THE SEVENTY-EIGHTH ANNUAL MEETING

OF THE

Neurosurgical Society of America

PUNTA MITA FOUR SEASONS
PUNTA MITA, MEXICO

JUNE 22 - 25, 2025

THE SEVENTY-EIGHTH ANNUAL MEETING

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Punta Mita, Mexico

June 22 – 25, 2025

“Adaptation and Natural Selection"

President	**Guy McKhann**
Vice President	**Michael Boland**
President-Elect	**Matthew Smyth**
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Web Site: www.neurosurgicalsociety.org

The border of the program book is Duke Navy Blue in honor of our President, Guy McKhann, MD

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Jeffrey Blount, Councilor (2023 - 2025)

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Paul Camarata

American College of Surgeons Advisory Council on Neurosurgery

Isaac Yang

Congress of Neurological Surgeons

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Foundation for International Education in Neurological Surgery

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International Society of Pediatric Neurological Surgeons

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Residency Review Committee for Neurological Surgery

Shelly Timmons

World Federation of Neurological Surgeons

Giuseppe Lanzino (Senior Delegate)
Chris Loftus (Second Delegate)

Society of Neurological Surgeons

Warren Selman

Neurosurgery Research and Education Foundation

Regis Haid

SOCIETY OBJECTIVES

The objectives of the Society shall be to enhance the advancement of the specialty of neurological surgery in America:

- By furnishing a *forum for intimate exchange of ideas and information* among a group of representative neurosurgeons;
- By fostering a *personal acquaintanceship among its members* to make free and confident exchange of information possible;
- By *bringing young neurosurgeons of promise into a group* where they can develop full expression of ideas before a cross-section of American neurosurgery;
- By *sponsoring international meetings* on a personal plane of critical but sympathetic discussion of progress in neurological surgery on this continent and abroad through further dissemination of new information in the field of neurological surgery; and
- By maintaining in its membership roll a *balance between academic and practicing neurosurgeons* to promote harmonious balance between teaching of neurosurgery and its practice in American communities.

NEUROSURGICAL SOCIETY OF AMERICA
78th ANNUAL MEETING SCHEDULE 2025
Punta Mita Four Seasons

Sunday, June 22, 2025

1:00-5:00 pm	Registration Desk Open	Takua Foyer
3:00-5:00 pm	Executive Committee Meeting	Tuturi
6:00-9:00 pm	Opening Reception/Dinner (Casual Dress)	Beach Cuevas

Monday, June 23, 2025

6:15 am-12:30 pm	Meeting Registration Desk	Takua Foyer
6:30-7:30 am	Members' Business Breakfast Meeting	Takua
6:30-7:30 am	Invited Guests' Breakfast	Aramara Restaurant
6:30-9:30 am	Family/Guests Breakfast	Aramara Restaurant
7:40-10:25 am	General Scientific Session I	Takua
10:25-10:45 am	Refreshment Break	Takua Foyer
10:45-12:30 pm	General Scientific Session II	Takua
1:00 pm	Dewey Golf Tournament	Pacifico Course
6:00-10:00 pm	Dinner	Nuna Pool Terrace

Tuesday, June 24, 2025

6:15am-12:30 pm	Meeting Registration Desk	Takua Foyer
6:30-7:30 am	Members/Invited Guests Breakfast	Takua
6:30-9:30 am	Family/Guests Breakfast	Aramara Restaurant
7:35-10:15 am	General Scientific Session III	Takua
9:42-10:05 am	Refreshment Break	Takua Foyer
10:10-10:30 am	Welcome to New Members	Takua
10:50-12:30 pm	General Scientific Session IV	Takua
5:00-6:00 pm	New Members' Reception	Beach Cuevas
6:00-10:00 pm	Gala Reception/Dinner (Linen/Light Suit, Fancy Beach Wear)	Beach Cuevas

Wednesday, June 25, 2025

6:15 am-12:30 pm	Meeting Registration Desk	Takua Foyer
6:30-7:30 am	Members/Invited Guests Breakfast	Toki
6:30-9:30 am	Family/Guests Breakfast	Aramara Restaurant
7:30-10:10 am	General Scientific Session V	Takua
10:10-10:30 am	Refreshment Break	Takua Foyer
10:30-11:40 am	General Scientific Session VI	Takua
12:30 pm	Adjourn	

FUTURE MEETING SITES

2025 Interim Meeting
September 26 – 27, 2025
St. Petersburg, Florida

2026 Annual Meeting
June 14 – 17, 2026
Grand Cayman

NOTES

Neurosurgical Society of America Medal for Outstanding Service – 2025

Donald O. Quest, MD, FAANS

Don Quest was born in 1939, in St. Louis, Missouri. He graduated from the University of Illinois with a degree in mathematics in 1961 and served on active duty with the United States Navy as a naval aviator aboard the U.S.S. Kittyhawk in the Vietnam conflict between 1961 and 1966.

He attended Columbia University's College of Physicians and Surgeons and was awarded his MD in 1970. He was elected to Alpha Omega Alpha and received the Winchester prize for overall excellence in his graduating medical school class. He interned in surgery at the Massachusetts General Hospital and then completed a residency in surgery. Don completed his residency in neurological surgery at the Neurological Institute of New York at the Columbia Presbyterian Medical Center between 1972 and 1976.

Don served as an assistant professor of neurological surgery at the Downstate Medical Center of the State University of New York and later joined the department of neurological surgery at the Columbia University College of Physicians and Surgeons and rose to the rank of professor of clinical neurosurgery in 1989. Dr. Quest has been a leader in the department of neurosurgery at Columbia for many years.

Dr. Quest was on the Executive Committee of the Congress of Neurological Surgeons, is a member of the American Association of Neurological Surgeons (AANS), the American Academy of Neurological Surgery, the American College of Surgeons, the American Medical Association, the Neurological Society of America and the Society of Neurological Surgeons. He was president of the American Academy of Neurological Surgery in 2002 and president of the AANS in 2007.

Joint Providership Disclaimer

In support of improving patient care, this activity has been planned and implemented by the University of Kansas Medical Center and the Neurosurgical Society of America. The University of Kansas Medical Center is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

Accreditation/Designation Statements

A Continuing Education Syllabus, provided separately from this program, provides details regarding the number of *AMA PRA Category 1 Credits*™ available.

Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Disclosure Information

Please see the course syllabus, available separately, for all disclosures.

Members of the planning committee who have disclosed a relationship with commercial interests are listed below.

Name	Industry	Relationship Disclosed
Aviva Abosch	Medtronic	Grant Funds (Investigator Role), Consulting Fee (Advisory Committee)
Judy Huang	Longeviti	Stocks (Ownership Interest)
Louis Kim	Spiway LLC, Philips North America	Stocks (Ownership), Consulting Fee
Guy McKhann	Koh Young Inc, NeuroOne Medical Technologies	Consulting Fees
Matthew Smyth	Zimmer Biomet, Monteris Medical, Cranial Devices	Consulting Fees, Stock Options
Jeffrey Blount	None	
Michael Boland	None	
Paul Camarata	None	
Eldan Eichbaum	None	
Gerald Grant	None	
David Hart	None	
Amy Lee	None	
Benjamin Kennedy	None	

The 78th ANNUAL MEETING
OF THE NEUROSURGICAL SOCIETY OF AMERICA

EDUCATIONAL GOALS AND OBJECTIVES

The primary goal of the Annual Scientific Meetings of the Neurosurgical Society of America is to provide a forum for the presentation of original ideas and research pertinent to the clinical practice of neurological surgery. This meeting is directed towards practicing neurosurgeons and neurological residents and will consist of spine surgery, cerebrovascular, tumor, pediatrics, trauma, education, and socioeconomics.

Upon completion of this educational activity, participants should be able to:

1.) Identify critical ways that central concept of balance is inextricably linked to the contemporary practice of neurosurgery.
2.) Define ways in which social determinants of health impact the wellness and being of neurosurgery patients.
3.) Understand the existence and underlying root causes of some of the disparities observed in neurosurgical conditions treated in neurosurgical disease.
4.) Identify key factors that exist in approaching spinal neurosurgery with a balanced viewpoint in terms of treatment options for our patients.
5.) Understand current state of the art regarding treatment of cerebrovascular disease, both from an endovascular and from an open perspective
6.) Identify key options in the treatment of brain tumors with a balanced viewpoint.
7.) Define different options for the treatment of pediatric pathologies.
8.) Discuss options in the treatment of neurotrauma.
9.) Understand the evolving role of functional neurosurgery and modern treatment.
10.) Understand balanced viewpoints in the treatment of epilepsy.
11.) Discuss the socioeconomic and global aspects of neurosurgery in the modern era.

A special thank you to our 2025 Abstract Reviewers

Betty Kim
Cargill Alleyne
Peter Fecci
Kathleen Dlouhy
Jay Howington
J Mocco
Jennifer Hong
Fedor Panov
Matthew Smyth
Luis Tumialan
Benjamin Kennedy
Patti Raksin
Ciara Harraher
Jack Moriarity
Christopher Winfree

NOTES

GENERAL SCIENTIFIC SESSIONS

Adaptation and Natural Selection

Monday, June 23. 2025	**Academic Neurosurgery**
Tuesday, June 24, 2025	**Innovation and Industry**
Wednesday, June 25, 2025	**Privademic and Private Practice**

GENERAL SCIENTIFIC SESSION I

Academic Neurosurgery

MONDAY, JUNE 23, 2025

6:30-7:30 am Breakfast/NSA Members Business Meeting

7:30-7:35 am Welcome and Announcements
Guy McKhann, MD, President NSA

7:35-7:40 am Scientific Program Overview
Gerald Grant, MD, Scientific Program Chair

7:40-8:40 am PANEL I: Resilience in the Face of Current Challenges: Academic Neurosurgery
Moderators*: Gerald Grant, Amy Lee*

Panelists*: Aviva Abosch, Mitesh Shah, Sander Connolly Jr, Paul Camarata, Griff Harsh, Matt Howard, Fady Charbel, Bernard Bendok, Allan Friedman, John Sampson, Nick Barbaro, Christopher Ogilvy, Vincent Traynelis, Judy Huang*

8:40-8:45 am Introduction of Dan Kraft, MD
Gerald Grant, MD

8:45-9:15 am Guest Speaker Dan Kraft, MD
Dan Kraft, MD

9:15-9:30 am Discussion

9:30-10:12 am Scientific Session I—Abstracts (Tumor)
Moderators: Carlos David, Edward Duckworth

9:30-9:36 am Intraoperative label-free fluorescence lifetime imaging predicts genomic-based glioma histology and identifies the tumor margin with high accuracy
Griff Harsh, MD, University of New Mexico, NM

9:36-9:42 am Thirty-five Years of Stereotactic Radiosurgery for Unresected and WHO Grade I Meningiomas: Experience from America's First Gamma Knife Center
Costas Hadjipanayis, MD, U of Pittsburgh Medical Center, Pittsburgh PA

9:42-9:48 am Multiplicative Impact of Specific Somatic Copy Number Alterations on Meningioma Recurrence Risk
Jennifer Moliterno-Gunel, MD, Smilow Cancer Hospital at Yale, CT

9:48-9:54 am Effective Reduction of High-Grade Meningioma Cell Viability *In Vitro* Using Combination Therapy with Calcium Channel Antagonists and Chemotherapeutic Agents
Vikram Prabhu, MD, Loyola University Stritch School of Medicine, IL

9:54-10:00 am Precision Personalized Neoantigen Tumor Vaccine for Glioblastoma
Mahua Dey, MD, University of Wisconsin Madison, WI

10:00-10:06 am Influence of Bipolar versus Monopolar Stimulation Motor Mapping on Outcomes in Craniotomies for Brain Tumors
Ian Parney, MD, Mayo Clinic, MN

10:06-10:12 am Use of Fluroescein in Brain Tumor Surgery
Kushal Shah, MD, Goodman Campbell Brain & Spine, IN

10:12-10:25 am Discussion

10:25-10:45 am Beverage Break

10:45-11:09 am Scientific Session II – Abstract (Vascular)
Moderators: Vikram Prabhu, Sophia Shakur

10:45-10:51 am Real-time Remote Telerobotic Magnetic Navigation for Endovascular Middle Cerebral Artery and Basilar Artery Simulated Stroke Thrombectomy Across 5,700 Miles
Bernard Bendok, MD, Mayo Clinic, AZ

10:51-10:57 am Increased Prevalence and Size of Incidental Unruptured Intracranial Aneurysms in Male Smokers: A Case-Control Study
Christopher Ogilvy, MD, Beth Israel Deaconess Medical Center, Harvard Medical School, MA

10:57-11:03 am Photoacoustic Imaging in Neurosurgery
Fady Charbel, MD, University of Illinois, IL

11:03-11:09 am Evolutionary Adaptation of Therapeutic Hypothermia Methods: Rapid Thin Liquid Convection in Acute Stroke Treatment – the SISCO Pilot Study
Clemens Schirmer, MD, Geisinger College of Health Sciences, PA

11:09-11:20 am Discussion

11:20-11:53 am Spiegel Shorts

Moderator: Gerald Grant

11:20-11:23 am Unveiling Novel Genetic Drivers of Meningioma: A Transcriptome-Wide Association Study Across Multi-Ancestry Cohorts
Peter Morone, MD, Vanderbilt University Medical Center, TN

11:23-11:26 am Endoscopic Endonasal Biopsy of the Posterior Lobe of the Pituitary Gland is a Safe Surgical Target for Lesions of the Infundibulum and Hypothalamus: Case Series and Surgical Nuances
Jacob Ruzevick, MD, University of Washington, WA

11:26-11:29 am Adaptive Design of mRNA-loaded Extracellular Vesicles for Targeted Immunotherapy of GBM
Kristin Huntoon, MD, University of Arizona, AZ

11:29-11:32 am Mobile Devices to Assess Vestibular Function in Vestibular Schwannoma Patients
Michael Ivan, MD, University of Miami, FL

11:32-11:35 am Drivers of Neurosurgeon Selection among Operative Intracranial Tumor Patients
Debraj Mukherjee, MD, Johns Hopkins University School of Medicine, MD

11:35-11:38 am The Role of Cesium-131 in Brachytherapy in the Upfront Treatment of Glioblastoma
Jay McCracken, MD, Piedmont Atlanta Hospital, GA

11:38-11:41 am Optimizing Aneurysm Neck Coverage with WEB and LVIS EVO Stent in Non-Geometric Wide-Neck Bifurcation Aneurysms: A Single-Center Experience
Omar Choudhri, MD, University of Pennsylvania, PA

11:41-11:44 am Open Cerebrovascular Cases Continue to Decline as Endovascular Technology Advances and Cases are Diluted by the Need for Thrombectomy Services
Brian Howard, MD, Emory University, GA

11:44-11:47 am Clinical Outcomes of Resolute Onyx Stents for Symptomatic Intracranial Stenosis: A Single Center Experience
Stavropoula Tjoumakaris, MD, Thomas Jefferson University Hospital, PA

11:47-11:50 am	Combination Albumin and Cilostazol Improves Outcomes in a Rodent Model of Subarachnoid Hemorrhage *Christopher Jackson, MD, Johns Hopkins University School of Medicine, MD*
11:50-11:53 am	Case Series of Direct MMA Embolization for Subdural Hematomas *Benjamin Waldau, MD, University of California Davis, CA*
11:53-12:05 pm	Discussion
12:05-12:10 pm	Introduction of Professor Marco Barajas *Guy McKhann, MD, President NSA*
12:10-12:30 pm	**Guest Speaker Marco Barajas MD** *President, Mexican Society of Surgical Neurology*
12:30 pm	**Dismissal for Afternoon Activities**

TITLE: INTRAOPERATIVE LABEL-FREE FLUORESCENCE LIFETIME IMAGING PREDICTS GENOMIC-BASED GLIOMA HISTOLOGY AND IDENTIFIES THE TUMOR MARGIN WITH HIGH ACCURACY

AUTHORS: Anbunesan S, Hassan M, Alfonso-Garcia A, Kraft L, Riestenberg R, Bobinski M, Lee H, Jin L-W, Harsh G, Bloch O, Marcu L

Presenter: Griff Harsh, MD

INTRODUCTION: The outcome of patients with malignant gliomas improves with more complete tumor resection. Intraoperative navigation based on preoperative imaging is distorted by shift of brain and tumor during tumor exposure and removal. Advanced classifiers of tissue type from interventional fluorescence lifetime imaging-(iFLIm)-derived parameters may better distinguish tumor from brain as tumor is resected.

METHODS: Histopathological classification of 280 specimens from the presumed margin of 44 adult diffuse gliomas was compared with that predicted by preoperative MRI-based neuro-navigation and intraoperative iFLIm (excitation: 355 nm; emission: 390/40, 470/28, 542/50 nm). Additionally, iFLIm data from 15 wild-type glioblastoma multiforme (GBM) and 12 IDH-mutant gliomas (oligodendrogliomas, astrocytomas) were analyzed. Linear discriminant analysis distinguished areas of high and low tumor cell density and Wilcoxon rank-sum assessed significance of differences between histological classes.

RESULTS: Linear discriminant analysis distinguished areas of high versus low tumor cell density. iFLIm was 40% more accurate than MRI in detecting tumor infiltration for both enhancing (PPV=81%, NPV=91.2%, sensitivity=79%, specificity=92.2%) and non-enhancing (PPV=67.9%, NPV=95.2%, sensitivity=86.4%, specificity=87%) tumors. IDH-mutant oligodendrogliomas exhibited shorter fluorescence lifetimes than IDH-mutant astrocytomas (3.3 ± 0.1 vs 4.1 ± 0.1 nsec, respectively; $p<0.01$).

CONCLUSION: iFLIm can be efficiently incorporated within the workflow of craniotomy for glioma resection and provides near-instantaneous *in vivo* evaluation of brain tissue, including identification of infiltrative margins and prediction of genomic-based histology. Future integration of multiple data streams (iFLIm, preoperative MRI, patient-specific historical data) within an AI-enabled intraprocedural platform may provide real-time surgical guidance conducive to more complete tumor resection and better patient outcome.

TITLE: THIRTY-FIVE YEARS OF STEREOTACTIC RADIOSURGERY FOR UNRESECTED AND WHO GRADE I MENINGIOMAS: EXPERIENCE FROM AMERICA'S FIRST GAMMA KNIFE CENTER

AUTHORS: Hadjipanayis CG, Wei CZ, Flickinger JC, Niranjan A, Lunsford LD

Presenter: Constantinos Hadjipanayis, MD

INTRODUCTION: Stereotactic radiosurgery (SRS) has increasingly been utilized for patients with intracranial meningiomas. We compared outcomes between patients treated with primary or adjuvant stereotactic radiosurgery (SRS) for either unresected or WHO Grade I benign meningiomas during a 35-year interval.

METHODS: The outcomes of meningioma patients (2,032 tumors) who underwent SRS at a single institution from September 1987 to April 2022 were analyzed. The rates of treated tumor control and overall survival (OS) up to 20 years after SRS were measured. Risk factors analyzed included age, gender, tumor volume, margin dose, Ki-67, anatomical location, and pre-SRS surgical resection.

RESULTS: Tumor control was achieved in 91.7% (1506/1642) of patients after a single session of SRS. The median OS following SRS was 18 years, with only 2.1% of patients dying from meningioma progression. The 5-, 10-, 15-, and 20-year LTC rates were 94.1%, 91.1%, 87.7%, and 85.0% for unresected tumors and 91.5%, 80.6%, 67.5%, and 59.1% for WHO Grade I tumors after resection ($p<0.001$). Patients treated with ≥60% of the tumor received at least 16 Gy demonstrated significantly superior tumor control. Forty-one patients (2.5%) experienced symptomatic adverse radiation effects after SRS.

CONCLUSION: Primary SRS was an effective strategy for patients with unresected or known WHO Grade I meningiomas with local control greater than 20 years. Adjuvant SRS was an important option to enhance tumor control and survival in patients with residual or progressive tumors after resection. Our 35-year data demonstrated that patients with meningiomas managed with SRS can achieve normal life expectancy.

TITLE: MULTIPLICATIVE IMPACT OF SPECIFIC SOMATIC COPY NUMBER ALTERATIONS ON MENINGIOMA RECURRENCE RISK

AUTHORS: Chavez M, Dincer A, Yalcin K, Tabor J, O'Brien J, Alok K, Erson-Omay EZ, Barak T, Yasuno K, Gunel M, Moliterno J

Presenter: Jennifer Moliterno, MD

INTRODUCTION: Meningiomas are the most prevalent primary intracranial tumors in adults, with clinical management traditionally guided by the World Health Organization (WHO) grading system. However, discrepancies between histological grade and clinical behavior highlight the limitations of this system. Somatic copy number alterations (SCNAs) have been implicated in meningioma pathogenesis, correlating with tumor aggressiveness and recurrence risk. Their integration into prognostic models may enhance outcomes. This study investigates the influence of SCNAs on meningioma recurrence, focusing on their patterns of mutual exclusivity and co-occurrence.

METHODS: We analyzed 334 primary meningiomas, noting 23 recurrences (6.9%). Clinical data, including age, sex, WHO grade, and tumor characteristics, were collected. SCNAs and mutations were derived from whole-exome sequencing of tumor and matched blood samples. We employed univariate and multivariate Cox proportional hazards regression analyses to identify SCNAs associated with recurrence, fitting the regression model with the cumulative number of SCNAs as a factor covariate. The Kaplan-Meier estimator was utilized for visualizing survival curves.

RESULTS: Five SCNAs were significantly associated with recurrence risk (adjusted $P < 0.05$): 10qLOSS, 11pLOSS, 2pLOSS, 14qLOSS, and 18qLOSS. Each SCNA independently increased recurrence risk; a single SCNA tripled this risk, while two co-occurring SCNAs increased it more than ninefold ($P = 0.00003$). Notably, meningiomas with four co-occurring SCNAs exhibited a greater than 22-fold increase in recurrence risk. Importantly, all identified SCNAs contributed to chromosomal instability, suggesting a synergistic effect that enhances tumor recurrence potential.

CONCLUSION: The accumulation and specific combinations of these five SCNAs significantly enhance the likelihood of meningioma recurrence. Although chr1pLOSS did not independently predict recurrence, it promotes chromosomal instability that facilitates the accumulation of these risk SCNAs. Our findings underscore the potential of SCNAs in predicting meningioma recurrence across all grades, contributing to improved patient management strategies.

TITLE: EFFECTIVE REDUCTION OF HIGH-GRADE MENINGIOMA CELL VIABILITY *IN VITRO* USING COMBINATION THERAPY WITH CALCIUM CHANNEL ANTAGONISTS AND CHEMOTHERAPEUTIC AGENTS

AUTHORS: White EI, Strelko O, Prabhu VC, Thakkar JP, Barton K, Piedras-Renteria ES

Presenter: Vikram Prabhu, MD

INTRODUCTION: Calcium channels play a role in proliferation and invasion of cancer cells, apoptosis evasion, and drug resistance. Chemotherapeutic options for high-grade malignant meningiomas are sparse. The presence of voltage-gated calcium channels (VGCC) in high-grade meningioma cell lines will allow treatment with calcium channel antagonists (CCA) targeting specific channels augmenting the effect of chemotherapy drugs on meningioma cell survival.

METHODS: High grade MN cell lines CH-157MN and IOMM-Lee MN were tested for the presence of L, N, and T-type VGCC. The effect of chemotherapy agents (temozolomide, octreotide, sunitinib, and hydroxyurea) was assessed on MN cell survival. CCAs (nimodipine (NIMO); Pregabalin (PGB) and mibefradil (MIB); and combination treatment using HU and CCAs, was assessed, on meningioma cell survival.

RESULTS: L, N, and T-type VGCCs were detected in both cell lines. Monotherapy with chemotherapy agents indicated HU was most efficient for decreasing cell viability. Monotherapy with MIB (T-type VGCC blocker) decreased cell viability more efficiently than NIMO (L-type VGCC blocker) and PGB (N-type VGCC blocker). Combination therapy using HU+NIMO and HU+PGB did not further affect cell viability compared to monotherapy, whereas HU+MIB effectively reduced cell viability in IOMM-Lee cells. Seven-day combination treatment with HU+MIB+NIMO decreased IOMM-Lee cell viability by 93-97%.

CONCLUSION: VGCCs are present in high-grade MN cell lines and are important for their survival. Monotherapy with CCAs decreased cell viability and cell number in IOMM-Lee cells (MIB>NIMO>PGB). CT (HU+MIB) and triple CT (HU+MIB+NIMO) effectively decreased cell viability in IOMM-Lee cells.

TITLE: PRECISION PERSONALIZED NEOANTIGEN TUMOR VACCINE FOR GLIOBLASTOMA

AUTHORS: Shireman J, Kendziorski C, Dey M

Presenter: Mahua Dey, MD

INTRODUCTION: Glioblastoma, characterized by significant inter- and intra- tumor heterogeneity, is one of the most therapeutically resistant cancers of the modern era. One of the hallmark features of GBM is its extreme adaptability to the therapeutic modalities resulting in 100% recurrence rate. Therapeutic personalized tumor vaccine such as DCVax has shown some promising outcome in larger phase III trial, however there is significant room for improvement. Neoantigen based personalized vaccine has also shown some promise in the context of treatment resident cancers such as pancreatic cancer as well as GBM and can better address GBM heterogeneity. Most current neoantigen vaccines predict MHC-I based neoantigens, however the immune response analyzed from the neoantigen clinical trial show presence of MHC-II restricted antigens. We designed an integrated MHC-I/MHC-II/TCR prediction workflow based on primary and recurrent GBM immunogenomics that might be able to better predict precision-personalized neoantigen for vaccine development.

METHODS: We collected the primary and recurrent GBM tumor samples and matched blood samples of patients undergoing surgical resection. DNA and RNA was isolated from the tumor and the matched blood samples and DNA, RNA and TCRseq was performed on each sample.

RESULTS: We found that GBM is very distinct compared to adjacent normal brain. Current standard of care for GBM, chemotherapy and radiation, changes the immunogenomic landscape of GBM. The overall genomic signature adapts from neuronal to cell division pathways under therapeutic stress. Both primary and recurrent tumors are infiltrated with macrophages. There is significant TCR repertoire diversity between primary and recurrent tumors with very limited TCR overlap. The largest T-cell population in the tumor microenvironment is CD4+ T-cells.

CONCLUSION: In conclusion, we found that integrating MHC binding pipeline with TCR matching pipeline we can narrow down neo-antigen prediction to more precise-personalized neoantigen. Predominant T-cell population in the GBM being CD4+ T-cells, neoantigen predicted based on MHC-II might be more effective than class-I and this might help to better recruit responders in the clinical trial.

TITLE: INFLUENCE OF BIPOLAR VERSUS MONOPOLAR STIMULATION MOTOR MAPPING ON OUTCOMES IN CRANIOTOMIES FOR BRAIN TUMORS

AUTHORS: Chow W, Loron A, Keough M, Malik N, You H, Do B, Schwartz J, Reilly C, Bauman M, Michaelcheck C, Hoffman M, Parney I

Presenter: Ian F Parney, MD

INTRODUCTION: Maximal safe resection of tumors near the motor cortex is aided by intraoperative cortical and subcortical stimulation motor mapping. Monopolar stimulation is thought to have better spatial resolution for subcortical motor mapping, but the influence of bipolar versus monopolar stimulation on outcome is unclear.

METHODS: A single surgeon retrospective analysis of patients undergoing craniotomy for brain tumor resection with motor mapping was performed comparing three cohorts: bipolar asleep (BAs), bipolar awake (motor + speech mapping; BAw), and monopolar asleep (M).

RESULTS: 284 patients undergoing 300 craniotomies with motor mapping were identified. Permanent motor deficits were rare (2.7%) and did not vary significantly between cohort. No significant differences in extent of resection (EOR) of non-enhancing tumors ($p = 0.333$) were identified between bipolar or monopolar cases but EOR was modestly greater for enhancing tumors resected with bipolar stimulation (92.7% vs. 83.5%; $p = 0.010$). Monopolar stimulation identified subcortical motor pathways more frequently than bipolar stimulation (78% vs. 40%; $p = 0.008$), with fewer intraoperative seizures ($p = 0.002$) and fewer aborted procedures ($p = 0.035$). Prior resection correlated with longer overall survival ($HR = 0.435$; $p < 0.001$). Preoperative aphasia ($HR = 2.02$; $p = 0.017$) and insular tumors ($HR = 4.16$; $p = < 0.001$) were negative predictors.

CONCLUSION: Permanent motor deficits were rare and no significant differences in postoperative neurologic deficits were found between bipolar and monopolar stimulation mapping. However, monopolar stimulation identified subcortical motor fibers more reliably and was associated with fewer intraoperative seizures or aborted resections.

TITLE: USE OF FLUORESCEIN IN BRAIN TUMOR SURGERY

AUTHORS: Shah K, Kulwin C, Payner T

Presenter: Kushal Shah, MD

INTRODUCTION: The extent of resection of brain tumor is critical to outcomes and prognosis. Many modalities are useful to impact extent of resection including neuronavigation. The utilization of fluorescein dye during surgical resection of high-grade glioma and metastasis has significant impact on improved resection.

METHODS: Intravenous sodium fluorescein (SF) is administered at induction of brain tumor surgery and the YELLOW 560nm microscope filter is utilized to differentiate tumor versus the surrounding brain. Tumor resections were performed using Stealth neuronavigation and SF. Retrospectively, our case experience was reviewed.

RESULTS: Over 1000 cases of experience using sodium fluorescein were performed between the three authors. Most cases were performed for high-grade gliomas and metastatic tumors. However, other pathologies where there is gadolinium enhancement on MRI were also useful for SF guided resection.

CONCLUSION: Sodium fluorescein guided resection for brain tumor removal is a very useful tool to improve extent of resection. It is most commonly used for gadolinium enhancing tumors, with high grade gliomas and metastatic tumors being the most frequent pathologies. SF is a cheap intravenous dye that is given at the time of surgery to help illuminate the tumor using the YELLOW 560nm microscope filter. This technology is especially helpful when neuronavigation is inaccurate or there is significant brain shift. This technology helps improve extent of resection in brain tumor surgery.

TITLE: REAL-TIME REMOTE TELEROBOTIC MAGNETIC NAVIGATION FOR ENDOVASCULAR MIDDLE CEREBRAL ARTERY AND BASILAR ARTERY SIMULATED STROKE THROMBECTOMY ACROSS 5,700 MILES

AUTHORS: Olson V; Turcotte E; Batjer H; Nelson B; Bendok BR

Presenter: Bernard R. Bendok, MD, MSCI

INTRODUCTION: Many trials of the last decade have shifted the paradigm of stroke care towards endovascular therapy; however, limited access stroke centers has remained a barrier for many patients. Endovascular robotic systems are posed to expand access through remote procedures while also raising the possibility of improved procedural precision.

METHODS: A telerobotic set-up consisting of an electromagnetic navigation system and a mechanical advancer was placed with a silicone vascular phantom in an interventional suite in Switzerland and connected by wireless internet to an operator console in Arizona. From the operator console, the neurosurgeon navigated a guidewire and aspiration catheter to simulated middle cerebral artery (n=10) and basilar artery (n=10) clots in consecutive timed procedural trials in evaluation of system feasibility and operator learning curve.

RESULTS: Clot aspiration was attempted in 4 trials and successful in each. Endovascular navigational time over 10 procedural trials to the M1 segment of the middle cerebral artery and 10 trials to the basilar artery were completed on average in 114 seconds (SD 44.4s) and 134 seconds (SD 65.8s) respectively. Sufficient operator mastery was demonstrated in 20 procedural iterations with an average 77% reduction in navigational time from aortic arch initial to final trials.

CONCLUSION: To our knowledge, we present the first intercontinental aspiration thrombectomy in the pre-clinical setting in comparable time to the clinical practice and demonstrate the early potential of telerobotic navigation. A lack of haptic feedback did not pose a hindrance, and the potential for intuitive operation offers to drive future research and adoption of this telesurgery system.

TITLE: INCREASED PREVALENCE AND SIZE OF INCIDENTAL UNRUPTURED INTRACRANIAL ANEURYSMS IN MALE SMOKERS: A CASE-CONTROL STUDY

AUTHORS: Ogilvy C, Fodor T, Lau T, Young M, Turcotte E ,Olson V, Enriquez-Marulanda A, Salih M, Pettersson S, Filo J, Ramirez-Velandia F, Alwakaa O, Gomez-Paz S, Muram S, Granstein J, Taussky P, Bendok B

Presenter: Christopher S. Ogilvy, M.D.

INTRODUCTION: The prevalence of unruptured intracranial aneurysms (UIA) in female cigarette smokers has been explored in recent studies. However, the occurrence in male smokers has not been explored before. This study aims to investigate the prevalence of incidental unruptured intracranial aneurysms (UIAs) among male smokers and the association with risk factors such as hypertension and other comorbidities.

METHODS: We conducted a dual center nested case-control study from a cohort of male patients aged 20-80 with a brain magnetic resonance image (MRI) between 2019 and 2022. Incidental 0UIAs were compared to patients with normal MRI in a 1:2 ratio. The association between smoking, hypertension, and other comorbidities with a diagnosis of incidental UIA was evaluated with logistic regression.

RESULTS: A total of 15100 male patients aged 20-80 years with MRI Head performed from 2019 to 2022 were included. A total of 486 patients were included in the 2:1 case-control study. Of 8532 never-smoker patients, 69 had incidental UIAs (0.81%), while in 1280 actively smoking patients 23 had incidental UIAs(1.8%), and former smokers had 70 incidental UIA in a population of 5288(1.32%). Of 162 aneurysm patients and 324 random controls, aneurysm patients were more likely to have a positive smoking history compared with healthy controls (57.2% vs 45.5% p=0.01). Multivariate analysis demonstrated a significant association between active smoking (OR 2.69) and UIA or hypertension and incidental aneurysm (OR 6.32). Patients with a smoking history had larger, more irregular, and more frequent anterior circulation aneurysms compared to never-smokers (p=0.004, p=0.07, p=0.006, respectively).

CONCLUSION: Males actively smoking or with a history of smoking cigarettes have a higher prevalence of UIAs than the general population, with larger and more irregular UIAs, increasing their rupture risk. Smoking and hypertension confer a higher risk of having a silent UIA. This population may pose a target for screening.

TITLE: PHOTOACOUSTIC IMAGING IN NEUROSURGERY

AUTHORS: Charbel F, Tarikul T, Benavides J, Prakash R, Zafar M, McGuire L, Siegel A, Erricolo D, Lin J, Gelovani J, Avanaki K.

Presenter: Fady Charbel, MD

INTRODUCTION: Photoacoustic imaging (PAI) is a promising technique that provides noninvasive detection of structural, functional, and molecular anomalies in biological tissue. It combines the technological advances of both optical and acoustic imaging, i.e., the high intrinsic contrast of optical imaging and the spatial resolution of ultrasound imaging. A PAI system was developed and its performance evaluated in vitro and in a large animal model of intraventricular hemorrhage (IVH) *in vivo*.

METHODS: To demonstrate the capability of PAI, a neonatal intraventricular hemorrage (IVH) model was developed in vitro and in live sheep. Several scenarios related to hemorrhage were studied. A germinal matrix hemorrhage that originates due to the rupture of germinal matrix, with progression (Grade I and II) towards the lateral ventricles was replicated by diluting blood samples to different concentrations. The performance of PAI was compared to US imaging.

RESULTS: In a vitro model consisting of a mixture of brain tissue and blood embedded in gelatin to mimic a severe hemorrhagic lesion (intraventricular hemorrhage causing ventriculomegaly, and intraparenchymal hemorrhage), a minimum concentration of 0.25% blood + tissue was successfully identified by PAI, in comparison to 1.2% detected by ultrasound. In vivo sheep model, by diluting blood samples to different concentrations; we showed detection of a minimum concentration of 0.2% blood under such circumstances as compared to 3% detected by US imaging.

CONCLUSION: These results indicate that TTAI is a novel imaging modality with high potential for accurate detection of IVH in neonates

TITLE: EVOLUTIONARY ADAPTATION OF THERAPEUTIC HYPOTHERMIA METHODS: RAPID THIN LIQUID CONVECTION IN ACUTE STROKE TREATMENT - THE SISCO PILOT STUDY

AUTHORS: Schirmer CM, Salerian JA, Schock RB, Sen S, Martin-Schild S, Goren O, Kupas DF, Freedman RJ Jr, Aysenne A

Presenter: Clemens M. Schirmer, MD

INTRODUCTION: The evolution of stroke treatment has revealed limitations in conventional cooling approaches, as demonstrated by the EuroHyp-1 and ICTUS 2/3 trials. While laboratory studies show therapeutic hypothermia (TH) <34°C can reduce stroke infarct volume by >50%, traditional cooling methods have failed to adapt to clinical needs due to slow cooling rates and extensive shivering. This necessitated the adaptation of more efficient cooling technologies.

METHODS: We evaluated the ThermoSuit® System (TSS), an adapted thin liquid convection cooling technology, in a feasibility study of up to 30 sedated ischemic stroke patients. Post-reperfusion cooling targeted 32-34°C for 24 hours. Primary outcomes included cooling efficiency, adverse events, and neurological outcomes using the Modified Rankin Score (mRS) at 90 days.

RESULTS: The study concluded early after 14 subjects from 3 sites met feasibility criteria, with 10 subjects qualifying for outcomes analysis. Median cooling time to 34°C was 40 minutes, representing a significant adaptation over conventional methods. Shivering occurred in 92% of patients but affected only 5.4% of hypothermic time. The pneumonia rate was 23% (3/13). Per-protocol analysis showed 90% of patients achieved acceptable outcomes (mRS≤3), with intention-to-treat analysis showing 82% success.

CONCLUSION: This evolutionary advancement in cooling technology demonstrates successful adaptation to clinical needs. The TSS proves safe and feasible for achieving rapid TH in stroke patients with minimal shivering, warranting further investigation into its cytoprotective benefits for functional independence.

TITLE: UNVEILING NOVEL GENETIC DRIVERS OF MENINGIOMA: A TRANSCRIPTOME-WIDE ASSOCIATION STUDY ACROSS MULTI-ANCESTRY COHORTS

AUTHORS: Morone P, Dambrino R, Lin P, Bledsoe X, Gamazon E.

Presenter: Peter Morone, MD, MSCI

INTRODUCTION: Meningiomas are the most common primary brain tumors, accounting for approximately one-third of all primary brain tumors. Previous genome-wide association studies (GWAS) identified risk loci at 10p12.31 and 11p15.5, but no transcriptome-wide association studies (TWAS) have been conducted to explore the biological mechanisms underlying meningioma development. TWAS assesses the impact of genetically determined gene expression on disease, offering deeper insights into disease biology.

METHODS: We conducted a multi-ancestry, meta-analytic TWAS using the United Kingdom Biobank (UKBB; ~500,000 participants) and Vanderbilt's BioVU DNA biobank (~110,000 participants). Genetic models of gene expression were trained using the Genotype-Tissue Expression (GTEx) Project reference transcriptome data. The PrediXcan method was applied to identify associations between genetically regulated expression (GReX) and meningioma phenotypes. Mendelian randomization (MR) tested causal gene effects, and findings were validated in BioVU.

RESULTS: Three genes—MIR1915HG, DNAJC3, and TBX1—showed significant associations ($p<0.0001$) with meningioma. Notably, TBX1, located on chromosome 22, is implicated in brain vascularization via VEGFR3 activation and craniofacial development in 22q11.2 deletion syndrome.

CONCLUSION: This study identifies novel gene associations with meningioma, providing insights into its genetic underpinnings. These findings highlight potential roles in brain angiogenesis and related comorbidities, paving the way for targeted therapeutic development. To our knowledge, these genes have not been previously linked to meningioma, marking a significant advance in understanding its molecular basis.

TITLE: ENDOSCOPIC ENDONASAL BIOPSY OF THE POSTERIOR LOBE OF THE PITUITARY GLAND (NEUROHYPOPHYSIS) IS A SAFE SURGICAL TARGET FOR LESIONS OF THE INFUNDIBULUM AND HYPOTHALAMUS: CASE SERIES AND SURGICAL NUANCES.

AUTHORS: Ruzevick J, Lee A, Bly R, Child D, Wisse B, Ferreira M, Emerson S

Presenter: Jacob Ruzevick, MD

INTRODUCTION: Embryologic development of the neurohypophysis from the neural ectoderm provides an anatomic continuity between the posterior lobe of the pituitary gland and the hypothalamus via the infundibulum. To minimize the risk to parasellar structures, the neurohypophysis represents a surgical target for biopsy of infundibular lesions via the endoscopic endonasal approach as it is anatomically contiguous with the area of concern with a high probability of a successful diagnostic specimen, even without radiographic visualization within the neurohypophysis.

METHODS: A single center retrospective review of patients undergoing posterior pituitary lobe biopsy for infundibular lesions via the endoscopic endonasal approach was performed. Radiographic, endocrinologic, ophthalmologic, surgical, and histopathological outcomes were assessed.

RESULTS: Four patients were included for study, of which three were women and the average age was 50.0±23.0 years. Imaging review showed an anatomically distinct lesion from the pituitary gland within the infundibulum and hypothalamus in all patients. All patients presented with DI and a variable degree of anterior pituitary dysfunction. Lesions were approached via a direct endoscopic endonasal approach. Following exposure of the pituitary gland, the inferior 1/3 of the anterior lobe was incised, allowing access to the neurohypophysis for biopsy. Biopsy resulted in a diagnostic specimen in all cases and included metastasis, pituicytoma, non-Langerhans cell histiocytosis, and germ cell tumor. Surgical video is available for presentation.

CONCLUSION: The direct anatomic axonal connection of the hypothalamus, infundibulum, and posterior lobe of the pituitary gland provides rationale for successful tissue sampling of the posterior pituitary gland for radiographically distinct infundibular and hypothalamic pathologies.

TITLE: ADAPTIVE DESIGN OF MRNA-LOADED EXTRACELLULAR VESICLES FOR TARGETED IMMUNOTHERAPY OF GBM

AUTHORS: Dong S, Liu X, Bi Y, Wang Y, Huntoon K, Lee D, Jeong S, Ma Y, Li X, Deng W, Shrank B, Grippin A, Ha J, Kang M, Chang M, Zhao Y, Sun R, Sun X, Yang J, Lee L, Lee AS, Teng L, Wang S, Teng L, Kim BYS, Yang Z, Jiang W

Presenter: Kristin Huntoon, PhD, DO

INTRODUCTION: The recent success of mRNA therapeutics against pathogenic infections has increased interest in their use for other human diseases including cancer. However, the precise delivery of the genetic cargo to cells and tissues of interest remains challenging.

METHODS: Here, we show an adaptive strategy that enables the docking of different targeting ligands onto the surface of mRNA-loaded small extracellular vesicles (sEVs). This is achieved by using a microfluidic electroporation approach in which a combination of nano- and milli-second pulses produces large amounts of IFN-γ mRNA-loaded sEVs with CD64 overexpressed on their surface. The CD64 molecule serves as an adaptor to dock targeting ligands, such as anti-CD71 and anti-programmed cell death-ligand 1 (PD-L1) antibodies.

RESULTS: The resulting immunogenic sEVs (imsEV) preferentially target glioblastoma cells and generate potent antitumor activities in vivo, including against tumors intrinsically resistant to immunotherapy.

CONCLUSION: Together, these results provide an adaptive approach to engineering mRNA-loaded sEVs with targeting functionality and pave the way for their adoption in cancer immunotherapy applications.

TITLE: MOBILE DEVICES TO ASSESS VESTIBULAR FUNCTION IN VESTIBULAR SCHWANNOMA PATIENTS

AUTHORS: Ivan M, Dinh C, Himic V, Maynard R

Presenter: Michael Ivan, MD

INTRODUCTION: Vestibular dysfunction is a common symptom in vestibular schwannoma patients, yet optimal treatment remains difficult to determine due to challenges in quantitatively assessing vestibular function. Physicians typically rely on patient-reported outcomes, physical examination, and formal vestibular tests such as videonystagmography (VNG) and vestibular evoked myogenic potentials (VEMP). Mobile health applications continuously collect data on activity, gait, and motion, which may correlate with balance issues. We aim to leverage this data to better assess vestibular function before and after treatment, ultimately improving outcome prediction.

METHODS: Under IRB approval, health data from 25 patients' mobile devices were extracted, including distance traveled, step count, step length, step rate, calories burned, flights climbed, and standing time. Data were normalized and tracked relative to key treatment events, including surgery, radiation, inpatient stay, physical therapy, and formal vestibular assessments. Preoperative and postoperative activity levels were analyzed to determine preoperative decline, recovery duration, and the percentage of patients exceeding their preoperative vestibular function. Outcomes were compared across treatment modalities, including surgery, radiation, and gentamicin injection.

RESULTS: Mobile health data strongly correlated with vestibular function. Patients with greater preoperative decline exhibited longer recovery times. Among patients without complications, all surpassed preoperative activity levels post-treatment. This method provides insight into treatment efficacy for vestibular dysfunction, though a larger dataset is needed for validation.

CONCLUSION: Mobile devices offer a novel approach to assessing vestibular function in vestibular schwannoma patients. This data could help stratify preoperative risk and guide treatment decisions in this population.

TITLE: DRIVERS OF NEUROSURGEON SELECTION AMONG OPERATIVE INTRACRANIAL TUMOR PATIENTS

AUTHORS: Horowitz M; Roy J; Parker M; Devgun A; Derin E; Ahmed A; Lee R; Jackson C, Bettegowda C; Mukherjee D

Presenter: Debraj Mukherjee, MD, MPH

INTRODUCTION: Modern patients have increased access to information regarding their potential medical providers. However, little is known regarding patients' values when pursuing neurosurgical care. We investigate which factors are most important to intracranial tumor patients when selecting a neurosurgeon for tumor resection.

METHODS: All living patients undergoing intracranial tumor resection (1/1/23-12/31/24) at a single institution were surveyed with 14 factors to be ranked on a 5-point Likert scale of self-reported importance. Mean±standard deviation scores and ordinal logistic regression for each factor were calculated.

RESULTS: Fifty survey respondents had mean age 54.15±13.82 years and were 54% female, 70% Caucasian, and 70% privately insured. On Likert scale, surgeon caseload and reported experience with a particular procedure (4.64±0.72) were the most important factors influencing choice of neurosurgeon. Overall hospital ranking was second (4.48±0.68), followed by overall years of experience (4.38±0.75), and surgeons' personal characteristics, including empathy, professionalism, and communication skills (4.2±1.14). Based on overall mean Likert scale scores, least important factors were word-of-mouth from family/friends, surgeons' age, and social media presence.

On subgroup analysis, word-of-mouth was ranked highly by non-Caucasians (OR:1.65), but received less importance in patients' undergoing revision surgery (OR:0.33). Medical school prestige was less likely to be valued by older patients (OR:0.92), non-Caucasians (OR:0.24), ethnic minorities (OR:0.009), and married patients (OR: 0.29).

CONCLUSION: Patients highly value neurosurgeon experience, hospital ranking, and personal characteristics. These findings have a wide range of implications, including resource allocation, marketing strategies, and understanding barriers to care in underserved populations.

TITLE: THE ROLE OF CESIUM-131 BRACHYTHERAPY IN THE UPFRONT TREATMENT OF GLIOBLASTOMA

AUTHORS: McCracken D; Nowlan A; Dunbar E; Pollard C; Johnson J; Mammoser A; Kenning T.

Presenter: D. Jay McCracken, MD

INTRODUCTION: Cesium-131 brachytherapy ("GammaTile") is an implantable form of radiation used to treat residual malignant brain tumors after craniotomy. Current standard of care after surgery involves 60 Gy of external beam radiation (EBRT) with concomitant temozolomide (TMZ) starting at four to six weeks. This delay in adjuvant therapy can result in local progression and worsened overall survival.

METHODS: A total of 19 patients with glioblastoma were treated with GammaTile brachytherapy at the time of surgical resection. Two groups were treated, those enrolled in the "Gestalt" clinical trial who underwent abbreviated EBRT to 46 Gy with concomitant TMZ between 3-5 weeks post-surgery and a second group who were perceived to likely have a delay in adjuvant care, prior to surgery. This group of patients received adjuvant EBRT +/- TMZ on a delayed timeline once able.

RESULTS: Eight patients were treated in the "Gestalt" group with average time to progression of 16 months. Eleven patients in the second group included those with dense neurological deficits, seizures, or severely decreased function at the time of presentation. This group went on to receive EBRT at a median time of 56 days from surgery and a median time to death of 8.1 months.

CONCLUSIONS: Providing immediate radiation therapy to glioblastoma seems to be a promising treatment strategy and can delay local progression. In patients where a delay in adjuvant therapy is likely, providing early cavitary radiation seems to confer a benefit in those who may have died in weeks to months.

TITLE: OPTIMIZING ANEURYSM NECK COVERAGE WITH WEB AND LVIS EVO STENT IN NON-GEOMETRIC WIDE-NECK BIFURCATION ANEURYSMS: A SINGLE-CENTER EXPERIENCE

AUTHORS: Gerlach A; Gandhi O; Habib M; Walker E; Choudhri O

Presenter: Omar Choudhri, MD

INTRODUCTION: Treating wide-neck bifurcation aneurysms is challenging due to a high risk of recurrence. The Woven Endo Bridge (WEB) intrasaccular device modifies blood flow at the aneurysm neck, while the LVIS EVO stent offers enhanced scaffolding with moderate flow diversion. Combining these devices may provide a synergistic effect with up to 85% metal coverage at the aneurysm neck. This study evaluates a novel hybrid technique (WEVO) combining the WEB device and LVIS EVO stent for these challenging aneurysms.

METHODS: We retrospectively reviewed 10 consecutive patients with wide-neck or bifurcation aneurysms treated at the Hospital of the University of Pennsylvania using the WEB and LVIS EVO devices. Data collected included demographics, aneurysm location/size, stent technique, antiplatelet management, angiographic results, and complications.

RESULTS: The cohort included 10 patients (mean age 69 years, 70% female). Aneurysm locations included the MCA bifurcation (40%), basilar artery (30%), anterior communicating artery (20%), and ICA terminus (10%). Successful stent deployment was achieved in all cases, with excellent neck scaffolding and immediate contrast stasis. Antiplatelet therapy and heparin were administered, and the decision to use the LVIS EVO stent was based on WEB volume discrepancies. No stent repositioning, thromboembolic events, or hemorrhagic complications were reported. At 3–6 months, 8 patients with follow-up available showed no residual or recurrent aneurysms.

CONCLUSION: Combining the WEB device with the LVIS EVO stent is a promising hybrid technique for wide-neck bifurcation aneurysms with non-geometric shapes, particularly for complex anatomies with circumferential necks or daughter sacs. This approach offers effective flow modification and neck scaffolding with excellent short-term outcomes.

TITLE: OPEN CEREBROVASCULAR CASES CONTINUE TO DECLINE AS ENDOVASCULAR TECHNOLOGY ADVANCES AND CASES ARE DILUTED BY THE NEED FOR THROMBECTOMY SERVICES

AUTHORS: Howard BM

Presenter: Brian Howard, MD

INTRODUCTION: Open cerebrovascular cases continue to decline as endovascular technology advances and cases are diluted by the need for thrombectomy services. Consequently, CV training has become more challenging despite continued need for microsurgical neurovascular treatments. CAST approved fellowship programs in CV have struggled to meet case minimums. Recently, CAST and the CV section revamped case categories and requirements for CV fellowships. The objective of this presentation is to update the community on the state of CV training using trend data from CAST fellowships and describe how a single, high-volume, academic, CV referral center has changed training to reflect modern CV neurosurgical care.

METHODS: The 3 most recent years of CAST CV fellowship data are reviewed and presented. 13 years of data from Emory University Neurosurgery are reviewed, trends described, and resultant changes in fellowship requirements elaborated.

RESULTS: In 2023, 4 of 12 programs were on probation. 3 programs did not report a fellow, but of the 9 that did, only 3 met minimum case requirements for the program and fellow. After changing case categories and minimums prior to the 2024 academic year, 11 of 12 programs met case minimums for overall volume, but 6 or 12 did not meet threshold for vascular malformations. Emory specific programmatic changes as a result of these trends will be described.

CONCLUSION: Many CAST approved CV fellowships have not met case minimums in recent years. Expectations for trainees and programs must adapt to meet the continued need for competent CV care in the future.

TITLE: CLINICAL OUTCOME OF RESOLUTE ONYX STENTS FOR SYMPTOMATIC INTRACRANIAL STENOSIS: A SINGLE-CENTER EXPERIENCE

AUTHORS: Tjoumakaris SI

Presenter: Stavropoula I Tjoumakaris, MD, MBA

INTRODUCTION: Intracranial atherosclerotic disease (ICAD) is a leading cause of stroke worldwide, with high rates of recurrent ischemic events in high-grade stenosis. Although endovascular treatment (ET) has faced challenges in early trials due to procedural complications and unfavorable outcomes, recent advancements in drug-eluting stents (DES), such as the Resolute Onyx, offer a promising alternative to bare-metal stents (BMS). This study evaluates the safety and efficacy of Resolute Onyx in treating symptomatic ICAD.

METHODS: We conducted a retrospective, single-center study of 22 patients with symptomatic ICAD who underwent stenting with Resolute Onyx. Inclusion criteria included ≥70% stenosis and recurrent stroke or transient ischemic attack (TIA) despite optimal medical therapy. Baseline characteristics, procedural details, and clinical outcomes were extracted from electronic medical records. Primary outcomes included cerebrovascular event recurrence (stroke, or intracranial hemorrhage) and symptomatic in-stent restenosis (ISR). Descriptive statistics were used for analysis.

RESULTS: The median age was 65 years (IQR, 61–72), and 72.7% (16/22) of patients were male. Hypertension was present in 90.9% (20/22), and the median time from the qualifying event to stenting was 1 day (IQR, 1–3). Procedural complications occurred in 4.5% (1/22) of patients. At a median follow-up of 12 months (IQR, 6–23), no strokes or intracranial hemorrhages were reported. Symptomatic ISR occurred in 9.0% (2/22) of patients, with one requiring reintervention. Residual stenosis of ≥30% was observed in 26.6% (4/15) of patients who underwent follow-up imaging.

CONCLUSION: The Resolute Onyx stent demonstrated favorable safety and efficacy in this cohort, with low procedural complication rates and no recurrent strokes or intracranial hemorrhages at follow-up. These findings, along with prior evidence supporting drug-eluting stents, highlight the potential of Resolute Onyx as a promising therapeutic option for symptomatic ICAD. Randomized controlled trials are needed to validate these results and explore broader clinical applications.

TITLE: COMBINATION ALBUMIN AND CILOSTAZOL IMPROVES OUTCOMES IN A RODENT MODEL OF SUBARACHNOID HEMORRHAGE

AUTHORS: Ahmed A, Feghali J, Shih Y, Miller J, Yazigi E, Hansen L, Khalifeh J, Reddy S, Xu R, Caplan J, Gonzalez F, Huang J, Tamargo R, Suarez J, Jackson C.

Presenter: Christopher M. Jackson**,** MD

INTRODUCTION: Delayed cerebral ischemia (DCI) remains a significant source of morbidity and mortality in patients with aneurysmal subarachnoid hemorrhage (aSAH). The current standard is oral nimodipine and supportive care. Albumin and cilostazol are promising interventions with strong preclinical and some early clinical data indicating efficacy in reducing DCI. There is mechanistic rationale to combine these agents, however, this combination has not been rigorously tested in preclinical models.

METHODS: Fifty-five mice underwent ICA perforation and were randomized as follows: sham; vehicle (0.9% saline); 25% human albumin; cilostazol; and combination 25% human albumin with cilostazol. Outcomes were measured using serial 28-point neuroscores and brain water weight. A separate cohort (n = 5 per group) underwent 11.7T MRI/MRA at 96 hours following SAH to quantify vasospasm and perfusion.

RESULTS: Large vessel diameter between groups in the L SCA (p=0.014), R SCA (p=0.018), and R ICA (p=0.026) with combined treatment outperforming either cilostazol or albumin alone. Treatment with albumin and cilostazol significantly improved MCA territory perfusion (8279±408.5 pixels, p=0.017). The treatment groups had lower brain water than the SAH control group, most pronounced in the SAH+albumin+cilostazol group compared to the SAH group (median 0.774 vs. 0.793, p=0.028). There was a significant difference in survival, with highest median neuroscore at all time points in the SAH+albumin+cilostazol group (p=0.018).

CONCLUSION: Combination albumin and cilostazol resulted in superior outcomes in brain edema, radiographic vasospasm, behavioral outcomes, and survival in a mouse model of aSAH. These data support moving forward with clinical trials of this combination regimen.

TITLE: CASE SERIES OF DIRECT MMA EMBOLIZATION FOR SUBDURAL HEMATOMAS

AUTHORS: Gerndt C; Cord B; Waldau B

Presenter: Benjamin Waldau, MD

INTRODUCTION: MMA embolization has been shown to be efficacious in preventing recurrence of subdural hematomas in 3 recent randomized trials. We have presented during the last NSA meeting in Portugal our first patient who underwent direct MMA embolization during mini-craniotomy for subdural hematoma evacuation. We now present a case series of 17 patients.

METHODS: We retrospectively reviewed prospectively collected data on intraoperative MMA embolization during mini-craniotomy for subdural hematoma evacuation on 17 patients.

RESULTS: Average age of patients was 71.5 years, and 13 patients were male. Subdural hematomas were chronic in 5 cases, subacute on chronic in 9 cases, subacute in 2 cases and acute on chronic in 1 case. All 17 patients underwent direct embolization of the MMA, and one patient underwent additional contralateral MMA embolization through access of the contralateral STA. Neuro-navigation to locate the MMA was used in 7 cases, a sponge stick to localize the MMA calvarial grooves on Xray in 3 cases, and no localization was used in 7 cases. Initial false catheterization of the MMV occurred in 6 cases. Average time between first run and last xray was 33.3 minutes. One patient developed inadvertent embolization of the ophthalmic artery resulting in ipsilateral blurry vision. 10 patients had mRS at 90 days – 8 had mRS < 3, and there was one death. No patient required repeat evacuation within 90 days.

CONCLUSION: Considering the short procedure time of 33.3 minutes, intraoperative MMA embolization during subdural hematoma evacuation can improve workflow by combining 2 operations into one.

GENERAL SCIENTIFIC SESSION II

Innovation and Industry

TUESDAY JUNE 24, 2025

6:30-7:30 am Breakfast

7:30-7:35 am Announcements
Gerald Grant, Guy McKhann

7:35-7:42 am Who owns the data?
Fedor Panov, MD, Mount Sinai Hospital, NY

7:42-7:45 am Introduction of Guest Speaker John Adler, MD
Gerald Grant, MD

7:45-8:15 am **Guest Speaker John Adler, MD**
"Disruptive Innovation"
John Adler, MD

8:15-8:30 am Discussion

8:30-9:15 am **PANEL II: Resilience in the Face of Current Challenges: Innovation and Industry**
Moderator*: John Adler, MD*
Panelists*: Regis Haid, Richard Fessler, Fedor Panov, Constantinos Hadjipanayis, Ian Kalfas*

9:15-9:51 am **Scientific Session III Abstracts (Pediatrics and Peripheral Nerve)**
Moderators: Jay Storm, Brian Dlouhy

9:15-9:21 am Cost Analysis of Open Versus Laser Interstitial Thermal Therapy Corpus Callosotomy
Matthew Smyth, MD, Johns Hopkins Medicine, FL

9:21-9:27 am Eyelid and Eyebrow Approaches in Young Children
Benjamin Kennedy, MD, Children's Hospital of Philadelphia, PA

9:27-9:33 am Compliance with Methicillin-susceptible Staphylococcus Aureus (MSSA) / Methicillin-resistant Staphylococcus Aureus (MRSA) Screening Reduces Surgical Site Infection in Pediatric Scoliosis
Jamal McClendon, MD, Mayo Clinic, AZ

9:33-9:39 am Fast Update on WHA 76.191; Folic Acid Fortification for Preventable Birth Defects
Jeffrey Blount, MD, Children's of Alabama, AL

9:39-9:45 am Surgical Outcomes of Hemispherotomy and Posterior Quadrant Disconnection in Infants with Medically Intractable Epilepsy
Afshin Salehi, MD, Children's Hospital of Omaha, NE

9:45-9:51 am The Surgical Management of Phrenic Neuropathy in Patients with Parsonage-Turner Syndrome
Christopher Winfree, MD, Columbia University, NY

9:51-10:00 am Discussion

10:00-10:15 am **Introduction of New Members**
Aviva Abosch, MD, PhD, Secretary, NSA

10:15-10:30 am Beverage Break

10:30-10:35 am **Introduction of the 2025 Neurosurgical Society of America Medalist**
Christopher Fox, MD, Chair of the NSA Medal Committee

10:35-10:50 am **NSA Medalist Statement**
Donald O. Quest, MD

10:50-11:38 am Scientific Session IV – Abstracts (Spine)
Moderators: Andrea Chamczuk, Michelle Clarke

10:50-10:56 am Anterior Cervical Disectomy and Fusion with 3D O-arm Based Surgical Navigation, a Study of the Benefits and Pitfalls
Devin Amin, MD, Southern Illinois University, IL

10:56-11:02 am Minimally Invasive Surgery for Grade 1 Spondylolisthesis is Most Beneficial for those with Body Mass Index Over 30: Two Year Follow Up from the Quality Outcomes Database
Dean Chou, MD, Columbia University, NY

11:02-11:08 am	Return to Work Following MIS versus OPEN Correction of Adult Deformity *Richard Fessler, MD, Rush University, IL*
11:08-11:14 am	Optimizing Multidisciplinary Spinal Oncology Care: A Decade of Innovation through the Penn SOaR^2 Program *Neil Malhotra, MD, University of Pennsylvania, PA*
11:14-11:20 am	How to Give Back to Your Employees: An Academic Health System's Experience with Bundled Payment Programs and a Center of Excellence for Spine Surgery *Gabriel Smith, MD, Case Western Reserve University School of Medicine, OH*
11:20-11:26 am	Decompression and Dynamic Sagittal Tether Stabilization for Degenerative Spondylolisthesis: Primary Outcomes of a Multicenter FDA IDE Trial *Alan Villavicencio, MD, Boulder Neurosurgical Associates, Longmont CO*
11:26-11:32 am	Evolution of Spine Care to the Ambulatory Surgery Center: Safety, Efficacy, and Outcomes *Christopher Holland, MD, Carolina Neurosurgery and Spine Associates, NC*
11:32-11:38 am	Postoperative Coronal Malalignment after Adult Spinal Deformity Surgery: Incidence, Risk Factors, and Impact on 2-Year Outcomes *Mena Kerolus, MD, Atlanta Brain and Spine Care, GA*
11:38-11:48 am	Discussion
11:48-11:55 am	**Gordon Baltuch: Wellness and Peer Support** *Gordon Baltuch, MD, Columbia University, NY*
11:55-12:05 pm	**Introduction of the President of the Neurosurgical Society of America** *E. Sander Connolly, MD, Columbia University, NY*
12:05-12:30 pm	**Presidential Address** *Guy McKhann, MD, President, NSA*
12:30 pm	**Dismissal for Afternoon Activities**

TITLE: COST ANALYSIS OF OPEN VERSUS LASER INTERSTITIAL THERMAL THERAPY CORPUS CALLOSOTOMY

AUTHORS: Smyth M; Aum D; Roland J.

Presenter: Matthew D. Smyth, MD

INTRODUCTION: Open and LITT corpus callosotomy have similar outcomes in drop seizure reduction/resolution and overall seizure outcome. Studies have shown that LITT leads to shorter hospital stays, less blood loss, and fewer surgical complications than open corpus callosotomy. However, both procedures require different workflows, personnel, imaging, and equipment. In this study, we analyze the cost differences between open and LITT corpus callosotomy in a pediatric cohort.

METHODS: We retrospectively reviewed a contemporary cohort of pediatric patients who had undergone open or LITT corpus callosotomy at St. Louis Children's Hospital between 2017 and 2024. We looked at the direct, indirect, and total costs categorized as room and care, intensive care unit, pharmacy, operating room, recovery room, anesthesiology, MRI, radiology, therapy, laboratory, and materials management.

RESULTS: We reviewed (n=11) open and (n=14) LITT corpus callosotomy cases. Total costs for the operating room were significantly higher in LITT ($31379 for LITT vs $11480 for open; $p < 0.001$). Total costs for MRI ($1043 for LITT vs $650 for open; $p < 0.020$) and radiology ($339 for LITT vs $121 for open; $p < 0.008$) were higher in LITT than open corpus callosotomy. The mean total direct cost was $34,242 for LITT vs $21,316 for open ($p < 0.081$). The mean total indirect cost was $10,238 for LITT vs $14,431 for open ($p < 0.070$). The mean total cost was $44,480 for LITT vs $35,747 for open ($p <0.001$).

CONCLUSION: While OR costs were higher in the LITT group, these patients had shorter hospitalizations which partially offset the increased cost. The anticipated additional costs of higher complication and re-admission rates for open callosotomy patients was not accounted for in this analysis. Open and LITT corpus callosotomy are both safe and effective procedures to treat medically refractory epilepsy. While LITT callosotomy has previously been shown to be associated with less morbidity and quicker recovery, these data quantify the increased total costs of LITT corpus callosotomy.

TITLE: EYELID AND EYEBROW APPROACHES IN YOUNG CHILDREN

AUTHORS: Kennedy B

Presenter: Benjamin Kennedy, MD

INTRODUCTION: Transorbital approaches through minimally invasive eyelid or eyebrow incisions have become more common in adult neurosurgery, mostly employed for aneurysm and meningioma surgery. There is a paucity of published experience utilizing these techniques in epilepsy surgery, less so in children, and even less so in the very young, age 4 and under. This age group has different pathologies than adults, smaller skull with significant growth remaining, smaller orbits, often less brain atrophy, and usually different surgeons with different training.

METHODS: A retrospective review was performed of all children age 4 or under who underwent an eyelid or eyebrow transorbital approach for the treatment of pediatric epilepsy at Children's Hospital of Philadelphia from September 2022-October 2023 with at least 1 year of follow-up.

RESULTS: Three children were identified, each with anatomically varied pathology. A 4-year-old girl had a focal cortical dysplasia encasing a pleomorphic xanthoastrocytoma of the amygdala and anteromedial temporal lobe, treated through an eyelid approach through the lateral orbit/greater sphenoid wing. A 26-month-old boy had a large glioneuronal tumor of the entire inferior frontal lobe, from pole to putamen/caudate/ventricle, approached through an eyebrow incision. A 4-year-old girl had a pedunculated hypothalamic hamartoma, resected through an eyebrow incision. All patients underwent gross total resection with no recurrence on follow-up and experienced an Engel Class 1A outcome (median follow-up 24 months). Each patient had developmental acceleration and excellent cosmetic result in follow-up.

CONCLUSION: Select very young patients are amenable to eyelid/eyebrow transorbital approaches for a wide anatomical variety of pediatric epilepsy pathologies.

TITLE: COMPLIANCE WITH METHICILLIN-SUSCEPTIBLE STAPHYLOCOCCUS AUREUS (MSSA)/METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) SCREENING REDUCES SURGICAL SITE INFECTION IN PEDIATRIC SCOLIOSIS

AUTHORS: McClendon J Jr., Ronecker J, Gawel J, McCalley K, Vaidya S,

Presenter: Jamal McClendon Jr., MD

INTRODUCTION: Quality initiates, including protocol-driven pathways and care plans, to minimize surgical site infection (SSI) in pediatric spinal deformity remain paramount for hospital systems to reduce perioperative morbidity and improve patient-reported outcomes. A multi-disciplinary initiative implementing methicillin-susceptible Staphylococcus aureus (MSSA)/methicillin-resistant Staphylococcus aureus (MRSA) swabbing aimed to lower SSI. Utilizing a proprietary, electronic medical record (EMR) dashboard, we tracked screening compliance and demonstrated reduced peri-operative morbidity.

METHODS: A retrospective analysis of an institutional, proprietary EMR dashboard was conducted for all patients < 18 years of age who underwent fusion for pediatric spinal deformity from January 2022 to December 2023. Neuromuscular (NM) spinal deformity patients were screened for MSSA/MRSA commencing in 2022. The protocol expanded to adolescent idiopathic scoliosis (AIS) and congenital scoliosis patients in 2023. Screening compliance, infection rate, and return to operating room (RTOR) were tracked and monitored. Screening protocol featured antibiotic susceptibility nomograms.

RESULTS: There were 904 patients encompassing 4751 visits in 2022, and 1035 patients encompassing 5415 visits in 2023 for scoliosis. There were 229 surgeries in 2022 (142 AIS/trauma, 87 NM/congenital cases). There were 264 surgeries in 2023 (137 AIS/trauma, 92 NM/syndromic, 35 congenital cases). Fifty-three NM patients and 0 AIS patients had MSSA/MRSA screening in 2022; while 44 NM, 45 syndromic, and 124 AIS patients had MSSA/MRSA screening in 2023. Nine cases of SSI were reported in 2022, and one did not RTOR within 90 days of their surgery. Three cases of SSI were reported in 2023 with one RTOR within 90 days of their surgery.

CONCLUSION: Compliance with MSSA/MRSA screening via EMR dashboard improves patient outcomes by minimizing infection rate and return to the OR. The MSSA/MRSA screening protocol utilizes an easy-access clinical dataset, and the program serves as a surrogate to track perioperative data.

TITLE: FAST UPDATE ON WHA 76.19L; FOLIC ACID FORTIFICATION FOR PREVENTABLE BIRTH DEFECTS

AUTHORS: Blount J, Ghotme K, Smith AA

Presenter: Jeffrey Blount, MD

INTRODUCTION: The Global Alliance for Prevention of Spina Bifida (GAPSBIF) was formed by neurosurgeons to advocate for folic acid fortification (FAF) to prevent SB. GAPSBIF contributed to efforts that culminated in passage of WHA Resolution 76.19 in 2023 that advocated for FAF. A three-year follow-up will be presented in 2026.

METHODS: Observational overview of progress and fronts in the FAF workspace.

RESULTS: Double fortified salt has evolved as a very promising vehicle to accomplish FAF. Significant progress has been made in index countries including Pakistan, India and Ethiopia. Corn masa fortification is an important omitted vehicle in the USA. Each of these will receive a 1-minute summary in this Spiegel Short presentation.

CONCLUSION: Excellent and promising progress has been made toward FAF and neurosurgical advocacy is playing a consistent contributory role.

TITLE: SURGICAL OUTCOMES OF HEMISPHEROTOMY AND POSTERIOR QUADRANT DISCONNECTION IN INFANTS WITH MEDICALLY INTRACTABLE EPILEPSY

AUTHORS: Salehi A, Lau SD, Yang P, Rolle ML, Roland JL, Smyth MD.

Presenter: Afshin Salehi, MD

INTRODUCTION: Hemispherotomy and posterior quadrant disconnection (PQD) are standard surgical treatments for medically intractable epilepsy in pediatrics. However, data on their efficacy and safety very young patients is limited. This study evaluates outcomes of patients ≤ 12 months old who underwent these procedures.

METHODS: A retrospective review was conducted of patients ≤ 12 months old who underwent epilepsy surgery at Washington University and St Louis Children's Hospital (2003 – 2023). Data on diagnosis, age, operative details, hospital length of stay, and complications were collected. The Engel classification and Gross Motor Function Classification System (GMFCS) were used to assess seizure and motor outcomes

RESULTS: 14 patients underwent either hemispherotomy (n=12) or PQD (n=2). Diagnosis included hemimegaloencephaly (57%), middle cerebral artery infarcts (29%), cortical malformation (14%). Average age at surgery was 6 months (youngest: 2 months), with mean blood loss of 58% of total blood volume. Average follow-up was 4.8 years. At last follow-up, 54% were free of disabling seizures (Engel I) with 57% of this subgroup completely seizure free (Engel IA). 23% experienced rare disabling seizures (Engel II), and 23% had worthwhile improvement (Engel III). At last follow-up, 66% of patients were GMFCS level I or II (walking with no or some limitations) and 34% were GMFCS level IV (assisted self-mobility). No deaths or long-term complications occurred.

CONCLUSION: Outcomes in this cohort are comparable to older children, with seizure freedom (74%) and favorable GMFCS outcomes (66%). Hemispherotomy and PQD are safe and effective for medically intractable epilepsy in very young patients.

TITLE: THE SURGICAL MANAGEMENT OF PHRENIC NEUROPATHY IN PATIENTS WITH PARSONAGE-TURNER SYNDROME.

AUTHOR: Winfree CJ.; Pendleton AC.; Ginsburg ME.

Presenter: Christopher J. Winfree, MD

INTRODUCTION: Parsonage-Turner syndrome is an autoimmune disorder that affects the peripheral nerves. In some cases, it can cause structural abnormalities in the affected nerve(s) such as nerve enlargement or hourglass constriction that prevents nerve recovery. When the phrenic nerve is involved, diaphragm paralysis and severe exertional dyspnea can occur.

METHODS: I will present our series of patients with Parsonage-Turner syndrome and phrenic neuropathy who underwent surgical treatment to decompress the phrenic nerve.

RESULTS: Phrenic neuropathies can occur in the setting of Parsonage-Turner syndrome. In many of these cases, structural compression of the phrenic nerve is present. The diagnosis may be made with some combination of history, clinical examination, and high-resolution phrenic nerve imaging. When present, phrenic nerve compression in the setting of Parsonage-Turner syndrome may be successfully treated with internal neurolysis.

CONCLUSION: Phrenic neuropathies are rarely encountered in neurosurgical practice; however, neurosurgeons with expertise in the diagnosis and treatment of peripheral nerve disorders can sometimes help these patients.

TITLE: ANTERIOR CERVICAL DISCECTOMY AND FUSION WITH 3D OARM BASED SURGICAL NAVIGATION, A STUDY OF THE BENEFITS AND PITFALLS.

AUTHORS: Cozzens J, Espinosa J, Amin D, Acakpo-Satchivi, L

Presenter: Devin V. Amin, MD, PhD

INTRODUCTION: Advancements in surgical navigation have allowed the application to the procedure of Anterior Cervical Discectomy and Fusion.

METHODS: All ACDFs for cervical spondylosis at two hospitals with four surgeons between 2010 and 2024 were included. The ACDFs were divided into navigated and non-navigated and records were assessed for patient demographics, American Society of Anesthesiology score, number of operated interspaces, operative time, length of stay, perioperative complications and 90-day readmissions.

RESULTS: In comparing the navigated and the non-navigated group after controlling for demographics the navigated group had less lateral plate deviation ($P < 0.05$) and longer operative time per level ($P < 0.05$) with no effect on angular plate deviation, length of stay, perioperative complications and 90 day readmission ($P > 0.05$).

CONCLUSION: In addition to the results demonstrated in this study we plan a further subgroup analysis to evaluate the divergent screw angle and length of the proximal and distal screws (can improve the compression loading of the bone graft) as well as plate length and graft size optimization. Obtaining an Oarm scan after placement of the hardware construct demonstrates the amount of lordosis gained by the procedure and confirms effective placement of the plate screws and intervertebral graft. This data is encouraging for the widespread application of 3D Oarm surgical navigation technology to the common procedure that is the Anterior Cervical Discectomy and Fusion.

TITLE: MINIMALLY INVASIVE SURGERY FOR GRADE 1 SPONDYLOLISTHESIS IS MOST BENEFICIAL FOR THOSE WITH BODY MASS INDEX OVER 30: TWO YEAR FOLLOW UP FROM THE QUALITY OUTCOMES DATABASE

AUTHORS: Pascual-Leone A, Chou D, Joiner E, Bydon M, Bisson E, Shaffrey C, Glassman S, Foley K, Potts E, Shaffrey M, Coric D, Knightly J, Park P, Wang, Fu K, Slotkin J, Asher A, Virk M, Haid R, Mummaneni P, Cha A

Presenter: Andres Pascual-Leone, MD

INTRODUCTION: Both minimally invasive (MIS) and open approaches may be effective for the treatment of degenerative lumbar spondylolisthesis (DLS). However, comparative effectiveness might be influenced by body mass index (BMI).

METHODS: Retrospective analysis of the prospective Quality Outcomes Database registry including patients operated on for grade 1 DLS. BMI was dichotomized into two groups: non-obese (BMI<30) and obese (BMI≥30). Outcomes included minimal clinically important differences (MCID) in Oswestry Disability Index (ODI), EQ-5D, and Numeric Rating Scale for leg and back pain, Patient Satisfaction Index, surgical complications, discharge disposition, and reoperation.

RESULTS: 608 patients with grade 1 DLS were identified (259 MIS, 349 open). 517 (85%) had 2-year follow-up (216 MIS, 301 open). There were 285 non-obese and 232 obese patients. 402 patients underwent instrumented fusion while 115 underwent decompression alone. Regardless of surgical technique or BMI, 2-year (2Y) ODI (mean difference [MD] -23.4+/-20.38, $p<0.001$), leg pain (MD -3.81+/-3.82, $p<0.001$) and back pain (MD -3.32+/-3.43, $p<0.0001$) improved from baseline. Among obese patients, the proportion of patients achieving MCID was larger after MIS compared to open surgery in 2Y ODI (73.3% vs 56.34%, $X^2=6.11$, $p=0.013$) and EQ-5D (53.33% vs 37.32%, $X^2=4.32$, $p=0.038$). However, no differences in outcomes were seen between MIS and open surgery in non-obese patients.

CONCLUSION: Regardless of approach, patients improved following surgery for grade 1 DLS. Our data suggest that for patients with BMI≥30, but not BMI<30, an MIS approach can lead to better long-term outcomes compared to open surgery. Thus, MIS may be ideal for treatment of obese patients.

TITLE: RETURN TO WORK FOLLOWING MIS VS OPEN CORRECTION OF ADULT DEFORMITY

AUTHORS: Fessler R.G., Members of the International Spine Surgery Group

Presenter: Richard G. Fessler, MD, PhD

INTRODUCTION: While faster recovery, such as return-to-work, is a touted benefit of minimally-invasive spinal operations, these differences have been poorly described for adult spinal deformity patients.

METHODS: Patients ≥18 years were queried from a multicenter, adult spinal deformity database. To ensure equal cohorts with MIS vs. open correction techniques, propensity score matched gender, age (68.2 years), BMI, PI-LL mismatch, and SVA. Of 190 patients with baseline surveys, 173 respondents (91.0%) had both baseline employment and 2yr follow up. The open (n=85) and cMIS (n=88) cohorts were compared with a chi-squared test. The rate of return-to-work was calculated via discrete-time proportional hazards model – reporting ORadj – at 3 follow up intervals: 6w, 1yr, 2yr.

RESULTS: Average length-of-stay was statistically significantly longer in open cohort (8.2 v 5.3, $p<0.001$). The cMIS cohort had a statistically significantly lower median number of posterior levels fused (4 vs 10, $p<0.001$) as well as a higher median number of anterior (2 vs 0, $p<0.001$) and lateral (2 vs 0, $p<0.001$) lumbar interbody fusions. TLIFs were equal. Baseline employment was nearly equal between open (n=85) vs cMIS (n=88) cohorts: employed (20.0% vs 21.5%), unemployed (3.5% vs 4.5%), disabled (4.7% vs 6.8%), and retired (71.7% vs 67.0%) ($p=0.888$). The number of employed patients between the open vs cMIS cohort statistically significantly differed at 1yr (10.5% vs 21.5%, $p=0.049$), but not at 6w(14.1% vs 15.9%, $p=0.741$) or 2yr (14.1% vs 19.3%, $p=0.277$). The velocity of return-to-work did not differ (ORadj=1.2, $p=0.549$). In a sub-analysis of 36 patients employed at baseline, return-to-work between the open vs cMIS cohort differed at 1 year (47.0% vs 89.4%, $p=0.006$), but not at 6 weeks or 2 years. Similar trends were appreciated in a sub-analysis of patients< 65 years.

CONCLUSION: Despite equivalent baseline employment status, more patients in the cMIS cohort were employed at 1 year. These differences were not appreciated at 6w or 2yr. The overall velocity of return-to-work was equivalent. These trends persisted in a sub-analysis of patients < 65 years and patients employed at baseline.

TITLE: OPTIMIZING MULTIDISCIPLINARY SPINAL ONCOLOGY CARE: A DECADE OF INNOVATION THROUGH THE PENN SOAR² PROGRAM

AUTHORS: Butala A, Xu, E, Malhotra RD, Karsalia R, Kost J, Peters GW, Hassankhani A, Knollman HM, Schuster J, Freeman CW, Malhotra NR

Presenter: Neil R. Malhotra, MD

INTRODUCTION: Spinal cancer requires multidisciplinary coordination to optimize care and resource utilization. The Penn SOaR² (Surgical Spinal Oncology, Medical Oncology, and Radiation Oncology/Radiology) program was launched in 2014 to streamline treatment, reduce burden, and improve outcomes. This study evaluates targeted improvement initiatives aimed.

METHODS: The spinal oncology Rapid Imaging Protocol (RIP) was design to reduce ER/hospital admissions. The Spine Oncology Imaging Score (SOIS) was developed to alert clinical teams and prioritize responses. For patients with concerning new symptoms, the Oncology Evaluation Center (OEC) was implemented for rapid spinal oncology patient evaluation to abate ED evaluations. The SOaR² multidisciplinary spinal oncology conference was initiated to accelerate focused care. For patients requiring oncological spinal surgery, consecutive patients (n=384) were enrolled and prospectively assessed with the Risk Assessment and Prediction Tool (RAPT). Lastly, PENN "Calvary" was launched to support perioperative patients at home and reduce hospital readmissions.

RESULTS: RIP was successfully deployed for 2,276 patients, significantly reducing unnecessary ED visits. SOIS demonstrated high adoption, with (n=50 applications/month/neuroradiologist) and high utilization (n=2,000 cases). The OEC provided an average of two evaluations per day, reduced ED dependency, and successfully expanded to 24-hour availability. The SOaR² multidisciplinary conference guided treatment for 3,120 cases. A low RAPT score (≤9) strongly correlated with non-home discharge (OR 4.33, p=0.02). Among low-scoring patients, 31.8% required post-acute care compared to 11.3% of high-scoring patients. The PENN Calvary Program was successfully initiated and is undergoing formal assessment.

CONCLUSIONS: SOaR² has reduced treatment time from 4–6 months to 4–6 weeks while improving efficiency and outcomes.

TITLE: HOW TO GIVE BACK TO YOUR EMPLOYEES. AN ACADEMIC HEALTH SYSTEM'S EXPERIENCE WITH BUNDLED PAYMENT PROGRAMS AND A CENTER OF EXCELLENCE FOR SPINE SURGERY

AUTHORS: Rosenthal M, Kimble M, Donich D, Patterson M, Mauria R, Smith G

Presenter: Gabriel Smith, MD

INTRODUCTION: Bundled payment programs and centers of excellence (COE) for spinal surgery continue to evolve across the changing landscape of facilities spinal surgery is occurring. Employers and insurance carriers continue to strive for improved outcomes and the elimination of clinical variability. In this abstract we report our three data on implementation of a bundled payment program in an academic health system.

METHODS: In 2020, a multicenter COE program for spinal surgery was formed to offer bundled payments within the University Hospitals Health System insurance plan in Cleveland, Ohio. We have over 40,000 insured patients across northeast Ohio. Bundled payments included single level lumbar spinal fusions, lumbar laminectomies, ACDF, and posterior cervical fusions with strict patient selection criteria.

RESULTS: From 2022 – 2024, 450 patients were referred to the COE for surgical evaluation. Our conversion rate to surgery was 15% (n=70) using strict inclusion criteria. Prior authorization was waived and our average cost savings to our employees was $2,150 and total savings of $150,000. We had four 30-day readmissions in 3 years and one surgical site infection requiring reoperation.

CONCLUSION: Our caregivers and families have directly saved over $150,000 in 3 years within the UH COE spine surgical program through our strict inclusion criteria and surgery types included in the program. These programs are viable in large health systems and offer a way to give back to our caregivers.

TITLE: DECOMPRESSION AND DYNAMIC SAGITTAL TETHER STABILIZATION FOR DEGENERATIVE SPONDYLOLISTHESIS: PRIMARY OUTCOMES OF A MULTICENTER FDA IDE TRIAL

AUTHORS: Villavicencio A, MD and the LimiFlex Study group

Presenter: Villavicencio A, MD

INTRODUCTION: An investigational procedure, spondyloplasty, incorporates direct surgical decompression and stabilization with a dynamic sagittal tether (DST). We report primary 24-month outcomes of an FDA IDE trial (NCT03115983) comparing spondyloplasty *versus* decompression and transforaminal lumbar interbody fusion (D+TLIF) for patients with Grade I spondylolisthesis with spinal stenosis.

METHODS: The primary outcome assessed noninferiority of spondyloplasty compared to D+TLIF on a composite clinical success (CCS) measure with a -12.5% noninferiority threshold.

RESULTS: Of 299 enrolled subjects, 287 were propensity-score (PS) selected. The spondyloplasty group had significantly shorter operative time, less blood loss and shorter hospital stay. CCS success rates were 78.8% in the spondyloplasty group and 61.2% in the D+TLIF group. Noninferiority was achieved in the PS-selected intent-to-treat (ITT-PS) population, and superiority was achieved in the per-protocol population. Angular motion and segmental translation were both reduced by 24% in the spondyloplasty group at 24-months and by 68% and 77%, respectively, in the D+TLIF group. Angular and translational motion at the suprajacent level were both significantly greater at 24 months in the D+TLIF group compared to the spondyloplasty group. Reoperations were lower in the spondyloplasty group, but statistically similar.

CONCLUSION: This Level I study demonstrated that both decompression and stabilization with DST and D+TLIF for spondylolisthesis with spinal stenosis offer comparable 24-month clinical outcomes with similar safety profiles, and superior outcomes in the spondyloplasty group in the per-protocol population. The spondyloplasty procedure represents a promising, motion-preserving, minimally invasive alternative to lumbar fusion for patients with symptomatic spondylolisthesis.

TITLE: EVOLUTION OF SPINE CARE TO THE AMBULATORY SURGERY CENTER: SAFETY, EFFICACY, AND OUTCOMES

AUTHORS: Holland C, Monk S, Hani U, Pfortmiller D, Bohl M, Smith M, Kim P, Adamson T, McGirt M

Presenter: Christopher M. Holland, MD, PhD

INTRODUCTION: Ambulatory surgery centers (ASCs) are increasingly utilized for spine surgery to reduce healthcare costs. Cervical and lumbar decompression have transitioned to ASCs with fusion procedures slowly becoming more common. Our center has conducted high-quality studies demonstrating the safety and cost-effectiveness of these procedures in the ASC environment.

METHODS: Retrospective analyses of patients prospectively enrolled in the Quality Outcomes Database who underwent surgical intervention at a single ASC were analyzed. For comparative analysis, inpatient procedures were queried for centers where inpatient procedures are standard of care. Surgical procedures included anterior cervical discectomy and fusion (ACDF), posterior cervical foraminotomy (PCF), microscopic lumbar discectomy (MLD), and minimally-invasive transforaminal lumbar interbody fusion (MIS-TLIF). Comparative cost-effectiveness analyses were performed.

RESULTS: In 2000 patients who underwent 1-3 level ACDF in the ASC, only 0.5% required inpatient transfer, 0.3% 30-day reoperation, and 1.9% readmission. In our study reporting the safety of PCF in 1106 patients in the ASC, there were no intraoperative or postoperative complications, low 30-day readmission (0.81%) and reoperation (0.36%) rates. Cost-utility analyses of 6500 ACDF, 3196 MLD, and 775 MIS-TLIF patients found no significant differences in complications or patient-reported outcomes between ASC and inpatient settings. Ambulatory ACDF, MLD, and MIS-TLIF was associated with significantly lower total costs and the incremental cost-effectiveness ratios (ICERs) were deemed unacceptably poor for all procedures in the inpatient setting.

CONCLUSION: ACDF, PCF, MLD and MIS-TLIF can be performed in a freestanding ASC with low to negligible rates of perioperative complications, similar reoperation and readmission rates, and at exceedingly lower costs.

TITLE: POSTOPERATIVE CORONAL MALALIGNMENT AFTER ADULT SPINAL DEFORMITY SURGERY: INCIDENCE, RISK FACTORS, AND IMPACT ON 2-YEAR OUTCOMES

AUTHORS: Zuckerman S; Lai C; Shen Y; Lee N; Kerolus M; Ha A; Buchanan I; Leung E; Cerpa M; Lehman R; Lenke L.

Presenter: Mena Kerolus, MD

INTRODUCTION: We seek to evaluate the incidence, risk factors, and patient-reported outcomes (PROs) of adult spinal deformity (ASD) patients with postoperative coronal malalignment.

METHODS: A single-institution, retrospective cohort study of ASD patients undergoing ≥ 6 level fusions from 2015 to 2019 was undertaken. The primary outcome was postoperative coronal malalignment, defined as C7-coronal vertical axis (CVA) > 3 cm. Secondary outcomes included: complications, readmissions, reoperations, and 2-year PROs.

RESULTS: A total of 243 ASD patients undergoing spinal surgery had preoperative and immediate postoperative measurements, and 174 patients (72%) had 2-year follow-up. Mean age was 49.3 ± 18.3yrs and mean instrumented levels was 13.5 ± 3.9. Mean preoperative CVA was 2.9 ± 2.7 cm, and 90 (37%) had preoperative coronal malalignment. Postoperative coronal malalignment occurred in 43 (18%) patients. Significant risk factors for postoperative coronal malalignment were: preoperative CVA (OR 1.21, $p = 0.001$), preoperative sagittal vertical axis (SVA) (OR 1.05, $p = 0.046$), pelvic obliquity (OR 1.21; $p = 0.008$), Qiu B vs. A (OR 4.17; $p = 0.003$), Qiu C vs. A (OR 7.39; $p < 0.001$), lumbosacral fractional (LSF) curve (OR 2.31; $p = 0.021$), max Cobb angle concavity opposite the CVA (OR 2.10; $p = 0.033$), and operative time (OR 1.16; $p = 0.045$). Postoperative coronal malalignment patients were more likely to sustain a major complication (31% vs. 14%; $p = 0.01$), yet no differences were seen in readmissions ($p = 0.72$) or reoperations ($p = 0.98$). No significant differences were seen in 2-year PROs ($p > 0.05$).

CONCLUSION: Postoperative coronal malalignment occurred in 18% of ASD patients and was most associated with preoperative CVA/SVA, pelvic obliquity, Qiu B/C curves, LSF curve concavity to the same side as the CVA, and maximum Cobb angle concavity opposite side of the CVA. Postoperative coronal malalignment was significantly associated with increased complications but not readmission, reoperation, or 2-year PROs.

GENERAL SCIENTIFIC SESSION III

Privademic and Private Practice

WEDNESDAY JUNE 25, 2025

6:30-7:30 am Breakfast

7:30 am Announcements

7:30-8:15 am PANEL III: Resilience in the Face of Current Challenges: Privademic and Private Practice
Moderator: *Jay Howington*
Panelists: *Jack Moriarity, Ciara Harraher, Jay Howington, Moustapha Abou-Samra, Alan Villavicencio, Robert Heary*

8:15-9:15 am Scientific Session V – Abstracts (Functional and Trauma)
Moderators: Lisa Mulligan, Jennifer Hong

8:15-8:21 am The Structure of Cerebral Microneural Circuitry
Stephen Dell, MD, Exam Works, CA

8:21-8:27 am Optimizing DBS for Refractory Epilepsy
Robert McGovern, MD, University of Minnesota, MN

8:27-8:33 am Connectivity Patterns in High Frequency Ultrasound Lesioned Tissue for Treatment of Tremor Using MNI-Template Deterministic Tractography: Analysis of Outcomes and Side Effects
Christopher Miller, MD, University of Kansas School of Medicine, KS

8:33-8:39 am A Modular Brain Computer Interface System of Wireless, Fully Implanted, Mechanically Flexible, High-Channel-Count Subdural and Depth Brain Electrode Arrays
Brett Youngerman, MD, Columbia University, NY

8:39-8:45 am Neurosurgery for Non-Neurosurgeons: A Necessity or Unwarranted
Paramita Das, MD, University of Chicago, IL

8:45-8:51 am Do It Yourself Solar Panels and Battery – Analogies to Skull Base Surgery
John Lee, MD, University of Pennsylvania, PA

8:51-8:57 am Real-Time Computer Vision System for Automated Surgical Instrument Detection and Management
Peter Morone, MD, Vanderbilt University Medical Center, TN

8:57-9:03 am Implementation of a Virtual Curriculum for Medical Students Completing Clinical Rotations in Neurosurgery
Debraj Mukherjee, MD, Johns Hopkins University School of Medicine, MD

9:03-9:09 am The Use of Virtual, Augmented and Mixed Reality, Artificial Intelligence, and 3-Dimensional Printing in Neurosurgical Education and Training: A Systematic Review of Literature
Piiamaria Virtanen, MD, Indiana University School of Medicine, IN

9:09-9:15 am Moving Practice Beyond Guidelines: Or, What Happens When Evidence Meets Critical Thinking
Patricia Raksin, MD, John H. Stroger Jr Hospital of Cook County, IL

9:15-9:25 am Discussion

9:25-9:55 am Guest Speaker: Katie Orrico, JD
CEO of the American Association of Neurological Surgeons (AANS)

9:55-10:10 am Discussion

10:10-10:30 am Beverage Break

10:30-11:26 am Scientific Session VI – Abstracts (Spine)
Moderators: Trent Tredway, John Atkinson

10:30-10:36 am Establishing the Viability of Robot-Navigated Sacroiliac Joint Fusion as a Salvage Surgery for Previous Lumbopelvic Fixation Failure in Adult Spinal Deformity Surgery
Khoi Than, MD, Durham University Medical Center, NC

10:36-10:42 am Effect on Length of Stay for Elective Spine Patients over age 65 when a Nine-Factor Sociomedical Checklist is Applied by the Surgical Team (Surgeon/APPs/Social Work) Pre-operatively: Ten Month Outcomes Compared to Historical Control
Diana Wiseman, MD, MBA, University of Washington, WA

10:42-10:48 am	Weight Loss Following Treatment with Glucagon-like Peptide-1 (GLP-1) Receptor Agonists Significantly Decreases Bone Mineral Density in the Spine as Measured by CT-Based Hounsfield Units *Benjamin Elder, MD, PhD, Mayo Clinic, Rochester MN*
10:48-10:54 am	Effect of Gender on Patient-Reported Outcomes and Satisfaction after Surgery for Grade-2 Spondylolisthesis Patients *Kai-ming Fu, MD, Cornell University, NY*
10:54-11:02 am	Quantitative Procedural Performance Analysis of Direct Augmented Reality Guidance in a Routine Spine Procedure *Miles Hudson, MD, Mayo Clinic, AZ*
11:02-11:08 am	Vertebral Cement Augmentation is Associated with Reduced Rates of Proximal Junctional Failure in Adult Spinal Deformity Surgery: A Systematic Review and Meta-analysis of 1,211 Patients *Srinivas Prasad, MD, Thomas Jefferson University & Jefferson Hospital for Neuroscience, PA*
11:08-11:14 am	Transforaminal Endoscopic Decompression of L5-S1 can be Safely Performed with Neuro-navigation in Select Patients *Joshua Baksheshian, MD, Mayo Clinic, AZ*
11:14-11:20 am	Comparing MIS Decompression Alone versus MIS TLIF for Degenerative Lumbar Spondylolisthesis: 5-year Results from the Quality Outcomes Database *Andrew Chan, MD, Columbia University, NY*
11:20-11:26 am	Impact of Patient Obesity on Healthcare Resource Utilization after Anterior or Posterior Fusion for Cervical Spondylotic Myelopathy *Luis Kolb, MD, Yale University School of Medicine, CT*
11:26-11:40 am	Discussion
11:40 am	**Closing Remarks** *Guy McKhann, MD, President, NSA*

TITLE: THE STRUCTURE OF CEREBRAL MICRONEURAL CIRCUITRY

AUTHORS: Dell, S.

Presenter: Stephen Dell

INTRODUCTION: Description and analysis of mammalian cortical network micro-structure has been mainly in localization rather than process. Cellular elements and their relevant molecular structures and actions (transmitter substances, enzymes, etc.) remain poorly understood.

Traditional models for scientific mechanisms (epistemology and heuristics) are founded largely upon forces and fields and cognate areas of physical chemistry, whose underlying mathematics has been deterministic analysis: calculus, algebra, geometry and statistics. These macroscopic methods suit less well elemental or microscopic biological phenomena. Except in rare, highly determined instances, the Newtonian paradigm – precise data description yielding global predictive equations – poorly describes specific biological or neurophysiological phenomena. Hence less-determined structures and functions have been developed, reoptimizing paradigms according to changing circumstances.

METHODS: Artificial (AI) has powerfully implemented understanding thought-like functions through a version of neural networks. Beginning from simple, almost random initial conditions with few generalized transfer and interaction functions, coupled to an assigned goal and metric for its approach, enables (a) prediction, (b) comparison of intermediate states, (c) some form of stochastic regression and (d) path correction (steps iterated indefinitely). There is no ruling 'deterministic' systemic equation. The mechanism created thereby is impossible to predict uniquely or to repetitively employ identically.

RESULTS: Applications of any larger neural network are therefore non-unique. The *stability* of neural functioning is a by-product of the ability to follow the process repetitively to a desired end, itself modifiable in its elements and processes (actions). Examples are given.

CONCLUSION: Computer cognition demonstrates what is achievable with employing weakly-predictive non-deterministic mathematics. Similarly, biological neural networks are robust and reliable. A tentative conclusion is to analyze cortical networks on this basis.

TITLE: OPTIMIZING DBS FOR REFRACTORY EPILEPSY

AUTHORS: Sanger Z, Lisko T, Netoff T, McGovern R

Presenter: Robert McGovern, MD

INTRODUCTION: Deep brain stimulation (DBS) is an effective treatment for refractory epilepsy but few patients ever become seizure-free. No current biomarkers for DBS efficacy exist, nor does any real rationale for setting DBS parameters except for those used in the SANTE trial. As a result, clinicians have no guidance as to its potential efficacy when programming DBS. We hypothesized that DBS could be optimized by recording thalamic local field potentials (LFPs) and adjusting settings to minimize broadband thalamic activity

METHODS: Eight patients with Medtronic Percept PC ANT-DBS implants underwent in-clinic streaming and at-home LFP recordings over 1-2 years. In-clinic baseline (stimulation OFF) and stimulation ON bilateral ANT LFPs were measured (fs=250Hz) at 9 different settings centered on the SANTE trial setting (145 Hz, 90 us) across multiple visits. At-home recordings are limited to 10 min averaged LFP power in a 5 Hz wide band.

RESULTS: DBS responders show low gamma oscillatory (30-45 Hz) peak that can be suppressed with acute stimulation in clinic, regardless of the specific settings chosen. Larger values of baseline gamma power correlated with gamma suppression during stimulation. Over 1-2 years, this low gamma peak gradually disappears, even during baseline testing with stimulation off. Non-responders either showed peaks in other regions that were not changed during stimulation or no peaks at all in their PSD plots.

CONCLUSION: Low gamma may represent a biomarker of both acute and long term DBS efficacy and should be investigated in future studies.

TITLE: CONNECTIVITY PATTERNS IN HIGH FREQUENCY ULTRASOUND LESIONED TISSUE FOR TREATMENT OF TREMOR USING MNI-TEMPLATE DETERMINISTIC TRACTOGRAPHY: ANALYSIS OF OUTCOMES AND SIDE EFFECTS.

AUTHORS: Yekzaman B; Miller C

Presenter: Christopher Miller, MD

INTRODUCTION: High Frequency Ultrasound (HiFU) targeting the Thalamus (Vim) provides significant tremor relief in the contralateral hand. Early side effects involve paresthesia, gait imbalance, and speech disturbance. Deterministic tractography extrapolates white matter tracts (WMT) which can be used to demonstrate the cortico-thalamic connections. This study utilizes MNI-template deterministic tractography to characterize HiFU lesions with regard to their WMT cortical endpoints to better understand outcomes and early side effects.

METHODS: A retrospective chart review was performed on 38 consecutive patients with immediate post procedure T2-weighted MRI imaging and documented tremor scores. Gait, paresthesia, and speech side effects were also collected. Image processing pipeline included: linear registration to MNI space, 2-step non-linear registration to MNI space with subcortical warp, and segmentation of HiFU lesions. Segmentations were imported into DSI Studio2® to generate WMTs and cortical endpoints. Comparison groups were made for tremor response and side effects.

RESULTS: 20/38 patients achieved >50% improvement on tremor scores at 3 months. Patients reported gait, paresthesia, and speech side effects in 27/38, 10/38, and 6/38 respectively. Cortical endpoints for patients with good tremor relief demonstrated tight clusters in the ipsilateral precentral gyrus. Patients with gait side effects demonstrated endpoints in the ipsilateral superior parietal lobule, traceable to lesion spread to the internal capsule. Speech and paresthesia side effects did not demonstrate discriminable patterns.

CONCLUSION: Ablated tissue in patients with good tremor control revealed focused connections to the precentral gyrus. Gait side effects may be related to lesion spread to the internal capsule.

TITLE: A MODULAR BRAIN COMPUTER INTERFACE SYSTEM OF WIRELESS, FULLY IMPLANTED, MECHANICALLY FLEXIBLE, HIGH-CHANNEL-COUNT SUBDURAL AND DEPTH BRAIN ELECTRODE ARRAYS

AUTHORS: Youngerman B, Jung T, Zeng N, Karatum O, Huq R, Gonzales I, Spinazzi E, Upadhyayula P, Canoll P, Cotton RJ, Schevon C, Shepard K

Presenter: Brett E. Youngerman, MD, MS

INTRODUCTION: Current brain computer interface (BCI) technologies suffer from tradeoffs between electrode density, ability to sample broad networks, and limitations on wireless data transmission and power. We developed a modular BCI system of fully implanted, wireless, high-channel-count intracranial electrode arrays.

METHODS: In the Bioelectronic Interface System to the Cortex (BISC), a custom integrated circuit thinned to less than 20µm supports high-channel-count recording and stimulation with wireless power and high-throughput telemetry though a wearable relay station. Flexible, customizable polyimide extender depth or surface arrays are bonded to each implanted circuit with support for up to 1,024 channels per implant. We performed initial feasibility and safety testing in a porcine model.

RESULTS: Thin-film subdural arrays were implanted over the sensorimotor cortex and depth electrodes from sensory cortex to thalamus in 4 animals. Somatosensory evoked potentials (SSEPs) were recorded during peripheral stimulation after complete wound closure in multiple sessions up to 14-weeks after implant with no signal degradation. For subdural arrays, mapping resulted in clearly separable clusters between peripheral stimulation sites. Decoding performance was quantified using a linear discriminant classification model that resulted in accuracy of 0.96. Depth electrodes recorded SSEPs maximal in the cortex. Duplex recording and micro-stimulation at a single site yielded large-scale network activity across the array, with an excitatory phase followed by inhibition before a return to baseline. Histopathology revealed mild microgliosis.

CONCLUSION: A modular BCI system consisting of a fully implanted custom integrated circuit, customizable polyimide extender arrays, and wireless external power and telemetry can support multi-regional high-resolution recording and micro-stimulation.

TITLE: NEUROSURGERY FOR NON-NEUROSURGEONS: A NECESSITY OR UNWARRANTED

AUTHORS: Das P, Rowell S, Mansour A, Goldenberg F.

Presenter: Paramita Das, MD

INTRODUCTION: Severe traumatic brain injury is a leading cause of death on the battlefield. Despite high mortality rates, in recent conflicts deployed neurosurgical capability has improved survival in casualties with TBI. Data from the DOD has demonstrated that mortality is decreased in severe combat related brain injury is lower when craniectomy is initiated within 5 hours of injury. Unfortunately, it is anticipated that evacuation to a location with neurosurgical capability will become increasingly challenging in large-scale combat operations (LSCO) against a near peer enemy due to loss of air superiority. As a result, casualty care in Role 2 settings will be prolonged, forcing more advanced neurosurgical care farther forward. Neurosurgeons in the military are a scarce resource and never found in a role 2 setting. We propose an education plan for general surgeons for them to provide basic neurosurgical and post-op care until evacuation to higher level of care is available. We hope to demonstrate that military general surgeons can become competent to perform emergency procedures. As neurosurgeons we know the decision on when to perform a procedure is so complex that it can take years of experience, is training a non-neurosurgeon ethical?

METHODS: The education plan is multifaceted involving virtual reality simulation, classroom didactics, cadaveric dissection, and hands on patient experience in a level 1 trauma center. The enrolled general surgeons are part of the military civilian partnership. The evaluation of these surgeons will involve their scores on simulator training, subjective responses on surveys, and also scores on a scale developed to measure adequate procedural skill acquisition.

RESULTS: Our current military partners are just beginning our program. We have begun the curriculum development and have a timeline to complete our project to create a program to prepare soon to deploy providers in neurosurgical and neurocritical care. The purpose of the discussion is rather to bring up whether this training is one which is beneficial and if there is a role at all for non-neurosurgeons. Discussion points will include how resource intensive these cases can be in a resource limited situation, is there any role for decompression without head CT, how can one manage complications with limited experience?

CONCLUSION: Training for non-neurosurgeons is about having deployable general surgeons be comfortable performing life-saving procedures. There may be limited situations where these skills need to be used. Although the non-neurosurgeon would not be doing interventions of this type in a civilian setting in a role 2 setting it may be an option which otherwise would not be present.

TITLE: DO IT YOURSELF SOLAR PANELS AND BATTERY – ANALOGIES TO SKULL BASE SURGERY

AUTHOR: Lee J

Presenter: John Y.K. Lee, MD, MSCE

INTRODUCTION: The author describes his recent journey into the world of do it yourself (DIY) solar panel installation on his own house as well as DIY battery installation/microgrid creation. Apprentice electrical work provides insight into the many similarities with neurosurgery technique and decision-making.

METHODS: In this case study, the author will describe his own experience -- from the first hole drilled into a perfectly functional and dry roof to the terrors of 500 volt direct current voltage wire connections, and then finally to the interconnection with the grid and installation of the net meter. At each step, analogies will be made to the exquisite craftsmanship of performing skull base surgery.

RESULTS: DIY solar panel installation by an apprentice/journeyman electrician is similar to watching a PGY-2 resident turn their first craniotomy. Each decision requires methodical, thoughtful attention to detail. In contrast, wiring high voltages with risks of arc-flash can result in personal injury and self-immolation, but neurosurgical misadventure renders the patient impaired but the surgeon physically but not necessarily emotionally or professionally unmolested. Skilled craftsmen refine technique over decades and similarly each repetitive attachment of 55 total solar panels results in a modest modicum of mastery.

CONCLUSION: Neurosurgeons and Electricians are fortunate to provide a valuable service to their patients or to their customers. We are fortunate to be able to learn and improve with practice and thoughtful self-reflection.

TITLE: REAL-TIME COMPUTER VISION SYSTEM FOR AUTOMATED SURGICAL INSTRUMENT DETECTION AND MANAGEMENT

AUTHORS: Morone P, Ayberk A, Wu JY.

Presenter: Peter Morone, MD, MSCI

INTRODUCTION: Surgical instrument management is essential for ensuring patient safety and procedural efficiency. Current manual processes in the Sterile Processing Department (SPD) and operating room (OR) are prone to errors, leading to incomplete or incorrect surgical trays, misplaced instruments, and increased operational costs. These challenges necessitate an automated solution to improve accuracy and efficiency.

METHODS: A computer vision-based system was developed to detect and track surgical instruments in real-time. The system utilized a dataset of 300 annotated images representing 20 unique surgical instruments under diverse conditions. Annotation was performed using the Computer Vision Annotation Tool, ensuring consistent labeling with bounding boxes and occlusion considerations. The trained model, based on YOLOv9, was deployed using an adjustable camera and a local processing unit for integration into existing workflows without modifying instruments or workspace configurations.

RESULTS: The model achieved an overall mean average precision (mAP) of 96.9%, with 18 out of 20 instruments exceeding a mAP of 0.99. Two nearly identical instruments demonstrated lower recall values of 0.631 and 0.615, respectively, indicating challenges in detecting these tools in the intended use scenario. Despite these limitations, the system accurately identified overlapping instruments and performed well in real-time evaluations.

CONCLUSION: This novel system offers a transformative approach to surgical instrument management, addressing critical inefficiencies in SPD and OR workflows. By improving instrument tracking and tray assembly, it has the potential to reduce costs, enhance workflow efficiency, and ultimately improve patient outcomes. Future efforts will focus on enhancing detection accuracy and expanding the system's capabilities.

TITLE: IMPLEMENTATION OF A VIRTUAL CURRICULUM FOR MEDICAL STUDENTS COMPLETING CLINICAL ROTATIONS IN NEUROSURGERY

AUTHORS: Parker M; Mynen, S; Judy B; Hersh A; Patel J; Ahmed A; Azad T; Dardick J; Xia Y; Xu R; Lubelski D; Groves M; Witham T; Huang T; Brem H; Mukherjee D

Presenter: Debraj Mukherjee, MD, MPH

INTRODUCTION: Medical student education currently lacks standardized exposure to core topics prior to neurosurgical clinical rotations. We assessed the impact of a virtual lecture series upon students' competency during clinical neurosurgical rotations.

METHODS: Neurosurgery residents (PGY3-6) prepared ~15 minute virtual lectures on management of brain tumors, subarachnoid hemorrhage, cauda equina, and intracranial hypertension. Clerkship students and sub-interns were randomized to either receive or not the virtual lectures.

Electronic pre-/post-rotation surveys assessed preparedness and operative skills, knowledge, interest, and perceptions of neurosurgery via 5-point Likert scale, compared with Wilcoxon matched-pair rank tests.

RESULTS: Of 44 respondents (mean 27 years old, 75% male), 25 received the intervention; 19 did not. Propensity-score matching was performed by educational year.

Overall, the intervention cohort demonstrated improved preparedness (median scores: 9/20 pre- vs. 13/20 post-rotation, p=0.007) and understanding of neurosurgical concepts (10/20 vs. 12/20, p=0.005), while interest and perception remained unchanged. Within the intervention cohort, sub-interns demonstrated improved preparedness (p=0.041) and manual dexterity (p=0.046), while clerks did not improve in these areas.

Both intervention and control cohorts reported improved knot tying after the rotation. Aside from this skill, the control group did not report significant gains in other operative skills or in understanding concepts covered in lectures. All lecture recipients felt the series improved rotation readiness; 56% of non-lecture students expressed a desire for virtual didactics.

CONCLUSION: A virtual lecture series effectively improved students' perceived preparedness for neurosurgical rotations and understanding of neurosurgical concepts. Future efforts to develop standardized curriculum may improve students' knowledge and comfort in early neurosurgical education.

TITLE: THE USE OF VIRTUAL, AUGMENTED AND MIXED REALITY, ARTIFICIAL INTELLIGENCE, AND 3-DIMENSIONAL PRINTING IN NEUROSURGICAL EDUCATION AND TRAINING: A SYSTEMATIC REVIEW OF THE LITERATURE

AUTHORS: Virtanen P; Chintala A; Line T; Laing J; Burket N; Shah M; Pease M; Richardson A

Presenter: Piiramaria Virtanen, MD

INTRODUCTION: Recent advances in virtual reality (VR), augmented reality (AR), mixed reality (MR), 3-dimensional (3D) printing, and artificial intelligence (AI) are revolutionizing the field of medicine, including neurosurgery. There is paucity of recent comprehensive reviews exploring these technologies in neurosurgical training. Herein, we present a systematic review of the literature on the application of these advanced technologies and examine the state-of-the-art and their vast prospects in neurosurgical education and training.

METHODS: A systematic literature review was conducted using electronic databases including PubMed, Ovid MEDLINE, Embase, Scopus, PsycINFO, and Web of Science to identify publications on utilization of VR, AR, MR, AI, and 3D printing in neurosurgical education. This was done in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The search included articles published through the end of January 2025. Authors review data on the type of technology used, study design, setting and population, training purpose, key findings, outcome measures, limitations, and discussions about future directions.

RESULTS: Articles found discuss applications ranging from 3-D training models in cerebrovascular neurosurgery, skills analysis by machine learning models, VR, AR and MR platforms for teaching anatomically complex approaches to skull base tumors and lateral access spine surgery, and haptic training simulation models for endoscopic endonasal surgery and simple procedures such as ventriculostomy.

CONCLUSION: In the thrilling era of technological advancement and novel surgical training platforms, this systematic review provides a thorough understanding of the current use and the immense potential of VR, AR, MR, AI and 3D-printing in neurosurgical education and training.

TITLE: MOVING PRACTICE BEYOND GUIDELINES: OR, WHAT HAPPENS WHEN EVIDENCE MEETS CRITICAL THINKING

AUTHORS: Raksin P.

Presenter: Patricia Raksin, MD

INTRODUCTION: In this era of heightened accountability – medicolegal, financial, and regulatory – much emphasis has been placed on adherence to guidelines as a tenet of "good" practice. At their best, guidelines improve efficiency, enhance delivery of healthcare, promote transparency, and contribute to better outcomes. However, they are also inherently restrictive – limited by the quality of the evidence that provides the basis for the recommendations contained therein. This is why we sometimes struggle in translating that evidence into something that is practicable at bedside.

METHODS: A critical examination of NAM best practices for guideline development will illustrate the shortcomings of the process and how this impacts the usability and applicability of the final product. Clinical examples will emphasize the need to integrate best available evidence with other external factors.

RESULTS: The author posits a paradigm shift to a post-guidelines state in which practice is *informed* by rather than *based* in evidence. The adoption of increasing rigorous evidence grading models paradoxically precludes arriving at a recommendation that is both reliable and useable. The post-guidelines practitioner must be a critical thinker – able to analyze the best available evidence, while complementing that data with clinical expertise, experience, and judgment, as well as a critical assessment of the intersection with other external factors such as patient values, risks and harms, and applicability across populations and practice settings.

CONCLUSION: Best practice in guidelines development dictates analysis of the best available evidence, weighed against relevant external factors, whereas effective clinical practice demands consideration of guidelines in a broader context.

TITLE: ESTABLISHING THE VIABILITY OF ROBOT-NAVIGATED SACROILIAC JOINT FUSION AS A SALVAGE SURGERY FOR PREVIOUS LUMBOPELVIC FIXATION FAILURE IN ADULT SPINAL DEFORMITY SURGERY

AUTHORS: Sharma A, Than K

Presenter: Khoi Than, MD

INTRODUCTION: Lumbopelvic fixation failure (LFF) remains prevalent in patients undergoing adult spinal deformity surgery, with failure rates ranging from 23.74-34.3%. Current revision surgeries are invasive and morbid, often requiring extensive incisions and long recovery times. Sacroiliac joint fusions (SIJF) demonstrate promise as a salvage procedure for LFF. Here, we aim to establish the viability of robot-navigated SIJF as a salvage surgery for LFF.

METHODS: This retrospective case series of a single surgeon from January 2022 to December 2024 were reviewed for patients who (1) underwent previous spinal fusion with posterior instrumentation and lumbopelvic fixation for adult spinal deformity, (2) evidence of instrumentation failure requiring revision surgery, and (3) subsequent salvage surgery with robot-navigated SIJF. Preoperative demographic, perioperative, and postoperative outcomes variables were collected. Data were analyzed using respective parametric models and linear regressions as appropriate.

RESULTS: 5 patients (average age 70.4 ± 12.8 years) met inclusion criteria. Perioperative metrics showed a mean length of surgery of 44.4 ± 9.4 min and estimated blood loss of 7.0 ± 5.6 ml. Average total length of patient stay was 356.8 ± 96.4 min. Self-reported percent pain improvement at 1.5 months follow-up was 60.0 ± 36.7% ($p = .011$, $d = 1.63$). Percent pain improvement at latest follow-up was 83.4 ± 14% ($p = .0001$, $d = 5.66$). No complications, 30-day readmissions, or 90-day readmissions occurred.

CONCLUSION: Robot-navigated SIJF offers a viable minimally invasive method for revision surgeries in instances of LFF. Further randomized prospective studies and assessments in long-term fusion rates are needed.

TITLE: EFFECT ON LENGTH OF STAY FOR ELECTIVE SPINE PATIENTS OVER AGE 65 WHEN A NINE-FACTOR SOCIOMEDICAL CHECKLIST IS APPLIED BY THE SURGICAL TEAM (SURGEON/APPS/SOCIAL WORK) PRE-OPERATIVELY: TEN MONTH OUTCOMES COMPARED TO HISTORICAL CONTROL

AUTHOR: Nistal D, Ingvalson J, Ravanpay A, Wiseman D

Presenter: Diana Wiseman, MD

INTRODUCTION: Over 45% of elective neurosurgery spine cases at Harborview Medical Center (HMC) exceed geometric length of stay (GMLOS). Nine factors were found to be associated with prolonged LOS. Traditional outpatient social work workflow faces incomplete information regarding outcomes and patient risks, limiting the impact for patient and team. We hypothesized that a new pre-operative workflow using an integrated team model to address these nine factors would reduce LOS.

METHODS: All elective Neurosurgery spine patients >65-years at HMC underwent pre-operative review of 9 factors associated with prolonged LOS. Factors that identified deficiencies were optimized pre-surgery. Post-discharge, patients who exceeded GMLOS were reviewed for causes related to the nine factors. Percentage of patients within this cohort that went over GMLOS was compared to a similar age-matched cohort from the Vizient database for the preceding 10-months.

RESULTS: Forty-eight patients >65-years underwent spine surgery during the study period. A total of 32/48 (67%) participants had a GMLOS>0.5 days compared with 54/89 (61%) in the Vizient cohort (p=0.49, Chi-squared test). The most common factor resulting in extended LOS was adequate pain control. Multiple failures in coding and documentation of comorbidities caused GMLOS estimates to inaccurately reflect the complexity of the patient. Inpatient providers demonstrated difficulty altering their workflow to review outpatient efforts.

CONCLUSIONS: Implementation of a pre-operative multi-disciplinary team and medical-social checklist for spine patients >65-years did not impact LOS versus historical control. Next steps currently in progress include: create an EMR tool to relay outpatient efforts to the inpatient team with no “clicks” required; expand acute pain service involvement with patients pre-operatively; improve coding and documentation training.

TITLE: WEIGHT LOSS FOLLOWING TREATMENT WITH GLUCAGON-LIKE PEPTIDE-1 (GLP-1) RECEPTOR AGONISTS SIGNIFICANTLY DECREASES BONE MINERAL DENSITY IN THE SPINE AS MEASURED BY CT-BASED HOUNSFIELD UNITS

AUTHORS: Martini ML, Hamouda A, Pennington Z, Rechberger J, Perez J, Flanigan P, Mikula AL, Lakomkin N, Astudillo-Potes M, Sebastian A, Freedman B, Nassr A, Fogelson J, Kennel K, and Elder BD.

Presenter: Benjamin Elder, MD/PhD

INTRODUCTION: Proximal junctional kyphosis is a common complication of thoracolumbar fusion and both bone 3 quality and paraspinal muscle sarcopenia have been posited as risk factors. The present study 4 aims to assess the relative contribution of each of these factors to PJK risk.

METHODS: Patients treated with any GLP-1 agonist for >3 months were retrospectively reviewed. Patient body weight (BW), BMI, and HU measurements at L1 were measured pre- and post- GLP-1 therapy. Patients were grouped by weight loss during GLP-1 therapy. One-way ANOVA compared mean changes in spinal HUs between each group.

RESULTS: 102 patients achieved a mean BW loss of 14.5±2.5 kg over 15.9±1.2 months of GLP-1 therapy. Of these, 7 patients (6.9%) lost >20% BW (mean L1 HU loss 36.3±7.1; p=0.011), 14 (13.7%) lost 15-20% BW (mean HU loss 18.2±8.3; p=0.038), 14 (13.7%) lost 10-15% BW (mean HU loss 12.2±5.1; p=0.036), 24 (23.5%) lost 5-10% BW (mean HU loss 15.7±3.2; p<0.0001), 26 (25.5%) lost <5% BW (mean HU loss 14.7±6.3; p=0.022), and 17 (16.7%) gained BW during GLP-1 therapy (mean HU loss 6.3±5.0; p=0.227). One-way ANOVA testing did not show a significant difference in HU loss across the cohorts (F=1.12; p=0.355). Finally, there was a significant correlation between L1 HU loss and GLP-1 therapy duration (r=-0.38; p=0.0001), but not weight loss (r=-0.18; p=0.070).

CONCLUSION: Despite similar pre-treatment BW and therapy durations, all weight loss cohorts experienced significant declines in vertebral HUs following GLP-1 use. This suggests that GLP-1 treatment (1.5 years) may significantly diminish spinal BMD regardless of the degree of weight loss achieved, with preferential effects on lean body mass loss.

TITLE: EFFECT OF GENDER ON PATIENT-REPORTED OUTCOMES AND SATISFACTION AFTER SURGERY FOR GRADE-2 SPONDYLOLISTHESIS PATIENTS

AUTHOR: Fu K, MD

Presenter: Kai-ming Fu, MD

INTRODUCTION: Hypothesis: In our prior QOD analysis of patients with grade 1 spondylolisthesis, female gender was associated with better outcomes than male gender. It is unknown if gender affects the patient reported outcomes (PRO's) and satisfaction after surgery for grade 2 spondylolisthesis patients (who have a higher rate of fusions than those with grade 1 spondylolisthesis).

It remains unknown how gender affects patient-reported outcomes in patients undergoing surgery for lumbar grade 2 spondylolisthesis.

METHODS: The prospectively collected Quality Outcomes Database was queried for patients treated surgically for grade 2 spondylolisthesis. Propensity-score matching (1:1) was utilized to create male and female cohorts that were well matched on PROs including Oswestry Disability Index (ODI) and the Numeric Rating Scale (NRS) for back and leg pain were administered. Propensity score matching (1:1) was performed to match male and female cohorts on baseline EQ5D, NRS back and leg pain, and ODI. Univariate and multivariate analyses were performed.

RESULTS: In total 400 (276 females – 69%) patients with grade 2 spondylolisthesis were identified. After propensity matching, the final study cohort included 262 patients (131 male matched to 131 female patients) with no significant baseline differences in age, BMI, ASA grade, EQ5D, NRS back/leg pain, and ODI ($p>0.05$). While well matched, the female cohort had higher levels of depression (24.2% vs 6.5%, $p<0.001$) and osteoporosis (8.9% vs 2.4%, $p=0.03$). In addition, immediately after surgery, female patients had lower rates of home (79.0% vs 91.1%, $p=0.002$) vs non-home discharge. However, at 3-, 12-, and 24-months postoperatively, there were no significant differences between the cohorts in measured PROs. Separate multivariate linear regression models for each PRO corroborated that gender was not associated with 24-month postoperative PROs.

CONCLUSION: In this propensity-matched study, is no difference in 24-month PROs between men and women undergoing surgery for grade 2 lumbar spondylolisthesis. Interestingly we did not observe an association between female gender and patient satisfaction as seen in grade 1 lumbar spondylolisthesis.

TITLE: QUANTITATIVE PROCEDURAL PERFORMANCE ANALYSIS OF DIRECT AUGMENTED REALITY GUIDANCE IN A ROUTINE SPINE PROCEDURE

AUTHORS: Hudson M, Royster E, Olson V, Singleton K, Swanson K, Krishna C, McClendon J, Bendok BR, Parker J

Presenter: Miles Hudson, MD

INTRODUCTION: Augmented reality (AR) enhances our native visual perception, allowing an individual to experience computerized information as a real time overlay in their natural visual field. Adapting this technology to neurosurgery offers a unique opportunity for enhancing surgical precision and accuracy. This study experimentally investigates the effects of direct AR guidance on a routine spinal procedure.

METHODS: A cohort of neurosurgeons (residents PGY-1/4/7 and attendings) performed 1/3rd medial facetectomies on a 3D-printed lumbar spine model of a patient with spondylosis, aiming for exactly 33% resection. Participants conducted the procedure without guidance and later with an AR guide. The guide, designed by a 3 attending committee, overlaid an idealized 33% resection onto the surgical field. Analysis was performed, including DICE measuring adherence to the guide.

RESULTS: The cohort mean drilled volume without guidance was 15.9% compared to 22.6% with AR ($P<0.001$). AR significantly improved surgical targeting in both resident and attending cohorts ($P<0.05$). With the average improvement in the resident group being 30% and the attending group being 14.6%. 3D heat map analysis demonstrated a 6% improvement in the homogeneity of bone removal in areas completed by at least 83% of participants ($P<0.05$). The mean cohort DICE coefficient was 0.6.

CONCLUSION: AR guidance significantly enhanced surgical accuracy in achieving a true 1/3rd mesial facetectomy, resulting in a 20% improvement in volumetric outcomes. Notably, residents exhibited the greatest improvement, highlighting AR's potential value in teaching. Overall, findings suggest that AR guidance can enhance surgical performance and improve the consistency of outcomes in routine non-instrumented spine procedures.

TITLE: VERTEBRAL CEMENT AUGMENTATION IS ASSOCIATED WITH REDUCED RATES OF PROXIMAL JUNCTIONAL FAILURE IN ADULT SPINAL DEFORMITY SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF 1,211 PATIENTS

AUTHORS: Matsoukas S, Gebeyehu T, Heller J, Jallo J, Harrop J, Prasad S

Presenter: Srinivas K. Prasad, MD, MS

INTRODUCTION: Vertebral cement augmentation (VCA) at upper instrumented vertebra (UIV) or UVI+1 has been proposed as a preventive strategy to decrease the risk of proximal junctional kyphosis (PJK) and proximal junctional failure (PJF) following adult spinal deformity (ASD).

METHODS: In this PRISMA-compliant meta-analysis, we sought evaluate the impact of VCA on PJK and PJF rates in ASD surgery patients. Most of the studies defined PJK as increase of ≥10° in sagittal Cobb angle from UIV to UIV+2 compared to preoperative. Need for revision surgery for PJK was defined as PJF.

RESULTS: Eight studies comprising 1,211 patients (VCA:355, no VCA:856) were included. The mean age of the VCA group was slightly higher (MD:5.2, CI:1.8-8.6, P=0.003), while BMI and smoking rates were comparable. The VCA group had a higher prevalence of osteoporosis (56.3% vs. 46.8%, OR:3.76, P<0.001). Pre-operative SVA (MD:0.14, CI:-0.8 – 2.1, I^2:0%, P=0.9), post-operative SVA (MD:0.86, CI:-0.7 – 2.4, I^2: 0%, P=0.3) and rates of overcorrection (VCA:60%, no VCA:63%, OR:0.98, CI:0.59-1.3, I^2:0%, P=0.9) were comparable between VCA and no VCA groups. Mean follow up ranged between 14.8-45 months. Although there was a trend towards lower PJK rates in the VCA group (22.8% vs. 29.4%, OR:0.61, P=0.1), statistical significance was not reached. However, VCA was associated with a significantly lower risk of PJF requiring surgical revision (6.8% vs. 13.3%, OR:0.43, P=0.02).

CONCLUSION: The use of VCA was associated with lower risk of PJF in ASD surgery patients, but its impact on PJK was inconclusive.

TITLE: TRANSFORAMINAL ENDOSCOPIC DECOMPRESSION OF L5-S1 CAN BE SAFELY PERFORMED WITH NEURONAVIGATION IN SELECT PATIENTS

AUTHORS: Bakhsheshian J; McClendon J; Krishna C and Bendok BR

Presenter: Joshua Bakhsheshian, MD

INTRODUCTION: Degenerative conditions of the spine commonly cause compression at L5-S1. Endoscopic transforaminal decompression allows a targeted approach for extraforaminal/foraminal decompression at L5-S1. This technique can be difficult due to a smaller working corridor, hindered by the iliac crest and hypertrophic ala. Therefore, we investigated the use of navigated-assisted transforaminal endoscopic approach to L5-S1.

METHODS: Ten patients underwent a navigation-assisted extraforaminal and/or foraminal full-endoscopic decompression of the L5 nerve root were prospectively analyzed with mean follow-up 6 months. Intraoperative navigation was utilized to plan an appropriate approach in all cases, and confirmed with fluoroscopy. Mean visual analog scale (VAS) for back and leg pain, Oswestry Disability Index (ODI), and MacNab scores were collected.

RESULTS: Eight patients had extraforaminal stenosis (herniated disc = 6, synovial cyst = 2) and two had foraminal stenosis (disc-osteophyte complex =2) at L5-S1. The use of stereotactic neuronavigation was successfully employed in all cases with access to L5-S1. All patients improved in their symptoms postoperatively, with mean VAS for back and leg pain, improved from 7.5±0.7 to 1.6±1.2 and from 9.0±0.7 to 1.7±1.7, respectively. ODI was also significantly improved from 73.4% to 23.5%. Macnab was excellent or good in nine patients and fair in one patient. No surgical complications occurred. One patient with disc-osteophyte stenosis developed dysesthesia that resolved after 3-weeks with short-course oral corticosteroid administration.

CONCLUSION: Transforaminal endoscopic decompression of L5-S1 can be safely accomplished with the aid of neuronavigation.

TITLE: COMPARING MIS DECOMPRESSION ALONE VERSUS MIS TLIF FOR DEGENERATIVE LUMBAR SPONDYLOLISTHESIS: 5-YEAR RESULTS FROM THE QUALITY OUTCOMES DATABASE.

AUTHORS: Chan A., Ambati V., Chou D., Bydon M., Bisson E., Glassman S., Foley K., Shaffrey C., Potts E., Coric D., Knightly J., Park P., Wang M., Fu K., Slotkin J., Asher A., Virk M., Haid R., Mummaneni P.

Presenter: Andrew K Chan, MD

INTRODUCTION: The SLIP trial reported the superiority of fusion compared to laminectomy alone for patients with degenerative grade 1 spondylolisthesis. However, it remains unclear if the advantages of fusion extend to minimally invasive (MIS) techniques, which limit the dissection of paraspinal muscles and osseoligamentous structures. This study compares 60-month outcomes of MIS TLIF versus decompression.

METHODS: Patients who underwent MIS TLIF or MIS decompression for grade 1 spondylolisthesis at the Quality Outcome Database's 12 highest-enrolling sites were identified. Patient-reported outcomes, including Oswestry Disability Index (ODI), numeric rating scale (NRS) back pain (NRS-BP), NRS leg pain (NRS-LP), EuroQol-5D (EQ-5D) and North American Spine Society (NASS) satisfaction score, were compared.

RESULTS: We compared 72 (50.3%) MIS TLIF and 71 (49.7%) MIS decompression cases. Cohorts were balanced in gender, BMI, symptom duration, ASA grade, ODI, NRS-LP, and EQ-5D. MIS TLIF patients were younger (62.1±10.5 vs 72.3±9.6 years) with higher NRS-BP (6.9±2.6 vs 5.6±3.2)($p<0.05$). MIS TLIF had greater blood loss (108.8±85.0 vs 33.0±63.2 mls), operative time (228.2±110.7 vs 101.8±48.0 mins), and length of stay (2.9±1.8 vs 0.7±1.2 days) ($p<0.001$).

In univariate and multivariable adjusted analyses, the rates of reaching a minimum clinically important difference for ODI, NRS-LP, NRS-BP, and EQ-5D were similar ($p>0.05$). However, the MIS TLIF cohort had higher satisfaction (NASS 1-2: 81.4% vs 57.6%) ($p<0.05$) and significantly lower reoperation rates (5.6% vs 15.5%, $p=0.001$).

CONCLUSION: While both MIS TLIF and decompression yield clinical benefits in well-selected patients with grade 1 lumbar spondylolisthesis, five-year results show MIS TLIF has lower reoperation rates and higher patient satisfaction.

TITLE: IMPACT OF PATIENT OBESITY ON HEALTHCARE RESOURCE UTILIZATION AFTER ANTERIOR OR POSTERIOR FUSION FOR CERICAL SPONDYLOTIC MYELOPATHY

AUTHORS: Elsamadicy A, Sayeed S, Craft S, Bartolomei J, Mendel E, Kolb L

Presenter: Luis Kolb M.D.

INTRODUCTION: In spine surgery, obesity has been previously associated with morbidity, non-routine discharge (NRD), and increased hospital length of stay (LOS). However, few prior studies have assessed the associations between obesity and postoperative outcomes following anterior cervical discectomy and fusion (ACDF) or posterior cervical decompression and fusion (PCDF) for cervical spondylotic myelopathy (CSM). The aim of this study was to assess the associations between obesity and LOS, NRD, and admission costs following ACDF or PCDF for CSM.

METHODS: A retrospective cohort study was performed using the 2016–2019 National Inpatient Sample database. Adult patients (≥18 years old) undergoing ACDF only or PCDF only for CSM, identified using ICD-10-CM coding, were categorized based on whether they received ACDF or PCDF, as well as preoperative obesity: Obese (BMI≥30) and Non-obese (BMI<30). Patient demographics, comorbidities, operative variables, perioperative adverse events (AEs), LOS, NRD, and costs were assessed. Multivariate logistic regression analyses were performed to identify associations between obesity and extended LOS, NRD, and increased admission costs.

RESULTS: Of the 49,950 study patients, 34,195 (68.5%) underwent ACDF and 15,755 (31.5%) underwent PCDF. In the ACDF and PCDF cohorts, 6,600 (19.3%) and 3,155 (20.0%) patients had preoperative obesity, respectively. Among patients undergoing ACDF, the obese cohort had a significantly greater mean LOS (*Non-obese: 2.47±3.38 days vs Obese: 2.91±3.42 days, p<0.001*), significantly greater mean total costs (*Non-obese: $21,065±13,162 vs Obese: $22,409±12,002, p<0.001*), and a significantly greater proportion of patients with NRDs (*Non-obese: 10.9% vs Obese: 14.6%, p=0.001*). Among patients undergoing PCDF, the obese cohort had a significantly longer median LOS (*Non-obese: 3 [2–5] days vs Obese: 3 [2–6] days, p=0.022*) and significantly greater mean total costs (*Non-obese: $26,282±21,269 vs Obese: $28,121±18,847, p=0.039*). Additionally, when compared to the ACDF cohort, the PCDF cohort had significantly greater mean LOS (*p<0.001*), rates of NRD (*p<0.001*), and mean admission costs (*p<0.001*). On multivariate analysis for ACDF, obesity was significantly associated with increased odds of extended LOS [*aOR: 1.50, CI (1.25, 1.79), p<0.001*], NRD [*aOR: 1.44, CI (1.18, 1.76), p<0.001*], and increased costs [*aOR: 1.22, CI (1.03, 1.44), p=0.020*], while on multivariate analysis for PCDF, obesity was significantly associated with increased odds of NRD [*aOR: 1.37, CI (1.11, 1.69), p<0.001*].

CONCLUSION: Our study found that obesity may impact postoperative outcomes following ACDF or PCDF for CSM. Additionally, patients undergoing PCDF may require greater healthcare resource utilization. Further studies are needed to optimize pre- and postoperative care protocols in these patients.

INVITED GUESTS

(Registered at time of publication)

GUEST	INSTITUTION	SPONSOR
Joshua Bakhsheshian	Mayo Clinic	Bernard Bendok
Gustavo Chagoya	Edward-Elmhurst Health	G Alexander Jones
Andrew K Chan	Columbia University	Dean Chou
Omar Choudhri	University of Pennsylvania	Patrick Connolly
Stephen Dell	ExamWorks	Martin Luken
Joseph Domino	Kansas University Medical Center	Paul Camarata
Benjamin Elder	Mayo Clinic	Lanzino Giuseppe
Kai-Ming Fu	Weill Cornell	Praveen Mummaneni
Christopher Holland	Carolina Neurosurgery and Spine Associates	Allan Friedman
Brian Howard	Emory University	Mark Bain
Kristin Huntoon	University of Arizona	Chandan Krishna
Ryan Kellogg	University of Virginia	Min Park
Robert Kellogg	UPMC Children's Hospital of Pittsburgh	Costas Hadjipanayis
Mena Kerolus	Atlanta Brain and Spine Care	Regis Haid
Miri Kim	Yale	Jennifer Moliterno
Luis Kolb	Yale	Juan Bartolomei
Robert McGovern	University of Minnesota Medical School	Matthew Hunt
Christopher Miller	University of Kansas School of Medicine	Paul Camarata
Peter Morone	Vanderbilt University Medical Center	Guy McKhann
Debraj Mukherjee	Johns Hopkins School of Medicine	Judy Huang
David Paul	University of Rochester Medical Center	Webster Pilcher
Srinivas Prasad	Jefferson Health	Kevin Judy
Khoi Than	Duke	John O'Toole
Stavropoula Tjoumakaris	Johns Hopkins University Medical Center	Judy Huang
Piiamaria Virtanen	Iowa University	Mitesh Shah
Nilesh Vyas	Seattle Children's Hospital	Amy Lee
Drew Wilkinson	Pennsylvania State University	Byron Thompson
Diana Wiseman	University of Washington	Amy Lee
Brett Youngerman	Columbia University	Guy McKhann
Akal Sethi	Sharp Healthcare San Diego	Christopher Roark

MEMBERS OF THE NEUROSURGICAL SOCIETY OF AMERICA

ACTIVE MEMBERS

Bold type indicates Active Member Inductee at 2025 Annual Meeting

Abosch, Aviva	aviva.abosch@unmc.edu University of Nebraska Medical Center	988437 Nebraska Medical Ctr Omaha, NE 68198 402-559-9606	Academic
Ahn, Edward	ahn.edward@mayo.edu Mayo Clinic - Rochester	200 First St SW Rochester, MN 55905	Academic
Alleyne, Jr., Cargill	challeynemd@gmail.com Piedmont Augusta	840 Stevens Creek Rd Augusta, GA 30907 706-414-2916	Private
Amin, Devin	damin@siumed.edu Southern Illinois University	751 N. Rutledge St Suite 3100 Springfield, IL 62702	Academic
Angevine, Peter	pda9@columbia.edu Columbia University	55 Palmer Ave Bronxville, NY 10708 914-330-4105	Academic
Ansari, Shaheryar	sheryansari@gmail.com Community Health Network	8040 Clearvista Pkwy Suite 240 Indianapolis, IN 46256	Private
Arginteanu, Marc	mnasurgery@hotmail.com Metropolitan Neurosurgery Associates	309 Engle St Suite 6 Englewood, NJ 07631	Private
Ashley, William	washley@lifebridgehealth.org Berman Brain and Spine Institute / LifeBridge Health System	2401 W Belvedere Ave Baltimore, MD 21215	Private
Bain, Mark	bainm@ccf.org Cleveland Clinic	9500 Euclid Ave Cleveland, OH. 44195	Academic

Bartolomei, Juan	juan.bartolomei@yale.edu Yale University	333 Cedar St New Haven, CT 06502	Private
Bendok, Bernard	Bendok.bernard@mayo.edu Mayo Clinic - Phoenix	5779 East Mayo Blvd Phoenix, AZ 85054	Academic
Bettegowda, Chetan	cbetteg1@jhmi.edu Johns Hopkins University	600 North Wolfe St Phipps Bldg Suite 118 Baltimore, MD 21287 443-847-7168	Academic
Bhangoo, Sandeep	sandeep12@broca44.com Neurosurgery of North Iowa	1010 4th St SW Suite 105 Mason City, IA 50401 765-969-8867	Private
Blackburn, Spiros	spirosblackburn@gmail.com University of Texas Health Science Center - Houston	6400 Fannin St Suite 2800 Houston, TX 77030	Academic
Blount, Jeffrey	jeffrey.blount@childrensal.org Children's Hospital of Alabama / University of Alabama - Birmingham	1600 7th Ave S Suite 400 Birmingham, AL 35233	Academic
Boehm, Peter	pboehm1972@gmail.com UT Erlanger Neurosurgery	979 East 3rd St C-920 Chattanooga, TN 37405	Private
Boland, Michael	bolandm@sbcglobal.net Neurosurgery of St. Louis	232 S. Woods Mill Rd Chesterfield, MO 63017 314-805-9512	Private
Boskovitz, Abraham	Abraham.boskovitz@kp.org Kaiser Permanente Medical Center	2025 Morse Ave Sacramento, CA 95825	Private

Britz, Gavin	gbritz@houstonmethodist.org Houston Methodist Neurological Institute	6560 Fannin #944 Houston, TX 77030	Academic
Brown, Benjamin	blbrown.md@gmail.com Ochsner Health	1203 S Tyler St Covington, LA 70433	Private
Caridi, John	jcaridi2@northwell.edu Lenox Hill Hospital / Northwell Health	130 E. 77th St 3 Black Hall New York, NY 10075	Academic
Carlson, Jonathan	jonathan.carlson@providence.org Inland Neurosurgery and Spine Associates	105 W. 8th Ave Suite 200 Spokane, WA 99204	Private
Chamzcuk, Andrea	achamczuk@gmail.com Independent Toronto	1044 Belmont Ave Youngstown, OH 44504	Private
Chandler, James	jchandle@nm.org Northwestern Medicine	676 North St Clair Suite 2210 Chicago, IL 60611	Academic
Charbel, Fady	fcharbel@uic.edu University of Illinois - Chicago	912 S. Wood St M/C 799 Chicago, IL 60612	Academic
Chiocca, E. Antonio	eachiocca@bwh.harvard.edu Brigham and Women's Hospital	75 Francis St Boston, MA 02116	Academic
Chou, Dean	dc3658@cumc.columbia.edu Columbia University / New York-Presbyterian Och Spine Hospital	5141 Broadway New York, NY 10034	Academic
Clarke, Michelle	clarke.michelle@mayo.edu Mayo Clinic - Rochester	1216 2nd St SW Rochester, MN 55902 507-319-8477	Academic

Cobbs, Charles	charles.cobbs@gmail.com Swedish Neuroscience Institute	550 17th Ave Suite 540 Seattle, WA 98122	Private
Codd, Patrick	patrick.codd@duke.edu Duke University	303 Research Dr Box 3050 Durham, NC 27710	Academic
Connolly, Patrick	patrick.connolly@pennmedicine.upenn.edu Penn Medicine Neurosurgery	1865 Rt 70 East Cherry Hill, NJ 08003	Academic
Connolly, Jr., E. Sander	esc5@columbia.edu Columbia University	710 168th St New York, NY 10032 917-414-9116	Academic
Cook, Douglas (DJ)	dj.cook@queensu.ca Queen's University	18 Stuart St Botterell Hall Kingston, ON K7L 3N6 Canada	Academic
Coon, Alexander	acoon2@gmail.com Carondelet-Neurological Institute	350 N Wilmot Rd Tucson, AZ 85711	Private
Crowley, R. Webster	rwcrowley1@gmail.com Rush University	1725 W Harrison St Suite 855 Chicago, IL 60612	Academic
Cuddy, Brian	briancuddy@aol.com Charleston Neurosurgical Associates	2145 Henry Tecklenburg Dr Suite 220 Charleston, SC 29414	Private
David, Carlos	carlosdavid1@me.com University of North Carolina	170 Manning Dr CB#7060 Chapel Hill, NC 27599	Academic

Day, John Diaz	jddday1962@gmail.com University Medical Center of El Paso	4824 Alberta Ave Annex Building, 4th Floor El Paso, TX 79905	Academic
Dey, Mahua	dey@neurosurgery.wisc.edu University of Wisconsin - Madison	600 Highland Ave CSC K3/803 Madison, WI 53792	Academic
Dlouhy, Brian	brian-dlouhy@uiowa.edu University of Iowa	3 Audrey Court NE Iowa City, IA 52240	Academic
Dlouhy, Kathleen	kathleen-dlouhy@uiowa.edu University of Iowa	3 Audrey Court NE Iowa City, IA 52240 314-605-3132	Academic
Dicks III, Robert	RDicksMD@earthlink.net Institute not available	Not available	Private
DiLuna, Michael	michael.diluna@yale.edu Yale University	1 Park St New Haven, CT 06504	Academic
Duckworth, Edward	duckwore@slhs.org St. Luke's Health System	190 E Bannock St 10th Floor Boise, ID 83712 713-373-7776	Academic
Ebersole, Koji	kebersole@kumc.edu Kansas University Medical Center	725 W 49th Ter Kansas City, MO 64112	Academic
Ecker, Robert	doniger5@icloud.com MaineHealth	92 Campus Dr 1st Floor Scarborough, ME 04074 207-653-8506	Private
Eichbaum, Eldan	eeichbaum@gmail.com Bell Neuroscience Institute of Silicon Valley	2500 Mowry Ave Suite 222 Fremont, CA 94538 707-695-0377	Private

Fecci, Peter	peter.fecci@duke.edu Duke University	303 Research Dr Box 3050 Durham, NC 27710	Academic
Fox, W. Christopher	fox.chris@mayo.edu Mayo Clinic - Florida	4500 San Pablo Rd S Jacksonville, FL 32224 734-223-2307	Academic
Gandhi, Chirag	chirag.gandhi@wmchealth.org Westchester Medical Center / New York Medical College	100 Woods Rd Taylor Pavilion E-Wing Valhalla, NY 10595 917-495-3409	Academic
Garton, Hugh	hgarton@med.umich.edu University of Michigan	1500 E Med Ctr Dr 3rd Floor Ann Arbor, MI 48109	Academic
Germanwala, Anand	agermanwala@gmail.com Loyola University	2160 S First Ave Maguire Bldg. 105, Rm 1900 Maywood, IL 60010	Academic
Girgis, Pierre	pierre.girgis@urmc.rochester.edu University of Rochester Medical Center	601 Elmwood Ave Box 670 Rochester, NY 14642	Academic
Grant, Gerald	gerald.grant@duke.edu Duke University	20 Duke Medicine Circle Clinic 3-1 Durham, NC 27710 919-452-5817	Academic
Greenlee, Jeremy	jeremy-greenlee@uiowa.edu University of Iowa	200 W. Hawkins Dr 1827 JCP Iowa City, IA 52242	Academic
Grewal, Sanjeet	grewal.sanjeet@mayo.edu Mayo Clinic - Florida	4500 San Pablo Rd S Jacksonville, FL 32224	Academic

Grossberg, Jonathan	jonathan.a.grossberg@emory.edu Emory Healthcare	1365 Clifton Road NE Suite 2200 Atlanta, GA 30322	Academic
Hadjipanayis, Constantinos	hadjipanayiscg2@upmc.edu University of Pittsburgh Medical Center	200 Lothrop St Suite B-400 Pittsburgh, PA 15213	Academic
Hall, Walter	hallw@upstate.edu Neurosurgical Associates of Central New York	750 East Adams St Syracuse, NY 13210	Academic
Harraher, Ciara	harraher@stanford.edu Stanford University	1595 Soquel Dr Suite 360 Santa Cruz, CA 95065 650-862-9424	Academic
Hart, David	dhartspine@gmail.com Indiana University Health Ball Memorial Hospital	2525 W. University Ave Suite 401 Muncie, IN 47303	Private
Helbig, Gregory	ghelbig4@gmail.com Darroch Brain and Spine Institute	4016 Dale Rd Modesto, CA 95356	Private
Heuer, Gregory	heuerg@chop.edu Children's Hospital of Philadelphia	3401 Civic Center Blvd Philadelphia, PA 19101	Academic
Holly, Langston	lholly@mednet.ucla.edu University of California – Los Angeles / David Geffen School of Medicine	300 Med Plaza Suite 562 Los Angeles, CA 90095	Academic
Hong, Jennifer	jennifer.hong@hitchcock.org Dartmouth Hitchcock Medical Center	1 Medical Center Dr Lebanon, NH 03755	Academic

Howard III, Matthew	matthew-howard@uiowa.edu University of Iowa	200 Hawkins Dr Iowa City, IA 52242	Academic
Howington, Jay	juhowington@neurosav.com Neurological & Spine Institute of Savannah	4 Jackson Blvd Savannah, GA 31405 912-655-2016	Private
Huang, Jason	Jason.Huang@BSWHealth.org Baylor Scott & White Health	2401 S. 31st St Temple, TX 76508	Academic
Huang, Judy	jhuang24@jhmi.edu Johns Hopkins University	1800 Orleans St Zayed Tower Suite 6115F Baltimore, MD 21287	Academic
Hunt, Matthew	huntx188@umn.edu M Health Fairview Neurosurgery	6545 France Ave S Suite 450 Edina, MN 55435 612-860-7601	Private
Johnson, J. Patrick	johnsonjp@cshs.org Cedars-Sinai Spine Center	444 S. San Vincente Blvd #8000 Los Angeles, CA 90048	Academic
Johnston, James	james.johnston@childrensal.org University of Alabama - Birmingham	1600 7th Ave S Birmingham, AL 35233 205-329-4672	Academic
Jones, G. Alexander	joneshvna@gmail.com NorthShore / Edward-Elmhurst Health	1200 S. York Rd Suite 3280 Elmhurst, IL 60126	Private
Judy, Kevin	kevin.judy@jefferson.edu Thomas Jefferson University / Sidney Kimmel Medical College	909 Walnut St Philadelphia, PA 19107 215-588-5486	Academic
Kalfas, Iain	kalfasi@ccf.org Cleveland Clinic	9500 Euclid Ave S-40 Cleveland, OH 44195 216-903-4804	Academic

Kaplitt, Michael	mik2002@med.cornell.edu Weill Cornell Medicine	525 E. 68th St #99 New York, NY 10065	Academic
Karahalios, Dean	deankarahalios@dkneuro.com Advocate Healthcare	2400 East Main St Ste. 103-367 St. Charles, IL 60174	Private
Kennedy, Benjamin	kennedybc@chop.edu Children's Hospital of Philadelphia	3401 Civic Center Blvd Philadelphia, PA 19104 847-962-0696	Academic
Kim, Betty	bykim@mdanderson.org University of Texas / MD Anderson Cancer Center	1515 Holcombe Blvd Houston, TX 77030	Academic
Kim, Louis	ljkim1@uw.edu University of Washington	908 Jefferson St Mailstop 359924 Seattle, WA 98104 206-465-3878	Academic
King, Wesley	king@neuroendo.org The Center for Minimally Invasive Neurosurgery	8436 W 3rd St #800 Los Angeles, CA 90048	Private
Klugh III, Arnett	arnett.klugh@gmail.com Children’s Nebraska / University of Nebraska Medical Center	988437 Nebraska Medical Ctr Omaha, NE 68198	Academic
Krishna, Chandan	chandan.krishna@gmail.com Mayo Clinic - Phoenix	5777 East Mayo Blvd Phoenix, AZ 85054	Academic
Lanzino, Giuseppe	lanzino.giuseppe@mayo.edu Mayo Clinic - Rochester	200 First St SW Gona 8-209 Rochester, MN 55902 507-993-8508	Academic

Lavine, Sean	sl2081@cumc.columbia.edu Columbia University	710 West 168th St Room 424 New York, NY 10032	Academic
Laxton, Adrian	alaxton@wakehealth.edu Wake Forest University	Medical Center Blvd 4th Floor Winston-Salem, NC 27157	Academic
Lee, Amy	amy.lee@seattlechildrens.org University of Washington / Seattle Children's Hospital	4800 Sandpoint Way NE M/S OA.9.220 Seattle, WA 98105 206-747-6005	Academic
Lee, John	leejohn@pennmedicine.upenn.edu University of Pennsylvania	801 Spruce St Pennsylvania Hospital Philadelphia, PA 19107	Academic
Levitt, Michael	mlevitt@uw.edu University of Washington	908 Jefferson St Seattle, WA 98104	Academic
Liau, Linda	lliau@mednet.ucla.edu University of California – Los Angeles / David Geffen School of Medicine	300 Stein Plaza Suite 420 Los Angeles, CA 90095	Academic
Limbrick, David	david.limbrick@vcuhealth.org Virginia Commonwealth University	417 North 11th St, Sixth Floor Box 980631 Richmond, Virginia 23298	Academic
Lin, Li-Mei	drlimeilin@gmail.com Institute not available	350 Panorama Blvd Sedona, AZ 86336	Private
Liu, Charles	cliu@usc.edu University of Southern California	1200 North State St Suite 3300 Los Angeles, CA 90033	Academic

Liu, John	jliu9862@gmail.com University of Southern California	9033 Wilshire Blvd Suite 400 Beverly Hills, CA 90211 847-809-9151	Academic
Luken III, Martin	lukenmd@msn.com University of Chicago	71 W 156th St Harvey, IL 60426	Private
Maher, Cormac	comaher@stanford.edu Stanford University	453 Quarry Rd Palo Alto, CA 94304	Academic
Mai, Jeffrey	jeffreymai@gmail.com Georgetown University	110 Irving St NW Suite G019 Washington DC 20010	Academic
Malhotra, Neil	neil.malholtra@pennmedicine.upenn.edu University of Pennsylvania	3400 Civic Ctr Blvd Perelman Center, S Pavilion 15th Floor Philadelphia, PA 19104	Academic
McClendon, Jr., Jamal	mcclendon.jamal@mayo.edu Mayo Clinic - Phoenix	5777 East Mayo Blvd Phoenix, AZ 85054	Academic
McKhann, Guy	gm317@columbia.edu Columbia University Irving Medical Center / New York Presbyterian Hospital	710 W. 168th St Neurological Inst. Rm. 411 New York, NY 10032 917-414-1461	Academic
Michael, L. Madison	mmichael@semmes-murphey.com Semmes-Murphey Clinic / University of Tennessee Health Science Center	6325 Humphrey's Blvd Memphis, TN 38120 901-831-7713	Academic
Mocco, J	j.mocco@mountsinai.org Mount Sinai Health System	1450 Madison Ave Box 1136 New York, NY 10029	Academic

Moliterno, Jennifer	jennifer.moliternogunel@yale.edu Yale University	15 York St LCI 810 New Haven, CT 06510	Academic
Moriarty, John (Jack)	jmojr1@gmail.com NewSouth NeuroSpine	2470 Flowood Dr Suite 2100 Flowood, MS 39232	Private
Mulligan, Lisa	lmulli222@gmail.com Institute not available	Not available	Military
Mummaneni, Praveen	praveen.mummaneni@ucsf.edu University of California – San Francisco	505 Parnassus Ave M780 San Francisco, CA 94143	Academic
Nottmeier, Eric	nottmeier.eric@mayo.edu Mayo Clinic - Florida	4500 San Pablo Rd S Jacksonville, FL 32224	Academic
Ogilvy, Christopher	cogilvy@bidmc.harvard.edu Beth Israel Deaconess Medical Center / Harvard University	110 Francis St Suite 3B Boston, MA 02215 617-633-0277	Academic
O'Kelly, Cian	cian.okelly@albertahealthservices.ca University of Alberta	8440 112 St NW Edmonton, AB T6G 2B7 Canada	Academic
O'Toole, John	john_otoole@rush.edu Rush University	1725 W. Harrison St Suite 855 Chicago, IL 60612	Academic
Panov, Fedor (Ted)	fedor.panov@mountsinai.org Mount Sinai	1000 Tenth Ave Suite 10-C New York, NY 10019 570-578-6634	Academic
Park, Min	min.park.1975@gmail.com University of Virginia	PO Box 800212 Charlottesville, VA 22908	Academic

Parney, Ian	parney.ian@mayo.edu Mayo Clinic - Rochester	200 First St SW Rochester, MN 55905	Academic
Patel, Aman	abpatel@mgh.harvard.edu Massachusetts General Hospital / Harvard University	15 Parkman St Wang-745 Boston, MA 02114	Academic
Phan, Nicolas	phann@marshall.edu Marshall University	1600 Med Ctr Drive Suite B500 Huntington, WV 25701	Academic
Pirris, Stephen	pirrsm@gmail.com Mayo Clinic - Florida	4500 San Pablo Rd S Jacksonville, FL 32224	Academic
Prabhu, Vikram	vprabhu@lumc.edu Loyola University Medical Center / Stritch School of Medicine	2160 S First Ave Maywood, IL 60153 630-607-4794	Academic
Raksin, Patti	patricia_raksin@rush.edu J.H. Stroger Jr Hospital of Cook County / Rush University Medical Center	1901 W Harrison St Suite 641 Chicago, IL 60612 312-420-7352	Academic
Roark, Christopher	cdroark@gmail.com University of Colorado	12401 E 17th Ave Leprino Bldg, 3rd Floor Aurora, CO 80045 612-716-2967	Academic
Robinson, Robert	rdrobinson67@gmail.com Alabama Neurological Surgery & Spine	3535 Grandview Pkwy Suite 150 Birmingham, AL 35243	Private
Sampson, John	john.sampson@cuanschutz.edu University of Colorado School of Medicine	DUMN Box 3271 Durham, NC 27710 919-450-5425	Academic

Sani, Sepehr	sepehr_sani@rush.edu Rush University	1725 W. Harrison St Suite 855 Chicago, IL 60612 312-343-0493	Academic
Schirmer, Clemens	cmschirmer@gmail.com Geisinger	950 East Mountain Blvd Wilkes Barre, PA 18702	Academic / Hybrid
Schwartz, Theodore	schwarh@med.cornell.edu Weill Cornell Medicine	525 East 68th St Box 99 New York, NY 10065 646-734-3801	Academic
Selman, Warren	warren.selman@baptisthealth.net Marcus Neuroscience Institute	800 Meadows Rd Boca Raton, FL 33486	Private
Shafron, David	dshafron@phoenixchildrens.com Phoenix Children's Hospital	1919 E Thomas Rd Phoenix, AZ 85016	Private
Shah, Kushal	Kushaljshahmd@gmail.com Goodman Campbell Brain & Spine	555 East County Line Rd Suite 202 Greenwood, IN 46143 630-854-8578	Private
Shakur, Sophia	sophiashakurmd@gmail.com TidalHealth	1630 Woodbrooke Dr Salisbury, MD 21804	Private
Sheehan, Jason	jps2f@virginia.edu University of Virginia	Box 800212 Health Science Ctr Charlottesville, VA 22908	Academic
Shrivastava, Raj	raj.shrivastava@mountsinai.org Mount Sinai Health System	One Gustave L. Levy Pl Box 1136, Annenberg Bldg Rm 8-40 New York, NY 10007	Academic
Simmons, Nathan	ns1@hitchcock.org Dartmouth Hitchcock Medical Center	One Medical Center Dr Lebanon, NH 03756	Academic

Smith, Gabriel	gabriel.smith@uhhospitals.org University Hospitals	960 Clague Rd Bldg A Ste 1200 Westlake, OH 44145	Academic
Smucker, Phil	phil@smucker1.com CHRISTUS St. Vincent Neurosurgical Associates	465 St. Michaels Dr Suite 107 Sante Fe, NM 87505	Private
Smyth, Matthew	msmyth4@jhmi.edu Johns Hopkins University	601 5th St. S Saint Petersburg, FL 33701	Academic
Stieg, Philip	pes2008@med.cornell.edu Weill Cornell Medical College	525 East 68th St Staff 651, Box 99 New York, NY 10065	Academic
Storm, Phillip (Jay)	storm@chop.edu Children's Hospital of Philadelphia	3401 Civic Center Blvd Wood Center, 6th Floor Philadelphia, PA 19103	Academic
Swong, Kevin	Kevin.swong@nm.org Northwestern Medicine	259 E Erie St Suite 1450 Chicago IL 60611	Academic
Thompson, B. Gregory	gregthom@med.umich.edu University of Michigan Health / Michigan Medicine	1500 East Med Ctr Dr TC 3470 Ann Arbor, MI 48109	Academic
Timmons, Shelly	stimmons@mac.com Medical College of Wisconsin	MCW Hub for Collaborative Medicine 8710 Watertown Plank Rd Room A4745 Milwaukee, WI 53226	Academic

Tomlin, Jeffrey	jmtomlin89@gmail.com UC San Diego Health	9300 Campus Pt Dr Neurosurgery MC #7893 La Jolla, CA 92037 619-772-0785	Academic
Tormenti, Matt	m.tormenti@princetonbrainandspine.com Princeton Brain, Spine, & Sports Medicine	1912 NJ-35 Suite 101 Oakhurst, NJ 07755	Private
Traynelis, Vincent	vincent_traynelis@rush.edu Rush University Medical Center	1725 W Harrison St Suite 855 Chicago, IL 60612 312-550-9228	Academic
Tredway, Trent	ttredway@hotmail.com Tredway Spine Institute	901 Boren Ave #600 Seattle, WA 98104	Private
Tumialan, Luis	luis.tumialan@barrowbrainandspine.com Barrow Brain and Spine	7242 E Osborn Rd Suite 420 Scottsdale, AZ 85251	Private
Uittenbogaard, Kyle	kyle.uittenbogaard@gmail.com Metropolitan Neurosurgery	11850 Blackfoot St NW Suite 490 Minneapolis, MN 55433	Private
Vangilder, John	jgvangilder@yahoo.com Benefis Healthcare	401 15th Ave. S Suite 108 Great Falls, MT 59405	Private
Vasquez, Ciro	cirovasquez80@gmail.com Neurosurgical Associates	913 East 26th St 305 Piper Building Minneapolis, MN 55404	Private
Vates, G. Edward	edward_vates@urmc.rochester.edu University of Rochester Medical Center	601 Elmwood Ave Rochester, NY 14642	Academic

Villavicencio, Alan	atv@bnasurg.com Boulder Neurosurgical Associates	4743 Arapahoe Ave #202 Boulder, CO 80303	Private
Walter, Kevin	kevin_walter@urmc.rochester.edu University of Rochester	2180 S. Clinton Ave Rochester, NY 14618 585-489-1989	Academic
Watson, Marshall	marshall.watson@stvin.org CHRISTUS St. Vincent Neurosurgical Associates	465 St. Michael's Dr Suite 107 Santa Fe, NM 87505	Private
Welch, William	william.welch@uphs.upenn.edu University of Pennsylvania	801 Spruce St Philadelphia, PA 19107	Academic
White, James Bradley (Brad)	jbwhite@txbsi.com The Texas Brain & Spine Institute	8441 St Hwy 47 Suite 4300 Bryan, TX 77807	Academic
Winfree, Christopher	cjw12@columbia.edu Columbia University	710 West 168th St New York, NY 10032 917-312-5556	Academic
Woo, Henry	hwoo1@northwell.edu Northwell Health	805 Northern Blvd Floor 1 Great Neck, NY 11021	Academic
Yang, Isaac	iyang@mednet.ucla.edu University of California – Los Angeles	300 Stein Plaza Suite 420 Los Angeles, CA 90095	Academic
Yao, Kevin	kyao.md@gmail.com Metropolitan Neurosurgery Associates	309 Engle St Englewood, NJ 07631 201-450-2555	Private
Zipfel, Gregory	zipfelg@wustl.edu Washington University School of Medicine	660 S. Euclid Ave Box 8057 St. Louis, MO 63110	Academic

SENIOR MEMBERS

Atkinson, John	jlda197772@gmail.com Mayo Clinic - Rochester	200 First St SW Rochester, MN 55905 507-254-3843	Academic
Ball, Perry	Perry.A.Ball@hitchcock.org Dartmouth Hitchcock Medical Center	1 Medical Center Dr Lebanon, NH 03756	Academic
Baltuch, Gordon	gb2774@cumc.columbia.edu Columbia University	710 West 168th St Floor 4 New York, NY 10032	Academic
Barbaro, Nicholas	Nicholas.Barbaro@austin.utexas.edu University of Texas – Austin / Dell Medical School	1601 Trinity St Z1500 Austin, TX 78756	Academic
Barrow, Daniel	dbarr01@emory.edu Emory Healthcare	1365-B Clifton Rd NE Atlanta, GA 30322	Academic
Belzberg, Allan	belzberg@jhu.edu Johns Hopkins Medicine	600 N. Wolfe St Phipps 454 Baltimore, MD 21287	Academic
Berger, Mitchel	bergerm@neurosurg.ucsf.edu University of California – San Francisco	400 Parnassus Ave Floor 8 San Francisco, CA 94143	Academic
Black, Keith	Keith.Black@cshs.org Cedars-Sinai Medical Center	127 So. San Vicente Blvd A6600 Los Angeles, CA 90048	Academic
Boehm, Sr, Peter	Peter.BoehmSr@erlanger.org UT Erlanger Neurosurgery	979 E. Third St C-920 Chattanooga, TN 37403	Private

Byrne, Richard	Richard_Byrne@mayo.edu Mayo Clinic - Florida	4500 San Pablo Rd S Jacksonville, FL 32224	Academic
Camarata, Paul	pcamarata@kumc.edu University of Kansas Medical Center	4000 Cambridge St MS 3021 Kansas City, KS 66160	Academic
Camel, Mark	mcamel@optonline.net Orthopaedic & Neurosurgery Specialists	6 Greenwich Office Park Greenwich, CT 06831	Private
Cozzens, Jeffrey	jeff.cozzens@gmail.com Southern Illinois School of Medicine	421 North 9th St PO Box 19680 Springfield, IL 62794	Academic
Cybulski, George	george.cybulski@gmail.com Northwestern University	201 East Huron St Galter Pavilion 12-240 Chicago, IL 60611	Academic
Dacey, Jr., Ralph	daceyr@nsurg.wustl.edu Washington University	660 S. Euclid Campus Box 8057 St. Louis, MO 63110	Academic
Day, Arthur	arthur.l.day@uth.tmc.edu University of Texas - Houston	6400 Fannin St Suite 2800 Houston, TX 77030	Academic
Deen, Jr., H. Gordon	hdeen@mayo.edu Mayo Clinic - Florida	4500 San Pablo Rd Jacksonville, FL 32224	Academic
Dempsey, Robert	dempsey@neurosurgery.wisc.edu University of Wisconsin	600 Highland Ave K4/866 CSC Box 8660 Madison, WI 53792	Academic

Dickey, Phillip	pdickey@newhavenneuro.com New Haven Neurosurgical Associates	1570 Boston Post Rd Suite 300 Guilford, CT 06437	Private
Edwards, Michael	msbedwards@ucdavis.edu University of California - Davis	4861 Y St Suite 3740 Sacramento, CA 95817	Academic
Feldkamp, Matthias	mfeldkamp@mac.com Kim Neurosurgery, PLLC	9325 Upland Lane N Suite 205 Maple Grove, MN 55369	Academic
Fessler, Richard	rfessler@rush.edu Rush University	1725 W. Harrison St Suite 855 Chicago IL 60612	Academic
Friedman, Allan	allan.friedman@duke.edu Duke University Medical Center	200 Trent Dr Box 3807 Durham, NC 27707	Academic
Giannotta, Steven	gianott@usc.edu Los Angeles General Medical Center / University of Southern California	1200 N. State St Suite 3300 Los Angeles, CA 90033	Academic
Gudeman, Steven	skgudeman@aol.com Neurosurgery & Spine Center of the Carolinas	811 Cox Rd Gastonia, NC 28054	Private
Guzman-Lopez, Luis	Not available Institute not available	Not available	Unclassified
Harsh, Griff	gharsh@ucdavis.edu University of California - Davis	4860 Y St Suite 3740 Sacramento, CA 95917	Academic

Heary, Robert	roberthearymd@gmail.com Hackensack Meridian School of Medicine	1 Bay Ave Harris Pavilion, Suite 5 Montclair, NJ 07042 973-634-7417	Academic
Hornig, Gregory	gregoryhornig@nicklaushealth.org Nicklaus Children's Hospital	3100 SW 62nd Ave ACB #3109 Miami, FL 33155	Academic
Ireland, Patrick	pcirish@comcast.net Winchester Medical Center	1818 Amherst St Winchester, VA 22601 540-974-2607	Private
Kim, Miriam	miriamkim@earthlink.net Kim Neurosurgery, PLLC	9325 Upland Lane N Suite 205 Maple Grove, MN 55369	Private
Mapstone, Timothy	Timothy-Mapstone@ouhsc.edu University of Oklahoma Health Sciences Center	100 N. Lincoln Blvd Suite 400 Oklahoma City, OK 73104	Academic
Martin, Neil	nmartin@pacificneuro.org Pacific Neuroscience Institute	2125 Arizona Ave Santa Monica, CA 90404	Private
Menezes, Arnold	arnold.menezes@uiowa.edu University of Iowa	200 Hawkins Dr Room 1824 JPP Iowa City, IA 52242	Academic
Nagib, Mahmoud	mnagib1@aol.com Neurosurgical Associates, Ltd.	800 28th St 305 Piper Bldg. Minneapolis, MN 55407	Private
Ortiz Suarez, Humberto	Not available Institute not available	Not available	Unclassified

Pilcher, Webster	webster_pilcher@urmc.rochester.edu University of Rochester Medical Center	601 Elmwood Ave Box 670 Rochester, NY 14642	Academic
Rockswold, Gaylan	gaylan.rockswold@hcmed.org Hennepin Healthcare Research Institute	701 Park Ave Minneapolis, MN 54416	Academic
Rodenhouse, Thomas	thomas_rodenhouse@urmc.rochester.edu University of Rochester	2180 Clinton Ave S Suite A Rochester, NY 14618 585-507-2956	Academic
Shah, Mitesh	mshah2@iu.edu Indiana University	355 W. 15th St Suite 5100 Indianapolis, IN 46202	Academic
Sternau, Linda	lsternau@aol.com Memorial Regional Hospital	North 35th Ave Suite 300, M1150 Hollywood, FL 33021	Private
Vollmer, Dennis	DV2K@virginia.edu University of Virginia	PO Box 800212 Medical Ctr Charlottesville, VA 22908	Academic
Walpert, Kimberly	kimberly.walpert@piedmont.org Piedmont Neurosurgery	242 King Ave 1st Flr, Medical Services Bldg Athens, GA 30606	Private
Wu, Julian	Julian.Wu@tuftsmedicine.org Tufts Medical Center	800 Washington St Boston, MA 02111 617 512-1128	Academic
Yazbak, Philip	philip.yazbak@neurosciencegroup.com The Neuroscience Group	1305 West American Dr Neenah, WI 54956	Private

SENIOR RETIRED MEMBERS

Name	Email
Abou Samra, Moustapha	mabousamra@aol.com
Ansell, Lee Vanderpool	LVAnsell@earthlink.net
Ausman, James	jamesausman@mac.com
Batjer, H. Hunt	Not available
Beck, David	peter.dog@live.com
Black, Peter	peter_black@hms.harvard.edu
Boop, Frederick	frederickboop@gmail.com
Bullitt, Elizabeth	ebullitt01@gmail.com
Camins, Martin	martin_camins@msn.com
Campbell, James	jcampbell@interwest.com
Canady, Alexa	alexadavis@aol.com
Carey, Michael	Not available
Cole, Harry	hocole@sbcglobal.net
De Los Reyes, R. Al	aldelosreyes@msn.com
Dewey, Richard	rcdewey147@cox.net
Diaz, Fernando	fdiaz@mhsi.us
Eller, Theodore	tedellerjr@gmail.com
Gutin, Philip	gutinp@mskcc.org
Hahn, Joseph	hahnj@ccf.org
Haid, Regis	reg@rwhaid.com
Haines, Stephen	shaines@umn.edu

Hankinson, Hal	hhanki@aol.com
Hardy, Jr., Russell	Not available
Heim, Robert	neurosurg57@gmail.com
Heros, Roberto	rheros@med.miami.edu
Hunt, David	davidhunt@mac.com
Kelly, Jr., David	dkelly@wfubmc.edu
Kopitnik, Jr., Thomas	tom@tagaviationllc.com
Kusske, John	jkusske@uci.edu
Lacin, Robert	robertlacin@hotmail.com
Laws, Edward	elaws@bwh.harvard.edu
Lee, James	drjflee@aol.com
Loftus, Christopher	cmloftus@icloud.com
Maroon, Joseph	maroonjc@gmail.com
McGillicuddy, John	jemc@umich.edu
Mehalic, Thomas	tmehalic41@gmail.com
Michelsen, W. Jost	jmichel646@aol.com
Morrison, Glenn	gmorrison@med.miami.edu
Mortara, Richard	amortar@msn.com
Neblett, Charles	cneblett@gmail.com
Neill, John	jneillsr@gmail.com
Nelson, Louis	Not available
Nelson, Paul	pnelson2@hmc.psu.edu

Newell, David	davidwnewell@gmail.com
Norrell, Horace	hnorrell@verizon.net
Payne, Nettleton	npayne2@comcast.net
Perrin, Richard	Richard.perrin@utoronto.ca
Piepgras, David	david.piepgras@gmail.com
Piepmeier, Joseph	joseph.piepmeier@yale.edu
Pritz, Michael	mpritz@gmu.edu
Quest, Donald	doq1@columbia.edu
Ratcheson, Robert	rar@case.edu
Rea, Gary	garylrea@yahoo.com
Rich, J. Charles	Not available
Rosseau, Gail	grosseaumd@gmail.com
Salcman, Michael	msalcman@gmail.com
Shafron, Melvin	maudemel3@aol.com
Sonntag, Volker	volker.sonntag@bnaneuro.net
Storrs, David	dstorrs@aol.com
Story, Jim	jlstory@swbell.net
Tarlov, Edward	Not available
Tew, Jr., John	Not available
Thienprasit, Phudhiphorn (Bee)	thuenprasitp@gmail.com
Tindall, George	Not available
Tippett, Troy	ttippett2@aol.com
Van Der Veer, Craig	Not available

Wallace, Christopher	cw9837222@gmail.com
Weiss, Martin	weiss@usc.edu
Welsh, Joseph	jwmd49@gmail.com
Wharen, Jr., Robert	rwharen@gmail.com
Williams, Jr., Phillip	DRPHIL.doctorswilliams@yahoo.com
Winn, H. Richard	hrwinn@nshs.edu
Wirth, Fremont	fpwirth@bellsouth.net
Young, Alfred Bryon	byronyoung@uky.edu
Young, Harold	Not available

HONORARY MEMBERS

Lagger, Raymond L	rlagger@earthlink.net
New, Kent	kentnew@me.com
Roberston, Jon	jrobertson@semmes-murphey.com
Vangilder, Kirsten	Kerstin.vangilder@gmail.com
Weinstein, Philip	Phil.weinstein@ucsf.edu

FOUNDING MEMBERS

Claude M. Bertrand
Joseph Dorsey
Carl J. Graf
C. D. Hawkes
Lewis M. Helfer
Thomas J. Holbrook
Everett F. Hurteau
Harry P. Maxwell
William F. Meacham
Arthur Morris
Frank Otenasek
William B. Patton
George E. Roulhac
Edward B. Schlesinger
I. Joshua Speigel
Charles E. Troland
Jack I. Woolf

RECENTLY DECEASED

Frances K. Conley – 08.2024
L. Nelson Hopkins III – 10.2024
Mark Shaffrey – 12.2024
James E. Rose – 2.2025

NSA Medal Recipients

William E. Hunt – 1998
William F. Collins – 1999
Charles A. Fager – 2000
Albert L. Rhoton, Jr. – 2001
John A. Jane – 2002
Charles B. Wilson -- 2003
Lyle A. French – 2004
Edward R. Laws – 2005
L. Nelson Hopkins – 2006
John C. VanGilder – 2007
Arthur L. Day – 2008
Donald P. Becker – 2009
Madjid Samii – 2010
Peter J. Jannetta – 2011
R. Michael Scott – 2012
Rodger Goodell – 2013
Arnold Menezes – 2014
Richard Fessler – 2015
H. Hunt Batjer – 2016
David Kline – 2017
Allan H. Friedman – 2018
Stephen Haines - 2019
Fredric Meyer – 2020
Robert Dempsey – 2021
Paul Nelson – 2022
Ralph G. Dacey, Jr. – 2023
David Piepgras – 2024
Donald O. Quest - 2025

Location of Annual Meetings
The Neurosurgical Society of America

Date	Place
June, 1948 - Organizational Meeting.	The Palmer House, Chicago, Illinois
1. November, 1948	The Ambassador East, Chicago, IL
2. October, 1949	Le Chateau Frontenac, Quebec City, Quebec
3. September, 1950	The Cloister, Sea Island, Georgia
4. September, 1951	Sun Valley Lodge, Sun Valley, Idaho
5. September, 1952	The Cloister, Sea Island, Georgia
6. September, 1953	The Broadmoor, Colorado Springs, Colorado
7. July, 1954	The Grand Hotel, Mackinac Island, Michigan
8. March, 1955	Marc Del Monte Lodge, Pebble Beach, California
9. January, 1956	Key Biscayne Hotel, Key Biscayne, Florida
10. January, 1957	El Mirador Hotel, Palm Springs, California
11. January, 1958	Key Biscayne Hotel, Key Biscayne, Florida
12. April, 1959	The Homestead, Hot Springs, Virginia
13. March, 1960	Del Monte Lodge, Pebble Beach, California
14. March, 1961	Boca Raton Hotel and Club, Boca Raton, Florida
15. March, 1962	Buena Vista Hotel, Biloxi, Mississippi
16. June, 1963	London, England
17. January, 1964	Litchfield Park, Arizona
18. January, 1965	San Juan, Puerto Rico
19. March, 1966	The Royal Orleans, New Orleans, Louisiana
20. October, 1967	The Biltmore, New York, New York
21. May, 1968	The Mark Hopkins, San Francisco, California
22. May, 1969	Key Biscayne Hotel, Key Biscayne, Florida
23. March, 1970	Ojai Valley Inn, Ojai Valley, California
24. May, 1971	The Cloister, Sea Island, Georgia
25. March, 1972	Del Monte Lodge, Pebble Beach, California
26. June, 1973	Southampton Princess Hotel, Southampton, Bermuda
27. May, 1974	Key Biscayne Hotel, Key Biscayne, Florida
28. March, 1975	The Inn at Rancho Bernardo, San Diego, California
29. March, 1976	Marco Beach Hotel, Marco Island, Florida
30. May, 1977	Broadmoor Hotel, Colorado Springs, Colorado
31. January, 1978	Acapulco Princess Hotel, Acapulco, Mexico
32. May, 1979	Greenbrier, White Sulphur Springs, West Virginia
33. March, 1980	Hyatt Hotel, Hilton Head Island, South Carolina
34. March, 1981	The Lodge at Pebble Beach, Pebble Beach, California
35. March, 1982	Marco Beach Hotel, Marco Island, Florida
36. May 8-11, 1983	Marriott's Casa Marina Resort, Key West, Florida
37. May 13-16, 1984	Hotel del Coronado, Coronado, California
38. May 19-22, 1985	Kiawah Island Company, Kiawah Island, South Carolina
39. April 2-5, 1986	Grand Hotel, Point Clear, Alabama
40. May 10-13, 1987	Salishan Lodge, Gleneden Beach, Oregon
41. April 5-9, 1988	The Homestead, Hot Springs, Virginia
42. May 10-13, 1989	Marriott's Castle Harbour Resort, Tucker's Town, Bermuda
43. April 8-11, 1990	The Inn at Spanish Bay, Pebble Beach, California
44. May 15-18, 1991	San Destin Beach Hotel, San Destin, Florida
45. June 14-17, 1992	Banff Springs Hotel, Banff, Alberta, Canada
46. March 24-27, 1993	Boca Raton Resort & Club, Boca Raton, Florida
47. May 22-25, 1994	The Inn at Semi-ah-Moo, Blaine, Washington
48. June 4-7, 1995	The Cloister, Sea Island, Georgia
49. May 4-8, 1996	The Ritz-Carlton, Laguna Niguel, California

50. March 30-April 5, 1997.....Langham Hilton, London & Robinson College, and University of Cambridge, Cambridge, England
51. May 13-17, 1998.....Le Chateau Frontenac, Quebec City, Quebec
52. March 28-31, 1999 .....The Scottsdale Princess, Scottsdale, Arizona
53. June 4-7, 2000.....…….The Sheraton Tamarron, Durango, Colorado
54. June 6-9, 2001.....The Ritz-Carlton, Amelia Island, Florida
55. April 21- 24, 2002..... Kiawah Island Resort, South Carolina
56. June 8-11, 2003.....Sunriver Resort, Oregon
57. June 6-9, 2004..... Eldorado Hotel, Santa Fe, New Mexico
58. June 5-8, 2005.....The Grand Floridian Resort and Spa, Orlando, Florida
59. June 4-7, 2006..... Ojai Valley Resort and Spa, Ojai, California
60. June 3-6, 2007..... The American Club, Kohler, Wisconsin
61. June 1-4, 2008..... The Fairmont Chateau, Whistler, British Columbia, Canada
62. June 7-10, 2009..... The Homestead, Hot Springs, Virginia
63. April 11-14, 2010..... The Inn at Spanish Bay, Pebble Beach, California
64. March 27-30, 2011 .....Mauna Lani Bay Hotel, Kohala Coast, Island of Hawaii
65. June 10-13, 2012..... The St. Regis Deer Crest Resort, Park City, Utah
66. April 7-10, 2013……..……..…… The Cloister, Sea Island, Georgia
67. June 8-11, 2014…… The Algonquin, St. Andrews-by-the-Sea, New Brunswick, Canada
68. April 12-15, 2015……..……..……. The Resort at Pelican Hill, Newport Coast, California
69. June 19-22, 2016……..…… Powerscourt Hotel Resort, Enniskerry Village, Wicklow Co., Ireland
70. April 2-5, 2017……..……Ponte Vedra Inn & Club, Ponte Vedra Beach, Florida
71. June 10-13, 2018..... Four Seasons Jackson Hole, Teton Village, Wyoming
72. June 16-19, 2019..... Fairmont Banff Springs, Banff, Alberta, Canada
73. June 14, 2020...……..…….Virtual
74. June 20-23, 2021…….Edgewood Resort, Lake Tahoe, Nevada
75. June 12-15, 2022…….Four Seasons Resort Maui at Wailea, Maui, Hawaii
76. June 19-21, 2023……Chatham Bars Inn, Cape Cod, Massachusetts
77. June 24-26, 2024……..….Penha Longa Resort, Lisbon, Portugal
78. June 23-25, 2025……..Punta Mita Four Seasons, Punta Mita, Mexico

Officers of The Neurosurgical Society of America

YEAR	PRESIDENT	PRESIDENT-ELECT	VICE-PRESIDENT	SECRETARY	TREASURER
1948	Arthur Morris		Frank Otenasek	Jack Woolf (Rec. Sec.) Edward Schlesinger (Cor. Sec.)	Joshua Speigel
1948-49	Arthur Morris		Frank Otenasek	Edward Schlesinger	I. Joshua Speigel
1949-50	Frank Otenasek		George Roulhac	C.D. Hawkes	I. Joshua Speigel
1950-51	George Roulhac		Joseph Dorsey	C.D. Hawkes	I. Joshua Speigel
1951-52	Joseph Dorsey		Lyle French	C.D. Hawkes	I. Joshua Speigel
1952-53	William Meacham		Harry Maxwell Kenneth E. Livingston	C.D. Hawkes	I. Joshua Speigel
1953-54	C.D. Hawkes		Carl J. Graf Charles Neill	Lester Mount	I. Joshua Speigel
1954-55	Everett F. Hurteau		Collin S. MacCarty George Ehni	Lester Mount	I. Joshua Speigel
1955-56	Charles E. Troland		Eben Alexander, Jr. Claude M. Bertrand	Lester Mount	I. Joshua Speigel
1956-57	I. Joshua Speigel		Lester Mount Robert Watson	Frank P. Smith	Bertram Selverstone
1957-58	Lyle A. French		Harvey Chenault Frank E. Nulsen	Frank P. Smith	Bertram Selverstone
1958-59	Charles L. Neill		Christian Keedy Raymond Thompson	Frank P. Smith	Bertram Selverstone
1959-60	Collin S. MacCarty		Thomas Holbrook Edward Schlesinger	Raymond Thompson	Bertram Selverstone
1960-61	Carl J. Graf		William Patton William Williamson	Raymond Thompson	Bertram Selverstone
1961-62	Lester Mount		John Adams Richard Schneider	Raymond Thompson	Bertram Selverstone
1962-63	Claude M. Bertrand		James C. Walker William F. Collins, Jr.	Courtland Davis, Jr.	Bertram Selverstone
1963-64	Kenneth Livingston	Raymond Thompson	Robert B. King	Courtland Davis, Jr.	Bertram Selverstone
1964-65	Raymond Thompson	Robert Wilson	Robert Weyand	Courtland Davis, Jr.	Thomas H. Mason
1965-66	Robert Watson	Bertram Selverstone	Ludwig Segerberg	Courtland Davis, Jr.	Thomas H. Mason
1966-67	Bertram Selverstone	John E. Adams	Frank P. Smith	Courtland Davis, Jr.	Thomas H. Mason
1967-68	John E. Adams	Frank P. Smith	Orlando J. Andy	Courtland Davis, Jr.	Thomas H. Mason
1968-69	Frank P. Smith	Courtland Davis, Jr.	W. Eugene Stern	William Collins, Jr.	Thomas H. Mason
YEAR	PRESIDENT	PRESIDENT-ELECT	VICE-PRESIDENT	SECRETARY	TREASURER
1969-70	Courtland Davis, Jr.	Edward Schlesinger	Thomas H. Mason	William Collins Jr.	Herbert Lourie

1970-71	**Edward Schlesinger**	**Frank E. Nulsen**	**Thomas P. Morley**	**William Collins, Jr.**	**Herbert Lourie**
1971-72	**Frank E. Nulsen**	**Thomas H. Mason**	**John Shillito**	**William Collins, Jr.**	**Herbert Lourie**
1972-73	**Thomas H. Mason**	**William F. Collins, Jr.**	**Martin P. Sayers**	**Shelley N. Chou**	**Herbert Lourie**
1973-74	**William F. Collins, Jr.**	**Robert S. Knighton**	**Eldon F. Foltz**	**Shelley N. Chou**	**Herbert Lourie**
1974-75	**Robert S. Knighton**	**Charles A. Fager**	**Ross H. Miller**	**Shelley N. Chou**	**Robert D. Weyand**
1975-76	**Charles A. Fager**	**George Ehni**	**William E. Hunt**	**August W. Geise**	**Robert D. Weyand**
1976-77	**George Ehni**	**Shelley N. Chou**	**Hugh V. Rizzoli**	**August W. Geise**	**Lucien R. Hodges**
1977-78	**Shelley N. Chou**	**William E. Hunt**	**Herbert Lourie**	**August W. Geise**	**Lucien R. Hodges**
1978-79	**William E. Hunt**	**Eldon F. Foltz**	**Lee A. Christoferson**	**Jim L. Story**	**Lucien R. Hodges**
1979-80	**Eldon F. Foltz**	**John Meagher**	**David Kelly, Jr.**	**Jim L. Story**	**Lucien R. Hodges**
1980-81	**John Meagher**	**Herbert Lourie**	**Horace A. Norrell, Jr.**	**Jim L. Story**	**Lucien R. Hodges**
1981-82	**Herbert Lourie**	**August W. Geise**	**Peter Jannetta**	**Jim L. Story**	**Richard A. Olafson**
1982-83	**August W. Geise**	**Martin P. Sayers**	**Joseph Galicich**	**Donald P. Becker**	**Richard A. Olafson**
1983-84	**Martin P. Sayers**	**Lucien R. Hodges**	**Calvin B. Early**	**Donald P. Becker**	**Richard A. Olafson**
1984-85	**Lucien R. Hodges**	**Jim L. Story**	**W. Jost Michelsen**	**Donald P. Becker**	**Richard A. Olafson**
1985-86	**Jim L. Story**	**Richard A. Olafson**	**John C. VanGilder**	**Donald P. Becker**	**Phillip Williams, Jr.**
1986-87	**Richard A. Olafson**	**W. Jost Michelsen**	**Carole A. Miller**	**Russell L. Travis**	**Phillip Williams, Jr.**
1987-88	**W. Jost Michelsen**	**Melvin Shafron**	**Harry O. Cole**	**Russell L. Travis**	**Phillip Williams, Jr.**
1988-89	**Melvin Shafron**	**Carole A. Miller**	**Robert G. Selker**	**Russell L. Travis**	**J. Paul Ferguson**
1989-90	**Carole A. Miller**	**Robert G. Selker**	**Charles D'Angelo**	**Russell W. Hardy**	**J. Paul Ferguson**
1990-91	**Robert G. Selker**	**Russell L. Travis**	**Stanley M. Patterson**	**Russell W. Hardy**	**J. Paul Ferguson**
1991-92	**Russell L. Travis**	**W. Ray Jouett**	**Arnold H. Menezes**	**Russell W. Hardy**	**Richard C. Dewey**
1992-93	**W. Ray Jouett**	**Russell W. Hardy**	**Ralph T. Wicker**	**Troy M. Tippett**	**Richard C. Dewey**
1993-94	**Russell W. Hardy**	**J. Paul Ferguson**	**Richard G. Perrin**	**Troy M. Tippett**	**Richard C. Dewey**
1994-95	**J. Paul Ferguson**	**Donald P. Becker**	**Robert Goodkin**	**Troy M. Tippett**	**Harry O. Cole**
1995-96	**Donald P. Becker**	**Richard C. Dewey**	**R. L. Ferguson**	**Willis E. Brown, Jr.**	**Harry O. Cole**
1996-97	**Richard C. Dewey**	**Robert Goodkin**	**Allan H. Friedman**	**Willis E. Brown, Jr.**	**Harry O. Cole**
1997-98	**Robert Goodkin**	**John C. VanGilder**	**Philip H. Gutin**	**Willis E. Brown, Jr.**	**Edward C. Tarlov**
1998-99	**John C. VanGilder**	**Troy M. Tippett**	**Robert A. Ratcheson**	**Paul B. Nelson**	**Edward C. Tarlov**
1999-00	**Troy M. Tippett**	**Robert A. Ratcheson**	**John E. McGillicuddy**	**Paul B. Nelson**	**Edward C. Tarlov**

YEAR	PRESIDENT	PRESIDENT-ELECT	VICE-PRESIDENT	SECRETARY	TREASURER
2000-01	Robert A. Ratcheson	Harry O. Cole	David G. Piepgras	Paul B. Nelson	Allan H. Friedman
2001-02	Harry O. Cole	Paul B. Nelson	Richard Morawetz	Joseph Piepmeier	Allan H. Friedman
2002-03	Paul B. Nelson	Willis E. Brown	Hal Hankinson	Joseph Piepmeier	Allan H. Friedman
2003-04	Willis E. Brown	Hal Hankinson	Edward C. Tarlov	Joseph Piepmeier	Richard G. Perrin
2004-05	Hal Hankinson	Edward C. Tarlov	Griffith R. Harsh III	Nicholas M. Barbaro	Richard G. Perrin
2005-06	Edward C. Tarlov	Allan H. Friedman	Stephen J. Haines	Nicholas M. Barbaro	Richard G. Perrin
2006-07	Allan H. Friedman	Joseph M. Piepmeier	Martin G. Luken III	Nicholas M. Barbaro	Moustapha Abou-Samra
2007-08	Joseph M. Piepmeier	Arnold H. Menezes	Phillip E. Williams, Jr.	John L. D. Atkinson	Moustapha Abou-Samra
2008-09	Arnold H. Menezes	Richard G. Perrin	Thomas Rodenhouse	John L. D. Atkinson	Moustapha Abou-Samra
2009-10	Richard G. Perrin	Nicholas M. Barbaro	H. Hunt Batjer	John L. D. Atkinson	Griffith R. Harsh, IV
2010-11	Nicholas M. Barbaro	Philip H. Gutin	Mitesh V. Shah	John L. D. Atkinson	Griffith R. Harsh, IV
2011-12	Philip H. Gutin	H. Hunt Batjer	Vincent C. Traynelis	John L. D. Atkinson	Griffith R. Harsh, IV
2012-13	H. Hunt Batjer	Stephen J. Haines	Robert E. Wharen, Jr.	John L.D. Atkinson	Richard W. Byrne
2013-14	Stephen J. Haines	Moustapha Abou-Samra	Martin G. Luken, III	Mitesh V. Shah	Richard W. Byrne
2014-15	Moustapha Abou-Samra	Griffith R Harsh IV	E. Sander Connolly, Jr.	Mitesh V. Shah	Richard W. Byrne
2015-16	Griffith R Harsh IV	John L. D. Atkinson	Iain Kalfas	Mitesh V. Shah	Paul J. Camarata
2016-17	John L. D. Atkinson	Richard W. Byrne	Christopher Wallace	Judy Huang	Paul J. Camarata
2017-18	Richard W. Byrne	Christopher Wallace	Gordon Deen	Judy Huang	Paul J. Camarata
2018-19	Christopher Wallace	E. Sander Connolly, Jr.	Eldan Eichbaum	Judy Huang	Guy McKhann
2019-20	E. Sander Connolly, Jr.	Mitesh V. Shah	Louis Kim	Matthew Smyth	Guy McKhann
2020-21	Mitesh V. Shah	Paul D. Camarata	Jeffrey Tomlin	Matthew Smyth	Guy McKhann
2021-22	Paul J. Camarata	Eldan Eichbaum	Matthew Howard	Matthew Smyth	Jeffrey Tomlin
2022-23	Eldan Eichbaum	Judy Huang	Bernard Bendok	Aviva Abosch	Jeffrey Tomlin
2023-24	Judy Huang	Guy McKhann	Gregory Zipfel	Aviva Abosch	Jeffrey Tomlin
2024-25	Guy McKhann	Matt Smyth	Michael Boland	Aviva Abosch	Louis Kim

Bylaws

Article I: Name and Organization

The Name of the Society shall be "The Neurosurgical Society of America."

The Society is a non-profit public benefit society and is not organized for the private gain of any person. It is organized for public educational and charitable purposes, operating exclusively within the meaning of Section 501(c)(3) of the Internal Revenue Code.

Notwithstanding any other provision in these articles, the Society shall not carry on any other activities not permitted to be carried on (a) by a society exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code or (b) by a society whose contributions are deductible under Section 170(c)(2) of the Internal Revenue Code.

No substantial part of the activities of this Society shall consist of carrying on propaganda, or otherwise attempting to influence legislation, and the Society shall not participate or intervene in any political campaign (including the publishing or distribution of statements) on behalf of any candidate for public office.

The property of this Society is irrevocably dedicated to educational and charitable purposes and no part of the net income or assets of this Society shall ever inure to the benefit of any director, officer or member thereof, or to the benefit of any private person. Upon dissolution of the Society, its assets remaining after payment, or provision for payment, of all debts and liabilities of this Society shall be distributed to a non-profit fund, foundation or society which is organized and operated exclusively for educational and charitable purposes and which has established its tax exempt status under Section 501(c)(3) of the Internal Revenue Code.

Article II: Objectives

The objectives of the Society shall be to enhance the advancement of the specialty of neurological surgery in America:

a. By furnishing a forum for intimate exchange of ideas and information among a group of representative neurosurgeons;

b. By fostering personal acquaintanceship among its members to make free and confident exchange of information possible;

c. By bringing young neurosurgeons of promise into a group where they can develop full expression of ideas before a cross section of American neurosurgery;

d. By sponsoring international meetings on a personal plane of critical but sympathetic discussion of progress in neurological surgery on this continent and abroad through further dissemination of new information in the field of neurological surgery;

e. By maintaining in its membership roll a balance between academic and community neurosurgeons to promote harmonious balance between teaching of neurosurgery and its general practice in American communities.

Article III: Membership

Section 1: Membership Categories

a. Active membership shall be formed from neurosurgeons who are certified by the American Board of Neurological Surgery or, in the case of residents of foreign countries, its equivalent in the opinion of the Executive Committee. The

privilege of voting shall be reserved for Active members and Senior members. The privilege of holding executive office shall be reserved for Active members. The Active membership cap shall be 200.

b. Senior Membership: An Active member may choose to change status to Senior after 15 years of Active membership. Senior members shall have the privilege of voting, may serve on committees but are not eligible to hold executive office.

c. Associate membership may be accorded to those who are not neurosurgeons, but who are in a closely related field and whose contributions and attendance will be of benefit to the Society. Associate members may serve on committees but will not have the privilege of voting or the privilege of holding executive office. Associate membership shall have no more than 10 members at any given time.

d. Honorary membership may be accorded to certain individuals whom the Society wishes to honor, without reference to qualifications or age. Any member may propose an individual for Honorary membership to the executive committee. If approved by the Executive Committee, the candidate shall then be put forth for a vote at the annual Business Meeting where a ¾-majority vote is required for election.

e. Inactive membership status may be accorded only once per member, to Active members who are temporarily unable to meet attendance requirements of Active membership, due to illness, injury, or other extenuating circumstances. Inactive membership status may apply for up to three years, at a maximum, from date of approval. Application for Inactive membership status must be made as a written request to both the Secretary and the Chair of the Membership Committee. Inactive members may not vote, may not serve on Committees, and may not hold Executive Office. Inactive Members shall be exempt from Annual Meeting registration fees, and during their Inactive status shall be exempt from paying membership dues. However, upon reinstatement as an Active member, membership dues shall be paid in arrears, the amount to be determined by the Executive Committee at the time of reinstatement. At any time within the three-year window, the Inactive member may request return to Active membership, with a written request to both the Secretary and the Chair of the Membership Committee. If the Inactive Member has been unable to return to Active Membership by the end of the three-year window, their membership in the Society will terminate.

Section 2: Procedure of Application and Election to membership for Active and Associate Membership

a. A candidate must meet the qualifications for Active membership outlined in Article III, Section 1a.

b. Candidates for membership must have attended at least one meeting of the Society and must have presented a paper at the meeting before being proposed by a sponsor and must attend two more meetings before being elected to membership.

c. Application for Active membership must be submitted prior to the applicant's 50th birthday, or within 10 years of completing military service or neurosurgical training. On a case-by-case basis, proposed members who fall outside these constraints may be considered for membership by the Executive Committee.

d. An application form must be completed including a picture and a CV, and letters from a sponsor and two other members.

e. The membership Chair shall present the full application of candidate members to the Executive Committee at the Interim Meeting for approval.

f. The Secretary shall then circulate the candidates' names to the entire membership electronically 60 days before the Annual Meeting for an electronic vote. A lack of a response shall be counted as a Yes vote.

g. Electronic vote results are communicated to the Executive Committee and elected members are notified.

h. The member is then formally inducted at the annual business meeting.

Section 3: Procedure for handling Rejected applications:

The Executive Committee, before notification of rejected applicants, shall review all rejected applications. This Committee may request convening of the Membership Committee for review of such rejected applications.

Section 4: Process for Reapplying for membership

Individuals whose membership is terminated under provision of these Bylaws may apply to the Membership Committee for readmission. Such applications shall be considered in the light of other pending applications for membership in the Society. Applicants for readmission shall be exempt from the age requirement described in Article III, Section 2c.

Article IV: Annual Meeting Attendance

Section 1: Active Members

a. Every Active member of the Society is expected to attend every Annual Meeting.

b. The membership of any Active member who fails to attend any meeting may be terminated unless they submit an excuse acceptable to the Executive Committee within ninety days.

Section 2: Associate Members

a. Associate members shall attend Annual Meetings at least every three years.

b. Absence from three consecutive meetings, except for reasons acceptable to the Executive Committee, shall result in automatic termination of membership.

Section 3: Senior Members

Senior members are exempt from mandatory meeting attendance.

Section 4: Inactive Members

Inactive members are exempt from mandatory meeting attendance.

Article V: Executive Committee

Section 1: Makeup of the Executive Committee

The officers of the organization shall be a President, President-Elect, Vice-President, Secretary, Treasurer, and five Councilors. These ten individuals shall constitute the Executive Committee. The President-Elect and Vice-President shall be elected annually. The President-Elect shall assume the office of President at the conclusion of the following Annual Meeting after becoming President-Elect. Councilors shall be the three immediate Past-Presidents and two councilors elected from membership. One councilor shall be nominated annually on the basis of their interest and demonstrated service to the Neurosurgical Society of America. This councilor shall take office at the end of the Annual Meeting at which they are elected and serve for two years.

Section 2: Nomination of Officers

a. Potential nominees must meet criteria as outlined in membership definitions.

b. Nominations are solicited from the membership 120 days prior to the annual Business Meeting by the Chair of the nominating committee.

c. The nominating committee subsequently convenes to propose additional names.

d. A roster of nominees is circulated to the membership 30 days prior to the Annual Meeting.

Section 3: Election of Officers

Officers are elected by a majority vote at the business meeting of the Annual Meeting.

Section 4: Terms of Office

a. The President shall serve from the end of one Annual Meeting through the end of the subsequent Annual Meeting (defined as one meeting cycle).

b. The President-Elect shall serve one meeting cycle.

c. The Vice-President shall serve one meeting cycle.

d. The Secretary and the Treasurer shall serve for three meeting cycles. Their term of office must be staggered so that they do not expire in the same year.

Section 5: Duties of Officers

a. **President**: It shall be the duty of the President to preside at all meetings of the Society, to call the vote, and to see that rules are properly enforced in all deliberations of the Society. They shall be an ex-officio member of all committees. They shall assume office at the end of the Annual Meeting at which they are installed and shall continue in office until the end of the subsequent Annual Meeting. In the event of a vacancy in any office, it shall be the privilege of the President to appoint an interim officer.

b. **President-Elect:** The President-Elect shall preside in the absence of the President. The President-Elect shall succeed the President at the next Annual Meeting.

c. **Vice-President**: In the absence of the President and President-Elect, the Vice-President shall preside and assume the usual duties of the President. In the absence of the President, President-Elect, and Vice-President, the Secretary shall preside pro tem.

d. **Secretary**: It shall be the duty of the Secretary to keep a true record of the proceedings of the meetings, to preserve all books, papers and articles belonging to the Society, and to keep a register of the members. They shall send notice of all meetings to each member at the appropriate time and notify all members of committees of their appointments. They shall also act as a Secretary of the Executive Committee. At the end of each Annual Meeting the Secretary shall summarize the Society's activities during the year and along with the printed program for the meeting deposit these documents with the Archivist.

e. **Treasurer**: It shall be the duty of the Treasurer to collect all money due from the members, keep a correct record of such funds, and disburse funds for the ordinary expenses of the Society as well as other funds ordered by the Executive Committee.

Article VI: Committees

Section 1: Standing committees of the NSA

The standing committees of the Society shall consist of Executive, Nominating, Membership, Scientific Program, Auditing and Finance, Local Arrangements, Bylaws, Long Range Planning and Site Selection Committees.

a. **The Executive Committee**: It shall be the duty of the Executive Committee to oversee the functioning of the various officers and committees and insure the efficient running of the Society. It shall have the power to drop from the roll any member who has failed to pay their dues for more than two years, or who misses any meeting of the Society without adequate excuse, or who fails for any reason to maintain professional standards in their community. It shall set the dues structure for various classes of membership.

b. **The Nominating Committee** shall consist of five members: The two immediate Past-Presidents and three additional members appointed by the President for a three-year term shall also serve on this committee. The Past-Past-President shall serve as Chair. This committee shall have the responsibility of presenting candidates for office each year. Nominations from the floor before balloting at the Annual Business Meeting shall be accepted. The committee shall also have the responsibility of presenting to the President and Executive Committee nominations for the CNS and AANS annually. Final nominations for the CNS and AANS shall be chosen by majority vote of the Executive Committee.

c. **The Membership Committee** shall consist of four members and a Chair appointed by the President. Each member shall serve for a maximum of 5 years. It shall be the responsibility of this committee to receive applications and present eligible candidates to the membership electronically for a vote; a lack of response shall be counted as a Yes vote. It shall be the major responsibility of the Membership Committee to examine the individuals proposed for membership with a view of their consonance with the ideals and objectives of the organization, with these ideals including the goal of promoting diversity within the organization's membership. The term of office for Chair of this committee is limited to five years.

d. **The Scientific Program Committee** shall consist of three members appointed by the President to prepare for and serve at the time of the next Annual Meeting.

e. **The Auditing and Finance Committee** shall consist of a Chair and four members appointed by the President. Each member shall serve for a maximum of 5 years. The duties of the committee shall be to examine the books of the Treasurer and state their condition at the ensuing meeting, as well as to oversee the financial affairs to be sure that the Society is managing its assets and expenses in the best way possible. Committee members may not include any current member of the Executive Committee or the prior year's Treasurer.

f. **The Local Arrangements Committee** shall consist of a Chair and two members selected by the President, producing continuity in physical arrangements and permitting each committee member to be responsible for the arrangements with the hotel and the membership for their meeting.

g. **The Site Selection Committee** shall consist of three members appointed by the President, each serving a 5-year term in addition to the two immediate Past-Presidents. It is responsible for identifying future meeting sites and negotiating meeting site contracts. The President shall appoint the Chair for a term of five years.

h. **The NSA Medal Committee** shall consist of seven members appointed by the President to serve three-year terms. It shall be the responsibility of this committee to select an individual to be honored by the Neurosurgical Society of America with the NSA Medal, which is bestowed at the Annual Meeting. The President shall appoint the Chair for a term limit of three years.

i. **The NSA Bylaws Committee** shall consist of a Chair and four members chosen by the President to serve 3-year terms. This committee shall have the responsibility of proposing changes to the Bylaws in accordance with rules governing their amendment in these documents.

j. **The Long-Range Planning Committee** shall consist of a Chair and four members appointed by the President. Each member shall serve for a maximum of 5 years. The members of this committee shall advise the Executive Committee regarding long-range strategic planning and issues which can affect the vitality of the Society. The committee shall also have the responsibility of heading communications with the public and with members of the Society.

Section 2: Ad Hoc Committees

a. The President shall have the power to appoint ad hoc committees as required in the best interests of the Society.

b. These committees shall dissolve at the end of the President's term unless specifically renewed by the incoming President.

Article VII: Archivist

The Archivist shall maintain materials that create and preserve a historical record for the Society. The Archivist may attend the Executive Committee meeting but shall not have a vote. The President shall appoint an Archivist for a period of five years.

Article VIII: Meetings

Section 1: Annual Meeting: Meetings shall be held annually.

Section 2: Interim Meeting: An Interim Meeting is held annually in the President's hometown.

Section 3: Special Meeting: The President or any three members of the Executive Committee may call special meetings.

Article IX: Quorum

The membership present at any Annual executive session of an Annual Meeting or Special Meeting shall constitute a quorum for business.

Article X: Removal and emergency suspension of officers

Section 1: Removal

Any officer may be removed from office by a three-fourths vote of the general membership at a Special Meeting or at the Annual Meeting. Notice of a pending motion to remove an officer must be published to the general membership at least thirty days prior to the meeting at which the removal motion shall be discussed and acted upon. In the event of removal of the President, succession shall be in accordance with Article V, Sec 5. If an officer other than the President is removed under this Article, a replacement officer shall be appointed by the Executive Committee to fill out the term of the officer removed.

Section 2: Emergency Suspension

The Executive Committee, under conditions that it considers emergent and by majority vote, may suspend from office any officer of the Neurosurgical Society of America. Upon such suspension from office, the officer shall cease to be a member of the Executive Committee and shall immediately turn over to the Executive Committee any and all Neurosurgical Society of America records in their possession. The Executive Committee shall promptly notify the Neurosurgical Society of America membership of the emergency suspension and shall recommend removal of the suspended officer in accordance with Article X, Section 1.

Article XI: Bylaws Amendments

Section 1: Proposal of bylaws amendments

a. The Bylaws committee may propose bylaws amendments at the annual Business Meeting.

b. Members may propose bylaws amendments to the Chair of the bylaws committee.

Section 2: Adoption of bylaws amendments

a. Proposed Bylaws amendments shall be circulated to the membership electronically 60 days before the Annual Meeting.

b. Bylaws amendments shall be presented for discussion at the Annual Meeting.

c. Bylaws amendments that had not been circulated in advance of the Annual Meeting shall be voted on at the following Annual Meeting.

d. Bylaws amendments require a ¾-majority vote of those attending the Annual Meeting.

Article XII: Dues

The Executive Committee of the Society shall have the power to determine dues and assessments of all categories of membership on an annual basis.

Article XIII: Parliamentary Procedure

Section 1: Deliberations

"Sturgis Standard Code of Parliamentary Procedure" shall govern the deliberations of this Society.

Section 2: Order of Business

The order of procedure of the Executive Session of the Society shall be as follows:

a. The call to order
b. The reading of the minutes
c. Reports of officers and committees
d. Election of officers
e. Installation of new members
f. Unfinished business
g. New business

CORPORATE SUPPORTERS

The Neurosurgical Society of America would like to thank the following companies for their corporate sponsorship of the 78th Annual NSA Meeting.