

Western Neurosurgical Society

53rd ANNUAL MEETING

Mauna Lani Resort
Kalahuipua'a, Hawaii

SEPTEMBER 8-11, 2007

Website: www.westnsurg.org



American
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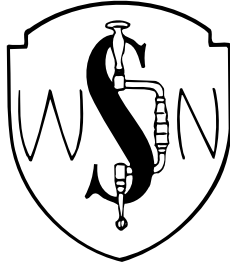
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Jonathan Miller	David Newell	Robert Rostomily
Srinath Samudrala	Gerald Silverberg	Gary Steinberg
Donald Trunkey	Philip Weinstein	Charles B Wilson
Kenneth Yonemura		



Western Neurosurgical Society

53rd ANNUAL MEETING 2007 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 current concepts in the management of tumors as they affect the central nervous system.
2. Analyze treatment options for intracranial vascular lesions.
3. Identify recent advances and techniques for improving outcomes in lumbar and cervical surgery.



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2007 GUESTS

M Samy Abdou	Gregory Gerras
Hillel Z Baldwin	L Philip Carter
Dongwoo John Chang	Austin Colohan
Moise Danielpour	Steve Giannotta
Fredric Edelman	Mel Cheatham
Farrokh Farrokhi	Charles Nussbaum
Frank Hsu	Austin Colohan
Steve Klein	Ronald Young
Michael Lim	Resident
Kenneth Liu	Resident Award
Jonathan Miller	Resident Award
Robert Rostomily	John Loeser
John Runnels	Gerald Silverberg
Srinath Samudrala	J Patrick Johnson
Donald Trunkey	Ablin Lecturer
Charles B Wilson	Cloward Lecturer

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Donald D. Trunkey, M.D.

Ablin Lecturer

Dr. Trunkey is regarded as an internationally renowned trauma surgeon and the father of modern trauma systems. He was one of the first surgeons to incorporate the concepts of preventable death methods and evidence based practice in support of trauma systems.

Dr. Trunkey was educated at Washington State University and received his medical training at the University of Washington. He completed his general surgical training at the University of California, San Francisco, and completed a fellowship in trauma at Southwestern Medical Center in Dallas, Texas. He served as Chief of Surgery at San Francisco General Hospital from 1978 until 1986 when he was appointed Chair of Surgery at the University of Oregon Health Sciences Center. He served in this capacity until 2001. Dr. Trunkey is a founding member of both the Homeland Security Department and the National Foundation for Trauma Care. He served as Chair of The American College of Surgeons Committee on Trauma and helped establish the Advanced Trauma Life Support Course.

Charles B. Wilson, M.D.

Cloward Award Lecturer

Dr. Wilson has achieved an international reputation as a neurosurgeon specializing in pituitary tumor removal. He has been recognized for educating and training young neurosurgical residents.

Dr. Wilson obtained his medical and neurosurgical training at Tulane Medical School before obtaining faculty appointments at Tulane, LSU, and the University of Kentucky. He served as Chairman of the Department of Neurosurgery at the University of California, San Francisco, beginning in 1968. He retired as Chairman of the Department in 1994 to pursue new interests. He has a Master's Degree in Health Administration and became a Senior Fellow at the Institute for the Future, a long range forecasting organization in Menlo Park, California. His current research involves medical technologies, particularly those related to molecular genetics. In 1999 he co-founded the Global AIDS Interfaith Alliance working in Sub-Saharan Africa and more recently was appointed senior advisor to the UCSF Global Health Sciences. Dr. Wilson has given lectures within North America and throughout Europe and Asia.

**WESTERN NEUROSURGICAL SOCIETY
53RD Annual Meeting**

***SCIENTIFIC PROGRAM
SESSION I***

Sunday, September 9, 2007

Moderators: David Newell, Jeff Rush

- 7:30-7:40 **Welcome, Kim Burchiel, President WNS**
- 7:40-7:55 1 **“Spinal Motion Preservation – Fundamentals of the New Posterior Column Implants”**
M Samy Abdou
- 7:55-8:00 Discussion
- 8:00-8:15 2 **“Complications of Anterior Cervical Fusion”**
Hillel Z Baldwin
- 8:15-8:20 Discussion
- 8:20-8:35 3 **“The No Drill Technique of Anterior Clinoidectomy – A Safer and More Direct Skull Base Approach to the Parasellar Region”**
Dong Woo Chang
- 8:35-8:40 Discussion
- 8:40-8:55 4 **“Dynamic Cervicomedullary Cord Compression and Alterations in Cerebrospinal Fluid Dynamics in Children with Achondroplasia”**
Moise Danielpour
- 8:55-9:00 Discussion
- 9:00-9:15 5 **“Three Peripheral Nerve Tumors”**
Fredric Edelman
- 9:15-9:20 Discussion
- 9:20-9:35 6 **“The Questionable Role of Microelectrode Recording in Accuracy of Targeting the Subthalamic Nucleus for Electrode Implantation in Treatment of Parkinson’s Disease and Dystonia”**
Steve Klein
- 9:35-9:40 Discussion
- 9:40-9:55 7 **“Molecular Determinants of Epithelial Mesenchymal Transition (EMT) in Human Gliomas Are Associated with Malignancy, Recurrence, and Invasiveness”**
Robert Rostomily
- 9:55-10:00 Discussion
- 10:00-10:30 Break – Visit Exhibits

SESSION II
Sunday, September 9, 2007

Moderators: Austin Colohan, Jack Bonner

10:30-10:45 8 **“Neurosurgeon to the Gladiator”**
Albert Capanna

10:45-10:50 Discussion

10:50-11:05 9 **“Multimodality Treatment of Posterior Fossa AVMs”**
Gary Steinberg

11:05-11:10 Discussion

11:10-11:20 Introduction of Ablin Lecturer
Kim Burchiel

11:20-11:45 **ABLIN LECTURE**

**“The Crisis in Surgery with Particular
Emphasis on Trauma”**
Donald Trunkey

SCIENTIFIC PROGRAM SESSION III
Monday, September 10, 2007

Moderators: Charles Nussbaum, Philip Weinstein

- 8:00-8:15 10 **“Resection of Intraventricular Tumors Using Advanced Image Guidance and 12 mm Transcortical Sleeve”**
Marvin Bergsneider
- 8:15-8:20 Discussion
- 8:20-8:35 11 **“SCIP and the Neurosurgeon”**
L Philip Carter
- 8:35-8:40 Discussion
- 8:40-8:55 12 **“Stanford Experience with Cyberknife Radiosurgical Ablation of Intramedullary Spinal Cord AVMs”**
Steven Chang
- 8:55-9:00 Discussion
- 9:00-9:15 13 **“Multicenter Experience of Treating Trigeminal Neuralgia with the Cyberknife”**
Michael Lim
- 9:15-9:20 Discussion
- 9:20-9:35 14 **“NPH is a Multifactorial Disease, Not Just Pressure Induced Ischemia”**
Gerald Silverberg
- 9:35-9:40 Discussion
-
- 9:40-9:55 15 **RESIDENT AWARD - CLINICAL SCIENCE**
- “Predictors of Long Term Success After Microvascular Decompression for Trigeminal Neuralgia”**
Jonathan Miller
-
- 9:55-10:00 Discussion
- 10:00-10:30 Break – Visit Exhibits

SCIENTIFIC PROGRAM SESSION IV
Monday, September 10, 2007

Moderator: Moustapha Abou-Samra

10:30-10:45 16 **RESIDENT AWARD – BASIC SCIENCE**

**“Poly (ADP – Ribose) Polymerase (PARP1) Mediated
Cell Death Following Cerebral Ischemia
Is Androgen Dependent”
Kenneth Liu**

10:45:10:50 Discussion

10:50-10:55 Introduction of Cloward Award Winner
Kim Burchiel

10:55:11:25 **CLOWARD AWARD**

**“The Future of Neuroscience”
Charles Wilson**

11:25-11:30 Introduction of WNS President
Philip Weinstein

11:30-12:00 **PRESIDENTIAL ADDRESS**

**“Arthur J McLean, A Return from Oblivion”
Kim Burchiel**

SCIENTIFIC PROGRAM SESSION V
Tuesday, September 11, 2007

Moderators: J Patrick Johnson

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

MOTION PRESERVATION IN THE SPINE

“Indications for Motion Preservation Surgery”

Srinath Samudrala

“Posterior Interspinous Spacers”

Kenneth Yonemura

“Posterior Pedicle Screw Based non-Fusion Technology”

Duncan McBride

“Facet Replacement and Circumferential Reconstruction”

Kenneth Yonemura

“Cervical Artificial Discs”

Phillip Weinstein

”Lumbar Artificial Disc Replacement”

J Patrick Johnson

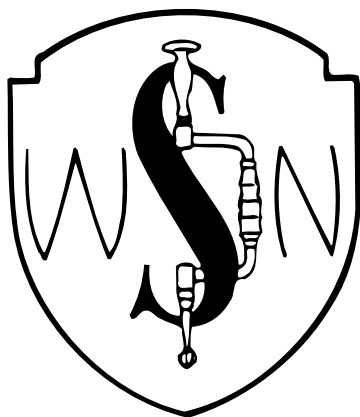
10:00:10:30 Break – Visit Exhibits

SCIENTIFIC PROGRAM SESSION VI
Tuesday, September 11, 2007

Moderators: L Philip Carter, Jeff Rush

- 10:30-10:45 17 **“Management of Ruptured Middle Cerebral Aneurysms Presenting with Life Threatening Intracerebral Hematoma”**
David Newell
- 10:45-10:50 Discussion
- 10:50-11:05 18 **“Solutions for the Health Care Crisis”**
James Ausman
- 11:05-11:10 Discussion
- 11:10-11:25 19 **“Gamma Knife Thalamotomy for Treatment of Essential Tremor – Long Term Results”**
Ronald F Young
- 11:25-11:30 Discussion
- 11:30-11:45 20 **“Frame-Based Stereotaxy in a Frameless Era: Current Capabilities, Relative Role, and the Positive and Negative Predictive Values of Blood through the Needle”**
Mark Linskey
- 11:45-11:50 Discussion
Adjournment

See you in Alaska 2008



ABSTRACTS

ABSTRACTS

1. SPINAL MOTION PRESERVATION – FUNDAMENTALS OF THE NEW POSTERIOR COLUMN IMPLANTS

M. Samy Abdou, M.D., San Diego, CA

A wide range of operative strategies and spinal implants are being developed to treat spinal instability, spinal stenosis, facet disease, and other manifestations of posterior spinal column degeneration without fusion.

The patho-physiology of posterior column disease will be reviewed. The rationale for implant designs and the biomechanical basis of non-fusion devices will be discussed.

The implants are generally divided into pedicle screw based and spinous process based devices. They include the X-stop, Dynasis, TOPS, and others. The relevant clinical trials will be presented. The limitations of the treatment strategies will also be reviewed.

2. COMPLICATIONS OF ANTERIOR CERVICAL FUSION

Hillel Z. Baldwin, M.D., Tucson, AZ

Anterior cervical decompression/fusion procedures are a mainstay of neurosurgical practice and have evolved significantly since the original description of the Cloward technique. With the present medico-legal climate and the controversy surrounding the use of allograft bone implants, the off-label use of Infuse (rh-BMP2) as a bone growth substitute for cervical fusion was implemented beginning in 2006. The observation of an increased rate of postoperative complications relative to the use of Infuse prompted a retrospective review of all anterior cervical procedures since the initiation of my practice. Patient records from 1993-2006 were reviewed from the practice data base revealing 527 anterior cervical fusion patients. Only one cervical wound hematoma was observed that required evacuation in the patient group from 1993-2005. There were 2 cases of non-union: 1 with iliac crest bone graft, 1 with allograft. The patient group of 2006 included 23 patients with PEEK/Infuse implantation (1.0-1.5mg/level) and 12 patients with allograft/autograft implantation. Two wound hematomas (6%) required evacuation in the PEEK/Infuse group (with five other hematomas in the practice associated with Infuse that required surgical evacuation). Three cases of symptomatic cervical edema (8%) in the Infuse group required steroids and/or hospitalization for resolutions of symptoms. All patients with PEEK/Infuse have solid

fusions. Additional complications for the entire series, as well as the mechanism of action of rh-BMP2, will be discussed. The series outcomes relative to the current literature of Infuse in cervical fusion will also be discussed. A significant rate of complications resulted after the use of Infuse. Fusion success with Infuse in the cervical spine is excellent and dependable. A thorough investigation is warranted to determine the optimal dose of rh-BMP2 that will promote cervical fusion and minimize complications.

3. THE NO-DRILL TECHNIQUE OF ANTERIOR CLINOIDECTOMY –A SAFER AND MORE DIRECT SKULL BASE APPROACH TO THE PARASELLAR AREA

Dongwoo John Chang, M.D., Sacramento, CA

Background: Classical published articles describe a power drilling technique for anterior clinoidectomy. The entire ‘shaft’ of the power drill is exposed in the operative field; thus, all the neurovascular structures in proximity to the full length of the rotating drill bit are at risk of direct mechanical and thermal injury. Ultrasonic bone removal has recently been developed to mitigate the risks of power drilling of the cranial base. However, ultrasound-related cranial neuropathies are recognized complications of its use, in addition to increased cost.

Methods: A retrospective review of the author’s 45 consecutive cases of anterior clinoidectomy utilizing the ‘no-drill’ technique is presented. Clinical indications include ophthalmic segment aneurysms, tuberculum sella meningiomas, clinoidal meningiomas, selected ICA-Pcomm bifurcation aneurysm, other large/giant/complex anterior circulation aneurysms, basilar bifurcation aneurysms, cavernous sinus lesions, pituitary macroadenomas, other peri-chiasmal lesions (sarcoïd), fibrous dysplasia, and other bone dysplasias.

Results: A bony opening is made in the mid to posterior orbital roof during the process of the initial craniotomy. Periorbita is dissected from the orbital roof from the inside of the orbital compartment. Subsequent piecemeal resection of the medial sphenoid wing, anterior clinoid process, and optic canal roof is performed with various bone biting instruments. No power drilling was employed. Optimal microsurgical exposure was obtained in all cases. There were no cases of direct injury to surrounding neurovascular structures. Illustrative cases and operative videos/photos are presented demonstrating the surgical technique.

Conclusions: Rigorous study of preoperative CT, MRI, and angiograms is essential to identify important anatomic relationships between the anterior clinoid and neighboring neurovascular structures. The 'no-drill' technique eliminates the risks of direct power drilling associated mechanical/thermal injuries and the risk of ultrasound associated cranial neuropathies. This modified technique achieves time-efficient and mechanically effective microsurgical exposure of the parasellar and paraclinoid regions for a variety of clinical scenarios in microneurosurgery.

4. DYNAMIC CERICOMEDULLARY CORD COMPRESSION AND ALTERATIONS IN CEREBROSPINAL FLUID DYNAMICS IN CHILDREN WITH ACHONDROPLASIA

Moise Danielpoir, M.D., Bill Wilcox, M.D., Yasemin Alanay, M.D., Barry Pressman, M.D., and David Rimoin, M.D., Los Angeles, CA

Common abnormalities of the cervicomedullary junction in infants and children with achondroplasia include stenotic foramen magnum and cervical spinal canal. Compression at the cervicomedullary junction can result in myelopathy, hypotonia, sleep apnea, and even sudden death. However, the frequency of these symptoms and percentage of patients undergoing surgical decompression have varied widely among skeletal dysplasia centers. The majority of children with achondroplasia who do not suffer from severe neurological symptoms will gain normal motor and intellectual development, are not at risk for sudden death, and do not require surgical intervention. Other infants with some symptoms and signs can gain normal function with time, since the foramen appears to grow faster than the spinal cord and they recover spontaneously, without requiring surgery.

There have been several reports on prospective assessment of achondropastic children in order to estimate the frequency of clinical and laboratory features referable to abnormalities of the cervicomedullary junction that can be best predictors of the need for surgical decompression. At our center we have incorporated MRI cerebrospinal fluid (CSF) flow studies in assessing children with cervicomedullary junction compression. Recently we identified a number of symptomatic children with normal MRI and flow studies in neutral positions, but complete blockage of CSF flow of flexion and more dramatic posterior cervicomedullary compression on extension studies. Their symptoms ranged from severe neurologic abnormalities and sleep apnea to others who developed headaches and/or apnea episodes when sleeping or

in a car seat. These children underwent decompressive surgery with dramatic improvement or resolution of signs and symptoms, which have persisted up to 18 months of follow-up. We propose that there is an increased risk for dynamic cord compression in achondroplasia that can only be detected with MRI's in both flexion and extension and which constitute an indication for surgical decompression at the cervicomedullary junction.

5. THREE PERIPHERAL NERVE TUMORS

Fredric Edelman, M.D., Los Angeles, CA

Three patients with peripheral nerve tumors will be presented. One had a common tumor in an unusual location, another had a very rare tumor, and the third was unexpectedly malignant.

The first patient is a 68 year old woman with a history of successfully treated colon cancer. Several years later she noted several masses in the left side of her neck, including one in the supraclavicular region. She was referred to ENT/Head and Neck for a biopsy. The supraclavicular mass proved to be on the vagus nerve and was consistent with a schwannoma. She was referred for neurosurgical evaluation and treatment. Surgery was performed with Head and Neck after consultation with anesthesia for possible cardiac arrhythmias and vocal cord paralysis. The tumor was excised and she was intact post-operatively.

The second patient is a 34 year old male with a history of a left sided foot drop of 16 years duration. He had developed left buttock and sciatic pain. A MRI scan of the buttock showed a fusiform mass in the sciatic nerve. At surgery, a 9 2 cm. mass was found incorporated into the lateral component of the sciatic nerve. Only a partial resection of the tumor was possible which was diagnosed as a glomangioma.

The third patient is a 38 year old male with right sciatic pain and atrophy of the right calf. A spine work up was negative. A MRI of the thigh showed a tumor of the sciatic nerve. At surgery, the medial component of the sciatic nerve was totally incorporated into the tumor. The mass with the involved nerve was excised and the gap bridged with cable grafts. The tumor was diagnosis was a malignant peripheral nerve sheath tumor and the patient was referred to oncology.

6. THE QUESTIONABLE ROLE OF MICROELECTRODE RECORDING IN ACCURACY OF TARGETING THE SUBTHALAMIC NUCLEUS FOR ELECTRODE IMPLANTATION IN TREATMENT OF PARKINSON'S DISEASE AND DYSTONIA

Steve Klein, M.D., Seattle, WA

102 consecutive patients were treated with deep stimulation for either Parkinson's disease or Dystonia by targeting the subthalamic nucleus (STN). Confirmatory activity was typically identified on the first pass 3.5 mm above the target providing this was the initial side and little atrophy was present. Electrode placement was verified physiologically with stimulation when possible (Dystonia patients were under general anesthesia) to both verify efficacy and lack of side effects. One side was done at a time and there was a minimum of 3 months waiting period before the other side was contemplated.

The procedure is frame based using the Leksell G head frame applied with local anesthesia and mild IV sedation. The fiducial box was placed and an MRI was performed with the target chosen based on a combination of direct visualization and coordinates based on the AC/PC line. With the MRI protocol used, the STN is typically well identified on axial and coronal images. Of 102 electrode placements, 101 passes were made that subsequently proved adequate both physiologically with on the table stimulation and anatomically with post operative MRI. One patient required two passes from a miscalculation of MRI data.

The first side usually generates fairly robust recordings, depending on electrode impedance, beneath 12 megaohms is best and above 2200 is not useful. Less than 50% of placements are clearly indicative of STN activity. If recordings are not definitive and/or in conflict with the MRI data, all settings are checked and if correct, the electrode path is not changed. Instead, a stimulating electrode is placed with the last contact at the inferior aspect of the STN and electrodes 1 and 2 in the dorsal position. High frequency stimulation with escalating voltage is applied to 3.5 v or less if side effects occur. Tremor suppression or reduction of tone has always been noted before side effects and no stimulating electrode has required movement. No intracranial hemorrhages have been identified on post operative MRIs.

Conclusions:

1. Microelectrode recording is helpful if confirmatory; microelectrode

recording should not be over emphasized in determination of final electrode placement.

2. If a stimulator has been placed on the opposite side, the recordings are less valuable.

3. The rate of hemorrhage increases with the number of passes. The routine use of microelectrode recording is reasonable; however, influence on the final placement of the intracranial electrode should not be over emphasized.

4. The influence of impedance is significant. When uniform electrodes can be produced, this may be a more useful method to help placement if very specific, highly effective areas of the STN can be identified.

7. MOLECULAR DETERMINANTS OF EPITHELIAL MESENCHYMAL TRANSITION (EMT) IN HUMAN GLIOMAS ARE ASSOCIATED WITH MALIGNANCY, RECURRENCE, AND INVASIVENESS

Robert Rostomily, M.D., Svetlana A Mikheeva, M.D.,
Andrei M Mikheev, M.D., John-Patrick Maxwell, M.D.,
Rob Oxford, M.D., Seattle, WA

Rationale: We previously demonstrated that TWIST1, a regulator of epithelial mesenchymal transition (EMT) associated with epithelial carcinoma metastasis, is upregulated in malignant gliomas and promotes invasion. We hypothesized that activation of a molecular program in human gliomas related to EMT in epithelial cancer contributes to the invasive glioma genotype.

Methods: Microarray analysis of SNB19 glioma cells over-expressing TWIST1 (SNB19 TW) compared to controls (SNB19 LXS) was used to identify EMT related target genes. Differentially regulated genes without prior functional characterization in gliomas were selected for further analysis by quantitative RT-PCR in 39 glioma samples and over-expression in the SNB 19 glioma cell line.

Results: Differentially expressed target genes selected from the microarray included the transcription factor SLUG (SNA12) and ECM proteins periostin (POSTN) and fibroblast activation protein (FAP). All genes correlated highly with TWIST1 in human glioma samples and were upregulated in grade IV gliomas, most markedly in gliosarcomas.

Expression of each gene was upregulated by at least 50% in the majority of recurrent tumors with the most robust changes noted for POSTN which demonstrated a >10-fold increase in expression in 6 of 11 samples. Forced over-expression of POSTN and SNA12 in SNB19 invasion in vitro increased 93% and 79% respectively.

Conclusions: the correlation between malignancy, recurrence, and mesenchymal differentiation of TWIST1 target genes SNA12, POSTN, and FAP and their in vitro proinvasive phenotypes, support the clinical relevance of EMT related molecular mechanisms for glioma invasion. Furthermore, the dual function of TWIST1, SNA12, and POSTN to promote cancer cell survival and invasion in other cancers supports the rationale to consider EMT related molecular networks as novel therapeutic targets in gliomas.

8. NEUROSURGEON TO THE GLADIATOR

Albert Capanna, M.D. and Dawn Capanna, RN, Las Vegas

Introduction: The neurosurgeon as a sports medicine doctor is less known than other specialists. The author relates experiences as a sports physician (ringside physician, basketball, football, gymnastics, etc.). The public pressure from serving on the Medical Advisory Board to the Nevada State Athletic Commission is reviewed from an inside perspective of a physician trying to make safe decisions for athletes against many conflicting interests.

Methods: The author presents cases from the acute life threatening subdural hematomas to the mild brachial plexus stretch injury. Decades of personal experience in the arenas of sport as well as in the back rooms for review and hearings of the Nevada State Athletic Commission will be discussed. Numerous case histories, surgeries, and results are analyzed.

Results: The review points out the advances that have been made to make sports safer and possible future improvements (ringside CT scans).

Conclusions: Neurosurgeons do have a place actively participating in sports medicine at all levels from amateur to elite professional sports. The pressures are different and more intense on neurosurgeons than other sports medicine physicians.

9. MULTIMODALITY TREATMENT OF POSTERIOR FOSSA AVMS

Gary K Steinberg, M.D., PhD, Michael Kelly, M.D.,
Raphael Guzman, M.D., John Sinclair, M.D.,
Terese E Bell-Stephens, RN, Regina Bower, Bsc,
Scott Hamilton, PhD, Michael Marks, M.D., Huy Do, M.D.,
S D Chang, M.D., John Adler, M.D., Richard Levy, M.D.,
Stanford, CA

Object: Posterior fossa AVMs are relatively uncommon and often difficult to treat. We present our experience with multimodality treatment of 76 posterior fossa AVMs, with an Emphasis on Spetzler-Martin Grade III-IV AVMs.

Methods: 76 patients with posterior fossa AVMs treated with radiosurgery, surgery, and endovascular techniques were analyzed.

Results: Between 1985 and 2005, 35 patients with cerebella AVMs, 33 with brainstem AVMs, and 7 with combined AVMs were treated. Natural history data was calculated for all patients ($n = 76$). The risk of hemorrhage from presentation until initial treatment was 8.4% per year and 9.6% per year after treatment and before obliteration. 48 patients had grade III-IV AVMs with a mean follow up of 4.8 years (range 0.1-18.4 years, median 3.1 years). 52% of patients with grade III-IV AVMs had complete obliteration at the last follow up. Three of 14 patients (21.4%) were cured with single treatment radiosurgery and 4 of 14 patients (28.6%) with 1 or 2 radio surgery treatments. 21 of 34 patients (61.8%) were cured with multimodality treatment. The mean Glasgow Outcome Score (GOS) after treatment was 3.8. Multivariate analysis performed on the 48 patients with grade III-IV AVMs showed radio surgery alone to be a positive predictor of excellent clinical outcome (GOS 5) ($p > 0.05$). 9 of 48 patients (18.8%) had major neurologic complications related to treatment.

Conclusions: Single treatment radio surgery has a low cure rate for Spetzler-Martin grade III-IV AVMs. Multimodality therapy nearly tripled this cure rate, with an acceptable risk of complications and excellent or good clinical outcomes in 81% of patients. Radiosurgery alone should be used for intrinsic brainstem AVMs and multimodality treatment should be considered for all other posterior fossa AVMs.

Conclusions: Application of 3 D modeling has added a clearer understanding of the nature of AVM anatomy and has assisted in patient

discussion, embolization and resection. Actual AVM size and location relationships offer particular help to neurosurgical residents. Future directions include color anatomy to bone, arterial, and venous components of the acrylic models.

10. RESECTION OF INTRAVENTRICULAR TUMORS USING ADVANCED IMAGE GUIDANCE AND 12 mm TRANSCORTICAL SLEEVE

Marvin Bergsneider, M.D., Los Angeles, CA

Introduction: Minimally invasive techniques can be used for resection of intraventricular brain tumors, but require the use of multiple technological advancements. Here, a technique is described aimed at reducing the amount of cortical injury by using preoperative surgical planning to incorporate a trans-sulcal microdissection to shorten the distance to the ventricle. Neuronavigation image fusion with DTI-based tractography was also used to minimize white matter injury (i.e. optic radiations).

Methods: Over a two year period, 14 patients underwent transcortical resections of intraventricular tumors using the 11. mm diameter Thoracoport sleeve. The mean age was 42, and tumor pathologies included glioma (5), colloid cyst (5), meningioma, plus others. A quarter sized craniotomy was performed and after microsurgical dissection of the sulcus, the subcortical white matter was dissected along fiber tracts. The blunt tipped obturator of the Thoracoport was stereotactically inserted. The lesions were resected using the surgical microscope with an endoscopic assistance in some cases.

Results: An image complete resection was obtained in 10 cases, with partial resection or biopsy performed in others. One patient had increased post operative memory deficits after resection of a recurrent colloid cyst and another a cerebral abcess along the resection tract. Four patients required VP shunts. Median hospital stay was 3.5 days.

Conclusions: With the aid of multimodality imaging and preoperative planning, intraventricular tumors can be removed with minimal cortical and subcortical injury. The use of adapted, commercially available ventricular ports eliminates the need for spatula retractors and minimizes the incision and craniotomy requirements.

11. SCIP AND THE NEUROSURGEON

L. Philip Carter, M.D., Joan Gerdes, RN, Carol Volk, RN,
Martin Weinand, M.D. Tucson, AZ

The Surgical Care Improvement Project (SCIP) is a national partnership of organizations focused on surgical care by reducing surgical complications. The SCIP goal is to reduce the incidence of surgical complications nationally by 25% by 2010. The SCIP target areas are: (1) surgical site infections (SSI), (2) adverse cardiac events, (3) deep vein thrombosis (DVT), and (4) postoperative pneumonia. Even though neurosurgical procedures are a small part of overall national surgical procedures, they are at significant risk for these complications and will be monitored and publicly reported. The SCIP quality measures are: (1) prophylactic antibiotics received 1 hour prior to surgical incision, (2) appropriate antibiotic selection, (3) discontinuing antibiotics within 24 hours after surgery end time, (4) appropriate surgical site hair removal, (5) appropriate DVT prophylaxis ordered, and (6) DVT prophylaxis given. Each institution that received federal funding through Medicare or Medicaid is obligated to report their statistics on these quality measures on a quarterly basis or else forfeit a significant portion of their federal funding. The statistics are reported publicly and are available for all interested citizens and the media.

In September and October of 2006 we implemented SCIP at University of Arizona Medical Center with an education process for nurses and physicians. In order to improve overall results we had to influence individual surgeon behavior. We have seen improvement in meeting the quality measures but a continuous education process for nursing, anesthesia, and surgery is necessary. December 20, 2006, the Tax Relief and Health Care Act of 2006 was signed. This authorizes pay for performance (P4P) using a designated set of quality measures which includes the SCIP quality measures. Individual surgeons statistics for SCIP quality measures are now being used for credentialing and will be used for P4P and public disclosure.

12. STANFORD EXPERIENCE WITH CYBERKNIFE RADIOSURGICAL ABLATION OF INTRAMEDULLARY SPINAL CORD AVMs

Steven Chang, M.D., Shaqielle Ali, M.D., Scott G Soltys, M.D.,
Iris C Gibbs, M.D., John R. Adler Jr., M.D., Stanford, CA

Stereotactic radiosurgery (SRS) is a widely accepted treatment for cerebral arteriovenous malformations (AVMs). The development of image-guided radiosurgery now permits very accurate spine irradiation. Since 1997, 23 spinal AVMs at Stanford University have been treated with Cyberknife radiosurgery. All patients had either unresectable type II ($n = 22$) or III ($n = 1$) spinal cord AVMs (12 cervical, 8 thoracic, and 3 involving the conus medullaris). Patients presented with hemorrhage ($n = 13$, 57%), or progressive myelopathy ($n = 10$, 43%). Prior to radiosurgery, ten of the AVMs (43%) underwent staged embolization for a median 3 sessions (range 1-7). The mean radiosurgical target volume was 2.8 cc (range 0.26-15cc), treated to a mean marginal dose of 2030 cGy (range 1600-2100 cGy) using a median of 2 sessions (range 1-4). The mean maximal intranidal dose was 2580 cGy (range 2250-3000 cGy). Radiosurgical equivalent dose (BED) was gradually escalated over the course of this study.

Mean clinical follow-up was 35 months (range, 4-83 months), while radiographic follow-up averaged 25.3 months (range, 0-72 months). Although serial post operative MRIs demonstrated noticeable reduction in the volume of all AVMs over the follow-up period, only 8 patients underwent post SRS angiography; among this group, three had complete angiographic obliteration. Our preliminary impression is that the rate of obliteration correlates with the effective radiosurgical BED and that the introduction of 3 D angiography may facilitate the more accurate delineation of an AVM target. No patient suffered a rebleed after SRS; clinical outcome was improved or unchanged in 96% of patients. A single patient, who was neurologically severely impaired prior to radiosurgery, developed clinical worsening and T2 signal change in the adjacent spinal cord. Our experience suggests that Cyberknife SRS is a relatively safe and increasingly effective therapy for select spinal cord AVMs. Further experience is needed to confirm this preliminary impression.

13. MULTICENTER EXPERIENCE OF TREATING TRIGEMINAL NEURALGIA WITH THE CYBERKNIFE

Michael Lim, M.D., A. Villavicencio, M.D., S. Burnekiene, M.D., P Romanelli, M.D., S D Chang, M.D., L McNeely, M.D., L Fariselli, M.D., M McIntyre, M.D., R Bower, M.D., G Broggi, M.D., J J Thramann, M.D., J R Adler, M.D., Stanford, CA

Objective: The treatment of trigeminal neuralgia (TN) with radiosurgery has gained in popularity. The use of the Cyberknife for TN has been limited to smaller numbers. We present our results from a multi-center experience for treating TN with the Cyberknife.

Methods: Between May 2002 and October 2005, 113 patients were treated for idiopathic or atypical TN. Pain control, complications, and recurrence of symptoms were specifically examined. Furthermore, optimal treatment parameters were identified from patients with none to minimal complications who experienced excellent and sustained pain relief.

Results: 71 out of 95 patients (74.7%) with idiopathic TN experienced initial excellent or moderate pain relief. 45 patients (47.4%) reported post-treatment numbness. The median time to pain relief was 14 days (range, 0.3-180 days). Statistical analysis demonstrated with significance that the pain relief and numbness correlated to higher Dmax ($P = 0.02$), or Dmin ($P = 0.006$) and the length of treated nerve ($P < 0.00001$). Interestingly, occurrence of post treatment numbness was predictive of better pain relief. In terms of durability, at a mean follow-up time of 2 years, 50 out 95 patients (52.6%) had sustained pain relief and 47 patients (49.5%) were completely off pain medications. The overall complication rate was 17.9%.

Conclusions: Cyberknife radiosurgery is an effective and durable form of treatment for TN. Pain relief and numbness appear to correlate to higher radiation doses and length of treated nerve. From our analysis, the optimal treatment parameters are: median Dmax near 78Gy and length of the treated nerve of 6 mm.

14. NORMAL PRESSURE HYDROCEPHALUS IS A MULTIFACTORIAL DISEASE

Gerald D Silverberg, M.D., Peter Klinge, M.D., PhD,
Thomas Brinker, M.D., PhD, Stanford, CA

Background: It has been postulated that NPH equals pressured induced ischemia. This postulate fails to take into consideration the high co-incidence of AD and cerebrovascular disease (CVD) with NPH: as well as the observation that ischemia persists despite resolution of the elevated CSFP. We content that NPH is a multifactorial disease and that impaired metabolite clearance, e.g. amyloid-beta peptides (ABeta) via the CSF and across the blood brain barrier (BBB), plays a significant role in the dementia and ischemia of NPH.

Methods: Aged Sprague-Dawley rats (12 months) had hydrocephalus induced by intracisternal kaolin injection. Brains were harvested at 2, 6, and 10 weeks post induction, $n=4-6$ for each group. The brains were stained for Abeta, hyperphosphorylated Tau (hpTau – epitopes pT231, intraneuronal, and AT100, extraneuronal), and the capillary Abeta transporters LRP-1, Pgp and RAGE by immunohistochemistry (IHC), supported by PCR and Western blotting (WB). Abeta and hpTau accumulation were assayed by WB and ELISA. Age matched rats served as controls.

Results: On IHC, Abeta accumulated in cortex and hippocampus with increasing hydrocephalus: around microvessels and in and around neurons. HpTau-pT231 was altered in neurons in a typical AD pattern: loss of dendritic hpTau and accumulation of hpTau granules in the cell soma. Extracellular hpTau-AT100 was seen to accumulate around blood vessels. The capillary Abeta transporters were significantly altered compared to controls: LRP-1 and Pgp were down-regulated, where as RAGE was up-regulated.

Conclusions: These studies show that the induction of hydrocephalus leads to impaired CSF and BBB metabolite clearance, and to the accumulation of Abeta, a known vasoconstrictor, and hpTau to cerebral blood vessels suggests that these toxins may play a role in the persistent ischemia and CVD seen in NPH. Hydrocephalus in aged animals causes a progressive inability to clear metabolites, and is likely a major cause of the dementia and ischemia in NPH.

15. PREDICTORS OF LONG TERM SUCCESS AFTER MICROVASCULAR DECOMPRESSION FOR TRIGEMINAL NEURALGIA

Jonathan Miller, M.D., Stephen Magill, M.D., Feridun Acar, M.D.,
Kim Burchiel, M.D., Portland, OR

Introduction: Microvascular decompression (MVD) is an effective treatment for many patients with trigeminal neuralgia (TN); however, relapse can occur after an initial excellent outcome. This study was designed to identify characteristics associated with improved long-term outcome.

Methods: 179 patients who had undergone MVD for TN at OHSU from 1998-2005 were contacted and 121 agreed to participate. Patients provided information about preoperative pain characteristics and were classified based on preponderance of shock-like (TN type 1) or constant (TN type 2) pain. Operative findings were obtained from operative reports and videos. Three groups were defined on the basis of outcome: (1) excellent, pain relief without medication; (2) good, mild, or intermittent pain controlled with low dose medication; and (3) poor, severe persistent pain or need for additional surgical treatment.

Results: Type of pain (TN type 1 vs TN type 2) was the best predictor of outcome, as assessed by multivariate analysis ($R^2=.211$, $F(10,110)=2.94$, $p < .01$). Overall. Results were excellent, good, and poor for TN type 1 vs TN type 2 in 63% vs 28%, 26% vs 39%, and 10% vs 33%, respectively. Less than two years duration of symptoms prior to MVD was associated with a good prognosis regardless of TN type ($p < 0.05$, Fisher's exact test). Arterial rather than venous compression was associated with a slightly better outcome for patients with TN type 1 but not patients with TN type 2. Presence of trigger points, response to antiepileptic medication, pain free intervals, and clear memory of onset each predicted better outcome, but these effects were small.

Conclusions: Type of TN pain was the best predictor of successful long-term outcome after MVD, followed by preoperative duration of symptoms and type of vascular compression. Application of the information should be helpful in the selection of TN patients likely to benefit from MVD.

16. POLY (ADP-RIBOSE) POLYMERASE (PARP-1) MEDIATED CELL DEATH FOLLOWING CEREBRAL ISCHEMIA IS ANDROGEN DEPENDENT

Kenneth Lui, M.D., Kamila Vagnerova, M.D.,
Stephanie J Murphey, M.D., Patricia Hurn, M.D. Portland OR

Activation of poly (ADP-ribose) polymerase-1 (PARP-1) is not only a well recognized initiator of caspase-independent neuronal death after ischemic brain injury but has been shown to be gender dependent: reduced PARP-1 activity attenuates ischemic injury in males but not females. Our previous data with knockout mice (PARP-1 $-/-$) suggest that reduced PARP-1 activity confers neuroprotection only in the presence of background androgens. To further test our hypothesis that this neuroprotection is indeed linked to reduced PARP-1 activity, we repeated our experiments in wild type (WT) male mice with PJ34, a potent PARP-1 inhibitor.

We compared ischemic damage in male 129 SvEv mice treated with either PJ34 or normal saline(NS). All animals underwent 90 minutes of transient middle cerebral artery occlusion (MCAO) followed by 24 hours of reperfusion. Castration and dihydrotestosterone (DHT) replacement were done 7 days prior to MCAO. Treatment groups were; 1) WT +NS, 2) WT + PJ34, 3) orchidectomized WT + NS, 4) orchidectomized WT + PJ34, 5) orchidectomized WT + DHT + NS, 6) orchidectomized WT + DHT + PJ34. Intra-ischemic physiological parameters carried out in separate treatment cohorts showed no differences among treatment groups. Testosterone levels decreased with castration and were restored with DHT replacement.

Infarction volume was evaluated by triphenyltetrazolium chloride (TTC) staining and expressed as the percentage of the contralateral hemisphere. Injury was reduced in WT animals treated with PJ34 (22% vs 39% with placebo, $p < 0.05$). This protection was not only abolished with the removal of background androgens but restored with DHT replacement. Thus, we have observed that the neuroprotection conferred by both the genetic deletion and pharmacologic blockade of PARP-1 occurs only in the presence of background androgens. We conclude that PARP-1 activation requires background androgens to be a key step in ischemic cell death.

17. MANAGEMENT OF RUPTURED MIDDLE CEREBRAL ARTERY ANEURYSMS PRESENTING WITH LIFE THREATENING INTRACRANIAL HEMATOMAS

David W Newell, M.D., Gill Sviri, M.D., Gavin W Britz, M.D.,
Seattle, WA

Object: Middle cerebral artery (MCA) aneurysms constitute about 20% of all intracranial aneurysms, and 20% of ruptured MCA aneurysms present with intraparenchymal hemorrhage. The object of this study was to evaluate the outcome, and predictors of favorable outcome in a large series of patients presenting with life threatening intraparenchymal hemorrhage from MCA aneurysm rupture managed aggressively with early surgery for aneurysm clipping, clot decompression, and aggressive post operative medical management.

Methods: A retrospective review was performed of 54 patients treated in a single center between January 2002 and July 2004 using a standardized approach. There were 15 males and 39 females. The average age of the patients was 55 (+/- 14, range 35-73). Aneurysm size was <1 cm in 19 pts, 1-2 cm in 23 pts, and >2 cm in 12 pts. Hematoma location was right in 29 pts and left in 25 pts. Hematoma location was temporal lobe in 34 pts, frontal in 12 pts, temporal and frontal opercular in 8 pts, and massive intraventricular in 16 pts. Hunt and Hess grade was V in 20 pts, IV in 25 pts, and III in 9 pts.

Results: Successful clipping was accomplished in all cases. Post operative angiography was accomplished in 51/54 pts and complete angiographic obliteration was accomplished in 44 (84%) and some residual neck was present in 8 (16%) with no residual aneurysm fundus. 15 pts developed hydrocephalus while vasospasm developed in 23 pts (43%) by TCD criterion and in 9 pts (17%) by clinical criterion. Angioplasty for vasospasm was performed in 7 pts (13%). Predictors of favorable outcome included age OR 1.87 [95% CI 1.56-4.3 ($p = 0.012$)], right side OR 2.3 [95% CI 1.96-6.7 ($p = 0.0013$)], best motor score OR 3.2 [95% CI 2.3-5.6 ($p = 0.001$)], and temporal hematoma OR 1.5 [95% CI 0.78-2.3 ($p = 0.087$)].

Conclusions: Aggressive surgical and medical management of ruptured MCA aneurysms with life threatening hematomas can result in a reasonable outcome in patients with preserved neurologic function. Younger patients with right sided hematomas and better initial neurologic function can be expected to have a better outcome.

18. “SOLUTIONS FOR THE HEALTH CARE CRISIS”

James Ausman, M.D., Los Angeles, CA

The key question for all countries in healthcare is “How can we provide quality health care for the largest number of people at the lowest cost?” The European, Asian, Canadian, and South American countries have utilized various forms of socialized medicine to answer this problem, and all are systems that are at stages of failure. Universal Health care will be a political proposal to solve the USA health crisis for the uninsured for the upcoming presidential election. The crisis is based on fallacious data that 45 million Americans are not covered by health insurance. About one half of this number is uninsured for more than 4 months. Others do not want health insurance; many are below age 35 or have incomes above \$50,000. We need to get the facts straight. A detailed presentation of this data will be made.

The cost of an illness begins from the time the patient leaves employment until the time the patient returns to work. Thus, the cost includes lost time from work, time waiting for diagnosis and treatment, physician, hospital, pharmaceutical, and medical device costs, paramedical help, and post rehabilitation or recovery time. The solution to this problem will not be found by focusing on only one or two parts of this equation. Solving this problem requires a multidisciplinary approach. Examples will be given. Employers, large and small, physicians, hospitals, insurance companies, government (which buys 45% of health care), biomedical industries, pharmaceutical houses and the public must be at the table to solve this issue.

This is 21st century thinking for a large and complex problem. The Space Program solved a complex problem with multidisciplinary input. With our increasingly complex, interrelated, and interdependent societies, we need new thinking-multidisciplinary approaches to solve these issues.

19. GAMMA KNIFE THALAMOTOMY FOR TREATMENT OF ESSENTIAL TREMOR: LONG TERM RESULTS

Ronald F Young, M.D., Sandra Vermeulon, M.D., Robert Meier, M.D.,
Francisco Li, Ms, Seattle, WA

Introduction: Essential tremor (ET) is the commonest movement disorder and although it responds initially well to Deep Brain Stimulation (DBS), recurrences, side effects, and hardware related problems limit its desirability. We describe our experience with Gamma Knife Thalamotomy between 1994 and 2006 in the treatment of ET in 157 patients.

Methods: 157 patients with disabling ET underwent unilateral (118 pts) or staged bilateral (39 pts) ventral intermediate nucleus (VIM) thalamotomy using the Gamma Knife stereo tactic surgery. In total, 196 procedures were performed. 106 patients (67.5%) exhibited absolute or relative contraindications for DBS. Blinded pre and post operative assessments were made by an independent team of movement disorder specialists using the Clinical Tremor Rating Scale (CTRS). Post procedure tremor scoring and MRI surveillance was done at 6 and 12 months after the procedure and annually thereafter. Median follow-up time was 61 months (range 12-158 months).

Results: Median tremor scores decreased from 3.17 preoperatively to 0.47 at last follow-up ($p < 0.0001$). 131 patients (83.4%) achieved total (tremor score 0) or near total (tremor score 0.5) tremor control at last follow-up. CTRS overall scores for tremor location/severity decreased by 55%. 7 patients (4.5%) experienced temporary and 6 patients (3.8%) permanent side effects from the treatments. Considering the total of 196 procedures performed as the denominator, the overall complication rate was 6.6% and the permanent complication rate was 3.1%. In all cases complications were related to transient excessive radiation or permanent radiation necrosis verified by MRI scanning.

Conclusions: VIM thalamotomy with the Gamma Knife is a safe and effective procedure for treatment of ET. It is particularly useful in patients with contraindication for DBS. In addition, we believe that it should be presented as an option to all patients with ET who are candidates for surgical treatment.

20. FRAME BASED STEREOTAXY IN A FRAMELESS ERA: CURRENT CAPABILITIES, RELATIVE ROLE, AND THE POSITIVE AND NEGATIVE PREDICTIVE VALUES OF BLOOD THROUGH THE NEEDLE

Christopher Owen, M.D. and Mark Linskey, M.D., Irvine, CA

Introduction: In the modern era of frameless stereotaxis (FL), the role of frame-based (FB) stereo tactic biopsy is evolving.

Methods: A retrospective review of the prospective database of 106 lesions in 91 consecutive patients undergoing FB stereotactic needle biopsy with a systematic “geologic core” technique by a single surgeon was made. Diagnostic accuracy was calculated comparing biopsy diagnosis with the final pathology in 11 patients who underwent subsequent surgical resection. All instances of intra-operative bleeding through the needle were prospectively noted and compared with the post biopsy CT scan. Lesions were classified as risky for FB technique if they were (1) infratentorial or pineal, (2) within 10 mm of the circle of Willis or root of the Sylvian fissure, or (3) within 10 mm of deep cerebral veins.

Results: The diagnostic yield was 94%. Diagnostic accuracy was 91%. Of 18 lesions involving the corpus callosum, 13 (72.2%) were GBM, 2 were anaplastic astrocytoma, and 1 each was found to be an anaplastic oligodendroglioma or primary central nervous system lymphoma (PCNSL) and tumescent MS. Of 25 multifocal lesions, malignant primary brain tumors were diagnosed in 17 (68%) [11 GBM, 3 PCNSL, 2 anaplastic oligodendroglioma, and 1 anaplastic astrocytoma]. The mortality was 0%. 3 patients developed temporary neurologic deficits and 1 had a permanent deficit. Absence of persistent blood through the needle had a negative predictive value of 98.8% for subsequent neuroimaging blood >5mm diameter. According to our criteria, 80% of patients would have been candidates for FL biopsy.

Conclusions: Stereotactic biopsy is an effective, safe, and important technique for histologic diagnosis of brain lesions, particularly for multifocal and corpus callosum lesions. Post biopsy CT can be safely reserved for patients who demonstrate persistent bleeding through the biopsy needle. FB stereotaxy remains an important technique for the 20% with small or deep seated lesions or when it is advantageous to avoid an incision, a burr hole, or general anesthesia.

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William A. Kelly	1970, 1971, 1972
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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
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Randall W. Smith	1997, 1998, 1999
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Sean D. Lavine, USC	1998
SooHo Choi, USC	1999
Michael Y. Wang, USC	2000
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Raymond Tien, OHSU	2002
Michael Sandquist, OHSU	2003
Iman Feiz-Erfan, Phoenix	2004
Johnathan Carlson, OHSU	2005
Mathew Hunt, OHSU	2005
Kirash Golshani, OHSU	2006
Edward Chang, UCSF	2006

*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
28. Jackson Lake Lodge, Jackson Hole, WY Sept 12-15, 1982

PAST MEETINGS OF THE SOCIETY

- | | |
|--|------------------------------|
| 29. Hotel del Coronado, Coronado, CA | Oct 2-5, 1983 |
| 30. The Broadmoor, Colorado Springs, CO | Sept 9-12, 1984 |
| 31. Silverado Country Club & Resort, Napa, CA | Sept 22-25, 1985 |
| 32. Maui Intercontinental, Wailea, Maui, HI | Sept 28-Oct 1, 1986 |
| 33. Banff Springs Hotel, Banff, AB | Sept 6-9, 1987 |
| 34. The Ritz-Carlton, Laguna Niguel, CA | Sept 11-14, 1988 |
| 35. The Lodge, Sun Valley, ID | Sept 10-13, 1989 |
| 36. Mauna Lani Bay Hotel, Kawaihae, HI | Sept 9-12, 1990 |
| 37. The Pointe, Phoenix, AZ | Sept 22-25, 1991 |
| 38. The Whistler, Whistler, BC | Sept 20-23, 1992 |
| 39. Mauna Lani Bay Hotel, Kawaihae, HI | Sept 19-22, 1993 |
| 40. Le Meridien Hotel, San Diego, CA | Sept 18-21, 1994 |
| 41. Salishan Lodge, Gleneden Beach, OR | Sept. 9-12, 1995 |
| 42. Manele Bay, Island of Lanai, HI | Sept 14-17, 1996 |
| 43. Ojai Valley Inn, Ojai, CA | Sept 20-23, 1997 |
| 44. Silverado Resort, Napa, CA | Sept 12-15, 1998 |
| 45. Coeur d'Alene Resort, Coeur d'Alene, ID | Sept 18-21, 1999 |
| 46. Mauna Lani Bay Hotel, Hawaii, HI | Sept 9-11, 2000 |
| 47. Ocean Pointe Resort, Victoria 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 |

FUTURE MEETINGS

- | | |
|-----------------------------------|-----------------------|
| Captain Cook Hotel, Anchorage, AK | August 16-19, 2008 |
| Sun River Resort, Sun River, OR | September 11-14, 2009 |

PAST VICE-PRESIDENTS

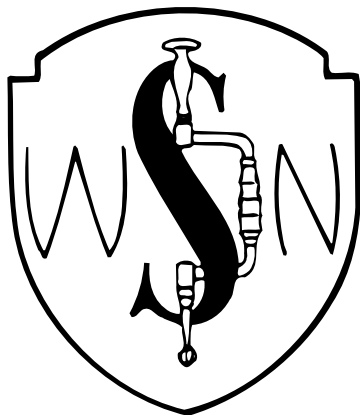
John Raaf*	1955	Robert W. Rand	1980
Frank Turnbull*	1956	Theodore S. Roberts	1981
Howard A. Brown*	1957	Ulrich Batzdorf	1982
Rupert R. Raney*	1958	George Ablin*	1983
Edmund J. Morrissey*	1959	George A. Ojemann	1984
C. Hunter Sheldon*	1960	Gale C. Clark*	1985
Ernest W. Mack*	1961	Robert Weyand	1986
Hale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

*deceased

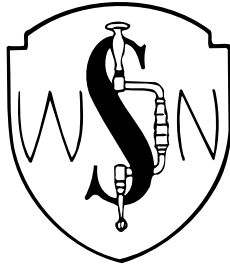
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David L. Reeves*	1955	William A. Kelly	1980
John Raaf*	1956	Byron C. Pevehouse	1981
Frank Turnbull*	1957	Robert W. Rand	1982
Howard A. Brown*	1958	Theodore S. Roberts	1983
Rupert R. Raney*	1959	Thomas K. Craigmile*	1984
Edmund G. Morrissey*	1960	Ulrich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

*deceased



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