



THE SOCIETY OF UNIVERSITY NEUROSURGEONS

Phoenix, Arizona

2016
ANNUAL MEETING
March 10-13, 2016



THE SOCIETY
OF UNIVERSITY
NEUROSURGEONS



HARVEY CUSHING

American
Association of
Neurological
Surgeons

Jointly Provided by the AANS

Phoenix, Arizona

We are excited to host this year's SUN meeting and welcome you to Phoenix, Arizona (The Valley of the Sun). Phoenix is a metropolitan area of more than 4 million people. With a skyscraper-filled skyline complemented by famed Camelback Mountain and surrounded by the beautiful desert landscape. Phoenix offers the perfect balance of urban energy and Southwestern scenery. It is home to big-league sporting events, renowned museums and plenty of mountain preserves with trails for biking and hiking.

Guests will be staying at the historic Arizona Biltmore Resort and Spa. Along with scientific sessions, we are pleased to feature some of the Valley's cultural hot spots including the Phoenix Botanical Gardens (the world's largest collection of desert plants), Arizona Science Center, and Scottsdale Stadium for a Cactus League pre-season baseball game. We will also enjoy dinner at the Musical Instrument Museum, the largest museum of its type in the world displaying over 15,000 musical instruments. In addition to the scheduled activities there will be plenty of free time to explore the Historic Biltmore Resort and experience its rich history, nearby hiking trails that border the beautiful Squaw Peak Preserve, 18-hole golf course and luxurious pools and grounds.

Phoenix is the largest city and capital of Arizona and is the 5th most populous city in the United States. The city is located in the Sonoran Desert, one of the wettest and greenest deserts in North America. It is surrounded by rugged mountains, scenic lakes and is home to the majestic Saguaro cactus. Phoenix is the gateway to the Grand Canyon, and its history is a testament to the spirit of the old west. We basks in sunshine 85 percent of daylight hours which makes it the perfect place to play a round of golf, attend a major league baseball game or go for a hike on one of our scenic trails.

St. Joseph's Hospital and Medical Center / Barrow Brain and Spine (BBS) are nationally ranked programs in neurosurgery and neurology. We are pleased to host the SUN Meeting in Phoenix, AZ 2016 and look forward to seeing you soon.

Warm Regards,

Felipe C. Albuquerque, MD
SUN Secretary/Treasurer, 2015-2018
Professor of Neurosurgery
Assistant Director of Endovascular Neurosurgery, BBS



Felipe C. Albuquerque, MD
HOST & SECRETARY
TREASURER

Nicholas Theodore, MD
Professor of Neurosurgery
Chief Spine Division
Director of Neuro Trauma Program



Nicholas Theodore, MD
CO-HOST

Present Officers

President

Mike Levy

Secretary/Treasurer

Felipe Albuquerque

Membership Committee

Arun Amar

Erol Veznedaroglu

Rich Anderson

President-Elect

Nelson Oyesiku

Member-at-large

Rich Ellenbogem

Future Site Committee

Mike Kaiser

Anthony Sin

Jeff Sorenson

Vice President

Michael Wang

Historian

Ken Smith

Previous Meetings

~~~~~1965~~~~~  
Montreal Neurological Institute  
Montreal, QUE

~~~~~1966~~~~~  
Duke University
Durham, NC

~~~~~1967~~~~~  
University of Minnesota  
Minneapolis, MN

~~~~~1968~~~~~  
Upstate Medical Center
Syracuse, NY

~~~~~1969~~~~~  
Massachusetts General Hospital  
Boston, MA

~~~~~1970~~~~~  
Baptist Memorial Hospital
Memphis, TN

~~~~~1971~~~~~  
Albert Einstein College of Medicine  
Bronx, NY

~~~~~1972~~~~~  
University of British Columbia
Vancouver, BC

~~~~~1973~~~~~  
Emory University  
Atlanta, GA

~~~~~1974~~~~~  
University of Texas Medical School
San Antonio, TX

~~~~~1975~~~~~  
Mayo Clinic  
Rochester, MN

~~~~~1976~~~~~  
Jefferson Medical College
Philadelphia, PA

~~~~~1977~~~~~  
Mayfield Neurological Institute  
Cincinnati, OH

~~~~~1975~~~~~  
Mayo Clinic
Rochester, MN

~~~~~1976~~~~~  
Jefferson Medical College  
Philadelphia, PA

~~~~~1977~~~~~  
Mayfield Neurological Institute
Cincinnati, OH

~~~~~1978~~~~~  
Medical College of Georgia  
Augusta, GA

~~~~~1979~~~~~  
University of Guadalajara
Guadalajara, MX

~~~~~1980~~~~~  
University of Florida  
Gainesville, FL

~~~~~1981~~~~~  
University of Western Ontario
London, ONT

~~~~~1982~~~~~  
University of Mississippi  
Jackson, MS

~~~~~1983~~~~~  
Duke University/University of NC
Durham/Chapel Hill, NC

~~~~~1984~~~~~  
University of Washington  
Seattle, WA

~~~~~1985~~~~~  
University of Colorado
Denver/Vail, CO

~~~~~1986~~~~~  
University of Louisville  
Louisville, KY

~~~~~1987~~~~~  
Medical College of Virginia
Richmond, VA

~~~~~1988~~~~~  
University of Tubingen  
Tubingen, FRG

~~~~~1989~~~~~  
University of Toronto
Toronto, ONT

~~~~~1990~~~~~  
Louisiana State Univ. Medical Center  
New Orleans, LA

~~~~~1991~~~~~  
Tufts New England Medical School
Boston, MA

~~~~~1992~~~~~  
Dartmouth Medical School  
Woodstock, VT

~~~~~1993~~~~~  
St. Louis University Medical School
St. Louis, MO

~~~~~1994~~~~~  
University of Lyon  
Lyon, France

~~~~~1995~~~~~  
Thomas Jefferson Medical School
Philadelphia, PA

~~~~~1996~~~~~  
University of Southern California  
Los Angeles, CA

~~~~~1997~~~~~  
University of Michigan
Ann Arbor, MI

~~~~~1998~~~~~  
University of Tennessee  
Memphis, TN

~~~~~1999~~~~~  
University of Melbourne
Melbourne, Australia

~~~~~2000~~~~~  
Harvard Medical School/  
Brigham & Women's  
Boston, MA

~~~~~2001~~~~~  
Oregon Health Sciences University
Portland, OR

~~~~~2002~~~~~  
Northwestern University/ Chicago  
Evanston, IL

~~~~~2003~~~~~  
Columbia Presby. Med Center/
NY Presby. Hospital
New York, NY

~~~~~2004~~~~~  
Karolinska Institute  
Stockholm, Sweden

~~~~~2005~~~~~  
Wake Forest University
School of Medicine
Winston-Salem, NC

~~~~~2006~~~~~  
University of California – San Diego  
Del Mar, CA

~~~~~2007~~~~~  
National Hospital for Neurology
and Neurosurgery
London, England

~~~~~2008~~~~~  
University of California  
San Francisco, CA

~~~~~2009~~~~~  
Sapienza University
Rome, Naples & Capri, Italy

~~~~~2010~~~~~  
University of Miami  
Miami, Florida

~~~~~2011~~~~~  
Istanbul, Turkey

~~~~~2012~~~~~  
Emory University  
Atlanta, Georgia

~~~~~2013~~~~~  
Carlos Haya University
Malaga, Spain

~~~~~2014~~~~~  
University of Washington  
Seattle, WA

~~~~~2015~~~~~  
Huashan Hospital Fudan University
Shanghai, China

Past Presidents

~~~~~1965~~~~~  
James T. Robertson, MD

~~~~~1966~~~~~  
George T. Tindall, MD

~~~~~1967~~~~~  
Robert G. Ojemann, MD

~~~~~1968~~~~~  
Charles L. Branch, MD

~~~~~1969~~~~~  
Jim Story, MD

~~~~~1970~~~~~  
Herbert Lourie, MD

~~~~~1971~~~~~  
Byron Pevehouse, MD

~~~~~1972~~~~~  
Kenneth Shulmann, MD

~~~~~1973~~~~~  
Darton Brown, MD

~~~~~1974~~~~~  
Ellis Keener, MD

~~~~~1975~~~~~  
Robert Hardy, MD

~~~~~1976~~~~~  
Phanor Perot, MD

~~~~~1977~~~~~  
Gordon Thompson, MD

~~~~~1978~~~~~  
Lucien R. Hodges, MD

~~~~~1979~~~~~  
Robert White, MD

~~~~~1980~~~~~  
Robert Grossman, MD

~~~~~1981~~~~~  
Stewart Dunsker, MD

~~~~~1982~~~~~  
Marshall Allen, MD

~~~~~1983~~~~~  
Ian Turnbull, MD

~~~~~1984~~~~~  
Henry Garretson, MD

~~~~~1985~~~~~  
Harold F. Young, MD

~~~~~1986~~~~~  
Robert Smith, MD

~~~~~1987~~~~~  
Kenneth R. Smith, Jr. MD

~~~~~1988~~~~~  
Willis Brown, MD

~~~~~1989~~~~~  
Glenn W. Kindt, MD

~~~~~1990~~~~~  
Salvador Gonzales-Cornejo, MD

~~~~~1991~~~~~  
Michael L.J. Apuzzo, MD

~~~~~1992~~~~~  
William A. Buchheit, MD

~~~~~1993~~~~~  
Alan R. Hudson, MD

~~~~~1994~~~~~  
Robert Maxwell, MD

~~~~~1995~~~~~  
Peter L. Black, MD

~~~~~1996~~~~~  
William Shucart, MD

~~~~~1997~~~~~  
Ronald F. Young, MD

~~~~~1998~~~~~  
David W. Roberts, MD

~~~~~1999~~~~~  
Charles S. Hodge, Jr. MD

~~~~~2000~~~~~  
John E. McGillicuddy, MD

~~~~~2001~~~~~  
H. Hunt Batjer, MD

~~~~~2002~~~~~  
Philip Stieg, PhD, MD

~~~~~2003~~~~~  
Robert Rosenwasser, MD

~~~~~2004~~~~~  
Robert Breeze, MD

~~~~~2005~~~~~  
Kim Burchiel, MD

~~~~~2006~~~~~  
Jon Robertson, MD

~~~~~2007~~~~~  
Carl Heilman, MD

~~~~~2008~~~~~  
Robert Solomon, MD

~~~~~2009~~~~~  
Jeffrey Bruce, MD

~~~~~2010~~~~~  
John Wilson, MD

~~~~~2011~~~~~  
Anil Nanda, MD

~~~~~2012~~~~~  
Thomas Oritano, MD

~~~~~2013~~~~~  
Neil Kitchen, MD

~~~~~2014~~~~~  
Sander Connolly, MD

~~~~~2015~~~~~  
Jacques Morcos, MD

# 2016 Meeting Attendees

## SUN Members

Adelson, David, MD  
Albuquerque, Felipe, MD  
Anderson, Richard, MD  
Bristol, Ruth, MD  
Bruce, Jeffrey, MD  
Chandler, James, MD  
Chin, Lawrence, MD  
Choi, David, MD  
Connolly, Sander, MD  
David, Carlos, MD  
DeMonte, Franco, MD  
Ecklund, James, MD  
Erkmen, Kadir, MD  
Grossman, Robert, MD  
Harbaugh, Robert, MD

Heilman, Carl, MD  
Hoh, Daniel, MD  
Kaiser, Michael, MD  
Kitchen, Neil, MD  
Lavine, Sean, MD  
Levy, Michael, MD  
Link, Michael, MD  
Liu, Charles, MD  
McCutcheon, Ian, MD  
Michael, Madison, MD  
Morcos, Jacques, MD  
Nanda, Anil, MD  
Ogden, Alfred, MD  
Origitano, Thomas, MD  
Oyesiku, Nelson, MD

Ogilvy, Christopher, MD  
Pruel, Mark, MD  
Prestigiaco, Charles, MD  
Sisti, Michale, MD  
Smith, Kenneth, MD  
Solomon, Robert, MD  
Sorenson, Jeffrey, MD  
Theodore, Nicholas, MD  
Varsos, Georgios, MD  
Veznedaroglu, Erol, MD  
Wang, Michael, MD  
Yoshor, Daniel, MD  
Zadeh, Gelareh, MD  
Mack, William, MD

## Members' Guests

**Abla, Adib, MD**  
(Theodore, Nicholas, MD)

**Bulsara, Ketan, MD**  
Notorianni, Christina, MD  
(Nanda, Anil, MD)

**Elder, James, MD**  
(Hoh, Daniel, MD)

**Krieger, Mark, MD**  
**Nakaji, Peter, MD**  
**Sanai, Nader, MD**  
**Ducruet, Andrew, MD**  
(Albuquerque, Felipe, MD)

**Liu, James, MD**  
(Morcos, Jacques, MD and  
Sorensen, Jeff, MD)

**Mahaney, Kelly, MD**  
(Bristol, Ruth, MD)

**Rabb, Craig, MD**  
(Chin, Lawrence, MD)

**Riesenburg, Ron, MD**  
(Heilman, Carl, MD)

**Wu, Jau Ching, MD**  
(Wang, Michael, MD)

**Amin-Hanjani, Sepideh, MD**  
(Morcos, Jacques, MD)

**Quest, Donald, MD**  
(Bruce, Jeffrey, MD)

# Distinguished Service Award



## Jeffrey N. Bruce M.D.

**J**effrey N. Bruce M.D. graduated With Distinction from the University of Virginia and received his medical degree from Rutgers-Robert Wood Johnson Medical School. He was a medical staff fellow in the Surgical Neurology Branch of the N.I.H. before completing a neurosurgery residency at the Neurological Institute of New York, Columbia University. He remained on staff and is currently the Edgar M. Housepian Professor of Neurological Surgery at Columbia University's College of Physicians and Surgeons, where he serves as Vice-Chairman, Residency Program Director, Co-Director of the Brain Tumor Center, Program Director for Neuro-oncology in the Cancer Center and Director of the Bartoli Brain Tumor Research Laboratory.

He has authored over 200 publications as leader of an NIH-funded translational brain tumor research

effort with interests in glioma immunotherapy, progenitor cell biology and drug delivery systems. Clinically he specializes in surgical neuro-oncology, with particular interests in skull base, pineal tumors and pituitary tumors. His numerous awards include the Teacher Recognition Award from Columbia University, the Physician of the Year from CancerCare, induction into the Alpha Omega Alpha honorary medical society, and the Distinguished Alumni Award from Rutgers-RWJMS.

He is currently Chairman of the American Board of Neurological Surgery and has previously served as Chairman of the Joint Section on Tumors for the AANS/CNS, Vice-President of the American Academy of Neurological Surgeons, President of the Society of University Neurosurgeons and President of the New York Society for Neurosurgery. He is a member of several editorial boards including Journal of Neuro-oncology (Associate Editor), Neurosurgery, Journal of Surgical Education and World Neurosurgery.



# Special Speakers



Dr. Carmona

**B**orn to a poor Hispanic family in New York City, Dr. Carmona experienced homelessness, hunger, and health disparities during his youth. The experiences greatly sensitized him to the relationships among culture, health, education and economic status and shaped his future.

After dropping out of high school, Dr. Carmona enlisted in the U.S. Army in 1967. While serving, he earned his General Equivalency Diploma and went on to become a combat-decorated Special Forces Vietnam veteran. After leaving active duty, he attended Bronx Community College of the City University of New York through an open enrollment program for veterans. He received an associate of arts degree. He then attended the University of California, San Francisco, where he received a bachelor of science degree (1977) and medical degree (1979). At the University of California Medical School, Dr. Carmona was awarded the prestigious gold-headed cane as the top graduate.

Trained in general and vascular surgery, Dr. Carmona also completed a National Institutes of Health-sponsored fellowship in trauma, burns, and critical care. Dr. Carmona was then recruited jointly by the Tucson (Arizona) Medical Center and the University of Arizona to start and direct Arizona's first regional trauma care system. He went on to become the chairman of the State of Arizona Southern Regional Emergency Medical System, a professor of surgery, public health and family and community medicine at the University of Arizona, and the Pima County Sheriff's Department surgeon and deputy sheriff. He is also a Fellow of the American College of Surgeons.

Public health came as a second career after Dr. Carmona went back to graduate school while working in order to complete a master's degree in public health at the University of Arizona. His interest in public health stemmed from the realization that most of his patients' illnesses and injuries were completely preventable.

Dr. Carmona has also served for over 30 years with the Pima County Sheriff's Department in Tucson, including as deputy sheriff, detective, SWAT team leader and department surgeon. He is one of the most highly decorated police officers in Arizona, and his numerous awards include the National Top Cop Award, the National SWAT Officer of the Year, and the National Tactical EMS Award. Dr. Carmona is a nationally recognized SWAT expert and has published extensively on SWAT training and tactics, forensics, and tactical emergency medical support. Dr. Carmona has also served as a medical director of police and fire departments and is a fully qualified peace officer with expertise in special operations and emergency preparedness, including weapons of mass destruction.

In 2002 Dr. Carmona was nominated by the president and unanimously confirmed by the United States Senate to become the 17th Surgeon General of the United States. Dr. Carmona was selected because of his extensive experience in public health, clinical sciences, health care management, preparedness, and his commitment to prevention as an effective means to improve public health and reduce health care costs while improving the quality and quantity of life.

As Surgeon General, Dr. Carmona focused on prevention, preparedness, health disparities, health literacy, and global health to include health diplomacy. He also issued many landmark Surgeon General communications during his tenure, including the definitive Surgeon General's Report about the dangers of second-hand smoke.

Dr. Carmona has published extensively and received numerous awards, decorations, and local and national recognitions for his achievements. A strong supporter of community service, he has served on community and public and private national boards and provided leadership to many diverse organizations.

In 2006, Dr. Carmona successfully completed the statutory four-year term of the U.S. Surgeon General and was named to the position of vice chairman for Canyon Ranch, a leader in the health and wellness field for over 35 years. He also serves as chief executive officer of the company's Health division and oversees health strategy and policy for all Canyon Ranch businesses. He is president of the nonprofit Canyon Ranch Institute and the first Distinguished Professor of Public Health at the University of Arizona's Mel and Enid Zuckerman College of Public Health.





## Vern Clark

Admiral Clark completed a distinguished 37-year Navy career in 2005 which concluded in the halls of the Pentagon as the Chief of Naval Operations, the uniformed leader of the Navy.

His career began serving in destroyers and then early command as a lieutenant. Ultimately he commanded three ships, two destroyer squadrons, the Atlantic Fleet's Anti-Submarine Training Center, a Carrier Battle Group, The Second Fleet/NATO's Striking Fleet, The U.S.

Atlantic Fleet and then the Navy.

His tenure as CNO was mark by significant change and renewed vision. His leadership led to the best retention in history, an enterprise which saved billions of dollars for taxpayers, and the highest operational readiness witnessed in decades.

Admiral Clark operates his own consulting company, serves on numerous boards, and lectures on national security and leadership.



## Greg Dunn

Greg Dunn is an artist who received his PhD in neuroscience from the University of Pennsylvania in 2011. While a graduate student, Dunn's artistic experiments demonstrated that the qualities of neural forms fit seamlessly into the aesthetic principles of minimalist Asian art and sumi-e scroll and gold leaf painting. Dunn is now a full time artist out of Philadelphia where he works to incorporate his knowledge of neuroscience, physics, and biology into the artistic process through both imagery and technique. Together with Dr. Brian Edwards, a collaborating artist and electrical engineer at Penn, Greg invented a revolutionary technique called reflective microetching that allows dynamic control of

imagery and color in reflective gold surfaces. This work has led to the awarding of a grant from the National Science Foundation to produce an enormous 8' X 12' microetching of the human brain, the most complex and detailed artistic piece on the brain that will exist in the world. Dunn and Edwards are currently working on this massive project with the help of neuroscience and fine art students that is expected to be completed and permanently hanging in the Franklin Institute in Philadelphia in Spring of 2016.



# Meeting Schedule

Thursday, March 10, 2016

6:30-9:30 pm: Welcome Reception

Biltmore 3rd Floor Terrace

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Friday, March 11, 2016

6:30-8:00 am: Breakfast at the AZ Biltmore

FLW Lawn

7:00-8:00 am: Executive Board Meeting (EC Members only)

Kaibab room

8:00 am: Board shuttles at AZ Biltmore to St. Joseph's Hospital and Medical Center

Goldman Auditorium

8:30-Noon Registration

Marley Lobby

8:30-12:30 pm: Scientific Session I at St. Joseph's Hospital

Goldman Auditorium

8:30-9:45 am: Moderator:

Albuquerque, Felipe, MD

8:30-8:35 am: Welcome Drs. Albuquerque and Theodore

8:35-8:45 am: Neurooncology at the BNI

Nader Sanai

8:45-8:55 am: The BNI at Phoenix Childrens Hospital - Program highlights and Initiatives

P.David Adelson

8:55-9:05 am: Neurosurgery Residency at the Barrow Neurological Institute

Peter Nakaji

9:05-9:15 am: Minimally Invasive Spine Surgery in 2020

Luis Tumialan

9:15-9:25 am: Barrow's Cerebrovascular Program

Joseph Zabramski

9:25-9:35 am: Advances in Spinal Cord Injury Therapeutics

Nicholas Theodore

9:35-9:45 am: Barrow's Pituitary Program

Andrew Little

9:45-10:00 am: Discussion

10:15-Noon: Moderator:

Theodore, Nicholas, MD

10:00-10:15 am: Break with exhibitors

10:15-10:25 am: Neurosurgery Practice Expansion

Mark Garrett

|                 |                                                                          |                   |
|-----------------|--------------------------------------------------------------------------|-------------------|
| 10:25-10:35 am: | Craniofacial Surgery in Phoenix                                          | Ruth Bristol      |
| 10:35-10:45 am: | Minimally Invasive Options for Brain Tumor and Epilepsy                  | Kris Smith        |
| 10:45-10:55 am: | Update on Acoustic Neuroma Program                                       | Randall Porter    |
| 10:55-11:05 am: | Neurosciences Research at BNI                                            | Mark Preul        |
| 11:05-11:15 am: | Discussion                                                               |                   |
| 11:15-11:20 am: | Introduction of Richard Carmona                                          | Nicholas Theodore |
| 11:20-11:50 am: | Guest Speaker: Richard Carmona 17th Surgeon General of the United States |                   |
| 11:50-12:00 pm: | Discussion                                                               |                   |
| 12:10-1:00 pm:  | Lunch                                                                    | Sonntag Pavilion  |
| 1:15 pm:        | Board shuttles back to AZ Biltmore                                       |                   |
| 1:45-4:15 pm:   | Free Time / Hotel activities                                             | AZ Biltmore       |
| 3:30 pm:        | Historical Tour of Biltmore Hidden Room                                  | AZ Biltmore Lobby |
| 4:30 pm:        | Board shuttles at AZ Biltmore to Musical Instrument Museum (MIM)         |                   |
| 5:00-6:30 pm:   | Tour Musical Instrument Museum                                           |                   |
| 6:30-7:30 pm:   | Cocktails and Hors d'oeuvres at MIM                                      |                   |
| 7:30-9:30 pm:   | Dinner                                                                   |                   |
| 9:30 pm:        | Board shuttles at MIM to AZ Biltmore                                     |                   |

## Spouses/Children 9:30am-1:00pm

Botanical Gardens Tour

## Saturday, March 12, 2016

|                       |                                                                                                                                                                         |                     |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 6:30-9:00 am:         | Breakfast at the AZ Biltmore                                                                                                                                            | FLW Lawn            |
| 7:00-8:00 am:         | Business Member Meeting - breakfast                                                                                                                                     | Sedona Room         |
| <b>8:00-11:30 am:</b> | <b>Scientific Session II at AZ Biltmore</b>                                                                                                                             | <b>Sedona Room</b>  |
| 8:00-9:10 am:         | Moderator:                                                                                                                                                              | Bristol, Ruth, MD   |
| 8:10-8:20 am:         | Does where you live influence how your vestibular schwannoma is managed? Examining geographical differences in vestibular schwannoma treatment across the United States | Michael Link        |
| 8:20-8:30 am:         | Genomic Landscape of Vestibular Schwannoma                                                                                                                              | Gelareh Zadeh       |
| 8:30-8:40 am:         | Skull Base Chondrosarcomas: The Role of Histology-Specific Treatment Protocols                                                                                          | Franco DeMonte      |
| 8:40-8:50 am:         | Traumatic Brain Injury                                                                                                                                                  | Lawrence Chin       |
| 8:50-9:00 am:         | A Novel, Minimally Invasive Surgical Technique For Evacuating Deep Intracerebral Hemorrhages                                                                            | Kenneth Liebman     |
| 9:00-9:10 am:         | Radiographic Predictors of "Second-look Surgery" in Pediatric Intracranial Germ Cell Tumors                                                                             | Mark Krieger        |
| 9:10-9:20 am:         | Discussion                                                                                                                                                              |                     |
| 9:20-11:30 am:        | Moderator:                                                                                                                                                              | DeMonte, Franco, MD |
| 9:20-9:35 am:         | Brainstem Cavernomas                                                                                                                                                    | Madison Michael     |
| 9:35-9:45 am:         | Dueling Medieval Neurosurgeons: Myth Vs. Maxim                                                                                                                          | Anil Nanda          |
| 9:45-9:55 am:         | Rising healthcare costs despite stable disease burden and mortality in pediatric hydrocephalus                                                                          | Kelly Mahaney       |
| 9:55-10:05 am:        | The importance of atlantoaxial fixation after odontoidectomy                                                                                                            | Jau Ching Wu        |
| 10:05-10:15 am:       | Effect of Intraoperative Injection of Liposomal Bupivacaine on Post-operative Analgesia after TLIF Surgery: A Retrospective Study of 74 Patients                        | Ron Riesenburger    |
| 10:15-10:25 am:       | Current, Past and Future C1-C2 Fixation                                                                                                                                 | Volker Sonntag      |
| 10:25-10:35 am:       | Management of Lesions in and Around the 3rd Ventricle                                                                                                                   | Robert Spetzler     |



|                 |                                                                                          |                   |
|-----------------|------------------------------------------------------------------------------------------|-------------------|
| 10:35-10:45 am: | REX, a Robotic Exoskeleton for the Restoration of Walking in Individuals with Paraplegia | Robert Grossman   |
| 10:50-10:55 am: | Distinguished Service Award Presented to Dr. Jeff Bruce                                  | Michael Levy      |
| 10:55-11:00 am: | Introduction of SUN President                                                            | Sean Lavine       |
| 11:00-11:30 am: | Presidential Address                                                                     | Mike Levy         |
| 11:30-11:35 am: | Introduction of Guest Speaker: Admiral Vern Clark                                        | Nicholas Theodore |
| 11:35-12:05 pm: | Guest Speaker: Admiral Vern Clark                                                        |                   |
| 12:30 pm:       | Board shuttles at AZ Biltmore to Scottsdale Ball Park                                    |                   |
| 1:00-4:15 pm:   | Pre Season MLB Game and Lunch                                                            |                   |
| 5:00 pm:        | Board shuttles back to AZ Biltmore                                                       |                   |
| 6:30-7:30 pm:   | Cocktails                                                                                | Aztec Lawn        |
| 7:30-9:30 pm:   | Gala Dinner at AZ Biltmore                                                               | Aztec Room        |

## Spouses/Children

8:30--11:00am

Biltmore Scenic Hike

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## Sunday, March 13, 2016

|                |                                                                                                                                                   |                      |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 7:00-9:00 am:  | Breakfast at the AZ Biltmore                                                                                                                      | FLW Lawn             |
| 8:00-11:30 am: | <b>Scientific Session III at AZ Biltmore</b>                                                                                                      | <b>Sedona Room</b>   |
| 8:00-10:00 am: | Moderator:                                                                                                                                        | Chin, Lawrence, MD   |
| 8:10-8:20 am:  | Current Treatment of Small and Very Small Ruptured Aneurysms by Comprehensively Trained Neurosurgeons                                             | Mandy Binning        |
| 8:20-8:30 am:  | Which One Ruptured? Accuracy and Implications of Identifying the Subarachnoid Hemorrhage Source in the Setting of Multiple Intracranial Aneurysms | Sepideh Amin-Hanjani |
| 8:30-8:40 am:  | Role of Anesthesia in Patients Undergoing Mechanical Thrombectomy for Acute Stroke                                                                | Kadir Erkmen         |

|                 |                                                                                                                                                                                                                                |                      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 8:40-9:50 am:   | Endovascular Treatment of Cerebral Aneurysms with Flow Diverters                                                                                                                                                               | Vasileios Varsos     |
| 9:50-10:00 am:  | Pipeline Embolization Device for small intracranial aneurysms: evaluation of safety and efficacy in a multicenter cohort                                                                                                       | Christopher Ogilvy   |
| 10:00-10:15 am: | Break with exhibitors                                                                                                                                                                                                          |                      |
| 10:15-11:20 am: | Moderator:                                                                                                                                                                                                                     | Erkmen, Kadir, MD    |
| 10:15-10:20 am: | Results of an International Survey on the Investigation and Endovascular Management of Cerebral Vasospasm and Delayed Cerebral Ischemia                                                                                        | Ketan Bulsara        |
| 10:20-10:30 am: | Relaxing Sphenoidal Slit Incision to Extend the Anterior and Posterior Reach of Pedicled Nasoseptal Flaps During Endoscopic Skull Base Reconstruction of Transcribriform Defects: Technical Note and Results in 20 Patients    | James Liu            |
| 10:30-10:40 am: | Subspecialty training for mid-level providers: Initial Experience with a Neurosurgical Primary Technical Skills Boot Camp for Physician Assistants and Nurse Practitioners and Evolution into a Mid-level Fellowship training. | TC Origitano         |
| 10:50-11:00 am: | Patterns of recurrence and survival in sporadic, neurofibromatosis type 1-associated, and radiation-associated malignant peripheral nerve sheath tumors                                                                        | Ian McCutcheon       |
| 11:00-11:10 am: | Early-practice Single-surgeon Experience with Basilar Apex Aneurysms using a complementary Open and Endovascular approach                                                                                                      | Adib Abla            |
| 11:10-11:20 am: | Discussion                                                                                                                                                                                                                     |                      |
| 11:20-11:50 am: | Guest Speaker: Greg Dunn Artist / Neuroscientist                                                                                                                                                                               |                      |
| 11:50 am:       | Concluding announcements                                                                                                                                                                                                       | Albuquerque/Theodore |

## Spouses/Children

Optional SPA services for guests at 15% discount. Must sign up when checking in to hotel.

## Learning Objectives

Upon completion of this CME activity, the participant should be able to:

- Discuss current practice patterns with regards to the symptomatology, diagnosis, treatment methods and complication avoidance with respect to the entire spectrum of neurosurgical conditions and allied specialties in the clinical and basic neurosciences.
- Review real clinical cases and specific treatment methods that are justified and explained by recognized world leaders in the field.
- Describe the most recent and future trends in neurosurgery around the world.
- Identify effective program innovations and models from experts around the world.

## Accreditation/ Continuing Medical Education (CME)

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the AANS and the Society of University Neurosurgeons. The AANS is accredited by the ACCME to provide continuing medical education for physicians.

The AANS designates this live activity for a maximum of 11 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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## Educational Format

Didactic lectures, case presentations/discussions, panel discussions, and oral paper presentations



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| Chin, Lawrence, MD   | AANS NREF<br>Walbridge Fund                                                                                                                                                                                                                                                 | University Grants/Research Support                                                                  |
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| Porter, Randall, MD  | The Medical Memory<br>chairman, The Medical Memory                                                                                                                                                                                                                          | Stocks or Shareholder<br>Fiduciary Position                                                         |

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| Riesenburger, Ron, MD  | Depuy spine                                                                                                                                                                                     | Honorarium                                                                                                  |
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| Zadeh, Gelareh, MD     | CIHR, Terry Fox<br>New Investigator                                                                                                                                                             | University Grants/Research Support                                                                          |

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| Liebman, Kenneth, MD      |                         |
| Link, Michael, MD         |                         |
| Liu, James, MD            |                         |
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# Abstracts

## **Does where you live influence how your vestibular schwannoma is managed? Examining geographical differences in vestibular schwannoma treatment across the United States**

**Link, Michael, MD**

### **Objective:**

To estimate the impact of place of residence on disease presentation and treatment of vestibular schwannoma (VS) in the United States.

### **Study Design:**

Analysis of a national population-based tumor registry

### **Methods:**

Analysis of the Surveillance, Epidemiology, and End Results (SEER) database including all patients identified with a diagnosis of VS. Associations between place of residence within one of 16 SEER geographic registries and treatment modality for tumors <3cm in size were analyzed with univariable and multivariable models. As a secondary outcome, associations between population density of the geographic registry with patient demographics and tumor characteristics were analyzed

### **Results:**

9,761 patients with VS were managed across the 16 SEER geographic registry areas. The mean age was 55.5 years and 52.7% were women with little variance seen across sites. Univariable analyses demonstrated strong associations between geographic location and tumor size at diagnosis ( $P < 0.0001$ ). When analyzing the 6,115 subjects with tumors between 0 and 3 cm in size, strong associations were identified between place of residence and treatment modality ( $P < 0.0001$ ). After adjusting for tumor size and age, compared to Greater California, residents of Utah (OR 3.04, 95% CI 2.26-4.08),  $P < 0.0001$ ), Iowa (OR 2.47, 95% CI 1.90-3.20,  $P < 0.001$ ), and Los Angeles (OR 1.75, 95% CI 1.41-2.18,  $P < 0.0001$ ) most commonly underwent operative treatment, whereas residents of New Mexico (OR 3.05, 95% CI 1.71-5.45,  $P = 0.0002$ ) and Connecticut (OR 2.16, 95% CI 1.67-2.79,  $P < 0.001$ ) more frequently underwent primary radiation treatment. Lastly, residents of Kentucky (OR 3.40, 95% CI 2.61-4.43,  $P < 0.0001$ ), Hawaii (OR 2.87, 95% CI 1.66-4.95,  $P = 0.0002$ ), Metropolitan Atlanta (OR 2.48, 95% CI 1.74-3.56,  $P < 0.0001$ ), and Seattle (OR 2.26, 95% CI 1.84-2.77,  $P < 0.0001$ ) most commonly underwent observation.

### **Conclusions:**

Place of residence significantly influences disease presentation and treatment of VS in the United States. These data suggest that treatment modality is significantly influenced by regional referral patterns, provider or institutional treatment preferences, and regional availability of subspecialty expertise.

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## **Genomic Landscape of Vestibular Schwannoma**

**Zadeh, Gelareh, MD**

Schwannomas are common peripheral nerve tumours with significant debilitating morbidities. Most notably vestibular schwannoma pose a continued clinical challenge for management in both its sporadic and NF2 associated form. Here we performed an integrative analysis to determine the somatic landscape of schwannomas. Whole exome sequencing followed by more focused targeted sequencing samples showed that in addition to NF2 mutation or loss, several recurrent mutations were identified, involving ARID1A, ARID1B and DDR1. Genome-wide methylation profiling identified two molecular subgroups for both vestibular and spinal schwannomas that are associated with tumour size. RNA sequencing analysis on 41 schwannoma samples with validation in an additional 84 samples identified a recurrent in-frame fusion involving SH3PXD2A and HTRA1 arising through a balanced chromosomal inversion on chromosome 10q. Functionally, the SH3PXD2A-HTRA1 fusion increases proliferation in schwannoma cells and schwann cells and promotes the ability to form tumors in vivo. Fusion-positive cells had elevated levels of total and phosphorylated ERK and were sensitive to MEK inhibitors. This study identifies recurrent driver alterations in schwannomas, including a subset with a novel fusion that promotes tumorigenesis.



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## Skullbase

*DeMonte, Franco, MD*

### Chondrosarcomas:

The Role of Histology-Specific Treatment Protocols  
Franco DeMonte MD, Shaan Raza MD, Paul W. Gidley MD

#### Introduction:

Limited data exists regarding outcomes from the multimodal management of chondrosarcomas(CSA) arising in the skull base. In light of advances in surgical technique, adjuvant therapy protocols and an improved understanding of histology-specific treatment, we reviewed our surgical experience to determine disease control rates and factors affecting progression-free survival. N

#### Methods:

A retrospective review of twenty-eight patients with chondrosarcomas with skull base involvement treated surgically at The University of Texas M.D. Anderson Cancer Center from 1994 – 2012 was performed. Of these patients, 75% had conventional CSAs, 21.4% had mesenchymal CSAs and 1 patient had a dedifferentiated CSA. Of the conventional subtype, 18% were Grade 1, 54% were Grade 2 and 4% were Grade 3. In addition to surgery, mesenchymal/dedifferentiated CSAs (18% of the cohort) underwent neoadjuvant chemotherapy (Vincristine, Adriamycin and Ifosfamide; median number of cycles: 3.6) and 43% received adjuvant radiotherapy (Range 60 – 70 Gy). The primary outcome assessed was median progression-free survival. Various tumor-related and treatment-related factors were assessed for their impact. Kaplan Meier analysis was performed and a univariate Log-Rank analysis was performed to compare survival curves.

#### Results:

Median PFS was 115 months for the entire cohort. Histological subtype of conventional versus mesenchymal/dedifferentiated was positively associated with median PFS (166 vs. 24 months,  $p < 0.05$ ). The ability to achieve a gross total resection resulted in a positive impact in conventional CSAs (111.8 vs. 42.9 months,  $p = .201$ ) and a significant impact in mesenchymal/dedifferentiated CSAs (58.2 vs. 1.0 month,  $p < 0.05$ ). The addition of adjuvant XRT demonstrated a significant impact in conventional grade 2/3 CSAs (192.5 versus 37 months,  $p < 0.05$ ) and a positive trend with mesenchymal/dedifferentiated CSAs (43.5 versus 22.0 months). The use of ifosfamide-based chemotherapy yielded improvements in PFS

for mesenchymal/dedifferentiated CSAs (50 versus 9 months,  $p = .089$ ).

#### Conclusions:

The results highlight the need for histological subtype and grade-specific treatment protocols. For conventional-type tumors, surgical resection alone provides very good results for conventional Grade 1 CSAs, while surgical resection followed by adjuvant XRT yields the best long-term results for conventional Grade 2/3 CSAs. The improvement in PFS seen with neoadjuvant therapy in the mesenchymal/dedifferentiated subcohort highlights the need to further study systemic therapies within this group of patients.

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### Hematopoietic growth factors on brain recovery in the subacute phase of traumatic brain injury: Part 2. Gentian Toshkezi, Li-Ru Zhao, Lawrence S. Chin

*Chin, Lawrence, MD*

#### Intro:

Traumatic brain injury (TBI) has a high incidence in young adults and creates a major cause of long-term disability and death in the United States. The subacute phase of TBI is a unique time period when both the secondary damage and repair process occur in the brain after injury. The lack of pharmaceutical therapy for subacute TBI remains a crucial medical challenge. Stem cell factor (SCF) and granulocyte-colony stimulating factor (G-CSF), two key hematopoietic growth factors, have shown neuroprotective and neurorestorative effects in experimental stroke. The objective of this study is to determine the therapeutic efficacy of SCF+G-CSF in subacute TBI.

#### Methods:

Young adult male C57BL mice were subject to TBI in the right hemisphere. After induction of TBI, mice were randomly divided into two groups: a vehicle control group and an SCF+G-CSF treatment group. In addition, mice without TBI served as sham operative controls. Treatment was given 2 weeks after TBI induction. This time point was chosen because it corresponds to the subacute phase of TBI. SCF (200 $\mu$ g/kg) and G-CSF (50 $\mu$ g/kg) or an equal volume of vehicle solution was subcutaneously injected daily for 7 days. A battery of neurobehavioral tests for evaluation of cognitive function (water maze and novel object recognition tests), anxiety (elevated plus maze test), and motor

function (Rota-Rod test) was performed during the period of 2 to 9 weeks after treatment.

### **Results:**

In the water maze test, SCF+G-CSF-treated TBI mice showed a significantly reduced latency to find the hidden platform as compared to the TBI vehicle controls. The mice in the TBI vehicle control group spent significantly longer time to find the hidden platform than those of sham controls, while the escape latency appeared to be no difference between the sham controls and SCF+G-CSF-treated TBI mice. The findings from the elevated plus maze test displayed a significant reduction of the post-traumatic anxiety and risk taking behavior in the SCF+G-CSF-treated TBI mice when compared to the TBI vehicle controls. No difference was observed between the SCF+G-CSF-treated TBI mice and sham control mice in the elevated plus maze test. Rota-Rod test and novel object recognition test did not reveal differences between the treated and non-treated TBI mice.

### **Conclusions:**

SCF+G-CSF treatment in the subacute phase of TBI improves recovery in spatial learning and memory and prevents the post-traumatic anxiety. These findings suggest a neurorestorative potential of hematopoietic growth factors in brain repair after TBI. Our ongoing studies will further elucidate the contribution of SCF+G-CSF treatment in rebuilding neural networks, inhibiting TBI-induced neurodegeneration, and modulating post-traumatic inflammatory.

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## **A Novel, Minimally Invasive Surgical Technique For Evacuating Deep Intracerebral Hemorrhages**

**Liebman, Kenneth, MD**

*Authors: Kenneth Liebman, Gerald Eckardt*

The appropriate treatment of intracerebral hemorrhages is controversial and deep seated cerebral hemorrhages are especially challenging to manage. The possible algorithms are, a conservative, noninvasive approach which involves maximizing medical management, and only proceeding to surgery if the patient decompensates or early surgical intervention. If early or delayed surgery is to be performed for deep clots, what surgical technique should be executed. Historically a decompressive hemi-craniectomy is performed. The blood is not

usually evacuated for fear of injuring normal brain. Data has illustrated that the evacuation of deep cerebral hemorrhages through open craniotomy has not resulted in long term benefit in terms of patient outcome. Despite the fact that early surgery for deep intracerebral hemorrhages has not shown positive outcomes in the past, it is clear that the blood is a toxin. Evacuating the blood has the benefit of controlling ICP, improving perfusion to the surrounding tissue, and potentially avoiding the detrimental effects of blood on the CNS. Studies have shown positive benefits with removal of deep hemorrhages using minimally invasive techniques. We retrospectively reviewed our data on those patients who underwent clot evacuation using a novel, minimally invasive aspiration system (MIS). This device (wand) is a low profile, endoscopic compatible instrument that combines irrigation, aspiration and vibration to evacuate the clot.

### **Methods:**

Noncontrast head CTs were obtained and loaded into our image guidance, neuronavigational system. Patients were taken to the operating room and a burr-hole craniotomy and surgical trajectory were planned using the navigation system. A rigid channel endoscope scope was introduced through a peel-away sheath that was positioned within the hemorrhage cavity. The wand is advanced through a working channel into clot under direct visualization and the clot is subsequently evacuated. Noncontrast head CTs were obtained immediately post-op. We compared our length of stay (LOS), number of imaging modalities, reduction of hematoma volume and mass effect post evacuation, and operative time with those patients who did not undergo invasive treatment, patients who underwent open craniotomy (OC) as well as previously published data from trials regarding similar patient populations.

### **Results:**

Results: Ten deep cerebral hemorrhages were evacuated via the MIS. The mean LOS, MIS 17.3 days, OC 23 days, nonsurgical 7.1 days. No difference in number of imaging modalities. Reduction in hematoma volume (%)/operative time (min), MIS 80%/67.3, OC 66%/109.1

### **Conclusion:**

Our minimally invasive approach using the endoscopic compatible aspiration system allows us to aspirate deep ICH not previously amenable to clot evacuation. The LOS (total and ICU) was reduced when compared to our patients undergoing OC and previously

published data. The operative time was less and the hematoma volume and midline shift was reduced compared to our historic data. Our follow up is not significant at this time but we will be studying overall outcome as defined by the mRS.

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## **Radiographic Predictors of “Second-look Surgery” in Pediatric Intracranial Germ Cell Tumors**

**Krieger, Mark, MD**

### **Introduction:**

Intracranial germ cell tumors (GCTs) are a heterogeneous group of tumors that vary in their response to chemotherapy and radiation. Often times, either persistently elevated serum markers or recurrent disease indicated on follow up radiographic imaging may necessitate a “second-look surgery” to evaluate for neoplastic elements unresponsive to up-front chemotherapy. The present study aims to characterize the radiographic features—available on the initial pretreatment MRI scan—most significantly associated with tumor recurrence and the need for second look surgery.

### **Methods:**

An IRB-approved retrospective review of all patients with intracranial germ cell tumors treated at our institution between January 2000 and July 2014 was undertaken. Radiographic variables of interest were calcifications, cysts, heterogeneity of enhancement, surrounding edema, restricted diffusion as determined by low ADC values, and invasiveness of the tumor at presentation. Primary outcomes included tumor recurrence and the need for second look surgery.

### **Results:**

Thirty-seven patients with the diagnosis of pure germinoma were identified. Six of these patients (16%) required second look surgery. Surrounding edema was strongly associated with tumor recurrence ( $p = .01$ ) and the need for second look surgery ( $p = 0.003$ ), while the remaining radiographic features assessed were not associated with either recurrence or surgery. Seventeen patients with non-germinomatous intracranial germ cell tumors (NGGCTs) were identified, with seven requiring second-look surgery (41%). Among these seventeen patients, the absence of cysts was significantly associated with the need for second look surgery ( $p = 0.03$ ).

### **Conclusions:**

In patients diagnosed with pure germinomas, moderate or severe surrounding edema on initial MRI may be a risk factor for recurrence and the need for second-look surgery, while in patients with NGGCTs the absence of cysts, rather, may predict the need for second-look surgery.

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## **Brainstem Cavernomas**

**Madison, Michael, MD**

### **Background:**

Cavernous angiomas located in the brainstem are historically difficult to treat. Surgical treatment has proven to be successful in removal of the lesions but carries with it potential morbidity and mortality. It is hypothesized that the learning curve for a neurosurgeon with fellowship training in cranial base surgery and understands the indications for surgery is short.

### **Methods:**

We reviewed the charts of patients who consecutively underwent resection of a brainstem cavernoma between June 2005 and December 2015.

### **Results:**

A total of 11 patients underwent surgical resection of a brainstem cavernoma. The approaches used included midline suboccipital, retrosigmoid, middle fossa anterior transpetrosal, and craniorbitozygomatic. There was no permanent morbidity or mortality associated with surgical intervention.

### **Conclusion:**

The learning curve for a neurosurgeon with fellowship training in cranial base surgery and understands the indications for surgery for brainstem cavernomas is quite short. Surgery should preferably be performed by those with the above credentials.

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## Dueling Medieval Neurosurgeons: Myth Vs. Maxim

**Nanda, Anil, MD**

When King Henry II of France suffered a jousting injury to his brain in 1559, his treatment was split between the most unlikely of duos, Ambroise Paré and Andreas Vesalius. Paré, the royal physician, served kings his whole career, including Henry II, Francis, II, Charles IX, and Henry III. He was esteemed as a father of surgery and a pioneer in battlefield medicine and trained at France's oldest hospital, Hôtel-Dieu. Meanwhile, Andreas Vesalius spent much of his childhood trapping and dissecting animals to learn anatomy. When he was no longer appeased by animal anatomy, he began grave robbing to dissect humans. He worked to reform the science of anatomy, writing his own text *On the Fabric of the Human Body*, and he eventually won the favor of King Phillip II of Spain. Though the two battled to heal Henry II, their partnership helped transform surgery, specifically neurosurgery, and medical training, making them both revolutionaries. A timeline and the controversies with surgical vignettes of this era will be presented.

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## Rising healthcare costs despite stable disease burden and mortality in pediatric hydrocephalus

**Mahaney, Kelly, MD**

### Object:

This study sought to assess current burden of diseases and costs of inpatient care for children with hydrocephalus as well as identify factors associated with in-hospital mortality.

### Methods:

The 2012 Kids' Inpatient Database (KID), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality was used to identify pediatric admissions for hydrocephalus. Patients with admitted with a diagnosis of hydrocephalus were identified by ICD-9 codes and procedure codes. Hospital charges, length of stay, and variables associated with in-hospital mortality were assessed. Unweighted the 2012 KID contains 3,195,782 discharges. Weighted, it estimates 6,675,222 discharges nationwide in the United States (US).

### Results:

In the 2012 KID there were 34,184 pediatric admissions for hydrocephalus in children aged 18 years and younger. Weighted, this sample estimates 48,396 pediatric admissions for hydrocephalus in the US. The mean age observed was 6 years (median 4 years). Mean length of stay was 11 days (median 3 days). The total (weighted) hospital charges amounted to \$5,333,012,635 (unweighted charges \$3,803,163,935). This indicates that hospital charges for pediatric hydrocephalus have approximately doubled over the past decade, despite similar numbers of admissions of patients. In-hospital mortality was 2.55%, unchanged from prior years. Consistent with prior studies, hospital mortality was higher in infants admitted in the first month of life, uninsured patients or patients with Medicare, and in patients with multiple chronic comorbid medical conditions. We also identified higher mortality in patients with post-hemorrhagic hydrocephalus (related to neonatal or fetal intraventricular hemorrhage) as etiology and in patients admitted on a weekend. During one third of hospital admissions, children with hydrocephalus underwent CSF diversion procedure. Admissions associated with an operative procedure for CSF diversion had a slightly higher, but statistically significant in-hospital mortality (2.95 vs. 2.34,  $p=0.0007$ ).

### Conclusion:

Hospitalizations for children with hydrocephalus represent a significant and growing healthcare expenditure, with costs doubled in the past decade for care of a similar number of patients. Hospitalization in children with hydrocephalus undergoing a CSF diversion procedure is associated with 3% mortality. Mortality is higher in neonates, uninsured and patients with chronic comorbid conditions.

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## The importance of atlantoaxial fixation after odontoidectomy

**Wu, Jauching, MD**

### Object:

Although anterior odontoidectomy has been widely accepted as a procedure for decompression of the craniovertebral junction (CVJ), postoperative biomechanical instability has not been well addressed. There is a paucity of data on the necessity for and choice of fixation.



## Methods:

The authors conducted a retrospective review of consecutively treated patients with basilar invagination who underwent anterior odontoidectomy and various types of posterior fixation. Posterior fixation included 1 of 3 kinds of constructs: occipitocervical (OC) fusion with atlantoaxial (AA) fixation, OC fusion without AA fixation, or AA-only (without OC) fixation. On the basis of the use or nonuse of AA fixation, these patients were assigned to either the AA group, in which the posterior fixation surgery involved both the atlas and axis simultaneously, regardless of whether the patient underwent OC fusion, or the non-AA group, in which the OC fusion construct spared the atlas, axis, or both. Clinical outcomes and neurological function were compared. Radiological results at each time point (i.e., before and after odontoidectomy and after fixation) were assessed by calculating the triangular area causing ventral indentation of the brainstem in the CVJ.

## Results:

Data obtained in 14 consecutively treated patients with basilar invagination were analyzed in this series; the mean follow-up time was 5.75 years. The mean age was 53.58 years; there were 7 males and 7 females. The AA and non-AA groups consisted of 7 patients each. The demographic data of both groups were similar. Overall, there was significant improvement in neurological function after the operation ( $p = 0.03$ ), and there were no differences in the postoperative Nurick grades between the 2 groups ( $p = 1.00$ ). According to radiological measurements, significant decompression of the ventral brainstem was achieved stepwise in both groups by anterior odontoidectomy and posterior fixation; the mean ventral triangular area improved from  $3.00 \pm 0.86 \text{ cm}^2$  to  $2.08 \pm 0.51 \text{ cm}^2$  to  $1.68 \pm 0.59 \text{ cm}^2$  (before and after odontoidectomy and after fixation, respectively;  $p < 0.05$ ). The decompression gained by odontoidectomy (i.e., reduction of the ventral triangular area) was similar in the AA and non-AA groups ( $0.66 \pm 0.42 \text{ cm}^2$  vs  $1.17 \pm 1.42 \text{ cm}^2$ , respectively;  $p = 0.38$ ). However, the decompression achieved by posterior fixation was significantly greater in the AA group than in the non-AA group ( $0.64 \pm 0.39 \text{ cm}^2$  vs  $0.17 \pm 0.16 \text{ cm}^2$ , respectively;  $p = 0.01$ ).

## Conclusions:

Anterior odontoidectomy alone provides significant decompression at the CVJ. Adjuvant posterior fixation further enhances the extent of decompression after the odontoidectomy. Moreover, posterior fixation that involves AA fixation yields significantly more

decompression of the ventral brainstem than OC fusion that spares AA fixation.

## Keywords:

AA = atlantoaxial; BI = basilar invagination; CVJ = craniovertebral junction; OC = occipitocervical; atlantoaxial fixation; cervical; craniovertebral junction; occipitocervical fixation; odontoidectomy

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## Effect of Intraoperative Injection of Liposomal Bupivacaine on Post-operative Analgesia after TLIF Surgery: A Retrospective Study of 74 Patients

*Riesenburger, Ron, MD*

## Introduction:

Post-operative pain following transforaminal lumbar interbody fusion (TLIF) is difficult to treat and can be a barrier to early mobilization. The purpose of this retrospective study was to investigate post-operative pain control, analgesic consumption, and length of stay in TLIF patients receiving intraoperative liposomal bupivacaine.

## Methods:

Seventy-four patients underwent unilateral, single level TLIFs. Half of these patients received standard of care post-operative analgesics, while the other half received an intraoperative injection of liposomal bupivacaine via local infiltration in addition to the standard of care post-operative analgesic regimen. Post-operative pain scores, analgesic consumption, length of stay, and postoperative complications were then compared between groups.

## Results:

Post-operative pain was assessed using a visual analog scale (VAS). Cumulative pain over twelve hour intervals was calculated using the area under the curve (AUC) method. AUC was significantly lower for the liposomal bupivacaine group between 0-12 hours ( $15.0 \pm 6.4$  versus  $45.2 \pm 3.6$ ,  $p=0.0029$ ) and 12-24 hours ( $37.6 \pm 3.4$  versus  $48.4 \pm 4.2$ ,  $p=0.0499$ ) after surgery. Both groups had minimal narcotic consumption between 0-12 hours post-operatively, while the liposomal bupivacaine group required significantly less narcotic equivalents than the control group between 12-24 hours ( $16.0 \pm 2.2 \text{ mg}$  versus  $24.1 \pm 3.2 \text{ mg}$  IV morphine equivalents,  $p=0.0425$ ). Length of stay for the liposomal bupivacaine group was significantly shorter than for the standard of care group by 1.2 days (decreased from  $4.3 \pm 0.2$  days to  $3.1 \pm 0.1$  days,  $p < 0.0001$ ). Mean hospital cost was \$590 less

per patient in the liposomal bupivacaine group. The complication rate was 8.1% in both groups.

### **Conclusions:**

Liposomal bupivacaine may be a useful adjunct during unilateral TLIF for decreasing pain and narcotic consumption in the first 24 hours and decreasing length of stay. However, prospective evaluation is necessary to corroborate these findings.

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## **Current, Past and Future C1-C2 Fixation**

*Sonntag, Volker, MD*

Current, Past and Future C1-C2 Fixation

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## **Management of Lesions in and Around the 3rd Ventricle**

*Spetzler, Robert, MD*

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## **REX, a Robotic Exoskeleton for the Restoration of Walking in Individuals with Paraplegia**

*Grossman, Robert, MD*

Robert G. Grossman, MD1, Jose L. Contreras-Vidal, PhD. 2, Atilla Kilicarslan, PhD2  
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Miniaturization of computers, actuators and sensors has fostered the development of wearable exoskeletons. At least five models are available in the USA and abroad. The Rexbionics Robotic Exoskeleton (REX), designed and manufactured in New Zealand, was chosen for our study because it is self-balancing, allowing the user to walk without the use of crutches or a walker. A major reason for our selection of REX is access to the software program that controls walking, allowing Brain-Machine Interface (BMI) control of the robot by the user's EEG. The following hypothesis are being tested: (1) REX can bring mobility to paraplegic individuals and improve their health and quality of life. (2) Accuracy and reproducibility can be achieved between the user's EEG patterns and the executed movements of REX. Our goals are to determine: (1) the neurological profile of individuals who are capable of using REX. (2) The incidence of adverse events in the use of REX. (3) The extent of mobility achieved with REX. (4) If bi-weekly exercise with REX improves

cardiovascular, pulmonary, bowel and bladder function and quality of life. (5) Refine the algorithms that are used to extract information from the user's EEG and signal the user's motor intent, e.g. "start", "stop", "turn right" and "turn left". (6) Identify the brain areas generating the EEG signals used for the BMI control of REX by using simultaneous recording of motor activity, EEG and functional MRI, with the goal of maximizing locations of the scalp electrodes used to detect EEG activity. Our experience with the use of REX and videos of individuals walking in REX will be presented.

Supported by the TIRR Foundation and the Cullen Foundation

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## **Which One Ruptured? Accuracy and Implications of Identifying the Subarachnoid Hemorrhage Source in the Setting of Multiple Intracranial Aneurysms**

*Amin-Hanjani, Sepideh, MD*

### **Introduction:**

When subarachnoid hemorrhage (SAH) is encountered in the setting of multiple intracranial aneurysms, hemorrhage pattern is generally the primary indicator of the ruptured lesion. When the pattern is not definitive, rupture site determination typically relies on angiographic features such as size, morphology and location. We examined the frequency with which such features lead to misidentification of the ruptured lesion, subsequently determined by open microsurgical evaluation.

### **Methods:**

SAH cases that proceeded to craniotomy over a ten year period were reviewed, and cases with multiple intracranial aneurysms were identified. Initial head CT scans were reviewed to determine whether the SAH pattern was definitive for the source aneurysm. Those with "non-definitive" hemorrhage patterns were blindly evaluated for presumed source by reviewing the characteristics of the aneurysms on angiography, and the original presumption of rupture site at time of the incident evaluation was also recorded. Operative reports were then reviewed to confirm or refute the imaging-based determination of the ruptured source.

### **Results:**

531 SAH cases undergoing craniotomy were identified; 151 had multiple aneurysms. 80 (53%) had "non-definitive" hemorrhage patterns on initial CT. Of the 71 with definitive bleed patterns, all had the assumed



rupture site confirmed to be accurate at the time of surgery. In contrast, 14 (17.5%) of the cases with non-definitive hemorrhage patterns on CT had discordance between the assumed source on original or secondary radiological review, and the actual intraoperative determination of the ruptured aneurysm.

### **Conclusion:**

SAH cases with multiple aneurysms are not infrequent and demonstrate a bleed pattern that does not definitively identify the source aneurysm in about half of cases. Morphological features cannot reliably be used to determine rupture site in these cases. Microsurgical clipping, confirming obliteration of the ruptured lesion, may be preferentially warranted in this setting, unless all lesions can be contemporaneously and effectively treated with endovascular embolization

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## **Role of Anesthesia in Patients Undergoing Mechanical Thrombectomy for Acute Stroke**

*Erkmen, Kadir, MD*

### **Introduction:**

There are two anesthetic approaches for patients undergoing Mechanical Thrombectomy (MT) for acute stroke: Conscious Sedation (CS) or General Anesthesia (GA). There are theoretical advantages and disadvantages of each approach, which is the subject of ongoing debate, despite not having been studied systematically. We present a series of 43 patients undergoing MT under either CS or GA.

### **Methods:**

This was a retrospective cohort study of 43 consecutive patients who received MT at Temple University Hospital in an 18 month period between 1/2013 and 6/2014.

### **Results:**

During the study period, 24 patients had MT with CS and 19 patients had GA. The two groups were similar with respect to age ( $63\pm 3.4$  vs.  $64.6\pm 3.8$  years; mean + SEM) and NIHSS at presentation ( $19.0\pm 1.7$  vs.  $17.4\pm 1.6$ ). The time from CT scan to groin puncture was similar between the groups ( $93.0\pm 12.3$  vs.  $95.3\pm 9.9$  minutes), as was the time from puncture to recanalization ( $54.5\pm 6.3$  vs.  $48.8\pm 7.1$ ). Similarly, no significant difference was seen in length of stay (LOS), ICU LOS and NIHSS at 48 hours ( $8.5\pm 1.1$  vs.  $10\pm 1.3$  days;  $6.1\pm 1.2$  vs.  $7.1\pm 1.1$  days;  $18.4\pm 2.2$  vs.  $17.7\pm 2.0$  respectively).

Three month follow-up mRS was available in 33 of the patients and demonstrated no significant difference. (CS - 21 patients; GA 12 patients;  $4.4\pm 0.4$  vs.  $4.75\pm 0.5$ ). There was however, a significant increase in the rate of good reperfusion (defined as a Thrombolysis in Cerebral Infarction (TICI) score of 2b or 3), in patients under GA (CS: 62.5% vs. GA: 84.2%). 5 patients who received CS (20.8%) and 3 patients who received GA (15.8%) expired during hospitalization.

### **Conclusions:**

Previous reviews have suggested poorer outcomes in patients undergoing GA for MT. Our study does not support that finding. There was no significant difference in NIHSS at 48 hours or 3 month mRS. We found GA did not delay the start of the procedure or time to revascularization, but resulted in significantly improved reperfusion rates. A larger study is likely needed to evaluate implications of improved reperfusion rates on long-term outcome.

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## **Endovascular Treatment of Cerebral Aneurysms with Flow Diverters**

*Varsos, Vasileios, MD*

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(2) Department of Clinical Neurosciences, University of Cambridge, Cambridge, UK

### **Introduction:**

The ultimate treatment goal for intracranial aneurysms is to reconstruct the vessel wall and correct the hemodynamic disturbance. However, options currently available are limited by the aneurysm size and location. A new device is being touted as the biggest breakthrough in brain aneurysm treatment since 1995, the introduction of coil embolization. Lately, a new technique known as "flow diverter devices" moves therapy from a mere endovascular occlusion to true parent vessel remodeling.

### **Aim**

This study aims to present our experience using flow diverters to those intracranial aneurysms which were not amenable to microsurgical clipping or considered of high risk to surgery.

### **Materials and Methods:**

In a 2-year time from 1/1/2014 till 12/31/2015 we treated 128 intracranial aneurysms in 70 males and 55 females, with 3 individuals having been found

to have 2 aneurysms. Eight (8) patients presented with subarachnoid hemorrhage, while the rest (120) presented as non-ruptured aneurysms, identified either through as causing visual or oculomotor problems or incidentally, as a random finding. A total of 92 aneurysms were located in the anterior circulation while the rest 36 in the posterior circulation. We used Pipeline Embolization Device (eV3, PED) in 103 aneurysms, FRED (Microvention) in 13 and SILK flow diverters (Balt, SFD) in 12.

### Results:

The outcome of the implantation of the device was in all cases excellent concerning the clinical and neurological condition of the patients. All of them had an excellent Glasgow outcome scale without any new neurological deficits. Reduction in circulation within aneurysm has detected in follow up as well as 3-5 fold increase in surface coverage compared to intracranial stents. The flexibility allowed us to deliver and use it in tortuous anatomy vessels. Because flow diverters are not an intrasaccular therapy, even thin walled aneurysms could be treated. Bimetallic microfabricate braid, provided a flexible yet supportive structure across the aneurysm neck. Scaffolding, promoted endothelial repavement, excluding the aneurysm from circulation.

### Discussion:

This technique presents both advantages and disadvantages which we discuss. Taking in account the results from the implantation of the diverters in our cases, it could be said that flow diverters represent an excellent solution for aneurysms that could not be embolized or operated with rather encouraging results. However, we need further results and a long-term follow-up of patients, so that the importance of diverters in aneurysm treatment could be concluded.

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## Pipeline Embolization Device for small intracranial aneurysms: evaluation of safety and efficacy in a multicenter cohort

**Ogilvy, Christopher, MD**

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### Abstract:

To date, the use of the flow diverting Pipeline Embolization Device (PED) for small intracranial aneurysms ( $\leq 7$  mm) has only been reported in single center series. The purpose of this study was to evaluate safety and efficacy in a multicenter cohort.

### Methods:

Five major academic institutions in the United States provided data on patient demographics, aneurysm features, and treatment characteristics of consecutive patients with aneurysms  $\leq 7$  mm treated with PED between 2009-2015. Radiographic outcome was assessed using digital subtraction angiography. Clinical outcome was measured using the modified Rankin Scale.

### Results:

The cumulative number of aneurysms  $\leq 7$  mm treated with PED at the five institutions was 149 in 117 patients (54 (29-87) years, male to female = 1 to 5.9). Aneurysms were most commonly located in the paraophthalmic (67.1%) segment of the internal carotid artery. Radiographic outcome at last follow up was available for 123 aneurysms (82.6%) with a complete occlusion rate of 87%. Thromboembolic and symptomatic procedural complications occurred in 8.7% and 6% of aneurysms treated, respectively. There was one mortality (0.9%) unrelated to the PED procedure. Multivariate logistic regression identified size  $< 4$  mm, balloon angioplasty to open device, and simultaneous treatment of multiple aneurysms as predictors of procedural complications. Good clinical outcome was achieved in 96% of electively treated patients.

### Conclusions:

In the largest series on PED for small aneurysms to date, data suggest that treatment with the flow diverting PED is safe and efficacious with complication rates comparable to traditional endovascular techniques.

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## Results of an International Survey on the Investigation and Endovascular Management of Cerebral Vasospasm and Delayed Cerebral Ischemia

*Bulsara, Ketan, MD*

### Background:

Delayed cerebral ischemia (DCI) is a major cause of morbidity and mortality in aneurysmal subarachnoid hemorrhage. Endovascular management of this condition offers a new hope in preventing adverse outcome; however, a uniform standard of practice is lacking owing to a paucity of clinical trials. We conducted an international survey on the use of investigative and endovascular techniques in the treatment of DCI to assess the variability of current practice.

### Methods:

Neurovascular neurosurgeons and neuroradiologists were contacted through professional societies from America, United Kingdom, Europe, and Australasia. Members were invited to complete a 13-item questionnaire regarding screening techniques, first-line and second-line therapies in endovascular intervention, and the role of angioplasty. Answers were compared using  $\chi^2$  testing for nonparametric data.

### Results:

Data from 344 respondents from 32 countries were analyzed: 167 non-United States and 177 U.S.

### Respondents:

More than half of all clinicians had 10+ years of experience in units with a mixture of higher and lower case volumes. Daily transcranial Doppler ultrasonography was the most commonly used screening technique by both U.S. (70%) and non-U.S. (53%) practitioners. Verapamil was the most common first-line therapy in the United States, whereas nimodipine was most popular in non-U.S. countries. Angioplasty was performed by 83% of non-U.S. and 91% of U.S. clinicians in the treatment of vasospasm; however, more U.S. clinicians reported using angioplasty for distal vasospasm.

### Conclusions:

Treatment practices for DCI vary considerably, with the greatest variability in the choice of agent for intra-arterial therapy. Our data demonstrate the wide variation of approaches in use at present. However, without further clinical trials and development of a uniform standard of best practice, variability in treatment and outcome for DCI is likely to continue.

## Relaxing Sphenoidal Slit Incision to Extend the Anterior and Posterior Reach of Pedicled Nasoseptal Flaps During Endoscopic Skull Base Reconstruction of Transcribriform Defects: Technical Note and Results in 20 Patients

*Liu, James, MD*

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### Abstract:

Background. Reconstruction of large anterior skull base (ASB) defects after an endoscopic endonasal transcribriform approach (EEA-TC) remains a challenge despite the advent of the vascularized pedicled nasoseptal flap (PNSF).

### Objective:

We describe a relaxing PNSF slit incision that extends the anterior and posterior reach of the PNSF to maximize tensionless flap coverage of transcribriform ASB defects.

### Methods:

A retrospective chart review was conducted on 20 consecutive patients who underwent EEA-TC and subsequent PNSF reconstruction with a relaxing slit incision. At the time of endoscopic ASB reconstruction, the PNSF is rotated into position so that the anterior margin of the flap is situated at the posterior table of the frontal sinus. A relaxing slit incision is made across the sphenoidal segment of the PNSF, which is the segment of flap that bridges across the sphenoid sinus once the flap is rotated into position. The anterior reach of the flap is increased to adequately cover the posterior table of the frontal sinus, and the redundant sphenoidal flap is rotated posteriorly to make contact to the bony planum sphenoidale.

### Results:

No patients developed postoperative CSF leaks (0%). The ASB repair was monitored via postoperative outpatient nasal endoscopy at various time points, which demonstrated excellent mucosalization of the ASB with a mean follow-up of 15.9 months (range: 1.0-32.1 months).

### Conclusions:

Our simple relaxing slit incision in the sphenoidal portion of the PNSF allows for maximal tensionless coverage of extensive transcribriform defects by increasing the anterior and posterior reach of the flap.

## **subspecialty training of mid-level providers:initial experience with a neurosurgical primary technical skills boot camp with evolution into a midlevel fellowship program**

**Origitano, TC, MD, PHD**

Changes in health care delivery are precipitating changes in health care delivery team structures both in academic and non-academic practices. This is most acutely seen in the evolution of the use of mid-level physician extenders. Mid-level providers already play an integral role in healthcare delivery in rural and semirural areas mainly in the delivery of primary care. There has been penetration into subspecialty care as the need has arisen exacerbated by changes in resident work hours restrictions, the economics of population health models, and changing methodologies in provider compensation. The role of Physician Assistance have changed dramatically over the past decade as noted by the 219% growth PA-C providers between 2003 and 2013 (43,500 to 95,583). Rapid penetration in academic practice has been required to meet the declining resident work hours. Current PA-C education is significantly oriented to primary care. Most programs are 26 months with one year of basic sciences and one of clinical rotations of core plus electives. No dedicated subspecialty training is required. Currently, PA-C subspecialty fellowship are available in spectrum of medicine/surgical subspecialties. Only ones is currently available dedicated to neurological surgery. Over the past 3 years we have conducted a mid-level PGY-1 neurosurgical boot camp (1/2 day case base didactic lectures, 1 full day of procedural simulations including: Application of tings; EVD placement; ICP bolt placement; Spinal trap/spinal drain; Shunt programming/Tapping; DBS programing; Pain pump programming; And a cranial skills module. We collected exit course evaluation from all 88 course participants which guided the development of one year med-level neurosurgical fellowship curriculum.

The curriculum was focused on building diagnostic, procedural and operative skills. Rotations included: Neurosurgical clinic; Neurosurgical operative assistance for spinal and cranial procedurals; Hospital management and emergency procedures (EVD, ICP, LP); and Electives in Neuroradiology, emergency medicine, pain management, and neuro-rehab and pain management. Mid-level subspecialty training in neurological surgery is currently significantly underserved. Competition for mid-level providers is acute. Neurological surgery should take an active

educational role in the development of subspecialty training of mid-level providers to optimize their performance and recruitment. The course curriculum, fellowship proposal and strategies for funding will be presented.

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## **Patterns of recurrence and survival in sporadic, neurofibromatosis type 1-associated, and radiation-associated malignant peripheral nerve sheath tumors**

**McCutcheon, Ian, MD**

### **Objective:**

Malignant peripheral nerve sheath tumors (MPNSTs) are an aggressive group of soft tissue sarcomas that can arise sporadically, in the context of neurofibromatosis type 1 (NF1), or at a site of prior irradiation. Large series profiling the features and outcomes of sporadic, NF1-associated, and radiation (RT)-associated MPNST are limited. The goal of this study was to elucidate differences between MPNST etiologies in a large single-institution retrospective study.

### **Methods:**

Patients (n = 317) were identified through our institutional tumor registry. Clinicopathological features were retrospectively collected. Features were compared among MPNST subtypes for patients who had sufficient clinical history (n = 289), and clinicopathologic features were used to identify adverse predictors of recurrence and survival outcomes.

### **Results:**

Five-year local recurrence-free survival (LRFS), distant recurrence-free survival (DRFS), and disease-specific survival (DSS) estimates were 56.6%, 49.6%, and 53.6% for the high-grade MPNST cohort, respectively. Five-year DSS was lower in NF1-associated and RT-associated compared to sporadic MPNST (48.7%, 40.9%, and 63.0%, respectively;  $p = 0.140$ ). RT-associated MPNST had worse LRFS than sporadic and NF1-associated subtypes ( $p = 0.047$ ). Truncally located tumors, positive surgical margins, local recurrence, and metastasis were predictors of adverse DSS in multivariate analysis.

Conclusion: RT-associated MPNSTs demonstrate shorter local recurrence-free and disease-specific survival than is seen with sporadic and NF1-associated tumors. NF1-associated MPNSTs may have worse



survival outcomes owing to large tumor size, compromising truncal location, and lower rate of negative resection margins compared to sporadic tumors.

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### **Early-practice Single-surgeon Experience with Basilar Apex Aneurysms using a complementary Open and Endovascular approach**

*Abla, Adib, MD*

#### **Introduction:**

Basilar apex aneurysms represent a unique and potentially challenging aneurysm location from a therapeutic standpoint. Either surgical or endovascular treatment, may involve inherent risks, including the potential for thalamic stroke and the associated morbidity.

#### **Objective:**

To demonstrate a single-center single-surgeon experience with both clipping and coiling of basilar apex aneurysms.

#### **Methods and Presentation:**

Over a 15 month period, 15 basilar apex aneurysm surgeries or coiling procedures were performed by a single operator in 13 patients. One patient underwent 3 treatments (two open, one endo).

Seven surgical clipping surgeries were performed and 8 coiling operations were performed. Patients initially chosen for surgery had a mean age of 49.2 years while those initially selected for endovascular repair had a mean age of 60.1 years.

Of the open surgeries, 4 were performed via a trans-Sylvian Orbitozygomatic approach, while 3 were approached from a right sided subtemporal extended trans-tentorial approach. Two coiling procedures did not involve stent placement, one in the setting of SAH. One procedure involved placement of one stent. Five procedures involved y-stenting.

One patient presented with a large SCA stroke involving a thrombosed fusiform aneurysmal component of his basilar apex aneurysm. He was initially clipped but did not follow-up until one year later amid ongoing methamphetamine abuse and a repeat open surgical procedure was needed but aborted secondary to impaired visibility from scarring. The patient was crossed over to stent-coiling. One patient with SAH underwent attempted coiling

by another operator and was crossed over to clipping. Another patient previously presented with subarachnoid hemorrhage and was coiled many years prior, and required re-treatment.

#### **Results:**

No patients were lost to followup. At last followup, 10 patients had mRS outcome of 0 or 1. One patient in the coiling group died from sepsis related to feeding tube complication, after she had suffered a thalamic stroke related to the coiling procedure. One patient (clipping group) had a mRS of 3 following thalamic stroke. Both cases represented the first coiling and clipping procedure, respectively. There were no additional cases of thalamic stroke.

One patient had a mRS of 4 following a Hunt-Hess 5 presentation with SAH, but made considerable improvement in the last week before discharge (speaking and following commands in all extremities), which is the most current followup.

The lessons learned in the experience and techniques aimed at complication avoidance will be discussed.

#### **Conclusion:**

A single operator approach is demonstrated for treating basilar apex aneurysms and may be performed early on in practice. Anatomic considerations, patient age, and patient preference are factors considered, as are the relative benefits to either an open or endovascular approach.

This particular approach exercises an honest assessment of the individual operator's ability to treat the aneurysm more safely with either an open or endovascular technique on a case-by-case basis.



**THE SOCIETY  
OF UNIVERSITY  
NEUROSURGEONS**

# SUN

## Cape Town 2017

### South Africa

### July 27 – 30th

The SUN 2017 meeting is slated for Cape Town, South Africa, July 27th – 30th , 2017 – Graham Fieggen, University of Cape Town is our local host.

For some a visit to Africa will be a once in a lifetime event, for others it will be just another stop on the ever enchanting global SUN itinerary. Either way this should whet your appetite. There will be ample opportunity to plan an exceptional and memorable trip on either side of the meeting, see 10 African Adventures Answer Call of the Wild and Comfort Graham is delighted to welcome the SUN for the first meeting on African soil. Africa is recognised as the cradle of humankind, the birthplace of our ancestors, and South Africa will offer you a meeting that celebrates our shared legacy while reflecting the different challenges we face in our modern lives.

Recently named the best place in the world to visit by both the New York Times and The Telegraph, Cape Town is without doubt one of the most scenic cities in the world. With a magnificent shoreline bathed by two oceans and a spine of mountains running down the peninsula, there is no shortage of leisure and sporting activities, from the gentle to the extreme.

At the foot of Table Mountain, one of the New 7 Wonders of the World, lies the 19th century Mount Nelson Hotel, named in honour of Lord Horatio Nelson but reminiscent of modern Nelsons- all leaders of great distinction! This will be the base for SUN 2017, with an academic program that reflects the intellectual and cultural vibrancy of our country

Planned activities including visits to Robben Island where Nelson Mandela was incarcerated for 18 years, Cape Point where the Atlantic and Indian Oceans meet, a trip up the mountain (either on foot or by cable car) and of course the pièce de résistance, the Cape Winelands. We will also celebrate our medical history with a visit to Groote Schuur Hospital where the first human heart transplant took place, and more importantly the CT scanner was conceived by Nobel Laureate Alan Cormack.

With its Mediterranean climate, July is the green season in the Cape and the best time of year to visit the country's game reserves. We will offer various pre- and post-congress excursions to the Winelands, the famous Garden Route and to the Game Reserves of the Eastern Cape, Kwa-Zulu Natal and the north, such as the world-famous Kruger National Park. We will also offer tours of the famous discoveries at Cradle of Humankind, a World Heritage site close to Johannesburg.

We look forward to offering you an intellectually and culturally stimulating meeting in one of the world's most beautiful settings- welcome to SUN 2017!

Graham Fieggen, MD  
University of Cape Town

Nelson M. Oyesiku, MD, PhD, FACS  
Emory University

# BYLAWS

OF

THE SOCIETY OF UNIVERSITY NEUROSURGEONS, INC

## ARTICLE 1

### NAME AND OBJECT

Section 1. This organization shall be known as "The Society of University Neurosurgeons, Incorporated."

Section 2. The objectives of this Society shall be: to promote scientific and social discourse among its members, to encourage investigative work in the neurological sciences, to improve teaching methods and techniques in neurological surgery, and to inspire its members to acquire humanistic ideals and to achieve clinical excellence in the practice of medicine."

To enhance academic neurosurgeons throughout the world and improve the state of clinical and laboratory neuroscience globally

#### Mission Statements:

- a) To improve the exchange of new ideas and scientific disclosures
- b) To enhance comprehension of global activities, university settings, and specific regional challenges in the academic sector
- c) To mentor and direct emerging academic neurosurgeons during the midcareer period

Section 3. No part of the income or property of this Society shall inure to the benefit of any individual.

## ARTICLE II

### MEMBERSHIP QUALIFICATIONS

Section 1. The membership of the Society shall be divided into five classifications.

- (a) Active
- (b) Senior
- (c) Honorary
- (d) Inactive

A member shall be elected as provided in Article V- CANDIDATES FOR MEMBERSHIP

### Section 2. Classification of Membership

(a) ACTIVE. Active members shall be neurological surgeons who have been certified by the American Board of Neurological Surgery, Inc., or are certificants of The Royal College of Physicians and Surgeons (Neurosurgery) of Canada and who are engaged in the practice of Neurological Surgery.

(b) SENIOR. An Active member may, upon request to and approval of the Executive Council, transfer to Senior membership upon attaining the age of sixty (60) years or upon retirement from practice of neurological surgery. Senior members may not vote or hold office but may serve on Committees; and are not required to pay dues or regularly attend annual meetings.

(c) HONORARY. Honorary members shall be chosen as recognized leaders in the field of neurological sciences. They shall not exceed five in number. They shall not be required to pay dues or attend annual meetings. They shall not vote or hold office but may serve on committees.

(d) INACTIVE. Inactive members shall be former Active members who by virtue of illness or other reasons can no longer maintain Active membership and are not eligible for any other classification of membership. An Active

member may, upon request to and approval of the Executive Council, transfer to Inactive status. An Inactive member may be restored to Active status by request to and approval of the Executive Council. Inactive members shall not vote, hold office or serve on Committees. They shall not be required to pay dues or attend annual meetings.

### Section 3. Qualifications for Membership.

The Membership Committee shall be cognizant of the objectives of the Society and shall recommend for membership individuals who are affiliated with a medical school or outstanding clinic. If an Active member ceases to comply with the membership requirements as provided in Section 2(a), he/she must resign from the Society or be transferred to a different membership classification. Individual exception to this rule requires recommendation by the Executive Council and approval by majority vote of the Active membership.

### Section 4. Limitation of Membership:

The number of Active members in the Society may be limited upon recommendation of The Executive Council and approval by a majority vote of the Active membership. Honorary members shall not exceed five in number at any time.

## ARTICLE III

### OFFICERS

Section 1. The officers of the Society shall be President, President Elect, Vice-President, and Secretary/Treasurer. The Executive Council shall be composed of the officers, one Active Member-at-Large appointed by the President, and the Immediate Past-President of the Society.

Section 2. The Nominating Committee shall present a slate of proposed officers to be elected for the succeeding year at each annual meeting. Active members present at the meeting may make additional nominations. Election of officers shall be by ballot; the member receiving the largest number of votes cast for that office shall be elected. Officers so elected shall take office at the close of that annual meeting.

Section 3. Vacancy of an office shall be filled by an appointee of the Executive Council.

Section 4. The President shall serve for a term of one (1) year. He/She shall preside at all meetings and decide all questions of order, appoint committees and cast the deciding vote in ties.

Section 5. The President Elect shall be elected at each annual meeting. He/She shall become President of the Society at the close of the subsequent annual meeting.

Section 6. The Vice-President shall assist the President. He/She shall preside at functions and meetings in the absence of the President.

Section 7. The Secretary/Treasurer shall serve for a term of three (3) years. The Executive Council shall determine at which year the election for Secretary/Treasurer will be held. He/She shall keep records of attendance and minutes of each meeting, read all correspondence to the Society, handle all notices and correspondence of the Society. He/She shall account for the finances of the Society, collect dues and notify members of delinquent standing. He/She shall receive all applications for membership or guest attendance and forward this information to the Membership Committee at least one month prior to the annual meeting.

Section 8: The Executive Council shall be the governing body of the Society and have charge of activities of the Society not otherwise provided in these Bylaws. The Executive Council shall work in close coordination with the Membership Committee concerning the proposal of candidates for membership in the Society.

Section 9: The Historian of the Society shall maintain and update the Society of University yearbooks, which should document the scientific and social programs of the yearly meeting.

## ARTICLE IV

### MEETINGS

Section 1. The Society shall meet annually in the Spring or Early Summer at a site determined by the Future Sites Committee

Section 2. The annual meeting shall be a three day scientific program preceded or followed by a weekend as determined by the Program Committee. The scientific presentations shall be balanced between clinical and investigative topics.

Section 3. The Chairman of the Program Committee shall serve as Host for the annual meeting, assisted by his/her Committee and will be responsible for arrangements of both social and scientific activities during the meeting.

Section 4. Robert's Rules of Order (Revised) shall govern the conduct of the business meetings of the Society and the duties of its officers. The order of business shall consist of a roll call, reading of minutes, reading of correspondences, old

business, new business, election of new members, reports of committees, the Secretary/Treasurer's report, election of officers, appointment of committees, and adjournment.

Section 5. Members of any class shall be assessed a pro rata share of the expenses of the annual meetings which they attend.

## ARTICLE V

### CANDIDATES FOR MEMBERSHIP

Section 1. Candidates for membership shall have the qualifications as provided in Articles 1,2, & 3.

Section 2. No candidate shall be elected to Active membership who has not attended at least one annual meeting as a guest.

Section 3. Each candidate shall be nominated in writing to the Secretary/Treasurer at least two (2) months prior to the next annual meeting. The nomination shall include the candidate's curriculum vitae and a statement of his/her present academic and professional status. The completed proposal for membership shall be forwarded to the Membership Committee for consideration. The Membership Committee shall present to the Executive Council their recommendations for new members. On approval of the Executive Council, candidates shall be proposed to the Active Membership for written secret ballot at the annual meeting of the Society. Election of a member requires affirmative vote of three fourths (3/4) of the Active members present and voting at the annual meeting.

Section 4. The Membership Committee shall present no more than five (5) candidates for active membership each year with no requirement of a minimal number to be presented.

Section 5. The Secretary/Treasurer shall notify each candidate elected to membership not earlier than two (2) weeks following the date of his/her election and collect a membership initiation and certificate fee, the amount to be determined each year by the Executive Council.

Section 6. A candidate who has failed to be elected may be reconsidered at subsequent annual meeting upon written request of three (3) Active members to the Executive Council.

## ARTICLE VI

### DUES

Section 1. All Active members of the Society shall be assessed annual dues, the amount to be determined each year by the Executive Council.

Section 2. Dues are payable in advance for the succeeding year at the time of or immediately following the annual meeting, at the discretion of the Secretary/Treasurer.

## ARTICLE VII

### STATUS OF MEMBERS

Section 1. All members shall be in good standing when abiding by the Bylaws of the Society.

Section 2. An Active member shall be suspended when dues or assessments have not been paid for the previous two (2) years. If he/she fails to attend two (2) consecutive annual meetings and does not present an excuse acceptable to the Executive Council, a warning letter will be sent. If an active member fails to attend three consecutive meetings, then his/her membership will be terminated.

Section 3. A member may be suspended or dropped from any class of membership in the Society by an affirmative vote of three-fourths (3/4) of the Active membership.

## ARTICLE VIII

### COMMITTEES

Section 1. The Society may have standing and ad hoc committees as determined by the President and the Executive Council. There shall be at least four standing committees: Membership Committee, Nominating Committee, Future Sites Committee and Program Committee.

Section 2. The Membership Committee shall be composed of three (3) members, one to be elected at large each year to serve a term of three (3) years. The senior member of the Committee shall serve as Chairman. This Committee shall review nominations for new members and present the applications of the most worthy and desirable candidates to the Executive Council. The names of the candidates approved by the Executive Council shall be submitted to a vote by the Active membership at the next annual meeting of the Society.



Section 3. The Executive Council shall serve as the Nominating Committee, with the Immediate Past-President of the Society as Chairman.

Section 4. The President taking office at the close of the annual meeting shall appoint the Program Committee each year. The Chairman of the Committee shall be the Host for the next annual meeting. The Program Committee may invite guests to complement the scientific program of the meeting

Section 5. The Future Sites Committee shall be composed of three (3) members, one to be elected at large each year to serve a term of three (3) years. The senior member of the Committee shall serve as Chairman. This Committee shall recommend the site of future meetings, at least three years in advance.

Section 6. The Bylaws Committee shall make recommendations to the Executive Committee by proposing amendments to the bylaws, rules, and regulations. The Bylaws Committee will be composed of three (3) to six (6) members, each serving a term of up to three (3) years. Recommendations so approved will then be voted upon by the Membership via email ballot or at the Annual Meeting.

Section 7. The Senior Advisory Committee shall make recommendations to the Executive Committee for maintaining the Vision and Mission of the Organization. Senior Advisory Committee members will be able to attend Executive Committee meetings. This Committee will be composed of three (3) to six (6) members, each serving a term of up to three (3) years

## ARTICLE IX

### GUESTS

Section 1. The Society shall encourage the presence of guests at its annual meeting.

Section 2. Certain invited guests of the Society shall not pay a registration fee or be charged for a share of the group expenses of the meeting. Such guests shall include individuals approved by the Executive Council.

Section 3. "Individual guests to the annual meeting may be invited by members. The member shall notify the Secretary/Treasurer of the name and address of his/her proposed guest, and the Secretary/Treasurer shall officially invite the guest to the meeting.

## ARTICLE X

### AMENDMENTS

Section 1. Amendments to these Bylaws may be made by a proposal in writing from a member of the Executive Council at any time. The amendment shall be voted on at the subsequent annual meeting. The Secretary/Treasurer shall notify all Active members in writing of the proposed amendment prior to the annual meeting, and such amendment shall require for adoption an affirmative vote of three fourths (3/4) of the Active members present and voting.

Section 2. Amendments to the Bylaws and voting procedures may also be conducted by email. The Secretary will notify members by email of the need to vote on an Amendment to the Bylaws, permitting 14 days for voting. Such proposed amendments shall require for adoption an affirmative vote of three quarters (3/4) of the Active Members responding. Amendments to the Bylaws and voting procedures may also be conducted by email. The Secretary will notify members by email of the need to vote on an Amendment to the Bylaws, permitting 14 days for voting. Such proposed amendments shall require for adoption an affirmative vote of three quarters (3/4) of the Active Members responding

## RULES AND REGULATIONS OF THE SOCIETY OF UNIVERSITY NEUROSURGEONS, INC.

### SUBJECT 1

#### MEMBERSHIP

Section 1. Candidate Profile

- (a) Candidates should be less than 48 years of age
- (b) Candidates should be committed to an academic career
- (c) Candidates should have sufficient publications that the quality of their academic activity can be evaluated
- (d) Candidates should have attended a SUN meeting, presented a paper before the Society, and expressed an interest in the Society.
- (e) Candidates should have potential for hosting a future SUN meeting.

## Section 2. Membership Process

- (a) Candidates must have attended at least one SUN meeting and presented at least one paper to the Society before being recommended for membership
- (b) No voting for membership will occur at the meeting where the candidate is a guest and presents a paper to the Society
- (c) The membership process would be initiated by obtaining the membership application form from the Secretary of the Society
- (d) Upon completion the form would be returned to the Secretary who, following documentation of its completeness, would forward it to the Chair of the Membership Committee
- (e) The candidate is proposed for membership to the Membership Committee and a recommendation is made to the Executive Committee based on the candidate's profile
- (f) At the next regular meeting, the candidate is brought forward for membership during the first business session
- (g) If elected by the membership, the candidate will be invited to membership and upon joining the Society, is then eligible to attend the next regular meeting

# Exhibitors

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