". At the time of his retirement, Canada's national newsmagazine, Maclean's, referred to him as "perhaps Canada's greatest living historian."

Michael Bliss was born in 1941, married in 1963, and has three children. He has been awarded Honorary degrees from McGill University, McMaster University, and the University of British Columbia, and is an Honorary Fellow of the Royal College of Physicians and Surgeons of Canada.

Ralph B. Cloward
1908-2000

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

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

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

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

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

Peter Jannetta, M.D.

Cloward Award Lecturer

Peter Jannetta, MD, is a nationally and internationally recognized expert in the pathology and treatment of cranial nerve compression syndromes. He developed a microvascular decompression procedure that has become the standard of care world wide for successful treatment of trigeminal neuralgia, hemifacial spasm, spasmodic torticollis, and neurogenic hypertension. He has authored over 280 scientific articles, book chapters, and abstracts. Dr Jannetta is active in many professional and scientific organizations and has earned several of his fields most prestigious awards, including the Olivecrona Award from the Karolinska Institute in Sweden, the Fedor Krause Medal from the German Neurosurgical Society, and the Zulich Prize for medical research from the Max Plank Society. Dr Jannetta is currently the Director of the Peter J. Jannetta Cranial Nerve Disorder Clinic at Allegheny General Hospital in Pittsburg.

Dr Jannetta received both an undergraduate degree in zoology and a medical degree from the University of Pennsylvania. He completed a surgical residency at the University of Pennsylvania and was then a NIH Fellow in Neurophysiology at the same institute. His neurosurgery training was completed at UCLA in1966. He was Professor and Chairman at the University of Pittsburg School of Medicine from 1973 to 1997 and continues as Professor of Neurosurgery at Drexel University College of Medicine.

WESTERN NEUROSURGICAL SOCIETY
2008 Annual Meeting

SCIENTIFIC PROGRAM
SESSION I
DAY 1, SUNDAY, AUGUST 17, 2008

Moderators: Jeff Rush, Charlie Nussbaum

7:30-7:35		**Welcome**
7:35-7:50	1	"**Macrophage Function and Activation in Gliomas"** Behnam Badie
7:50-7:55		Discussion
7:55-8:10	2	"**Outcomes of Treatment of ACOM Aneurysms: Comparison of Microsurgical and Endovascular Treatment"** Laligam Sekhar
8:10-8:15		Discussion
8:15-8;30	3	"**Two is Better than One – Minimally Invasive Skull Base Surgery**" Frank P.K. Hsu
8:30-8:35		Discussion
8:35-8:50	4	"**Subarachnoid Hemorrhage: What is New and What is Next?**" John Zhang
8:50-8:55		Discussion
8:55-9:10	5	"**An Alternative to Two-Surgeon Neuroendoscopes"** Joshua Dusick
9:10-9:15		Discussion
9:15-9:45		**Special Lecture** **"The Challenges of Evidence-Based Pain Surgery"** Kim Burchiel
9:45-9:50		Discussion
9:50-10:30		BREAK—VISIT EXHIBITS

SESSION II
DAY 1, SUNDAY, AUGUST 17, 2008

Moderators:	Larry Shuer, Grant Gauger
10:30-10:45 6	"**Cyberknife Radiosurgery Ablation of Large Benign Skull Base Tumors: Is There a Size Limit?"** John Borchers
10:45-10:50	Discussion
10:50-11:20	**SPECIAL LECTURE**
	"Facts and an Action Plan for the November Elections" James Ausman
11:20-11:25	Discussion
11:25-11:30	Introduction of Ablin Lecturer Gerald Silverberg
11:30-12:00	**ABLIN LECTURE**
	"**Working Too Hard and Achieving Too Much? The Cost of Being Harvey Cushing**" Michael Bliss

SCIENTIFIC PROGRAM
SESSION III
DAY 2, MONDAY, AUGUST 18, 2008

Moderators: David Newell, Austin Colohan

8:00-8:15	7	**"Intraoperative CT: Its applications in Pediatric Neurosurgery – A Clinical Report"** Hector James
8:15-8:20		Discussion
8:20-8:35	8	**"Classification of Trigeminal Neuralgia: Clinical, Therapeutic, and Prognostic Implications in a Series of 144 Patients Undergoing Microvascular Decompression"** Kim Burchiel
8:35-8:40		Discussion
8:40-8:55	9	**RESIDENT AWARD – CLINICAL SCIENCE**
		"A Pre-Operative Scoring System for Long Term Survival and Recurrence for Adult Hemispheric Low Grade Gliomas" Edward Chang
9:00-9:05		Discussion
9:05-920	10	**RESIDENT AWARD – BASIC SCIENCE**
		"Coupled Control of Pain and Cerebral Blood Flow in the Medulla" Justin Cetas
9:20-9:25		Discussion
9:25-9:30		Introduction of Cloward Lecture Larry Schuer
9:30-10:00		**CLOWARD LECTURE**
		"Vascular Compression in the Brainstem: Main Streaming Neurosurgery" Peter Jannetta
10:00-10:30		BREAK—VISIT EXHIBITS

SESSION IV
DAY 2, MONDAY, AUGUST 18, 2008

Moderators: Betty MacRae, Moose Abou-Samra

10:30-10:45	11	"**High Density EEG Predicts Invasive Localization of Intractable Focal Epilepsy**" Jeff Ojemann
10:45-10:50		Discussion
10:50-11:20	12	**SPECIAL LECTURE** **Adult Scoliosis: A Growing Problem in an Aging Population** Chris Shaffrey
11:20-11:25		Discussion
11:25-11:30		Introduction of President Elizabeth MacRae
11:30-12:00		**PRESIDENTIAL ADDRESS** **"Of Aging and the Brain"** Gerald Silverberg

SCIENTIFIC PROGRAM
SESSION V
DAY 3, TUESDAY, August, 19, 2008

Moderators: Mitchel Berger

7:30-10:00 **MINI SYMPOSIUM**

CNS TUMORS

MODERATOR: Mitchel Berger

1. Mark Schwartz

"Vestibular Schwannomas"

2. Richard Ellenbogen

"Pediatric Tumors"

3. Michael McDermott

"Meningiomas"

4. Mitchel Berger

"Gliomas"

Panel Discussion 20 minutes

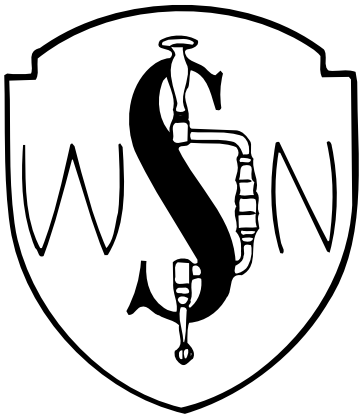
10:00-10:30 BREAK—VISIT EXHIBITS

SCIENTIFIC PROGRAM
SESSION VI
DAY 3, TUESDAY, August, 19, 2008

Moderators: Jeff Rush

10:30-10:45	13	**"An Update on Ultrasound Applications in the Brain: From Diagnostics to Therapeutics"** David Newell
10:45-10:50		Discussion
10:50-11:05	14	**Endovascular Coiling of Intracranial Aneurysms in Elderly Patients: Report of 205 Treated Aneurysms** Joshua Dusick
11:05-11:10		Discussion
11:10-11:25	15	**Tethered Cord Syndrome Presented as Failed Back** Shokei Yamada
11:25-11:30		Discussion
11:30		Meeting Adjournment

See you in Sun River, Oregon, in 2009



ABSTRACTS

1. Macrophage Function and Activation in Gliomas
Behnam Badie, MD, Duarte, CA

Most cancers have devised mechanisms to escape the host immune system by not only making the immune cells ineffective in generating an antitumor response, but also, by exploiting them to promote tumor growth. For example, the ability of malignant gliomas to escape the host immune system despite a large influx of immune cells has been associated to their poor prognosis and lack of response to conventional therapy.

Being the first line of defense against pathogens, macrophages (MP) have been proposed to play a role in tumor tissue homeostasis. As innate immune cells, it is not surprising to see a significant MP response in a number of CNS disease processes such as trauma, encephalitis and brain tumors. Studies by us and others have demonstrated that in addition to tumor cells, tumor-infiltrating MP are also responsible for the production of immunosuppressive factors. In this presentation, we will review our understanding of MP immune function in gliomas and discuss potential application of these cells as nanoparticle delivery vehicles and a targeted therapeutic approach for malignant brain tumors.

2. Outcomes of Treatment of ACOM Aneurysms: Comparison of Microsurgical and Endovascular Treatment
Laligam N Sekhar, MD, Sabareesh K Natarajan, MD, Louis J Kim, MD, Danial Hallam, MD, Basavaraj Ghodke, MD, Seattle,WA

Objective: Compare the outcomes of microsurgical clipping and endovascular coiling in the treatment of ruptured ACOM aneurysms.

Methods: Between January 2005 and Dec 2007, 383 patients with aneurysmal subarachnoid hemorrhage were treated in the UW Aneurysm Center. Among these, the largest group was 127 patients with 128 ACOM aneurysms. The mode of definitive treatment (microsurgery vs endovascular) was decided on the basis of patient and aneurysm related factors, the remainder of the management was standardized. The three month outcomes, and other factors related to the treatment were analyzed and compared between the microsurgical and endovascular groups.

Results: One patient died before treatment. Of the remaining 126 patients, 74 patients were underwent endovascular coiling and 52

patients had clipping. The admission Hunt and Hess scores of the patients selected for coiling was worse compared to patients who were clipped. Of the 74 patients selected for coiling, there were 8 treatment failures [failed catherization (n= 4), suboptimal coiling (n= 2), recanalization (n= 2)]. Of these, 7 underwent clipping and one patient (failed catheterization) died before treatment. Two patients had perforations during coiling without consequences. Of the 52 patients who were clipped, one patient had a residual aneurysm which rebled, requiring reoperation. There were 2 intraoperative ruptures without consequences. Nineteen of the coiled and 4 of the clipped patients died secondary to SAH. There was no significant difference between the rates of angioplasty performed for vasospasm between the clipped and coiled groups (21.2% vs. 20.2%, p=0.90) The modified Rankin score at 3 months was 1.71, 2.85 in clipped and coiled patients respectively. Linear regression multivariate analysis (which retropectively matches the groups for the differences in their pretreatment predictors including admission grade) showed that clipping has a better 3 month outcome than coiling (p=0.04).

Conclusion: In this consecutive series of patients, results of clipping were better than coiling, although a larger number of patients in worse H & H grades were coiled. There was a higher rate of treatment failure with coiling requiring a cross over to clipping (n=7, 9.5%). The reason for better outcomes with clipping was not explained by vasospasm, but may be due to the brain decompression by surgery.

3. Two is Better than One – Minimally Invasive Skull Base Surgery
Jan M. Eckermann, MD, Dennis Chang, MD,
and Frank P.K. Hsu, MD, Ph D, Loma Linda, CA

Introduction: Traditionally skull base surgery means big craniotomy to minimize brain retraction. The new trend of minimally invasive skull base surgery (MISBS) means tailoring exposure for pathology through small opening and natural corridors. Anterior skull base pathology lends itself well to minimally invasive approaches through the endonasal transsphenoidal passages. Endoscopic techniques require an assembly of a modern skull base team composed of both neurosurgeons and otolaryngologists. The level of proficiencies determines the type of pathology that can be dealt with by the team. Many centers are developing such teams for this purpose. We describe our experience at our institution for building a multidisciplinary minimally invasive skull base team designed to not only treat with, but also educate on minimally invasive skull base techniques.

Methods: Clinical retrospective review for cases since 2005 demonstrated that we have adopted endoscopic transnasal transsphnoidal approach for all pituitary adenomas (n=20). There was no conversion to open cases. In addition we treated various types of pathology including meningiomas (1), chordomas (3), epidermoid tumors (1), adenocarcimona (1), plasmacytomas (1), repair of CSF leak (3), and craniopharyngiomas (2). Compared to historical control cases the outcome and extent of resection were equivalent.

Conclusion: Minimally invasive skull base surgery is a new trend for the future. While it cannot replace traditional open craniotomy and skull base approaches, it can certainly add to the techniques we currently utilize to treat skull base pathology. MISBS is based primarily on endoscopic platforms. It requires a multidisciplinary approach. The level of proficiency depends on the education and experience of the team. Once the team is properly trained the advantages of MISBS include patient comfort, avoidance of scars, and faster recovery. We continue to collect data prospectively with regards to length of hospital stay, ICU stay, and postoperative complications, and patient satisfaction. Besides the patient, the residents are the beneficiaries of this task force. Both neurosurgery and otolaryngology residents have high educational benefits by learning and operating with experts, enjoy a great case variety, and increased case load. Furthermore, the formation of a team allows for combining funds and resources, making educational events/ guest lectures more affordable.

4. Subarachnoid Hemorrhage: What is New and What is Next?
John H. Zhang, MD, Ph D, and Austin Colohan, MD,
Loma Linda, CA

Subarachnoid hemorrhage (SAH) is a deadly and expansive disease. SAH carries high mortality rate, about 45% patients die within the first 30 days and about 50% survivors have major disability (Broderick et al., 1993). SAH is an expansive disease to treat, because of the ICU and long hospital stay. In the United State, it costs more than $200,000 to treat the first incident of SAH (Qureshi et al., 2005).

SAH can be divided into two phases, an early brain injury phase which lasts from the onset of SAH to the first 72 hrs; a delayed vasospasm phase, which begins on day 4 and lasts into 2 or 3 weeks. In the past, cerebral vasospasm is believed the major complication in patients after SAH. The presumption is that prevention of vasospasm will improve the overall outcome (Hansen-Schwartz et al., 2007).

The new development of SAH research in the past three years is the refocus of target from cerebral vasospasm to early brain injury. The driving force of this refocus is an ongoing clinical trial using Clazosentan which is an endothelin-receptor antagonist. From the early result, Clazosentan reduced the occurrence of cerebral vasospasm substantially by 65% but failed to improve the overall outcome at 3 months. This study leads to reemphasizing the importance of early brain injury after SAH (Macdonald et al., 2007) which may be responsible for 70-80% mortality in the first 30 days after SAH (Broderick et al., 1993).

What is early brain injury? The early brain injury from the impact of the initial bleeding includes elevation of intracranial pressure, reduction of cerebral blood flow, suppression of cerebral perfusion pressure, depression of brain oxygenation, disruption of blood-brain barrier (BBB), development of brain edema, and neuronal cell death within 72hr after SAH. The mechanisms of early brain injury are unknown and no treatment is available (Hansen-Schwartz et al., 2007). Some preliminary studies demonstrated that early brain injury is a neurovascular injury and neurovascular protection may have potentials to reduce mortality and improve the overall outcome of SAH (Cahill et al., 2007).

What is the next step? We need to study early brain injury after SAH, to develop more outcome measurements in animal models and in clinical trials to evaluate treatment strategies targeting early brain injury, and to study other factors related to early brain injury including microcirculation failure, inflammation, and cortical spreading depression.

5. An Alternative to Two-Surgeon Neuroendoscope Techniques: A Single-Surgeon Neuroendoscope for Skull Base and Cerebrovascular Procedures

Joshua R. Dusick, MD and John G. Frazee, MD, Los Angeles, CA

Objectives: Advanced endoscopic skull-base procedures have typically required an awkward two-surgeon technique, particularly for endonasal surgeries. We have helped to develop a new, intuitive neuroendoscope (Frazee II Advanced Neuro-Endoscope; Karl Storz, Tuttlingen, Germany) particularly suited for the single-surgeon treatment of complicated skull-base and cerebrovascular lesions previously treated microscopically or using two surgeons.

Methods: The 4 mm rod lens scope, light source, and camera have been entirely incorporated into a lightweight instrument that can be held

and manipulated comfortably with one hand. Rapidly interchangeable, variable-length suction tips, sizes 5-12 French, are attached to the scope by a cam lock. The lens tip and light source are recessed from the suction tip so that the suction can be held and manipulated as it would be in a microsurgical procedure while providing bright illumination and a clear, unobstructed view of the working area. The design frees the surgeon's other hand to use familiar microsurgical instruments, obviating the need for a second surgeon or a scope holder. Bayoneted dissection instruments have been designed to complement the scope.

Results: Twenty neurosurgical procedures have been performed utilizing, in part or solely, this neuroendoscope. Approaches for these procedures include: 4 endonasal (1 nasal carcinoma, 1 encephalocele, 1 planum epidermoid, 1 planum meningioma); 4 anterior fossa (3 aneurysms, 1 parasaggital meninigioma); 10 posterior fossa (4 vestibular nerve sections, 2 vestibular nerve tumors, 1 cavernous malformation, 1 microvascular decompression, 1 AVM, 1 epidermoid); 2 intraventricualar tumors (1 colloid cyst, 1 subependymal glioma).

Conclusions: We present a new compact neuroendoscope combined with interchangeable suction tips that promises to make neuroendoscopic procedures more intuitive to microscopic surgeons. We hope that this new design will make neuroendoscopy less cumbersome and awkward, and will make it easier and desirable for traditionally-trained microsurgeons to transition from the microscope to the endoscope.

6. CyberKnife Radiosurgical Ablation of Large Benign Skull Base Tumors: Is There a Size Limit?

F Tuniz, MD, GT Sakamoto, MD, JD Borchers, MD, and JR Adler, Jr., MD, Stanford, CA

Despite advances in microsurgical technique, the resection of many skull base tumors remains formidable and fraught with significant risk of neurologic impairment. Moreover, tumor recurrence even after apparent gross total resection is not uncommon. Although radiosurgery can play an important role in managing skull base lesions, there are limits to such an approach. In particular, when treating larger tumors, traditional single fraction radiosurgical ablation results in an unacceptable risk of adverse effects. In this retrospective study, we evaluate the radiosurgical outcome in terms of safety and efficacy, among a group of patients with very large skull base tumors who were managed primarily with a multi-session CyberKnife technique.

Between January 2001 and Febuary 2008, 40 consecutive patients with meningioma (23, schmannoma (9), glomus jugulare (4), chordoma (3), and malignant nerve sheath tumor (1), whose tumor volumn measured more than 15 cm^3 underwent primary radiation using a multi-session approach at Stanford University for their brain or skull base lesion. 50 % of these patients had previous subtotal surgical resection, or prior treatment with conventionally fractionated or proton beam radiotherapy. Within this cohort of patients, CyberKnife radiosurgery was delivered in two to eight sessions (average 3.63) to a mean tumor volume of 22.24 cm3 (range 15 – 69 cm3). Mean marginal dose for this series was 23.28 Gy (range 18 – 50 Gy) prescribed on an average to the 73% isodose line.

After a mean follow-up of 33.4 months (range 2 – 84 months), there was clinical improvement in 4 patients, while the neurologic status remained unchanged among the others. Other than 2 patients with phako matoses who suffered transient cerebral edema, there were no major side effects from radiosurgery; of note, no new cranial neuropathies were observed. Although the follow-up is still quite short, multi-session radiosurgery appears to be a safe and effective procedure for large benign brain and skull base lesions. To date tumor growth control has been excellent.

7. Intraoperative CT in Pediatric Neurosurgery: A Clinical Report
Hector James, MD, Jacksonville, FL

Introduction: To demonstrate the diverse clinical applications in pediatric neurosurgical interventions of a motorized intraoperative CT (iCT) unit.

Methods: The iCT (Mayfield MobileScan) was employed with the radiolucent table extension on a modified cantalivered base (SMI 7300, Schaerermayfield), with either a radiolucent horseshoe headrest, or a radiolucent skull clamp and radiolucent skull pins. When necessary the DICOM device would send images to the Neuronavigational System (Stealth, Medtronic), PACS services and when employed, the operating microscope with a Multivision platform, to permit the microscope to be a Stealth probe, injecting the images into the ocular. The children were anesthetized, fiducials were placed, or Axiem programming performed, then iCT executed. While operative planning was being performed, arterial, central venous lines, and bladder catheters were inserted. There were no remodeling or special rooms needed.

Results: From April 2006 to June 2007 a total of 26 interventions with iCT were performed. Craniotomy and neuronavigation with the microscope as a Stealth probe: 6. Fenestration of arachnoid cysts, with or without endoscopy: 9. iCT following shunt procedures to confirm catheter location: 4. Preoperative planning and postoperative documentation of craniofacial reconstruction: 2 iCT for assessment of III ventriculosomy patency: 3. Cervical and/or thoracic instrumentation (navigation planning or confirmation of instrumentation prior to closure): 2.

Conclusions: iCT is an additional practical tool for pediatric neurosurgical interventions by reducing the need for transport of the anesthesized child from the operating theater to radiology. It eliminates additional pre and post operating room sedation and/or anesthesia, for treatment and perioperative assessment.

8. Classification of trigeminal neuralgia: clinical, therapeutic, and prognostic implications in a series of 144 patients undergoing microvascular decompression.

Jonathan P. Miller MD, Feridun Acar MD, and Kim J. Burchiel, MD, Portland, OR

Object. Trigeminal neuralgia (TN) presents a diagnostic challenge because of the variety of symptoms, findings during microvascular decompression (MVD), and post-surgical outcomes observed among patients who suffer from this disorder. Recently, a new paradigm for classification of TN was proposed, based on the quality of pain. This study represents the first clinical analysis of this paradigm.

Methods. We analyzed 144 consecutive patients who underwent MVD for TN. Preoperative symptoms were classified into one of two categories based on the preponderance of shock like (Type 1 TN) or constant (Type 2 TN) pain. Analysis of clinical characteristics, neurovascular pathology, and postoperative outcome was performed.

Results. Compared to Type 2 TN, Type 1 TN patients were older, more likely to have right-sided symptoms, and reported a shorter duration of symptoms prior to evaluation. Previous treatment by percutaneous or radiosurgical procedures was not a predictor of symptoms, surgical findings, or outcome ($p = 0.48$). Type 1 TN was significantly more likely to be associated with arterial compression. Venous or no compression was more common among Type 2 TN patients ($p < 0.01$). Type 1 TN patients were also more likely to be pain-free immediately after surgery,

and less likely to have a recurrence of pain within two years ($p < 0.05$). While a subset of patients progressed from Type 1 to Type 2 TN over time, their pathologic and prognostic profile nevertheless resembled Type 1 TN.

Conclusions. Type 1 and Type 2 TN represent distinct clinical, pathological, and prognostic entities. Classification of patients according to this paradigm should be helpful to determine how best to treat patients with this disorder.

9. A Pre-Operative Scoring System for Long-term Survival and Recurrence for Adult Hemispheric Low Grade Gliomas

Edward F. Chang, MD, Justin S. Smith, MD PhD, Susan M. Chang, MD, Kathleen R. Lamborn, PhD, Michael D. Prados, MD, Nicholas M. Barbaro, MD, Andrew T. Parsa, MD PhD, Mitchel S. Berger, MD, and Michael M. McDermott, MD, San Francisco, CA

Background: Hemispheric low grade gliomas have an unpredictable progression and overall survival profile. As a result, our objective was to design a pre-operative scoring system to prognosticate long-term outcomes for patients with LGGs.

Methods: We conducted a retrospective review with long-term follow-up of 281 patients with adult hemispheric low grade gliomas (WHO II). Clinical and radiographic data were collected and then analyzed to identify pre-operative predictors of overall survival (OS), progression-free survival (PFS), and extent of resection (EOR). These variables were used to devise a pre-operative prognostic scoring system.

Results: The 5-year estimated survival probability was 0.86. Multivariate Cox proportional hazard modeling demonstrated that four factors were associated with lower OS: presumed eloquent location [hazard ratio (HR) =4.12; 95% confidence interval (CI) 1.71-10.42], KPS≤80 (HR 3.53; 95%CI 1.56-8.00), age >50 years (HR 1.96; 95%CI 1.47-3.77), and diameter >4 cm (HR 3.43; 95%CI 1.43-8.06). A scoring system calculated from the sum of these factors (range, 0-4) demonstrated risk stratification in the study populations, with the following 5-year cumulative survival estimates: Scores 0-1 OS=0.97, PFS=0.76; Score 2 OS=0.81, PFS=0.49; and Scores 3-4 OS=0.56, PFS=0.18 (logrank<0.001 for both OS and PFS). This proposed scoring system demonstrated a high degree of inter-scorer reliability (kappa=0.86). Four illustrative cases will be described. We also provide external validation from outside institutions.

Conclusions: We propose a simple and reliable scoring system that can be used pre-operatively to prognosticate degree of resectability, PFS and OS in patients with LGGs. The application of a standardized scoring system for LGGs should improve clinical decision-making and allow physicians to reliably predict patient outcome at the time of the original imaging diagnosis.

10. Coupled Control of Pain and Cerebral Blood Flow in the Medulla
Justin S. Cetas , MD, Delaina Lee, MD, Nabil J Alkayed, MD, Riukang Wang, MD, and Mary M Heinricher, MD, Portland, OR

Introduction: The cerebrovascular and functional subspecialties of neurosurgery do not often overlap. However, cervical cord stimulation has been used to treat both pain and vasospasm after subarachnoid hemorrhage to some effect. Based on this interesting clinical overlap between the pain and vascular systems we wondered if a brainstem modulatory system known to regulate sensory processing in the trigeminal system, the rostral ventromedial medulla (RVM), might also modulate cerebral blood flow and impact vasospasm following subarachnoid hemorrhage.

Methods: In the first set of experiments the RVM was directly activated by focal stereotaxic application of the GABAa antagonist bicuculine or inactivated using the GABAa agonist muscimol. Cerebral blood flow was measured using laser Doppler. In the second experiment, blood was injected into the preoptic cistern to model an acute subarachnoid hemorrhage (SAH) with and without prior inactivation of the RVM.

Results: With RVM activation, there was a significant increase in global cerebral blood flow. Blood pressure was not significantly altered by RVM activation. By contrast, RVM inactivation led to a pronounced drop in global cerebral blood flow without a change in resting blood pressure. Inactivation of the RVM prior to blood injection resulted in an enhanced drop in blood flow in response to the blood injection.

Conclusions: This is the first study to implicate the RVM, traditionally understood to be an autonomic and pain control center, in regulating cerebral blood flow. Further, the RVM appears to play a role in restoration of blood flow as part of the acute response to SAH. These data raise the possibility that central mechanisms may play an important role in vasospasm secondary to SAH.

11. High Density EEG predicts invasive localization of intractable focal epilepsy

JG Ojemann MD, MD Holmes, MD,D Tucker, MD,J Quiring, MD, S Hakimian, MD, JW Miller,MD, Seattle, WA

Rationale: Though patients with intractable seizures and a focus evident on MRI enjoy good surgical outcomes, many patients with uncontrolled epilepsy, especially with extra-temporal foci, prove difficult surgical candidates. One relevant recent technologic advance is the ability to record with as many 256 EEG electrodes from the scalp. This technique, referred to as dense array EEG, improves the spatial resolution of noninvasive surface recordings and can be applied for long enough to capture seizures and onset. We compare the localization of the seizure onset estimated from ictal recordings with dense array long-term EEG-video monitoring (LTM) to subsequent intracranial ictal recordings.

Methods: Ten patients (age 10-49, 7 male) with medically refractory epilepsy, all surgical candidates, underwent intracranial LTM after standard noninvasive evaluation (including MRI, standard scalp EEG LTM, SPECT, PET, and neuropsychological testing) failed to provide adequate localization of ictal origin. MRI was normal in six; one each had cerebellar hypoplasia, frontal-parietal dyplasia, and multiple cavernous angiomas. Prior to invasive studies all subjects underwent dense array EEG LTM, where habitual clinical seizures were recorded for each patient.

Results: Ictal onsets from invasive recordings were medial temporal lobe (3 patients), parietal (3), frontal (3), and inferior temporal-occipital (1). Dense array EEG localized ictal onsets to the same region as intracranial monitoring in 8/10 cases. Nine patients had resections (based only on the intracranial EEG) and all were either seizure-free (5/9, 56%) or had clinically significant (>90%) seizure reduction on follow-up. When the focus as determined by dense array EEG was removed, 63% (5/8) were seizure free. This compares quite favorably to extra-temporal, non-lesional series where success rates are often well below 50%.

Conclusions: Dense array EEG has the potential to assist in the noninvasive localization of epileptic seizures, when standard methods of evaluation fail to provide adequate information on ictal origins.

12. Adult Scoliosis: A Growing Problem in an Aging Population
Chris Shaffrey, MD, Charlottesville, VA

Over the next 25 years, the number of people>65 years old will increase by 125% (70 million). A survey of >100K Medicare beneficiaries >65 found heart and lung disease and back pain were the most important factors impacting the physical health status of older Americans. A scoliosis rate of 68% in an asymptomatic adult population with an average age of 70.5 years has been found. 58 patients treated from 7/2000 to 7/2003 for adult spinal deformity and followed for greater than 2 years were prospectively evaluated. Oswestry questionnaire, SF-36, and VAS pain scores preoperatively, 6 weeks, 3 months, 6 months, 1 year, 2 year, and 5 year follow-up periods were obtained. The ODI improved from a mean preoperative value of 45.1 to 24.9 at 5 years. SF-36 (PCS) improved from 23.3 to 42.1 Aat 5 years. There was a 41.3% complication rate. Patient satisfaction was high and improvement in neurological signs and symptoms was consistently demonstrated.

13. Update on Ultrasound Applications in the Brain: From Diagnostics to Therapeutics
David W Newell, MD, Seattle, WA

Transcranial Doppler ultrasound was introduced in 1981 initially as a diagnostic test to detect vasospasm in neurosurgical patients. Numerous other applications in neurology and neurosurgery have emerged from this technology. The ability to measure cerebral hemodynamics in real time and the ability to detect intraarterial cerebral emboli have enabled investigators to make many important observations regarding physiology of the cerebral circulation in normal and abnormal states.

More recently Transcranial Doppler has been shown to be effective in increasing the rate arterial recanalization in stroke in patients with acute middle cerebral artery occlusions treated with TPA, through an effect known as sonothrombolysis. New applications of this technology using refined and specifically designed equipment hold promise for increasing the effectiveness of acute thrombolytic treatment in patients with stroke.

The observation that ultrasound enhances TPA induced thrombolysis has led to the institution of a treatment trial for acute intracerebral hemorrhage lysis using an ultrasound tipped microcatheter. This trial of ultrasound induced thromobolysis in the brain is called SLEUTH to study the safety of direct application of ultrasound and TPA to intraventricular

and intracerebral hemorrhage to enhance the rate of thrombolysis in selected lesions. Details and rational for the study will be provided.

14. Endovascular Coiling of Intracranial Aneurysms in Elderly Patients: Report of 205 Treated Aneurysms

Nestor R. Gonzalez, MD, Joshua R. Dusick, MD, Neil A. Martin, MD, and Fernando Vinuela, MD, Los Angeles, CA

Acknowledgement: Saman Hazani, MD and Joaquin Zamarro for their contribution in reviewing clinical charts.

INTRODUCTION: With expansion of the elderly population, more individuals are presenting with intracranial aneurysms. Many of these patients have co-morbidities that make them poor surgical candidates and often undergo endovascular treatment. However, large series have not been reported. We present our experience with embolization in elderly patients.

METHODS: We performed a retrospective review of elderly(≥70-years-old) patients treated with coil embolization for intracranial aneurysms.

RESULTS: In a 16-year period, 205 aneurysms were treated in 196 individuals ranging in age from 70 to 96 (mean 77.3), including 159 females and 37 males. Average clinical follow-up was 9 months (SD 19 months). Clinical condition at presentation was good in 132(unruptured and SAH Hunt-and-Hess grades 1 and 2) and poor in 64(grades 3-5). There were 118 small, 63 large and 23 giant aneurysms, 75 with small and 130 with wide necks. Complete occlusion was achieved in 53(26%) patients with a neck remnant in 126(62%) and incomplete occlusion in 13(6%). There were 13 unsuccessful attempts. Post-embolization, 90% of patients were neurologically intact/unchanged while 8% had new deficits. Four patients died, one with Grade 2 SAH and 3 with initial poor clinical grade. Follow-up angiograms (average of 9±13 months) were available for 103 aneurysms, with 59% unchanged, 21% further thrombosed and 19% recanalized. Four aneurysms re-ruptured during follow-up. Re-rupture was not significantly associated with incomplete/neck-remnant results (OR=1.05,CI=0.09-26.72,p=0.92). Twenty-six aneurysms required re-embolization. Additional treatment was not associated with new neurological deficits or death (OR=0.95,CI=0.21-3.75,p=0.9). Patients who presented in good clinical condition had lower rates of long-term deficits or death (OR=0.23,CI=0.09-0.58,p<0.001).

CONCLUSIONS: Coil embolization of intracranial aneurysm is a safe and effective treatment in the elderly. Pre-embolization clinical condition strongly correlates with clinical outcome. There does not appear to be a higher re-rupture risk with incomplete embolizations in this population. Need for additional embolization did not affect the clinical results.

15. Tethered Cord Syndrome Presented as Failed Back

Shokei Yamada, MD. PhD, FACS, Javed Siddiqi, MD, PhD, FACS , FRCS, Austin R.T. Colohan, MD, FACS, Loma LInda, CA

Introduction: Severe back and leg pain is the chief complaint of adult and late teenage patients with tethered cod syndrome (TCS). The pain pattern is muscular, and neither radicular nor accentuated by straight leg raising test. This paper discusses the mechanism of TCS-related back pain, mostly referred as failed back syndrome.

Method: We report 125 TCS patients in this age group, in whom the spinal cord tip was anchored by an inelastic filum. All complained of severe back and leg pain, aggravated by postures that straighten the lumbosacral spine, resulting in cord stretching, e.g. slightly bending over the sink. Motor, sensory and bladder dysfunction was subtle. Patients had minimum physical activities due to severe pain, often showing disuse muscle atrophy. Resection of the filum was performed for cord untethering in all cases.

Results: After untethering surgery, all patients were relieved of leg pain on awakening from anesthesia, and back pain subsided within two weeks. As ambulation increased, however, all patients began to complain of stress-induced back and leg muscle pain, which was similar to what paraparetic patients experience during muscle training. After muscle strengthening therapy, our patients became free of muscle pain in 3 to 18 months, depending on preoperative pain severity and duration, and regained normal activities.

Conclusion: TCS pain in back and leg muscles is likely to be due to excessive motor activities through excitable spinal reflex arcs in response to repetitive cord stretching caused by forceful extension and flexion of the lumbosacral spine.

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Mathew Hunt, OHSU	2005
Kirash Golshani, OHSU	2006
Edward Chang, UCSF	2006
Jonathan Miller, OHSU	2007
Kenneth Liu, OHSU	2007

*deceased **WNS Member

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

PAST MEETINGS OF THE SOCIETY

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, 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 B.C., Canada	Sept 15-18, 2001 (Cancelled)
48. Delta Victoria Resort, B.C. Canada	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, California	Sept. 17-20, 2005
52. Semiahmoo Resort & Spa, Blaine, Washington	Sept. 16-19, 2006
53. Mauna Lani Bay Hotel, Kawaihe, HI	Sept. 8-11, 2007

FUTURE MEETINGS

Sun River Resort, Sun River, OR	September 11-14, 2009
El Dorado Hotel, Santa Fe, NM	October 8-11, 2010

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Frank Turnbull*	1956
Howard A. Brown*	1957
Rupert R. Raney*	1958
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Ernest W. Mack*	1961
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Edward K. Kloos*	1973
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George Ablin*	1989
Robert Weyand	1990
Basil Harris	1991
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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
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