THE SOCIETY OF UNIVERSITY NEUROSURGEONS

New York/Southampton, NY

2023
ANNUAL MEETING

July 9th-July 14th, 2023

THE SOCIETY OF UNIVERSITY NEUROSURGEONS

American Association of Neurological Surgeons

Jointly Provided by the AANS

Welcome To
New York/Southampton, NY

We couldn't be more thrilled to host the 61st Annual Meeting of the Society of University Neurosurgeons on the Island of Manhattan in New York City and the Town of Southampton, New York from Sunday July 9th to Friday July 14th, 2023 . Although the smallest of the 5 boroughs, Manhattan, aka The City, is the urban center of the New York Metropolitan area. By some, Manhattan is considered the cultural, financial, and entertainment capital of the world. From the top of One World Trade Center to the bright lights on Broadway, there are an endless variety of experiences to explore during a visit to Manhattan. In a "New York Minute" you can immerse yourself in one of more than 500 museums and art galleries, splurge on some lavish couture along 5th Avenue, or catch one of the over 200 Broadway and Off-Broadway performances that bring people from around the world to NYC every day. Every culinary pleasure imaginable is available in Manhattan, from enjoying a slice of pizza at the "Famous Original Ray's Pizza" to fine dining at over 60 Michelin star restaurants. Want to take a break from the fast pace of New York City? Try enjoying a leisurely stroll through central park, watch the model sailboats race across the reservoir, or just sit and relax on a park bench while taking in the unique energy of the city. Whatever your fancy, Manhattan will provide an unparalleled opportunity.

SUN members, guests, and families will be staying at the Beekman Hotel in the heart of downtown Manhattan. Rated among the top hotels in Manhattan, the Beekman is a restored historic landmark and one of the first skyscrapers of the New York City skyline. A treasure of lower Manhattan, you will be captivated by the Beekman's Victorian décor and timeless charm, particularly as you enjoy a cocktail in the lounge as the fading sunlight from the atrium skylight above Temple Court fills the room.

Our first two scientific sessions will take place at New York University Langone Medical Center, overlooking the East River of Manhattan. With over twenty physicians at the forefront of basic science, translational, and clinical research, the Department of Neurosurgery at NYU Langone is rated among the nation's premier neurosurgical programs.

From Manhattan, the SUN will travel to Southampton, New York for our satellite scientific session, the gala dinner, and a complete change of pace. Southampton is the oldest and largest community in the "summer colony" of New York, known as the Hamptons, and is a nationally renowned beach resort. We will be staying at the Southampton Inn, where the SUN has booked all of the rooms and will have the entire run of the hotel. With a shuttle to the beach every 10-15 minutes, members and guests will be able to relax on the beach, take a stroll through town, or satisfy their sweet cravings at the original Tate's Bake Shop.

Plan to attend the 2023 SUN meeting and don't miss the opportunity to visit New York City! Perhaps Ayn Rand captured it best. . . "I would give the greatest sunset in the world for one sight of New York's skyline."

John Golfinos, MD

Richard Anderson, MD

Mike Kaiser, MD

Present Officers

President
Ian McCutcheon, MD

President-Elect
Sean Lavine, MD

Vice President
Richard Anderson, MD

Secretary/Treasurer
Mike Kaiser, MD

Historian
Ken Smith, MD

Member-at-Large
Kadir Erkmen, MD

Membership Committee
Mandy Binning, MD, Chair
Daniel Hoh, MD
Sepideh Amin-Hanjani, MD

Future Sites Committee
Daniel Yoshor, MD, Chair
Ruth Bristol, MD
Pascal Jabbour, MD

CME
Carlos David, MD

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 Origitano, MD

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

~~~~~~2014~~~~~~
E. Sander Connolly, MD

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

~~~~~~2016~~~~~~
Michael Levy, MD

~~~~~~2017~~~~~~
Nelson Oyesiku, MD

~~~~~~2018~~~~~~
Michael Wang, MD

~~~~~~2019~~~~~~
Richard Ellenbogen, MD

~~~~~~2020/2021~~~~~~
Erol Veznedaroglu, MD

~~~~~~2022~~~~~~
Felipe Albuquerque, MD

THE SOCIETY
OF UNIVERSITY
NEUROSURGEONS
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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~~~~~~
Havard 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
~~~~~~2016~~~~~~
Barrow Neurological Institute
Phoenix, AZ
~~~~~~2017~~~~~~
University of Cape Town
Cape Town, South Africa
~~~~~~2018~~~~~~
MD Anderson Cancer Center
Houston, TX
~~~~~~2019~~~~~~
University of Zagreb, Medical School
Clinical Hospital Centre Zagreb
Dubrovnik, Croatia
~~~~~~2020~~~~~~
Canceled
~~~~~~2021~~~~~~
Whitefish, Montana
~~~~~~2022~~~~~~
Prague, Czech Republic
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2023 Meeting Attendees

SUN Members

Felipe Albuquerque, MD
Richard Anderson, MD
Marvin Bergsneider, MD
Mandy Binning, MD
Nicholas Boulis, MD
Ruth Bristol, MD
Gavin Britz, MD
Jeffrey Bruce, MD
Kim Burchiel, MD
Paul Camarata, MD
Roukoz Chamoun, MD
Fady Charbel, MD
Lawrence Chin, MD
Kevin Cockroft, MD
E. Sander Connolly, MD
Carlos David, MD
Franco DeMonte, MD
Kadir Erkmen, MD
Carl Heilman, MD
Michael Kaiser, MD
Mark Krieger, MD
Frederick Lang, MD
Sean LaVine, MD
Michael Levy, MD
Kenneth Liebman, MD
James Liu, MD
James Markert, MD
Ian McCutcheon, MD
Guy McKhann, MD
L. Madison Michael II, MD
Jacques Morcos, MD
Anil Nanda, MD
Raj Narayan, MD
Alfred T. Ogden, MD
Nelson M. Oyesiku, MD
Thomas Pittman, MD
Sujit Prabhu, MD
Craig Rabb, MD
Ron Riesenburger, MD
Charles Rosen, MD
Martin Sames, MD
Mitesh Shah, MD
Anthony Sin, MD
Michael Sisti MD
Kenneth Smith, MD
Jeff Sorenson, MD
Gregory Thompson MD
Erol Veznedaroglu, MD
Nilesh Vyas, MD
Michael Wang, MD
John Wilson, MD
Jang Yoon, MD
Daniel Yoshor, MD
Eric Zager, MD

Members' Guests

Dorothea Altschul, MD
Geoffrey Appleboom, MD
David Estin, MD
Paul Gigante, MD
John Golfinos, MD
Rupa Juthani MD
Ilya Laufer, MD
Jonathan Lustgarten, MD
Ivan Sosa, MD
(Richard Anderson, MD
Michael Kaiser, MD)

Allan Belzberg, MD
(Eric Zager, MD)

Jan-Karl Burkhardt, MD
Howard Weiner, MD
(Daniel Yosher, MD)

Jacques Favre, MD
(Kim Burchiel, MD)

Daniel Felbaum, MD
(Mandy Binning, MD)

Michael Galgano, MD
(Carlos David, MD)

Bharat Guthikonda, MD
(Anthony Sin, MD)

Ibrahim Hussain, MD
(Michael Wang, MD)

Stephen Johnson, MD
(Anil Nanda, MD)

Michael Kinsman, MD
(Paul Camarata, MD)

David Langer, MD
(Jeffrey Bruce, MD)

Stephen Magill, MD
(James Chandler, MD)

Michael Schulder, MD
(Jeffrey Sorenson, MD)

Claudio Tatsui, MD
Linda Liau, MD
(Ian McCutcheon, MD)

SUN 2024
Adelaide, Australia
July, 1-7 2024

Welcome to SUN 2024 in beautiful South Australia!

It's a great honour and privilege to host you in our charming city of Adelaide, known as the City of Churches, famous for its cultural arts festivals, exceptional natural beauty, and as the home of one of the world's great wine regions. In recent years, South Australia has also grown into a burgeoning centre of excellence in higher education, science, and innovation, so it is a perfect location for the Society of University Neurosurgeons Annual Meeting. The SUN meeting will take place in the heart of Adelaide at the biomedical city along the Torrens River precinct, featuring eclectic architecture, exceptional accommodation, many truly superb restaurants, surrounded by the lush parklands that border this fabulous city.

You will enjoy an excellent scientific program - a steadfast feature of SUN conferences since its inception in 1965. Outside of our engaging conference days, Adelaide also offers a unique, relaxing, and inspiring atmosphere, where daily adventures will include culinary escapes, taking in the natural beauty or getting to know Australia's incredible native wildlife. It is worth noting that we meet in the middle of winter when Adelaide transforms from Australia's leading cultural destination noted for the world-renowned Fringe Festival, Womad and Adelaide Festival, into a Mecca for Australia's cold season obsession: Australian rules football. Adelaide has two teams in the national competition, and you will no doubt be whipped into the excitement in the city on game day! The climate in June will be cool and crisp. Average daytime temperatures range from 54°F to 63°F but despite the cooler temperatures, this is Australia, so sunshine is never far away.

While modern Adelaide is a relatively young city, it is the home to the First Nation peoples of Kaurna, Ngarrindjeri, Adnyamathanha and Barngarla, who have a deep spiritual connection to the land, having inhabited the region for thousands of years. European settlement only occurred in 1836, and in the Australian context, Adelaide is unique in this sense too, being the only major free settlement, founded not by convicts but by migrants, here to build an idealistic modern settlement. Over the years, South Australia has become a diverse and multicultural state with a blend of cultures and ethnicities contributing to its vibrant social fabric. In comparison with the chaos of other Australian cities, Adelaide's unique design renders it idyllic for getting around easily and taking in the charm of the city.

Alma Mater of many famous distinguished medical graduates (including Howard Florey, Ray Last, Hugh Cairns and Donald Simpson, to name a few), The University of Adelaide was founded in 1874. The Adelaide Health and Medical Sciences building is part of the Biomedical city (The largest health and biomedical precinct in the southern hemisphere), alongside Adelaide's Riverbank Precinct, which has emerged as the city's leading cultural, sporting, educational, scientific, innovative, and medical hub. In addition to being a conference and entertainment zone, it has helped establish Adelaide as Australia's Convention City.

Furthermore, to the great hotel and restaurant precinct at the west of the city (some of the best in the world), there will also be an opportunity to explore the world-famous Barossa and McLaren Vale wine regions to the north and the south of the city. The gala dinner will be held at the spectacular venue of Penfolds Magill Estate, the home of Grange: Australia's most revered and iconic wine.

A special aspect of the conference will be a satellite meeting at Kangaroo Island off the coast, ironically famous for its koalas! A natural paradise, with a rugged coastline and unique flora and fauna residing within its national parks. The island offers superb accommodation options that blend seamlessly with the natural surroundings and promises a gastronomic journey that celebrates the island's unique food heritage.
We invite you to make the journey to experience the spirit of our unique city and look forward to a most fruitful and memorable SUN meeting 2024.

Sincerely,

Amal Abou-Hamden,
A/Professor of Neurosurgery and Program Director: Cerebrovascular surgery Fellowship and Neurosurgery Education and Training.
The Royal Adelaide Hospital, Women's & Children's Hospital, the University of Adelaide and Neurosurgical Society of Australasia, Royal Australasian College of Surgeons.
Chair, Royal Australasian College of Surgeons, South Australia.

Distinguished Service Award

E. Sander Connolly, MD

Dr. Connolly serves as the Byron Stookey Professor and Chair of the Department of Neurological Surgery at the Vagelos College of Physicians and Surgeons of Columbia University and the Surgeon-in-Chief of the New York Neurological Institute and the New York Presbyterian Hospital – Columbia University Irving Medical Center. He is also the Surgical Director of the Neuro-Intensive Care Unit and directs the Cerebrovascular Research Laboratory. He attended the Isidore Newman School, Dartmouth College, and Louisiana State University School of Medicine, from which he graduated AOA. He completed his surgical internship at Columbia-Presbyterian Medical Center and a residency in neurological surgery at the New York Neurological Institute under Bennett Stein. In 1997, he joined the faculty as assistant professor of neurological surgery and was named the Bennett M. Stein Professor of neurological surgery in 2008. His clinical practice focuses on the microsurgical treatment of patients with cerebral aneurysms, arteriovenous malformations, carotid stenosis, moyamoya, as well as, cerebral hemorrhage and ischemia. His basic research interests, which have been continuously funded by the NIH since 1998, span the spectrum of cerebrovascular disease with a focus on the role inflammatory cascades play in the pathophysiology of cerebral ischemia and cerebral hemorrhage. His clinical research efforts have been directed at improving the functional outcome of patients with cerebrovascular emergencies, as well as, the cognitive outcome of patients undergoing cerebral revascularization. In addition, he has worked collaboratively on the genetics of familial cerebral aneurysms. He has served on the editorial boards of Neurosurgery and the Journal of Neurosurgery and in leadership roles with the AANS, the AANS/CNS Joint Section for Cerebrovascular Surgery, the Society of Neurological Surgeons, the New York Society of Neurosurgery, the Neurosurgical Society of America, the American Academy of Neurological Surgery, the American Board of Neurological Surgery, the American Board of Medical Specialties, the American College of Surgeons, and the National Residency Matching Program. He has been an active member of the Society of University Neurosurgeons (SUN) for years. Dr. Connolly has served as the SUN Secretary/Treasurer and in 2014 was the 50th President of the SUN.

Special Speakers

Robert Grossman, MD
CEO of NYU Langone Health
Dean NYU School of Medicine

Robert I. Grossman, MD, is one of the world's premier healthcare leaders, best known for overseeing the evolution of NYU Langone Health into one of the top academic medical centers in the nation.

As chief executive officer of NYU Langone Health and dean of NYU School of Medicine, positions he has held since 2007, Dr. Grossman leads more than 45,000 employees, students, and noncompensated faculty across 6 inpatient locations and over 320 sites throughout the New York City region and in Florida.

NYU Grossman School of Medicine, which was renamed in his honor in 2019, has trained thousands of physicians and scientists who have helped to shape the course of medical history since 1841. Dr. Grossman led the historic and unprecedented initiative of providing tuition-free medical education for all current and future students in its MD degree program. He also curated a new approach to medical education, called Curriculum for the 21st Century (C21), which emphasizes clinical training from the beginning of medical school and includes a revolutionary three-year MD program for select candidates. Most recently, Dr. Grossman was the driving force behind the creation of NYU Long Island School of Medicine—a partnership between NYU and NYU Langone Health—offering full-tuition scholarships with an accelerated three-year curriculum exclusively devoted to training primary care physicians.

In collaboration with the Board of Trustees and institutional leadership, Dr. Grossman increased NYU Langone's revenue from $2 billion in 2007 to $10.7 billion in 2022, and more than $4.5 billion in philanthropy has also been raised. Also of note, NYU Langone's National Institutes of Health (NIH) 2021 research awards totaled $815 million—an increase of more than 532 percent compared to 2007.

Early in his tenure, Dr. Grossman launched a major campus transformation that resulted in the addition of more than 13 million square feet of clinical, educational, and research space across campuses in Manhattan, Brooklyn, and Long Island. Of note was the opening of a new Science Building, Kimmel Pavilion, and Hassenfeld Children's Hospital at NYU Langone.

In 2019, NYU Langone completed a full-asset merger with Winthrop-University Hospital, now known as NYU Langone Hospital—Long Island—one of Long Island's top medical centers. Most recently, NYU Langone affiliated with Long Island Community Hospital, creating a clinically integrated healthcare network between the two organizations. Also part of NYU Langone is Perlmutter Cancer Center, a National Cancer Institute–designated comprehensive cancer center.

Each year, NYU Langone Health and NYU Grossman School of Medicine are recognized by outside accreditation entities for providing outstanding care, including U.S. News & World Report's "Top Hospitals" and "Best Graduate Schools;" the Center for Medicare and Medicaid Services; the Leapfrog Group; Vizient, Inc.; and more.

In 2018, Dr. Grossman was named to Time magazine's inaugural Health Care 50 list of the 50 most influential healthcare leaders who changed the state of healthcare in America, together with Ken Langone, chairman of NYU Langone's Board of Trustees. Additionally, he was named a "Living Landmark" by the New York Landmarks Conservancy in 2013 for his leadership in the aftermath of Hurricane Sandy, which caused

unprecedented damage to NYU Langone's facilities and required the safe evacuation of 322 patients. Recently, Dr. Grossman's pivotal leadership at NYU Langone was chronicled in William A. Haseltine's book World Class: A Story of Adversity, Transformation, and Success at NYU Langone Health.

A prolific and highly respected scientist, Dr. Grossman was awarded the Javits Neuroscience Investigator Award by the NIH in 1999 for his work on multiple sclerosis. He was a member (1995–2000) and chairman (1997–2000) of the Diagnostic Radiology Study Section at the NIH, was appointed to the NIH's National Advisory Council for Biomedical Imaging and Bioengineering (2003–2007), and, in 2004, became the first recipient of the Outstanding Contributions in Research Award, given annually by the Foundation of the American Society of Neuroradiology in recognition of lifelong accomplishment and consistent excellence in clinical neuroscience.

In 2010, he received the International Society for Magnetic Resonance in Medicine's (ISMRM's) Gold Medal for his pioneering research in magnetic resonance in medicine and biology. In addition, he received the Lifetime Achievement of the Emeritus Class from Tulane University (2019), was named a Distinguished Graduate of the University of Pennsylvania School of Medicine (2010), and was awarded an honorary doctorate from the University of Bordeaux, France (2010). Most recently, he received the American Society of Neuroradiology (ASNR) Gold Medal for his contributions to the field of neuroradiology (2021), and was elected to the American Academy of Arts and Sciences (AAAS) for excellence and leadership (2022).

Dr. Grossman is a passionate educator and widely published scholar. He has trained more than 100 fellows, many of whom occupy prominent positions worldwide, and has authored 339 publications and 5 books, including Neuroradiology: The Requisites.

Dr. Grossman joined NYU Langone in 2001 as the Louis Marx Professor of Radiology, chairman of the Department of Radiology, and professor of neurology, neurosurgery, and physiology and neuroscience. In his previous position at the Hospital of the University of Pennsylvania, he was a professor of radiology, neurosurgery, and neurology; chief of neuroradiology; and associate chairman of radiology.

Terrie Sultan

Terrie Sultan served as Director of the Parrish Art Museum in Watermill, NY from 2008-2020, during which time she oversaw the design and construction of a new facility created by the architects Herzog & de Meuron and developed an exhibition and collection program that delved deeply into the art history and creative legacy of the East End of Long Island. She is highly knowledgeable about the artists and writers who lived and worked in the Hamptons from the mid-nineteenth century to the present.

Now an independent curator and cultural consultant and Founding Director of the firm Art Museum Strategies, Sultan has thirty-eight years of experience as a museum curator and director. She has organized more than 50 exhibitions in her career focusing on modern and contemporary art and has published and lectured widely on issues related to visual art and culture. In 2003 she was awarded the Chevalier dans l'Ordre des Arts et Lettres by the Government of France.

Lt Col Stephen Rush, M.D., USAF Special Warfare

Lt Col Stephen Rush, M.D. obtained a B.S.-M.D. degree at Howard University College of Medicine in 1983. His post graduate training included a surgical internship at Lenox Hill Hospital and then a Radiation Oncology Residency at NYU from 1986-1989. Dr Rush then practiced Radiation Oncology on Long Island until 2007 where he specialized in the treatment of brain tumors and head and neck cancer. He also performed Gamma Knife Radiosurgey at NYU from 2000 until 2015. He had joint appointments in the Departments of Radiation Oncology and Neurosurgery. He is a past president of the New York Head and Neck Society.

In 2008 Dr. Rush joined the Air Force as the Flight Surgeon for the 103rd Rescue Squadron. Duties included medical oversight and training PJs for operational medicine and aerospace medicine. In 2012 he was named the USAF Pararescue Medical Director. His duties include creation of policy and procedures for the practice of battlefield and rescue medicine for Air Force PJs, as well as oversight of the human performance and mental health care of Pararescuemen. In 2018 he was assigned as the Commander of the 106th Rescue Wing Medical Group where he oversees the care for over 1,000 Wing members and develops the training for medics for support of combat deployments. During COVID, he helped guide the Wing through the pandemic in NY, and spearheaded the deployment of 14 PJs during the height of COVID to a NY hospital.

Meeting Schedule

Sunday July 9, 2023

4:30-5:30 pm:	Executive Board Meeting (EC Members only)	Farnsworth, Kelly Cellar
6:00-9:30 pm:	Welcome/ Opening Reception	Farnsworth, Kelly Cellar

Monday July 10, 2023

7:00-9:00 am:	**Breakfast for spouses and children will be served**	**Clinton Hall**
6:15 am:	SHUTTLE TO NYU for Speakers/Reps	
6:30 am:	SHUTTLE TO NYU for Members/Guests	
7:30 am-11:35 am:	**General sessions lectures**	**Farkas Auditorium/NYU**
7:00-7:30 am:	Breakfast Members/Speakers/Reps	
7:30 am-11:35 am:	**Moderator**	**Ilya Laufer, MD**
7:30-7:40 am:	Welcome address	John Golfinos, MD
7:40-8:25 am:	**SPECIAL SPEAKER** **NYU/Langone Medical Center**	**Robert Grossman, MD**
8:25-8:35 am:	NYUMets: A massive, open-source, longitudinal dataset of metastatic brain cancer clinical and imaging data for global use	Douglas Kondziolka, MD
8:35-8:45 am:	Health System Scale Language Models are General Purpose Prediction Engines	Eric Oermann, MD
8:45-8:55 am:	New concepts in glioblastoma therapeutics	Dimitris Placontanakis, MD
8:55-9:05 am:	Elevating Brain Tumor Surgery Through Optics and Artificial Intelligence	Daniel Orringer, MD
9:05-9:15 am:	Intracranial aneurysm management update	Howard Riina, MD
9:15-9:25 am:	Endovascular treatment of Idiopathic intracranial hypertension (IIH)	Dorothea Altschul, MD
9:25-9:55 am:	**Break with exhibitors**	**Vendor Greeting Session**
9:55-10:05 am:	Simulated Patient Encounters - Residents under the Microscope	David Harter, MD
10:05-10:15 am:	Risk factors for fusion failure in children undergoing occiput to C2 rigid instrumentation and fusion	Richard Anderson, MD
10:15-10:25 am:	Vertebral Column Resection for Treatment of Severe Kyphoscoliosis in Children and Young Adults	Darryl Lau, MD
10:25-10:35 am:	The Impact of Intraoperative MRI on Pituitary Adenoma Surgery: Is it Worth It?	Donato Pacione, MD

10:35-10:45 am:	Focused Ultrasound: Current and emerging indications	Alon Mogliner, MD
10:45-10:55 am:	Expanding Functional Neurosurgery: Program Development, Economic Considerations, and Barriers to Patient Access	Paul Gigante, MD
10:55-11:05 am:	Anterior Clinoid meningiomas: personal experience on results and complications	Chandranath Sen, MD
	SPECIAL SPEAKER	
11:05-11:35 am:	**Hamptons Bohemia: How Artists Created A Place of Wonder and Beauty**	**Terrie Sultan**
11:45 am:	**SHUTTLE TO BEEKMAN**	
12:15 pm:	**Boxed Lunch**	
1:30-5:00 pm:	**911 Memorial Tour (Meet @ St. Paul's Chapel, 209 Broadway-3 minute walk from Beekman Hotel)**	
5:00-5:10 pm:	**10 minute walk from Freedom Tower to Beekman**	
6:00-10:00 pm:	**Dinner at Manhatta (5 min walk from Beekman)**	**Whitman Ballroom, Bay Room Lounge**

Tuesday July 11, 2023

7:00-9:00 am:	**Breakfast for spouses and children will be served**	**Farnsworth**
6:15 am:	SHUTTLE TO NYU for Speakers/Reps	
6:30 am:	SHUTTLE TO NYU for Members/Guests	
8:00 am-1:00 pm:	**General sessions lectures**	**Farkas Auditorium/NYU**
7:00-8:00 am:	Breakfast Members/Speakers/Reps	
8:00 am-10:00 am:	**Moderator**	**Kadir Erkmen, MD Ken Liebman, MD**
8:00-8:15 am:	One point technique in brainstem cavernous malformation surgery	Amir Dehdashti, MD
8:15-8:30 am:	To cut or not to cut: is the pill yet mightier than the scalpel in the treatment of cerebral cavernous malformations?	Jan-Karl Burkhardt, MD
8:30-8:45 am:	Open Surgical Treatment of Indirect Carotid Cavernous Fistulas	Carl Heilman, MD
8:45-9:00 am:	Co-occurrence of remote intracranial aneurysms and dural arteriovenous fistulas - incidence, clinical presentation, and treatment	Carlos David, MD
9:00-9:15 am:	Three-dimensional printing of cerebrovascular aneurysm models as an educational and hands-on training tool for neurosurgery residents and fellows	Michael Kinsman, MD

9:15-9:30 am:	Surgical Revascularization for Extracranial Vertebrobasilar Disease: Indications and Techniques	Fady Charbel, MD
9:30-9:45 am:	Treatment Outcomes for Unruptured Wide-Necked Middle Cerebral Artery Aneurysms: A Propensity-Matched Analysis from the Neurovascular Quality Initiative-Quality Outcomes Database (NVQI-QOD).	Kevin Cockroft, MD
9:45-10:00 am:	**Discussion**	
10:00-10:30 am:	**Break with exhibitors**	**Vendor Greeting Session**
10:30-12:10 pm:	**Moderator**	**Nilesh Vyas, MD James Liu, MD**
10:30-10:45 am:	Vertebrobasilar flow evaluation by QMRA: hemodynamic VB insufficiency reversed with occipital artery to vertebral artery bypass	Martin Sames, MD
10:45-11:00 am:	Intra-arterial Verapamil for Neuroprotection in Ischemic Stroke	Kenneth Liebman, MD
11:00-11:15 am:	Emergent IV dye preparation	Mandy Binning, MD
11:15-11:30 am:	Who needs an automated programmable shunt dashboard? Your patients do!	Ruth Bristol, MD
11:30-11:45 am:	Behavioral improvements following lesion resection for pediatric epilepsy: pediatric psychosurgery?	Howard Weiner, MD
11:45-12:00 pm:	The Genomics of Trigeminal Neuralgia with and without Neurovascular Compression	Kim Burchiel, MD
12:00-12:10 pm:	**Discussion**	
12:10-12:20 pm:	DISTINGUISHED SERVICE AWARD	E. Sander Connolly
12:20-12:30 pm:	INTRODUCTION OF PRESIDENT	Franco DeMonte, MD
12:30-1:00 pm:	PRESIDENTIAL ADDRESS	Ian McCutcheon, MD
1:15 pm:	SHUTTLE TO BEEKMAN	
	FREE AFTERNOON/EVENING	

Wednesday, July 12, 2023

Travel to Southampton for remainder of meeting

8:30am	**Board Transport to Southampton Inn**
9:00-11:30 am:	Bus service to Southampton Inn (Breakfast snack will be provided on the bus)
12:00-3:00 pm:	Check-In/Box Lunch

12:00-6:45 pm:	FREE TIME	
6:45 pm:	Southampton Inn to Gin-Village Beach	
7:00-10:00pm:	Clam Bake on the Beach	

Thursday July 13, 2023

6:30-9:00 am:	Breakfast Southampton Inn South	South Lawn Tent
7:00-8:00 am:	**SUN Business Meeting – MEMBERS ONLY**	**Southampton Ballroom**
8:00 am-12:45 pm:	**General sessions lectures**	**Southampton Ballroom**
8:00-10:30 am:	**Moderators**	**Madison Michael, MD** **Ruth Bristol, MD**
8:00-8:15 am:	Malignant scalp tumors with cranial extension: multidisciplinary surgical strategies and outcomes	Ian McCutcheon, MD
8:15-8:30 am:	Race-specific survival disparities in patients with glioblastoma	James Markert, MD
8:30-8:45 am:	Targeted gene expression profiling predicts meningioma outcomes and radiotherapy responses	Stephen Magill, MD
8:45-9:00 am:	Petroclival meningiomas: An analysis on outcomes, complications, and recurrence rates - A Personal experience	Anil Nanda, MD
9:00-9:15 am:	Early experience with simultaneous cochlear implantation and microsurgical resection of acoustic neuroma	Franco DeMonte, MD
9:15-9:30 am:	Expanded endoscopic transsphenoidal surgery: Developing confidence in tumor resection and reconstruction	Bharat Guthikonda, MD
9:30-9:45 am:	Falcotentorial Meningiomas: Maximizing Extent of Resection and Avoidance of Venous Complications via the Interhemispheric Precuneal Retrosplenial Transfalcine Transtentorial Approach with Endoscopic-Assistance	James K. Liu, MD
9:45-10:00 am:	Intraoperative language mapping utilizing gamma-band modulations of electrocorticogram (ECoG) induced by word/tone categorization task: comparison with cognitive-linguistic tasks and reproducible speech arrests induced by Direct Cortical	Sujit Prabhu, MD

	Stimulation (DCS)	
10:00-10:15 am:	Where does surgical resection and radiosurgery fall short for large metastatic brain lesions?	Michael Schulder, MD
10:15-10:30 am:	**Discussion**	
10:30-11:00 am:	**Break with exhibitors**	**SHINNECOCK ROOM**
11:00-12:45 pm:	**Moderators**	**Anthony Sin, MD Claudio Tatsui, MD**
11:00-11:15 am:	Allograft Nerve Repair Following Nerve Sheath Tumor Resection	Eric Zager, MD
11:15-11:30 am:	A Pro-oncogenic Lentiviral Swine Model of Spinal Cord Glioma	Nicholas Boulis, MD
11:30-11:45 am:	Surgical Management of Complex Cervical Deformity	Michael Galgano, MD
11:45-12:00 pm:	Can I Use EMG Guidance for Pedicle Screw Placement in Awake Spine Surgery?	Ron Riesenburger, MD
12:00-12:15 pm:	In Vitro and In Vivo Investigation of Tumor Treating Fields for Treatment of Spinal Metastasis	Claudio Tatsui, MD
12:15-12:30 pm:	Preliminary Results with the Cerevasc eShunt Implant in the Treatment of Normal Pressure Hydrocephalus (NPH), Aneurysmal Subarachnoid Hemorrhage (SAH) Related Hydrocephalus and Idiopathic Intracranial Hypertension (IIH)	Carl Heilman, MD
12:30-12:45 pm:	**Discussion**	
12:45-1:15 pm:	**SPECIAL SPEAKER New Profiles in Courage: Stories from our Nation's Elite Rescue Force**	**Lt Col Stephen Rush, M.D., USAF Special Warfare**
1:30-2:30 pm:	Lunch at the South Hampton Inn – South Lawn Tent	
1:45-7:30 pm:	Free time	
7:30-10:00 pm:	Awards Dinner at Southampton Inn South Lawn Tent	

Friday July 14, 2023

6:30-9:00 am:	Breakfast Southampton Inn South Lawn Tent
11:00 am:	**CHECKOUT**

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 treat ment 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 12.25 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Joint Providership Disclaimer

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Educational Format

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

Disclosure Information

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All of the relevant financial relationships listed for these individuals have been mitigated.

Name	Disclosure	Type of Relationship*
Fady T. Charbel, MD	Transonic, Inc	Consultant Fee
John Golfinos, MD	Surgical Theater MLBPA	Stock Shareholder Consultant
Michael Galgano, MD	Medtronic	Surgical Consultant
Ian McCutcheon, MD	Merck, Inc.	Consultant Fee
Carl Heilman, MD	Cerevasc Inc	Consultant Fee Stock or Shareholder Fiduciary Position
Nicholas Boulis, MD	Nipro	Stock or Shareholder
Dorothea Altschul, MD	Siemens Healthineers viz.ai Stryker Cerenovus Microvention	Consultant Fee
	Von Vascular Serenity Bendit Technologies Sim&Cure Synchron	Stock or Shareholder
Douglas Kondziolka, MD	Neuropoint Alliance Chiefy	University Grants/Research Support Stock or Shareholder
Eric Oermann, MD	Sofinnova Artisight Mirati therapeutic	Consultant Fe Stock or Shareholder Employee
Kevin Cockroft, MD	Intersocietal NICO	Fiduciary Position Industry Grants Research Support

Daniel Orringer, MD	NXDC Stryker Medexus Invenio Imaging Imagenomix	Consult Fee Stock or Shareholder Fiduciary Position
Darryl Lau, MD	Stryker Medtronic Nuvasive ATEC Cerapedics	Consultant Fee
Dimitris Placantonakis, MD	Advantis Tocagen Monteris Robeaute Synaptive	Consultant Fee
Howard Riina, MD	Medtronic	Consultant Fee
James Liu, MD	Stryker	Consult Fee and Honorarium
Ilya Laufer, MD	Globus SpineWave Depuy/Synthes	Consultant Fee
Michael Schulder, MD	Hyperfine, Inc.	Stock or Shareholder

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Abstracts

NYUMets: A massive, open-source, longitudinal dataset of metastatic brain cancer clinical and imaging data for global use

Douglas Kondziolka, MD

NYUMets is the world's largest publicly available dataset of annotated tumor imaging, brain metastases, and longitudinal multi-modal medical data. Opening this data to the scientific research community has the potential to substantially advance the state of the art in medical computer vision, and to potentially unlock new insights into metastatic brain tumor science and care. The dataset can be accessed at https://nyumets.org/ after registration with the NYUMets team and creation of an Amazon Web Services account.

Health System Scale Language Models are General Purpose Prediction Engines

Eric Oermann, MD

Summary: Existing structured data-based clinical predictive models have limited use in everyday practice owing to complexity in data processing as well as model development and deployment. We showed that unstructured clinical notes from the electronic health record can enable the training of clinical language models which can be used as all-purpose clinical predictive engines with low-resistance development and deployment. Our approach leverages recent advances in natural language processing to train a large language model for medical language (NYUTron) and subsequently fine-tune it across a wide range of clinical and operational predictive tasks with state-of-the-art results across all tasks. Our results show the potential for using clinical language models in medicine to read alongside physicians and provide guidance at the point of care.

New concepts in glioblastoma therapeutics

Dimitris Placontanakis, MD

Glioblastoma, the most common and aggressive brain malignancy, represents the toughest disease entity in all of oncology. Conventional therapy, consisting of surgical cytoreduction and chemoradiotherapy, produces poor clinical outcomes due to biological properties of tumor cells and their microenvironment that facilitate brain infiltration and resistance to radiation and alkylating agents. I will discuss novel concepts in glioblastoma therapeutics that have emerged from the work of our group and others and include: minimally invasive surgical cytoreduction options; paradigms for engaging the immune system in conjunction with surgery; disruption of the blood-brain barrier; and development of tumor-specific biologics informed by our basic science laboratory studies.

AElevating Brain Tumor Surgery Through Optics and Artificial Intelligence

Daniel Orringer, MD

Histologic data has not been historically accessible to neurosurgeons in the operating room. Advances in rapid, label-free optical histology has created a new opportunity to integrate microscopic data into the decision-making during brain tumor surgery. In addition, advances in artificial intelligence create opportunities to forecast the genetic makeup of tumor cells and to detect the presence of tumor-associated macrophages. This presentation will summarize how recent advances in optical histology and artificial intelligence have the potential to enable more effective surgical care for brain tumor patients and enable a better understanding of the tumor-immune microenvironment.

Intracranial aneurysm management update

Howard Riina, MD

Review the history and evolution of cerebrovascular aneurysm management and outline current trends and future directions.

Endovascular treatment of Idiopathic intracranial hypertension (IIH)

Dorothea Altschul, MD

Idiopathic intracranial hypertension (IIH), also known as pseudotumor cerebri, is a condition characterized by increased intracranial pressure without an identifiable cause. It typically affects young overweight women, and symptoms can include headaches, visual disturbances, and papilledema.

Endovascular treatment options for IIH are limited but have been expanding in recent years. The primary

goal of management is to reduce intracranial pressure. The mainstay of treatment for IIH includes weight loss, medications, and occasionally surgical CSF diversion interventions. However, in certain cases, endovascular procedures may be considered.

This presentation will describe the current literature and possible scenarios for endovascular treatments of IIH.

Some studies have suggested that stenosis of the transverse sinuses can contribute to the development of IIH. In cases where significant stenosis is identified, endovascular stenting may be performed. The stent helps to restore normal blood flow, reducing intracranial pressure and alleviating symptoms. This procedure is not suitable for all patients with IIH and is typically reserved for those with confirmed venous sinus stenosis.

Simulated Patient Encounters - Residents under the Microscope.

David Harter, MD

We describe the development of a curriculum for simulated patient encounters addressing informed consent and delivering bad news. These scenarios allow direct observation of resident performance with feedback from faculty observers and experienced simulated patients (actors).

Risk factors for fusion failure in children undergoing occiput to C2 rigid instrumentation and fusion

Richard Anderson, MD

Introduction: Modern studies investigating outcomes after pediatric occipital-cervical fusions have mostly been limited to small or single center evaluations. Failure rates have been reported as high as 20%, with significant clinical variation among pediatric spine surgeons. The purpose of this study was to identify risk factors for fusion failure among children undergoing occipital to C2 rigid instrumentation and fusion.

Methods: The Pediatric Spine Study Group (PSSG) registry was queried to identify patients </= 21 years old who underwent occiput-C2 posterior spinal rigid instrumentation and fusion and had two year minimum clinical and radiographic follow-up (lateral radiograph or CT scan). Clinical, radiographic, and surgical variables were investigated. The primary outcome was fusion failure, defined by hardware revision (> 30 days) or radiographic screw haloing or device failure.
Results: 74 patients were included in the study (median age 9 years; 51% male). The most common etiologies included syndromic (55%) and congenital (20%). Fusion failure was identified in 28/74 (38%) patients, with 13/74 (18%) undergoing revision and 15/74 (20%) with screw haloing or breakage. Univariate analysis demonstrated that the use of structural rib autograft (p = .02) and postoperative immobilization with a hard collar (p = .04) were associated with lower rates of fusion failure. Multivariable logistic regression analysis showed that patients with rib autograft had a 75% reduction in the odds of fusion failure (OR=0.25; 95% CI=0.08-0.75; p=0.01). Age, etiology (including Down syndrome), instrumentation type, unilateral instrumentation, and other variables were not associated with fusion failure.

Conclusion: In this multicenter, multidisciplinary, international registry of children undergoing occipital to C2 instrumentation and fusion, a high rate of fusion failure (38%) was seen, likely due to the high frequency of syndromic and congenital etiologies. Use of structural rib autograft was associated with a 75% decrease in the odds of fusion failure.

Vertebral Column Resection for Treatment of Severe Kyphoscoliosis in Children and Young Adults

Darryl Lau, MD

This lecture will discuss the surgical indications, risk profile, and modern approach to safely performing vertebral column resection to treat severe kyphoscoliosis. The importance of halo traction and role of preoperative spinal angiograms will be highlighted.

The Impact of Intraoperative MRI on Pituitary Adenoma Surgery: Is it Worth It?

Donato Pacione, MD

An evaluation of of the utility of intraoperative MRI in Pituitary Surgery. An outcome and cost analysis assessment.

Focused Ultrasound: Current and emerging indications

Alon Mogilner, MD

We will discuss the history of as well as current and future indications for focused ultrasound in neurosurgery.
Currently, High-intensity focused ultrasound is approved for intracranial lesioning for essential tremor and parkinson's disease.
Low-intensity focused ultrasound shows promise in opening the blood-brain barrier with potential neuro-oncologic and neuro-degnerative applications.

Expanding Functional Neurosurgery: Program Development, Economic Considerations, and Barriers to Patient Access

Paul Gigante, MD

Developments in deep brain stimulation (DBS) intraoperative technology and telemedicine have allowed for the creation of comprehensive multidisciplinary programs in private community hospitals, with minimal capital investment from health systems. Subspecialty-trained movement disorders neurologists and functional neurosurgeons should consider the expansion of satellite or secondary programs to include populations who historically are unable to access to large academic tertiary centers.

Anterior Clinoid meningiomas: personal experience on results and complications

Chandranath Sen, MD

Medial sphenoid wing meningiomas comprise 9% of intracranial meningiomas. Between 2005 and 2021, I have operated on 74 clinoidal meningiomas. In majority of the cases I have used a frontotemporal craniotomy along with a zygomatic osteotomy. In more than 80% of cases, I have performed an optic canal drill out along with opening the optic nerve sheath. Radiation therapy has been used in 16% of patients for residual disease or progression. Based on my experience, I will discuss the factors influencing the degree of resection and visual outcome. I will also discuss my surgical complications and the reasons.

This article is intended to highlight a novel approach for the treatment of brainstem cavernous malformations, with an emphasis on the use of the one point technique to guide resection.

Amir Dehdashti, MD

Methods
We describe a case series of BCMs treated through a variety of skull base approaches, describing our decision making strategy. We review the concept of the one point technique via two representative cases and also perform a retrospective review of 32 consecutive patients who underwent BCM resection to present outcomes and the comparison of two point vs one point technique.

Results
Consecutive series of 32 patients in whom one point technique was used is presented.
In 8 patients (25%), the traditional two point technique would suggest a different trajectory than the one point technique. Post-operative MRI confirmed complete resection in thirty patients (95%) and twenty-nine patients (91%) had mRS (0-2) at follow up. 8/8 patients in whom one point technique guided a different trajectory had gross total removal of the cavernous malformation, with one patient having long-term new neurological impairment from the surgery. There were no mortalities.

Conclusions
Despite surgical advances in recent decades and more widespread understanding of surgical anatomy and safe entry zones, surgical resection of BCMs remains a formidable challenge. The one point technique offers a safe approach while considering all the different modalities in our armamentarium and can be utilized to determine the optimal approach to resect BCMs.

To cut or not to cut: is the pill yet mightier than the scalpel in the treatment of cerebral cavernous malformations?

Jan-Karl Burkhardt, MD

Cerebral cavernous malformations (CCMs) are rare vascular malformations leading to dysregulated vessel growth and stroke in young patients. CCM disease arises sporadically as a single lesion or as part of a familial, autosomal dominant disease that is associated with multiple lesions. Human and mouse genetic studies over the last years have demonstrated that CCM lesions form following endothelial cell

loss of function in three genes, KRIT1, CCM2, and PDCD10, that encode components of the CCM complex required to regulate the MEKK3-KLF2/4 signaling pathway. Treatment of CCM is limited to mainly observation or surgical resection, which can be challenging in eloquent locations including the brainstem or in patients with multiple lesions. Current medical trials investigate different targets especially for these patients with multiple lesions or lesions with a rapid growth / hemorrhage in eloquent locations, but without significant effect on lesion reduction / stabilization. In addition, the clinical observation that only a subset of CCM lesions exhibits rapid growth and hemorrhage associated with clinical symptoms while most of CCM lesions remain silent has suggested that other genetic participate. We have recently discovered that accumulation of multiple somatic mutations including both the loss of vascular malformation suppressor gene (CCM gene) and the gain of vascular malformation growth gene (PIK3CA) occurs in CCM lesions with this progressive growth pattern. This multiple hit mechanism is analogous to cancer, and CCM disease may have a similar natural history and offers a response to therapy. Besides others one promising FDA approved drug to interfere with this pathway is the mTOR inhibitor Rapamycin.

Open Surgical Treatment of Indirect Carotid Cavernous Fistulas
Carl Heilman MD
Tufts Medical Center

Carl Heilman, MD

Indirect carotid cavernous fistulas are usually treated by CNS endovascular techniques. A transvenous approach for fistula closure is generally the preferred treatment modality. There are occasional patients with an indirect carotid cavernous fistula who have no good transvenous access to the site of the fistula. Over the past 30 years I have been asked to assist in the treatment of 9 carotid cavernous fistulas using open surgical techniques.

In four patients, I performed a superior ophthalmic vein cutdown for endovascular access to the cavernous sinus. In one patient, a sylvian fissure vein to sphenoparietal sinus was cannulated under direct vision via a pterional craniotomy. One patient underwent direct puncture of the anterior cavernous sinus for NBCA embolization. Finally, three patients underwent direct surgical obliteration of an indirect CC fistula by packing the fistula site with crushed temporalis muscle.

This presentation will focus on the three patients who underwent open direct fistula obliteration with crushed muscle. One CC fistula was closed through the anterior medial triangle, one through the supratrochlear triangle and one through Parkinson's triangle. The fistula was cured in each case. One patient developed a transient abducens palsy. Videos of two fistula obliterations will be shown.

Co-occurrence of remote intracranial aneurysms and dural arteriovenous fistulas – incidence, clinical presentation, and treatment

Carlos David, MD

Background The co-occurrence of remote intracranial aneurysms (rIAs) and dural arteriovenous fistulas (DAVF) is rare, and their relationship is not well established in the literature.

Objective The purpose of this study was to clarify the incidence, clinical presentation, treatments, and outcomes of rIAs associated with DAVFs.

Methods 128 subjects with DAVFs were retrospectively reviewed at two centers for the presence of rIAs. In the same period, 1110 subjects with IAs were studied for the presence of DAVF. Demographics, clinical symptoms, location of aneurysms and DAVFs, treatment, and follow-up outcomes were evaluated and compared with 28 cases from the literature.

Results Out of 128 subjects with DAVFs, 14 (10.9%) had a combined total of 19 rIAs and 18 DAVFs. Eleven of 14 (78%) patients had a history of arterial hypertension. Common presentations included headaches (n=7) and subarachnoid hemorrhage (SAH) associated with a ruptured rIA (n=4). Except for 3 low-flow DAVFs, all DAVFs were successfully treated either endovascularly (n=14) or surgically (n=1). Eight aneurysms were treated with and without stent-assisted coil embolization, and two aneurysms with only a flow diverter. Two aneurysms were treated with microsurgical clipping. The remaining unruptured aneurysms were observed for follow-up. There were no treatment complications. During follow-up, all untreated low-flow DAVFs decreased in size angiographically. Eleven patients had a mRS score of 0, two patients had scores of 1, and one patient had a score of 4. The incidence of DAVFs in IA cases was 11.5%.

Conclusions The incidence of rIAs in subjects with DAVFs is similar to DAVFs associated with IAs. In the

presence of rIAs, underlying collagen disorder may be a cause for DAVF development. Unlike IA, incidence of rIAs does not prefer gender. In our series the incidence of rIAs bleed is high and thus whenever possible, initial treatment should focus on rIA prior to addressing the DAVF.

Three-dimensional printing of cerebrovascular aneurysm models as an educational and hands-on training tool for neurosurgery residents and fellows.

Michael Kinsman, MD
Ahmad Masri, MD[1]; Ian Blat, BSRT[1, 2]; Christopher Park, BS[1]; Max Hardenbrook, BA, RN1; Michael Kinsman, MD[1]

[1]Department of Neurosurgery, The University of Kansas Health System
[2]Department of Neuroendovascular surgery, The University of Kansa Health System

Objective
Three-dimensional (3D) printing has evolved into a cost effective and invaluable educational and training tool in medical education. Many 3D models have already found application in neurosurgery, including in neuro-oncology and cerebrovascular. This study evaluates whether training using 3D printed models can increase neurosurgical trainees' knowledge and technical performance in endovascular approaches to aneurysm treatment.

Methods
We printed 3 separate 1:1 scaled; patient-specific models of cerebrovascular aneurysms on a Stratasys J750 using Agilus30 Clear resin. Print time was 35 hours and 50 minutes. Two models involved aneurysms of the anterior circulation (middle cerebral artery bifurcation aneurysm and an anterior communicating artery aneurysm) and the remaining model involving a basilar tip aneurysm. Using commercially available software applications, our team designed the models based on the computed tomography angiogram (CTA) scans. The final models were hollow, life-sized 3D replicas produced by a material jetting (UV Cured) printer that extended from the femoral artery to the site of pathology.

We conducted hands-on practice simulation sessions for the residents in various areas of neuroendovascular surgery under the guidance of two neuroendovascular neurosurgeons and the PI of this abstract (Kinsman). This was followed by a simulated treatment session during which each resident's technical performance was assessed using a global 5-point rating scale and pass/fail outcome derived from the objective structured assessment of technical skills (OSATS). Finally, each participating trainee evaluated the model and its application as a training tool.

Results
Training using the hollow life-sized 3D-printed models was performed by 8 trainees. The trainees' assessment was favorable for all 3 models, with all trainees noting the models' realism. Trainees agreed the models imparted a better understanding of the pathologies and improved technical skills for their endovascular treatment. During the simulated training sessions, each trainee scored high on the OSATS-derived global 5-points scale rubric with all residents obtaining a passing score.

Conclusion
Patient-specific 3D models of cerebrovascular aneurysms can aid the training and education of neurosurgery residents and fellows. They may improve both the knowledge of cerebrovascular pathology and improve technical proficiency in endovascular techniques used for treatment.

Surgical Revascularization for Extracranial Vertebrobasilar Disease: Indications and Techniques

Fady Charbel, MD

Background: Vertebrobasilar stenosis associated with a low flow state, is associated with a high risk of stroke recurrence. While further work is needed to identify the optimal strategy for intracranial disease, mostly due to the higher risks of interventions in that location, surgical interventions on the extracranial V1 to V3 segments are lower risk, effective, yet less familiar than endovascular techniques.

Methods: This report reviews a selected retrospective series of patients with symptomatic vertebrobasilar disease treated with surgical approaches to the V1 to V3 segments of the vertebral artery.

Results: Twenty-two patients presented with variable symptoms related to vertebral artery compromise. Surgical interventions were directed to the V1 (n=5), V2 proximal (n=4), V2 distal (n=8), V3 (n=2), or combined with other surgical or endovascular interventions (n=3). No patient had worsening in mRS, and all but one had resolution and/or no recurrence of their pre-operative symptoms

Conclusion: Surgical Revascularization techniques for Vertebrobasilar Disease are effective albeit likely underutilized. Increased knowledge of the indications and performance of these procedures may lead to wider implementation and potentially beneficial outcomes.

Treatment Outcomes for Unruptured Wide-Necked Middle Cerebral Artery Aneurysms: A Propensity-Matched Analysis from the Neurovascular Quality Initiative-Quality Outcomes Database (NVQI-QOD).

Kevin Cockroft, MD

Objective: Microsurgery (MS) has traditionally been the treatment of choice for unruptured, wide-necked middle cerebral artery (WN-MCA) aneurysms. However, continuing advances in endovascular devices have made endovascular treatment (EVT) a much more viable option. We examined the relative safety and efficacy of MS versus EVT for these aneurysms using data from NVQI-QOD.

Methods: NVQI-QOD, a multi-institutional prospectively collected outcomes registry, was queried for unruptured WN-MCA aneurysms treated between 2006 and 2022. Wide-neck was defined as aneurysm neck 4 mm or dome:neck ratio 2. Demographics, aneurysm characteristics, and safety data were recorded. Aneurysm occlusion status and modified Rankin score (mRS) at discharge and last follow up was evaluated. Propensity score matching (PSM) was utilized to match aneurysm size, number of aneurysms treated, patient age and aneurysm status (asymptomatic or symptomatic).

Results: Of 671 unruptured MCA aneurysms, 319 were wide-necked. Thirty operations were excluded as the aneurysm was previously treated. 289 operations in 282 patients were assessed (203 EVT, 86 MS). After PSM, there were 86 procedures in each group. The median aneurysm size was 5.6 mm (EVT) versus 5.3 mm (MS), p=0.243. Patients who underwent MS were more likely to have complete occlusion at discharge (90.4% vs. 58.8%, p<0.001). The median follow up was 404 days in the EVT group versus 157.5 days in the MS group (p=0.241). Patients who underwent EVT were more likely to have a mRS of zero at discharge (50/59, 84.8% versus 29/54, 53.7%, p<0.0003) and last follow up (36/55, 65.5% versus 13/36, 36.1%, p=0.006). Intra-operative (7% EVT vs. 3.5% MS, p=0.496) and post-operative (4.7% EVT vs. 7% MS, p=0.750) complication rates were similar.

Conclusion: In NVQI-QOD, patients undergoing MS for WN-MCA aneurysms were more likely to have complete aneurysm occlusion at discharge when compared to EVT patients. However, EVT patients had better functional outcomes at discharge and last follow up.

Vertebrobasilar flow evaluation by QMRA: hemodynamic VB insufficiency reversed with occipital artery to vertebral artery bypass (OA-V3 bypass)

Martin Sames, MD
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Introduction: Vertebrobasilar (VB) circulation stroke represent 30% of all ischemic stroke. Large artery disease is etiological factor in 32% according to posterior circulation registry (1). The aim of this study is to evaluate patients with recently symptomatic VB disease by QMRA and indicate them for active approach (endovascular of bypass revascularization).

Methods: Study protocol was inspired by Veritas study (2), we included patients with stroke or TIA in VB territory, CTA demonstration of ≥50% stenosis or occlusion of extracranial or intracranial vertebral or basilar artery. These patients were evaluated by quantitative MRA (QMRA NOVA) for flow measurement. Patients with QMRA flows evaluated as low (22% cumulative risk of recurrent stroke at 12 months) we indicated for more aggressive interventional therapy (stent, angioplasty or bypass).

Results: We evaluated 22 patients from 9/2019 to 9/2022 according to our protocol. Three patients (14%) were evaluated as "low flow" cases and were indicated for intervention: 2 patients for stenting, one patient for occipital artery-V3 bypass.
Discussion: We will present symptoms, diagnostic protocol and microsurgical technique of the OA-V3 bypass (3D animation, video)

Conclusion: QMRA is effective method for evaluating patients with VB disease and selecting high risk patients for revascularization procedure.

Literature:
1. Caplan et al. Ann Neurol, 2004
2. Amin-Hanjani S. JAMA Neurol, 2016

Intraarterial Verapamil for Neuroprotection in Ischemic Stroke

Kenneth Liebman, MD

Introduction
Neuroprotective efforts are paramount when dealing with acute ischemic stroke. Neuroprotective compounds used within 24 hours of stroke onset can help prevent cell damage and improve clinical outcomes. Verapamil is an FDA approved calcium channel blocker that has been administered as treatment of vasospasm. Preclinical studies have shown that verapamil is associated with reducing inflammation and protecting penumbra neurons from further damage and death. We are seeking to investigate the safety and efficacy of verapamil injection via intra-arterial delivery for neuroprotection in a clinical population.

Methods
Verapamil study patients are recruited based on inclusion criteria, including have experienced an acute ischemic stroke or computed tomographic scan consistent with acute cerebral ischemia. Investigators administered 10 mg verapamil during thrombectomy procedure and patients were followed up with as standard of care. The National Institutes of Health Stroke Scale was used as a predictor of patient outcome and Modified Rankin Scale was assessed to measure neurologic disability following stroke.

Results
The verapamil group included a total of 19 patients ranging in age from 38 to 75 years old with a mean of 60.5 years of age. All 19 patients presented with an MCA occlusion and underwent mechanical thrombectomy for acute ischemic stroke. Within the verapamil study group of seventeen patients, seven (41.2%) received tPA within 4.5 hours of symptom onset. Mean presenting NIHSS among total patients was 10.2±5.6, and the median was 11. Sixteen of the 17 (94.1%) total patients exhibited complete reperfusion with a score of TICI 2b/3.

Conclusions
Previous preclinical studies have supported the use of verapamil delivered IA for neuroprotection in treatment of vasospasm. This study suggests that verapamil is a safe and effective neuroprotective drug used in clinical populations that have experienced an ischemic stroke and require mechanical thrombectomy for treatment.

Emergent IV dye preparation

Mandy Binning, MD

Adverse reactions to intravenous (IV) dye contrast occur in about 5-8% of patients. The American College of Radiology (ACR) gives some guidelines for an accelerated four to five hour dye prep, but does not outline what to do in cases of emergent need for contrast studies such as trauma, pulmonary embolism, aortic dissection, or stroke (1). For stroke patients having a typical large vessel acute ischemic stroke, 120 million neurons, 830 billion synapses, and 714 km (447 miles) of myelinated fibers are lost each hour (2). Reported IV dye allergy can complicate necessary timely evaluation and rapid imaging of stroke patients. Our institution implemented a protocol to administer an emergent IV dye preparation for stroke alert patients requiring advanced neuroimaging. The emergent IV dye preparation consists of diphenhydramine 50 mg IV once, famotidine 20 mg IV once, and dexamethasone 10 mg IV once, followed immediately by Computed Tomography (CT) Angiography and/or CT Perfusion. In this concept paper, we describe the rationale for an emergent IV dye preparation protocol and report two case studies detailing patients with reported IV dye allergy who received the emergent preparation with no adverse outcomes where benefit outweighed the risk.

Who needs an automated programmable shunt dashboard? Your patients do!

Ruth Bristol, MD
Ruth Bristol MD, Katie Klas NP, Christian Manly PA-C, Vinay Vaidya MD

On March 21, 2022 Phoenix Children's Hospital launched a new, automated alerting system for patients with programmable shunts for hydrocephalus. Several of the most common programmable shunt valves for hydrocephalus are susceptible to the strong magnetic field of MRI. This results in unplanned changes in setting, which can adversely affect shunt function and therefore patient safety. These patients have required either a shunt x-ray or visit with a provider to confirm shunt setting after MRI. Unfortunately, due to the disparate scheduling systems, as in many hospitals, the radiology scheduling is not linked to the Neurosurgery scheduling, and the responsibility of coordinating visits has fallen on the patient. Historically, this has resulted in many missed visits or x-rays, occasionally resulting in patient harm.

Methods:
The Phoenix Children's Hospital Information Technology department developed a Dashboard Tool that aggregates data from the Electronic Medical Record (EMR) from multiple sources and multiple systems. The tool displays this data in near real-time in a visually intuitive manner that drives action. This data often comes from multiple sources that are typically difficult and time consuming for an end user to sort through and collate. This dashboard was paired with a HIPPA compliant text notification system. Once the patient has a significant event noted in their EMR containing the name of the shunt valve, a notification is sent to the on-call providers anytime ANY MRI is ordered on that patient. The dashboard then searches for a reprogramming note, and a report is sent to the managing providers on a daily basis to ensure that no vulnerable programmable valve is missed.

Results:
After implementation of the tool and alert system, the miss rate for programmable shunt valves has dropped from 24% to 0% over the past 12 months. In the 180 days prior to abstract submission, there were 113 MRIs completed. Four patients triggered the "missing reprogram" alert, but all were found to either no longer have a shunt, or have a note documented past the algorithm time frame. The dashboard can be viewed at any time by any neurosurgery provider. There are multiple fields that can be searched – such as date, location, and shunt type. Data such as upcoming scans is also available.

Conclusion:
The implementation of an automated alerting system for programmable shunts that are exposed to MRI will significantly decrease morbidity for our neurosurgical patients. Following tool implementation, it has accurately identified all patients. Moreover, it relieves the patient and providers' office of the responsibility for coordinating visits, thus eliminating call backs and multiple trips for shunt reprogramming.

Behavioral improvements following lesion resection for pediatric epilepsy: pediatric psychosurgery?

Howard Weiner, MD

Introduction: Resection of brain lesions causing refractory epilepsy to achieve seizure control is well-accepted. However, concurrent behavioral effects of these lesions such as changes in mood, personality, and cognition have not been well characterized. We describe 5 such children with epileptogenic lesions and significant behavioral abnormalities which resolved after surgery.

Objectives: To describe behavioral improvements after lesionectomy in pediatric patients with brain lesions causing refractory epilepsy.

Methods: Retrospective chart review was performed for clinical, radiographic and pathologic features (IRB H-51678).

Results: Of 638 brain tumor patients treated between 2017 and 2022, five (ages 3-14 years) with major behavioral abnormalities and lesional epilepsy were identified. Behavioral problems included academic impairment, impulsivity, self-injurious behavior, and decreased social interaction with diagnoses of ADHD, oppositional defiant disorder, and autism. Pre-operative neuropsychiatric testing in 4/5 patients revealed low-average cognitive and intellectual abilities for their age, attentional difficulties, and poor memory. Lesions were located in the temporal (2 gangliogliomas, 1 JPA, 1 cavernoma) and parietal (1 DNET) lobes. GTR was achieved in all cases. At mean 1-year follow-up, seizure freedom (Engel 1a in 3 patients, Engel 1c in 2 patients) and significant behavioral improvements (academic performance, attention, socialization, and aggression) were achieved in all. Two patients manifested violence pre-operatively; one had extreme behavior with violence towards teachers and peers despite low seizure burden. Since surgery, his behavior has normalized.

Conclusion: We identified five patients with severe behavioral disorders in the setting of lesional epilepsy, all of whom demonstrated improvement after surgery. The degree of behavioral abnormality was disproportionate to epilepsy severity, suggesting that these lesions may impact behavior by a network mechanism distinct from epilepsy. We propose a novel paradigm in which lesionectomy may offer behavioral benefit even when seizures are not refractory. Thus, behavioral improvement may be an important novel goal for neurosurgical resection in children with epileptic brain lesions.

THE SOCIETY OF UNIVERSITY NEUROSURGEONS

The Genomics of Trigeminal Neuralgia With and Without Neurovascular Compression

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Methods:
Eight neurosurgical centers from US (6), Canada (1), and England (1) collaborated to determine if there was evidence of any genetic predisposition to the development of Type 1 Trigeminal Neuralgia (TN1). DNA samples were collected from 781 patients and compared to 827 controls. Analysis was primarily by Genome Wide Association Study (GWAS), and a smaller group (100) by Whole Genome Sequencing (WGS). Patients were characterized as having neurovascular compression (WNVC), or without NVC (WONVC) according to the Sindou scale (Grade 1-3). A subset of 299 patients (227 WNVC and 72 WONVC) were separately analyzed for genetic association with NVC.

Results:
There was a strong association of KCNK10 (aka Trek2) a GABA-B receptor agonist, with TNNVC (Log10 p > 0.00000005 [7.3]), and to a smaller extent for TENM3 (nervous system connectivity) (Log10 p > 0.000001 [6.0]). There was also a strong association with LRP1B (maturation and activation of oligodendrocytes) in the subgroup of patients WONVC (Log10 p > 0.00000005 [7.3]). Further, a validation study for NVC presence or severity was carried out at OHSU with NVC scored from video recordings of the procedure. This study showed no statistically significant differences in the associations for WNVC and WONVC for the three genes (KCNK10, TENM3 and LRP1B). The impact of gender and age was also examined, and we found that young onset female patients (< 45 yo) with TN1 carry a missense variant that changes an amino acid in BDNF and an antisense variant that that strongly effects the amount of BDNF protein (OR 5.1 p = 0.00000012).

Conclusions:
TN1 genetic associations are influenced by: (1) Presence or absence of NVC (KCNK10, LRP1B), (2) Gender and age of onset (BDNF). We conclude that while TN can be associated both with and without NVC, different gene polymorphisms are strongly associated in TN patients WNVC (KCNK10 [TREK-2}) and WONVC (LRP1B & TENM3). Gender and age also play a major role in the genomics of trigeminal neuralgia in that young females WONVC have a polymorphism in the BDNF regulatory region. Therefore, genetic variants are a major factor in the development of TN1, and while NVC plays an important role, genomic polymorphisms also have a strong influence in the disorder. TN1 appears to be a phenotype with multiple etiologies

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Malignant scalp tumors with cranial extension: multidisciplinary surgical strategies and outcomes

Ian McCutcheon, MD

Objective. Malignant skin cancers of the scalp may exhibit calvarial invasion, dural extension, and rarely cerebral involvement. Typically, such lesions involve a multi-disciplinary approach involving neurosurgery and plastic surgery for optimal resection and reconstruction. We present a retrospective analysis of patients with scalp malignancies who underwent resection and reconstruction.

Methods. Patients presenting with scalp malignancies (1993-2021, n=84) who required neurosurgical assistance for tumor resection were prospectively entered into a database. These data were retrospectively reviewed for this case series. We classified the extent of neurosurgical resection into four levels of involvement: scalp (level I), calvarial (level II), dural (level III), or intraparenchymal (level IV). Complications and evidence of local, locoregional, or regional recurrence were documented.

Results. Patients underwent resection to level I (n=2), level II (n=61), level III (n=13), and level IV (n=8). At a mean follow-up of 35.5 ± 45.9 months, overall survival was 48.8% (n=41) and recurrence-free survival was 51.2% (n=43). Scalp-based reconstruction involving plastic surgery was performed in 75 (89.3%) patients. The most commonly used free flap was a latissimus dorsi flap (n=46, 61.3%). One or more postoperative complications occurred in 29.8% of all patients, the most common being wound dehiscence and delayed wound healing in 13% (n=11). Our analysis suggests that aggressive resection (level II and higher) is effective at reducing locoregional recurrence and is not associated with a higher risk of complications relative to resection without craniectomy.

Conclusions. Our study is the first attempt to classify the extent of neurosurgical resection for malignant scalp tumors with intracranial extension and the largest series describing their treatment.

A multidisciplinary approach with aggressive neurosurgical resection is associated with good outcomes despite invasive disease on presentation. Neurosurgical intervention should include the entire area of calvarial, dural, or even parenchymal involvement in order to prevent local recurrence of these tumors.

Race-specific survival disparities in patients with glioblastoma

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· Background: Emerging reports have shown differences in glioblastoma survival derived by race and different proxies of socioeconomic status (SES) among other demographics. Nevertheless, the causes behind these survival differences remain largely elusive. Moreover, studying racial disparities in the context of distinct tumor biology remains an unmet need in glioblastoma research.

· Methods: We retrospectively reviewed charts adult glioblastoma patients who presented to our institution from 2008 to 2019. Various prognostically-significant variables were obtained to test our hypothesis. Then, we conducted multimodal statistical analyses with median overall survival (mOS) as the primary outcome of interest.

· Results: A total of 995 patient met inclusion and exclusion criteria, of whom 117 (11.7%) patients were African Americans (AAs). The mOS of the entire cohort was 14.23 months. Univariate survival analysis depicted age, race, insurance, income, IDH, MGMT, surgical resection, and chemoradiotherapy as potentially significant variables dictating prognosis. Our multivariate regression analysis indicated that AAs were more likely to survive as compared to their white counterparts with glioblastoma. This survival difference remained significant even after accounting for the missing molecular data. However, when evaluating the impact of interactions between SES and race, AAs with low SES had significantly lower mOS as compared to their white peers.

· Conclusions: Our findings indicate significant differences in survival among races which cannot be fully attributed to access to care. Further studies should be conducted to explore the differences in tumor biology and response to therapy in different races affected by glioblastoma as well as cause-specific death among the disadvantaged groups.

Targeted gene expression profiling predicts meningioma outcomes and radiotherapy responses

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Background
Surgery is the mainstay of meningioma treatment, the most common primary intracranial tumor. Improvements in risk stratification are needed and indications for postoperative radiotherapy are controversial. Recent studies proposed prognostic meningioma classification systems using DNA methylation profiling, copy number variants, DNA sequencing, RNA sequencing, histology, or models based on multiple features. Targeted gene expression profiling has generated robust biomarkers for other cancers but is understudied in meningioma.

Methods
Targeted gene expression profiling was performed on 173 meningiomas and an optimized gene expression biomarker (34 genes) and risk score (0 to 1) was developed to predict clinical outcomes. Clinical and analytical validation was performed on 1683 independent meningiomas from 12 institutions

across 3 continents, including 103 meningiomas from a prospective clinical trial. The gene expression biomarker was compared against 9 other meningioma classification systems.

Results
The gene expression biomarker improved discrimination of meningioma outcomes compared to all other classification systems in the independent clinical validation cohort (N=866 meningiomas, 6 institutions) for local recurrence (5-year area under the curve [AUC] 0.81) and overall survival (5-year AUC 0.80). The increase in area under the curve compared to the current standard of care, World Health Organization 2021 grade, was 0.11 for local recurrence (95% confidence interval [CI] 0.07-0.17, P<0.001). The gene expression biomarker identified meningiomas benefiting from postoperative radiotherapy (hazard ratio 0.54, 95% CI 0.37-0.78, P=0.0001), and re-classified up to 52.1% meningiomas compared to conventional clinical and histological criteria, suggesting postoperative management could be refined for 29.8% of patients.

Conclusions
A targeted gene expression biomarker improves discrimination of meningioma outcomes and predicts postoperative radiotherapy responses.

Petroclival meningiomas: An analysis on outcomes, complications, and recurrence rates - A Personal experience

Anil Nanda, MD

Introduction
Given the demanding nature of petroclival meningiomas and their association with the critical neurovascular structures, these lesions are technically challenging.

Objective
Emphasis was placed on evaluating modes of presentation, surgical approaches, postoperative neurological outcome, complications, and recurrence rates.

Methods
Eighty patients underwent surgical treatment. The majority of them were women (65%). Authors retrospectively reviewed the patients' medical records, imaging studies, and pathology reports between 1993 and 2021.

Results
Headache was the most common presentation (62.5%). The frequently used approach was transpetrous (33.75%), followed by orbitozygomatic (26.25%). Gross-total resection was performed in 34 patients (42.5%), and the remaining had a residual tumor (57.5%). Twenty-eight patients with remnants were treated with Gamma Knife surgery. Thirty patients had post-operative cranial neuropathies. The most common cranial nerve (CN) deficit was CN III dysfunction (22.5%), and facial weakness (17.5%). CN dysfunction was transient and permanent in 14 (46.7%), and 9 (30%) patients, respectively. Twelve patients developed hydrocephalus requiring ventriculoperitoneal shunt. CSF leak was noted in 4 patients. Adequate radiographic follow-up (minimum 6 months) was available for 54 patients (67.5%). The mean follow-up was 38 months. In eleven patients, tumor progression or recurrences were noted. The median time to recurrence was 87 months. At discharge, 91.5% had good outcomes (GOS Scores 4 and 5). Four patients died of causes unrelated to surgery.

Conclusion
The authors' primary surgical goal was to attain maximal tumor resection while preserving or improving neurological function and favored the treatment of residual or recurrent tumors with stereotactic radiosurgery.

Early experience with simultaneous cochlear implantation and microsurgical resection of acoustic neuroma

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Single- sided deafness is a significant morbidity associated with vestibular schwabbomas. Cochlear implants can rehabilitate hearing if the cochlear nerve is intact. In two patients a cochlear implant was placed and used to elicit electrically evoked direct cochlear nerve and auditory brainstem response (eABR) monitoring during translabyrinthine microsurgical resection of acoustic neuroma. Both patients had non-useful hearing and non-monitorable ABRs prior to surgery. Following a translabyrinthine approach the cochlear implant was placed and tested to identify signal capture and the presence of a monitorable eABR. Once achieved, the tumor was surgically resected during continuous monitoring. In both instances a total tumor removal was accomplished

with the eABRs being maintained. Testing at one-month postop patient 1 had 16% word recognition score (WRS) (0% preop) while patient 2 had a 98% WRS (24% preop). Full patient details and surgical steps will be discussed.

Results
The gene expression biomarker improved discrimination of meningioma outcomes compared to all other classification systems in the independent clinical validation cohort (N=866 meningiomas, 6 institutions) for local recurrence (5-year area under the curve [AUC] 0.81) and overall survival (5-year AUC 0.80). The increase in area under the curve compared to the current standard of care, World Health Organization 2021 grade, was 0.11 for local recurrence (95% confidence interval [CI] 0.07-0.17, P<0.001). The gene expression biomarker identified meningiomas benefiting from postoperative radiotherapy (hazard ratio 0.54, 95% CI 0.37-0.78, P=0.0001), and re-classified up to 52.1% meningiomas compared to conventional clinical and histological criteria, suggesting postoperative management could be refined for 29.8% of patients.

Conclusions
A targeted gene expression biomarker improves discrimination of meningioma outcomes and predicts postoperative radiotherapy responses.

Expanded endoscopic transsphenoidal surgery: Developing confidence in tumor resection and reconstruction.

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Abstract:
Expanded endoscopic transsphenoidal surgery (EETS) has been increasingly used in the resection of tumors located along the sella and other skull base locations. Over the years, the EETS technique has undergone significant advancements in terms of tumor resection and reconstruction, leading to improved surgical outcomes and enhanced patient recovery.
We present our team's experience in progressive expansion of our endoscopic endonasal transsphenoidal surgical practice. We seek to share our experience in developing more confidence and attempt to identify key factors in developing such a program. Our learning curve of EETS, including remaining safe with the tumor resection and complete with reconstruction techniques, will be detailed. Our results over the past decade will be highlighted in successive intevals of time. The evolution of reconstruction with the nasoseptal flap and a deeper understanding of the anatomy using cadaveric work have contributed to pushing the boundaries of the technique by our team. The cadaveric studies allow surgeons to gain a better understanding of the complex anatomy of the skull base region, enabling them to develop a more precise and effective surgical approach. Understanding anatomy from a different perspective, along with the technological advancements, including a variety of endoscopes and neuronavigation, allowed surgeons to push the boundaries.

We describe our experience with expanded endoscopic transsphenoidal surgery and, more specifically, highlight our progress in safely removing lesions requiring a more expanded approach. We also describe case examples of more complex pathology removed via this approach.

Falcotentorial Meningiomas: Maximizing Extent of Resection and Avoidance of Venous Complications via the Interhemispheric Precuneal Retrosplenial Transfalcine Transtentorial Approach with Endoscopic-Assistance

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Falcotentorial meningiomas are rare tumors of the pineal region that arise from the dural folds where the falx and tentorium meet and are often intimately related to the vein of Galen and straight sinus. These lesions often present with signs and symptoms related to hydrocephalus and brainstem compression. Surgical resection of falcotentorial meningiomas remains the definitive treatment, with a variety of surgical approaches used to resect these lesions. The choice of approach depends on several factors, including the size and location of the tumor relative to the vein of Galen complex. Falcotentorial meningiomas can be technically challenging to remove with significant risk of morbidity because of the close proximity to and occasional invasion of the vein of Galen and straight sinus. In paper, the author describes the operative nuances for resection of challenging falcotentorial region meningiomas via the interhemispheric precuneal retrosplenial transfalcine transtentorial approach with endoscopic-assistance. The surgical

nuances are discussed, including the surgical anatomy, gravity-assisted interhemispheric approach in the lateral position, retrocallosal dissection, transfalcine exposure, tumor removal, and preservation of the vein of Galen complex. The surgical outcomes are presented in 8 patients.

Intraoperative language mapping utilizinggamma-band modulations of electrocorticogram (ECoG) induced by word/tone categorization task: comparison with cognitive-linguistic tasks and reproducible speech arrests induced by Direct Cortical Stimulation (DCS)

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OBJECTIVE: Determination of the feasibility of using gamma-band modulations observed from electrocorticogram (ECoG) recording induced by linguistic tasks with different levels of complexities for intraoperative functional language mapping during temporal lobe tumor resection surgeries.

METHODS: Three subjects (age 56, 60, 64 years) with left temporal lobe glioma underwent surgery involving awake craniotomy. All of them were monolingual native American English speakers. A 4x8 ECoG electrode grid (2.3mm contact exposure, 1cm pitch) was placed above the respective tumor area. A MATLAB-Simulink based real-time software system running on a portable laptop computer was used to map gamma-band modulations as a 2D heat map while the subjects engaged in different linguistic tasks. The tasks included word/tone categorization by pressing a button or verbal response; verbally responding to visual object and action naming, written descriptive naming, and auditory descriptive naming. Auditory stimulus was applied during word/tone categorization task (duration 300 ~ 500ms) and auditory descriptive naming (> 1s). But these tasks had different level of complexities: during the categorization task the auditory stimuli were single words (nouns, verbs) and tones (pure tone, piano chords) which the subjects had to recognize and categorize as either word or tone, while during auditory naming task the stimuli were complete interrogative sentences which subjects had to answer using a single word. The other naming tasks involved visual stimulus only, including reading aloud and naming to written descriptions, and naming pictured objects or actions. Combination of these tasks are used to map the functional areas involved in different modalities of linguistic processing: comprehension/listening, speaking, and reading. The subjects repeated the four naming tasks while bipolar DCS (2/4/6 mA, 60Hz, 2s) was applied at different electrode pairs. RESULTS: The electrodes having strongest gamma-band modulations were distinct for different tasks. Despite the differences in task complexities, cortical regions activated by word stimuli and the auditory naming task were similar. Across the subjects, the auditory stimuli modulated superior and middle temporal gyrus (STG, MTG) activations. Other naming tasks induced gamma-band modulations in posterior MTG (pMTG) with written descriptive naming task inducing additional long latency activations around STG. This shows probable indication of STG being involved in higher level cognitive-linguistic processing. Reproducible speech arrests occurred during object, action, and auditory naming tasks while stimulating specific electrode pairs, even though not all these electrodes had strong activations during the tasks. Speech arrests occurred while stimulating STG (two subjects: during object, auditory naming for subject 1 and action naming for subject 2) and pMTG (one subject; during object, action and auditory naming). This indicates that there is considerable inter-person variability of language areas identified with DCS, despite the similarity of task-specific gamma-band modulated regions across subjects. Moreover DCS alone cannot localize the entire eloquent cortex involved in different modalities of language processing.

CONCLUSION: Intraoperative language mapping guided by gamma-band ECoG modulations induced by word/tone categorization tasks can be utilized to localize eloquent cortex associated with auditory processing, especially in patients that may be unable to perform more complex cognitive-auditory mapping paradigms. This task together with DCS mapping guided by picture naming tasks can be implemented to map the eloquent cortical language areas and aid in reducing post-operative language deficits.

Allograft Nerve Repair Following Nerve Sheath Tumor Resection

Eric Zager, MD

Acellularized nerve allografts (ANA's) have been developed as substitutes for nerve autograft to promote nerve regeneration after surgical repair.

In this presentation, we demonstrate operative techniques for using ANA's to repair potentially functional nerve fascicles during tumor resection. A 67-year-old female with schwannomatosis requested resection of a painful enlarging mass of the left ulnar nerve proximal to the elbow. During surgery, neuromonitoring suggested that fascicles entering the tumor could be functional. Therefore, nerve allograft was used to repair the transected fascicles. The patient recovered with full strength and sensation in the ulnar nerve distribution, with resolution of her preoperative symptoms.

After fresh transplanted nerve allografts were first shown to be as efficacious as autologous nerve, decellularization techniques have since been developed to avoid the need for immunosuppression during host axonal regeneration. These processing techniques allow the allografts to retain the extracellular matrix and endoneurial architecture of the native nerve, which promote cell migration, nerve fiber elongation and axonal outgrowth. ANA's are now widely available and approved for clinical application in a variety of sizes, to facilitate nerve repair techniques for sensorimotor deficits. In this case, allograft nerve was used to repair potentially functional nerve fascicles after nerve sheath tumor resection. Postoperatively the patient had full strength and sensation in the ulnar nerve distribution. Pathology revealed W.H.O. Grade I schwannoma.

A Pro-oncogenic Lentiviral Swine Model of Spinal Cord Glioma
Mohib Tora PhD and Nicholas M Boulis MD

Nicholas Boulis, MD

Background: The current literature does not describe well-characterized topical large mammalian models of spinal cord glioma (SCG) for use in pre-clinical neurosurgical studies. Prior work has applied driver mutations targeting the RTK/RAS/PI3K and p53 pathways to induce the formation of high-grade gliomas in rodent models. The present study reports our efforts at modeling high-grade SCG in the minipig using lentiviral gene transfer.

Methods: Six Gottingen Minipigs received thoracolumbar (T14-L1) lateral white matter injections of a combination of lentiviral vectors, expressing platelet-derived growth factor beta (PDGF-B), constitutive HRAS, and shRNA-p53. Animals underwent baseline and endpoint magnetic resonance imaging (MRI) and were evaluated daily for clinical deficits. Hematoxylin and eosin (H&E) and immunohistochemical (IHC) analysis was conducted and comparisons of the tumor core and leading edge. Data are presented using descriptive statistics including relative frequencies, mean, standard deviation. Statistical comparisons between tumor core and leading edge were conducted using two-way ANOVA and Tukey's Post-Hoc, where $P < 0.05$ considered statistically significant(Prism Graphpad 9, San Diego, CA).

Results: 100% of animals (n = 6/6) developed quantifiable clinical motor deficits ipsilateral to the oncogenic lentiviral injections by a pre-determined 3-week endpoint. MRI scans demonstrated contrast enhancing mass-forming lesions at T-14-L1. Neuropathologic features demonstrate consistent and reproducible growth of a high-grade glioma with astrocytic morphology in all animals. Ki-67 index was highly immunopositive across all tumors, with a mean of 37.1% (SD: 14.2). The tumors were grossly immunopositive for SOX2, Olig2, and NG2, and were immunonegative for PDGFRA. We observed statistically significant differences in Ki-67, SOX2, Olig2, and NG2 ($P<0.001$) immunopositivity in comparing the tumor core and leading edge, but not PDGFRA. RNA-sequencing and gene-set enrichment analysis demonstrated statistically significant enrichment of mesenchymal and classical glioma subtypes using Verhaak, Neftel, and Suva gene sets ($P<0.05$) and several hallmark pathways.

Conclusions: Utilization of vector driven gene transfer offers a feasible pathway to glioma modeling in large mammalian models. The present minipig model is the first vector induced pig model of high-grade SCG and may potentially be used in pre-clinical neurosurgical development programs.

Surgical Management of Complex Cervical Deformity

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The cervical spine harbors unique biomechanical properties. Any alteration of alignment from degenerative spondylotic disease, traumatic, infectious, or oncological etiologies, can lead to a cascade of debilitating pain & deformity. In such situations, the cervical spinal cord is often draped over segments of kyphosis, lending to signs & symptoms of stretch myelopathy.

Within this presentation, we will aim to define the different subtypes of cervical deformity. Short video vignettes will accompany case examples, displaying a variety of deformity correction techniques & technical nuances.

By the end of this presentation, the audience should gain a basic understanding of the classification, workup, and surgical correction techniques of cervical deformity.

Can I Use EMG Guidance for Pedicle Screw Placement in Awake Spine Surgery?

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Background: Triggered electromyography (tEMG) is an intraoperative neuromonitoring technique used to assess pedicle screw placement during instrumented fusion procedures. Although spinal anesthesia is a safe alternative to general anesthesia in patients undergoing lumbar fusion, its use may potentially block conduction of triggered action potentials or may require higher threshold currents to elicit myotomal responses when using tEMG. Given the broad utilization of tEMG for confirmation of pedicle screw placement, adoption of spinal anesthesia may be hindered by limited studies of its use alongside tEMG.

Objective: To investigate whether spinal anesthesia affects the efficacy of tEMG, we compare the baseline spinal nerve thresholds during lumbar fusion procedures under general vs spinal anesthesia.
Methods: Twenty-three consecutive patients (12 general and 11 spinal) undergoing single-level transforaminal lumbar interbody fusion were included in the study. Baseline nerve threshold was determined through direct stimulation of the spinal nerve using tEMG.

Results: Baseline spinal nerve threshold did not differ between the general and spinal anesthesia cohorts (3.25 ± 1.14 vs 3.64 ± 2.16 mA, respectively; P = .949). General and spinal anesthesia cohorts did not differ by age, body mass index, American Society of Anesthesiologists score status, or surgical indication.

Conclusion: We report that tEMG for pedicle screw placement can be safely and effectively used in procedures under spinal anesthesia. The baseline nerve threshold required to illicit a myotomal response did not differ between patients under general or spinal anesthesia. This preliminary finding suggests that spinal anesthetic blockade does not contraindicate the use of tEMG for neuromonitoring during pedicle screw placement.

Preliminary Results with the Cerevasc eShunt Implant in the Treatment of Normal Pressure Hydrocephalus (NPH), Aneurysmal Subarachnoid Hemorrhage (SAH) Related Hydrocephalus and Idiopathic Intracranial Hypertension (IIH)

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Introduction: NPH, hydrocephalus due to aneurysmal SAH, and IIH have all been treated historically with ventriculo-peritoneal (VP) shunt surgery. VP shunts require catheter placement through brain tissue and can be complicated by shunt infection, malfunction, hemorrhage and/or over-drainage. We recently described the first percutaneous transfemoral deployment of an endovascular CSFshunt via a transvenous approach to treat post SAH communicating hydrocephalus (eShunt® System; CereVasc, Inc., Auburndale, MA, USA). The eShunt drains CSF from the cerebellopontine angle cistern to the jugular vein. Here we present our initial multi-center clinical experience with use of the eShunt implant for NPH, post SAH communicating hydrocephalus and one case of IIH.

Methods: Two separate trials are ongoing for the use of the eShunt. In the SAH related hydrocephalus trial, patients were included if they demonstrate elevated sustained ICP upon clamping of their EVD and have inferior petrosal sinus anatomy suitable for eShunt deployment. ICP was measured continuously before and after deployment of the eShunt implant via the EVD for 36 hours to evaluate for resolution of elevated ICP. Primary endpoint was reached when the ICP remained below 20 cmH2O consistently at which point

the EVD was removed. NPH patients were a candidate if they demonstrate sufficient gait improvement with lumbar drainage and have inferior petrosal sinus anatomy that enables eShunt deployment. Outcomes were assessed for gait using the Timed Up & Go (TUG) test, cognitive function using the Montreal cognitive assessment (MoCA), and urinary incontinence using the Neurogenic Bladder Symptom Score (NBSS). Results were normalized on a per-patient basis to pre-treatment scores. A composite outcome score (COS) was computed with equally weighted changes in TUG/MOCA/NBSS. Clinical examination was performed pre- and post-treatment and at 30-, 90-, and 180-days. In both trials, CT imaging of the brain was obtained immediately post-eShunt placement to rule out procedural hemorrhage.

Results: Nineteen patients have been treated with the eShunt to date. Seven with post SAH hydrocephalus, eleven with NPH and one compassionate use case of IIH. All seven patients in the SAH trial achieved the primary endpoint enabling removal of all EVD catheters by 36-48 hours following eShunt placement. Mean ICP rapidly decreased from pre-procedural clamping pressure of 33.4 to 13 cmH2O within 1 hour ($p<0.0001$) and progressively decreased to 9 cmH2O ($p<0.0001$) at 36 hours post eShunt placement. Preliminary follow-up data in the NPH trial has shown significant improvement in gait with TUG test improving by 35.4% at 30-days (n=6, $P<0.003$), 24.8% at 90-days (n=6, $p<0.03$) and by 32.8% at 180-days (n=4, $p<0.01$) compared to baseline (Figure 1). MOCA and NBSS showed significant improvements at 30-days and the COS was significantly improved at all time points ($p<0.005$ at 30-, 90- and 180-days). There have been no hemorrhages seen on the post procedure CT scan or unexpected readmissions or revisions in patients who underwent eShunt procedure during this early follow-up
phase.

Conclusion: These early results suggest a future role for the less invasive percutaneous endovascular approach provided by the eShunt system in the post SAH hydrocephalus and NPH patient population.

Where does surgical resection and radiosurgery fall short for large metastatic brain lesions?

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Introduction:
There is ongoing debate about the optimal treatment for large metastatic lesions of the brain and whether the most efficacious treatment is neurosurgical resection, radiosurgery, or systemic therapy. Recent treatment paradigms have been shown to produce excellent local control of these lesions and while it is known that these current paradigms work well for smaller brain metastases, there have been no studies identifying and quantifying lesion characteristics where efficacy and local control suffers.

Objective:
To present our institution's clinical outcomes with large brain metastases utilizing a combination of surgical resection, radiosurgery, and systemic therapy to identify lesions that are more at risk for poor tumor control.

Methods:
We retrospectively identified patients who received surgical resection and/or hypofractionated Gamma Knife radiosurgery (HF-GKRS) between 2017 and 2022 for the treatment of metastatic brain tumors greater than 10cc. Clinical, treatment, and radiological data was collected. Local failure (LF) events were examined, and independent factors associated with subsequent local failure were identified.

Results:
105 lesions greater than 10cc (in 97 patients) were treated and the median patient follow-up was 10.1 months. The median gross tumor volume was 15.8cc (range 10.1-62.4). Prior surgical resection was performed on 49 lesions (54%). Tumor volume larger than 33.5cc ($p=0.029$; LF rate 38%) and radioresistant histology ($p=0.047$; LF rate 54%) were associated with increased risk of LF ($p=0.018$) whereas prior surgical resection did not correlate with increased risk of LF ($p=0.642$).

Conclusion(s):
We present our experience treating large BM greater than 10cc using a combination of neurosurgical resection and HF-GKRS. We identified that BM that are greater than 4cm in diameter and of radioresistant histology (primary origin of gastrointestinal adenocarcinoma, melanoma, or renal cell carcinoma) are especially prone to local failure; hence, a more aggressive neurosurgical, radiosurgical, and systemic therapy approach should be utilized in such scenarios.

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